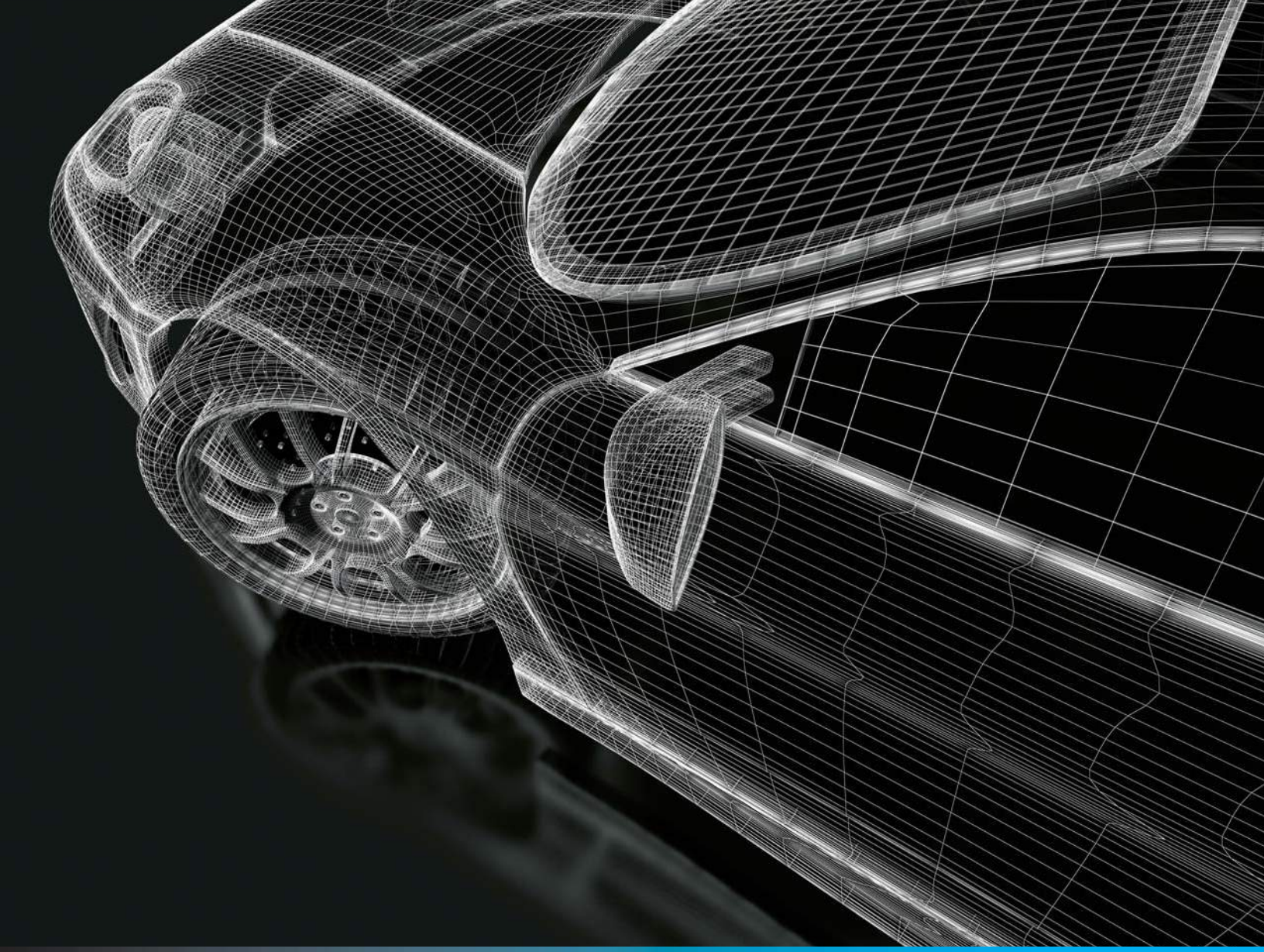


AUTOMOTIVE PRODUCTS CATALOG

AEC-Q200 QUALIFIED

CERAMIC CAPACITORS
TANTALUM CAPACITORS
NIOBIUM OXIDE CAPACITORS
CONDUCTIVE POLYMER CAPACITORS
FILM CAPACITORS
RF/MICROWAVE COMPONENTS
MULTILAYER VARISTORS
NTC THERMISTORS
TIMING DEVICES
CONNECTORS

AVX®

Version 18.10

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AVX®

AVX is a worldwide leading supplier of passive components for the automotive industry.

We offer a wide range of components manufactured to the highest quality and reliability standards of the automotive industry. Our products include ceramic, tantalum, and film capacitors, inductors, varistors, thermistors, filters, couplers, connectors, and timing devices.

Our long track record, and more than 30 years of expertise in automotive products, enable customers to rely on AVX as the one stop source for passive components needs.

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With our expanding portfolio of automotive products, and our focus on quality, reliability, research, and development, AVX is committed to supporting the automotive industry's needs today and into the future.

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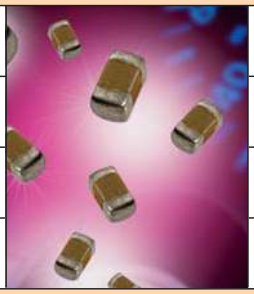
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AUTOMOTIVE SERIES SMT CERAMIC CAPACITORS

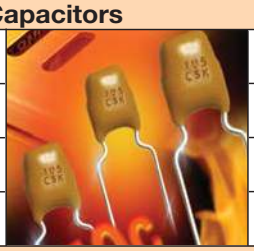
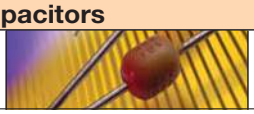
Dielectric	Fig.	Max Operating Temp	Capacitance Range	Voltage Range	Description	Page
Tin Termination						
NP0		+125°C	1pF – 4.7nF	25V – 100V	Low ESR, wide range of capacitance values, voltage ratings and dielectrics. NP0 capacitors offer highly stable voltage and temperature characteristics. X7R capacitors offer higher capacitance values. These capacitors are also available with voltage ratings up to 3000V. X8R/X8L parts are designed for high temperature applications up to +150°C. FLEXITERM® available for X7R and X8R.	11
X7R		+125°C	220pF – 22µF	16V – 500V		12
X7R High Voltage		+125°C	100pF – 0.15µF	600V – 3000V		13
X8R/X8L		+150°C	330pF – 1µF	25V – 100V		14
FLEXITERM®						
X7R		+125°C	270pF – 22µF	16V – 200V	FLEXITERM® is designed to enhance the mechanical flexure and temperature cycling performance. Board flexure - 5mm bend test guaranteed Increased temperature cycling performance, 3000 cycles and beyond.	15
FLEXISAFE™						
X7R		+125°C	1nF – 470nF	16V – 100V	Probably safest MLCC in the world. Combines FLEXITERM® layer in conjunction with the cascade design for improved reliability.	16
ESD-Safe™						
X7R		+125°C	4.7nF – 2.2µF	25V – 100V	MLCCs designed to withstand electrostatic discharge (ESD). Provides ESD protection through transient voltage integration.	17
IPC Array						
NP0		+125°C	1pF – 470pF	16V – 100V	Space saving array type capacitors available in wide range of voltage and capacitance combinations. Available also with FLEXITERM® for X7R and X8R.	18-19
X7R		+125°C	220pF – 100nF	10V – 100V		

LOW INDUCTANCE CERAMIC CAPACITORS (LICC)

Dielectric	Fig.	Max Operating Temp	Capacitance Range	Voltage Range	Description	Page
AEC-Q200 LICC						
X7R		-55°C to +125°C	1nF – 2.2µF	6.3V – 50V	Low inductance ceramic capacitors for automotive applications available in 0306, 0508 and 0612 case sizes."	20-23

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AUTOMOTIVE SERIES RADIAL AND AXIAL CERAMIC CAPACITORS

Dielectric	Fig.	Max Operating Temp	Capacitance Range	Voltage Range	Description	Page
Radial Leaded Capacitors						
NP0		+125°C	1pF – 8200pF	50V – 200V	AVX leaded MLCCs offer offer robust mechanical shock and vibration characteristics, exceptional thermal resistance and proven reliability and quality. With a wide range of dielectric materials, capacitance values, voltage ratings and lead styles. Both dipped and molded configurations are available.	25
X7R		+125°C	470pF – 4.7µF	50V – 100V		26
X7R High Voltage		+125°C	470pF – 10nF	1000V-3000V		28
X8R		+150°C	1nF – 330pF	50V		27
Axial Leaded Capacitors						
X7R		+125°C	10nF – 100nF	50V – 100V	Axial version of the leaded epoxy coated capacitors. Both dipped and molded configurations available.	29-30

AUTOMOTIVE EMI FEEDTHRU FILTER CERAMIC CAPACITORS

Dielectric	Fig.	Max Operating Temp	Capacitance Range	Voltage Range	Description	Page
NP0 and X7R		+125°C	22pF – 47pF	50V – 100V	Capacitors with excellent filtering capability thanks to the feedthru T filter design.	31-36

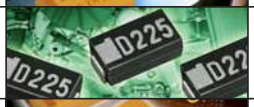
RF/MICROWAVE COMPONENTS

Product	Fig.	Max Operating Temp	Value Range	Voltage Current Power Rating	Description	Page
Capacitors						
U Series		+125°C	0.2pF – 1.0nF	50V – 200V	AEC-Q200 qualified RF ceramic capacitors. Uniquely designed for RF applications requiring low ESR.	38-39
Accu-P®		+125°C	0.05 – 68pF	10V – 200V	Thin film capacitors offer the tightest tolerance and highest precision in the industry. Continuous capacitance values available.	40-64
SQ Series		+125°C	0.1 – 100,000pF	50V – 500V	Ultra low ESR MLCC.	65-77
HQ Series		+125°C	1 – 5100pF	300V – 7200V	High power RF MLCCs suitable for high voltage wireless charging applications.	78-84
Inductors						
Accu-L®		+125°C	0.33 – 22nH	150 – 2000mA	Thin film inductors offer high Q and tight tolerance with part to part and lot to lot repeatability.	85-92
HLC		+125°C	0.8 – 32nH	175 – 875mA	Multilayer organic inductors offer the highest quality factor in a multilayer package. CTE matched to most standard PCBs.	93-94
Filters						
Harmonic Low Pass Filters		+85°C	DC – 6GHz	3W	Thin film harmonic low pass filters.	95-106
MLO® Diplexers		+85°C	DC – 6GHz	3W	Multilayer organic diplexers are excellent for multi-band wireless applications including, but not limited to: WLAN, BT, CDMA, WCDMA, GSM, GPS.	107-120
Couplers						
Directional Couplers		+85°C	DC – 6GHz	3W	Thin film directional couplers.	121-129
High Directivity Couplers		+85°C	DC – 6GHz	3W	Thin film high directivity directional couplers.	130-147
-3dB 90° Couplers		+85°C	DC – 6GHz	3W – 10W	Thin film 3dB 90° couplers with power ratings ranging from 3W to 10W.	148-177

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Automotive Product Line

TANTALUM CAPACITORS

Product	Fig.	Max Operating Temp	Capacitance Range	Voltage Range	Description	Page
Tantalum Capacitors						
TAJ		+125°C	0.22µF – 680µF	6.3V – 50V	Automotive AEC-Q200 qualified range of standard tantalum capacitors	179-184
F93-AJ6		+125°C	1µF – 680µF	4V –35V		185-186
TPS		+125°C	0.22µF – 680µF	6.3V – 50V		187-195
F91-AJ6		+125°C	10µF –220µF	6.3V –16V		196-197
TRJ		+125°C	0.1µF – 680µF	4V – 50V	Automotive AEC-Q200 qualified range of standard tantalum capacitors. High ripple and surge current capability; Robust against higher thermo-mechanical stresses; Thicker dielectric; Reduced DCL limit by 25%	198-204
F97		+125°C	0.33µF – 150µF	6.3V –35V	Automotive AEC-Q200 qualified range of standard tantalum capacitors	205-208
TRM		+125°C	4.7µF – 1500µF	2.5V – 50V	Automotive AEC-Q200 qualified range of standard tantalum capacitors. High ripple and surge current capability; Robust against higher thermo-mechanical stresses; Thicker dielectric; Reduced DCL limit by 25%	209-212
TMJ		+125°C	0.22µF – 680µF	6.3V – 50V	Ultra low DCL (leakage current) capacitors - AEC-Q200 per request	213-217
F97-HT3		+135°C	0.33µF – 100µF	6.3V –35V	Automotive AEC-Q200 qualified range of standard tantalum capacitors designed for higher temperature applications up to 135°C or 150°C	217-221
F9H		+150°C	10µF – 47µF	10V –16V		222-223
THJ +175ºC		+175°C	0.1µF – 220µF	6.3V – 50V	Automotive AEC-Q200 qualified range of standard tantalum capacitors designed for use in extreme temperature up to 175°C	224-227

CONDUCTIVE POLYMER CAPACITORS

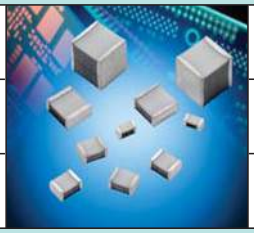
Product	Fig.	Max Operating Temp	Capacitance Range	Voltage Range	Description	Page
Conductive Polymer Capacitors						
TCQ		105/125°C	10µF - 470µF	4V -50V	Automotive polymer series of low ESR capacitors. Qualified in accordance to AEC-Q200.	228-230

NIOBIUM OXIDE CAPACITORS

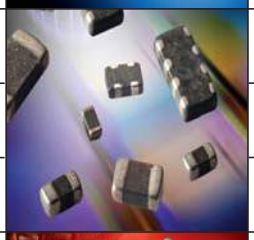
Product	Fig.	Max Operating Temp	Capacitance Range	Voltage Range	Description	Page
Niobium Oxide Capacitors – OxiCap®						
NOJ		+105°C	4.7µF – 1000µF	1.8V – 10V	Automotive AEC-Q200 qualified range of standard niobium oxide capacitors. Non burn safe technology More resistive to overvoltage breakdown High resistance failure mode Lower recommended derating	231-236
NOS		+125°C	10µF – 1000µF	1.8V –8V		237-241
NOM		+125°C	220µF – 680µF	1.8V – 6.3V		242-244

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FILM CAPACITORS

Product	Fig.	Max Operating Temp	Capacitance Range	Voltage Range	Description	Page
Film Chip Capacitors						
PPS		+125°C	1nF – 180nF	16V – 50V	Self healing technology Low dissipation factor, ESR, ESL No piezoelectric effect Excellent thermal shock resistance	246
PEN		+125°C	0.01µF – 4.7µF	25V – 630V		247
PEN-HT		+125°C	0.01µF – 4.7µF	63V – 630V		248
Medium Power Film Capacitors						
FFVE Custom Parts		+105°C	10µF – 4.7µF	75V – 1400V	Custom designed medium power film capacitors for DC filtering, high rms current, high temperature automotive applications	249

CIRCUIT PROTECTION

Product	Fig.	Max Operating Temp	Capacitance or Energy Range	Voltage Range	Description	Page
Automotive Series Multilayer Varistors						
TransGuard® Automotive Series		+125°C	0.05 – 12J	5.6Vdc – 85Vdc	Multilayer Varistors (MLV) suitable for a wide range of automotive applications.	251-257
Automotive StaticGuard		+125°C	40-80pF	18Vdc	Lower capacitance version of TransGuard varistors for automotive applications	258-259
CANBUS FlexRay		+125°C	15-37pF	18, 32Vdc	For CANBUS and Flexray communication networks. Discrete, 2 and 4 element arrays available.	260-263
Automotive AG Series		+125°C	2-12pF	18Vdc	Low capacitance varistors for applications such as Antennas, RF, high speed datalinks.	264-266
Automotive Sub pF AG Series		+125°C	0.8pF	16Vdc	Ultra Low capacitance varistors for applications such as sensors, HDMI, high speed datalinks, touch controls.	267-268
Controlled Capacitance		+125°C	47, 82pF	22, 26Vdc	Circuit protection and targeted EMI filtering.	269-270
Miniature AC Varistor (MAV)		+125°C	6-22pF	70Vdc/52Vac	Designed for AC resonant circuits and higher DC data lines. Discrete and 2-element array available.	271-273
Automotive High Temperature		+150°C	12-22pF	18, 32Vdc	High temperature version of CAN bus and AntennaGuard Series varistors.	274
Automotive High Temperature Low Leakage		+150°C	15pF	32Vdc	High temperature, low leakage version of CAN bus and Controlled Capacitance multilayer varistors.	275-276
Radial Automotive Varistors		+125°C	0.1-2J	14-48Vdc	Radial epoxy coated part for harsh, high temp environment.	277-280
Radial CapGuard™		+125°C	0.47, 1µF	26, 45Vdc	Combines advantages of varistor and MLC capacitor for TVS and EMI/RFI filtering	281-282
Automotive Glass Encapsulated		+125°C	0.6 – 13.8J	16-65Vdc	Varistor with Feedthru construction for ESD suppression and enhanced EMI filtering.	283-285
Automotive TransFeed		+125°C	0.05-0.3J	5.6-26Vdc	Three terminal multilayer varistors for circuit protection and broadband EMI filtering.	286-289

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Automotive Product Line

NTC THERMISTORS

Product	Fig.	Max Operating Temp	B(K)	Resistance	Description	Page
NTC Thermistors						
SMT Series		+125°C	B25/85: 3250-4400K	R: 10 – 1MΩ	SMT thermistors for wide range of applications.	290-291
Disc		+150°C	B25/85: 3250 – 4840K	R: 68 – 1MΩ	Disc thermistors for wide range of applications.	292-295
High Accurate		+150°C	B25/85: 3625 – 4380K	R: 2K – 0.1K Ω	Highly accurate thermistors with tolerances from ±1%.	296

CONNECTORS

Product	Fig.	Range	Capacitance	Page
Custom Automotive Connectors		Designed based on customer's requirements	Various custom connectors (door, roof, ECU) designed in close cooperation with automotive customers.	298
IDC		AWG: 18-28 1-3 positions, end to end stackable	Provide gas tight secure connection for various wire sizes. End to end stackable.	299-320
Board-to-Board		20-120 pos 3 – 9mm stacking height	Fine pitch, vertical board to board connectors.	321-323
Secure Locking FFC/FPC		8-80 positions right angle and vertical types	FFC/FPC cable connectors with secure locking mechanism.	324-325
High Speed FFC/FPC		24-51 positions right angle	FFC/FPC cable connectors for high data speed.	326
SDIO		Reverse and normal mount type 2.7-2.9mm connector max height	SDIO connectors for SD memory cards with push-push spring eject mechanism.	327-328

TIMING DEVICES

Product	Fig.	Operating Temp	Range	Capacitance	Page
Crystal Units		+85ºC +125ºC +150ºC	4MHz – 52MHz	Crystal units for automotive applications.	330-338
kHz Range Crystal Devices		+85ºC +125ºC	32.768kHz	kHz crystal units for automotive applications	339-343
Clock Oscillators		+85ºC +105ºC +125ºC	1.5 – 60MHz	Clock oscillators for automotive applications	344-345
TCXO		+75ºC +80ºC +85ºC	13 – 52MHz	Temperature compensated crystal oscillators for automotive applications.	346-349
Ceramic Chip Resonators		+85ºC +125ºC +150ºC	4 – 20MHz	Ceramic chip resonators for automotive applications.	349-351

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Automotive Applications

	SAFETY							BODY ELECTRONICS													
	Airbag	Anti-Lock Brake System	Crash Avoidance Circuit	Tire Pressure	Traction Control (ESP)	Seat Weight Sensor	V2X Communications	Small Motor Drives (e.g. Windows)	Communication Bus (LIN, CAN, FlexRay)	Transponders	Dashboard Systems	Car Alarm	Lamp/LED Driver	HID Lighting	Windshield Wipers	Rain Sensor	Light Sensor	Engine Control Unit (ECU)	Electronic Clutch	Fuel Pump	Water Pump	Electric Oil Pump
Ceramic Capacitors																						
NP0	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●			
X7R	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
X7R High Voltage														●								
High Temperature X8R																			●	●	●	●
FLEXITERM®	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
FLEXISAFE™	●	●	●		●														●			
U Series				●			●		●													
IPC Array	●	●									●							●				
ESD-Safe™					●	●				●	●	●						●				
Radial and Axial Capacitor								●							●					●	●	●
X7R Feedthru			●		●		●	●	●								●	●				
Tantalum Capacitors																						
TAJ / F93-AJ6				●		●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●
TPS / F91-AJ6						●	●	●			●	●	●					●		●	●	●
TRJ / F97	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TRM		●			●			●														
TMJ				●																		
F97-HT3 / F9H		●											●	●				●	●			●
THJ		●												●				●	●			
Conductive Polymer Capacitors																						
TCQ						●		●	●	●	●	●	●		●	●	●					
Niobium Oxide - OxiCap®																						
NOJ	●		●	●		●	●		●		●	●	●			●	●			●	●	●
NOS			●								●	●								●	●	●
NOM																						
Film Capacitors																						
PPS Film Chip																						
PEN Film Chip	●							●					●		●							
PET-HT Film Chip	●							●					●	●	●							
FFV / FFLI / Custom parts																						
FAV																						
Circuit Protection																						
Automotive TransGuard®	●				●	●		●	●	●	●	●	●		●	●	●	●	●	●	●	●
Communication Bus Varistor		●	●		●				●		●		●					●	●			
Automotive StaticGuard		●		●		●	●			●	●	●				●						
Automotive AG/Sub pF AG							●		●	●						●	●					
Controlled Capacitance			●						●	●					●			●				
High Temperature Varistors																		●				
Miniature AC Varistors									●	●												
Radial Varistors								●												●	●	●
CapGuard								●							●					●	●	●
Glass Encapsulated Varistors	●				●										●				●	●	●	●
Automotive TransFeed			●								●								●			
NTC Thermistors																						
SMT Thermistors						●					●		●					●				
Leaded Thermistors						●					●									●	●	●
Connectors																						
IDC						●		●	●			●	●									
FFC/FPC											●	●	●			●	●					
Board to Board													●									
SDIO																						
Custom Automotive	●	●	●		●	●		●			●	●	●	●	●	●		●	●	●		●
Timing Devices																						
Timing Devices	●	●	●	●	●		●		●	●	●	●			●			●		●		●

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DRIVE TRAIN								COMFORT AND CONVENIENCE												HYBRID AND ELECTRIC					
	Gear Box Sensors	Electric Power Steering	Engine Cooling Fan	Temperature Sensor	Transmission Control Unit	Turbo Charger	Underhood Modules	Seat Heating	Air Conditioning	GPS Location System	Electric Seat Controls	Electric Window Controls	Electric Mirror Controls	Parking Assistant	Audio Entertainment	Satellite Radio	Keyless System	Cruise Control	Remote Start	DC/DC Converters	Regenerative Braking	Start/Stop System	Electric Drive	Battery Management I Charging	Battery Cell Temperature Monitoring
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		●	●	●	●		●		●	●	●	●		●	●	●	●	●	●					●	

*In cabine only

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CERAMIC CAPACITORS

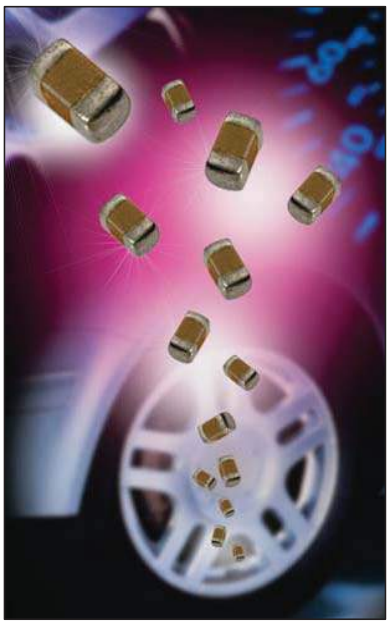
Ceramic capacitors are the basic building block for every electronic application. AVX has a long history in manufacturing ceramic capacitors which enables us to offer a wide range of automotive qualified ceramic capacitors while constantly bringing new innovative solutions to the market.

Some of the innovative solutions include:

- FLEXITERM® and FLEXISAFE™ Offer improved resistance against failures caused by board flexing and temperature shock.
- X8R and X8L DIELECTRICS MLCC performance elevated to accommodate high temperature applications up to +150°C.
- AXIAL and RADIAL CAPACITORS Ceramic technology in leaded, epoxy encapsulated packaging for harsh environment applications.
- EMI FEEDTHRU FILTER CAPACITORSFeedthru construction enables enhanced filtering capability.



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AVX Corporation has supported the Automotive Industry requirements for Multilayer Ceramic Capacitors consistently for more than 20 years. Products have been developed and tested specifically for automotive applications and all manufacturing facilities are QS9000 and VDA 6.4 approved.

NP0 Capacitors provide excellent temperature stability, low ESR and are available with tight tolerances starting from +/- 1%

NP0 parts are ideal for use in MHz range in applications such as sensors, transmitters, timing circuits where precision control of the capacitance is requested.

FEATURES

- Excellent Temperature Stability
- Excellent Voltage and Frequency Stability
- Low ESR/Low Loss
- Tight Tolerances

APPLICATIONS

- Sensors
- Timing Circuits
- RF Applications
- Applications in MHz Range

AND MORE

GENERAL CHARACTERISTICS

Operating Temperature:
-55ºC to 125ºC
Capacitance Variation: 0±60ppm

HOW TO ORDER

0805	5	A	101	K	4	T	2	A
Size	**Voltage**	**Dielectric**	**Capacitance Code (In pF)**	**Capacitance Tolerance**	**Failure Rate**	**Terminations**	**Packaging**	**Special Code**
0603	3 = 25V	NP0 = A	2 Significant Digits + Number of Zeros	F = ±1% (≥10pF)	4 = Automotive	T = Plated Ni and Sn	2 = 7" Reel	A = Std. Product
0805	5 = 50V		e.g. 10µF = 106	G = ±2% (≥10pF)			4 = 13" Reel	
1206	1 = 100V			J = ±5% (≤1µF)				
1210	2 = 200V			K = ±10%				
1812	7 = 500V			M = ±20%				

RoHS COMPLIANT

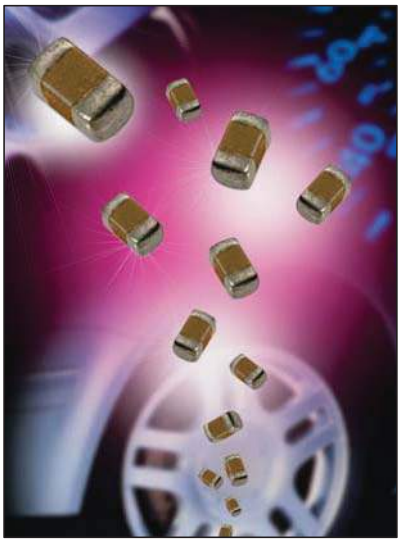
Contact factory for availability of Tolerance Options for Specific Part Numbers.

AUTOMOTIVE MLCC – NP0

		0402		0603				0805					1206					
Soldering		Reflow/Wave		Reflow/Wave				Reflow/Wave					Reflow/Wave					
		25V	50V	25V	50V	100V	200V	25V	50V	100V	200V	250V	25V	50V	100V	200V	250V	500V
100	10pF	C	C	G	G	G	G	J	J	J	N	N	J	J	J	J	J	J
120	12	C	C	G	G	G	G	J	J	J	N	N	J	J	J	J	J	J
150	15	C	C	G	G	G	G	J	J	J	N	N	J	J	J	J	J	J
180	18	C	C	G	G	G	G	J	J	J	N	N	J	J	J	J	J	J
220	22	C	C	G	G	G	G	J	J	J	N	N	J	J	J	J	J	J
270	27	C	C	G	G	G	G	J	J	J	N	N	J	J	J	J	J	J
330	33	C	C	G	G	G	G	J	J	J	N	N	J	J	J	J	J	J
390	39	C	C	G	G	G	G	J	J	J	N	N	J	J	J	J	J	J
470	47			G	G	G	G	J	J	J	N	N	J	J	J	J	J	J
510	51			G	G	G	G	J	J	J	N	N	J	J	J	J		
560	56			G	G	G	G	J	J	J	N	N	J	J	J	J		
680	68			G	G	G	G	J	J	J	N	N	J	J	J	J		
820	82			G	G	G	G	J	J	J	N	N	J	J	J	J		
101	100			G	G	G	G	J	J	J	N	N	J	J	J	J		
121	120			G	G	G		J	J	J	N	N	J	J	J	J		
151	150			G	G	G		J	J	J	N	N	J	J	J	J		
181	180			G	G	G		J	J	J	N	N	J	J	J	J		
221	220			G	G	G		J	J	J	N	N	J	J	J	J		
271	270			G	G	G		J	J	J	N	N	J	J	J	J		
331	330			G	G	G		J	J	J	N	N	J	J	J	J		
391	390			G	G			J	J	J			J	J	J	J		
471	470			G	G			J	J	J			J	J	J	J		
561	560			G	G			J	J	J			J	J	J	J		
681	680			G	G			J	J	J			J	J	J	J		
821	820							J	J	J			J	J	J	J		
102	1000							J	J	J			J	J	J	J		
122	1200																	
152	1500																	
182	1800																	
222	2200																	
272	2700																	
332	3300																	
392	3900																	
472	4700																	
103	10nF																	
		25V	50V	25V	50V	100V	200V	25V	50V	100V	200V	250V	25V	50V	100V	200V	250V	500V
		0402		0603				0805					1206					

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER					EMBOSSED							

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AVX Corporation has supported the Automotive Industry requirements for Multilayer Ceramic Capacitors consistently for more than 20 years. Products have been developed and tested specifically for automotive applications and all manufacturing facilities are QS9000 and VDA 6.4 approved.

X7R Capacitors provide temperature stability, low ESR and high reliability in wide range of capacitance values and voltages

AVX offers one of the highest capacitance values in the industry for automotive qualified X7R capacitors.

GENERAL CHARACTERISTICS

Operating Temperature:
-55ºC to 125ºC
Capacitance Variation: ±15%

FEATURES

- Temperature Stability
- Wide Range of Values
- High Capacitance Values
- Low Loss

APPLICATIONS

- CAN Bus
- Voltage regulator
- DC/DC converter
- Applications in kHz range

AND MORE

HOW TO ORDER

0805	5	C	104	K	4	T	2	A
Size	**Voltage**	**Dielectric**	**Capacitance Code (In pF)**	**Capacitance Tolerance**	**Failure Rate**	**Terminations**	**Packaging**	**Special Code**
0402	Y = 16V	X7R = C	2 Significant Digits +	J = ±5%	4 = Automotive	T = Plated Ni and Sn		A = Std. Product
0603	3 = 25V		Number of Zeros	K = ±10%		Z = FLEXITERM®	2 = 7" Reel	
0805	5 = 50V		e.g. 10µF = 106	M = ±20%		U = Conductive Epoxy	4 = 13" Reel	
1206	1 = 100V							
1210	2 = 200V							
1812	7 = 500V							
2220								

NOTE: Contact factory for non-specified capacitance values. 0402 case size available in T termination only.
Contact factory for availability of Termination and Tolerance Options for Specific Part Numbers.

LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

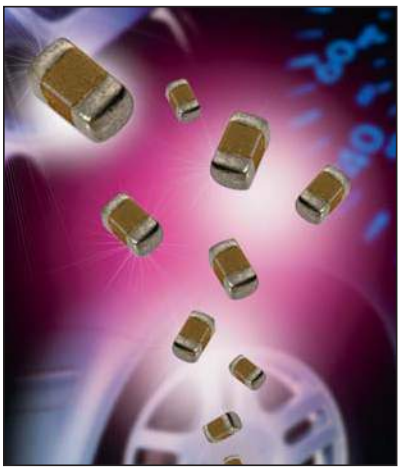
AUTOMOTIVE MLCC – X7R

		0402			0603							0805						1206							1210				1812		2220		
Soldering		Reflow/Wave			Reflow/Wave							Reflow/Wave						Reflow/Wave							Reflow Only				Reflow Only		Reflow Only		
		16V	25V	50V	10V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	500V	16V	25V	50V	100V	50V	100V	25V	50V	100V
221	Cap 220	C	C	C																													
271	(pF) 270	C	C	C																													
331	330	C	C	C																													
391	390	C	C	C																													
471	470	C	C	C																													
561	560	C	C	C																													
681	680	C	C	C																													
821	820	C	C	C																													
102	1000	C	C	C	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
182	1800	C	C	C	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
222	2200	C	C	C	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
332	3300	C	C	C	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
472	4700	C	C	C	G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
103	Cap 001	C			G	G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
123	(µF) 0012	C			G	G	G	G	G			J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	K	K			
153	0.015	C			G	G	G	G	G			J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	K	K			
183	0.018	C			G	G	G	G	G			J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	K	K			
223	0.022	C			G	G	G	G	G			J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	K	K			
273	0.027	C			G	G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	K	K			
333	0.033	C			G	G	G	G				J	J	J	N	N	N	J	J	J	J	J	J		K	K	K	K	K	K			
473	0.047				G	G	G	G				J	J	J	N	N	N	J	J	J	M	M	M		K	K	K	K	K	K			
563	0.056				G	G	G	G				J	J	J	N			J	J	J	M	M	M		K	K	K	M	K	K			
683	0.068				G	G	G	G				J	J	J	N			J	J	J	M	M	M		K	K	K	M	K	K			
823	0.082				G	G	G	G				J	J	J	N			J	J	J	M	M	M		K	K	K	M	K	K			
104	0.01				G	G	G	G				J	J	M	N			J	J	J	M	M	M		K	K	K	M	K	K			
124	0.12				G							J	J	N	N			J	J	M	M	Q	Q		K	K	K	P	K	K			
154	0.15				G							M	N	N	N			J	J	M	M	Q	Q		K	K	K	P	K	K			
224	0.22				G							M	N	N	N			J	M	M	Q	Q	Q		M	M	M	P	M	M			
334	0.33											N	N	N	N			J	M	P	Q				P	P	P	Q	X	X			
474	0.47											N	N	N	N			M	M	P	Q				P	P	P	Q	X	X			
684	0.68											N	N	N				M	Q	Q	Q				P	P	Q	X	X	X			
105	1											N	N	N				M	Q	Q	Q				P	Q	Q	X	X	X		Z	Z
155	1.5																	Q	Q	Q	Q				P	Q	Z	Z	X	X		Z	Z
225	2.2																	Q	Q	Q	Q				X	Z	Z	Z	Z	Z		Z	Z
335	3.3																	Q	Q	Q					X	Z	Z	Z	Z			Z	Z
475	4.7																	Q	Q	Q					X	Z	Z	Z	Z			Z	Z
106	10																								Z	Z	Z		Z		Z	Z	Z
226	22																														Z		
		16V	25V	50V	10V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	500V	16V	25V	50V	100V	50V	100V	25V	50V	100V
		0402			0603							0805						1206							1210				1812		2220		

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER					EMBOSSED							

AEC-Q200 Qualified

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High voltage, low leakage and small size are difficult parameters to obtain in capacitors for high voltage systems. AVX special high voltage MLC chip capacitors meet these performance characteristics and are designed for applications such as snubbers in high frequency power converters, resonators in SMPS, and high voltage coupling/DC blocking. These high voltage chip designs exhibit low ESRs at high frequencies.

GENERAL CHARACTERISTICS

Operating Temperature:
-55ºC to 125ºC
Capacitance Variation: ±15%

FEATURES

- High Voltage
- Low ESR
- Compact size

APPLICATIONS

- High voltage power converters
- High voltage coupling/DC blocking
- Resonators in SMPS

AND MORE

HOW TO ORDER

1808	A	C	272	K	4	Z	1	A
AVX Style 1206 1210 1808 1812 1825 2220 ***	**Voltage** C = 600V/630V A = 1000V S = 1500V G = 2000V W = 2500V H = 3000V	**Temperature Coefficient** X7R = C	**Capacitance Code** (2 significant digits + no. of zeros) Examples: 10 pF = 100 100 pF = 101 1,000 pF = 102 22,000 pF = 223 220,000 pF = 224 1 µF = 105	**Capacitance Tolerance** X7R: K = ±10% M = ±20% Z = +80%, -20%	**Test Level**	**Termination*** Z = FLEXITERM® 100% Tin (RoHS Compliant)	**Packaging** 1 or 2 = 7" Reel 3 or 4= 13" Reel 9 = Bulk	**Special Code** A = Standard

Notes: Capacitors with X7R dielectrics are not intended for applications across AC supply mains or AC line filtering with polarity reversal. Contact plant for recommendations. Capacitors may require protective surface coating to prevent external arcing. Contact factory for availability of Termination and Tolerance options for Specific Part Numbers.

*** AVX offers nonstandard chip sizes. Contact factory for details.

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

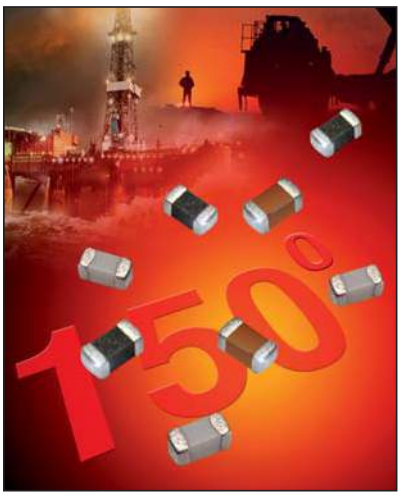
RoHS COMPLIANT

HIGH VOLTAGE AUTOMOTIVE MLCC – X7R

Case Size		1206					1210				1808						1812						2220			
Soldering		Reflow/Wave					Reflow Only				Reflow Only						Reflow Only						Reflow Only			
(L) Length	mm (in.)	3.20 ± 0.20 (0.126 ± 0.008)					3.20 ± 0.20 (0.126 ± 0.008)				4.57 ± 0.25 (0.180 ± 0.010)						4.50 ± 0.30 (0.177 ± 0.012)						5.70 ± 0.40 (0.224 ± 0.016)			
(W) Width	mm (in.)	1.60 ± 0.20 (0.063 ± 0.008)					2.50 ± 0.20 (0.098 ± 0.008)				2.03 ± 0.25 (0.080 ± 0.010)						3.20 ± 0.20 (0.126 ± 0.008)						5.00 ± 0.40 (0.197 ± 0.016)			
(T) Thickness	mm (in.)	1.52 (0.060)					1.70 (0.067)				2.03 (0.080)						2.54 (0.100)						3.30 (0.130)			
(t) Terminal	min max	0.25 (0.010) 0.75 (0.030)					0.25 (0.010) 0.75 (0.030)				0.25 (0.010) 1.02 (0.040)						0.25 (0.010) 1.02 (0.040)						0.25 (0.010) 1.02 (0.040)			
Voltage (V)		630	1000	1500	2000	2500	630	1000	1500	2000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	630	1000	1500	2000
Cap (pF)	100	101	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
	120	121	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
	150	151	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
	180	181	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
	220	221	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
	270	271	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
	330	331	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
	390	391	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
	470	471	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	560	561	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	680	681	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	820	821	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	1000	102	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	1200	122	■	■	■	■		■	■	■	■	■	■	■	■		■	■	■	■	■		■	■	■	■
	1500	152	■	■	■	■		■	■	■	■	■	■	■			■	■	■	■	■		■	■	■	■
	1800	182	■	■	■			■	■	■	■	■	■				■	■	■	■	■		■	■	■	■
	2200	222	■	■	■			■	■	■	■	■	■				■	■	■	■	■		■	■	■	■
	2700	272	■	■	■			■	■	■	■	■	■				■	■	■	■			■	■	■	■
	3300	332	■	■				■	■	■	■	■	■				■	■	■	■			■	■	■	■
	3900	392	■	■				■	■		■	■	■				■	■	■	■			■	■	■	■
	4700	472	■	■				■	■		■	■					■	■	■	■			■	■	■	■
	5600	562	■	■				■	■		■	■					■	■	■	■			■	■	■	■
	6800	682	■	■				■	■		■	■					■	■	■	■			■	■	■	■
	8200	822	■	■				■	■		■	■					■	■	■	■			■	■	■	■
Cap (µF)	0.01	103	■					■	■		■	■					■	■	■				■	■	■	■
	0.012	123						■	■		■	■					■	■	■				■	■	■	
	0.015	153						■	■		■	■					■	■	■				■	■	■	
	0.018	183						■	■		■	■					■	■					■	■	■	
	0.022	223						■	■		■	■					■	■					■	■	■	
	0.027	273						■	■		■	■					■						■	■		
	0.033	333						■	■		■	■					■						■	■		
	0.039	393						■	■		■	■					■						■	■		
	0.047	473						■	■		■	■					■						■	■		
	0.056	563																					■			
	0.068	683																					■			
	0.082	823																					■			
	0.100	104																					■			
	0.120	124																					■			
	0.150	154																					■			
Voltage (V)		630	1000	1500	2000	2500	630	1000	1500	2000	630	1000	1500	2000	2500	3000	630	1000	1500	2000	2500	3000	630	1000	1500	2000
Case Size		1206					1210				1808						1812						2220			

NOTE: Contact factory for non-specified capacitance values

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AVX has developed a range of multilayer ceramic capacitors designed for use in applications up to 150ºC. These capacitors are manufactured with an X8R and an X8L dielectric material. X8R material has capacitance variation of ±15% between -55ºC and +150ºC. The X8L material has capacitance variation of ±15% between -55ºC to 125ºC and +15/-40% from +125ºC to +150ºC.

The need for X8R and X8L performance has been driven by customer requirements for parts that operate at elevated temperatures.

They are ideal for automotive under the hood sensors, and various industrial applications. Typical industrial application would be drilling monitoring system. They can also be used as bulk capacitors for high temperature camera modules.

Both X8R and X8L dielectric capacitors are automotive AEC-Q200 qualified.

GENERAL CHARACTERISTICS

Operating Temperature: -55ºC to 150ºC
Capacitance Variation X8R: ±15%
Capacitance Variation X8L: +15%/-40%

FEATURES

- High Temperature
- Stable Capacitance
- Low Loss

APPLICATIONS

- Under the hood sensors
- Turbocharger
- Engine Cooling Fan
- Transmission Control Unit
- Other High Temperature Applications

HOW TO ORDER

0805	5	F	104	K	4	T	2	A
Size 0603 0805 1206	**Voltage** 16V = Y 25V = 3 50V = 5 100V = 1	**Dielectric** X8R = F X8L = L	**Capacitance Code (In pF)** 2 Significant Digits + Number of Zeros e.g. 10µF = 106	**Capacitance Tolerance** J = ±5% K = ±10% M = ±20%	**Failure Rate** 4 = Automotive	**Terminations** T = Plated Ni and Sn Z = FLEXITERM® U = Conductive Epoxy for Hybrid apps	**Packaging** 2 = 7" Reel 4 = 13" Reel	**Special Code** A = Std. Product

RoHS COMPLIANT

NOTE: Contact factory for availability of Termination and Tolerance Options for Specific Part Numbers.

X8R

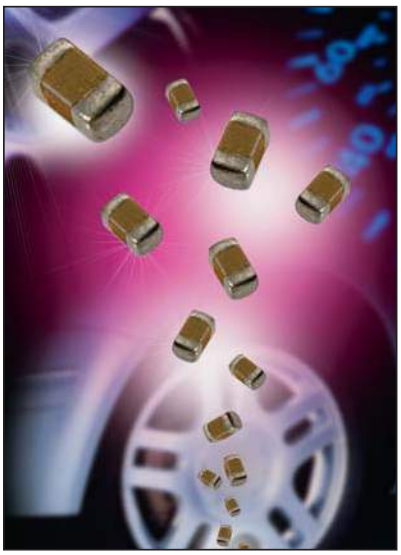
SIZE		0603		0805		1206	
Soldering		Reflow/Wave		Reflow/Wave		Reflow/Wave	
	WVDC	25V	50V	25V	50V	25V	50V
331	Cap 330	G	G	J	J		
471	(pF) 470	G	G	J	J		
681	680	G	G	J	J		
102	1000	G	G	J	J	J	J
152	1500	G	G	J	J	J	J
222	2200	G	G	J	J	J	J
332	3300	G	G	J	J	J	J
472	4700	G	G	J	J	J	J
682	6800	G	G	J	J	J	J
103	Cap 0.01	G	G	J	J	J	J
153	(µF) 0.015	G	G	J	J	J	J
223	0.022	G	G	J	J	J	J
333	0.033	G	G	J	J	J	J
473	0.047	G	G	J	J	J	J
683	0.068	G		N	N	M	M
104	0.1			N	N	M	M
154	0.15			N	N	M	M
224	0.22			N		M	M
334	0.33					M	M
474	0.47					M	
684	0.68						
105	1						
155	1.5						
225	2.2						
	WVDC	25V	50V	25V	50V	25V	50V
SIZE		0603		0805		1206	

X8L

SIZE		0603			0805			1206				1210		
Soldering		Reflow/Wave			Reflow/Wave			Reflow/Wave				Reflow/Wave		
	WVDC	25V	50V	100V	25V	50V	100V	16V	25V	50V	100V	10V	50V	100V
271	Cap 270	G	G											
331	(pF) 330	G	G	G	J	J	J							
471	470	G	G	G	J	J	J							
681	680	G	G	G	J	J	J							
102	1000	G	G	G	J	J	J		J	J				
152	1500	G	G	G	J	J	J		J	J	J			
182	1800	G	G	G	J	J	J		J	J	J			
222	2200	G	G	G	J	J	J		J	J	J			
272	2700	G	G	G	J	J	J		J	J	J			
332	3300	G	G	G	J	J	J		J	J	J			
392	3900	G	G	G	J	J	J		J	J	J			
472	4700	G	G	G	J	J	J		J	J	J			
562	5600	G	G	G	J	J	J		J	J	J			
682	6800	G	G	G	J	J	J		J	J	J			
822	8200	G	G	G	J	J	J		J	J	J			
103	Cap 0.01	G	G	G	J	J	J		J	J	J			
123	(µF) 0.012	G	G		J	J	J		J	J	J			
153	0.015	G	G		J	J	J		J	J	J			
183	0.018	G	G		J	J	J		J	J	J			
223	0.022	G	G		J	J	J		J	J	J			
273	0.027	G	G		J	J	J		J	J	J			
333	0.033	G	G		J	J	N		J	J	J			
393	0.039	G	G		J	J	N		J	J	J			
473	0.047	G	G		J	J	N		J	J	J			
563	0.056	G	G		J	J	N		J	J	J			
683	0.068	G	G		J	J	N		J	J	J			
823	0.082	G	G		J	J	N		J	J	J			
104	0.1	G	G		J	J	N		J	J	M			
124	0.12				J	N			J	J	M			
154	0.15				J	N		J	J	J	Q			
184	0.18				N	N		J	J	J	Q			
224	0.22				N	N		J	J	J	Q			
274	0.27				N			J	M	M	Q			
334	0.33				N			J	M	M	Q			
394	0.39				N			M	M	P	Q			
474	0.47				N			M	M	P	Q			
684	0.68				N			M	M	P	Q			
824	0.82				N			M	M	P	Q			
105	1				N			M	M	P	Q			
155	1.5							M	M					
225	2.2							M	M				Z	Z
475													Z	
106												Z		
	WVDC	25V	50V	100V	25V	50V	100V	16V	25V	50V	100V	10V	50V	100V
SIZE		0603			0805			1206				1210		

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER					EMBOSSED							

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With increased requirements from the automotive industry for additional component robustness, AVX recognized the need to produce a MLCC with enhanced mechanical strength. It was noted that many components may be subject to severe flexing and vibration when used in various under the hood automotive and other harsh environment applications.

FLEXITERM® is designed to enhance the mechanical flexure and temperature cycling performance of an automotive ceramic capacitor.

The industry standard for flexure is 2mm minimum. Using FLEXITERM®, AVX provides up to 5mm of flexure without internal cracks. Beyond 5mm, the capacitor will generally fail "open".

FLEXITERM® will provide Design Engineers with a satisfactory solution when designing PCB's which may be subject to high levels of board flexure.

GENERAL CHARACTERISTICS

Operating Temperature: -55ºC to 125ºC
Capacitance Variation: ±15%

FEATURES

- Increased flexure resistance
- Improved temperature cycling performance
- High reliability

APPLICATIONS

- Harsh environment
- Underhood applications
- Signal lines
- DC/DC convertors

AND MORE

HOW TO ORDER

0805	5	C	104	K	4	Z	2	A
Size	**Voltage**	**Dielectric**	**Capacitance Code (In pF)**	**Capacitance Tolerance**	**Failure Rate**	**Terminations**	**Packaging**	**Special Code**
0603	Z = 10V	X7R = C	2 Significant Digits	J = ±5%*	4 = Automotive	Z = FLEXITERM®	2 = 7" Reel	A = Std. Product
0805	Y = 16V		+ Number of Zeros	K = ±10%		U = Conductive Epoxy	4 = 13" Reel	
1206	3 = 25V		e.g. 10µF = 106	M = ±20%				
1210	5 = 50V							
1812	1 = 100V			*≤ 1µF only				
2220	2 = 200V							

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

NOTE: Contact factory for non-specified capacitance values.

		0402			0603							0805						1206							1210				1812		2220		
Soldering		Reflow/Wave			Reflow/Wave							Reflow/Wave						Reflow/Wave							Reflow Only				Reflow Only		Reflow Only		
		16V	25V	50V	10V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	500V	16V	25V	50V	100V	50V	100V	25V	50V	100V
221	Cap 220	C	C	C																													
271	(pF) 270	C	C	C																													
331	330	C	C	C																													
391	390	C	C	C																													
471	470	C	C	C																													
561	560	C	C	C																													
681	680	C	C	C																													
821	820	C	C	C																													
102	1000	C	C	C		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
182	1800	C	C	C		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
222	2200	C	C	C		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
332	3300	C	C	C		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
472	4700	C	C	C		G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
103	Cap 0.01	C				G	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K			
123	(µF) 0.012	C				G	G	G				J	J	J	M	J	J	J	J	J	J	J	J		K	K	K	K	K	K			
153	0.015	C				G	G	G				J	J	J	M	J	J	J	J	J	J	J	J		K	K	K	K	K	K			
183	0.018	C				G	G	G				J	J	J	M	J	J	J	J	J	J	J	J		K	K	K	K	K	K			
223	0.022	C				G	G	G				J	J	J	M	J	J	J	J	J	J	J	J		K	K	K	K	K	K			
273	0.027	C				G	G	G				J	J	J	M	J	J	J	J	J	J	J	J		K	K	K	K	K	K			
333	0.033	C				G	G	G				J	J	J	M	J	J	J	J	J	J	J	J		K	K	K	K	K	K			
473	0.047					G	G	G				J	J	J	M	J	J	J	J	J	M	J	J		K	K	K	K	K	K			
563	0.056					G	G	G				J	J	J	M			J	J	J	M	J	J		K	K	K	M	K	K			
683	0.068					G	G	G				J	J	J	M			J	J	J	M	J	J		K	K	K	M	K	K			
823	0.082					G	G	G				J	J	J	M			J	J	J	M	J	J		K	K	K	M	K	K			
104	0.01					G	G	G				J	J	M	M			J	J	J	M	J	J		K	K	K	M	K	K			
124	0.12											J	J	M	N			J	J	M	M				K	K	K	P	K	K			
154	0.15											M	N	M	N			J	J	M	M				K	K	K	P	K	K			
224	0.22				G							M	N	M	N			J	M	M	Q				M	M	M	P	M	M			
334	0.33											N	N	M	N			J	M	P	Q				P	P	P	Q	X	X			
474	0.47											N	N	M	N			M	M	P	Q				P	P	P	Q	X	X			
684	0.68											N	N	N				M	Q	Q	Q				P	P	Q	X	X	X			
105	1											N	N	N				M	Q	Q	Q				P	Q	Q	X	X	X			
155	1.5																	Q	Q	Q					P	Q	Z	Z	X	X			
225	2.2																	Q	Q	Q					X	Z	Z	Z	Z	Z			
335	3.3																	Q	Q						X	Z	Z	Z	Z				
475	4.7																	Q	Q						X	Z	Z	Z	Z				Z
106	10																								Z	Z						Z	Z
226	22																														Z		
		16V	25V	50V	10V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	500V	16V	25V	50V	100V	50V	100V	25V	50V	100V
		0402			0603							0805						1206							1210				1812		2220		

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z	7
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)	3.30 (0.130)
	PAPER					EMBOSSED								

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FLEXISAFE MLCC
For Ultra Safety Critical Applications



AVX have developed a range of components specifically for safety critical applications.

Utilizing the award-winning FLEXITERM® layer in conjunction with the cascade design previously used for high voltage MLCCs, a range of ceramic capacitors is now available for customers who require components designed with an industry leading set of safety features.

The FLEXITERM® layer protects the component from any damage to the ceramic resulting from mechanical stress during PCB assembly or use with end customers.

Board flexure type mechanical damage accounts for the majority of MLCC failures. The addition of the cascade structure protects the component from low insulation resistance failure resulting from other common causes for failure; thermal stress damage, repetitive strike ESD damage and placement damage. With the inclusion of the cascade design structure to complement the FLEXITERM® layer, the FLEXISAFE range of capacitors has unbeatable safety features.

GENERAL CHARACTERISTICS

Operating Temperature: -55ºC to 125ºC
Capacitance Variation: ±15%

FEATURES

- High Reliability
- Cascade Design
- FLEXITERM®
- Low Loss

APPLICATIONS

- Safety Critical Application
- ABS, ESP
- Crash avoidance systems
- Airbag

AND MORE

HOW TO ORDER

FS03	5	C	104	K	Q	Z	2	A
Size FS03 = 0603 FS05 = 0805 FS06 = 1206 FS10 = 1210	**Voltage** 16V = Y 25V = 3 50V = 5 100V = 1	**Dielectric** X7R = C	**Capacitance Code (In pF)** 2 Sig. Digits + Number of Zeros e.g. 10µF =106	**Capacitance Tolerance** J = ±5% K = ±10% M = ±20%	**Failure Rate** A = Commercial 4 = Automotive Q = APS	**Terminations** Z = FLEXITERM™ X = FLEXITERM™ with 5% min lead* *Not RoHS Compliant	**Packaging** 2 = 7" Reel 4 = 13" Reel	**Special Code** A = Std. Product

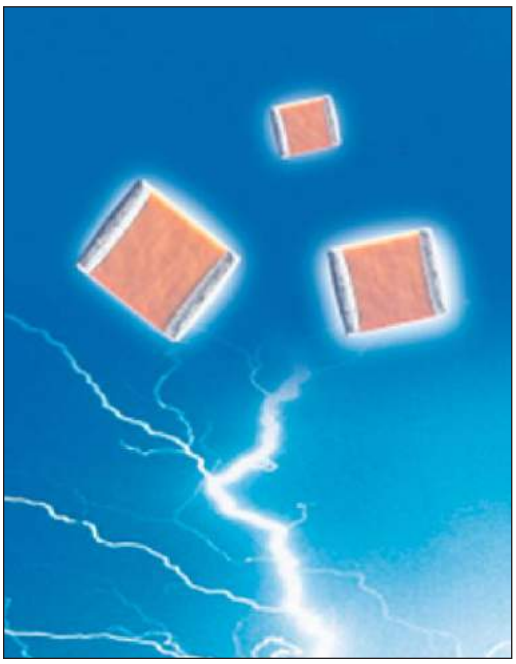
LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT
RoHS COMPLIANT
For RoHS compliant products, please select correct termination style.

FLEXISAFE X7R RANGE

Capacitance Code		FS03 = 0603				FS05 = 0805				FS06 = 1206			FS10 = 1210		
Soldering		Reflow/Wave				Reflow/Wave				Reflow/Wave			Reflow Only		
		16	25	50	100	16	25	50	100	16	25	50	16	25	50
102	µF 0.001	■	■	■	■	■	■	■	■	■	■	■			
182	0.0018	■	■	■	■	■	■	■	■	■	■	■			
222	0.0022	■	■	■	■	■	■	■	■	■	■	■			
332	0.0033	■	■	■	■	■	■	■	■	■	■	■			
472	0.0047	■	■	■	■	■	■	■	■	■	■	■			
103	0.01	■	■	■	■	■	■	■	■	■	■	■			
123	0.012	■	■	■		■	■	■	■	■	■	■			
153	0.015	■	■	■		■	■	■	■	■	■	■			
183	0.018	■	■	■		■	■	■	■	■	■	■			
223	0.022	■	■	■		■	■	■	■	■	■	■			
273	0.027					■	■	■	■	■	■	■			
333	0.033					■	■	■	■	■	■	■			
473	0.047					■	■	■	■	■	■	■			
563	0.056					■	■	■	■	■	■	■			
683	0.068					■	■	■	■	■	■	■			
823	0.082					■	■	■	■	■	■	■			
104	0.1					■	■	■	■	■	■	■			
124	0.12									■	■	■			
154	0.15									■	■	■	■	■	■
224	0.22												■	■	■
334	0.33												■	■	■
474	0.47												■	■	■

■ Qualified

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The ESD-Safe™ series is an enhanced MLC capacitor developed and designed specifically for general ESD protection. (ESD = Electro Static Discharge).

ESD-Safe™ capacitors are utilized for ESD protection of I/O gates. ESD capacitors are used on nearly every pin of an automotive module. Their use at that point averages the voltage that the wiring harness can be charged to and the module voltage.

The small footprint makes them ideal for high density electronic devices. Capacitance selection is a trade off. Large capacitance values provide better ESD protection however a larger could corrupt the data stream.

ESD-Safe™ Capacitors provide (beside ESD protection) RF filtering function.

GENERAL CHARACTERISTICS

Operating Temperature:
-55ºC to 125ºC
Capacitance Variation:
±15% (X7R)

FEATURES

- AEC Q200 Qualified
- ESD Qualified per HBM of AEC Q200-002
- ISO 10605 (uses both 330pf/2kohm and 150pf/2kohm networks)*
- EN61000-4 -2 (uses 150pf/330 Ohm network)*

*Contact factory for ESD performance

APPLICATIONS

- General ESD protection of I/O gates

HOW TO ORDER

ESD	3	5	C	103	K	4	Z	2	A	18
Type ESD Applications	**Case Size** 3 = 0603 5 = 0805 6 = 1206	**Voltage** Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V	**Dielectric** X7R = C	**Capacitance Code (In pF)** 2 Sig. Digits + Number of Zeros e.g. 1000pF =102	**Capacitance Tolerance** J = ±5% K = ±10% M = ±20%	**Failure Rate** 4 = Automotive	**Terminations** T = 100% Sn Z = FLEXITERM®	**Packaging** 2 = 7" Reel 4 = 13" Reel	**Special Code** A = Std. Product	**ESD rating (kV)** 18 = 18kV 20 = 20kV 22 = 22kV 24 = 24kV 26 = 26kV 28 = 28kV 30 = 30kV

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

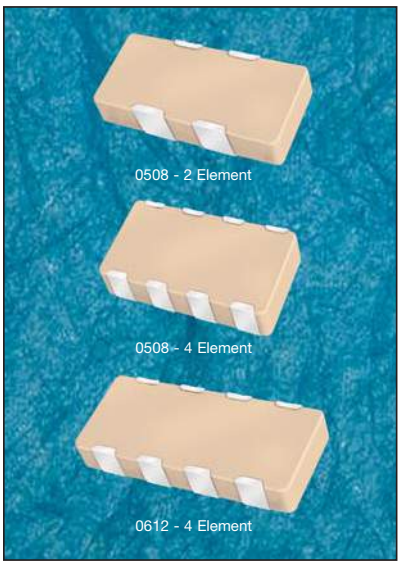
ESD-SAFE™ X7R RANGE

Capacitance Code		0603		0805			1206		
Soldering		Reflow/Wave		Reflow/Wave			Reflow/Wave		
		50V	100V	25V	50V	100V	25V	50V	100V
472	4.7 (nF)	18kV	18kV	18kV	18kV	18kV	20kV	20kV	20kV
682	6.8	18kV	18kV	18kV	18kV	18kV	20kV	20kV	20kV
103	10	18kV	18kV	18kV	18kV	18kV	20kV	20kV	20kV
153	15	20kV		20kV	20kV	20kV	22kV	22kV	22kV
223	22	20kV		22kV	22kV	22kV	24kV	24kV	24kV
333	33	20kV		22kV	22kV	22kV	24kV	24kV	24kV
473	47	22kV		22kV	22kV	22kV	26kV	26kV	26kV
683	68	22kV		24kV	24kV	24kV	26kV	26kV	26kV
104	100	24kV		24kV	24kV	24kV	26kV	26kV	26kV
154	150			24kV	24kV	24kV	28kV	28kV	28kV
224	220			26kV	26kV	26kV	28kV	28kV	28kV
334	330			26kV	26kV	26kV	28kV	28kV	28kV
474	470			26kV	26kV	26kV	28kV	28kV	28kV
684	680			26kV			28kV	28kV	28kV
105	1 (µF)			26kV			28kV	28kV	28kV
155	1.5						30kV		
225	2.2						30kV		

Letter		G	N	Q
Max. Thickness	mm	0.740 – 0.90	1.127 – 1.400	1.430 – 1.780
	inch	(0.029 – 0.035)	(0.045 – 0.055)	(0.057 – 0.070)
		PAPER	EMBOSSED	

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Automotive Capacitor Arrays
AEC-Q200 Series NP0/C0G and X7R



As the market leader in the development and manufacture of capacitor arrays AVX is pleased to offer a range of AEC-Q200 qualified arrays to compliment our product offering to the Automotive Industry. Both the AVX 0612 and 0508 4-element capacitor array styles are qualified to the AEC-Q200 automotive specifications.

Automotive capacitor arrays provide reduction of board space taken by the components and reduction of pick-and-place costs and increased throughput.

GENERAL CHARACTERISTICS

Operating Temperature NP0/X7R:
-55ºC to 125ºC
Operating Temperature X8R:
-55ºC to 150ºC
Capacitance Variation NP0: 0±60ppm
Capacitance Variation X7R/X8R: ±15%

FEATURES

- Multi-element Component
- Reduces pick-and-place costs
- Saves Board Space

APPLICATIONS

- Navigation
- Multimedia systems
- Commercial Vehicles

AND MORE

HOW TO ORDER

W	3	A	4	Y	C	104	K	4	T	2A
Style W = RoHS L = SnPb	**Case Size** 2 = 0508 3 = 0612	**Array**	**Number of Caps**	**Voltage** Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V	**Dielectric** A = NP0 C = X7R F = X8R	**Capacitance Code (In pF)** Significant Digits + Number of Zeros e.g. 10µF=106	**Capacitance Tolerance** *J = ±5% *K = ±10% M = ±20%	**Failure Rate** 4 = Automotive	**Terminations** *T = Plated Ni and Sn *Z = FLEXITERM® B = 5% min lead X = FLEXITERM® with 5% min lead *RoHS compliant	**Packaging & Quantity Code** 2A = 7" Reel (4000) 4A = 13" Reel (10000) 2F = 7" Reel (1000)

*Contact factory for availability by part number for K = ±10% and J = ±5% tolerance.

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT
RoHS COMPLIANT

AUTOMOTIVE CAPACITOR ARRAYS

NP0/C0G

SIZE		W2 = 0508				W3 = 0612			
No. of Elements		4				4			
	WVDC	16	25	50	100	16	25	50	100
1R0 1R2 1R5	Cap 1.0 (pF) 1.2 1.5								
1R8 2R2 2R7	1.8 2.2 2.7								
3R3 3R9 4R7	3.3 3.9 4.7								
5R6 6R8 8R2	5.6 6.8 8.2								
100 120 150	10 12 15								
180 220 270	18 22 27								
330 390 470	33 39 47								
560 680 820	56 68 82								
101 121 151	100 120 150								
181 221 271	180 220 270								
331 391 471	330 390 470								
561 681 821	560 680 820								
102 122 152	1000 1200 1500								
182 222 272	1800 2200 2700								
332 392 472	3300 3900 4700								
562 682 822	5600 6800 8200								

= NPO/COG

X7R

SIZE		W2 = 0508				W2 = 0508				W3 = 0612				
No. of Elements		2				4				4				
	WVDC	16	25	50	100	16	25	50	100	10	16	25	50	100
101 121 151	Cap 100 (pF) 120 150													
181 221 271	180 220 270													
331 391 471	330 390 470													
561 681 821	560 680 820													
102 122 152	1000 1200 1500													
182 222 272	1800 2200 2700													
332 392 472	3300 3900 4700													
562 682 822	5600 6800 8200													
103 123 153	Cap 0.010 (µF) 0.012 0.015													
183 223 273	0.018 0.022 0.027													
333 393 473	0.033 0.039 0.047													
563 683 823	0.056 0.068 0.082													
104 124 154	0.10 0.12 0.15													
224	0.22													

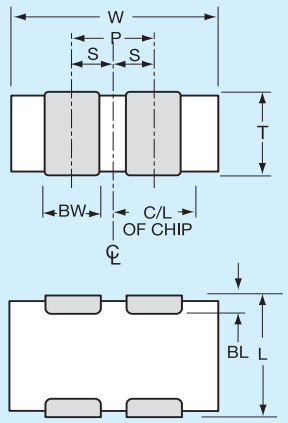
= X7R

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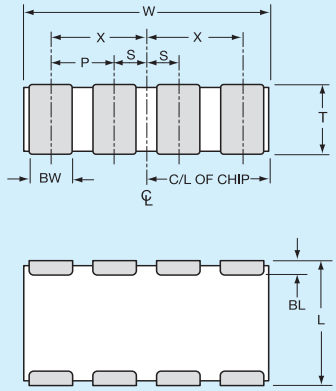
PART & PAD LAYOUT DIMENSIONS

millimeters (inches)

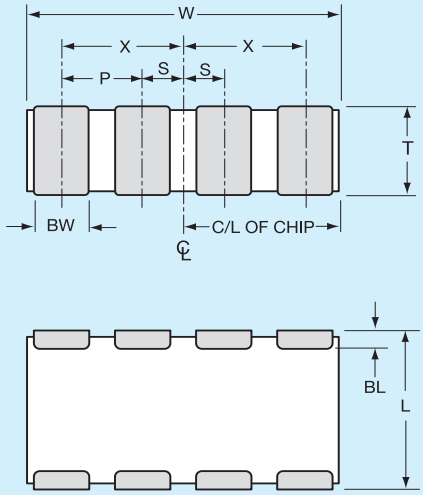
0508 - 2 Element



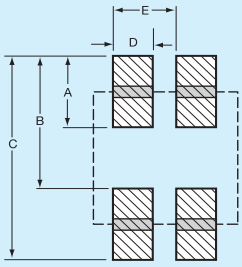
0508 - 4 Element



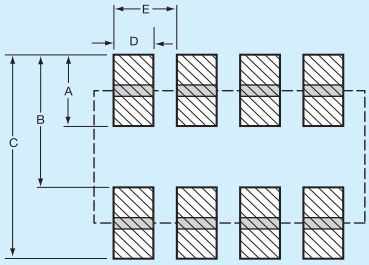
0612 - 4 Element



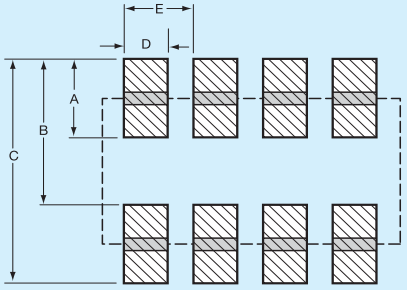
PAD LAYOUT



PAD LAYOUT



PAD LAYOUT



PART DIMENSIONS

0508 - 2 Element

L	W	T	BW	BL	P	S
1.30 ± 0.15 (0.051 ± 0.006)	2.10 ± 0.15 (0.083 ± 0.006)	0.94 MAX (0.037 MAX)	0.43 ± 0.10 (0.017 ± 0.004)	0.33 ± 0.08 (0.013 ± 0.003)	1.00 REF (0.039 REF)	0.50 ± 0.10 (0.020 ± 0.004)

0508 - 4 Element

L	W	T	BW	BL	P	X	S
1.30 ± 0.15 (0.051 ± 0.006)	2.10 ± 0.15 (0.083 ± 0.006)	0.94 MAX (0.037 MAX)	0.25 ± 0.06 (0.010 ± 0.003)	0.20 ± 0.08 (0.008 ± 0.003)	0.50 REF (0.020 REF)	0.75 ± 0.10 (0.030 ± 0.004)	0.25 ± 0.10 (0.010 ± 0.004)

0612 - 4 Element

L	W	T	BW	BL	P	X	S
1.60 ± 0.20 (0.063 ± 0.008)	3.20 ± 0.20 (0.126 ± 0.008)	1.35 MAX (0.053 MAX)	0.41 ± 0.10 (0.016 ± 0.004)	$0.18^{+0.25}_{-0.08}$ ($0.007^{+0.010}_{-0.003}$)	0.76 REF (0.030 REF)	1.14 ± 0.10 (0.045 ± 0.004)	0.38 ± 0.10 (0.015 ± 0.004)

PAD LAYOUT DIMENSIONS

0508 - 2 Element

A	B	C	D	E
0.68 (0.027)	1.32 (0.052)	2.00 (0.079)	0.46 (0.018)	1.00 (0.039)

0508 - 4 Element

A	B	C	D	E
0.56 (0.022)	1.32 (0.052)	1.88 (0.074)	0.30 (0.012)	0.50 (0.020)

0612 - 4 Element

A	B	C	D	E
0.89 (0.035)	1.65 (0.065)	2.54 (0.100)	0.46 (0.018)	0.76 (0.030)

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The signal integrity characteristics of a Power Delivery Network (PDN) are becoming critical aspects of board level and semiconductor package designs due to higher operating frequencies, larger power demands, and the ever shrinking lower and upper voltage limits around low operating voltages. These power system challenges are coming from mainstream designs with operating frequencies of 300MHz or greater, modest ICs with power demand of 15 watts or more, and operating voltages below 3 volts.

The classic PDN topology is comprised of a series of capacitor stages. Figure 1 is an example of this architecture with multiple capacitor stages.

An ideal capacitor can transfer all its stored energy to a load instantly. A real capacitor has parasitics that prevent instantaneous transfer of a capacitor's stored energy. The true nature of a capacitor can be modeled as an RLC equivalent circuit. For most simulation purposes, it is possible to model the characteristics of a real capacitor with one capacitor, one resistor, and one inductor. The RLC values in this model are commonly referred to as equivalent series capacitance (ESC), equivalent series resistance (ESR), and equivalent series inductance (ESL).

The ESL of a capacitor determines the speed of energy transfer to a load. The lower the ESL of a capacitor, the faster that energy can be transferred to a load. Historically, there has been a tradeoff between energy storage (capacitance) and inductance (speed of energy delivery). Low ESL devices typically have low capacitance. Likewise, higher capacitance devices typically have higher ESLs. This tradeoff between ESL (speed of energy delivery) and capacitance (energy storage) drives the PDN design topology that places the fastest low ESL capacitors as close to the load as possible. Low Inductance MLCCs are found on semiconductor packages and on boards as close as possible to the load.

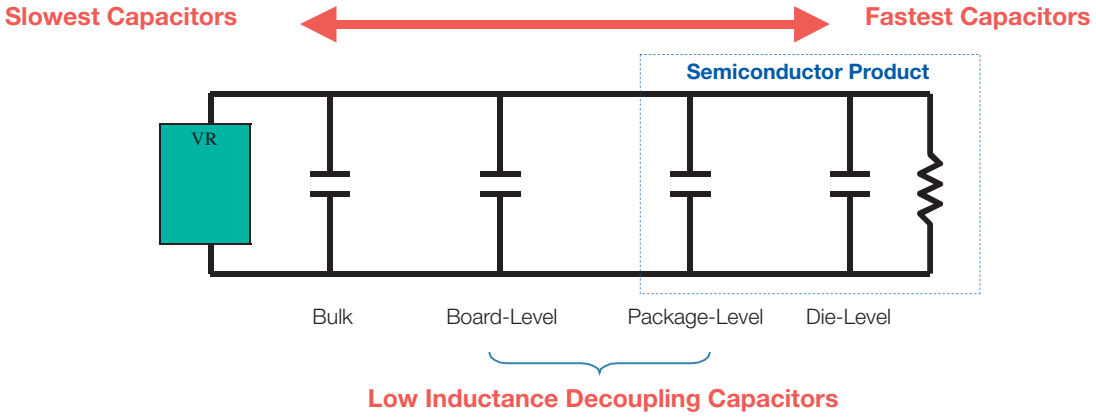


Figure 1 Classic Power Delivery Network (PDN) Architecture

LOW INDUCTANCE CHIP CAPACITORS

The key physical characteristic determining equivalent series inductance (ESL) of a capacitor is the size of the current loop it creates. The smaller the current loop, the lower the ESL. A standard surface mount MLCC is rectangular in shape with electrical terminations on its shorter sides. A Low Inductance Chip Capacitor (LICC) sometimes referred to as Reverse Geometry Capacitor (RGC) has its terminations on the longer side of its rectangular shape.

When the distance between terminations is reduced, the size of the current loop is reduced. Since the size of the current loop is the primary driver of inductance, an 0306 with a smaller current loop has significantly lower ESL then an 0603. The reduction in ESL varies by EIA size, however, ESL is typically reduced 60% or more with an LICC versus a standard MLCC.

INTERDIGITATED CAPACITORS

The size of a current loop has the greatest impact on the ESL characteristics of a surface mount capacitor. There is a secondary method for decreasing the ESL of a capacitor. This secondary method uses adjacent opposing current loops to reduce ESL. The InterDigitated Capacitor (IDC) utilizes both primary and secondary methods of reducing inductance. The IDC architecture shrinks the distance between terminations to minimize the current loop size, then further reduces inductance by creating adjacent opposing current loops.

An IDC is one single capacitor with an internal structure that has been optimized for low ESL. Similar to standard MLCC versus LICCs, the reduction in ESL varies by EIA case size. Typically, for the same EIA size, an IDC delivers an ESL that is at least 80% lower than an MLCC.

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LAND GRID ARRAY (LGA) CAPACITORS

Land Grid Array (LGA) capacitors are based on the first Low ESL MLCC technology created to specifically address the design needs of current day Power Delivery Networks (PDNs). This is the 3rd low inductance capacitor technology developed by AVX. LGA technology provides engineers with new options. The LGA internal structure and manufacturing technology eliminates the historic need for a device to be physically small to create small current loops to minimize inductance.

The first family of LGA products are 2 terminal devices. A 2 terminal 0306 LGA delivers ESL performance that is equal to or better than an 0306 8 terminal IDC. The 2 terminal 0805 LGA delivers ESL performance that approaches the 0508 8 terminal IDC. New designs that would have used 8 terminal IDCs are moving to 2 terminal LGAs because the layout is easier for a 2 terminal device and manufacturing yield is better for a 2 terminal LGA versus an 8 terminal IDC.

LGA technology is also used in a 4 terminal family of products that AVX is sampling and will formerly introduce in 2008. Beyond 2008, there are new multi-terminal LGA product families that will provide even more attractive options for PDN designers.

LOW INDUCTANCE CHIP ARRAYS (LICA®)

The LICA® product family is the result of a joint development effort between AVX and IBM to develop a high performance MLCC family of decoupling capacitors. LICA was introduced in the 1980s and remains the leading choice of designers in high performance semiconductor packages and high reliability board level decoupling applications.

LICA® products are used in 99.999% uptime semiconductor package applications on both ceramic and organic substrates. The C4 solder ball termination option is the perfect compliment to flip-chip packaging technology. Mainframe class CPUs, ultimate performance multi-chip modules, and communications systems that must have the reliability of 5 9's use LICA®.

LICA® products with either Sn/Pb or Pb-free solder balls are used for decoupling in high reliability military and aerospace applications. These LICA® devices are used for decoupling of large pin count FPGAs, ASICs, CPUs, and other high power ICs with low operating voltages.

When high reliability decoupling applications require the very lowest ESL capacitors, LICA® products are the best option.

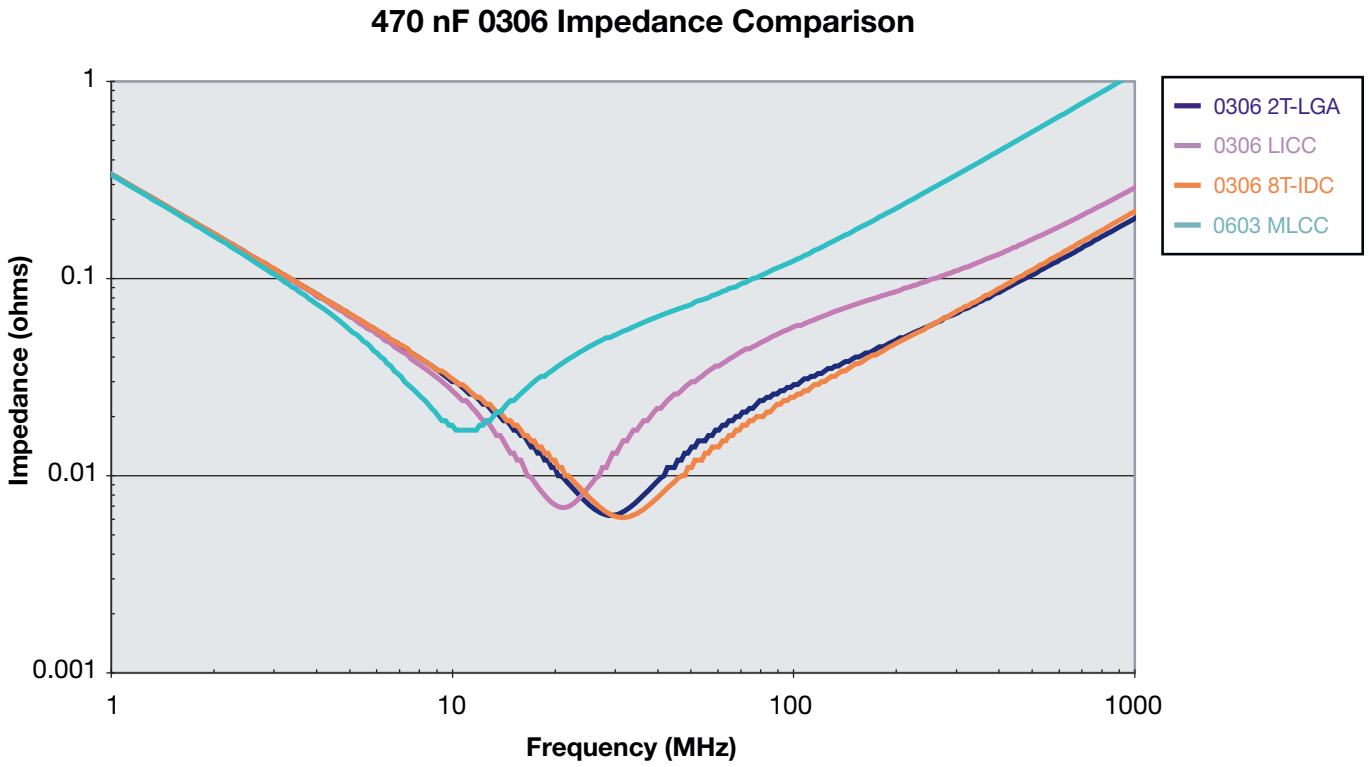


Figure 2 MLCC, LICC, IDC, and LGA technologies deliver different levels of equivalent series inductance (ESL).

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GENERAL DESCRIPTION

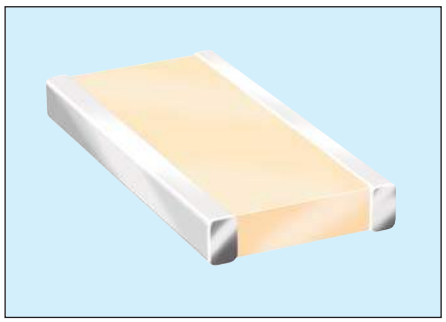
The key physical characteristic determining equivalent series inductance (ESL) of a capacitor is the size of the current loop it creates. The smaller the current loop, the lower the ESL.

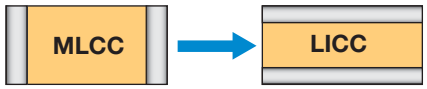
A standard surface mount MLCC is rectangular in shape with electrical terminations on its shorter sides. A Low Inductance Chip Capacitor (LICC) sometimes referred to as Reverse Geometry Capacitor (RGC) has its terminations on the longer sides of its rectangular shape. The image on the right shows the termination differences between an MLCC and an LICC.

When the distance between terminations is reduced, the size of the current loop is reduced. Since the size of the current loop is the primary driver of inductance, an 0306 with a smaller current loop has significantly lower ESL then an 0603. The reduction in ESL varies by EIA size, however, ESL is typically reduced 60% or more with an LICC versus a standard MLCC.

AVX LICC products are now qualified to AEC-Q200 for automotive applications.

RoHS COMPLIANT





PERFORMANCE CHARACTERISTICS

Capacitance Tolerances	K = ±10%; M = ±20%
Operation Temperature Range	X7R = -55°C to +125°C
Temperature Coefficient	X7R = ±15%
Voltage Ratings	6.3, 10, 16, 25, 50 VDC
Dissipation Factor	6.3V = 6.5% max; 10V = 5.0% max; 16V = 3.5% max; 25V = 3.0% max; 50V = 2.5% max
Insulation Resistance (@+25°C, RVDC)	100,000MΩ min, or 1,000MΩ per µF min.,whichever is less

HOW TO ORDER

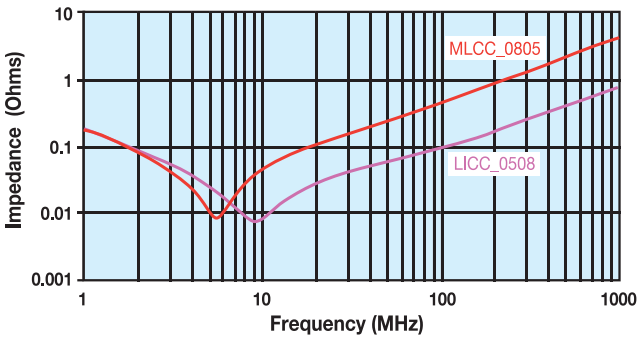
0612	Z	C	105	M	A	T	2	A*
Size 0306 0508 0612	**Voltage** 6 = 6.3V Z = 10V Y = 16V 3 = 25V 5 = 50V	**Dielectric** C = X7R	**Capacitance Code (In pF)** 2 Sig. Digits + Number of Zeros	**Capacitance Tolerance** K = ±10% M = ±20%	**Failure Rate** 4 = Automotive	**Terminations** T = Plated Ni and Sn	**Packaging** 2 = 7" Reel 4 = 13" Reel	**Thickness** mm (in) 0.56 (0.022) 0.76 (0.030) 1.02 (0.040) 1.27 (0.050)

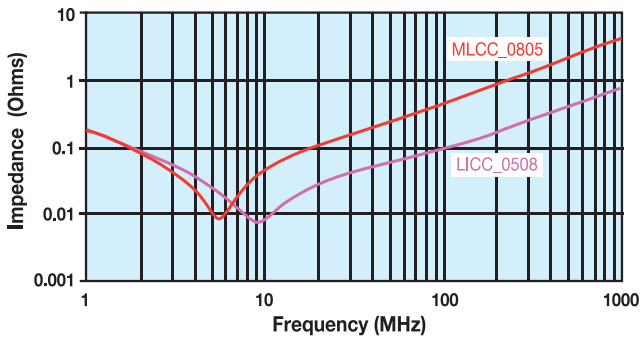
***See the thickness tables on the next page.**

NOTE: Contact factory for availability of Termination and Tolerance Options for Specific Part Numbers.

*Note: For each case size, see Thickness Codes section on the next page.

TYPICAL IMPEDANCE CHARACTERISTICS





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SIZE		0306				0508					0612				
Packaging		Embossed				Embossed					Embossed				
Length mm (in.)		0.81 ± 0.15 (0.032 ± 0.006)				1.27 ± 0.25 (0.050 ± 0.010)					1.60 ± 0.25 (0.063 ± 0.010)				
Width mm (in.)		1.60 ± 0.15 (0.063 ± 0.006)				2.00 ± 0.25 (0.080 ± 0.010)					3.20 ± 0.25 (0.126 ± 0.010)				
Cap Code	WVDC	6.3	10	16	25	6.3	10	16	25	50	6.3	10	16	25	50
102	Cap 0.001	A	A	A	A	S	S	S	S	V	S	S	S	S	V
222	(µF) 0.0022	A	A	A	A	S	S	S	S	V	S	S	S	S	V
332	0.0033	A	A	A	A	S	S	S	S	V	S	S	S	S	V
472	0.0047	A	A	A	A	S	S	S	S	V	S	S	S	S	V
682	0.0068	A	A	A	A	S	S	S	S	V	S	S	S	S	V
103	0.01	A	A	A	A	S	S	S	S	V	S	S	S	S	V
153	0.015	A	A	A	A	S	S	S	S	V	S	S	S	S	W
223	0.022	A	A	A	A	S	S	S	S	V	S	S	S	S	W
333	0.033	A	A	A		S	S	S	V	V	S	S	S	S	W
473	0.047	A	A	A		S	S	S	V	A	S	S	S	S	W
683	0.068	A	A	A		S	S	S	A	A	S	S	S	V	W
104	0.1					S	S	V	A	A	S	S	S	V	W
154	0.15					S	S				S	S	S	W	W
224	0.22					S	S				S	S	V	W	
334	0.33					V	V				S	S			
474	0.47					V	V				S	S			
684	0.68					A	A				V	V			
105	1					A	A				V	V			
155	1.5										W	W			
225	2.2										A	A			
335	3.3														
475	4.7														
685	6.8														
106	10														

THICKNESS CODES:

mm (in.)

0306	
Code	Thickness
A	0.56 (0.022)

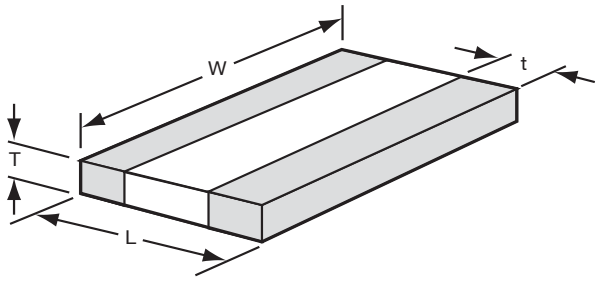
mm (in.)

0508	
Code	Thickness
S	0.56 (0.022)
V	0.76 (0.030)
A	1.02 (0.040)

mm (in.)

0612	
Code	Thickness
S	0.56 (0.022)
V	0.76 (0.030)
W	1.02 (0.040)
A	1.27 (0.050)

PHYSICAL DIMENSIONS AND PAD LAYOUT



PHYSICAL DIMENSIONS

mm (in)

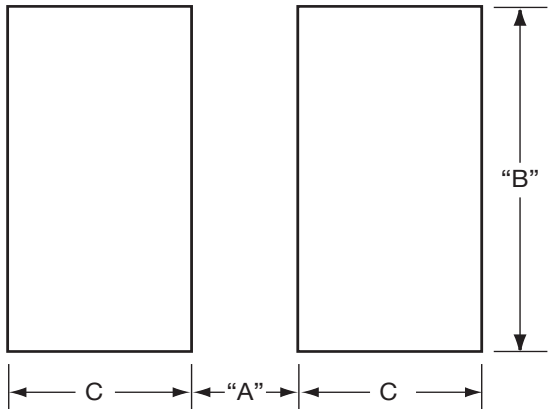
	L	W	t
0306	0.81 ± 0.15 (0.032 ± 0.006)	1.60 ± 0.15 (0.063 ± 0.006)	0.13 min. (0.005 min.)
0508	1.27 ± 0.25 (0.050 ± 0.010)	2.00 ± 0.25 (0.080 ± 0.010)	0.13 min. (0.005 min.)
0612	1.60 ± 0.25 (0.063 ± 0.010)	3.20 ± 0.25 (0.126 ± 0.010)	0.13 min. (0.005 min.)

T - See Range Chart for Thickness and Codes

PAD LAYOUT DIMENSIONS

mm (in)

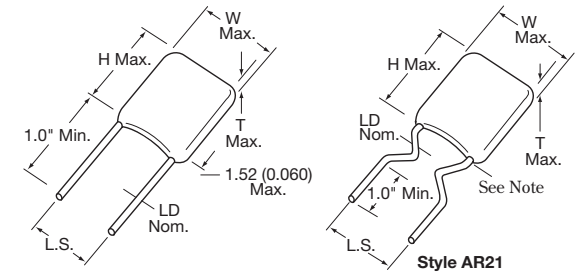
	A	B	C
0306	0.31 (0.012)	1.52 (0.060)	0.51 (0.020)
0508	0.51 (0.020)	2.03 (0.080)	0.51 (0.020)
0612	0.76 (0.030)	3.05 (0.120)	0.635 (0.025)



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Dimensions: Millimeters (Inches)



Styles AR15, AR20, AR30, AR40

Style AR21

Note: Coating clean .784 (0.031) min. above seating plane

Drawings are for illustrative purposes only.
Actual lead form shape could vary within stated tolerances based on body size.

GENERAL INFORMATION

AVX AR Series
Conformally Coated Radial Leaded MLC
Temperature Coefficients: C0G (NP0), X7R, X8R
3000, 2000, 1000, 200, 100, 50 Volts
Case Material: Epoxy
Lead Material: RoHS Compliant, 100% Tin
Qualified: to AEC-Q200, PPAP Available
Temperature Range: up to 150ºC

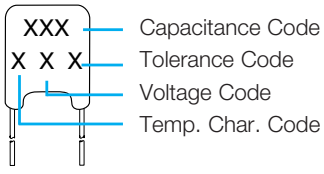
RoHS COMPLIANT

HOW TO ORDER

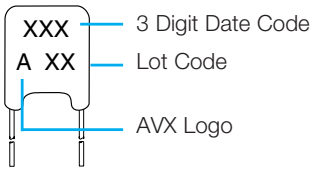
AR21	5	F	104	M	4	R	TR1
AVX Style	**Voltage** 5 = 50V 1 = 100V 2 = 200V A = 1000V G = 2000V H = 3000V	**Temperature Coefficient** A = C0G (NP0) C = X7R F = X8R	**Capacitance** First two digits are the significant figures of capacitance. Third digit indicates the additional number of zeros. For example, order 100,000 pF as 104. (For values below 10pF use "R" in place of decimal point, e.g., 1R4 = 1.4pF.)	**Capacitance Tolerance** C0G (NP0): C = ±.25pF D = ±.5pF F = ±1% (>50pF only) G = ±2% (>25pF only) J = ±5% K = ±10% X7R: J = ±5% K = ±10% M = ±20% X8R: J = ±5% K = ±10% M = ±20%	**Failure Rate** 4 = AEC-Q200	**Leads** R = RoHS Long Lead 1.0" minimum	**Packaging** Blank = Bulk Packaging T = Trimmed Leads .230"± .030" Bulk packaging TR1 = Tape and Reel Packaging AP1 = Ammopack Packaging See packaging specification page 33-34.

MARKING

FRONT



BACK



PACKAGING REQUIREMENTS

	Quantity per Bag
AR15, 20, 21, 30	1000 Pieces
AR40	500 Pieces

Note: AR15, AR20, AR21, AR30, and AR40 available on tape and reel per EIA specifications RS-468. See pages 33 and 34.

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SIZE AND CAPACITANCE SPECIFICATIONS

EIA Characteristic

Dimensions: Millimeters (Inches)

	AVX Style	**AR15**			**AR20**			**AR21**		
	AVX "Insertable"	AR07			AR29			AR59		
	Width (W)	3.81 (.150)			5.08 (.200)			5.08 (.200)		
	Height (H)	3.81 (.150)			5.08 (.200)			5.08 (.200)		
	Thickness (T)	2.54 (.100)			3.175 (.125)			3.175 (.125)		
	Lead Spacing (L.S.)	2.54 (.100)			2.54 (.100)			5.08 (.200)		
	Lead Diameter (L.D.)	.508 (.020)			.508 (.020)			.508 (.020)		
Cap in pF	**Industry Preferred Values in Blue**	**WVDC**			**WVDC**			**WVDC**		
		200	**100**	**50**	**200**	**100**	**50**	**200**	**100**	**50**
1	AR_____A1R0D4R			■	■	■	■	■	■	■
10	**AR_____A100K4R**			■	■	■	■	■	■	■
15	AR_____A150K4R			■	■	■	■	■	■	■
22	AR_____A220K4R			■	■	■	■	■	■	■
33	AR_____A330K4R			■	■	■	■	■	■	■
39	AR_____A390K4R			■	■	■	■	■	■	■
47	AR_____A470K4R			■	■	■	■	■	■	■
68	AR_____A680K4R			■	■	■	■	■	■	■
100	**AR_____A101K4R**			■	■	■	■	■	■	■
150	AR_____A151K4R			■	■	■	■	■	■	■
220	AR_____A221K4R			■	■	■	■	■	■	■
330	AR_____A331K4R			■	■	■	■	■	■	■
390	AR_____A391K4R			■	■	■	■	■	■	■
470	AR_____A471K4R			■	■	■	■	■	■	■
680	AR_____A681K4R			■	■	■	■	■	■	■
1,000	**AR_____A102K4R**			■	■	■	■	■	■	■
1,500	AR_____A152K4R				■	■	■	■	■	■
2,200	AR_____A222K4R				■	■	■	■	■	■
3,900	AR_____A392K4R					■	■		■	■
4,700	**AR_____A472K4R**					■	■		■	■
6800	AR_____A682K4R						■			■
8200	AR_____A822K4R						■			■

Notes:
"Insertable" make reference to alternative AVX style using the same range of capacitance available on the matrix.
For others Styles, voltages, tolerance and lead lengths see Skycap catalog or contact factory.
Others capacitance values available upon special request.
Others styles available: AR12, AR14, AR62, AR89.

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SIZE AND CAPACITANCE SPECIFICATIONS

EIA Characteristic Dimensions: Millimeters (Inches)

	AVX Style	AR15		AR20		AR21		AR30		AR40	
	AVX "Insertable"	AR07		AR29		AR59		AR65		AR75	
	Width (W)	3.81 (.150)		5.08 (.200)		5.08 (.200)		7.62 (.300)		10.16 (.400)	
	Height (H)	3.81 (.150)		5.08 (.200)		5.08 (.200)		7.62 (.300)		10.16 (.400)	
	Thickness (T)	2.54 (.100)		3.175 (.125)		3.175 (.125)		3.81 (.150)		3.81 (.150)	
	Lead Spacing (L.S.)	2.54 (.100)		2.54 (.100)		5.08 (.200)		5.08 (.200)		5.08 (.200)	
	Lead Diameter (L.D.)	.508 (.020)		.508 (.020)		.508 (.020)		.508 (.020)		.508 (.020)	
Cap in pF	Industry Preferred Values in Blue	WVDC 100	50	WVDC 100	50	WVDC 100	50	WVDC 100	50	WVDC 100	50
470	AR_____C471K4R	■	■								
1000	**AR_____C102K4R**	■	■	■	■	■	■				
1500	AR_____C152K4R	■	■	■	■	■	■				
2200	AR_____C222K4R	■	■	■	■	■	■				
3300	AR_____C332K4R	■	■	■	■	■	■				
4700	AR_____C472K4R	■	■	■	■	■	■				
6800	AR_____C682K4R	■	■	■	■	■	■				
10,000	**AR_____C103K4R**	■	■	■	■	■	■				
15,000	AR_____C153K4R	■	■	■	■	■	■				
22,000	AR_____C223K4R	■	■	■	■	■	■				
33,000	AR_____C333K4R	■	■	■	■	■	■				
47,000	AR_____C473K4R	■	■	■	■	■	■				
68,000	AR_____C683K4R	■	■	■	■	■	■				
100,000	**AR_____C104K4R**	■	■	■	■	■	■				
150,000	AR_____C154K4R				■		■				
220,000	AR_____C224K4R				■		■				
330,000	AR_____C334K4R				■		■		■		
390,000	AR_____C394K4R				■		■		■		
470,000	AR_____C474K4R				■		■		■		
680,000	AR_____C684K4R				■		■		■	■	
1.0 uF	**AR_____C105K4R**				■		■		■	■	
4,700,000	AR_____C475K4R				■		■		■		
6,800,000	AR_____C685K4R										
10.0 uF	**AR_____C106K4R**										

■ = Extended range with 0.150" thickness maximum

Notes:
"Insertable" make reference to alternative AVX style using the same range of capacitance available on the matrix.
For others Styles, voltages, tolerance and lead lengths see Skycap catalog or contact factory.
Others capacitance values available upon special request.
Others styles available: AR12, AR14, AR62, AR89, AR32, AR38.

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SIZE AND CAPACITANCE SPECIFICATIONS

EIA Characteristic Dimensions: Millimeters (Inches)

AVX Style		AR20			AR21		
AVX "Insertable"		AR29			AR59		
Width (W)		5.08 (.200)			5.08 (.200)		
Height (H)		5.08 (.200)			5.08 (.200)		
Thickness (T)		3.175 (.125)			3.175 (.125)		
Lead Spacing (L.S.)		2.54 (.100)			5.08 (.200)		
Lead Diameter (L.D.)		.508 (.020)			.508 (.020)		
Cap in pF	Industry Preferred Values in Blue	WVDC 200	100	50	WVDC 200	100	50
1,000	AR_____F102K4R						
10,000	AR_____F103K4R						
100,000	AR_____F104K4R						
330,000	AR_____F334K4R						

Notes:
"Insertable" make reference to alternative AVX style using the same range of capacitance available on the matrix.
For others Styles, voltages, tolerance and lead lengths see Skycap catalog or contact factory.
Others capacitance values available upon special request.
Others styles available: AR14, AR62, AR89.

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SIZE AND CAPACITANCE SPECIFICATIONS

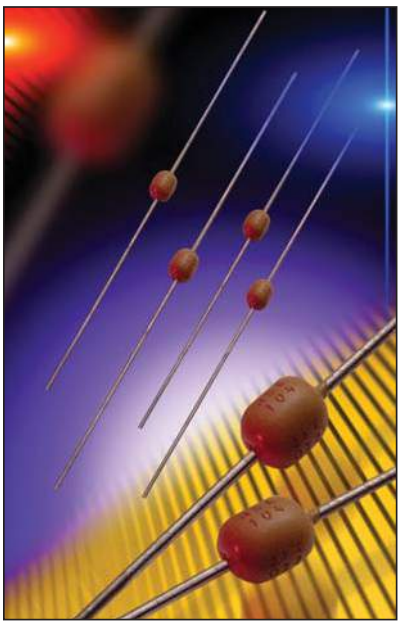
EIA Characteristic Dimensions: Millimeters (Inches)

	AVX Style	AR20	AR21	AR22	AR27	AR30	
	AVX "Insertable"	AR29	AR59	N/A	N/A	AR65	
Cap in pF	Industry Preferred Values in Blue	WVDC 1000	WVDC 1000	WVDC 1000	WVDC 1000	WVDC 2000	WVDC 3000
470	AR_____C471K4R						
1000	**AR_____C102K4R**						
1500	AR_____C152K4R						
2200	AR_____C222K4R						
3300	AR_____C332K4R						
4700	AR_____C472K4R						
6800	AR_____C682K4R						
10,000	**AR_____C103K4R**						
15,000	AR_____C153K4R						
22,000	AR_____C223K4R						
47,000	AR_____C473K4R						
68,000	AR_____C683K4R						

For others Styles, voltages, tolerance and lead lengths see Skycap catalog or contact factory.

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AA Series (Automotive)
SpinGuard® Axial Conformal Coated X7R Dielectric



AVX AA Series are conformally coated axial leaded capacitors. Axial Capacitors are available in X7R dielectrics.

AA Series parts are automotive AEC-Q200 qualified.

GENERAL CHARACTERISTICS

Operating Temperature: -55ºC to 125ºC
Capacitance Variation: ±15%

FEATURES

- Axial construction
- Epoxy Coated
- Capacitance Stability
- Excellent Mechanical Performance

APPLICATIONS

- Positioning Sensors
- Fuel Pumps
- Brush Card Motors

HOW TO ORDER

AA10	5	C	104	M	4	R
AVX Style	**Voltage** 5 = 50V 1 = 100V 2 = 200V	**Temperature Coefficient** C = X7R	**Capacitance** First two digits are the significant figures of capacitance. Third digit indicates the additional number of zeros. For example, order 100,000 pF as 104. (For values below 10pF use "R" in place of decimal point, e.g., 1R4 = 1.4pF.)	**Capacitance Tolerance** J = ±5% K = ±10% M = ±20%	**Failure Rate** 4 = AEC-Q200	**Leads** R = RoHS

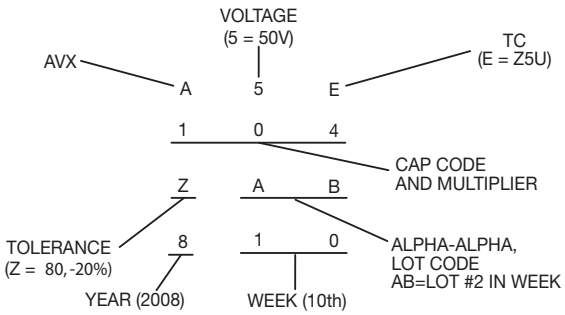
LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

X7R DIELECTRIC

AVX Style	AA10		AA11		AA30	
Cap in pF	WVDC 100	50	WVDC 100	50	WVDC 100	50
10,000						
100,000						

AA SERIES MARKING



AA SERIES PACKAGING

Tape and Reel Ø 14": 7500 pieces
Class I/RS-296

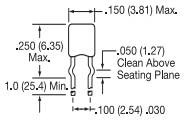
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AR SERIES DIMENSIONS

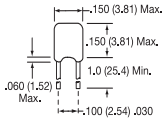
LEAD SPACING .100 ±.030

Dimensions: Inches (Millimeters)

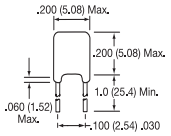
AR07
(T=.100)



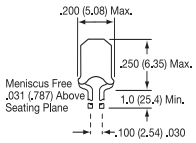
AR15
(T=.100)



AR20
(T=.125)



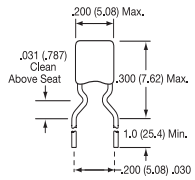
AR29
(T=.125)



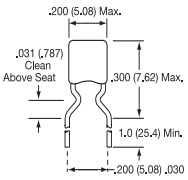
LEAD SPACING .200 ±.030

Dimensions: Inches (Millimeters)

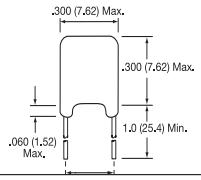
AR21
(T=.125)



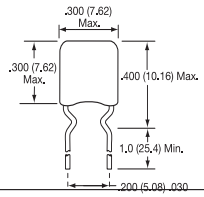
AR59
(T=.125)



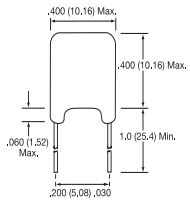
AR30
(T=.150)



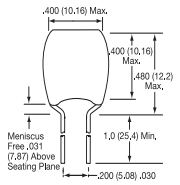
AR65
(T=.150)



AR40
(T=.150)

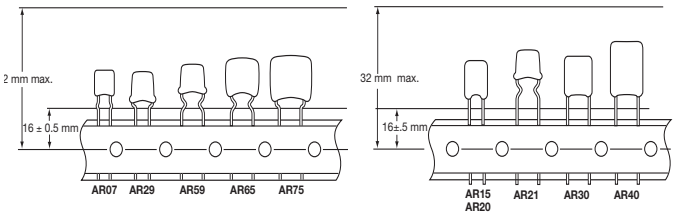


AR75
(T=.150)
Leads = #22 AWG

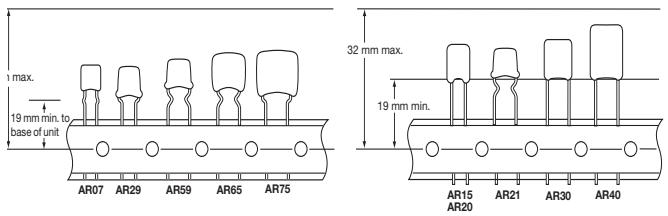


AA SERIES DIMENSIONS

STANDARD 1 (TR1)



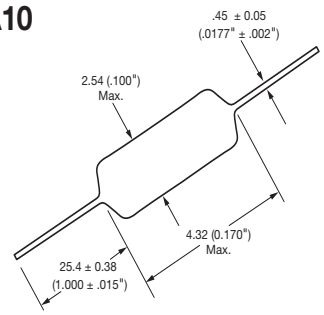
STANDARD 2 (TR2)



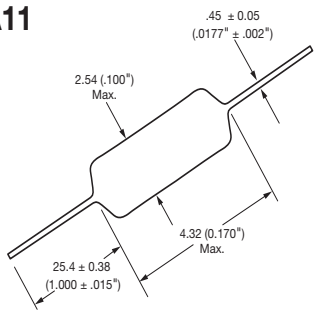
AA SERIES DIMENSIONS

Dimensions: Inches (Millimeters)

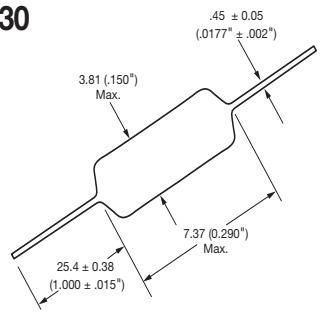
AA10



AA11

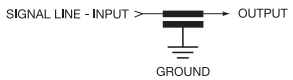


AA30



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Available in both a standard 0805 and 1206 size, AVX's line of EMI Feedthru filter capacitors are ideal choices for EMI suppression, broadband I/O filtering, or Vcc power line conditioning. The unique construction of EMI Feedthru filter capacitors provides low parallel inductance and offers excellent decoupling capability for all high di/dt environments and provides significant noise reduction in digital circuits to <5 GHz. A large range of capacitor values are available in either NP0 or X7R ceramic dielectrics.

GENERAL CHARACTERISTICS

Operating Temperature: -55ºC to 125ºC
Capacitance Variation NP0: 0±60ppm
Capacitance Variation X7R: ±15%

FEATURES

- Low parallel inductance
- Excellent decoupling
- Low Loss

APPLICATIONS

- Broadband I/O Filtering
- Vcc Power Line Conditioning
- Drive by Wire

AND MORE

CAPACITOR VALUES

Part Number	Size	Voltage	Dielectric	Capacitance
W2F11A 220 84Txx	0805	100V	NP0	22pF
W2F11A 470 84Txx	0805	100V	NP0	47pF
W2F11A 101 84Txx	0805	100V	NP0	100pF
W2F11A 221 84Txx	0805	100V	NP0	220pF
W2F11A 471 84Txx	0805	100V	NP0	470pF
W2F15C 102 84Txx	0805	50V	X7R	1000pF
W2F15C 222 84Txx	0805	50V	X7R	2200pF
W2F15C 472 84Txx	0805	50V	X7R	4700pF
W2F15C 103 84Txx	0805	50V	X7R	10000pF
W2F15C 223 84Txx	0805	50V	X7R	22000pF
W2F15C 473 84Txx	0805	50V	X7R	47000pF
W3F11A 220 84Txx	1206	100V	NP0	22pF
W3F11A 470 84Txx	1206	100V	NP0	47pF
W3F11A 101 84Txx	1206	100V	NP0	100pF
W3F11A 221 84Txx	1206	100V	NP0	220pF
W3F11A 471 84Txx	1206	100V	NP0	470pF
W3F15C 102 84Txx	1206	50V	X7R	1000pF
W3F15C 222 84Txx	1206	50V	X7R	2200pF
W3F15C 472 84Txx	1206	50V	X7R	4700pF
W3F15C 103 84Txx	1206	50V	X7R	10000pF
W3F15C 223 84Txx	1206	50V	X7R	22000pF
W3F15C 473 84Txx	1206	50V	X7R	47000pF

PERFORMANCE CHARACTERISTICS

	NP0	X7R
Capacitance Tolerance	+50%, -20%	+50%, -20%
Voltage Rating	100V	50V
Current Rating	300mA	300mA
Insulation Resistance	1000MΩ	1000MΩ
DC Resistance	<0.6Ω	<0.6Ω
Operating Temperature Range	-55 to +125°C	

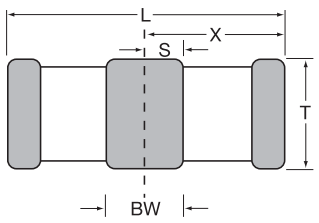
RoHS COMPLIANT

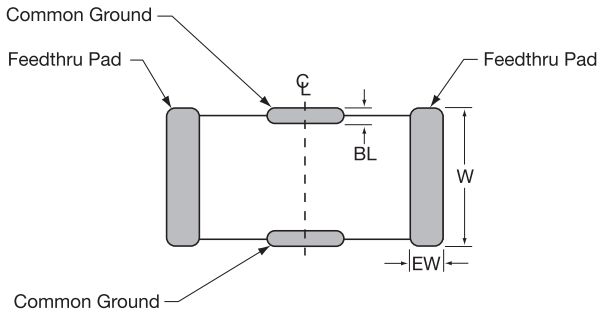
HOW TO ORDER

W	3	F	1	5	C	223	8	A	T	3	A
Style W = Plated Ni & Sn L = Plated SnPb	**Size** 2 = 0805 3 = 1206	**Feedthru**	**Number of Elements**	**Voltage** 1 = 100V 5 = 50V	**Dielectric** A = NP0 C = X7R	**Capacitance Code**	**Capacitance Tolerance** 8 = +50/-20%	**Failure Rate** 4 = AUTOMOTIVE	**Termination** T = Plated Ni & Sn B = Plated SnPb	**Packaging Code (Reel Size)** 1 & 2 = 7" Reel Embossed Tape 3 & 4 = 13" Reel Embossed Tape	**Quantity Code (Pcs./Reel)** F = 1,000 A = 2,000, 4,000 or 10,000

*Note: NP0 available in 100V only and X7R available in 50V only.

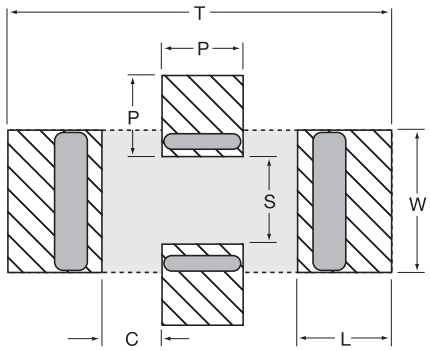
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DIMENSIONS

	L	W	T	BW	BL	EW	X	S
0805 MM (in.)	2.01 ± 0.20 (0.079 ± 0.008)	1.25 ± 0.20 (0.049 ± 0.008)	1.14 Max. (0.045 Max.)	0.46 ± 0.10 (0.018 ±0.004)	0.18 + 0.25 -0.08 (0.007 + 0.010 -0.003)	0.25 ± 0.13 (0.010 ± 0.005)	1.02 ± 0.10 (0.040 ± 0.004)	0.23 ± 0.15 (0.009 ± 0.006)
1206 MM (in.)	3.20 ± 0.20 (0.126 ± 0.008)	1.60 ± 0.20 (0.063 ± 0.008)	1.27 Max. (0.050 Max.)	0.89 ± 0.10 (0.035 ± 0.004)	0.18 + 0.25 -0.08 (0.007 + 0.010 -0.003)	0.38 ± 0.18 (0.015 ± 0.007)	1.60 ± 0.10 (0.063 ± 0.004)	0.46 ± 0.15 (0.018 ± 0.006)

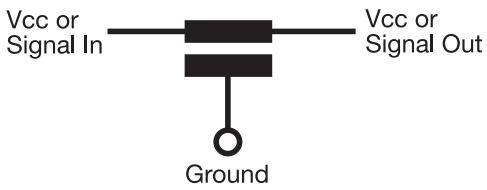


RECOMMENDED SOLDER PAD LAYOUT (TYPICAL DIMENSIONS)

	T	P	S	W	L	C
0805 MM (in.)	3.45 (0.136)	0.51 (0.020)	0.76 (0.030)	1.27 (0.050)	1.02 (0.040)	0.46 (0.018)
1206 MM (in.)	4.54 (0.179)	0.94 (0.037)	1.02 (0.040)	1.65 (0.065)	1.09 (0.043)	0.71 (0.028)

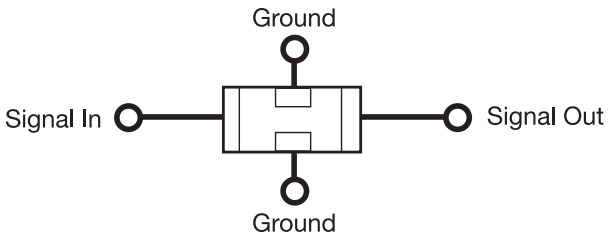
TYPICAL FEEDTHRU CHIP CAP CONNECTION

Feedthru Chip Component Model

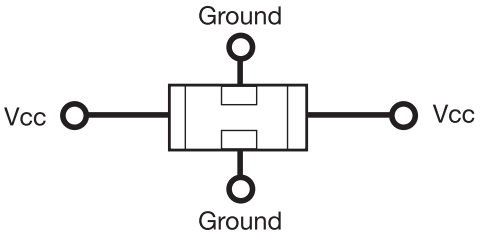


The terminals are connected internally side to side. Left side and right side are connected and front and back are connected internally.
For Decoupling, the chip is usually surrounded by four vias, two for Vcc and two for GND.
For Signal Filtering, the in and out lines need to be separated on the circuit board.

Physical Layout - A



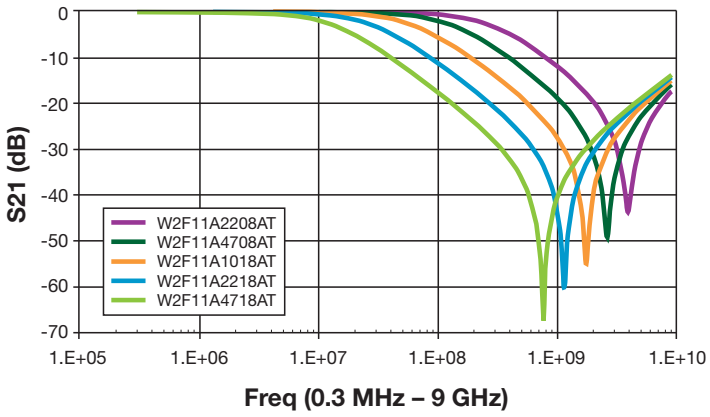
Physical Layout - B



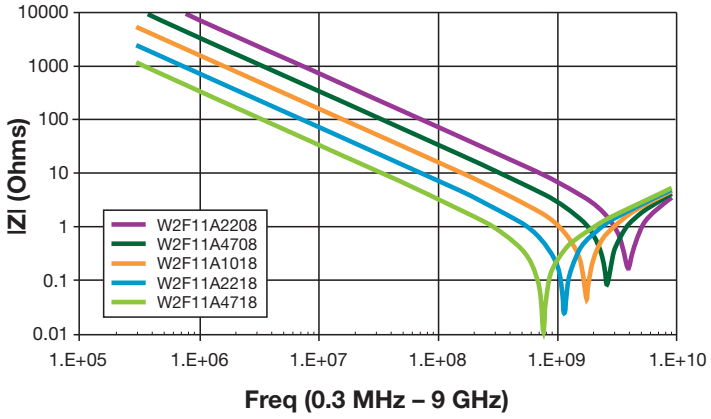
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PERFORMANCE CHARACTERISTICS

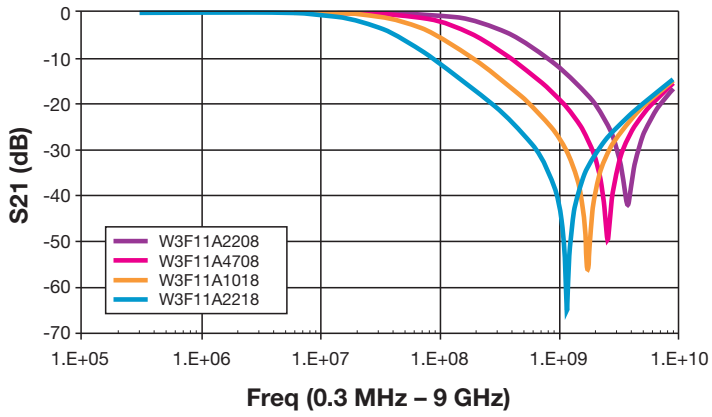
S21 0805 – 100V



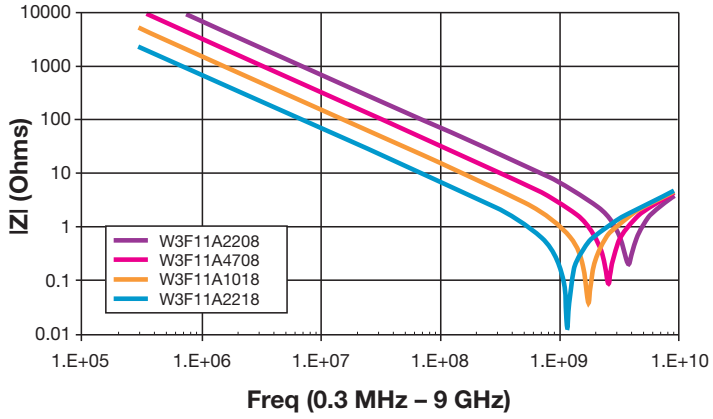
IMPEDANCE 0805 – 100V



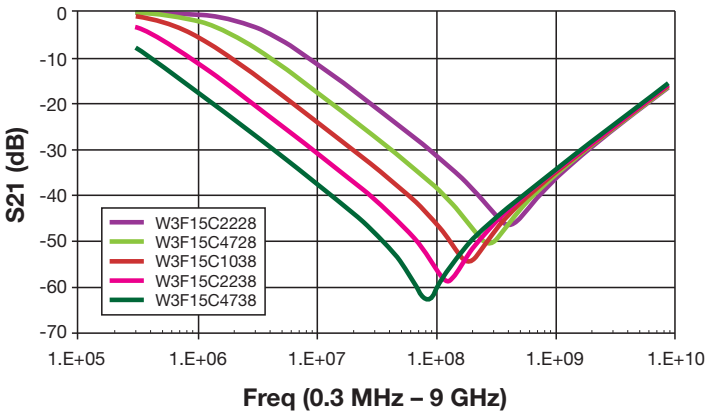
S21 1206 – 100V



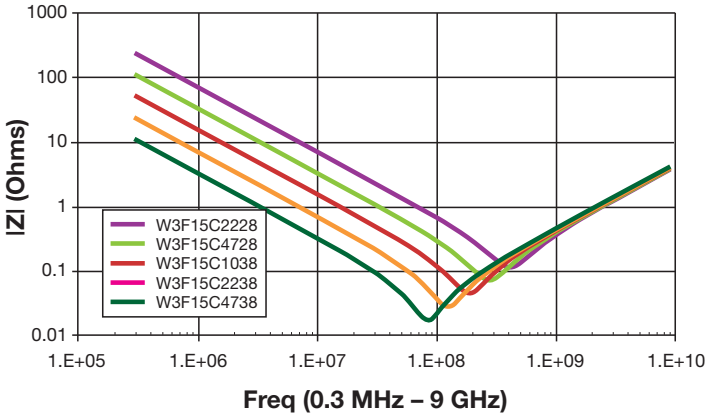
IMPEDANCE 1206 – 100V



S21 1206 – 50V

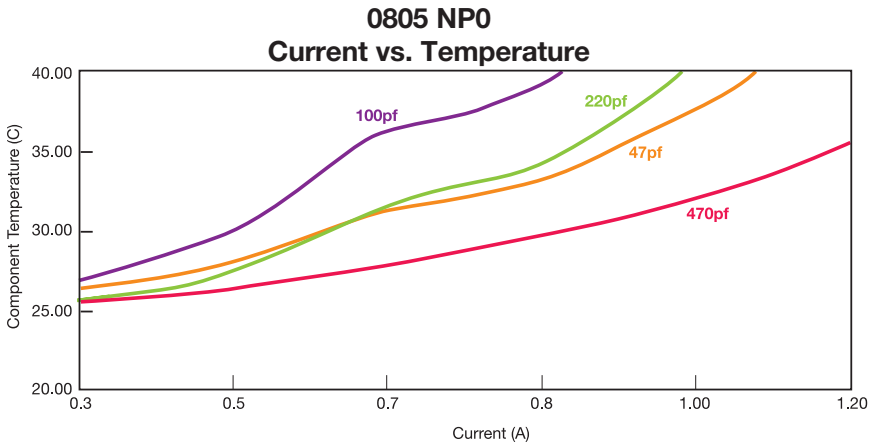


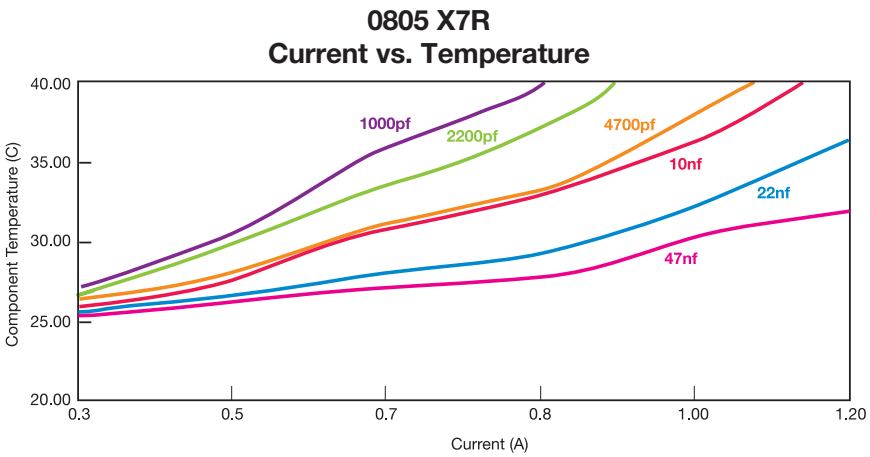
IMPEDANCE 1206 – 50V

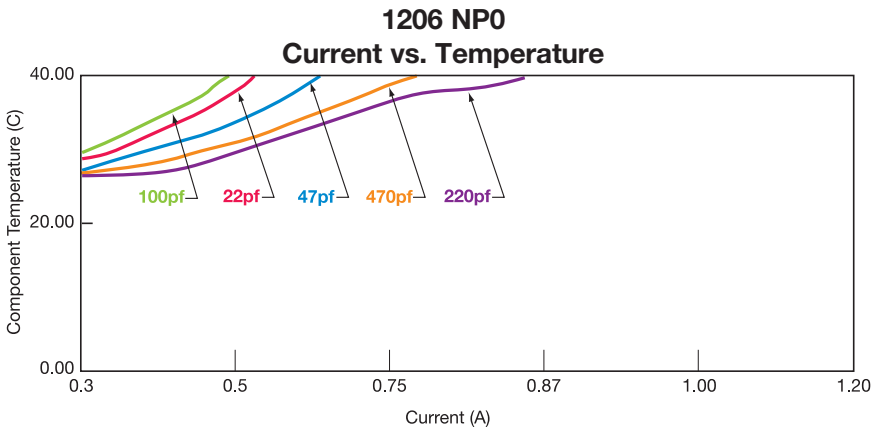


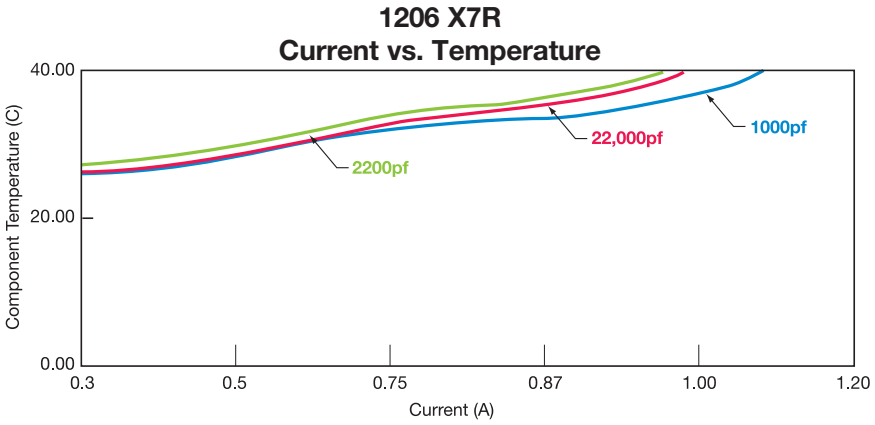
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PERFORMANCE CHARACTERISTICS









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High current EMI feedthru filter capacitors are designed as a broadband EMI filters that are specially designed to have high current handling capability. These SMT EMI feedthru filter capacitors offer an optimized frequency response with high attenuation across a wide RF spectrum due to optimized parallel and series inductances.

These W2H/W3H EMI feedthru filter capacitors can actually replace discrete L/C filter networks.

GENERAL CHARACTERISTICS

Operating Temperature: -55ºC to 125ºC
Capacitance Variation NP0: 0±60ppm
Capacitance Variation X7R: ±15%

FEATURES

- Low parallel inductance
- Excellent decoupling
- Low Loss
- High rated current

APPLICATIONS

- Power supervisory circuits
- High Current Power (Vcc) Lines
- DC:DC Converters
- Regulators
- PA Decoupling

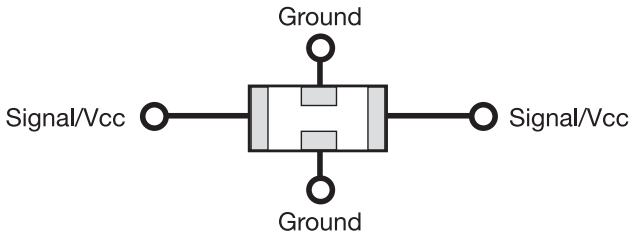
HOW TO ORDER

W2H1	5	C	473	8	A	T	3	A
Size & Style W2H1 = 0805 Ni-Sn L2H1 = 0805 SnPb	**Voltage** 3 = 25v 5 = 50v 1 = 100v	**Dielectric** A = NP0 C = X7R	**Capacitance Code**	**Capacitance Tolerance** 8 = +50/-20% M = ±20%	**Failure Rate** 4 = Automotive	**Terminations** T = Plated Ni & Sn B = Plated SnPb	**Packaging Code (Reel Size)** 1 & 2 = 7" Reel Embossed Tape 3 & 4 = 13" Reel Embossed Tape	**Quantity Code (Pcs./Reel)** F = 1,000 A = 2,000, 4,000 or 10,000

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

PINOUT CONFIGURATION



W2H1 – 0805 Style

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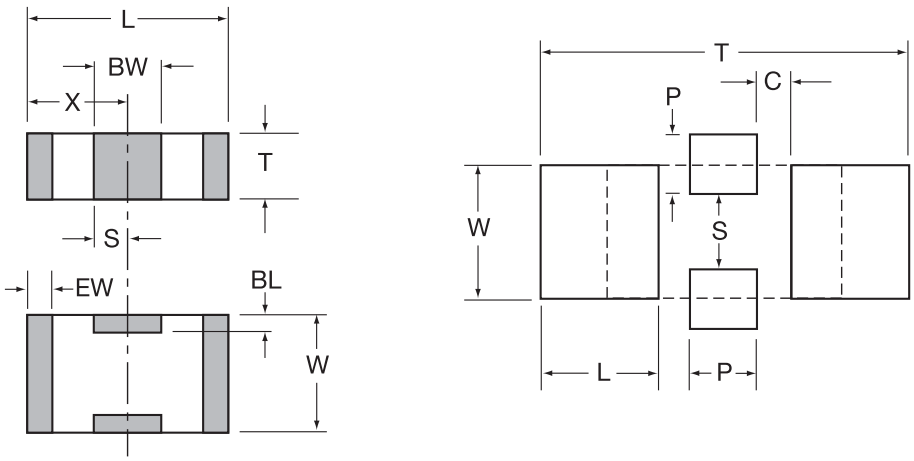
ELECTRICAL PARAMETERS

Insulation Resistance	1000 MΩ Minimum
DC Resistance	<0.150 Ω
Operating Temperature	-55C to +125C

CAPACITOR VALUES

Part Number	Size	Dielectric	Capacitance	Tolerance	Voltage	Current
W2H13C 104 84T	0805	X7R	100,000pF	+50%, -20%	25V	2A
W2H15C 473 84T	0805	X7R	47,000pF	+50%, -20%	50V	2A
W2H15C 223 84T	0805	X7R	22,000pF	+50%, -20%	50V	1A
W2H15C 103 84T	0805	X7R	10,000pF	+50%, -20%	50V	1A
W2H15C 102 84T	0805	X7R	1,000pF	+50%, -20%	50V	1A
W2H11A 471 84T	0805	NP0	470pF	+50%, -20%	100V	0.5A
W2H11A 221 84T	0805	NP0	220pF	+50%, -20%	100V	0.5A
W2H11A 101 84T	0805	NP0	100pF	+50%, -20%	100V	0.5A
W2H11A 470 84T	0805	NP0	47pF	+50%, -20%	100V	0.5A
W2H11A 220 84T	0805	NP0	22pF	+50%, -20%	100V	0.5A

PHYSICAL DIMENSIONS AND PAD LAYOUT



W2H1 – 0805 Style

PHYSICAL DIMENSIONS

	L	W	T	BW	BL	ES	EW	X	S
W2H1– 0805 MM (in.)	2.01 ± 0.20 (0.079 ± 0.008)	1.25 ± 0.20 (0.049 ± 0.008)	1.14 Max. (0.045 Max.)	0.46 ± 0.10 (0.018 ±0.004)	0.18 + 0.25 -0.08 (0.007 + 0.010 -0.003)	NA	0.25 ± 0.13 (0.010 ± 0.005)	1.02 ± 0.10 (0.040 ± 0.004)	0.23 ± 0.05 (0.009 ± 0.002)

PAD DIMENSIONS

	T	P	S	W	L	C	X
W2H1– 0805 MM (in.)	3.45 (0.136)	0.51 (0.020)	0.76 (0.030)	1.27 (0.050)	1.02 (0.040)	0.46 (0.018)	NA

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RF/MICROWAVE COMPONENTS

AVX produces a wide range of passive RF/Microwave components designed for precision and high performance in demanding high frequency applications. Components include: capacitors, inductors, filters, diplexers and couplers.

Capacitors

- U Series: AEC-Q200 qualified RF/Microwave MLCCs.
- Accu-P®: Thin Film capacitors that offer high Q, high repeatability and continuous capacitance values.
- SQ Series: Ultra low ESR/high Q RF/Microwave MLCCs.
- HQ Series: High power RF/Microwave MLCCs for high voltage wireless charging.

Inductors

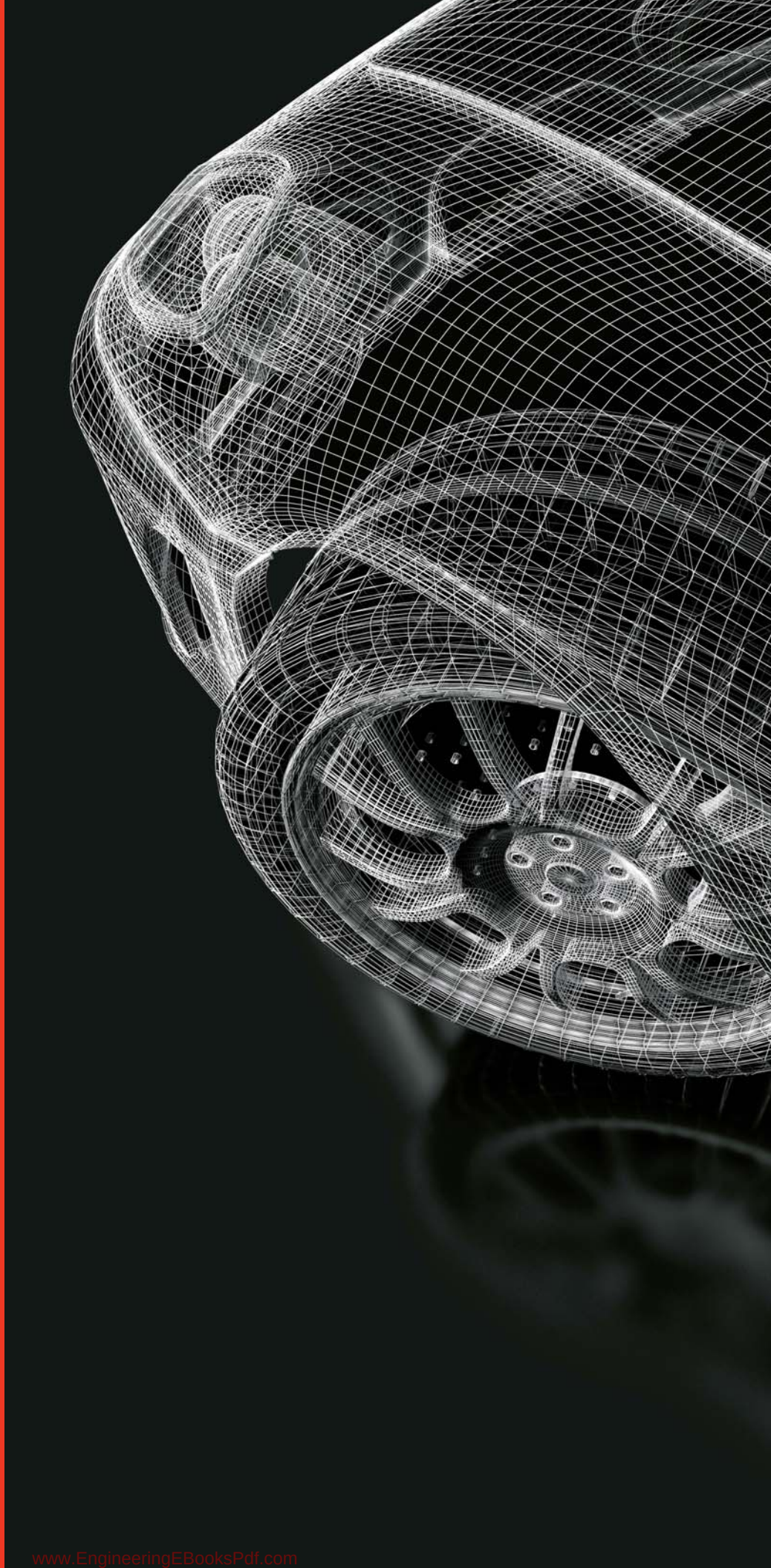
- Accu-L®: Thin film inductors that offer high Q and high repeatability.
- HLC Series: High current, 0402 multilayer organic (MLO(R)) inductors.

Filters

- Low Pass Filters: Harmonic low pass filters.
- MLO® Diplexers: Multilayer organic diplexers for multi-band RF/Microwave systems.

Couplers

- Directonal Couplers: Thin film directional couplers for applications between DC and 6GHz.
- High Directivity Couplers: Thin film high directivity couplers for applications between DC and 6GHz.
- 3dB 90° Couplers: Thin film hybrid 3dB 90° couplers for applications between DC and 6GHz.



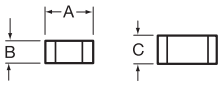
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GENERAL INFORMATION

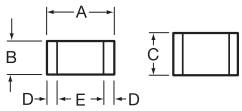
Automotive "U" Series capacitors are C0G (NP0) chip capacitors specially designed for "Ultra" low ESR for applications in the automotive market. Max ESR and effective capacitance are met on each value producing lot to lot uniformity. Sizes available are EIA chip sizes 0402 and 0603.

DIMENSIONS: mm (inches)

0402



0603



Size	A	B	C	D	E
0402	1.00±0.1 (0.039±0.004)	0.50±0.1 (0.020±0.004)	0.60 max (0.024)	N/A	N/A
0603	1.52±0.25 (0.060±0.010)	0.76±0.25 (0.030±0.010)	0.91 max (0.036)	0.25±0.13 (0.010±0.005)	0.76 min (0.030)

HOW TO ORDER

0402 — **Case Size**
0402
0603

1 — **Voltage Code**
5 = 50V
1 = 100V
2 = 200V

U — **Dielectric = Ultra Low ESR**

100 — **Capacitance**
EIA Capacitance Code in pF.
First two digits = significant figures or "R" for decimal place.
Third digit = number of zeros or after "R" significant figures.

J — **Capacitance Tolerance Code**
B = ±0.1pF
C = ±0.25pF
D = ±0.5pF
F = ±1%
G = ±2%
J = ±5%
K = ±10%
M = ±20%

4 — **Failure Rate Code**
4 = Automotive

T — **Termination**
T= Plated Ni and Sn

2 — **Packaging Code**
2 = 7" Reel
4 = 13" Reel

A — **Special Code**
A = Standard

RoHS COMPLIANT

ELECTRICAL CHARACTERISTICS

Capacitance Values and Tolerances:
Size 0402 - 0.2 pF to 30 pF @ 1 MHz
Size 0603 - 1.0 pF to 100 pF @ 1 MHz

Temperature Coefficient of Capacitance (TC):
0±30 ppm/°C (-55° to +125°C)

Insulation Resistance (IR):
10^{12} Ω min. @ 25°C and rated WVDC
10^{11} Ω min. @ 125°C and rated WVDC

Working Voltage (WVDC):
Size Working Voltage
0402 - 100, 50, 25 WVDC
0603 - 200, 100, 50 WVDC

Dielectric Working Voltage (DWV):
250% of rated WVDC

Equivalent Series Resistance Typical (ESR):
0402 - See Performance Curve
0603 - See Performance Curve

Automotive Specifications
Meets or exceeds the requirements of AEC Q200

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CAPACITANCE RANGE

Cap (pF)	Available Tolerance	Size 0402	Size 0603
0.2	B,C	100V	N/A
0.3	↓	↓	↓
0.4	↓	↓	↓
0.5	B,C	↓	↓
0.6	B,C,D	↓	↓
0.7	↓	↓	↓
0.8	↓	↓	↓
0.9	B,C,D	↓	↓

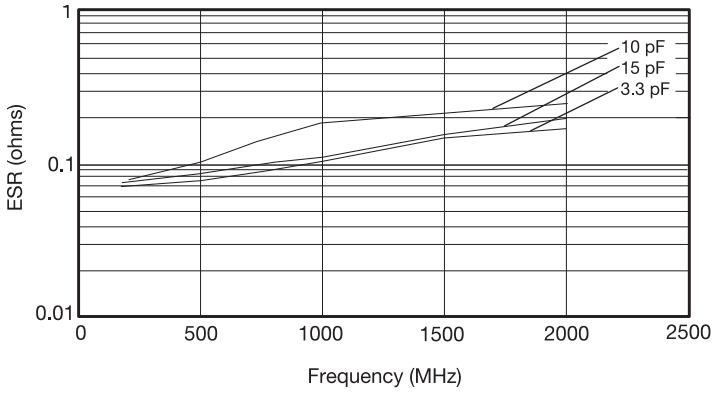
Cap (pF)	Available Tolerance	Size 0402	Size 0603
1.0	B,C,D	100V	200V
1.1	↓	↓	↓
1.2	↓	↓	↓
1.3	↓	↓	↓
1.4	↓	↓	↓
1.5	↓	↓	↓
1.6	↓	↓	↓
1.7	↓	↓	↓
1.8	↓	↓	↓
1.9	↓	↓	↓
2.0	↓	↓	↓
2.1	↓	↓	↓
2.2	↓	↓	↓
2.4	↓	↓	↓
2.7	↓	↓	↓
3.0	↓	↓	↓
3.3	↓	↓	↓
3.6	↓	↓	↓
3.9	↓	↓	↓
4.3	↓	↓	↓
4.7	↓	↓	↓
5.1	↓	↓	↓
5.6	↓	↓	↓
6.2	B,C,D	↓	↓
6.8	B,C,J,K,M	↓	↓

Cap (pF)	Available Tolerance	Size 0402	Size 0603
7.5	B,C,J,K,M	100V	200V
8.2	↓	↓	↓
9.1	B,C,J,K,M	↓	↓
10	F,G,J,K,M	100V	↓
11	↓	50V	↓
12	↓	↓	↓
13	↓	↓	↓
15	↓	↓	↓
18	↓	↓	200V
20	↓	↓	100V
22	↓	↓	↓
24	↓	↓	↓
27	↓	↓	↓
30	↓	50V	↓
33	↓	N/A	↓
36	↓	↓	↓
39	↓	↓	↓
43	↓	↓	↓
47	↓	↓	↓
51	↓	↓	↓
56	↓	↓	↓
68	↓	↓	↓
75	↓	↓	↓
82	↓	↓	↓
91	↓	↓	↓

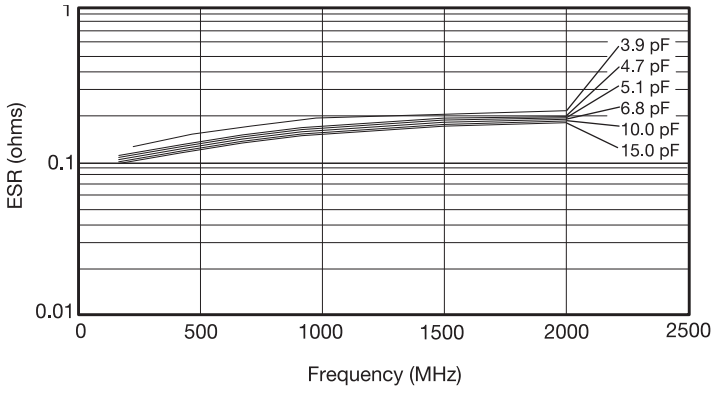
Cap (pF)	Available Tolerance	Size 0402	Size 0603
100	F,G,J,K,M	N/A	100V
110	↓	↓	50V
120	↓	↓	50V
130	↓	↓	N/A
140	↓	↓	↓
150	↓	↓	↓
160	↓	↓	↓
180	↓	↓	↓
200	↓	↓	↓
220	↓	↓	↓
270	↓	↓	↓
300	↓	↓	↓
330	↓	↓	↓
360	↓	↓	↓
390	↓	↓	↓
430	↓	↓	↓
470	↓	↓	↓
510	↓	↓	↓
560	↓	↓	↓
620	↓	↓	↓
680	↓	↓	↓
750	↓	↓	↓
820	↓	↓	↓
910	↓	↓	↓
1000	F,G,J,K,M	↓	↓

ULTRA LOW ESR, "U" SERIES

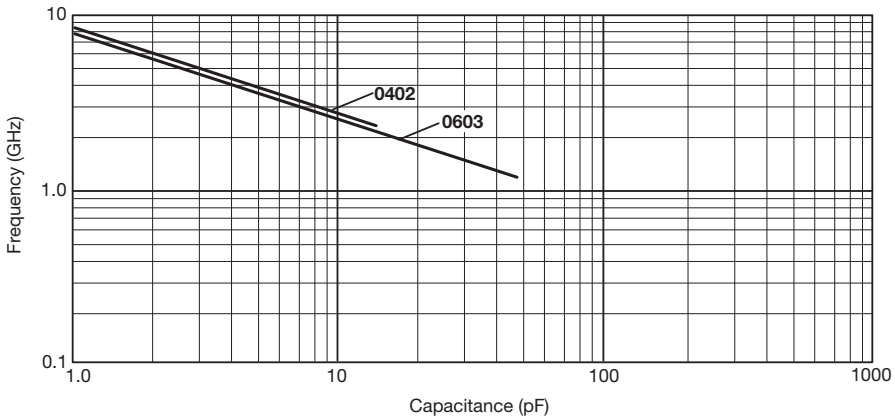
TYPICAL ESR vs. FREQUENCY 0402 "U" SERIES



TYPICAL ESR vs. FREQUENCY 0603 "U" SERIES



TYPICAL SERIES RESONANT FREQUENCY "U" SERIES CHIP



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THE IDEAL CAPACITOR

The non-ideal characteristics of a real capacitor can be ignored at low frequencies. Physical size imparts inductance to the capacitor and dielectric and metal electrodes result in resistive losses, but these often are of negligible effect on the circuit. At the very high frequencies of radio communication (>100MHz) and satellite systems (>1GHz), these effects become important. Recognizing that a real capacitor will exhibit inductive and resistive impedances in addition to capacitance, the ideal capacitor for these high frequencies is an ultra low loss component which can be fully characterized in all parameters with total repeatability from unit to unit.

Until recently, most high frequency/microwave capacitors were based on fired-ceramic (porcelain) technology. Layers of ceramic dielectric material and metal alloy electrode paste are interleaved and then sintered in a high temperature oven. This technology exhibits component variability in dielectric quality (losses, dielectric constant and insulation resistance), variability in electrode conductivity and variability in physical size (affecting inductance). An alternate thin-film technology has been developed which virtually eliminates these variances. It is this technology which has been fully incorporated into Accu-P® and Accu-P® to provide high frequency capacitors exhibiting truly ideal characteristics.

The main features of Accu-P® may be summarized as follows:

- High purity of electrodes for very low and repeatable ESR.
- Highly pure, low-K dielectric for high breakdown field, high insulation resistance and low losses to frequencies above 40GHz.
- Very tight dimensional control for uniform inductance, unit to unit.
- Very tight capacitance tolerances for high frequency signal applications.

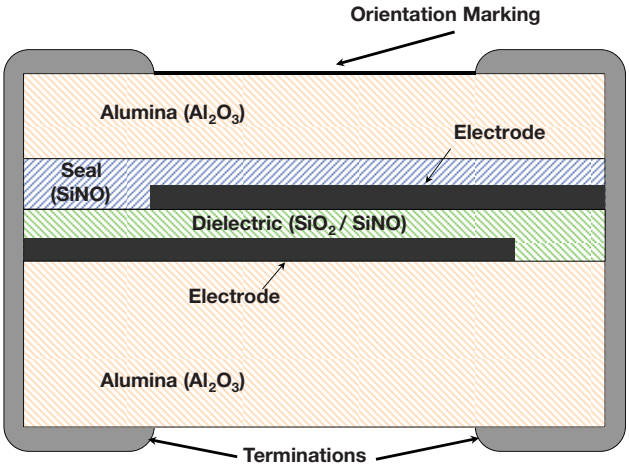
This accuracy sets apart these Thin-Film capacitors from ceramic capacitors so that the term Accu has been employed as the designation for this series of devices, an abbreviation for “accurate.”

THIN-FILM TECHNOLOGY

Thin-film technology is commonly used in producing semiconductor devices. In the last two decades, this technology has developed tremendously, both in performance and in process control. Today’s techniques enable line definitions of below 1µm, and the controlling of thickness of layers at 100Å (10^{-2}µm). Applying this technology to the manufacture of capacitors has enabled the development of components where both electrical and physical properties can be tightly controlled.

The thin-film production facilities at AVX consist of:

- Class 1000 clean rooms, with working areas under laminar-flow hoods of class 100, (below 100 particles per cubic foot larger than 0.5µm).
- High vacuum metal deposition systems for high-purity electrode construction.
- Photolithography equipment for line definition down to 2.0µm accuracy.
- Plasma-enhanced CVD for various dielectric depositions (CVD=Chemical Vapor Deposition).
- High accuracy, microprocessor-controlled dicing saws for chip separation.
- High speed, high accuracy sorting to ensure strict tolerance adherence.



ACCU-P® CAPACITOR STRUCTURE

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ACCU-P® TECHNOLOGY

The use of very low-loss dielectric materials, silicon dioxide and silicon oxynitride, in conjunction with highly conductive electrode metals results in low ESR and high Q. These high-frequency characteristics change at a slower rate with increasing frequency than for ceramic microwave capacitors.

Because of the thin-film technology, the above-mentioned frequency characteristics are obtained without significant compromise of properties required for surface mounting.

The main Accu-P® properties are:

- Internationally agreed sizes with excellent dimensional control.
- Ultra small size chip capacitors (01005) are available.
- Ultra tight capacitance tolerances.
- Low ESR at VHF, UHF and microwave frequencies.
- Enhanced RF power handling capablity.
- High stability with respect to time, temperature, frequency and voltage variation.
- Nickel/solder-coated terminations to provide excellent solderability and leach resistance.

ACCU-P® FEATURES

Accu-P® meets the fast-growing demand for low-loss (high-Q) capacitors for use in surface mount technology especially for the mobile communications market, such as cellular radio of 450 and 900 MHz, UHF walkie-talkies, UHF cordless telephones to 2.3 GHz, low noise blocks at 11-12.5 GHz and for other VHF, UHF and microwave applications.

Accu-P® is currently unique in its ability to offer very low capacitance values (0.05pF) and very tight capacitance tolerances (±0.01pF).

- The RF power handling capability of the Accu-P® allows for its usage in both small signal and RF power applications.
- Thin Film Technology guarantees minimal batch to batch variability of parameters at high frequency.
- Inspection test and quality control procedures in accordance with ISO 9001, CECC, IECQ and USA MIL Standards yield products of the highest quality.
- Hand soldering Accu-P®: Due to their construction utilizing relatively high thermal conductivity materials, Accu-P's have become the preferred device in R & D labs and production environments where hand soldering is used.

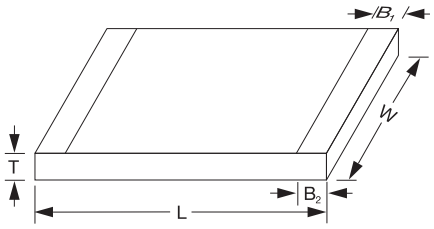
APPLICATIONS

Cellular Communications
CT2/PCN (Cordless Telephone/Personal Comm. Networks)
Satellite TV
Cable TV
GPS (Global Positioning Systems)
Vehicle Location Systems
Vehicle Alarm Systems
Paging
Military Communications
Radar Systems
Video Switching
Test & Measurements
Filters
VCO's
Matching Networks
RF Amplifiers

APPROVALS

ISO 9001

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ACCU-P® (Signal and Power Type Capacitors)

	01005*	0201*	0402*	0603*	0805*	1210
L	0.405±0.020 (0.016±0.001)	0.60±0.05 (0.023±0.002)	1.00±0.1 (0.039±0.004)	1.60±0.1 (0.063±0.004)	2.01±0.1 (0.079±0.004)	3.02±0.1 (0.119±0.004)
W	0.215 ± 0.020 (0.0085 ± 0.001)	0.325±0.050 (0.0128±0.002)	0.55±0.07 (0.022±0.003)	0.81±0.1 (0.032±0.004)	1.27±0.1 (0.050±0.004)	2.5±0.1 (0.100±0.004)
T	0.145 ± 0.020 (0.006 ± 0.001)	0.225±0.050 (0.009±0.002)	0.40±0.1 (0.016±0.004)	0.63±0.1 (0.025±0.004)	0.93±0.2 (0.036±0.008)	0.93±0.2 (0.036±0.008)
B_1	$0.00^{+0.1}_{-0.0}$ ($0.000^{+0.004}_{-0.000}$)	0.10±0.10 (0.004±0.004)	$0.00^{+0.1}_{-0.0}$ ($0.000^{+0.004}_{-0.000}$)	0.35±0.15 (0.014±0.006)	0.30±0.1 (0.012±0.004)	0.43±0.1 (0.017±0.004)
B_2	0.10 ± 0.03 (0.004 ± 0.001)	0.15±0.05 (0.006±0.002)	0.20±0.1 (0.008±0.004)	0.35±0.15 (0.014±0.006)	0.30±0.1 (0.012±0.004)	0.43±0.1 (0.017±0.004)

*Mount Black Side Up

DIMENSIONS: millimeters (inches)

HOW TO ORDER

0402 | 3 | J | 4R7 | A | B | S | TR

Size
C005
0201
0402
0603
0805
1210*

Voltage
2 = 200V
1 = 100V
5 = 50V
3 = 25V
Y = 16V
Z = 10V

Temperature Coefficient (1)
J = 0±30ppm/°C (-55°C to +125°C)
K = 0±60ppm/°C (-55°C to +125°C)

Capacitance
Capacitance expressed in pF. (2 significant digits + number of zeros)
for values <10pF, letter R denotes decimal point.
Example:
68pF = 680
8.2pF = 8R2

Tolerance for C≤2.0pF*
Z = ±0.01pF
P = ±0.02pF
Q = ±0.03pF
A = ±0.05pF
B = ±0.1pF
C = ±0.25pF

for C≤3.0pF
Q = ±0.03pF
A = ±0.05pF
B = ±0.1pF
C = ±0.25pF

for C≤5.6pF
A = ±0.05pF
B = ±0.1pF
C = ±0.25pF

for 5.6pF<C<10pF
B = ±0.1pF
C = ±0.25pF
D = ±0.5pF

for C≥10pF
F = ±1%
G = ±2%
J = ±5%

Specification Code
B = Accu-P® technology

Termination Code
W = Nickel/Solder Coated ***Accu-P® 0402*** Sn90, Pb10***
T = Nickel/High Temperature Solder Coated ***Accu-P® 0805**, 1210**** Sn96, Ag4
Nickel/Solder Coated ***Accu-P® 0603***** Sn63, Pb37
S = Nickel/Lead Free Solder Coated ***Accu-P® 01005, 0201, 0402, 0603* Sn100

Packaging Code
TR = Tape & Reel

(1) TC's shown are per EIA/IEC Specifications.

Engineering Kits Available
see pages 118-119

* Tolerances as tight as ±0.01pF are available. Please consult the factory.

**RoHS compliant
*** Not RoHS Compliant

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

For RoHS compliant products, please select correct termination style.

ELECTRICAL SPECIFICATIONS

Operating and Storage Temperature Range	-55°C to +125°C
Temperature Coefficients (1)	0 ± 30ppm/°C dielectric code "J" / 0 ± 60ppm/°C dielectric code "K"
Capacitance Measurement	1 MHz, 1 Vrms
Insulation Resistance (IR)	$\geq 10^{11}$ Ohms ($\geq 10^{10}$ Ohms for 0201 and 0402 size)
Proof Voltage	2.5 U_R for 5 secs.
Aging Characteristic	Zero
Dielectric Absorption	0.01%

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Accu-P® Capacitance Ranges (pF)

TEMP. COEFFICIENT CODE

"J" = 0±30ppm/°C (-55°C to +125°C)[2] "K" = 0±60ppm/°C (-55°C to +125°C)[2]

Size																						
Size Code		C005	0201					0402						0603				0805			1210	
Voltage		16	100	50	25	16	10	200	100	50	25	16	10	200	100	50	25	100	50	25	100	50
Cap in pF[1]	Cap code																					
0.1	0R1																					
0.2	0R2																					
0.3	0R3																					
0.4	0R4																					
0.5	0R5																					
0.6	0R6																					
0.7	0R7																					
0.8	0R8																					
0.9	0R9																					
1.0	1R0																					
1.1	1R1																					
1.2	1R2																					
1.3	1R3																					
1.4	1R4																					
1.5	1R5																					
1.6	1R6																					
1.7	1R7																					
1.8	1R8																					
1.9	1R9																					
2.0	2R0																					
2.1	2R1																					
2.2	2R2																					
2.3	2R3																					
2.4	2R4																					
2.5	2R5																					
2.6	2R6																					
2.7	2R7																					
2.8	2R8																					
2.9	2R9																					
3.0	3R0																					
3.1	3R1																					
3.2	3R2																					
3.3	3R3																					
3.4	3R4																					
3.5	3R5																					
3.6	3R6																					
3.7	3R7																					
3.8	3R8																					
3.9	3R9																					
4.0	4R0																					
4.1	4R1																					
4.2	4R2																					
4.3	4R3																					
4.4	4R4																					
4.5	4R5																					
4.6	4R6																					
4.7	4R7																					
5.1	5R1																					
5.6	5R6																					
6.2	6R2																					
6.8	6R8																					
7.5	7R5																					
8.2	8R2																					
9.1	9R1																					
10.0	100																					
11.0	110																					
12.0	120																					
13.0	130																					
14.0	140																					
15.0	150																					
16.0	160																					
17.0	170																					
18.0	180																					
19.0	190																					
20.0	200																					
21.0	210																					
22.0	220																					
24.0	240																					
27.0	270																					
30.0	300																					
33.0	330																					
39.0	390																					
47.0	470																					
56.0	560																					
68.0	680																					

[1] For capacitance values higher than listed in table, please consult factory.
[2] TC shown is per EIA/IEC Specifications.
These values are produced with "K" temperature coefficient code only.

Intermediate values are available within the indicated range.

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Capacitance @ 1MHz and Tolerance		Self Resonance Frequency (GHz) Typ.	Q Standard Value @ 1GHz		Frequency 900MHz			Frequency 1900MHz			Frequency 2400MHz		
C (pF)	Tol.		Typ.	Min.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.
0.05	±0.02	20.9	599	402	0.055	650	3220	0.056	265	4010	0.057	195	4450
0.1	±0.02	19.4	574	316	0.110	614	2682	0.112	246	3036	0.113	188	3113
0.15	±0.02	17.9	510	280	0.163	550	2087	0.166	220	2404	0.168	170	2441
0.2	±0.02	16.4	445	245	0.216	520	1693	0.220	210	1971	0.223	160	1970
0.25	±0.02	15.5	436	240	0.262	510	1371	0.268	204	1604	0.272	153	1646
0.3	±0.02	14.6	427	235	0.309	500	1149	0.316	199	1337	0.320	146	1421
0.35	±0.02	14.1	423	232	0.360	494	1001	0.369	196	1177	0.374	144	1265
0.4	±0.02	12.5	418	230	0.411	489	874	0.421	193	1038	0.427	142	1129
0.45	±0.02	11.9	413	227	0.461	484	819	0.473	191	972	0.481	140	1066
0.5	±0.02	11.3	408	224	0.512	478	765	0.526	188	906	0.535	138	1003
0.55	±0.02	10.9	403	222	0.563	473	710	0.578	186	840	0.588	137	940
0.6	±0.02	10.4	398	219	0.614	468	667	0.631	183	791	0.642	135	882
0.65	±0.02	10.0	394	217	0.664	462	624	0.683	181	742	0.695	133	825
0.7	±0.02	9.5	389	214	0.715	457	580	0.735	178	693	0.749	131	767
0.75	±0.02	9.3	384	211	0.766	452	557	0.788	176	664	0.802	129	729
0.8	±0.02	9.1	379	209	0.817	446	534	0.840	173	635	0.856	127	692
0.85	±0.02	8.9	374	206	0.868	441	511	0.893	171	606	0.909	126	654
0.9	±0.02	8.8	370	203	0.918	436	487	0.945	168	577	0.963	124	616
0.95	±0.02	8.6	365	201	0.969	430	464	0.998	166	548	1.016	122	579
1	±0.02	8.4	360	198	1.020	425	441	1.050	163	519	1.070	120	541
1.05	±0.02	8.2	358	197	1.078	421	426	1.112	161	502	1.134	119	523
1.1	±0.02	8.0	355	195	1.135	418	410	1.173	159	486	1.199	117	505
1.15	±0.02	7.8	353	194	1.193	414	395	1.235	157	469	1.263	116	488
1.2	±0.02	7.6	350	193	1.251	411	379	1.296	155	452	1.327	115	470
1.25	±0.02	7.5	348	191	1.308	407	364	1.358	153	436	1.392	114	452
1.3	±0.02	7.4	345	190	1.366	403	348	1.419	151	419	1.456	112	434
1.35	±0.02	7.3	343	189	1.424	400	333	1.481	149	402	1.520	111	416
1.4	±0.02	7.2	340	187	1.481	396	317	1.542	147	386	1.585	110	398
1.45	±0.02	7.1	338	186	1.539	393	302	1.604	145	369	1.649	109	381
1.5	±0.02	7.0	335	184	1.597	389	287	1.665	144	353	1.713	107	363
1.55	±0.02	6.8	332	183	1.642	386	282	1.714	142	347	1.764	106	358
1.6	±0.02	6.7	330	181	1.687	382	277	1.762	141	342	1.815	105	352
1.65	±0.02	6.6	327	180	1.732	378	272	1.810	140	337	1.866	104	347
1.7	±0.02	6.5	324	178	1.777	375	267	1.859	138	331	1.917	103	342
1.75	±0.02	6.4	321	176	1.822	371	262	1.907	137	326	1.968	102	337
1.8	±0.02	6.3	318	175	1.866	367	257	1.955	136	321	2.018	101	331
1.85	±0.02	6.2	315	173	1.911	364	252	2.003	134	316	2.069	100	326
1.9	±0.02	6.2	312	172	1.956	360	247	2.052	133	310	2.120	99	321
1.95	±0.02	6.1	309	170	2.001	357	242	2.100	132	305	2.171	98	316
2	±0.03	6.0	306	168	2.046	353	237	2.148	131	300	2.222	97	310
2.1	±0.03	5.9	301	166	2.150	348	232	2.263	128	293	2.344	95	303
2.2	±0.03	5.7	296	163	2.254	343	227	2.377	125	287	2.467	93	296
2.3	±0.03	5.6	292	160	2.358	337	222	2.491	122	281	2.590	91	289
2.4	±0.03	5.5	287	158	2.462	332	217	2.606	120	274	2.712	89	282
2.5	±0.03	5.4	282	155	2.566	327	212	2.720	117	268	2.835	87	275
2.6	±0.03	5.3	277	152	2.670	322	207	2.834	114	262	2.958	85	268
2.7	±0.03	5.2	272	150	2.773	317	202	2.949	112	255	3.080	83	261
2.8	±0.03	5.1	269	148	2.878	312	199	3.066	110	252	3.209	81	258
2.9	±0.03	5.0	265	146	2.983	308	196	3.184	108	248	3.337	80	254
3	±0.03	4.9	261	144	3.088	304	193	3.301	106	245	3.465	78	251
3.1	±0.05	4.8	257	141	3.192	299	190	3.419	105	241	3.593	77	247
3.2	±0.05	4.7	253	139	3.297	295	187	3.536	103	238	3.722	76	244
3.3	±0.05	4.6	250	137	3.402	291	185	3.654	101	234	3.850	74	240
3.4	±0.05	4.6	246	135	3.506	286	182	3.771	99	231	3.978	73	237
3.5	±0.05	4.5	242	133	3.611	282	179	3.889	98	227	4.107	71	233
3.6	±0.05	4.5	238	131	3.716	278	176	4.006	96	224	4.235	70	230
3.7	±0.05	4.4	234	129	3.820	273	173	4.124	94	220	4.363	69	226
3.8	±0.05	4.4	230	127	3.925	269	170	4.241	92	217	4.492	67	223
3.9	±0.05	4.3	227	125	4.030	265	167	4.359	91	213	4.620	66	219

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Capacitance @ 1MHz and Tolerance		Self Tesonance Frequency (GHz) Typ.	Q Standard Value @ 1GHz		Frequency 900MHz			Frequency 1900MHz			Frequency 2400MHz		
C (pF)	Tol.		Typ.	Min.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.
4	±0.05	4.3	224	123	4.138	262	165	4.484	89	210	4.760	65	216
4.1	±0.05	4.2	222	122	4.247	259	162	4.610	88	207	4.901	64	213
4.2	±0.05	4.2	220	121	4.356	257	159	4.735	87	204	5.041	63	210
4.3	±0.05	4.1	218	120	4.464	254	157	4.860	86	201	5.181	62	207
4.4	±0.05	4.1	216	119	4.573	252	154	4.986	85	198	5.322	61	204
4.5	±0.05	4.0	214	118	4.682	249	152	5.111	83	195	5.462	60	201
4.6	±0.05	4.0	212	116	4.790	246	149	5.237	82	192	5.602	59	198
4.7	±0.05	3.9	209	115	4.899	244	147	5.362	81	189	5.743	58	195
5.1	±0.05	3.8	201	110	5.334	233	136	5.863	76	178	6.304	54	183
5.6	±0.05	3.6	190	105	5.877	220	124	6.490	70	163	7.006	49	168
6.2	±0.1	3.5	177	97	6.488	208	126	7.290	65	167	7.993	45	174
6.8	±0.1	3.3	164	90	7.100	195	128	8.090	60	171	8.980	41	179
7.5	±0.1	3.2	153	84	7.901	182	125	9.129	56	166	10.27	38	173
8.2	±0.1	3.0	142	78	8.701	168	121	10.17	52	160	11.56	34	167
9.1	±0.1	2.9	135	74	9.676	159	118	11.57	49	154	13.49	32	161
10	±1%	2.8	128	70	10.65	151	114	12.96	45	148	15.41	29	155
11	±1%	2.7	120	66	11.73	141	110	14.52	42	142	17.55	27	148
12	±1%	2.5	112	62	12.82	132	105	16.07	39	135	19.68	24	141
13	±1%	2.4	105	58	13.92	124	104	17.82	36	135	22.38	22	142
14	±1%	2.4	98	54	15.02	116	103	19.57	32	135	25.08	19	142
15	±1%	2.3	91	50	16.12	108	102	21.32	29	135	27.78	17	143
16	±1%	2.2	86	47	17.37	102	103	24.04	27	135	NA	NA	NA
17	±1%	2.2	81	44	18.63	96	105	26.76	25	136	NA	NA	NA
18	±1%	2.1	76	42	19.88	90	106	29.48	23	136	NA	NA	NA
19	±1%	2.1	71	39	21.14	83	108	32.20	21	136	NA	NA	NA
20	±1%	2.1	65	36	22.39	77	109	34.92	19	136	NA	NA	NA
22	±1%	2.0	55	30	24.90	65	112	40.36	15	137	NA	NA	NA

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Capacitance @ 1MHz and Tolerance		Self Resonance Frequency (GHz) Typ.	Q Standard Value @ 1GHz		Frequency 900MHz			Frequency 1900MHz			Frequency 2400MHz		
C (pF)	Tol.		Typ.	Min.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.
0.05	±0.02	20.9	856	471	0.06	881	1411	0.06	562	1216	0.06	498	983
0.1	±0.02	19.4	848	466	0.11	873	1316	0.11	554	1115	0.11	490	914
0.15	±0.02	17.9	840	462	0.16	866	1222	0.16	547	1013	0.16	482	845
0.2	±0.02	16.4	832	457	0.21	858	1128	0.21	539	912	0.22	474	776
0.25	±0.02	15.5	823	453	0.26	850	1033	0.27	532	810	0.27	465	707
0.3	±0.02	14.6	815	448	0.31	842	939	0.32	525	708	0.32	457	638
0.35	±0.02	14.1	807	444	0.36	834	844	0.37	517	607	0.37	449	569
0.4	±0.02	12.5	799	439	0.41	827	750	0.42	510	505	0.42	441	500
0.45	±0.02	11.9	791	435	0.46	819	667	0.47	502	458	0.48	432	453
0.5	±0.02	11.3	783	430	0.51	811	583	0.52	495	410	0.53	424	407
0.55	±0.02	10.9	774	426	0.57	803	500	0.57	487	363	0.58	416	360
0.6	±0.02	10.4	766	421	0.62	796	465	0.62	480	343	0.63	408	339
0.65	±0.02	10.0	758	417	0.67	788	431	0.67	472	322	0.68	399	317
0.7	±0.02	9.5	750	413	0.72	780	396	0.72	465	302	0.73	391	296
0.75	±0.02	9.3	746	410	0.77	776	375	0.78	456	290	0.79	381	285
0.8	±0.02	9.1	743	408	0.82	772	354	0.83	447	277	0.84	370	273
0.85	±0.02	9.0	739	406	0.87	768	334	0.88	438	265	0.89	360	262
0.9	±0.02	8.8	735	404	0.92	764	313	0.93	429	253	0.95	350	250
0.95	±0.02	8.4	732	402	0.97	760	292	0.98	420	240	1.00	339	239
1	±0.02	8.0	728	400	1.02	756	271	1.04	411	228	1.05	329	227
1.05	±0.02	7.9	725	398	1.07	752	258	1.09	406	221	1.11	323	221
1.1	±0.02	7.8	721	397	1.12	749	245	1.14	401	214	1.16	318	214
1.15	±0.02	7.6	718	395	1.17	745	232	1.20	396	207	1.22	312	208
1.2	±0.02	7.4	714	393	1.22	742	218	1.25	391	200	1.27	306	202
1.25	±0.02	7.2	711	391	1.27	738	205	1.31	386	193	1.32	301	195
1.3	±0.02	7.0	707	389	1.32	734	192	1.36	381	185	1.38	295	189
1.35	±0.02	6.9	704	387	1.37	731	179	1.41	376	178	1.43	289	183
1.4	±0.02	6.8	700	385	1.42	727	165	1.47	371	171	1.49	283	177
1.45	±0.02	6.7	697	383	1.47	724	152	1.52	366	164	1.54	278	170
1.5	±0.02	6.5	693	381	1.52	720	139	1.58	361	157	1.60	272	164
1.55	±0.02	6.5	690	379	1.56	716	135	1.62	358	153	1.65	269	159
1.6	±0.02	6.5	686	377	1.61	713	130	1.67	355	148	1.70	267	155
1.65	±0.02	6.5	683	375	1.66	709	126	1.72	352	143	1.76	264	150
1.7	±0.02	6.4	679	373	1.71	705	122	1.77	349	139	1.81	261	146
1.75	±0.02	6.3	676	372	1.75	702	118	1.82	347	134	1.86	259	141
1.8	±0.02	6.2	672	370	1.80	698	113	1.87	344	130	1.92	256	137
1.85	±0.02	6.1	669	368	1.85	694	109	1.92	341	125	1.97	253	132
1.9	±0.02	6.0	665	366	1.90	690	105	1.97	338	121	2.02	251	128
1.95	±0.02	5.9	662	364	1.94	687	101	2.01	335	116	2.08	248	123
2	±0.03	5.7	658	362	1.99	683	96	2.06	332	112	2.13	245	119
2.1	±0.03	5.4	651	358	2.10	676	93	2.18	326	108	2.26	241	115
2.2	±0.03	5.1	643	354	2.21	669	89	2.30	321	104	2.38	236	112
2.3	±0.03	5.0	636	350	2.31	662	85	2.42	315	101	2.51	231	109
2.4	±0.03	4.9	629	346	2.42	656	81	2.54	309	97	2.64	226	106
2.5	±0.03	4.7	622	342	2.53	649	77	2.65	303	94	2.76	221	102
2.6	±0.03	4.6	614	338	2.64	642	74	2.77	298	90	2.89	216	99
2.7	±0.03	4.5	607	334	2.75	635	70	2.89	292	86	3.02	211	96
2.8	±0.03	4.5	600	330	2.85	628	68	3.01	288	83	3.15	207	92
2.9	±0.03	4.4	592	326	2.95	621	66	3.13	283	80	3.28	203	88
3	±0.03	4.4	585	322	3.06	614	64	3.24	279	76	3.41	200	84
3.1	±0.05	4.4	578	318	3.16	607	62	3.36	274	73	3.54	196	80
3.2	±0.05	4.3	570	314	3.27	600	60	3.48	270	70	3.67	192	76
3.3	±0.05	4.3	563	310	3.37	593	58	3.60	265	67	3.80	188	72
3.4	±0.05	4.3	556	306	3.47	586	57	3.71	261	63	3.93	184	68
3.5	±0.05	4.2	548	302	3.58	579	55	3.83	256	60	4.06	180	64
3.6	±0.05	4.2	541	298	3.68	572	53	3.95	252	57	4.19	177	60
3.7	±0.05	4.1	534	294	3.78	565	51	4.06	247	54	4.32	173	56
3.8	±0.05	4.0	526	289	3.89	558	49	4.18	243	50	4.45	169	52
3.9	±0.05	3.9	519	285	3.99	551	47	4.30	238	47	4.58	165	48

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Capacitance @ 1MHz and Tolerance		Self Resonance Frequency (GHz) Typ.	Q Standard Value @ 1GHz		Frequency 900MHz			Frequency 1900MHz			Frequency 2400MHz		
C (pF)	Tol.		Typ.	Min.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.
4	±0.05	3.9	513	282	4.10	545	47	4.42	235	47	4.73	162	48
4.1	±0.05	3.8	507	279	4.20	539	47	4.55	232	46	4.87	160	48
4.2	±0.05	3.8	501	275	4.30	534	46	4.67	228	46	5.01	157	48
4.3	±0.05	3.7	495	272	4.41	528	46	4.79	225	46	5.16	154	48
4.4	±0.05	3.7	489	269	4.51	522	46	4.92	222	46	5.30	151	47
4.5	±0.05	3.6	483	265	4.61	516	46	5.04	219	45	5.44	149	47
4.6	±0.05	3.6	477	262	4.72	511	45	5.16	216	45	5.59	146	47
4.7	±0.05	3.5	471	259	4.82	505	45	5.29	213	45	5.73	143	47
5.1	±0.05	3.4	446	245	5.23	482	44	5.78	200	43	6.30	133	47
5.6	±0.05	3.3	416	229	5.75	453	43	6.40	184	42	7.02	119	46
6.2	±0.1	3.0	388	213	6.41	427	44	7.26	167	44	8.11	107	47
6.8	±0.1	2.8	360	198	7.07	400	44	8.12	150	45	9.19	95	48
7.5	±0.1	2.7	338	186	7.85	378	45	9.17	139	47	10.57	86	49
8.2	±0.1	2.6	315	173	8.62	356	45	10.22	128	48	11.95	77	50
9.1	±0.1	2.5	292	160	9.63	333	45	11.75	115	47	14.23	69	50
10	±1%	2.4	268	148	10.65	310	45	13.28	103	47	16.50	61	49
11	±1%	2.3	242	133	11.77	285	44	14.98	89	46	19.04	51	49
12	±1%	2.2	217	119	12.90	259	44	16.68	75	45	21.57	42	48
13	±1%	2.2	202	111	14.03	241	44	18.83	68	47	25.73	38	49
14	±1%	2.1	187	103	15.17	223	44	20.97	62	49	29.89	33	49
15	±1%	2.1	172	94	16.30	204	45	23.12	56	51	34.05	29	50
16	±1%	2.0	157	87	17.53	187	44	25.91	50	49	41.44	25	49
17	±1%	1.9	143	79	18.75	169	43	28.70	45	46	48.82	21	47
18	±1%	1.8	129	71	19.98	152	42	31.49	39	44	56.21	17	46
19	±1%	1.8	121	67	21.11	143	42	33.51	36	44	60.92	15	47
20	±1%	1.8	110	61	22.25	131	41	35.53	33	43	65.63	14	48
22	±1%	1.8	98	54	24.51	116	41	39.57	26	42	75.05	10	51
24	±1%	1.8	87	48	27.51	104	37	54.94	21	35	NA	NA	NA
27	±1%	1.7	70	39	32.01	85	32	77.98	13	23	NA	NA	NA
30	±1%	1.7	65	36	35.89	78	28	106.50	10	12	NA	NA	NA
33	±1%	1.7	60	33	40.05	74	27	NA	NA	NA	NA	NA	NA
36	±1%	1.7	58	32	45.13	71	28	NA	NA	NA	NA	NA	NA
39	±1%	1.7	56	31	50.21	69	28	NA	NA	NA	NA	NA	NA
43	±1%	1.6	53	29	56.98	66	29	NA	NA	NA	NA	NA	NA
47	±1%	1.6	50	28	63.75	63	30	NA	NA	NA	NA	NA	NA
51	±1%	1.6	48	26	70.53	60	31	NA	NA	NA	NA	NA	NA
56	±1%	1.6	44	24	78.99	56	33	NA	NA	NA	NA	NA	NA
58	±1%	1.6	42	23	83.54	54	34	NA	NA	NA	NA	NA	NA
68	±1%	1.6	32	18	106.28	42	40	NA	NA	NA	NA	NA	NA

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Capacitance @ 1MHz and Tolerance		Self Resonance Frequency (GHz) Typ.	Q Standard Value @ 1GHz		Frequency 900MHz			Frequency 1900MHz			Frequency 2400MHz		
C (pF)	Tol.		Typ.	Min.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.
0.05	±0.02	25.6	1200	660	0.06	1333	945	0.06	556	832	0.06	397	880
0.1	±0.02	18.1	1156	636	0.11	1284	675	0.11	535	628	0.11	382	667
0.15	±0.02	14.8	1111	611	0.16	1235	555	0.16	514	533	0.16	367	567
0.2	±0.02	12.8	1067	587	0.21	1185	483	0.21	494	474	0.22	353	505
0.25	±0.02	11.4	1022	562	0.26	1136	433	0.27	473	433	0.27	338	462
0.3	±0.02	10.4	978	538	0.31	1086	397	0.32	453	402	0.32	323	430
0.35	±0.02	9.7	933	513	0.36	1037	368	0.37	432	378	0.37	309	404
0.4	±0.02	9.0	889	489	0.41	988	345	0.42	412	358	0.42	294	383
0.45	±0.02	8.5	844	464	0.46	938	326	0.47	391	341	0.48	279	365
0.5	±0.02	8.1	800	440	0.51	889	310	0.52	370	327	0.53	265	350
0.55	±0.02	7.7	788	434	0.57	875	296	0.57	363	315	0.58	261	337
0.6	±0.02	7.4	777	427	0.62	860	283	0.62	356	304	0.63	258	326
0.65	±0.02	7.1	765	421	0.67	846	273	0.67	348	294	0.68	255	315
0.7	±0.02	6.8	754	414	0.72	832	263	0.72	341	285	0.73	252	306
0.75	±0.02	6.6	742	408	0.77	817	254	0.78	334	277	0.79	248	298
0.8	±0.02	6.4	730	402	0.82	803	247	0.83	326	270	0.84	245	290
0.85	±0.02	6.2	719	395	0.87	789	239	0.88	319	264	0.89	242	283
0.9	±0.02	6.0	707	389	0.92	775	233	0.93	312	258	0.95	239	277
0.95	±0.02	5.9	696	383	0.97	760	227	0.98	304	252	1.00	235	271
1	±0.02	5.7	684	376	1.019	746	216	1.061	297	242	1.101	232	260
1.05	±0.02	5.6	667	367	1.076	731	213	1.126	290	239	1.171	226	256
1.1	±0.02	5.4	649	357	1.134	717	210	1.190	282	236	1.241	220	253
1.15	±0.02	5.3	632	347	1.192	702	206	1.254	275	233	1.311	214	250
1.2	±0.02	5.2	614	338	1.250	687	203	1.318	267	230	1.381	209	247
1.25	±0.02	5.1	605	333	1.307	677	200	1.382	262	227	1.451	203	244
1.3	±0.02	5.0	596	328	1.365	667	197	1.446	257	224	1.521	197	241
1.35	±0.02	4.9	587	323	1.423	658	194	1.511	252	221	1.591	191	238
1.4	±0.02	4.8	578	318	1.481	648	190	1.575	247	218	1.661	185	235
1.45	±0.02	4.8	569	313	1.538	638	187	1.639	242	215	1.731	179	232
1.5	±0.02	4.7	560	308	1.596	628	184	1.703	237	212	1.801	173	229
1.55	±0.02	4.6	551	303	1.645	620	181	1.760	233	209	1.866	170	226
1.6	±0.02	4.5	542	298	1.694	611	178	1.817	228	206	1.930	166	222
1.65	±0.02	4.5	534	293	1.743	603	175	1.874	224	203	1.995	163	219
1.7	±0.02	4.4	525	289	1.792	595	172	1.931	219	200	2.060	159	216
1.75	±0.02	4.3	516	284	1.841	587	169	1.988	215	197	2.124	156	213
1.8	±0.02	4.2	507	279	1.890	578	166	2.045	211	194	2.189	153	209
1.85	±0.02	4.2	498	274	1.939	570	163	2.102	206	191	2.253	149	206
1.9	±0.02	4.1	490	269	1.988	562	160	2.158	202	188	2.318	146	203
1.95	±0.02	4.1	481	264	2.037	553	157	2.215	197	185	2.383	142	199
2	±0.03	4.0	472	260	2.086	545	154	2.272	193	182	2.447	139	196
2.1	±0.03	3.9	462	254	2.190	535	151	2.402	187	180	2.604	134	193
2.2	±0.03	3.8	452	249	2.295	524	148	2.532	181	177	2.761	129	191
2.3	±0.03	3.8	442	243	2.400	514	145	2.662	175	175	2.917	124	188
2.4	±0.03	3.7	433	238	2.504	503	143	2.793	168	172	3.074	118	186
2.5	±0.03	3.6	423	232	2.609	493	140	2.923	162	170	3.230	113	183
2.6	±0.03	3.6	413	227	2.714	482	137	3.053	156	167	3.387	108	181
2.7	±0.03	3.5	403	222	2.818	472	134	3.183	150	165	3.543	103	178
2.8	±0.03	3.4	395	217	2.933	463	133	3.336	147	164	3.742	100	177
2.9	±0.03	3.4	388	213	3.047	453	131	3.489	144	162	3.940	97	175
3	±0.03	3.3	380	209	3.162	444	130	3.642	140	161	4.139	95	174
3.1	±0.05	3.2	372	205	3.276	435	129	3.795	137	160	4.337	92	172
3.2	±0.05	3.2	365	201	3.391	425	127	3.947	134	159	4.536	89	171
3.3	±0.05	3.1	357	196	3.506	416	126	4.100	131	157	4.734	86	169
3.4	±0.05	3.1	349	192	3.620	407	125	4.253	128	156	4.933	84	168
3.5	±0.05	3.1	342	188	3.735	397	123	4.406	125	155	5.131	81	166
3.6	±0.05	3.0	334	184	3.849	388	122	4.559	121	154	5.330	78	165
3.7	±0.05	3.0	326	179	3.964	379	121	4.712	118	152	5.528	75	164
3.8	±0.05	3.0	318	175	4.078	369	119	4.865	115	151	5.727	73	162
3.9	±0.05	2.9	311	171	4.193	360	118	5.018	112	150	5.925	70	161

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Capacitance @ 1MHz and Tolerance		Self Resonance Frequency (GHz) Typ.	Q Standard Value @ 1GHz		Frequency 900MHz			Frequency 1900MHz			Frequency 2400MHz		
C (pF)	Tol.		Typ.	Min.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.
4	±0.05	2.9	307	169	4.301	355	117	5.188	110	149	6.188	68	160
4.1	±0.05	2.8	303	167	4.410	351	116	5.358	108	148	6.450	67	159
4.2	±0.05	2.8	299	164	4.518	347	116	5.528	106	148	6.713	65	158
4.3	±0.05	2.7	295	162	4.627	342	115	5.698	104	147	6.975	64	157
4.4	±0.05	2.7	291	160	4.735	338	114	5.867	102	146	7.238	62	157
4.5	±0.05	2.7	287	158	4.843	333	113	6.037	100	146	7.500	61	156
4.6	±0.05	2.6	283	156	4.952	329	112	6.207	98	145	7.763	59	155
4.7	±0.05	2.6	279	154	5.060	324	112	6.377	96	144	8.025	58	154
5.1	±0.05	2.5	263	145	5.494	307	109	7.057	88	142	9.075	52	151
5.6	±0.05	2.4	244	134	6.035	285	105	7.906	78	138	10.39	44	147
6.2	±0.1	2.3	228	126	6.865	267	102	9.517	72	133	13.66	40	141
6.8	±0.1	2.2	213	117	7.694	250	100	11.13	66	128	16.93	35	135
7.5	±0.1	2.1	195	107	8.367	227	98	12.63	57	125	20.91	28	132
8.2	±0.1	2.0	176	97	9.041	205	96	14.14	49	123	24.88	21	129
9.1	±0.1	1.9	161	89	10.20	188	96	18.09	42	122	40.00	16	128
10	±1%	1.8	146	80	11.37	171	95	22.05	36	121	70.00	12	127
11	±1%	1.7	129	71	12.66	153	95	26.44	29	120	140.0	6	126
12	±1%	1.6	112	62	13.95	134	94	30.83	22	119	231.3	1	125
13	±1%	1.6	102	56	15.31	122	93	40.37	18	118	n/a	n/a	n/a
14	±1%	1.5	92	51	16.67	111	92	49.91	15	118	n/a	n/a	n/a
15	±1%	1.5	82	45	18.03	99	90	59.44	11	117	n/a	n/a	n/a
16	±1%	1.4	79	43	19.61	96	90	80.00	8	117	n/a	n/a	n/a
17	±1%	1.4	76	42	21.18	92	90	120.0	6	116	n/a	n/a	n/a
18	±1%	1.3	73	40	22.76	89	90	190.0	4	116	n/a	n/a	n/a
19	±1%	1.3	69	38	24.37	84	89	n/a	n/a	n/a	n/a	n/a	n/a
20	±1%	1.2	65	36	25.98	80	89	n/a	n/a	n/a	n/a	n/a	n/a
22	±1%	1.2	57	31	29.21	72	87	n/a	n/a	n/a	n/a	n/a	n/a
24	±1%	1.2	48	26	34.44	62	87	n/a	n/a	n/a	n/a	n/a	n/a
27	±1%	1.1	43	24	41.87	56	86	n/a	n/a	n/a	n/a	n/a	n/a
30	±1%	1.0	37	21	49.29	49	85	n/a	n/a	n/a	n/a	n/a	n/a
33	±1%	1.0	32	18	56.72	43	84	n/a	n/a	n/a	n/a	n/a	n/a
36	±1%	1.0	27	15	64.15	37	83	n/a	n/a	n/a	n/a	n/a	n/a
39	±1%	1.0	21	12	71.57	30	82	n/a	n/a	n/a	n/a	n/a	n/a

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Capacitance @ 1MHz and Tolerance		Self Resonance Frequency (GHz) Typ.	Q Standard Value @ 1GHz		Frequency 900MHz			Frequency 1900MHz			Frequency 2400MHz		
C (pF)	Tol.		Typ.	Min.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.
0.1	±0.02	17.2	880	484	0.125	890	3296	0.125	545	2417	0.126	447	2265
0.15	±0.02	14.1	872	480	0.176	885	2073	0.178	530	1626	0.181	434	1546
0.2	±0.02	12.3	864	475	0.228	880	1492	0.231	516	1227	0.235	420	1178
0.25	±0.02	11.0	857	471	0.279	874	1156	0.284	501	986	0.290	407	955
0.3	±0.02	10.1	849	467	0.331	869	938	0.337	487	825	0.344	394	804
0.35	±0.02	9.4	841	462	0.382	864	787	0.390	472	710	0.399	380	695
0.4	±0.02	8.8	833	458	0.433	859	675	0.443	458	623	0.453	367	613
0.45	±0.02	8.3	825	454	0.485	853	590	0.496	443	555	0.508	353	549
0.5	±0.02	7.9	817	450	0.536	848	523	0.549	429	501	0.562	340	497
0.55	±0.02	7.5	811	446	0.584	843	469	0.600	420	456	0.616	331	454
0.6	±0.02	7.2	805	443	0.631	838	425	0.651	411	419	0.670	322	418
0.65	±0.02	6.9	798	439	0.679	834	387	0.702	402	387	0.724	313	388
0.7	±0.02	6.7	792	436	0.726	829	356	0.753	393	360	0.778	304	362
0.75	±0.02	6.5	786	432	0.774	824	329	0.804	384	337	0.832	295	339
0.8	±0.02	6.3	779	429	0.822	819	306	0.855	375	316	0.886	286	319
0.85	±0.02	6.1	773	425	0.869	814	285	0.906	366	298	0.940	277	301
0.9	±0.02	5.9	767	422	0.917	810	267	0.957	357	282	0.994	268	285
0.95	±0.02	5.8	760	418	0.964	805	251	1.008	348	267	1.049	260	271
1	±0.02	5.6	754	415	1.012	800	231	1.059	339	235	1.103	251	242
1.05	±0.02	5.5	747	411	1.065	794	223	1.120	335	228	1.170	247	235
1.1	±0.02	5.4	740	407	1.119	788	215	1.181	330	221	1.237	244	228
1.15	±0.02	5.3	732	403	1.172	782	208	1.242	326	214	1.304	240	220
1.2	±0.02	5.1	725	399	1.225	776	200	1.304	322	207	1.371	237	213
1.25	±0.02	5.0	718	395	1.279	770	192	1.365	318	200	1.438	233	206
1.3	±0.02	4.9	711	391	1.332	764	184	1.426	313	193	1.505	230	199
1.35	±0.02	4.9	704	387	1.386	758	176	1.487	309	186	1.573	226	192
1.4	±0.02	4.8	696	383	1.439	752	169	1.548	305	179	1.640	223	184
1.45	±0.02	4.7	689	379	1.492	746	161	1.609	300	172	1.707	219	177
1.5	±0.02	4.6	682	375	1.546	740	153	1.670	296	165	1.774	216	170
1.55	±0.02	4.6	675	371	1.600	733	151	1.734	292	163	1.850	212	168
1.6	±0.02	4.5	668	367	1.654	726	148	1.799	287	161	1.927	208	165
1.65	±0.02	4.4	660	363	1.708	719	146	1.864	283	159	2.003	204	163
1.7	±0.02	4.3	653	359	1.762	712	143	1.928	278	157	2.079	200	160
1.75	±0.02	4.3	646	355	1.816	705	141	1.993	274	155	2.156	197	158
1.8	±0.02	4.2	639	351	1.870	698	139	2.058	269	152	2.232	193	155
1.85	±0.02	4.2	632	347	1.924	691	136	2.122	265	150	2.308	189	153
1.9	±0.02	4.1	624	343	1.978	684	134	2.187	260	148	2.385	185	150
1.95	±0.02	4.1	617	339	2.033	677	131	2.252	256	146	2.461	181	148
2	±0.03	4.0	610	336	2.087	670	129	2.316	251	144	2.537	177	145
2.1	±0.03	3.9	597	328	2.183	658	127	2.440	245	142	2.690	171	143
2.2	±0.03	3.8	584	321	2.280	646	124	2.563	239	139	2.843	165	141
2.3	±0.03	3.8	571	314	2.377	634	122	2.687	233	137	2.996	159	139
2.4	±0.03	3.6	557	307	2.474	623	119	2.810	227	135	3.149	154	136
2.5	±0.03	3.6	544	299	2.571	611	117	2.934	221	133	3.301	148	134
2.6	±0.03	3.6	531	292	2.668	599	114	3.057	215	130	3.454	142	132
2.7	±0.03	3.4	518	285	2.764	587	112	3.181	209	128	3.607	136	130
2.8	±0.03	3.4	507	279	2.875	575	111	3.348	204	127	3.850	132	129
2.9	±0.03	3.4	497	273	2.987	564	110	3.514	199	125	4.093	129	127
3	±0.03	3.3	486	267	3.098	552	109	3.681	194	124	4.335	125	126
3.1	±0.05	3.3	475	261	3.209	540	108	3.848	189	123	4.578	121	125
3.2	±0.05	3.2	465	256	3.320	528	107	4.014	183	122	4.821	118	123
3.3	±0.05	3.1	454	250	3.431	517	106	4.181	178	120	5.064	114	122
3.4	±0.05	3.1	443	244	3.542	505	105	4.348	173	119	5.307	110	121
3.5	±0.05	3.1	433	238	3.653	493	104	4.515	168	118	5.549	107	119
3.6	±0.05	3.0	422	232	3.764	481	103	4.681	163	116	5.792	103	118
3.7	±0.05	3.0	412	226	3.875	470	102	4.848	158	115	6.035	99	116
3.8	±0.05	3.0	401	220	3.986	458	101	5.015	153	114	6.278	96	115
3.9	±0.05	2.9	390	215	4.097	446	100	5.182	148	113	6.521	92	114

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Capacitance @ 1MHz and Tolerance		Self Resonance Frequency (GHz) Typ.	Q Standard Value @ 1GHz		Frequency 900MHz			Frequency 1900MHz			Frequency 2400MHz		
C (pF)	Tol.		Typ.	Min.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.
4	±0.05	2.9	384	211	4.214	440	99	5.378	144	112	6.861	89	113
4.1	±0.05	2.9	378	208	4.331	434	98	5.574	141	112	7.201	86	113
4.2	±0.05	2.8	372	205	4.448	428	98	5.769	138	111	7.541	84	112
4.3	±0.05	2.7	366	202	4.564	422	97	5.965	134	111	7.881	81	111
4.4	±0.05	2.7	360	198	4.681	415	96	6.161	131	110	8.222	78	111
4.5	±0.05	2.7	355	195	4.798	409	96	6.357	128	110	8.562	75	110
4.6	±0.05	2.7	349	192	4.915	403	95	6.553	124	109	8.902	72	110
4.7	±0.05	2.6	343	188	5.032	397	94	6.749	121	109	9.242	69	109
5.1	±0.05	2.5	319	175	5.499	373	91	7.533	108	107	10.60	58	107
5.6	±0.05	2.4	289	159	6.083	342	88	8.513	91	104	12.30	44	104
6.2	±0.1	2.3	264	145	6.842	313	86	10.43	79	102	18.03	36	103
6.8	±0.1	2.2	239	131	7.601	283	84	12.35	68	101	23.76	28	102
7.5	±0.1	2.1	218	120	8.468	259	83	14.84	61	100	37.25	21	101
8.2	±0.1	2.0	198	109	9.334	234	82	17.32	55	100	50.74	15	100
9.1	±0.1	1.9	179	99	10.57	213	82	24.90	46	100	n/a	n/a	n/a
10	±1%	1.8	160	88	11.80	191	81	32.48	37	100	n/a	n/a	n/a
11	±1%	1.7	139	77	13.17	167	81	40.90	26	101	n/a	n/a	n/a
12	±1%	1.6	119	65	14.54	143	80	49.32	16	101	n/a	n/a	n/a
13	±1%	1.6	110	60	16.17	134	80	n/a	n/a	n/a	n/a	n/a	n/a
14	±1%	1.5	101	55	17.79	125	80	n/a	n/a	n/a	n/a	n/a	n/a
15	±1%	1.5	92	51	19.42	116	80	n/a	n/a	n/a	n/a	n/a	n/a
16	±1%	1.4	87	48	21.13	110	79	n/a	n/a	n/a	n/a	n/a	n/a
17	±1%	1.4	83	46	22.85	104	78	n/a	n/a	n/a	n/a	n/a	n/a
18	±1%	1.3	78	43	24.57	99	77	n/a	n/a	n/a	n/a	n/a	n/a
19	±1%	1.3	73	40	26.41	92	77	n/a	n/a	n/a	n/a	n/a	n/a
20	±1%	1.3	67	37	28.26	85	76	n/a	n/a	n/a	n/a	n/a	n/a
22	±1%	1.2	57	31	31.95	72	76	n/a	n/a	n/a	n/a	n/a	n/a
24	±1%	1.2	46	25	35.64	59	75	n/a	n/a	n/a	n/a	n/a	n/a
27	±1%	1.1	41	22	44.94	54	74	n/a	n/a	n/a	n/a	n/a	n/a
30	±1%	1.0	36	20	54.24	48	73	n/a	n/a	n/a	n/a	n/a	n/a
33	±1%	1.0	30	17	63.54	42	72	n/a	n/a	n/a	n/a	n/a	n/a
36	±1%	0.9	25	14	72.84	37	71	n/a	n/a	n/a	n/a	n/a	n/a
39	±1%	0.9	20	11	82.14	31	70	n/a	n/a	n/a	n/a	n/a	n/a
43	±1%	0.9	16	9	102.9	27	66	n/a	n/a	n/a	n/a	n/a	n/a
47	±1%	0.8	12	7	123.7	23	63	n/a	n/a	n/a	n/a	n/a	n/a

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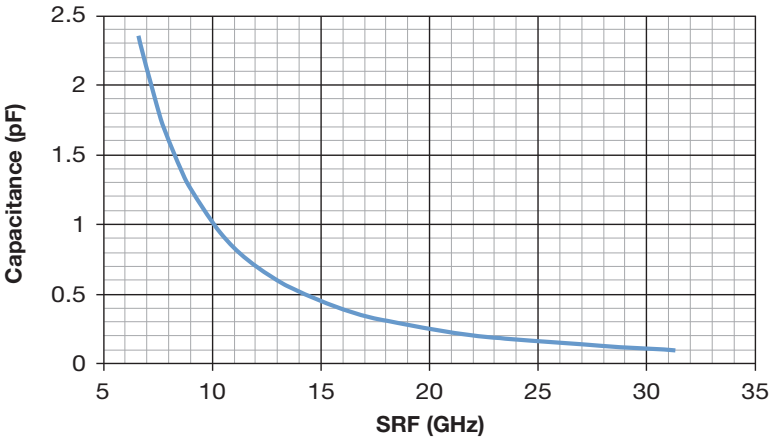
Capacitance @ 1MHz and Tolerance		Self Resonance Frequency (GHz) Typ.	Q Standard Value @ 1GHz		Frequency 900MHz			Frequency 1900MHz			Frequency 2400MHz		
C (pF)	Tol.		Typ.	Min.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.
0.1	±0.02	15.6	1190	654	0.136	1176	3633	0.136	606	2149	0.136	450	2068
0.15	±0.03	12.7	1179	648	0.190	1166	2129	0.190	597	1407	0.191	444	1370
0.2	±0.02	11.0	1168	642	0.244	1156	1457	0.244	589	1042	0.246	438	1023
0.25	±0.02	9.8	1156	636	0.297	1145	1086	0.299	581	826	0.301	432	816
0.3	±0.02	8.9	1145	630	0.351	1135	854	0.353	573	683	0.356	426	678
0.35	±0.02	8.3	1134	624	0.405	1125	697	0.408	565	581	0.411	421	580
0.4	±0.02	7.7	1123	618	0.459	1115	584	0.462	557	505	0.466	415	506
0.45	±0.02	7.3	1112	612	0.513	1105	500	0.516	549	447	0.521	409	449
0.5	±0.02	6.9	1101	606	0.567	1095	435	0.571	541	400	0.576	403	404
0.55	±0.02	6.6	1090	599	0.617	1084	384	0.621	532	362	0.627	397	366
0.6	±0.02	6.3	1079	593	0.666	1074	342	0.672	524	331	0.679	391	335
0.65	±0.02	6.0	1068	587	0.716	1064	308	0.723	516	304	0.731	385	309
0.7	±0.02	5.8	1057	581	0.765	1054	279	0.774	508	282	0.783	379	287
0.75	±0.02	5.6	1046	575	0.815	1044	255	0.824	500	262	0.834	374	267
0.8	±0.02	5.4	1035	569	0.864	1034	234	0.875	492	245	0.886	368	250
0.85	±0.02	5.3	1023	563	0.914	1024	216	0.926	484	230	0.938	362	236
0.9	±0.02	5.1	1012	557	0.963	1013	201	0.976	476	217	0.989	356	222
0.95	±0.02	5.0	1001	551	1.013	1003	187	1.027	467	205	1.041	350	210
1	±0.02	5.0	992	546	1.062	983	167	1.078	459	170	1.093	344	177
1.05	±0.02	4.9	981	539	1.107	975	163	1.124	451	167	1.141	338	174
1.1	±0.02	4.8	969	533	1.152	966	158	1.170	443	165	1.189	331	172
1.15	±0.02	4.7	958	527	1.196	958	154	1.217	435	162	1.236	325	169
1.2	±0.02	4.6	946	521	1.241	950	150	1.263	427	160	1.284	318	167
1.25	±0.02	4.5	935	514	1.285	942	146	1.309	419	157	1.332	312	164
1.3	±0.02	4.4	923	508	1.330	933	142	1.355	410	155	1.380	305	162
1.35	±0.02	4.3	912	502	1.375	925	138	1.402	402	152	1.428	299	159
1.4	±0.02	4.2	900	495	1.419	917	134	1.448	394	150	1.476	293	156
1.45	±0.02	4.1	889	489	1.464	908	129	1.494	386	147	1.524	286	154
1.5	±0.02	4.1	877	483	1.508	900	125	1.541	378	144	1.572	280	151
1.55	±0.02	4.0	862	474	1.567	890	123	1.618	371	143	1.638	274	150
1.6	±0.02	3.9	846	465	1.626	881	122	1.694	363	142	1.704	268	149
1.65	±0.02	3.9	831	457	1.685	871	120	1.771	356	140	1.770	262	148
1.7	±0.02	3.8	815	448	1.743	862	118	1.848	349	139	1.836	256	147
1.75	±0.02	3.7	800	440	1.802	852	116	1.925	342	138	1.902	250	145
1.8	±0.02	3.7	784	431	1.861	843	114	2.002	334	136	1.968	244	144
1.85	±0.02	3.6	769	423	1.920	833	112	2.079	327	135	2.034	239	143
1.9	±0.02	3.5	753	414	1.978	824	110	2.156	320	134	2.100	233	142
1.95	±0.02	3.4	737	406	2.037	814	108	2.233	313	132	2.167	227	141
2	±0.03	3.3	722	397	2.096	805	107	2.310	305	131	2.233	221	139
2.1	±0.03	3.2	691	380	2.213	786	103	2.464	291	128	2.365	209	137
2.2	±0.03	3.0	660	363	2.331	767	99	2.618	276	126	2.497	198	135
2.3	±0.03	2.9	644	354	2.420	747	97	2.681	268	123	2.613	191	132
2.4	±0.03	2.9	629	346	2.508	728	96	2.744	259	121	2.729	185	130
2.5	±0.03	2.8	614	338	2.597	709	94	2.807	251	118	2.845	179	128
2.6	±0.03	2.8	598	329	2.686	689	93	2.870	242	116	2.961	173	126
2.7	±0.03	2.7	583	321	2.775	670	91	2.933	234	114	3.077	167	123
2.8	±0.03	2.7	574	316	2.875	659	90	3.047	230	113	3.205	164	122
2.9	±0.03	2.7	566	311	2.975	647	89	3.162	227	112	3.334	161	121
3	±0.03	2.7	557	306	3.075	636	88	3.276	223	111	3.462	157	121
3.1	±0.05	2.7	548	302	3.174	625	87	3.390	220	110	3.590	154	120
3.2	±0.05	2.6	540	297	3.274	613	87	3.504	216	109	3.718	151	119
3.3	±0.05	2.6	531	292	3.374	602	86	3.619	213	108	3.847	148	118
3.4	±0.05	2.6	522	287	3.474	591	85	3.733	209	107	3.975	145	117
3.5	±0.05	2.6	514	283	3.574	579	84	3.847	206	106	4.103	141	116
3.6	±0.05	2.5	505	278	3.674	568	83	3.961	202	105	4.231	138	115
3.7	±0.05	2.5	496	273	3.773	556	82	4.076	198	104	4.359	135	114
3.8	±0.05	2.5	488	268	3.873	545	81	4.190	195	103	4.488	132	113
3.9	±0.05	2.4	479	264	3.973	534	80	4.304	191	102	4.616	129	112

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Capacitance @ 1MHz and Tolerance		Self Resonance Frequency (GHz) Typ.	Q Standard Value @ 1GHz		Frequency 900MHz			Frequency 1900MHz			Frequency 2400MHz		
C (pF)	Tol.		Typ.	Min.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.	C(eff) (pF) Typ.	Q Typ.	ESR (mOhm) Typ.
4	±0.05	2.4	473	260	4.083	528	79	4.435	189	101	4.768	127	112
4.1	±0.05	2.4	467	257	4.192	522	78	4.565	186	100	4.919	125	111
4.2	±0.05	2.4	462	254	4.302	516	78	4.695	183	100	5.071	123	110
4.3	±0.05	2.3	456	251	4.411	511	77	4.825	180	99	5.223	121	110
4.4	±0.05	2.3	450	247	4.521	505	76	4.956	178	98	5.375	119	109
4.5	±0.05	2.3	444	244	4.630	499	75	5.086	175	98	5.526	117	108
4.6	±0.05	2.3	438	241	4.740	493	75	5.216	172	97	5.678	115	108
4.7	±0.05	2.2	432	238	4.849	487	74	5.347	170	96	5.830	113	107
5.1	±0.05	2.1	408	225	5.288	464	71	5.868	159	93	6.437	106	105
5.6	±0.05	2.0	379	208	5.835	435	67	6.519	145	90	7.195	96	102
6.2	±0.1	1.9	355	195	6.440	408	65	7.176	137	86	7.897	91	96
6.8	±0.1	1.8	330	182	7.044	380	62	7.832	129	83	8.599	85	91
7.5	±0.1	1.7	308	169	7.823	351	61	8.927	115	81	10.08	74	89
8.2	±0.1	1.7	285	157	8.601	322	60	10.02	100	78	11.55	63	87
9.1	±0.1	1.6	266	146	9.600	304	58	11.55	93	77	13.93	57	85
10	±1%	1.5	247	136	10.60	285	57	13.09	85	76	16.30	50	84
11	±1%	1.5	225	124	11.71	265	56	14.79	76	74	18.94	43	82
12	±1%	1.4	204	112	12.82	244	54	16.49	68	73	21.57	36	81
13	±1%	1.3	193	106	13.97	230	53	18.64	61	72	26.09	32	80
14	±1%	1.3	181	99	15.13	215	53	20.80	55	71	30.61	28	79
15	±1%	1.2	169	93	16.28	200	52	22.95	48	70	35.13	24	78
16	±1%	1.2	164	90	17.51	195	51	26.01	46	69	46.51	22	76
17	±1%	1.2	159	88	18.75	189	50	29.07	43	67	57.90	19	75
18	±1%	1.1	154	85	19.98	183	49	32.14	41	66	69.29	17	73
19	±1%	1.1	150	82	21.21	178	49	36.34	39	66	n/a	n/a	n/a
20	±1%	1.1	145	80	22.43	172	49	40.55	38	65	n/a	n/a	n/a
22	±1%	1.0	136	75	24.88	162	49	48.96	34	64	n/a	n/a	n/a
24	±1%	1.0	126	70	27.34	151	48	57.38	31	63	n/a	n/a	n/a
27	±1%	0.9	112	62	31.02	135	48	70.00	26	62	n/a	n/a	n/a
30	±1%	0.9	101	56	36.14	121	48	n/a	n/a	n/a	n/a	n/a	n/a
33	±1%	0.8	90	50	41.27	108	48	n/a	n/a	n/a	n/a	n/a	n/a
36	±1%	0.8	79	44	46.39	95	48	n/a	n/a	n/a	n/a	n/a	n/a
39	±1%	0.8	68	38	51.52	82	48	n/a	n/a	n/a	n/a	n/a	n/a
43	±1%	0.7	54	30	58.35	64	48	n/a	n/a	n/a	n/a	n/a	n/a
47	±1%	0.7	39	21	65.18	46	48	n/a	n/a	n/a	n/a	n/a	n/a
82	±1%	0.7	17	10	148.400	24	48	n/a	n/a	n/a	n/a	n/a	n/a

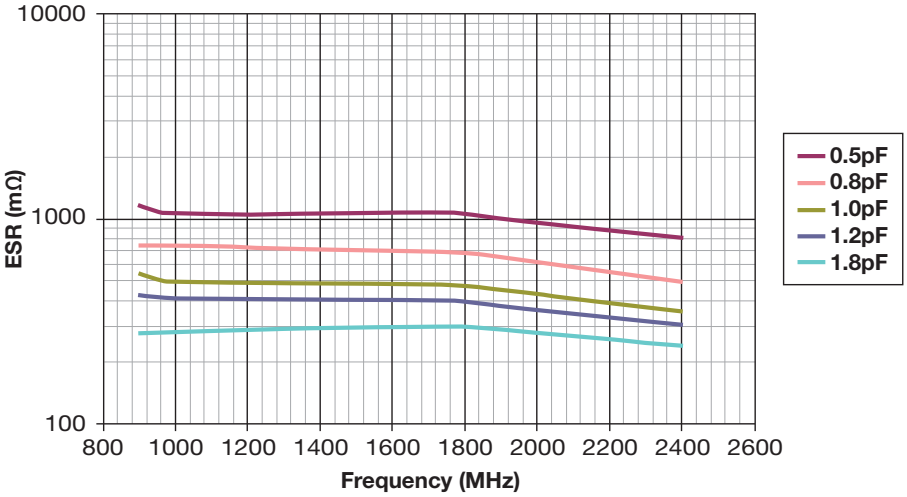
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Accu-P® 01005 Typical SRF vs Capacitance



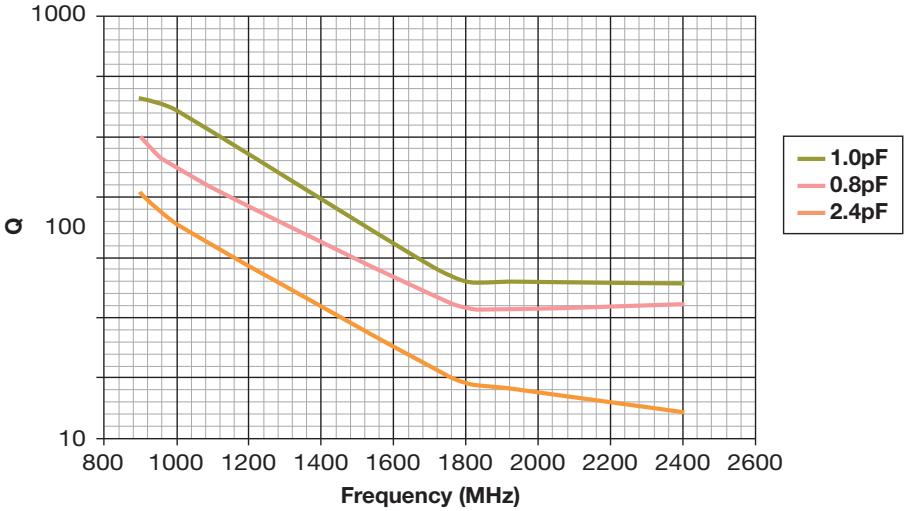
Measured on HP8720ES

Accu-P® 01005 Typical ESR vs Frequency



Measured on Agilent 4278A/4991A

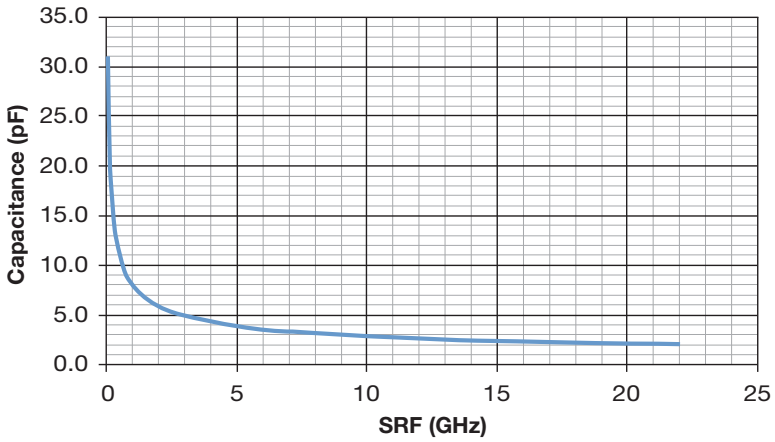
Accu-P® 01005 Typical Q vs Frequency



Measured on Agilent 4278A/4991A

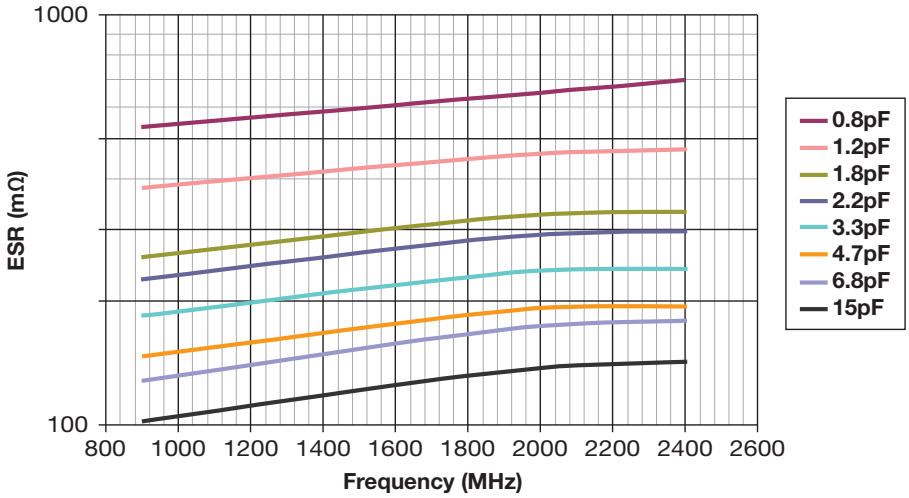
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Accu-P® 0201 Typical SRF vs Capacitance



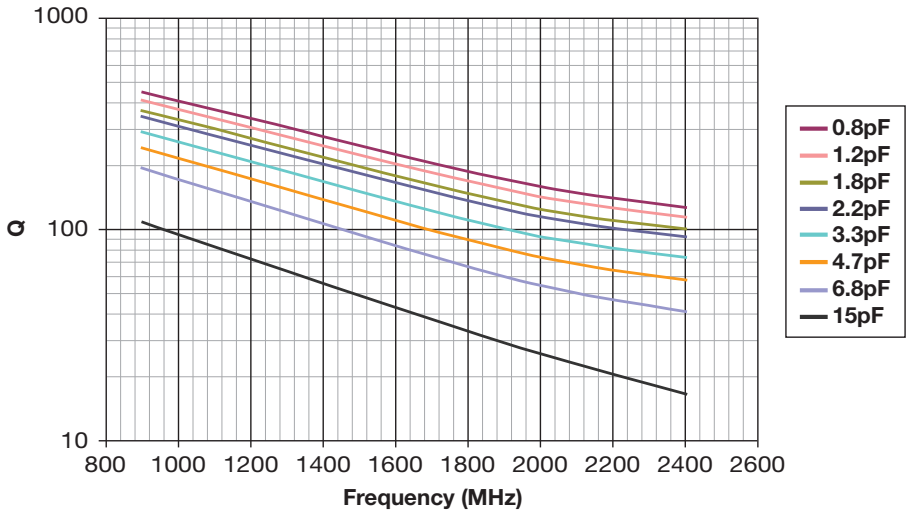
Measured on HP8720ES

Accu-P® 0201 Typical ESR vs Frequency



Measured on Agilent 4278A/4991A

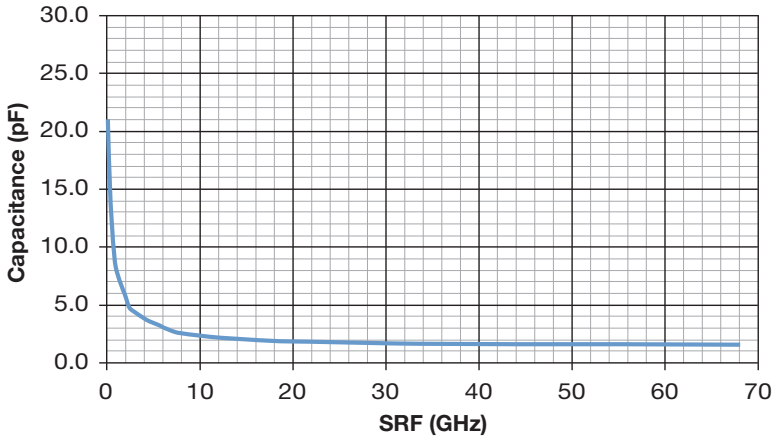
Accu-P® 0201 Typical Q vs Frequency



Measured on Agilent 4278A/4991A

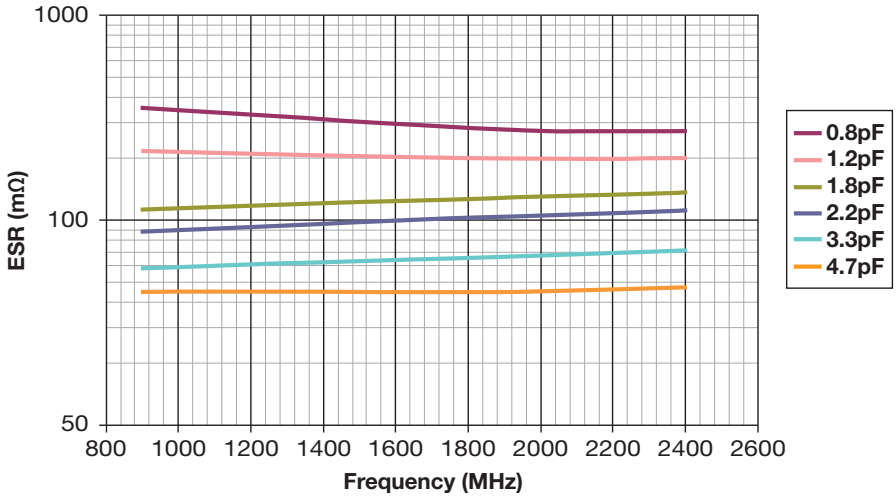
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Accu-P® 0402 Typical SRF vs Capacitance



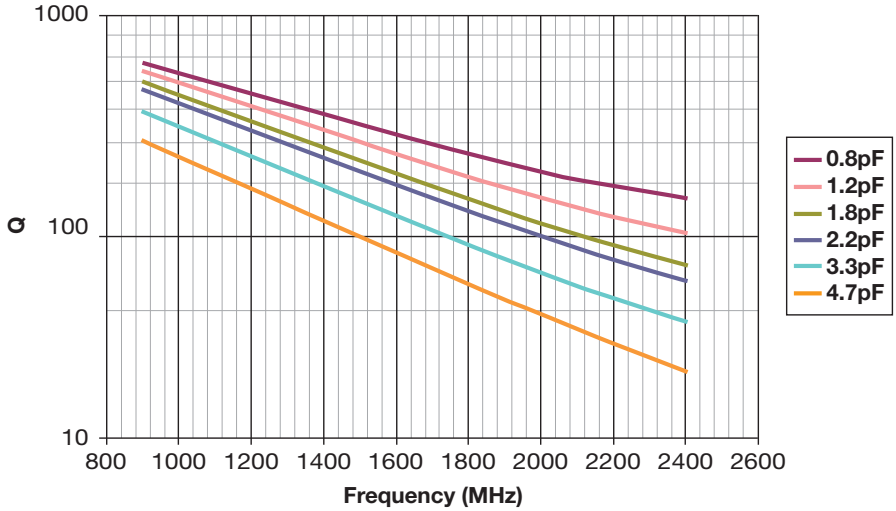
Measured on HP8720ES

Accu-P® 0402 Typical ESR vs Frequency



Measured on Agilent 4278A/4991A

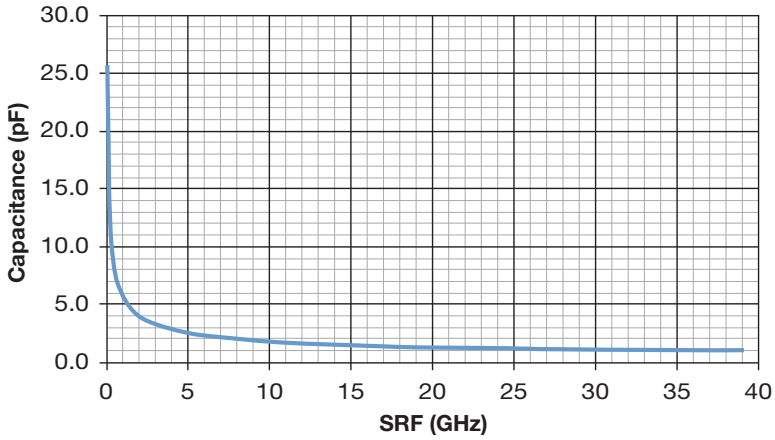
Accu-P® 0402 Typical Q vs Frequency



Measured on Agilent 4278A/4991A

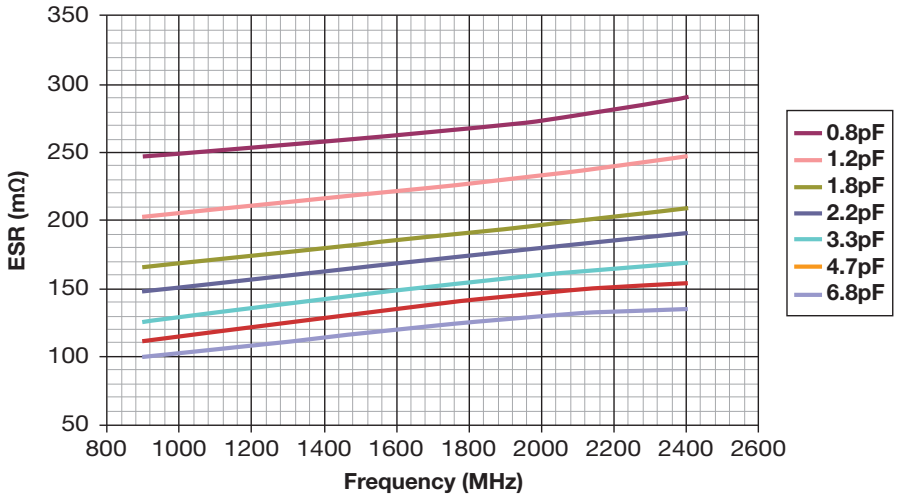
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Accu-P® 0603 Typical SRF vs Capacitance



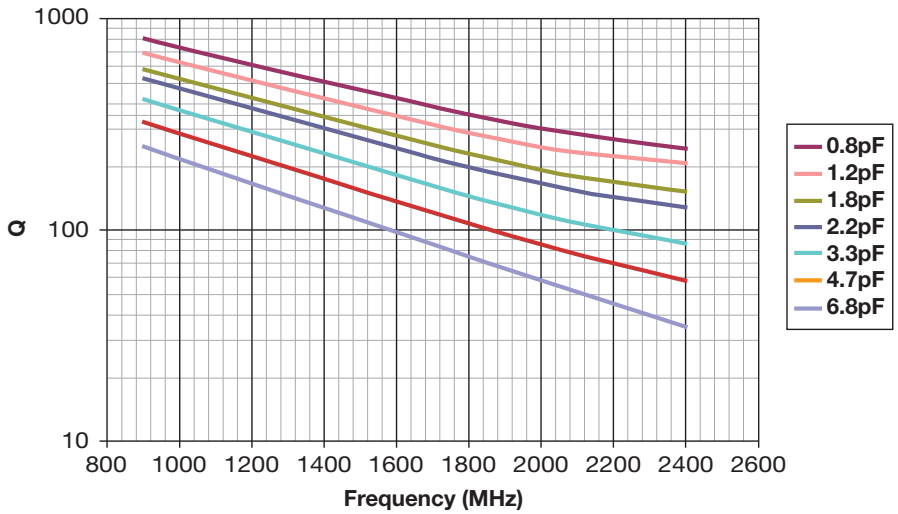
Measured on HP8720ES

Accu-P® 0603 Typical ESR vs Frequency



Measured on Agilent 4278A/4991A

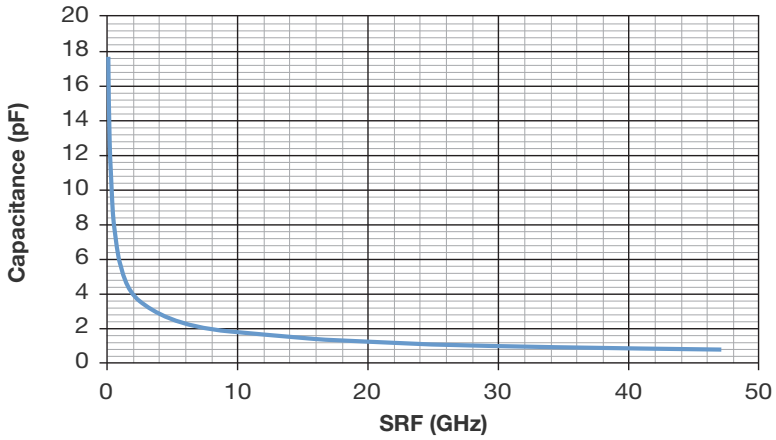
Accu-P® 0603 Typical Q vs Frequency



Measured on Agilent 4278A/4991A

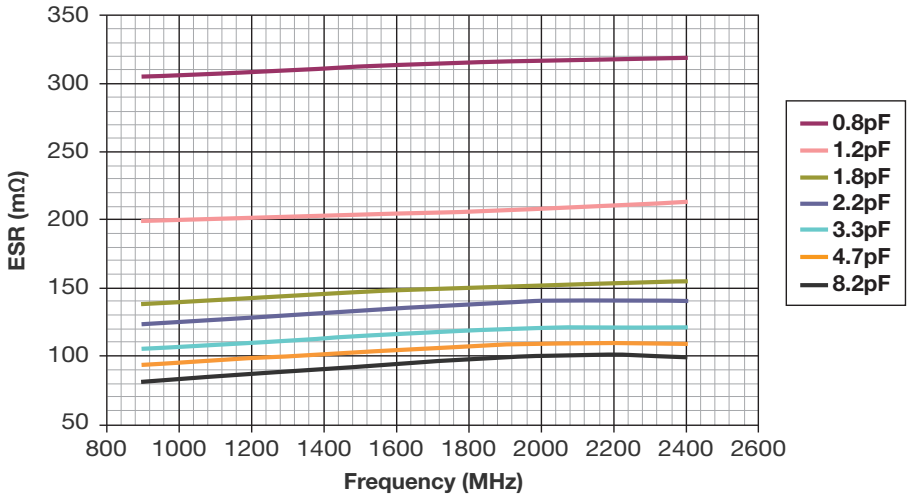
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Accu-P® 0805 Typical SRF vs Capacitance



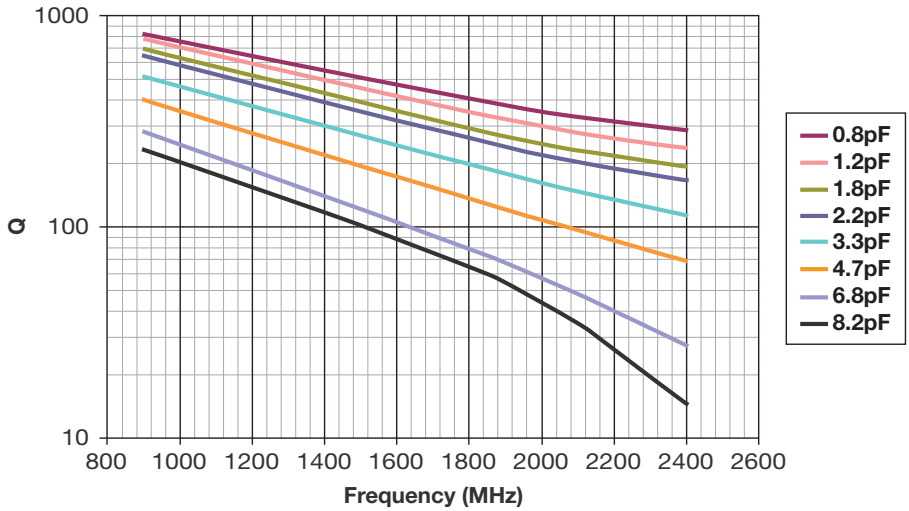
Measured on HP8720ES

Accu-P® 0805 Typical ESR vs Frequency



Measured on Agilent 4278A/4991A

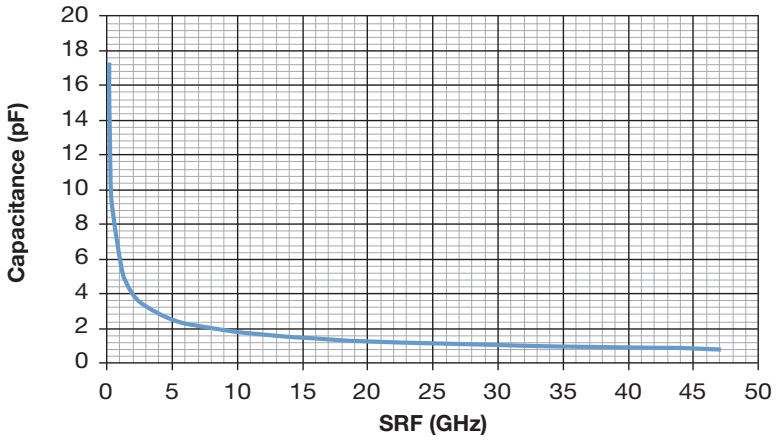
Accu-P® 0805 Typical Q vs Frequency



Measured on Agilent 4278A/4991A

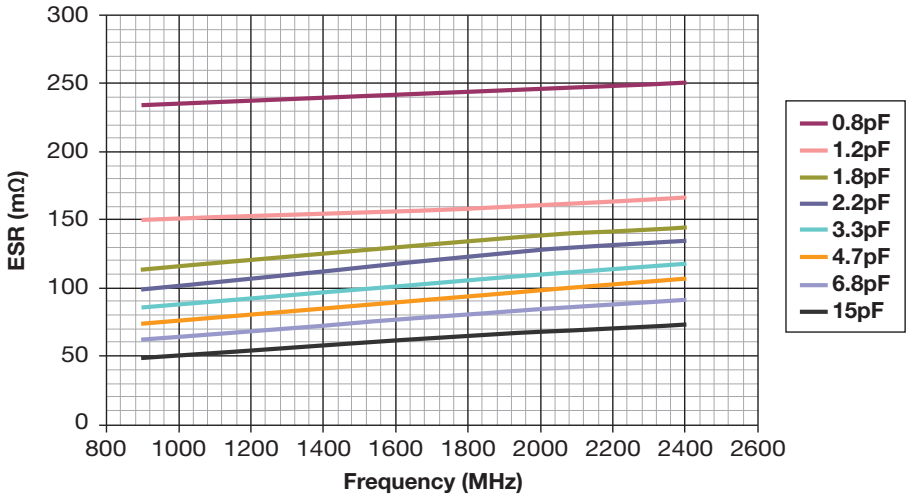
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Accu-P® 1210 Typical SRF vs Capacitance



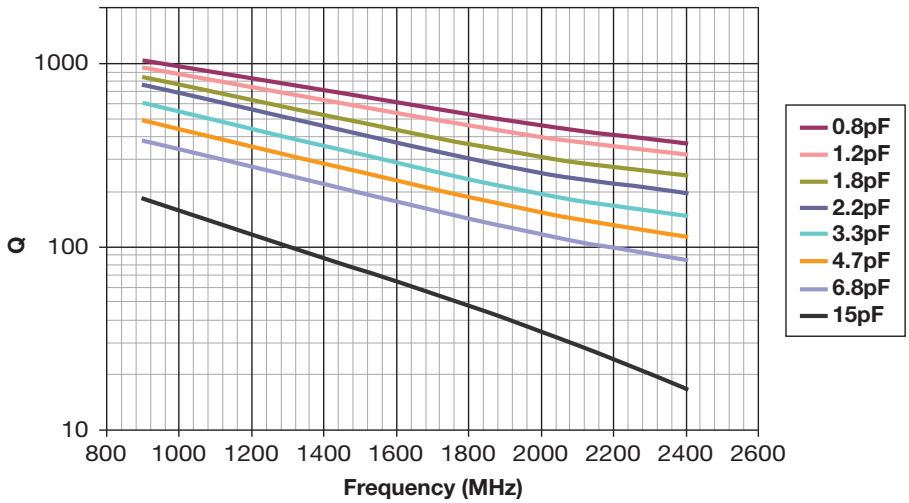
Measured on HP8720ES

Accu-P® 1210 Typical ESR vs Frequency



Measured on Agilent 4278A/4991A

Accu-P® 1210 Typical Q vs Frequency



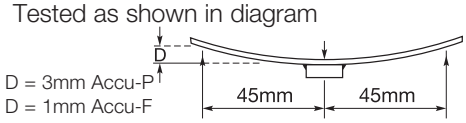
Measured on Agilent 4278A/4991A

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ENVIRONMENTAL CHARACTERISTICS

TEST	CONDITIONS	REQUIREMENT
Life (Endurance) MIL-STD-202F Method 108A	125°C, $2U_R$,1000 hours	No visible damage Δ C/C ≤ 2% for C≥5pF Δ C ≤ 0.25pF for C<5pF
Accelerated Damp Heat Steady State MIL-STD-202F Method 103B	85°C, 85% RH, U_R, 1000 hours	No visible damage Δ C/C ≤ 2% for C≥5pF Δ C ≤ 0.25pF for C<5pF
Temperature Cycling MIL-STD-202F Method 107E MIL-STD-883D Method 1010.7	-55°C to +125°C, 15 cycles – Accu-P®	No visible damage Δ C/C ≤ 2% for C≥5pF Δ C ≤ 0.25pF for C<5pF
Resistance to Solder Heat IEC-68-2-58	260°C ± 5°C for 10 secs	C remains within initial limits

MECHANICAL CHARACTERISTICS

TEST	CONDITIONS	REQUIREMENT
Solderability IEC-68-2-58	Components completely immersed in a solder bath at 235°C for 2 secs.	Terminations to be well tinned, minimum 95% coverage
Leach Resistance IEC-68-2-58	Components completely immersed in a solder bath at 260±5°C for 60 secs.	Dissolution of termination faces ≤15% of area Dissolution of termination edges ≤25% of length
Adhesion MIL-STD-202F Method 211A	A force of 5N applied for 10 secs.	No visible damage
Termination Bond Strength IEC-68-2-21 Amend. 2	Tested as shown in diagram 	No visible damage Δ C/C ≤ 2% for C≥5pF Δ C ≤ 0.25pF for C<5pF
Robustness of Termination IEC-68-2-21 Amend. 2	A force of 5N applied for 10 secs.	No visible damage
High Frequency Vibration MIL-STD-202F Method 201A, 204D *(Accu-P® only)*	55Hz to 2000Hz, 20G	No visible damage
Storage	12 months minimum with components stored in “as received” packaging	Good solderability

QUALITY & RELIABILITY

Accu-P® is based on well established thin-film technology and materials.

• ON-LINE PROCESS CONTROL

This program forms an integral part of the production cycle and acts as a feedback system to regulate and control production processes. The test procedures, which are integrated into the production process, were developed after long research work and are based on the highly developed semiconductor industry test procedures and equipment. These measures help AVX to produce a consistent and high yield line of products.

• FINAL QUALITY INSPECTION

Finished parts are tested for standard electrical parameters and visual/mechanical characteristics. Each production lot is 100% evaluated for: capacitance and proof voltage at 2.5 U_R. In addition, production is periodically evaluated for:

Average capacitance with histogram printout for capacitance distribution;

IR and Breakdown Voltage distribution;

Temperature Coefficient;

Solderability;

Dimensional, mechanical and temperature stability.

QUALITY ASSURANCE

The reliability of these thin-film chip capacitors has been studied intensively for several years. Various measures have been taken to obtain the high reliability required today by the industry. Quality assurance policy is based on well established international industry standards. The reliability of the capacitors is determined by accelerated testing under the following conditions:

Life (Endurance)	125°C, $2U_R$, 1000 hours
Accelerated Damp Heat Steady State	85°C, 85% RH, U_R, 1000 hours.

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RF POWER APPLICATIONS

In RF power applications capacitor losses generate heat. Two factors of particular importance to designers are:

- Minimizing the generation of heat.
- Dissipating heat as efficiently as possible.

CAPACITOR HEATING

- The major source of heat generation in a capacitor in RF power applications is a function of RF current (I) and ESR, from the relationship:

  Power dissipation = I^2_{RMS} x ESR

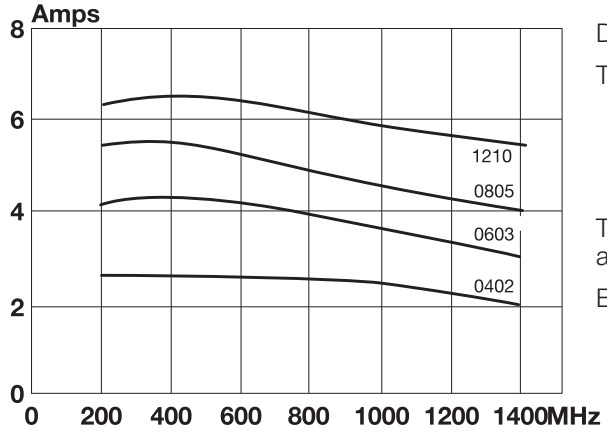
- Accu-P® capacitors are specially designed to minimize ESR and therefore RF heating. Values of ESR for Accu-P® capacitors are significantly less than those of ceramic MLC components currently available.

HEAT DISSIPATION

- Heat is dissipated from a capacitor through a variety of paths, but the key factor in the removal of heat is the thermal conductivity of the capacitor material.
- The higher the thermal conductivity of the capacitor, the more rapidly heat will be dissipated.
- The table below illustrates the importance of thermal conductivity to the performance of Accu-P® in power applications.

PRODUCT	MATERIAL	THERMAL CONDUCTIVITY W/mK
Accu-P® Microwave MLC	Alumina Magnesium Titanate	18.9 6.0

Power Handling
Accu-P® 10pF



Data used in calculating the graph:

Thermal impedance of capacitors:

0402	17°C/W
0603	12°C/W
0805	6.5°C/W
1210	5°C/W

Thermal impedance measured using RF generator, amplifier and strip-line transformer.

ESR of capacitors measured on Boonton 34A

THERMAL IMPEDANCE

Thermal impedance of Accu-P® chips is shown below compared with the thermal impedance of Microwave MLC's.

The thermal impedance expresses the temperature difference in °C between chip center and termination caused by a power dissipation of 1 watt in the chip. It is expressed in °C/W.

CAPACITOR TYPE	CHIP SIZE	THERMAL IMPEDANCE (°C/W)
Accu-P®	0805 1210	6.5 5
Microwave MLC	0505 1210	12 7.5

ADVANTAGES OF ACCU-P® IN RF POWER CIRCUITS

The optimized design of Accu-P® offers the designer of RF power circuits the following advantages:

- Reduced power losses due to the inherently low ESR of Accu-P®.
- Increased power dissipation due to the high thermal conductivity of Accu-P®.

- THE ONLY TRUE TEST OF A CAPACITOR IN ANY PARTICULAR APPLICATION IS ITS PERFORMANCE UNDER OPERATING CONDITIONS IN THE ACTUAL CIRCUIT.

PRACTICAL APPLICATION IN RF POWER CIRCUITS

- There is a wide variety of different experimental methods for measuring the power handling performance of a capacitor in RF power circuits. Each method has its own problems and few of them exactly reproduce the conditions present in "real" circuit applications.
- Similarly, there is a very wide range of different circuit applications, all with their unique characteristics and operating conditions which cannot possibly be covered by such "theoretical" testing.

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GENERAL

Accu-P® SMD capacitors are designed for soldering to printed circuit boards or other substrates. The construction of the components is such that they will withstand the time/temperature profiles used in both wave and reflow soldering methods.

HANDLING

SMD capacitors should be handled with care to avoid damage or contamination from perspiration and skin oils. The use of plastic tipped tweezers or vacuum pick-ups is strongly recommended for individual components. Bulk handling should ensure that abrasion and mechanical shock are minimized. For automatic equipment, taped and reeled product gives the ideal medium for direct presentation to the placement machine.

CIRCUIT BOARD TYPE

The circuit board types which may be used with Accu-P® are as follows:

All flexible types of circuit boards
(eg. FR-4, G-10) and also alumina.

For other circuit board materials, please consult factory.

COMPONENT PAD DESIGN

Component pads must be designed to achieve good joints and minimize component movement during reflow soldering. Pad designs are given below for both wave and reflow soldering.

The basis of these designs is:

a. Pad width equal to component width. It is permissible to decrease this to as low as 85% of component width but it is not advisable to go below this.

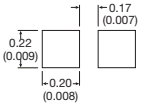
b. Pad overlap 0.5mm beneath large components. Pad overlap about 0.3mm beneath small components.

c. Pad extension of 0.5mm for reflow of large components and pad extension about 0.3mm for reflow of small components. Pad extension about 1.0mm for wave soldering.

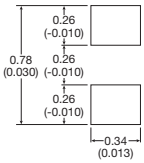
REFLOW SOLDERING

PAD DIMENSIONS: millimeters (inches)

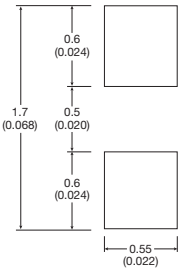
01005
Accu-P®



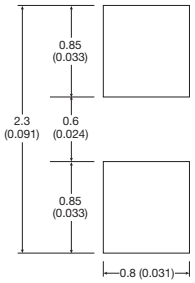
0201
Accu-P®



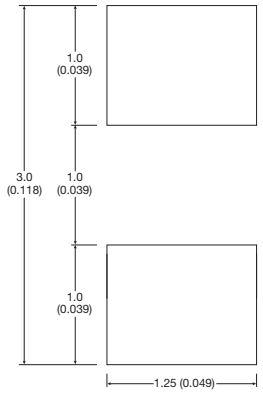
0402
Accu-P®



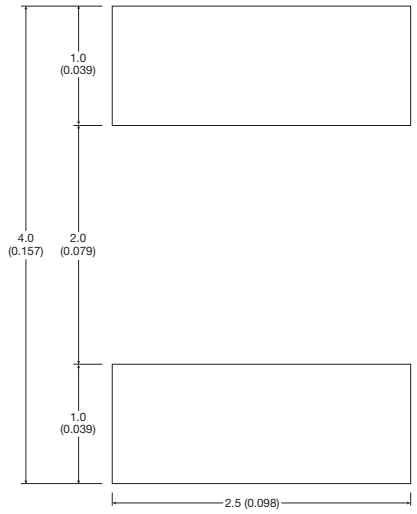
0603
Accu-P®



0805
Accu-P®



1210
Accu-P®



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PREHEAT & SOLDERING

The rate of preheat in production should not exceed 4°C/second and a recommended maximum is about 2°C/second. Temperature differential from preheat to soldering should not exceed 100°C.

For further specific application or process advice, please consult AVX.

COOLING

After soldering, the assembly should preferably be allowed to cool naturally. In the event of assisted cooling, similar conditions to those recommended for preheating should be used.

HAND SOLDERING & REWORK

Hand soldering is permissible. Preheat of the PCB to 150°C is required. The most preferable technique is to use hot air soldering tools. Where a soldering iron is used, a temperature controlled model not exceeding 30 watts should be used and set to not more than 260°C.

CLEANING RECOMMENDATIONS

Care should be taken to ensure that the devices are thoroughly cleaned of flux residues, especially the space beneath the device. Such residues may otherwise become conductive and effectively offer a lossy bypass to the device. Various recommended cleaning conditions (which must be optimized for the flux system being used) are as follows:

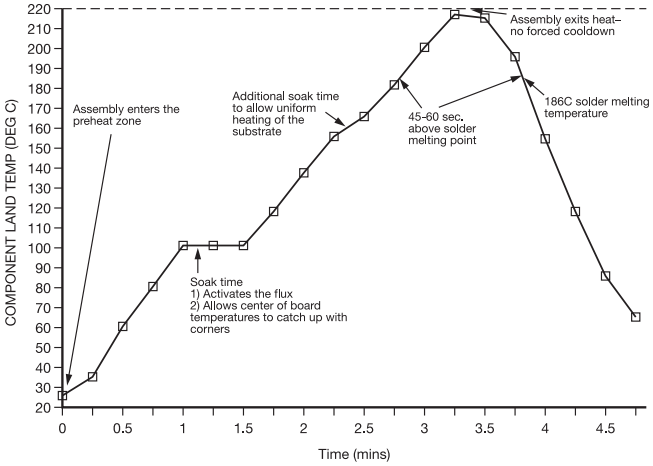
Cleaning liquids	i-propanol, ethanol, acetylacetone, water and other standard PCB cleaning liquids.
Ultrasonic conditions	power-20w/liter max. frequency-20kHz to 45kHz.
Temperature	80°C maximum (if not otherwise limited by chosen solvent system).
Time	5 minutes max.

STORAGE CONDITIONS

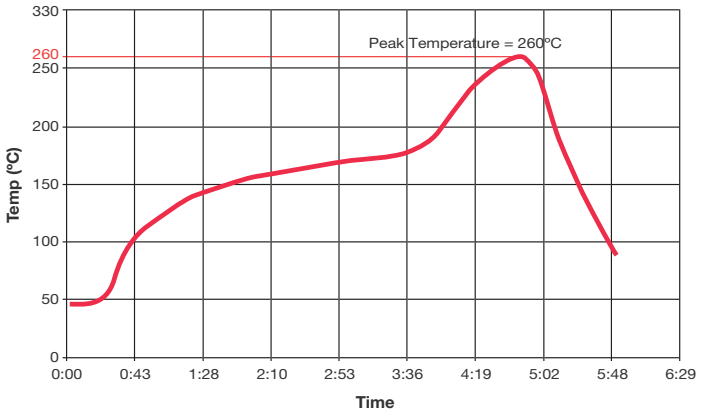
Recommended storage conditions for Accu-P® prior to use are as follows:

Temperature	15°C to 35°C
Humidity	≤65%
Air Pressure	860mbar to 1060mbar

RECOMMENDED REFLOW SOLDERING PROFILE COMPONENTS WITH SnPb TERMINATIONS



RECOMMENDED REFLOW SOLDERING PROFILE LEAD FREE COMPONENTS WITH Sn100 TERMINATIONS



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TAPE & REEL

All tape and reel specifications are in compliance with EIA 481-1-A. (equivalent to IEC 286 part 3).

- 8mm carrier
- Reeled quantities: Reels of 3,000 per 7" reel or 10,000 pieces per 13" reel
  01005, 0201 and 0402 = 5,000 pieces per 7" reel and 20,000 pieces per 13" reel

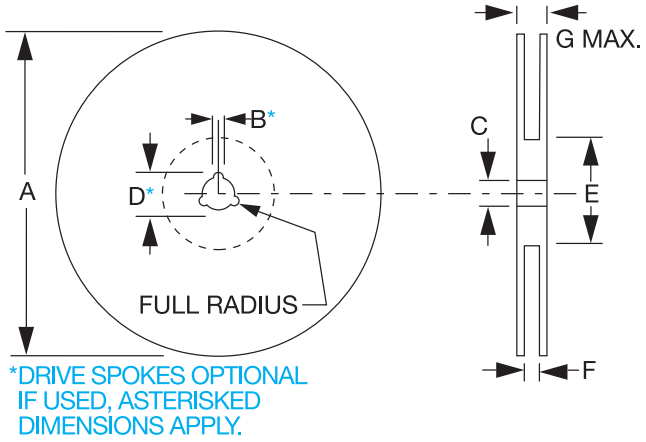
REEL

DIMENSIONS: millimeters (inches)

A(1)	B	C	D	E	F	G
180±1.0 (7.087±0.039)	1.5 min. (0.059 min.)	13±0.2 (0.512 ± 0.008)	20.2 min. (0.795 min.)	50 min. (1.969 min.)	9.6±1.5 (0.370 ± 0.050)	14.4 max. (0.567 max.)

Metric dimensions will govern.
Inch measurements rounded and for reference only.

(1) 330mm (13 inch) reels are available.

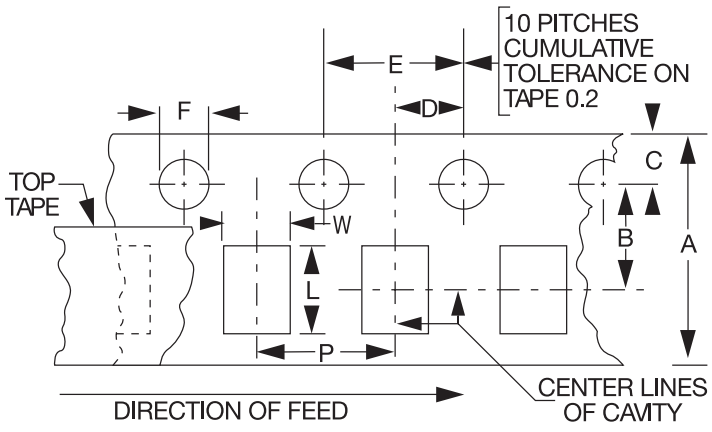


CARRIER

DIMENSIONS: millimeters (inches)

A	B	C	D	E	F
8.0 ± 0.3 (0.315 ± 0.012)	3.5 ± 0.05 (0.138 ± 0.002)	1.75±0.1 (0.069 ± 0.004)	2.0 ± 0.05 (0.079 ± 0.002)	4.0 ± 0.1 (0.157 ± 0.004)	$1.5^{+0.1}_{-0.0}$ ($0.059^{+0.004}_{-0.000}$)

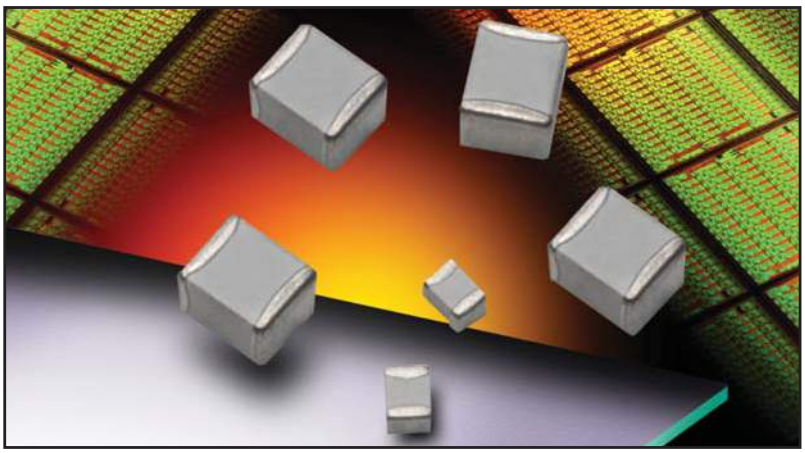
The nominal dimensions of the component compartment (W,L) are derived from the component size.



P = 4mm for 0603, 0805, 1210
P = 2mm for C005, 0201 and 0402

AVX reserves the right to change the information published herein without notice.

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FEATURES:

- Low ESR
- High Q
- High Self Resonance
- Capacitance Range 0.1 pF to 5100 pF
- 175ºC Capability SQCB (Standard voltages only)

APPLICATIONS:

- RF Power Amplifiers
- Low Noise Amplifiers
- Filter Networks
- MRI Systems

HOW TO ORDER

SQ	CA	7	M	100	J	A	T	1A

AVX Style

Case Size
CA = 0505
CB = 1111

See mechanical dimensions below

Voltage Code
5 = 50V
1 = 100V
E = 150V
2 = 200V
V = 250V
9 = 300V
7 = 500V
C = 600V
A = 1000V
S = 1500V

Temperature Coefficient Code
M = +90±20ppm/°C
A = 0±30ppm/°C
C = 15% ("J" Termination only)

Capacitance
EIA Capacitance Code in pF.
First two digits = significant figures or "R" for decimal place.
Third digit = number of zeros or after "R" significant figures.

Capacitance Tolerance Code
B = ±.1 pF
C = ±.25 pF
D = ±.5 pF
F = ±1%
G = ±2%
J = ±5%
K = ±10%
M = ±20%
N = ±30%

Failure Rate Code
A = Not Applicable

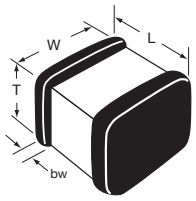
Termination Style Code
**T = 100% Tin
J = Nickel Barrier Sn/Pb (60/40)
**7 = Ag/Ni/Au
H = Cu/Sn (Non-Magnetic)

Packaging Code
1A = 7" Reel Unmarked
6A = Waffle Pack Unmarked
ME = 7" Reel Marked
WE = Waffle Pack Marked

* Vertical T&R available

**RoHS compliant

MECHANICAL DIMENSIONS: inches (millimeters)



Case	Length (L)	Width (W)	Thickness (T)	Band Width (bw)
SQCA*	.055 + .015 - .010 (1.40+ .381 - .254)	.055±.015 (1.40±.381)	.020/.057 (.508/1.45)	.010 + .010 -.005 (.254 +.254 -.127)
SQCB*	.110 + .020 - .010 (2.79 +.508 -.254)	.110±.010 (2.79±.254)	.030/.102 (.762/2.59)	.015±.010 (.381±.254)

TAPE & REEL: All tape and reel specifications are in compliance with EIA RS481 (equivalent to IEC 286 part 3).

—8mm carrier
—7" reel: SQCA/SQCB = 1000 pcs

WAFFLE PACK

SQCA 100 pcs
SQCB 100 pcs

Not RoHS Compliant

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

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ELECTRICAL SPECIFICATIONS

Dielectric		M & A	C
Temperature Coefficient (TCC)		(M) +90 ± 20 PPM/ºC (-55ºC to +125ºC) (M) +90 ± 30 PPM/ºC (+125ºC to +175ºC)* (A) 0 ± 30 PPM/ºC	±15% (-55ºC to 125ºC)
Capacitance Range		(M) 0.1 pF to 1000 pF (A) 0.1 pF to 5100 pF	0.001µF to 0.1µF
Operating Temperature		A Case: -55ºC to +125ºC* B Case (M Dielectric): 0.1 pF to 330 pF: from -55ºC to +175ºC 360 pF to 5100 pF: from -55ºC to +125ºC B Case (A Dielectric): 0.1 pF to 200 pF: from -55ºC to +175ºC 220 pF to 5100 pF: from -55ºC to +125ºC	-55°C to +125°C
Quality Factor (Q)	M Dielectric A & B Case	Greater than 10,000 at 1 MHz	2.5% @ 1kHz
	A Dielectric B Case	Greater than 10,000 at 1 MHz Greater than 2,000 at 1 MHz Greater than 2,000 at 1 KHz	0.1 - 200 pF 220 - 1000 pF 1100 - 5100 pF
	A Dielectric A Case	Greater than 10,000 at 1 MHz Greater than 2,000 at 1 MHz	0.1 - 100 pF 110 - 1000 pF
Insulation Resistance (IR)		0.2 pF to 470 pF 10^6 Megohms min. @ 25ºC at rated WVDC 10^5 Megohms min. @ 125ºC at rated WVDC 510 pF to 5100 pF 10^5 Megohms min. @ 25ºC at rated WVDC 10^4 Megohms min. @ 125ºC at rated WVDC	10^4 Megohms min. @ 25ºC at rated WVDC 10^3 Megohms min. @ 125ºC at rated WVDC
Working Voltage (WVDC)		See Capacitance Values table	See Capacitance Values table
Dielectric Withstanding Voltage (DWV)		WVDC 500V or less: 250% of rated WVDC for 5 seconds WVDC 1250V or less: 150% of rated WVDC for 5 seconds WVDC > 1250V: 120% of rated WVDC for 5 seconds	250% of rated WVDC for 5 secs
Aging Effects		None	<3% per decade hour
Piezoelectric Effects		None	None
Capacitance Drift		± (0.02% or 0.02 pF), whichever is greater	Not Applicable

* 175 SQCB only

ENVIRONMENTAL CHARACTERISTICS

AVX SQ will meet and exceed the requirements of EIA-198, MIL-PRF-55681 and MIL-PRF-123

Themal Shock	Mil-STD-202, Method 107, Condition A
Moisture Resistance	Mil-STD-202, Method 106
Low Voltage Humidity	Mil-STD-202, Method 103, condition A, with 1.5 VDC applied while subjected to an environment of 85ºC with 85% relative humidity for 240 hours
Life Test	Mil-STD-202, Method 108, for 2000 hours at 125ºC
Shock	Mil-STD-202, Method 213, Condition J
Vibration	Mil-STD-202, Method 204, Condition B
Immersion	Mil-STD-202, Method 104, Condition B
Salt Spray	Mil-STD-202, Method 101, Condition B
Solderability	Mil-STD-202, Method 208
Terminal Strength	Mil-STD-202, Method 211
Temperature Cycling	Mil-STD-202, Method 102, Condition C
Barometric Pressure	Mil-STD-202, Method 105, Condition B
Resistance to Solder Heat	Mil-STD-202, Method 210, Condition C

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Case Size A

TABLE I: TC: M (+90±20PPM/°C)

Cap. pF	Cap. Tol.	WVDC* STD	WVDC* HV
0.1	B	150	250
0.2	B	150	250
0.3	B,C	150	250
0.4	B,C	150	250
0.5	B, C, D	150	250
0.6	B, C, D	150	250
0.7	B, C, D	150	250
0.8	B, C, D	150	250
0.9	B, C, D	150	250
1.0	B, C, D	150	250
1.1	B, C, D	150	250
1.2	B, C, D	150	250
1.3	B, C, D	150	250
1.4	B, C, D	150	250
1.5	B, C, D	150	250
1.6	B, C, D	150	250
1.7	B, C, D	150	250
1.8	B, C, D	150	250
1.9	B, C, D	150	250
2.0	B, C, D	150	250
2.2	B, C, D	150	250
2.4	B, C, D	150	250
2.7	B, C, D	150	250
3.0	B, C, D	150	250
3.3	B, C, D	150	250
3.6	B, C, D	150	250
3.9	B, C, D	150	250
4.3	B, C, D	150	250
4.7	B, C, D	150	250
5.1	B, C, D	150	250
5.6	B, C, D	150	250
6.2	B, C, D	150	250
6.8	B, C, J, K	150	250
7.5	B, C, J, K	150	250
8.2	B, C, J, K	150	250
9.1	B, C, J, K	150	250
10	F, G, J, K	150	250
11	F, G, J, K	150	250
12	F, G, J, K	150	250
13	F, G, J, K	150	250
15	F, G, J, K	150	250
16	F, G, J, K	150	250
18	F, G, J, K	150	250
20	F, G, J, K	150	250
22	F, G, J, K	150	250
24	F, G, J, K	150	250
27	F, G, J, K	150	250
30	F, G, J, K	150	250
33	F, G, J, K	150	250
36	F, G, J, K	150	250
39	F, G, J, K	150	250
43	F, G, J, K	150	250
47	F, G, J, K	150	250
51	F, G, J, K	150	250
56	F, G, J, K	150	250
62	F, G, J, K	150	200
68	F, G, J, K	150	200
75	F, G, J, K	150	200
82	F, G, J, K	150	200
91	F, G, J, K	150	200
100	F, G, J, K	150	200

TABLE II: TC: A (0±30PPM/°C)

Cap. pF	Cap. Tol.	WVDC* STD	WVDC* HV
0.1	B	150	250
0.2	B	150	250
0.3	B,C	150	250
0.4	B,C	150	250
0.5	B, C, D	150	250
0.6	B, C, D	150	250
0.7	B, C, D	150	250
0.8	B, C, D	150	250
0.9	B, C, D	150	250
1.0	B, C, D	150	250
1.1	B, C, D	150	250
1.2	B, C, D	150	250
1.3	B, C, D	150	250
1.4	B, C, D	150	250
1.5	B, C, D	150	250
1.6	B, C, D	150	250
1.7	B, C, D	150	250
1.8	B, C, D	150	250
1.9	B, C, D	150	250
2.0	B, C, D	150	250
2.2	B, C, D	150	250
2.4	B, C, D	150	250
2.7	B, C, D	150	250
3.0	B, C, D	150	250
3.3	B, C, D	150	250
3.6	B, C, D	150	250
3.9	B, C, D	150	250
4.3	B, C, D	150	250
4.7	B, C, D	150	250
5.1	B, C, D	150	250
5.6	B, C, D	150	250
6.2	B, C, D	150	250
6.8	B, C, J, K	150	250
7.5	B, C, J, K	150	250
8.2	B, C, J, K	150	250
9.1	B, C, J, K	150	250
10	F, G, J, K	150	250
11	F, G, J, K	150	250
12	F, G, J, K	150	250
13	F, G, J, K	150	250
15	F, G, J, K	150	250
16	F, G, J, K	150	250
18	F, G, J, K	150	250
20	F, G, J, K	150	250
22	F, G, J, K	150	250
24	F, G, J, K	150	250
27	F, G, J, K	150	250
30	F, G, J, K	150	250
33	F, G, J, K	150	250
36	F, G, J, K	150	250
39	F, G, J, K	150	250
43	F, G, J, K	150	250
47	F, G, J, K	150	250
51	F, G, J, K	150	250
56	F, G, J, K	150	250
62	F, G, J, K	150	200
68	F, G, J, K	150	200
75	F, G, J, K	150	200
82	F, G, J, K	150	200
91	F, G, J, K	150	200
100	F, G, J, K	150	–
110	F, G, J, K	150	–
120	F, G, J, K	150	–
130	F, G, J, K	150	–
150	F, G, J, K	150	–
160	F, G, J, K	150	–
180	F, G, J, K	150	–
200	F, G, J, K	150	–
220	F, G, J, K	150	–
240	F, G, J, K	150	–
270	F, G, J, K	150	–
300	F, G, J, K	150	–
330	F, G, J, K	150	–
360	F, G, J, K	150	–
390	F, G, J, K	150	–
430	F, G, J, K	150	–
470	F, G, J, K	150	–
510	F, G, J, K	150	–
560	F, G, J, K	150	–
620	F, G, J, K	150	–
680	F, G, J, K	50	–
750	F, G, J, K	50	–
820	F, G, J, K	50	–
910	F, G, J, K	50	–
1000	F, G, J, K	50	–

TABLE III: TC: C (±15%)

Cap. pF	Cap. Tol.	WVDC STD
1000	K, M, N	50
1200	K, M, N	50
1500	K, M, N	50
1800	K, M, N	50
2000	K, M, N	50
2200	K, M, N	50
2700	K, M, N	50
3300	K, M, N	50
3900	K, M, N	50
4700	K, M, N	50
5100	K, M, N	50
5600	K, M, N	50
6800	K, M, N	50
8200	K, M, N	50
10000	K, M, N	50

*STD = Standard voltage rating; HV = High voltage rating

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Case Size B

TABLE IV: TC: M (+90±20PPM/°C)

Cap. pF	Cap. Tol.	WVDC*	
		STD	HV
0.1	B	500	1500
0.2	B	500	1500
0.3	B,C	500	1500
0.4	B,C	500	1500
0.5	B, C, D	500	1500
0.6	B, C, D	500	1500
0.7	B, C, D	500	1500
0.8	B, C, D	500	1500
0.9	B, C, D	500	1500
1.0	B, C, D	500	1500
1.1	B, C, D	500	1500
1.2	B, C, D	500	1500
1.3	B, C, D	500	1500
1.4	B, C, D	500	1500
1.5	B, C, D	500	1500
1.6	B, C, D	500	1500
1.7	B, C, D	500	1500
1.8	B, C, D	500	1500
1.9	B, C, D	500	1500
2.0	B, C, D	500	1500
2.2	B, C, D	500	1500
2.4	B, C, D	500	1500

Cap. pF	Cap. Tol.	WVDC*	
		STD	HV
2.7	B, C, D	500	1500
3.0	B, C, D	500	1500
3.3	B, C, D	500	1500
3.6	B, C, D	500	1500
3.9	B, C, D	500	1500
4.3	B, C, D	500	1500
4.7	B, C, D	500	1500
5.1	B, C, D	500	1500
5.6	B, C, D	500	1500
6.2	B, C, D	500	1500
6.8	B, C, J, K	500	1500
7.5	B, C, J, K	500	1500
8.2	B, C, J, K	500	1500
9.1	B, C, J, K	500	1500
10	F, G, J, K	500	1500
11	F, G, J, K	500	1500
12	F, G, J, K	500	1500
13	F, G, J, K	500	1500
15	F, G, J, K	500	1500
16	F, G, J, K	500	1500
18	F, G, J, K	500	1500

Cap. pF	Cap. Tol.	WVDC*	
		STD	HV
20	F, G, J, K	500	1500
22	F, G, J, K	500	1500
24	F, G, J, K	500	1500
27	F, G, J, K	500	1500
30	F, G, J, K	500	1500
33	F, G, J, K	500	1500
36	F, G, J, K	500	1500
39	F, G, J, K	500	1500
43	F, G, J, K	500	1500
47	F, G, J, K	500	1500
51	F, G, J, K	500	1500
56	F, G, J, K	500	1500
62	F, G, J, K	500	1500
68	F, G, J, K	500	1500
75	F, G, J, K	500	1500
82	F, G, J, K	500	1500
91	F, G, J, K	500	1500
100	F, G, J, K	500	1500
110	F, G, J, K	300	1500
120	F, G, J, K	300	1000
130	F, G, J, K	300	1000

Cap. pF	Cap. Tol.	WVDC*	
		STD	HV
150	F, G, J, K	300	1000
160	F, G, J, K	300	1000
180	F, G, J, K	300	1000
200	F, G, J, K	300	1000
220	F, G, J, K	200	1000
240	F, G, J, K	200	600
270	F, G, J, K	200	600
300	F, G, J, K	200	600
330	F, G, J, K	200	600
360	F, G, J, K	200	600
390	F, G, J, K	200	600
430	F, G, J, K	200	600
470	F, G, J, K	200	600
510	F, G, J, K	100	300
560	F, G, J, K	100	300
620	F, G, J, K	100	300
680	F, G, J, K	50	300
750	F, G, J, K	50	300
820	F, G, J, K	50	300
910	F, G, J, K	50	300
1000	F, G, J, K	50	300

TABLE V: TC: A (0±30PPM/°C)

Cap. pF	Cap. Tol.	WVDC*	
		STD	HV
0.1	B	500	1500
0.2	B	500	1500
0.3	B,C	500	1500
0.4	B,C	500	1500
0.5	B, C, D	500	1500
0.6	B, C, D	500	1500
0.7	B, C, D	500	1500
0.8	B, C, D	500	1500
0.9	B, C, D	500	1500
1.0	B, C, D	500	1500
1.1	B, C, D	500	1500
1.2	B, C, D	500	1500
1.3	B, C, D	500	1500
1.4	B, C, D	500	1500
1.5	B, C, D	500	1500
1.6	B, C, D	500	1500
1.7	B, C, D	500	1500
1.8	B, C, D	500	1500
1.9	B, C, D	500	1500
2.0	B, C, D	500	1500
2.2	B, C, D	500	1500
2.4	B, C, D	500	1500
2.7	B, C, D	500	1500
3.0	B, C, D	500	1500
3.3	B, C, D	500	1500
3.6	B, C, D	500	1500

Cap. pF	Cap. Tol.	WVDC*	
		STD	HV
3.9	B, C, D	500	1500
4.3	B, C, D	500	1500
4.7	B, C, D	500	1500
5.1	B, C, D	500	1500
5.6	B, C, D	500	1500
6.2	B, C, D	500	1500
6.8	B, C, J, K	500	1500
7.5	B, C, J, K	500	1500
8.2	B, C, J, K	500	1500
9.1	B, C, J, K	500	1500
10	F, G, J, K	500	1500
11	F, G, J, K	500	1500
12	F, G, J, K	500	1500
13	F, G, J, K	500	1500
15	F, G, J, K	500	1500
16	F, G, J, K	500	1500
18	F, G, J, K	500	1500
20	F, G, J, K	500	1500
22	F, G, J, K	500	1500
24	F, G, J, K	500	1500
27	F, G, J, K	500	1500
30	F, G, J, K	500	1500
33	F, G, J, K	500	1500
36	F, G, J, K	500	1500
39	F, G, J, K	500	1500
43	F, G, J, K	500	1500

Cap. pF	Cap. Tol.	WVDC*	
		STD	HV
47	F, G, J, K	500	1500
51	F, G, J, K	500	1000
56	F, G, J, K	500	1000
62	F, G, J, K	500	1000
68	F, G, J, K	500	1000
75	F, G, J, K	500	1000
82	F, G, J, K	500	1000
91	F, G, J, K	500	1000
100	F, G, J, K	500	1000
110	F, G, J, K	300	1000
120	F, G, J, K	300	1000
130	F, G, J, K	300	1000
150	F, G, J, K	300	1000
160	F, G, J, K	300	1000
180	F, G, J, K	300	1000
200	F, G, J, K	300	1000
220	F, G, J, K	200	–
240	F, G, J, K	200	–
270	F, G, J, K	200	–
300	F, G, J, K	200	–
330	F, G, J, K	200	–
360	F, G, J, K	200	–
390	F, G, J, K	200	–
430	F, G, J, K	200	–
470	F, G, J, K	200	–
510	F, G, J, K	100	–

Cap. pF	Cap. Tol.	WVDC*	
		STD	HV
560	F, G, J, K	100	–
620	F, G, J, K	100	–
680	F, G, J, K	50	–
750	F, G, J, K	50	–
820	F, G, J, K	50	–
910	F, G, J, K	50	–
1000	F, G, J, K	50	–
1100	F, G, J, K	50	–
1200	F, G, J, K	50	–
1300	F, G, J, K	50	–
1500	F, G, J, K	50	–
1600	F, G, J, K	50	–
1800	F, G, J, K	50	–
2000	F, G, J, K	50	–
2200	F, G, J, K	50	–
2400	F, G, J, K	50	–
2700	F, G, J, K	50	–
3000	F, G, J, K	50	–
3300	F, G, J, K	50	–
3600	F, G, J, K	50	–
3900	F, G, J, K	50	–
4300	F, G, J, K	50	–
4700	F, G, J, K	50	–
5000	F, G, J, K	50	–
5100	F, G, J, K	50	–

TABLE VI: TC: C (±15%)

Cap. pF	Cap. Tol.	WVDC STD
5000	K, M, N	50
6800	K, M, N	50
8200	K, M, N	50
10000	K, M, N	50
12000	K, M, N	50

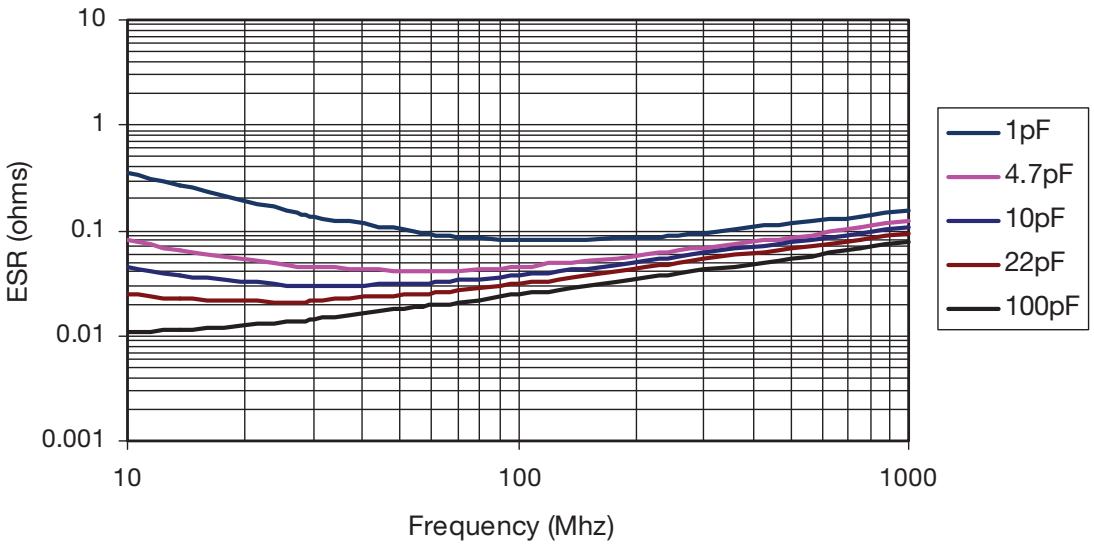
Cap. pF	Cap. Tol.	WVDC STD
15000	K, M, N	50
18000	K, M, N	50
27000	K, M, N	50
33000	K, M, N	50
39000	K, M, N	50

Cap. pF	Cap. Tol.	WVDC STD
47000	K, M, N	50
68000	K, M, N	50
82000	K, M, N	50
100000	K, M, N	50

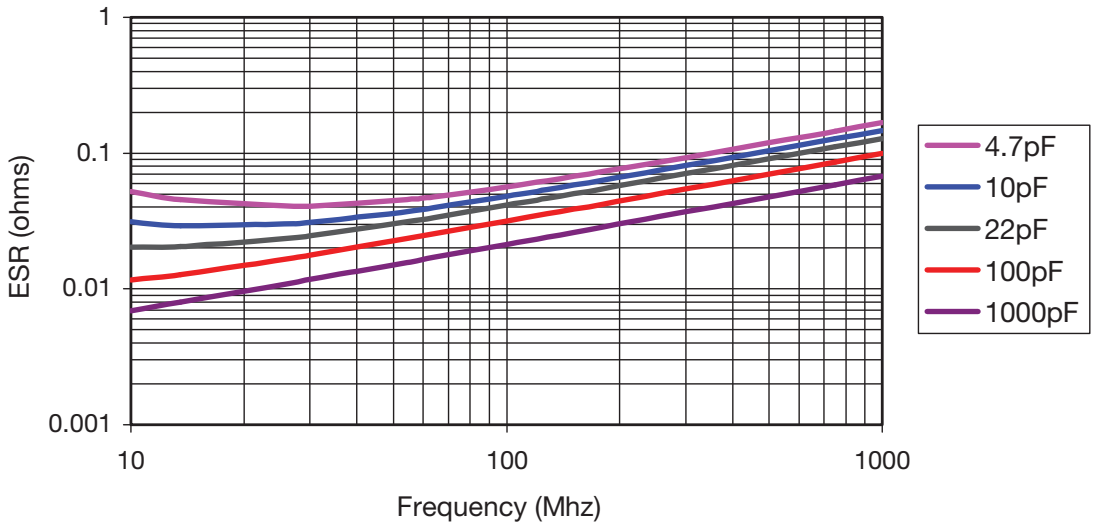
*STD = Standard voltage rating; HV = High voltage rating

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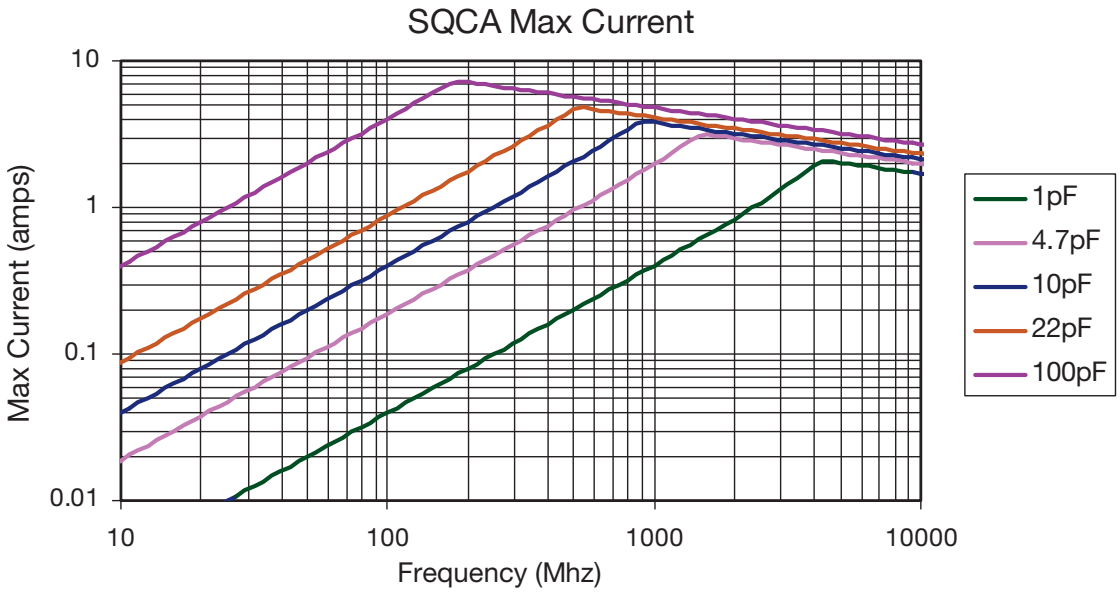
Typical ESR SQCA

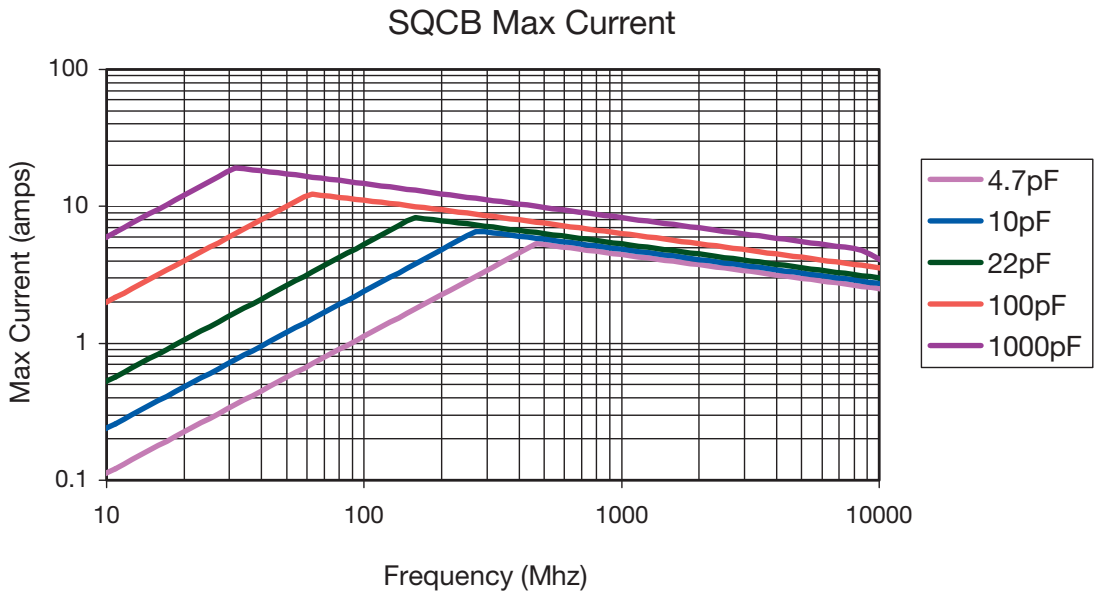


Typical ESR SQCB

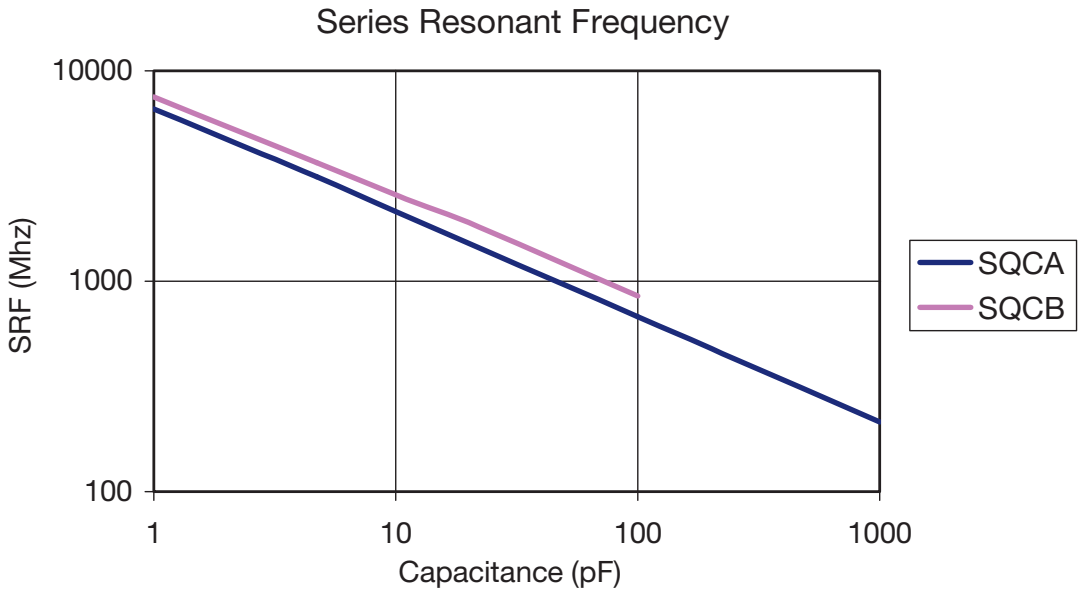


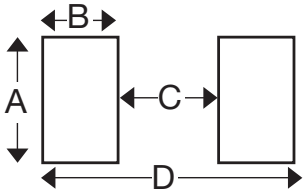
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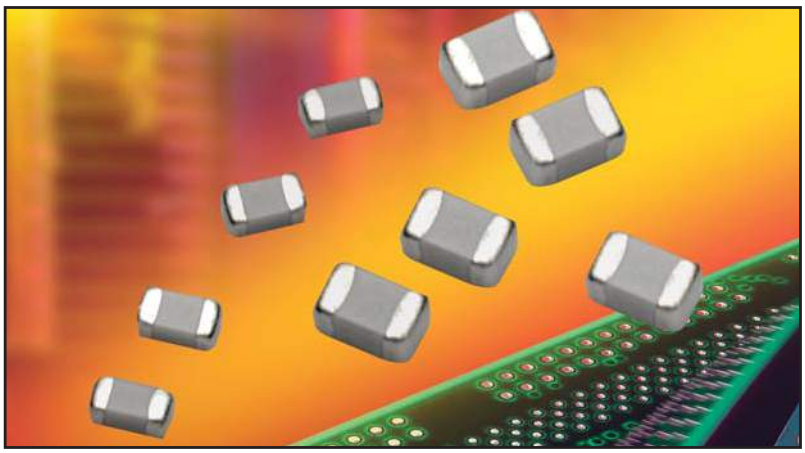
MOUNTING PAD DIMENSIONS: inches (millimeters)

Case	A min	B min	C min	D min
SQCA	0.082 (2.083)	0.051 (1.295)	0.032 (0.813)	0.130 (3.302)
SQCB	0.131 (3.327)	0.051 (1.295)	0.074 (1.880)	0.177 (4.496)
SQCS	0.038 (0.965)	0.043 (1.092)	0.025 (0.635)	0.112 (2.845)
SQCF	0.059 (1.499)	0.051 (1.295)	0.024 (0.610)	0.125 (3.175)

SQCA & SQCB DESIGN KITS

PN	Series	Diel	Term	Range	Different Values	# per value
KITSQ100LF	SQCA	P90	100% Tin RoHS	.1 to 2pF	16	15
KITSQ400LF		C0G				
KITSQ200LF	SQCA	P90	100% Tin RoHS	1 to 10pF	16	15
KITSQ500LF		C0G				
KITSQ300LF	SQCA	P90	100% Tin RoHS	10 to 100pF	16	15
KITSQ600LF		C0G				
KITSQ700LF	SQCA	C0G	100% Tin RoHS	100 to 1000pF	16	15
KITSQ800LF	SQCB	P90	100% Tin RoHS	1 to 10pF	16	15
KITSQ1100LF		C0G				
KITSQ900LF	SQCB	P90	100% Tin RoHS	10 to 100pF	16	15
KITSQ1200LF		C0G				
KITSQ1000LF	SQCB	P90	100% Tin RoHS	100 to 1000pF	16	15
KITSQ1300LF		C0G				
KITSQ1400LF	SQCB	C0G	100% Tin RoHS	1000 to 5100 pF	11	15

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FEATURES:

- Low ESR
- High Q
- High Self Resonance
- Capacitance Range 0.1 pF to 240 pF
- EIA Size

APPLICATIONS:

- RF Power Amplifiers
- Low Noise Amplifiers
- Filter Networks
- Point to Point Radios

HOW TO ORDER

SQ	CS	V	A	100	J	A	T	1A

AVX Style

Case Size
CS = 0603
CF = 0805

Voltage Code
V = 250V

Temperature Coefficient Code
A = 0±30ppm/°C

Capacitance
EIA Capacitance Code in pF.
First two digits = significant figures or "R" for decimal place.
Third digit = number of zeros or after "R" significant figures.

Capacitance Tolerance Code
A = ±.05 pF
B = ±.1 pF
C = ±.25 pF
D = ±.5 pF
F = ±1%
G = ±2%
J = ±5%

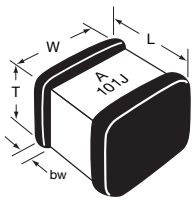
Failure Rate Code
A = Not Applicable

Termination Style Code
**1 = Pd/Ag
**7 = Ag/Ni/Au
J = Nickel Barrier Sn/Pb (60/40)
**T = 100% Tin (Standard)

Packaging Code
1A = 7" Reel Unmarked
ME = 7" Reel Marked

* Vertical T&R available
* 500 piece reels available

**RoHS compliant



MECHANICAL DIMENSIONS: inches (millimeters)

Case	Length (L)	Width (W)	Thickness (T)	Band Width (bw)
SQCS	.063±.006 (1.60±.152)	.032±.006 (.813±.152)	.030 Max. (.762)	.014±.006 (.357±.152)
SQCF	.079±.008 (2.01±.200)	.049±.008 (1.24±.200)	.045 Max. (1.14)	.014±.006 (.357±.152)

TAPE & REEL: All tape and reel specifications are in compliance with EIA RS481 (equivalent to IEC 286 part 3).

—8mm carrier
—7" reel = 4000 pcs (500 piece options)

Not RoHS Compliant

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

For RoHS compliant products, please select correct termination style.

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ELECTRICAL SPECIFICATIONS

Temperature Coefficient (TCC)	(A) 0 ± 30 PPM/ºC
Operating Temperature	-55ºC to +125ºC
Quality Factor (Q)	Greater than 10,000 at 1 MHz
Insulation Resistance (IR)	0.1 pF to 240 pF 10^5 Megohms min. @ 25ºC at rated WVDC 10^4 Megohms min. @ 125ºC at rated WVDC
Working Voltage (WVDC)	See Capacitance Values table
Dielectric Withstanding Voltage (DWV)	250% of rated WVDC for 5 secs
Aging Effects	None
Piezoelectric Effects	None
Capacitance Drift	± (0.02% or 0.02 pF), whichever is greater

ENVIRONMENTAL CHARACTERISTICS

AVX SQ will meet and exceed the requirements of EIA-198, MIL-PRF-55681 and MIL-PRF-123

Themal Shock	Mil-STD-202, Method 107, Condition A
Moisture Resistance	Mil-STD-202, Method 106
Low Voltage Humidity	Mil-STD-202, Method 103, condition A, with 1.5 VDC applied while subjected to an environment of 85ºC with 85% relative humidity for 240 hours
Life Test	Mil-STD-202, Method 108, for 2000 hours at 125ºC
Shock	Mil-STD-202, Method 213, Condition J
Vibration	Mil-STD-202, Method 204, Condition B
Immersion	Mil-STD-202, Method 104, Condition B
Salt Spray	Mil-STD-202, Method 101, Condition B
Solderability	Mil-STD-202, Method 208
Terminal Strength	Mil-STD-202, Method 211
Temperature Cycling	Mil-STD-202, Method 102, Condition C
Barometric Pressure	Mil-STD-202, Method 105, Condition B
Resistance to Solder Heat	Mil-STD-202, Method 210, Condition C

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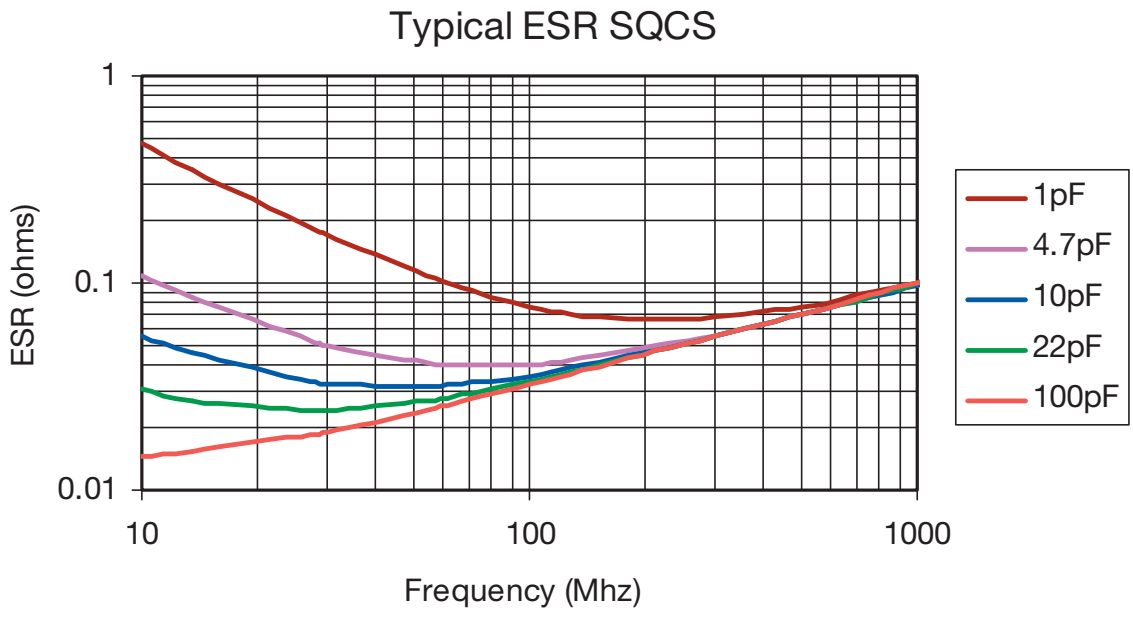
TABLE I: TC: A (0±30PPM/°C) CASE SIZE S

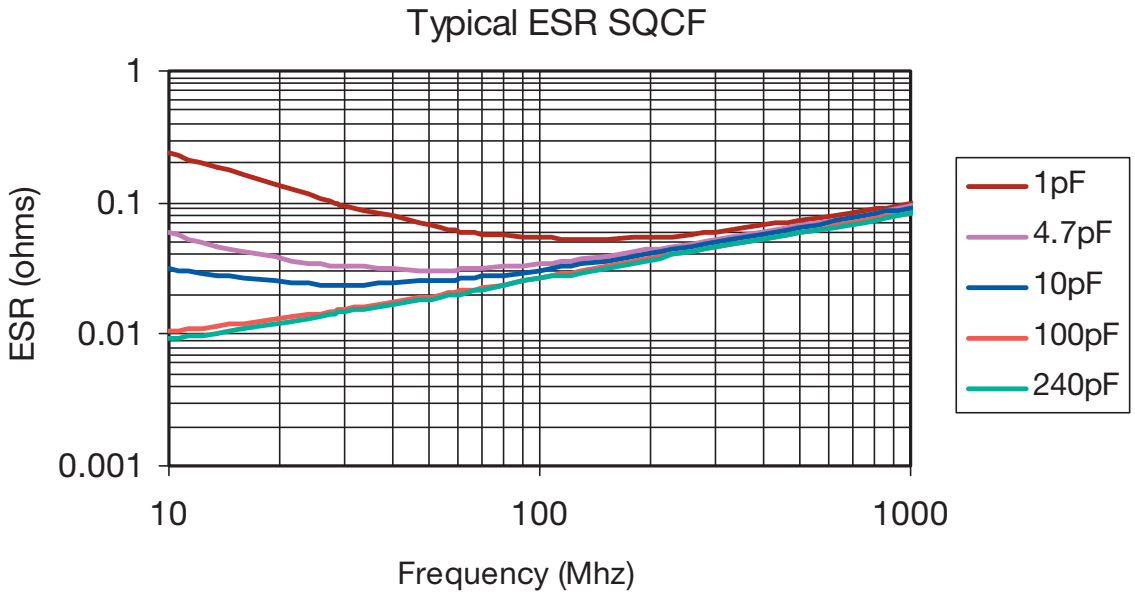
Cap. pF	Cap. Tol.	WVDC
0.1	A, B	250
0.2	A, B	250
0.3	A, B	250
0.4	A, B	250
0.5	A, B, C	250
0.6	A, B, C	250
0.7	A, B, C	250
0.8	A, B, C	250
0.9	A, B, C	250
1.0	A, B, C	250
1.1	A, B, C	250
1.2	A, B, C	250
1.3	A, B, C	250
1.4	A, B, C	250
1.5	A, B, C	250
1.6	A, B, C	250
1.7	A, B, C	250
1.8	A, B, C	250
1.9	A, B, C	250
2.0	A, B, C	250
2.2	A, B, C	250
2.4	A, B, C	250
2.7	A, B, C	250
3.0	A, B, C	250
3.3	A, B, C	250
3.6	A, B, C	250
3.9	A, B, C	250
4.3	A, B, C	250
4.7	A, B, C	250
5.1	A, B, C	250
5.6	A, B, C	250
6.2	A, B, C	250
6.8	B, C, D	250
7.5	B, C, D	250
8.2	B, C, D	250
9.1	B, C, D	250
10	F, G, J	250
11	F, G, J	250
12	F, G, J	250
13	F, G, J	250
15	F, G, J	250
16	F, G, J	250
18	F, G, J	250
20	F, G, J	250
22	F, G, J	250
24	F, G, J	250
27	F, G, J	250
30	F, G, J	250
33	F, G, J	250
36	F, G, J	250
39	F, G, J	250
43	F, G, J	250
47	F, G, J	250
51	F, G, J	250
56	F, G, J	250
62	F, G, J	250
68	F, G, J	250
75	F, G, J	250
82	F, G, J	250
91	F, G, J	250
100	F, G, J	250

TABLE II: TC: A (0±30PPM/°C) CASE SIZE F

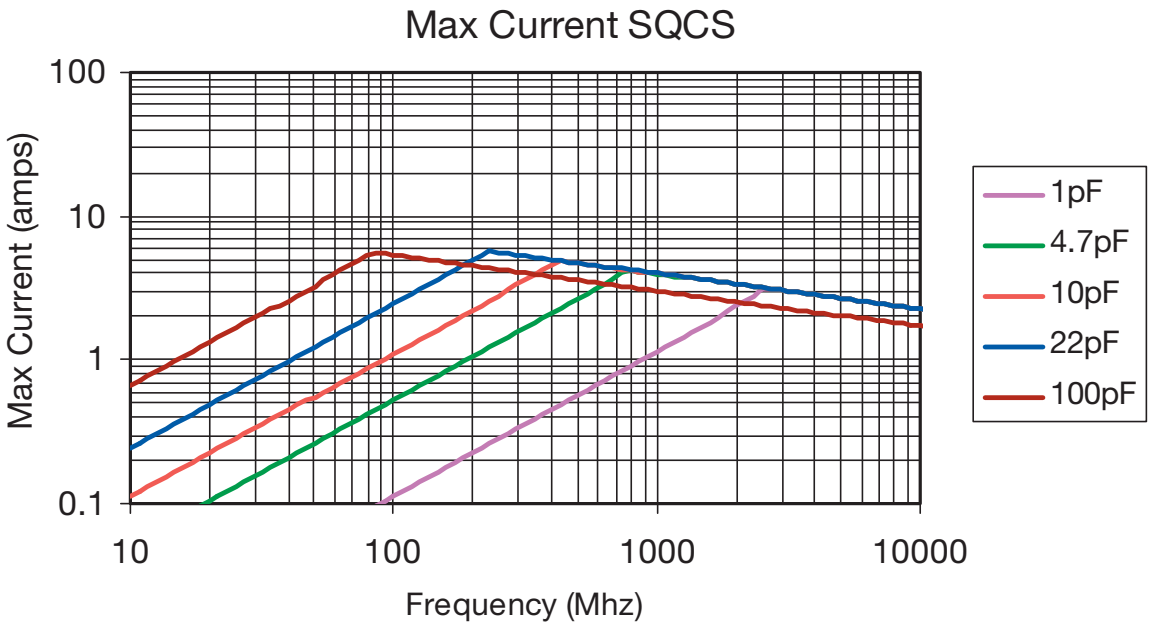
Cap. pF	Cap. Tol.	WVDC
0.1	A, B	250
0.2	A, B	250
0.3	A, B	250
0.4	A, B	250
0.5	A, B, C	250
0.6	A, B, C	250
0.7	A, B, C	250
0.8	A, B, C	250
0.9	A, B, C	250
1.0	A, B, C	250
1.1	A, B, C	250
1.2	A, B, C	250
1.3	A, B, C	250
1.4	A, B, C	250
1.5	A, B, C	250
1.6	A, B, C	250
1.7	A, B, C	250
1.8	A, B, C	250
1.9	A, B, C	250
2.0	A, B, C	250
2.2	A, B, C	250
2.4	A, B, C	250
2.7	A, B, C	250
3.0	A, B, C	250
3.3	A, B, C	250
3.6	A, B, C	250
3.9	A, B, C	250
4.3	A, B, C	250
4.7	A, B, C	250
5.1	A, B, C	250
5.6	A, B, C	250
6.2	A, B, C	250
6.8	B, C, D	250
7.5	B, C, D	250
8.2	B, C, D	250
9.1	B, C, D	250
10	F, G, J	250
11	F, G, J	250
12	F, G, J	250
13	F, G, J	250
15	F, G, J	250
16	F, G, J	250
18	F, G, J	250
20	F, G, J	250
22	F, G, J	250
24	F, G, J	250
27	F, G, J	250
30	F, G, J	250
33	F, G, J	250
36	F, G, J	250
39	F, G, J	250
43	F, G, J	250
47	F, G, J	250
51	F, G, J	250
56	F, G, J	250
62	F, G, J	250
68	F, G, J	250
75	F, G, J	250
82	F, G, J	250
91	F, G, J	250
100	F, G, J	250
110	F, G, J	250
120	F, G, J	250
150	F, G, J	250
180	F, G, J	250
200	F, G, J	250
220	F, G, J	250
240	F, G, J	250

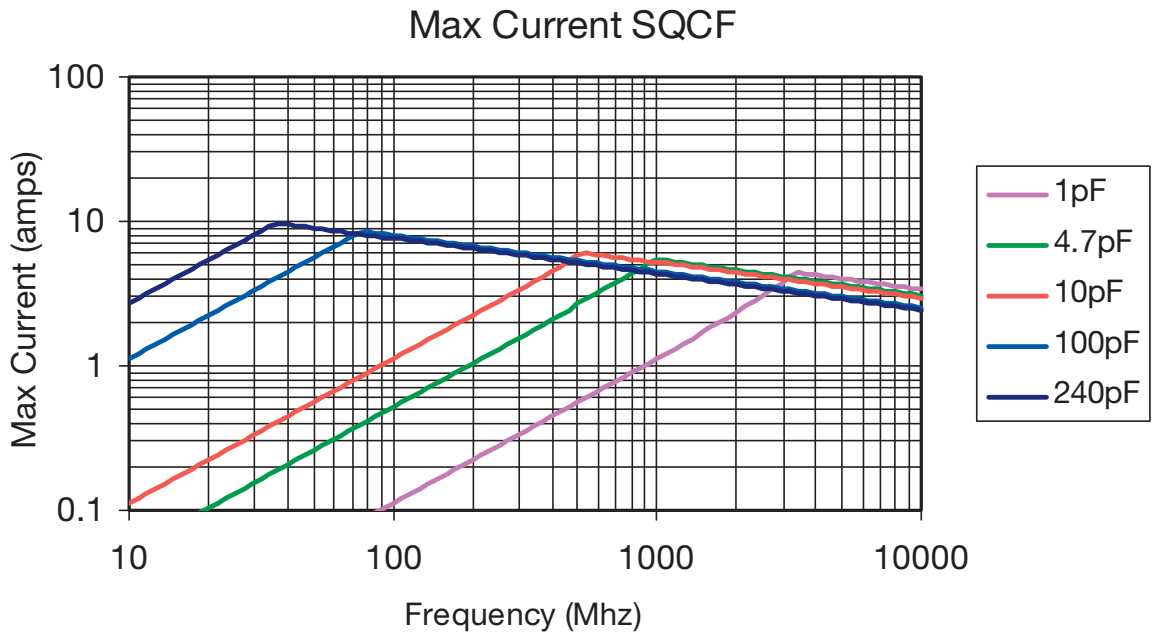
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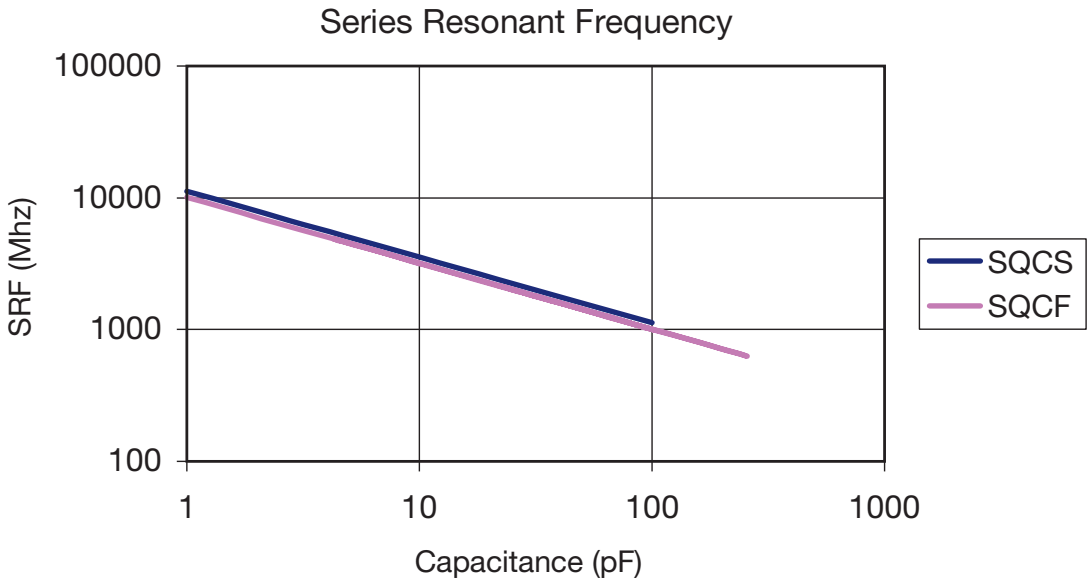


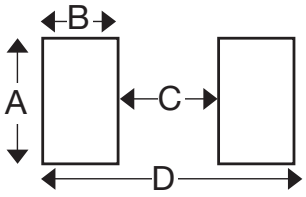
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MOUNTING PAD DIMENSIONS: inches (millimeters)

Case	A min	B min	C min	D min
SQCA	0.082 (2.083)	0.051 (1.295)	0.032 (0.813)	0.130 (3.302)
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SQCF	0.059 (1.499)	0.051 (1.295)	0.024 (0.610)	0.125 (3.175)

SQCS & SQCF ENGINEERING KITS

PN	Series	Diel	Term	Range	Different Values	# per value
Kit SQ1800LF	SQCF	C0G	100% Tin	.1 to 10pF	27	15
Kit SQ1900LF			RoHS	10 to 240pF	22	
Kit SQ1500LF	SQCS	C0G	100%Tin	.1 to 10pF	27	
Kit SQ1600LF			RoHS	10 to 100pF	16	15

Tolerance per PF:	
B from .1 to 3.3	J from 10 to 240
C from 3.9 to 8.2	

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PRODUCT OFFERING

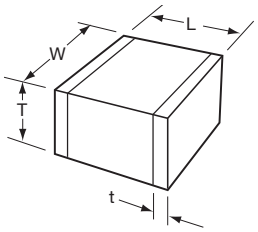
Hi-Q®, high RF power, surface mount MLC capacitors from AVX Corporation are characterized with ultra-low ESR and dissipation factor at high frequencies. They are designed to handle high power and high voltage levels for applications in RF power amplifiers, inductive heating, high magnetic field environments (MRI coils), medical and industrial electronics.

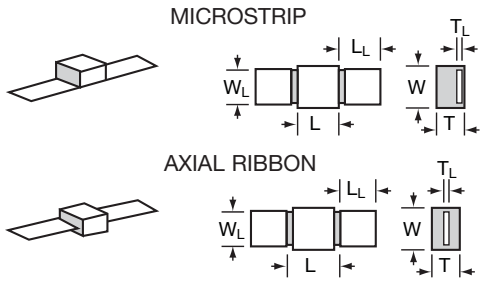
HOW TO ORDER

HQCC	A	A	271	J	A	T	1A
AVX Style	**Voltage**	**Temperature Coefficient**	**Capacitance Code**	**Capacitance Tolerance**	**Test Level**	**Termination***	**Packaging**
HQCC	300V = 9	C0G = A	(2 significant digits	B = 0.1pf (<8.2pF)	A = Standard	T = Plated Ni and Sn (RoHS Compliant)	1A = 7" Reel*
HQCE	500V = 7	P90 = M	+ no. of zeros)	C = ±0.25pF (<8.2pF)		J = 5% Min Pb	6A = Waffle Pack
HQLC	800V = U		Examples:	D = ±0.50pF (<8.2pF)		7 = Plated Ni and Au	
HQLE	1000V = A		4.7 pF = 4R7	F = ±1% (≥10pF)		A = Axial Ribbon	*HQCC & HQCE only
	1500V = S		10 pF = 100	G = ±2%		M = Microstrip	
	2500V = W		100 pF = 101	J = ±5%		H = Cu/Sn (Non-Magnetic)	
	3000V = H		1,000 pF = 102	K = ±10%		4 = Axial Ribbon (Non-Magnetic)	
	3600V = J			M = ±20%		5 = Microstrip (Non-Magnetic)	
	5000V = K						
	7200V = M						

DIMENSIONS

millimeters (inches)





STYLE	HQCC	HQCE
(L) Length	5.84 +0.51 -0.25 (0.230 +0.020 -0.010)	9.65 +0.38 -0.25 (0.380 +0.015 -0.010)
(W) Width	6.35 ± 0.38 (0.250 ± 0.015)	9.65 ± 0.25 (0.380 ± 0.010)
(T) Thickness Max.	3.68 (0.145) max. for capacitance values ≤ 680pF	4.32 (0.170) max.
	4.19 (0.165) max. for capacitance values > 680pF	
(Y) Overlap	1.20 ± (0.040) max.	1.02 ± (0.040) max.

STYLE	HQLC	HQLE
(L) Length	6.22 ± 0.64 (0.245 ± 0.025)	9.65 +0.89 -0.25 (0.380 +0.035 -0.010)
(W) Width	6.35 ± 0.38 (0.250 ±0.015)	9.65 ± 0.25 (0.380 ± 0.010)
(T) Thickness Max.	3.68 (0.145) max. for capacitance values ≤ 680pF	4.32 (0.170) max.
	4.19 (0.165) max. for capacitance values ≤ 680pF	
(Y) Overlap	N/A	N/A
(L_L) Lead Length	12.7 min. (0.500)	19.05 (0.750)
(W_L) Lead Width	6.10 ± 0.127 (0.240 ± 0.005)	8.89 ± 0.25 (0.350 ±0.010)
(T_L) Lead Thickness	0.102 ±0.025 (0.004 ± 0.001)	0.25 ± 0.13 (0.010 ±0.005)
Lead Material	High Purity Silver Leads Leads are attached with High Temperature Solder	High Purity Silver Leads Leads are attached with High Temperature Solder

Not RoHS Compliant

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

For RoHS compliant products, please select correct termination style.

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DIELECTRIC PERFORMANCE CHARACTERISTICS

Capacitance Range	1.0pF to 2,700pF (25°C, 1.0 ±0.2 Vrms at 1kHz, for ≤ 1000 pF use 1MHz)
Capacitance Tolerances	±0.10pF, ±0.25pF, ±0.50pF, ±1%, ±2%, ±5%, ±10%, ±20%
Dissipation Factor 25°C	0.1% Max (+25°C, 1.0 ±0.2 Vrms at 1kHz, for ≤ 1000 pF use 1MHz)
Operating Temperature Range	-55°C to +125°C
Temperature Characteristic	C0G: 0 ± 30 ppm/°C (-55°C to +125°C), P90: 90 ± 30 ppm/°C (-55°C to +125°C)
Insulation Resistance	100K MΩ min. @ +25°C and 500VDC 10K MΩ min. @ +125°C and 500VDC
Dielectric Strength	250% of WVDC for capacitors rated at 500 volts DC or less for 5 seconds. 150% of WVDC for capacitors rated at 1250 volts DC or less for 5 seconds. 120% of WVDC for capacitors rated above 1250 volts DC or less for 5 seconds.

HQCC CAPACITANCE VALUES (A DIELECTRIC)

Cap Code	Cap (pF)	Tol.	Rated WVDC
1R0	1.0	B, C, D	2500
1R2	1.2		
1R5	1.5		
1R8	1.8		
2R2	2.2		
2R7	2.7		
3R3	3.3		
3R9	3.9		
4R7	4.7		
5R6	5.6		
6R8	6.8		

Cap Code	Cap (pF)	Tol.	Rated WVDC
8R2	8.2	B, C, D	2500
100	10	F, G, J K, M	
120	12		
150	15		
180	18		
220	22		
270	27		
330	33		
390	39		
470	47		
560	56		

Cap Code	Cap (pF)	Tol.	Rated WVDC
680	68	F, G, J K, M	2500
820	82		
101	100		
121	120		
151	150		
181	180		
221	220		
271	270		
331	330		1500
391	390		

Cap Code	Cap (pF)	Tol.	Rated WVDC
471	470	F, G, J K, M	1500
561	560		1000
681	680		
821	820		
102	1000		
122	1200		
152	1500		500
182	1800		
222	2200		300
272	2700		

HQCC CAPACITANCE VALUES (M DIELECTRIC)

Cap Code	Cap (pF)	Tol.	Rated WVDC	
			Standard	Extended
1R0	1.0	B, C, D	2500	3600
1R1	1.1			
1R2	1.2			
1R3	1.3			
1R4	1.4			
1R5	1.5			
1R6	1.6			
1R7	1.7			
1R8	1.8			
1R9	1.9			
2R0	2.0			
2R1	2.1			
2R2	2.2			
2R4	2.4			
2R5	2.5			
3R0	3.0			
3R3	3.3			
3R6	3.6			
3R9	3.9			
4R3	4.3			
4R7	4.7			
5R1	5.1			
5R6	5.6			
6R2	6.2			
6R8	6.8			
7R5	7.5			
8R2	8.2			
9R1	9.1			

Cap Code	Cap (pF)	Tol.	Rated WVDC	
			Standard	Extended
100	10	F, G, J K, M	2500	3600
110	11			
120	12			
130	13			
150	15			
160	16			
180	18			
200	20			
220	22			
240	24			
270	27			
300	30			
330	33			
360	36			
390	39			
430	43			
470	47			
510	51			
560	56			
620	62			
680	68			
750	75			
820	82			
910	91			
101	100			
111	110		3000	
121	120			
131	130			
151	150			

Cap Code	Cap (pF)	Tol.	Rated WVDC	
			Standard	Extended
161	160	F, G, J K, M	2500	3000
181	180			
201	200			
221	220			
241	240			
271	270			
301	300		1500	2000
331	330			
331	330			
361	360			
391	390			
431	430			
471	470			
511	510		1000	1500
561	560			
621	620			
681	680			
751	750			
821	820			
911	910			
102	1000			
112	1100			
122	1200			
152	1500		500	800
182	1800			
222	2200		300	500
242	2400			
272	2700			

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HQCE CAPACITANCE VALUES (A DIELECTRIC)

Cap Code	Cap (pF)	Tol.	Rated WVDC	
			Standard	Extended
1R0	1.0	C, D	3600	7200
1R2	1.2			
1R5	1.5			
1R8	1.8			
2R2	2.2			
2R7	2.7			
3R3	3.3			
3R9	3.9			
4R7	4.7			
5R6	5.6			
6R8	6.8			
8R2	8.2			
100	10	G, J, K, M		
120	12			

Cap Code	Cap (pF)	Tol.	Rated WVDC	
			Standard	Extended
150	15	G, J, K, M	3600	7200
180	18			
220	22			
270	27			
330	33			
390	39			
470	47			
560	56			
680	68			
820	82			
101	100			
121	120			5000
151	150			
181	180			

Cap Code	Cap (pF)	Tol.	Rated WVDC	
			Standard	Extended
221	220	G, J, K, M	3600	NA
271	270			
331	330			
391	390			
471	470		2500	
561	560			
681	680			
821	820		1000	
102	1000			
122	1200			
152	1500			
182	1800			
222	2200			

HQCE CAPACITANCE VALUES (M DIELECTRIC)

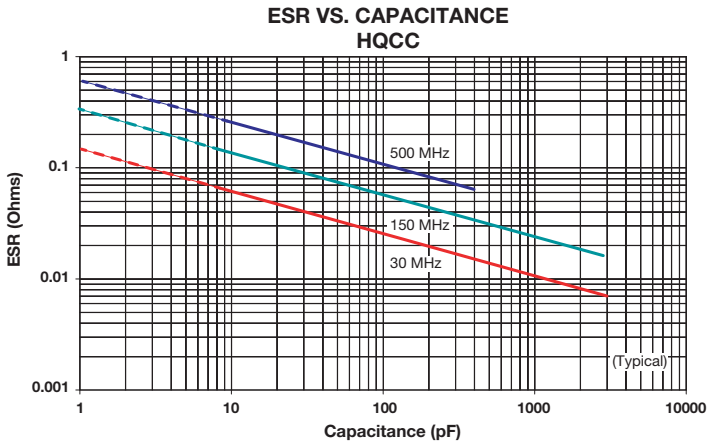
Cap Code	Cap (pF)	Tol.	Rated WVDC	
			Standard	Extended
1R0	1.0	B, C, D	3600	7200
1R2	1.2			
1R5	1.5			
1R8	1.8			
2R2	2.2			
2R7	2.7			
3R3	3.3			
3R9	3.9			
4R7	4.7			
5R6	5.6			
6R8	6.8			
8R2	8.2			
100	10	F, G, J, K, M		
120	12			
150	15			

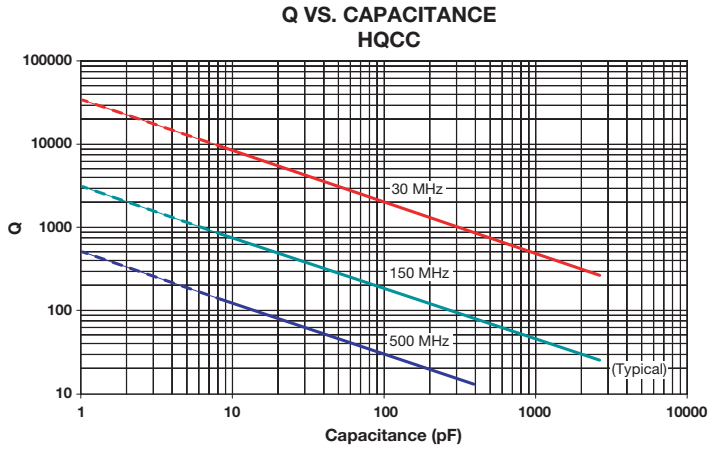
Cap Code	Cap (pF)	Tol.	Rated WVDC	
			Standard	Extended
180	18	F, G, J, K, M	3600	7200
220	22			
270	27			
330	33			
390	39			
470	47			
560	56			
680	68			
820	82			
101	100			
121	120			5000
151	150			
181	180			
221	220			3600
271	270			

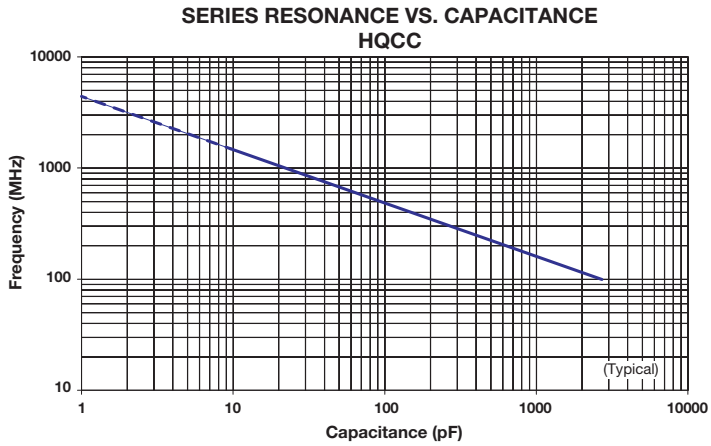
Cap Code	Cap (pF)	Tol.	Rated WVDC	
			Standard	Extended
331	330	F, G, J, K, M	3600	NA
391	390			
471	470		2500	
561	560			
681	680			
821	820		1000	
102	1000			
122	1200			
152	1500			
182	1800			
222	2200			
272	2700	G, J K, M	500	
332	3300			
472	4700			
512	5100			

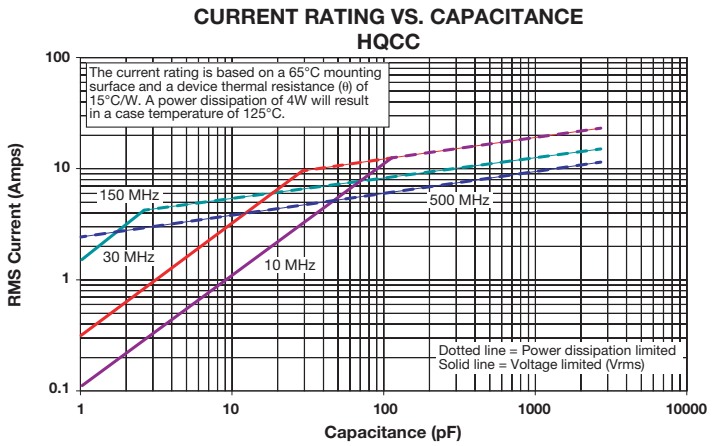
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HQCC PERFORMANCE CHARACTERISTICS (A DIELECTRIC)

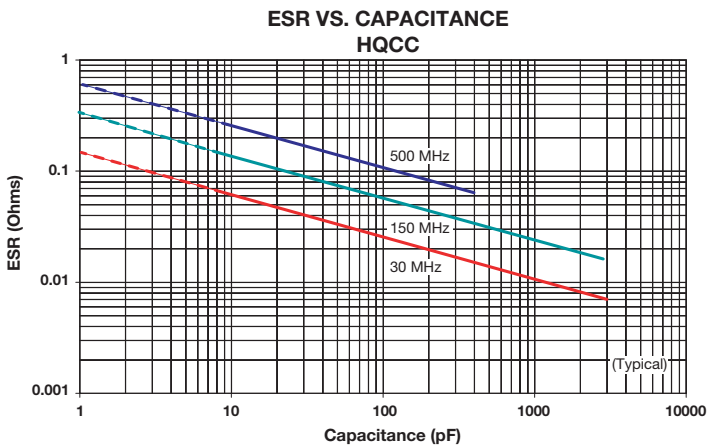


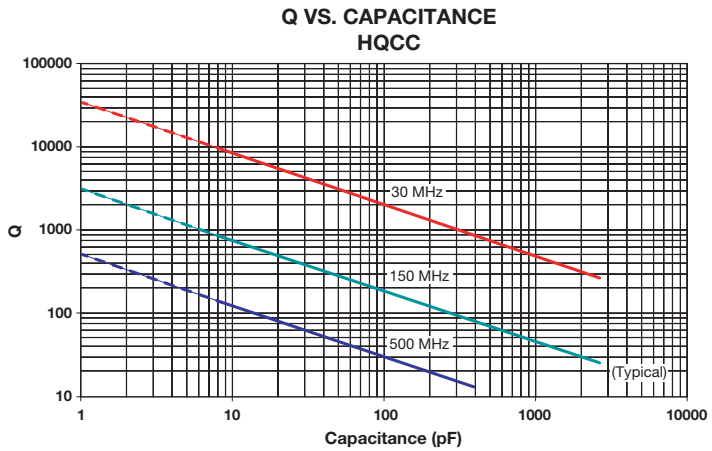






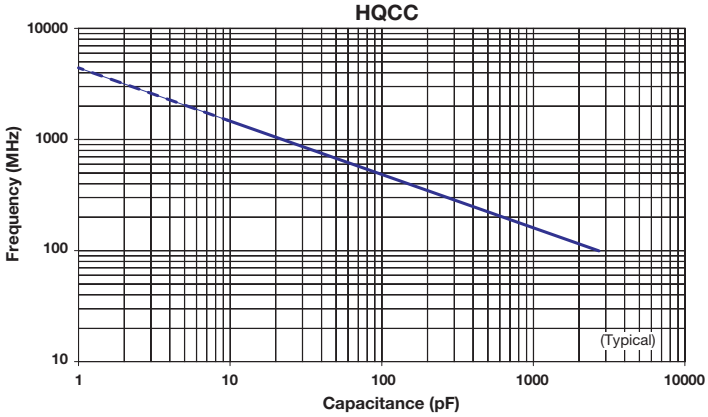
HQCC PERFORMANCE CHARACTERISTICS (M DIELECTRIC)



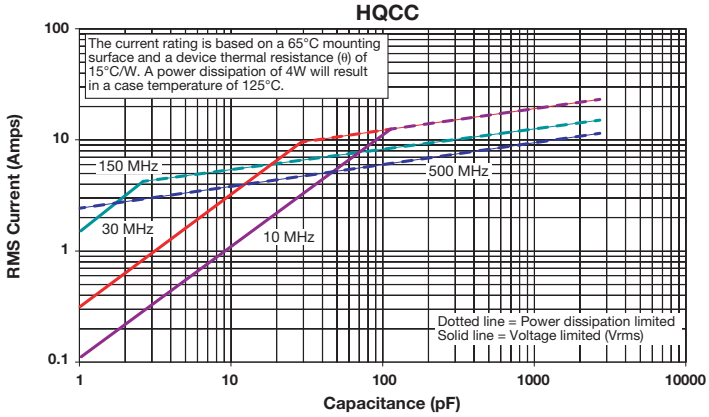


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SERIES RESONANCE VS. CAPACITANCE
HQCC

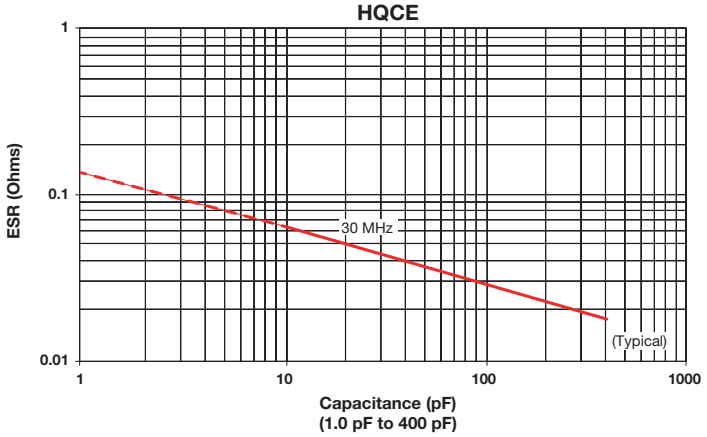


CURRENT RATING VS. CAPACITANCE
HQCC

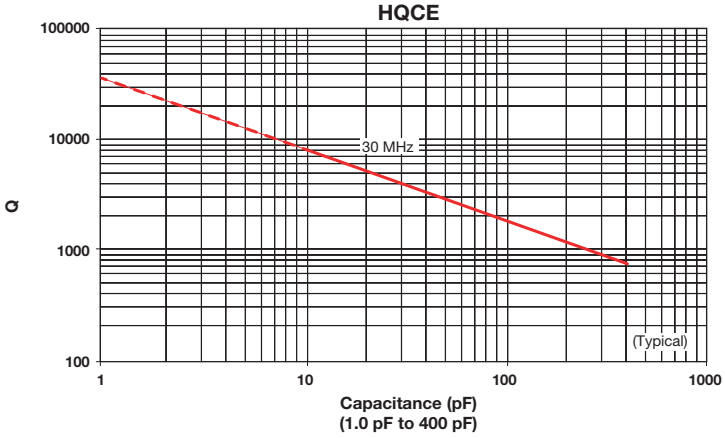


HQCE PERFORMANCE CHARACTERISTICS (A DIELECTRIC)

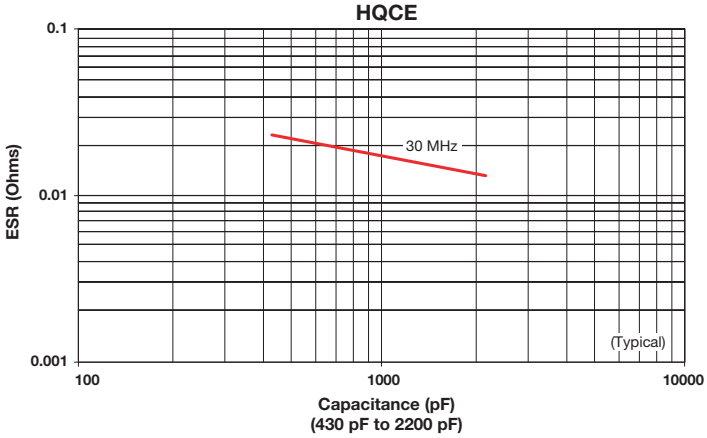
ESR VS. CAPACITANCE
HQCE



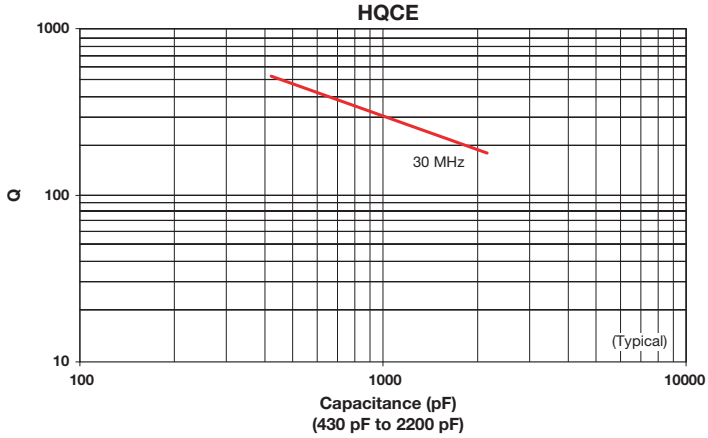
Q VS. CAPACITANCE
HQCE



ESR VS. CAPACITANCE
HQCE

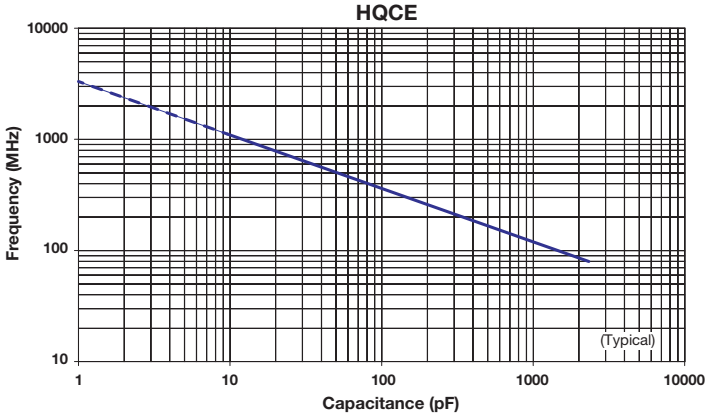


Q VS. CAPACITANCE
HQCE

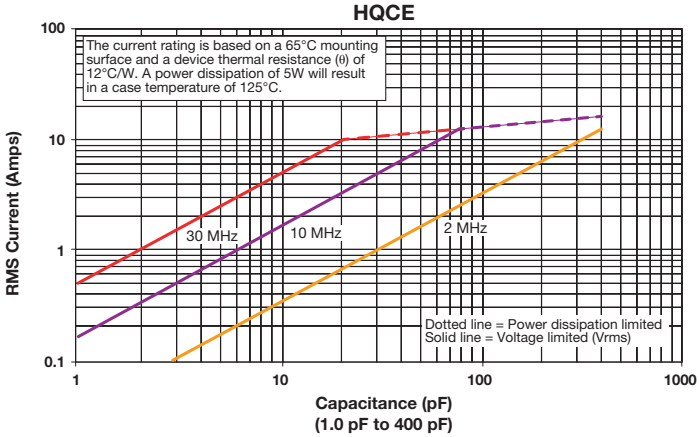


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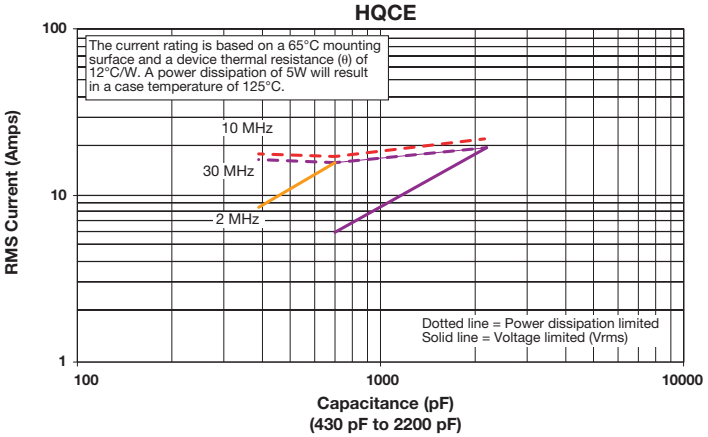
SERIES RESONANCE VS. CAPACITANCE
HQCE



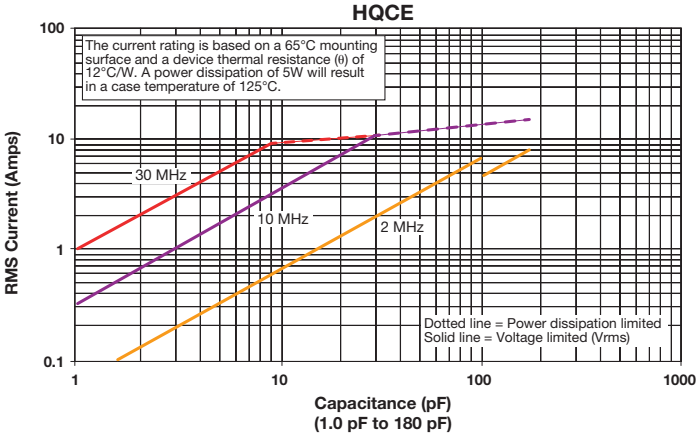
CURRENT RATING VS. CAPACITANCE
HQCE



CURRENT RATING VS. CAPACITANCE
HQCE

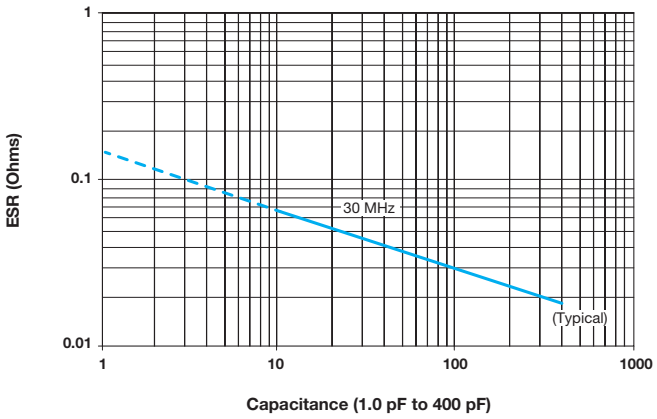


CURRENT RATING VS. CAPACITANCE
HQCE

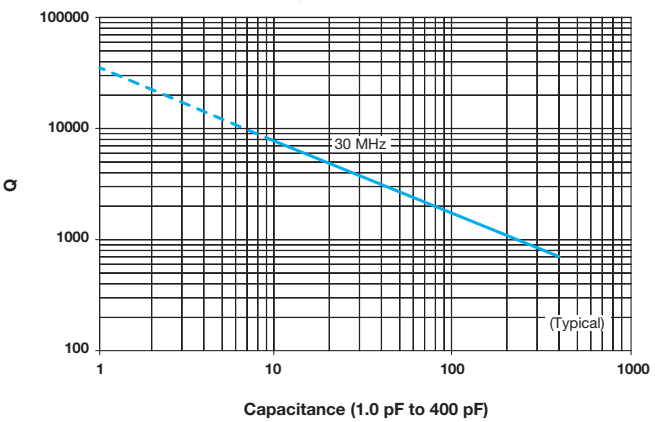


HQCE PERFORMANCE CHARACTERISTICS (M DIELECTRIC)

ESR VS CAPACITANCE
HQCE M Dielectric

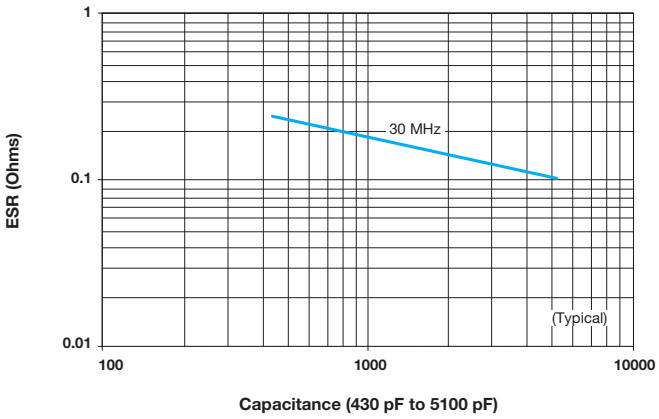


Q VS CAPACITANCE
HQCE M Dielectric

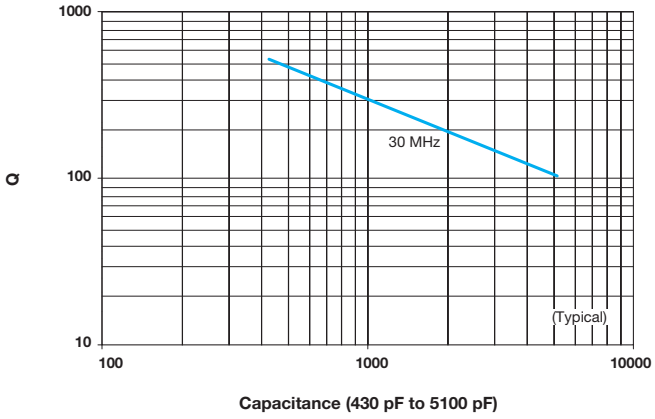


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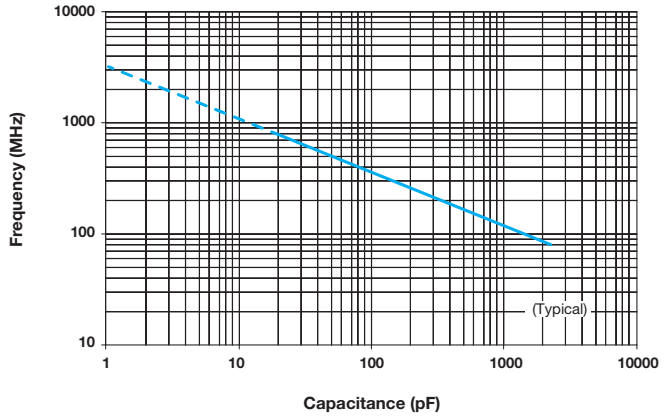
ESR VS CAPACITANCE
HQCE M Dielectric



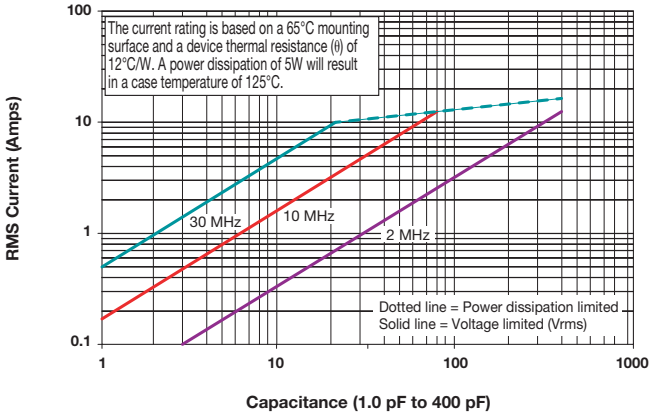
Q VS CAPACITANCE
HQCE M Dielectric



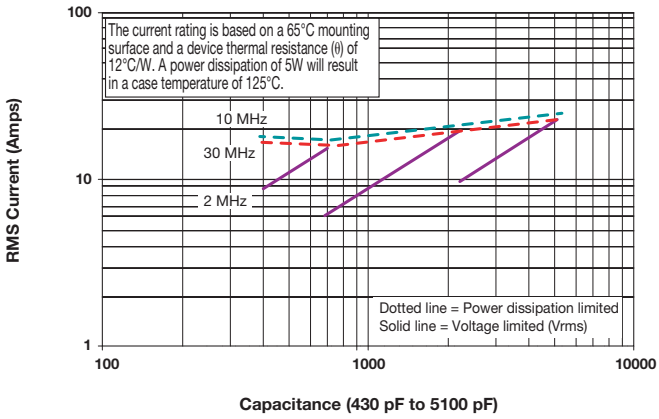
SERIES RESONANCE VS CAPACITANCE
HQCE M Dielectric



CURRENT RATING VS CAPACITANCE
HQCE M Dielectric



CURRENT RATING VS CAPACITANCE
HQCE M Dielectric



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ACCU-L® TECHNOLOGY

The L0201 SMD Tuning Inductor is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

APPLICATIONS

- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's
- Filters
- Matching Networks

HOW TO ORDER

L0201	XXX	X	H	S	TR
	Inductance (nH)	Tolerance	Series	Lead Free Termination	Taped & Reeled

RoHS COMPLIANT

P/N Example: **L02013R3BHSTR**

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

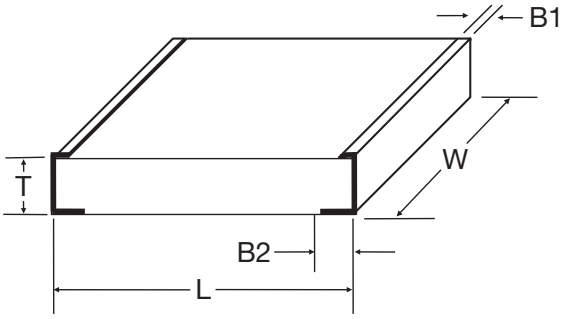
- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I_R, 4 hours

TERMINATION

Nickel/Lead Free solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

DIMENSIONS: (TOP View)

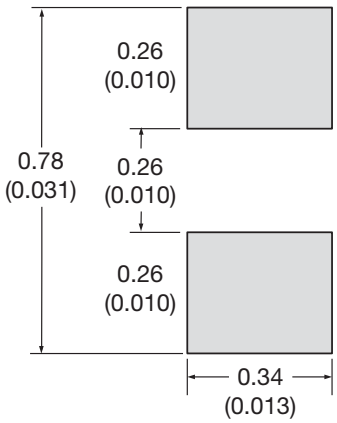
millimeters (inches)



L	0.600±0.050 (0.024±0.002)
W	0.325±0.050 (0.013±0.002)
T	0.225±0.050 (0.009±0.002)

B1	0.100±0.100 (0.004±0.004)
B2	0.150±0.050 (0.006±0.002)

Recommended Pad Layout Dimensions **mm (inches)**



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ELECTRICAL SPECIFICATIONS

450MHz			900MHz	1900MHz	2400MHz	SRF	R_{DC}	I_{DC}
L(nH)	Tolerance A=±0.05nH , B=±0.1nH, C=±0.2nH, D=±0.5nH	Q (min)	Q (Typ)	Q (Typ)	Q (Typ)	min. (GHz)	max. (Ω)	max. (mA)
0.33	±0.05nH , ± 0.1nH , ± 0.2nH	13	24	36	39	35	0.1	550
0.39	±0.05nH , ± 0.1nH , ± 0.2nH	11	23	34	38	33	0.1	550
0.47	±0.05nH , ± 0.1nH , ± 0.2nH	10	18	26	30	32	0.1	550
0.56	±0.05nH , ± 0.1nH , ± 0.2nH	9	16	24	27	31	0.1	500
0.68	±0.05nH , ± 0.1nH , ± 0.2nH	8	19	28	32	30	0.2	500
0.82	±0.05nH , ± 0.1nH , ± 0.2nH	8	19	28	32	28	0.2	400
1.0	±0.05nH , ± 0.1nH , ± 0.2nH	7	16	26	30	26	0.2	400
1.2	±0.05nH , ± 0.1nH , ± 0.2nH	7	16	26	30	24	0.3	300
1.5	± 0.1nH , ± 0.2nH , ± 0.5nH	7	16	26	30	23	0.5	250
1.8	± 0.1nH , ± 0.2nH , ± 0.5nH	7	15	25	29	20	0.5	250
2.2	± 0.1nH , ± 0.2nH , ± 0.5nH	7	15	22	24	18	0.6	200
2.7	± 0.1nH , ± 0.2nH , ± 0.5nH	7	15	22	24	14	0.7	180
3.3	± 0.1nH , ± 0.2nH , ± 0.5nH	7	15	22	24	13	1.0	150

All intermediate Inductance values within the indicated range are available.

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GENERAL DESCRIPTION
ITF TECHNOLOGY

The L0402 LGA Inductor is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

APPLICATIONS

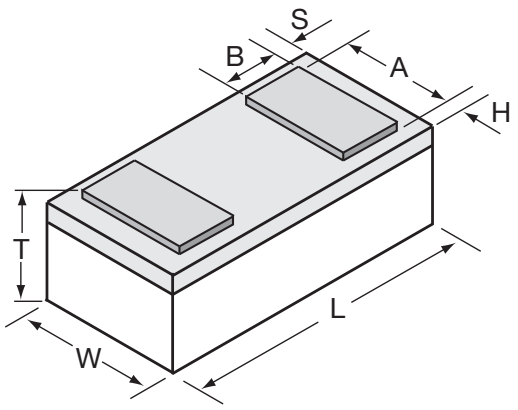
- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's
- Filters
- Matching Networks

LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

DIMENSIONS: (Bottom View)

millimeters (inches)



L	1.00±0.10 (0.039±0.004)	A	0.48±0.05 (0.019±0.002)
W	0.58±0.07 (0.023±0.003)	B	0.17±0.05 (0.007±0.002)
T	0.35±0.10 (0.014±0.004)	S, H	0.064±0.05 (0.003±0.002)

HOW TO ORDER

L0402	XXX	X	H	N	TR
	Inductance (nH)	Tolerance	Series	LGA Termination Sn100	Taped & Reeled

P/N Example: **L04023R3BHNTR**

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

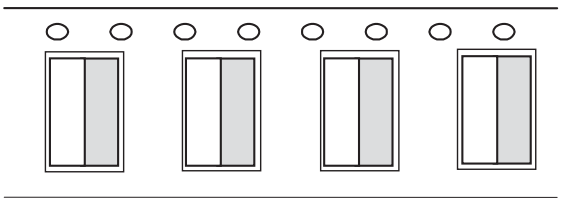
- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I_R, 4 hours

TERMINATION

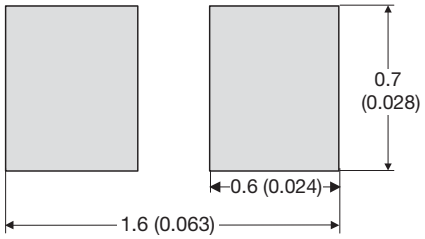
Nickel/Lead Free solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

MAKING AND ORIENTATION IN TAPE

(Top View)



Recommended Pad Layout Dimensions mm (inches)



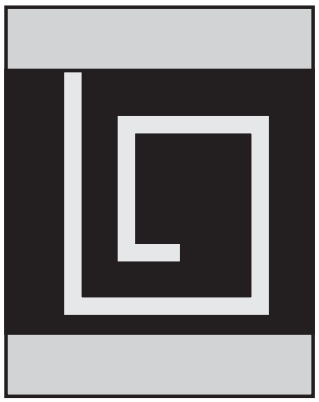
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ELECTRICAL SPECIFICATIONS

450MHz				900MHz	1900MHz	2400MHz	SRF	R_{DC}	I_{DC}
L(nH)	Tolerance A=±0.05nH , B=±0.1nH, C=±0.2nH, D=±0.5nH	Q (min)	Q (Typ)	Q (Typ)	Q (Typ)	Q (Typ)	min. (MHz)	max. (Ω)	max. (mA)
0.56	± 0.05nH, ± 0.1nH	35	45	55	65	75	20000	0.02	1000
0.68	± 0.05nH, ± 0.1nH	30	40	50	60	70	20000	0.04	750
0.82	± 0.05nH, ± 0.1nH	25	40	50	60	70	20000	0.06	500
1.0	± 0.05nH, ± 0.1nH	20	30	35	40	50	20000	0.15	500
1.2	± 0.05nH, ± 0.1nH, ± 0.2nH	20	30	30	40	45	20000	0.20	400
1.5	± 0.05nH, ± 0.1nH, ± 0.2nH	20	25	30	40	40	18000	0.20	400
1.8	± 0.05nH, ± 0.1nH, ± 0.2nH	18	20	30	35	40	16000	0.20	400
2.2	± 0.05nH, ± 0.1nH, ± 0.2nH	15	20	25	35	40	15000	0.20	400
2.7	± 0.05nH, ± 0.1nH, ± 0.2nH	15	20	25	35	40	9500	0.25	250
3.3	± 0.1nH, ± 0.2nH, ± 0.5nH	15	20	25	35	40	8500	0.40	250
3.9	± 0.1nH, ± 0.2nH, ± 0.5nH	13	20	20	30	30	8000	0.45	250
4.7	± 0.1nH, ± 0.2nH, ± 0.5nH	13	20	20	30	30	7500	0.45	250
5.6	± 0.1nH, ± 0.2nH, ± 0.5nH	13	20	20	30	30	7000	0.65	200
6.8	± 0.1nH, ± 0.2nH, ± 0.5nH	12	15	20	25	30	6500	0.90	200

Please contact factory for intermediate inductance values within the indicated range.

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10 nH Inductor (Top View)

ACCU-L® TECHNOLOGY

The Accu-L® SMD Inductor is based on thin-film multilayer technology. This technology provides a level of control on the electrical and physical characteristics of the component which gives consistent characteristics within a lot and lot-to-lot.

The original design provides small size, excellent high-frequency performance and rugged construction for reliable automatic assembly.

The Accu-L® inductor is particularly suited for the telecommunications industry where there is a continuing trend towards miniaturization and increasing frequencies. The Accu-L® inductor meets both the performance and tolerance requirements of present cellular frequencies 450MHz and 900MHz and of future frequencies, such as 1700MHz, 1900MHz and 2400MHz.

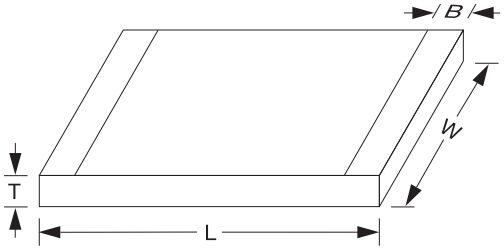
FEATURES

- High Q
- RF Power Capability
- High SRF
- Low DC Resistance
- Ultra-Tight Tolerance on Inductance
- Standard 0603 and 0805 Chip Size
- Low Profile
- Rugged Construction
- Taped and Reeled

APPLICATIONS

- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Locations Systems
- Filters
- Matching Networks

DIMENSIONS: millimeters (inches)



	0603	0805
L	1.6±0.10 (0.063±0.004)	2.11±0.10 (0.083±0.004)
W	0.81±0.10 (0.032±0.004)	1.5±0.10 (0.059±0.004)
T	0.61±0.10 (0.024±0.004)	0.91±0.13 (0.036±0.005)
B	top: 0.0 +0.3/-0.0 (0.0+0.012) bottom: 0.35±0.20 (0.014±0.008)	0.25±0.15 (0.010±0.006)

Operating/Storage Temp. Range: -55°C to +125°C

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HOW TO ORDER

L	0805	4R7	D	E	S	TR
Product Inductor	**Size** 0603 0805	**Inductance** Expressed in nH (2 significant digits + number of zeros) **for values <10nH,** letter R denotes decimal point. Example: 22nH = 220 4.7nH = 4R7	**Tolerance for L ≤ 4.7nH,** B = ±0.1nH C = ±0.2nH D = ±0.5nH **4.7nH<L<10nH,** C = ±0.2nH D = ±0.5nH **L ≥ 10nH,** G = ±2% J = ±5%	**Specification Code** E = Accu-L® 0805 technology G = Accu-L® 0603 technology	**Termination Code** W = Nickel/ solder coated (Sn 63, Pb 37) **S = Nickel/ Lead Free Solder coated (Sn100)	**Packaging Code** TR = Tape and Reel (3,000/reel)

Not RoHS Compliant

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

For RoHS compliant products, please select correct termination style.

**RoHS compliant

Engineering Kits Available see pages 118-119

ELECTRICAL SPECIFICATIONS TABLE FOR ACCU-L® 0603

450 MHz Test Frequency			900 MHz Test Frequency		1900 MHz Test Frequency		2400 MHz Test Frequency		SRF min (MHz)	RDC max (Ω)	IDC max (mA)
Inductance L (nH)	Available Inductance Tolerance	Q Typical	L (nH)	Q Typical	L (nH)	Q Typical	L (nH)	Q Typical			(1)
1.2	±0.1, ±0.2nH	49	1.2	70	1.2	134	1.2	170	10000	0.04	1000
1.5	±0.1, ±0.2nH	26	1.54	39	1.52	63	1.52	76	10000	0.06	1000
1.8	±0.1, ±0.2nH	20	1.74	30	1.73	50	1.72	59	10000	0.07	1000
2.2	±0.1, ±0.2nH	20	2.2	30	2.24	49	2.24	56	10000	0.08	1000
2.7	±0.1, ±0.2nH	21	2.7	30	2.75	48	2.79	54	9000	0.08	750
3.3	±0.1, ±0.2, ±0.5nH	24	3.33	35	3.39	56	3.47	64	8400	0.08	750
3.9	±0.1, ±0.2, ±0.5nH	25	3.9	57	4.06	60	4.21	69	6500	0.12	500
4.7	±0.1, ±0.2, ±0.5nH	23	4.68	32	4.92	46	5.2	49	5500	0.15	500
5.6	±0.2, ±0.5nH	26	5.65	36	5.94	54	6.23	60	5000	0.25	300
6.8	±0.2, ±0.5nH	23	6.9	33	7.3	47	8.1	39	4500	0.30	300
8.2	±0.2, ±0.5nH	23	8.4	31	10	35	12.1	31	3800	0.35	300
10.0	±2%, ±5%	28	10	39	11.8	47	14.1	41	3500	0.45	300
12.0	±2%, ±5%	28	13.2	38	14.1	30	17.2	20	3000	0.50	300
15.0	±2%, ±5%	28	16.2	38	25.9	30	49.8	15	2500	0.60	300

(1) I_{DC} measured for 15°C rise at 25°C ambient temperature when soldered to FR-4 board.

Inductance and Q measured on Agilent 4291B / 4287 using the 16196A test fixture.

ELECTRICAL SPECIFICATIONS TABLE FOR ACCU-L® 0805

450 MHz Test Frequency			900 MHz Test Frequency		1700 MHz Test Frequency		2400 MHz Test Frequency		SRF min (MHz)	RDC max (Ω)	IDC max (mA)	
Inductance L (nH)	Available Inductance Tolerance	Q Typical	L (nH)	Q Typical	L (nH)	Q Typical	L (nH)	Q Typical			ΔT = 15°C (1)	ΔT = 70°C (2)
1.2	±0.1nH, ±0.2nH, ±0.5nH	60	1.2	92	1.2	122	1.2	92	10000	0.05	1000	2000
1.5	±0.1nH, ±0.2nH, ±0.5nH	50	1.5	74	1.5	102	1.5	84	10000	0.05	1000	2000
1.8	±0.1nH, ±0.2nH, ±0.5nH	50	1.8	72	1.8	88	1.9	73	10000	0.06	1000	2000
2.2	±0.1nH, ±0.2nH, ±0.5nH	42	2.2	62	2.2	82	2.3	72	10000	0.07	1000	2000
2.7	±0.1nH, ±0.2nH, ±0.5nH	42	2.7	62	2.8	80	2.9	70	10000	0.08	1000	2000
3.3	±0.1nH, ±0.2nH, ±0.5nH	38	3.3	46	3.4	48	3.5	57	10000	0.11	750	1500
3.9	±0.1nH, ±0.2nH, ±0.5nH	27	3.9	36	4.0	38	4.1	42	10000	0.20	750	1500
4.7	±0.1nH, ±0.2nH, ±0.5nH	43	4.8	62	5.3	76	5.8	60	5500	0.10	750	1500
5.6	±0.5nH	50	5.7	68	6.3	73	7.6	62	4600	0.10	750	1500
6.8	±0.5nH	43	7.0	62	7.7	71	9.4	50	4500	0.11	750	1500
8.2	±0.5nH	43	8.5	56	10.0	55	15.2	32	3500	0.12	750	1500
10	±2%, ±5%	46	10.6	60	13.4	52	–	–	2500	0.13	750	1500
12	±2%, ±5%	40	12.9	50	17.3	40	–	–	2400	0.20	750	1500
15	±2%, ±5%	36	16.7	46	27	23	–	–	2200	0.20	750	1000
18	±2%, ±5%	30	21.9	27	–	–	–	–	1700	0.35	500	1000
22	±2%, ±5%	36	27.5	33	–	–	–	–	1400	0.40	500	1000

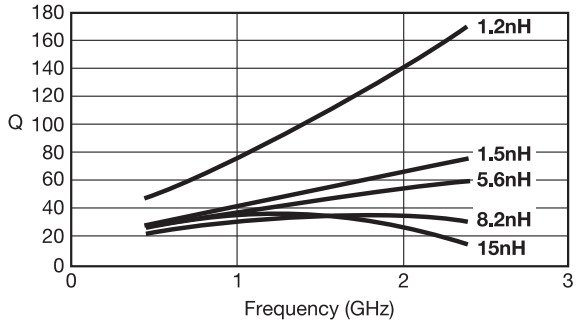
(1) I_{DC} measured for 15°C rise at 25°C ambient temperature
(2) I_{DC} measured for 70°C rise at 25°C ambient temperature

L, Q, SRF measured on HP 4291A, Boonton 34A and Wiltron 360 Vector Analyzer, R_{DC} measured on Keithley 580 micro-ohmmeter.

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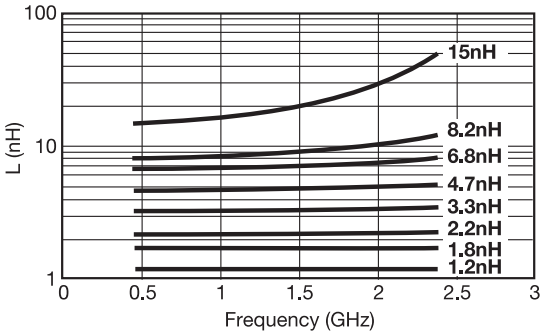
L0603

Typical Q vs. Frequency L0603



Measured on AGILENT 4291B/4287 using the 16196A test fixture

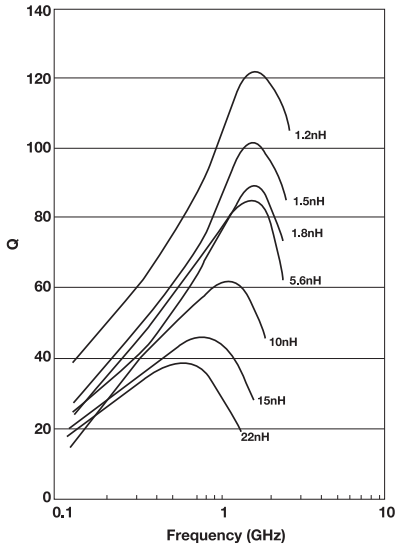
Typical Inductance vs. Frequency L0603



Measured on AGILENT 4291B/4287 using the 16196A test fixture

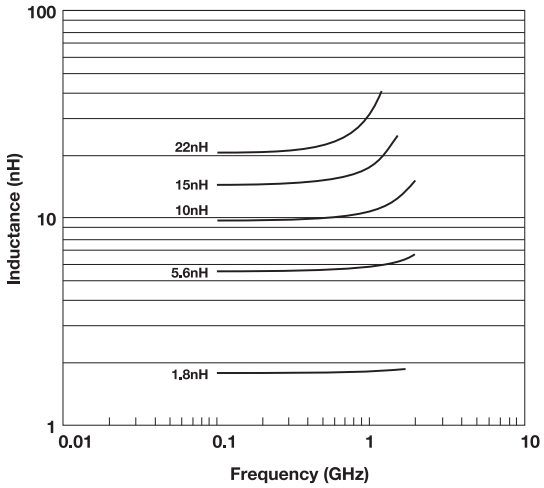
L0805

Typical Q vs. Frequency L0805



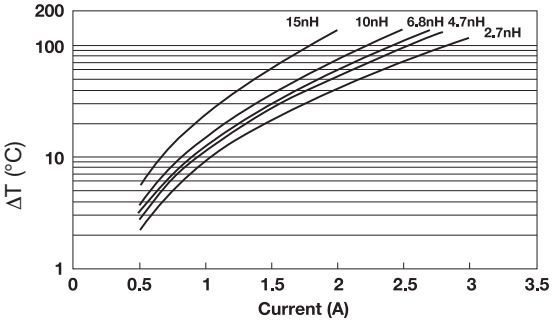
Measured on HP4291A and Boonton 34A Coaxial Line

Typical Inductance vs. Frequency L0805



Measured on HP4291A and Wiltron 360 Vector Analyzer

Maximum Temperature Rise at 25°C ambient temperature (on FR-4) L0805



Temperature rise will typically be no higher than shown by the graph

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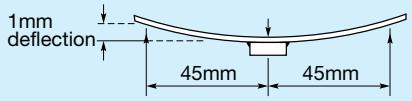
FINAL QUALITY INSPECTION

Finished parts are tested for electrical parameters and visual/mechanical characteristics.

Parts are 100% tested for inductance at 450MHz. Parts are 100% tested for R_{DC}. Each production lot is evaluated on a sample basis for:

- Q at test frequency
- Static Humidity Resistance: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I_R, 4 hours

ENVIRONMENTAL CHARACTERISTICS

TEST	CONDITIONS	REQUIREMENT
Solderability	Components completely immersed in a solder bath at 235 ± 5°C for 2 secs.	Terminations to be well tinned. No visible damage.
Leach Resistance	Components completely immersed in a solder bath at 260 ±5°C for 60 secs.	Dissolution of termination faces ≤ 15% of area. Dissolution of termination edges ≤ 25% of length.
Storage	12 months minimum with components stored in "as received" packaging.	Good solderability
Shear	Components mounted to a substrate. A force of 5N applied normal to the line joining the terminations and in a line parallel to the substrate.	No visible damage
Rapid Change of Temperature	Components mounted to a substrate. 5 cycles -55°C to +125°C.	No visible damage
Bend Strength	Tested as shown in diagram 	No visible damage
Temperature Coefficient of Inductance (TCL)	Component placed in environmental chamber -55°C to +125°C.	+0 to +125 ppm/°C (typical) T_1 = 25°C $TCL = \frac{L_2-L_1}{L_1 (T_2-T_1)} \cdot 10^6$

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MLO™ High Current Inductors



The Multilayer Organic High Current Inductor is a low profile organic based inductor that can support mobile communications, satellite applications, GPS, matching networks, and collision avoidance. Based on AVX's patented multilayer organic technology (US patent 6,987,307), the 0402 size Multilayer Organic High Current Inductor allows for much higher current handling over similar multilayer ceramic chip inductors, a 50% average increase in current handling over comparable thin film products with similar Q, and current handling approaching that of wire wound ceramic chip inductors. MLO™ High Current Inductors incorporate very low loss organic materials which allow for high Q and high stability over frequency. They are surface mountable and are expansion matched to FR4 printed wiring boards. MLO™ High Current Inductors utilize fine line high density interconnect technology thereby allowing for tight tolerance control and high repeatability. Reliability testing is performed to JEDEC and mil standards. Finishes are available in RoHS compliant Sn.

APPLICATIONS

- Mobile communications
- Satellite Applications
- GPS
- Collision Avoidance
- Wireless LAN's

FEATURES

- High Q
- High SRF
- High Frequency
- High Current Handling
- Low DC Resistance
- Surface Mountable
- 0402 Case Size
- RoHS Compliant Finishes
- Available in Tape and Reel

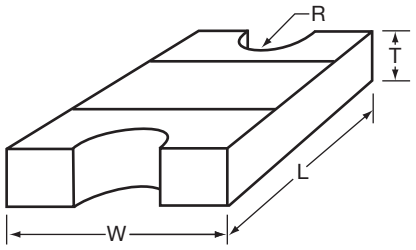
SURFACE MOUNT ADVANTAGES

- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation
- Expansion Matched to PCB

HOW TO ORDER

HLC	02	XXX	X	T	TR	
Type	**Size**	**Inductance**	**Tolerance**	**Termination**	**Packaging**	
HLC = High Current	02 = 0402	Expressed in nH (2 significant digits + number of zeros) **for values <10nH,** letter R denotes decimal point. Example: 22nH = 220 4.7nH = 4R7	B = ±0.1nH C = ±0.2nH D = ±0.5nH G = ±2% H = ±3%. J = ±5%	Sn100	5000pcs T&R	RoHS COMPLIANT

DIMENSIONS



mm (inches)

L	W	T	R
1.00±0.10 (0.040±0.004)	0.58±0.075 (0.023±0.003)	0.35±0.10 (0.014±0.004)	0.125±0.050 (0.005±0.002)

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

TERMINATION

RoHS compliant Sn finish.

OPERATING TEMPERATURE

-55ºC to +125ºC

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0402 ELECTRICAL SPECIFICATIONS

450 MHz Test Frequency			900 MHz Test Frequency		1900 MHz Test Frequency		2400 MHz Test Frequency		SRF Min (GHz)	Rdc Max (mΩ)	Idc Max (mA)
L (nH) 450 MHz	Available Inductance Tolerance B = ±0.1nH, C = ±0.2nH D = ±0.5nH, G = ±2% H = ±3%, J = ±5%	Q 450 MHz	L (nH) 900 MHz	Q 900 MHz	L (nH) 1900 MHz	Q 1900 MHz	L (nH) 2400 MHz	Q 2400 MHz			
0.8	±0.1nH, ±0.2nH, ±0.5nH	30	0.8	42	0.8	55	0.8	61	>20	100	875
0.9	±0.1nH, ±0.2nH, ±0.5nH	26	0.9	36	0.9	47	0.9	52	>20	100	835
1	±0.1nH, ±0.2nH, ±0.5nH	25	1.0	34	1.0	45	1.0	50	>20	100	800
1.1	±0.1nH, ±0.2nH, ±0.5nH	24	1.1	33	1.1	43	1.1	48	20	100	782
1.2	±0.1nH, ±0.2nH, ±0.5nH	24	1.2	33	1.2	44	1.2	48	20	110	751
1.3	±0.1nH, ±0.2nH, ±0.5nH	25	1.3	34	1.3	44	1.3	49	19	130	725
1.5	±0.1nH, ±0.2nH, ±0.5nH	25	1.5	35	1.5	45	1.5	50	19	150	679
1.6	±0.1nH, ±0.2nH, ±0.5nH	25	1.6	35	1.6	45	1.6	49	18	150	660
1.8	±0.1nH, ±0.2nH, ±0.5nH	25	1.8	35	1.8	45	1.8	49	18	160	626
2	±0.1nH, ±0.2nH, ±0.5nH	26	2.0	35	2.0	45	2.1	49	17	180	596
2.2	±0.1nH, ±0.2nH, ±0.5nH	27	2.2	36	2.2	46	2.2	50	16	200	571
2.4	±0.1nH, ±0.2nH, ±0.5nH	27	2.4	37	2.4	47	2.4	50	15	200	549
2.7	±0.1nH, ±0.2nH, ±0.5nH	27	2.7	36	2.7	46	2.7	48	14	250	521
3	±0.1nH, ±0.2nH, ±0.5nH	27	3.0	36	3.0	44	3.1	46	12	300	497
3.3	±0.1nH, ±0.2nH, ±0.5nH	27	3.3	36	3.3	44	3.4	46	11	340	476
3.6	±0.1nH, ±0.2nH, ±0.5nH	27	3.6	37	3.7	45	3.8	46	10	350	457
3.9	±0.1nH, ±0.2nH, ±0.5nH	28	3.9	38	4.0	46	4.1	47	10	400	441
4.7	±0.1nH, ±0.2nH, ±0.5nH	29	4.7	39	4.9	45	5.1	44	9	480	405
5.6	±0.1nH, ±0.2nH, ±0.5nH	30	5.7	40	6.0	44	6.3	42	8	500	375
6.8	±2%, ±3%, ±5%	30	6.9	39	7.5	41	8.0	37	7	600	343
8.2	±2%, ±3%, ±5%	29	8.4	37	9.4	37	10.4	31	6	800	315
10	±2%, ±3%, ±5%	30	10.3	38	12.0	35	13.9	27	5	1000	290
12	±2%, ±3%, ±5%	32	12.5	40	15.7	31	19.8	19	4	1100	265
15	±2%, ±3%, ±5%	32	15.9	38	22.3	24	33.0	9	4	1200	240
18	±2%, ±3%, ±5%	28	19.4	32	31.1	15	60.0	0.3	3	1500	210
22	±2%, ±3%, ±5%	30	24.0	34	44.7	11	n/a	n/a	3	1900	202
27	±2%, ±3%, ±5%	29	30.5	30	n/a	n/a	n/a	n/a	3	2100	184
30	±2%, ±3%, ±5%	28	34.0	27	n/a	n/a	n/a	n/a	2	2200	180
32	±2%, ±3%, ±5%	28	37.7	27	n/a	n/a	n/a	n/a	2	2200	175

Specifications based on performance of component assembled properly on printed circuit board with 50Ω nominal impedance.

Idc max: Maximum 15ºC rise in component temperature over ambient.

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RFAP TECHNOLOGY

The LP0402N Series Harmonic Low Pass Filter is based on the proprietary RFAP Thin-Film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The RFAP Harmonic Low Pass Filter is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

APPLICATIONS

- Wireless communications
- Wireless LAN's
- GPS
- WiMAX

LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

HOW TO ORDER

LP	0402	N	XXXX	X	N	TR
Style	**Size**	**Type**	**Frequency** MHz	**Sub-Type**	**Termination** LGA Lead Free	**Taped & Reeled**

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

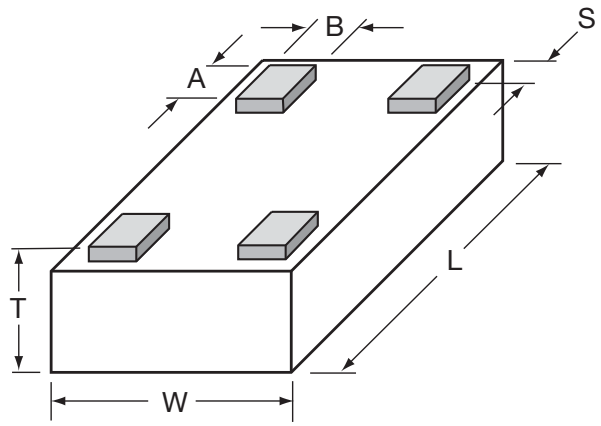
- Static Humidity: 85ºC, 85% RH, 160 hours
- Endurance: 125ºC, IR, 4 hours

TERMINATION

Nickel/Lead-Free solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

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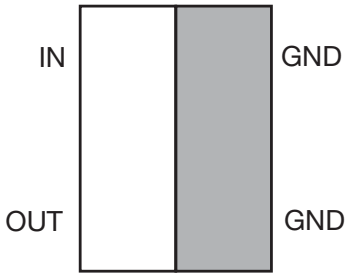
DIMENSIONS: millimeters (inches)
(Bottom View)



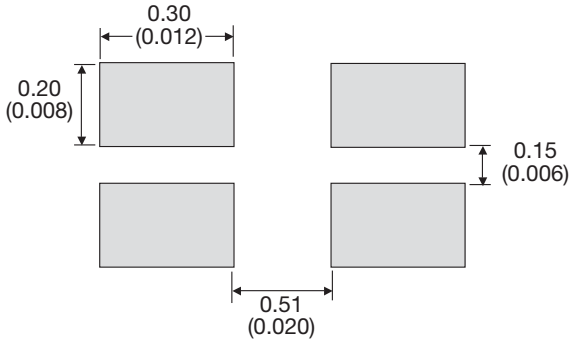
L	1.0±0.05 (0.040±0.002)
W	0.58±0.04 (0.023±0.002)
T	0.35±0.5 (0.014±0.002)

A	0.20±0.06 (0.008±0.002)
B	0.18±0.05 (0.007±0.002)
S	0.05±0.05 (0.002±0.002)

TERMINALS (Top View)



RECOMMENDED PAD LAYOUT (mm)



ELECTRICAL CHARACTERISTICS

(Guaranteed over –40°C to +85°C Operating Temperature Range)

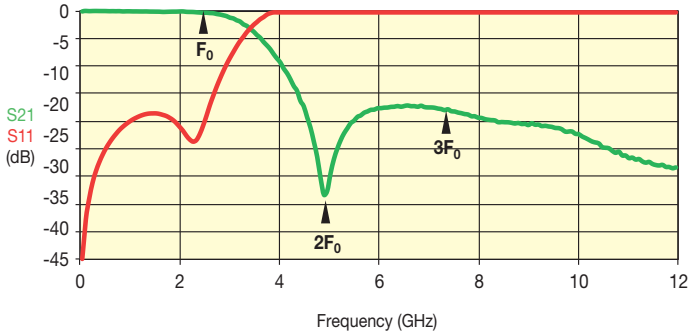
P/N	Frequency Band [MHz]	I. Loss [dB]	R. Loss [dB]	Attenuation @ 2xF_0 [dB]	Attenuation @ 3xF_0 [dB]
LP0402N2442ANTR	2400-2484	0.35 typ 0.5 max	20	30	17
LP0402N2690ANTR	2640-2740	0.35 typ 0.5 max	20	30	20
LP0402N3500ANTR	3400-3600	0.3 typ 0.5 max	19	30	20
LP0402N5200ANTR	5500-5350	0.2 typ 0.5 max	19	30	20
LP0402N5500ANTR	5350-5650	0.2 typ 0.5 max	15	30	–
LP0402N5800ANTR	5600-6000	0.2 typ 0.5 max	16	25	–

NOTE: Additional Frequencies Available Upon Request

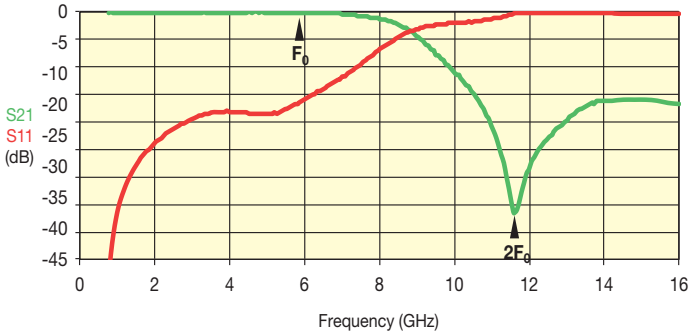
RoHS COMPLIANT

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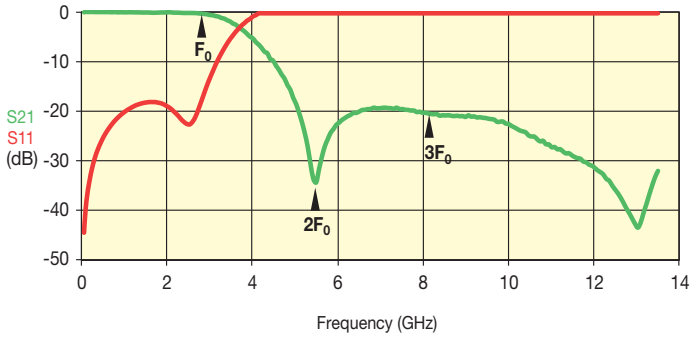
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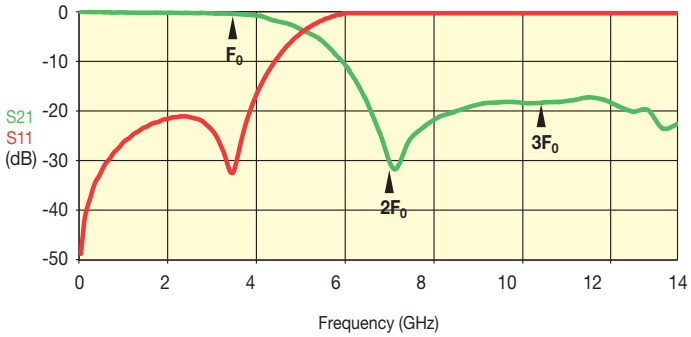
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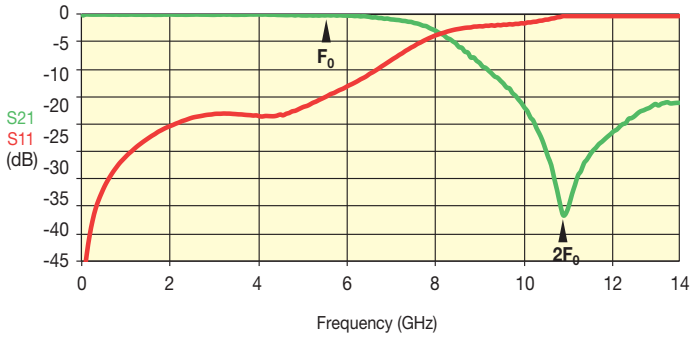
LP0402N2690ANTR



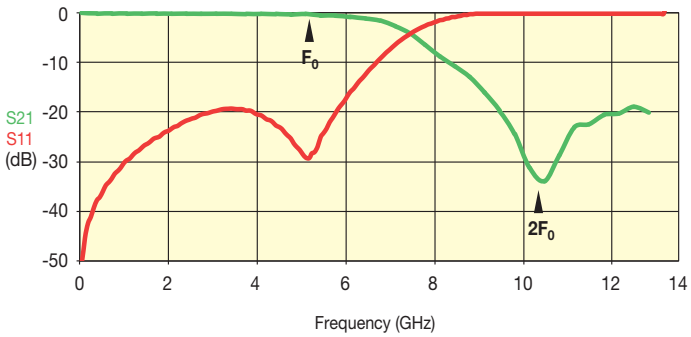
LP0402N3500ANTR



LP0402N5500ANTR



LP0402N5200ANTR



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TEST JIG FOR LP0402 LOW PASS FILTER

GENERAL DESCRIPTION

These jigs are designed for testing the LP0603 LGA Low Pass Filters using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50Ω microstrips as conducting lines and a bottom ground plane located at a distance of 0.127mm from the microstrips.

The substrate used is Neltec's NH9338ST0127C1BC (or similar).

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841 (or similar).

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50Ω SMA termination.

MEASUREMENT PROCEDURE

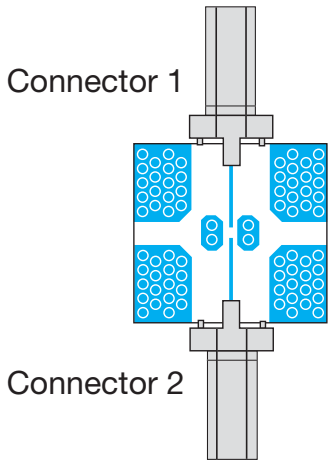
Follow the VNA's instruction manual and use the calibration jig to perform a full 2-Port calibration in the required band-widths.

Solder the filter to the measurement jig as follows:

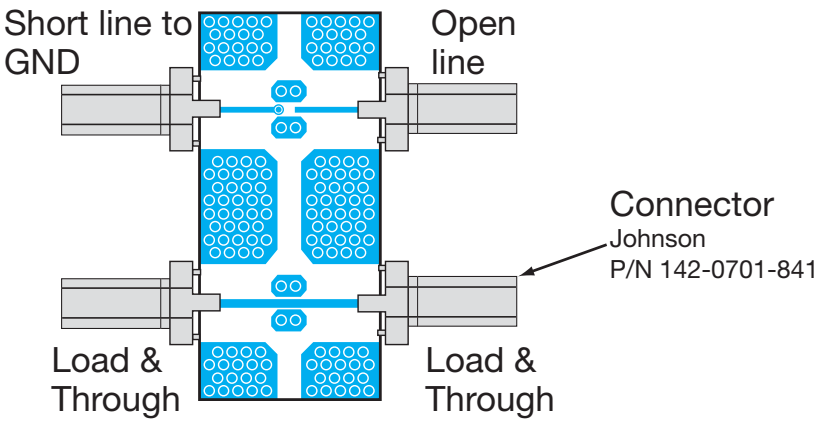
Input (Filter)	➨ Connector 1 (Jig)	GND (Filter)	➨ GND (Jig)
Output (Filter)	➨ Connector 2 (Jig)	GND (Filter)	➨ GND (Jig)

Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig terminal connected to port 2 (using an RF cable).

Measurement



Calibration Jig



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GENERAL DESCRIPTION

The LP0603 ITF (Integrated Thin Film) Lead-Free LGA Low Pass Filter is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Low Pass Filters are offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

FEATURES

- Miniature Size: 0603
- Frequency Range: 900MHz-5.5HGz
- Characteristic Impedance: 50 Ohm
- Operating/Storage Temperature: -40°C to +85°C
- Power Rating: 3W Continuous
- Low Profile
- Rugged Construction
- Lead Free
- Taped and Reeled

APPLICATIONS

- Mobile communications
- Satellite TV receivers
- GPS
- Vehicle location systems
- Wireless LANs
- RFID

LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

HOW TO ORDER

LP	0603	A	XXXX	A	N	TR
Style	**Size** 0603	**Type** A or N	**Frequency** MHz	**Sub-Type**	**Termination** LGA **Ni/Lead Free Solder	**Taped & Reeled**

**RoHS compliant

FINAL QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, IR, 4 hours

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

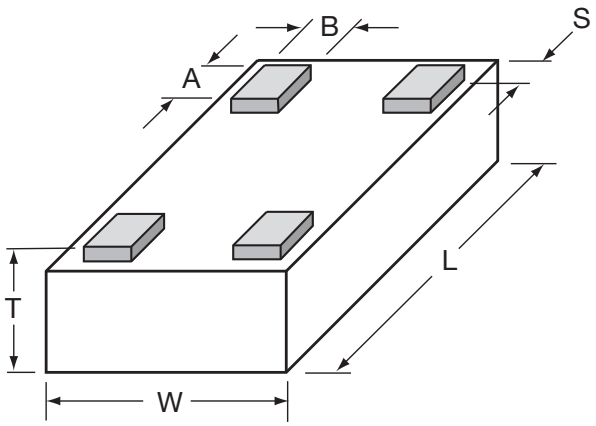
RoHS COMPLIANT

TERMINATION

Nickel/Lead-Free Solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

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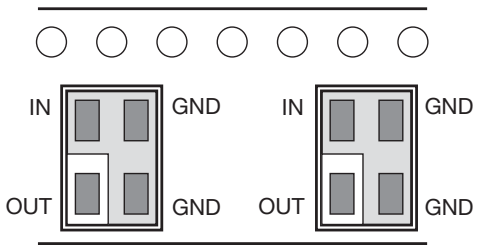
DIMENSIONS: millimeters (inches)
(Bottom View)



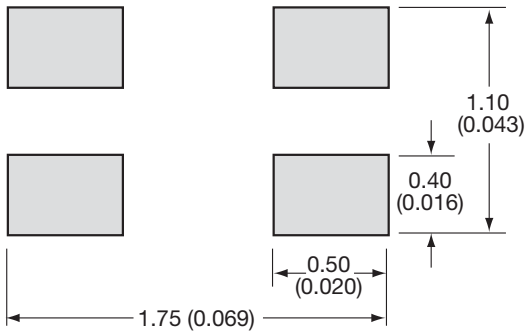
L	1.6±0.1 (0.063±0.004)
W	0.84±0.1 (0.033±0.004)
T	0.60±0.1 (0.024±0.004)

A	0.25±0.05 (0.010±0.002)
B	0.20±0.05 (0.008±0.002)
S	0.05±0.05 (0.002±0.002)

TERMINALS AND ORIENTATION IN TAPE (Top View)



RECOMMENDED PAD LAYOUT (mm)



ELECTRICAL CHARACTERISTICS

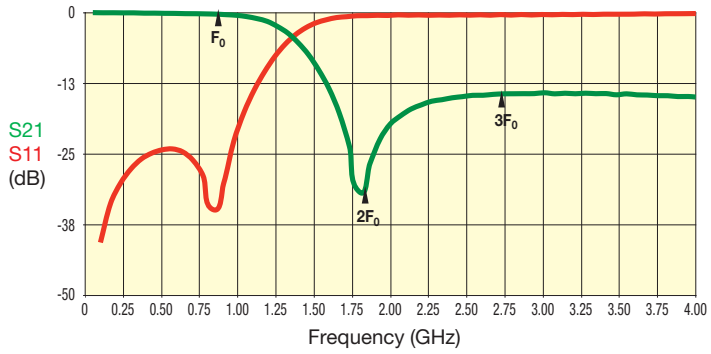
(Guaranteed over –40°C to +85°C Operating Temperature Range)

P/N	Frequency Band [MHz]	I. Loss [dB]	VSWR max [dB]	Attentuation typ. [dB]
LP0603A0902ANTR	890-915	0.35 typ (0.5 max)	1.4	25 @ 2xF_0 14 @ 3xF_0
LP0603A0947ANTR	935-960	0.35 typ (0.5 max)	1.4	25 @ 2xF_0 17 @ 3xF_0
LP0603A1747ANTR	1710-1785	0.3 typ (0.5 max)	1.4	25 @ 2xF_0 17 @ 3xF_0
LP0603A1842ANTR	1805-1880	0.3 typ (0.5 max)	1.4	27 @ 2xF_0 15 @ 3xF_0
LP0603A1880ANTR	1840-1920	0.3 typ (0.5 max)	1.4	25 @ 2xF_0 17 @ 3xF_0
LP0603A1950ANTR	1920-1980	0.3 typ (0.5 max)	1.4	27 @ 2xF_0 15 @ 3xF_0
LP0603A2140ANTR	2110-2170	0.3 typ (0.5 max)	1.4	27 @ 2xF_0 17 @ 3xF_0
LP0603A2442ANTR	2412-2472	0.3 typ (0.5 max)	1.4	25 @ 2xF_0 17 @ 3xF_0
LP0603N3500ANTR	3400-3600	-0.3 typ. -0.5 max.	1.4	30 @ 2xF_0 20 @ 3xF_0
LP0603N5200ANTR	5050-5350	-0.2 typ. -0.5 max.	1.4	30 @ 2xF_0 20 @ 3xF_0
LP0603N5500ANTR	5350-5650	-0.2 typ. -0.5 max.	1.4	30 @ 2xF_0 20 @ 3xF_0

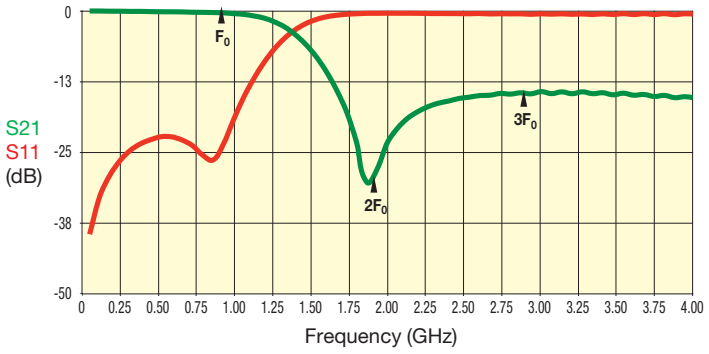
NOTE: Additional Frequencies Available Upon Request

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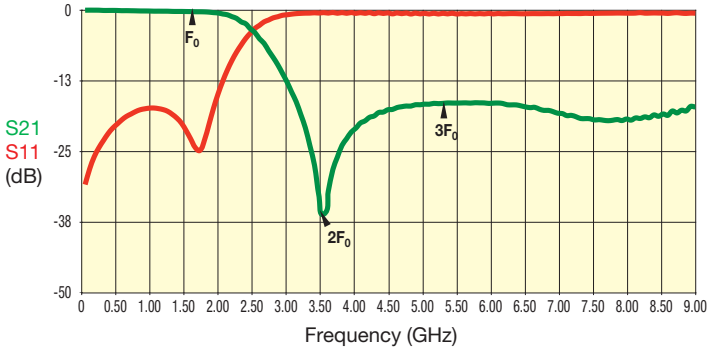
LP0603A0902ANTR



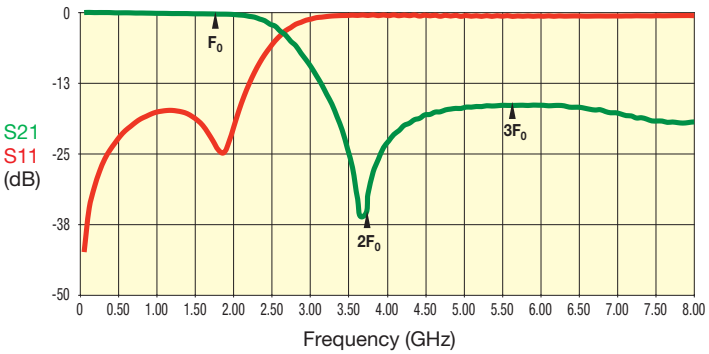
LP0603A0947ANTR



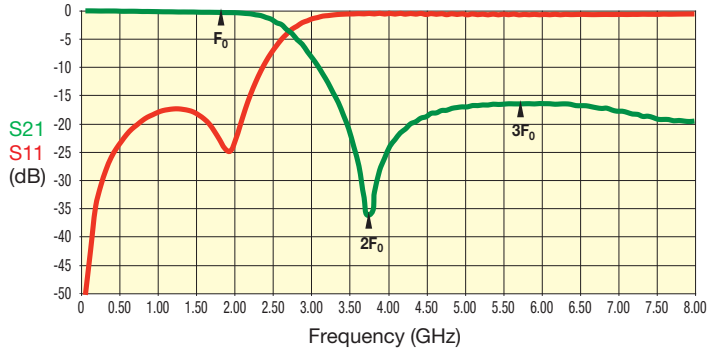
LP0603A1747ANTR



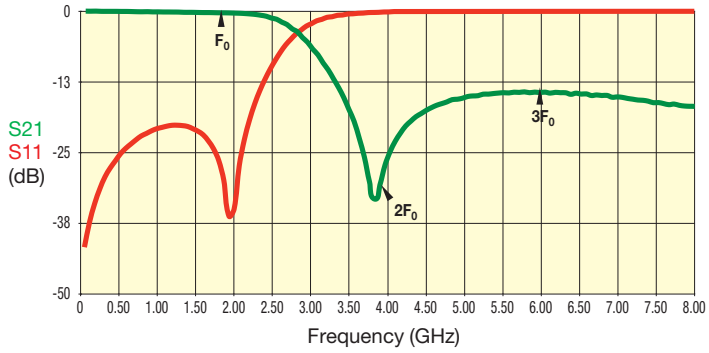
LP0603A1842ANTR



LP0603A1880ANTR

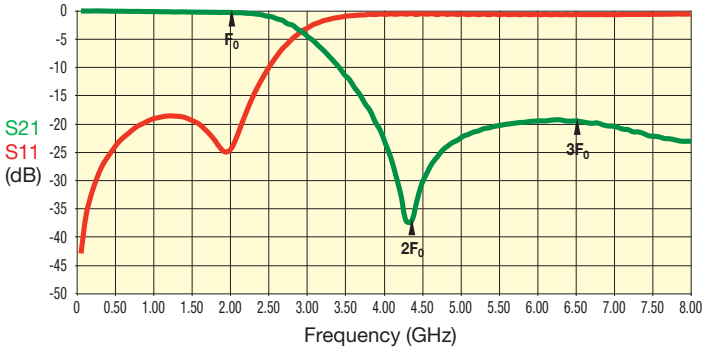


LP0603A1950ANTR

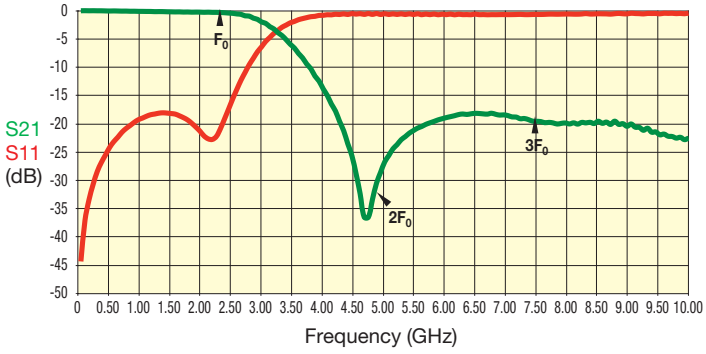


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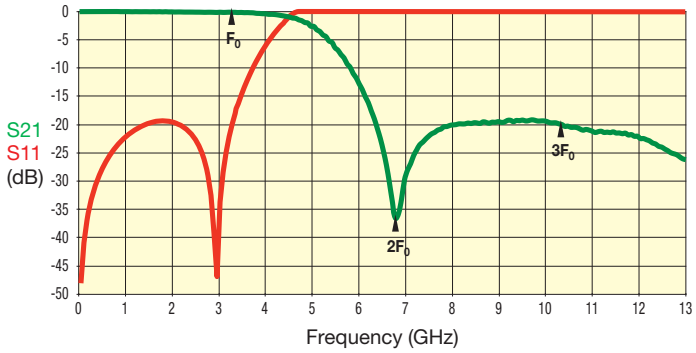
LP0603A2140ANTR



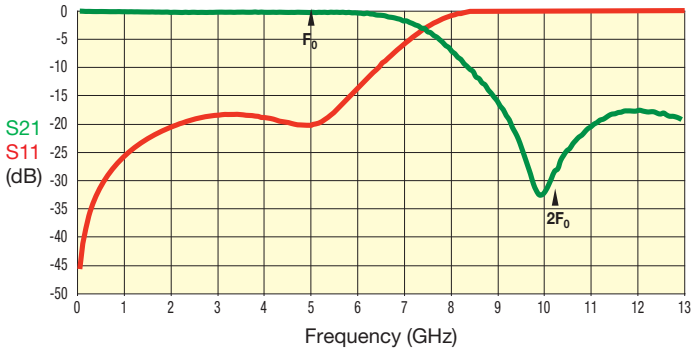
LP0603A2442ANTR



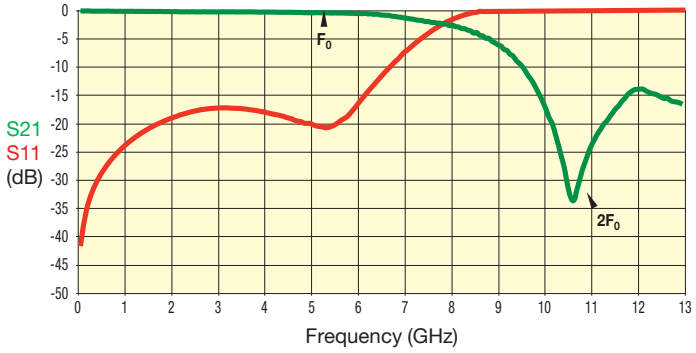
LP0603N3500ANTR



LP0603N5200ANTR



LP0603N5500ANTR



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TEST JIG FOR LP0603 LEAD-FREE LGA LOW PASS FILTER

GENERAL DESCRIPTION

These jigs are designed for testing the LP0603 LGA Low Pass Filters using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50Ω microstrips as conducting lines and a bottom ground plane located at a distance of 0.127mm from the microstrips.

The substrate used is Neltec's NH9338ST0127C1BC (or similar).

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841 (or similar).

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50Ω SMA termination.

MEASUREMENT PROCEDURE

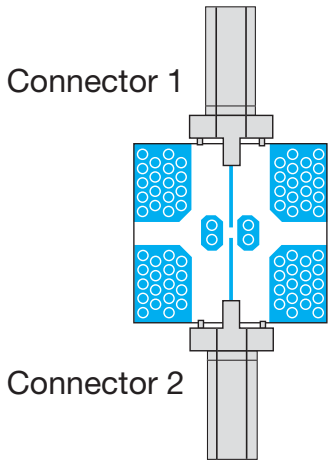
Follow the VNA's instruction manual and use the calibration jig to perform a full 2-Port calibration in the required band-widths.

Solder the filter to the measurement jig as follows:

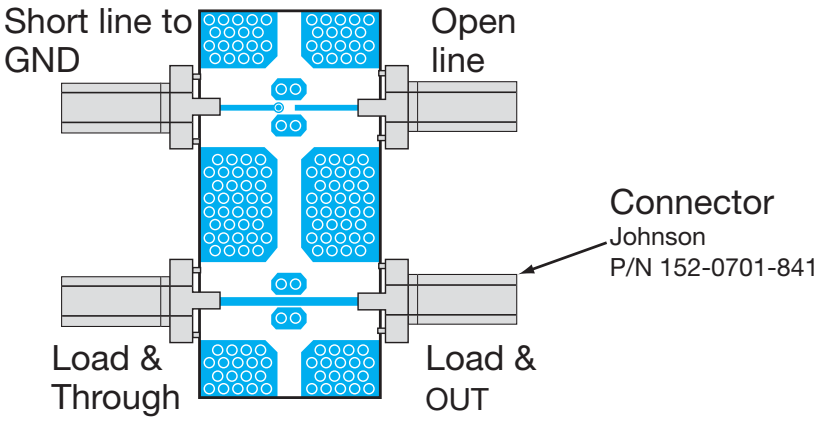
Input (Filter)	➨ Connector 1 (Jig)	GND (Filter)	➨ GND (Jig)
Output (Filter)	➨ Connector 2 (Jig)	GND (Filter)	➨ GND (Jig)

Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig terminal connected to port 2 (using an RF cable).

Measurement



Calibration Jig



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GENERAL DESCRIPTION

The ITF (Integrated Thin-Film) SMD Filter is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Filter is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

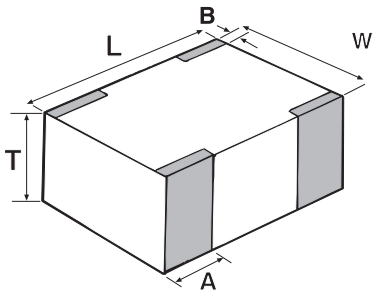
FEATURES

- Small Size: 0805
- Frequency Range: 800MHz - 3.5GHz
- Characteristic Impedance: 50Ω
- Operating / Storage Temp.: -40°C to +85°C
- Power Rating: 3W Continuous
- Low Profile
- Rugged Construction
- Taped and Reeled

APPLICATIONS

- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's

DIMENSIONS: millimeters (inches)



L	2.03±0.1 (0.080±0.004)
W	1.55±0.1 (0.061±0.004)
T	1.02±0.1 (0.040±0.004)
A	0.56±0.25 (0.022±0.010)
B	0.35±0.15 (0.014±0.006)

PAD LAYOUT

See CP0805 pad layout on page 64.

FINAL QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual/mechanical characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I_R 4 hours

TERMINATION

Nickel/Solder coating (Sn, Pb) compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

HOW TO ORDER

LP	0805A	0902	AW	TR
Style Low Pass	**Size** 0805	**Frequency** MHz	**Termination** AW= Nickel/Solder (SnPb) **AS = Nickel/ Lead Free Solder (Sn100)	**Packaging Code** TR = Tape and Reel

**RoHS compliant

Not RoHS Compliant

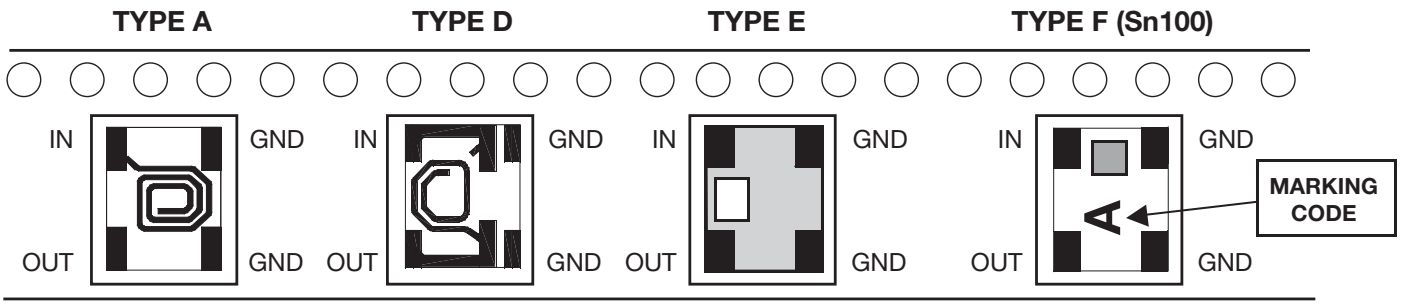
LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

For RoHS compliant products, please select correct termination style.

TERMINALS AND LAYOUT (Top View)

Orientation in Tape



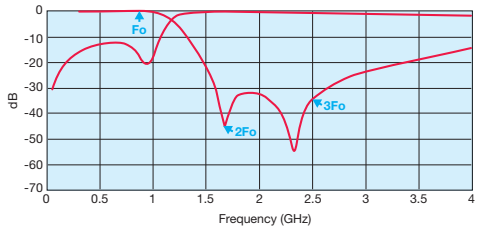
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ELECTRICAL CHARACTERISTICS

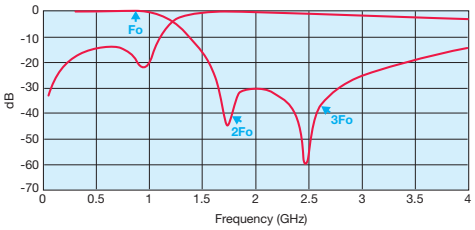
Application	Part Number	Frequency Band (MHz)	I. Loss max	VSWR max	Attenuation (dB) Typical	Layout Type (SnPb)	Layout Type F Marking Code
E-GSM	LP0805A0897AS	880 - 915	0.4dB (0.3dB typ)	1.7	30 @ 2XFo 20 @ 3xFo	A	E
	LP0805A0942AS	925 - 960				A	F
GSM	LP0805A0902AS	890 - 915				A	E
	LP0805A0947AS	935 - 960				A	F
	LP0805A1119AS	1101 - 1137				A	H
AMPS	LP0805A0836AS	824 - 849				A	A
	LP0805A0881AS	869 - 894				A	C
PCN	LP0805A1747AS	1710 - 1785				D	I
	LP0805A1842AS	1805 - 1880				D	J
PCS	LP0805A1880AS	1850 - 1910				D	K
	LP0805A1960AS	1930 - 1990				D	M
PHP	LP0805A1907AS	1895 - 1920				D	L
DECT	LP0805A1890AS	1880 - 1900				D	K
3G	LP0805A2150AS	1905 - 2180				D	N
Wireless LAN	LP0805A2442AS	2400 - 2484				D	S
WLL	LP0805A3500AS	3400 ~ 3600				E	X

Typical Electrical Performance

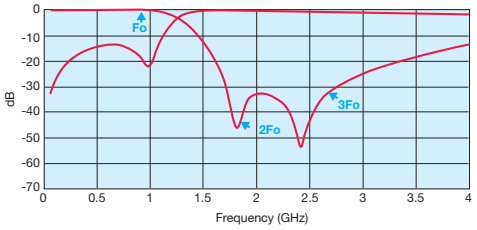
LP0805A0836ASTR



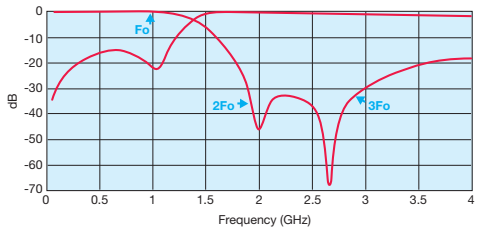
LP0805A0881ASTR



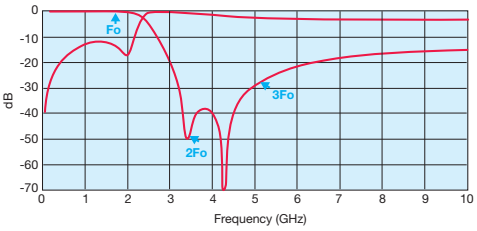
LP0805A0902ASTR



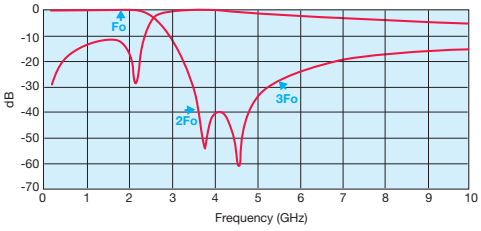
LP0805A0967ASTR



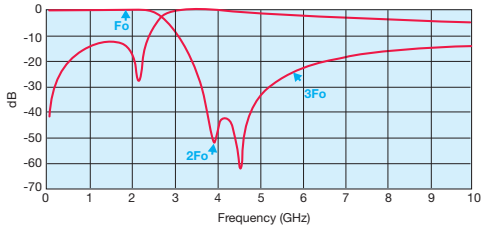
LP0805A1747ASTR



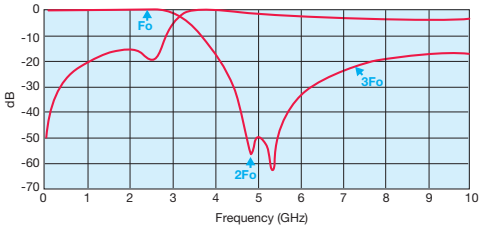
LP0805A1842ASTR



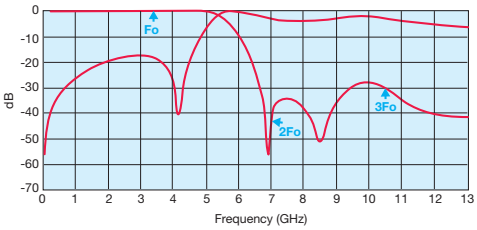
LP0805A1950ASTR



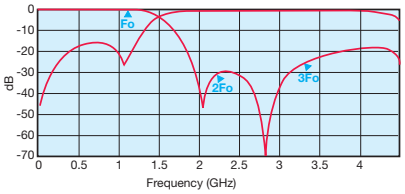
LP0805A2442ASTR



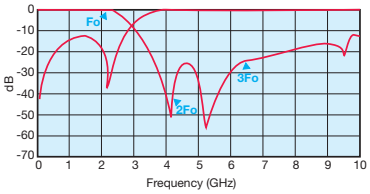
LP0805A3500ASTR



LP0805A1119ASTR



LP0805A2150ASTR



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ITF TEST JIG FOR LOW PASS FILTER 0805

GENERAL DESCRIPTION

These jigs are designed for testing the LPF0805 Low Pass Filters using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50W microstrips as conducting lines and a bottom ground plane located at a distance of 0.254 mm from the microstrips.

The substrate used is RF-35-0100-C1B107 (or similar).

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841(or similar).

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50W SMA termination.

MEASUREMENT PROCEDURE

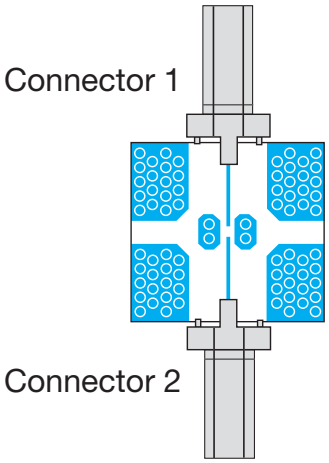
Follow the VNA's instruction manual and use the calibration jig to perform a full 2-Port calibration in the required band-widths.

Solder the filter to the measurement jig as follows:

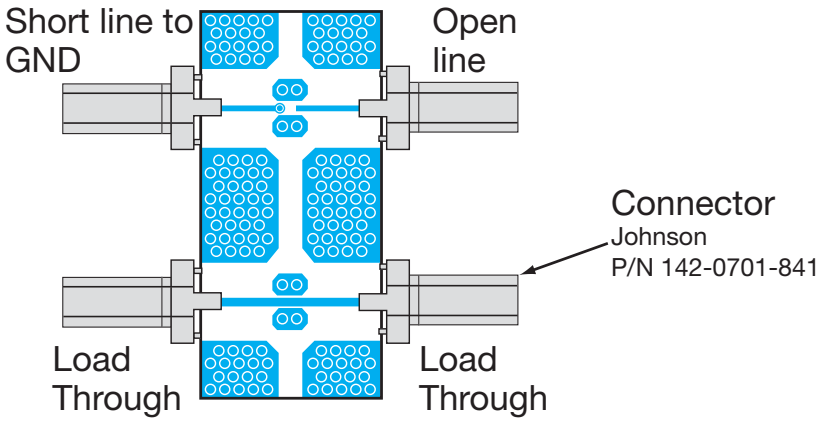
Input (Filter)	➨ Connector 1 (Jig)	GND (Filter)	➨ GND (Jig)
Output (Filter)	➨ Connector 2 (Jig)	GND (Filter)	➨ GND (Jig)

Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig terminal connected to port 2 (using an RF cable).

Measurement



Calibration Jig



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MLO™ TECHNOLOGY

The 0603 diplexer is a best in class low profile multilayer organic passive device that is based on AVX's patented multilayer organic high density interconnect technology. The MLO™ diplexer uses high dielectric constant and low loss materials to realize high Q passive printed elements such as inductors, and capacitors in a multilayer stack up. The MLO™ diplexers can support multiple wireless standards such as WCDMA, CDMA, WLAN, GSM, and BT. These diplexers are less than 0.5mm in height and are ideally suited for band switching for dual band systems. All diplexers are expansion matched to printed circuit boards thereby resulting in improved reliability vs. ceramic and Si components.

APPLICATIONS

Multiband applications including WiFi, WiMax, GPS, and cellular bands

LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- High Heat Dissipation

HOW TO ORDER

DP	03	B	5425	7	TR
Type	Size	Design	Frequency (MHz)	Finish 7 = Au T = NiSn	Packaging Tape & Reel

RoHS COMPLIANT

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

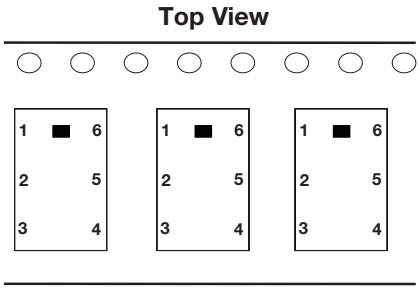
OPERATING TEMPERATURE

-40ºC to +85ºC

TERMINATION

Finishes available in Ni Au, Ni Sn and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

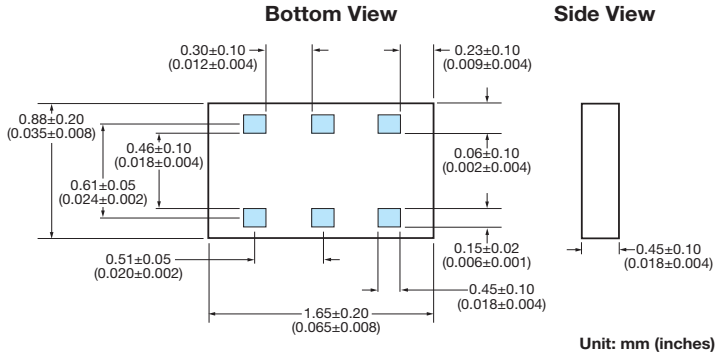
ORIENTATION IN TAPE



POWER CAPACITY

4.5W Maximum

COMPONENT DIMENSIONS AND FUNCTIONS



Unit: mm (inches)

Terminal No.	Terminal Name
1	GND
2	Common
3	GND
4	Low Frequency Port
5	GND
6	High Frequency Port

PART NUMBER: DP03B54257TR

Electrical Characteristics @ 25ºC

No.	Parameter	Freq. (MHz)	Port	Specification	Typ. value	Unit
1	Insertion Loss	2400-2496	Low	0.55 max	0.40	dB
2		4900-5950	High	1.2 max	0.80	dB
3	Attenuation	500-2700	High	28 min	35	dB
4		9800-11900	High	10 min	14	dB
6	Attenuation	4800-4992	Low	20 min	25	dB
7		4900-5950	Low	23 min	27	dB
8		7200-7500	Low	26 min	30	dB
9	Isolation	500-2700	Low-High	28 min	35	dB
10		4900-5950	Low-High	22 min	25	dB
11	VSWR	2400-2500	Ant	2.0 max	1.5	-
12	VSWR	4900-5950	Ant	2.0 max	1.3	-
13	VSWR	2400-2500	Low	2.0 max	1.5	-
14	VSWR	4900-5950	High	2.0 max	1.3	-

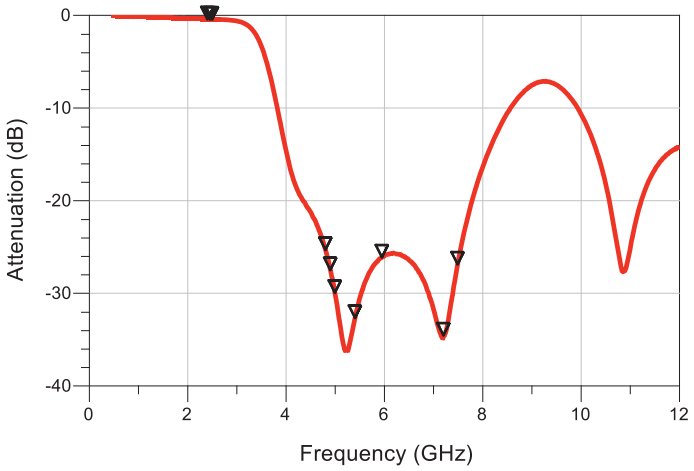
Mechanical Characteristics @ 25ºC

Size [mm(inches)]	1.65 x 0.88 (0.065 x 0.035)
Height [mm(inches)]	0.42 (0.017)
Volume (mm^3)	0.77

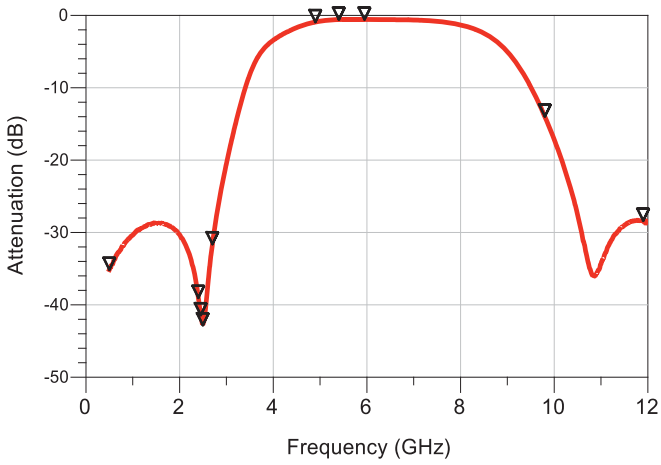
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S PARAMETER MEASUREMENTS

LOW BAND PORT ATTENUATION



HIGH BAND PORT ATTENUATION



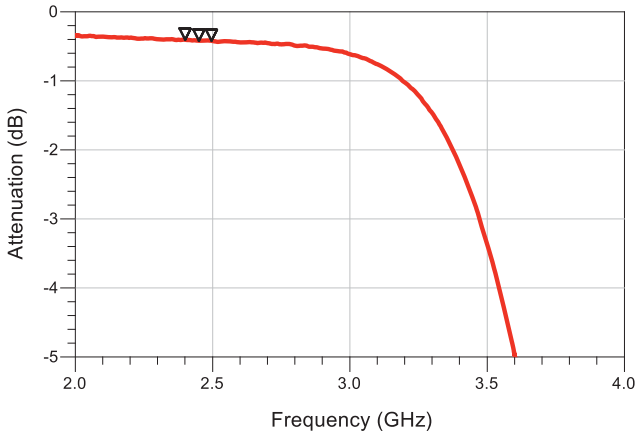
Low Band Attenuation

Frequency	Attenuation
4.800 GHz	25.302
4.992 GHz	29.935
4.900 GHz	27.471
5.400 GHz	32.647
5.590 GHz	26.099
7.200 GHz	34.531
7.488 GHz	26.860

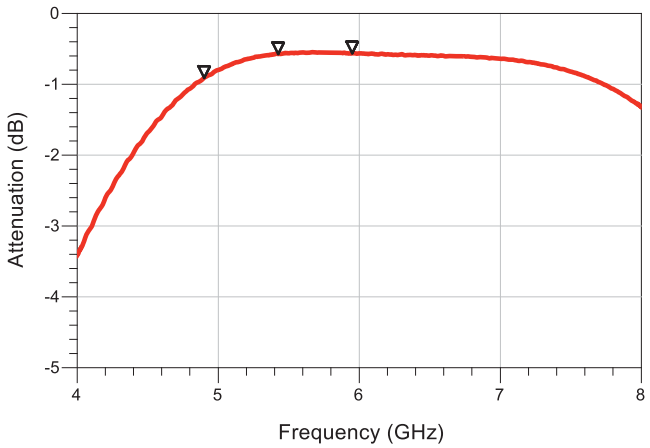
High Band Attenuation

Frequency	Attenuation
0.500 GHz	35.133
2.400 GHz	39.019
2.450 GHz	41.406
2.496 GHz	42.793
2.700 GHz	31.607
9.800 GHz	13.967
11.90 GHz	28.352

LOW BAND INSERTION LOSS



HIGH BAND INSERTION LOSS



Low Band Insertion Loss

Frequency	Insertion Loss
2.400 GHz	0.404
2.450 GHz	0.418
2.496 GHz	0.420

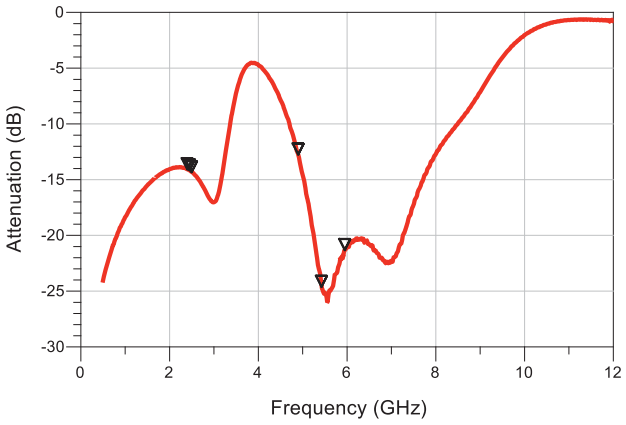
High Band Insertion Loss

Frequency	Insertion Loss
4.900 GHz	0.909
5.400 GHz	0.577
5.950 GHz	0.562

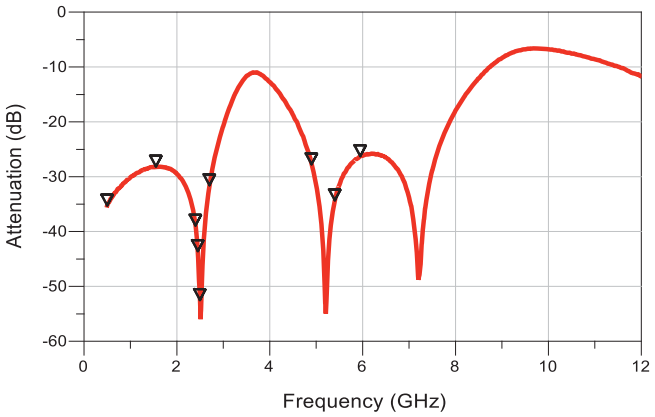
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S PARAMETER MEASUREMENTS

COMMON PORT RETURN LOSS



ISOLATION



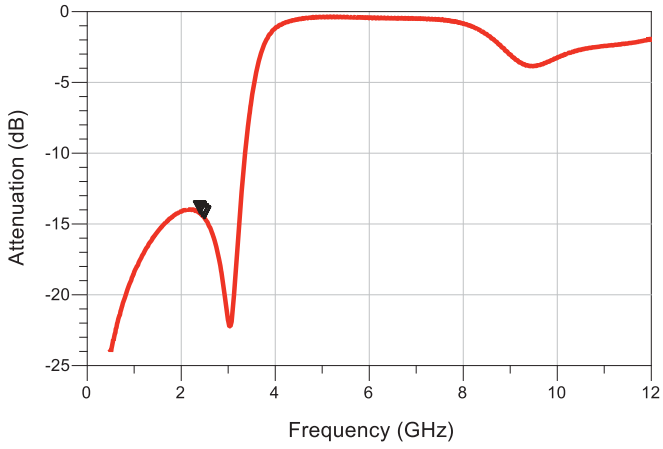
Common Return Loss

Frequency	Return Loss	VSWR
2.400 GHz	14.066	1.494
2.450 GHz	14.162	1.487
2.496 GHz	14.325	1.476
4.900 GHz	12.750	1.599
5.400 GHz	24.603	1.125
5.950 GHz	21.310	1.188

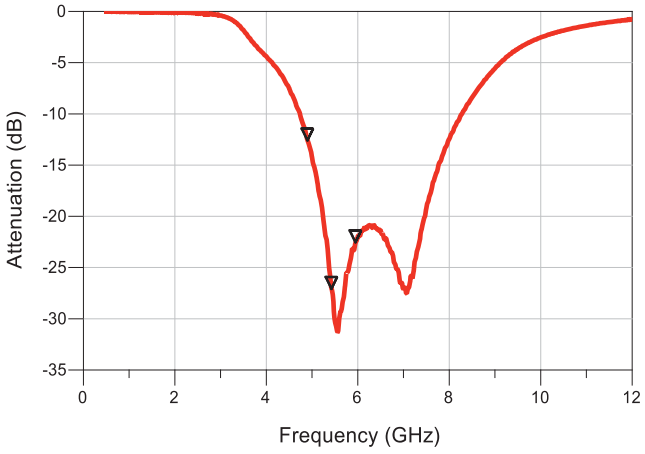
Isolation

Frequency	Attenuation
0.500 GHz	32.253
1.550 GHz	28.144
2.400 GHz	28.913
2.450 GHz	43.562
2.496 GHz	52.470
2.700 GHz	31.566
4.900 GHz	27.731
5.400 GHz	34.304
5.950 GHz	26.249

LOW BAND RETURN LOSS



HIGH BAND RETURN LOSS



Low Band Return Loss

Frequency	Return Loss	VSWR
2.400 GHz	14.232	1.482
2.450 GHz	14.429	1.469
2.496 GHz	14.572	1.459

High Band Return Loss

Frequency	Return Loss	VSWR
4.900 GHz	12.587	
5.400 GHz	27.577	1.087
5.950 GHz	22.533	1.161

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MLO™ TECHNOLOGY

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APPLICATIONS

Multiband applications including WiFi, WiMax, GPS, and cellular bands

LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- High Heat Dissipation

HOW TO ORDER

DP	03	A	5425	7	TR
Type	Size	Design	Frequency (MHz)	Finish 7 = Au T = NiSn	Packaging Tape & Reel

RoHS COMPLIANT

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

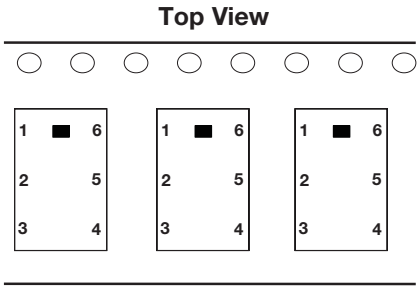
OPERATING TEMPERATURE

-40ºC to +85ºC

TERMINATION

Finishes available in Ni Au, Ni Sn and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

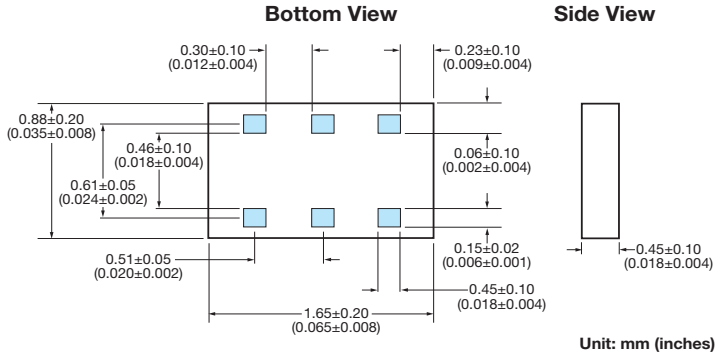
ORIENTATION IN TAPE



POWER CAPACITY

4.5W Maximum

COMPONENT DIMENSIONS AND FUNCTIONS



Unit: mm (inches)

Terminal No.	Terminal Name
1	Low Frequency Port
2	GND
3	High Frequency Port
4	GND
5	Common
6	GND

PART NUMBER: DP03A54257TR

Electrical Characteristics @ 25ºC

No.	Parameter	Freq. (MHz)	Port	Specification	Typ. value	Unit
1	Insertion Loss	2400-2496	Low	0.55 max	0.40	dB
2		4900-5950	High	1.2 max	0.80	dB
3	Attenuation	500-2700	High	28 min	35	dB
4		9800-11900	High	10 min	14	dB
6	Attenuation	4800-4992	Low	20 min	25	dB
7		4900-5950	Low	23 min	27	dB
8		7200-7500	Low	26 min	30	dB
9	Isolation	500-2700	Low-High	28 min	35	dB
10		4900-5950	Low-High	22 min	25	dB
11	VSWR	2400-2500	Ant	2.0 max	1.5	-
12	VSWR	4900-5950	Ant	2.0 max	1.3	-
13	VSWR	2400-2500	Low	2.0 max	1.5	-
14	VSWR	4900-5950	High	2.0 max	1.3	-

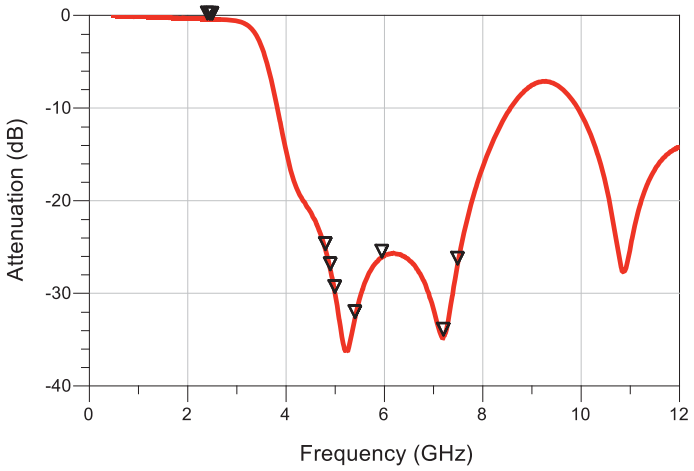
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Height [mm(inches)]	0.42 (0.017)
Volume (mm^3)	0.77

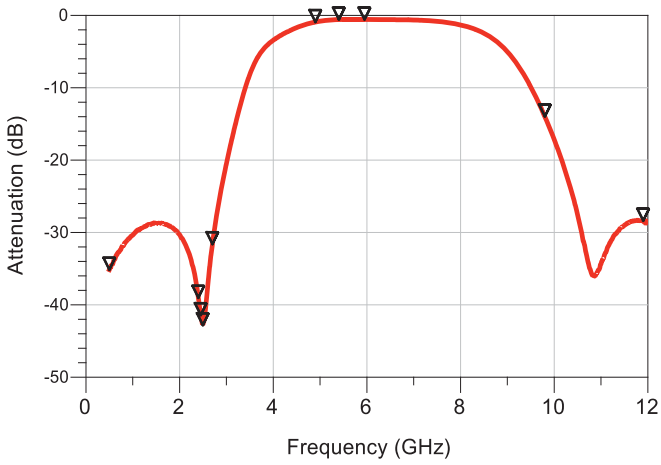
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S PARAMETER MEASUREMENTS

LOW BAND PORT ATTENUATION



HIGH BAND PORT ATTENUATION



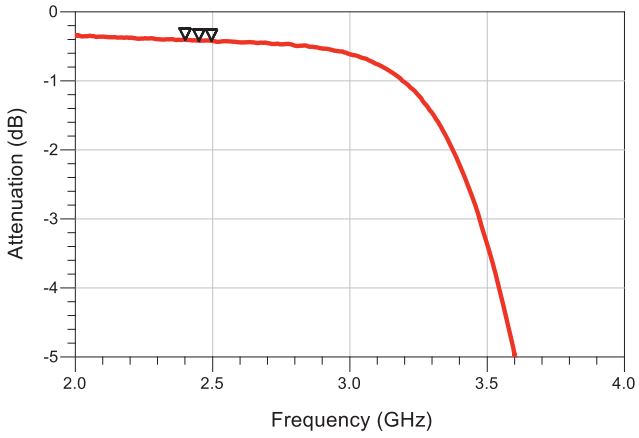
Low Band Attenuation

Frequency	Attenuation
4.800 GHz	25.302
4.992 GHz	29.935
4.900 GHz	27.471
5.400 GHz	32.647
5.590 GHz	26.099
7.200 GHz	34.531
7.488 GHz	26.860

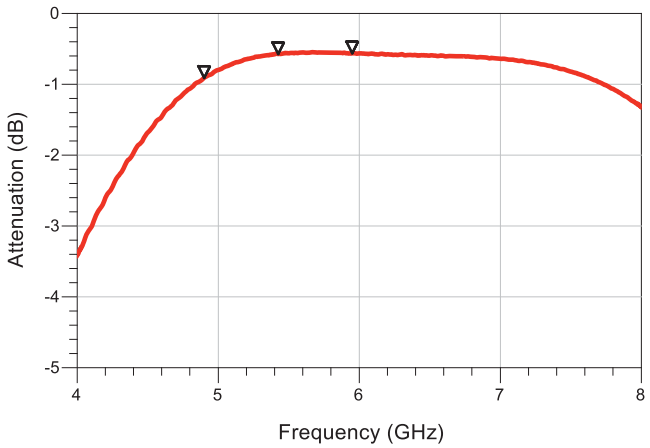
High Band Attenuation

Frequency	Attenuation
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2.450 GHz	41.406
2.496 GHz	42.793
2.700 GHz	31.607
9.800 GHz	13.967
11.90 GHz	28.352

LOW BAND INSERTION LOSS



HIGH BAND INSERTION LOSS



Low Band Insertion Loss

Frequency	Insertion Loss
2.400 GHz	0.404
2.450 GHz	0.418
2.496 GHz	0.420

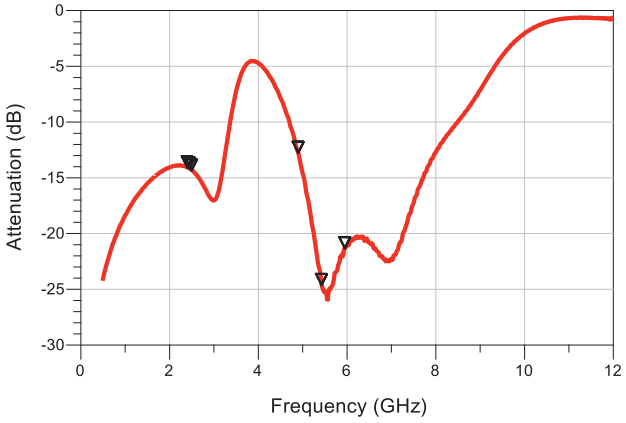
High Band Insertion Loss

Frequency	Insertion Loss
4.900 GHz	0.909
5.400 GHz	0.577
5.950 GHz	0.562

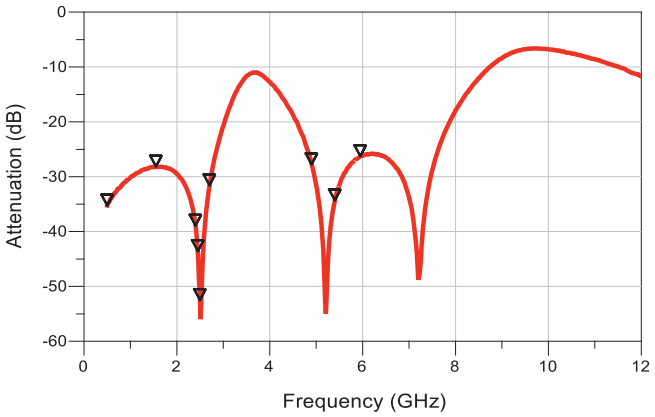
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S PARAMETER MEASUREMENTS

COMMON PORT RETURN LOSS



ISOLATION



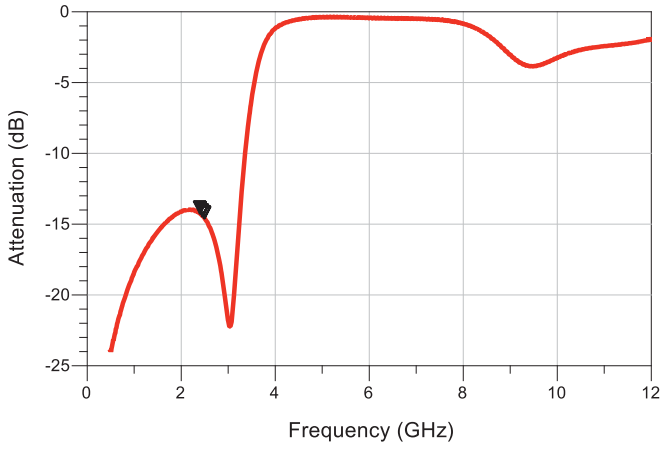
Common Return Loss

Frequency	Return Loss	VSWR
2.400 GHz	14.066	1.494
2.450 GHz	14.162	1.487
2.496 GHz	14.325	1.476
4.900 GHz	12.750	1.599
5.400 GHz	24.603	1.125
5.950 GHz	21.310	1.188

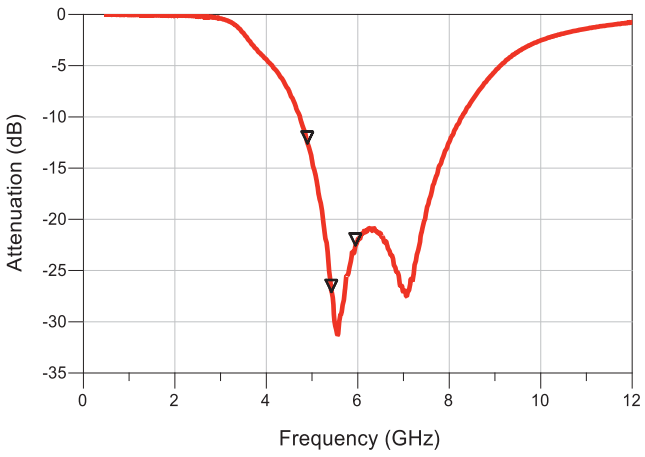
Isolation

Frequency	Attenuation
0.500 GHz	32.253
1.550 GHz	28.144
2.400 GHz	28.913
2.450 GHz	43.562
2.496 GHz	52.470
2.700 GHz	31.566
4.900 GHz	27.731
5.400 GHz	34.304
5.950 GHz	26.249

LOW BAND RETURN LOSS



HIGH BAND RETURN LOSS



Low Band Return Loss

Frequency	Return Loss	VSWR
2.400 GHz	14.232	1.482
2.450 GHz	14.429	1.469
2.496 GHz	14.572	1.459

High Band Return Loss

Frequency	Return Loss	VSWR
4.900 GHz	12.587	
5.400 GHz	27.577	1.087
5.950 GHz	22.533	1.161

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MLO™ TECHNOLOGY

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APPLICATIONS

Multiband applications including WCDMA, WLAN, WiMax, GPS, and cellular bands

LAND GRID ARRAY ADVANTAGES

- Low Insertion Loss
- Excellent Solderability
- Low Parasitics
- Low Profile

HOW TO ORDER

DP	05	A	1920	7	TR
Type	Size	Design	Frequency (MHz)	Finish	Packaging

Finish: 7 = Au, T = NiSn

Packaging: Tape & Reel, TR = 3 Kpcs, TR/500 = 500 pcs

RoHS COMPLIANT

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

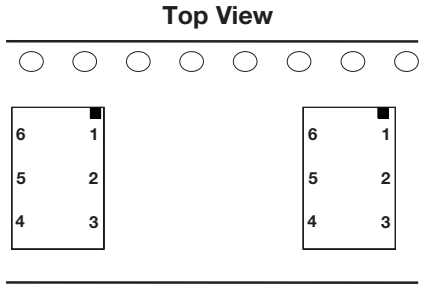
OPERATING TEMPERATURE

-40ºC to +85ºC

TERMINATION

Finishes available in Ni/Sn, Immersion Sn, Immersion Au and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

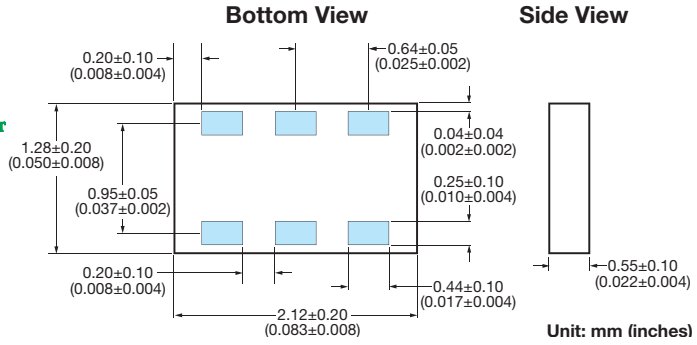
ORIENTATION IN TAPE



POWER CAPACITY

4.5W Maximum

COMPONENT DIMENSIONS AND FUNCTIONS



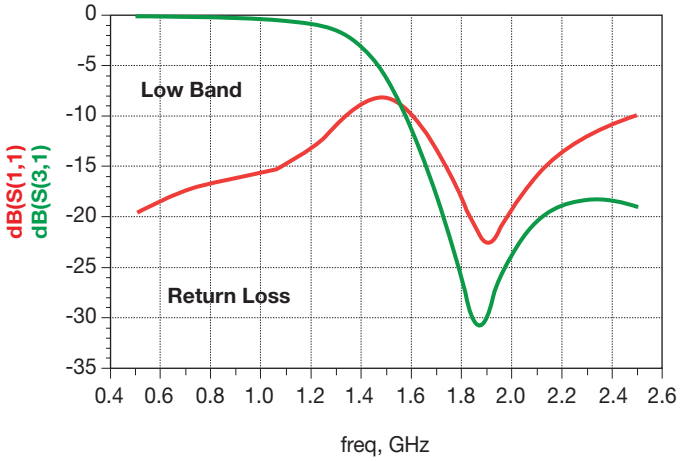
Terminal No.	Terminal Name
1	High Frequency Port
2	GND
3	Low Frequency Port
4	GND
5	Common Port
6	GND

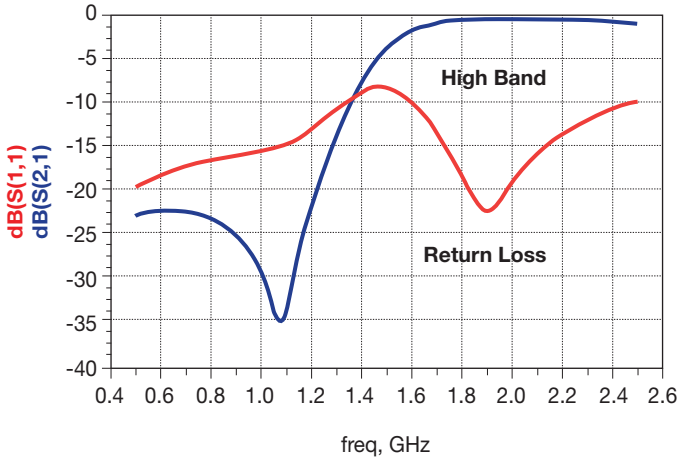
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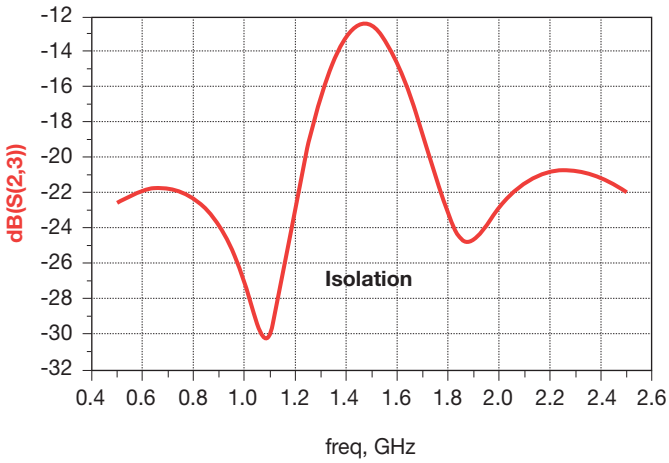
Specification @ 25ºC	
Size [mm(inches)]	2.12 x 1.28 (0.083 x 0.050)
Height [mm(inches)]	0.55 (0.021)
Volume (mm^3)	1.5
Frequency Range (F1) (MHz)	859±35
Frequency Range (F2) (MHz)	1920±70
Insertion Loss (F1, at Fc) (dB)	-0.4
Insertion Loss (F2, at Fc) (dB)	-0.6
Attenuation (F1) at (F2) (dB)	-23
Attenuation (F2) at (F1) (dB)	-23
VSWR (Input @ F1)	1.4
VSWR (Input @ F2)	1.3
VSWR (Lowband @ F1)	1.4
VSWR (Highband @ F2)	1.4

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S PARAMETER MEASUREMENTS







Note: Measurements were taken using an Anritsu 4 port VNA; Diplexer was mounted on a custom evaluation board. To reduce systematic errors from the VNA, the coaxial measurement cables, and evaluation board, a Short-Open-Load-Thru (SOLT) calibration was performed, using a custom fabricated calibration substrate. This is the most common coaxial calibration methods.

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APPLICATIONS

Multiband applications including WCDMA, WLAN, WiMax, GPS, and cellular bands

LAND GRID ARRAY ADVANTAGES

- Low Insertion Loss
- Excellent Solderability
- Low Parasitics
- Low Profile

HOW TO ORDER

DP	05	A	1940	7	TR
Type	Size	Design	Frequency (MHz)	Finish	Packaging

Finish: 7 = Au, T = NiSn

Packaging: Tape & Reel, TR = 3 Kpcs, TR/500 = 500 pcs

RoHS COMPLIANT

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

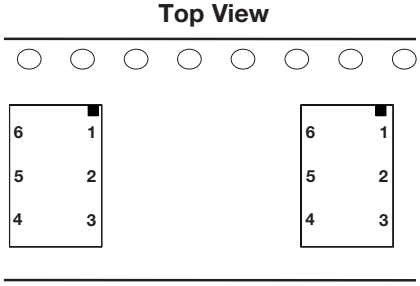
OPERATING TEMPERATURE

-40ºC to +85ºC

TERMINATION

Finishes available in Ni/Sn, Immersion Sn, Immersion Au and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

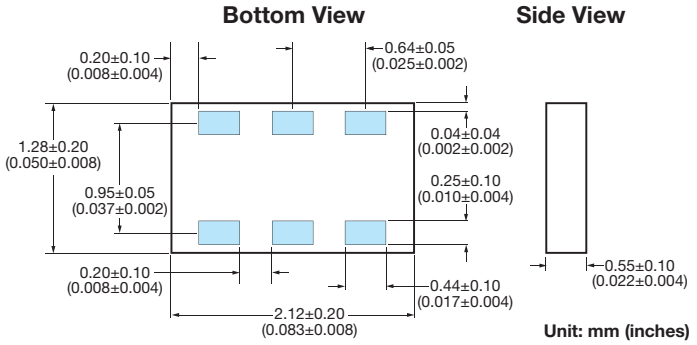
ORIENTATION IN TAPE



POWER CAPACITY

4.5W Maximum

COMPONENT DIMENSIONS AND FUNCTIONS



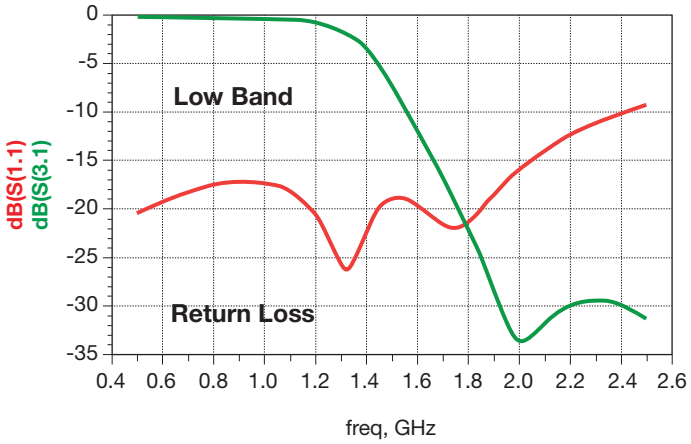
Terminal No.	Terminal Name
1	High Frequency Port
2	GND
3	Low Frequency Port
4	GND
5	Common Port
6	GND

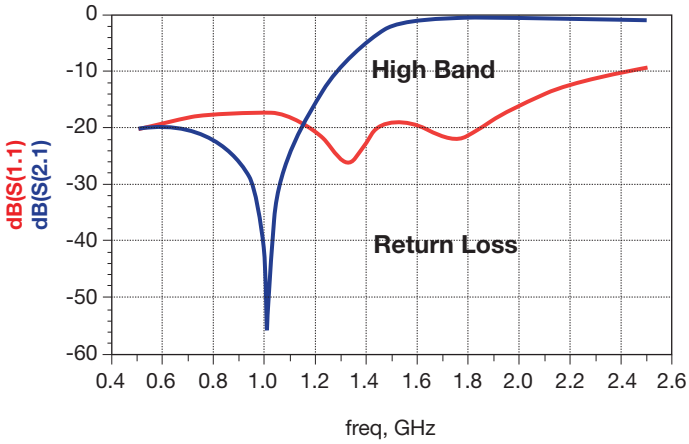
PART NUMBER: DP05A19407TR

Specification @ 25ºC	
Size [mm(inches)]	2.12 x 1.28 (0.083 x 0.050)
Height [mm(inches)]	0.55 (0.021)
Volume (mm^3)	1.5
Frequency Range (F1) (MHz)	892±68
Frequency Range (F2) (MHz)	1940±230
Insertion Loss (F1, at Fc) (dB)	-0.4
Insertion Loss (F2, at Fc) (dB)	-0.65
Attenuation (F1) at (F2) (dB)	-23
Attenuation (F2) at (F1) (dB)	-20
VSWR (Input @ F1)	1.3
VSWR (Input @ F2)	1.4
VSWR (Lowband @ F1)	1.4
VSWR (Highband @ F2)	1.2

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S PARAMETER MEASUREMENTS







Note: Measurements were taken using an Anritsu 4 port VNA; Diplexer was mounted on a custom evaluation board. To reduce systematic errors from the VNA, the coaxial measurement cables, and evaluation board, a Short-Open-Load-Thru (SOLT) calibration was performed, using a custom fabricated calibration substrate. This is the most common coaxial calibration methods.

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MLO™ TECHNOLOGY

The 0805 diplexer is a best in class low profile multilayer organic passive device that is based on AVX's patented multilayer organic high density interconnect technology. The MLO™ diplexer uses high dielectric constant and low loss materials to realize high Q passive printed elements such as inductors and capacitors in a multilayer stack up. The MLO™ diplexers can support multiple wireless standards such as WCDMA, CDMA, WLAN and GSM. These components which are less than 0.6mm in thickness are ideally suited for band switching for dual band systems. All diplexers are expansion matched to FR4 thereby resulting in improved reliability over standard Si and ceramic devices.

APPLICATIONS

Multiband applications including WiFi, WiMax, GPS, and cellular bands

LAND GRID ARRAY ADVANTAGES

- Low Insertion Loss
- Excellent Solderability
- Low Parasitics
- Low Profile

HOW TO ORDER

DP	05	A	5250	7	TR
Type	Size	Design	Frequency (MHz)	Finish	Packaging

Finish: 7 = Au, T = NiSn

Packaging: Tape & Reel, TR = 3 Kpcs, TR/500 = 500 pcs

RoHS COMPLIANT

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

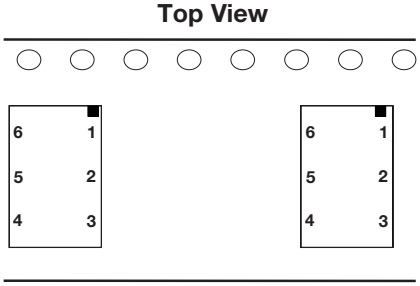
OPERATING TEMPERATURE

-40ºC to +85ºC

TERMINATION

Finishes available in Ni/Sn, Immersion Sn, Immersion Au and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

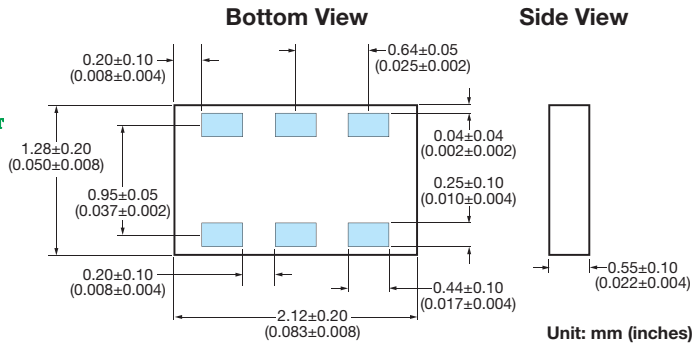
ORIENTATION IN TAPE



POWER CAPACITY

4.5W Maximum

COMPONENT DIMENSIONS AND FUNCTIONS



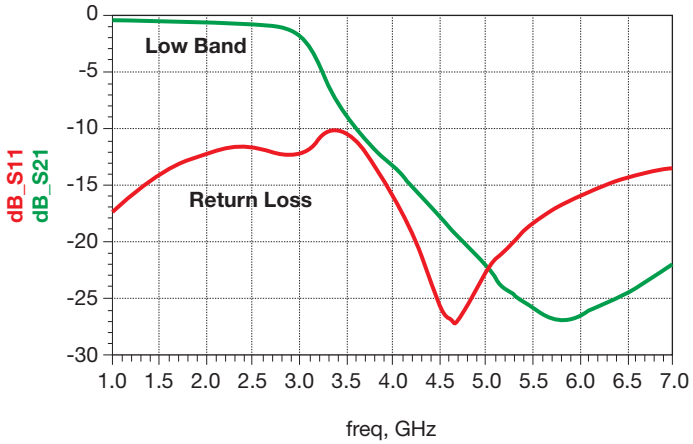
Terminal No.	Terminal Name
1	High Frequency Port
2	GND
3	Low Frequency Port
4	GND
5	Common Port
6	GND

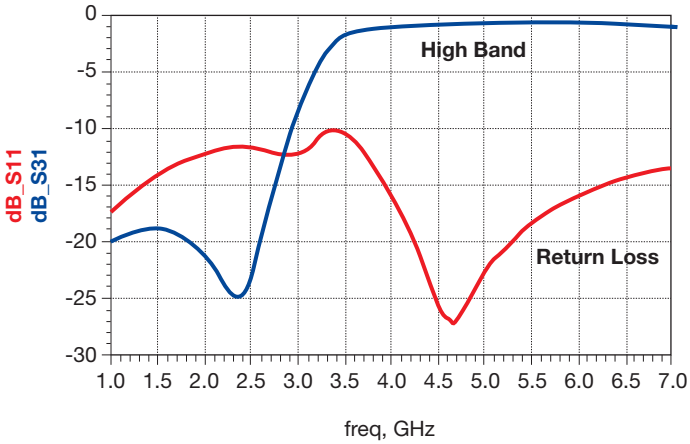
PART NUMBER: DP05A52507TR

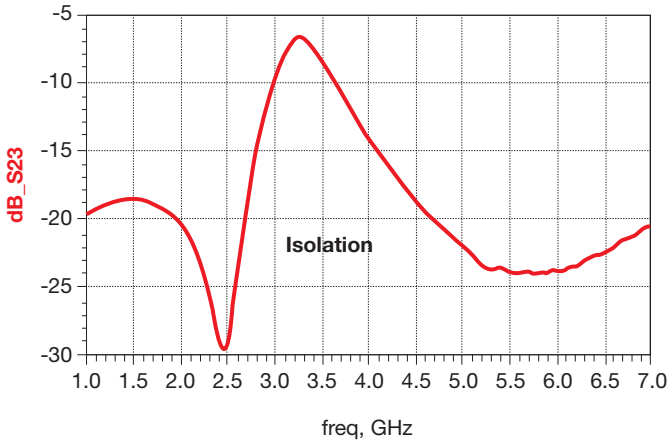
Specification @ 25ºC	
Size [mm(inches)]	2.12 x 1.28 (0.083 x 0.050)
Height [mm(inches)]	0.55 (0.021)
Volume (mm^3)	1.5
Frequency Range (F1) (MHz)	2450±50
Frequency Range (F2) (MHz)	5250±100
Insertion Loss (F1) (dB)	-0.5
Insertion Loss (F2) (dB)	-0.5
Attenuation (F1) at (F2) (dB)	-20
Attenuation (F2) at (F1) (dB)	-20
Return Loss (Lowband @ F1) (dB)	-12
Return Loss (Highband @ F2) (dB)	-12
Isolation (Lowband @ F1) (dB)	-25
Isolation (Highband @ F2) (dB)	-21

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S PARAMETER MEASUREMENTS







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MLO™ TECHNOLOGY

The 0805 MLO™ diplexer is best in class low profile multilayer organic passive device that is based on AVX's patented multilayer organic high density interconnect technology. The MLO™ diplexer uses high dielectric constant and low loss materials to realize high Q passive printed elements such as inductors and capacitors in a multilayer stack up. The MLO™ diplexers can support multiple wireless standards such as WCDMA, CDMA, WLAN and GSM. These components which are less than 0.5mm in thickness are ideally suited for band switching for dual band systems. All MLO™ diplexers are expansion matched to FR4 thereby resulting in improved reliability over standard Si and ceramic devices.

APPLICATIONS

Multiband applications including WiFi, BT, WiMax, GPS, and cellular bands

LAND GRID ARRAY ADVANTAGES

- Low Insertion Loss
- Excellent Solderability
- Low Parasitics
- Matched CTE to PCB

HOW TO ORDER

DP	05	B	5425	7	TR
Type	Size	Design	Frequency (MHz)	Finish	Packaging
				7 = Au T = NiSn	Tape & Reel TR = 3 Kpcs TR/500 = 500 pcs

RoHS COMPLIANT

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics.

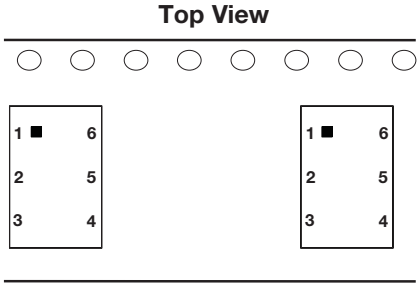
OPERATING TEMPERATURE

-40ºC to +85ºC

TERMINATION

Finishes available in Ni/Sn, Immersion Sn, Immersion Au and OSP coatings which are compatible with automatic soldering technologies which include reflow, wave soldering, vapor phase and manual.

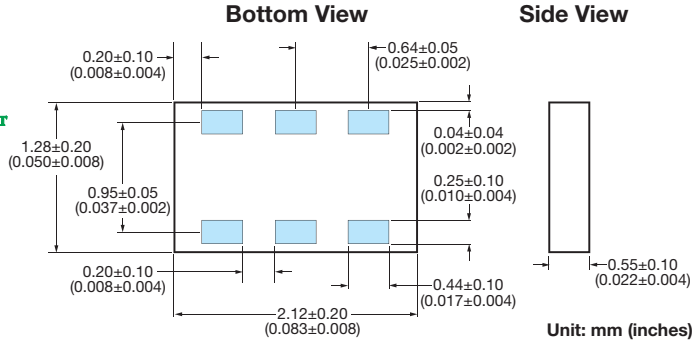
ORIENTATION IN TAPE



POWER CAPACITY

4.5W Maximum

COMPONENT DIMENSIONS AND FUNCTIONS



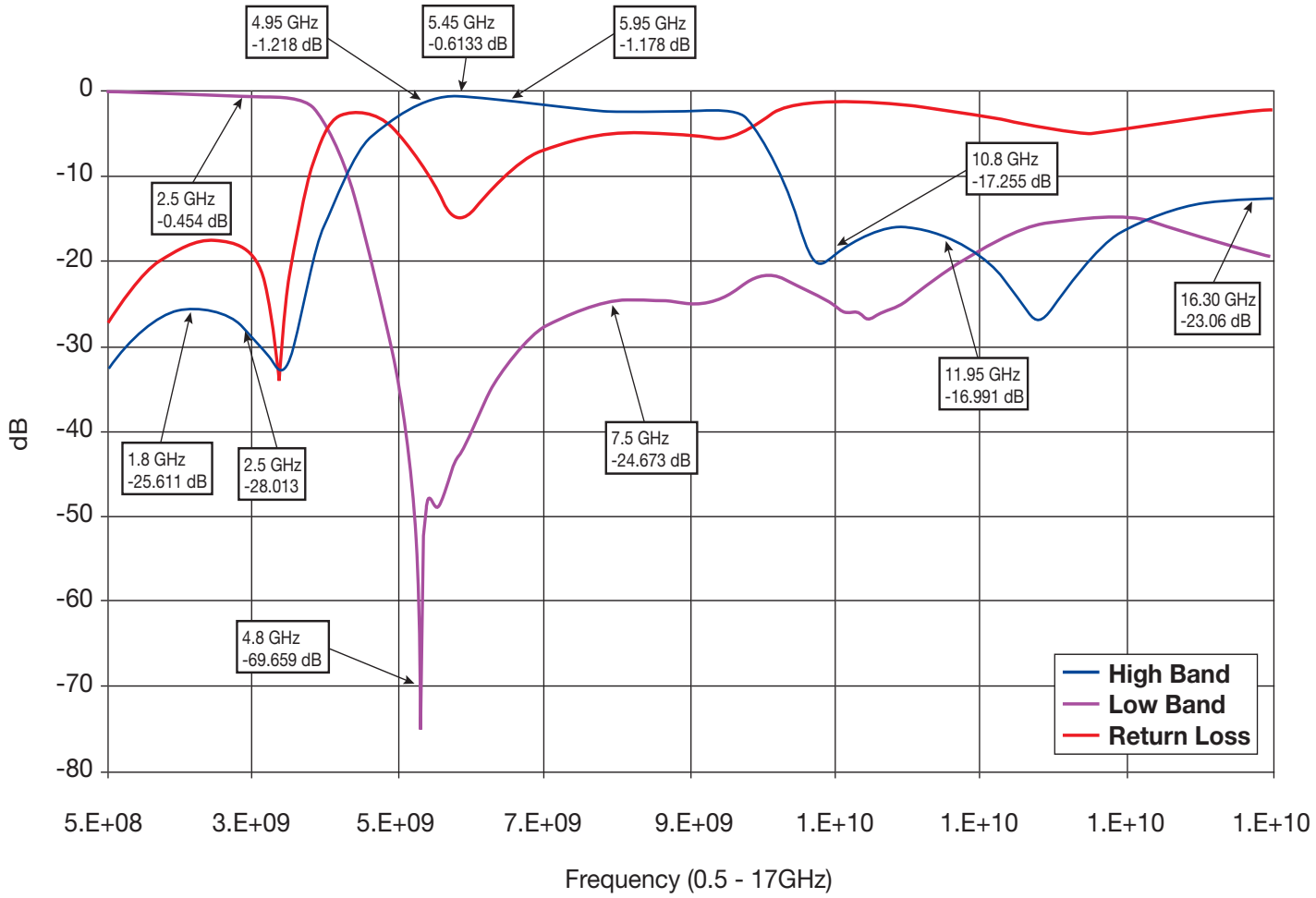
Terminal No.	Terminal Name
1	Low Frequency Port
2	GND
3	High Frequency Port
4	GND
5	Common Port
6	GND

PART NUMBER: DP05B54257TR

Specification @ 25ºC	
Size [mm(inches)]	2.12 x 1.28 (0.083 x 0.050)
Height [mm(inches)]	0.55 (0.021)
Volume (mm^3)	1.5
Pass Band Range (F1) (MHz)	2450 +/-50MHz
Pass Band Range (F2) (MHz)	5425 +/-525MHz
Insertion Loss (F1) (dB)	-0.5
Insertion Loss (F2) (dB)	-1.0
Attenuation (F1) 4800MHz - 6000MHz (dB)	-36
Attenuation 3 x (F1) (dB)	-31
Attenuation (F2) 1800MHz - 2500MHz (dB)	-26
Attenuation 2 x (F2) (dB)	-13
Attenuation 3 x (F2) (dB)	-15
VSWR (Input @ F1)	1.2
VSWR (Input @ F2)	1.7
VSWR (Lowband @ F1)	1.2
VSWR (Highband @ F2)	1.7

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S PARAMETER MEASUREMENTS



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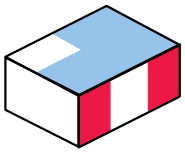
GENERAL DESCRIPTION
ITF (Integrated Thin-Film) TECHNOLOGY

The ITF SMD Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

DIMENSIONS:

millimeters (inches)



Top View

	0603
L	1.6±0.1 (0.063±0.004)
W	0.84±0.1 (0.033±0.004)
T	0.60±0.1 (0.028±0.004)
A	0.35±0.15 (0.014±0.006)
B	0.175±0.1 (0.007±0.004)
B1	0.00+0.1/0-0.0 (0.00+0.004/-0.0)

APPLICATIONS

- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's

FEATURES

- Miniature Size: 0603
- Frequency Range: 800MHz - 3GHz
- Characteristic Impedance: 50Ω
- Operating / Storage Temp.: -40ºC to +85ºC
- Power Rating: 3W Continuous
- Low Profile
- Rugged Construction
- Taped and Reeled

HOW TO ORDER

CP	0603	X	****	X	S	TR
Style Directional Coupler	**Size** 0603	**Type**	**Frequency** MHz	**Sub Type**	**Termination Code** W = Sn90, Pb10 **S = Sn100	**Packaging Code** TR = Tape and Reel

**RoHS compliant

QUALITY INSPECTION

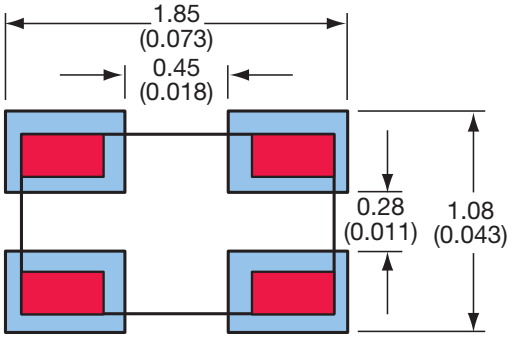
Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I_R, 4 hours

TERMINATION

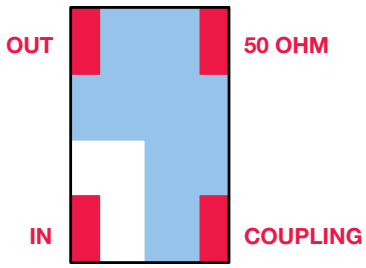
Nickel/Solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

Recommended Pad Layout Dimensions mm (inches)



TERMINALS (Top View)

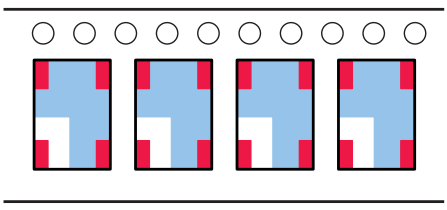
Not RoHS Compliant



LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

For RoHS compliant products, please select correct termination style.



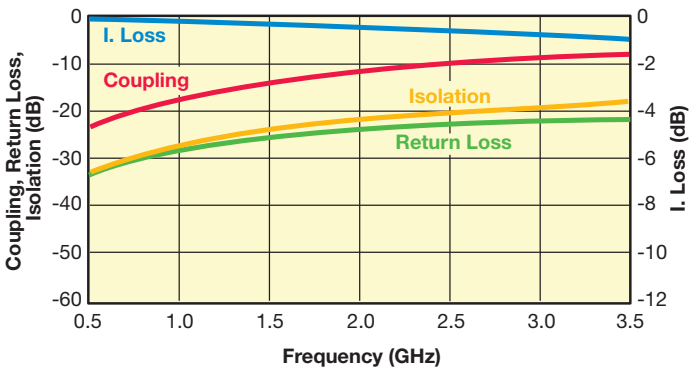
Orientation in tape

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Coupler P/N CP0603A****AS

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0603A0836AS	824 - 849	18.5±1	0.25	1.2
	CP0603A0881AS	869 - 894	18.5±1		
GSM	CP0603A0902AS	890 - 915	18±1		
	CP0603A0947AS	935 - 960	17.5±1		
E-GSM	CP0603A0897AS	880 - 915	18±1		
	CP0603A0942AS	925 - 960	17.5±1		
PDC	CP0603A1441AS	1429 - 1453	14±1	0.4	
PCN	CP0603A1747AS	1710 - 1785	12.5±1	0.6	
	CP0603A1842AS	1805 - 1880	12±1		
PCS	CP0603A1880AS	1850 - 1910	12±1		
	CP0603A1960AS	1930 - 1990	11.5±1	0.65	
PHP	CP0603A1907AS	1895 - 1920	12±1	0.6	
DECT	CP0603A1890AS	1880 - 1900	12±1		
Wireless LAN	CP0603A2442AS	2400 - 2484	10±1	0.85	

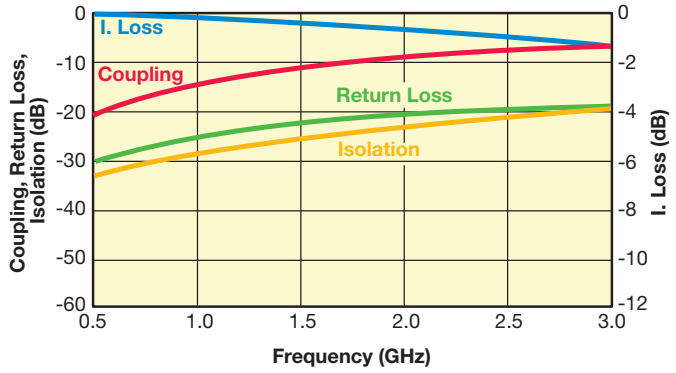
CP0603A****AS



Coupler P/N CP0603A****BS

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0603A0836BS	824 - 849	16±1	0.25	1.2
	CP0603A0881BS	869 - 894	15.5±1		
GSM	CP0603A0902BS	890 - 915	15.5±1		
	CP0603A0947BS	935 - 960	15±1		
E-GSM	CP0603A0897BS	880 - 915	15.5±1		
	CP0603A0942BS	925 - 960	15±1		
PDC	CP0603A1441BS	1429 - 1453	11.5±1	0.55	
PCN	CP0603A1747BS	1710 - 1785	10±1	0.8	1.3
	CP0603A1842BS	1805 - 1880	9.5±1		
PCS	CP0603A1880BS	1850 - 1910	9±1		1.4
	CP0603A1960BS	1930 - 1990	9±1		
PHP	CP0603A1907BS	1895 - 1920	9±1		
DECT	CP0603A1890BS	1880 - 1900	9±1		
Wireless LAN	CP0603A2442BS	2400 - 2484	7.5±1	1.1	

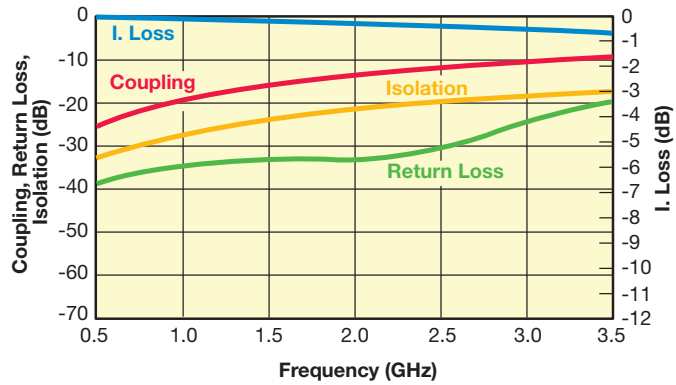
CP0603A****BS



Coupler P/N CP0603A****CS

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0603A0836CS	824 - 849	21±1	0.25	1.2
	CP0603A0881CS	869 - 894	20.5±1		
GSM	CP0603A0902CS	890 - 915	20.5±1		
	CP0603A0947CS	935 - 960	20±1		
E-GSM	CP0603A0897CS	880 - 915	20.5±1		
	CP0603A0942CS	925 - 960	20±1		
PDC	CP0603A1441CS	1429 - 1453	16.5±1	0.40	
PCN	CP0603A1747CS	1710 - 1785	15±1	0.5	
	CP0603A1842CS	1805 - 1880	14.5±1		
PCS	CP0603A1880CS	1850 - 1910	14.5±1		
	CP0603A1960CS	1930 - 1990	14±1		
PHP	CP0603A1907CS	1895 - 1920	14.5±1		
DECT	CP0603A1890CS	1880 - 1900	14.5±1		
Wireless LAN	CP0603A2442CS	2400 - 2484	12.5±1	0.65	

CP0603A****CS

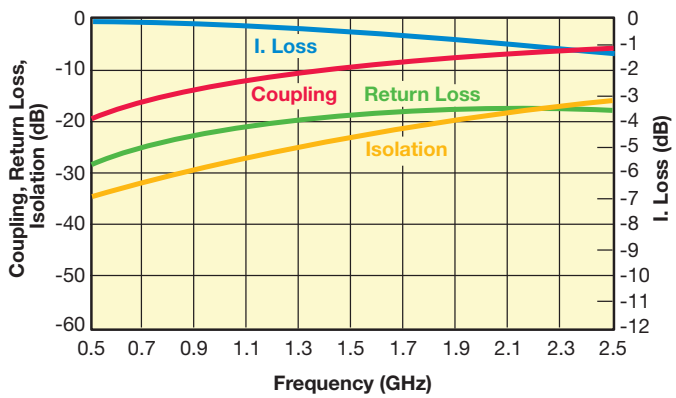


Coupler P/N CP0603A****DS

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0603A0836DS	824 - 849	15.0±1	0.40	1.2
	CP0603A0881DS	869 - 894	14.5±1		
GSM	CP0603A0902DS	890 - 915	14.5±1		
	CP0603A0947DS	935 - 960	14±1		
E-GSM	CP0603A0897DS	880 - 915	14.5±1		
	CP0603A0942DS	925 - 960	14±1		
PDC	CP0603A1441DS	1429 - 1453	10.5±1	0.7	1.3
PCN	CP0603A1747DS	1710 - 1785	9±1	0.9	1.5
	CP0603A1842DS	1805 - 1880	8.5±1		
PCS	CP0603A1880DS	1850 - 1910	8.5±1	1.0	
	CP0603A1960DS	1930 - 1990	8±1		
PHP	CP0603A1907DS	1895 - 1920	8.5±1		
DECT	CP0603A1890DS	1880 - 1900	8.5±1		
Wireless LAN	CP0603A2442DS	2400 - 2484	6.5±1	1.5	

Important: Couplers can be used at any frequency within the indicated range.

CP0603A****DS

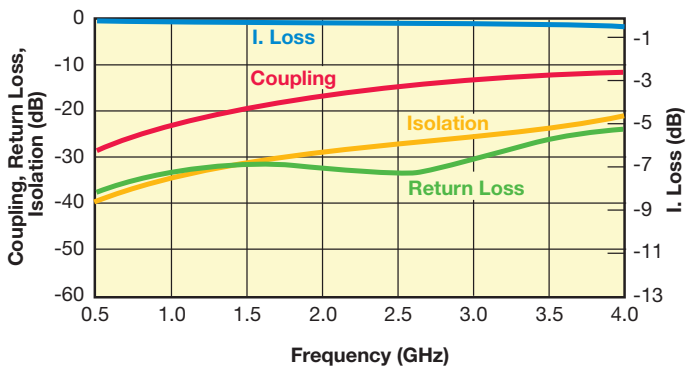


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Coupler P/N CP0603B****AS

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0603B0836AS	824 - 849	24.5±1	0.2	1.2
	CP0603B0881AS	869 - 894	24±1		
GSM	CP0603B0902AS	890 - 915	24±1		
	CP0603B0947AS	935 - 960	23.5±1		
E-GSM	CP0603B0897AS	880 - 915	24±1		
	CP0603B0942AS	925 - 960	23.5±1		
PDC	CP0603B1441AS	1429 - 1453	20±1	0.25	
PCN	CP0603B1747AS	1710 - 1785	18±1		
	CP0603B1842AS	1805 - 1880	17.5±1	0.3	
PCS	CP0603B1880AS	1850 - 1910	17.5±1		
	CP0603B1960AS	1930 - 1990	17.5±1		
PHP	CP0603B1907AS	1895 - 1920	17.5±1		
DECT	CP0603B1890AS	1880 - 1900	17.5±1		
Wireless LAN	CP0603B2442AS	2400 - 2484	15.5±1	0.45	

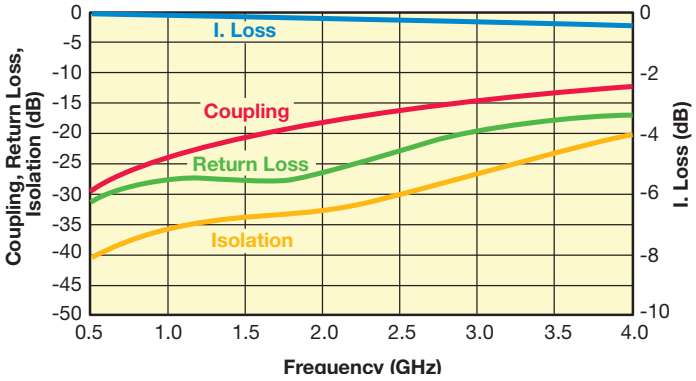
CP0603B****AS



Coupler P/N CP0603B****BS

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0603B0836BS	824 - 849	25.5±1	0.2	1.2
	CP0603B0881BS	869 - 894	25±1		
GSM	CP0603B0902BS	890 - 915	25±1		
	CP0603B0947BS	935 - 960	24.5±1		
E-GSM	CP0603B0897BS	880 - 915	25±1		
	CP0603B0942BS	925 - 960	24.5±1		
PDC	CP0603B1441BS	1429 - 1453	21±1		
PCN	CP0603B1747BS	1710 - 1785	19±1	0.25	
	CP0603B1842BS	1805 - 1880	19±1		
PCS	CP0603B1880BS	1850 - 1910	18.5±1		
	CP0603B1960BS	1930 - 1990	18.5±1		
PHP	CP0603B1907BS	1895 - 1920	18.5±1		
DECT	CP0603B1890BS	1880 - 1900	18.5±1		
Wireless LAN	CP0603B2442BS	2400 - 2484	16.5±1	0.35	

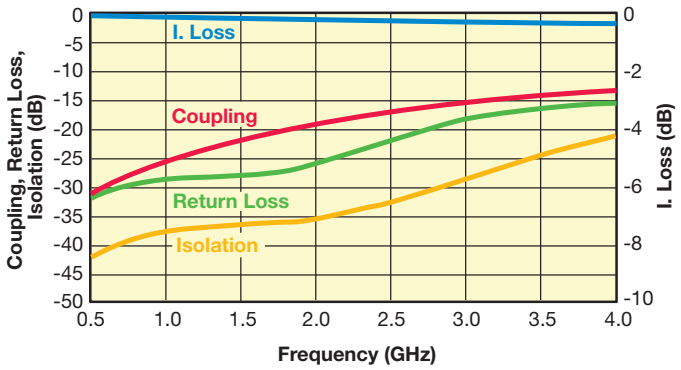
CP0603B****BS



Coupler P/N CP0603B****CS

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0603B0836CS	824 - 849	26.5±1	0.2	1.2
	CP0603B0881CS	869 - 894	26±1		
GSM	CP0603B0902CS	890 - 915	26±1		
	CP0603B0947CS	935 - 960	25.5±1		
E-GSM	CP0603B0897CS	880 - 915	26±1		
	CP0603B0942CS	925 - 960	25.5±1		
PDC	CP0603B1441CS	1429 - 1453	22±1		
PCN	CP0603B1747CS	1710 - 1785	20.5±1	0.25	
	CP0603B1842CS	1805 - 1880	20±1		
PCS	CP0603B1880CS	1850 - 1910	20±1		
	CP0603B1960CS	1930 - 1990	19.5±1		
PHP	CP0603B1907CS	1895 - 1920	20±1		
DECT	CP0603B1890CS	1880 - 1900	20±1		
Wireless LAN	CP0603B2442CS	2400 - 2484	18±1	0.35	1.3

CP0603B****CS



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GENERAL DESCRIPTION
ITF (Integrated Thin-Film) TECHNOLOGY

The ITF SMD Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

FEATURES

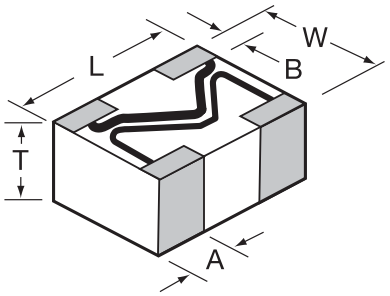
- Small Size: 0805
- Frequency Range: 800MHz - 3GHz
- Characteristic Impedance: 50Ω
- Operating / Storage Temp.: -40°C to +85°C
- Power Rating: 3W Continuous
- Low Profile
- Rugged Construction
- Taped and Reeled

APPLICATIONS

- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's

DIMENSIONS: (Top View)

millimeters (inches)



	0805
L	2.03±0.1 (0.080±0.004)
W	1.55±0.1 (0.061±0.004)
T	0.98±0.1 (0.039±0.004)
A	0.56±0.25 (0.022±0.010)
B	0.35±0.15 (0.014±0.006)

HOW TO ORDER

CP	0805	A	0902	A	S	TR
Style Directional Coupler	**Size** 0805	**Layout Type** (see layout types)	**Frequency** MHz	**Sub Type** (see layout sub-types)	**Termination Code** W = Nickel/Solder (Sn/Pb) **S = Nickel / Lead Free Solder (Sn100)	**Packaging Code** TR = Tape and Reel

Not RoHS Compliant

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

For RoHS compliant products, please select correct termination style.

**RoHS compliant

QUALITY INSPECTION

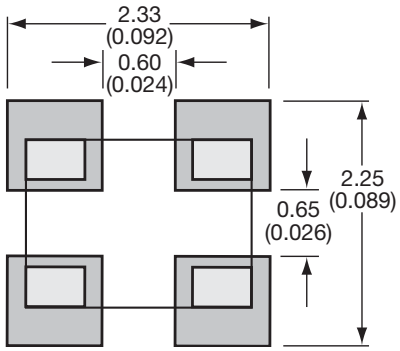
Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I_R, 4 hours

TERMINATION

Nickel/Solder coating (Sn, Pb) compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

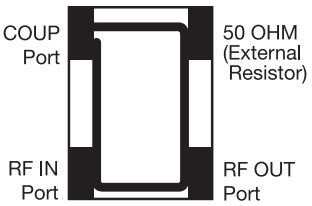
Recommended Pad Layout Dimensions mm (inches)



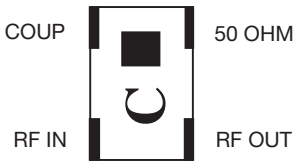
NOTE: Components must be mounted on the board with the white (Alumina) side DOWN.

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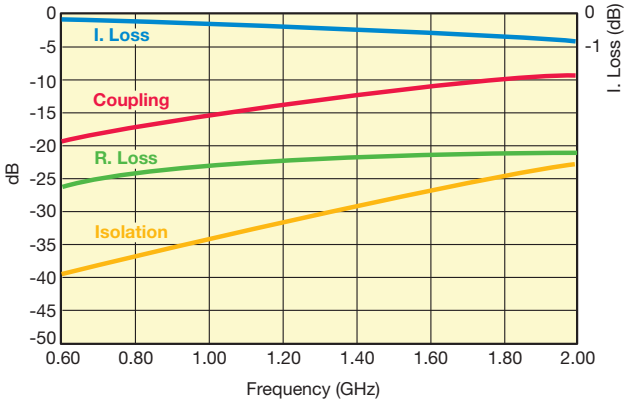
LAYOUT



Sn100 LAYOUT

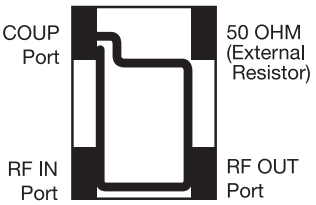


Type: A
Sub-Type: A



Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0805A0836AW	824 - 849	16.5±1	0.25	1.2
	CP0805A0881AW	869 - 894	16±1		
GSM	CP0805A0902AW	890 - 915	16±1		
	CP0805A0947AW	935 - 960	15.5±1		
E-GSM	CP0805A0897AW	880 - 915	16±1		
	CP0805A0942AW	925 - 960	15.5±1		
PDC	CP0805A1441AW	1429 - 1453	12±1	0.5	1.3
PCN	CP0805A1747AW	1710 - 1785	10.5±1	0.7	1.4
	CP0805A1842AW	1805 - 1880	10±1	0.8	
PCS	CP0805A1880AW	1850 - 1910	9.5±1		
	CP0805A1960AW	1930 - 1990	9.5±1		
PHP	CP0805A1907AW	1895 - 1920	9.5±1		
DECT	CP0805A1890AW	1880 - 1900	9.5±1		

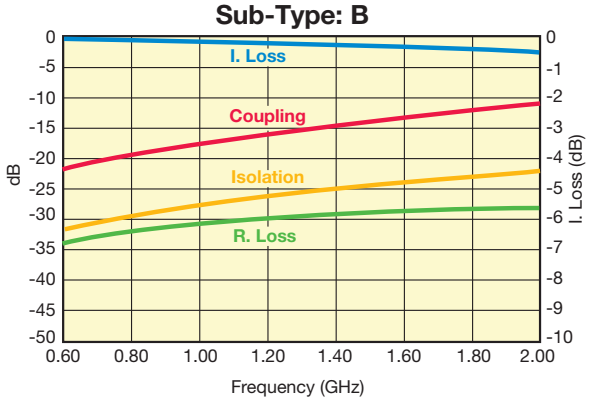
LAYOUT



Sn100 LAYOUT

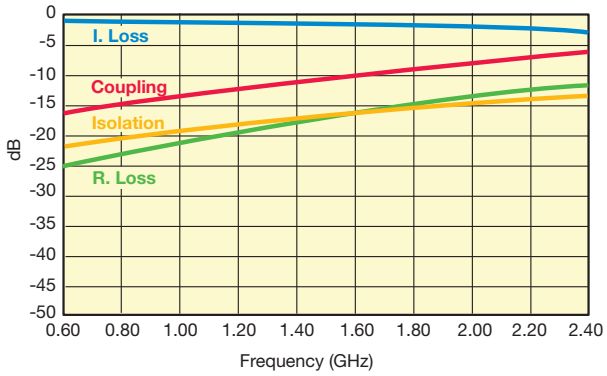


Type: A
Sub-Type: B

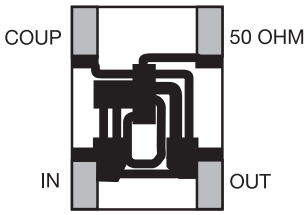


Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0805A0836BW	824 - 849	19±1	0.25	1.2
	CP0805A0881BW	869 - 894	18.5±1		
GSM	CP0805A0902BW	890 - 915	18±1		
	CP0805A0947BW	935 - 960	18±1		
E-GSM	CP0805A0897BW	880 - 915	18.5±1		
	CP0805A0942BW	925 - 960	18±1		
PDC	CP0805A1441BW	1429 - 1453	14.5±1	0.35	
PCN	CP0805A1747BW	1710 - 1785	12.5±1	0.5	1.4
	CP0805A1842BW	1805 - 1880	12.5±1		
PCS	CP0805A1880BW	1850 - 1910	12±1	0.6	
	CP0805A1960BW	1930 - 1990	11.5±1	0.7	
PHP	CP0805A1907BW	1895 - 1920	12±1	0.6	
DECT	CP0805A1890BW	1880 - 1900	12±1		
Wireless LAN	CP0805A2442BW	2400 - 2484	10±1	0.9	

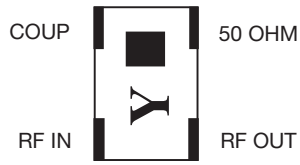
Type: A
Sub-Type: C



LAYOUT



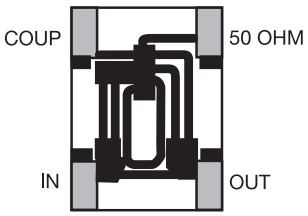
Sn100 LAYOUT



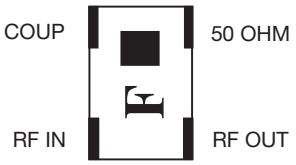
Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0805A0836CW	824 - 849	14±1	0.5	1.4
	CP0805A0881CW	869 - 894	13.5±1		
GSM	CP0805A0902CW	890 - 915	13.5±1		
	CP0805A0947CW	935 - 960	13±1		
E-GSM	CP0805A0897CW	880 - 915	13.5±1		
	CP0805A0942CW	925 - 960	13±1		
PDC	CP0805A1441CW	1429 - 1453	9.5±1	1.15	1.8
PCN	CP0805A1747CW	1710 - 1785	8±1	1.6	2.2
	CP0805A1842CW	1805 - 1880	8±1		
PCS	CP0805A1880CW	1850 - 1910	7.5±1	1.75	
	Cp0805A1960CW	1930 - 1990	7.5±1		
PHP	CP0805A1907CW	1895 - 1920	7.5±1		
DECT	CP0805A1890CW	1880 - 1900	7.5±1		
Wireless LAN	CP0805A2442CW	2400 - 2484	6±1	2.5	

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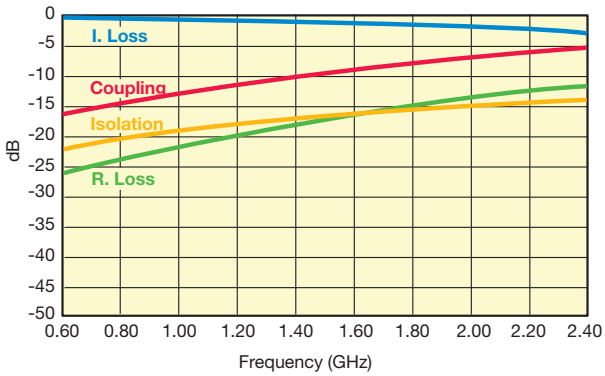
LAYOUT



Sn100 LAYOUT

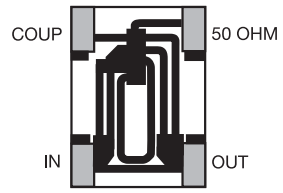


Type: A
Sub-Type: D

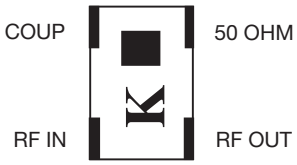


Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0805A0836DW	824 - 849	13.0±1	0.5	1.4
	CP0805A0881DW	869 - 894	12.5±1		
GSM	CP0805A0902DW	890 - 915	12.5±1		
	CP0805A0947DW	935 - 960	12±1		
E-GSM	CP0805A0897DW	880 - 915	12.5±1		
	CP0805A0942DW	925 - 960	12±1		
PDC	CP0805A1441DW	1429 - 1453	8.5±1	1.25	1.8
PCN	CP0805A1747DW	1710 - 1785	7±1	1.85	
	CP0805A1842DW	1805 - 1880	7±1		
PCS	CP0805A1880DW	1850 - 1910	7±1		
	Cp0805A1960DW	1930 - 1990	6.5±1	2.15	2.1
PHP	CP0805A1907DW	1895 - 1920	6.5±1		
DECT	CP0805A1890DW	1880 - 1900	7±1	1.85	1.8
Wireless LAN	CP0805A2442DW	2400 - 2484	5.5±1	2.4	2.1

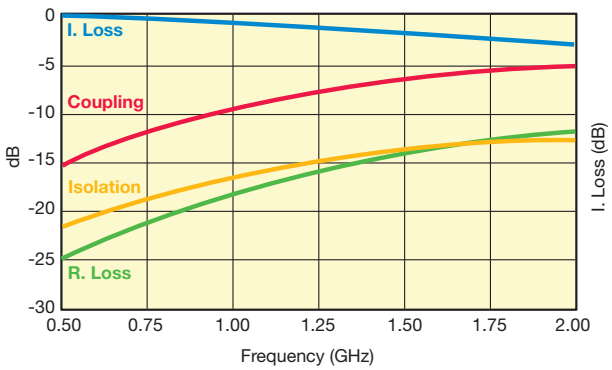
LAYOUT



Sn100 LAYOUT

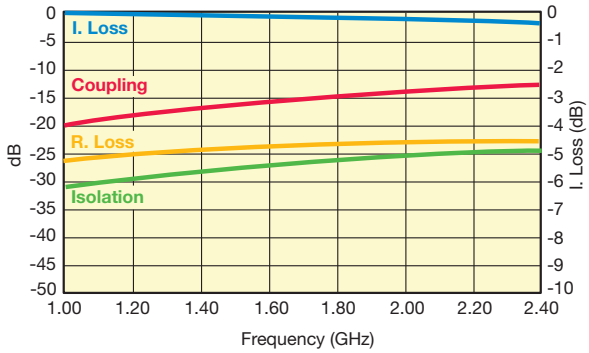


Type: A
Sub-Type: E

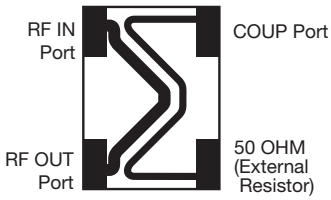


Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0805A0836EW	824 - 849	11±1	0.85	1.4
	CP0805A0881EW	869 - 894	10.5±1		
GSM	CP0805A0902EW	890 - 915	10.5±1		
	CP0805A0947EW	935 - 960	10±1		
E-GSM	CP0805A0897EW	880 - 915	10.5±1		
	CP0805A0942EW	925 - 960	10±1		
PDC	CP0805A1441EW	1429 - 1453	7±1	1.8	1.8
PCN	CP0805A1747EW	1710 - 1785	5.5±1	2.7	2.2
	CP0805A1842EW	1805 - 1880	5.5±1		
PCS	CP0805A1880EW	1850 - 1910	5±1	3.15	2.4
	Cp0805A1960EW	1930 - 1990	5±1		
PHP	CP0805A1907EW	1895 - 1920	5±1		
DECT	CP0805A1890EW	1880 - 1900	5±1		
Wireless LAN	CP0805A2442EW	2400 - 2484	4±1	4.2	

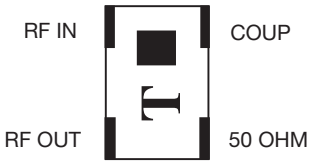
Type: B
Sub-Type: A



LAYOUT



Sn100 LAYOUT

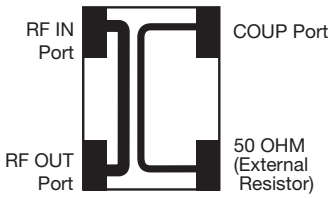


Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0805B0836AW	824 - 849	21.5±1	0.25	1.2
	CP0805B0881AW	869 - 894	21±1		
GSM	CP0805B0902AW	890 - 915	21±1		
	CP0805B0947AW	935 - 960	20.5±1		
E-GSM	CP0805B0897AW	880 - 915	21±1		
	CP0805B0942AW	925 - 960	20.5±1		
PDC	CP0805B1441AW	1429 - 1453	17±1		
PCN	CP0805B1747AW	1710 - 1785	15.5±1		
	Cp0805B1842AW	1805 - 1880	15.5±1	0.3	
PCS	CP0805B1880AW	1850 - 1910	15±1		
	CP0805B1960AW	1930 - 1990	14.5±1	0.4	
PHP	CP0805B1907AW	1895 - 1920	15±1	0.3	
DECT	CP0805B1890AW	1880 - 1900	15±1		
Wireless LAN	CP0805B2442AW	2400 - 2484	13±1	0.4	

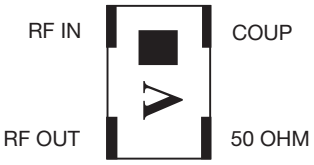
Important: Couplers can be used at any frequency within the indicated range.

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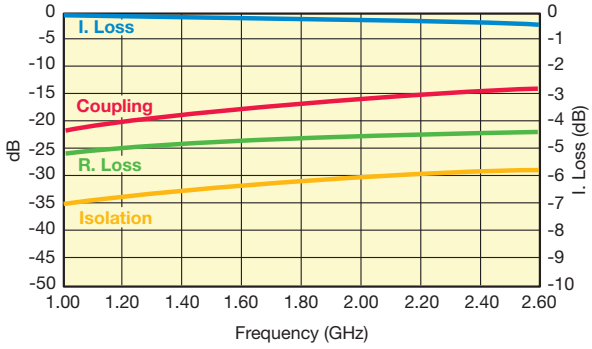
LAYOUT



Sn100 LAYOUT

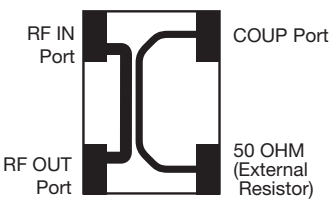


Type: B
Sub-Type: B

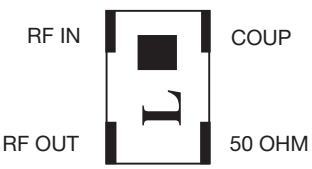


Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0805B0836BW	824 - 849	23.5±1	0.25	1.2
	CP0805B0881BW	869 - 894	23±1		
GSM	CP0805B0902BW	890 - 915	22.5±1		
	CP0805B0947BW	935 - 960	22±1		
E-GSM	CP0805B0897BW	880 - 915	23±1		
	CP0805B0942BW	925 - 960	22±1		
PDC	CP0805B1441BW	1429 - 1453	18.5±1		
PCN	CP0805B1747BW	1710 - 1785	17±1		
	CP0805B1842BW	1805 - 1880	16.5±1		
PCS	CP0805B1880BW	1850 - 1910	16.5±1		
	CP0805B1960BW	1930 - 1990	16±1		
PHP	CP0805B1907BW	1895 - 1920	16±1		
DECT	CP0805B1890BW	1880 - 1900	16±1		
Wireless LAN	CP0805B2442BW	2400 - 2484	14±1	0.4	

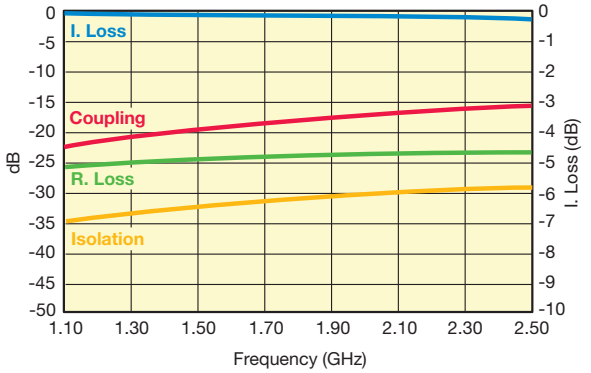
LAYOUT



Sn100 LAYOUT



Type: B
Sub-Type: C

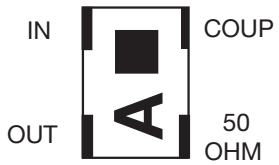


Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max	VSWR max
AMPS	CP0805B0836CW	824 - 849	25±1	0.25	1.2
	CP0805B0881CW	869 - 894	24.5±1		
GSM	CP0805B0902CW	890 - 915	24±1		
	CP0805B0947CW	935 - 960	24±1		
E-GSM	CP0805B0897CW	880 - 915	24.5±1		
	CP0805B0942CW	925 - 960	24±1		
PDC	CP0805B1441CW	1429 - 1453	20±1		
PCN	CP0805B1747CW	1710 - 1785	18.5±1		
	Cp0805B1842CW	1805 - 1880	18.5±1		
PCS	CP0805B1880CW	1850 - 1910	18±1		
	Cp0805B1960CW	1930 - 1990	17.5±1		
PHP	CP0805B1907CW	1895 - 1920	18±1		
DECT	CP0805B1890CW	1880 - 1900	18±1		
Wireless LAN	CP0805B2442CW	2400 - 2484	16±1	0.4	

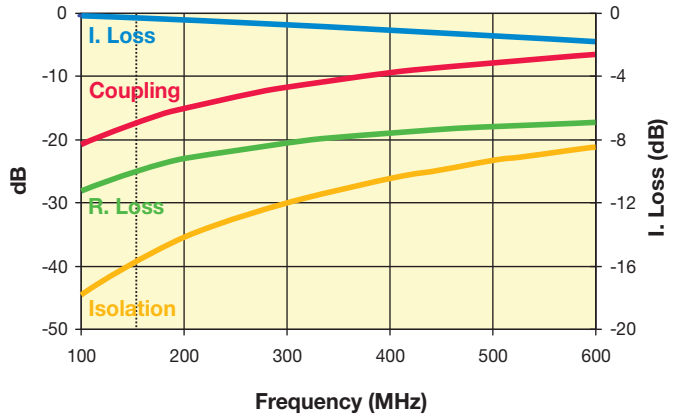
Important: Couplers can be used at any frequency within the indicated range.

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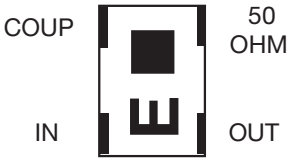
VHF DIRECTIONAL COUPLER
CP0805L0155ASTR
Sn100 LAYOUT



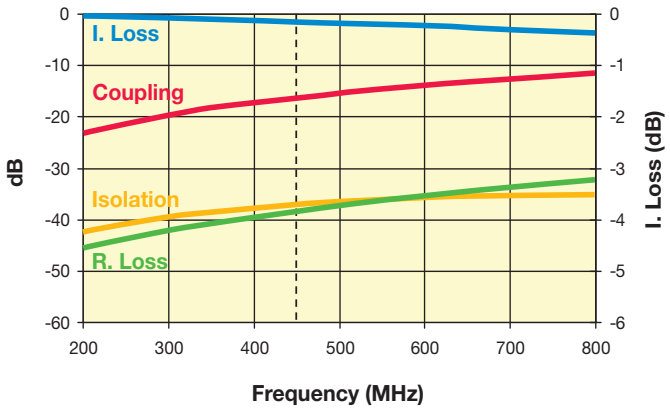
P/N	Frequency [MHz]	Coupling [dB]	R. Loss [dB]	I. Loss max [dB]	Directivity [dB]
CP0805L0155ASTR	155	17.1±1	24	0.35	22



UHF DIRECTIONAL COUPLER
CP0805L0436BSTR
Sn100 LAYOUT



P/N	Frequency [MHz]	Coupling [dB]	R. Loss [dB]	I. Loss max [dB]	Directivity [dB]
CP0805L0436BSTR	403-470	15.85±1	35	0.25	22



Important: Couplers can be used at any frequency within the indicated range.

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ITF TEST JIG FOR COUPLER TYPES 0805 AND 0603 SMD

GENERAL DESCRIPTION

This jig is designed for the testing of CP0805 and CP0603 series Directional Couplers using a vector network analyzer.

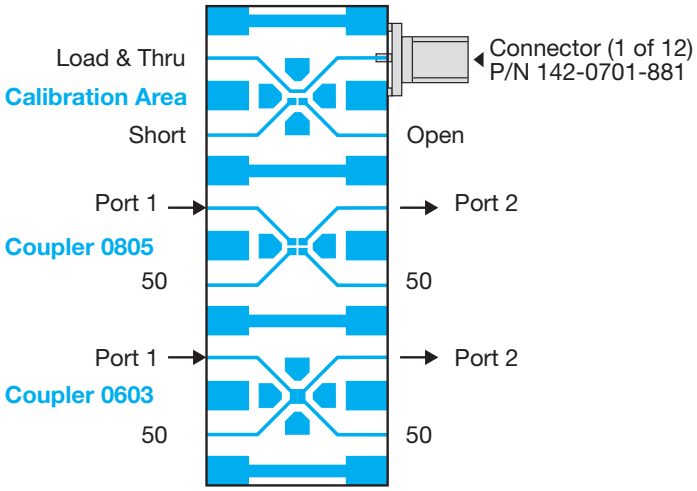
It consists of a FR4 multi-layer substrate, having 50Ω microstrips as conducting lines and a ground plane in the middle layer, located at a distance of 0.2mm from the microstrips.

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-881.

The jig is designed for a full 2-port calibration. LOAD calibration can be done either by a 50Ω SMA termination, or by soldering a 50Ω chip resistor at the 50Ω ports.

MEASUREMENT PROCEDURE

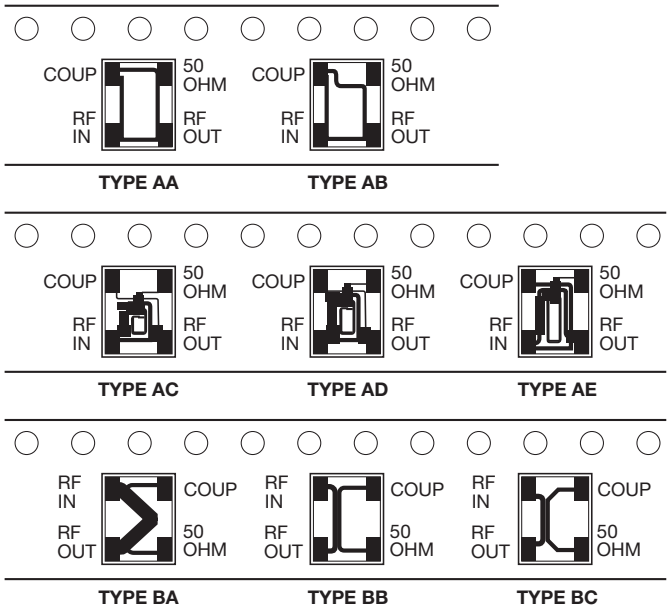
When measuring a component, it can be either soldered or pressed by a non-metallic stick until all four ports touch the appropriate pads. To measure the coupling (and the R. Loss) place the component on the Port 1 & Port 2 pads. Use two SMA 50Ω terminations (male) to terminate the ports, which are not connected to the network analyzer, and connect the network analyzer to the two ports. A 90° rotation of the component on its pads allows measuring a second parameter (I. Loss).



CP0805 SERIES DIRECTIONAL COUPLERS

Orientation and Tape and Reel Packaging Specification

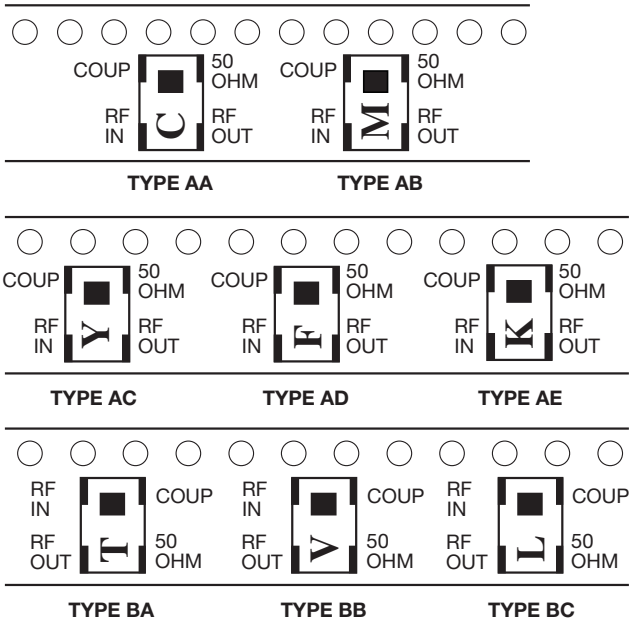
(Top View)



The parts should be mounted on the PCB with White (Alumina) side down and the "dark" side up.

CP0805xxxxxxSTR (Sn100)

(Top View)



The parts should be mounted on the PCB with printed side up.

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GENERAL DESCRIPTION

ITF (Integrated Thin-Film) TECHNOLOGY

The ITF High Directivity LGA Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

APPLICATIONS

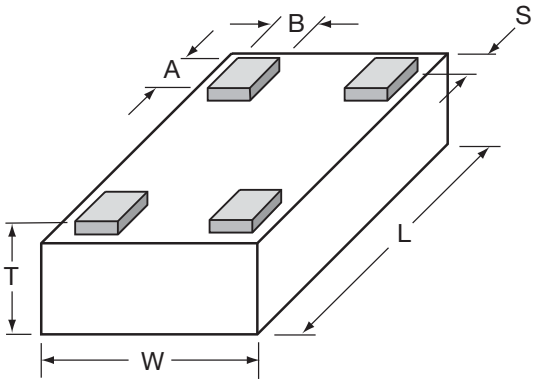
- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's

FEATURES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation
- Operating/Storage Temp -40°C to +85°C
- Power Rating 3W RF Cont

DIMENSIONS: (Bottom View)

millimeters (inches)



L	1.00±0.05 (0.040±0.002)	A	0.20±0.05 (0.008±0.002)
W	0.58±0.04 (0.023±0.002)	B	0.18±0.05 (0.007±0.002)
T	0.35±0.05 (0.014±0.002)	S	0.05±0.05 (0.002±0.002)

HOW TO ORDER

CP	0402	X	****	X	N	TR
Style Directional Coupler	**Size** 0402	**Type**	**Frequency** (MHz)	**Sub Type**	**LGA Termination** L = LGA Sn90, Pb10 **N = LGA Sn100	**Packaging Code** TR = Tape and Reel

**RoHS compliant

QUALITY INSPECTION

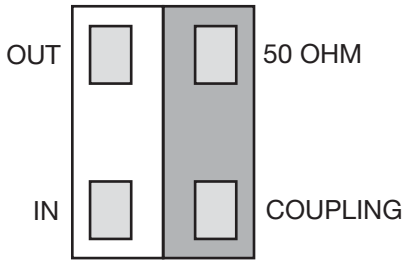
Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I_R, 4 hours

TERMINATION

Sn90Pb10 or Lead-Free Sn100 Nickel/Solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

TERMINALS (Top View)



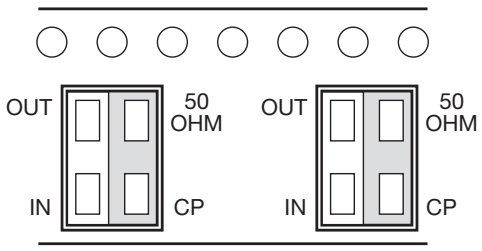
Not RoHS Compliant

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

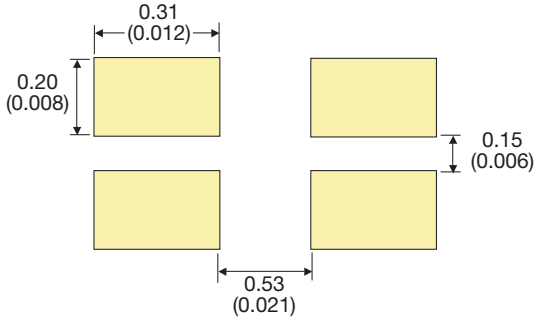
RoHS COMPLIANT

For RoHS compliant products, please select correct termination style.

ORIENTATION IN TAPE



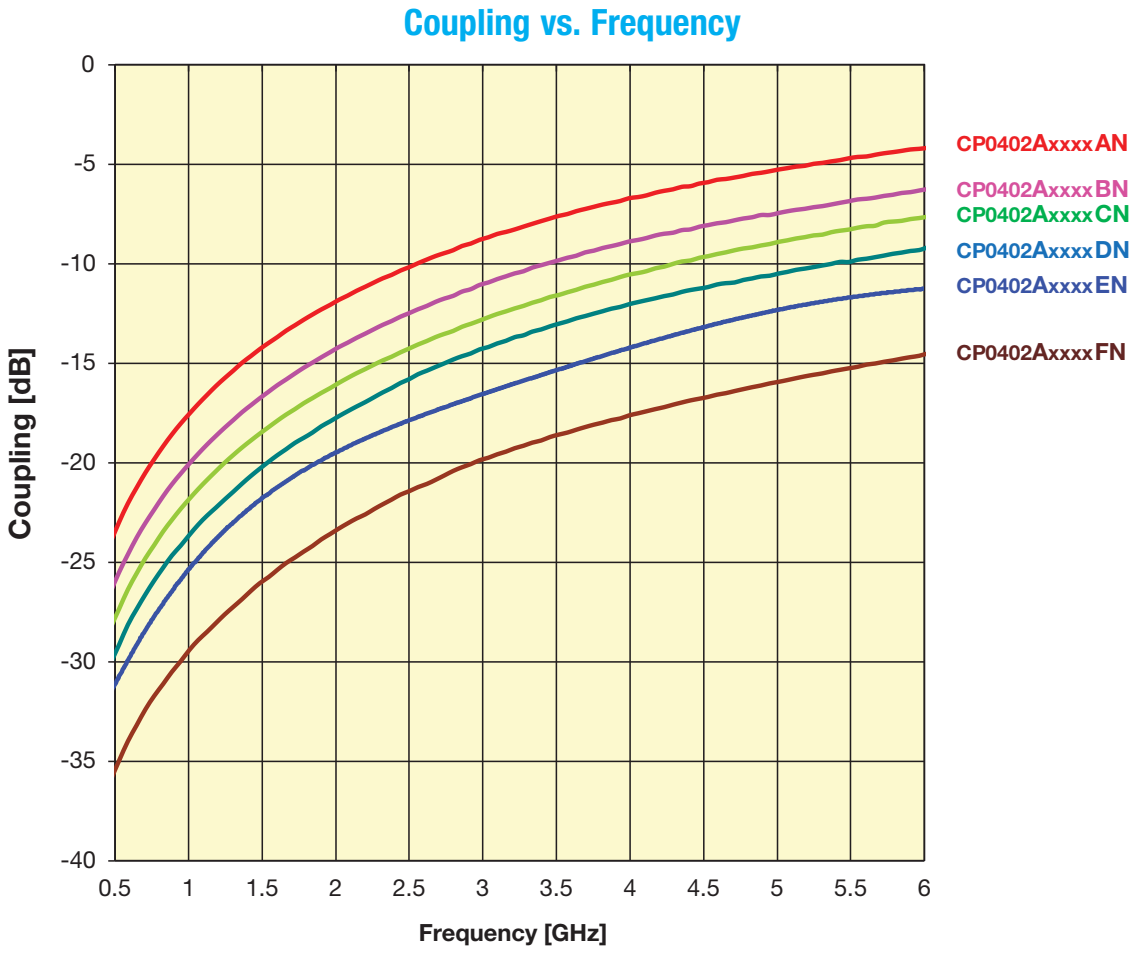
Recommended Pad Layout Dimensions mm (inches)



*The recommended distance to the PCB Ground Plane is 0.254mm (0.010")

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CP0402 - TYPE SELECTION CHART



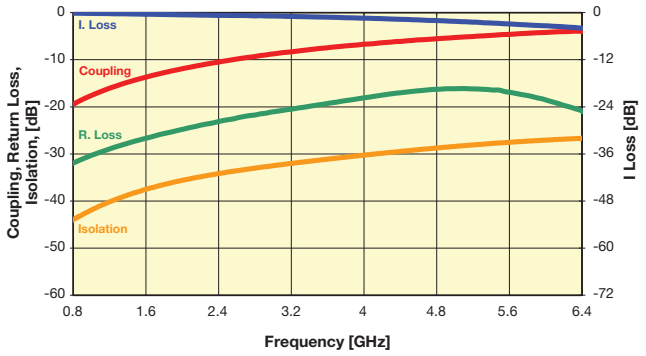
Intermediate coupling factors are readily available.
Please contact factory.

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Coupler P/N CP0402AxxxxAN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0402A0836AN	824 - 849	19.10	0.25	32	21
	CP0402A0881AN	869 - 894	18.60	0.25	31	
GSM	CP0402A0902AN	890 - 915	18.50	0.25	31	
	CP0402A0947AN	935 - 960	18.00	0.25	31	
E-GSM	CP0402A0897AN	880 ÷915	18.50	0.25	31	
	CP0402A0942AN	925 ÷960	18.00	0.25	31	
PDC	CP0402A1441AN	1429 - 1453	14.50	0.40	28	
PCN	CP0402A1747AN	1710 - 1785	13.00	0.50	26	
	CP0402A1842AN	1805 - 1880	12.50	0.50	26	
PCS	CP0402A1880AN	1850 - 1910	12.30	0.50	25	
	CP0402A1960AN	1930 - 1990	12.00	0.50	25	
PHP	CP0402A1907AN	1895 - 1920	12.30	0.50	25	
DECT	CP0402A1890AN	1880 - 1900	12.30	0.50	25	
Wireless LAN	CP0402A2442AN	2400 - 2484	10.30	0.70	23	
WiFi	CP0402A3500AN	3450 - 3550	7.60	1.30	15	14
	CP0402A5000AN	4950 - 5050	5.00	1.50	15	13
	CP0402A5500AN	5450 - 5550	4.60	1.50	14	13
	CP0402A6000AN	5950 - 6050	4.00	1.50	14	13

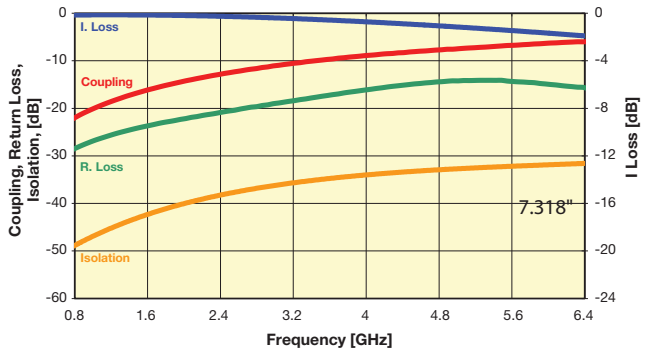
CP0402AxxxxANTR



Coupler P/N CP0402AxxxxBN

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0402A0836BN	824 - 849	22.00	0.20	28	27
	CP0402A0881BN	869 - 894	21.70	0.20	28	
GSM	CP0402A0902BN	890 - 915	21.50	0.20	28	
	CP0402A0947BN	935 - 960	21.00	0.25	27	
E-GSM	CP0402A0897BN	880 ÷915	21.50	0.20	28	
	CP0402A0942BN	925 ÷960	21.00	0.25	27	
PDC	CP0402A1441BN	1429 - 1453	17.50	0.25	24	
PCN	CP0402A1747BN	1710 - 1785	16.00	0.30	23	
	CP0402A1842BN	1805 - 1880	15.50	0.35	23	
PCS	CP0402A1880BN	1850 - 1910	15.50	0.35	23	
	CP0402A1960BN	1930 - 1990	15.00	0.35	22	
PHP	CP0402A1907BN	1895 - 1920	15.50	0.35	23	
DECT	CP0402A1890BN	1880 - 1900	15.50	0.35	23	
Wireless LAN	CP0402A2442BN	2400 - 2484	13.30	0.40	21	
WiFi	CP0402A3500BN	3450 - 3550	9.40	0.80	18	14
	CP0402A5000BN	4950 - 5050	7.40	1.20	14	13
	CP0402A5500BN	5450 - 5550	6.70	1.60	14	13
	CP0402A6000BN	5950 - 6050	6.10	2.00	14	13

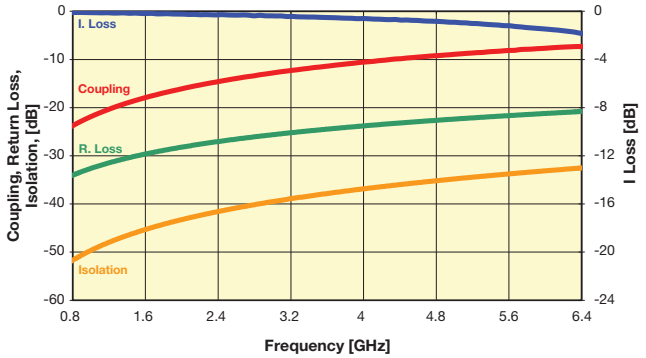
CP0402AxxxxBNTR



Coupler P/N CP0402AxxxxCN

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0402A0836CN	824 - 849	23.60	0.20	33	22
	CP0402A0881CN	869 - 894	23.00	0.20	33	
GSM	CP0402A0902CN	890 - 915	23.00	0.20	26	
	CP0402A0947CN	935 - 960	22.50	0.20	33	
E-GSM	CP0402A0897CN	880 ÷915	23.00	0.20	25	
	CP0402A0942CN	925 ÷960	22.50	0.20	32	
PDC	CP0402A1441CN	1429 - 1453	19.00	0.25	31	
PCN	CP0402A1747CN	1710 - 1785	17.20	0.25	30	19
	CP0402A1842CN	1805 - 1880	17.00	0.25	30	
PCS	CP0402A1880CN	1850 - 1910	16.80	0.25	30	
	CP0402A1960CN	1930 - 1990	16.50	0.25	29	
PHP	CP0402A1907CN	1895 - 1920	16.80	0.25	29	
DECT	CP0402A1890CN	1880 - 1900	16.80	0.25	30	
Wireless LAN	CP0402A2442CN	2400 - 2484	14.70	0.45	28	
WiFi	CP0402A3500CN	3450 - 3550	10.97	0.67	23	17
	CP0402A5000CN	4950 - 5050	8.00	1.00	21	16
	CP0402A5500CN	5450 - 5550	7.50	1.10	21	15
	CP0402A6000CN	5950 - 6050	7.10	1.30	23	15

CP0402AxxxxCNTR



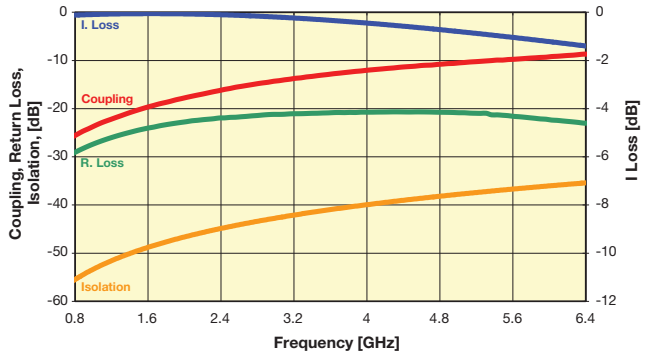
Important: Couplers can be used at any frequency within the indicated range.

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Coupler P/N CP0402AxxxxDN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0402A0836DN	824 - 849	25.20	0.20	29	20
	CP0402A0881DN	869 - 894	24.80	0.20	28	
GSM	CP0402A0902DN	890 - 915	24.70	0.20	28	
	CP0402A0947DN	935 - 960	24.10	0.20	28	
E-GSM	CP0402A0897DN	880 ÷915	24.70	0.20	28	
	CP0402A0942DN	925 ÷960	24.10	0.20	28	
PDC	CP0402A1441DN	1429 - 1453	20.50	0.20	25	
PCN	CP0402A1747DN	1710 - 1785	19.00	0.20	24	18
	CP0402A1842DN	1805 - 1880	18.50	0.25	23	
PCS	CP0402A1880DN	1850 - 1910	18.20	0.25	23	
	CP0402A1960DN	1930 - 1990	18.00	0.25	23	
PHP	CP0402A1907DN	1895 - 1920	18.10	0.25	23	
DECT	CP0402A1890DN	1880 - 1900	18.20	0.25	23	
Wireless LAN	CP0402A2442DN	2400 - 2484	16.00	0.35	22	
WiFi	CP0402A3500DN	3450 - 3550	12.50	0.46	21	17
	CP0402A5000DN	4950 - 5050	10.00	0.65	21	16
	CP0402A5500DN	5450 - 5550	9.60	0.76	20	15
	CP0402A6000DN	5950 - 6050	9.10	0.84	20	15

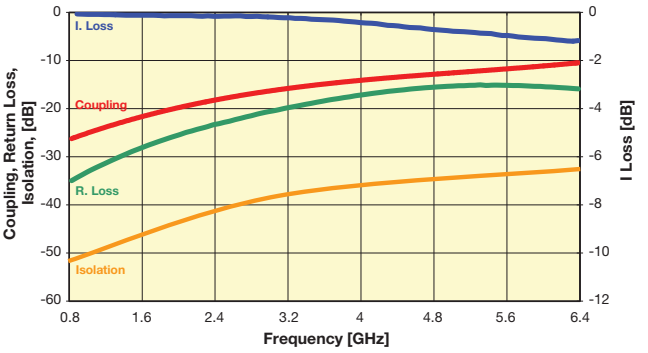
CP0402AxxxxDNTR



Coupler P/N CP0402AxxxxEN

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0402A0836EN	824 - 849	27.20	0.20	35	25
	CP0402A0881EN	869 - 894	26.80	0.20	34	
GSM	CP0402A0902EN	890 - 915	26.50	0.20	34	
	CP0402A0947EN	935 - 960	26.00	0.20	34	
E-GSM	CP0402A0897EN	880 ÷915	26.50	0.20	34	
	CP0402A0942EN	925 ÷960	26.00	0.20	34	
PDC	CP0402A1441EN	1429 - 1453	22.30	0.25	29	
PCN	CP0402A1747EN	1710 - 1785	20.50	0.25	27	23
	CP0402A1842EN	1805 - 1880	20.30	0.25	26	
PCS	CP0402A1880EN	1850 - 1910	20.00	0.25	26	
	CP0402A1960EN	1930 - 1990	20.00	0.25	26	
PHP	CP0402A1907EN	1895 - 1920	20.00	0.25	26	
DECT	CP0402A1890EN	1880 - 1900	20.00	0.25	26	
Wireless LAN	CP0402A2442EN	2400 - 2484	18.00	0.35	23	
WiFi	CP0402A3500EN	3450 - 3550	15.00	0.37	20	16
	CP0402A5000EN	4950 - 5050	12.50	0.50	18	13
	CP0402A5500EN	5450 - 5550	11.50	0.65	16	13
	CP0402A6000EN	5950 - 6050	11.10	0.70	15	13

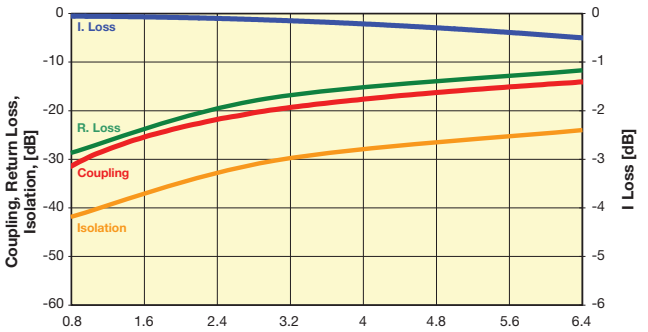
CP0402AxxxxENTR



Coupler P/N CP0402AxxxxFN

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0402A0836FN	824 - 849	31.00	0.20	29.10	11
	CP0402A0881FN	869 - 894	30.70	0.20	28.60	
GSM	CP0402A0902FN	890 - 915	30.60	0.20	28.50	
	CP0402A0947FN	935 - 960	30.00	0.20	28.10	
E-GSM	CP0402A0897FN	880 ÷915	30.60	0.20	28.50	
	CP0402A0942FN	925 ÷960	30.00	0.20	28.10	
PDC	CP0402A1441FN	1429 - 1453	26.50	0.20	25.00	
PCN	CP0402A1747FN	1710 - 1785	25.00	0.20	23.80	
	CP.0402A1842FN	1805 - 1880	24.50	0.20	23.60	
PCS	CP0402A1880FN	1850 - 1910	24.20	0.20	23.50	
	CP0402A1960FN	1930 - 1990	24.00	0.20	23.30	
PHP	CP0402A1907FN	1895 - 1920	24.20	0.20	23.40	
DECT	CP0402A1890FN	1880 - 1900	24.20	0.20	23.50	
Wireless LAN	CP0402A2442FN	2400 - 2484	22.00	0.25	22.60	
WiFi	CP0402A3500FN	3450 - 3550	18.00	0.27	22.00	9
	CP0402A5000FN	4950 - 5050	15.70	0.30	23.01	8
	CP0402A5500FN	5450 - 5550	15.20	0.30	20.36	7.5
	CP0402A6000FN	5950 - 6050	14.50	0.30	18.94	7.5

CP0402AxxxxFNTR



Important: Couplers can be used at any frequency within the indicated range.

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GENERAL DESCRIPTION
ITF (Integrated Thin-Film) TECHNOLOGY

The ITF LGA Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

APPLICATIONS

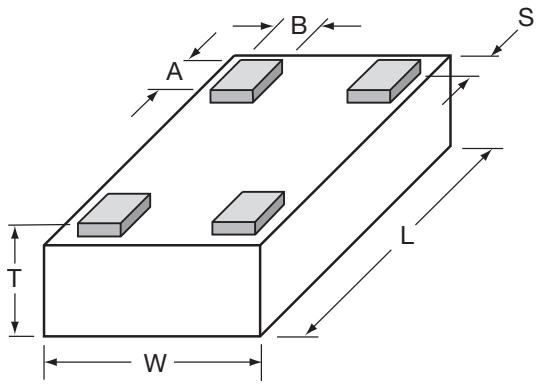
- Mobile Communications
- Satellite TV Receivers
- GPS
- Vehicle Location Systems
- Wireless LAN's

FEATURES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation
- Operating/Storage Temp -40°C to +85°C
- Power Rating 3W RF Cont

DIMENSIONS: (Bottom View)

millimeters (inches)



L	1.60±0.10 (0.063±0.004)	A	0.25±0.05 (0.010±0.002)
W	0.84±0.10 (0.033±0.004)	B	0.20±0.05 (0.008±0.002)
T	0.60±0.10 (0.024±0.004)	S	0.05±0.05 (0.002±0.002)

HOW TO ORDER

CP	0603	X	****	X	N	TR
Style Directional Coupler	**Size** 0603	**Type**	**Frequency** (MHz)	**Sub Type**	**Termination Code** L = LGA Sn90, Pb10 **N = LGA Sn100	**Packaging Code** TR = Tape and Reel

**RoHS compliant

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

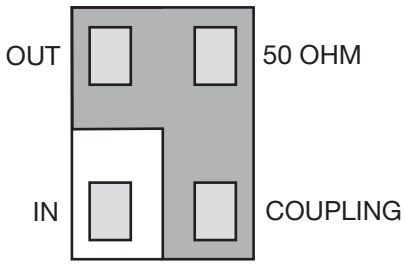
- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I_R, 4 hours

TERMINATION

Sn90Pb10 or Lead-Free Sn100 Nickel/Solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

TERMINALS (Top View)

Not RoHS Compliant

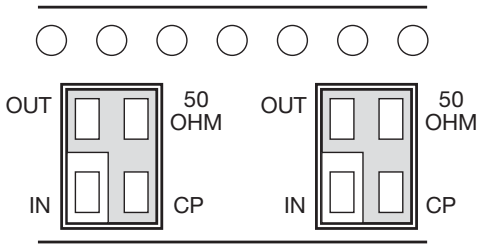


LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

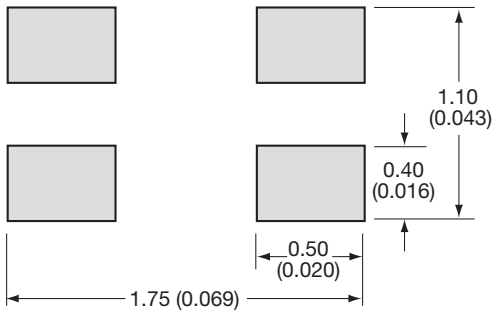
RoHS COMPLIANT

For RoHS compliant products, please select correct termination style.

ORIENTATION IN TAPE



Recommended Pad Layout Dimensions mm (inches)

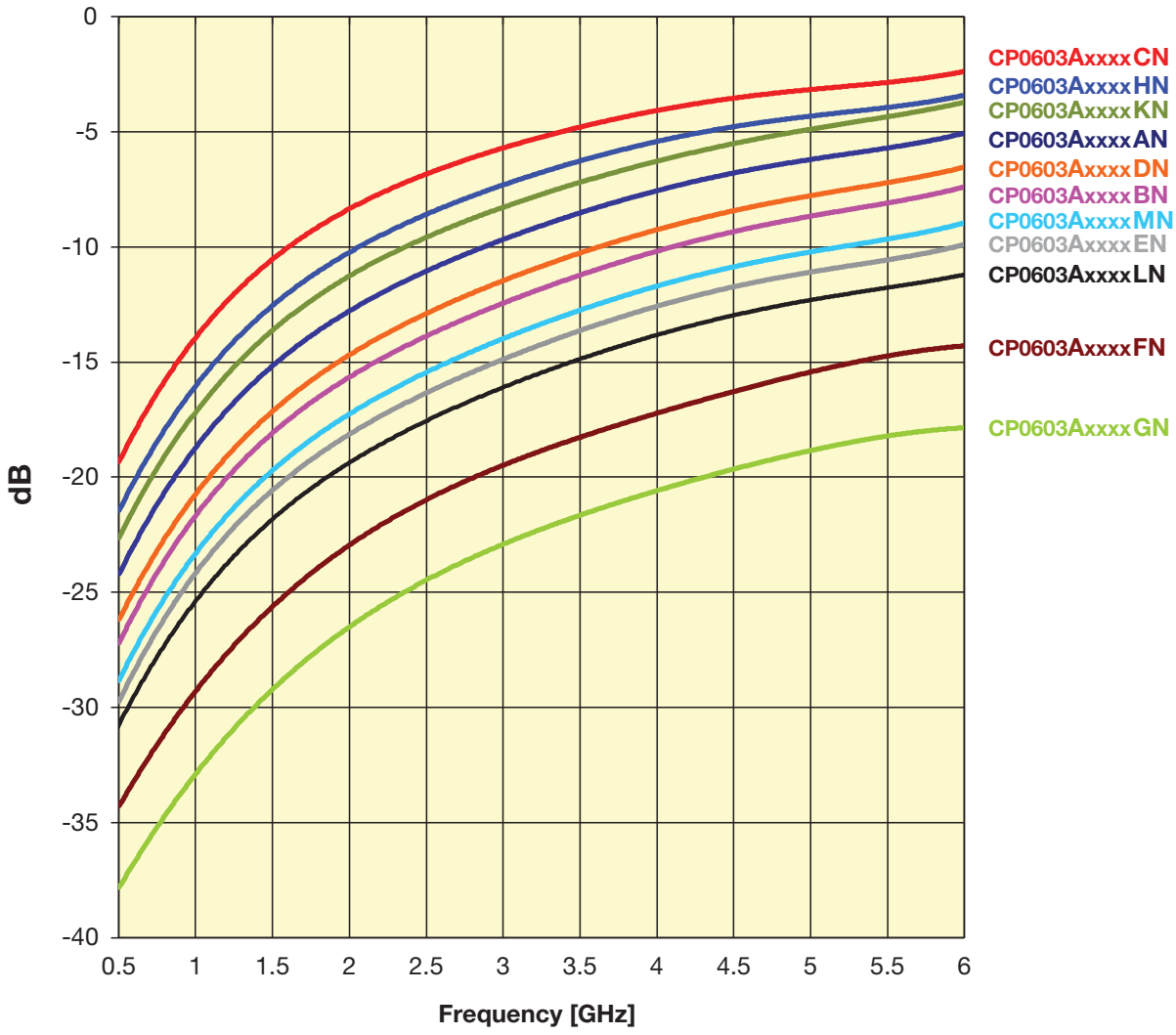


*The recommended distance to the PCB Ground Plane is 0.254mm (0.010")

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CP0603 - TYPE SELECTION CHART

Coupling vs. Frequency



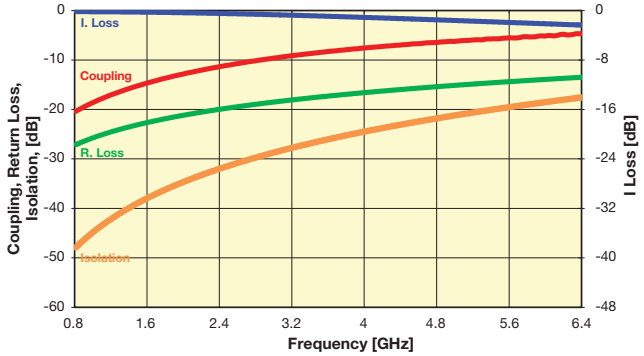
Intermediate coupling factors are readily available.
Please contact factory.

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Coupler P/N CP0603AxxxxAN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836AN	824 - 849	20.0	0.25	28	22
	CP0603A0881AN	869 - 894	19.7	0.25	28	
GSM	CP0603A0902AN	890 - 915	19.4	0.25	27	
	CP0603A0947AN	935 - 960	19.0	0.25	27	
E-GSM	CP0603A0897AN	880 - 915	19.4	0.25	28	
	CP0603A0942AN	925 - 960	19.0	0.25	27	
PDC	CP0603A1441AN	1429 - 1453	15.5	0.40	24	
PCN	CP0603A1747AN	1710 - 1785	14.0	0.50	22	
	CP0603A1842AN	1805 - 1880	13.5	0.50	22	
PCS	CP0603A1880AN	1850 - 1910	13.2	0.50	22	
	CP0603A1960AN	1930 - 1990	13.0	0.55	21	
PHP	CP0603A1907AN	1895 - 1920	13.2	0.50	22	
DECT	CP0603A1890AN	1880 - 1900	13.2	0.50	22	
Wireless LAN	CP0603A2442AN	2400 - 2484	11.5	0.75	20	
WiFi	CP0603A3500AN	3450 - 3550	8.6	1.3	17	20
	CP0603A5000AN	4950 - 5050	6.1	2.2	13	14
	CP0603A5500AN	5450 - 5550	5.5	2.5	15	13
	CP0603A6000AN	5950 - 6050	5	3	11.6	13

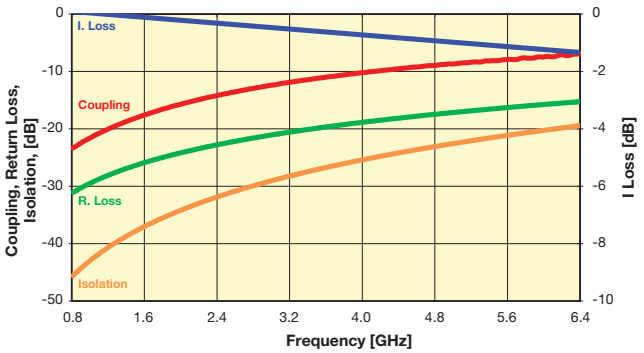
CP0603AxxxxANTR



Coupler P/N CP0603AxxxxBN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836BN	824 - 849	23.0	0.20	31	24
	CP0603A0881BN	869 - 894	22.7	0.20	31	
GSM	CP0603A0902BN	890 - 915	22.5	0.20	31	
	CP0603A0947BN	935 - 960	22.0	0.20	30	
E-GSM	CP0603A0897BN	880 - 915	22.5	0.20	31	
	CP0603A0942BN	925 - 960	22.0	0.20	30	
PDC	CP0603A1441BN	1429 - 1453	18.5	0.25	27	
PCN	CP0603A1747BN	1710 - 1785	17.0	0.25	25	21
	CP0603A1842BN	1805 - 1880	16.4	0.25	25	
PCS	CP0603A1880BN	1850 - 1910	16.2	0.25	25	
	CP0603A1960BN	1930 - 1990	16.0	0.25	24	
PHP	CP0603A1907BN	1895 - 1920	16.1	0.25	25	
DECT	CP0603A1890BN	1880 - 1900	16.2	0.25	25	
Wireless LAN	CP0603A2442BN	2400 - 2484	14.2	0.35	23	
WiFi	CP0603A3500BN	3450 - 3550	11.2	0.6	20	20
	CP0603A5000BN	4950 - 5050	8.4	1.1	16.7	17
	CP0603A5500BN	5450 - 5550	7.8	1.4	15.7	16
	CP0603A6000BN	5950 - 6050	7.2	1.6	15	15

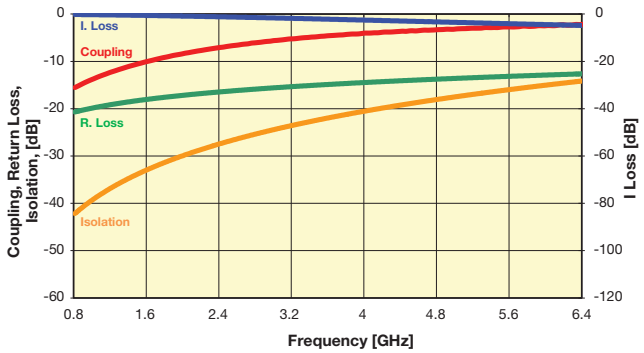
CP0603AxxxxBNTR



Coupler P/N CP0603AxxxxCN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836CN	824 - 849	15.2	0.35	23	23
	CP0603A0881CN	869 - 894	15.0	0.35	23	
GSM	CP0603A0902CN	890 - 915	14.7	0.35	23	
	CP0603A0947CN	935 - 960	14.3	0.40	22	
E-GSM	CP0603A0897CN	880 - 915	14.7	0.35	23	
	CP0603A0942CN	925 - 960	14.3	0.40	22	
PDC	CP0603A1441CN	1429 - 1453	11.0	0.70	19	
PCN	CP0603A1747CN	1710 - 1785	9.5	0.80	18	21
	CP0603A1842CN	1805 - 1880	9.0	0.90	17	
PCS	CP0603A1880CN	1850 - 1910	8.8	0.90	17	
	CP0603A1960CN	1930 - 1990	8.5	1.00	17	
PHP	CP0603A1907CN	1895 - 1920	8.8	0.90	17	
DECT	CP0603A1890CN	1880 - 1900	8.8	0.90	17	
Wireless LAN	CP0603A2442CN	2400 - 2484	7.0	1.40	15	
WiFi	CP0603A3500CN	3450 - 3550	4.8	2.0	23	20
	CP0603A5000CN	4950 - 5050	3.0	3.6	21	17
	CP0603A5500CN	5450 - 5550	3.0	4.0	20.6	16
	CP0603A6000CN	5950 - 6050	2.5	4.5	20.5	16

CP0603AxxxxCNTR



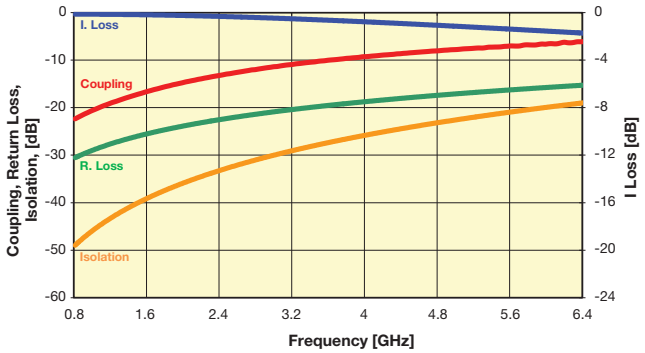
Important: Couplers can be used at any frequency within the indicated range.

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Coupler P/N CP0603AxxxxDN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836DN	824 - 849	22.0	0.25	31	30
	CP0603A0881DN	869 - 894	21.8	0.25	30	
GSM	CP0603A0902DN	890 - 915	21.3	0.25	30	
	CP0603A0947DN	935 - 960	21.0	0.30	30	
E-GSM	CP0603A0897DN	880 - 915	21.3	0.25	30	
	CP0603A0942DN	925 - 960	21.0	0.30	30	
PDC	CP0603A1441DN	1429 - 1453	17.7	0.40	27	
PCN	CP0603A1747DN	1710 - 1785	16.0	0.40	25	25
	CP0603A1842DN	1805 - 1880	15.4	0.40	25	
PCS	CP0603A1880DN	1850 - 1910	15.2	0.40	24	
	CP0603A1960DN	1930 - 1990	15.0	0.40	24	
PHP	CP0603A1907DN	1895 - 1920	15.2	0.40	24	
DECT	CP0603A1890DN	1880 - 1900	15.2	0.40	24	
Wireless LAN	CP0603A2442DN	2400 - 2484	13.3	0.55	22	
WiFi	CP0603A3500DN	3450 - 3550	10.1	0.66	25.3	20
	CP0603A5000DN	4950 - 5050	7.8	1.17	21.1	18
	CP0603A5500DN	5450 - 5550	6.8	1.39	19.9	18
	CP0603A6000DN	5950 - 6050	6.3	1.64	18.8	17

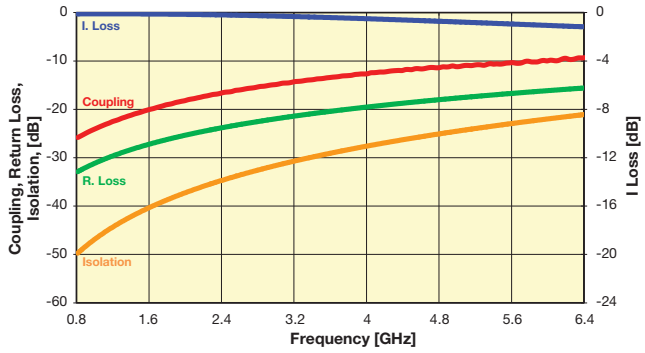
CP0603AxxxxDNTR



Coupler P/N CP603AxxxxEN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836EN	824 - 849	25.8	0.20	32	21
	CP0603A0881EN	869 - 894	25.3	0.20	32	
GSM	CP0603A0902EN	890 - 915	25.0	0.20	32	
	CP0603A0947EN	935 - 960	24.7	0.20	31	
E-GSM	CP0603A0897EN	880 - 915	26.0	0.20	32	
	CP0603A0942EN	925 - 960	24.7	0.20	31	
PDC	CP0603A1441EN	1429 - 1453	22.0	0.25	28	
PCN	CP0603A1747EN	1710 - 1785	19.5	0.30	26	
	CP0603A1842EN	1805 - 1880	19.0	0.30	26	
PCS	CP0603A1880EN	1850 - 1910	18.8	0.30	26	
	CP0603A1960EN	1930 - 1990	18.5	0.30	26	
PHP	CP0603A1907EN	1895 - 1920	18.7	0.30	26	
DECT	CP0603A1890EN	1880 - 1900	18.8	0.30	26	
Wireless LAN	CP0603A2442EN	2400 - 2484	17.0	0.40	24	
WiFi	CP0603A3500EN	3450 - 3550	13.2	0.5	18	20
	CP0603A5000EN	4950 - 5050	10.7	0.9	13	16
	CP0603A5500EN	5450 - 5550	10.2	1.2	12	15
	CP0603A6000EN	5950 - 6050	9.7	1.4	12	14

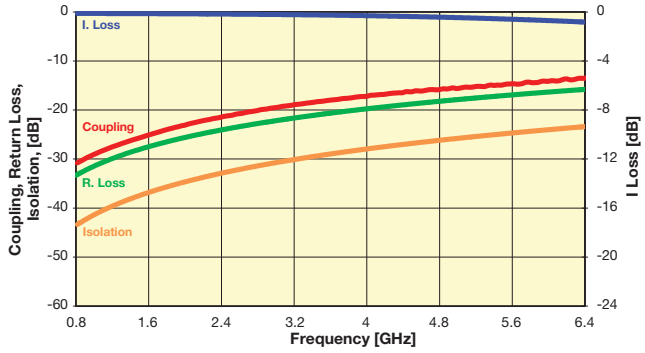
CP0603AxxxxENTR



Coupler P/N CP603AxxxxFN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836FN	824 - 849	31.2	0.20	32	12
	CP0603A0881FN	869 - 894	30.8	0.20	32	
GSM	CP0603A0902FN	890 - 915	30.5	0.20	30	
	CP0603A0947FN	935 - 960	30.2	0.20	30	
E-GSM	CP0603A0897FN	880 - 915	30.5	0.20	30	
	CP0603A0942FN	925 - 960	30.2	0.20	30	
PDC	CP0603A1441FN	1429 - 1453	27.0	0.25	28	
PCN	CP0603A1747FN	1710 - 1785	25.0	0.25	27	
	CP0603A1842FN	1805 - 1880	26.5	0.25	27	
PCS	CP0603A1880FN	1850 - 1910	24.3	0.25	27	
	CP0603A1960FN	1930 - 1990	24.0	0.25	28	
PHP	CP0603A1907FN	1895 - 1920	24.2	0.25	27	
DECT	CP0603A1890FN	1880 - 1900	24.2	0.25	27	
Wireless LAN	CP0603A2442FN	2400 - 2484	21.5	0.25	25	
WiFi	CP0603A3500FN	3450 - 3550	17.8	0.33	20.0	13
	CP0603A5000FN	4950 - 5050	15.4	0.62	14.86	12
	CP0603A5500FN	5450 - 5550	14.8	0.86	13.58	12
	CP0603A6000FN	5950 - 6050	14.3	1.02	12.58	11

CP0603AxxxxFNTR



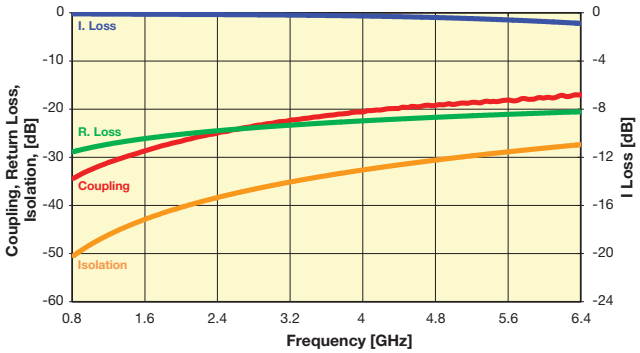
Important: Couplers can be used at any frequency within the indicated range.

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Coupler P/N CP603AxxxxGN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836GN	824 - 849	34.2	0.20	30	13
	CP0603A0881GN	869 - 894	33.8	0.20	30	
GSM	CP0603A0902GN	890 - 915	33.6	0.20	30	
	CP0603A0947GN	935 - 960	33.2	0.20	29	
E-GSM	CP0603A0897GN	880 - 915	33.6	0.20	30	
	CP0603A0942GN	925 - 960	33.2	0.20	29	
PDC	CP0603A1441GN	1429 - 1453	30.0	0.25	25	
PCN	CP0603A1747GN	1710 - 1785	28.5	0.25	24	
	CP0603A1842GN	1805 - 1880	28.0	0.25	24	
PCS	CP0603A1880GN	1850 - 1910	27.7	0.25	24	
	CP0603A1960GN	1930 - 1990	27.5	0.25	23	
PHP	CP0603A1907GN	1895 - 1920	27.6	0.25	24	
DECT	CP0603A1890GN	1880 - 1900	27.7	0.25	24	
Wireless LAN	CP0603A2442GN	2400 - 2484	25.5	0.25	22	
WiFi	CP0603A3500GN	3450 - 3550	21.6	0.31	20	13
	CP0603A5000GN	4950 - 5050	19	0.39	16	12
	CP0603A5500GN	5450 - 5550	18.5	0.57	15	12
	CP0603A6000GN	5950 - 6050	18.0	0.74	14	11

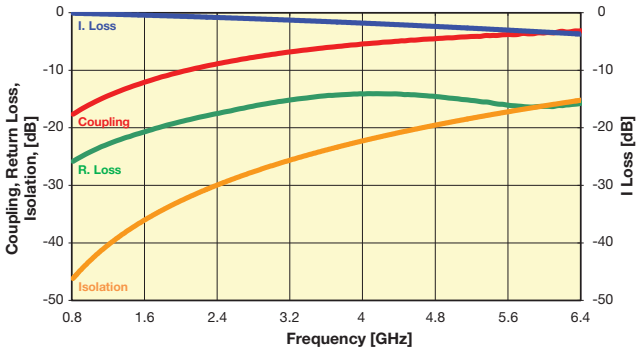
CP0603AxxxxGNTR



Coupler P/N CP603AxxxxHN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836HN	824 - 849	17.3	0.30	26	26
	CP0603A0881HN	869 - 894	17.0	0.30	25	
GSM	CP0603A0902HN	890 - 915	16.7	0.30	25	
	CP0603A0947HN	935 - 960	16.3	0.35	25	
E-GSM	CP0603A0897HN	880 - 915	17.0	0.35	25	
	CP0603A0942HN	925 - 960	16.3	0.35	25	
PDC	CP0603A1441HN	1429 - 1453	13.0	0.55	22	
PCN	CP0603A1747HN	1710 - 1785	11.4	0.75	20	24
	CP0603A1842HN	1805 - 1880	11.0	0.75	20	
PCS	CP0603A1880HN	1850 - 1910	10.8	0.75	19	
	CP0603A1960HN	1930 - 1990	10.5	0.75	19	
PHP	CP0603A1907HN	1895 - 1920	10.7	0.75	19	
DECT	CP0603A1890HN	1880 - 1900	10.8	0.75	19	
Wireless LAN	CP0603A2442HN	2400 - 2484	8.8	1.00	17	
WiFi	CP0603A3500HN	3450 - 3550	5.9	1.48	25	21
	CP0603A5000HN	4950 - 5050	4.4	2.59	22	18
	CP0603A5500HN	5450 - 5550	4	2.95	22	17
	CP0603A6000HN	5950 - 6050	3.5	3.37	21	17

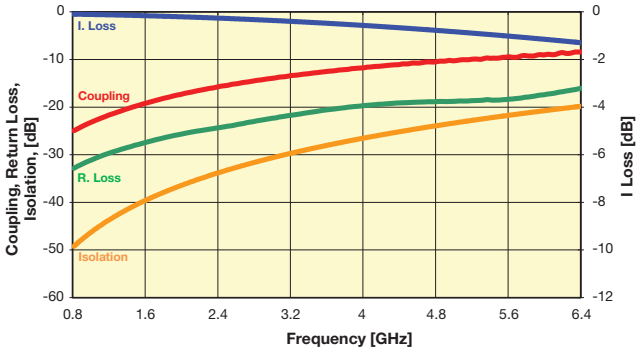
CP0603AxxxxHNTR



Coupler P/N CP603AxxxxMN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836MN	824 - 849	24.2	0.20	33	23
	CP0603A0881MN	869 - 894	23.8	0.20	32	
GSM	CP0603A0902MN	890 - 915	23.4	0.20	32	
	CP0603A0947MN	935 - 960	23.2	0.20	32	
E-GSM	CP0603A0897MN	880 - 915	23.4	0.20	32	
	CP0603A0942MN	925 - 960	23.2	0.20	32	
PDC	CP0603A1441MN	1429 - 1453	20.0	0.25	28	
PCN	CP0603A1747MN	1710 - 1785	18.4	0.25	27	20
	CP0603A1842MN	1805 - 1880	18.0	0.25	26	
PCS	CP0603A1880MN	1850 - 1910	17.8	0.25	26	
	CP0603A1960MN	1930 - 1990	17.5	0.25	26	
PHP	CP0603A1907MN	1895 - 1920	17.7	0.25	26	
DECT	CP0603A1890MN	1880 - 1900	17.8	0.25	26	
Wireless LAN	CP0603A2442MN	2400 - 2484	15.6	0.35	24	
WiFi	CP0603A3500MN	3450 - 3550	12.8	0.58	18	20
	CP0603A5000MN	4950 - 5050	10.2	1.0	15	16
	CP0603A5500MN	5450 - 5550	9.7	1.2	15	14
	CP0603A6000MN	5950 - 6050	8.9	1.5	13.5	9

CP0603AxxxxMNTR



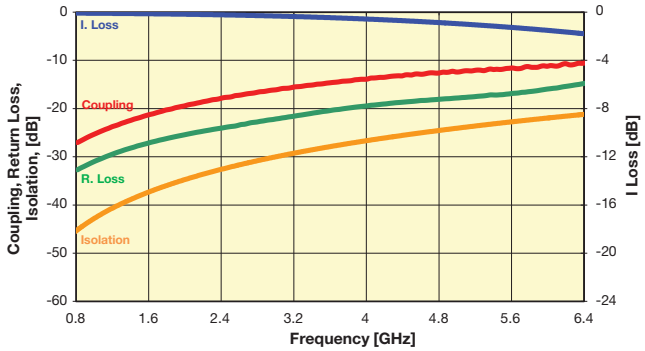
Important: Couplers can be used at any frequency within the indicated range.

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Coupler P/N CP603AxxxxLN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836LN	824 - 849	26.89	0.08	32.5	18
	CP0603A0881LN	869 - 894	26.55	0.08	32.2	
GSM	CP0603A0902LN	890 - 915	26.2	0.09	31.9	
	CP0603A0947LN	935 - 960	25.87	0.09	31.5	
E-GSM	CP0603A0897LN	880 - 915	26.2	0.09	31.9	
	CP0603A0942LN	925 - 960	25.87	0.09	31.5	
PDC	CP0603A1441LN	1429 - 1453	22.31	0.12	28.1	17.5
PCN	CP0603A1747LN	1710 - 1785	20.51	0.15	26.4	16.5
	CP0603A1842LN	1805 - 1880	20.03	0.15	26	
PCS	CP0603A1880LN	1850 - 1910	19.87	0.16	26	
	CP0603A1960LN	1930 - 1990	19.57	0.17	25.5	
PHP	CP0603A1907LN	1895 - 1920	19.77	0.16	25.7	
DECT	CP0603A1890LN	1880 - 1900	19.87	0.16	25.8	
Wireless LAN	CP0603A2442LN	2400 - 2484	17.7	0.22	23.9	
WiFi	CP0603A3500LN	3450 - 3550	14.85	0.56	20.6	16
	CP0603A5000LN	4950 - 5050	12.4	0.95	17.8	11
	CP0603A5500LN	5450 - 5550	11.83	1.2	17.1	9
	CP0603A6000LN	5950 - 6050	11.08	1.33	15.9	

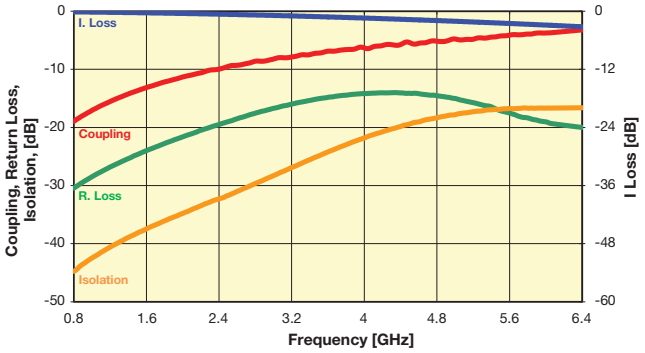
CP0603AxxxxLNTR



Coupler P/N CP603AxxxxKN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0603A0836KN	824 - 849	18.5	0.14	30	26
	CP0603A0881KN	869 - 894	18.1	0.14	29	
GSM	CP0603A0902KN	890 - 915	17.6	0.15	29	25
	CP0603A0947KN	935 - 960	17.3	0.15	29	
E-GSM	CP0603A0897KN	880 - 915	17.9	0.147	29	
	CP0603A0942KN	925 - 960	17.6	0.15	29	
PDC	CP0603A1441KN	1429 - 1453	14	0.27	25	
PCN	CP0603A1747KN	1710 - 1785	12.4	0.36	23	24
	CP0603A1842KN	1805 - 1880	12	0.39	22.5	
PCS	CP0603A1880KN	1850 - 1910	11.8	0.4	22	
	CP0603A1960KN	1930 - 1990	11.4	0.44	22	
PHP	CP0603A1907KN	1895 - 1920	11.5	0.43	22	
DECT	CP0603A1890KN	1880 - 1900	11.7	0.41	22	
Wireless LAN	CP0603A2442KN	2400 - 2484	9.7	0.6	19	23
WiFi	CP0603A3500KN	3450 - 3550	7.2	1.15	15	19
	CP0603A5000KN	4950 - 5050	4.7	2.15	15	13
	CP0603A5500KN	5450 - 5550	4.2	2.5	17	
	CP0603A6000KN	5950 - 6050	3.7	2.8	19	

CP0603AxxxxKNTR



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GENERAL DESCRIPTION

These jigs are designed for testing the CP0402 and CP0603 High Directivity Couplers using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50Ω microstrips as conducting lines and a bottom ground plane located at a distance of 0.254mm (0.010") from the microstrips.

The substrate used is Neltec's NH9338ST0254C1BC.

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841.

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50Ω SMA termination.

MEASUREMENT PROCEDURE

When measuring a component, it can be either soldered or pressed using a non-metallic stick until all four ports touch the appropriate pads. Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig terminal connected to port 2. Follow the VNA's instruction manual and use the calibration jig to perform a full 2-Port calibration in the required bandwidths.

Place the coupler on the measurement jig as follows:

Input (Coupler) ➜ Connector 1 (Jig)
Output (Coupler) ➜ Connector 2 (Jig)
Termination (Coupler) ➜ Connector 3 (Jig)
Coupling (Coupler) ➜ Connector 4 (Jig)

To measure I. Loss connect:

Connector 1 (Jig) ➜ Port 1 (VNA)
Connector 2 (Jig) ➜ Port 2 (VNA)
Connector 3 (Jig) ➜ 50Ω
Connector 4 (Jig) ➜ 50Ω

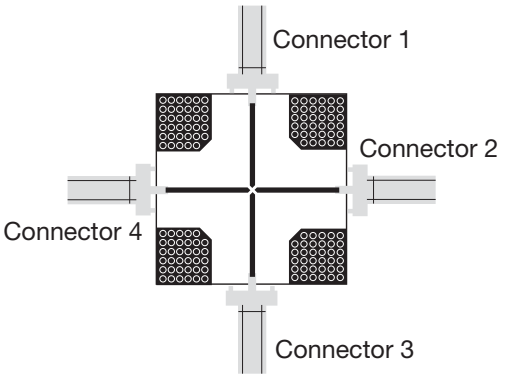
To measure R. Loss and Coupling connect:

Connector 1 (Jig) ➜ Port 1 (VNA)
Connector 2 (Jig) ➜ 50Ω
Connector 3 (Jig) ➜ 50Ω
Connector 4 (Jig) ➜ Port 2 (VNA)

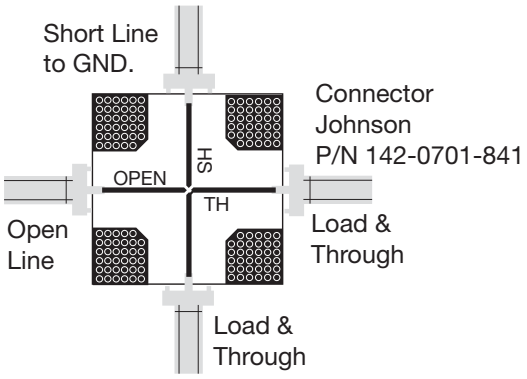
To measure Isolation connect:

Connector 1 (Jig) ➜ 50Ω
Connector 2 (Jig) ➜ Port 1 (VNA)
Connector 3 (Jig) ➜ 50Ω
Connector 4 (Jig) ➜ Port 2 (VNA)

Measurement Jig



Calibration Jig



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GENERAL DESCRIPTION

ITF (Integrated Thin-Film) TECHNOLOGY

The CP0402P Series High Directivity, Tight Coupling Tolerance LGA Coupler is based on the proprietary RFAP Thin-Film multilayer technology. The technology provides a miniature part with excellent high frequency performance and ugged construction for reliable automatic assembly.

The ITF Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

APPLICATIONS

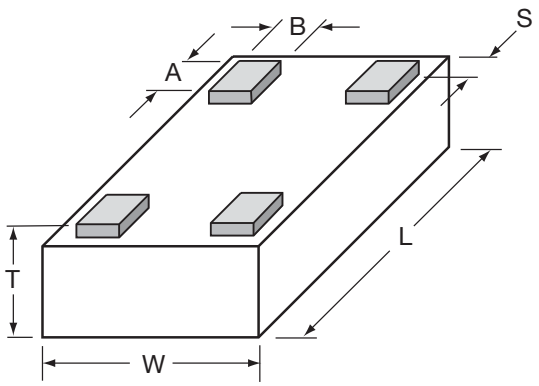
- Wireless communications
- Wireless LAN's
- GPS
- WiMAX

LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation
- Power Rating 3W RF Continuous

DIMENSIONS: (Bottom View)

millimeters (inches)



L	1.00±0.05 (0.040±0.002)
W	0.58±0.04 (0.023±0.002)
T	0.35±0.05 (0.014±0.002)

A	0.20±0.05 (0.008±0.002)
B	0.18±0.05 (0.007±0.002)
S	0.05±0.05 (0.002±0.002)

HOW TO ORDER

CP	0402	P	XXXX	X	N	TR
Style	**Size** 0402	**Type** ±0.5dB Tight Tolerance	**Frequency** MHz	**Sub-Type**	**Termination** LGA Lead-Free	**Taped & Reeled**

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

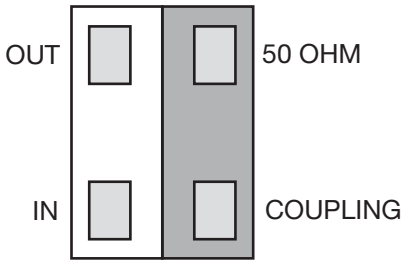
RoHS COMPLIANT

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I_R, 4 hours

TERMINALS (Top View)



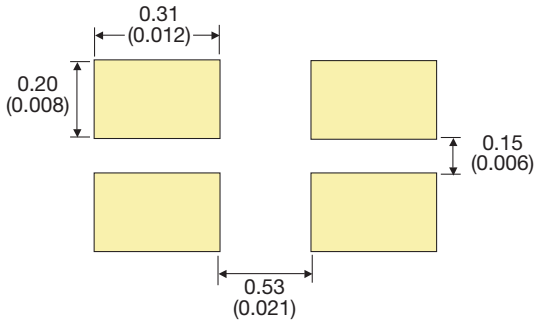
TERMINATION

Nickel/Lead-Free Solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

OPERATING TEMPERATURE:

-40°C to +85°C

Recommended Pad Layout Dimensions mm (inches)

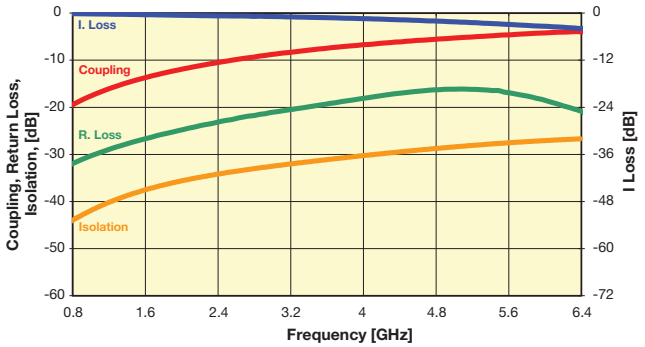


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Coupler P/N CP0402PxxxxAN

Application	P/N Examples*	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0402P0836AN	824 - 849	19.10±0.5	0.25	32	21
	CP0402P0881AN	869 - 894	18.60±0.5	0.25	31	
GSM	CP0402P0902AN	890 - 915	18.50±0.5	0.25	31	
	CP0402P0947AN	935 - 960	18.00±0.5	0.25	31	
E-GSM	CP0402P0897AN	880 - 915	18.50±0.5	0.25	31	
	CP0402P0942AN	925 - 960	18.00±0.5	0.25	31	
PDC	CP0402P1441AN	1429 - 1453	14.50±0.5	0.40	28	
PCN	CP0402P1747AN	1710 - 1785	13.00±0.5	0.50	26	
	CP0402P1842AN	1805 - 1880	12.50±0.5	0.50	26	
PCS	CP0402P1880AN	1850 - 1910	12.30±0.5	0.50	25	
	CP0402P1960AN	1930 - 1990	12.00±0.5	0.50	25	
PHP	CP0402P1907AN	1895 - 1920	12.30±0.5	0.50	25	
DECT	CP0402P1890AN	1880 - 1900	12.30±0.5	0.50	25	
Wireless LAN	CP0402P2442AN	2400 - 2484	10.30±0.5	0.70	23	
WiFi	CP0402P3500AN	3450 - 3550	7.60±0.5	1.30	15	14
	CP0402P5000AN	4950 - 5050	5.00±0.5	1.50	15	13
	CP0402P5500AN	5450 - 5550	4.60±0.5	1.50	14	13
	CP0402P6000AN	5950 - 6050	4.00±0.5	1.50	14	13

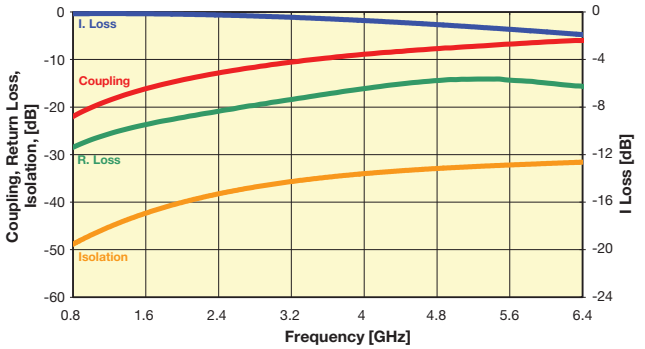
CP0402PxxxxANTR



Coupler P/N CP0402PxxxxBN

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0402P0836BN	824 - 849	22.00±0.5	0.20	28	27
	CP0402P0881BN	869 - 894	21.70±0.5	0.20	28	
GSM	CP0402P0902BN	890 - 915	21.50±0.5	0.20	28	
	CP0402P0947BN	935 - 960	21.00±0.5	0.25	27	
E-GSM	CP0402P0897BN	880 - 915	21.50±0.5	0.20	28	
	CP0402P0942BN	925 - 960	21.00±0.5	0.25	27	
PDC	CP0402P1441BN	1429 - 1453	17.50±0.5	0.25	24	
PCN	CP0402P1747BN	1710 - 1785	16.00±0.5	0.30	23	
	CP0402P1842BN	1805 - 1880	15.50±0.5	0.35	23	
PCS	CP0402P1880BN	1850 - 1910	15.50±0.5	0.35	23	
	CP0402P1960BN	1930 - 1990	15.00±0.5	0.35	22	
PHP	CP0402P1907BN	1895 - 1920	15.50±0.5	0.35	23	
DECT	CP0402P1890BN	1880 - 1900	15.50±0.5	0.35	23	
Wireless LAN	CP0402P2442BN	2400 - 2484	13.30±0.5	0.40	21	
WiFi	CP0402P3500BN	3450 - 3550	9.40±0.5	0.80	18	14
	CP0402P5000BN	4950 - 5050	7.40±0.5	1.20	14	13
	CP0402P5500BN	5450 - 5550	6.70±0.5	1.60	14	13
	CP0402P6000BN	5950 - 6050	6.10±0.5	2.00	14	13

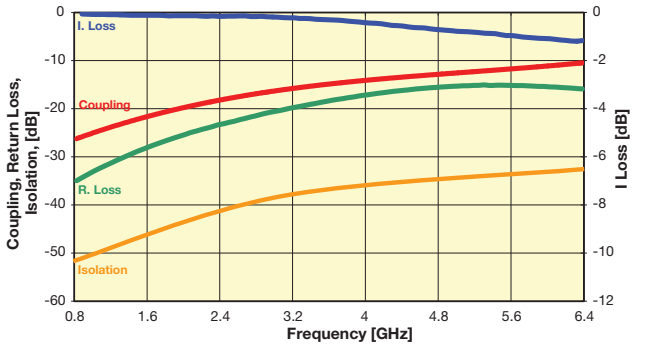
CP0402PxxxxBNTR



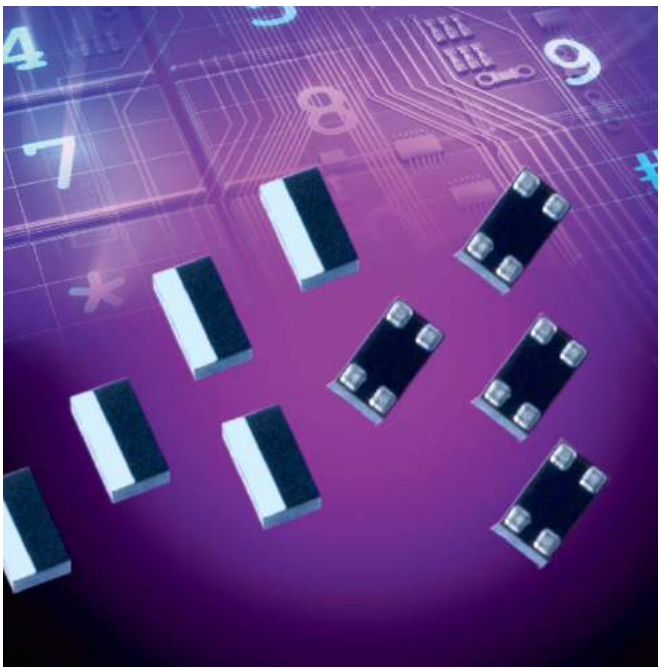
Coupler P/N CP0402PxxxxEN

Application	P/N Examples	Frequency Band [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
AMPS	CP0402P0836EN	824 - 849	27.20±0.5	0.20	35	25
	CP0402P0881EN	869 - 894	26.80±0.5	0.20	34	
GSM	CP0402P0902EN	890 - 915	26.50±0.5	0.20	34	
	CP0402P0947EN	935 - 960	26.00±0.5	0.20	34	
E-GSM	CP0402P0897EN	880 - 915	26.50±0.5	0.20	34	
	CP0402P0942EN	925 - 960	26.00±0.5	0.20	34	
PDC	CP0402P1441EN	1429 - 1453	22.30±0.5	0.25	29	
PCN	CP0402P1747EN	1710 - 1785	20.50±0.5	0.25	27	23
	CP0402P1842EN	1805 - 1880	20.30±0.5	0.25	26	
PCS	CP0402P1880EN	1850 - 1910	20.00±0.5	0.25	26	
	CP0402P1960EN	1930 - 1990	20.00±0.5	0.25	26	
PHP	CP0402P1907EN	1895 - 1920	20.00±0.5	0.25	26	
DECT	CP0402P1890EN	1880 - 1900	20.00±0.5	0.25	26	
Wireless LAN	CP0402P2442EN	2400 - 2484	18.00±0.5	0.35	23	
WiFi	CP0402P3500EN	3450 - 3550	15.00±0.5	0.37	20	16
	CP0402P5000EN	4950 - 5050	12.50±0.5	0.50	18	13
	CP0402P5500EN	5450 - 5550	11.50±0.5	0.65	16	13
	CP0402P6000EN	5950 - 6050	11.10±0.5	0.70	15	13

CP0402PxxxxENTR



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ITF TECHNOLOGY

The ITF High Directivity Wide Band LGA Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The Wide Band High Directivity Coupler displays a stable coupling factor over a wide frequency band.

APPLICATIONS

- Mobile communications
- Satellite TV receivers
- GPS
- Vehicle location systems
- Wireless LAN's

LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

HOW TO ORDER

CP	0402	W	XXXX	X	N	TR
		Type Wide Band	**Frequency (MHz)**	**Sub-Type**	**LGA Termination** Sn100	**Taped & Reeled**

RoHS COMPLIANT

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance: 125°C, I_R, 4 hours

TERMINATION

Nickel/Lead Free solder coating compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

OPERATING TEMPERATURE

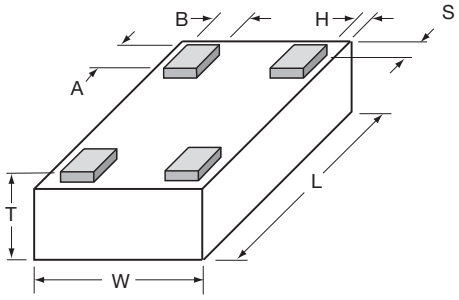
-40°C to +85°C

POWER RATING

3W RF Continuous

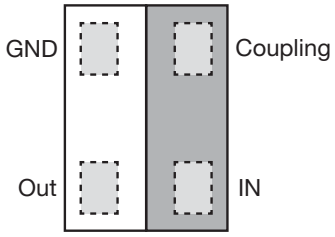
DIMENSIONS (Bottom View)

mm (inches)

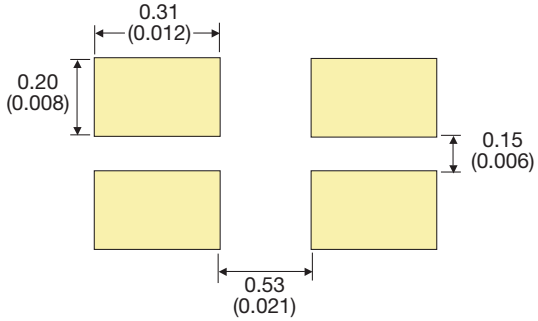


L	1.00±0.05 (0.040±0.002)
W	0.58±0.04 (0.023±0.002)
T	0.35±0.05 (0.014±0.002)
A	0.20±0.05 (0.008±0.002)
B	0.18±0.05 (0.007±0.002)
S, H	0.05±0.05 (0.002±0.002)

TERMINALS (Top View)



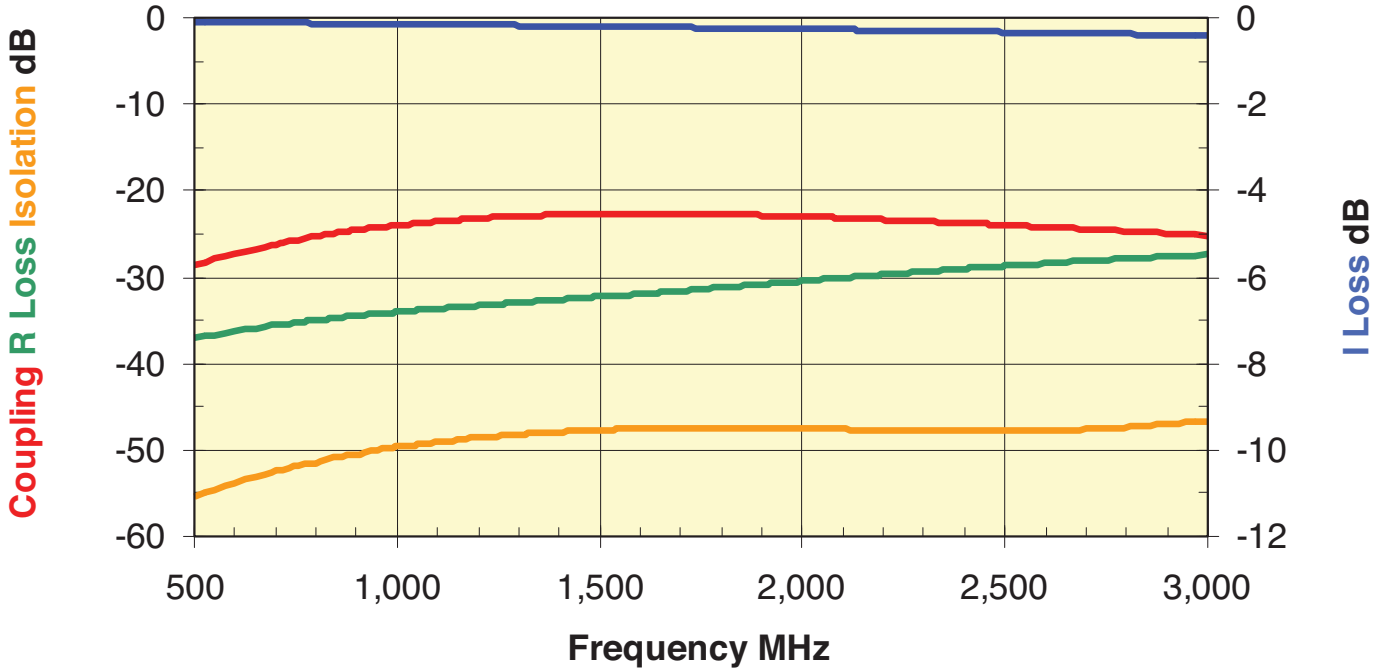
Recommended Pad Layout Dimensions mm (inches)



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Directional Coupler Type CP0402W2700FNTR

P/N	Frequency [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
CP0402W2700FNTR	700-2,700	24±2	0.3	18	20



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GENERAL DESCRIPTION

These jigs are designed for testing the CP0402W2700FNTR High Directivity Couplers using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50Ω microstrips as conducting lines and a bottom ground plane located at a distance of 0.254mm (0.010") from the microstrips.

The substrate used is Neltec's NH9338ST0254C1BC.

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841.

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50Ω SMA termination.

MEASUREMENT PROCEDURE

When measuring a component, it can be either soldered or pressed using a non-metallic stick until all four ports touch the appropriate pads. Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig terminal connected to port 2. Follow the VNA's instruction manual and use the calibration jig to perform a full 2-Port calibration in the required bandwidths.

Place the coupler on the measurement jig as follows:

GND (Coupler) ➜ Connector 1 (Jig)
IN (Coupler) ➜ Connector 3 (Jig)
Coupling (Coupler) ➜ Connector 2 (Jig)
Out (Coupler) ➜ Connector 4 (Jig)

To measure I. Loss connect:

Connector 3 (Jig) ➜ Port 1 (VNA)
Connector 2 (Jig) ➜ 50Ω
Connector 4 (Jig) ➜ Port 2 (VNA)

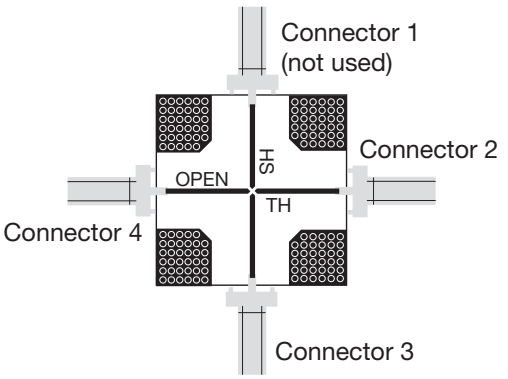
To measure R. Loss and Coupling connect:

Connector 3 (Jig) ➜ Port 1 (VNA)
Connector 4 (Jig) ➜ 50Ω
Connector 2 (Jig) ➜ Port 2 (VNA)

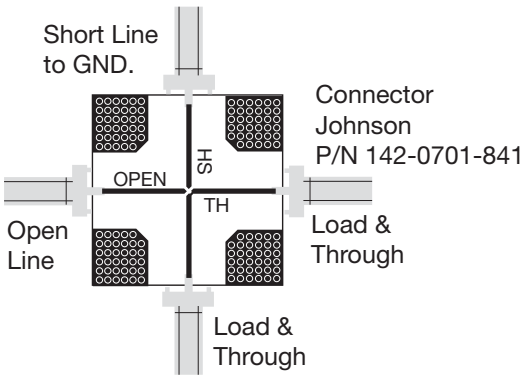
To measure Isolation connect:

Connector 4 (Jig) ➜ Port 1 (VNA)
Connector 2 (Jig) ➜ Port 2 (VNA)
Connector 3 (Jig) ➜ 50Ω

Measurement Jig



Calibration Jig



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CP0302P5425ENTR / CP0302A5425ENTR / CP0402Q5425ENTR / CP0603Q5425ENTR
HIGH DIRECTIVITY DIRECTIONAL COUPLERS FOR WIFI BANDS

TECHNOLOGY

These High Directivity LGA Couplers are based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly. The WiFi Bands Couplers are offered in 0302, 0402 and 0603 standard sizes having identical electrical performance.

RoHS COMPLIANT

APPLICATIONS:

- WiFi

PART NUMBERS

CP0302P5425ENTR
CP0302A5425ENTR
CP0402Q5425ENTR
CP0603Q5425ENTR

QUALITY INSPECTION

Finished parts are 100% tested for electrical parameters and visual characteristics. Each production lot is evaluated on a sample basis for:

- Static Humidity: 85°C, 85% RH, 160 hours
- Endurance : 125°C, IR, 4 hours

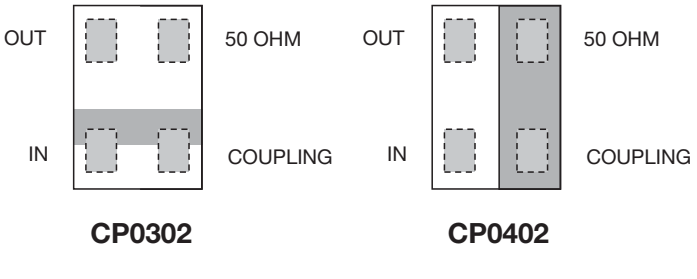
TERMINATION

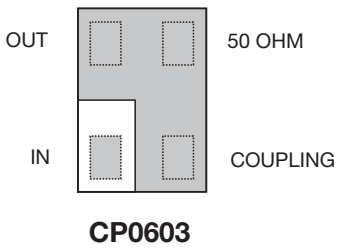
Nickel/Lead-Free Solder coating (Sn100) compatible with automatic soldering technologies: reflow, wave soldering, vapor phase and manual.

OPERATING TEMPERATURE

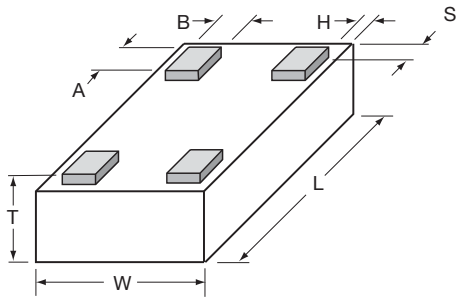
-40°C to +85°C

TERMINALS (Top View)





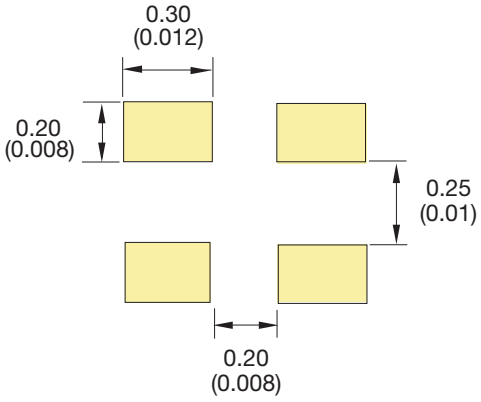
DIMENSIONS (Bottom View) mm (inches)



	CP0302	CP0402	CP0603
L	0.65±0.04 (0.026±0.002)	1.0±0.05 (0.040±0.002)	1.6±0.1 (0.063±0.004)
W	0.50±0.04 (0.02±0.002)	0.58±0.04 (0.023±0.002)	0.84±0.1 (0.033±0.004)
T	0.25±0.05 (0.01±0.002)	0.35±0.05 (0.014±0.002)	0.60±0.1 (0.024±0.004)
A	0.20±0.05 (0.008±0.002)	0.20±0.05 (0.008±0.002)	0.25±0.05 (0.01±0.002)
B	0.10±0.04 (0.004±0.002)	0.18±0.05 (0.007±0.002)	0.20±0.05 (0.008±0.002)
S, H	0.025±0.025 (0.001±0.001)	0.05±0.05 (0.002±0.002)	0.05±0.05 (0.002±0.002)

RECOMMENDED PAD LAYOUT DIMENSTIONS mm (inches)

CP0302



CP0402 / CP0603: see pages 49 / 53

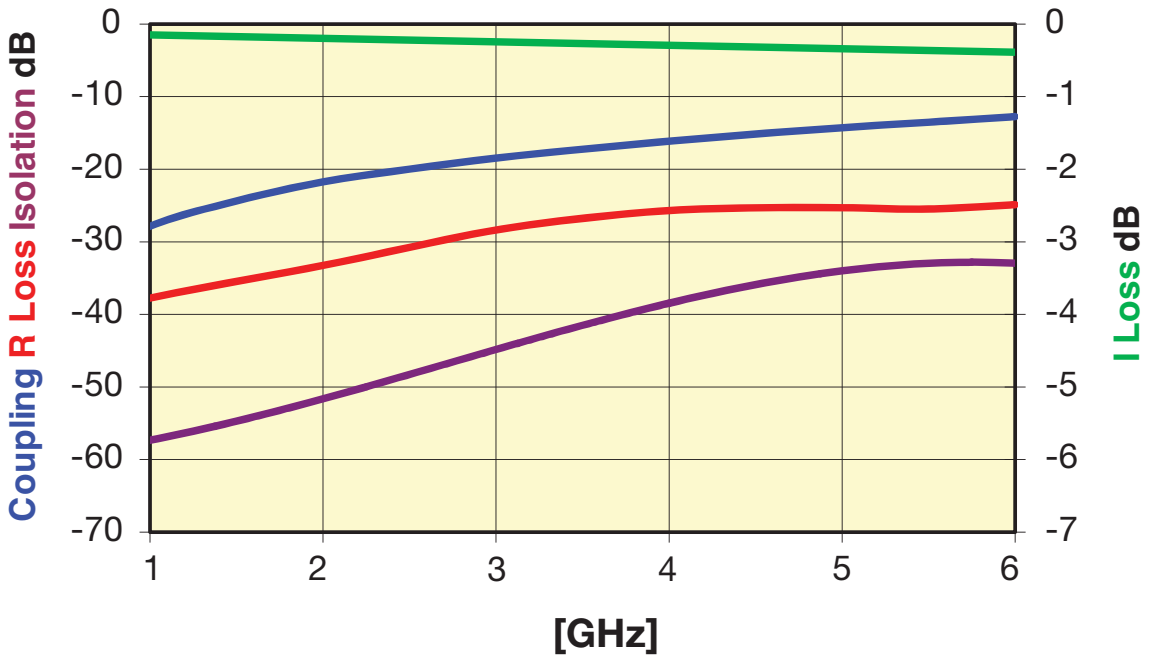
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ELECTRICAL CHARACTERISTICS

P/N	Frequency [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
CP0302P5425ENTR	2,400-2,496	-20±0.5	-0.2	-30	20
	4,900-5,950	-13±0.5	-0.4	-25	20

P/N	Frequency [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
CP0302A5425ENTR	2,400-2,496	-20±1	-0.2	-30	20
	4,900-5,950	-13±1	-0.4	-25	20

P/N	Frequency [MHz]	Coupling [dB]	I. Loss max. [dB]	Return Loss [dB]	Directivity [dB]
CP0402Q5425ENTR CP0603Q5425ENTR	2,400-2,496	-20±1	-0.3	-30	20
	4,900-5,950	-13±1	-0.4	-25	20



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GENERAL DESCRIPTION RFAP TECHNOLOGY

The DB0603N 3dB 90° Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The RFAP LGA 3dB 90° Coupler will be offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

RoHS COMPLIANT

APPLICATIONS

- Balanced Amplifiers and Signal Distribution in Wireless Communications

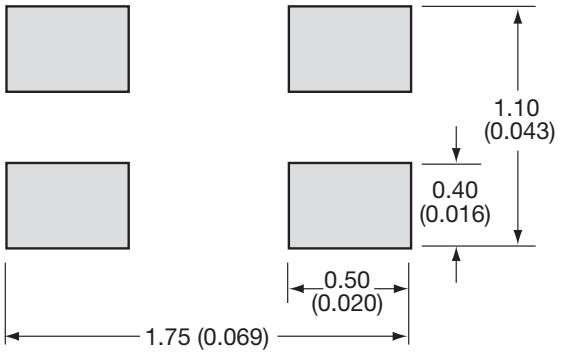
FEATURES

- Miniature 0603 size
- Low I. Loss
- High Isolation
- Surface Mountable
- RoHS Compliant
- Supplied on T&R
- Power Rating: 10W RF Continuous

LAND GRID ARRAY ADVANTAGES:

- Inherent Low Profile
- Self Alignment during Reflow
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

Recommended Pad Layout Dimensions mm (inches)

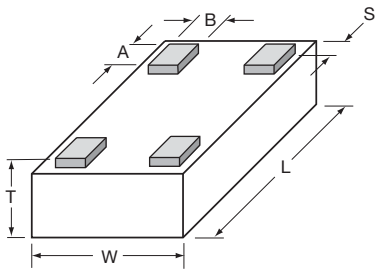


DIMENSIONS:

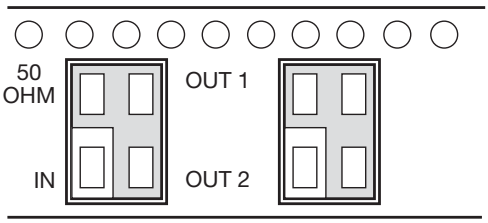
millimeters (inches)

L	1.60±0.10 (0.063±0.004)
W	0.84±0.10 (0.033±0.004)
T	0.60±0.10 (0.024±0.004)
A	0.25±0.05 (0.010±0.002)
B	0.20±0.05 (0.008±0.002)
S	0.05±0.05 (0.002±0.002)

Bottom View



ORIENTATION IN TAPE



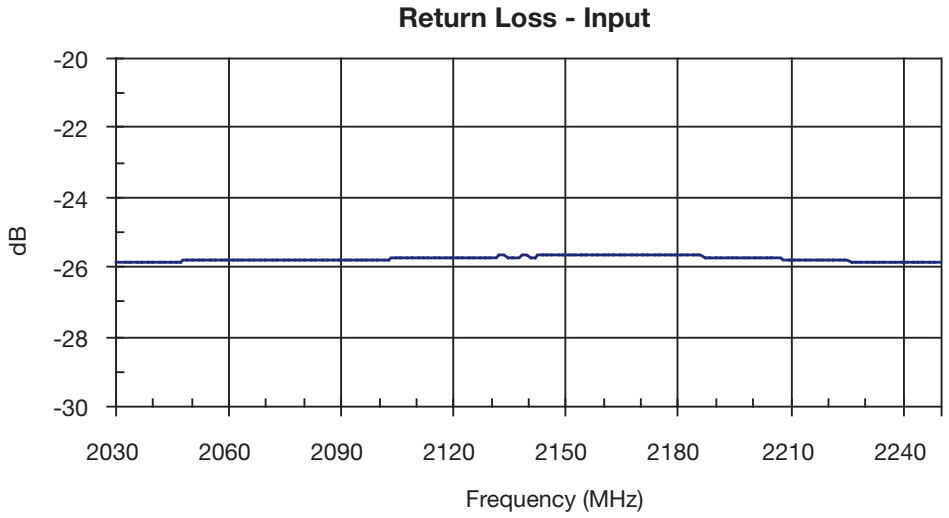
ELECTRICAL PARAMETERS

Part Number	Frequency MHz		Port Impedance Ω	Return Loss [dB]		Isolation [dB]		Insertion Loss [dB]		Ampltidue Balance [dB]		Phase Balance (Relative to 90°) Deg		Power Handing Watts
	Min.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Typ.	Max.	Typ.	Max.	Typ.	Max	Max.
DB0603N2140ANTR	2040	2240	50	15	26	15	23	0.30	0.40	0.50	0.80	2	3	10
DB0603N2400ANTR	2300	2500	50	12	17	15	23	0.25	0.35	0.30	0.80	2	3	10
DB0603N2600ANTR	2400	2800	50	12	17	15	23	0.25	0.35	0.30	0.80	2	3	10
DB0603N3000ANTR	2850	3150	50	12	15	15	26	0.20	0.30	0.30	0.80	2	3	10
DB0603N3500ANTR	3300	3700	50	12	15	15	26	0.20	0.30	0.30	0.80	2	3	10
DB0603N4600ANTR	4200	5000	50	12	16	12	15	0.50	0.70	0.40	1.00	1.5	3	10
DB0603N5500ANTR	5100	5900	50	12	16	10	14	0.60	0.80	0.80	1.50	1	3	10
DB0603N5800ANTR	5600	6000	50	12	16	12	17	0.40	0.90	0.30	0.90	2	3	10

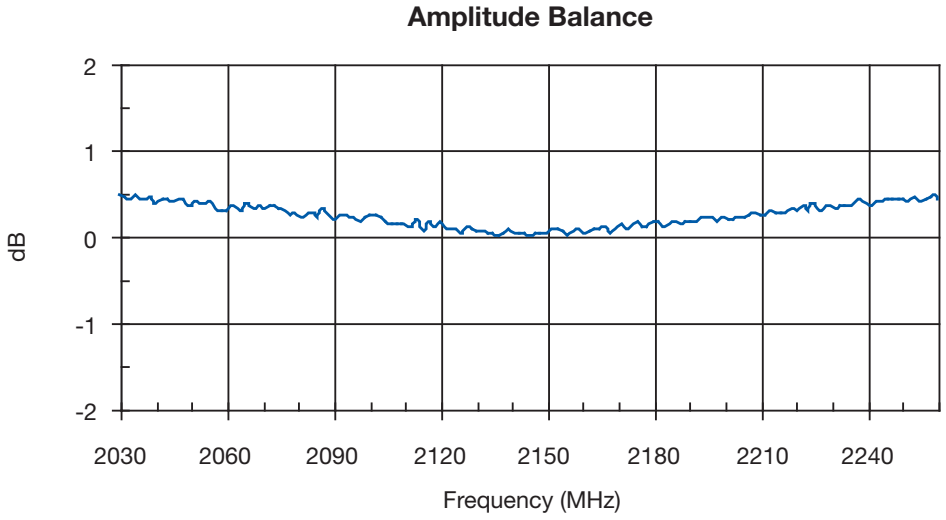
NOTE: Additional Frequencies Available Upon Request

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2040MHz to 2240MHz DB0603N2140ANTR



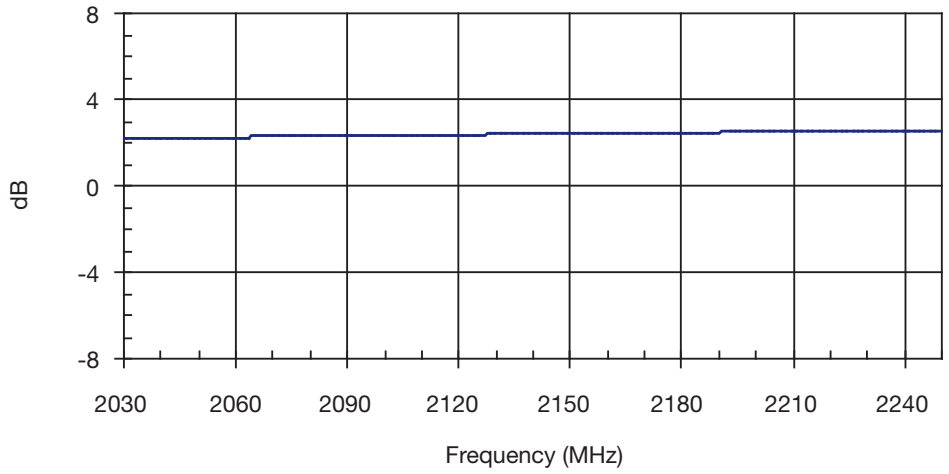




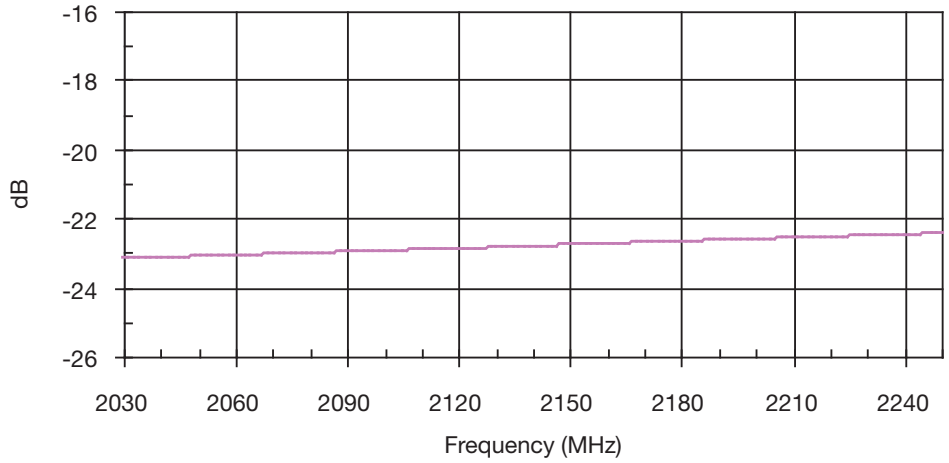
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2040MHz to 2240MHz DB0603N2140ANTR

Phase Balance



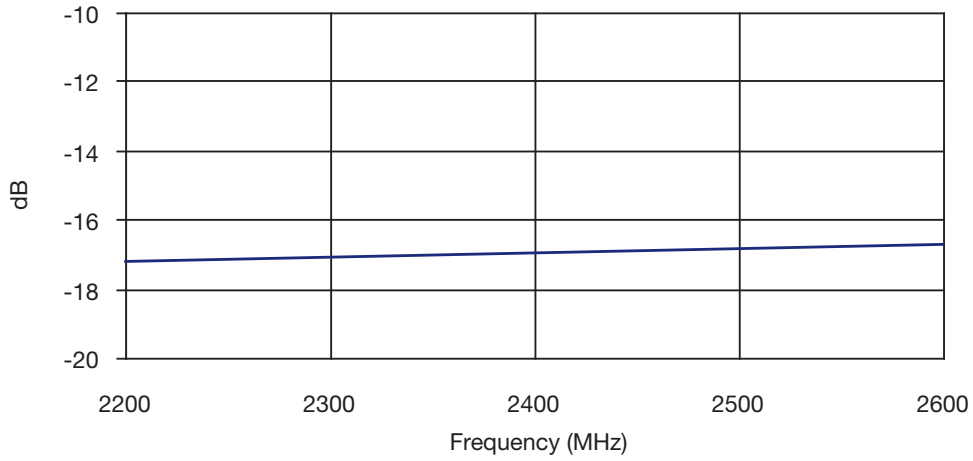
Isolation



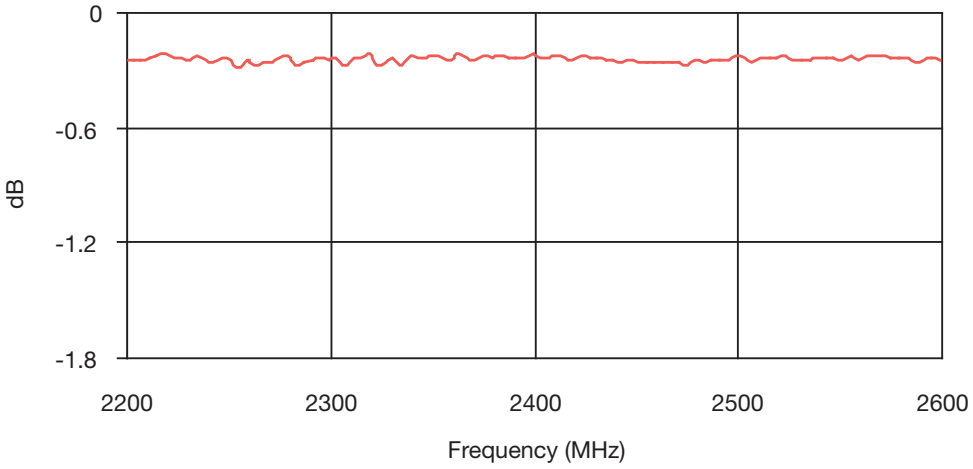
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2200MHz to 2600MHz DB0603N2400ANTR

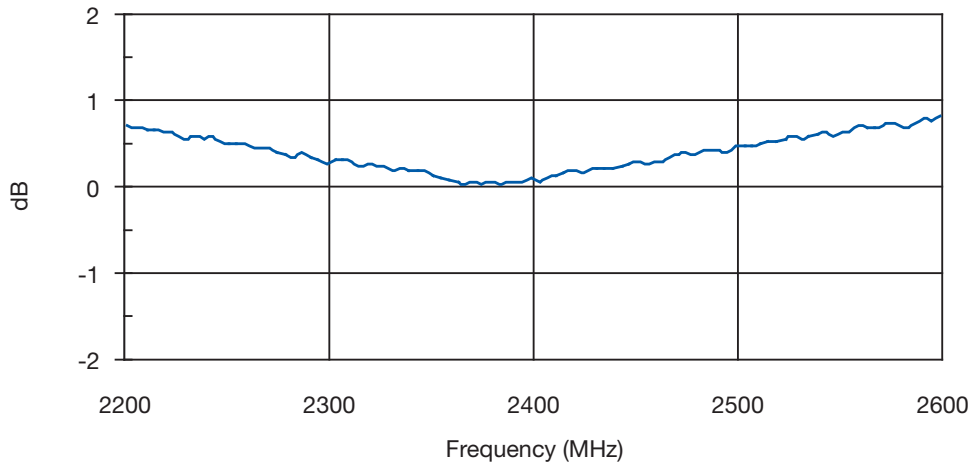
Return Loss - Input



Insertion Loss



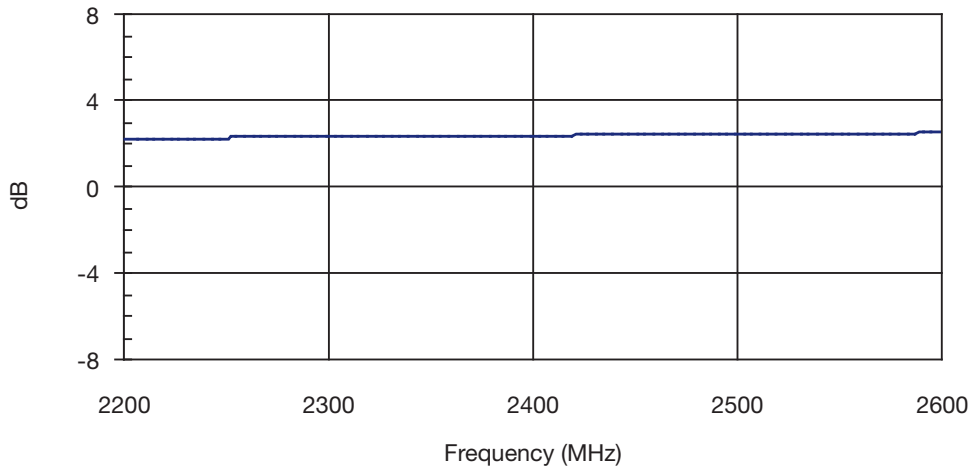
Amplitude Balance



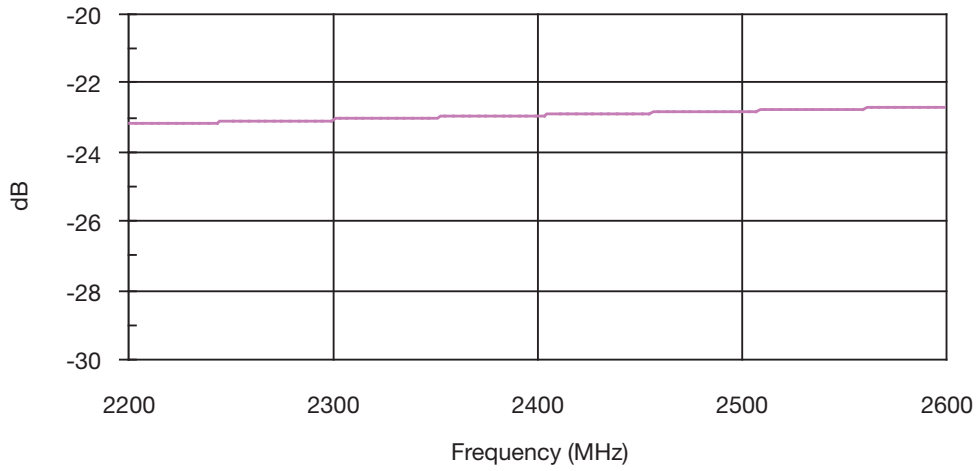
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2200MHz to 2600MHz DB0603N2400ANTR

Phase Balance

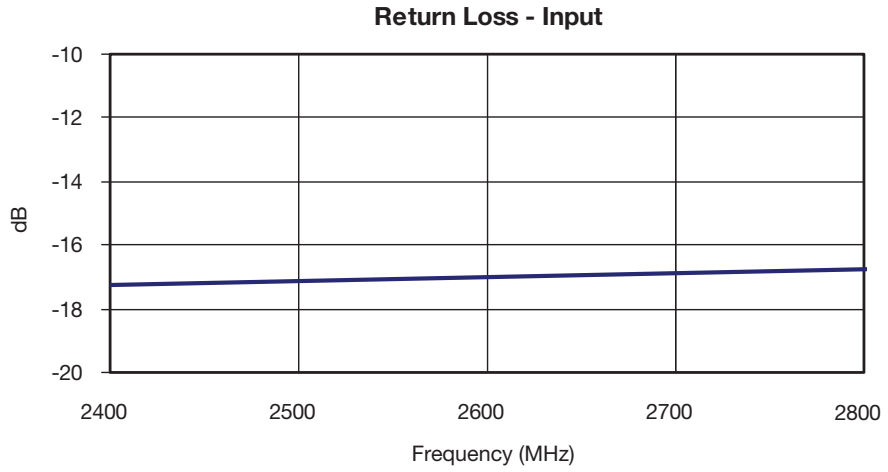


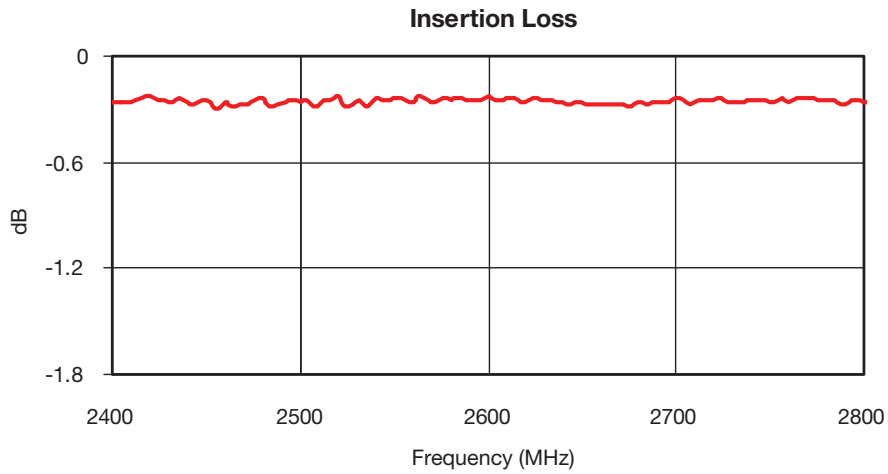
Isolation

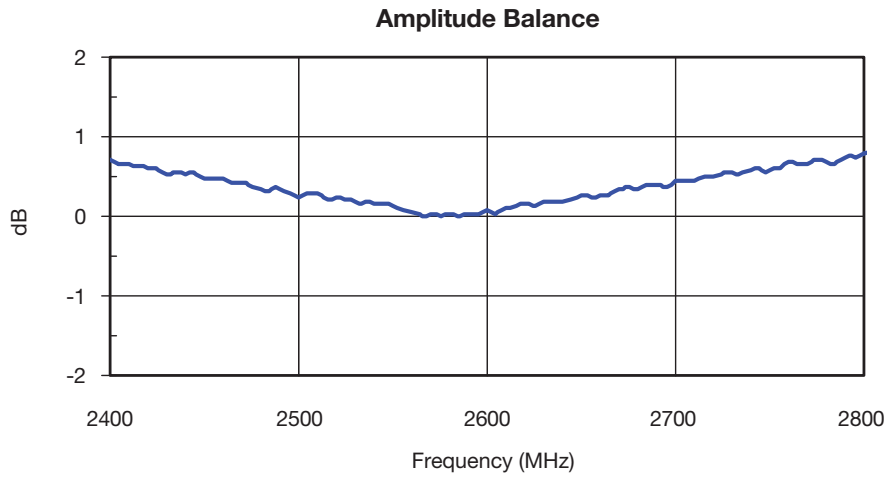


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2400MHz TO 2800MHz DB0603N2600ANTR



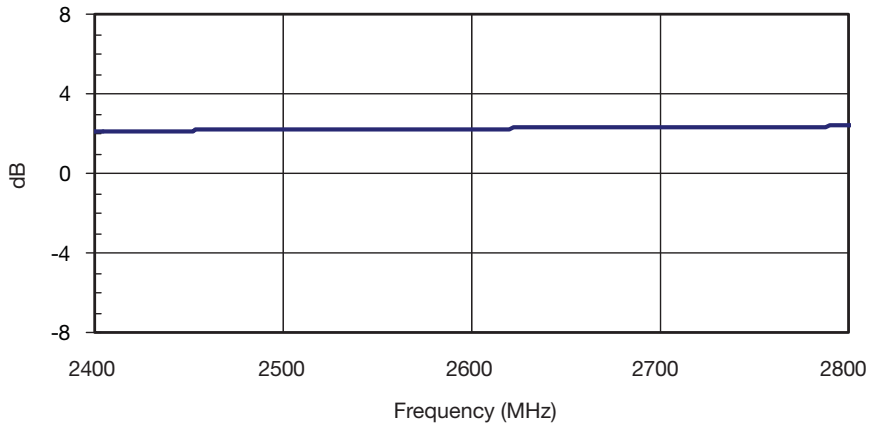




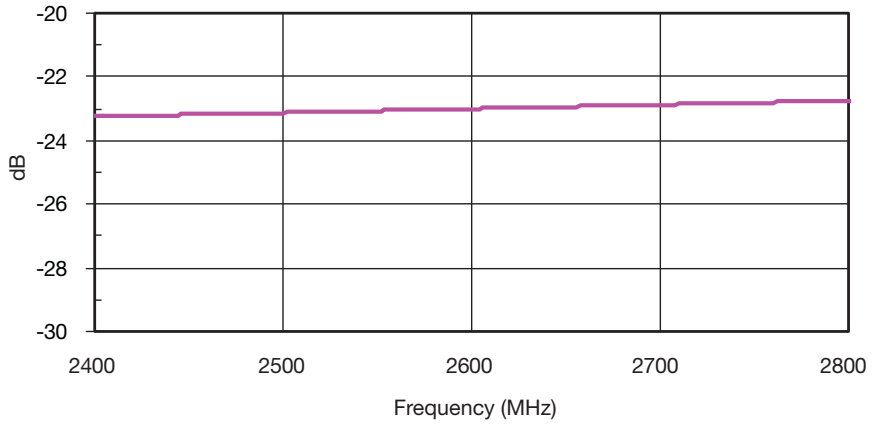
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2400MHz TO 2800MHz DB0603N2600ANTR

Phase Balance



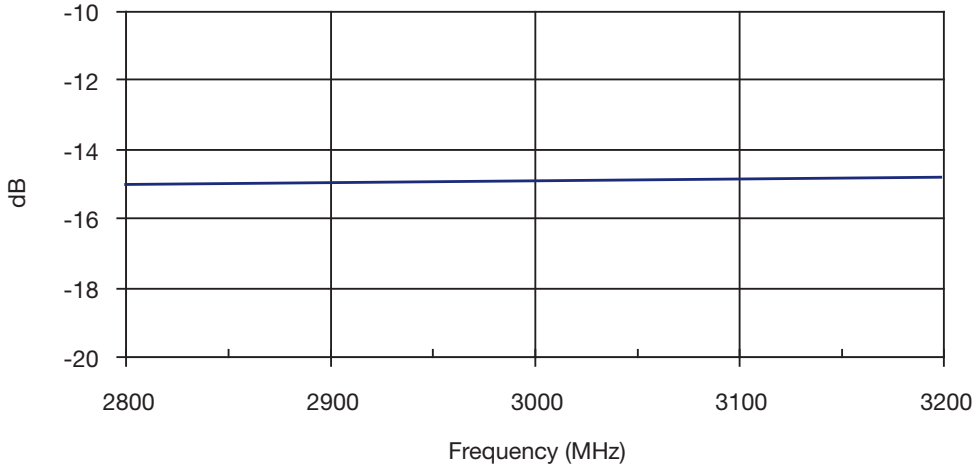
Isolation



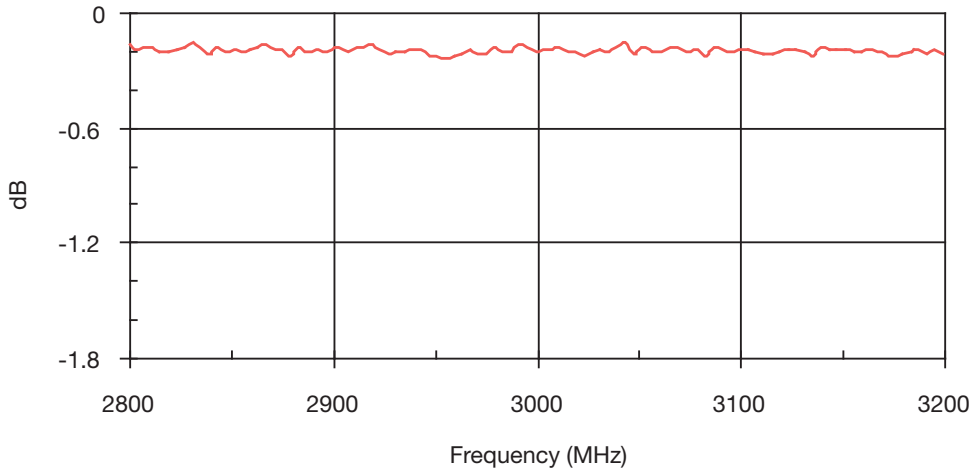
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2850MHz to 3150MHz DB0603N3000ANTR

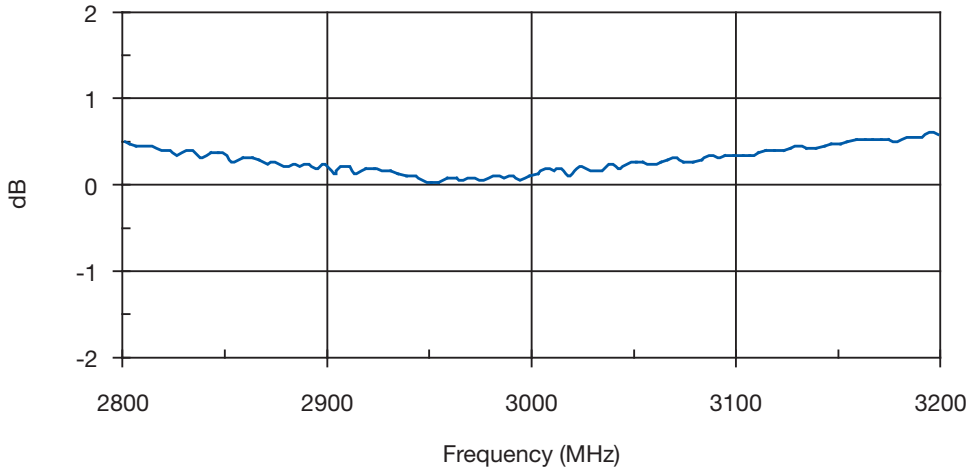
Return Loss - Input



Insertion Loss



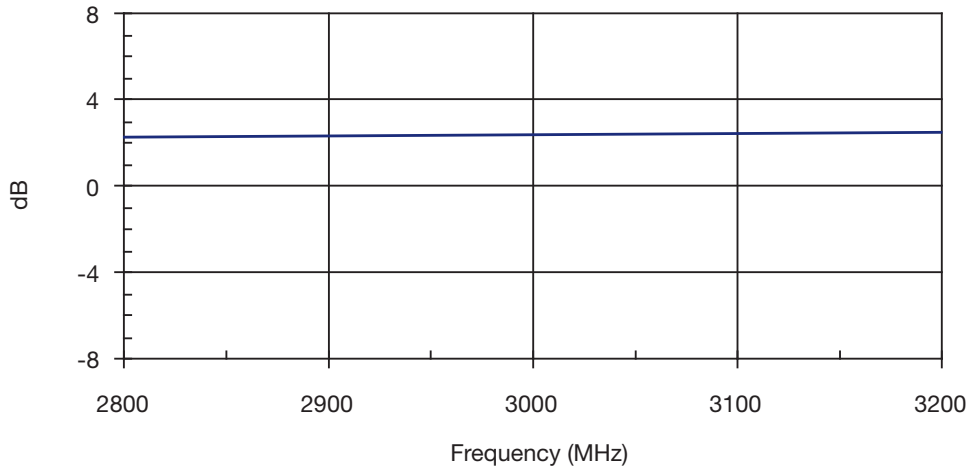
Amplitude Balance



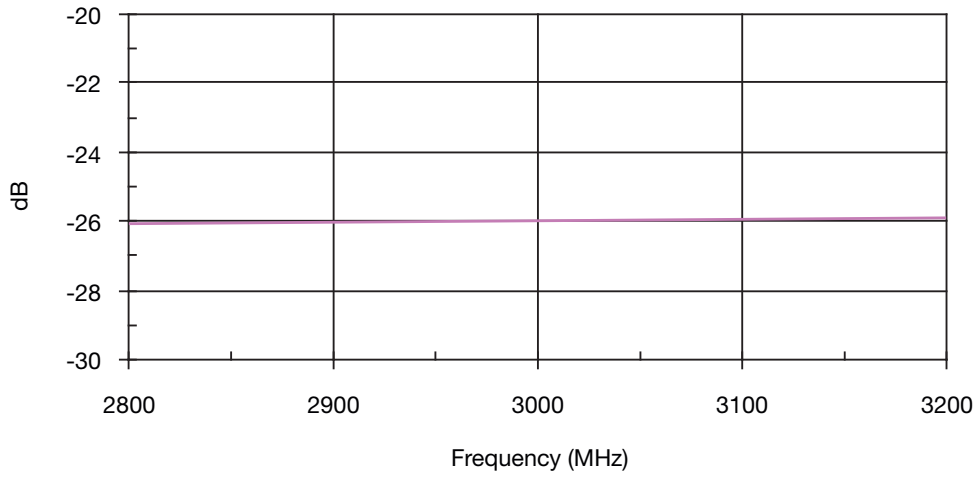
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2850MHz to 3150MHz DB0603N3000ANTR

Phase Balance



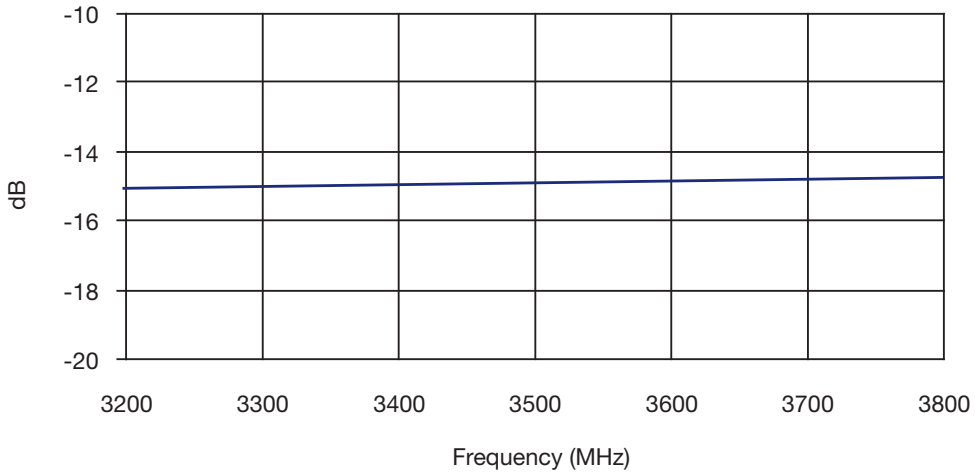
Isolation



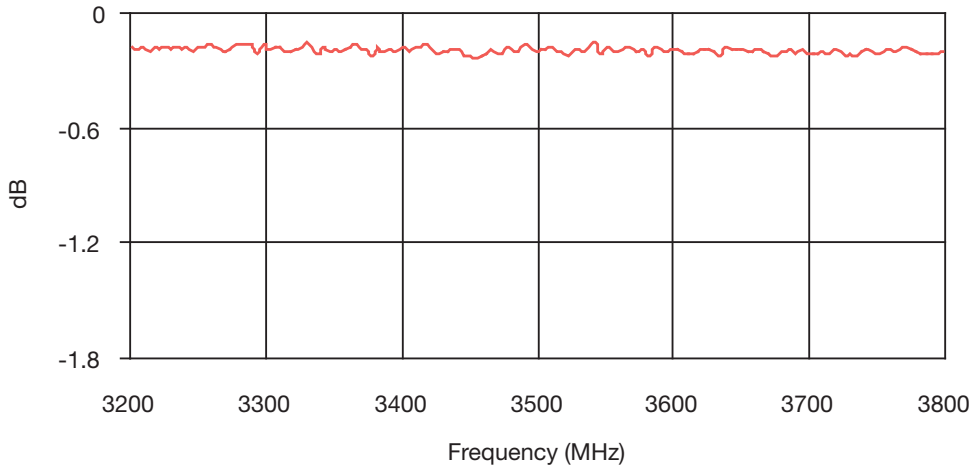
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3200MHz to 3800MHz DB0603N3500ANTR

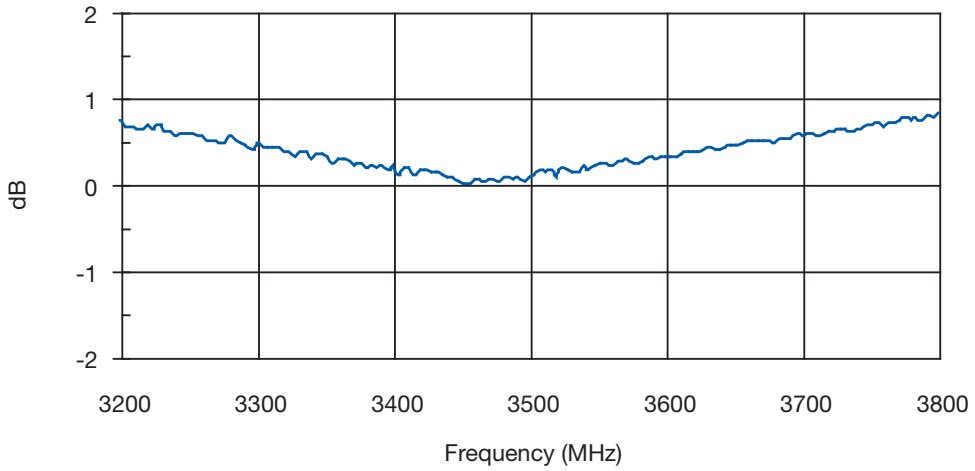
Return Loss - Input



Insertion Loss



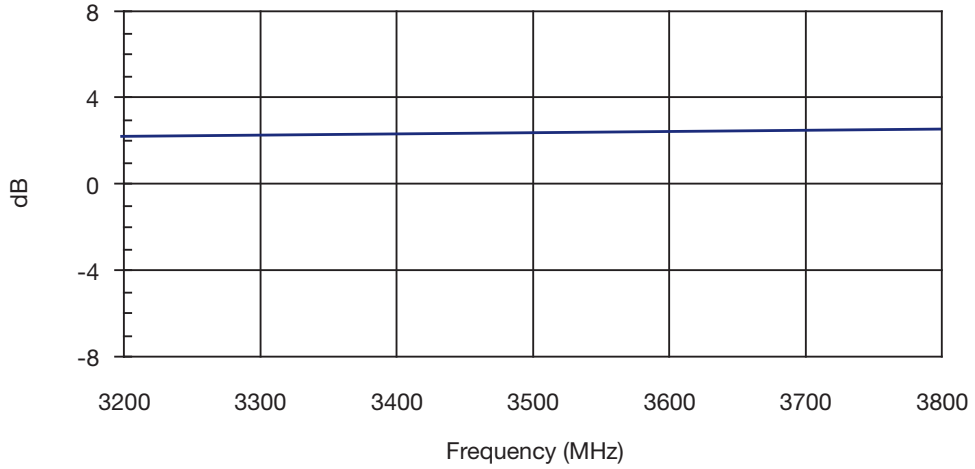
Amplitude Balance



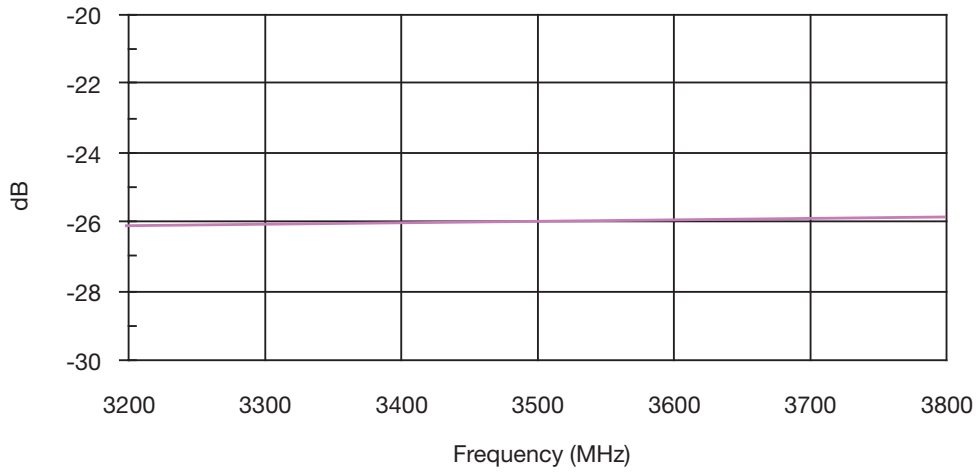
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3200MHz to 3800MHz DB0603N3500ANTR

Phase Balance

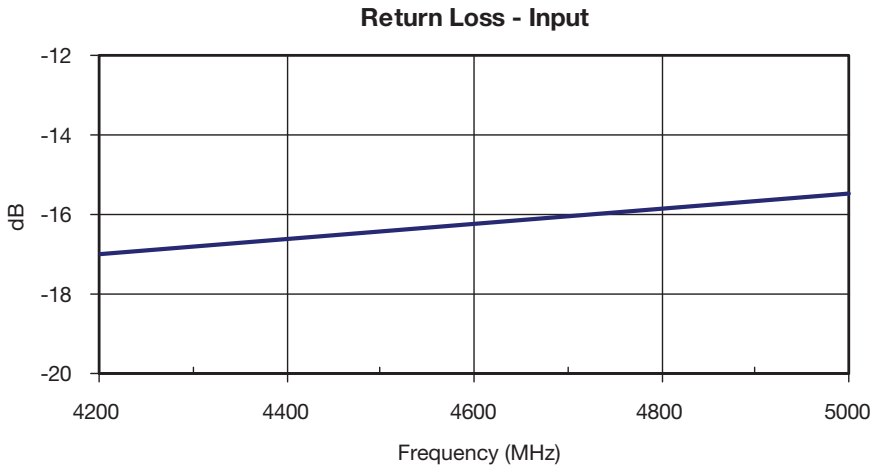


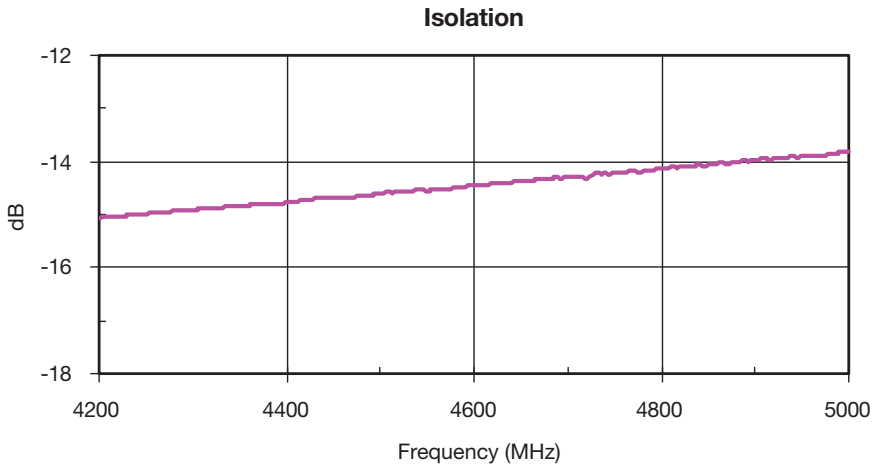
Isolation

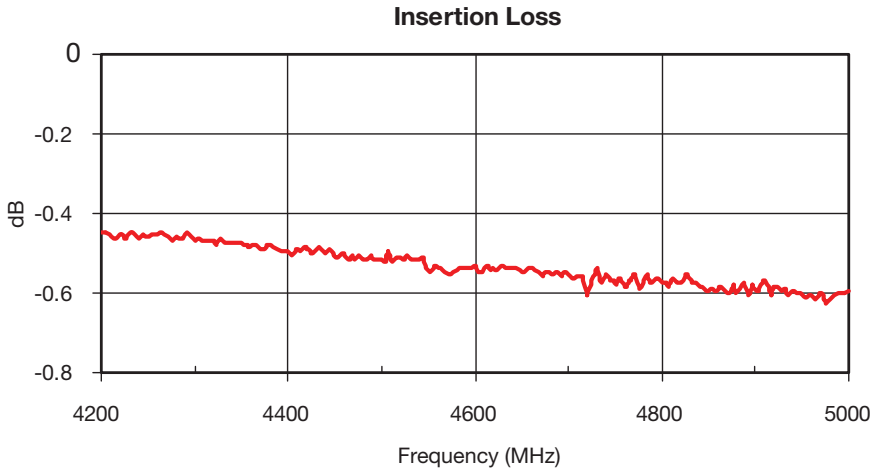


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4200MHz TO 5000MHz DB0603N4600ANTR

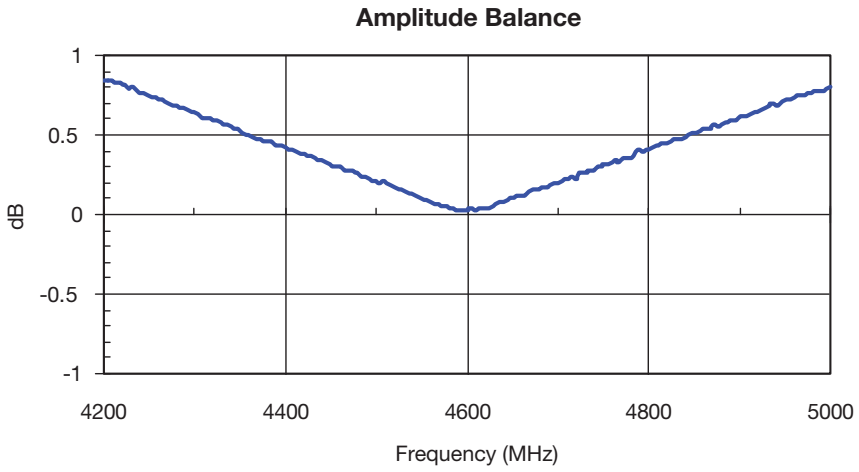


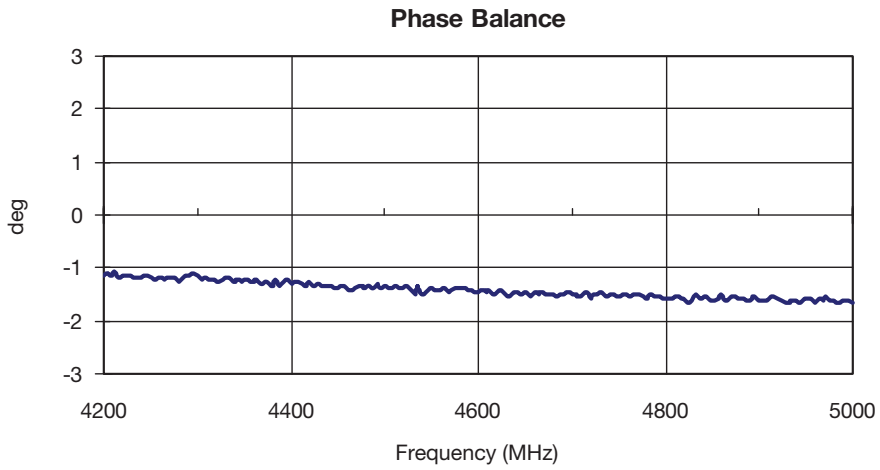




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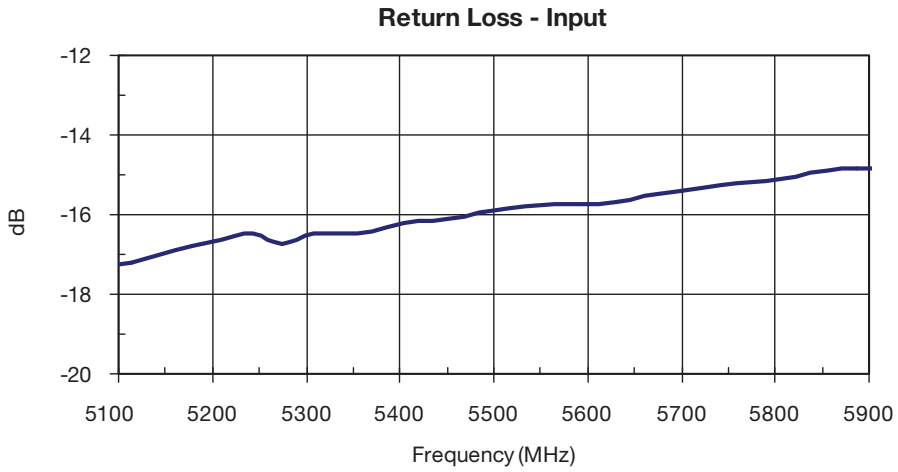
4200MHz TO 5000MHz DB0603N4600ANTR

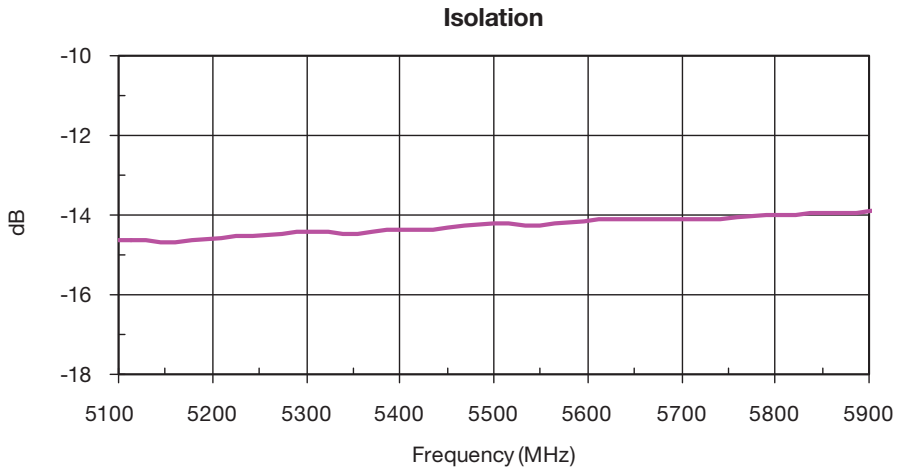


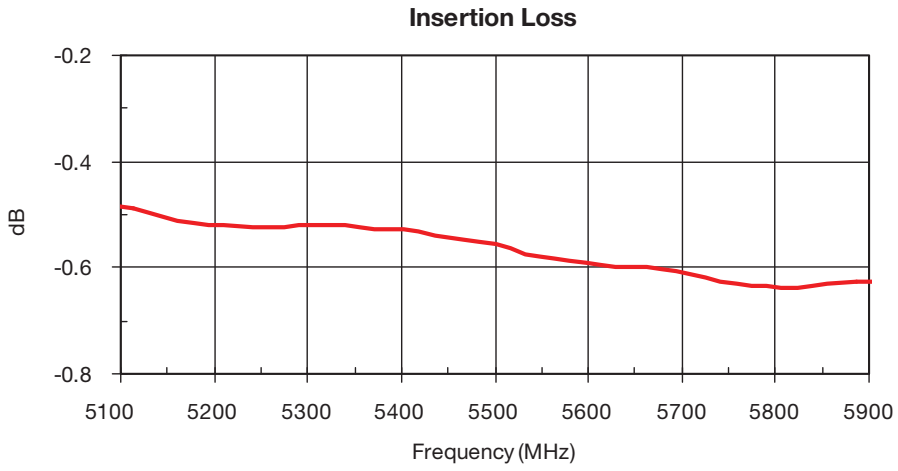


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5100MHz TO 5900MHz DB0603N5500ANTR

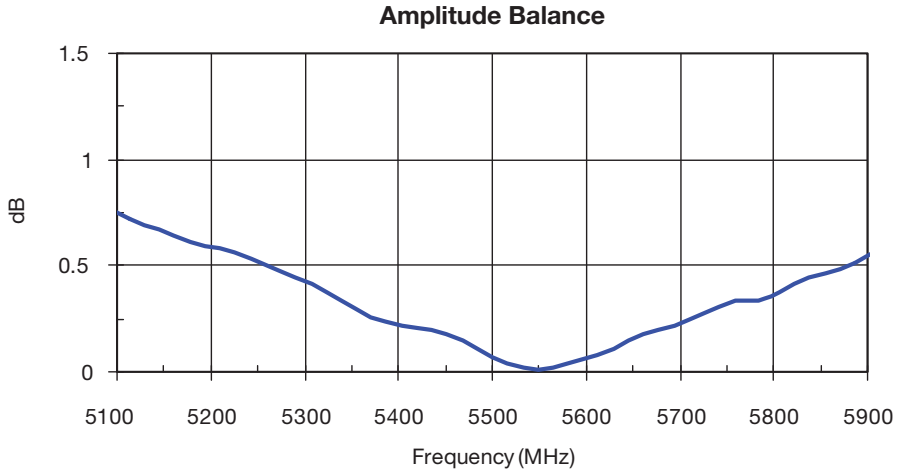


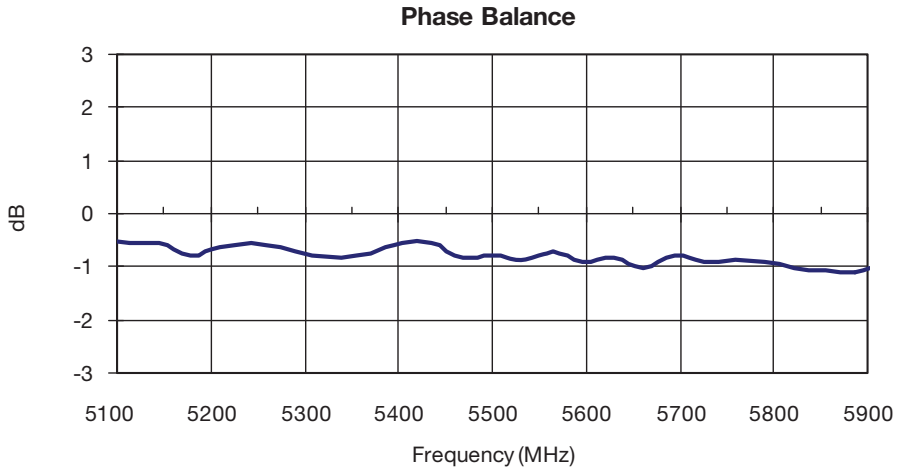




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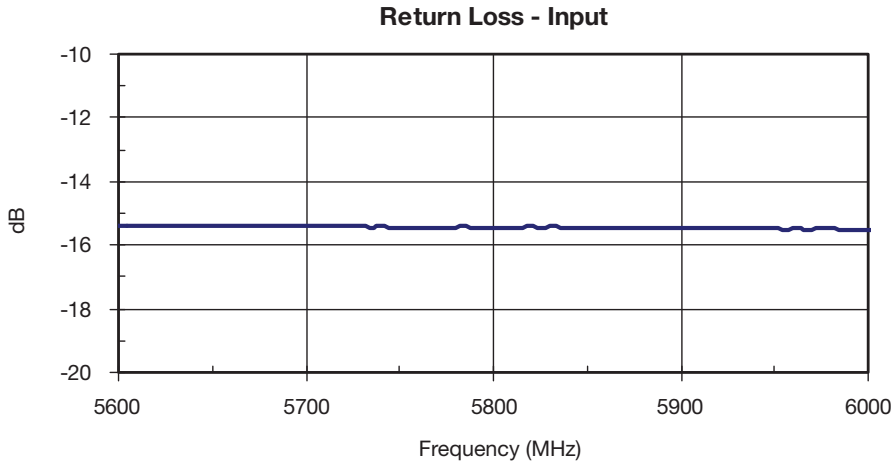
5100MHz TO 5900MHz DB0603N5500ANTR

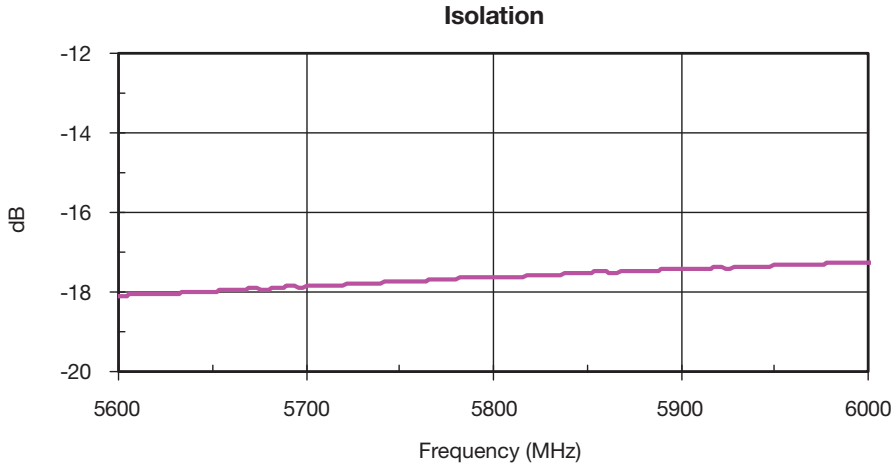


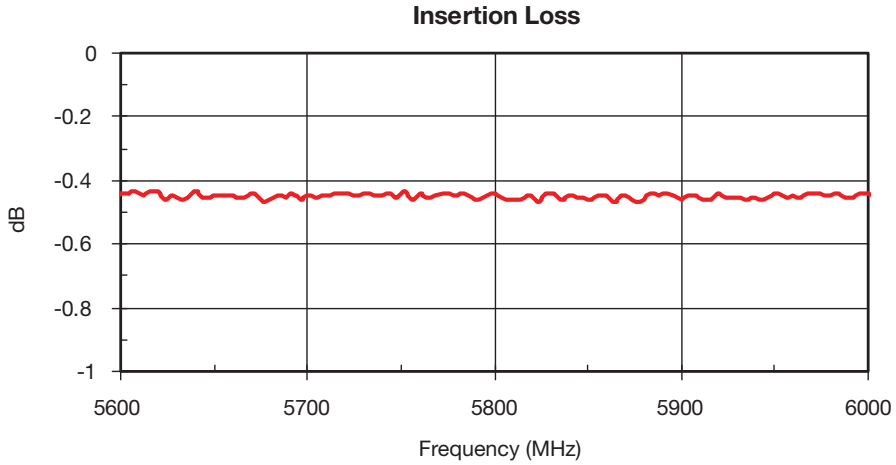


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5600MHz TO 6000MHz DB0603N5800ANTR

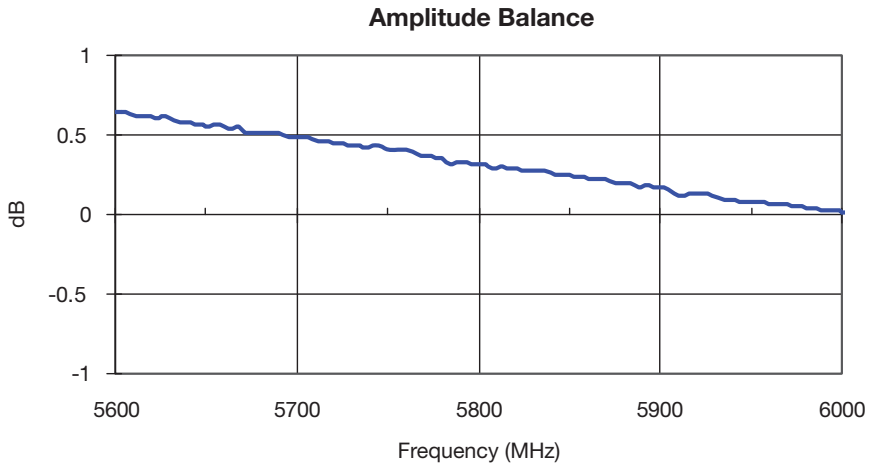


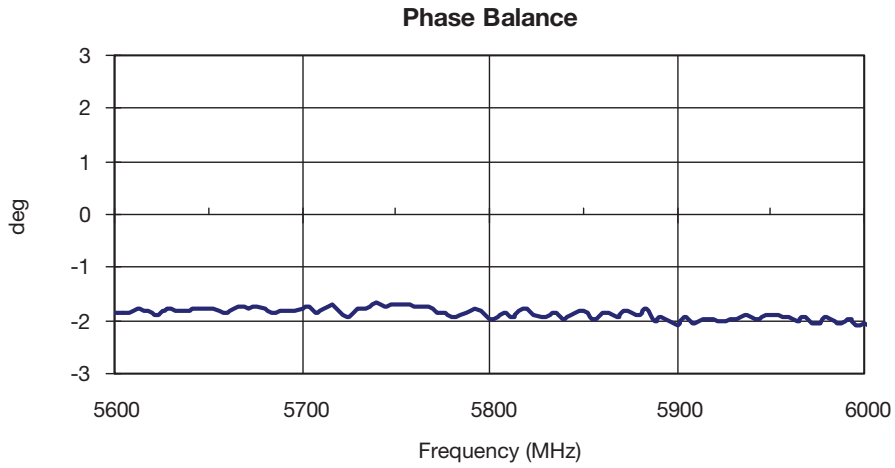




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5600MHz TO 6000MHz DB0603N5800ANTR





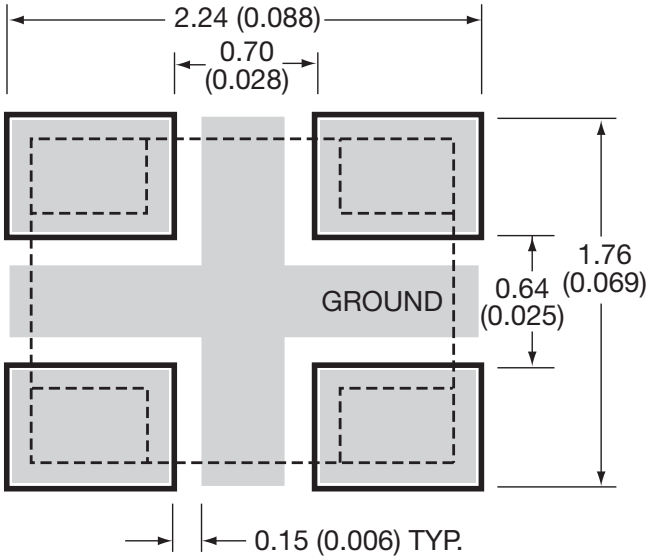
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GENERAL DESCRIPTION
ITF TECHNOLOGY

The ITF SMD 3dB 90° Coupler is based on thin-film multilayer technology. The technology provides a miniature part with excellent high frequency performance and rugged construction for reliable automatic assembly.

The ITF 3dB 90° Coupler is offered in a variety of frequency bands compatible with various types of high frequency wireless systems.

Recommended Pad Layout Dimensions mm (inches)



APPLICATIONS

- Balanced Amplifiers and Signal Distribution in Mobile Communications

FEATURES

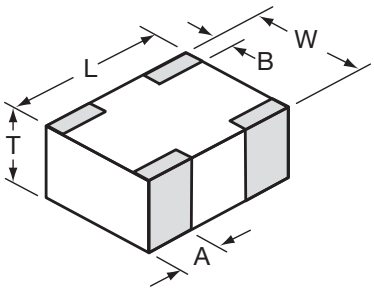
- Miniature 0805 size
- Low I. Loss
- High Isolation
- Power Handling: 10W RF CW
- Surface Mountable
- Supplied on Tape and Reel
- Operating Temperature -40°C to +85°C

DIMENSIONS:

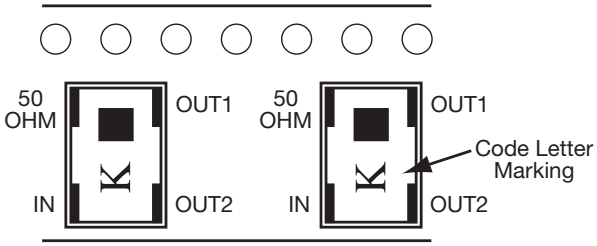
millimeters (inches)

L	2.03±0.10 (0.080±0.004)
W	1.55±0.10 (0.061±0.004)
T	0.98±0.15 (0.037±0.006)
A	0.56±0.25 (0.022±0.010)
B	0.35±0.15 (0.014±0.006)

Bottom View



TERMINALS (Top View)
Orientation in Tape



ELECTRICAL PARAMETERS*

Part Number**	Frequency F_O [MHz]	I. Loss @ F_O [dB]	Phase Balance [deg] max.	Code Letter Marking
DB0805A0880ASTR	880±30	0.35	3	Y
DB0805A0915ASTR	915±30	0.35	3	V
DB0805A0967ASTR	967±30	0.35	3	V
DB0805A1350ASTR	1350±50	0.35	3	C
DB0805A1650ASTR	1650±50	0.35	3	F
DB0805A1800ASTR	1800±50	0.30	3	F
DB0805A1850ASTR	1850±50	0.30	3	K
DB0805A1900ASTR	1900±50	0.30	3	K
DB0805A1950ASTR	1950±50	0.25	3	K
DB0805A2140ASTR	2140±50	0.25	3	L
DB0805A2325ASTR	2325±50	0.25	3	T

*With Recommended Pad Layout

NOTE: Additional Frequencies Available Upon Request

**LEAD FREE TERMINATION PART NUMBERS:

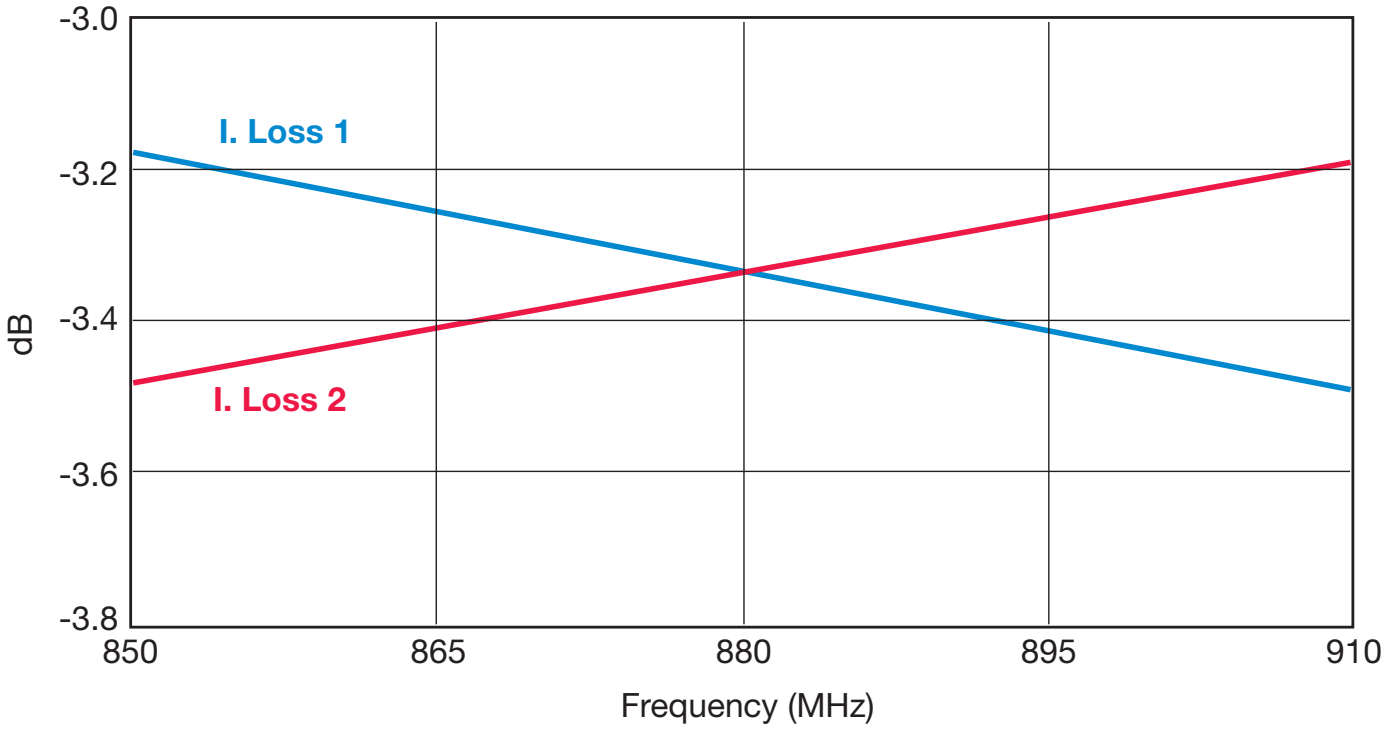
DB0805AxxxxASTR

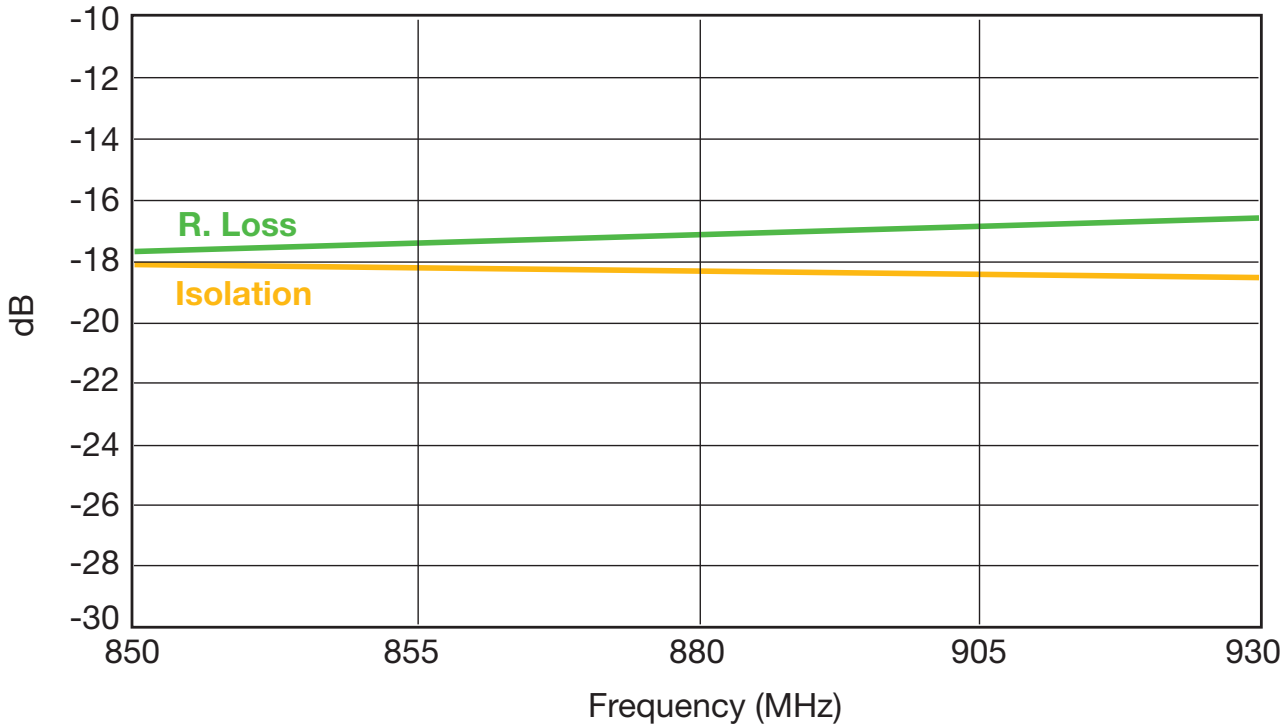
LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

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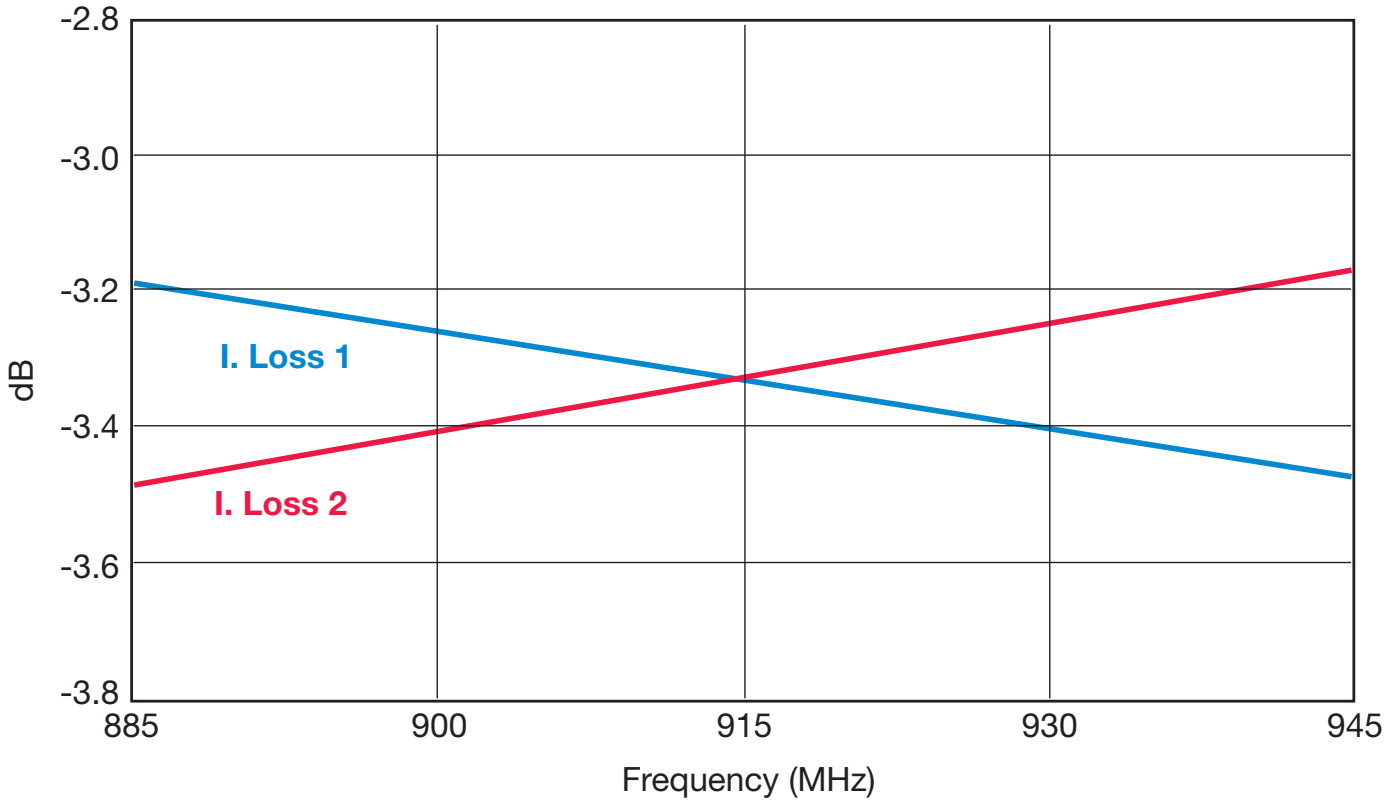
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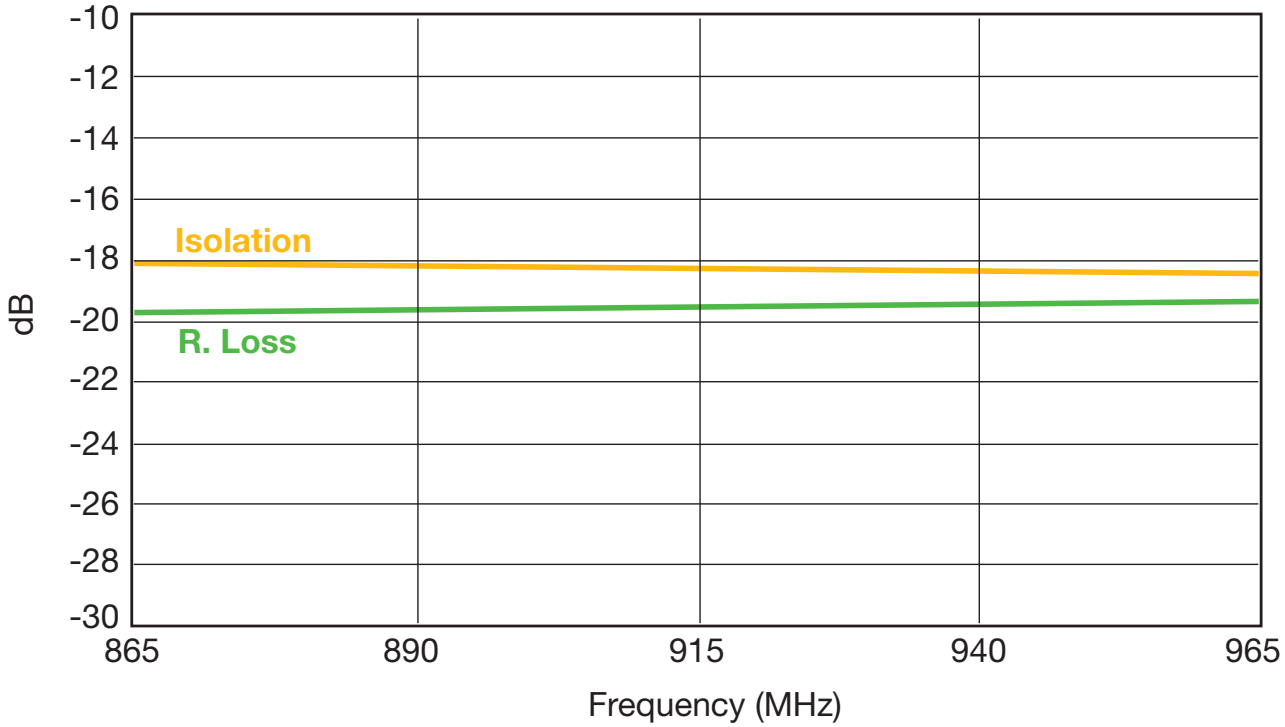




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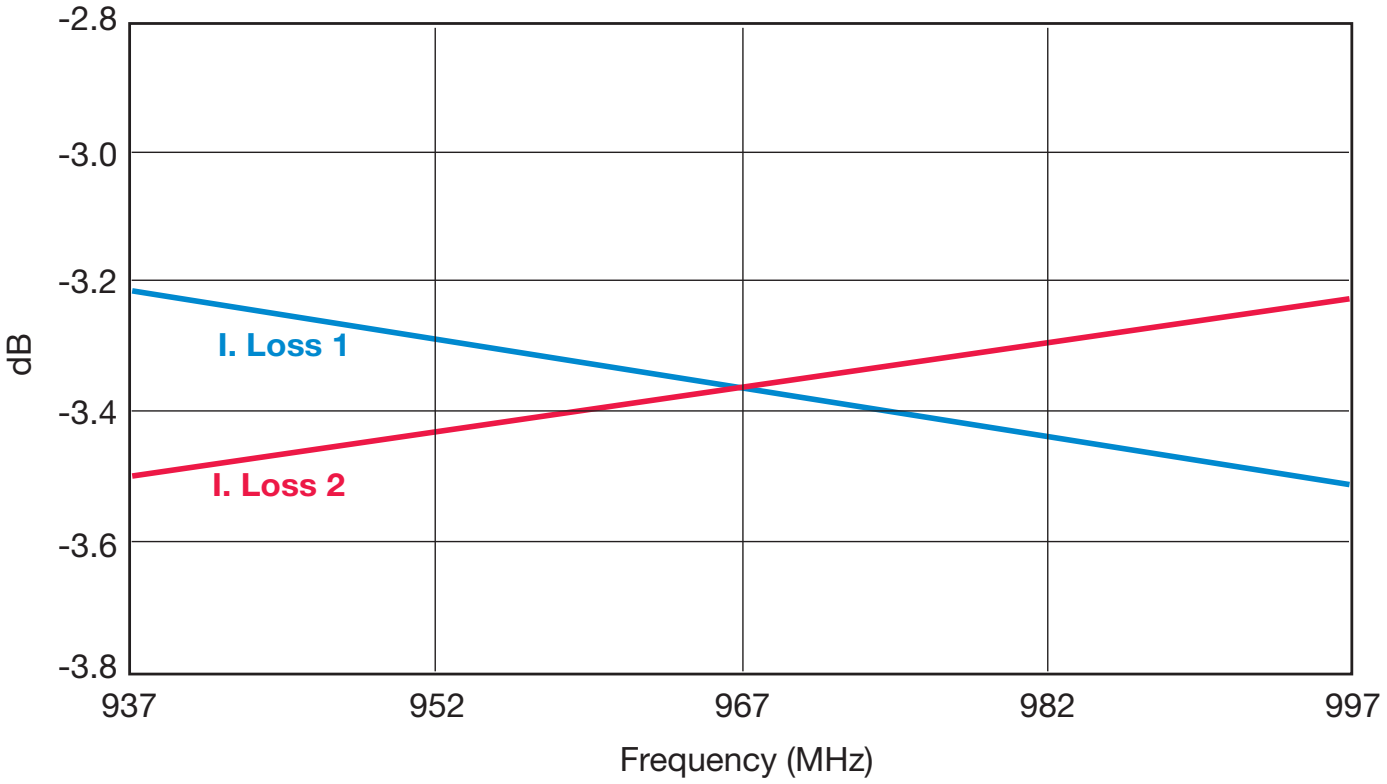
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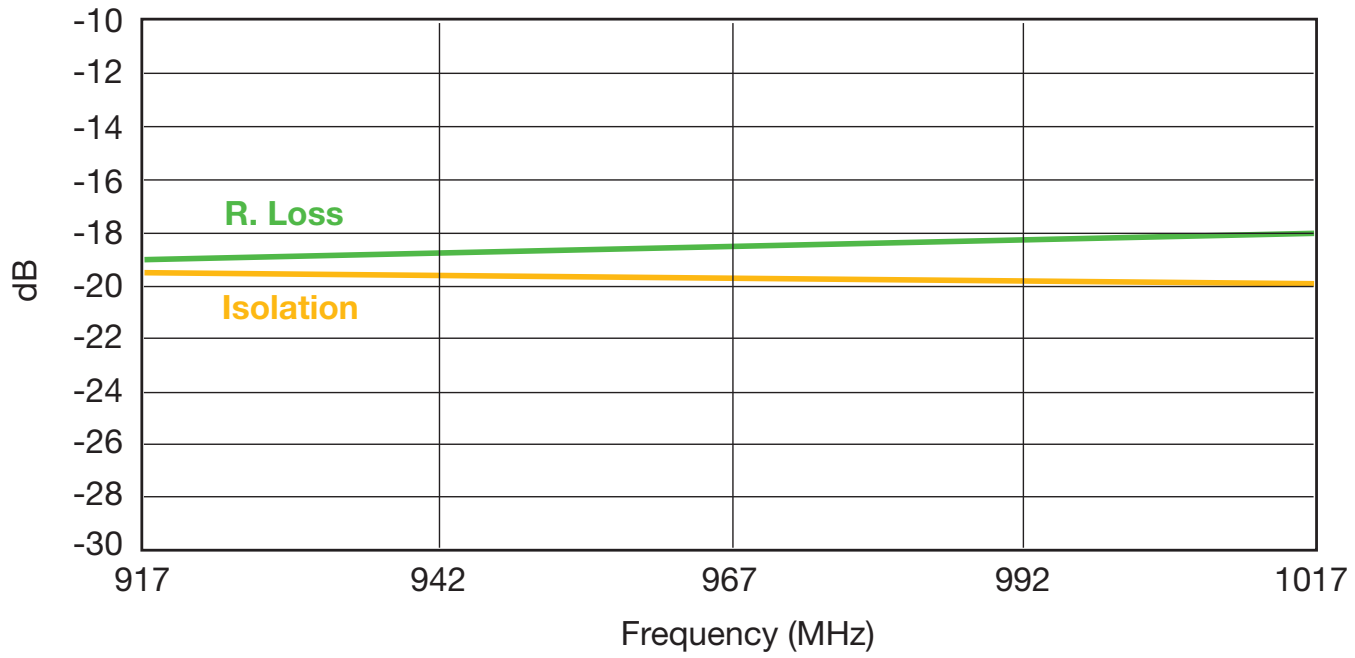




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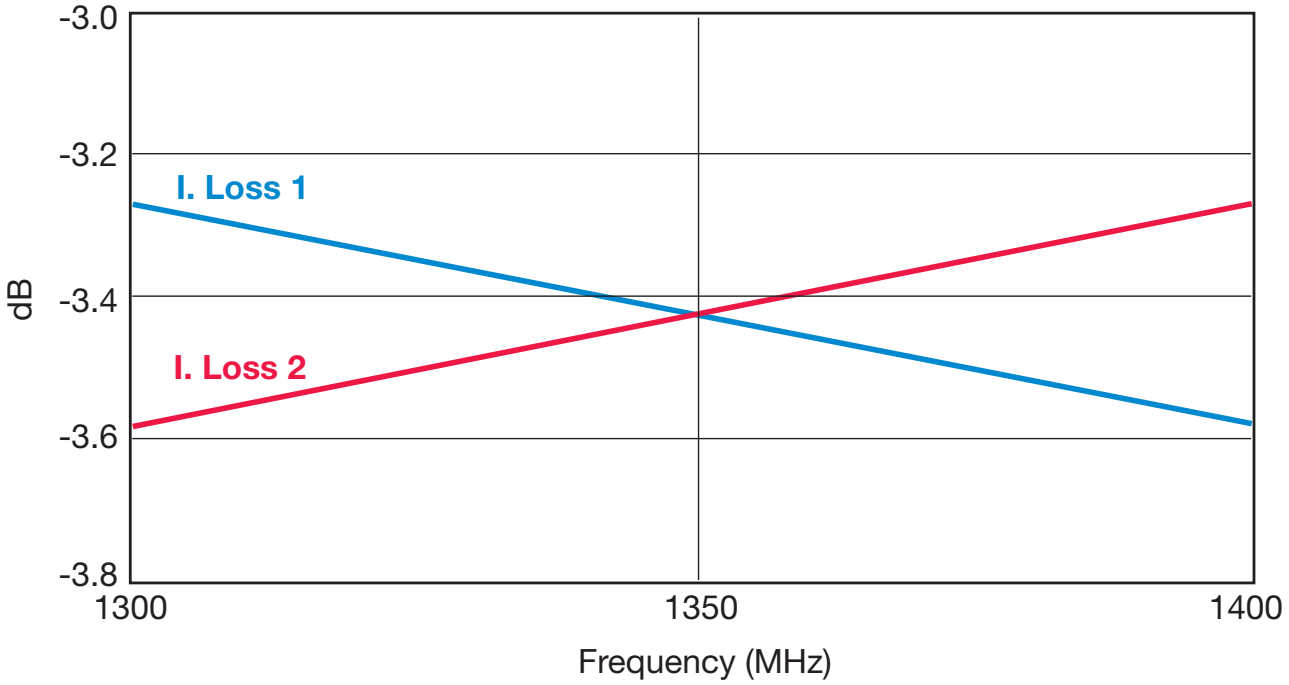
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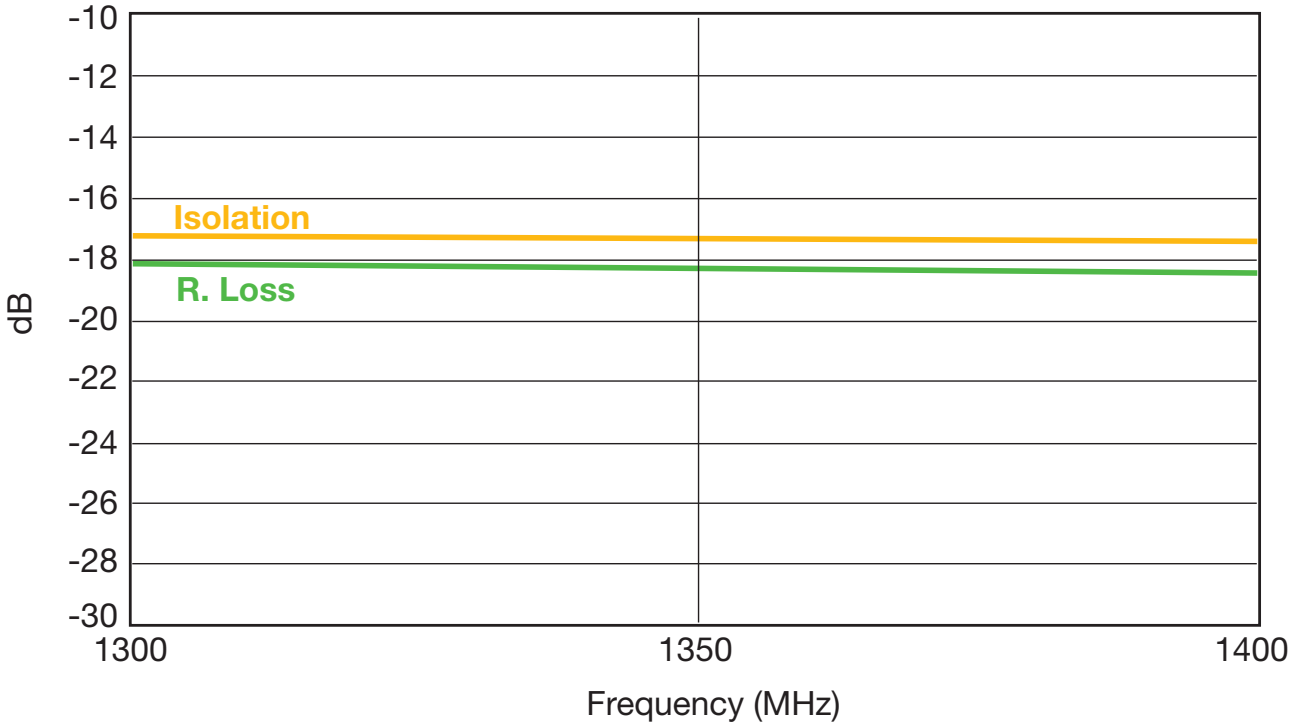




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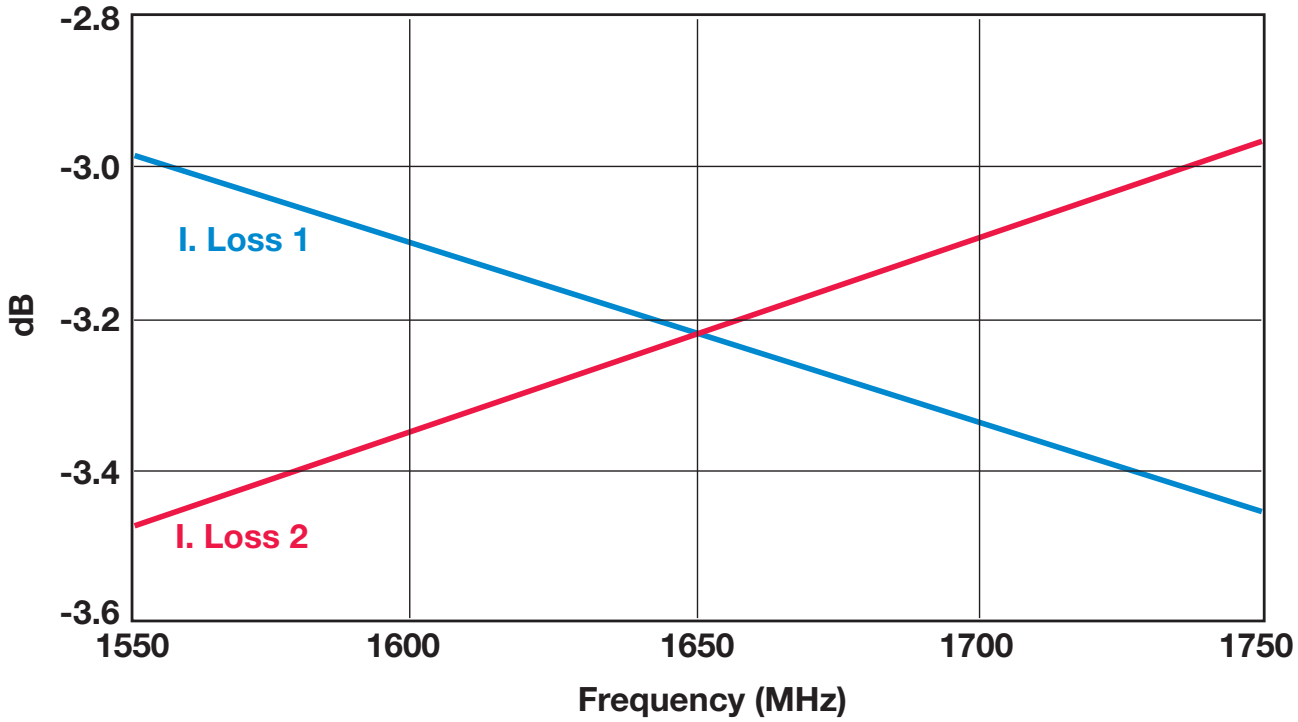
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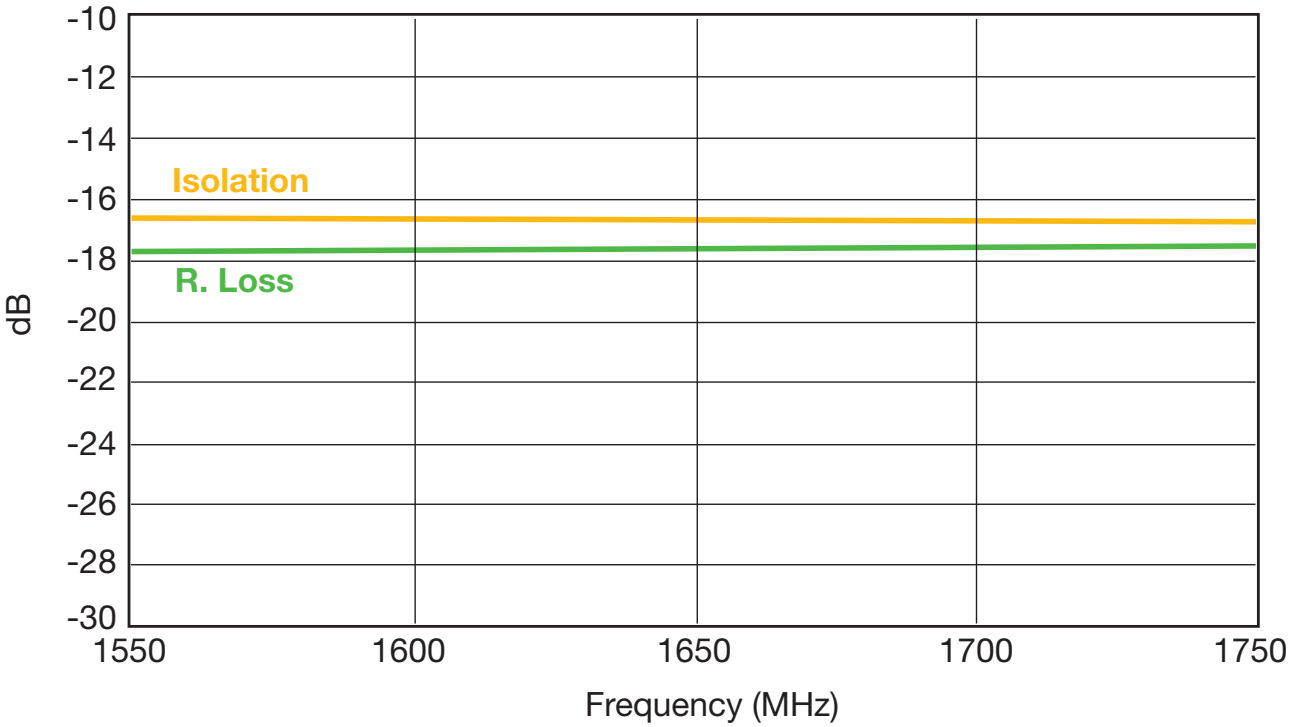




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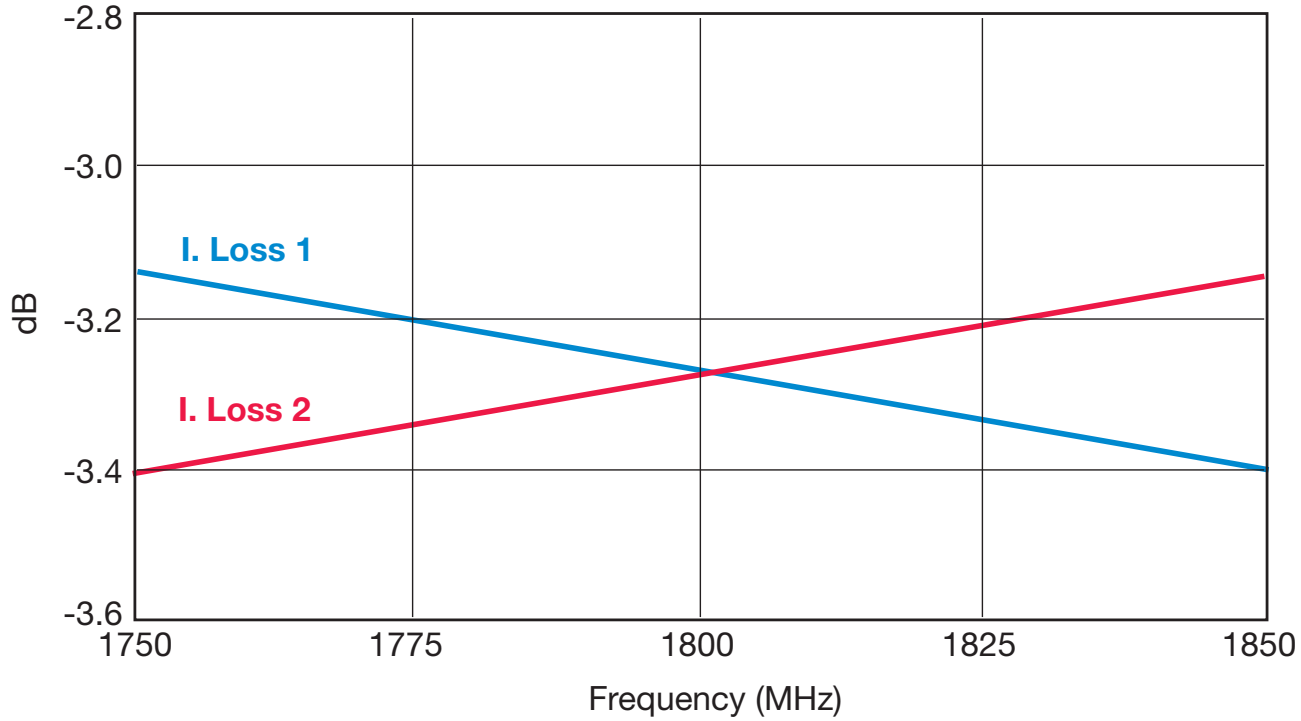
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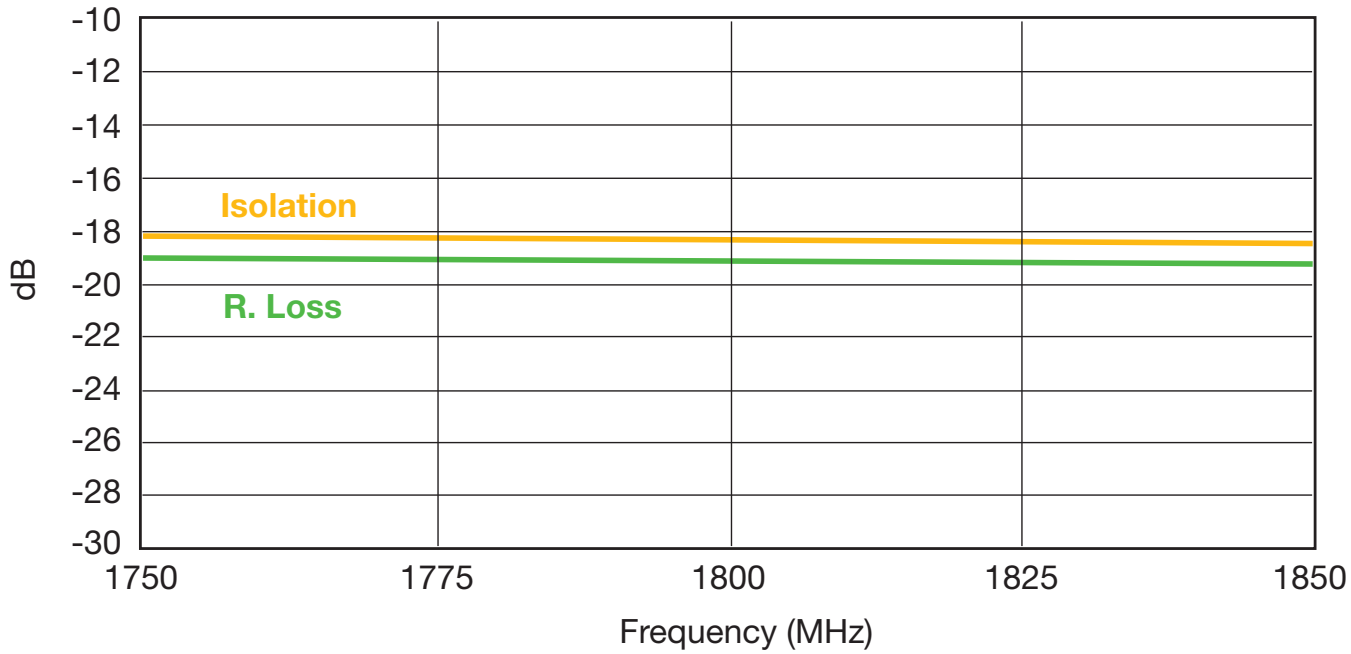




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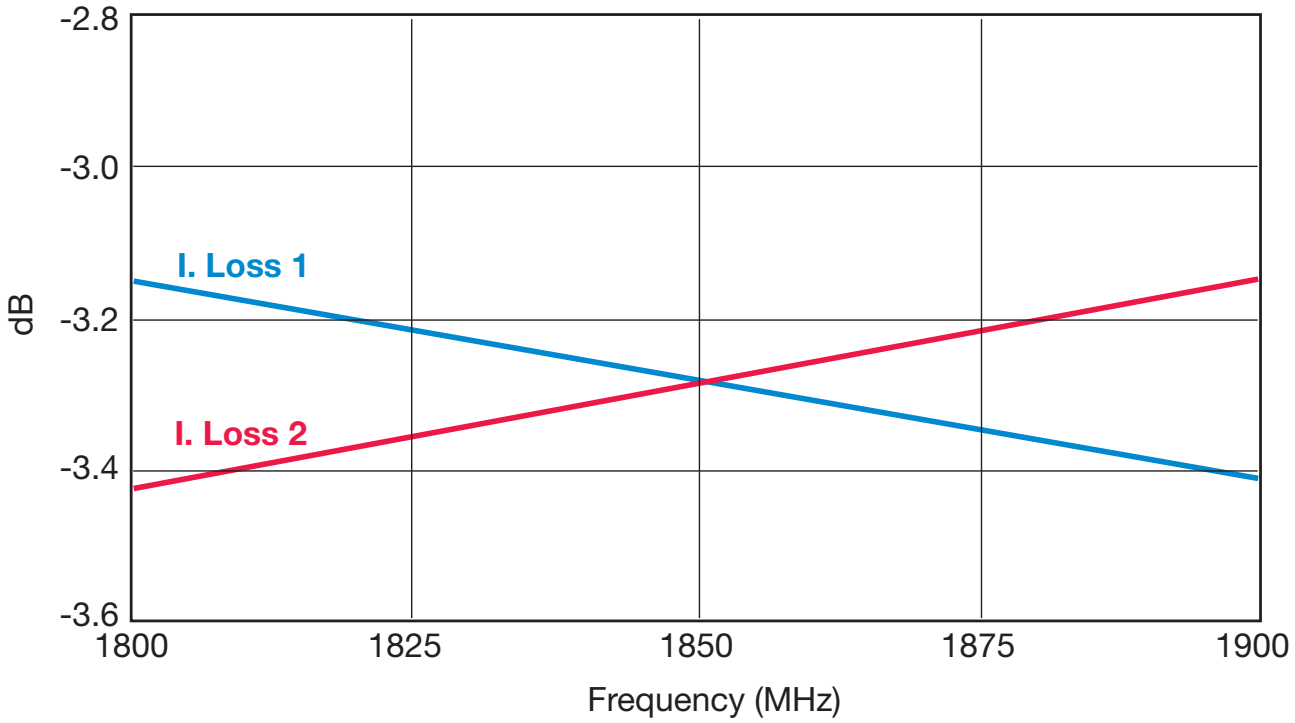
1800 ± 50MHz DB0805A1800ASTR

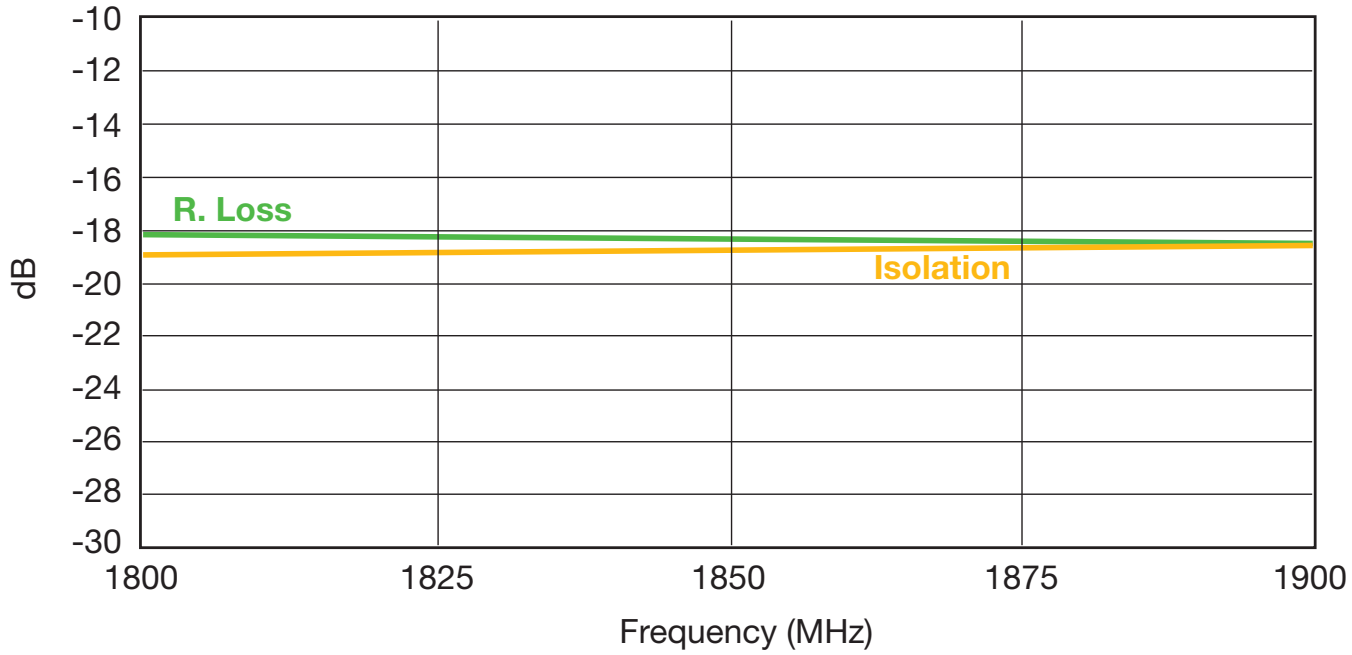




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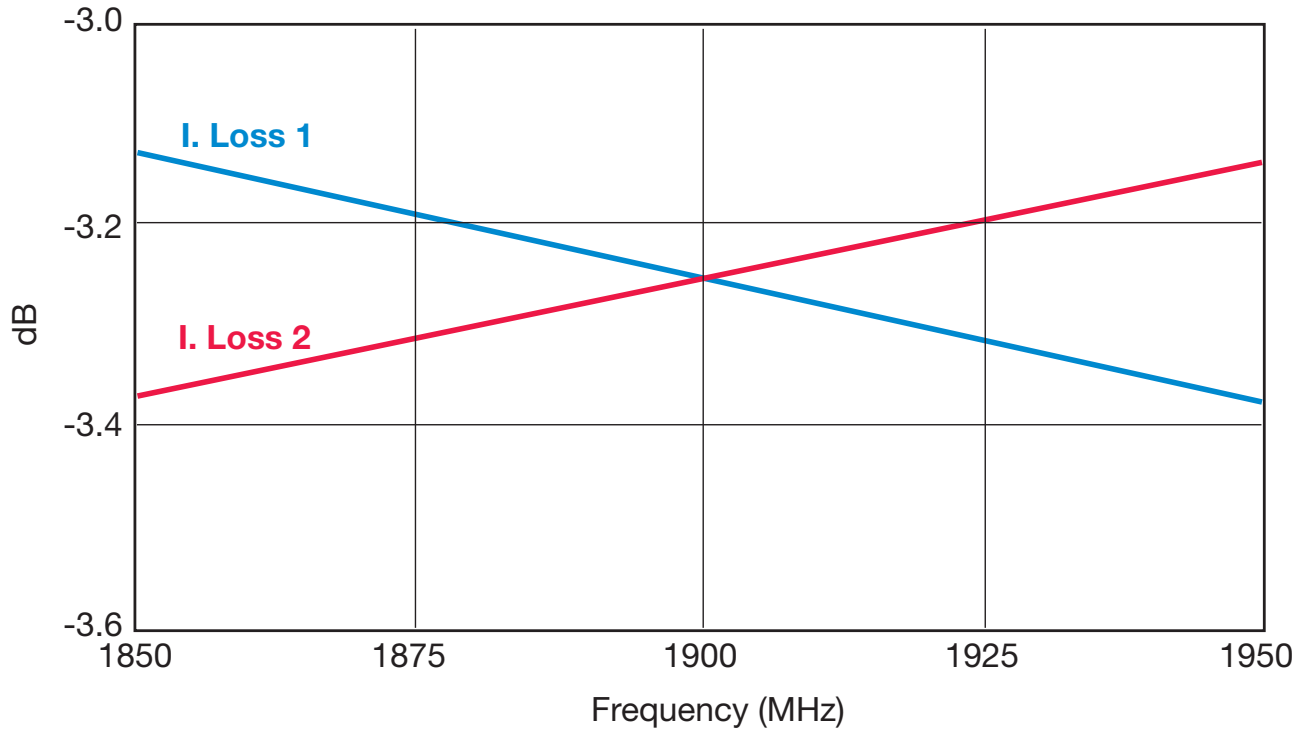
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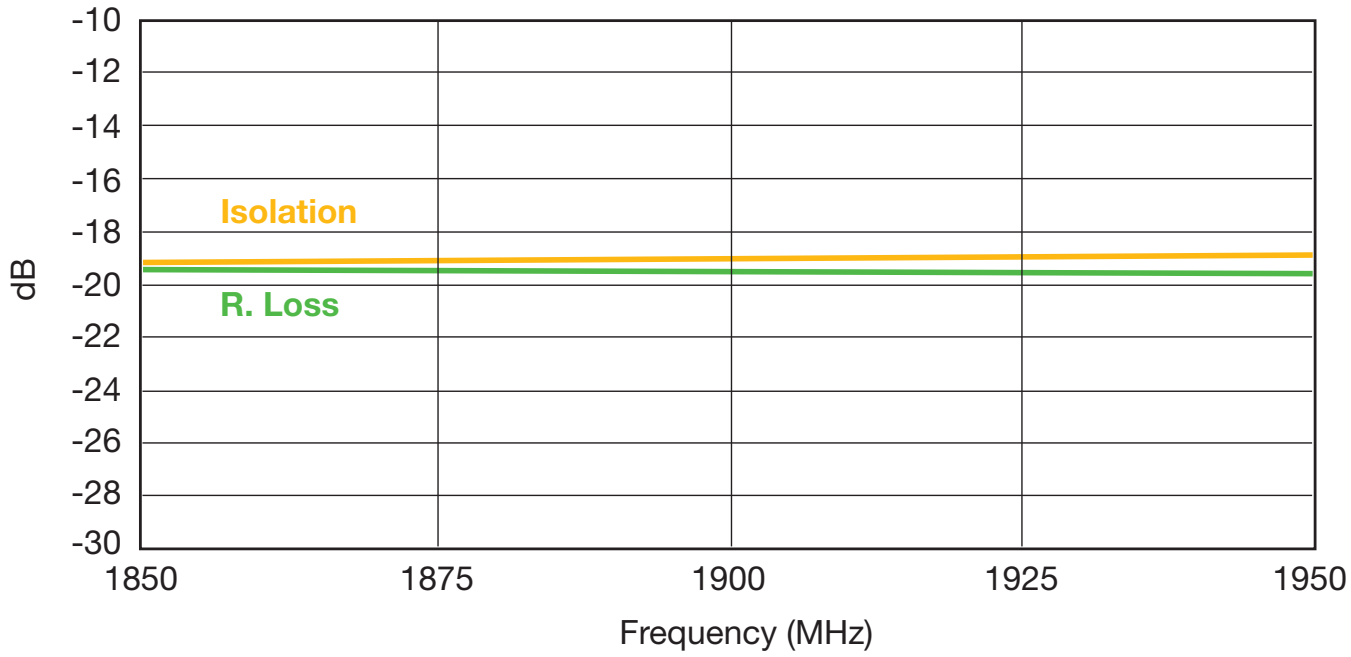




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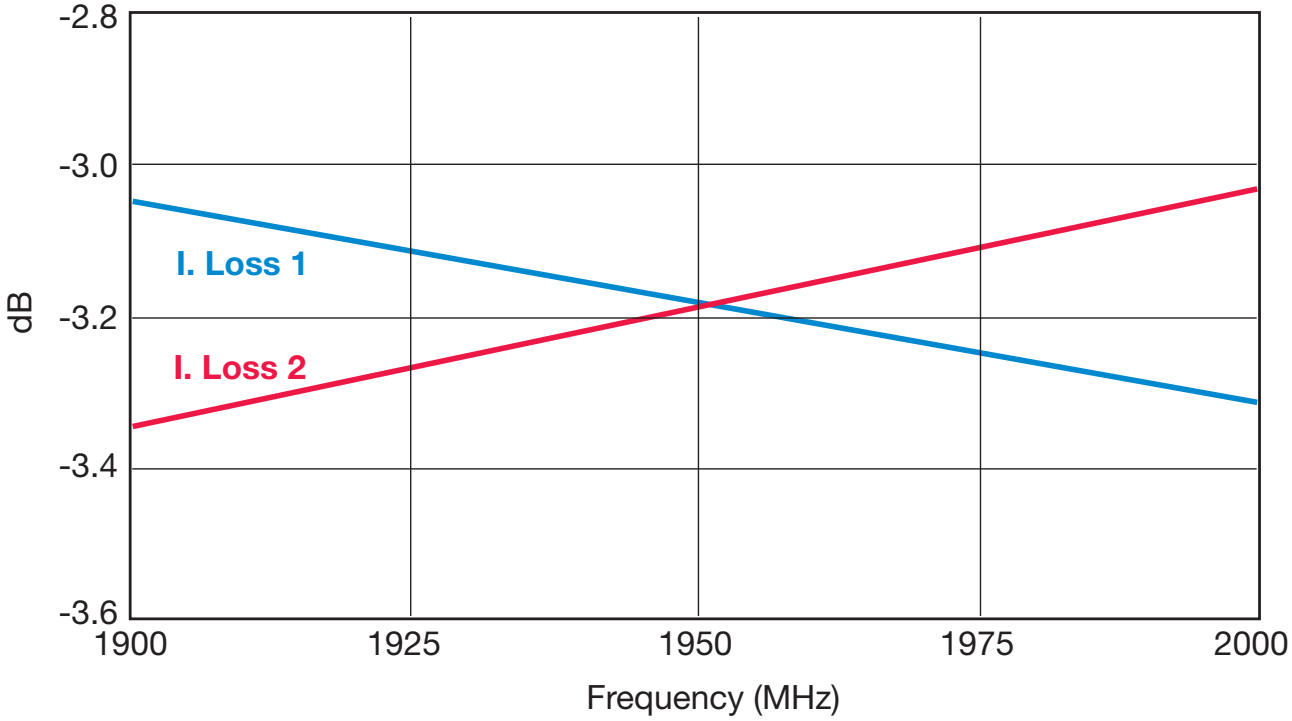
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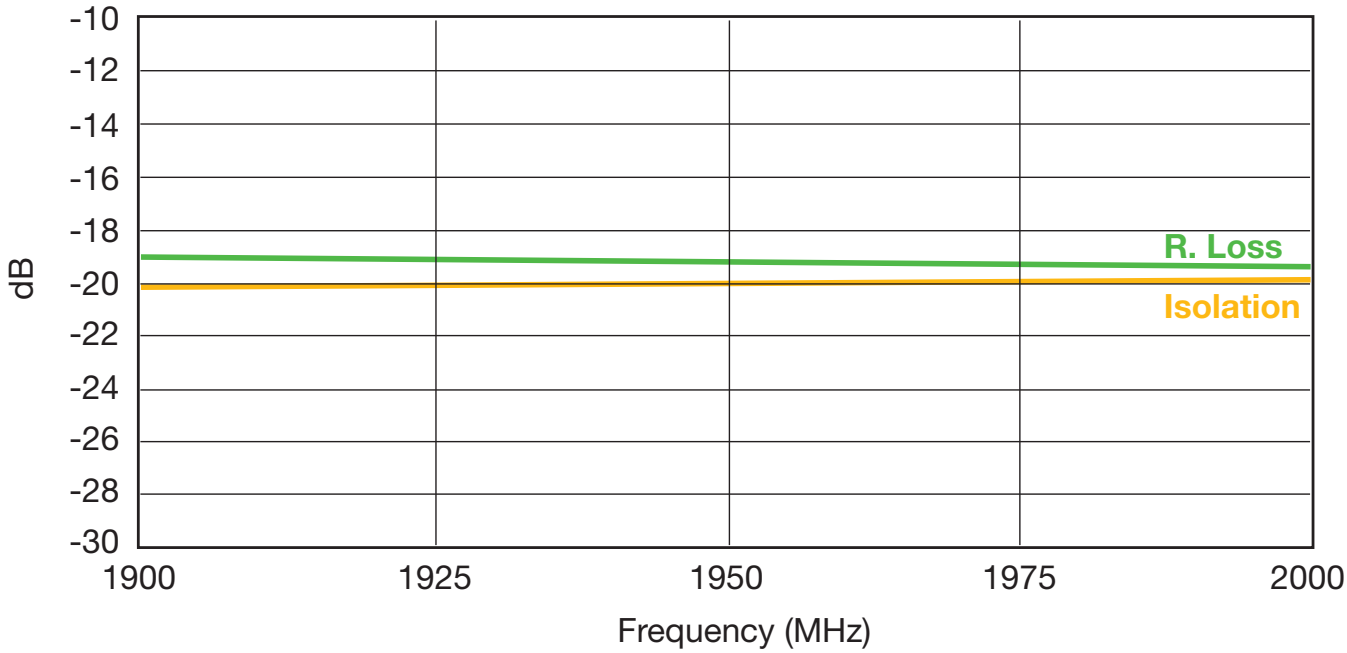




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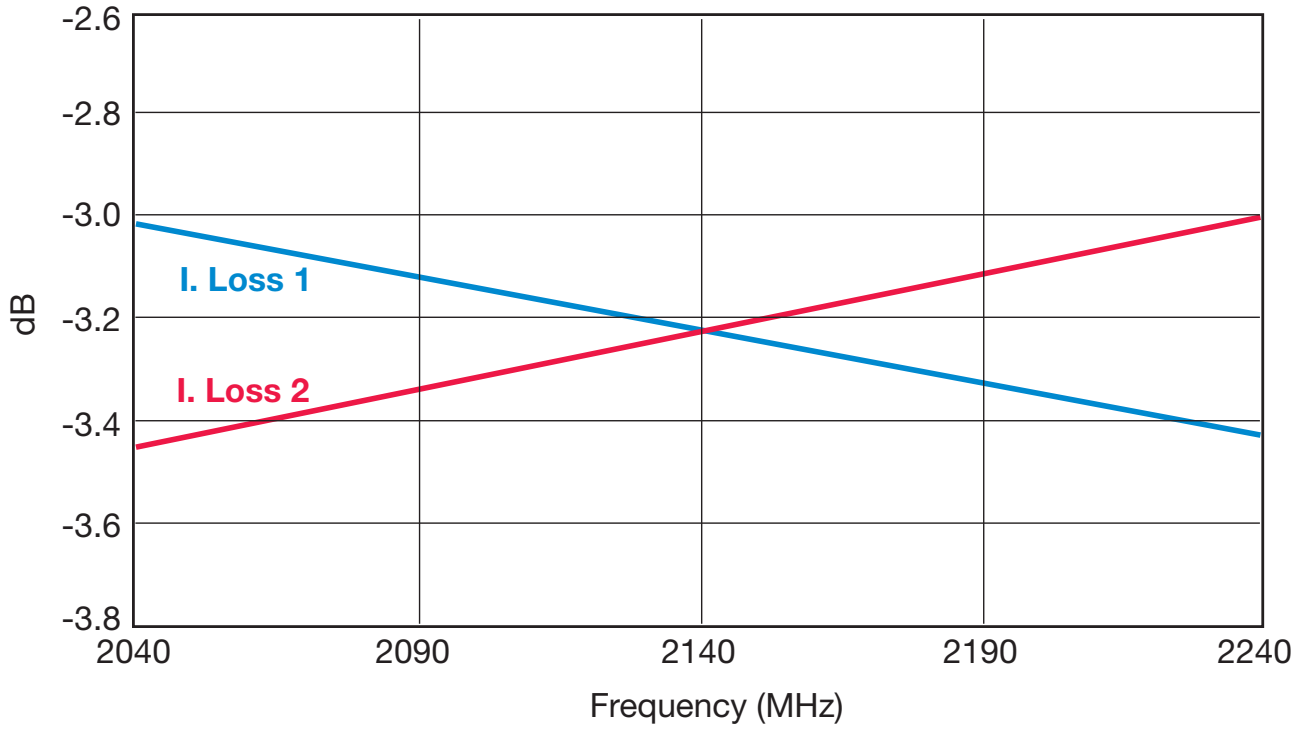
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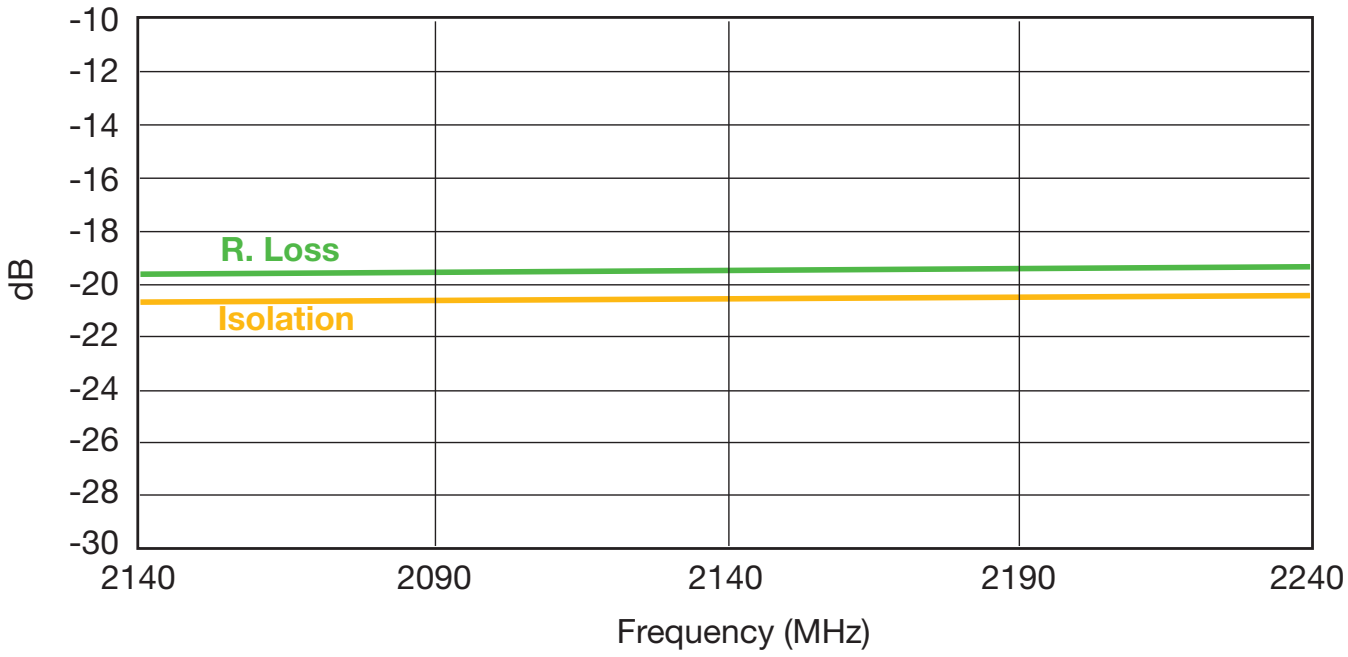




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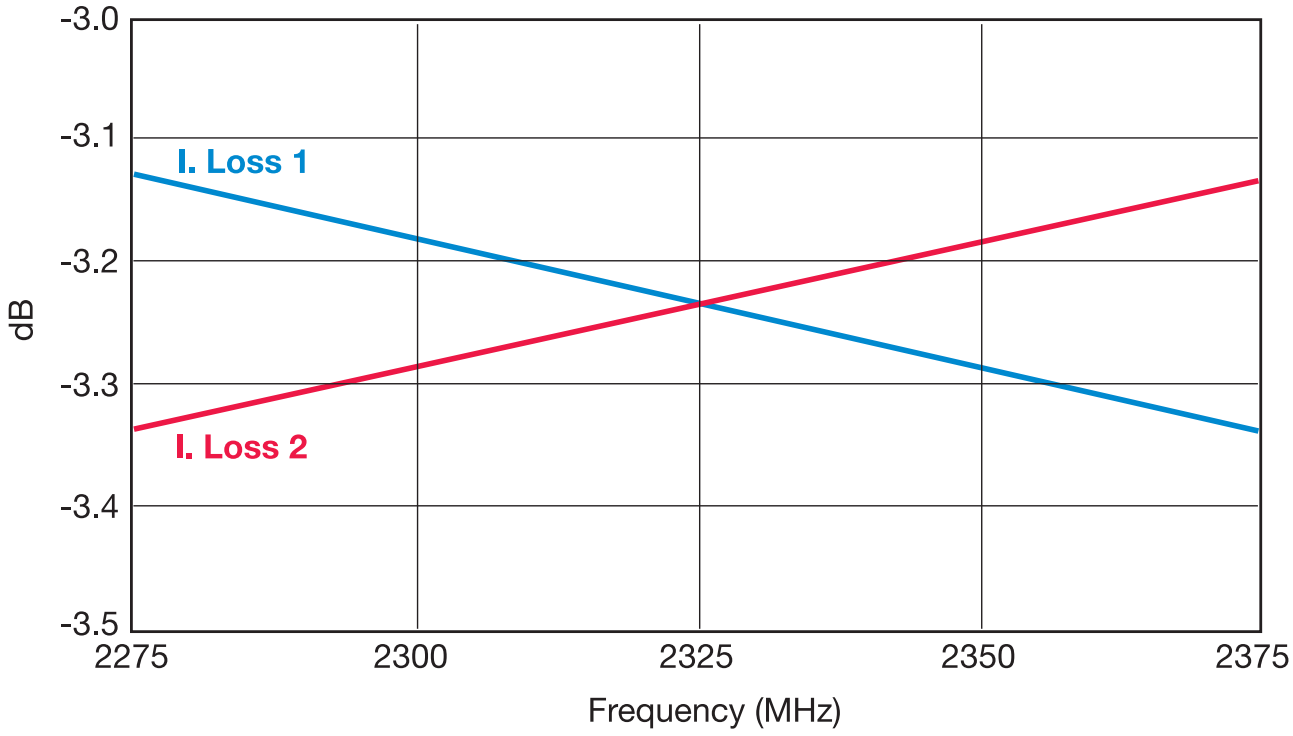
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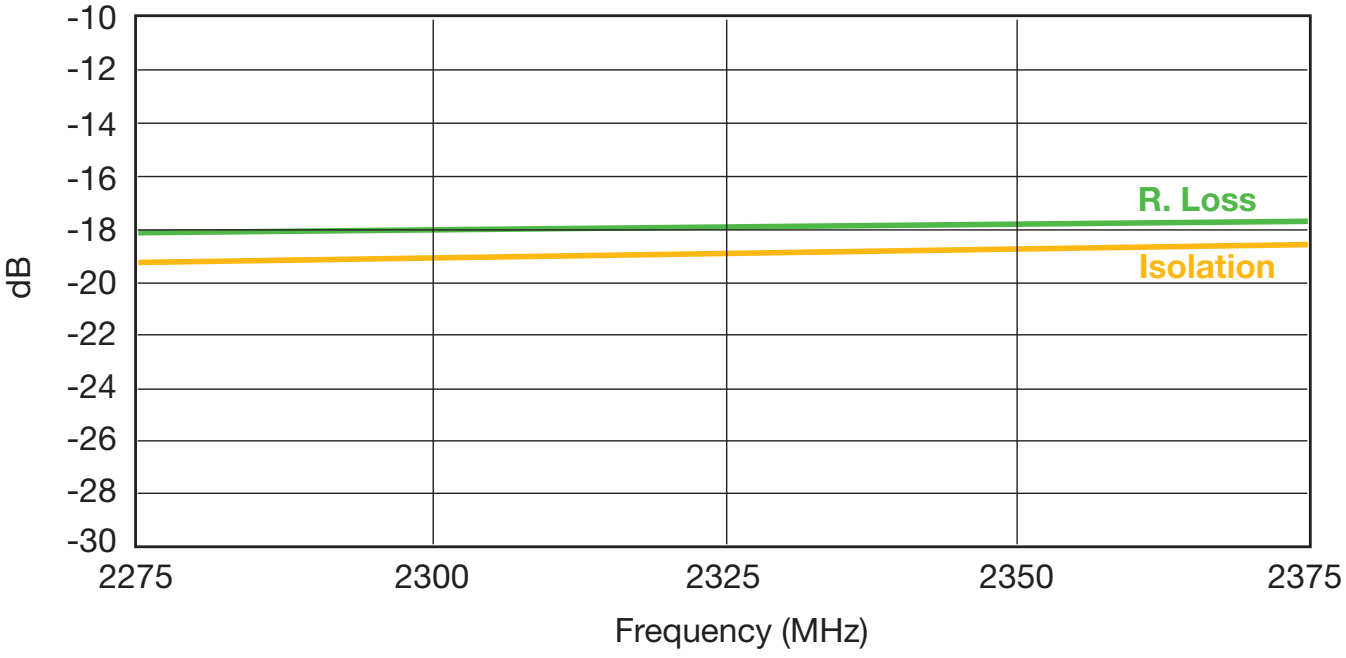




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2325 ± 50MHz DB0805A2325ASTR





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GENERAL DESCRIPTION

These jigs are designed for testing the DB0805 3dB 90° Couplers using a Vector Network Analyzer.

They consist of a dielectric substrate, having 50Ω microstrips as conducting lines and a bottom ground plane located at a distance of 0.254mm from the microstrips.

The substrate used is Neltec's NH9338ST0254C1BC.

The connectors are SMA type (female), 'Johnson Components Inc.' Product P/N: 142-0701-841.

Both a measurement jig and a calibration jig are provided.

The calibration jig is designed for a full 2-port calibration, and consists of an open line, short line and through line. LOAD calibration can be done by a 50Ω SMA termination.

MEASUREMENT PROCEDURE

When measuring a component, it can be either soldered or pressed using a non-metallic stick until all four ports touch the appropriate pads. Set the VNA to the relevant frequency band. Connect the VNA using a 10dB attenuator on the jig terminal connected to port 2. Follow the VNA's instruction manual and use the calibration jig to perform a full 2-port calibration in the required bandwidths.

Place the coupler on the measurement jig as follows:

Input (Coupler) ➜ Connector 1 (Jig)
50Ω (Coupler) ➜ Connector 2 (Jig)
Output 1 (Coupler) ➜ Connector 3 (Jig)
Output 2 (Coupler) ➜ Connector 4 (Jig)

To measure R. Loss and I. Loss 1 connect:

Connector 1 (Jig) ➜ Port 1 (VNA)
Connector 2 (Jig) ➜ 50Ω
Connector 3 (Jig) ➜ Port 2 (VNA)
Connector 4 (Jig) ➜ 50Ω

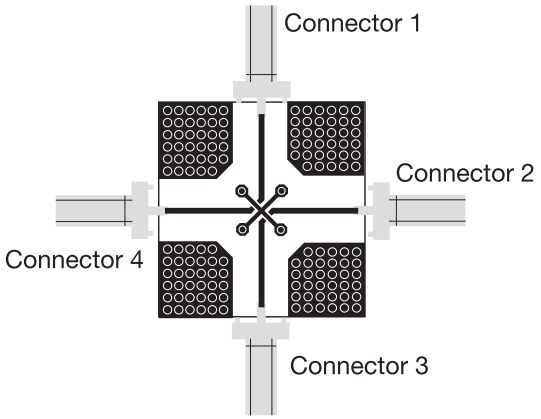
To measure R. Loss and I. Loss 2 connect:

Connector 1 (Jig) ➜ Port 1 (VNA)
Connector 2 (Jig) ➜ 50Ω
Connector 3 (Jig) ➜ 50Ω
Connector 4 (Jig) ➜ Port 2 (VNA)

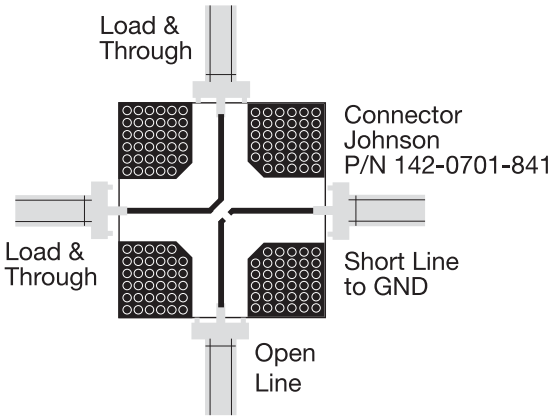
To measure Isolation connect:

Connector 1 (Jig) ➜ 50Ω
Connector 2 (Jig) ➜ 50Ω
Connector 3 (Jig) ➜ Port 1 (VNA)
Connector 4 (Jig) ➜ Port 2 (VNA)

Measurement Jig



Calibration Jig



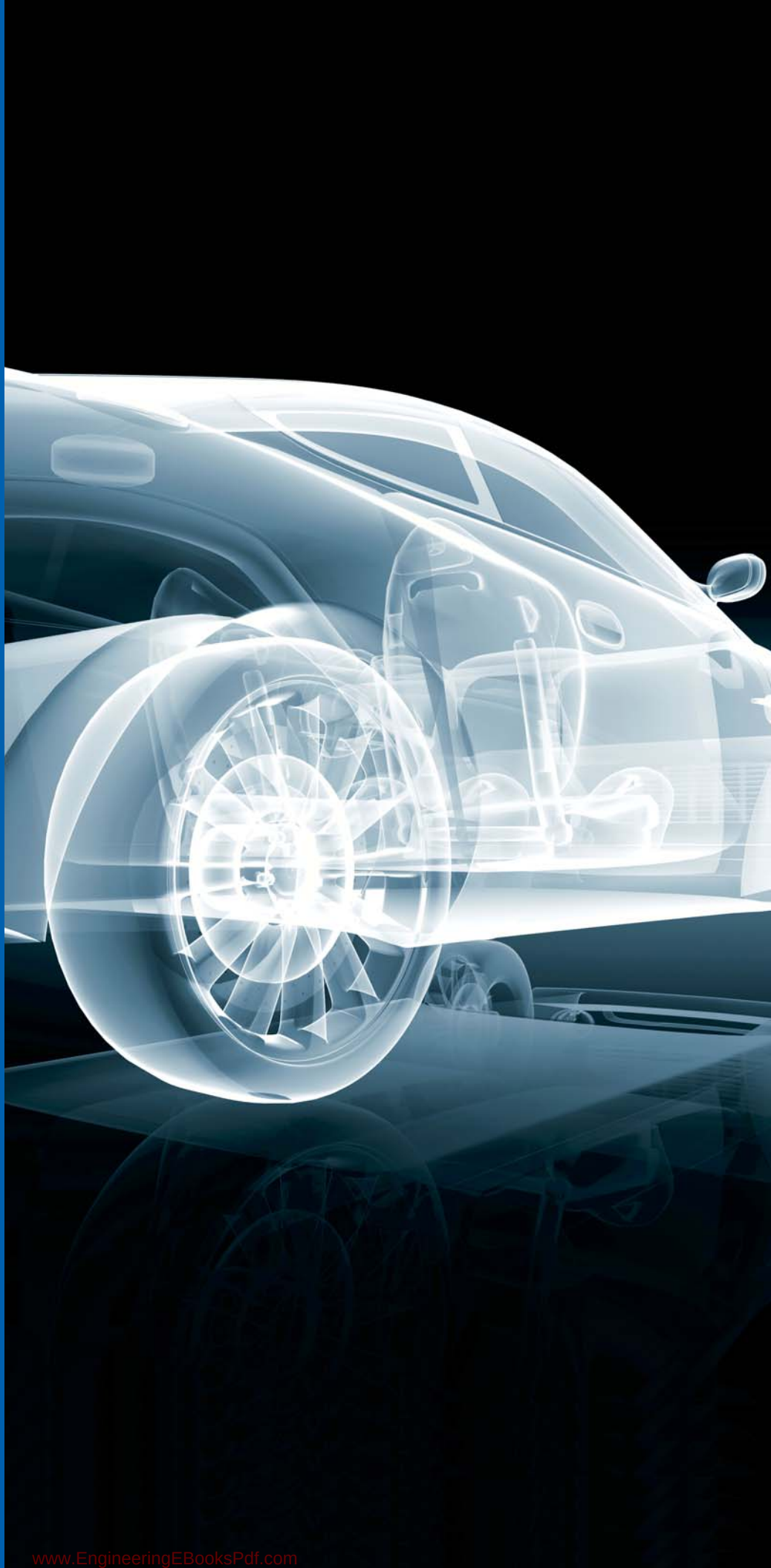
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TANTALUM CAPACITORS

AVX is a worldwide leading supplier of tantalum capacitors. Tantalum capacitors provide high capacitance, high reliability and no piezo noise effect.

Some of the innovative solutions include:

- NIOBIUM OXIDE CAPACITORS
  Innovative dielectric with non-burn technology.
- HIGH TEMPERATURE TANTALUM
  Tantalum capacitors with industry leading high temperature performance
  for applications up to +175ºC.
- LOW ESR TANTALUM
  Capacitors designed with very low ESR value for improved filtering performance.
- CONDUCTIVE POLYMER
  New automotive polymer series offering extremly low ESR values with benign failure mode.



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TAJ Automotive Series
Standard Tantalum - Automotive Product Range



FEATURES

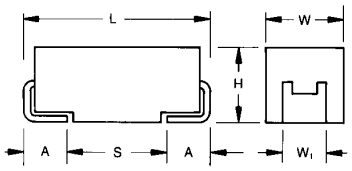
- General purpose SMT chip tantalum series
- 6 case sizes available
- CV range: 0.22-680µF / 6.3-50V

APPLICATIONS

- Audio Systems
- GPS
- Seat Controls
- Dashboard

GENERAL CHARACTERISTICS

Operating Temperature:
-55ºC to 125ºC



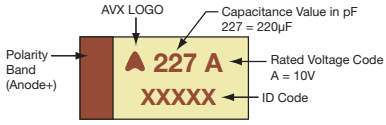
CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) -0.10 (0.004)	H+0.20 (0.008) -0.10 (0.004)	W_1±0.20 (0.008)	A+0.30 (0.012) -0.20 (0.008)	S Min.
A	1206	3216-18	3.20 (0.126)	1.60 (0.063)	1.60 (0.063)	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)
B	1210	3528-21	3.50 (0.138)	2.80 (0.110)	1.90 (0.075)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)
C	2312	6032-28	6.00 (0.236)	3.20 (0.126)	2.60 (0.102)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
D	2917	7343-31	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
Y	2917	7343-20	7.30 (0.287)	4.30 (0.169)	2.00 (0.079)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)

W_1 dimension applies to the termination width for A dimensional area only.

MARKING

A, B, C, D, E, Y CASE



HOW TO ORDER

TAJ C 106 M 035 T NJ V

Type

Case Size
See table above

Capacitance Code
pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

Tolerance
K = ±10%
M = ±20%

Rated DC Voltage
006 = 6.3Vdc
010 = 10Vdc
016 = 16Vdc
020 = 20Vdc
025 = 25Vdc
035 = 35Vdc
050 = 50Vdc

Packaging
T = Automotive Lead Free 7" Reel
U = Automotive Lead Free 13" Reel

Specification Suffix
NJ = Std Suffix

Dry Pack Option
(D,E,Y case sizes mandatory)

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

TECHNICAL SPECIFICATIONS

Technical Data:	All technical data relate to an ambient temperature of +25°C							
Capacitance Range:	0.22 µF to 680 µF							
Capacitance Tolerance:	±10%; ±20%							
Rated Voltage (V_R)	≤ +85°C:	6.3	10	16	20	25	35	50
Category Voltage (V_C)	≤ +125°C:	4	7	10	13	17	23	33
Surge Voltage (V_S)	≤ +85°C:	8	13	20	26	32	46	65
Surge Voltage (V_S)	≤ +125°C:	5	8	13	16	20	28	40
Temperature Range:	-55°C to +125°C							
Environmental Classification:	55/125/56 (IEC 68-2)							
Reliability:	1% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance, 60% confidence level							
Termination Finished:	Sn Plating (standard), Gold and SnPb Plating upon request							
	Meets requirements of AEC-Q200							

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TAJ AUTOMOTIVE RANGE
CAPACITANCE AND RATED VOLTAGE RANGE
(LETTER DENOTES CASE SIZE)

Capacitance		Rated voltage DC (V_R) to 85°C						
µF	Code	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
0.10	104							
0.15	154							
0.22	224							A
0.33	334						A	A
0.47	474					A	A	A/B
0.68	684					A	A	B
1.0	105			A	A	A	A/B	B/C
1.5	155				A	A/B	A/B	C
2.2	225		A	A	A/B	A/B	B/C	C/D
3.3	335	A		A/B	A/B	A/B	B/C	C/D
4.7	475		A/B	A/B	A/B	B/C	B/C/D	C/D
6.8	685		A/B	A/B	A/B/C	B/C	C/D	D
10	106	A/B	A/B	A/B/C	B/C	B/C/D	C/D/Y	D/E
15	156	A	A/B/C	B/C	B/C	C/D/Y	D/Y	E
22	226	A/B/C	A/B/C	B/C/D	B/C/D/Y	C/D/Y	D/E	
33	336	A/B	B/C	B/C/D/Y	C/D/Y	D	D/E	
47	476	A/B/C	B/C/D	C/D/Y	D/Y	D/E	E	
68	686	B/C	B/C/D/Y	C/D/Y	D/E	E		
100	107	B/C/D/Y	C/D/Y	D/E	E	E		
150	157	C/D/Y	D/E/Y	D/E				
220	227	C/D/Y	D/E	E				
330	337	D/E	D/E					
470	477	D/E						
680	687	D/E						

Not recommended for new designs; higher voltage or smaller case size alternatives are available.

Released ratings

Engineering samples - please contact AVX

Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (Ω)	100kHz RMS Current (mA)			MSL
										25°C	85°C	125°C	
6.3 Volt @ 85°C													
TAJA335*006TNJ	A	3.3	6.3	85	4	125	0.5	6	7	104	93	41	1
TAJA106*006TNJ	A	10	6.3	85	4	125	0.6	6	4	137	123	55	1
TAJB106*006TNJ	B	10	6.3	85	4	125	0.5	6	3	168	151	67	1
TAJA156*006TNJ	A	15	6.3	85	4	125	0.9	6	3.5	146	132	59	1
TAJA226*006TNJ	A	22	6.3	85	4	125	1.4	6	3	158	142	63	1
TAJB226*006TNJ	B	22	6.3	85	4	125	1.4	6	2.5	184	166	74	1
TAJC226*006TNJ	C	22	6.3	85	4	125	1.4	6	2	235	211	94	1
TAJA336*006TNJ	A	33	6.3	85	4	125	2.1	8	2.2	185	166	74	1
TAJB336*006TNJ	B	33	6.3	85	4	125	2.1	6	2.2	197	177	79	1
TAJA476*006TNJ	A	47	6.3	85	4	125	2.8	10	1.6	217	195	87	1
TAJB476*006TNJ	B	47	6.3	85	4	125	3	6	2	206	186	82	1
TAJC476*006TNJ	C	47	6.3	85	4	125	3	6	1.6	262	236	105	1
TAJB686*006TNJ	B	68	6.3	85	4	125	4	8	0.9	307	277	123	1
TAJC686*006TNJ	C	68	6.3	85	4	125	4.3	6	1.5	271	244	108	1
TAJB107*006TNJ	B	100	6.3	85	4	125	6.3	10	1.4	246	222	99	1
TAJC107*006TNJ	C	100	6.3	85	4	125	6.3	6	0.9	350	315	140	1
TAJD107*006TNJV	D	100	6.3	85	4	125	6.3	6	0.9	408	367	163	3
TAJY107*006TNJV	Y	100	6.3	85	4	125	6.3	6	0.7	423	380	169	3
TAJC157*006TNJ	C	150	6.3	85	4	125	9.5	6	1.3	291	262	116	1
TAJD157*006TNJV	D	150	6.3	85	4	125	9.5	6	0.9	408	367	163	3
TAJY157*006TNJV	Y	150	6.3	85	4	125	9.5	6	0.4	559	503	224	3
TAJC227*006TNJ	C	220	6.3	85	4	125	8.8	8	1.2	303	272	121	1
TAJD227*006TNJV	D	220	6.3	85	4	125	13.9	8	0.4	612	551	245	3
TAJY227*006TNJV	Y	220	6.3	85	4	125	13.9	8	0.7	423	380	169	3
TAJD337*006TNJV	D	330	6.3	85	4	125	20.8	8	0.4	612	551	245	3
TAJE337*006TNJV	E	330	6.3	85	4	125	20.8	8	0.4	642	578	257	3
TAJD477*006TNJV	D	470	6.3	85	4	125	28	12	0.4	612	551	245	3
TAJE477*006TNJV	E	470	6.3	85	4	125	28	10	0.4	642	578	257	3
TAJD687*006TNJV	D	680	6.3	85	4	125	40.8	20	0.5	548	493	219	3
TAJE687*006TNJV	E	680	6.3	85	4	125	42.8	10	0.5	574	517	230	3
10 Volt @ 85°C													
TAJA225*010TNJ	A	2.2	10	85	7	125	0.5	6	7	104	93	41	1
TAJA475*010TNJ	A	4.7	10	85	7	125	0.5	6	5	122	110	49	1
TAJB475*010TNJ	B	4.7	10	85	7	125	0.5	6	4	146	131	58	1
TAJA685*010TNJ	A	6.8	10	85	7	125	0.7	6	4	137	123	55	1
TAJB685*010TNJ	B	6.8	10	85	7	125	0.7	6	3	168	151	67	1
TAJA106*010TNJ	A	10	10	85	7	125	1	6	3	158	142	63	1
TAJB106*010TNJ	B	10	10	85	7	125	1	6	2.1	201	181	80	1
TAJA156*010TNJ	A	15	10	85	7	125	1.5	6	3.2	153	138	61	1
TAJB156*010TNJ	B	15	10	85	7	125	1.5	6	2.8	174	157	70	1
TAJC156*010TNJ	C	15	10	85	7	125	1.5	6	2	235	211	94	1
TAJA226*010TNJ	A	22	10	85	7	125	2.2	8	3	158	142	63	1
TAJB226*010TNJ	B	22	10	85	7	125	2.2	6	2.4	188	169	75	1
TAJC226*010TNJ	C	22	10	85	7	125	2.2	6	1.8	247	222	99	1
TAJB336*010TNJ	B	33	10	85	7	125	3.3	6	1.8	217	196	87	1
TAJC336*010TNJ	C	33	10	85	7	125	3.3	6	1.6	262	236	105	1
TAJB476*010TNJ	B	47	10	85	7	125	4.7	8	1	292	262	117	1
TAJC476*010TNJ	C	47	10	85	7	125	4.7	6	1.2	303	272	121	1
TAJD476*010TNJV	D	47	10	85	7	125	4.7	6	0.4	612	551	245	3
TAJB686*010TNJ	B	68	10	85	7	125	6.8	8	1.4	246	222	99	1
TAJC686*010TNJ	C	68	10	85	7	125	6.8	6	1.3	291	262	116	1
TAJD686*010TNJV	D	68	10	85	7	125	6.8	6	0.9	408	367	163	3
TAJY686*010TNJV	Y	68	10	85	7	125	6.8	6	0.9	373	335	149	3
TAJC107*010TNJ	C	100	10	85	7	125	10	8	1.2	303	272	121	1
TAJD107*010TNJV	D	100	10	85	7	125	10	6	0.9	408	367	163	3
TAJY107*010TNJV	Y	100	10	85	7	125	10	6	0.9	373	335	149	3
TAJD157*010TNJV	D	150	10	85	7	125	15	8	0.9	408	367	163	3
TAJE157*010TNJV	E	150	10	85	7	125	15	8	0.9	428	385	171	3
TAJY157*010TNJV	Y	150	10	85	7	125	15	6	1.2	323	290	129	3
TAJD227*010TNJV	D	220	10	85	7	125	22	8	0.5	548	493	219	3
TAJE227*010TNJV	E	220	10	85	7	125	22	8	0.5	574	517	230	3
TAJD337*010TNJV	D	330	10	85	7	125	33	8	0.9	408	367	163	3
TAJE337*010TNJV	E	330	10	85	7	125	33	8	0.9	428	385	171	3
16 Volt @ 85°C													
TAJA105*016TNJ	A	1	16	85	10	125	0.5	4	11	83	74	33	1
TAJA225*016TNJ	A	2.2	16	85	10	125	0.5	6	6.5	107	97	43	1
TAJA335*016TNJ	A	3.3	16	85	10	125	0.5	6	5	122	110	49	1
TAJB335*016TNJ	B	3.3	16	85	10	125	0.5	6	4.5	137	124	55	1
TAJA475*016TNJ	A	4.7	16	85	10	125	0.8	6	4	137	123	55	1
TAJB475*016TNJ	B	4.7	16	85	10	125	0.8	6	3.5	156	140	62	1
TAJA685*016TNJ	A	6.8	16	85	10	125	1.1	6	3.5	146	132	59	1

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (Ω)	100kHz RMS Current (mA)			MSL
										25°C	85°C	125°C	
TAJB685*016TNJ	B	6.8	16	85	10	125	1.1	6	2.5	184	166	74	1
TAJA106*016TNJ	A	10	16	85	10	125	1.6	6	3	158	142	63	1
TAJB106*016TNJ	B	10	16	85	10	125	1.6	6	2.5	184	166	74	1
TAJC106*016TNJ	C	10	16	85	10	125	1.6	6	2	235	211	94	1
TAJB156*016TNJ	B	15	16	85	10	125	2.4	6	2.5	184	166	74	1
TAJC156*016TNJ	C	15	16	85	10	125	2.4	6	1.8	247	222	99	1
TAJB226*016TNJ	B	22	16	85	10	125	3.5	6	2.3	192	173	77	1
TAJC226*016TNJ	C	22	16	85	10	125	3.5	6	1	332	298	133	1
TAJD226*016TNJV	D	22	16	85	10	125	3.5	6	1.1	369	332	148	3
TAJB336*016TNJ	B	33	16	85	10	125	5.3	8	2.1	201	181	80	1
TAJC336*016TNJ	C	33	16	85	10	125	5.3	6	1.5	271	244	108	1
TAJD336*016TNJV	D	33	16	85	10	125	5.3	6	0.9	408	367	163	3
TAJY336*016TNJV	Y	33	16	85	10	125	5.3	6	0.9	373	335	149	3
TAJC476*016TNJ	C	47	16	85	10	125	7.5	6	0.5	469	422	188	1
TAJD476*016TNJV	D	47	16	85	10	125	7.5	6	0.9	408	367	163	3
TAJY476*016TNJV	Y	47	16	85	10	125	7.5	6	0.7	423	380	169	3
TAJC686*016TNJ	C	68	16	85	10	125	10.9	6	1.3	291	262	116	1
TAJD686*016TNJV	D	68	16	85	10	125	10.9	6	0.9	408	367	163	3
TAJY686*016TNJV	Y	68	16	85	10	125	10.9	6	0.9	373	335	149	3
TAJD107*016TNJV	D	100	16	85	10	125	16	6	0.6	500	450	200	3
TAJE107*016TNJV	E	100	16	85	10	125	16	6	0.9	428	385	171	3
TAJD157*016TNJV	D	150	16	85	10	125	24	6	0.9	408	367	163	3
TAJE157*016TNJV	E	150	16	85	10	125	23	8	0.3	742	667	297	3
TAJE227*016TNJV	E	220	16	85	10	125	35.2	10	0.5	574	517	230	3
20 Volt @ 85°C													
TAJA105*020TNJ	A	1	20	85	13	125	0.5	4	9	91	82	37	1
TAJA155*020TNJ	A	1.5	20	85	13	125	0.5	6	6.5	107	97	43	1
TAJA225*020TNJ	A	2.2	20	85	13	125	0.5	6	5.3	119	107	48	1
TAJB225*020TNJ	B	2.2	20	85	13	125	0.5	6	3.5	156	140	62	1
TAJA335*020TNJ	A	3.3	20	85	13	125	0.7	6	4.5	129	116	52	1
TAJB335*020TNJ	B	3.3	20	85	13	125	0.7	6	3	168	151	67	1
TAJA475*020TNJ	A	4.7	20	85	13	125	0.9	6	4	137	123	55	1
TAJB475*020TNJ	B	4.7	20	85	13	125	0.9	6	3	168	151	67	1
TAJA685*020TNJ	A	6.8	20	85	13	125	1.4	6	2.4	177	159	71	1
TAJB685*020TNJ	B	6.8	20	85	13	125	1.4	6	2.5	184	166	74	1
TAJC685*020TNJ	C	6.8	20	85	13	125	1.4	6	2	235	211	94	1
TAJB106*020TNJ	B	10	20	85	13	125	2	6	2.1	201	181	80	1
TAJC106*020TNJ	C	10	20	85	13	125	2	6	1.2	303	272	121	1
TAJB156*020TNJ	B	15	20	85	13	125	3	6	2	206	186	82	1
TAJC156*020TNJ	C	15	20	85	13	125	3	6	1.7	254	229	102	1
TAJB226*020TNJ	B	22	20	85	13	125	4.4	6	1.8	217	196	87	1
TAJC226*020TNJ	C	22	20	85	13	125	4.4	6	1.6	262	236	105	1
TAJD226*020TNJV	D	22	20	85	13	125	4.4	6	0.9	408	367	163	3
TAJY226*020TNJV	Y	22	20	85	13	125	4.4	6	0.9	373	335	149	3
TAJC336*020TNJ	C	33	20	85	13	125	6.6	6	1.5	271	244	108	1
TAJD336*020TNJV	D	33	20	85	13	125	6.6	6	0.9	408	367	163	3
TAJY336*020TNJV	Y	33	20	85	13	125	6.6	6	0.6	456	411	183	3
TAJD476*020TNJV	D	47	20	85	13	125	9.4	6	0.9	408	367	163	3
TAJY476*020TNJV	Y	47	20	85	13	125	9.4	6	0.9	373	335	149	3
TAJD686*020TNJV	D	68	20	85	13	125	13.6	6	0.4	612	551	245	3
TAJE686*020TNJV	E	68	20	85	13	125	13.6	6	0.9	428	385	171	3
TAJE107*020TNJV	E	100	20	85	13	125	20	6	0.4	642	578	257	3
25 Volt @ 85°C													
TAJA474*025TNJ	A	0.47	25	85	17	125	0.5	4	14	73	66	29	1
TAJA684*025TNJ	A	0.68	25	85	17	125	0.5	4	10	87	78	35	1
TAJA105*025TNJ	A	1	25	85	17	125	0.5	4	8	97	87	39	1
TAJA155*025TNJ	A	1.5	25	85	17	125	0.5	6	7.5	100	90	40	1
TAJB155*025TNJ	B	1.5	25	85	17	125	0.5	6	5	130	117	52	1
TAJA225*025TNJ	A	2.2	25	85	17	125	0.6	6	7	104	93	41	1
TAJB225*025TNJ	B	2.2	25	85	17	125	0.6	6	4.5	137	124	55	1
TAJA335*025TNJ	A	3.3	25	85	17	125	0.8	6	3.7	142	128	57	1
TAJB335*025TNJ	B	3.3	25	85	17	125	0.8	6	3.5	156	140	62	1
TAJB475*025TNJ	B	4.7	25	85	17	125	1.2	6	1.5	238	214	95	1
TAJC475*025TNJ	C	4.7	25	85	17	125	1.2	6	2.4	214	193	86	1
TAJB685*025TNJ	B	6.8	25	85	17	125	1.7	6	2.8	174	157	70	1
TAJC685*025TNJ	C	6.8	25	85	17	125	1.7	6	2	235	211	94	1
TAJB106*025TNJ	B	10	25	85	17	125	2.5	6	2.5	184	166	74	1
TAJC106*025TNJ	C	10	25	85	17	125	2.5	6	1.8	247	222	99	1
TAJD106*025TNJV	D	10	25	85	17	125	2.5	6	1.2	354	318	141	3
TAJC156*025TNJ	C	15	25	85	17	125	3.8	6	1.6	262	236	105	1
TAJD156*025TNJV	D	15	25	85	17	125	3.8	6	1	387	349	155	3
TAJY156*025TNJV	Y	15	25	85	17	125	3.8	6	1	354	318	141	3

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (Ω)	100kHz RMS Current (mA)			MSL
										25°C	85°C	125°C	
TAJC226*025TNJ	C	22	25	85	17	125	5.5	6	1.4	280	252	112	1
TAJD226*025TNJV	D	22	25	85	17	125	5.5	6	0.9	408	367	163	3
TAJY226*025TNJV	Y	22	25	85	17	125	5.5	6	0.8	395	356	158	3
TAJD336*025TNJV	D	33	25	85	17	125	8.3	6	0.9	408	367	163	3
TAJD476*025TNJV	D	47	25	85	17	125	11.8	6	0.9	408	367	163	3
TAJE476*025TNJV	E	47	25	85	17	125	11.8	6	0.9	428	385	171	3
TAJE686*025TNJV	E	68	25	85	17	125	17	6	0.9	428	385	171	3
TAJE107*025TNJV	E	100	25	85	17	125	25	10	0.3	742	667	297	3
35 Volt @ 85°C													
TAJA334*035TNJ	A	0.33	35	85	23	125	0.5	4	15	71	64	28	1
TAJA474*035TNJ	A	0.47	35	85	23	125	0.5	4	12	79	71	32	1
TAJA684*035TNJ	A	0.68	35	85	23	125	0.5	4	8	97	87	39	1
TAJA105*035TNJ	A	1	35	85	23	125	0.5	4	7.5	100	90	40	1
TAJB105*035TNJ	B	1	35	85	23	125	0.5	4	6.5	114	103	46	1
TAJA155*035TNJ	A	1.5	35	85	23	125	0.5	6	7.5	100	90	40	1
TAJB155*035TNJ	B	1.5	35	85	23	125	0.5	6	5.2	128	115	51	1
TAJB225*035TNJ	B	2.2	35	85	23	125	0.8	6	4.2	142	128	57	1
TAJC225*035TNJ	C	2.2	35	85	23	125	0.8	6	3.5	177	160	71	1
TAJB335*035TNJ	B	3.3	35	85	23	125	1.2	6	3.5	156	140	62	1
TAJC335*035TNJ	C	3.3	35	85	23	125	1.2	6	2.5	210	189	84	1
TAJB475*035TNJ	B	4.7	35	85	23	125	1.6	6	3.1	166	149	66	1
TAJC475*035TNJ	C	4.7	35	85	23	125	1.6	6	2.2	224	201	89	1
TAJD475*035TNJV	D	4.7	35	85	23	125	1.6	6	1.5	316	285	126	3
TAJC685*035TNJ	C	6.8	35	85	23	125	2.4	6	1.8	247	222	99	1
TAJD685*035TNJV	D	6.8	35	85	23	125	2.4	6	1.3	340	306	136	3
TAJC106*035TNJ	C	10	35	85	23	125	3.5	6	1.6	262	236	105	1
TAJD106*035TNJV	D	10	35	85	23	125	3.5	6	1	387	349	155	3
TAJY106*035TNJV	Y	10	35	85	23	125	3.5	6	1	354	318	141	3
TAJD156*035TNJV	D	15	35	85	23	125	5.3	6	0.9	408	367	163	3
TAJY156*035TNJV	Y	15	35	85	23	125	5.3	6	0.6	456	411	183	3
TAJD226*035TNJV	D	22	35	85	23	125	7.7	6	0.9	408	367	163	3
TAJE226*035TNJV	E	22	35	85	23	125	7.7	6	0.5	574	517	230	3
TAJD336*035TNJV	D	33	35	85	23	125	11.6	6	0.9	408	367	163	3
TAJE336*035TNJV	E	33	35	85	23	125	11.6	6	0.9	428	385	171	3
TAJE476*035TNJV	E	47	35	85	23	125	16.5	6	0.9	428	385	171	3
50 Volt @ 85°C													
TAJA224*050TNJ	A	0.22	50	85	33	125	0.5	4	18	65	58	26	1
TAJA334*050TNJ	A	0.33	50	85	33	125	0.5	4	17	66	60	27	1
TAJA474*050TNJ	A	0.47	50	85	33	125	0.5	4	9.5	89	80	36	1
TAJB474*050TNJ	B	0.47	50	85	33	125	0.7	4	9.5	95	85	38	1
TAJB684*050TNJ	B	0.68	50	85	33	125	0.5	4	8	103	93	41	1
TAJB105*050TNJ	B	1	50	85	33	125	0.5	6	7	110	99	44	1
TAJC105*050TNJ	C	1	50	85	33	125	0.5	4	5.5	141	127	57	1
TAJC155*050TNJ	C	1.5	50	85	33	125	0.8	6	4.5	156	141	63	1
TAJC225*050TNJ	C	2.2	50	85	33	125	1.1	8	2.5	210	189	84	1
TAJD225*050TNJV	D	2.2	50	85	33	125	1.1	6	2.5	245	220	98	3
TAJC335*050TNJ	C	3.3	50	85	33	125	1.6	6	2.5	210	189	84	1
TAJD335*050TNJV	D	3.3	50	85	33	125	1.7	6	2	274	246	110	3
TAJC475*050TNJ	C	4.7	50	85	33	125	0.5	4	1.4	280	252	112	1
TAJD475*050TNJV	D	4.7	50	85	33	125	2.4	6	1.4	327	295	131	3
TAJD685*050TNJV	D	6.8	50	85	33	125	3.4	6	1	387	349	155	3
TAJD106*050TNJV	D	10	50	85	33	125	5	6	0.8	433	390	173	3
TAJE106*050TNJV	E	10	50	85	33	125	5	6	1	406	366	162	3
TAJE156*050TNJV	E	15	50	85	33	125	7.5	6	0.6	524	472	210	3

Moisture Sensitivity Level (MSL) is defined according to J-STD-020

*Please use "U" instead of "T" in the suffix letter for 13'' reel packaging

Please use specific PN for automotive version – see "HOW TO ORDER".

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts.

DCL is measured at rated voltage after 5 minutes.

NOTE: AVX reserves the right to supply higher voltage ratings or tighter tolerance part in the same case size, to the same reliability standards.

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QUALIFICATION TABLE

<table>
<tr><th>TEST</th><th colspan="2">TAJ automotive series (Temperature range -55ºC to +125ºC)
Condition</th><th colspan="7">Characteristics</th></tr>
<tr><td rowspan="5">Endurance</td><td colspan="2" rowspan="5">Apply rated voltage (Ur) at 85ºC and / or category voltage (Uc) at 125ºC for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±10% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">initial limit</td></tr>
<tr><td rowspan="5">Storage Life</td><td colspan="2" rowspan="5">Store at 125ºC, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±10% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">initial limit</td></tr>
<tr><td rowspan="5">Humidity</td><td colspan="2" rowspan="5">Store at 65ºC and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">1.5 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±10% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">1.2 x initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">initial limit</td></tr>
<tr><td rowspan="5">Biased Humidity</td><td colspan="2" rowspan="5">Apply rated voltage (Ur) at 85ºC, 85% relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">2 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±10% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">1.2 x initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">initial limit</td></tr>
<tr><td rowspan="7">Temperature Stability</td><td>Step</td><td>Temperature°C</td><td>Duration(min)</td><td></td><td>+20ºC</td><td>-55ºC</td><td>+20ºC</td><td>+85ºC</td><td>+125ºC</td><td>+20ºC</td></tr>
<tr><td>1</td><td>+20</td><td>15</td><td>DCL</td><td>IL*</td><td>n/a</td><td>IL*</td><td>10 x IL*</td><td>12.5 x IL*</td><td>IL*</td></tr>
<tr><td>2</td><td>-55</td><td>15</td><td>ΔC/C</td><td>n/a</td><td>+0/-10%</td><td>±5%</td><td>+10/-0%</td><td>+12/-0%</td><td>±5%</td></tr>
<tr><td>3</td><td>+20</td><td>15</td><td>DF</td><td>IL*</td><td>1.5 x IL*</td><td>IL*</td><td>1.5 x IL*</td><td>2 x IL*</td><td>IL*</td></tr>
<tr><td>4</td><td>+85</td><td>15</td><td>ESR</td><td>IL*</td><td>2 x IL*</td><td>IL*</td><td>IL*</td><td>IL*</td><td>IL*</td></tr>
<tr><td>5</td><td>+125</td><td>15</td><td colspan="6"></td></tr>
<tr><td>6</td><td>+20</td><td>15</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Surge Voltage</td><td colspan="2" rowspan="5">Apply 1.3x category voltage (Uc) at 125ºC for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±5% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">initial limit</td></tr>
<tr><td rowspan="5">Mechanical Shock</td><td colspan="2" rowspan="5">MIL-STD-202, Method 213, Condition F</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±5% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">initial limit</td></tr>
<tr><td rowspan="5">Vibration</td><td colspan="2" rowspan="5">MIL-STD-202, Method 204, Condition D</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±5% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">initial limit</td></tr>
</table>

*Initial Limit

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F93-AJ6 Series
Automotive Series Tantalum Capacitors



FEATURES
- Compliant to the RoHS2 directive 2011/65/EU
- Compliant to AEC-Q200

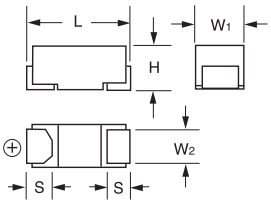
APPLICATIONS
- Cabin electronics
- Infotainment

GENERAL CHARACTERISTICS
Operating Temperature:
-55ºC to 125ºC

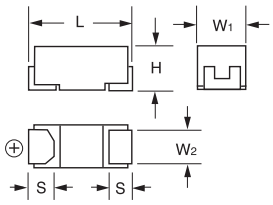
CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L	W_1	W_2	H	S
A	1206	3216-18	3.20 ± 0.20 (0.126 ± 0.008)	1.60 ± 0.20 (0.063 ± 0.008)	1.20 ± 0.10 (0.047 ± 0.004)	1.60 ± 0.20 (0.063 ± 0.008)	0.80 ± 0.20 (0.031 ± 0.008)
B	1210	3528-21	3.50 ± 0.20 (0.126 ± 0.008)	2.80 ± 0.20 (0.110 ± 0.008)	2.20 ± 0.10 (0.087 ± 0.004)	1.90 ± 0.20 (0.075 ± 0.008)	0.80 ± 0.20 (0.031 ± 0.008)
C	2312	6032-27	6.00 ± 0.20 (0.236 ± 0.008)	3.20 ± 0.20 (0.126 ± 0.008)	2.20 ± 0.10 (0.087 ± 0.004)	2.50 ± 0.20 (0.098 ± 0.008)	1.30 ± 0.20 (0.051 ± 0.008)
N	2917	7343-30	7.30 ± 0.20 (0.287 ± 0.008)	4.30 ± 0.20 (0.169 ± 0.008)	2.40 ± 0.10 (0.094 ± 0.004)	2.80 ± 0.20 (0.110 ±0.008)	1.30 ± 0.20 (0.051 ± 0.008)

A, B CASE

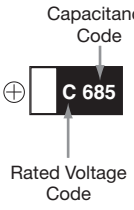


C, N CASE

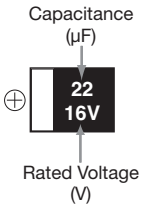


MARKING

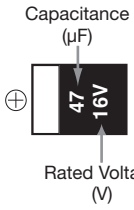
A CASE



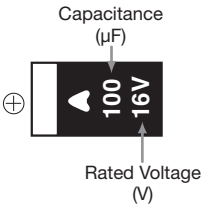
B CASE



C CASE



N CASE



4V	G	20V	D
6.3V	J	25V	E
10V	A	35V	V
16V	C		

HOW TO ORDER

F93	1A	106	M	A	□	AJ6
Type	**Rated Voltage**	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** K = ±10% M = ±20%	**Case Size** See table above	**Packaging** See Tape & Reel Packaging Section	**AEC-Q200 Compliant**

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55 to +125°C
Rated Temperature:	+85°C
Capacitance Tolerance:	±20%, ±10% at 120Hz
Dissipation Factor:	Refer to next page
ESR 100kHz:	Refer to next page
Leakage Current:	After 1 minute's application of rated voltage, leakage current at 20°C is not more than 0.01CV or 0.5µA, whichever is greater.
	After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5µA, whichever is greater.
	After 1 minute's application of derated voltage, leakage current at 125°C is not more than 0.125CV or 6.3µA, whichever is greater.
Capacitance Change By Temperature	+15% Max. at +125°C
	+10% Max. at +85°C
	-10% Max. at -55°C

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CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage						
µF	Code	4V (0G)	6.3V (0J)	10V (1A)	16V (1C)	20V (1D)	25V (1E)	35V (1V)
1.0	105				A		A	A
1.5	155				A		A	A
2.2	225				A	A	A	A/B
3.3	335				A	A	A	B
4.7	475			A	A	A/B	A/B	B/C
6.8	685			A	A	A/B		C
10	106		A	A	A/B	A/B	B/C	C
15	156		A	A	A/B	C	C	N
22	226	A	A	A/B	A/B/C	B/C	C/N	N
33	336	A	A	A/B	B/C	C/N	N	N
47	476	A	A/B	A/B/C	B(M)/C/N	C/N	N	
68	686	A	A/B	B/C	C/N			
100	107	A/B	A/B/C	C/N	C/N			
150	157	B	B/C	N	N			
220	227	B/C	C/N	N				
330	337	C	N	N				
470	477	N	N					
680	687	N						

Released ratings (M tolerance only)

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL (µA)	DF @ 120Hz (%)	ESR @ 100kHz (Ω)	*1 ΔC/C (%)	MSL
4 Volt								
F930G226#AAAJ6	A	22	4	0.9	6	2.5	*	3
F930G336#AAAJ6	A	33	4	1.3	8	2.5	*	3
F930G476#AAAJ6	A	47	4	1.9	18	2.5	*	3
F930G686#AAAJ6	A	68	4	2.7	24	2.5	*	3
F930G107#AAAJ6	A	100	4	4	30	2.0	*	3
F930G107#BAAJ6	B	100	4	4	14	0.9	*	3
F930G157#BAAJ6	B	150	4	6	16	0.7	*	3
F930G227#BAAJ6	B	220	4	8.8	18	0.7	*	3
F930G227#CCAJ6	C	220	4	8.8	12	0.7	*	3
F930G337#CCAJ6	C	330	4	13.2	14	0.7	*	3
F930G477#NCAJ6	N	470	4	18.8	16	0.3	*	3
F930G687#NCAJ6	N	680	4	27.2	18	0.3	*	3
6.3 Volt								
F930J106#AAAJ6	A	10	6.3	0.6	6	3.0	*	3
F930J156#AAAJ6	A	15	6.3	0.9	6	2.9	*	3
F930J226#AAAJ6	A	22	6.3	1.4	8	2.5	*	3
F930J336#AAAJ6	A	33	6.3	2.1	8	2.5	*	3
F930J476#AAAJ6	A	47	6.3	3	18	2.5	*	3
F930J476#BAAJ6	B	47	6.3	3	6	1.0	*	3
F930J686#AAAJ6	A	68	6.3	4.3	20	2.0	*	3
F930J686#BAAJ6	B	68	6.3	4.3	8	1.0	*	3
F930J107#AAAJ6	A	100	6.3	6.3	35	2.0	±15	3
F930J107#BAAJ6	B	100	6.3	6.3	14	0.9	*	3
F930J107#CCAJ6	C	100	6.3	6.3	8	0.7	*	3
F930J157#BAAJ6	B	150	6.3	9.5	18	0.9	*	3
F930J157#CCAJ6	C	150	6.3	9.5	12	0.7	*	3
F930J227#CCAJ6	C	220	6.3	13.9	14	0.7	*	3
F930J227#NCAJ6	N	220	6.3	13.9	10	0.5	*	3
F930J337#NCAJ6	N	330	6.3	20.8	14	0.5	*	3
F930J477#NCAJ6	N	470	6.3	29.6	16	0.3	*	3
10 Volt								
F931A475#AAAJ6	A	4.7	10	0.5	6	4.0	*	3
F931A685#AAAJ6	A	6.8	10	0.7	6	3.5	*	3
F931A106#AAAJ6	A	10	10	1	6	3.0	*	3
F931A156#AAAJ6	A	15	10	1.5	8	2.9	*	3
F931A226#AAAJ6	A	22	10	2.2	12	2.5	*	3
F931A226#BAAJ6	B	22	10	2.2	6	1.9	*	3
F931A336#AAAJ6	A	33	10	3.3	18	2.5	*	3
F931A336#BAAJ6	B	33	10	3.3	8	1.4	*	3
F931A476#AAAJ6	A	47	10	4.7	40	2.0	*	3
F931A476#BAAJ6	B	47	10	4.7	8	1.0	*	3
F931A476#CCAJ6	C	47	10	4.7	6	0.9	*	3
F931A686#BAAJ6	B	68	10	6.8	12	0.9	±15	3
F931A686#CCAJ6	C	68	10	6.8	8	0.8	*	3
F931A107#CCAJ6	C	100	10	10	10	0.7	*	3
F931A107#NCAJ6	N	100	10	10	8	0.6	*	3
F931A157#NCAJ6	N	150	10	15	10	0.6	*	3
F931A227#NCAJ6	N	220	10	22	12	0.5	*	3
F931A337#NCAJ6	N	330	10	33	18	0.5	*	3
16 Volt								
F931C105#AAAJ6	A	1	16	0.5	4	7.5	*	3
F931C155#AAAJ6	A	1.5	16	0.5	4	6.0	*	3
F931C225#AAAJ6	A	2.2	16	0.5	4	5.0	*	3
F931C335#AAAJ6	A	3.3	16	0.5	4	4.5	*	3
F931C475#AAAJ6	A	4.7	16	0.8	6	4.0	*	3
F931C685#AAAJ6	A	6.8	16	1.1	6	3.5	*	3
F931C106#AAAJ6	A	10	16	1.6	6	3.0	*	3
F931C106#BAAJ6	B	10	16	1.6	6	2.0	*	3
F931C156#AAAJ6	A	15	16	2.4	10	3.0	*	3
F931C156#BAAJ6	B	15	16	2.4	6	2.0	*	3
F931C226#AAAJ6	A	22	16	3.5	15	3.0	±15	3
F931C226#BAAJ6	B	22	16	3.5	8	1.9	*	3
F931C226#CCAJ6	C	22	16	3.5	6	1.1	*	3
F931C336#BAAJ6	B	33	16	5.3	8	1.9	*	3
F931C336#CCAJ6	C	33	16	5.3	6	1.1	*	3
F931C476MBAAJ6	B	47	16	7.5	16	2.0	±15	3
F931C476#CCAJ6	C	47	16	7.5	8	0.9	*	3
F931C476#NCAJ6	N	47	16	7.5	6	0.7	*	3
F931C686#CCAJ6	C	68	16	10.9	10	0.8	*	3
F931C686#NCAJ6	N	68	16	10.9	6	0.6	*	3
F931C107#CCAJ6	C	100	16	16	15	0.7	*	3
F931C107#NCAJ6	N	100	16	16	10	0.6	*	3
F931C157#NCAJ6	N	150	16	24	15	0.6	*	3
20 Volt								
F931D225#AAAJ6	A	2.2	20	0.5	4	5.0	*	3
F931D335#AAAJ6	A	3.3	20	0.7	4	4.5	*	3
F931D475#AAAJ6	A	4.7	20	0.9	6	3.0	*	3
F931D475#BAAJ6	B	4.7	20	0.9	6	2.8	*	3
F931D685#AAAJ6	A	6.8	20	1.4	6	3.5	*	3
F931D685#BAAJ6	B	6.8	20	1.4	6	2.5	*	3
F931D106#AAAJ6	A	10	20	2	8	3.5	*	3
F931D106#BAAJ6	B	10	20	2	6	2.1	*	3
F931D156#CCAJ6	C	15	20	3	6	1.2	*	3
F931D226#BAAJ6	B	22	20	4.4	8	1.9	*	3
F931D226#CCAJ6	C	22	20	4.4	8	1.1	*	3
F931D336#CCAJ6	C	33	20	6.6	8	1.1	*	3
F931D336#NCAJ6	N	33	20	6.6	6	0.7	*	3
F931D476#CCAJ6	C	47	20	9.4	10	1.1	*	3
F931D476#NCAJ6	N	47	20	9.4	8	0.7	*	3
25 Volt								
F931E105#AAAJ6	A	1	25	0.5	4	7.5	*	3
F931E155#AAAJ6	A	1.5	25	0.5	4	6.7	*	3
F931E225#AAAJ6	A	2.2	25	0.6	6	6.3	*	3
F931E335#AAAJ6	A	3.3	25	0.8	6	6.0	*	3
F931E475#AAAJ6	A	4.7	25	1.2	8	4.0	*	3
F931E475#BAAJ6	B	4.7	25	1.2	6	2.8	*	3
F931E106#BAAJ6	B	10	25	2.5	12	1.9	*	3
F931E106#CCAJ6	C	10	25	2.5	6	1.5	*	3
F931E156#CCAJ6	C	15	25	3.8	8	1.2	*	3
F931E226#CCAJ6	C	22	25	5.5	8	1.1	*	3
F931E226#NCAJ6	N	22	25	5.5	6	0.7	*	3
F931E336#NCAJ6	N	33	25	8.3	8	0.7	*	3
F931E476#NCAJ6	N	47	25	11.8	8	0.7	*	3
35 Volt								
F931V105#AAAJ6	A	1	35	0.5	4	7.5	*	3
F931V155#AAAJ6	A	1.5	35	0.5	6	7.5	*	3
F931V225#AAAJ6	A	2.2	35	0.8	6	7.0	*	3
F931V225#BAAJ6	B	2.2	35	0.8	4	3.8	*	3
F931V335#BAAJ6	B	3.3	35	1.2	4	3.5	*	3
F931V475#BAAJ6	B	4.7	35	1.6	8	3.1	*	3
F931V475#CCAJ6	C	4.7	35	1.6	6	1.8	*	3
F931V685#CCAJ6	C	6.8	35	2.4	6	1.8	*	3
F931V106#CCAJ6	C	10	35	3.5	6	1.6	*	3
F931V156#NCAJ6	N	15	35	5.3	6	0.7	*	3
F931V226#NCAJ6	N	22	35	7.7	8	0.7	*	3
F931V336#NCAJ6	N	33	35	11.6	8	0.7	*	3

*1: ΔC/C Marked "∗"

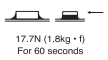
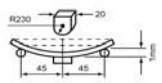
Item	All Case (%)
Damp Heat	±10
Temperature cycles	±10
Resistance soldering heat	±10
Surge	±10
Endurance	±10
Load Humidity	±10

*#: "M" for ±20% tolerance, "K" for ± 10% tolerance. When you need K tolerance for the part numbers which have M tolerance only, please contact to your local AVX sales office.

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

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QUALIFICATION TABLE

TEST	F93-AJ6 series (Temperature range -55ºC to +125ºC) Condition
Damp Heat (Steady State)	At 40°C, 90 to 95% R.H., 500 hours (No voltage applied) Capacitance Change ..... Refer to page 187 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Load Humidity	After 1000 hour's application of rated voltage in series with a 33Ω resistor at 85°C, 85% R.H., capacitors meet the characteristics requirements table below. Capacitance Change ..... Refer to page 187 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... 125% or less than the initial specified value
Temperature Cycles	At -55°C / +125°C, 30 minutes each, 1000 cycles Capacitance Change ..... Refer to page 187 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Resistance to Soldering Heat	10 seconds reflow at 260°C, 10 seconds immersion at 260°C. Capacitance Change ..... Refer to page 187 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Surge	After application of surge voltage in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85ºC, capacitors shall meet the characteristic requirements in the table above. Capacitance Change ..... Refer to page 187 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Endurance	After 2000 hours' application of rated voltage in series with a 3Ω resistor at 85°C, or derated voltage in series with a 3Ω resistor at 125°C, capacitors shall meet the characteristic requirements in the table above. Capacitance Change ..... Refer to page 187 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Shear Test	After applying the pressure load of 17.7N for 60 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on a substrate, there shall be found neither exfoliation nor its sign at the terminal electrode. 
Terminal Strength	Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of capacitor, the pressure strength is applied with a specified jig at the center of the substrate so that substrate may bend by1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals. 
Failure Rate	1% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance, 60% confidence level.

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FEATURES

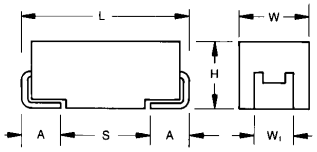
- Meets Requirements of AEC-Q200
- 5 case sizes available
- Low ESR
- Robust MnO_2 solid electrolyte capacitors
- Range: 0.22-680µF / 6.3-50V

APPLICATIONS

- Power Supply
- Electric Window Control
- Battery management systems
- DC/DC Converters

GENERAL CHARACTERISTICS

Operating Temperature:
-55ºC to 125ºC



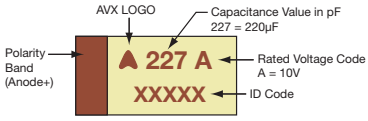
CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) -0.10 (0.004)	H+0.20 (0.008) -0.10 (0.004)	W_1±0.20 (0.008)	A+0.30 (0.012) -0.20 (0.008)	S Min.
A	1206	3216-18	3.20 (0.126)	1.60 (0.063)	1.60 (0.063)	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)
B	1210	3528-21	3.50 (0.138)	2.80 (0.110)	1.90 (0.075)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)
C	2312	6032-28	6.00 (0.236)	3.20 (0.126)	2.60 (0.102)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
D	2917	7343-31	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)

W1 dimension applies to the termination width for A dimensional area only.

MARKING

A, B, C, D, E CASE



HOW TO ORDER

TPS	C	107	M	010	T	0150	V
Type	**Case Size** See table above	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** K = ±10% M = ±20%	**Rated DC Voltage** 006 = 6.3Vdc 010 = 10Vdc 016 = 16Vdc 020 = 20Vdc 025 = 25Vdc 035 = 35Vdc 050 = 50Vdc	**Packaging** T = Automotive Lead Free 7" Reel U = Automotive Lead Free 13" Reel	**ESR in mΩ**	**Dry Pack Option** (D,E case sizes mandatory)

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

TECHNICAL SPECIFICATIONS

Technical Data:	All technical data relate to an ambient temperature of +25°C							
Capacitance Range:	0.22 µF to 680 µF							
Capacitance Tolerance:	±10%; ±20%							
Rated Voltage (V_R)	≤ +85°C:	6.3	10	16	20	25	35	50
Category Voltage (V_C)	≤ +125°C:	4	7	10	13	17	23	33
Surge Voltage (V_S)	≤ +85°C:	8	13	20	26	32	46	65
Surge Voltage (V_S)	≤ +125°C:	5	8	13	16	20	28	40
Temperature Range:	-55°C to +125°C							
Environmental Classification:	55/125/56 (IEC 68-2)							
Reliability:	1% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance, 60% confidence level							
Termination Finished:	Sn Plating (standard), Gold and SnPb Plating upon request							
	Meets requirements of AEC-Q200							

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TPS AUTOMOTIVE RANGE
CAPACITANCE AND RATED VOLTAGE RANGE
(LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V_R) to 85°C						
µF	Code	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
0.15	154							
0.22	224							A(7000)
0.33	334						A(6000)	A(7000)
0.47	474					A(7000)	A(6000)	A(6500), B(6000)
0.68	684					A(6000)	A(6000)	B(4000)
1.0	105			A(6200)	A(3000)	A(4000)	A(3000), B(2000)	B(3000), C(2500)
1.5	155				A(3000)	A(3000)	A(3000), B(2500)	C(1500,2000)
2.2	225		A(1800)	A(1800,3500)	A(3000), B(1700)	A(2500), B(900,1200,2500)	B(750,1500,2000), C(1000)	C(1500), D(1200)
3.3	335	A(2100)		A(3500), B(2500)	A(2500), B(1300)	B(750,1500,2000)	B(1000), C(700)	C(1000), D(800)
4.7	475		A(1400), B(1400)	A(2000), B(800,1500)	A(1800), B(750,1000)	B(700,900), C(700)	B(700,1500), C(600), D(700)	C(800), D(250,500,700)
6.8	685		A(1800), B(1300)	A(1500), B(600,1200)	B(600,1000), C(700)	B(700), C(500,600,700)	C(350), D(400,500)	D(500,600)
10	106	A(1500), B(1500)	A(900,1800), B(1000)	A(1000), B(500,800), C(500)	B(500,1000), C(500,700)	B(1800), C(300,500), D(500)	C(600), D(300)	D(500), E(250,300,400,500)
15	156	A(700,1500)	A(1000), B(450,600), C(700)	B(500,800) C(300,700)	B(500), C(400,450)	C(220,300), D(300)	D(300)	E(250)
22	226	A(300,500,900), B(375,600), C(500)	A(900), B(400,500,700), C(180,300)	B(400,600), C(300,375), D(500), D(700)	B(400,600), C(400), D(200,300)	C(275,400), D(200,300)	D(200,300,400), E(200,300)	
33	336	A(600), B(250,350,450,600)	B(250,425,500,650), C(375,500)	B(500), C(225,300), D(200)	C(300), D(160,200)	D(200,300)	D(200,300), E(250,300)	
47	476	B(250,350,500), C(300)	B(250,350,500,650), C(200,350), D(100,300)	C(350), D(100,200)	D(200)	D(125,150,250), E(125)	E(200,250)	
68	686	B(250,350,500), C(150,200)	C(200,300), D(150)	C(200), D(150)	D(150,200,300), E(125,150,200)	E(200)		
100	107	C(150), D(300)	C(100,150,200), D(100,125,150)	D(80,100,125,150), E(100,125,150)	E(100,150,200)	E(150)		
150	157	C(100,150,200,250), D(125)	D(85,100), E(100)	E(100)				
220	227	D(100,125)	D(100,150), E(70,100,125,150)	E(100,150)				
330	337	D(45,50,70,100), E(100,125,150)	E(50,60,100)					
470	477	D(45,60,100,200), E(45,50,60,100,200)						
680	687	E(45,60,100)						

Not recommended for new designs; higher voltage or smaller case size alternatives are available.
Released ratings, (ESR ratings in mOhms in parentheses)
Engineering samples - please contact AVX
Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (A)			MSL
										25°C	85°C	125°C	
6.3 Volt @ 85°C													
TPSA335*006T2100	A	3.3	6.3	85	4	125	0.5	6	2100	0.189	0.170	0.076	1
TPSA106*006T1500	A	10	6.3	85	4	125	0.6	6	1500	0.224	0.201	0.089	1
TPSB106*006T1500	B	10	6.3	85	4	125	0.6	6	1500	0.238	0.214	0.095	1
TPSA156*006T0700	A	15	6.3	85	4	125	0.9	6	700	0.327	0.295	0.131	1
TPSA156*006T1500	A	15	6.3	85	4	125	0.9	6	1500	0.224	0.201	0.089	1
TPSA226*006T0300	A	22	6.3	85	4	125	1.4	6	300	0.500	0.450	0.200	1
TPSA226*006T0500	A	22	6.3	85	4	125	1.4	6	500	0.387	0.349	0.155	1
TPSA226*006T0900	A	22	6.3	85	4	125	1.4	6	900	0.289	0.260	0.115	1
TPSB226*006T0375	B	22	6.3	85	4	125	1.4	6	375	0.476	0.428	0.190	1
TPSB226*006T0600	B	22	6.3	85	4	125	1.4	6	600	0.376	0.339	0.151	1
TPSC226*006T0500	C	22	6.3	85	4	125	1.4	6	500	0.469	0.422	0.188	1
TPSA336*006T0600	A	33	6.3	85	4	125	2.1	8	600	0.354	0.318	0.141	1
TPSB336*006T0250	B	33	6.3	85	4	125	2.1	6	250	0.583	0.525	0.233	1
TPSB336*006T0350	B	33	6.3	85	4	125	2.1	6	350	0.493	0.444	0.197	1
TPSB336*006T0450	B	33	6.3	85	4	125	2.1	6	450	0.435	0.391	0.174	1
TPSB336*006T0600	B	33	6.3	85	4	125	2.1	6	600	0.376	0.339	0.151	1
TPSB476*006T0250	B	47	6.3	85	4	125	3	6	250	0.583	0.525	0.233	1
TPSB476*006T0350	B	47	6.3	85	4	125	3	6	350	0.493	0.444	0.197	1
TPSB476*006T0500	B	47	6.3	85	4	125	3	6	500	0.412	0.371	0.165	1
TPSC476*006T0300	C	47	6.3	85	4	125	3	6	300	0.606	0.545	0.242	1
TPSB686*006T0250	B	68	6.3	85	4	125	4	8	250	0.583	0.525	0.233	1
TPSB686*006T0350	B	68	6.3	85	4	125	4	8	350	0.493	0.444	0.197	1
TPSB686*006T0500	B	68	6.3	85	4	125	4	8	500	0.412	0.371	0.165	1
TPSC686*006T0150	C	68	6.3	85	4	125	4.3	6	150	0.856	0.771	0.343	1
TPSC686*006T0200	C	68	6.3	85	4	125	4.3	6	200	0.742	0.667	0.297	1
TPSC107*006T0150	C	100	6.3	85	4	125	6.3	6	150	0.856	0.771	0.343	1
TPSD107*006T0300V	D	100	6.3	85	4	125	6.3	6	300	0.707	0.636	0.283	3
TPSC157*006T0100	C	150	6.3	85	4	125	9.5	6	100	1.049	0.944	0.420	1
TPSC157*006T0150	C	150	6.3	85	4	125	9.5	6	150	0.856	0.771	0.343	1
TPSC157*006T0200	C	150	6.3	85	4	125	9.5	6	200	0.742	0.667	0.297	1
TPSC157*006T0250	C	150	6.3	85	4	125	9.5	6	250	0.663	0.597	0.265	1
TPSD157*006T0125V	D	150	6.3	85	4	125	9.5	6	125	1.095	0.986	0.438	3
TPSD227*006T0100V	D	220	6.3	85	4	125	13.9	8	100	1.225	1.102	0.490	3
TPSD227*006T0125V	D	220	6.3	85	4	125	13.9	8	125	1.095	0.986	0.438	3
TPSD337*006T0045V	D	330	6.3	85	4	125	20.8	8	45	1.826	1.643	0.730	3
TPSD337*006T0050V	D	330	6.3	85	4	125	20.8	8	50	1.732	1.559	0.693	3
TPSD337*006T0070V	D	330	6.3	85	4	125	20.8	8	70	1.464	1.317	0.586	3
TPSD337*006T0100V	D	330	6.3	85	4	125	20.8	8	100	1.225	1.102	0.490	3
TPSE337*006T0100V	E	330	6.3	85	4	125	20.8	8	100	1.285	1.156	0.514	3
TPSE337*006T0125V	E	330	6.3	85	4	125	20.8	8	125	1.149	1.034	0.460	3
TPSE337*006T0150V	E	330	6.3	85	4	125	20.8	8	150	1.049	0.944	0.420	3
TPSD477*006T0045V	D	470	6.3	85	4	125	28	12	45	1.826	1.643	0.730	3
TPSD477*006T0060V	D	470	6.3	85	4	125	28	12	60	1.581	1.423	0.632	3
TPSD477*006T0100V	D	470	6.3	85	4	125	28	12	100	1.225	1.102	0.490	3
TPSD477*006T0200V	D	470	6.3	85	4	125	28	12	200	0.866	0.779	0.346	3
TPSE477*006T0045V	E	470	6.3	85	4	125	28	10	45	1.915	1.723	0.766	3
TPSE477*006T0050V	E	470	6.3	85	4	125	28	10	50	1.817	1.635	0.727	3
TPSE477*006T0060V	E	470	6.3	85	4	125	28	10	60	1.658	1.492	0.663	3
TPSE477*006T0100V	E	470	6.3	85	4	125	28	10	100	1.285	1.156	0.514	3
TPSE477*006T0200V	E	470	6.3	85	4	125	28	10	200	0.908	0.817	0.363	3
TPSE687*006T0045V	E	680	6.3	85	4	125	42.8	10	45	1.915	1.723	0.766	3
TPSE687*006T0060V	E	680	6.3	85	4	125	42.8	10	60	1.658	1.492	0.663	3
TPSE687*006T0100V	E	680	6.3	85	4	125	42.8	10	100	1.285	1.156	0.514	3
10 Volt @ 85°C													
TPSA225*010T1800	A	2.2	10	85	7	125	0.5	6	1800	0.204	0.184	0.082	1
TPSA475*010T1400	A	4.7	10	85	7	125	0.5	6	1400	0.231	0.208	0.093	1
TPSB475*010T1400	B	4.7	10	85	7	125	0.5	6	1400	0.246	0.222	0.099	1
TPSA685*010T1800	A	6.8	10	85	7	125	0.7	6	1800	0.204	0.184	0.082	1
TPSB685*010T1300	B	6.8	10	85	7	125	0.7	6	1300	0.256	0.230	0.102	1
TPSA106*010T0900	A	10	10	85	7	125	1	6	900	0.289	0.260	0.115	1
TPSA106*010T1800	A	10	10	85	7	125	1	6	1800	0.204	0.184	0.082	1
TPSB106*010T1000	B	10	10	85	7	125	1	6	1000	0.292	0.262	0.117	1
TPSA156*010T1000	A	15	10	85	7	125	1.5	6	1000	0.274	0.246	0.110	1
TPSB156*010T0450	B	15	10	85	7	125	1.5	6	450	0.435	0.391	0.174	1
TPSB156*010T0600	B	15	10	85	7	125	1.5	6	600	0.376	0.339	0.151	1
TPSC156*010T0700	C	15	10	85	7	125	1.5	6	700	0.396	0.357	0.159	1
TPSA226*010T0900	A	22	10	85	7	125	2.2	8	900	0.289	0.260	0.115	1
TPSB226*010T0400	B	22	10	85	7	125	2.2	6	400	0.461	0.415	0.184	1
TPSB226*010T0500	B	22	10	85	7	125	2.2	6	500	0.412	0.371	0.165	1
TPSB226*010T0700	B	22	10	85	7	125	2.2	6	700	0.348	0.314	0.139	1
TPSC226*010T0180	C	22	10	85	7	125	2.2	6	180	0.782	0.704	0.313	1
TPSC226*010T0300	C	22	10	85	7	125	2.2	6	300	0.606	0.545	0.242	1
TPSB336*010T0250	B	33	10	85	7	125	3.3	6	250	0.583	0.525	0.233	1

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (A)			MSL
										25°C	85°C	125°C	
TPSB336*010T0425	B	33	10	85	7	125	3.3	6	425	0.447	0.402	0.179	1
TPSB336*010T0500	B	33	10	85	7	125	3.3	6	500	0.412	0.371	0.165	1
TPSB336*010T0650	B	33	10	85	7	125	3.3	6	650	0.362	0.325	0.145	1
TPSC336*010T0375	C	33	10	85	7	125	3.3	6	375	0.542	0.487	0.217	1
TPSC336*010T0500	C	33	10	85	7	125	3.3	6	500	0.469	0.422	0.188	1
TPSB476*010T0250	B	47	10	85	7	125	4.7	8	250	0.583	0.525	0.233	1
TPSB476*010T0350	B	47	10	85	7	125	4.7	8	350	0.493	0.444	0.197	1
TPSB476*010T0500	B	47	10	85	7	125	4.7	8	500	0.412	0.371	0.165	1
TPSB476*010T0650	B	47	10	85	7	125	4.7	8	650	0.362	0.325	0.145	1
TPSC476*010T0200	C	47	10	85	7	125	4.7	6	200	0.742	0.667	0.297	1
TPSC476*010T0350	C	47	10	85	7	125	4.7	6	350	0.561	0.505	0.224	1
TPSD476*010T0100V	D	47	10	85	7	125	4.7	6	100	1.225	1.102	0.490	3
TPSD476*010T0300V	D	47	10	85	7	125	4.7	6	300	0.707	0.636	0.283	3
TPSC686*010T0200	C	68	10	85	7	125	6.8	6	200	0.742	0.667	0.297	1
TPSC686*010T0300	C	68	10	85	7	125	6.8	6	300	0.606	0.545	0.242	1
TPSD686*010T0150V	D	68	10	85	7	125	6.8	6	150	1.000	0.900	0.400	3
TPSC107*010T0100	C	100	10	85	7	125	10	8	100	1.049	0.944	0.420	1
TPSC107*010T0150	C	100	10	85	7	125	10	8	150	0.856	0.771	0.343	1
TPSC107*010T0200	C	100	10	85	7	125	10	8	200	0.742	0.667	0.297	1
TPSD107*010T0100V	D	100	10	85	7	125	10	6	100	1.225	1.102	0.490	3
TPSD107*010T0125V	D	100	10	85	7	125	10	6	125	1.095	0.986	0.438	3
TPSD107*010T0150V	D	100	10	85	7	125	10	6	150	1.000	0.900	0.400	3
TPSD157*010T0085V	D	150	10	85	7	125	15	8	85	1.328	1.196	0.531	3
TPSD157*010T0100V	D	150	10	85	7	125	15	8	100	1.225	1.102	0.490	3
TPSE157*010T0100V	E	150	10	85	7	125	15	8	100	1.285	1.156	0.514	3
TPSD227*010T0100V	D	220	10	85	7	125	22	8	100	1.225	1.102	0.490	3
TPSD227*010T0150V	D	220	10	85	7	125	22	8	150	1.000	0.900	0.400	3
TPSE227*010T0070V	E	220	10	85	7	125	22	8	70	1.535	1.382	0.614	3
TPSE227*010T0100V	E	220	10	85	7	125	22	8	100	1.285	1.156	0.514	3
TPSE227*010T0125V	E	220	10	85	7	125	22	8	125	1.149	1.034	0.460	3
TPSE227*010T0150V	E	220	10	85	7	125	22	8	150	1.049	0.944	0.420	3
TPSE337*010T0050V	E	330	10	85	7	125	33	8	50	1.817	1.635	0.727	3
TPSE337*010T0060V	E	330	10	85	7	125	33	8	60	1.658	1.492	0.663	3
TPSE337*010T0100V	E	330	10	85	7	125	33	8	100	1.285	1.156	0.514	3
16 Volt @ 85°C													
TPSA105*016T6200	A	1.0	16	85	10	125	0.5	4	6200	0.110	0.099	0.044	1
TPSA225*016T1800	A	2.2	16	85	10	125	0.5	6	1800	0.204	0.184	0.082	1
TPSA225*016T3500	A	2.2	16	85	10	125	0.5	6	3500	0.146	0.132	0.059	1
TPSA335*016T3500	A	3.3	16	85	10	125	0.5	6	3500	0.146	0.132	0.059	1
TPSB335*016T2500	B	3.3	16	85	10	125	0.5	6	2500	0.184	0.166	0.074	1
TPSA475*016T2000	A	4.7	16	85	10	125	0.8	6	2000	0.194	0.174	0.077	1
TPSB475*016T0800	B	4.7	16	85	10	125	0.8	6	800	0.326	0.293	0.130	1
TPSB475*016T1500	B	4.7	16	85	10	125	0.8	6	1500	0.238	0.214	0.095	1
TPSA685*016T1500	A	6.8	16	85	10	125	1.1	6	1500	0.224	0.201	0.089	1
TPSB685*016T0600	B	6.8	16	85	10	125	1.1	6	600	0.376	0.339	0.151	1
TPSB685*016T1200	B	6.8	16	85	10	125	1.1	6	1200	0.266	0.240	0.106	1
TPSA106*016T1000	A	10	16	85	10	125	1.6	6	1000	0.274	0.246	0.110	1
TPSB106*016T0500	B	10	16	85	10	125	1.6	6	500	0.412	0.371	0.165	1
TPSB106*016T0800	B	10	16	85	10	125	1.6	6	800	0.326	0.293	0.130	1
TPSC106*016T0500	C	10	16	85	10	125	1.6	6	500	0.469	0.422	0.188	1
TPSB156*016T0500	B	15	16	85	10	125	2.4	6	500	0.412	0.371	0.165	1
TPSB156*016T0800	B	15	16	85	10	125	2.4	6	800	0.326	0.293	0.130	1
TPSC156*016T0300	C	15	16	85	10	125	2.4	6	300	0.606	0.545	0.242	1
TPSC156*016T0700	C	15	16	85	10	125	2.4	6	700	0.396	0.357	0.159	1
TPSB226*016T0400	B	22	16	85	10	125	3.5	6	400	0.461	0.415	0.184	1
TPSB226*016T0600	B	22	16	85	10	125	3.5	6	600	0.376	0.339	0.151	1
TPSC226*016T0300	C	22	16	85	10	125	3.5	6	300	0.606	0.545	0.242	1
TPSC226*016T0375	C	22	16	85	10	125	3.5	6	375	0.542	0.487	0.217	1
TPSD226*016T0500V	D	22	16	85	10	125	3.5	6	500	0.548	0.493	0.219	3
TPSD226*016T0700V	D	22	16	85	10	125	3.5	6	700	0.463	0.417	0.185	3
TPSB336*016T0500	B	33	16	85	10	125	5.3	8	500	0.412	0.371	0.165	1
TPSC336*016T0225	C	33	16	85	10	125	5.3	6	225	0.699	0.629	0.280	1
TPSC336*016T0300	C	33	16	85	10	125	5.3	6	300	0.606	0.545	0.242	1
TPSD336*016T0200V	D	33	16	85	10	125	5.3	6	200	0.866	0.779	0.346	3
TPSC476*016T0350	C	47	16	85	10	125	7.5	6	350	0.561	0.505	0.224	1
TPSD476*016T0100V	D	47	16	85	10	125	7.5	6	100	1.225	1.102	0.490	3
TPSD476*016T0200V	D	47	16	85	10	125	7.5	6	200	0.866	0.779	0.346	3
TPSC686*016T0200	C	68	16	85	10	125	10.9	6	200	0.742	0.667	0.297	1
TPSD686*016T0150V	D	68	16	85	10	125	10.9	6	150	1.000	0.900	0.400	3
TPSD107*016T0080V	D	100	16	85	10	125	16	6	80	1.369	1.232	0.548	3
TPSD107*016T0100V	D	100	16	85	10	125	16	6	100	1.225	1.102	0.490	3
TPSD107*016T0125V	D	100	16	85	10	125	16	6	125	1.095	0.986	0.438	3
TPSD107*016T0150V	D	100	16	85	10	125	16	6	150	1.000	0.900	0.400	3
TPSE107*016T0100V	E	100	16	85	10	125	16	6	100	1.285	1.156	0.514	3
TPSE107*016T0125V	E	100	16	85	10	125	16	6	125	1.149	1.034	0.460	3

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (A)			MSL
										25°C	85°C	125°C	
TPSE107*016T0150V	E	100	16	85	10	125	16	6	150	1.049	0.944	0.420	3
TPSE157*016T0100V	E	150	16	85	10	125	23	8	100	1.285	1.156	0.514	3
TPSE227*016T0100V	E	220	16	85	10	125	35.2	10	100	1.285	1.156	0.514	3
TPSE227*016T0150V	E	220	16	85	10	125	35.2	10	150	1.049	0.944	0.420	3
20 Volt @ 85°C													
TPSA105*020T3000	A	1	20	85	13	125	0.5	4	3000	0.158	0.142	0.063	1
TPSA155*020T3000	A	1.5	20	85	13	125	0.5	6	3000	0.158	0.142	0.063	1
TPSA225*020T3000	A	2.2	20	85	13	125	0.5	6	3000	0.158	0.142	0.063	1
TPSB225*020T1700	B	2.2	20	85	13	125	0.5	6	1700	0.224	0.201	0.089	1
TPSA335*020T2500	A	3.3	20	85	13	125	0.7	6	2500	0.173	0.156	0.069	1
TPSB335*020T1300	B	3.3	20	85	13	125	0.7	6	1300	0.256	0.230	0.102	1
TPSA475*020T1800	A	4.7	20	85	13	125	0.9	6	1800	0.204	0.184	0.082	1
TPSB475*020T0750	B	4.7	20	85	13	125	0.9	6	750	0.337	0.303	0.135	1
TPSB475*020T1000	B	4.7	20	85	13	125	0.9	6	1000	0.292	0.262	0.117	1
TPSB685*020T0600	B	6.8	20	85	13	125	1.4	6	600	0.376	0.339	0.151	1
TPSB685*020T1000	B	6.8	20	85	13	125	1.4	6	1000	0.292	0.262	0.117	1
TPSC685*020T0700	C	6.8	20	85	13	125	1.4	6	700	0.396	0.357	0.159	1
TPSB106*020T0500	B	10	20	85	13	125	2	6	500	0.412	0.371	0.165	1
TPSB106*020T1000	B	10	20	85	13	125	2	6	1000	0.292	0.262	0.117	1
TPSC106*020T0500	C	10	20	85	13	125	2	6	500	0.469	0.422	0.188	1
TPSC106*020T0700	C	10	20	85	13	125	2	6	700	0.396	0.357	0.159	1
TPSB156*020T0500	B	15	20	85	13	125	3	6	500	0.412	0.371	0.165	1
TPSC156*020T0400	C	15	20	85	13	125	3	6	400	0.524	0.472	0.210	1
TPSC156*020T0450	C	15	20	85	13	125	3	6	450	0.494	0.445	0.198	1
TPSB226*020T0400	B	22	20	85	13	125	4.4	6	400	0.461	0.415	0.184	1
TPSB226*020T0600	B	22	20	85	13	125	4.4	6	600	0.376	0.339	0.151	1
TPSC226*020T0400	C	22	20	85	13	125	4.4	6	400	0.524	0.472	0.210	1
TPSD226*020T0200V	D	22	20	85	13	125	4.4	6	200	0.866	0.779	0.346	3
TPSD226*020T0300V	D	22	20	85	13	125	4.4	6	300	0.707	0.636	0.283	3
TPSC336*020T0300	C	33	20	85	13	125	6.6	6	300	0.606	0.545	0.242	1
TPSD336*020T0160V	D	33	20	85	13	125	6.6	6	160	0.968	0.871	0.387	3
TPSD336*020T0200V	D	33	20	85	13	125	6.6	6	200	0.866	0.779	0.346	3
TPSD476*020T0200V	D	47	20	85	13	125	9.4	6	200	0.866	0.779	0.346	3
TPSD686*020T0150V	D	68	20	85	13	125	13.6	6	150	1.000	0.900	0.400	3
TPSD686*020T0200V	D	68	20	85	13	125	13.6	6	200	0.866	0.779	0.346	3
TPSD686*020T0300V	D	68	20	85	13	125	13.6	6	300	0.707	0.636	0.283	3
TPSE686*020T0125V	E	68	20	85	13	125	13.6	6	125	1.149	1.034	0.460	3
TPSE686*020T0150V	E	68	20	85	13	125	13.6	6	150	1.049	0.944	0.420	3
TPSE686*020T0200V	E	68	20	85	13	125	13.6	6	200	0.908	0.817	0.363	3
TPSE107*020T0100V	E	100	20	85	13	125	20	6	100	1.285	1.156	0.514	3
TPSE107*020T0150V	E	100	20	85	13	125	20	6	150	1.049	0.944	0.420	3
TPSE107*020T0200V	E	100	20	85	13	125	20	6	200	0.908	0.817	0.363	3
25 Volt @ 85°C													
TPSA474*025T7000	A	0.47	25	85	17	125	0.5	4	7000	0.104	0.093	0.041	1
TPSA684*025T6000	A	0.68	25	85	17	125	0.5	4	6000	0.112	0.101	0.045	1
TPSA105*025T4000	A	1.0	25	85	17	125	0.5	4	4000	0.137	0.123	0.055	1
TPSA155*025T3000	A	1.5	25	85	17	125	0.5	6	3000	0.158	0.142	0.063	1
TPSA225*025T2500	A	2.2	25	85	17	125	0.6	6	2500	0.173	0.156	0.069	1
TPSB225*025T0900	B	2.2	25	85	17	125	0.6	6	900	0.307	0.277	0.123	1
TPSB225*025T1200	B	2.2	25	85	17	125	0.6	6	1200	0.266	0.240	0.106	1
TPSB225*025T2500	B	2.2	25	85	17	125	0.6	6	2500	0.184	0.166	0.074	1
TPSB335*025T0750	B	3.3	25	85	17	125	0.8	6	750	0.337	0.303	0.135	1
TPSB335*025T1500	B	3.3	25	85	17	125	0.8	6	1500	0.238	0.214	0.095	1
TPSB335*025T2000	B	3.3	25	85	17	125	0.8	6	2000	0.206	0.186	0.082	1
TPSB475*025T0700	B	4.7	25	85	17	125	1.2	6	700	0.348	0.314	0.139	1
TPSB475*025T0900	B	4.7	25	85	17	125	1.2	6	900	0.307	0.277	0.123	1
TPSC475*025T0700	C	4.7	25	85	17	125	1.2	6	700	0.396	0.357	0.159	1
TPSB685*025T0700	B	6.8	25	85	17	125	1.7	6	700	0.348	0.314	0.139	1
TPSC685*025T0500	C	6.8	25	85	17	125	1.7	6	500	0.469	0.422	0.188	1
TPSC685*025T0600	C	6.8	25	85	17	125	1.7	6	600	0.428	0.385	0.171	1
TPSC685*025T0700	C	6.8	25	85	17	125	1.7	6	700	0.396	0.357	0.159	1
TPSB106*025T1800	B	10	25	85	17	125	2.5	6	1800	0.217	0.196	0.087	1
TPSC106*025T0300	C	10	25	85	17	125	2.5	6	300	0.606	0.545	0.242	1
TPSC106*025T0500	C	10	25	85	17	125	2.5	6	500	0.469	0.422	0.188	1
TPSD106*025T0500V	D	10	25	85	17	125	2.5	6	500	0.548	0.493	0.219	3
TPSC156*025T0220	C	15	25	85	17	125	3.8	6	220	0.707	0.636	0.283	1
TPSC156*025T0300	C	15	25	85	17	125	3.8	6	300	0.606	0.545	0.242	1
TPSD156*025T0300V	D	15	25	85	17	125	3.8	6	300	0.707	0.636	0.283	3
TPSC226*025T0275	C	22	25	85	17	125	5.5	6	275	0.632	0.569	0.253	1
TPSC226*025T0400	C	22	25	85	17	125	5.5	6	400	0.524	0.472	0.210	1
TPSD226*025T0200V	D	22	25	85	17	125	5.5	6	200	0.866	0.779	0.346	3
TPSD226*025T0300V	D	22	25	85	17	125	5.5	6	300	0.707	0.636	0.283	3
TPSD336*025T0200V	D	33	25	85	17	125	8.3	6	200	0.866	0.779	0.346	3
TPSD336*025T0300V	D	33	25	85	17	125	8.3	6	300	0.707	0.636	0.283	3
TPSD476*025T0125V	D	47	25	85	17	125	11.8	6	125	1.095	0.986	0.438	3
TPSD476*025T0150V	D	47	25	85	17	125	11.8	6	150	1.000	0.900	0.400	3

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (A)			MSL
										25°C	85°C	125°C	
TPSD476*025T0250V	D	47	25	85	17	125	11.8	6	250	0.775	0.697	0.310	3
TPSE476*025T0125V	E	47	25	85	17	125	11.8	6	125	1.149	1.034	0.460	3
TPSE686*025T0200V	E	68	25	85	17	125	17	6	200	0.908	0.817	0.363	3
TPSE107*025T0150V	E	100	25	85	17	125	25	10	150	1.049	0.944	0.420	3
35 Volt @ 85°C													
TPSA334*035T6000	A	0.33	35	85	23	125	0.5	4	6000	0.112	0.101	0.045	1
TPSA474*035T6000	A	0.47	35	85	23	125	0.5	4	6000	0.112	0.101	0.045	1
TPSA684*035T6000	A	0.68	35	85	23	125	0.5	4	6000	0.112	0.101	0.045	1
TPSA105*035T3000	A	1	35	85	23	125	0.5	4	3000	0.158	0.142	0.063	1
TPSB105*035T2000	B	1	35	85	23	125	0.5	4	2000	0.206	0.186	0.082	1
TPSA155*035T3000	A	1.5	35	85	23	125	0.5	6	3000	0.158	0.142	0.063	1
TPSB155*035T2500	B	1.5	35	85	23	125	0.5	6	2500	0.184	0.166	0.074	1
TPSB225*035T0750	B	2.2	35	85	23	125	0.8	6	750	0.337	0.303	0.135	1
TPSB225*035T1500	B	2.2	35	85	23	125	0.8	6	1500	0.238	0.214	0.095	1
TPSB225*035T2000	B	2.2	35	85	23	125	0.8	6	2000	0.206	0.186	0.082	1
TPSC225*035T1000	C	2.2	35	85	23	125	0.8	6	1000	0.332	0.298	0.133	1
TPSB335*035T1000	B	3.3	35	85	23	125	1.2	6	1000	0.292	0.262	0.117	1
TPSC335*035T0700	C	3.3	35	85	23	125	1.2	6	700	0.396	0.357	0.159	1
TPSB475*035T0700	B	4.7	35	85	23	125	1.6	6	700	0.348	0.314	0.139	1
TPSB475*035T1500	B	4.7	35	85	23	125	1.6	6	1500	0.238	0.214	0.095	1
TPSC475*035T0600	C	4.7	35	85	23	125	1.6	6	600	0.428	0.385	0.171	1
TPSD475*035T0700V	D	4.7	35	85	23	125	1.6	6	700	0.463	0.417	0.185	3
TPSC685*035T0350	C	6.8	35	85	23	125	2.4	6	350	0.561	0.505	0.224	1
TPSD685*035T0400V	D	6.8	35	85	23	125	2.4	6	400	0.612	0.551	0.245	3
TPSD685*035T0500V	D	6.8	35	85	23	125	2.4	6	500	0.548	0.493	0.219	3
TPSC106*035T0600	C	10	35	85	23	125	3.5	6	600	0.428	0.385	0.171	1
TPSD106*035T0300V	D	10	35	85	23	125	3.5	6	300	0.707	0.636	0.283	3
TPSD156*035T0300V	D	15	35	85	23	125	5.3	6	300	0.707	0.636	0.283	3
TPSD226*035T0200V	D	22	35	85	23	125	7.7	6	200	0.866	0.779	0.346	3
TPSD226*035T0300V	D	22	35	85	23	125	7.7	6	300	0.707	0.636	0.283	3
TPSD226*035T0400V	D	22	35	85	23	125	7.7	6	400	0.612	0.551	0.245	3
TPSE226*035T0200V	E	22	35	85	23	125	7.7	6	200	0.908	0.817	0.363	3
TPSE226*035T0300V	E	22	35	85	23	125	7.7	6	300	0.742	0.667	0.297	3
TPSD336*035T0200V	D	33	35	85	23	125	11.6	6	200	0.866	0.779	0.346	3
TPSD336*035T0300V	D	33	35	85	23	125	11.6	6	300	0.707	0.636	0.283	3
TPSE336*035T0250V	E	33	35	85	23	125	11.6	6	250	0.812	0.731	0.325	3
TPSE336*035T0300V	E	33	35	85	23	125	11.6	6	300	0.742	0.667	0.297	3
TPSE476*035T0200V	E	47	35	85	23	125	16.5	6	200	0.908	0.817	0.363	3
TPSE476*035T0250V	E	47	35	85	23	125	16.5	6	250	0.812	0.731	0.325	3
50 Volt @ 85°C													
TPSA224*050T7000	A	0.22	50	85	33	125	0.5	4	7000	0.104	0.093	0.041	1
TPSA334*050T7000	A	0.33	50	85	33	125	0.5	4	7000	0.104	0.093	0.041	1
TPSA474*050T6500	A	0.47	50	85	33	125	0.5	4	6500	0.107	0.097	0.043	1
TPSB474*050T6000	B	0.47	50	85	33	125	0.5	4	6000	0.119	0.107	0.048	1
TPSB684*050T4000	B	0.68	50	85	33	125	0.5	4	4000	0.146	0.131	0.058	1
TPSB105*050T3000	B	1	50	85	33	125	0.5	6	3000	0.168	0.151	0.067	1
TPSC105*050T2500	C	1	50	85	33	125	0.5	4	2500	0.210	0.189	0.084	1
TPSC155*050T1500	C	1.5	50	85	33	125	0.8	6	1500	0.271	0.244	0.108	1
TPSC155*050T2000	C	1.5	50	85	33	125	0.8	6	2000	0.235	0.211	0.094	1
TPSC225*050T1500	C	2.2	50	85	33	125	1.1	8	1500	0.271	0.244	0.108	1
TPSD225*050T1200V	D	2.2	50	85	33	125	1.1	6	1200	0.354	0.318	0.141	3
TPSC335*050T1000	C	3.3	50	85	33	125	1.6	6	1000	0.332	0.298	0.133	1
TPSD335*050T0800V	D	3.3	50	85	33	125	1.7	6	800	0.433	0.390	0.173	3
TPSC475*050T0800	C	4.7	50	85	33	125	2.4	6	800	0.371	0.334	0.148	1
TPSD475*050T0250V	D	4.7	50	85	33	125	2.4	6	250	0.775	0.697	0.310	1
TPSD475*050T0500V	D	4.7	50	85	33	125	2.4	6	500	0.548	0.493	0.219	3
TPSD475*050T0700V	D	4.7	50	85	33	125	2.4	6	700	0.463	0.417	0.185	3
TPSD685*050T0500V	D	6.8	50	85	33	125	3.4	6	500	0.548	0.493	0.219	3
TPSD685*050T0600V	D	6.8	50	85	33	125	3.4	6	600	0.500	0.450	0.200	3
TPSD106*050T0500V	D	10	50	85	33	125	5	6	500	0.548	0.493	0.219	3
TPSE106*050T0250V	E	10	50	85	33	125	5	6	250	0.812	0.731	0.325	3
TPSE106*050T0300V	E	10	50	85	33	125	5	6	300	0.742	0.667	0.297	3
TPSE106*050T0400V	E	10	50	85	33	125	5	6	400	0.642	0.578	0.257	3
TPSE106*050T0500V	E	10	50	85	33	125	5	6	500	0.574	0.517	0.230	3
TPSE156*050T0250V	E	15	50	85	33	125	7.5	6	250	0.812	0.731	0.325	3

Moisture Sensitivity Level (MSL) is defined according to J-STD-020

*Please use "U" instead of "T" in the suffix letter for 13'' reel packaging

Please use specific PN for automotive version – see “HOW TO ORDER”.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

The EIA & CECC standards for low ESR Solid Tantalum Capacitors allow an ESR movement to 1.25 times catalogue limit post mounting.

NOTE: AVX reserves the right to supply higher voltage ratings or tighter tolerance part in the same case size, to the same reliability standards.

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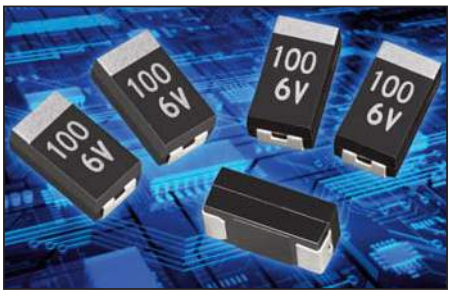
QUALIFICATION TABLE

<table>
<tr><th rowspan="2">TEST</th><th colspan="3">TPS automotive series (Temperature range -55ºC to +125ºC)</th></tr>
<tr><th colspan="2">Condition</th><th colspan="2">Characteristics</th></tr>
<tr><td rowspan="5">Endurance</td><td colspan="2" rowspan="5">Apply rated voltage (Ur) at 85ºC and / or category voltage (Uc) at 125ºC for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td>no visible damage</td></tr>
<tr><td>DCL</td><td>1.25 x initial limit</td></tr>
<tr><td>ΔC/C</td><td>within ±10% of initial value</td></tr>
<tr><td>DF</td><td>initial limit</td></tr>
<tr><td>ESR</td><td>1.25 x initial limit</td></tr>
<tr><td rowspan="5">Storage Life</td><td colspan="2" rowspan="5">Store at 125ºC, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td>no visible damage</td></tr>
<tr><td>DCL</td><td>1.25 x initial limit</td></tr>
<tr><td>ΔC/C</td><td>within ±10% of initial value</td></tr>
<tr><td>DF</td><td>initial limit</td></tr>
<tr><td>ESR</td><td>1.25 x initial limit</td></tr>
<tr><td rowspan="5">Humidity</td><td colspan="2" rowspan="5">Store at 65ºC and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.</td><td>Visual examination</td><td>no visible damage</td></tr>
<tr><td>DCL</td><td>1.5 x initial limit</td></tr>
<tr><td>ΔC/C</td><td>within ±10% of initial value</td></tr>
<tr><td>DF</td><td>1.2 x initial limit</td></tr>
<tr><td>ESR</td><td>1.25 x initial limit</td></tr>
<tr><td rowspan="5">Biased Humidity</td><td colspan="2" rowspan="5">Apply rated voltage (Ur) at 85ºC, 85% relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.</td><td>Visual examination</td><td>no visible damage</td></tr>
<tr><td>DCL</td><td>2 x initial limit</td></tr>
<tr><td>ΔC/C</td><td>within ±10% of initial value</td></tr>
<tr><td>DF</td><td>1.2 x initial limit</td></tr>
<tr><td>ESR</td><td>1.25 x initial limit</td></tr>
<tr><td rowspan="7">Temperature Stability</td><td>Step</td><td>Temperature°C</td><td>Duration(min)</td><td></td><td>+20ºC</td><td>-55ºC</td><td>+20ºC</td><td>+85ºC</td><td>+125ºC</td><td>+20ºC</td></tr>
<tr><td>1</td><td>+20</td><td>15</td><td>DCL</td><td>IL*</td><td>n/a</td><td>IL*</td><td>10 x IL*</td><td>12.5 x IL*</td><td>IL*</td></tr>
<tr><td>2</td><td>-55</td><td>15</td><td>ΔC/C</td><td>n/a</td><td>+0/-10%</td><td>±5%</td><td>+10/-0%</td><td>+12/-0%</td><td>±5%</td></tr>
<tr><td>3</td><td>+20</td><td>15</td><td>DF</td><td>IL*</td><td>1.5 x IL*</td><td>IL*</td><td>1.5 x IL*</td><td>2 x IL*</td><td>IL*</td></tr>
<tr><td>4</td><td>+85</td><td>15</td><td rowspan="3">ESR</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">2.5 x IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td><td rowspan="3">1.25 x IL*</td></tr>
<tr><td>5</td><td>+125</td><td>15</td></tr>
<tr><td>6</td><td>+20</td><td>15</td></tr>
<tr><td rowspan="5">Surge Voltage</td><td colspan="2" rowspan="5">Apply 1.3x category voltage (Uc) at 125ºC for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω</td><td>Visual examination</td><td>no visible damage</td></tr>
<tr><td>DCL</td><td>initial limit</td></tr>
<tr><td>ΔC/C</td><td>within ±5% of initial value</td></tr>
<tr><td>DF</td><td>initial limit</td></tr>
<tr><td>ESR</td><td>1.25 x initial limit</td></tr>
<tr><td rowspan="5">Mechanical Shock</td><td colspan="2" rowspan="5">MIL-STD-202, Method 213, Condition F</td><td>Visual examination</td><td>no visible damage</td></tr>
<tr><td>DCL</td><td>initial limit</td></tr>
<tr><td>ΔC/C</td><td>within ±5% of initial value</td></tr>
<tr><td>DF</td><td>initial limit</td></tr>
<tr><td>ESR</td><td>1.25 x initial limit</td></tr>
<tr><td rowspan="5">Vibration</td><td colspan="2" rowspan="5">MIL-STD-202, Method 204, Condition D</td><td>Visual examination</td><td>no visible damage</td></tr>
<tr><td>DCL</td><td>initial limit</td></tr>
<tr><td>ΔC/C</td><td>within ±5% of initial value</td></tr>
<tr><td>DF</td><td>initial limit</td></tr>
<tr><td>ESR</td><td>1.25 x initial limit</td></tr>
</table>

*Initial Limit

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F91-AJ6 Series
Low ESR, Resin-Molded Chip - Automotive Product Range



FEATURES
- Compliant to the RoHS2 directive 2011/65/EU
- Compliant to AEC-Q200

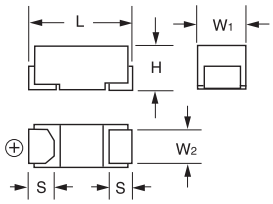
APPLICATIONS
- Cabin electronics
- Infotainment

GENERAL CHARACTERISTICS
Operating Temperature:
-55ºC to 125ºC

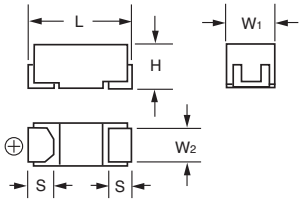
CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L	W_1	W_2	H	S
A	1206	3216-18	3.20 ± 0.20 (0.126 ± 0.008)	1.60 ± 0.20 (0.063 ± 0.008)	1.20 ± 0.10 (0.047 ± 0.004)	1.60 ± 0.20 (0.063 ± 0.008)	0.80 ± 0.20 (0.031 ± 0.008)
B	1210	3528-21	3.50 ± 0.20 (0.126 ± 0.008)	2.80 ± 0.20 (0.110 ± 0.008)	2.20 ± 0.10 (0.087 ± 0.004)	1.90 ± 0.20 (0.075 ± 0.008)	0.80 ± 0.20 (0.031 ± 0.008)
N	2917	7343-30	7.30 ± 0.20 (0.287 ± 0.008)	4.30 ± 0.20 (0.169 ± 0.008)	2.40 ± 0.10 (0.094 ± 0.004)	2.80 ± 0.20 (0.110 ±0.008)	1.30 ± 0.20 (0.051 ± 0.008)

A, B CASE

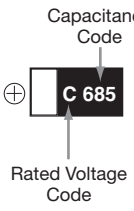


N CASE



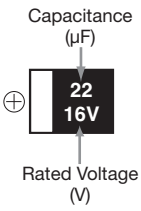
MARKING

A CASE

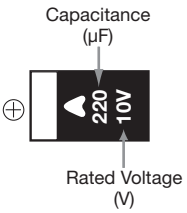


6.3V	J
10V	A
16V	C

B CASE



N CASE



HOW TO ORDER

F91	1C	226	M	B	□	AJ6
Type	**Rated Voltage**	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** K = ±10% M = ±20%	**Case Size** See table above	**Packaging** See Tape & Reel Packaging Section	**AEC-Q200 Compliant**

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55 to +125°C
Rated Temperature:	+85°C
Capacitance Tolerance:	±20%, ±10% at 120Hz
Dissipation Factor:	Refer to next page
ESR 100kHz:	Refer to next page
Leakage Current:	After 1 minute's application of rated voltage, leakage current at 20°C is not more than 0.01CV or 0.5µA, whichever is greater.
	After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5µA, whichever is greater.
	After 1 minute's application of derated voltage, leakage current at 125°C is not more than 0.125CV or 6.3µA, whichever is greater.
Capacitance Change By Temperature	+15% Max. at +125°C
	+10% Max. at +85°C
	-10% Max. at -55°C

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CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage		
µF	Code	6.3V (0J)	10V (1A)	16V (1C)
10	106		A	A
22	226	A	A	B
33	336	A	B	B
47	476	A,B	A,B	
100	107	A,B		N
220	227		N	

Released ratings

RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL (µA)	DF @ 120Hz (%)	ESR @ 100kHz (mΩ)	100kHz RMS Current (mA) 20°C	*1 ΔC/C (%)	MSL
6.3 Volt									
F910J226#AAAJ6	A	22	6.3	1.4	8	1250	245	*	3
F910J336#AAAJ6	A	33	6.3	2.1	8	1250	245	*	3
F910J476#AAAJ6	A	47	6.3	3.0	18	1250	245	*	3
F910J476#BAAJ6	B	47	6.3	3.0	6	500	412	*	3
F910J107#AAAJ6	A	100	6.3	6.3	35	1000	274	±15	3
F910J107#BAAJ6	B	100	6.3	6.3	14	450	435	*	3
10 Volt									
F911A106#AAAJ6	A	10	10	1.0	6	1500	224	*	3
F911A226#AAAJ6	A	22	10	2.2	12	1250	245	*	3
F911A336#BAAJ6	B	33	10	3.3	8	700	348	*	3
F911A476#AAAJ6	A	47	10	4.7	40	1000	274	±15	3
F911A476#BAAJ6	B	47	10	4.7	8	500	412	*	3
F911A227#NCAJ6	N	220	10	22.0	12	100	1225	*	3
16 Volt									
F911C106#AAAJ6	A	10	16	1.6	6	1500	224	*	3
F911C226#BAAJ6	B	22	16	3.5	8	950	299	*	3
F911C336#BAAJ6	B	33	16	5.3	8	950	299	*	3
F911C107#NCAJ6	N	100	16	16.0	10	100	1225	*	3

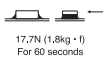
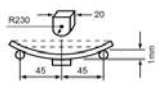
#: "M" for ±20% tolerance, "K" for ± 10% tolerance.

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

*1: ΔC/C Marked "∗"

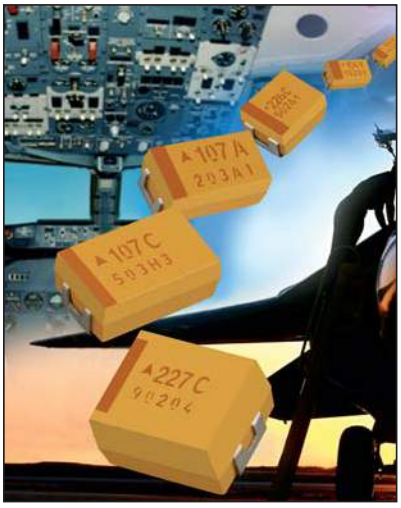
Item	All Case (%)
Damp Heat	±10
Temperature cycles	±10
Resistance soldering heat	±10
Surge	±10
Endurance	±10

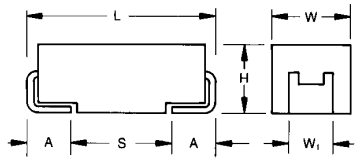
QUALIFICATION TABLE

TEST	F91-AJ6 series (Temperature range -55ºC to +125ºC) Condition
Damp Heat (Steady State)	At 40°C, 90 to 95% R.H., 500 hours (No voltage applied) Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Load Humidity	After 1000 hour's application of rated voltage in series with a 33Ω resistor at 85°C, 85% R.H., capacitors meet the characteristics requirements table below. Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... 125% or less than the initial specified value
Temperature Cycles	At -55°C / +125°C, 30 minutes each, 1000 cycles Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Resistance to Soldering Heat	10 seconds reflow at 260°C, 10 seconds immersion at 260°C. Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Surge	After application of surge voltage in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85ºC, capacitors shall meet the characteristic requirements in the table above. Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Endurance	After 2000 hours' application of rated voltage in series with a 3Ω resistor at 85°C, or derated voltage in series with a 3Ω resistor at 125°C, capacitors shall meet the characteristic requirements in the table above. Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Shear Test	After applying the pressure load of 17.7N for 60 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on a substrate, there shall be found neither exfoliation nor its sign at the terminal electrode.  17.7N (1.8kg · f) For 60 seconds
Terminal Strength	Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of capacitor, the pressure strength is applied with a specified jig at the center of the substrate so that substrate may bend by1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals. 
Failure Rate	1% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance, 60% confidence level.

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TRJ Series
Professional Series Tantalum Capacitor





FEATURES
- Improved reliability – 2x standard
- DCL reduced by 25% to 0.0075 CV
- Robust against higher thermo-mechanical stresses during assembly process
- CV range: 0.10-680µF / 4-50V
- 6 case sizes available
- 130 low ESR parts released
- Automotive, industrial and other higher end applications

APPLICATIONS
- Automotive ECU
- ABS
- Airbag systems
- Avionics,
- Industrial control units

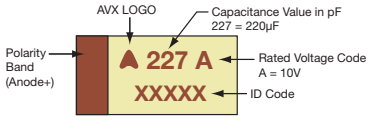
GENERAL CHARACTERISTICS
Operating Temperature:
-55ºC to 125ºC

CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) -0.10 (0.004)	H+0.20 (0.008) -0.10 (0.004)	W_1±0.20 (0.008)	A+0.30 (0.012) -0.20 (0.008)	S Min.
A	1206	3216-18	3.20 (0.126)	1.60 (0.063)	1.60 (0.063)	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)
B	1210	3528-21	3.50 (0.138)	2.80 (0.110)	1.90 (0.075)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)
C	2312	6032-28	6.00 (0.236)	3.20 (0.126)	2.60 (0.102)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
D	2917	7343-31	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
U	2924	7361-43	7.30 (0.287)	6.10 (0.240)	4.10 (0.162)	3.10 (0.120)	1.30 (0.051)	4.40 (0.173)

W_1 dimension applies to the termination width for A dimensional area only.

MARKING
A, B, C, D, E, U CASE



HOW TO ORDER

TRJ	B	105	*	035	R	RJ	—
Type	**Case Size** See table above	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** K=±10% M=±20%	**Rated DC Voltage** 004 = 4V 006 = 6.3V 010 = 10V 016 = 16V 020 = 20V 025 = 25V 035 = 35V 050 = 50V	**Packaging** R = Pure Tin 7" Reel S = Pure Tin 13" Reel A = Gold Plating 7" Reel (Contact Manufacturer) B = Gold Plating 13" Reel (Contact Manufacturer) H = Tin Lead 7" Reel (Contact Manufacturer) K = Tin Lead 13" Reel (Contact Manufacturer) H, K = Non RoHS	**Standard Suffix** OR **0100** **Low ESR in mΩ**	**Additional characters may be added for special requirements** V = Dry pack Option (selected codes only)

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT
SnPb termination option is not RoHS compliant.

RoHS COMPLIANT

TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C								
Capacitance Range:		0.10 µF to 680 µF								
Capacitance Tolerance:		±10%; ±20%								
Leakage Current DCL:		0.0075CV or 0.3µA whichever is the greater								
Rated Voltage (V_R)	≤ +85°C:	4	6.3	10	16	20	25	35	50	
Category Voltage (V_C)	≤ +125°C:	2.7	4	7	10	13	17	23	33	
Surge Voltage (V_S)	≤ +85°C:	5.2	8	13	20	26	32	46	65	
Surge Voltage (V_S)	≤ +125°C:	3.4	5	8	13	16	20	28	40	
Temperature Range:		-55°C to +125°C								
Reliability:		0.5% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance, 60% confidence level								
Termination Plating:		Sn Plating (standard), Gold and SnPb Plating upon request								
		Meets requirements of AEC-Q200								

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CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V_R) to 85°C							
µF	Code	4V (G)	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
0.10	104							A	
0.15	154							A, A(6000)	
0.22	224							A, A(6000)	A, A(7000)
0.33	334							A, A(6000)	A
0.47	474						A, A(7000)	A, A(4000)	B
0.68	684						A, A(6000)	A, A(6000)	B, B(2000)
1.0	105				A	A, A(3000)	A, A(3000)	A, B, A(3000), B(2000)	C, B, B(2000)
1.5	155			A		A, A(3000)	A, B, A(3000)	A, B, A(2000), B(2500)	C, C(1500)
2.2	225			A	A, A(3500)	A, A(3000)	A, B, A(1600), B(1200)	B, B(2000)	C, D, C(1000), D(1200)
3.3	335				A, B, A(3500)	A, B, A(2500), B(1300)	B, B(2000)	B, C, D, B(1000), C(800)	C, D, C(1000), D(800)
4.7	475			A, A(2000)	A, B, A(2000), B(1500)	A, B, A(1800), B(1000)	B, B(1000)	B, C, D, B(1500), C(600)	D, D(600)
6.8	685			A, B, A(1800)	A, B, C, A(1500), B(1200)	B, C, B(1000)	B, C, B(1000), C(600)	C, D, C(600)	D
10	106		A, B, A(1500)	A, B, A(1800), B(800)	B, C, B(800)	B, C, B(1000), C(500)	C, D, C(600)	C, D, C(600), D(250,400)	E, E(300,400)
15	156	B	A, B, A(1500), B(700)	A, B, C, A(1000), B(600)	B, B(800)	B, C, D, B(500), C(400)	C, D, C(500), D(300)	D, D(225)	U
22	226		A, B, C, A(900), B(600)	B, B(700)	B, C, D, B(600), C(350)	C, D, C(400), D(150,300)	D, D(300)	D, D(200.400)	U
33	336	C	B, C, B(600)	B, C, D, B(650), C(300)	C, C(300)	C, D, C(300), D(250)	D, D(400)	E, E(150,250)	
47	476		B, C, B(500), C(250)	C, D, C(300)	C, D, C(350), D(200)	D, D(200)	D, E, D(250), E(150)	U, U(200)	
68	686		C, C(200)	C, C(300)	C, D C(200), D(150)	D, E, D(200), E(120,200)	U		
100	107		C, C(300)	C, D, E, C(200) D(100,150), E(100)	D, E, D(150), E(150)	E, E(150)	U		
150	157		C, D, C(300), D(150)	D, E, D(150), E(150)	E, E(150)	U, U(250)			
220	227		D, D(150)	D, E, E(150)	U, U(200)				
330	337		D, E, E(150)	E, E(100)	U, U(200)				
470	477		E, E(200)	U, U(200)					
680	687		U, U(250)						

Not recommended for new designs; higher voltage or smaller case size alternatives are available.

Released ratings, (ESR ratings in mOhms in parentheses)

Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)			MSL
										25°C	85°C	125°C	
4 Volt @ 85°C													
TRJB156*004#RJ	B	15	4	85	2.7	125	0.45	6	3000	168	151	67	1
TRJC336*004#RJ	C	33	4	85	2.7	125	1	6	2000	235	211	94	1
6.3 Volt @ 85°C													
TRJA106*006#RJ	A	10	6.3	85	4	125	0.45	6	2200	185	166	74	1
TRJA106*006#1500	A	10	6.3	85	4	125	0.45	6	1500	224	201	89	1
TRJB106*006#RJ	B	10	6.3	85	4	125	0.45	6	3000	168	151	67	1
TRJA156*006#RJ	A	15	6.3	85	4	125	0.68	6	2030	192	173	77	1
TRJA156*006#1500	A	15	6.3	85	4	125	0.68	6	1500	224	201	89	1
TRJB156*006#RJ	B	15	6.3	85	4	125	0.68	6	2030	205	184	82	1
TRJB156*006#0700	B	15	6.3	85	4	125	0.68	6	700	348	314	139	1
TRJA226*006#RJ	A	22	6.3	85	4	125	0.99	6	1700	210	189	84	1
TRJA226*006#0900	A	22	6.3	85	4	125	0.99	6	900	289	260	115	1
TRJB226*006#RJ	B	22	6.3	85	4	125	0.99	6	1880	213	191	85	1
TRJB226*006#0600	B	22	6.3	85	4	125	0.99	6	600	376	339	151	1
TRJC226*006#RJ	C	22	6.3	85	4	125	0.99	6	2000	235	211	94	1
TRJB336*006#RJ	B	33	6.3	85	4	125	1.5	6	1740	221	199	88	1
TRJB336*006#0600	B	33	6.3	85	4	125	1.5	6	600	376	339	151	1
TRJC336*006#RJ	C	33	6.3	85	4	125	1.5	6	1800	247	222	99	1
TRJB476*006#RJ	B	47	6.3	85	4	125	2.1	6	1620	229	206	92	1
TRJB476*006#0500	B	47	6.3	85	4	125	2.1	6	500	412	371	165	1
TRJC476*006#RJ	C	47	6.3	85	4	125	2.1	6	540	451	406	181	1
TRJC476*006#0250	C	47	6.3	85	4	125	2.1	6	250	663	597	265	1
TRJC686*006#RJ	C	68	6.3	85	4	125	3.1	6	490	474	426	190	1
TRJC686*006#0200	C	68	6.3	85	4	125	3.1	6	200	742	667	297	1
TRJC107*006#RJ	C	100	6.3	85	4	125	4.5	6	440	500	450	200	1
TRJC107*006#0300	C	100	6.3	85	4	125	4.5	6	300	606	545	242	1
TRJC157*006#RJ	C	150	6.3	85	4	125	6.8	8	500	469	422	188	1
TRJC157*006#0300	C	150	6.3	85	4	125	6.8	8	300	606	545	242	1
TRJD157*006#RJ	D	150	6.3	85	4	125	6.8	6	400	612	551	245	1
TRJD157*006#0150	D	150	6.3	85	4	125	6.8	6	150	1000	900	400	1
TRJD227*006#RJ	D	220	6.3	85	4	125	9.9	8	360	645	581	258	1
TRJD227*006#0150	D	220	6.3	85	4	125	9.9	8	150	1000	900	400	1
TRJD337*006#RJ	D	330	6.3	85	4	125	14	8	400	612	551	245	1
TRJE337*006#RJ	E	330	6.3	85	4	125	14	8	330	707	636	283	1[1)]
TRJE337*006#0150	E	330	6.3	85	4	125	14	8	150	1049	944	420	1[1)]
TRJE477*006#RJ	E	470	6.3	85	4	125	21	8	250	812	731	325	1[1)]
TRJE477*006#0200	E	470	6.3	85	4	125	21	8	200	908	817	363	1[1)]
TRJU687*006RRJV	U	680	6.3	85	4	125	30	30	500	574	517	230	3
TRJU687*006R0250V	U	680	6.3	85	4	125	30	30	250	812	731	325	3
10 Volt @ 85°C													
TRJA155*010#RJ	A	1.5	10	85	7	125	0.3	6	7000	104	93	41	1
TRJA225*010#RJ	A	2.2	10	85	7	125	0.3	6	7000	104	93	41	1
TRJA475*010#RJ	A	4.7	10	85	7	125	0.35	6	2900	161	145	64	1
TRJA475*010#2000	A	4.7	10	85	7	125	0.35	6	2000	194	174	77	1
TRJA685*010#RJ	A	6.8	10	85	7	125	0.51	6	2650	168	151	67	1
TRJA685*010#1800	A	6.8	10	85	7	125	0.51	6	1800	204	184	82	1
TRJB685*010#RJ	B	6.8	10	85	7	125	0.51	6	3000	168	151	67	1
TRJA106*010#RJ	A	10	10	85	7	125	0.75	6	2200	185	166	74	1
TRJA106*010#1800	A	10	10	85	7	125	0.75	6	1800	204	184	82	1
TRJB106*010#RJ	B	10	10	85	7	125	0.75	6	2200	197	177	79	1
TRJB106*010#0800	B	10	10	85	7	125	0.75	6	800	326	293	130	1
TRJA156*010#RJ	A	15	10	85	7	125	1.1	6	1800	204	184	82	1
TRJA156*010#1000	A	15	10	85	7	125	1.1	6	1000	274	246	110	1
TRJB156*010#RJ	B	15	10	85	7	125	1.1	6	2030	205	184	82	1
TRJB156*010#0600	B	15	10	85	7	125	1.1	6	600	376	339	151	1
TRJC156*010#RJ	C	15	10	85	7	125	1.1	6	2000	235	211	94	1
TRJB226*010#RJ	B	22	10	85	7	125	1.7	6	1880	213	191	85	1
TRJB226*010#0700	B	22	10	85	7	125	1.7	6	700	348	314	139	1
TRJB336*010#RJ	B	33	10	85	7	125	2.5	6	1000	292	262	117	1
TRJB336*010#0650	B	33	10	85	7	125	2.5	6	650	362	325	145	1
TRJC336*010#RJ	C	33	10	85	7	125	2.5	6	590	432	389	173	1
TRJC336*010#0300	C	33	10	85	7	125	2.5	6	300	606	545	242	1
TRJD336*010#RJ	D	33	10	85	7	125	2.5	6	1100	369	332	148	1
TRJC476*010#RJ	C	47	10	85	7	125	3.5	6	540	451	406	181	1
TRJC476*010#0300	C	47	10	85	7	125	3.5	6	300	606	545	242	1
TRJD476*010#RJ	D	47	10	85	7	125	3.5	6	400	612	551	245	1
TRJC686*010#RJ	C	68	10	85	7	125	5.1	6	490	474	426	190	1
TRJC686*010#0300	C	68	10	85	7	125	5.1	6	300	606	545	242	1
TRJC107*010#RJ	C	100	10	85	7	125	7.5	8	500	469	422	188	1
TRJC107*010#0200	C	100	10	85	7	125	7.5	8	200	742	667	297	1

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AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)			MSL
										25°C	85°C	125°C	
TRJD107*010#RJ	D	100	10	85	7	125	7.5	6	440	584	525	234	1
TRJD107*010#0100	D	100	10	85	7	125	7.5	6	100	1225	1102	490	1
TRJD107*010#0150	D	100	10	85	7	125	7.5	6	150	1000	900	400	1
TRJE107*010#RJ	E	100	10	85	7	125	7.5	6	440	612	551	245	1[1)]
TRJE107*010#0100	E	100	10	85	7	125	7.5	6	100	1285	1156	514	1[1)]
TRJD157*010#RJ	D	150	10	85	7	125	11	8	400	612	551	245	1
TRJD157*010#0150	D	150	10	85	7	125	11	8	150	1000	900	400	1
TRJE157*010#RJ	E	150	10	85	7	125	11	8	400	642	578	257	1[1)]
TRJE157*010#0150	E	150	10	85	7	125	11	8	150	1049	944	420	1[1)]
TRJD227*010#RJ	D	220	10	85	7	125	17	8	500	548	493	219	1
TRJE227*010#RJ	E	220	10	85	7	125	17	8	360	677	609	271	1[1)]
TRJE227*010#0150	E	220	10	85	7	125	17	8	150	1049	944	420	1[1)]
TRJE337*010#RJ	E	330	10	85	7	125	25	8	300	742	667	297	1[1)]
TRJE337*010#0100	E	330	10	85	7	125	25	8	100	1285	1156	514	1[1)]
TRJU477*010RRJV	U	470	10	85	7	125	35	30	400	642	578	257	3
TRJU477*010R0200V	U	470	10	85	7	125	35	30	200	908	817	363	3
16 Volt @ 85°C													
TRJA105*016#RJ	A	1.0	16	85	10	125	0.3	6	10000	87	78	35	1
TRJA225*016#RJ	A	2.2	16	85	10	125	0.3	6	4550	128	116	51	1
TRJA225*016#3500	A	2.2	16	85	10	125	0.3	6	3500	146	132	59	1
TRJA335*016#RJ	A	3.3	16	85	10	125	0.4	6	3740	142	127	57	1
TRJA335*016#3500	A	3.3	16	85	10	125	0.4	6	3500	146	132	59	1
TRJB335*016#RJ	B	3.3	16	85	10	125	0.4	6	4500	137	124	55	1
TRJA475*016#RJ	A	4.7	16	85	10	125	0.56	6	3160	154	139	62	1
TRJA475*016#2000	A	4.7	16	85	10	125	0.56	6	2000	194	174	77	1
TRJB475*016#RJ	B	4.7	16	85	10	125	0.56	6	3160	164	148	66	1
TRJB475*016#1500	B	4.7	16	85	10	125	0.56	6	1500	238	214	95	1
TRJA685*016#RJ	A	6.8	16	85	10	125	0.82	4	2000	194	174	77	1
TRJA685*016#1500	A	6.8	16	85	10	125	0.82	4	1500	224	201	89	1
TRJB685*016#RJ	B	6.8	16	85	10	125	0.82	6	2650	179	161	72	1
TRJB685*016#1200	B	6.8	16	85	10	125	0.82	6	1200	266	240	106	1
TRJC685*016#RJ	C	6.8	16	85	10	125	0.82	6	2500	210	189	84	1
TRJB106*016#RJ	B	10	16	85	10	125	1.2	6	2200	197	177	79	1
TRJB106*016#0800	B	10	16	85	10	125	1.2	6	800	326	293	130	1
TRJC106*016#RJ	C	10	16	85	10	125	1.2	6	2000	235	211	94	1
TRJB156*016#RJ	B	15	16	85	10	125	1.8	6	2030	205	184	82	1
TRJB156*016#0800	B	15	16	85	10	125	1.8	6	800	326	293	130	1
TRJB226*016#RJ	B	22	16	85	10	125	2.6	6	1100	278	250	111	1
TRJB226*016#0600	B	22	16	85	10	125	2.6	6	600	376	339	151	1
TRJC226*016#RJ	C	22	16	85	10	125	2.6	6	700	396	357	159	1
TRJC226*016#0350	C	22	16	85	10	125	2.6	6	350	561	505	224	1
TRJD226*016#RJ	D	22	16	85	10	125	2.6	6	1100	369	332	148	1
TRJC336*016#RJ	C	33	16	85	10	125	4	6	590	432	389	173	1
TRJC336*016#0300	C	33	16	85	10	125	4	6	300	606	545	242	1
TRJC476*016#RJ	C	47	16	85	10	125	5.6	6	540	451	406	181	1
TRJC476*016#0350	C	47	16	85	10	125	5.6	6	350	561	505	224	1
TRJD476*016#RJ	D	47	16	85	10	125	5.6	6	540	527	474	211	1
TRJD476*016#0200	D	47	16	85	10	125	5.6	6	200	866	779	346	1
TRJC686*016#RJ	C	68	16	85	10	125	8.2	6	490	474	426	190	1
TRJC686*016#0200	C	68	16	85	10	125	8.2	6	200	742	667	297	1
TRJD686*016#RJ	D	68	16	85	10	125	8.2	6	490	553	498	221	1
TRJD686*016#0150	D	68	16	85	10	125	8.2	6	150	1000	900	400	1
TRJD107*016#RJ	D	100	16	85	10	125	12	6	440	584	525	234	1
TRJD107*016#0150	D	100	16	85	10	125	12	6	150	1000	900	400	1
TRJE107*016#RJ	E	100	16	85	10	125	12	6	440	612	551	245	1[1)]
TRJE107*016#0150	E	100	16	85	10	125	12	6	150	1049	944	420	1[1)]
TRJE157*016#RJ	E	150	16	85	10	125	16	6	300	742	667	297	1[1)]
TRJE157*016#0150	E	150	16	85	10	125	16	6	150	1049	944	420	1[1)]
TRJU227*016RRJV	U	220	16	85	10	125	26.4	12	500	574	517	230	3
TRJU227*016R0200V	U	220	16	85	10	125	26.4	12	200	908	817	363	3
TRJU337*016RRJV	U	330	16	85	10	125	39	30	400	642	578	257	3
TRJU337*016R0200V	U	330	16	85	10	125	39	30	200	908	817	363	3
20 Volt @ 85°C													
TRJA105*020#RJ	A	1	20	85	13	125	0.3	4	6630	106	96	43	1
TRJA105*020#3000	A	1	20	85	13	125	0.3	4	3000	158	142	63	1
TRJA155*020#RJ	A	1.5	20	85	13	125	0.3	6	5460	117	105	47	1
TRJA155*020#3000	A	1.5	20	85	13	125	0.3	6	3000	158	142	63	1
TRJA225*020#RJ	A	2.2	20	85	13	125	0.33	6	4550	128	116	51	1
TRJA225*020#3000	A	2.2	20	85	13	125	0.33	6	3000	158	142	63	1
TRJA335*020#RJ	A	3.3	20	85	13	125	0.5	6	3740	142	127	57	1
TRJA335*020#2500	A	3.3	20	85	13	125	0.5	6	2500	173	156	69	1

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AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)			MSL
										25°C	85°C	125°C	
TRJB335*020#RJ	B	3.3	20	85	13	125	0.5	6	3740	151	136	60	1
TRJB335*020#1300	B	3.3	20	85	13	125	0.5	6	1300	256	230	102	1
TRJA475*020#RJ	A	4.7	20	85	13	125	0.71	5	2500	184	166	74	1
TRJA475*020#1800	A	4.7	20	85	13	125	0.71	5	1800	217	196	87	1
TRJB475*020#RJ	B	4.7	20	85	13	125	0.71	6	3160	164	148	66	1
TRJB475*020#1000	B	4.7	20	85	13	125	0.71	6	1000	292	262	117	1
TRJB685*020#RJ	B	6.8	20	85	13	125	1	6	2650	179	161	72	1
TRJB685*020#1000	B	6.8	20	85	13	125	1	6	1000	292	262	117	1
TRJC685*020#RJ	C	6.8	20	85	13	125	1	6	2000	235	211	94	1
TRJB106*020#RJ	B	10	20	85	13	125	1.5	6	2200	197	177	79	1
TRJB106*020#1000	B	10	20	85	13	125	1.5	6	1000	292	262	117	1
TRJC106*020#RJ	C	10	20	85	13	125	1.5	6	800	371	334	148	1
TRJC106*020#0500	C	10	20	85	13	125	1.5	6	500	469	422	188	1
TRJB156*020#RJ	B	15	20	85	13	125	2.3	6	1400	280	252	112	1
TRJB156*020#0500	B	15	20	85	13	125	2.3	6	500	469	422	188	1
TRJC156*020#RJ	C	15	20	85	13	125	2.3	6	720	391	352	156	1
TRJC156*020#0400	C	15	20	85	13	125	2.3	6	400	524	472	210	1
TRJD156*020#RJ	D	15	20	85	13	125	2.3	6	1100	369	332	148	1
TRJC226*020#RJ	C	22	20	85	13	125	3.3	6	650	411	370	165	1
TRJC226*020#0400	C	22	20	85	13	125	3.3	6	400	524	472	210	1
TRJD226*020#RJ	D	22	20	85	13	125	3.3	6	650	480	432	192	1
TRJD226*020#0150	D	22	20	85	13	125	3.3	6	150	1000	900	400	1
TRJD226*020#0300	D	22	20	85	13	125	3.3	6	300	707	636	283	1
TRJC336*020#RJ	C	33	20	85	13	125	5	6	590	432	389	173	1
TRJC336*020#0300	C	33	20	85	13	125	5	6	300	606	545	242	1
TRJD336*020#RJ	D	33	20	85	13	125	5	6	590	504	454	202	1
TRJD336*020#0250	D	33	20	85	13	125	5	6	250	775	697	310	1
TRJD476*020#RJ	D	47	20	85	13	125	7.1	6	540	527	474	211	1
TRJD476*020#0200	D	47	20	85	13	125	7.1	6	200	866	779	346	1
TRJD686*020#RJ	D	68	20	85	13	125	10	6	490	553	498	221	1
TRJD686*020#0200	D	68	20	85	13	125	10	6	200	866	779	346	1
TRJE686*020#RJ	E	68	20	85	13	125	10	6	490	580	522	232	1[1)]
TRJE686*020#0120	E	68	20	85	13	125	10	6	120	1173	1055	469	1[1)]
TRJE686*020#0200	E	68	20	85	13	125	10	6	200	908	817	363	1[1)]
TRJE107*020#RJ	E	100	20	85	13	125	15	6	300	742	667	297	1[1)]
TRJE107*020#0150	E	100	20	85	13	125	15	6	150	1049	944	420	1[1)]
TRJU157*020RRJV	U	150	20	85	13	125	22	30	500	574	517	230	3
TRJU157*020R0250V	U	150	20	85	13	125	22	30	250	812	731	325	3
25 Volt @ 85°C													
TRJA474*025#RJ	A	0.47	25	85	17	125	0.3	4	9530	89	80	35	1
TRJA474*025#7000	A	0.47	25	85	17	125	0.3	4	7000	104	93	41	1
TRJA684*025#RJ	A	0.68	25	85	17	125	0.3	4	7980	97	87	39	1
TRJA684*025#6000	A	0.68	25	85	17	125	0.3	4	6000	112	101	45	1
TRJA105*025#RJ	A	1	25	85	17	125	0.3	4	6630	106	96	43	1
TRJA105*025#3000	A	1	25	85	17	125	0.3	4	3000	158	142	63	1
TRJA155*025#RJ	A	1.5	25	85	17	125	0.3	6	5460	117	105	47	1
TRJA155*025#3000	A	1.5	25	85	17	125	0.3	6	3000	158	142	63	1
TRJB155*025#RJ	B	1.5	25	85	17	125	0.3	6	5000	130	117	52	1
TRJA225*025#RJ	A	2.2	25	85	17	125	0.41	6	2900	161	145	64	1
TRJA225*025#1600	A	2.2	25	85	17	125	0.41	6	1600	217	195	87	1
TRJB225*025#RJ	B	2.2	25	85	17	125	0.41	6	4550	137	123	55	1
TRJB225*025#1200	B	2.2	25	85	17	125	0.41	6	1200	266	240	106	1
TRJB335*025#RJ	B	3.3	25	85	17	125	0.62	6	3740	151	136	60	1
TRJB335*025#2000	B	3.3	25	85	17	125	0.62	6	2000	206	186	82	1
TRJB475*025#RJ	B	4.7	25	85	17	125	0.88	6	3160	164	148	66	1
TRJB475*025#1000	B	4.7	25	85	17	125	0.88	6	1000	292	262	117	1
TRJB685*025#RJ	B	6.8	25	85	17	125	1.3	6	1500	238	214	95	1
TRJB685*025#1000	B	6.8	25	85	17	125	1.3	6	1000	292	262	117	1
TRJC685*025#RJ	C	6.8	25	85	17	125	1.3	6	1070	321	289	128	1
TRJC685*025#0600	C	6.8	25	85	17	125	1.3	6	600	428	385	171	1
TRJC106*025#RJ	C	10	25	85	17	125	1.9	6	800	371	334	148	1
TRJC106*025#0600	C	10	25	85	17	125	1.9	6	600	428	385	171	1
TRJD106*025#RJ	D	10	25	85	17	125	1.9	6	1200	354	318	141	1
TRJC156*025#RJ	C	15	25	85	17	125	2.8	6	720	391	352	156	1
TRJC156*025#0500	C	15	25	85	17	125	2.8	6	500	469	422	188	1
TRJD156*025#RJ	D	15	25	85	17	125	2.8	6	720	456	411	183	1
TRJD156*025#0300	D	15	25	85	17	125	2.8	6	300	707	636	283	1
TRJD226*025#RJ	D	22	25	85	17	125	4.1	6	650	480	432	192	1
TRJD226*025#0300	D	22	25	85	17	125	4.1	6	300	707	636	283	1
TRJD336*025#RJ	D	33	25	85	17	125	6.2	6	590	504	454	202	1
TRJD336*025#0400	D	33	25	85	17	125	6.2	6	400	612	551	245	1

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)			MSL
										25°C	85°C	125°C	
TRJD476*025#RJ	D	47	25	85	17	125	8.8	6	540	527	474	211	1
TRJD476*025#0250	D	47	25	85	17	125	8.8	6	250	775	697	310	1
TRJE476*025#RJ	E	47	25	85	17	125	8.8	6	540	553	497	221	1[1)]
TRJE476*025#0150	E	47	25	85	17	125	8.8	6	150	1049	944	420	1[1)]
TRJU686*025RRJV	U	68	25	85	17	125	12	30	500	574	517	230	3
TRJU107*025RRJV	U	100	25	85	17	125	18	30	500	574	517	230	3
35 Volt @ 85°C													
TRJA104*035#RJ	A	0.1	35	85	23	125	0.3	4	20000	61	55	24	1
TRJA154*035#RJ	A	0.15	35	85	23	125	0.3	4	16470	67	61	27	1
TRJA154*035#6000	A	0.15	35	85	23	125	0.3	4	6000	112	101	45	1
TRJA224*035#RJ	A	0.22	35	85	23	125	0.3	4	13710	74	67	30	1
TRJA224*035#6000	A	0.22	35	85	23	125	0.3	4	6000	112	101	45	1
TRJA334*035#RJ	A	0.33	35	85	23	125	0.3	4	11280	82	73	33	1
TRJA334*035#6000	A	0.33	35	85	23	125	0.3	4	6000	112	101	45	1
TRJA474*035#RJ	A	0.47	35	85	23	125	0.3	4	9530	89	80	35	1
TRJA474*035#4000	A	0.47	35	85	23	125	0.3	4	4000	137	123	55	1
TRJA684*035#RJ	A	0.68	35	85	23	125	0.3	4	7980	97	87	39	1
TRJA684*035#6000	A	0.68	35	85	23	125	0.3	4	6000	112	101	45	1
TRJA105*035#RJ	A	1	35	85	23	125	0.3	4	6630	106	96	43	1
TRJA105*035#3000	A	1	35	85	23	125	0.3	4	3000	158	142	63	1
TRJB105*035#RJ	B	1	35	85	23	125	0.3	4	3400	158	142	63	1
TRJB105*035#2000	B	1	35	85	23	125	0.3	4	2000	206	186	82	1
TRJA155*035#RJ	A	1.5	35	85	23	125	0.39	6	3100	166	149	66	1
TRJA155*035#2000	A	1.5	35	85	23	125	0.39	6	2000	206	186	82	1
TRJB155*035#RJ	B	1.5	35	85	23	125	0.39	6	5460	125	112	50	1
TRJB155*035#2500	B	1.5	35	85	23	125	0.39	6	2500	184	166	74	1
TRJB225*035#RJ	B	2.2	35	85	23	125	0.58	6	4550	137	123	55	1
TRJB225*035#2000	B	2.2	35	85	23	125	0.58	6	2000	206	186	82	1
TRJB335*035#RJ	B	3.3	35	85	23	125	0.87	6	3740	151	136	60	1
TRJB335*035#1000	B	3.3	35	85	23	125	0.87	6	1000	292	262	117	1
TRJC335*035#RJ	C	3.3	35	85	23	125	0.87	6	1840	245	220	98	1
TRJC335*035#0800	C	3.3	35	85	23	125	0.87	6	800	371	334	148	1
TRJD335*035#RJ	D	3.3	35	85	23	125	0.87	6	2000	274	246	110	1
TRJB475*035#RJ	B	4.7	35	85	23	125	1.2	6	2200	224	201	89	1
TRJB475*035#1500	B	4.7	35	85	23	125	1.2	6	1500	271	244	108	1
TRJC475*035#RJ	C	4.7	35	85	23	125	1.2	6	1410	279	251	112	1
TRJC475*035#0600	C	4.7	35	85	23	125	1.2	6	600	428	385	171	1
TRJD475*035#RJ	D	4.7	35	85	23	125	1.2	6	1500	316	285	126	1
TRJC685*035#RJ	C	6.8	35	85	23	125	1.8	6	1070	321	289	128	1
TRJC685*035#0600	C	6.8	35	85	23	125	1.8	6	600	428	385	171	1
TRJD685*035#RJ	D	6.8	35	85	23	125	1.8	6	1300	340	306	136	1
TRJC106*035#RJ	C	10	35	85	23	125	2.6	6	800	371	334	148	1
TRJC106*035#0600	C	10	35	85	23	125	2.6	6	600	428	385	171	1
TRJD106*035#RJ	D	10	35	85	23	125	2.6	6	800	433	390	173	1
TRJD106*035#0250	D	10	35	85	23	125	2.6	6	250	775	697	310	1
TRJD106*035#0400	D	10	35	85	23	125	2.6	6	400	612	551	245	1
TRJD156*035#RJ	D	15	35	85	23	125	3.9	6	720	456	411	183	1
TRJD156*035#0225	D	15	35	85	23	125	3.9	6	225	816	735	327	1
TRJD226*035#RJ	D	22	35	85	23	125	5.8	6	650	480	432	192	1
TRJD226*035#0200	D	22	35	85	23	125	5.8	6	200	866	779	346	1
TRJD226*035#0400	D	22	35	85	23	125	5.8	6	400	612	551	245	1
TRJE336*035#RJ	E	33	35	85	23	125	8.7	6	590	529	476	212	1[1)]
TRJE336*035#0150	E	33	35	85	23	125	8.7	6	150	1049	944	420	1[1)]
TRJE336*035#0250	E	33	35	85	23	125	8.7	6	250	812	731	325	1[1)]
TRJU476*035RRJV	U	47	35	85	23	125	12.3	10	400	642	578	257	3
TRJU476*035R0200V	U	47	35	85	23	125	12.3	10	200	908	8.17	363	3
50 Volt @ 85°C													
TRJA224*050#RJ	A	0.22	50	85	33	125	0.3	4	7500	100	90	40	1
TRJA224*050#7000	A	0.22	50	85	33	125	0.3	4	7000	104	93	41	1
TRJA334*050#RJ	A	0.33	50	85	33	125	0.3	4	7000	104	93	41	1
TRJB474*050#RJ	B	0.47	50	85	33	125	0.3	4	5000	130	117	52	1
TRJB684*050#RJ	B	0.68	50	85	33	125	0.3	4	4000	146	131	58	1
TRJB684*050#2000	B	0.68	50	85	33	125	0.3	4	2000	206	186	82	1
TRJB105*050#RJ	B	1	50	85	33	125	0.4	4	3400	158	142	63	1
TRJB105*050#2000	B	1	50	85	33	125	0.4	4	2000	206	186	82	1
TRJC105*050#RJ	C	1	50	85	33	125	0.4	4	3000	191	172	77	1
TRJC155*050#RJ	C	1.5	50	85	33	125	0.6	6	2500	210	189	84	1
TRJC155*050#1500	C	1.5	50	85	33	125	0.6	6	1500	271	244	108	1
TRJC225*050#RJ	C	2.2	50	85	33	125	0.8	6	1700	254	229	102	1
TRJC225*050#1000	C	2.2	50	85	33	125	0.8	6	1000	332	298	133	1
TRJD225*050#RJ	D	2.2	50	85	33	125	0.8	4.5	2000	274	246	110	1

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)			MSL
										25°C	85°C	125°C	
TRJD225*050#1200	D	2.2	50	85	33	125	0.8	4.5	1200	354	318	141	1
TRJC335*050#RJ	C	3.3	50	85	33	125	1.2	6	1400	280	252	112	1
TRJC335*050#1000	C	3.3	50	85	33	125	1.2	6	1000	332	298	133	1
TRJD335*050#RJ	D	3.3	50	85	33	125	1.2	4.5	1100	369	332	148	1
TRJD335*050#0800	D	3.3	50	85	33	125	1.2	4.5	800	433	390	173	1
TRJD475*050#RJ	D	4.7	50	85	33	125	1.8	4.5	900	408	367	163	1
TRJD475*050#0600	D	4.7	50	85	33	125	1.8	4.5	600	500	450	200	1
TRJD685*050#RJ	D	6.8	50	85	33	125	2.6	4.5	700	463	417	185	1
TRJE106*050#RJ	E	10	50	85	33	125	3.8	4.5	700	486	437	194	1[1)]
TRJE106*050#0300	E	10	50	85	33	125	3.8	4.5	300	742	667	297	1[1)]
TRJE106*050#0400	E	10	50	85	33	125	3.8	4.5	400	642	578	257	1[1)]
TRJU156*050RRJV	U	15	50	85	33	125	5.6	30	500	574	517	230	3
TRJU226*050RRJV	U	22	50	85	33	125	8.2	30	500	574	517	230	3

1[1)] Dry pack option (see How to order) is recommended for reduction of stress during soldering. Dry pack parts should be treated as MSL 3.

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

The EIA & CECC standards for low ESR Solid Tantalum Capacitors allow an ESR movement to 1.25 times catalogue limit post mounting.

NOTE: AVX reserves the right to supply a higher voltage ratings or tighter tolerance part in the same case size, to the same reliability standards.

QUALIFICATION TABLE

TEST	TRJ professional series (Temperature range -55°C to +125°C)		
	Condition	Characteristics	
Endurance	Apply rated voltage (Ur) at 85°C and / or category voltage (Uc) at 125°C for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	1.25 x initial limit
		ΔC/C	within ±10% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Storage Life	Store at 125°C, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	1.25 x initial limit
		ΔC/C	within ±10% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Humidity	Store at 65°C and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	1.5 x initial limit
		ΔC/C	within ±10% of initial value
		DF	1.2 x initial limit
		ESR	1.25 x initial limit
Biased Humidity	Apply rated voltage (Ur) at 85°C, 85% relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	2 x initial limit
		ΔC/C	within ±10% of initial value
		DF	1.2 x initial limit
		ESR	1.25 x initial limit
Temperature Stability	Step 1: +20°C, 15 min Step 2: -55°C, 15 min Step 3: +20°C, 15 min Step 4: +85°C, 15 min Step 5: +125°C, 15 min Step 6: +20°C, 15 min		

	+20°C	-55°C	+20°C	+85°C	+125°C	+20°C
DCL	IL*	n/a	IL*	10 x IL*	12.5 x IL*	IL*
ΔC/C	n/a	+0/-10%	±5%	+10/-0%	+12/-0%	±5%
DF	IL*	1.5 x IL*	IL*	1.5 x IL*	2 x IL*	IL*
ESR	1.25 x IL*	2.5 x IL*	1.25 x IL*	1.25 x IL*	1.25 x IL*	1.25 x IL*

Surge Voltage	Apply 1.3x category voltage (Uc) at 125°C for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Mechanical Shock	MIL-STD-202, Method 213, Condition F	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Vibration	MIL-STD-202, Method 204, Condition D	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	1.25 x initial limit

*Initial Limit

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FEATURES

- Compliant to the RoHS2 directive 2011/65/EU
- Compliant to AEC-Q200
- Improved reliability - FR=0.5%/1000hrs
- SMD J-lead

APPLICATIONS

- Automotive electronics (Engine ECU)
- Industrial equipment

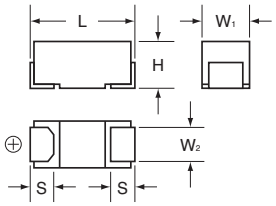
GENERAL CHARACTERISTICS

Operating Temperature:
-55°C to 125°C

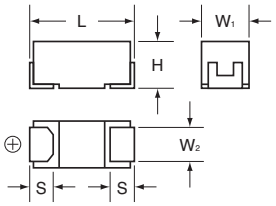
CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L	W_1	W_2	H	S
A	1206	3216-18	3.20 ± 0.20 (0.126 ± 0.008)	1.60 ± 0.20 (0.063 ± 0.008)	1.20 ± 0.10 (0.047 ± 0.004)	1.60 ± 0.20 (0.063 ± 0.008)	0.80 ± 0.20 (0.031 ± 0.008)
B	1210	3528-21	3.50 ± 0.20 (0.126 ± 0.008)	2.80 ± 0.20 (0.110 ± 0.008)	2.20 ± 0.10 (0.087 ± 0.004)	1.90 ± 0.20 (0.075 ± 0.008)	0.80 ± 0.20 (0.031 ± 0.008)
C	2312	6032-27	6.00 ± 0.20 (0.236 ± 0.008)	3.20 ± 0.20 (0.126 ± 0.008)	2.20 ± 0.10 (0.087 ± 0.004)	2.50 ± 0.20 (0.098 ± 0.008)	1.30 ± 0.20 (0.051 ± 0.008)
N	2917	7343-30	7.30 ± 0.20 (0.287 ± 0.008)	4.30 ± 0.20 (0.169 ± 0.008)	2.40 ± 0.10 (0.094 ± 0.004)	2.80 ± 0.20 (0.110 ±0.008)	1.30 ± 0.20 (0.051 ± 0.008)

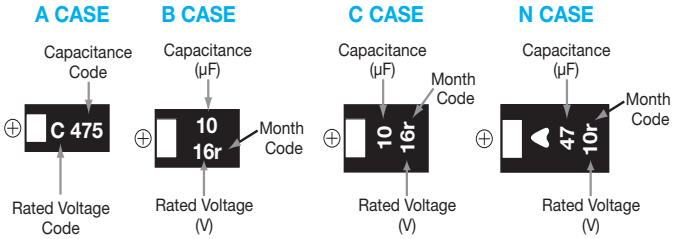
A, B CASE



C, N CASE



MARKING



HOW TO ORDER

F97	1C	335	M	A	□
Type	**Rated Voltage**	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** K = ±10% M = ±20%	**Case Size** See table above	**Packaging** See Tape & Reel Packaging Section

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55 to +125°C
Rated Temperature:	+85°C
Capacitance Tolerance:	±20%, ±10% at 120Hz
Dissipation Factor:	Refer to next page
ESR 100kHz:	Refer to next page
Leakage Current:	After 1 minute's application of rated voltage, leakage current at 20°C is not more than 0.01CV or 0.5µA, whichever is greater.
	After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5µA, whichever is greater.
	After 1 minute's application of derated voltage, leakage current at 125°C is not more than 0.125CV or 6.3µA, whichever is greater.
Capacitance Change By Temperature	+15% Max. at +125°C
	+10% Max. at +85°C
	-10% Max. at -55°C

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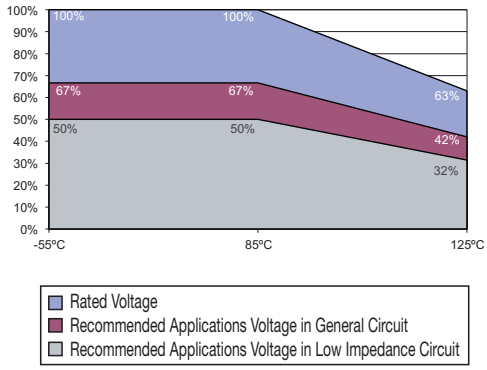
CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage					
µF	Code	6.3V (0J)	10V (1A)	16V (1C)	20V (1D)	25V (1E)	35V (1V)
0.33	334						A
0.47	474						A
0.68	684				A	A	A
1.0	105			A	A	A	B
1.5	155			A	A		B
2.2	225		A	A	A	B	B
3.3	335	A	A	A	B	B	C
4.7	475	A	A/B	A/B	A/B	C	C
6.8	685	A/B	B	B	C	C	N
10	106		A/B	A/B/C	C	C/N	N
15	156	B	B	A/C	N	N	
22	226	A/B	A/B	B/C/N	C/N	N	
33	336	A/C	B/C/N	B/C/N			
47	476	B/C	B/C/N	C/N			
68	686	N	N				
100	107	N	C				
150	157	C					

Released ratings

Please contact to your local AVX sales office when these series are being designed in your application.

Voltage vs Temperature Rating



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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL (µA)	DF @ 120Hz (%)	ESR @ 100kHz (Ω)	*1 ΔC/C (%)	MSL
6.3 Volt								
F970J335#AA	A	3.3	6.3	0.5	4	4.5	∗	3
F970J475#AA	A	4.7	6.3	0.5	6	4.0	∗	3
F970J685#AA	A	6.8	6.3	0.5	6	3.5	∗	3
F970J685#BA	B	6.8	6.3	0.5	6	2.5	∗	3
F970J156#BA	B	15	6.3	0.9	6	2.0	∗	3
F970J226#AA	A	22	6.3	1.4	12	2.5	∗	3
F970J226#BA	B	22	6.3	1.4	8	1.9	∗	3
F970J336#AA	A	33	6.3	2.1	12	2.5	∗	3
F970J336#CC	C	33	6.3	2.1	6	1.1	∗	3
F970J476#BA	B	47	6.3	3.0	8	1.0	∗	3
F970J476#CC	C	47	6.3	3.0	6	0.9	∗	3
F970J686#NC	N	68	6.3	4.3	6	0.6	∗	3
F970J107#NC	N	100	6.3	6.3	8	0.6	∗	3
F970J157#CC	C	150	6.3	9.5	12	0.7	∗	3
10 Volt								
F971A225#AA	A	2.2	10	0.5	4	5.0	∗	3
F971A335#AA	A	3.3	10	0.5	4	4.5	∗	3
F971A475#AA	A	4.7	10	0.5	6	4.0	∗	3
F971A475#BA	B	4.7	10	0.5	6	2.8	∗	3
F971A685#BA	B	6.8	10	0.7	6	2.5	∗	3
F971A106#AA	A	10	10	1.0	6	3.0	∗	3
F971A106#BA	B	10	10	1.0	6	2.0	∗	3
F971A156#BA	B	15	10	1.5	6	2.0	∗	3
F971A226#AA	A	22	10	2.2	15	3.0	∗	3
F971A226#BA	B	22	10	2.2	8	1.9	∗	3
F971A336#BA	B	33	10	3.3	8	1.9	∗	3
F971A336#CC	C	33	10	3.3	6	1.1	∗	3
F971A336#NC	N	33	10	3.3	6	0.7	∗	3
F971A476#BA	B	47	10	4.7	10	1.0	∗	3
F971A476#CC	C	47	10	4.7	8	0.9	∗	3
F971A476#NC	N	47	10	4.7	6	0.7	∗	3
F971A686#NC	N	68	10	6.8	6	0.6	∗	3
F971A107#CC	C	100	10	10.0	10	0.7	∗	3
16 Volt								
F971C105#AA	A	1	16	0.5	4	7.5	∗	3
F971C155#AA	A	1.5	16	0.5	4	6.3	∗	3
F971C225#AA	A	2.2	16	0.5	4	5.0	∗	3
F971C335#AA	A	3.3	16	0.5	4	4.5	∗	3
F971C475#AA	A	4.7	16	0.8	8	4.0	∗	3
F971C475#BA	B	4.7	16	0.8	6	2.8	∗	3
F971C685#BA	B	6.8	16	1.1	6	2.5	∗	3
F971C106#AA	A	10	16	1.6	8	3.5	∗	3
F971C106#BA	B	10	16	1.6	6	2.1	∗	3
F971C106#CC	C	10	16	1.6	6	1.5	∗	3
F971C156#AA	A	15	16	2.4	12	3.5	±10	3
F971C156#CC	C	15	16	2.4	6	1.2	∗	3
F971C226#BA	B	22	16	3.5	8	1.9	∗	3
F971C226#CC	C	22	16	3.5	8	1.1	∗	3
F971C226#NC	N	22	16	3.5	6	0.7	∗	3
F971C336#BA	B	33	16	5.3	10	2.1	∗	3
F971C336#CC	C	33	16	5.3	8	1.1	∗	3
F971C336#NC	N	33	16	5.3	6	0.7	∗	3
F971C476#CC	C	47	16	7.5	10	1.1	∗	3
F971C476#NC	N	47	16	7.5	8	0.7	∗	3
20 Volt								
F971D684#AA	A	0.68	20	0.5	4	7.6	∗	3
F971D105#AA	A	1	20	0.5	4	7.5	∗	3
F971D155#AA	A	1.5	20	0.5	4	6.7	∗	3
F971D225#AA	A	2.2	20	0.5	6	6.3	∗	3
F971D335#BA	B	3.3	20	0.7	4	3.1	∗	3
F971D475#AA	A	4.7	20	0.9	8	4.0	∗	3
F971D475#BA	B	4.7	20	0.9	6	2.8	∗	3
F971D685#CC	C	6.8	20	1.4	6	1.8	∗	3
F971D106#CC	C	10	20	2.0	6	1.5	∗	3
F971D156#NC	N	15	20	3.0	6	0.7	∗	3
F971D226#CC	C	22	20	4.4	8	1.1	∗	3
F971D226#NC	N	22	20	4.4	6	0.7	∗	3
25 Volt								
F971E684#AA	A	0.68	25	0.5	4	7.6	∗	3
F971E105#AA	A	1	25	0.5	4	7.5	∗	3
F971E225#BA	B	2.2	25	0.6	4	3.8	∗	3
F971E335#BA	B	3.3	25	0.8	4	3.5	∗	3
F971E475#CC	C	4.7	25	1.2	6	1.8	∗	3
F971E685#CC	C	6.8	25	1.7	6	1.8	∗	3
F971E106#CC	C	10	25	2.5	6	1.6	∗	3
F971E106#NC	N	10	25	2.5	6	1.0	∗	3
F971E156#NC	N	15	25	3.8	6	0.7	∗	3
F971E226#NC	N	22	25	5.5	6	0.7	∗	3
35 Volt								
F971V334#AA	A	0.33	35	0.5	4	12.0	∗	3
F971V474#AA	A	0.47	35	0.5	4	10.0	∗	3
F971V684#AA	A	0.68	35	0.5	4	7.6	∗	3
F971V105#BA	B	1	35	0.5	4	4.0	∗	3
F971V155#BA	B	1.5	35	0.5	4	4.0	∗	3
F971V225#BA	B	2.2	35	0.8	4	3.8	∗	3
F971V335#CC	C	3.3	35	1.2	4	2.0	∗	3
F971V475#CC	C	4.7	35	1.6	6	1.8	∗	3
F971V685#NC	N	6.8	35	2.4	6	1.0	∗	3
F971V106#NC	N	10	35	3.5	6	1.0	∗	3

#: "M" for ±20% tolerance, "K" for ± 10% tolerance.

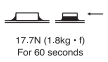
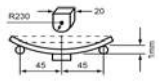
Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

*1: ΔC/C Marked "∗"

Item	All Case (%)
Damp Heat	±10
Temperature cycles	±5
Resistance soldering heat	±5
Surge	±5
Endurance	±10
Load Humidity	±10

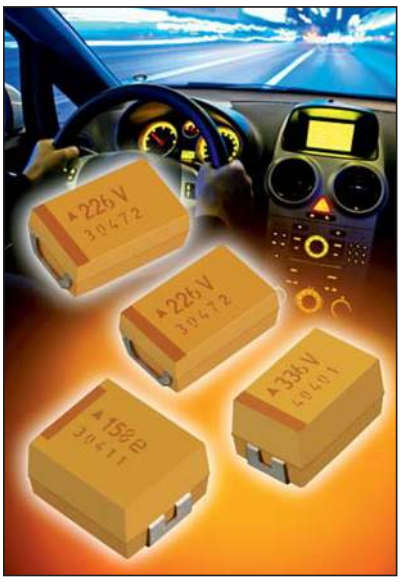
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QUALIFICATION TABLE

TEST	F97 series (Temperature range -55ºC to +125ºC) Condition
Damp Heat (Steady State)	At 85°C, 85% R.H., 1000 hours (No voltage applied) Capacitance Change ..... Refer to page 207 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... 125% or less than the initial specified value
Load Humidity	After 1000 hour's application of rated voltage in series with a 33Ω resistor at 85°C, 85% R.H., capacitors meet the characteristics requirements table below. Capacitance Change ..... Refer to page 207 (*1) Dissipation Factor ..... 120% or less than the initial specified value Leakage Current ..... 200% of less than the initial specified value
Temperature Cycles	At -55°C / +125°C, 30 minutes each, 1000 cycles Capacitance Change ..... Refer to page 207 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Resistance to Soldering Heat	10 seconds reflow at 260°C, 5 seconds immersion at 260°C. Capacitance Change ..... Refer to page 207 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Solderability	After immersing capacitors completely into a solder pot at 245ºC for 2 to 3 seconds, more than 3/4 of their electrode area shall remain covered with new solder.
Surge	After application of surge voltage in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85ºC, capacitors shall meet the characteristic requirements in the table above. Capacitance Change ..... Refer to page 207 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Endurance	After 2000 hours' application of rated voltage in series with a 3Ω resistor at 85°C, or derated voltage in series with a 3Ω resistor at 125°C, capacitors shall meet the characteristic requirements in the table above. Capacitance Change ..... Refer to page 207 (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Shear Test	After applying the pressure load of 17.7N for 60 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on a substrate, there shall be found neither exfoliation nor its sign at the terminal electrode.. 
Terminal Strength	Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of capacitor, the pressure strength is applied with a specified jig at the center of the substrate so that substrate may bend by1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals. 
Failure Rate	0.5% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance, 60% confidence level.

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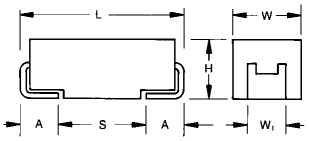
TRM Professional Multianode
Tantalum Ultra Low ESR Capacitor



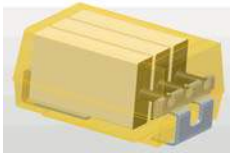
FEATURES
- Improved reliability – 0.5%/1khrs (twice better than standard)
- DCL reduced by 25% to 0.0075 CV
- Robust against higher thermo-mechanical stresses during assembly process
- Multi-anode construction
- Super low ESR
- CV range 4.7-1500µF / 2.5-50V
- "Mirror" construction used with D case capacitors reduces ESL to half
- Automotive, industrial and other higher end applications

APPLICATIONS
- Small Motor Drives
- Electric window control
- Electric seat control
- DC/DC converter

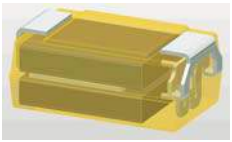
GENERAL CHARACTERISTICS
Operating Temperature:
-55ºC to 125ºC



MULTIANODE CONSTRUCTION



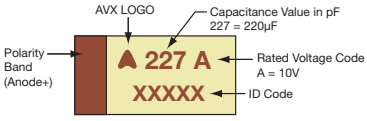
MULTIANODE TRM D LOW SELF INDUCTANCE CONSTRUCTION "MIRROR" DESIGN



CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) -0.10 (0.004)	H+0.20 (0.008) -0.10 (0.004)	W_1±0.20 (0.008)	A+0.30 (0.012) -0.20 (0.008)	S Min.
D	2917	7343-31	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
U	2924	7361-43	7.30 (0.287)	6.10 (0.240)	4.10 (0.162)	3.10 (0.120)	1.30 (0.051)	4.40 (0.173)
W_1 dimension applies to the termination width for A dimensional area only.								

MARKING
D, E, U CASE



HOW TO ORDER

TRM	E	108	*	004	R	0023
Type	**Case Size** See table above	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** K=±10% M=±20%	**Rated DC Voltage** 002 = 2.5Vdc 004 = 4Vdc 006 = 6.3Vdc 010 = 10Vdc 012 = 12Vdc 016 = 16Vdc 020 = 20Vdc 025 = 25Vdc 035 = 35Vdc 050 = 50Vdc	**Packaging** R = Pure Tin 7" Reel S = Pure Tin 13" Reel H = Tin Lead 7" Reel (Contact Manufacturer) K = Tin Lead 13" Reel (Contact Manufacturer) H, K = Non RoHS	**ESR in mΩ**

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT
SnPb termination option is not RoHS compliant.

TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C									
Capacitance Range:		4.7 µF to 1500 µF									
Capacitance Tolerance:		±10%; ±20%									
Rated Voltage (V_R)	≤ +85°C:	2.5	4	6.3	10	12	16	20	25	35	50
Category Voltage (V_C)	≤ +125°C:	1.7	2.7	4	7	8	10	13	17	23	33
Surge Voltage (V_S)	≤ +85°C:	3.3	5.2	8	13	16	20	26	32	46	65
Surge Voltage (V_S)	≤ +125°C:	2.2	3.4	5	8	10	13	16	20	28	40
Temperature Range:		-55°C to +125°C									
Reliability:		0.5% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance, 60% confidence level									
		Meets requirements of AEC-Q200									

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CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V_R) to 85°C									
µF	Code	2.5V (e)	4V (G)	6.3V (J)	10V (A)	12V (B)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
4.7	475										D(200)
6.8	685										
10	106									D(120)	
15	156										
22	226									D(70)/E(60,100)	
33	336								D(65)	E(50,65)	
47	476						D(100)	D(55)	E(65)		
68	686										
100	107							E(35,45)			
150	157				D(45)		E(30,40)				
220	227				D(35)	E(35)	U(30,40)				
330	337		D(35)	D(35)	E(35)						
470	477		D(35)	E(30)	U(23,30)						
680	687		E(23)	U(18,23)							
1000	108	D(25)	E(23) U(18,23)								
1500	158	E(18) U(18,23)									

Released ratings, (ESR ratings in mOhms in parentheses)
Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (ºC)	Category Voltage (V)	Category Temperature (ºC)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (A)			MSL
										25ºC	85ºC	125ºC	
2.5 Volt @ 85°C													
TRMD108*002#0025	D	1000	2.5	85	1.7	125	18.8	8	25	3.194	2.874	1.277	3
TRME158*002#0018	E	1500	2.5	85	1.7	125	28.1	6	18	3.873	3.486	1.549	3
TRMU158*002#0018	U	1500	2.5	85	1.7	125	22.5	6	18	4.048	3.643	1.619	3
TRMU158*002#0023	U	1500	2.5	85	1.7	125	22.5	6	23	3.581	3.223	1.433	3
4 Volt @ 85°C													
TRMD337*004#0035	D	330	4	85	2.7	125	9.9	8	35	2.699	2.429	1.080	3
TRMD477*004#0035	D	470	4	85	2.7	125	14.1	8	35	2.699	2.429	1.080	3
TRME687*004#0023	E	680	4	85	2.7	125	20.4	6	23	3.426	3.084	1.370	3
TRME108*004#0023	E	1000	4	85	2.7	125	30	6	23	3.426	3.084	1.370	3
TRMU108*004#0018	U	1000	4	85	2.7	125	30	6	18	4.048	3.643	1.619	3
TRMU108*004#0023	U	1000	4	85	2.7	125	30	6	23	3.581	3.223	1.433	3
6.3 Volt @ 85°C													
TRMD337*006#0035	D	330	6.3	85	4	125	14.9	8	35	2.699	2.429	1.080	3
TRME477*006#0030	E	470	6.3	85	4	125	21.2	6	30	3.000	2.700	1.200	3
TRMU687*006#0018	U	680	6.3	85	4	125	30.6	6	18	4.048	3.643	1.619	3
TRMU687*006#0023	U	680	6.3	85	4	125	30.6	6	23	3.581	3.223	1.433	3
10 Volt @ 85°C													
TRMD157*010#0045	D	150	10	85	7	125	11.3	8	45	2.380	2.142	0.952	3
TRMD227*010#0035	D	220	10	85	7	125	16.5	8	35	2.699	2.429	1.080	3
TRME337*010#0035	E	330	10	85	7	125	24.8	6	35	2.777	2.500	1.111	3
TRMU477*010#0023	U	470	10	85	7	125	35.3	8	23	3.581	3.223	1.433	3
TRMU477*010#0030	U	470	10	85	7	125	35.3	8	30	3.136	2.822	1.254	3
12 Volt @ 85°C													
TRME227*012#0035	E	220	12	85	8.4	125	19.8	6	35	2.777	2.500	1.111	3
16 Volt @ 85°C													
TRMD476*016#0100	D	47	16	85	10	125	5.6	8	100	1.597	1.437	0.639	3
TRME157*016#0030	E	150	16	85	10	125	18	6	30	3.000	2.700	1.200	3
TRME157*016#0040	E	150	16	85	10	125	18	6	40	2.598	2.338	1.039	3
TRMU227*016#0030	U	220	16	85	10	125	26.4	8	30	3.136	2.822	1.254	3
TRMU227*016#0040	U	220	16	85	10	125	26.4	8	40	2.716	2.444	1.086	3
20 Volt @ 85°C													
TRMD476*020#0055	D	47	20	85	13	125	7.1	8	55	2.153	1.938	0.861	3
TRME107*020#0035	E	100	20	85	13	125	15	6	35	2.777	2.500	1.111	3
TRME107*020#0045	E	100	20	85	13	125	15	6	45	2.449	2.205	0.980	3
25 Volt @ 85°C													
TRMD336*025#0065	D	33	25	85	17	125	6.2	8	65	1.981	1.783	0.792	3
TRME476*025#0065	E	47	25	85	17	125	8.8	6	65	2.038	1.834	0.815	3
35 Volt @ 85°C													
TRMD106*035#0120	D	10	35	85	23	125	2.6	8	120	1.458	1.312	0.583	3
TRMD226*035#0070	D	22	35	85	23	125	5.8	8	70	1.909	1.718	0.763	3
TRME226*035#0060	E	22	35	85	23	125	5.8	6	60	2.121	1.909	0.849	3
TRME226*035#0100	E	22	35	85	23	125	5.8	6	100	1.643	1.479	0.657	3
TRME336*035#0050	E	33	35	85	23	125	8.7	6	50	2.324	2.091	0.930	3
TRME336*035#0065	E	33	35	85	23	125	8.7	6	65	2.038	1.834	0.815	3
50 Volt @ 85°C													
TRMD475*050#0200	D	4.7	50	85	33	125	1.8	8	200	1.129	1.016	0.452	3

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.
All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts.
DCL is measured at rated voltage after 5 minutes.
The EIA & CECC standards for low ESR Solid Tantalum Capacitors allow an ESR movement to 1.25 times catalogue limit post mounting.
NOTE: AVX reserves the right to supply higher voltage ratings or tighter tolerance part in the same case size, to the same reliability standards.

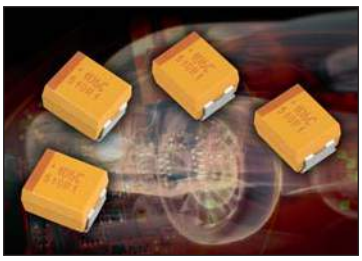
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QUALIFICATION TABLE

TEST	TRM professional multianode series (Temperature range -55ºC to +125ºC)		
	Condition	Characteristics	
Endurance	Apply rated voltage (Ur) at 85ºC and / or category voltage (Uc) at 125ºC for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±10% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Storage Life	Store at 125ºC, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	1.25 x initial limit
		ΔC/C	within ±10% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Humidity	Store at 65ºC and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	1.5 x initial limit
		ΔC/C	within ±10% of initial value
		DF	1.2 x initial limit
		ESR	1.25 x initial limit
Biased Humidity	Apply rated voltage (Ur) at 85ºC, 85% relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	2 x initial limit
		ΔC/C	within ±10% of initial value
		DF	1.2 x initial limit
		ESR	1.25 x initial limit
Temperature Stability	Step 1: +20 ºC, 15 min Step 2: -55 ºC, 15 min Step 3: +20 ºC, 15 min Step 4: +85 ºC, 15 min Step 5: +125 ºC, 15 min Step 6: +20 ºC, 15 min		
		DCL	+20ºC: IL*; -55ºC: n/a; +20ºC: IL*; +85ºC: 10 x IL*; +125ºC: 12.5 x IL*; +20ºC: IL*
		ΔC/C	+20ºC: n/a; -55ºC: +0/-10%; +20ºC: ±5%; +85ºC: +10/-0%; +125ºC: +12/-0%; +20ºC: ±5%
		DF	+20ºC: IL*; -55ºC: 1.5 x IL*; +20ºC: IL*; +85ºC: 1.5 x IL*; +125ºC: 2 x IL*; +20ºC: IL*
		ESR	+20ºC: 1.25 x IL*; -55ºC: 2.5 x IL*; +20ºC: 1.25 x IL*; +85ºC: 1.25 x IL*; +125ºC: 1.25 x IL*; +20ºC: 1.25 x IL*
Surge Voltage	Apply 1.3x category voltage (Uc) at 125ºC for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Mechanical Shock	MIL-STD-202, Method 213, Condition F	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Vibration	MIL-STD-202, Method 204, Condition D	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	1.25 x initial limit

*Initial Limit

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The AVX S1gma™ series is offering a next generation of statistical screening and process control enhancement of tantalum capacitors for professional applications with improved reliability and extremely low DCL needs.

FEATURES

- -55 to +125°C operation temperature
- Basic reliability better than 0.5%/1000 hours
- (2x improvement over commercial series)
- improved DCL limits 0.001CV* and 0.005CV

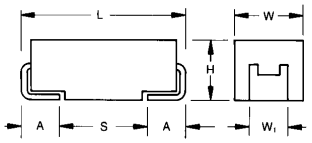
S1gma™ Prime – Utilises 3 S1gma™ electrical screening to remove possible maverick parts from the distribution.
S1gma™ Premium – S1gma™ Prime, with addition of capability statistical screening utilising the AVX patented Q-Process to effectively remove components that may experience excessive parametric shifts or instability in operational life.
S1gma™ Pro Custom – A custom option where specific parameter limits and screening methods can be agreed based on 3 S1gma™ and Q-Process statistical screening based on capability techniques.
*selected codes, 0.001CV limit is available with S1gma™ Premium and Pro Custom options only

APPLICATIONS

- Wireless battery operated sensors
- TPM
- Automotive
- Avionics
- Safety systems
- Energy harvesting

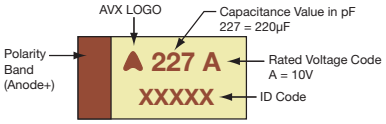
For additional information on Q-process please consult the AVX technical publication "Reaching the Highest Reliability for Tantalum Capacitors"
(see the link: http://www.avx.com/docs/techinfo/Qprocess.pdf)

TMJ CONSTRUCTION



MARKING

A, B, C, D, E, U CASE



GENERAL CHARACTERISTICS

Operating Temperature: -55ºC to 125ºC

CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) -0.10 (0.004)	H+0.20 (0.008) -0.10 (0.004)	W_1±0.20 (0.008)	A+0.30 (0.012) -0.20 (0.008)	S Min.
A	1206	3216-18	3.20 (0.126)	1.60 (0.063)	1.60 (0.063)	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)
B	1210	3528-21	3.50 (0.138)	2.80 (0.110)	1.90 (0.075)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)
C	2312	6032-28	6.00 (0.236)	3.20 (0.126)	2.60 (0.102)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
D	2917	7343-31	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
U	2924	7361-43	7.30 (0.287)	6.10 (0.240)	4.10 (0.162)	3.10 (0.120)	1.30 (0.051)	4.40 (0.173)

W1 dimension applies to the termination width for A dimensional area only.

HOW TO ORDER

TMJ	D	227	K	006	#	C	^	A
Type	**Case Size** See table above	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** K = ±10%	**Rated DC Voltage** 006 = 6.3Vdc 010 = 10Vdc 016 = 16Vdc 020 = 20Vdc 025 = 25Vdc 035 = 35Vdc 050 = 50Vdc	**Packaging** R = Pure Tin 7" Reel H = Tin Lead 7" Reel (Contact Manufacturer) Non RoHS	**ESR Range** C = Standard L = Low ESR	**Suffix** QX = S1gma™ Prime QY = S1gma™ Premium xx = S1gma™ Pro Custom	**DCL** A = 0.001CV C = 0.005CV

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT
SnPb termination option is not RoHS compliant.

RoHS COMPLIANT

TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C						
Capacitance Range:		0.22 µF to 680 µF						
Capacitance Tolerance:		±10%						
Leakage Current DCL:		(A) 0.001CV, (C) 0.005CV						
Rated Voltage (V_R)	≤ +85°C:	6.3	10	16	20	25	35	50
Category Voltage (V_C)	≤ +125°C:	4	7	10	13	17	23	33
Surge Voltage (V_S)	≤ +85°C:	8	13	20	26	32	46	65
Surge Voltage (V_S)	≤ +125°C:	5	8	13	16	20	28	40
Temperature Range:		-55ºC to +125°C						
Reliability:		0.5% per 1000 hours at 85°C, VR with 0.1Ω/V series impedance, 60% confidence level						
		AEC-Q200 per request						

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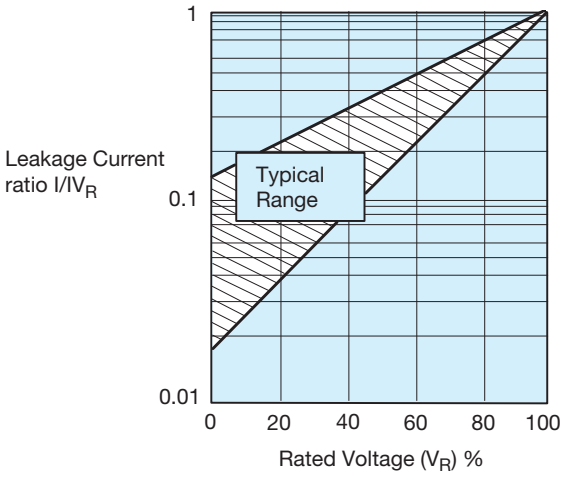
CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated voltage (V_R) to 85°C (Voltage Code)						
µF	Code	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
0.22	224							A
0.33	334						A	A
0.47	474						A	B
0.68	684						A	B
1.0	105					A	B	C
1.5	155				A	A	B	C
2.2	225			A	A	B	B	C
3.3	335			A	A	B	B	C
4.7	475		A	A	B	B	C	D
6.8	685		A	B	B	C	C	D
10	106	A	A	B	C	C	C	E
15	156	A	B	B	C	C	D	U
22	226	B	B	C	C	D	D	U
33	336	B	C	C	D	D	E	
47	476	C	C	D	D	D	U	
68	686	C	C	D	E	U		
100	107	C	D	E	E	U		
150	157	D	D	E	U			
220	227	D	E	U				
330	337	E	E					
470	477	E	U					
680	687	U						

Released ratings

Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

LEAKAGE CURRENT vs. RATED VOLTAGE



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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)			MSL
										25°C	85°C	125°C	
6.3 Volt @ 85°C													
TMJA106K006#CQYA	A	10	6.3	85	4	125	0.1	6	1500	224	201	89	3
TMJA106K006#C^C	A	10	6.3	85	4	125	0.3	6	1500	224	201	89	3
TMJA156K006#CQYA	A	15	6.3	85	4	125	0.1	6	1500	224	201	89	3
TMJA156K006#C^C	A	15	6.3	85	4	125	0.45	6	1500	224	201	89	3
TMJB226K006#C^C	B	22	6.3	85	4	125	0.66	6	600	376	339	151	3
TMJB336K006#C^C	B	33	6.3	85	4	125	0.99	6	600	376	339	151	3
TMJC476K006#CQYA	C	47	6.3	85	4	125	0.28	6	300	606	545	242	3
TMJC476K006#C^C	C	47	6.3	85	4	125	1.41	6	300	606	545	242	3
TMJC686K006#CQYA	C	68	6.3	85	4	125	0.41	6	300	606	545	242	3
TMJC686K006#C^C	C	68	6.3	85	4	125	2.04	6	300	606	545	242	3
TMJC107K006#CQYA	C	100	6.3	85	4	125	0.60	6	300	606	545	242	3
TMJC107K006#C^C	C	100	6.3	85	4	125	3	6	300	606	545	242	3
TMJD157K006#CQYA	D	150	6.3	85	4	125	0.90	6	200	866	779	346	3
TMJD157K006#C^C	D	150	6.3	85	4	125	4.5	6	200	866	779	346	3
TMJD227K006#CQYA	D	220	6.3	85	4	125	1.32	8	200	866	779	346	3
TMJD227K006#C^C	D	220	6.3	85	4	125	6.6	8	200	866	779	346	3
TMJE337K006#C^C	E	330	6.3	85	4	125	9.9	8	200	908	817	363	3
TMJE477K006#CQYA	E	470	6.3	85	4	125	2.82	8	200	908	817	363	3
TMJE477K006#C^C	E	470	6.3	85	4	125	14.1	8	200	908	817	363	3
TMJU687K006#C^C	U	680	6.3	85	4	125	20.4	12	250	812	731	325	3
10 Volt @ 85°C													
TMJA475K010#CQXC	A	4.7	10	85	7	125	0.24	6	2000	194	174	77	3
TMJA685K010#CQYA	A	6.8	10	85	7	125	0.1	6	2000	194	174	77	3
TMJA685K010#C^C	A	6.8	10	85	7	125	0.34	6	2000	194	174	77	3
TMJA106K010#CQYA	A	10	10	85	7	125	0.10	6	2000	194	174	77	3
TMJA106K010#C^C	A	10	10	85	7	125	0.5	6	2000	194	174	77	3
TMJB156K010#C^C	B	15	10	85	7	125	0.75	6	700	348	314	139	3
TMJB226K010#C^C	B	22	10	85	7	125	1.1	6	700	348	314	139	3
TMJC336K010#C^C	C	33	10	85	7	125	1.65	6	300	606	545	242	3
TMJC476K010#C^C	C	47	10	85	7	125	2.35	6	300	606	545	242	3
TMJC686K010#C^C	C	68	10	85	7	125	3.4	6	300	606	545	242	3
TMJD107K010#C^C	D	100	10	85	7	125	5.00	6	150	1000	900	400	3
TMJD157K010#C^C	D	150	10	85	7	125	7.50	8	150	1000	900	400	3
TMJE227K010#C^C	E	220	10	85	7	125	11	8	150	1049	944	420	3
TMJE337K010#CQYA	E	330	10	85	7	125	3.3	8	150	1049	944	420	3
TMJE337K010#C^C	E	330	10	85	7	125	16.5	8	150	1049	944	420	3
TMJU477K010#C^C	U	470	10	85	7	125	23.5	12	200	908	817	363	3
16 Volt @ 85°C													
TMJA225K016#CQXC	A	2.2	16	85	10	125	0.18	6	3500	146	132	59	3
TMJA335K016#CQXC	A	3.3	16	85	10	125	0.26	6	3500	146	132	59	3
TMJA475K016#C^C	A	4.7	16	85	10	125	0.38	6	3500	146	132	59	3
TMJB685K016#C^C	B	6.8	16	85	10	125	0.54	6	1200	266	240	106	3
TMJB106K016#C^C	B	10	16	85	10	125	0.80	6	1200	266	240	106	3
TMJB156K016#C^C	B	15	16	85	10	125	1.20	6	1200	266	240	106	3
TMJC226K016#C^C	C	22	16	85	10	125	1.76	6	350	561	505	224	3
TMJC336K016#C^C	C	33	16	85	10	125	2.64	6	350	561	505	224	3
TMJD476K016#C^C	D	47	16	85	10	125	3.76	6	200	866	779	346	3
TMJD686K016#C^C	D	68	16	85	10	125	5.44	6	200	866	779	346	3
TMJE107K016#C^C	E	100	16	85	10	125	8.00	6	150	1049	944	420	3
TMJE157K016#C^C	E	150	16	85	10	125	12	6	150	1049	944	420	3
TMJU227K016#C^C	U	220	16	85	10	125	17.6	1	200	908	817	363	3
20 Volt @ 85°C													
TMJA155K020#CQXC	A	1.5	20	85	13	125	0.15	6	3000	158	142	63	3
TMJA225K020#CQXC	A	2.2	20	85	13	125	0.22	6	3000	158	142	63	3
TMJA335K020#C^C	A	3.3	20	85	13	125	0.33	6	3000	158	142	63	3
TMJB475K020#C^C	B	4.7	20	85	13	125	0.47	6	1000	292	262	117	3
TMJB685K020#C^C	B	6.8	20	85	13	125	0.68	6	1000	292	262	117	3
TMJC106K020#C^C	C	10	20	85	13	125	1	6	500	469	422	188	3
TMJC156K020#C^C	C	15	20	85	13	125	1.5	6	500	469	422	188	3
TMJC226K020#C^C	C	22	20	85	13	125	2.2	6	500	469	422	188	3
TMJD336K020#C^C	D	33	20	85	13	125	3.3	6	250	775	697	310	3
TMJD476K020#C^C	D	47	20	85	13	125	4.70	6	250	775	697	310	3
TMJE686K020#C^C	E	68	20	85	13	125	6.8	6	200	908	817	363	3
TMJE107K020#C^C	E	100	20	85	13	125	10	6	200	908	817	363	3
TMJU157K020#CQXC	U	150	20	85	13	125	15	12	250	812	731	325	3
25 Volt @ 85°C													
TMJA105K025#CQXC	A	1	25	85	17	125	0.13	4	3000	158	142	63	3
TMJA155K025#CQXC	A	1.5	25	85	17	125	0.19	6	3000	158	142	63	3
TMJB225K025#C^C	B	2.2	25	85	17	125	0.28	6	2000	206	186	82	3
TMJB335K025#C^C	B	3.3	25	85	17	125	0.41	6	2000	206	186	82	3

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)			MSL
										25°C	85°C	125°C	
TMJB475K025#C^C	B	4.7	25	85	17	125	0.59	6	2000	206	186	82	3
TMJC685K025#C^C	C	6.8	25	85	17	125	0.85	6	600	428	385	171	3
TMJC106K025#C^C	C	10	25	85	17	125	1.25	6	600	428	385	171	3
TMJC156K025#C^C	C	15	25	85	17	125	1.88	6	600	428	385	171	3
TMJD226K025#CQYA	D	22	25	85	17	125	0.55	6	400	612	551	245	3
TMJD226K025#C^C	D	22	25	85	17	125	2.75	6	400	612	551	245	3
TMJD336K025#CQYA	D	33	25	85	17	125	0.82	6	400	612	551	245	3
TMJD336K025#C^C	D	33	25	85	17	125	4.13	6	400	612	551	245	3
TMJD476K025#C^C	D	47	25	85	17	125	5.88	6	400	612	551	245	3
TMJU686K025#CQXC	U	68	25	85	17	125	8.5	12	450	606	545	242	3
TMJU107K025#CQXC	U	100	25	85	17	125	12.5	12	450	606	545	242	3
35 Volt @ 85°C													
TMJA334K035#CQXC	A	0.33	35	85	23	125	0.1	4	6000	112	101	45	3
TMJA474K035#CQXC	A	0.47	35	85	23	125	0.1	4	6000	112	101	45	3
TMJA684K035#CQXC	A	0.68	35	85	23	125	0.12	4	6000	112	101	45	3
TMJB105K035#CQXC	B	1	35	85	23	125	0.18	4	2500	184	166	74	3
TMJB155K035#C^C	B	1.5	35	85	23	125	0.26	6	2500	184	166	74	3
TMJB225K035#C^C	B	2.2	35	85	23	125	0.39	6	2500	184	166	74	3
TMJB335K035#C^C	B	3.3	35	85	23	125	0.58	6	2500	184	166	74	3
TMJC475K035#CQYA	C	4.7	35	85	23	125	0.16	6	600	428	385	171	3
TMJC475K035#C^C	C	4.7	35	85	23	125	0.82	6	600	428	385	171	3
TMJC685K035#C^C	C	6.8	35	85	23	125	1.19	6	600	428	385	171	3
TMJC106K035#C^C	C	10	35	85	23	125	1.75	6	600	428	385	171	3
TMJD156K035#CQYA	D	15	35	85	23	125	0.52	6	400	612	551	245	3
TMJD156K035#C^C	D	15	35	85	23	125	2.63	6	400	612	551	245	3
TMJD226K035#CQYA	D	22	35	85	23	125	0.77	6	400	612	551	245	3
TMJD226K035#C^C	D	22	35	85	23	125	3.85	6	400	612	551	245	3
TMJE336K035#CQYA	E	33	35	85	23	125	1.15	6	250	812	731	325	3
TMJE336K035#C^C	E	33	35	85	23	125	5.78	6	250	812	731	325	3
TMJU476K035#CQXC	U	47	35	85	23	125	8.23	12	300	742	667	297	3
TMJU476K035#CQYA	U	47	35	85	23	125	1.64	12	300	742	667	297	3
50 Volt @ 85°C													
TMJA224K050#CQXC	A	0.22	50	85	33	125	0.1	4	7000	104	93	41	3
TMJA334K050#CQXC	A	0.33	50	85	33	125	0.1	4	7000	104	93	41	3
TMJB474K050#CQXC	B	0.47	50	85	33	125	0.12	4	2000	206	186	82	3
TMJB684K050#CQXC	B	0.68	50	85	33	125	0.17	4	2000	206	186	82	3
TMJC105K050#C^C	C	1	50	85	33	125	0.25	4	1500	271	244	108	3
TMJC155K050#C^C	C	1.5	50	85	33	125	0.38	6	1500	271	244	108	3
TMJC225K050#CQYA	C	2.2	50	85	33	125	0.11	6	1500	271	244	108	3
TMJC225K050#C^C	C	2.2	50	85	33	125	0.55	6	1500	271	244	108	3
TMJC335K050#CQYA	C	3.3	50	85	33	125	0.17	6	1500	271	244	108	3
TMJC335K050#C^C	C	3.3	50	85	33	125	0.83	6	1500	271	244	108	3
TMJD475K050#C^C	D	4.7	50	85	33	125	1.18	4.5	600	500	450	200	3
TMJD685K050#C^C	D	6.8	50	85	33	125	1.7	4.5	600	500	450	200	3
TMJE106K050#CQYA	E	10	50	85	33	125	0.5	4.5	400	642	578	257	3
TMJE106K050#C^C	E	10	50	85	33	125	2.5	4.5	400	642	578	257	3
TMJU156K050#CQXC	U	15	50	85	33	125	3.75	12	450	606	545	242	3
TMJU226K050#CQXC	U	22	50	85	33	125	5.5	12	450	606	545	242	3

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

The EIA & CECC standards for low ESR Solid Tantalum Capacitors allow an ESR movement to 1.25 times catalogue limit post mounting.

NOTE: AVX reserves the right to supply higher voltage ratings or tighter tolerance part in the same case size, to the same reliability standards.

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QUALIFICATION TABLE

<table>
<tr><th rowspan="2">TEST</th><th colspan="7">TMJ S1gma™ series (Temperature range -55ºC to +125ºC)</th></tr>
<tr><th colspan="3">Condition</th><th colspan="4">Characteristics</th></tr>
<tr><td>Endurance</td><td colspan="3" rowspan="5">Apply rated voltage (Ur) at 85ºC and / or category voltage (Uc) at 125ºC for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="3">no visible damage</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td colspan="3">2 x initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td colspan="3">within ±10% of initial value</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td colspan="3">initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ESR</td><td colspan="3">1.25 x initial limit</td></tr>
<tr><td>Storage Life</td><td colspan="3" rowspan="5">Store at 125ºC, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="3">no visible damage</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td colspan="3">2 x initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td colspan="3">within ±10% of initial value</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td colspan="3">initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ESR</td><td colspan="3">1.25 x initial limit</td></tr>
<tr><td>Humidity</td><td colspan="3" rowspan="5">Store at 65ºC and 90 - 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="3">no visible damage</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td colspan="3">3 x initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td colspan="3">within ±10% of initial value</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td colspan="3">1.2 x initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ESR</td><td colspan="3">1.25 x initial limit</td></tr>
<tr><td>Biased Humidity</td><td colspan="3" rowspan="5">Apply rated voltage (Ur) at 85ºC, 85% relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="3">no visible damage</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td colspan="3">3 x initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td colspan="3">within ±10% of initial value</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td colspan="3">1.2 x initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ESR</td><td colspan="3">1.25 x initial limit</td></tr>
<tr><td rowspan="8">Temperature Stability</td><td>Step</td><td>Temperature°C</td><td>Duration(min)</td><td></td><td>+20ºC</td><td>-55ºC</td><td>+20ºC</td><td>+85ºC</td><td>+125ºC</td><td>+20ºC</td></tr>
<tr><td>1</td><td>+20</td><td>15</td><td>DCL</td><td>IL*</td><td>n/a</td><td>IL*</td><td>10 x IL*</td><td>15 x IL*</td><td>1.5 x IL*</td></tr>
<tr><td>2</td><td>-55</td><td>15</td><td>ΔC/C</td><td>n/a</td><td>+0/-10%</td><td>±5%</td><td>+10/-0%</td><td>+15/-0%</td><td>±5%</td></tr>
<tr><td>3</td><td>+20</td><td>15</td><td>DF</td><td>IL*</td><td>1.5 x IL*</td><td>IL*</td><td>1.5 x IL*</td><td>2 x IL*</td><td>IL*</td></tr>
<tr><td>4</td><td>+85</td><td>15</td><td>ESR</td><td>1.25 x IL*</td><td>2.5 x IL*</td><td>1.25 x IL*</td><td>1.25 x IL*</td><td>1.25 x IL*</td><td>1.25 x IL*</td></tr>
<tr><td>5</td><td>+125</td><td>15</td><td colspan="6"></td></tr>
<tr><td>6</td><td>+20</td><td>15</td><td colspan="6"></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Surge Voltage</td><td colspan="3">Apply 1.3x category voltage (Uc) at 125ºC for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω</td><td>Visual examination</td><td colspan="3">no visible damage</td></tr>
<tr><td></td><td></td><td></td><td>DCL</td><td colspan="3">2 x initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ΔC/C</td><td colspan="3">within ±5% of initial value</td></tr>
<tr><td></td><td></td><td></td><td>DF</td><td colspan="3">initial limit</td></tr>
<tr><td></td><td></td><td></td><td>ESR</td><td colspan="3">1.25 x initial limit</td></tr>
</table>

*Initial Limit

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F97-HT3 Series
High Temperature 135ºC, Resin-mounded Chip, High Realiability



FEATURES

- High temperature 135°C
- AEC-Q200 qualified
- Failure rate level 0.5%/ 1000 hrs

LEAD-FREE
LEAD-FREE COMPATI-BLE COMPONENT

RoHS COMPLIANT

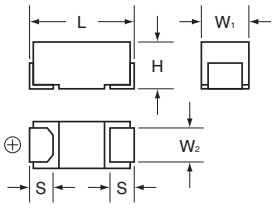
APPLICATIONS

- Automotive electronics (Engine ECU, Transmission, Oil pump)
- Industrial equipment

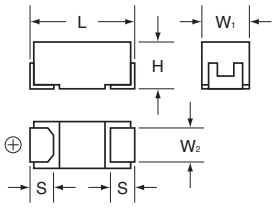
CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L	W_1	W_2	H	S
A	1206	3216-18	3.20 ± 0.20 (0.126 ± 0.008)	1.60 ± 0.20 (0.063 ± 0.008)	1.20 ± 0.10 (0.047 ± 0.004)	1.60 ± 0.20 (0.063 ± 0.008)	0.80 ± 0.20 (0.031 ± 0.008)
B	1210	3528-21	3.50 ± 0.20 (0.126 ± 0.008)	2.80 ± 0.20 (0.110 ± 0.008)	2.20 ± 0.10 (0.087 ± 0.004)	1.90 ± 0.20 (0.075 ± 0.008)	0.80 ± 0.20 (0.031 ± 0.008)
C	2312	6032-27	6.00 ± 0.20 (0.236 ± 0.008)	3.20 ± 0.20 (0.126 ± 0.008)	2.20 ± 0.10 (0.087 ± 0.004)	2.50 ± 0.20 (0.098 ± 0.008)	1.30 ± 0.20 (0.051 ± 0.008)
N	2917	7343-30	7.30 ± 0.20 (0.287 ± 0.008)	4.30 ± 0.20 (0.169 ± 0.008)	2.40 ± 0.10 (0.094 ± 0.004)	2.80 ± 0.20 (0.110 ±0.008)	1.30 ± 0.20 (0.051 ± 0.008)

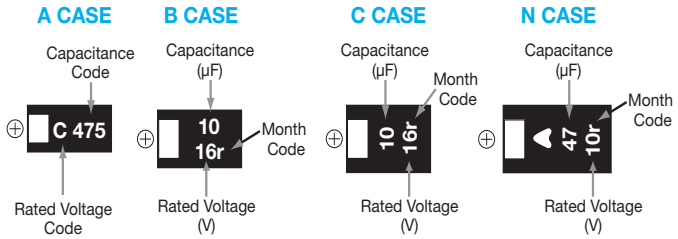
A, B CASE



C, N CASE



MARKING



HOW TO ORDER

F97	1C	335	M	A	□	HT3
Series	**Rated Voltage**	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** K = ±10% M = ±20%	**Case Size** See table above	**Packaging** See Tape & Reel Packaging Section	**Temperature Range** 135ºC MAX

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55 to +135°C
Rated Temperature:	+95°C
Capacitance Tolerance:	±20%, ±10% at 120Hz
Dissipation Factor:	Refer to next page
ESR 100kHz:	Refer to next page
Leakage Current*:	After 1 minute's application of rated voltage, leakage current at 20°C is not more than 0.01CV or 0.5µA, whichever is greater.
	After 1 minute's application of rated voltage, leakage current at 95°C is not more than 0.1CV or 5µA, whichever is greater.
	After 1 minute's application of derated voltage, leakage current at 135°C is not more than 0.125CV or 6.3µA, whichever is greater.
Capacitance Change By Temperature	+15% Max. at +135°C
	+10% Max. at +95°C
	-10% Max. at -55°C

*As for the surge voltage and derated voltage at 135°C, refer to page precautions for details.

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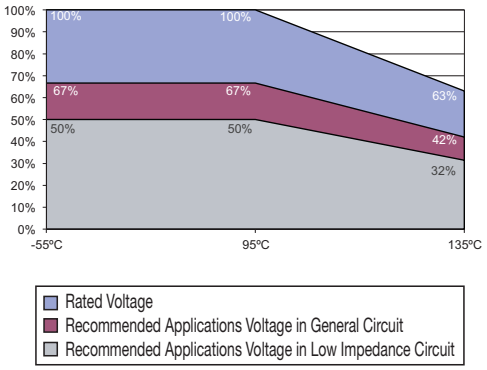
CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage					
µF	Code	6.3V (0J)	10V (1A)	16V (1C)	20V (1D)	25V (1E)	35V (1V)
0.33	334						A
0.47	474						A
0.68	684				A	A	A
1	105			A	A	A	B
1.5	155			A	A		B
2.2	225		A	A	A	B	B
3.3	335	A	A	A	B	B	C
4.7	475	A	A/B	A/B	A/B	C	C
6.8	685	A/B	B	B	C	C	N
10	106		A/B	A/B/C	C	C/N	N
15	156	B	A/B	C	N	N	
22	226	A/B	A/B	B/C/N	C/N		
33	336	A/C	B/C/N	B/C/N			
47	476	B/C	C/N	C/N			
68	686	N	N				
100	107	N					

Released ratings

Please contact to your local AVX sales office when these series are being designed in your application.

Voltage vs Temperature Rating



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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Leakage Current (µA)	DF @ 120Hz (%)	ESR @ 100kHz (Ω)	*1 ΔC/C (%)	MSL
6.3 Volt								
F970J335#AAHT3	A	3.3	6.3	0.5	4	4.5	*	3
F970J475#AAHT3	A	4.7	6.3	0.5	6	4.0	*	3
F970J685#AAHT3	A	6.8	6.3	0.5	6	3.5	*	3
F970J685#BAHT3	B	6.8	6.3	0.5	6	2.5	*	3
F970J156#BAHT3	B	15	6.3	0.9	6	2.0	*	3
F970J226#AAHT3	A	22	6.3	1.4	12	2.5	*	3
F970J226#BAHT3	B	22	6.3	1.4	8	1.9	*	3
F970J336#AAHT3	A	33	6.3	2.1	12	2.5	*	3
F970J336#CCHT3	C	33	6.3	2.1	6	1.1	*	3
F970J476#BAHT3	B	47	6.3	3.0	8	1.0	*	3
F970J476#CCHT3	C	47	6.3	3.0	6	0.9	*	3
F970J686#NCHT3	N	68	6.3	4.3	6	0.6	*	3
F970J107#NCHT3	N	100	6.3	6.3	8	0.6	*	3
10 Volt								
F971A225#AAHT3	A	2.2	10	0.5	4	5.0	*	3
F971A335#AAHT3	A	3.3	10	0.5	4	4.5	*	3
F971A475#AAHT3	A	4.7	10	0.5	6	4.0	*	3
F971A475#BAHT3	B	4.7	10	0.5	6	2.8	*	3
F971A685#BAHT3	B	6.8	10	0.7	6	2.5	*	3
F971A106#AAHT3	A	10	10	1.0	6	3.0	*	3
F971A106#BAHT3	B	10	10	1.0	6	2.0	*	3
F971A156#AAHT3	A	15	10	1.5	10	3.0	*	3
F971A156#BAHT3	B	15	10	1.5	6	2.0	*	3
F971A226#AAHT3	A	22	10	2.2	15	3.0	*	3
F971A226#BAHT3	B	22	10	2.2	8	1.9	*	3
F971A336#BAHT3	B	33	10	3.3	8	1.9	*	3
F971A336#CCHT3	C	33	10	3.3	6	1.1	*	3
F971A336#NCHT3	N	33	10	3.3	6	0.7	*	3
F971A476#CCHT3	C	47	10	4.7	8	0.9	*	3
F971A476#NCHT3	N	47	10	4.7	6	0.7	*	3
F971A686#NCHT3	N	68	10	6.8	6	0.6	*	3
16 Volt								
F971C105#AAHT3	A	1	16	0.5	4	7.5	*	3
F971C155#AAHT3	A	1.5	16	0.5	4	6.3	*	3
F971C225#AAHT3	A	2.2	16	0.5	4	5.0	*	3
F971C335#AAHT3	A	3.3	16	0.5	4	4.5	*	3
F971C475#AAHT3	A	4.7	16	0.8	8	4.0	*	3
F971C475#BAHT3	B	4.7	16	0.8	6	2.8	*	3
F971C685#BAHT3	B	6.8	16	1.1	6	2.5	*	3
F971C106#AAHT3	A	10	16	1.6	8	3.5	*	3
F971C106#BAHT3	B	10	16	1.6	6	2.1	*	3
F971C106#CCHT3	C	10	16	1.6	6	1.5	*	3
F971C156#CCHT3	C	15	16	2.4	6	1.2	*	3
F971C226#BAHT3	B	22	16	3.5	8	1.9	*	3
F971C226#CCHT3	C	22	16	3.5	8	1.1	*	3
F971C226#NCHT3	N	22	16	3.5	6	0.7	*	3
F971C336#BAHT3	B	33	16	5.3	10	2.1	*	3
F971C336#CCHT3	C	33	16	5.3	8	1.1	*	3
F971C336#NCHT3	N	33	16	5.3	6	0.7	*	3
F971C476#CCHT3	C	47	16	7.5	10	1.1	*	3
F971C476#NCHT3	N	47	16	7.5	8	0.7	*	3
20 Volt								
F971D684#AAHT3	A	0.68	20	0.5	4	7.6	*	3
F971D105#AAHT3	A	1	20	0.5	4	7.5	*	3
F971D155#AAHT3	A	1.5	20	0.5	4	6.7	*	3
F971D225#AAHT3	A	2.2	20	0.5	6	6.3	*	3
F971D335#BAHT3	B	3.3	20	0.7	4	3.1	*	3
F971D475#AAHT3	A	4.7	20	0.9	8	4.0	*	3
F971D475#BAHT3	B	4.7	20	0.9	6	2.8	*	3
F971D685#CCHT3	C	6.8	20	1.4	6	1.8	*	3
F971D106#CCHT3	C	10	20	2.0	6	1.5	*	3
F971D156#NCHT3	N	15	20	3.0	6	0.7	*	3
F971D226#CCHT3	C	22	20	4.4	8	1.1	*	3
F971D226#NCHT3	N	22	20	4.4	6	0.7	*	3
25 Volt								
F971E684#AAHT3	A	0.68	25	0.5	4	7.6	*	3
F971E105#AAHT3	A	1	25	0.5	4	7.5	*	3
F971E225#BAHT3	B	2.2	25	0.6	4	3.8	*	3
F971E335#BAHT3	B	3.3	25	0.8	4	3.5	*	3
F971E475#CCHT3	C	4.7	25	1.2	6	1.8	*	3
F971E685#CCHT3	C	6.8	25	1.7	6	1.8	*	3
F971E106#CCHT3	C	10	25	2.5	6	1.6	*	3
F971E106#NCHT3	N	10	25	2.5	6	1.0	*	3
F971E156#NCHT3	N	15	25	3.8	6	0.7	*	3
35 Volt								
F971V334#AAHT3	A	0.33	35	0.5	4	12.0	*	3
F971V474#AAHT3	A	0.47	35	0.5	4	10.0	*	3
F971V684#AAHT3	A	0.68	35	0.5	4	7.6	*	3
F971V105#BAHT3	B	1	35	0.5	4	4.0	*	3
F971V155#BAHT3	B	1.5	35	0.5	4	4.0	*	3
F971V225#BAHT3	B	2.2	35	0.8	4	3.8	*	3
F971V335#CCHT3	C	3.3	35	1.2	4	2.0	*	3
F971V475#CCHT3	C	4.7	35	1.6	6	1.8	*	3
F971V685#NCHT3	N	6.8	35	2.4	6	1.0	*	3
F971V106#NCHT3	N	10	35	3.5	6	1.0	*	3

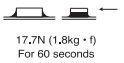
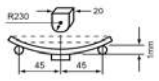
#: "M" for ±20% tolerance, "K" for ± 10% tolerance.
Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

1: ΔC/C Marked ""

Item	All Case (%)
Damp Heat	±10
Temperature cycles	±5
Resistance soldering heat	±5
Surge	±5
Endurance	±10
Load Humidity	±10

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QUALIFICATION TABLE

TEST	F97-HT3 series (Temperature range -55°C to +135°C) Condition
Damp Heat (Steady State)	At 85°C, 85% RH For 1000 hours (No voltage applied) Capacitance Change....Refer to page 220 (*1) Dissipation Factor .... Initial specied value or less Leakage Current .... 125% or less than the initial specified value
Load Humidity	After 1000 hours application of rated voltage in series with a 33Ω resistor at 85°C, 85% RH capacitors meet the characteristics requirements table below. Capacitance Change ...Refer to page 220 (*1) Dissipation Factor .....120% or less than the Initial specified value Leakage Current.....200% or less than the initial specified value
Temperature Cycles	At -55°C / +135°C,For 30 minutes each,1000 cycles Capacitance Change ...Refer to page 220 (*1) Dissipation Factor .....Initial specified value or less Leakage Current.....Initial specified value or less
Resistance to Soldering Heat	10 seconds reow at 260°C, 5 seconds immersion at 260°C. Capacitance Change ...Refer to page 220 (*1) Dissipation Factor .....Initial specified value or less Leakage Current.....Initial specified value or less
Solderability	After immersing capacitors completely into a solder pot at 245°C for 2 to 3 seconds, more than 3/4 of their electrode area shall remain covered with new solder.
Surge*	After application of surge in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF,for 1000 successive test cycles at 95°C,capacitors shall meet the characteristic requirements table below. Capacitance Change ...Refer to page 220 (*1) Dissipation Factor .....Initial specified value or less Leakage Current.....Initial specified value or less
Endurance*	After 2000 hours application of rated voltage in series with a 3Ω resistor at 95°C,or derated voltage in series with a 3Ω resistor at 135°C,capacitors shall meet the characteristic requirements table below. Capacitance Change ...Refer to page 220 (*1) Dissipation Factor .....Initial specified value or less Leakage Current.....Initial specified value or less
Shear Test	After applying the pressure load of 17.7N for 60 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on a substrate, there shall be found neither exfoliation nor its sign at the terminal electrode.  17.7N (1.8kg • f) For 60 seconds
Terminal Strength	Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of capacitor, the pressure strength is applied with a specified jig at the center of the substrate so that substrate may bend by 1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals. 

* As for the surge voltage and derated voltage at 135°C, refer to page precautions for details.

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FEATURES

- Compliant to the RoHS2 directive 2011/65/EU
- Compliant to AEC-Q200
- Improved reliability - FR=0.5%/1000hrs
- SMD J-lead

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

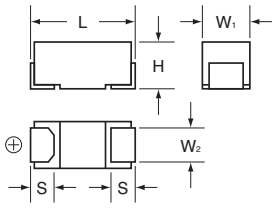
APPLICATIONS

- Automotive electronics (Engine ECU, Transmission ECU, ISG, Head lamp)
- Industrial equipment

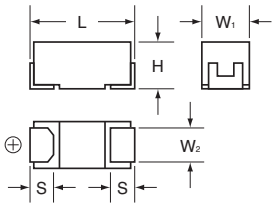
CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L	W_1	W_2	H	S
A	1206	3216-18	3.20 ± 0.20 (0.126 ± 0.008)	1.60 ± 0.20 (0.063 ± 0.008)	1.20 ± 0.10 (0.047 ± 0.004)	1.60 ± 0.20 (0.063 ± 0.008)	0.80 ± 0.20 (0.031 ± 0.008)
B	1210	3528-21	3.50 ± 0.20 (0.126 ± 0.008)	2.80 ± 0.20 (0.110 ± 0.008)	2.20 ± 0.10 (0.087 ± 0.004)	1.90 ± 0.20 (0.075 ± 0.008)	0.80 ± 0.20 (0.031 ± 0.008)
C	2312	6032-27	6.00 ± 0.20 (0.236 ± 0.008)	3.20 ± 0.20 (0.126 ± 0.008)	2.20 ± 0.10 (0.087 ± 0.004)	2.50 ± 0.20 (0.098 ± 0.008)	1.30 ± 0.20 (0.051 ± 0.008)

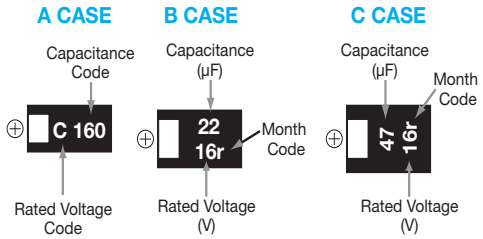
A, B CASE



C CASE



MARKING



HOW TO ORDER

F9H	1C	106	M	A	□
Type	**Rated Voltage**	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** K = ±10% M = ±20%	**Case Size** See table above	**Packaging** See Tape & Reel Packaging Section

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55 to +150°C
Rated Temperature:	+105°C
Capacitance Tolerance:	±20%, ±10% at 120Hz
Dissipation Factor:	Refer to next page
ESR 100kHz:	Refer to next page
Leakage Current:	After 1 minute's application of rated voltage, leakage current at 20°C is not more than 0.01CV or 0.5µA, whichever is greater.
	After 1 minute's application of rated voltage, leakage current at 105°C is not more than 0.1CV or 5µA, whichever is greater.
	After 1 minute's application of derated voltage, leakage current at 150°C is not more than 0.125CV or 6.3µA, whichever is greater.
Capacitance Change By Temperature	+15% Max. at +150°C
	+10% Max. at +105°C
	-10% Max. at -55°C

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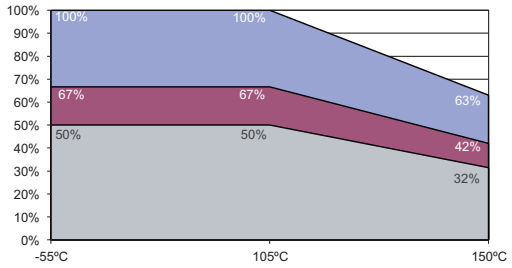
CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage	
µF	Code	10V (1A)	16V (1C)
10	106		A
15	156	A	
22	226		B
33	336		
47	476		C

Released ratings

Please contact to your local AVX sales office when these series are being designed in your application.

Voltage vs Temperature Rating



RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Leakage Current (µA)	DF @ 120Hz (%)	ESR @ 100kHz (Ω)	*1 ΔC/C (%)	MSL
10 Volt								
F9H1A156#AA	A	15	10	1.5	10	3.0	*	3
16 Volt								
F9H1C106#AA	A	10	16	1.6	8	3.5	*	3
F9H1C226#BA	B	22	16	3.5	8	1.9	*	3
F9H1C476#CC	C	47	16	7.5	10	1.1	*	3

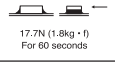
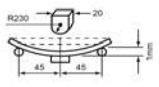
#: "M" for ±20% tolerance, "K" for ± 10% tolerance.

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

1: ΔC/C Marked ""

Item	All Case (%)
Damp Heat	±10
Temperature cycles	±5
Resistance soldering heat	±5
Surge	±5
Endurance	±10
Load Humidity	±10

QUALIFICATION TABLE

TEST	F9H series (Temperature range -55ºC to +150ºC) Condition
Damp Heat (Steady State)	At 85°C, 85% R.H., 1000 hours (No voltage applied) Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... 125% or less than the initial specified value
Load Humidity	After 1000 hour's application of rated voltage in series with a 33Ω resistor at 85°C, 85% R.H., capacitors meet the characteristics requirements table below. Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... 120% or less than the initial specified value Leakage Current ..... 200% of less than the initial specified value
Temperature Cycles	At -55°C / +150°C, 30 minutes each, 1000 cycles Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Resistance to Soldering Heat	10 seconds reflow at 260°C, 5 seconds immersion at 260°C. Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Solderability	After immersing capacitors completely into a solder pot at 245ºC for 2 to 3 seconds, more than 3/4 of their electrode area shall remain covered with new solder.
Surge	After application of surge voltage in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85ºC, capacitors shall meet the characteristic requirements in the table above. Capacitance Change ..... Refer to above(*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Endurance	After 2000 hours' application of rated voltage in series with a 3Ω resistor at 105°C, or derated voltage in series with a 3Ω resistor at 150°C, capacitors shall meet the characteristic requirements in the table above. Capacitance Change ..... Refer to above (*1) Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Shear Test	After applying the pressure load of 17.7N for 60 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on a substrate, there shall be found neither exfoliation nor its sign at the terminal electrode.. 
Terminal Strength	Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of capacitor, the pressure strength is applied with a specified jig at the center of the substrate so that substrate may bend by1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals. 
Failure Rate	0.5% per 1000 hours at 105°C, V_R with 0.1Ω/V series impedance, 60% confidence level.

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THJ Series +175ºC
High Temperature Tantalum Chip Capacitor



FEATURES

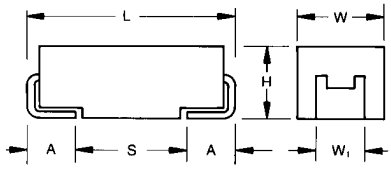
- Improved reliability – 2x standard
- 175°C @ 0.5V_R continuous operation
- CV range: 0.10-220µF / 6.3-50V
- 5 case sizes available
- Low ESR options on approval
- High temperature automotive and industry applications

APPLICATIONS

- Automotive ECU and ABS control electronics
- Geothermal instrumentation

GENERAL CHARACTERISTICS

Operating Temperature:
-55ºC to 125ºC



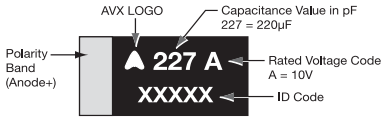
CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) -0.10 (0.004)	H+0.20 (0.008) –0.10 (0.004)	W_1 ±0.20 (0.008)	A+0.30 (0.012) -0.20 (0.008)	S Min.
A	1206	3216-18	3.20 (0.126)	1.60 (0.063)	1.60 (0.063)	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)
B	1210	3528-21	3.50 (0.138)	2.80 (0.110)	1.90 (0.075)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)
C	2312	6032-28	6.00 (0.236)	3.20 (0.126)	2.60 (0.102)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
D	2917	7343-31	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)

W_1 dimension applies to the termination width for A dimensional area only.

MARKING

A, B, C, D, E CASE



HOW TO ORDER

THJ	B	105	*	035	R	JN	—
Type	**Case Size** See table above	**Capacitance Code** pF code: 1st two digits represent significant figures 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** K=±10% M=±20%	**Rated DC Voltage** 006=6.3Vdc 010=10Vdc 016=16Vdc 020=20Vdc 025=25Vdc 035=35Vdc 050=50Vdc	**Packaging** R = Pure Tin 7" Reel S = Pure Tin 13" Reel A = Gold Plating 7" Reel (Contact Manufacturer) B = Gold Plating 13" Reel (Contact Manufacturer) H = Tin Lead 7" Reel (Contact Manufacturer) K = Tin Lead 13" Reel (Contact Manufacturer) H, K = Non RoHS	**Standard Suffix** OR **0100** **Low ESR in mΩ**	**Additional characters may be added for special requirements** V = Dry pack Option

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT
RoHS COMPLIANT
SnPb termination option is not RoHS compliant.

TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C						
Capacitance Range:		0.10 µF to 220 µF						
Capacitance Tolerance:		±10%; ±20%						
Rated Voltage (V_R)	≤ +85°C:	6.3	10	16	20	25	35	50
Category Voltage (V_C)	≤ +125°C:	4	7	10	13	17	23	33
Category Voltage (V_C)	≤ +175°C:	3	5	8	10	12	17	25
Surge Voltage (V_S)	≤ +85°C:	8	13	20	26	32	46	65
Surge Voltage (V_S)	≤ +125°C:	5	8	13	16	20	28	40
Surge Voltage (V_S)	≤ +175°C:	4	6	10	12	15	21	30
Temperature Range:		-55ºC to 175°C voltage derating.						
Reliability:		0.5% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance, 60% confidence level, 3.5 Fits at 40°C, 0.5V_R						
Termination Finish:		Sn Plating (standard), Gold and SnPb Plating upon request						
		Meets requirements of AEC-Q200						

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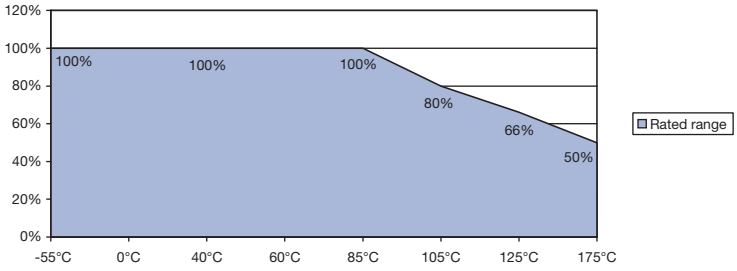
CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated voltage (V_R) to 85°C (Voltage Code)						
µF	Code	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
0.10	104						A	
0.15	154						A	
0.22	224						A	
0.33	334						A	
0.47	474					A	B	
0.68	684					A	B	
1.0	105					A	A/B	
1.5	155				A		C	
2.2	225			A, A(1500)		B, B(1500)	C	
3.3	335		A	A	B		C	D
4.7	475	A	A	A/B			C	D
6.8	685	A	A	A/B		C	D	D
10	106	A	A/B	B		C	D	D/E
15	156	B	B	B	C		D	
22	226	B	B	C, C(500)		D	D, D(300)	
33	336	B	C	C	D	D	E, E(150)	
47	476	C	C	C/D				
68	686	C	D	D				
100	107	D	D	E				
150	157	D						
220	227		E					

Released ratings (ESR ratings in mOhms in parentheses)

Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

THJ 175°C Voltage vs Temperature Rating



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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (Ω)	100kHz RMS Current (mA)				MSL
										25°C	85°C	125°C	175°C	
6.3 Volt @ 85°C														
THJA475*006#JN	A	4.7	6.3	85	3	175	0.5	6	6	112	101	45	22	1
THJA685*006#JN	A	6.8	6.3	85	3	175	0.5	4.5	2.6	170	153	68	34	1
THJA106*006#JN	A	10	6.3	85	3	175	0.6	4.5	2.2	185	166	74	37	1
THJB156*006#JN	B	15	6.3	85	3	175	0.9	6	2.5	184	166	74	37	1
THJB226*006#JN	B	22	6.3	85	3	175	1.4	6	2.5	184	166	74	37	1
THJB336*006#JN	B	33	6.3	85	3	175	1.9	6	2.2	197	177	79	39	1
THJC476*006#JN	C	47	6.3	85	3	175	3.0	6	1.6	262	236	105	52	1
THJC686*006#JN	C	68	6.3	85	3	175	4.3	6	1.5	271	244	108	54	1
THJD107*006#JN	D	100	6.3	85	3	175	6	4.5	0.4	612	551	245	122	1[1)]
THJD157*006#JN	D	150	6.3	85	3	175	9.5	6	0.9	408	367	163	82	1[1)]
10 Volt @ 85°C														
THJA335*010#JN	A	3.3	10	85	5	175	0.5	6	5.5	117	105	47	23	1
THJA475*010#JN	A	4.7	10	85	5	175	0.5	4.5	2.9	161	145	64	32	1
THJA685*010#JN	A	6.8	10	85	5	175	0.7	4.5	2.6	170	153	68	34	1
THJA106*010#JN	A	10	10	85	5	175	1	6	2.7	167	150	67	33	1
THJB106*010#JN	B	10	10	85	5	175	1	4.5	1.8	217	196	87	43	1
THJB156*010#JN	B	15	10	85	5	175	1.5	4.5	1.5	238	214	95	48	1
THJB226*010#JN	B	22	10	85	5	175	2.2	6	2.4	188	169	75	38	1
THJC336*010#JN	C	33	10	85	5	175	3.3	6	1.6	262	236	105	52	1
THJC476*010#JN	C	47	10	85	5	175	4.7	4.5	0.5	469	422	188	94	1
THJD686*010#JN	D	68	10	85	5	175	6.8	4.5	0.4	612	551	245	122	1[1)]
THJD107*010#JN	D	100	10	85	5	175	10	6	0.9	408	367	163	82	1[1)]
THJE227*010#JN	E	220	10	85	5	175	22	10	0.5	574	517	230	115	1[1)]
16 Volt @ 85°C														
THJA225*016#JN	A	2.2	16	85	8	175	0.5	4.5	3	158	142	63	32	1
THJA225*016#1500	A	2.2	16	85	8	175	0.5	4.5	1.5	224	201	89	45	1
THJA335*016#JN	A	3.3	16	85	8	175	0.5	6	5	122	110	49	24	1
THJA475*016#JN	A	4.7	16	85	8	175	0.8	4.5	2.9	161	145	64	32	1
THJB475*016#JN	B	4.7	16	85	8	175	0.8	6	3.5	156	140	62	31	1
THJA685*016#JN	A	6.8	16	85	8	175	1.1	6	3.5	146	132	59	29	1
THJB685*016#JN	B	6.8	16	85	8	175	1.1	6	2.5	184	166	74	37	1
THJB106*016#JN	B	10	16	85	8	175	1.6	4.5	2.8	174	157	70	35	1
THJB156*016#JN	B	15	16	85	8	175	2.4	6	2	206	186	82	41	1
THJC226*016#JN	C	22	16	85	8	175	3.5	6	1.6	262	236	105	52	1
THJC226*016#0500	C	22	16	85	8	175	3.5	4.5	0.5	469	422	188	94	1
THJC336*016#JN	C	33	16	85	8	175	5.3	6	1.5	271	244	108	54	1
THJC476*016#JN	C	47	16	85	8	175	7.5	6	0.9	371	334	148	74	1
THJD476*016#JN	D	47	16	85	8	175	7.5	6	0.9	408	367	163	82	1[1)]
THJD686*016#JN	D	68	16	85	8	175	10.9	4.5	0.9	408	367	163	82	1[1)]
THJE107*016#JN	E	100	16	85	8	175	16	8	0.4	642	578	257	128	1[1)]
20 Volt @ 85°C														
THJA155*020#JN	A	1.5	20	85	10	175	0.5	6	6.5	107	97	43	21	1
THJB335*020#JN	B	3.3	20	85	10	175	0.7	6	3	168	151	67	34	1
THJC156*020#JN	C	15	20	85	10	175	3.0	6	1.7	254	229	102	51	1
THJD336*020#JN	D	33	20	85	10	175	6.6	6	0.9	408	367	163	82	1[1)]
25 Volt @ 85°C														
THJA474*025#JN	A	0.47	25	85	12	175	0.5	4	14	73	66	29	15	1
THJA684*025#JN	A	0.68	25	85	12	175	0.5	4	10	87	78	35	17	1
THJA105*025#JN	A	1.0	25	85	12	175	0.5	3	5.2	120	108	48	24	1
THJB225*025#JN	B	2.2	25	85	12	175	0.6	6	4.5	137	124	55	27	1
THJB225*025#1500	B	2.2	25	85	12	175	0.6	6	1.5	238	214	95	48	1
THJC685*025#JN	C	6.8	25	85	12	175	1.7	6	2	235	211	94	47	1
THJC106*025#JN	C	10	25	85	12	175	2.5	6	1.8	247	222	99	49	1
THJD226*025#JN	D	22	25	85	12	175	5.5	6	0.9	408	367	163	82	1[1)]
THJD336*025#JN	D	33	25	85	12	175	8.3	6	0.9	408	367	163	82	1[1)]
35 Volt @ 85°C														
THJA104*035#JN	A	0.1	35	85	17	175	0.5	4	24	56	50	22	11	1
THJA154*035#JN	A	0.15	35	85	17	175	0.5	4	21	60	54	24	12	1
THJA224*035#JN	A	0.22	35	85	17	175	0.5	4	18	65	58	26	13	1
THJA334*035#JN	A	0.33	35	85	17	175	0.5	4	15	71	64	28	14	1
THJB474*035#JN	B	0.47	35	85	17	175	0.5	4	10	92	83	37	18	1
THJB684*035#JN	B	0.68	35	85	17	175	0.5	4	8	103	93	41	21	1
THJA105*035#JN	A	1.0	35	85	17	175	0.5	4	7.5	100	90	40	20	1
THJB105*035#JN	B	1.0	35	85	17	175	0.5	4	6.5	114	103	46	23	1
THJC155*035#JN	C	1.5	35	85	17	175	0.5	6	4.5	156	141	63	31	1
THJC225*035#JN	C	2.2	35	85	17	175	0.8	6	3.5	177	160	71	35	1
THJC335*035#JN	C	3.3	35	85	17	175	1.2	6	2.5	210	189	84	42	1
THJC475*035#JN	C	4.7	35	85	17	175	1.6	6	2.2	224	201	89	45	1
THJD685*035#JN	D	6.8	35	85	17	175	2.4	6	1.3	340	306	136	68	1[1)]

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (ºC)	Category Voltage (V)	Category Temperature (ºC)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (Ω)	100kHz RMS Current (mA)				MSL
										25ºC	85ºC	125ºC	175ºC	
THJD106*035#JN	D	10	35	85	17	175	3.5	6	1	387	349	155	77	1[1)]
THJD156*035#JN	D	15	35	85	17	175	5.3	6	0.9	408	367	163	82	1[1)]
THJD226*035#JN	D	22	35	85	17	175	7.7	6	0.6	500	450	200	100	1[1)]
THJD226*035#0300	D	22	35	85	17	175	7.7	6	0.3	707	636	283	141	1[1)]
THJE336*035#JN	E	33	35	85	17	175	11.6	6	0.5	574	517	230	115	1[1)]
THJE336*035#0150	E	33	35	85	17	175	11.6	6	0.15	1049	944	420	210	1[1)]
50 Volt @ 85°C														
THJD335*050#JN	D	3.3	50	85	25	175	1.7	6	1.1	369	332	148	74	1[1)]
THJD475*050#JN	D	4.7	50	85	25	175	2.4	6	0.9	463	417	185	93	1[1)]
THJD685*050#JN	D	6.8	50	85	25	175	3.4	6	0.7	408	367	163	82	1[1)]
THJD106*050#JN	D	10	50	85	25	175	5	6	0.7	463	417	185	93	1[1)]
THJE106*050#JN	E	10	50	85	25	175	5	6	0.7	486	437	194	97	1[1)]

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

All PNs also available with Dry pack option - MSL 3 (see How to order).

[1)] –Dry pack option (see How to order) is recommended for reduction of stress during soldering.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

The EIA & CECC standards for low ESR Solid Tantalum Capacitors allow an ESR movement to 1.25 times catalogue limit post mounting.

NOTE: AVX reserves the right to supply a higher voltage ratings or tighter tolerance part in the same case size, to the same reliability standards.

QUALIFICATION TABLE

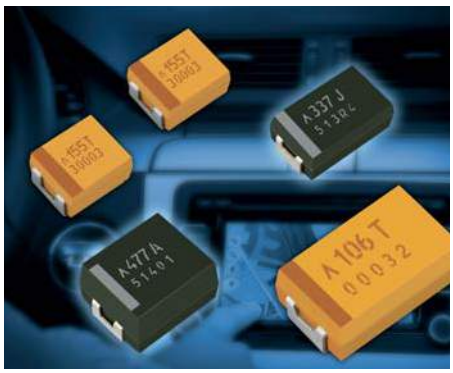
TEST	THJ series (Temperature range -55ºC to +175ºC)		
	Condition	Characteristics	
Endurance	Apply rated voltage (Ur) at 85ºC and / or category voltage (Uc) at 175ºC for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	1.25 x initial limit
		ΔC/C	within ±10% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Storage Life	Store at 175ºC, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	1.25 x initial limit
		ΔC/C	within ±10% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Biased Humidity	Apply rated voltage (Ur) at 85ºC, 85% relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	2 x initial limit
		ΔC/C	within ±10% of initial value
		DF	1.2 x initial limit
		ESR	1.25 x initial limit
Temperature Stability	Step 1: Temperature°C +20, Duration(min) 15 Step 2: -55, 15 Step 3: +20, 15 Step 4: +125, 15 Step 5: +175, 15 Step 6: +20, 15		

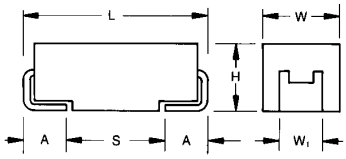
	+20ºC	-55ºC	+20ºC	+125ºC	+175ºC	+20ºC
DCL	IL*	n/a	IL*	10 x IL*	12.5 x IL*	IL*
ΔC/C	n/a	+0/-10%	±5%	+10/-0%	+18/-0%	±5%
DF	IL*	1.5 x IL*	IL*	1.5 x IL*	2 x IL*	IL*
ESR	1.25 x IL*	2.5 x IL*	1.25 x IL*	1.25 x IL*	1.25 x IL*	1.25 x IL*

Surge Voltage	Apply 1.3x category voltage (Uc) at 175ºC for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Mechanical Shock	MIL-STD-202, Method 213, Condition F	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Vibration	MIL-STD-202, Method 204, Condition D	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±5% of initial value
		DF	initial limit
		ESR	1.25 x initial limit

*Initial Limit

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FEATURES

- Conductive polymer electrode
- Benign failure mode under recommended use conditions
- Robust design for automotive applications
- Meets requirements of AEC-Q200
- Humidity 85°C/85%RH, Vr, (up to 500 or 1000 hours see reference table)
- Basic reliability 1%/1000hrs@85°C Vr with 60% confidence level
- -55 to +125°C operation temperature
- Full voltage range: 4-50V
- DCL 0.1 CV
- 3x reflow 260°C compatible

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

APPLICATIONS

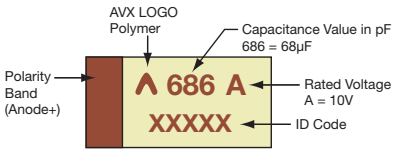
DC/DC converters, Telecommunication (coupling/decoupling), Industrial & special, Automotive (body electronics, cabin controls, infotainment, comfort, after market etc)

Not recommended for use of conductive polymer parts in safety critical or high temperature exposure applications. For more information please see AVX automotive application guide at avx.com (see the link: http://www.avx.com/docs/techinfo/ApplicationGuides/Automotive-Application-Guide.pdf), or contact manufacturer.

AVX's qualification of TCQ capacitors meets requirements of AEC-Q200. TCQ series is manufactured in an IATF 16949 certified facility.

MARKING

B, D, U, Y CASE



CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) -0.10 (0.004)	H+0.20 (0.008) -0.10 (0.004)	W_1±0.20 (0.008)	A+0.30 (0.012) -0.20 (0.008)	S Min.
B	1210	3528-21	3.50 (0.138)	2.80 (0.110)	1.90 (0.075)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)
D	2917	7343-31	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
U	2924	7361-43	7.30 (0.287)	6.10 (0.240)	4.10 (0.162)	3.10 (0.120)	1.30 (0.051)	4.40 (0.173)
Y	2917	7343-20	7.30 (0.287)	4.30 (0.169)	2.00 (0.079) max	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)

W1 dimension applies to the termination width for A dimensional area only.

HOW TO ORDER

TCQ	B	476	M	006	#	0070	E
Type	**Case Size** See table above	**Capacitance Code** pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)	**Tolerance** M = ±20%	**Rated DC Voltage** 004 = 4Vdc 006 = 6.3Vdc 010 = 10Vdc 016 = 16Vdc 020 = 20Vdc 025 = 25Vdc 035 = 35Vdc 050 = 50Vdc	**Packaging** R = Pure Tin 7" Reel S = Pure Tin 13" Reel	**ESR in mΩ**	**Additional Character** E = Black resin

TECHNICAL SPECIFICATIONS

Technical Data:	All technical data relate to an ambient temperature of +25°C
Capacitance Range:	10 µF to 470 µF
Capacitance Tolerance:	±20%
Leakage Current DCL:	0.1CV
Temperature Range:	-55°C to +125°C
Reliability:	1% per 1000 hours at 85°C, V_R with 0.1Ω/V series impedance 60% confidence level
	Meets requirements of AEC-Q200 (for humidity 85°C/85%RH, V_R details see reference table)

NOTE: Conductive Polymer Capacitors are designed to operate within the limits of the environmental conditions specified for each series. If operated continuously at their maximum temperature and / or humidity limit, or beyond these limits, capacitors may exhibit a parametric shift in capacitance and increases in ESR. These changes may occur earlier if the specified environmental conditions are exceeded. Similarly, their normal operational time period will be significantly extended if their general duty cycle includes operation below maximum temperature within humidity controlled environments. Careful attention should be paid to maximum temperature with associated high humidity environments as well as voltage derating, ripple current and current surges. Please reference the AVX Conductive Polymer Capacitor Guidelines for more information or contact factory for application assistance.

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CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V_R) @ 105°C							
µF	Code	4V (G)	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
10	106							D(70)	D(90)
15	156						D(70)		
22	226		B(70)			D(70)			
33	336		B(70)	B(70)	D(70),Y(70)			U(70)	
47	476		B(70)	B(70)	D(70),Y(70)	D(70),Y(70)		U(70)	
68	686		B(70)	D(25,40)					
100	107	B(70)		D(25,40)			U(70)		
150	157		D(25,40)	D(25)					
220	227	D(25), Y(25)	D(25)	D(25)					
330	337	D(25)	D(25)						
470	477	D(25)							

Released ratings, (ESR ratings in mOhms in parentheses)
Engineering samples – please contact AVX
Note: Voltage ratings are minimum values. AVX reserves the right to supply higher volage ratings in the same case size, to the same reliability standards.

RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Maximum Operating Temp. (°C)	DCL Max (µA)	DF Max (%)	ESR Max @ 100kHz (mΩ)	100kHz RMS Current (mA)				Humidity 85°C/85%RH, Vr (hrs)	MSL
								45°C	85°C	105°C	125°C		
4 Volt													
TCQB107M004#0070E	B	100	4	125	40	8	70	1336	935	601	334	1000	3
TCQD227M004#0025	D	220	4	125	88	6	25	3000	2100	1350	750	1000	3
TCQY227M004#0025	Y	220	4	125	88	6	25	2720	1904	1224	680	500	3
TCQD337M004#0025	D	330	4	125	132	6	25	3000	2100	1350	750	1000	3
TCQD477M004#0025	D	470	4	125	188	6	25	3000	2100	1350	750	1000	3
6.3 Volt													
TCQB226M006#0070	B	22	6.3	125	13.2	6	70	1336	935	601	334	500	3
TCQB226M006#0070E	B	22	6.3	125	13.2	6	70	1336	935	601	334	1000	3
TCQB336M006#0070	B	33	6.3	125	19.8	6	70	1336	935	601	334	500	3
TCQB336M006#0070E	B	33	6.3	125	19.8	6	70	1336	935	601	334	1000	3
TCQB476M006#0070	B	47	6.3	125	28.2	6	70	1336	935	601	334	500	3
TCQB476M006#0070E	B	47	6.3	125	28.2	6	70	1336	935	601	334	1000	3
TCQB686M006#0070E	B	68	6.3	125	40.8	8	70	1336	935	601	334	1000	3
TCQD157M006#0025	D	150	6.3	125	90	6	25	3000	2100	1350	750	1000	3
TCQD157M006#0040	D	150	6.3	125	90	6	40	2372	1660	1067	593	1000	3
TCQD227M006#0025	D	220	6.3	125	132	6	25	3000	2100	1350	750	1000	3
TCQD337M006#0025	D	330	6.3	125	198	6	25	3000	2100	1350	750	1000	3
10 Volt													
TCQB336M010#0070E	B	33	10	125	33	6	70	1336	935	601	334	1000	3
TCQB476M010#0070E	B	47	10	125	47	6	70	1336	935	601	334	1000	3
TCQD686M010#0025	D	68	10	125	68	6	25	3000	2100	1350	750	1000	3
TCQD686M010#0040	D	68	10	125	68	6	40	2372	1660	1067	593	1000	3
TCQD107M010#0025	D	100	10	125	100	6	25	3000	2100	1350	750	1000	3
TCQD107M010#0040	D	100	10	125	100	6	40	2372	1660	1067	593	1000	3
TCQD157M010#0025E	D	150	10	125	150	6	25	3000	2100	1350	750	1000	3
TCQD227M010#0025E	D	220	10	125	220	6	25	3000	2100	1350	750	1000	3
16 Volt													
TCQD336M016#0070	D	33	16	125	52.8	6	70	1793	1255	807	448	1000	3
TCQY336M016#0070E	Y	33	16	125	52.8	6	70	1626	1138	732	406	1000	3
TCQD476M016#0070	D	47	16	125	75.2	6	70	1793	1255	807	448	1000	3
TCQY476M016#0070E	Y	47	16	125	75.2	6	70	1626	1138	732	406	1000	3
20 Volt													
TCQD226M020#0070	D	22	20	125	44	6	70	1793	1255	807	448	1000	3
TCQD476M020#0070E	D	47	20	125	94	6	70	1793	1255	807	448	1000	3
TCQY476M020#0070E	Y	47	20	125	94	6	70	1626	1138	732	406	1000	3
25 Volt													
TCQD156M025#0070	D	15	25	125	37.5	6	70	1793	1255	807	448	1000	3
TCQU107M025#0070E	U	100	25	125	250	12	70	2330	1631	1048	582	500	3
35 Volt													
TCQD106M035#0070	D	10	35	125	35	6	70	1793	1255	807	448	1000	3
TCQU336M035#0070E	U	33	35	125	115.5	12	70	2330	1631	1048	582	500	3
TCQU476M035#0070E	U	47	35	125	164.5	12	70	2330	1631	1048	582	500	3
50 Volt													
TCQD106M050#0090	D	10	50	125	50	10	90	1581	1107	712	395	500	3

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.
All technical data relates to an ambient temperature of +25ºC. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

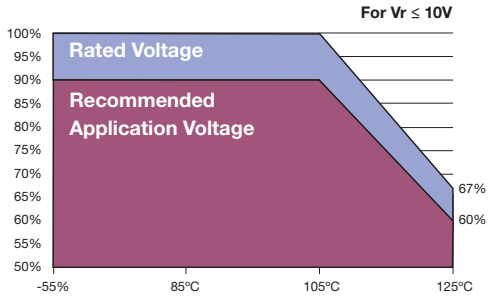
ESR allowed to move up to 1.25 times catalog limit post mounting.
NOTE: AVX reserves the right to supply higher voltage ratings or tighter tolerance part in the same case size, to the same reliability standards.

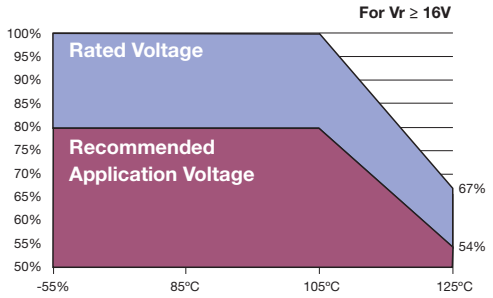
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RECOMMENDED DERATING FACTOR

Voltage and temperature derating as percentage of Vr.

Rated voltage	Operating Temperature		
	≤85°C	105°C	125°C
≤10V	90%	90%	60%
≥16V	80%	80%	54%





QUALIFICATION TABLE

TEST	TCQ series (Temperature range -55°C to 125°C)		
	Condition	Characteristics	
Endurance	Apply 2/3 rated voltage (Ur) at 125°C for 1000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	2 x initial limit
		ΔC/C	within +10/-20% of initial value
		DF	2 x initial limit
		ESR	2 x initial limit
Storage Life	Store at 125°C, no voltage applied, for 1000 hours. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	2x initial limit
		ΔC/C	within +10/-20% of initial value
		DF	2 x initial limit
		ESR	2 x initial limit
Biased Humidity	Apply rated voltage (Ur) at 85°C, 85% relative humidity for 1000 (500) hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	2 x initial limit
		ΔC/C	within +35/-5% of initial value
		DF	1.5 x initial limit
		ESR	2 x initial limit
Temperature Stability	Step 1: +20°C, 15 min Step 2: -55°C, 15 min Step 3: +20°C, 15 min Step 4: +85°C, 15 min Step 5: +125°C, 15 min Step 6: +20°C, 15 min		

	+20°C	-55°C	+20°C	+85°C	+125°C	+20°C
DCL	IL*	n/a	IL*	10 x IL*	12.5 x IL*	IL*
ΔC/C	n/a	±20%	±5%	±20%	±30%	±5%
DF	IL*	IL*	IL*	1.2 x IL*	1.5 x IL*	IL*

Surge Voltage	Apply 1.3x 2/3x rated voltage (Ur) at 125°C for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω	Visual examination: no visible damage DCL: initial limit ΔC/C: within +10/-20% of initial value for $V_r \leq 10V$; within +20/-30% of initial value for $V_r \geq 16V$ DF: initial limit for Vr ≤ 10V; 1.25x initial limit for Vr ≥ 16V ESR: 1.25 x initial limit
Mechanical Shock	MIL-STD-202, Method 213, Condition F	Visual examination: no visible damage DCL: initial limit ΔC/C: within ±10% of initial value DF: initial limit ESR: 1.25 x initial limit
Vibration	MIL-STD-202, Method 204, Condition D	Visual examination: no visible damage DCL: initial limit ΔC/C: within ±10% of initial value DF: initial limit ESR: 1.25 x initial limit

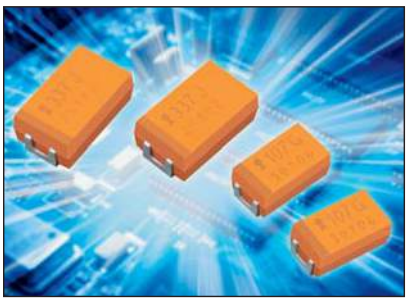
*Initial Limit

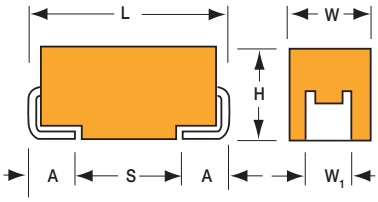
For use outside of recommended conditions and special request, please contact AVX.

Initial measurement max. 1hr after the removal from dry pack or after pretreatment at 85°C for 24 hours.

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NOJ Series
Standard and Low Profile Niobium Oxide Capacitor





FEATURES

- Non-burn safe technology
- Reliability level: 0.5%/1000 hours at 85ºC
- 13 case sizes available, standard and low profile
- Environmentally friendly, RoHS Compliant
- CV range: 2.2-1000µF / 1.8-10V
- Elektra Component of the Year Award, 2005



Elektra Award 2005

APPLICATIONS

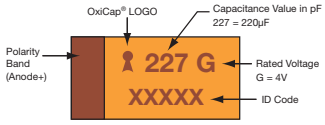
- Automotive, Avionics, Digital, FPGA, Industrial low voltage control circuits
- Downsized industrial and automotive DC/DC converters

GENERAL CHARACTERISTICS

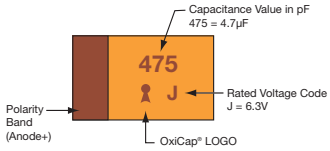
Operating Temperature: -55ºC to 105ºC

MARKING

A, B, C, D, E, F, S, T, V, W, X, Y CASE



P CASE



STANDARD CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) –0.10 (0.004)	H+0.20 (0.008) –0.10 (0.004)	W_1±0.20 (0.008)	A+0.30 (0.012) –0.20 (0.008)	S Min.
A	1206	3216-18	3.20 (0.126)	1.60 (0.063)	1.60 (0.063)	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)
B	1210	3528-21	3.50 (0.138)	2.80 (0.110)	1.90 (0.075)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)
C	2312	6032-28	6.00 (0.236)	3.20 (0.126)	2.60 (0.102)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
D	2917	7343-31	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
V	2924	7361-38	7.30 (0.287)	6.10 (0.240)	3.55 (0.140)	3.10 (0.120)	1.30 (0.051)	4.40 (0.173)

W_1 dimension applies to the termination width for A dimensional area only.

LOW PROFILE CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) –0.10 (0.004)	H Max	W_1±0.20 (0.008)	A+0.30 (0.012) –0.20 (0.008)	S Min.
F	2312	6032-20	6.00 (0.236)	3.20 (0.126)	2.00 (0.079)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
P	0805	2012-15	2.05 (0.081)	1.35 (0.053)	1.50 (0.059)	1.00±0.10 (0.039±0.004)	0.50 (0.020)	0.85 (0.033)
S	1206	3216-12	3.20 (0.126)	1.60 (0.063)	1.20 (0.047)	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)
T	1210	3528-12	3.50 (0.138)	2.80 (0.110)	1.20 (0.047)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)
W	2312	6032-15	6.00 (0.236)	3.20 (0.126)	1.50 (0.059)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
X	2917	7343-15	7.30 (0.287)	4.30 (0.169)	1.50 (0.059)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
Y	2917	7343-20	7.30 (0.287)	4.30 (0.169)	2.00 (0.079)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)

W_1 dimension applies to the termination width for A dimensional area only.
Pad Stand-off is 0.1±0.1.

HOW TO ORDER

NOJ	D	107	M	006	R	WJ	–
Type	**Case Size** See tables above	**Capacitance Code** 1st two digits represent significant figures, 3rd digit represents multiplier in pF	**Tolerance** M=±20%	**Rated DC Voltage** 001 = 1.8Vdc 002 = 2.5Vdc 004 = 4Vdc 006 = 6.3Vdc 010 = 10Vdc	**Packaging** R = Pure Tin 7" Reel S = Pure Tin 13" Reel	**Specification Suffix** WJ = Standard WB = Low ESR	**Additional characters may be added for special requirements** V = dry pack option (selected ratings only - dry pack is standard for all D, E, V, X, Y case size ratings)

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C is not stated					
Capacitance Range:		2.2 µF to 1000 µF					
Capacitance Tolerance:		±20%					
Leakage Current DCL:		0.02CV or 1.0µA whichever is the greater					
Rated Voltage DC (V_R)	≤ +85°C:	1.8	2.5	4	6.3	10	
Category Voltage (V_C)	≤ +105°C:	1.2	1.7	2.7	4	7	
Surge Voltage (V_S)	≤ +85°C:	2.3	3.3	5.2	8	13	
Surge Voltage (V_S)	≤ +105°C:	1.6	2.2	3.4	5	8	
Temperature Range:		-55°C to +105°C					
Reliability:		0.5% per 1000 hours at 85°C, V_R, 0.1Ω/V series impedance, 60% confidence level					
		Meets requirements of AEC-Q200					

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STANDARD NIOBIUM OXIDE CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V_R) to 85°C				
µF	Code	1.8V (x)	2.5V (e)	4V (G)	6.3V (J)	10V (A)
4.7	475				A	A
6.8	685				A	A
10	106				A	A/B
15	156			A	A/B	A/B
22	226		A	A/B	A/B	B/C/B(700)
33	336		A/B	A/B	B/C/B(700)	C
47	476	A	A/B	A/B/C	B/C	C
68	686	B	B/C	B/C	B/C	C
100	107	B/C	B/C	B/C/B(250)	B/C/D/B(400)	D/D(150)
150	157	C	C	C/D	C/D	
220	227	C	C	C/D	C/D/E	
330	337	C	C/D	D	D/E	
470	477		D/E	D/E	E/V/E(75)	
680	687		E	E/V		
1000	108		V	V		

LOW PROFILE NIOBIUM OXIDE CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V_R) to 85°C				
µF	Code	1.8V (x)	2.5V (e)	4V (G)	6.3V (J)	10V (A)
1.0	105					
1.5	155					
2.2	225					P
3.3	335					P
4.7	475				P/S	T
6.8	685			P/S	P/S/T	T
10	106		P/S	P/S/T	P/T	T
15	156	P/S	P/S/T	P/T		
22	226	P/S/T	P/T	T	T	
33	336	T	T	T	W	
47	476	T	T	W	W	
68	686		W	W	X/Y	
100	107	W	W	W/X	F/Y	
150	157		X	Y	F/Y	
220	227	X	Y	F/Y	Y	
330	337	Y	Y	Y		
470	477	Y				

Released ratings (ESR ratings in mOhms in parentheses)

Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (Ω)	100kHz RMS Current (A)			MSL
										25°C	85°C	105°C	
1.8 Volt @ 85°C													
NOJP156M001#WJ	P	15	1.8	85	1.2	105	1.0	10	4.1	0.133	0.119	0.053	1
NOJS156M001#WJ	S	15	1.8	85	1.2	105	1.0	6	2	0.197	0.178	0.079	1
NOJP226M001#WJ	P	22	1.8	85	1.2	105	1.0	10	3.8	0.138	0.124	0.055	1
NOJS226M001#WJ	S	22	1.8	85	1.2	105	1.0	8	1.9	0.203	0.182	0.081	1
NOJT226M001#WJ	T	22	1.8	85	1.2	105	1.0	6	1.8	0.231	0.208	0.092	1
NOJT336M001#WJ	T	33	1.8	85	1.2	105	1.2	6	1.7	0.238	0.214	0.095	1
NOJA476M001#WJ	A	47	1.8	85	1.2	105	1.7	8	1.6	0.237	0.213	0.095	1
NOJB476M001#WJ	B	47	1.8	85	1.2	105	1.7	6	1.6	0.252	0.227	0.101	1
NOJT476M001#WJ	T	47	1.8	85	1.2	105	1.7	10	1.6	0.245	0.220	0.098	1
NOJB686M001#WJ	B	68	1.8	85	1.2	105	2.5	6	1.5	0.261	0.235	0.104	1
NOJB107M001#WJ	B	100	1.8	85	1.2	105	3.6	6	1.4	0.270	0.243	0.108	1
NOJC107M001#WJ	C	100	1.8	85	1.2	105	3.6	6	0.4	0.574	0.517	0.230	1
NOJW107M001#WJ	W	100	1.8	85	1.2	105	3.6	6	0.4	0.520	0.468	0.208	1
NOJC157M001#WJ	C	150	1.8	85	1.2	105	5.4	8	0.4	0.574	0.517	0.230	1
NOJC227M001#WJ	C	220	1.8	85	1.2	105	8.0	8	0.4	0.574	0.517	0.230	1
NOJX227M001#WJ	X	220	1.8	85	1.2	105	8.0	8	0.4	0.548	0.493	0.219	3
NOJC337M001#WJ	C	330	1.8	85	1.2	105	11.9	8	0.3	0.663	0.597	0.265	1
NOJY337M001#WJ	Y	330	1.8	85	1.2	105	11.9	8	0.3	0.707	0.636	0.283	3
NOJY477M001#WJ	Y	470	1.8	85	1.2	105	17.0	8	0.3	0.707	0.636	0.283	3
2.5 Volt @ 85°C													
NOJP106M002#WJ	P	10	2.5	85	1.7	105	1.0	6	4.5	0.126	0.114	0.051	1
NOJS106M002#WJ	S	10	2.5	85	1.7	105	1.0	6	2.2	0.188	0.169	0.075	1
NOJP156M002#WJ	P	15	2.5	85	1.7	105	1.0	6	4	0.134	0.121	0.054	1
NOJS156M002#WJ	S	15	2.5	85	1.7	105	1.0	8	2	0.197	0.178	0.079	1
NOJT156M002#WJ	T	15	2.5	85	1.7	105	1.0	6	2	0.219	0.197	0.088	1
NOJA226M002#WJ	A	22	2.5	85	1.7	105	1.1	6	1.9	0.218	0.196	0.087	1
NOJP226M002#WJ	P	22	2.5	85	1.7	105	1.1	10	3.8	0.138	0.124	0.055	1
NOJT226M002#WJ	T	22	2.5	85	1.7	105	1.1	6	1.9	0.225	0.202	0.090	1
NOJA336M002#WJ	A	33	2.5	85	1.7	105	1.7	6	1.7	0.230	0.207	0.092	1
NOJB336M002#WJ	B	33	2.5	85	1.7	105	1.7	6	1.7	0.245	0.220	0.098	1
NOJT336M002#WJ	T	33	2.5	85	1.7	105	1.7	6	1.7	0.238	0.214	0.095	1
NOJA476M002#WJ	A	47	2.5	85	1.7	105	2.4	8	1.6	0.237	0.213	0.095	1
NOJB476M002#WJ	B	47	2.5	85	1.7	105	2.4	6	1.6	0.252	0.227	0.101	1
NOJT476M002#WJ	T	47	2.5	85	1.7	105	2.4	10	1.6	0.245	0.220	0.098	1
NOJB686M002#WJ	B	68	2.5	85	1.7	105	3.4	6	1.5	0.261	0.235	0.104	1
NOJC686M002#WJ	C	68	2.5	85	1.7	105	3.4	6	0.5	0.514	0.462	0.206	1
NOJW686M002#WJ	W	68	2.5	85	1.7	105	3.4	6	0.4	0.520	0.468	0.208	1
NOJB107M002#WJ	B	100	2.5	85	1.7	105	5.0	6	1.4	0.270	0.243	0.108	1
NOJC107M002#WJ	C	100	2.5	85	1.7	105	5.0	6	0.4	0.574	0.517	0.230	1
NOJW107M002#WJ	W	100	2.5	85	1.7	105	5.0	6	0.4	0.520	0.468	0.208	1
NOJC157M002#WJ	C	150	2.5	85	1.7	105	7.5	6	0.4	0.574	0.517	0.230	1
NOJX157M002#WJ	X	150	2.5	85	1.7	105	7.5	6	0.4	0.548	0.493	0.219	3
NOJC227M002#WJ	C	220	2.5	85	1.7	105	11.0	8	0.4	0.574	0.517	0.230	1
NOJY227M002#WJ	Y	220	2.5	85	1.7	105	11.0	8	0.4	0.612	0.551	0.245	3
NOJC337M002#WJ	C	330	2.5	85	1.7	105	16.5	10	0.3	0.663	0.597	0.265	1
NOJD337M002#WJ	D	330	2.5	85	1.7	105	16.5	10	0.3	0.775	0.697	0.310	3
NOJY337M002#WJ	Y	330	2.5	85	1.7	105	16.5	10	0.3	0.707	0.636	0.283	3
NOJD477M002#WJ	D	470	2.5	85	1.7	105	23.5	12	0.3	0.775	0.697	0.310	3
NOJE477M002#WJ	E	470	2.5	85	1.7	105	23.5	10	0.3	0.812	0.731	0.325	3
NOJE687M002#WJ	E	680	2.5	85	1.7	105	34.0	14	0.3	0.812	0.731	0.325	3
NOJV108M002#WJ	V	1000	2.5	85	1.7	105	50.0	16	0.3	1.000	0.900	0.400	3
4 Volt @ 85°C													
NOJP685M004#WJ	P	6.8	4	85	2.7	105	1.0	6	5.3	0.117	0.105	0.047	1
NOJS685M004#WJ	S	6.8	4	85	2.7	105	1.0	6	2.6	0.173	0.156	0.069	1
NOJP106M004#WJ	P	10	4	85	2.7	105	1.0	20	4.5	0.126	0.114	0.051	1
NOJS106M004#WJ	S	10	4	85	2.7	105	1.0	8	2.2	0.188	0.169	0.075	1
NOJT106M004#WJ	T	10	4	85	2.7	105	1.0	6	2.2	0.209	0.188	0.084	1
NOJA156M004#WJ	A	15	4	85	2.7	105	1.2	6	2	0.212	0.191	0.085	1
NOJP156M004#WJ	P	15	4	85	2.7	105	1.2	10	4.1	0.133	0.119	0.053	1
NOJT156M004#WJ	T	15	4	85	2.7	105	1.2	6	2	0.219	0.197	0.088	1
NOJA226M004#WJ	A	22	4	85	2.7	105	1.8	6	1.9	0.218	0.196	0.087	1
NOJB226M004#WJ	B	22	4	85	2.7	105	1.8	6	1.9	0.232	0.209	0.093	1
NOJT226M004#WJ	T	22	4	85	2.7	105	1.8	6	1.8	0.231	0.208	0.092	1
NOJA336M004#WJ	A	33	4	85	2.7	105	2.6	10	1.7	0.230	0.207	0.092	1
NOJB336M004#WJ	B	33	4	85	2.7	105	2.6	6	1.7	0.245	0.220	0.098	1
NOJT336M004#WJ	T	33	4	85	2.7	105	2.6	14	2	0.219	0.197	0.088	1
NOJA476M004#WJ	A	47	4	85	2.7	105	3.8	18	2.2	0.202	0.182	0.081	1
NOJB476M004#WJ	B	47	4	85	2.7	105	3.8	6	1.6	0.252	0.227	0.101	1
NOJC476M004#WJ	C	47	4	85	2.7	105	3.8	6	0.5	0.514	0.462	0.206	1
NOJW476M004#WJ	W	47	4	85	2.7	105	3.8	6	0.5	0.465	0.418	0.186	1

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AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (Ω)	100kHz RMS Current (A)			MSL
										25°C	85°C	105°C	
NOJB686M004#WJ	B	68	4	85	2.7	105	5.4	6	1.5	0.261	0.235	0.104	1
NOJC686M004#WJ	C	68	4	85	2.7	105	5.4	6	0.5	0.514	0.462	0.206	1
NOJW686M004#WJ	W	68	4	85	2.7	105	5.4	6	0.4	0.520	0.468	0.208	1
NOJB107M004#WJ	B	100	4	85	2.7	105	8.0	16	1.4	0.270	0.243	0.108	1
NOJB107M004#WB	B	100	4	85	2.7	105	8.0	16	0.25	0.639	0.575	0.255	3
NOJC107M004#WJ	C	100	4	85	2.7	105	8.0	6	0.4	0.574	0.517	0.230	1
NOJW107M004#WJ	W	100	4	85	2.7	105	8.0	8	0.4	0.520	0.468	0.208	1
NOJX107M004#WJ	X	100	4	85	2.7	105	8.0	6	0.4	0.548	0.493	0.219	3
NOJC157M004#WJ	C	150	4	85	2.7	105	12.0	6	0.4	0.574	0.517	0.230	1
NOJD157M004#WJ	D	150	4	85	2.7	105	12.0	6	0.3	0.775	0.697	0.310	3
NOJY157M004#WJ	Y	150	4	85	2.7	105	12.0	6	0.4	0.612	0.551	0.245	3
NOJC227M004#WJ	C	220	4	85	2.7	105	17.6	8	0.4	0.574	0.517	0.230	1
NOJD227M004#WJ	D	220	4	85	2.7	105	17.6	8	0.4	0.671	0.604	0.268	3
NOJF227M004#WJ	F	220	4	85	2.7	105	17.6	10	0.4	0.548	0.493	0.219	1
NOJY227M004#WJ	Y	220	4	85	2.7	105	17.6	10	0.4	0.612	0.551	0.245	3
NOJD337M004#WJ	D	330	4	85	2.7	105	26.4	8	0.3	0.775	0.697	0.310	3
NOJY337M004#WJ	Y	330	4	85	2.7	105	26.4	12	0.3	0.707	0.636	0.283	3
NOJD477M004#WJ	D	470	4	85	2.7	105	37.6	12	0.3	0.775	0.697	0.310	3
NOJE477M004#WJ	E	470	4	85	2.7	105	37.6	12	0.3	0.812	0.731	0.325	3
NOJE687M004#WJ	E	680	4	85	2.7	105	54.4	14	0.3	0.812	0.731	0.325	3
NOJV687M004#WJ	V	680	4	85	2.7	105	54.4	14	0.3	1.000	0.900	0.400	3
NOJV108M004#WJ	V	1000	4	85	2.7	105	80.0	18	0.3	1.000	0.900	0.400	3
6.3 Volt @ 85°C													
NOJA475M006#WJ	A	4.7	6.3	85	4	105	1.1	6	3.2	0168	0.151	0.067	1
NOJP475M006#WJ	P	4.7	6.3	85	4	105	1.0	6	6.1	0.109	0.098	0.043	1
NOJS475M006#WJ	S	4.7	6.3	85	4	105	1.0	6	3.2	0.156	0.141	0.062	1
NOJA685M006#WJ	A	6.8	6.3	85	4	105	1.1	6	2.6	0.186	0.167	0.074	1
NOJP685M006#WJ	P	6.8	6.3	85	4	105	1.0	10	5.2	0.118	0.106	0.047	1
NOJS685M006#WJ	S	6.8	6.3	85	4	105	1.0	8	2.7	0.170	0.153	0.068	1
NOJT685M006#WJ	T	6.8	6.3	85	4	105	1.0	6	2.6	0.192	0.173	0.077	1
NOJA106M006#WJ	A	10	6.3	85	4	105	1.2	6	2.2	0.202	0.182	0.081	1
NOJP106M006#WJ	P	10	6.3	85	4	105	1.2	10	4.5	0.126	0.114	0.051	1
NOJT106M006#WJ	T	10	6.3	85	4	105	1.2	6	2.2	0.209	0.188	0.084	1
NOJA156M006#WJ	A	15	6.3	85	4	105	1.8	8	2	0.212	0.191	0.085	1
NOJB156M006#WJ	B	15	6.3	85	4	105	1.8	6	2	0.226	0.203	0.090	1
NOJA226M006#WJ	A	22	6.3	85	4	105	2.6	8	1.8	0.224	0.201	0.089	1
NOJB226M006#WJ	B	22	6.3	85	4	105	2.6	6	1.9	0.232	0.209	0.093	1
NOJT226M006#WJ	T	22	6.3	85	4	105	2.6	8	1.8	0.231	0.208	0.092	1
NOJB336M006#WJ	B	33	6.3	85	4	105	4.0	6	1.7	0.245	0.220	0.098	1
NOJB336M006#WB	B	33	6.3	85	4	105	4.0	6	0.7	0.382	0.344	0.153	3
NOJC336M006#WJ	C	33	6.3	85	4	105	4.0	6	0.5	0.514	0.462	0.206	1
NOJW336M006#WJ	W	33	6.3	85	4	105	4.0	6	0.5	0.465	0.418	0.186	1
NOJB476M006#WJ	B	47	6.3	85	4	105	5.6	6	0.8	0.357	0.321	0.143	1
NOJC476M006#WJ	C	47	6.3	85	4	105	5.7	6	0.5	0.514	0.462	0.206	1
NOJW476M006#WJ	W	47	6.3	85	4	105	5.7	6	0.5	0.465	0.418	0.186	1
NOJB686M006#WJ	B	68	6.3	85	4	105	8.2	20	1.5	0.261	0.235	0.104	1
NOJC686M006#WJ	C	68	6.3	85	4	105	8.2	6	0.5	0.514	0.462	0.206	1
NOJX686M006#WJ	X	68	6.3	85	4	105	8.2	6	0.5	0.490	0.441	0.196	3
NOJY686M006#WJ	Y	68	6.3	85	4	105	8.2	6	0.5	0.548	0.493	0.219	3
NOJB107M006#WJ	B	100	6.3	85	4	105	60.0	20	1.7	0.245	0.220	0.098	1
NOJB107M006#WB	B	100	6.3	85	4	105	60.0	20	0.4	0.505	0.454	0.202	3
NOJC107M006#WJ	C	100	6.3	85	4	105	12.0	8	0.4	0.574	0.517	0.230	1
NOJD107M006#WJ	D	100	6.3	85	4	105	12.0	6	0.4	0.671	0.604	0.268	3
NOJF107M006#WJ	F	100	6.3	85	4	105	12	8	0.4	0.548	0.493	0.219	1
NOJY107M006#WJ	Y	100	6.3	85	4	105	12.0	6	0.4	0.612	0.551	0.245	3
NOJC157M006#WJ	C	150	6.3	85	4	105	18.0	6	0.4	0.574	0.517	0.230	1
NOJD157M006#WJ	D	150	6.3	85	4	105	18.0	6	0.4	0.671	0.604	0.268	3
NOJF157M006#WJ	F	150	6.3	85	4	105	18.0	8	0.4	0.548	0.493	0.219	1
NOJY157M006#WJ	Y	150	6.3	85	4	105	18.0	6	0.4	0.612	0.551	0.245	3
NOJC227M006#WJ	C	220	6.3	85	4	105	26.4	14	0.4	0.574	0.517	0.230	1
NOJD227M006#WJ	D	220	6.3	85	4	105	26.4	8	0.4	0.671	0.604	0.268	3
NOJE227M006#WJ	E	220	6.3	85	4	105	26.4	12	0.4	0.704	0.633	0.281	3
NOJY227M006#WJ	Y	220	6.3	85	4	105	26.4	10	0.4	0.612	0.551	0.245	3
NOJD337M006#WJ	D	330	6.3	85	4	105	39.6	10	0.3	0.775	0.697	0.310	3
NOJE337M006#WJ	E	330	6.3	85	4	105	39.6	12	0.3	0.812	0.731	0.325	3
NOJE477M006#WJ	E	470	6.3	85	4	105	56.4	16	0.3	0.812	0.731	0.325	3
NOJE477M006#WB	E	470	6.3	85	4	105	56.4	16	0.075	1.625	1.462	0.650	3
NOJV477M006#WJ	V	470	6.3	85	4	105	56.4	14	0.3	1.000	0.900	0.400	3

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (Ω)	100kHz RMS Current (A)			MSL
										25°C	85°C	105°C	
10 Volt @ 85°C													
NOJP225M010#WJ	P	2.2	10	85	7	105	1.0	8	8.3	0.093	0.084	0.037	1
NOJP335M010#WJ	P	3.3	10	85	7	105	1.0	8	7	0.101	0.091	0.041	1
NOJA475M010#WJ	A	4.7	10	85	7	105	1.0	6	3.1	0.170	0.153	0.068	1
NOJT475M010#WJ	T	4.7	10	85	7	105	1.0	6	3.1	0.176	0.158	0.070	1
NOJA685M010#WJ	A	6.8	10	85	7	105	1.4	6	2.6	0.186	0.167	0.074	1
NOJT685M010#WJ	T	6.8	10	85	7	105	1.4	6	2.6	0.192	0.173	0.077	1
NOJA106M010#WJ	A	10	10	85	7	105	2.0	6	2.2	0.202	0.182	0.081	1
NOJB106M010#WJ	B	10	10	85	7	105	2.0	6	1	0.319	0.287	0.128	1
NOJT106M010#WJ	T	10	10	85	7	105	2.0	6	2.2	0.209	0.188	0.084	1
NOJA156M010#WJ	A	15	10	85	7	105	3.0	6	2	0.212	0.191	0.085	1
NOJB156M010#WJ	B	15	10	85	7	105	3.0	6	2	0.226	0.203	0.090	1
NOJB226M010#WJ	B	22	10	85	7	105	4.4	6	1.8	0.238	0.214	0.095	1
NOJB226M010#WB	B	22	10	85	7	105	4.4	6	0.7	0.382	0.344	0.153	3
NOJC226M010#WJ	C	22	10	85	7	105	4.4	6	0.5	0.514	0.462	0.206	1
NOJC336M010#WJ	C	33	10	85	7	105	6.6	6	0.5	0.514	0.462	0.206	1
NOJC476M010#WJ	C	47	10	85	7	105	9.4	6	0.4	0.574	0.517	0.230	1
NOJC686M010#WJ	C	68	10	85	7	105	13.6	12	0.5	0.514	0.462	0.206	1
NOJD107M010#WJ	D	100	10	85	7	105	20.0	12	0.4	0.671	0.604	0.268	3
NOJD107M010#WB	D	100	10	85	7	105	20.0	12	0.15	1.095	0.986	0.438	3

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

The EIA & CECC standards for capacitors allow an ESR movement to 1.25 times catalog limit post mounting.

NOTE: AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

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QUALIFICATION TABLE

<table>
<tr><th rowspan="2">TEST</th><th colspan="3">NOJ series (Temperature range -55ºC to +105ºC)</th></tr>
<tr><th colspan="2">Condition</th><th colspan="7">Characteristics</th></tr>
<tr><td rowspan="5">Endurance</td><td colspan="2" rowspan="5">Apply rated voltage (Ur) at 85ºC and / or category voltage (Uc) at 105ºC for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±10% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td rowspan="5">Storage Life</td><td colspan="2" rowspan="5">Store at 105ºC, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±10% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td rowspan="5">Humidity</td><td colspan="2" rowspan="5">Store at 65ºC and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">1.5 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±10% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">1.2 x initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td rowspan="5">Biased Humidity</td><td colspan="2" rowspan="5">Apply rated voltage (Ur) at 85°C, 85°C relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">2 x initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±10% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">1.2 x initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td rowspan="8">Temperature Stability</td><td>Step</td><td>Temperature°C</td><td>Duration(min)</td><td></td><td>+20ºC</td><td>-55ºC</td><td>+20ºC</td><td>+85ºC</td><td>+105ºC</td><td>+20ºC</td></tr>
<tr><td>1</td><td>+20</td><td>15</td><td>DCL</td><td>IL*</td><td>n/a</td><td>IL*</td><td>10 x IL*</td><td>12.5 x IL*</td><td>IL*</td></tr>
<tr><td>2</td><td>-55</td><td>15</td><td>ΔC/C</td><td>n/a</td><td>+0/-10%</td><td>±5%</td><td>+10/-0%</td><td>+12/-0%</td><td>±5%</td></tr>
<tr><td>3</td><td>+20</td><td>15</td><td>DF</td><td>IL*</td><td>1.5 x IL*</td><td>IL*</td><td>1.5 x IL*</td><td>2 x IL*</td><td>IL*</td></tr>
<tr><td>4</td><td>+85</td><td>15</td><td rowspan="4">ESR</td><td rowspan="4">1.25 x IL*</td><td rowspan="4">2.5 x IL*</td><td rowspan="4">1.25 x IL*</td><td rowspan="4">1.25 x IL*</td><td rowspan="4">1.25 x IL*</td><td rowspan="4">1.25 x IL*</td></tr>
<tr><td>5</td><td>+105</td><td>15</td></tr>
<tr><td>6</td><td>+20</td><td>15</td></tr>
<tr><td></td></tr>
<tr><td rowspan="5">Surge Voltage</td><td colspan="2" rowspan="5">Apply 1.3x category voltage (Uc) at 105ºC for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±5% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td rowspan="5">Mechanical Shock</td><td colspan="2" rowspan="5">MIL-STD-202, Method 213, Condition F</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±5% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">1.25 x initial limit</td></tr>
<tr><td rowspan="5">Vibration</td><td colspan="2" rowspan="5">MIL-STD-202, Method 204, Condition D</td><td>Visual examination</td><td colspan="6">no visible damage</td></tr>
<tr><td>DCL</td><td colspan="6">initial limit</td></tr>
<tr><td>ΔC/C</td><td colspan="6">within ±5% of initial value</td></tr>
<tr><td>DF</td><td colspan="6">initial limit</td></tr>
<tr><td>ESR</td><td colspan="6">1.25 x initial limit</td></tr>
</table>

*Initial Limit

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NOS Series
Low ESR OxiCap® Niobium Oxide Capacitor

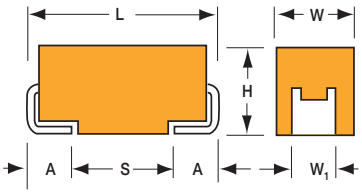


FEATURES

- Low ESR Nb0 capacitors
- Non-burn safe technology
- Reliability level: 0.2%/1000 hrs.
- CV range: 10-1000µF / 1.8-8V
- 9 case sizes available
- IBM global approval received in 2004
- Elektra Award received in 2005
- Meets requirements of AEC-Q200
- -55 to +125°C operation temperature



Elektra Award
2005



APPLICATIONS

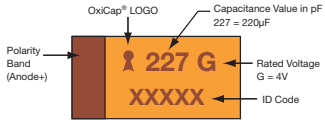
- Medium power DC/DC for transportation and automotive industry

GENERAL CHARACTERISTICS

Operating Temperature: -55ºC to 125ºC

MARKING

A, B, C, D, E, V, W, X, Y CASE



CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) –0.10 (0.004)	H+0.20 (0.008) –0.10 (0.004)	W_1±0.20 (0.008)	A+0.30 (0.012) –0.20 (0.008)	S Min.
A	1206	3216-18	3.20 (0.126)	1.60 (0.063)	1.60 (0.063)	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)
B	1210	3528-21	3.50 (0.138)	2.80 (0.110)	1.90 (0.075)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)
C	2312	6032-28	6.00 (0.236)	3.20 (0.126)	2.60 (0.102)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
D	2917	7343-31	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
V	2924	7361-38	7.30 (0.287)	6.10 (0.240)	3.55 (0.140)	3.10 (0.120)	1.30 (0.051)	4.40 (0.173)
W	2312	6032-15	6.00 (0.236)	3.20 (0.126)	1.50 (0.059) max.	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)
X	2917	7343-15	7.30 (0.287)	4.30 (0.169)	1.50 (0.059) max.	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
Y	2917	7343-20	7.30 (0.287)	4.30 (0.169)	2.00 (0.079) max	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)

W_1 dimension applies to the termination width for A dimensional area only.

HOW TO ORDER

NOS	D	107	M	006	R	0100	—
Type	**Case Size** See table above	**Capacitance Code** 1st two digits represent significant figures, 3rd digit represents multiplier in pF	**Tolerance** M=±20%	**Rated DC Voltage** 001 = 1.8Vdc 002 = 2.5Vdc 004 = 4Vdc 006 = 6.3Vdc 008 = 8Vdc	**Packaging** R = Pure Tin 7" Reel S = Pure Tin 13" Reel	**ESR in mΩ**	**Additional characters may be added for special requirements** V = dry pack option (selected ratings only - dry pack is standard for all D, E, V, X, Y case size ratings)

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

NON-BURN NON-SMOKE

TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C is not stated					
Capacitance Range:		10 µF to 1000 µF					
Capacitance Tolerance:		±20%					
Leakage Current DCL:		0.02CV					
Rated Voltage DC (V_R)	≤ +85°C:	1.8	2.5	4	6.3	8	
Category Voltage (V_C)	≤ +105°C:	1.2	1.7	2.7	4	7	
Category Voltage (V_C)	≤ +125°C:	0.9	1.3	2	3	4	
Surge Voltage (V_S)	≤ +85°C:	2.3	3.3	5.2	8	10	
Surge Voltage (V_S)	≤ +105°C:	1.6	2.2	3.4	5	8	
Surge Voltage (V_S)	≤ +125°C:	1.2	1.7	2.6	4	5.3	
Temperature Range:		-55°C to +125°C					
Reliability:		0.2% per 1000 hours at 85°C, V_R, 0.1Ω/V series impedance, 60% confidence level					
		Meets requirements of AEC-Q200					

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CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V_R) to 85°C				
µF	**Code**	**1.8V (x)**	**2.5V (e)**	**4.0V (G)**	**6.3V (J)**	**8V (P)**
10	106				A(800,1000, 2000,2200)	A(2200) B(1000)
15	156			A(1500,2000)	B(600,2000)	B(1000)
22	226		A(900,1900)	B(600,1900)	B(600,1900)	B(700,1800) C(500)
33	336		B(1700)	B(600,1700)	B(600,1700) C(500) W(250,500)	C(500)
47	476		B(500,1600)	B(500,1600) C(300,500) W(150,500)	B(500,800) C(300,500)	C(400)
68	686		C(200,500) W(150,400)	C(200,500)	C(75,200,500) X(100,500) Y(100,500)	C(500)
100	107	B(350,1400) W(150,400)	C(150,400)	C(70,150,400) X(100,400)	C(150,400) D(80,100,400) Y(100,400)	D(400)
150	157	C(400)	C(65,150,400) X(100,400)	C(90,150,400) Y(100,400)	D(50,70,100,400) Y(100,400)	
220	227	C(125,400) X(100,400)	C(80,125,400) Y(100,400	D(40,60,100,400) Y(100,400)	D(45,60,100,400) E(80,100,400)	
330	337	Y(100,300)	D(35,50,100,300) Y(100,300)	D(35,55,100,300) E(100) Y(150,300)	E(80,100,300)	
470	477	Y(100,300)	D(35,55,100,300) E(100,300)	D(100,300) E(75,100,300)	V(75,300)	
680	687		E(60,300)	V(75,300)		
1000	108		V(50,300)			

Released ratings (ESR ratings in mOhms in parentheses)

Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (A)			MSL
										25°C	85°C	125°C	
1.8 Volt @ 85°C													
NOSB107M001#0350	B	100	1.8	85	0.9	125	3.6	6	350	0.540	0.486	0.216	1
NOSB107M001#1400	B	100	1.8	85	0.9	125	3.6	6	1400	0.270	0.243	0.108	1
NOSW107M001#0150	W	100	1.8	85	0.9	125	3.6	6	150	0.849	0.764	0.339	1
NOSW107M001#0400	W	100	1.8	85	0.9	125	3.6	6	400	0.520	0.468	0.208	1
NOSC157M001#0400	C	150	1.8	85	0.9	125	5.4	8	400	0.574	0.517	0.230	1
NOSC227M001#0125	C	220	1.8	85	0.9	125	8.0	8	125	1.028	0.925	0.411	1
NOSC227M001#0400	C	220	1.8	85	0.9	125	8.0	8	400	0.574	0.517	0.230	1
NOSX227M001#0100	X	220	1.8	85	0.9	125	8.0	8	100	1.095	0.986	0.438	3
NOSX227M001#0400	X	220	1.8	85	0.9	125	8.0	8	400	0.548	0.493	0.219	3
NOSY337M001#0100	Y	330	1.8	85	0.9	125	11.9	8	100	1.225	1.102	0.490	3
NOSY337M001#0300	Y	330	1.8	85	0.9	125	11.9	8	300	0.707	0.636	0.283	3
NOSY477M001#0100	Y	470	1.8	85	0.9	125	17.0	8	100	1.225	1.102	0.490	3
NOSY477M001#0300	Y	470	1.8	85	0.9	125	17.0	8	300	0.707	0.636	0.283	3
2.5 Volt @ 85°C													
NOSA226M002#0900	A	22	2.5	85	1.3	125	1.1	6	900	0.316	0.285	0.126	1
NOSA226M002#1900	A	22	2.5	85	1.3	125	1.1	6	1900	0.218	0.196	0.087	1
NOSB336M002#1700	B	33	2.5	85	1.3	125	1.7	6	1700	0.245	0.220	0.098	1
NOSB476M002#0500	B	47	2.5	85	1.3	125	2.4	6	500	0.452	0.406	0.181	1
NOSB476M002#1600	B	47	2.5	85	1.3	125	2.4	6	1600	0.252	0.227	0.101	1
NOSC686M002#0200	C	68	2.5	85	1.3	125	3.4	6	200	0.812	0.731	0.325	1
NOSC686M002#0500	C	68	2.5	85	1.3	125	3.4	6	500	0.514	0.462	0.206	1
NOSW686M002#0150	W	68	2.5	85	1.3	125	3.4	6	150	0.849	0.764	0.339	1
NOSW686M002#0400	W	68	2.5	85	1.3	125	3.4	6	400	0.520	0.468	0.208	1
NOSC107M002#0150	C	100	2.5	85	1.3	125	5.0	6	150	0.938	0.844	0.375	1
NOSC107M002#0400	C	100	2.5	85	1.3	125	5.0	6	400	0.574	0.517	0.230	1
NOSC157M002#0065	C	150	2.5	85	1.3	125	7.5	6	65	1.425	1.283	0.570	1
NOSC157M002#0150	C	150	2.5	85	1.3	125	7.5	6	150	0.938	0.844	0.375	1
NOSC157M002#0400	C	150	2.5	85	1.3	125	7.5	6	400	0.574	0.517	0.230	1
NOSX157M002#0100	X	150	2.5	85	1.3	125	7.5	6	100	1.095	0.986	0.438	3
NOSX157M002#0400	X	150	2.5	85	1.3	125	7.5	6	400	0.548	0.493	0.219	3
NOSC227M002#0080	C	220	2.5	85	1.3	125	11.0	8	80	1.285	1.156	0.514	1
NOSC227M002#0125	C	220	2.5	85	1.3	125	11.0	8	125	1.028	0.925	0.411	1
NOSC227M002#0400	C	220	2.5	85	1.3	125	11.0	8	400	0.574	0.517	0.230	1
NOSY227M002#0100	Y	220	2.5	85	1.3	125	11.0	8	100	1.225	1.102	0.490	3
NOSY227M002#0400	Y	220	2.5	85	1.3	125	11.0	8	400	0.612	0.551	0.245	3
NOSD337M002#0035	D	330	2.5	85	1.3	125	16.5	10	35	2.268	2.041	0.907	3
NOSD337M002#0050	D	330	2.5	85	1.3	125	16.5	10	50	1.897	1.708	0.759	3
NOSD337M002#0100	D	330	2.5	85	1.3	125	16.5	10	100	1.342	1.207	0.537	3
NOSD337M002#0300	D	330	2.5	85	1.3	125	16.5	10	300	0.775	0.697	0.310	3
NOSY337M002#0100	Y	330	2.5	85	1.3	125	16.5	10	100	1.225	1.102	0.490	3
NOSY337M002#0300	Y	330	2.5	85	1.3	125	16.5	10	300	0.707	0.636	0.283	3
NOSD477M002#0035	D	470	2.5	85	1.3	125	23.5	12	35	2.268	2.041	0.907	3
NOSD477M002#0055	D	470	2.5	85	1.3	125	23.5	12	55	1.809	1.628	0.724	3
NOSD477M002#0100	D	470	2.5	85	1.3	125	23.5	12	100	1.342	1.207	0.537	3
NOSD477M002#0300	D	470	2.5	85	1.3	125	23.5	12	300	0.775	0.697	0.310	3
NOSE477M002#0100	E	470	2.5	85	1.3	125	23.5	10	100	1.407	1.266	0.563	3
NOSE477M002#0300	E	470	2.5	85	1.3	125	23.5	10	300	0.812	0.731	0.325	3
NOSE687M002#0060	E	680	2.5	85	1.3	125	34.0	14	60	1.817	1.635	0.727	3
NOSE687M002#0300	E	680	2.5	85	1.3	125	34.0	14	300	0.812	0.731	0.325	3
NOSV108M002#0050	V	1000	2.5	85	1.3	125	50.0	16	50	2.449	2.205	0.980	3
NOSV108M002#0300	V	1000	2.5	85	1.3	125	50.0	16	300	1.000	0.900	0.400	3
4 Volt @ 85°C													
NOSA156M004#1500	A	15	4	85	2	125	1.2	6	1500	0.245	0.220	0.098	1
NOSA156M004#2000	A	15	4	85	2	125	1.2	6	2000	0.212	0.191	0.085	1
NOSB226M004#0600	B	22	4	85	2	125	1.8	6	600	0.412	0.371	0.165	1
NOSB226M004#1900	B	22	4	85	2	125	1.8	6	1900	0.232	0.209	0.093	1
NOSB336M004#0600	B	33	4	85	2	125	2.6	6	600	0.412	0.371	0.165	1
NOSB336M004#1700	B	33	4	85	2	125	2.6	6	1700	0.245	0.220	0.098	1
NOSB476M004#0500	B	47	4	85	2	125	3.8	6	500	0.452	0.406	0.181	1
NOSB476M004#1600	B	47	4	85	2	125	3.8	6	1600	0.252	0.227	0.101	1
NOSC476M004#0300	C	47	4	85	2	125	3.8	6	300	0.663	0.597	0.265	1
NOSC476M004#0500	C	47	4	85	2	125	3.8	6	500	0.514	0.462	0.206	1
NOSW476M004#0150	W	47	4	85	2	125	3.8	6	150	0.849	0.764	0.339	1
NOSW476M004#0500	W	47	4	85	2	125	3.8	6	500	0.465	0.418	0.186	1
NOSC686M004#0200	C	68	4	85	2	125	5.4	6	200	0.812	0.731	0.325	1
NOSC686M004#0500	C	68	4	85	2	125	5.4	6	500	0.514	0.462	0.206	1
NOSC107M004#0070	C	100	4	85	2	125	8.0	6	70	1.373	1.236	0.549	1
NOSC107M004#0150	C	100	4	85	2	125	8.0	6	150	0.938	0.844	0.375	1
NOSC107M004#0400	C	100	4	85	2	125	8.0	6	400	0.574	0.517	0.230	1
NOSX107M004#0100	X	100	4	85	2	125	8.0	6	100	1.095	0.986	0.438	3

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (A)			MSL
										25°C	85°C	125°C	
NOSX107M004#0400	X	100	4	85	2	125	8.0	6	400	0.548	0.493	0.219	3
NOSC157M004#0090	C	150	4	85	2	125	12.0	6	90	1.211	1.090	0.484	1
NOSC157M004#0150	C	150	4	85	2	125	12.0	6	150	0.938	0.844	0.375	1
NOSC157M004#0400	C	150	4	85	2	125	12.0	6	400	0.574	0.517	0.230	1
NOSY157M004#0100	Y	150	4	85	2	125	12.0	6	100	1.225	1.102	0.490	3
NOSY157M004#0400	Y	150	4	85	2	125	12.0	6	400	0.612	0.551	0.245	3
NOSD227M004#0040	D	220	4	85	2	125	17.6	8	40	2.121	1.909	0.849	3
NOSD227M004#0060	D	220	4	85	2	125	17.6	8	60	1.732	1.559	0.693	3
NOSD227M004#0100	D	220	4	85	2	125	17.6	8	100	1.342	1.207	0.537	3
NOSD227M004#0400	D	220	4	85	2	125	17.6	8	400	0.671	0.604	0.268	3
NOSY227M004#0100	Y	220	4	85	2	125	17.6	10	100	1.225	1.102	0.490	3
NOSY227M004#0400	Y	220	4	85	2	125	17.6	10	400	0.612	0.551	0.245	3
NOSD337M004#0035	D	330	4	85	2	125	26.4	8	35	2.268	2.041	0.907	3
NOSD337M004#0055	D	330	4	85	2	125	26.4	8	55	1.809	1.628	0.724	3
NOSD337M004#0100	D	330	4	85	2	125	26.4	8	100	1.342	1.207	0.537	3
NOSD337M004#0300	D	330	4	85	2	125	26.4	8	300	0.775	0.697	0.310	3
NOSE337M004#0100	E	330	4	85	2	125	26.4	8	100	1.407	1.266	0.563	3
NOSY337M004#0150	Y	330	4	85	2	125	26.4	12	150	1.000	0.900	0.400	3
NOSY337M004#0300	Y	330	4	85	2	125	26.4	12	300	0.707	0.636	0.283	3
NOSD477M004#0100	D	470	4	85	2	125	37.6	12	100	1.342	1.207	0.537	3
NOSD477M004#0300	D	470	4	85	2	125	37.6	12	300	0.775	0.697	0.310	3
NOSE477M004#0075	E	470	4	85	2	125	37.6	12	75	1.625	1.462	0.650	3
NOSE477M004#0100	E	470	4	85	2	125	37.6	12	100	1.407	1.266	0.563	3
NOSE477M004#0300	E	470	4	85	2	125	37.6	12	300	0.812	0.731	0.325	3
NOSV687M004#0075	V	680	4	85	2	125	54.4	14	75	2.000	1.800	0.800	3
NOSV687M004#0300	V	680	4	85	2	125	54.4	14	300	1.000	0.900	0.400	3
6.3 Volt @ 85°C													
NOSA106M006#0800	A	10	6.3	85	3	125	1.2	6	800	0.335	0.302	0.134	1
NOSA106M006#1000	A	10	6.3	85	3	125	1.2	6	1000	0.300	0.270	0.120	1
NOSA106M006#2000	A	10	6.3	85	3	125	1.2	6	2000	0.212	0.191	0.085	1
NOSA106M006#2200	A	10	6.3	85	3	125	1.2	6	2200	0.202	0.182	0.081	1
NOSB156M006#0600	B	15	6.3	85	3	125	1.8	6	600	0.412	0.371	0.165	1
NOSB156M006#2000	B	15	6.3	85	3	125	1.8	6	2000	0.226	0.203	0.090	1
NOSB226M006#0600	B	22	6.3	85	3	125	2.6	6	600	0.412	0.371	0.165	1
NOSB226M006#1900	B	22	6.3	85	3	125	2.6	6	1900	0.232	0.209	0.093	1
NOSB336M006#0600	B	33	6.3	85	3	125	4.0	6	600	0.412	0.371	0.165	1
NOSB336M006#1700	B	33	6.3	85	3	125	4.0	6	1700	0.245	0.220	0.098	1
NOSC336M006#0500	C	33	6.3	85	3	125	4.0	6	500	0.514	0.462	0.206	1
NOSW336M006#0250	W	33	6.3	85	3	125	4.0	6	250	0.657	0.592	0.263	1
NOSW336M006#0500	W	33	6.3	85	3	125	4.0	6	500	0.465	0.418	0.186	1
NOSB476M006#0500	B	47	6.3	85	3	125	5.6	6	500	0.452	0.406	0.181	1
NOSB476M006#0800	B	47	6.3	85	3	125	5.6	6	800	0.357	0.321	0.143	1
NOSC476M006#0300	C	47	6.3	85	3	125	5.7	6	300	0.663	0.597	0.265	1
NOSC476M006#0500	C	47	6.3	85	3	125	5.7	6	500	0.514	0.462	0.206	1
NOSC686M006#0075	C	68	6.3	85	3	125	8.2	6	75	1.327	1.194	0.531	1
NOSC686M006#0200	C	68	6.3	85	3	125	8.2	6	200	0.812	0.731	0.325	1
NOSC686M006#0500	C	68	6.3	85	3	125	8.2	6	500	0.514	0.462	0.206	1
NOSX686M006#0100	X	68	6.3	85	3	125	8.2	6	100	1.095	0.986	0.438	3
NOSX686M006#0500	X	68	6.3	85	3	125	8.2	6	500	0.490	0.441	0.196	3
NOSY686M006#0100	Y	68	6.3	85	3	125	8.2	6	100	1.225	1.102	0.490	3
NOSY686M006#0500	Y	68	6.3	85	3	125	8.2	6	500	0.548	0.493	0.219	3
NOSC107M006#0150	C	100	6.3	85	3	125	12.0	8	150	0.938	0.844	0.375	1
NOSC107M006#0400	C	100	6.3	85	3	125	12.0	8	400	0.574	0.517	0.230	1
NOSD107M006#0080	D	100	6.3	85	3	125	12.0	6	80	1.500	1.350	0.600	3
NOSD107M006#0100	D	100	6.3	85	3	125	12.0	6	100	1.342	1.207	0.537	3
NOSD107M006#0400	D	100	6.3	85	3	125	12.0	6	400	0.671	0.604	0.268	3
NOSY107M006#0100	Y	100	6.3	85	3	125	12.0	6	100	1.225	1.102	0.490	3
NOSY107M006#0400	Y	100	6.3	85	3	125	12.0	6	400	0.612	0.551	0.245	3
NOSD157M006#0050	D	150	6.3	85	3	125	18.0	6	50	1.897	1.708	0.759	3
NOSD157M006#0070	D	150	6.3	85	3	125	18.0	6	70	1.604	1.443	0.641	3
NOSD157M006#0100	D	150	6.3	85	3	125	18.0	6	100	1.342	1.207	0.537	3
NOSD157M006#0400	D	150	6.3	85	3	125	18.0	6	400	0.671	0.604	0.268	3
NOSY157M006#0100	Y	150	6.3	85	3	125	18.0	6	100	1.225	1.102	0.490	3
NOSY157M006#0400	Y	150	6.3	85	3	125	18.0	6	400	0.612	0.551	0.245	3
NOSD227M006#0045	D	220	6.3	85	3	125	26.4	8	45	2.000	1.800	0.800	3
NOSD227M006#0060	D	220	6.3	85	3	125	26.4	8	60	1.732	1.559	0.693	3
NOSD227M006#0100	D	220	6.3	85	3	125	26.4	8	100	1.342	1.207	0.537	3
NOSD227M006#0400	D	220	6.3	85	3	125	26.4	8	400	0.671	0.604	0.268	3
NOSE227M006#0080	E	220	6.3	85	3	125	26.4	12	80	1.573	1.416	0.629	3
NOSE227M006#0100	E	220	6.3	85	3	125	26.4	12	100	1.407	1.266	0.563	3
NOSE227M006#0400	E	220	6.3	85	3	125	26.4	12	400	0.704	0.633	0.281	3

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RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (A)			MSL
										25°C	85°C	125°C	
NOSE337M006#0080	E	330	6.3	85	3	125	39.6	12	80	1.573	1.416	0.629	3
NOSE337M006#0100	E	330	6.3	85	3	125	39.6	12	100	1.407	1.266	0.563	3
NOSE337M006#0300	E	330	6.3	85	3	125	39.6	12	300	0.812	0.731	0.325	3
NOSV477M006#0075	V	470	6.3	85	3	125	56.4	14	75	2.000	1.800	0.800	3
NOSV477M006#0300	V	470	6.3	85	3	125	56.4	14	300	1.000	0.900	0.400	3
8 Volt @ 85°C													
NOSA106M008#2200	A	10	8	85	4	125	1.6	10	2200	0.202	0.182	0.081	1
NOSB106M008#1000	B	10	8	85	4	125	1.6	10	1000	0.319	0.287	0.128	1
NOSB156M008#1000	B	15	8	85	4	125	2.4	10	1000	0.319	0.287	0.128	1
NOSB226M008#0700	B	22	8	85	4	125	3.5	10	700	0.382	0.344	0.153	1
NOSB226M008#1800	B	22	8	85	4	125	3.5	10	1800	0.238	0.214	0.095	1
NOSC226M008#0500	C	22	8	85	4	125	3.5	10	500	0.514	0.462	0.206	1
NOSC336M008#0500	C	33	8	85	4	125	5.3	10	500	0.514	0.462	0.206	1
NOSC476M008#0400	C	47	8	85	4	125	7.5	10	400	0.574	0.517	0.230	1
NOSC686M008#0500	C	68	8	85	4	125	11.0	16	500	0.514	0.462	0.206	1
NOSD107M008#0400	D	100	8	85	4	125	16.0	16	400	0.671	0.604	0.268	3

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

The EIA & CECC standards for capacitors allow an ESR movement to 1.25 times catalog limit post mounting.

NOTE: AVX reserves the right to supply a higher voltage ratings or tighter tolerance part in the same case size, to the same reliability standards.

QUALIFICATION TABLE

TEST	NOS series (Temperature range -55°C to +125°C)		
	Condition	Characteristics	
Endurance	Apply rated voltage (Ur) at 85°C and / or category voltage (Uc) at 125°C for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±10% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Storage Life	Store at 125°C, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	initial limit
		ΔC/C	within ±10% of initial value
		DF	initial limit
		ESR	1.25 x initial limit
Biased Humidity	Apply rated voltage (Ur) at 85°C, 85% relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.	Visual examination	no visible damage
		DCL	2 x initial limit
		ΔC/C	within ±10% of initial value
		DF	1.2 x initial limit
		ESR	1.25 x initial limit

Temperature Stability

Step	Temperature°C	Duration(min)
1	+20	15
2	-55	15
3	+20	15
4	+85	15
5	+125	15
6	+20	15

	+20°C	-55°C	+20°C	+85°C	+125°C	+20°C
DCL	IL*	n/a	IL*	12 x IL*	15 x IL*	IL*
ΔC/C	n/a	+0/-10%	±5%	+10/-0%	+12/-0%	±5%
DF	IL*	1.5 x IL*	IL*	1.5 x IL*	2 x IL*	IL*
ESR	1.25 x IL*	2.5 x IL*	1.25 x IL*	1.25 x IL*	1.25 x IL*	1.25 x IL*

Surge Voltage	Apply 1.3x category voltage (Uc) at 125°C for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω	Visual examination: no visible damage DCL: initial limit ΔC/C: within ±5% of initial value DF: initial limit ESR: 1.25 x initial limit
Mechanical Shock	MIL-STD-202, Method 213, Condition F	Visual examination: no visible damage DCL: initial limit ΔC/C: within ±5% of initial value DF: initial limit ESR: 1.25 x initial limit
Vibration	MIL-STD-202, Method 204, Condition D	Visual examination: no visible damage DCL: initial limit ΔC/C: within ±5% of initial value DF: initial limit ESR: 1.25 x initial limit

*Initial Limit

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NOM Series
Ultra Low ESR OxiCap® Niobium Oxide Capacitor



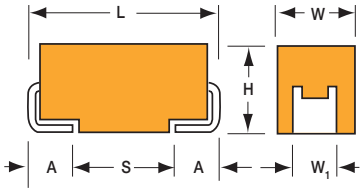
FEATURES
- Multi-anode construction
- Super low ESR
- Non-burn safe technology
- CV range: 220-680µF / 1.8-6.3V
- IBM global approval received in 2004
- Elektra award received in 2005

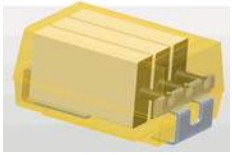


Elektra Award 2005

APPLICATIONS
- High power low voltage industrial power supplies

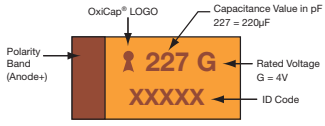
GENERAL CHARACTERISTICS
Operating Temperature: -55ºC to 125ºC





NOM MULTIANODE CONSTRUCTION

MARKING
E CASE



CASE DIMENSIONS: millimeters (inches)

Code	EIA Code	EIA Metric	L±0.20 (0.008)	W+0.20 (0.008) −0.10 (0.004)	H+0.20 (0.008) −0.10 (0.004)	W_1±0.20 (0.008)	A+0.30 (0.012) −0.20 (0.008)	S Min.
E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
W_1 dimension applies to the termination width for A dimensional area only.								

HOW TO ORDER

NOM	E	227	M	006	R	0040
Type	**Case Size** See table above	**Capacitance Code** 1st two digits represent significant figures, 3rd digit represents multiplier in pF	**Tolerance** M=±20%	**Rated DC Voltage** 001 = 1.8Vdc 002 = 2.5Vdc 004 = 4Vdc 006 = 6.3Vdc	**Packaging** R = Pure Tin 7" Reel S = Pure Tin 13" Reel	**ESR in mΩ**

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

NON-BURN NON-SMOKE

TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C is not stated				
Capacitance Range:		220 µF to 680 µF				
Capacitance Tolerance:		±20%				
Leakage Current DCL:		0.02CV				
Rated Voltage DC (V_R)	≤ +85°C:	1.8	2.5	4	6.3	
Category Voltage (V_C)	≤ +125°C:	0.9	1.3	2	3	
Surge Voltage (V_S)	≤ +85°C:	2.3	3.3	5.2	8	
Surge Voltage (V_S)	≤ +125°C:	1.2	1.7	2.6	4	
Temperature Range:		-55°C to +125°C				
Reliability:		0.2% per 1000 hours at 85°C, V_R, 0.1Ω/V series impedance, 60% confidence level				
		Meets requirements of AEC-Q200				

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CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V_R) to 85°C			
µF	Code	1.8V (x)	2.5V (e)	4.0V (G)	6.3V (J)
220	227				E(40)
330	337			E(35)	E(23,35)
470	477		E(30)	E(23,30)	
680	687	E(23)	E(23)		

Released ratings, (ESR ratings in mOhms in parentheses)
Note: Voltage ratings are minimum values. AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	Rated Temperature (°C)	Category Voltage (V)	Category Temperature (°C)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (A)			MSL
										25°C	85°C	125°C	
1.8 Volt @ 85°C													
NOME687M001#0023	E	680	1.8	85	0.9	125	24.5	6	23	3.753	3.378	1.501	3
2.5 Volt @ 85°C													
NOME477M002#0030	E	470	2.5	85	1.3	125	23.5	10	30	3.286	2.958	1.315	3
NOME687M002#0023	E	680	2.5	85	1.3	125	34	6	23	3.753	3.378	1.501	3
4 Volt @ 85°C													
NOME337M004#0035	E	330	4	85	2	125	26.4	8	35	3.043	2.738	1.217	3
NOME477M004#0023	E	470	4	85	2	125	37.6	6	23	3.753	3.378	1.501	3
NOME477M004#0030	E	470	4	85	2	125	37.6	6	30	3.286	2.958	1.315	3
6.3 Volt @ 85°C													
NOME227M006#0040	E	220	6.3	85	3	125	26.4	12	40	2.846	2.561	1.138	3
NOME337M006#0023	E	330	6.3	85	3	125	39.6	6	23	3.753	3.378	1.501	3
NOME337M006#0035	E	330	6.3	85	3	125	39.6	6	35	3.043	2.738	1.217	3

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

ESR allowed to move up to 125 times catalog limit post mounting.

NOTE: AVX reserves the right to supply higher voltage ratings or tighter tolerance part in the same case size, to the same reliability standards.

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QUALIFICATION TABLE

TEST	NOM series (Temperature range -55ºC to +125ºC)									
	Condition			Characteristics						
Endurance	Apply rated voltage (Ur) at 85ºC and / or category voltage (Uc) at 125ºC for 2000 hours through a circuit impedance of ≤0.1Ω/V. Stabilize at room temperature for 1-2 hours before measuring.			Visual examination	no visible damage					
				DCL	initial limit					
				ΔC/C	within ±10% of initial value					
				DF	initial limit					
				ESR	1.25 x initial limit					
Storage Life	Store at 125ºC, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.			Visual examination	no visible damage					
				DCL	initial limit					
				ΔC/C	within ±10% of initial value					
				DF	initial limit					
				ESR	1.25 x initial limit					
Humidity	Store at 65ºC and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.			Visual examination	no visible damage					
				DCL	1.5 x initial limit					
				ΔC/C	within ±10% of initial value					
				DF	1.2 x initial limit					
				ESR	1.25 x initial limit					
Biased Humidity	Apply rated voltage (Ur) at 85ºC, 85% relative humidity for 1000 hours. Stabilize at room temperature and humidity for 1-2 hours before measuring.			Visual examination	no visible damage					
				DCL	2 x initial limit					
				ΔC/C	within ±10% of initial value					
				DF	1.2 x initial limit					
				ESR	1.25 x initial limit					
Temperature Stability	Step	Temperature°C	Duration(min)		+20ºC	-55ºC	+20ºC	+85ºC	+125ºC	+20ºC
	1	+20	15	DCL	IL*	n/a	IL*	12 x IL*	15 x IL*	IL*
	2	-55	15	ΔC/C	n/a	+0/-10%	±5%	+10/-0%	+12/-0%	±5%
	3	+20	15	DF	IL*	1.5 x IL*	IL*	1.5 x IL*	2 x IL*	IL*
	4	+85	15	ESR	1.25 x IL*	2.5 x IL*	1.25 x IL*	1.25 x IL*	1.25 x IL*	1.25 x IL*
	5	+125	15							
	6	+20	15							
Surge Voltage	Apply 1.3x category voltage (Uc) at 125ºC for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω			Visual examination	no visible damage					
				DCL	initial limit					
				ΔC/C	within ±5% of initial value					
				DF	initial limit					
				ESR	1.25 x initial limit					
Mechanical Shock	MIL-STD-202, Method 213, Condition F			Visual examination	no visible damage					
				DCL	initial limit					
				ΔC/C	within ±5% of initial value					
				DF	initial limit					
				ESR	1.25 x initial limit					
Vibration	MIL-STD-202, Method 204, Condition D			Visual examination	no visible damage					
				DCL	initial limit					
				ΔC/C	within ±5% of initial value					
				DF	initial limit					
				ESR	1.25 x initial limit					

*Initial Limit

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FILM CAPACITORS

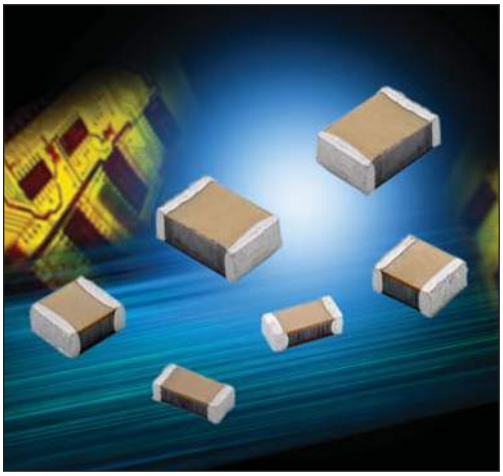
AVX reliable film capacitor technology offers design engineers many advantages over aluminum capacitors in automotive applications.

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Film Chip Capacitors
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Film chip capacitor using a naked and stacked construction with metallized PPS (Polyphenylene sulfide).

- Use of high temperature dielectric films makes these capacitors suitable for IR or vapor phase reflow processes. This chip is built without specific encapsulation.
- The intrinsic elasticity of the dielectric film allows an excellent compatibility of the capacitor with all types of material for printed circuit boards.
- The self-healing property of film technology results in a safe open circuit failure mode and better overall reliability.

FEATURES

- Self Healing
- Excellent thermal shock resistance
- Low dissipation factor, ESR and ESL
- No piezoelectric effect
- Non-polar construction
- Excellent Temperature Stability

APPLICATIONS

- Bluetooth
- GSM
- Constant, filtering or oscillation and resonance within PLL circuit

AND MORE

GENERAL CHARACTERISTICS

Operating Temperature:
-55ºC to 125ºC

HOW TO ORDER

CB	02	8	B	0104	G	--
Type SMD Lead Free Ni/100% Sn	**Size** 01 = 1206 02 = 1210 03 = 1812	**Dielectric** 8 = PPS	**Voltage** B = 16V D = 50V	**Capacitance EIA Code** 1st digit: 0 2nd & 3rd digit: the 2nd significant figures of the capacitance value 4th digit: the number of zeros to be added to the capacitance value	**Tolerance** G = 2% J = 5% K = 10%	**Suffix Packaging** -- = Bulk BA = tape & reel diameter: 180mm

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

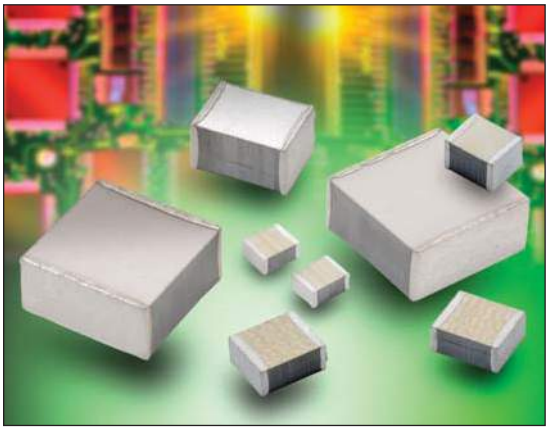
- Available in tape and reel suitable for automatic placement

VOLTAGE (Vdc / Vac)					
Capacitance		**16 Vdc / 10 Vac**		**50 Vdc / 40 Vac**	
Value	Cap Code	Size Code	H max	Size Code	H max
0.001µF	0102	1206	1.15	1206	1.15
0.0015	0152	1206	1.15	1206	1.15
0.0022	0222	1206	1.15	1206	1.15
0.0033	0332	1206	1.15	1206	1.15
0.0047	0472	1206	1.15	1206	1.15
0.0068	0682	1206	1.15	1206	1.15
0.010	0103	1206	1.15	1206	1.15
0.015	0153	1206	1.15	1210	1.8
0.022	0223	1206	1.15	1210	1.8
0.033	0333	1206	1.15	1210	2.1
0.047	0473	1210	1.8	1812	2.4
0.068	0683	1210	1.8	1812	2.4
0.100	0104	1210	1.8	1812	2.4
0.150	0154	1812	2.3		
0.180	0184	1812	2.5		

For other values : upon request

AEC-Q200 Qualified

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Film chip capacitor using a naked and stacked construction with metallized PET-HT (Hi-Temp polyethylene tetraphtalate).

- Use of high temperature dielectric films makes these capacitors suitable for IR or vapor phase reflow processes. This chip is built without specific encapsulation.
- The intrinsic elasticity of the dielectric film allows an excellent compatibility of the capacitor with all types of material for printed circuit boards.
- The self-healing property of film technology results in a safe open circuit failure mode and better overall reliability.

FEATURES

- Self Healing
- Excellent thermal shock resistance
- Low dissipation factor, ESR and ESL
- No piezoelectric effect
- Non-polar construction

APPLICATIONS

- LED driver/LED lights
- HID lights
- Windscreen Wipers
- Small Motors

GENERAL CHARACTERISTICS

Operating Temperature:
-55ºC to 125ºC

HOW TO ORDER

CB	02	2	B	0104	K	--
Type	**Size**	**Dielectric**	**Voltage**	**Capacitance EIA Code**	**Tolerance**	**Suffix Packaging**
SMD Lead Free Ni/100% Sn	01 = 1206 02 = 1210 03 = 1812 04 = 2220 05 = 2824 16 = 4030 17 = 5040 18 = 6054	2 = PEN-HT	D = 63V E = 100V G = 250V I = 400V K = 630V	1st digit: 0 2nd & 3rd digit: the 2nd significant figures of the capacitance value 4th digit: the number of zeros to be added to the capacitance value	K = 10% J = 5%	-- = Bulk BA = tape & reel diameter: 180mm BC = tape & reel diameter: 330mm

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

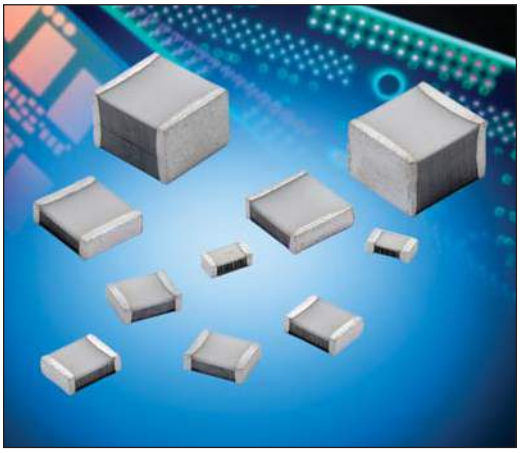
RoHS COMPLIANT

VOLTAGE (Vdc / Vac)											
Capacitance		**63 Vdc / 40 Vac**		**100 Vdc / 63 Vac**		**250 Vdc / 160 Vac**		**400 Vdc / 200 Vac**		**630 Vdc / 250 Vac**	
Value	Cap Code	Size Code	H max	Size Code	H max	Size Code	H max	Size Code	H max	Size Code	H max
0.010µF	0103							2220	2.4	2220	2.8
0.015	0153							2220	2.4	2220	4.0
0.022	0223							2220	3.0	2824	3.4
0.033	0333							2220	4.2	2824	5.0
0.047	0473					2220	3.0	2824	4.5	4030	3.6
0.068	0683					2220	4.1	4030	3.6	4030	5.2
0.100	0104					2220	4.55	4030	4.7	5040	5.0
0.150	0154					2824	4.3	5040	4.6	5040	6.9
0.220	0224			2220	3.3	2824	4.9	6054	4.0	6054	5.8
0.330	0334	2220	3.3	2220	4.0	4030	5.6	6054	5.6		
0.470	0474	2220	3.5	2824	4.4	4030	6.15				
0.680	0684	2220	4.0	2824	5.2	5040	6.5				
1.0µF	0105	2220	4.0	2824	5.7	6054	6.0				
1.5	0155	2824	5.4	4030	6.1	6054	7.0				
2.2	0225	4030	5.7	5040	5.5						
3.3	0335	6054	5.5	6054	5.2						
4.7	0475	6054	4.9	6054	7.1						

For other values : upon request

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Film Chip Capacitors
CB-PEN Series PEN Dielectric



Film chip capacitor using a naked and stacked construction with metallized PEN (polyethylene naphtalate).

- Use of high temperature dielectric films makes these capacitors suitable for IR or vapor phase reflow processes. This chip is built without specific encapsulation.
- The intrinsic elasticity of the dielectric film allows an excellent compatibility of the capacitor with all types of material for printed circuit boards.
- The self-healing property of film technology results in a safe open circuit failure mode and better overall reliability.

FEATURES

- Self Healing
- Excellent thermal shock resistance
- Low dissipation factor, ESR and ESL
- No piezoelectric effect
- Non-polar construction

APPLICATIONS

- LED driver/LED lights
- HID lights
- Windscreen Wipers
- Small Motors

AND MORE

GENERAL CHARACTERISTICS

Operating Temperature:
-55ºC to 125ºC

HOW TO ORDER

CB	01	7	D	0103	J	BA
Type	**Size**	**Dielectric**	**Voltage**	**Capacitance EIA Code**	**Tolerance**	**Suffix Packaging**
SMD Lead Free Ni/100% Sn	01 = 1206 02 = 1210 03 = 1812 04 = 2220 05 = 2824 16 = 4030 17 = 5040 18 = 6054	7 = PEN	C = 25V D = 50/63V E = 100V G = 250V I = 400V K = 630V	1st digit: 0 2nd & 3rd digit: the 2nd significant figures of the capacitance value 4th digit: the number of zeros to be added to the capacitance value	K = 10% J = 5%	-- = Bulk BA = tape & reel diameter: 180mm BC = tape & reel diameter: 330mm

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

VOLTAGE (Vdc / Vac)															
Capacitance		**25 Vdc / 16 Vac**		**50-63 Vdc / 40 Vac**				**100 Vdc / 63 Vac**		**250 Vdc / 160 Vac**		**400 Vdc / 200 Vac**		**630 Vdc / 250 Vac**	
Value	Cap Code	Size Code	H max	Size Code		H max		Size Code	H max	Size Code	H max	Size Code	H max	Size Code	H max
0.001µF	0102	1206	1.15	1206	1812	1.15	1.9	1206	1.15	1812	2.0	1812	2.0	1812	2.0
0.0015	0152	1206	1.15	1206	1812	1.15	1.9	1206	1.15	1812	2.0	1812	2.0	1812	2.0
0.0022	0222	1206	1.15	1206	1812	1.15	1.9	1206	1.15	1812	2.0	1812	2.0	1812	2.0
0.0033	0332	1206	1.15	1206	1812	1.15	1.9	1206	1.15	1812	2.0	1812	2.0	1812	2.0
0.0047	0472	1206	1.15	1206	1812	1.15	2.0	1206	1.15	1812	2.0	1812	2.0	1812	2.5
0.0068	0682	1206	1.15	1206	1812	1.15	2.0	1206	1.15	1812	2.0	1812	2.0	2220	2.0
0.010	0103	1206	1.15	1206	1812	1.15	2.0	1206	1.15	1812	2.0	2220	1.9	2220	2.4
0.015	0153	1206	1.15	1206	1812	1.15	2.4	1210	1.8	1812	2.4	2220	2.2	2220	3.4
0.022	0223	1206	1.15	1206	1812	1.15	2.0	1210	1.8	1812	2.9	2220	2.8	2824	3.4
0.033	0333	1210	1.8	1210	1812	1.8	2.0	1812	2.0	2220	2.2	2220	3.9	2824	4.8
0.047	0473	1210	1.8	1210	1812	1.8	2.7	1812	2.6	2220	2.9	2824	3.2	4030	4.0
0.068	0683	1210	1.8	1210	1812	1.8	2.0	1812	2.0	2220	4.0	2824	4.4	4030	5.5
0.100	0104	1210	2.3	1210	1812	2.3	2.8	1812	3.0	2220	4.5	4030	5.3	5040	5.2
0.150	0154			1812		2.0		2220	3.3	2824	4.7	4030	6.0	5040**	6.9
0.220	0224			1812		3.0		2220	4.0	2824	5.7	5040	5.0	6054	6.0
0.330	0334			2220		4.0		2220	4.2	4030	6.1	6054	5.9		
0.470	0474			2220		4.0		2824*	4.5	5040	5.5	6054	6.5		
0.680	0684			2220		3.9		2824*	4.5	6054	4.6				
1	0105			2824*		4.7		4030	6.0	6054	6.4				
1.5	0155			2824*		4.7		5040	5.5						
2.2	0225			4030		6.1		5040	6.9						
3.3	0335			6054		5.3		6054	7.1						
4.7	0475			6054		7.2									

50V
63V

For other values: upon request
*Special length: 7.3 +0.7/-0.3 (0.287 +0.028/-0.012)
**Only available in tolerance 10%

AEC-Q200 Qualified

www.EngineeringEBooksPdf.com



The FFLC for EV / HEV are specifically designed for DC filtering, high rms current and high temperature capability for automotive applications.

Parts are designed based on customer's requirements with rectangular, resin filled plastic case or aluminum case according to request.

FFLC capacitors for EV / HEV meet the level 2 requirement of the fire behaviour standard NF F 16 102.

GENERAL CHARACTERISTICS

Operating Temperature	-40C to +105ºC hotspot temperature up to +115ºC hotspot for low duration
Working Voltage	75Vdc to 1400Vdc
Capacitance	1µF to 27mF
Test Voltage between Terminals	1.5x$U_N$dc during 10s @ 25ºC
Test Voltage between Terminals and Case	4kVrms@50Hz during 1min. Will only be performed on type sets

APPLICATIONS

- Power transmission on EV and HEV
  - to prevent ripple currents from reaching back to the power source
  - to smooth out DC bus voltage variations
- DC filtering
  - DC/DC inverters for air conditioning

AND MORE

HOW TO ORDER

To prepare an offer according to your exact requirements, please provide us the following information:

Capacitance value: nominal, tolerance, minimum at the end of life

Voltage: mission of profile, for example x% time @ V1, y% time @ V2, z% time at V3, etc…

Temperature of use mission of profile, for example x% time @ T1, y% time @ T2, z% time at V3, etc…

Cooling: air, cooling plate, cooling plate on one side, air on other sides

Rms current: mission of profile, for example x% time @ Irms1 y% time @ Irms2, z% time at Irms3, etc…

Life time expectancy: with voltage, without voltage

Dimensions: preferred if not fixed at beginning of design if fixed: maximum dimensions allowed
Electrical tab location

RoHS COMPLIANT

TECHNOLOGY COMPARISON

Type	Film Capacitors	Electrolytic Capacitors
Surge Voltage	up to 2 times Undc	1.2 Undc max.
Reversal Voltage	Yes	No
Rms. Current	up to 1Arms per µF	0.025 Arms per µF
MTBF	10M hours	1M hours
Life Time	> 100,000 hours	40,000 hours
Storage	> 10 years	1 year max.
Environment	Friendly	No
End of Life	Soft	Explosion

One unique feature of this technology (as opposed to electrolytics) is how the capacitor reacts at the end of its lifetime. Unlike aluminium electrolytics, film capacitors using controlled self-healing technology do not have a catastrophic failure mode. FFLC for EV / HEV simply experience a parametric loss of capacitance of about 5% or 10% function of requests, with no risk of short circuit.

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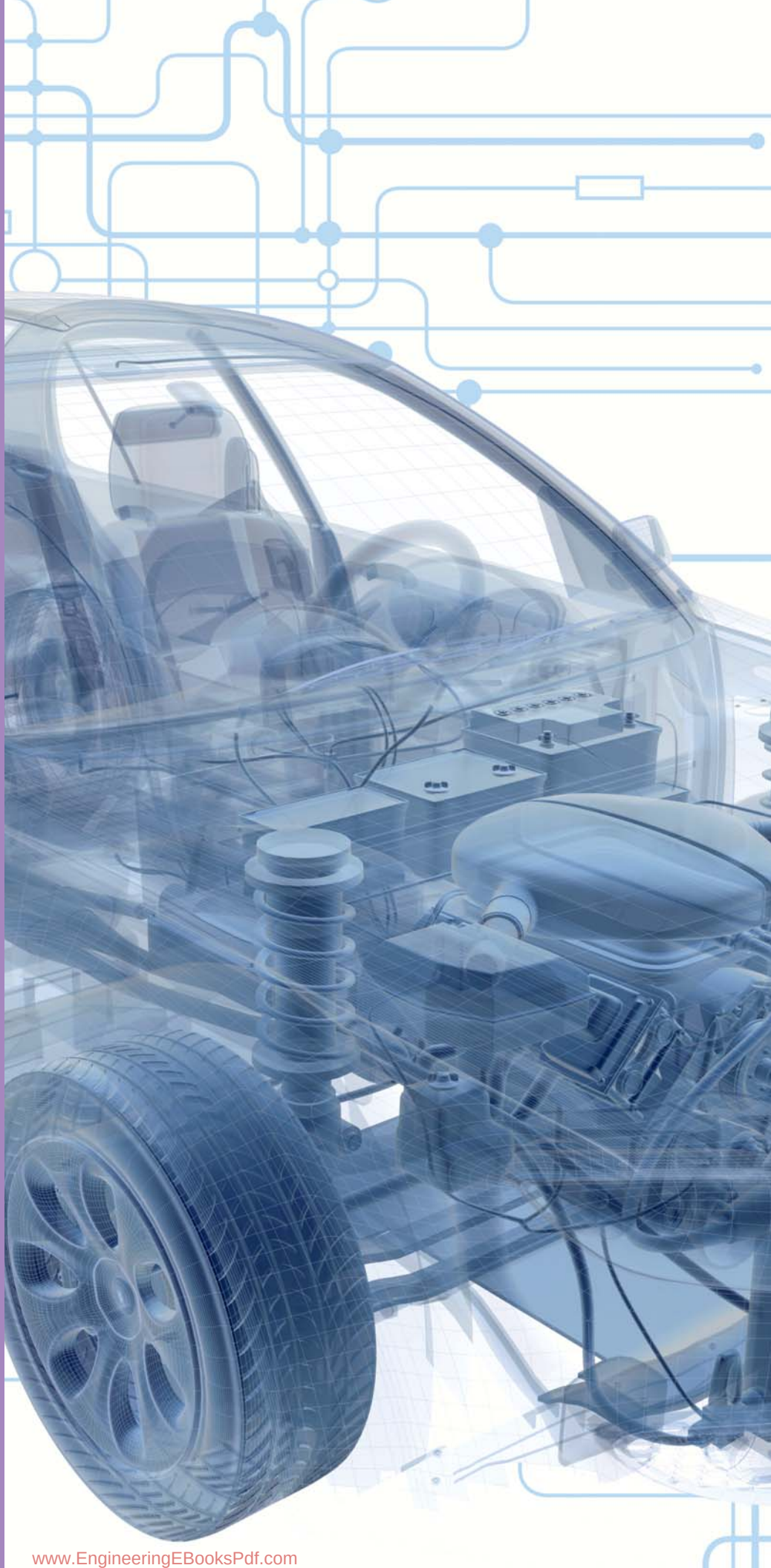
CIRCUIT PROTECTION & SIGNAL INTEGRITY

AVX Automotive varistors and thermistors help to protect sensitive electronic systems against ESD transients while reducing EMI/RFI and monitoring temperatures.

Innovative solutions include:

- General Circuit Protection
  Multilayer varistors in discrete and array pages for protecting sensitive circuits in demanding automotive environments.
- Load Dump Protection
  AVX designs, manufactures and qualifies multilayer varistors to protect against load dump transients.
- CANBUS and FLEXRAY VARISTOR
  A single component solution for protecting automotive communication BUS lines while providing EMI/RFI filtering.
- CONTROLLED CAPACITANCE VARISTOR
  Provides protection against transient voltage and targeted EMI/RFI filtering for optimal system performance.
- HIGH TEMPERATURE VARISTORS
  SMT and radial varistors with a 150°C max operating temperature are designed for under hood and high temperature applications.
- ULTRA LOW CAPACITANCE VARISTOR
  Sub pF AG series ultra-low capacitance parts are designed for capacitance sensitive applications such as high speed data lines, sensors, RF circuits, HDMI, touch screens, touch controls and others.

AVX®



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LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

GENERAL DESCRIPTION

The TransGuard Automotive Series are zinc oxide (ZnO) based ceramic semiconductor devices with non-linear, bi-directional voltage-current characteristics.

They have the advantage of offering bi-directional overvoltage protection as well as EMI/RFI attenuation in a single SMT package. The Automotive Series high current and high energy handling capability make them well suited for protection against automotive related transients.

AVX VG series parts (large case size, high energy) are glass encapsulated. These parts provide the same high reliability as traditional VC series parts. The glass encapsulation provides also enhanced resistance against harsh environment or process such as acids, salts, chlorite flux.

Operating Temperature: -55ºC to +125ºC

FEATURES

- High Reliability
- High Energy Absorption (Load Dump)
- High Current Handling
- AEC Q200 Qualified
- Bi-Directional protection
- EMI/RFI attenuation
- Multi-strike capability
- Sub 1nS response to ESD strike

APPLICATIONS

- Internal Combustion Engine (ICE) Vehicles
- Hybrid Electric Vehicles (HEV)
- Plug-in Hybrid Electric Vehicles (PHEV)
- Commercial Vehicles
  - CAN, LIN, FLEXRAY based modules
  - Sensors
  - Module load dump protection
  - Motor/inductive load transient suppression

HOW TO ORDER

VC	AS	1206	18	D	400	R	P

Varistor Chip
VC = Varistor Chip
VG = Varistor Glass Encapsulated Chip

Automotive Series

Case Size
0402
0603
0805
1206
1210
1812
2220
3220

Working Voltage

03 = 3.3Vdc	30 = 30Vdc
05 = 5.6Vdc	31 = 31Vdc
09 = 9Vdc	34 = 34Vdc
12 = 12Vdc	38 = 38Vdc
14 = 14Vdc	42 = 42Vdc
16 = 16Vdc	45 = 45Vdc
18 = 18Vdc	48 = 48Vdc
22 = 22Vdc	56 = 56Vdc
26 = 26Vdc	60 = 60Vdc
	65 = 65Vdc
	85 = 85Vdc

Energy Rating

A = 0.1J	L = 0.8J
B = 0.2J	S = 1.9-2.0J
C = 0.3J	X = 0.05J
D = 0.4J	M = 1J
E = 0.5J	N = 1.1J
F = 0.7J	U = 4.0-5.0J
H = 1.2J	P = 2.5-3.7J
J = 1.5J	Y = 6.5-12J
K = 0.6J	

Clamping Voltage

140 = 14V	570 = 57V
150 = 18V	580 = 60V
220 = 22V	620 = 67V
250 = 27V	650 = 67V
300 = 32V	770 = 77V
380 = 38V	800 = 80V
390 = 42V	900 = 90V
400 = 42V	101 = 100V
440 = 44V	111 = 110V
490 = 49V	131 = 135V
540 = 54V	151 = 150V

Package
D = 7" (1000)*
R = 7" (4000)*
T = 13" (10,000)*
W = 7" (10,000)**
0402 only

*Not available for 0402
**Only available for 0402

Termination
P = Ni/Sn plated

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ELECTRICAL CHARACTERISTICS

AVX PN	V_W (DC)	V_W (AC)	V_B	V_C	I_{VC}	I_L	E_T	E_{LD}	I_P	Cap	Freq	V_{Jump}	$P_{Diss.\ Max}$
	Vdc	Vac	V	V	A	µA	J	J	A	pF	V	W	
VCAS060303A140	3.3	2.3	6.0±20%	14	1	50	0.1	-	30	1450	K	-	0.002
VCAS080503A140	3.3	2.3	6.0±20%	14	1	50	0.1	-	40	1000	K	-	0.002
VCAS080503C140	3.3	2.3	6.0±20%	14	1	50	0.3	-	120	4500	K	-	0.006
VCAS120603A140	3.3	2.3	6.0±20%	14	1	50	0.1	-	40	1500	K	-	0.002
VCAS120603D140	3.3	2.3	6.0±20%	14	1	50	0.4	-	150	4000	K	-	0.009
VCAS040205X150 _ _	5.6	4.0	8.5±20%	18	1	35	0.05	-	20	175	M	-	0.001
VCAS060305A150 _ _	5.6	4.0	8.5±20%	18	1	35	0.1	-	30	750	K	-	0.001
VCAS080505A150 _ _	5.6	4.0	8.5±20%	18	1	35	0.1	-	40	1100	K	-	0.001
VCAS080505C150 _ _	5.6	4.0	8.5±20%	18	1	35	0.3	-	120	3000	K	-	0.005
VCAS120605A150 _ _	5.6	4.0	8.5±20%	18	1	35	0.1	-	40	1200	K	-	0.002
VCAS120605D150 _ _	5.6	4.0	8.5±20%	18	1	35	0.4	-	150	3000	K	-	0.008
VCAS040209X200 _ _	9	6.4	12.7±15%	22	1	25	0.05	-	20	175	M	-	0.001
VCAS060309A200 _ _	9	6.4	12.7±15%	22	1	25	0.1	-	30	550	K	-	0.002
VCAS080509A200 _ _	9	6.4	12.7±15%	22	1	25	0.1	-	40	750	K	-	0.002
VCAS080512A250 _ _	12	8.5	16±15%	27	1	25	0.1	-	40	525	K	-	0.002
VCAS040214X300 _ _	14	10	18.5±12%	32	1	15	0.05	-	20	85	K	16	0.001
VCAS060314A300 _ _	14	10	18.5±12%	32	1	15	0.1	-	30	350	K	16	0.002
VCAS080514A300 _ _	14	10	18.5±12%	32	1	15	0.1	-	40	325	K	16	0.002
VCAS080514C300 _ _	14	10	18.5±12%	32	1	15	0.3	-	120	900	K	20	0.006
VCAS120614A300 _ _	14	10	18.5±12%	32	1	15	0.1	-	40	600	K	20	0.002
VCAS120614D300 _ _	14	10	18.5±12%	32	1	15	0.4	-	150	1050	K	20	0.008
VCAS060316B400 _ _	16	11	25.5±10%	42	1	10	0.2	0.25	30	150	K	27.5	0.003
VCAS120616K380 _ _	16	11	25.5±10%	38	1	10	0.6	1.5	200	930	K	27.5	0.010
VCAS121016J390 _ _	16	11	25.5±10%	42	5	10	1.6	3	500	3100	K	27.5	0.030
VGAS121016S390	16	14	24.5±10%	40	2.5	15	2	5	500	3000	K	27.5	0.01
VGAS181216P390	16	11	24.5±10%	40	5	15	2.9	10	1000	7000	K	27.5	0.07
VGAS222016Y390	16	11	24.5±10%	40	10	15	10.2	45	1500	20000	K	27.5	0.08
VGAS181216P400 _ _	16	11	24.5±10%	42	5	10	2.9	10	1000	5000	K	27.5	0.070
VGAS222016Y400	16	11	24.5±10%	42	10	10	7.2	25	1500	13000	K	25.5	0.100
VCAS040218X400 _ _	18	13	25.5±10%	42	1	10	0.05	0.05	20	65	M	27.5	0.001
VCAS060318A400 _ _	18	13	25.5±10%	42	1	10	0.1	0.25	30	150	K	27.5	0.003
VCAS080518A400 _ _	18	13	25.5±10%	42	1	10	0.1	0.1	30	225	K	27.5	0.002
VCAS080518C400 _ _	18	13	25.5±10%	42	1	10	0.3	1	120	550	K	27.5	0.007
VCAS120618A400 _ _	18	13	25.5±10%	42	1	10	0.1	0.5	30	350	K	27.5	0.002
VCAS120618D400 _ _	18	13	25.5±10%	42	1	10	0.4	1.5	150	900	K	27.5	0.008
VCAS120618E380 _ _	18	13	25.5±10%	38	1	10	0.5	1.5	200	930	K	27.5	0.010
VCAS121018J390 _ _	18	13	25.5±10%	42	5	10	1.6	3	500	3100	K	27.5	0.030
VGAS181218P440	18	14	27.5±10%	44	5	15	2.9	6	800	5000	K	27.5	0.05
VGAS222022Y490	22	17	30±10%	49	10	15	6.8	25	1200	12000	K	27.5	0.03
VCAS060326A580 _ _	26	18	34.5±10%	60	1	10	0.1	0.1	30	155	K	27.5	0.002
VCAS080526A580 _ _	26	18	34.5±10%	60	1	10	0.1	0.15	30	120	K	27.5	0.002
VCAS080526C580 _ _	26	18	34.5±10%	60	1	10	0.3	0.5	100	250	K	27.5	0.006
VCAS120626D580 _ _	26	18	34.5±10%	60	1	10	0.4	1	120	500	K	27.5	0.008
VCAS120626F540 _ _	26	18	33.0±10%	54	1	15	0.7	1.5	200	600	K	27.5	0.008
VCAS121026H560 _ _	26	18	34.5±10%	60	5	10	1.2	3	300	2150	K	27.5	0.018
VGAS181226P570	26	23	35.0±10%	57	5	15	2.5	8	600	3000	K	30	0.015
VGAS222026Y570	26	23	35±10%	57	10	15	6.8	25	1100	7000	K	30	0.030
VGAS322026Z570	26	23	35±10%	57	10	15	13	50	1800	15000	K	30	0.04
VCAS060330A650 _ _	30	21	41.0±10%	67	1	10	0.1	0.15	30	125	K	29	0.002
VCAS080530A650 _ _	30	21	41.0±10%	67	1	10	0.1	0.15	30	90	M	29	0.002
VCAS080530C650 _ _	30	21	41.0±10%	67	1	10	0.3	0.5	80	250	K	29	0.005
VCAS120630D650 _ _	30	21	41.0±10%	67	1	10	0.4	1	120	400	K	29	0.008
VCAS121030H620 _ _	30	21	41.0±10%	67	5	10	1.2	3	280	1850	K	30	0.018
VCAS121030S620 _ _	30	21	41.0±10%	67	5	10	1.9	3	300	1500	K	29	0.038
VCAS080531C650 _ _	31	25	39.0±10%	65	1	10	0.3	0.5	80	250	K	29	0.005
VCAS120631M650 _ _	31	25	39.0±10%	65	1	15	1	1.5	200	500	K	29	0.008
VGAS181231P650	31	25	39.0±10%	65	5	15	3.7	8	800	2600	K	30	0.06
VCAS120634N770 _ _	34	30	47.0±10%	77	1	15	1.1	1.5	200	400	K	48	0.008
VGAS121034S770 _ _	34	30	47.0±10%	77	2.5	15	2	3.0	400	1000	K	48	0.040
VGAS181234U770 _ _	34	30	47.0±10%	77	5	15	5	6.1	800	1500	K	48	0.080
VGAS222034Y770	34	30	47.0±10%	77	10	15	12	25	2000	6300	K	48	0.240
VCAS080538C770 _ _	38	30	47.0±10%	77	1	10	0.3	-	80	200	K	48	0.006
VCAS120642L800 _ _	42	32	51.0±10%	80	1	15	0.8	-	180	600	K	48	0.016
VCAS120642K900	42	32	56±10%	90	1	15	0.6		200	260	K	48	0.012
VGAS181242U900	42	35	56.0±10%	90	5	15	4.0	6	500	1200	K	48	0.015

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ELECTRICAL CHARACTERISTICS

AVX PN	V_W (DC)	V_W (AC)	V_B	V_C	I_{VC}	I_L	E_T	E_{LD}	I_P	Cap	Freq	V_{Jump}	$P_{Diss.\ Max}$
	Vdc	Vac	V	V	A	µA	J	J	A	pF	V	W	
VGAS222042Y900	42	37	56±10%	90	10	15	12	24	1000	5000	K	48	0.06
VCAS120645K900	45	35	56±10%	90	1	25	0.6		200	260	K	48	0.012N
VCAS120648D101 _ _	48	34	62.0±10%	100	1	10	0.4	-	100	225	K	48	0.008
VCAS121048H101 _ _	48	34	62.0±10%	100	1	10	1.2	-	250	500	K	48	0.022
VCAS120656F111 _ _	56	40	68.0±10%	110	1	15	0.7	-	100	180	K	48	0.014
VGAS181256U111	56	40	68±10%	110	5	15	4.8	-	500	1100	K	48	0.04
VCAS120660M131 _ _	60	50	82.0±10%	135	1	15	1	-	150	250	K	48	0.008
VCAS121060J121	60	42	76±10%	120	5	10	1.5		250	400	K	48	0.03
VGAS121065P131	65	50	82±10%	135	2.5	15	2.7		350	600	K	48	0.05
VGAS181265U131	65	50	82±10%	135	5	15	4.5	-	400	800	K	48	0.03
VGAS222065Y131	65	50	82±10%	135	10	15	6.5	-	1100	3000	K	48	0.06
VCAS121085S151 _ _	85	60	100.0±10%	150	1	35	2	-	250	275	K	48	0.040
VGAS181285U161	85	60	100±10%	165	5	15	4.5	-	400	500	K	48	0.04

V_W(DC) DC Working Voltage [V]
V_W(AC) AC Working Voltage [V]
V_B Typical Breakdown Votage [V @ 1mA$_{DC}$]
V_C Clamping Voltage [V @ I_{IV}]
I_{VC} Test Current for V_C
I_L Maximum leakage current at the working voltage [µA]

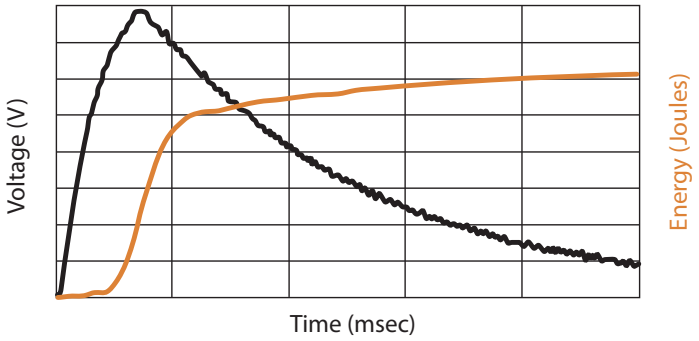
E_t Transient Energy Rating [J, 10x1000µS]
I_P Peak Current Rating [A, 8x20µS]
Cap Typical capacitance [pF] @ frequency specified and 0.5V_{RMS}
V_{Jump} Jump Start (V)
$P_.$ Power Dissipation (W)

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AUTOMOTIVE SERIES – LOAD DUMP TEST

According to ISO DP7637 rev 2 Pulse 5

Automotive Load Dump Pulse (According to ISO 7637 Pulse 5)



When using the test method indicated below, the amount of Energy dissipated by the varistor must not exceed the Load Dump Energy value specified in the product table.

LOAD DUMP LIBRARY

Typical max Vz versus Pulse duration and Ri

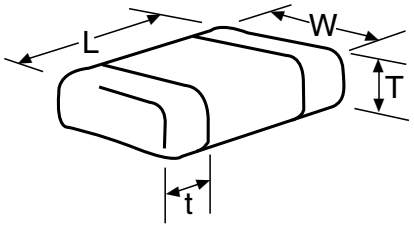
12V SYSTEMS

VCAS060316B400	0.5Ω	1Ω	4Ω
100ms	37	38	42
200ms	36	37	41
400ms	35	36	39
VCAS120616K380	0.5Ω	1Ω	4Ω
100ms	42	45	55
200ms	40	43	50
400ms	39	40	45
VCAS121016J390	0.5Ω	1Ω	4Ω
100ms	48	53	74
200ms	46	50	64
400ms	43	46	56
VGAS181216P400	0.5Ω	1Ω	4Ω
100ms	46	52	72
200ms	37	41	59
400ms	32	35	51
VGAS222016Y400	0.5Ω	1Ω	4Ω
100ms	53	60	77
200ms	50	55	73
400ms	47	50	66
VCAS040218X400	0.5Ω	1Ω	4Ω
100ms	38	39	40
200ms	37	37	38
400ms	34	35	36
VCAS060318A400	0.5Ω	1Ω	4Ω
100ms	37	38	42
200ms	36	37	41
400ms	35	36	39
VCAS080518A400	0.5Ω	1Ω	4Ω
100ms	37	39	40
200ms	35	38	39
400ms	33	37	38
VCAS080518C400	0.5Ω	1Ω	4Ω
100ms	40	41	48
200ms	39	40	45
400ms	38	39	42
VCAS120618A400	0.5Ω	1Ω	4Ω
100ms	43	45	55
200ms	41	43	48
400ms	40	41	45
VCAS120618D400	0.5Ω	1Ω	4Ω
100ms	42	45	55
200ms	40	42	50
400ms	39	40	45
VCAS120618E380	0.5Ω	1Ω	4Ω
100ms	42	45	55
200ms	40	43	50
400ms	39	40	45
VCAS121018J390	0.5Ω	1Ω	4Ω
100ms	48	53	74
200ms	46	50	64
400ms	43	46	56

24V SYSTEMS

VCAS060326A580	1Ω	4Ω	8Ω
100ms	51	56	58
200ms	50	54	56
400ms	49	51	53
VCAS080526A580	1Ω	4Ω	8Ω
100ms	51	53	59
200ms	49	51	57
400ms	48	50	51
VCAS080526C580	1Ω	4Ω	8Ω
100ms	51	54	62
200ms	49	51	56
400ms	48	49	51
VCAS120626D580	1Ω	4Ω	8Ω
100ms	52	60	68
200ms	50	57	65
400ms	47	54	61
VCAS121026H560	1Ω	4Ω	8Ω
100ms	61	74	91
200ms	59	69	82
400ms	55	64	70
VCAS060330A650	1Ω	4Ω	8Ω
100ms	57	59	63
200ms	56	58	61
400ms	54	57	58
VCAS080530A650	1Ω	4Ω	8Ω
100ms	58	62	66
200ms	56	61	64
400ms	53	57	61
VCAS080530C650	1Ω	4Ω	8Ω
100ms	58	61	63
200ms	57	58	62
400ms	55	56	59
VCAS120630D650	1Ω	4Ω	8Ω
100ms	61	70	75
200ms	57	66	69
400ms	56	62	64
VCAS121030H620	1Ω	4Ω	8Ω
100ms	70	77	98
200ms	64	70	89
400ms	56	65	70
VGAS181234U770	1Ω	4Ω	8Ω
100ms	87	110	125
200ms	82	97	114
400ms	75	85	95
VGAS222034Y770	1Ω	4Ω	8Ω
100ms	100	125	165
200ms	91	115	155
400ms	84	104	120

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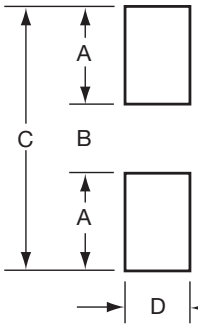


DIMENSIONS: mm (inches)

AVX Style		0402	0603	0805	1206	1210	1812	2220	3220
(L) Length	mm (in.)	1.00±0.10 (0.040±0.004)	1.60±0.15 (0.063±0.006)	2.01±0.20 (0.079±0.008)	3.20±0.20 (0.126±0.008)	3.20±0.20 (0.126±0.008)	4.50±0.30 (0.177±0.012)	5.70±0.40 (0.224±0.016)	8.20±0.40 (0.323±0.016)
(W) Width	mm (in.)	0.50±0.10 (0.020±0.004)	0.80±0.15 (0.031±0.006)	1.25±0.20 (0.049±0.008)	1.60±0.20 (0.063±0.008)	2.49±0.20 (0.098±0.008)	3.20±0.30 (0.126±0.012)	5.00±0.40 (0.197±0.016)	5.00±0.40 (0.197±0.016)
(T) Max Thickness	mm (in.)	0.6 (0.024)	0.9 (0.035)	1.02 (0.040)	1.02 (0.040) 1.70 (0.067)[1)] 1.80 (0.071)[2)]	1.70 (0.067)	2.00 (0.080)	2.50 (0.098)	2.50 max. (0.098 max.)
(t) Land Length	mm (in.)	0.25±0.15 (0.010±0.006)	0.35±0.15 (0.014±0.006)	0.71 max. (0.028 max.)	0.94 max. (0.037 max.)	1.14 max. (0.045 max.)	1.00 max. (0.039 max.)	1.00 max. (0.039 max.)	1.30 max. (0.051 max.)

1) Applicable for: VCAS120618E380, VCAS120626F540, VCAS120631M650, VCAS120634N770, VCAS120642L800, VCAS120645K900, VCAS120656F111

2) Applicable for: VCAS120642L800, VCAS120660M131



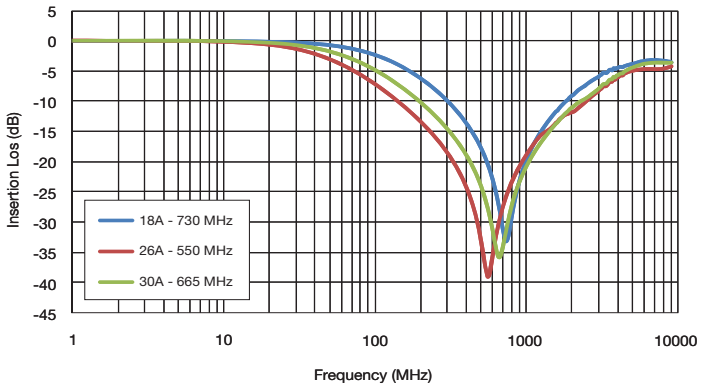
SOLDERING PAD: mm (inches)

Pad Layout	0402	0603	0805	1206	1210	1812	2220	3220
A	1.61 (0.024)	0.89 (0.035)	1.02 (0.040)	1.02 (0.040)	1.02 (0.040)	1.00 (0.039)	1.00 (0.039)	2.21 (0.087)
B	1.51 (0.020)	0.76 (0.030)	1.02 (0.040)	2.03 (0.080)	2.03 (0.080)	3.60 (0.142)	4.60 (0.18)	5.79 (0.228)
C	1.70 (0.067)	2.54 (0.100)	3.05 (0.120)	4.06 (0.160)	4.06 (0.160)	5.60 (0.220)	6.60 (0.26)	10.21 (0.402)
D	1.51 (0.020)	0.76 (0.030)	1.27 (0.050)	1.65 (0.065)	2.54 (0.100)	3.00 (0.118)	5.00 (0.20)	5.50 (0.217)

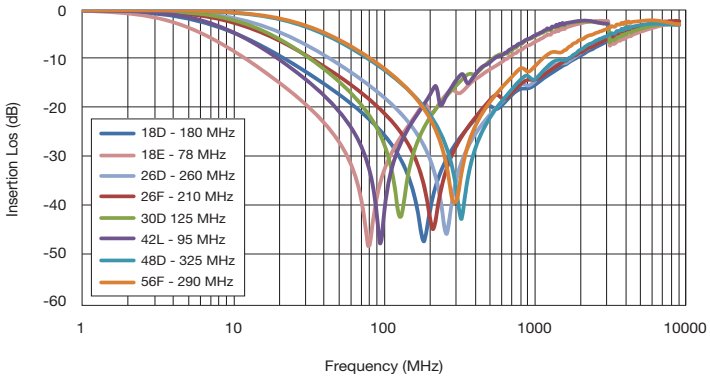
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FORWARD TRANSMISSION CHARACTERISTICS (S21)

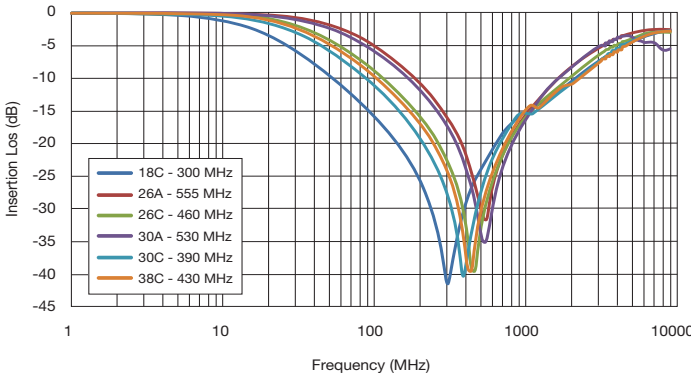
0603 Case Size



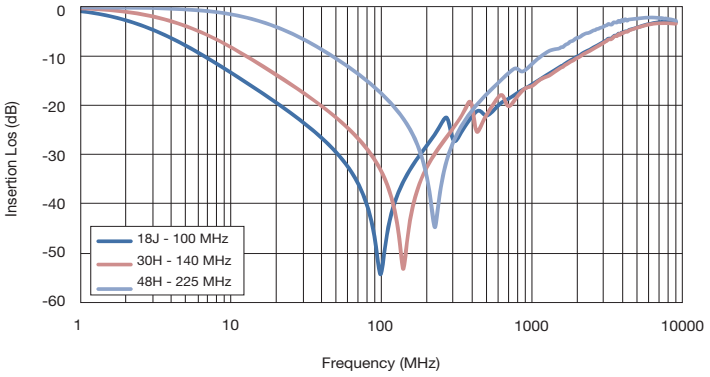
1206 Case Size



0805 Case Size

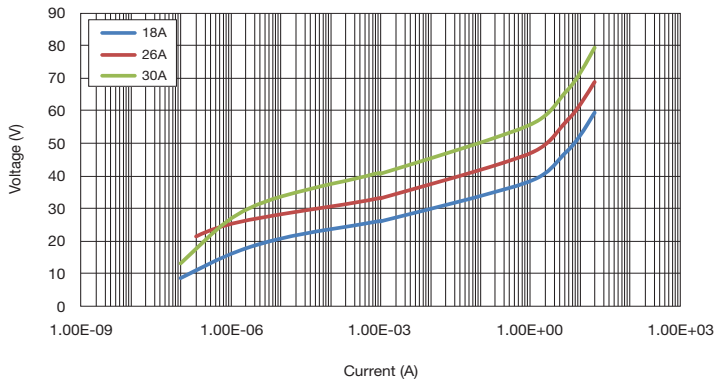


1210 Case Size

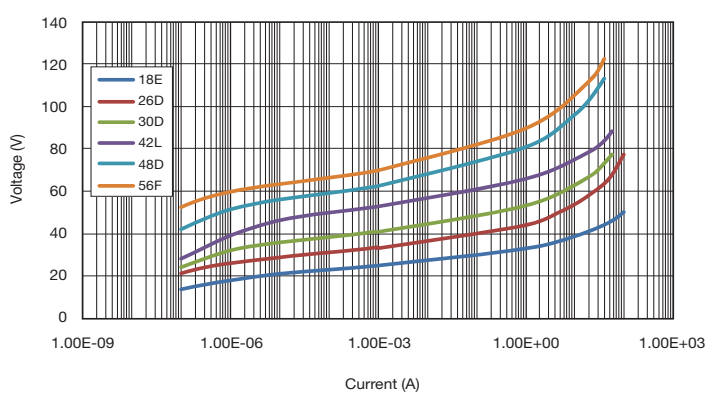


V-I CHARACTERISTICS

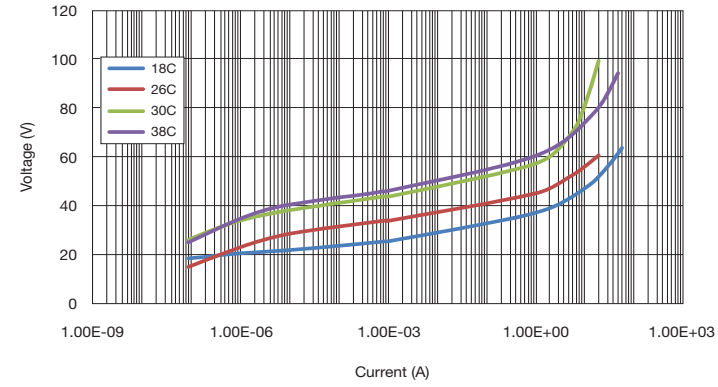
0603 Case Size



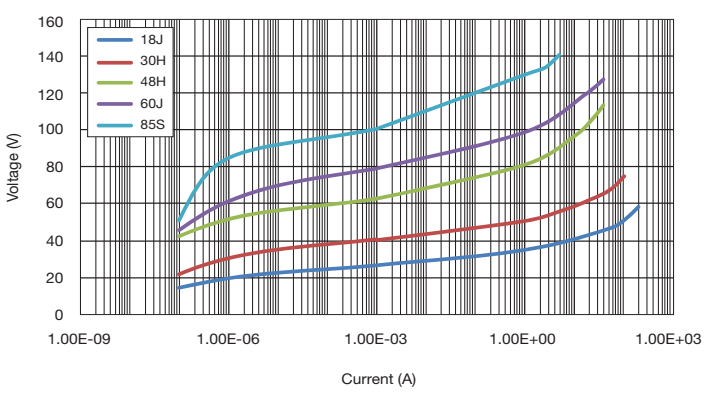
1206 Case Size



0805 Case Size

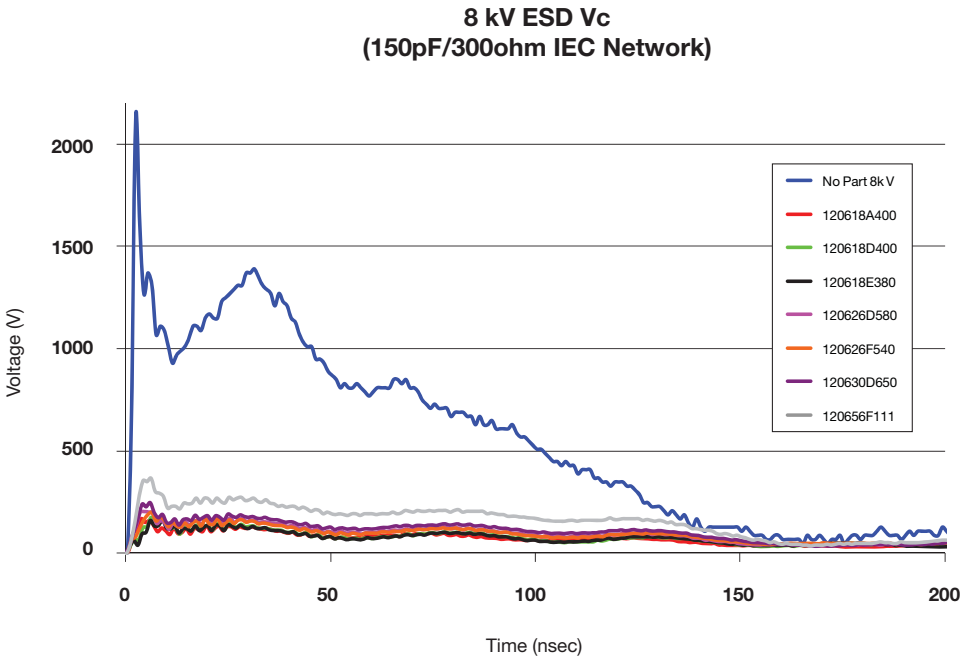


1210 Case Size



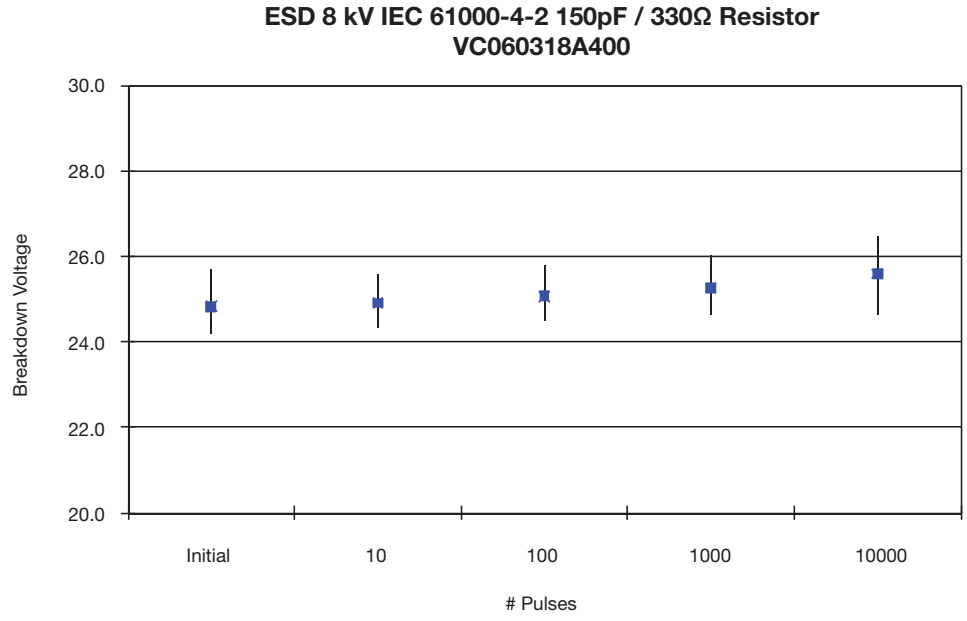
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ESD V-I CHARACTERISTICS

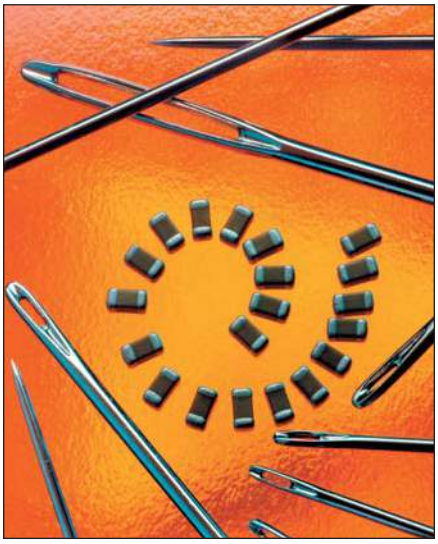


TYPICAL VOLTAGE AT 8 KV PULSE

8kV Pulse	Peak Voltage (V)	30ns Voltage (V)	100ns Voltage (V)
No Part (No Suppression)	2130	1370	517
120618A400	171	123	65
120618D400	177	133	66
120618E380	161	121	63
120626D580	203	155	88
102626F540	201	159	84
120630D650	249	177	106
120656F111	366	262	169



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The StaticGuard Automotive Series are low capacitance versions of the TransGuard and are designed for general ESD protection of CMOS, Bi-Polar, and SiGe based systems. The low capacitance makes these products suitable for use in automotive CAN and LIN bus communication lines as well as other high speed data transmission applications requiring low capacitance protection.

FEATURES

- AEC Q200 Qualified
- ISO 7637 Pulse 1-3 capability
- Meet 27.5Vdc Jump Start requirements
- Multi-strike capability
- Sub 1nS response to ESD strike

APPLICATIONS

- CAN BUS
- LIN BUS
- CMOS
- Module interfaces
- Switches
- Sensors
- Camera modules
- Datalines
- Capacitance sensitive applications

AND MORE

GENERAL CHARACTERISTICS

- Operating Temperature: -55ºC to 125ºC
- Working Voltage: ≤ 18Vdc
- Case Size: 0402, 0603, 0805

HOW TO ORDER

VC	AS	06	LC	18	X	500	R	P
Varistor Chip	**Series** AS = Automotive	**Case Size** 04 = 0402 06 = 0603 08 = 0805	**Low Cap Design**	**Working Voltage** 18 = 18.0VDC	**Energy Rating** A = 0.10 Joules V = 0.02 Joules X = 0.05 Joules	**Clamping Voltage** 150 = 18V 200 = 22V 300 = 32V 400 = 42V 500 = 50V	**Packaging** (PCS/REEL) D = 1,000 R = 4,000 T = 10,000 W = 0402 10000	**Termination** P = Ni/Sn

LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

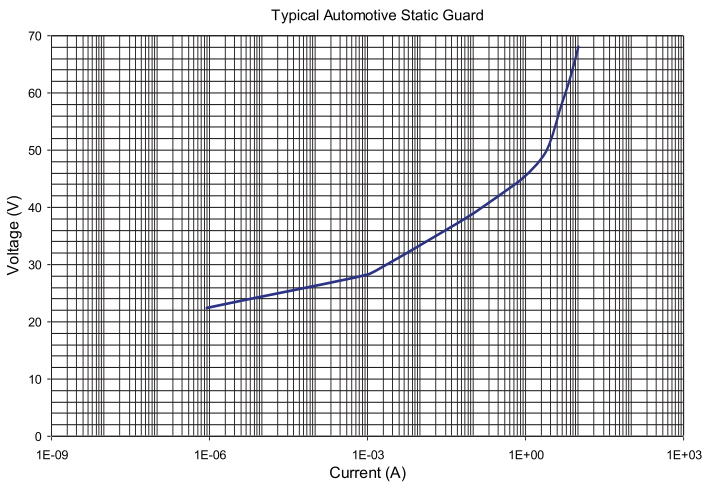
ELECTRIAL CHARACTERISTICS

AVX PN	V_W (DC)	V_W (AC)	V_B	V_C	I_{VC}	I_L	E_T	I_P	Cap	Freq	V_{JUMP}	P_{DISS}	Size
VCAS04LC18V500	≤18.0	≤14.0	25-40	50	1	10	0.02	15	40	M	27.5	0.0004	0402
VCAS06LC18X500	≤18.0	≤14.0	25-40	50	1	10	0.05	30	50	M	27.5	0.001	0603
VCAS08LC18A500	≤18.0	≤14.0	25-40	50	1	10	0.1	30	80	M	27.5	0.002	0805

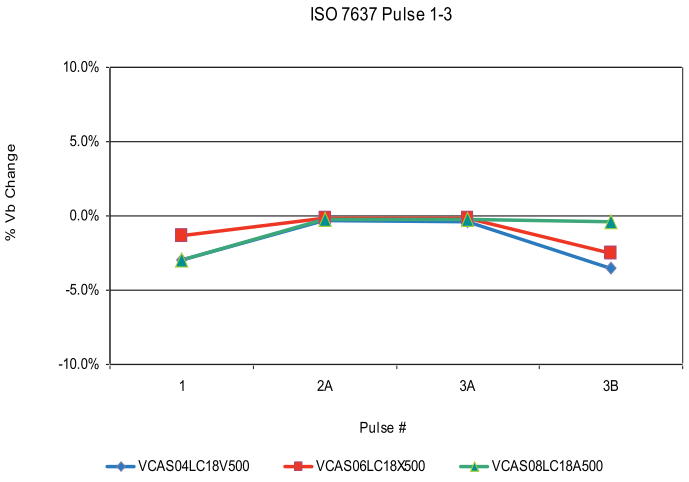
V_W(DC) DC Working Voltage [V]
V_W(AC) AC Working Voltage [V]
V_B Typical Breakdown Votage [V @ 1mA$_{DC}$, 25°C]
V_C Clamping Voltage [V @ I_{VC}]
I_{VC} Test Current for V_C [A, 8x20µs]
I_L Maximum leakage current at the working voltage, 25°C [µA]
E_T Transient Energy Rating [J, 10x1000µS]
I_P Peak Current Rating [A, 8x20µS]
Cap Typical capacitance [pF] @ frequency specified and 0.5V_{RMS}, 25°C, M = 1MHz, K = 1kHz
V_{Jump} Jump Start [V, 5 min]
P_{DISS} Power Dissipation [W]

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VOLTAGE/CURRENT CHARACTERISTICS

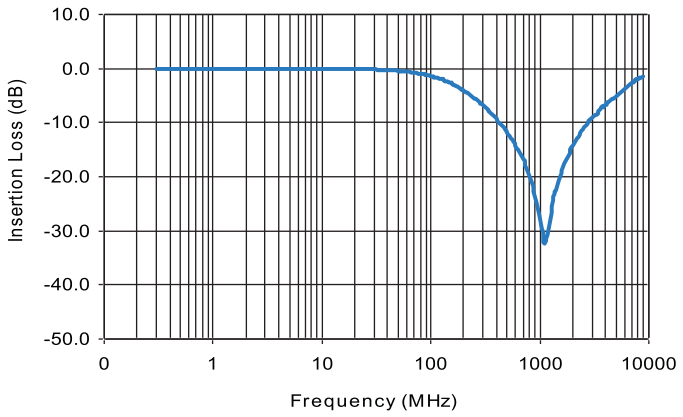


ELECTRICAL TRANSIENT CONDUCTION

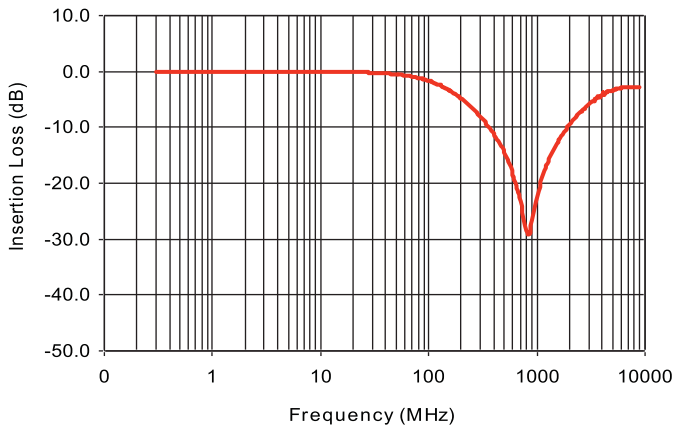


VOLTAGE/CURRENT CHARACTERISTICS

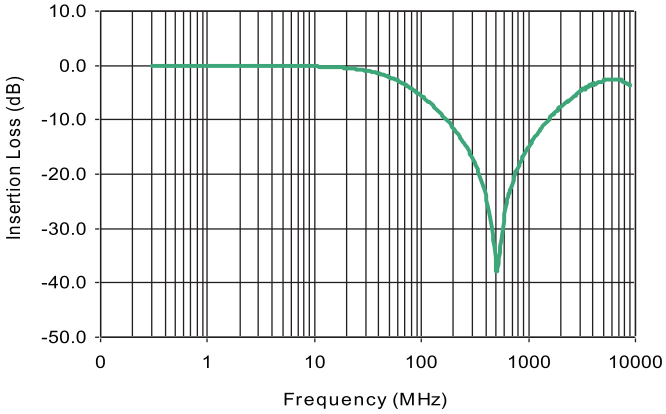
VCAS04LC18V500



VCAS06LC18X500



VCAS08LC18A500



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GENERAL DESCRIPTION



The CAN BUS and FlexRay varistor is a zinc oxide (ZnO) based ceramic semiconductor device with non-linear voltage-current characteristics (bi-directional) similar to back-to-back Zener diodes and an EMC capacitor in parallel (see equivalent circuit model). They have the added advantage of greater current and energy handling capabilities as well as EMI/RFI attenuation. Devices are fabricated by a ceramic sintering process that yields a structure of conductive ZnO grains surrounded by electrically insulating barriers, creating varistor like behavior.

AVX Communication Bus Varistors offer the advantages of large in-rush current capability, low capacitance to minimize signal distortion, fast turn on time to conservatively clamp the energy before its maximum and off state EMI filtering through their bulk capacitance. These features coupled with an extremely low FIT rate and excellent process capability make an ideal device for today's automotive or general circuit protection.

GENERAL CHARACTERISTICS

- Operting Teperature: -55°C to +125°C
- Working Voltage: ≤18Vdc
- Case Size: 0402, 0603
  0405 2xArray
  0612 4xArray

FEATURES

- Compact footprint
- High ESD capability (25kV)
- High Inrush Current (8x20µs)
- EMI/RFI Attenuation
- Low Capacitance/Low Insertion Loss
- Very Fast Response Time
- High Reliability <0.1 FIT
- AEC-Q200 Qualified

APPLICATIONS

- Communication Bus:
  CAN Bus, FlexRay, etc.
- General I/O Protocols
- Keyboard Interfaces
- Datalines
- Sensors
- Capacitance sensitive applications
  and more

HOW TO ORDER

CAN — **Style**
CAN = CAN BUS
FLX = FlexRay

0001 — **Case Size**
0001 = 0603 Discrete
0002 = 0405 2-Element
0003 = 0405 2-Element
0004 = 0612 4-Element
0005 = 0402 Discrete
0006 = 0402 Discrete
0007 = 0603 Discrete

D — **Packaging Code (Reel Size)**
D = 7" reel (1,000 pcs.)
R = 7" reel (4,000 pcs.)
T = 13" reel (10,000 pcs.)
W = 7" reel (10,000 pcs.) 0402 only

P — **Termination**
P = Ni/Sn (Plated)

RoHS COMPLIANT

PERFORMANCE CHARACTERISTICS

AVX PN	V_W (DC)	V_W (AC)	V_B	V_C	I_{VC}	I_L	E_T	I_P	Cap	Freq	V_{Jump}	$P_{Diss\ Max}$	Case	Elements
CAN0001 _ _	≤ 18	≤ 14	120	225	1	2	0.015	4	22 Max	M	27.5	0.003	0603	1
CAN0002 _ _	≤ 18	≤ 14	70	145	1	2	0.015	4	22 Max	M	27.5	0.003	0405	2
CAN0003 _ _	≤18	≤14	28.5	50	1	5	0.02	15	50 Max	M	27.5	0.0008	0405	2
CAN0004 _ _	≤ 18	≤ 14	100	180	1	2	0.015	4	22 Max	M	27.5	0.003	0612	4
CAN0005 _ _	≤ 18	≤ 14	33	55	1	2	0.05	10	37 Max	M	27.5	0.01	0402	1
CAN0006 _ _	≤18	≤14	26	45	1	5	0.02	4	17 Max	M	27.5	0.004	0402	1
CAN0007 _ _	≤ 32.0	≤ 25.0	61	120	1	5	0.05	5	15 Max	M	27.5	0.003	0603	1
FLX0005 _ _	≤ 18	≤ 14	26	45	1	5	0.02	4	17 Max	M	27.5	0.004	0402	1

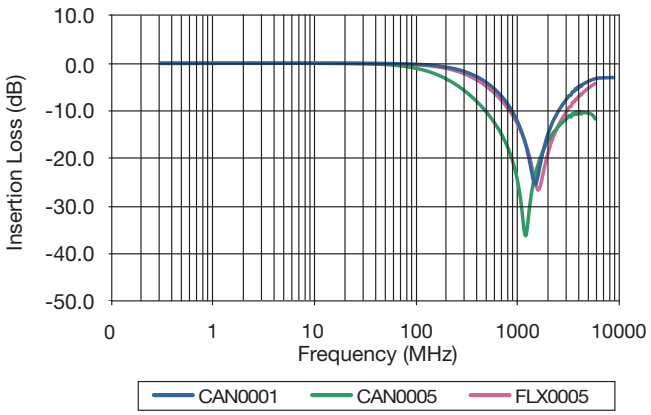
Termination Finish Code
Packaging Code

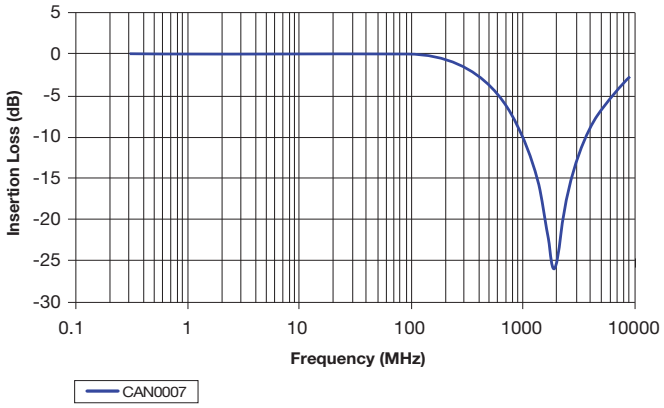
V_W (DC) DC Working Voltage (V)
V_W (AC) AC Working Voltage (V)
V_B Typical Breakdown Voltage (V @ $1mA_{DC}$)
V_C Clamping Voltage (V @ I_{VC})
I_{VC} Test Current for V_C (A, 8x20µS)
I_L Maximum Leakage Current at the Working Voltage (µA)

E_T Transient Energy Rating (J, 10x1000µS)
I_P Peak Current Rating (A, 8x20µS)
Cap Maximum Capacitance (pF) @ 1 MHz and 0.5Vrms
Temp Range -55ºC to +125ºC

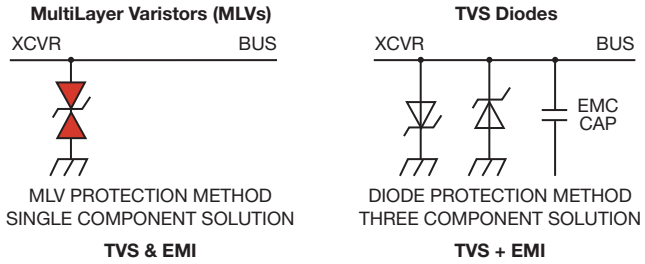
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S21 CHARACTERISTICS

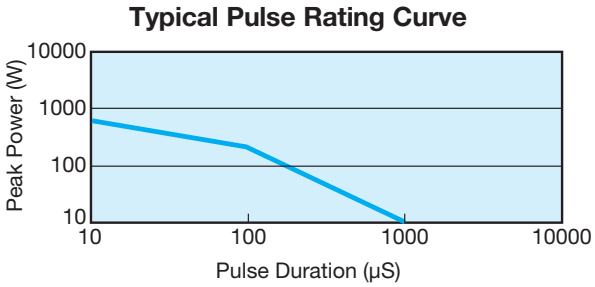




TYPICAL MLV IMPLEMENTATION

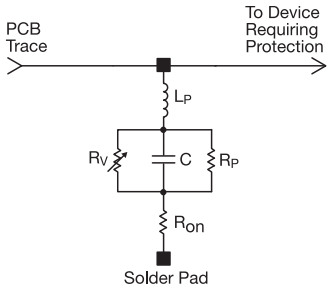


TYPICAL PULSE RATING CURVE



EQUIVALENT CIRCUIT MODEL

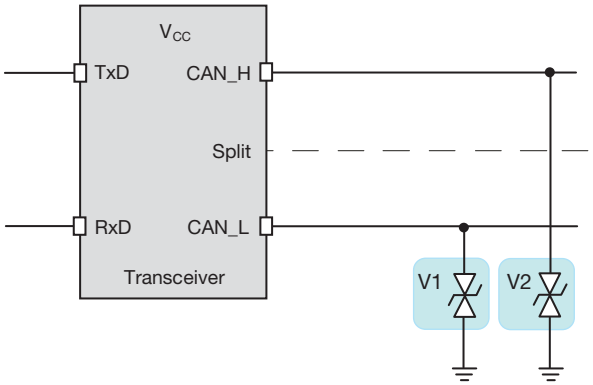
Discrete MLV Model



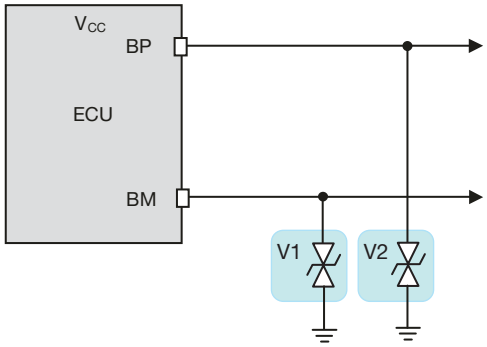
Where: R_V = Voltage Variable resistance (per VI curve)
R_p ≥ 10^{12} Ω
C = defined by voltage rating and energy level
R_{on} = turn on resistance
L_p = parallel body inductance

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TYPICAL CAN BUS IMPLEMENTATION SCHEME



TYPICAL FLEX RAY IMPLEMENTATION SCHEME



PHYSICAL DIMENSIONS

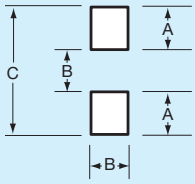
mm (inches)

	0402 Discrete	0603 Discrete	0405 Array	0612 Array
Length	1.00 ±0.10 (0.040 ±0.004)	1.60 ±0.15 (0.063 ±0.006)	1.00 ±0.15 (0.039 ±0.006)	1.60 ±0.20 (0.063 ±0.008)
Width	0.50 ±0.10 (0.020 ±0.004)	0.80 ±0.15 (0.032 ±0.006)	1.37 ±0.15 (0.054 ±0.006)	3.20 ±0.20 (0.126 ±0.008)
Thickness	0.60 Max. (0.024 Max.)	0.90 Max. (0.035 Max.)	0.66 Max. (0.026 Max.)	1.22 Max. (0.048 Max.)
Term Band Width	0.25 ±0.15 (0.010 ±0.006)	0.35 ±0.15 (0.014 ±0.006)	0.36 ±0.10 (0.014 ±0.004)	0.41 ±0.10 (0.016 ±0.010)

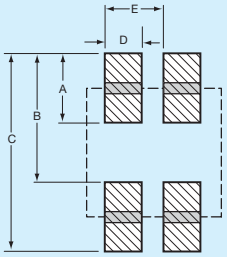
SOLDER PAD DIMENSIONS

mm (inches)

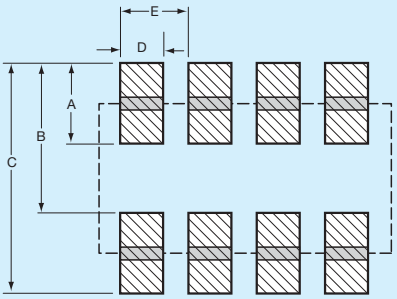
0402/0603 Discrete



0405 Array



0612 Array





0402, 0603 Discrete | **0405 Array** | **0612 Array**

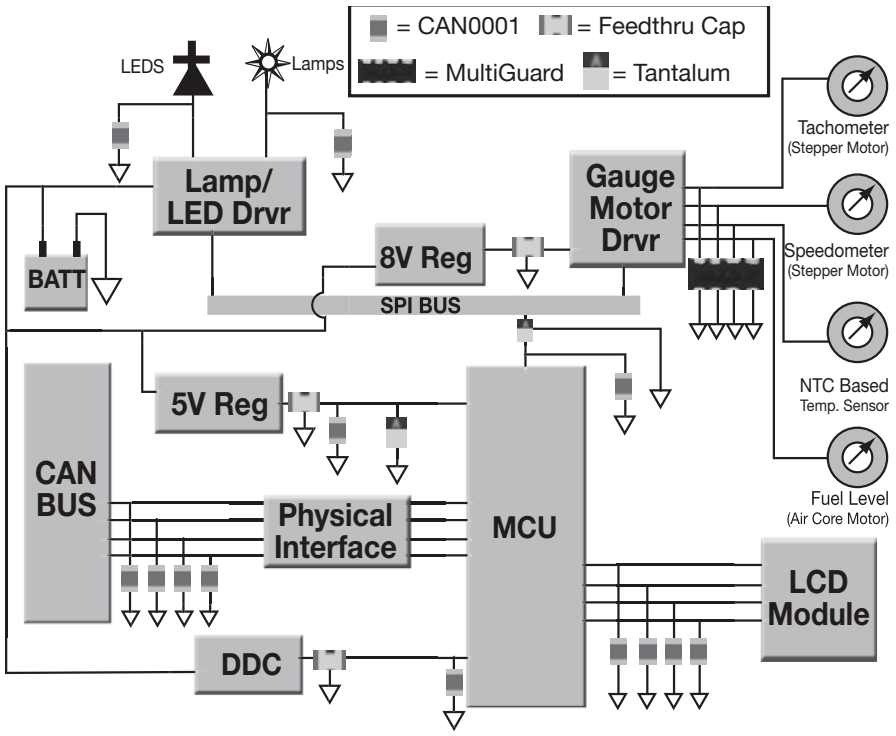
	A	B	C	D	E
0402 Discrete	0.61 (0.024)	0.51 (0.020)	1.70 (0.067)	–	–
0603 Discrete	0.89 (0.035)	0.76 (0.030)	2.54 (0.100)	–	–
0405 Array	0.46 (0.018)	0.74 (0.029)	0.12 (0047)	0.38 (0.015)	0.64 (0.025)
0612 Array	0.89 (0.035)	1.65 (0.065)	2.54 (0.100)	0.46 (0.018)	0.76 (0.030)

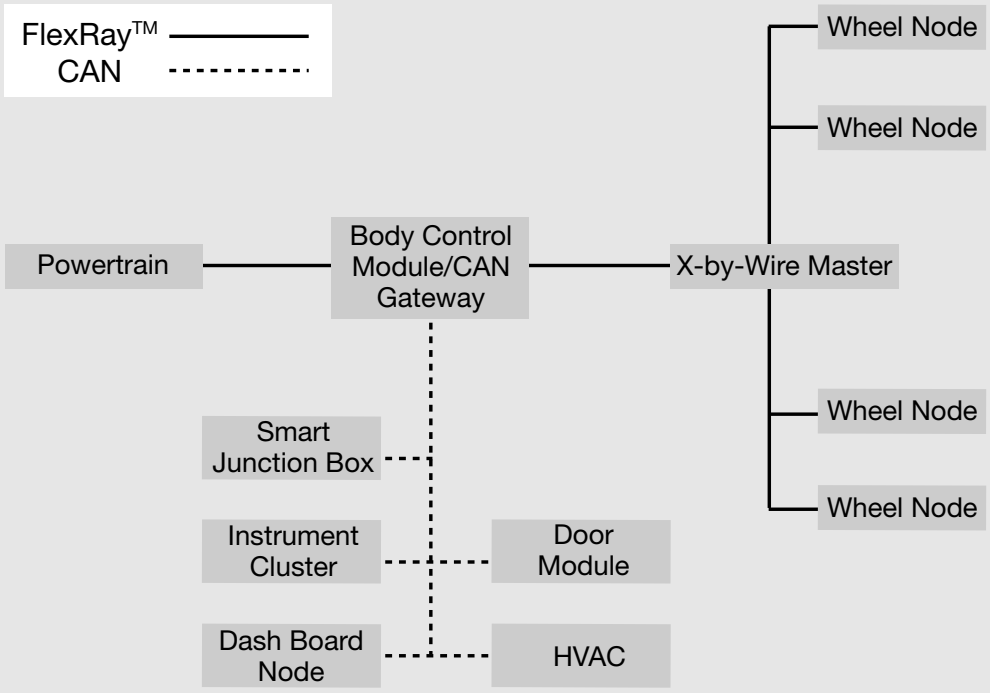
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APPLICATION

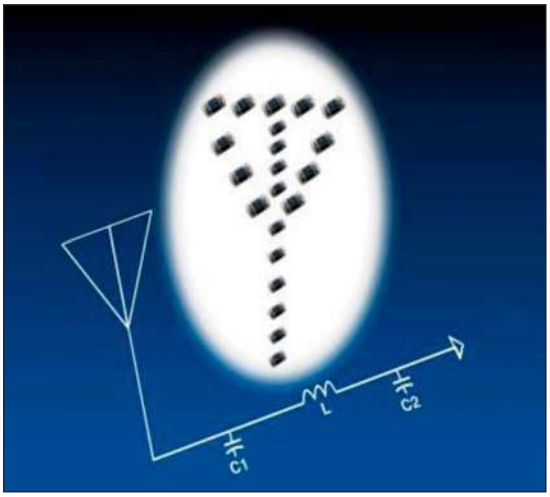
AVX CAN BUS and FlexRay varistors offer significant advantages in general areas of a typical CAN or FlexRay network as shown on the right. Some of the advantages over diodes include:

- space savings
- higher ESD capability @ 25kV contact
- higher in rush current (4A) 8 x 20µS
- FIT rate ≤0.1 failures (per billion hours)





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GENERAL DESCRIPTION

AVX 0402/0603 Automotive AntennaGuard products are an ultra low capacitance extension to the Automotive TransGuard® Series and are intended for use in RF and other capacitance sensitive circuits.

These low capacitance values have low insertion loss, low leakage current and unsurpassed reliability compared to diode options. These advantages combined with size advantages and bi-directional protection make the AntennaGuard the right choice for automotive applications including RF circuits, sensors, high-speed signal transmission lines, etc…

RoHS COMPLIANT

GENERAL CHARACTERISTICS

- Operting Teperature: -55°C to +125°C
- Working Voltage: ≤18Vdc
- Case Size: 0402, 0603

FEATURES

- AEC Q200 Qualified
- 25kV ESD rating
- Meet 27.5Vdc Jump Start requirements
- Multi-strike capability
- Sub 1nS response to ESD strike

APPLICATIONS

- RF Circuit
- Sensors
- Antennas
- Data lines
- Keyless entry
- Capacitance sensitive applications

HOW TO ORDER

VC	AS	06	AG	18	3R0	Y	A	T	1	A
Varistor Chip	**Series** AS = Automotive	**Case Size** 04 = 0402 06 = 0603	**Type**	**Working Voltage** 18 = 18.0VDC	**Capacitance** 2R0 = 2pF 3R0 = 3pF 120 = 12pF	**Non-Std Cap Tol** C = ±0.25pF (2R0) Y = Max (for 3pF) Y = +4/-2pF (for 12pF)	**Not Applicable**	**Termination** T = Ni/Sn Plated	**Reel Size** 1 = 7" reel 3 = 13" reel W = 7" reel (0402 only)	**Reel Qty** A = 4K or 10K pcs (i.e.: 1A = 4,000 3A = 10,000 WA = 10,000)

ELECTRIAL CHARACTERISTICS

AVX Part Number	V_W (DC)	V_W (AC)	I_L	Cap	Cap Tolerance	V_{Jump}	Case Size
VCAS04AG183R0YAT_ _	≤ 18	≤ 14	0.1	3	Max	27.5	0402
VCAS06AG182R0CAT_ _	≤ 18	≤ 14	0.1	2	±0.25pF	27.5	0603
VCAS06AG183R0YAT_ _	≤ 18	≤ 14	0.1	3	Max	27.5	0603
VCAS06AG18120YAT_ _	≤ 18	≤ 14	0.1	12	+4, -2pF	27.5	0603

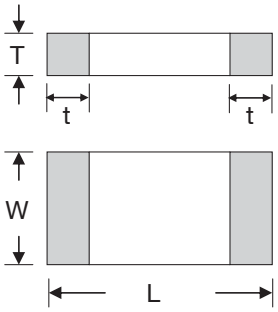
Termination Finish Code

Packaging Code

V_W (DC)	DC Working Voltage (V)
V_W (AC)	AC Working Voltage (V)
I_L	Maximum Leakage Current at the Working Voltage (µA)
Cap	Maximum Capacitance (pF) @ 1 MHz and 0.5 Vrms; VC06AG18120YAT capacitance tolerance: +4, -2pF
V_{Jump}	Jump Start (V)

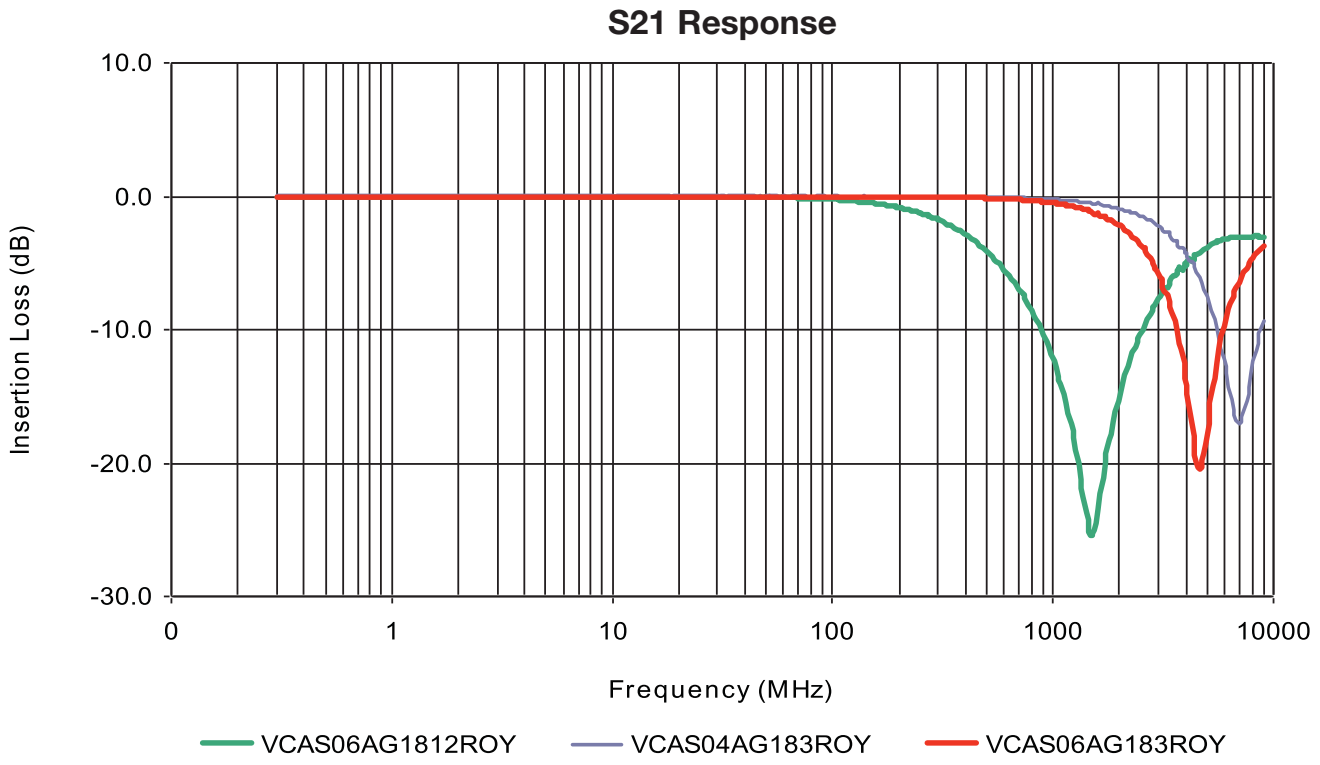
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PHYSICAL DIMENSIONS: mm (inches)



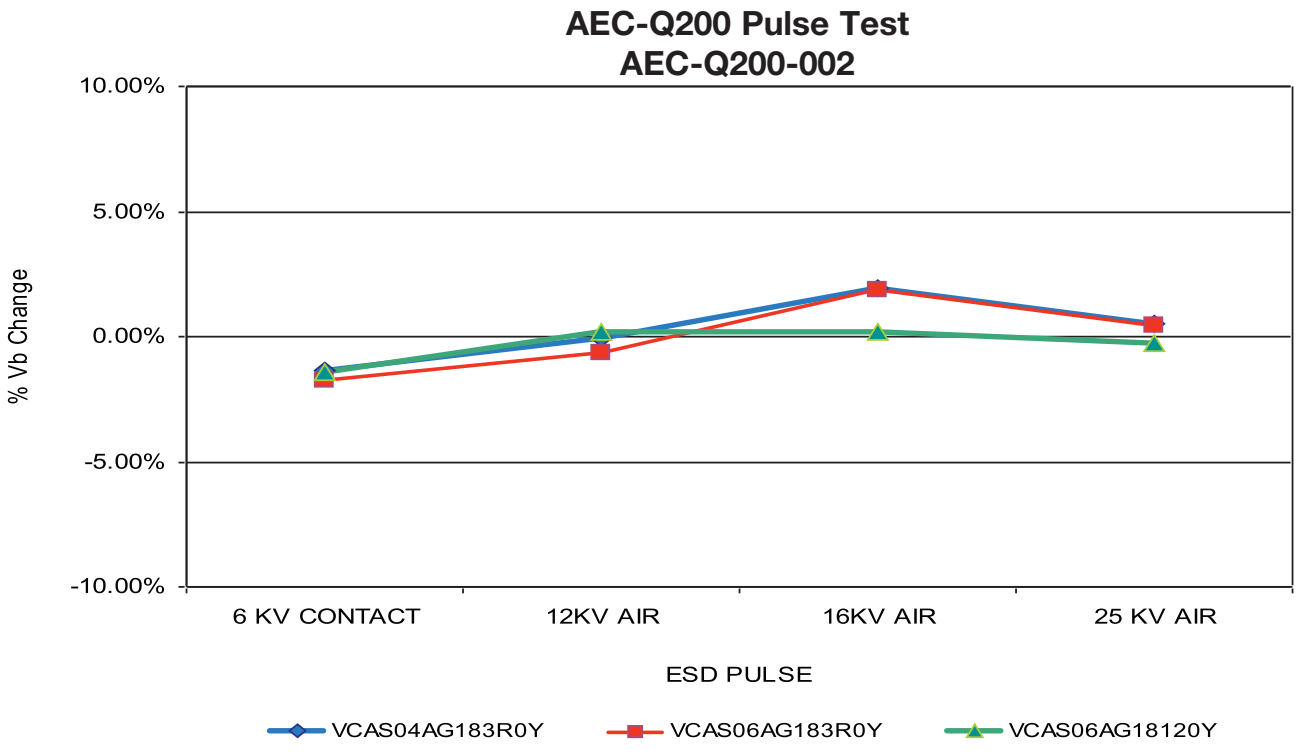
Size (EIA)	Length (L)	Width (W)	Max Thickness (T)	Land Length (t)
0402	1.00±0.10 (0.040±0.004)	0.50±0.10 (0.020±0.004)	0.60 (0.024)	0.25±0.15 (0.010±0.006)
0603	1.60±0.15 (0.063±0.006)	0.80±0.15 (0.031±0.006)	0.90 (0.035)	0.35±0.15 (0.014±0.006)

S21 TRANSMISSION CHARACTERISTICS

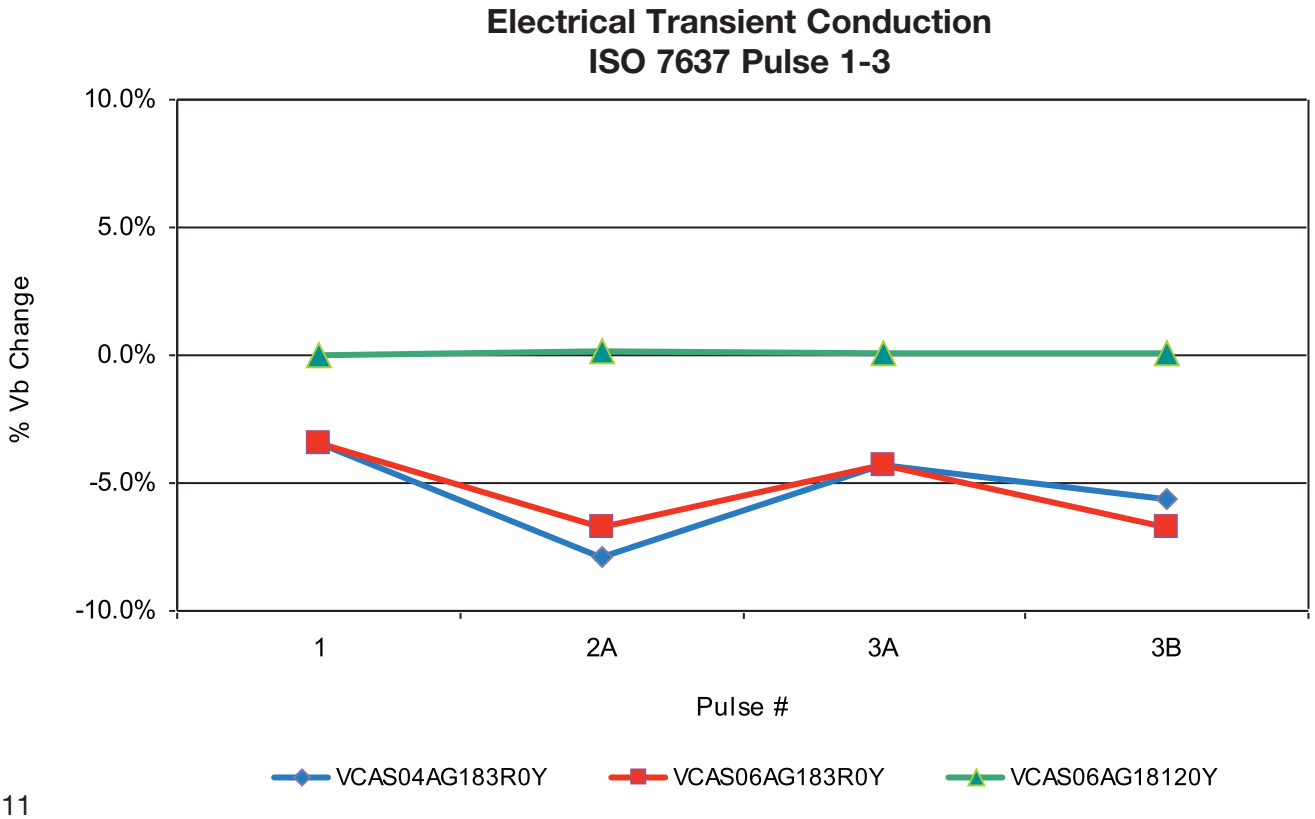


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ESD CHARACTERISTICS



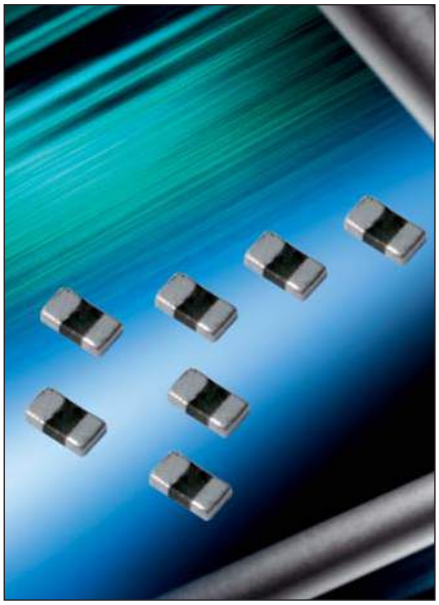
ELECTRICAL TRANSIENT CONDUCTION



092011

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Automotive Sub pF AG Series
Ultra Low Capacitance MLV for Automotive Applications



AVX offers ultra-low capacitance ESD protection in the Sub 1pF range for use in automotive circuits that are sensitive to capacitance. The Automotive Sub pF Varistor (ASPV) is available in 0.8pF capacitance value in a compact 0402 low profile package. ASPV devices provide excellent response time to ESD strikes to protect sensitive circuits from over voltage.

The development of new information processing technologies call for ever increasing digital system speeds. Higher speeds necessitate the use of ultra-low capacitance values in order to minimize signal distortion.

FEATURES
- High Reliability
- Capacitance <1pF
- Bi-Directional protection
- Fastest response time to ESD strikes
- Multi-strike capability
- Low insertion loss
- Low profile 0402 case size
- AEC-Q 200 Qualified

APPLICATIONS
- Antennas, RF circuits
- Optics
- HDMI, Firewire, Thunderbolt
- High speed communication bus
- GPS
- Camera link
- Sensors
- Touch screen interfaces
- Circuits sensitive to capacitance

GENERAL CHARACTERISTICS
- Operting Teperature: -55°C to +125°C
- Working Voltage: ≤18Vdc
- Case Size: 0402

HOW TO ORDER

VC	AS	H4	AG	16	0R8	M	A	T	W	A
Varistor Chip	**Automotive Series**	**Chip Size** Low Profile 0402	**Varistor Series** AG Series Ultra-low Capacitance	**Working Voltage** 16 = 16V	**Capacitance** 0R8 = 0.8pF	**Tolerance** M = ±20%	**N/A**	**Termination** T = Ni Barrier/ 100% Sn	**Reel Size** W = 7"	**Reel Quantity** A = 10k

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

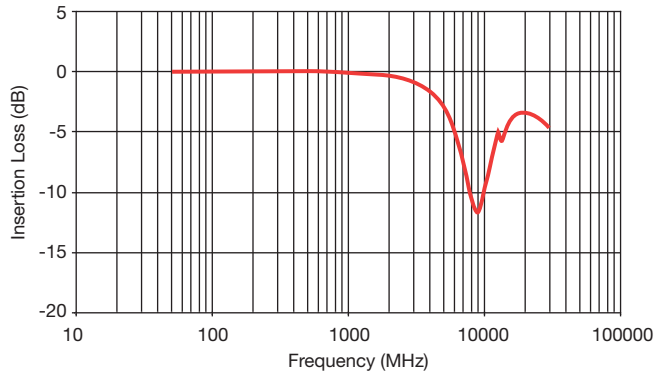
ANTENNAGUARD CATALOG PART NUMBERS/ELECTRICAL VALUES

AVX Part Number	V_W (DC)	V_B	I_L	Cap	Cap Tolerance	3db Freq (MHz)	Case Size
VCASH4AG160R8MA	≤16	125	1	0.8	±20%	5800	LP 0402

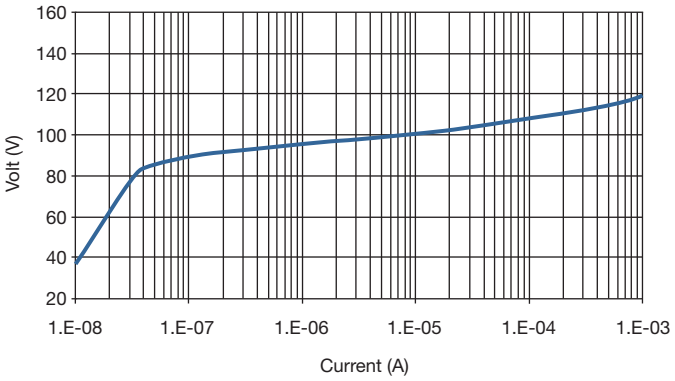
V_W (DC)	DC Working Voltage (V)
V_B	Typical Breakdown Voltage (V @ $1mA_{DC}$)
I_L	Typical leakage current at the working voltage
Cap	Typical capacitance (pF) @ frequency specified and $0.5V_{RMS}$
Freq	Frequency at which capacitance is measured (M = 1MHz)

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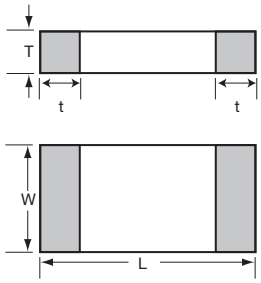
S21 Transmission Characteristics -SPV



V/I Curve - SPV



DIMENSIONS

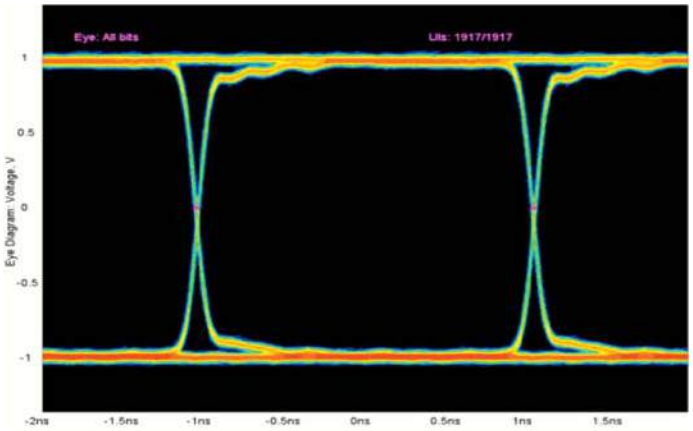


mm (inches)

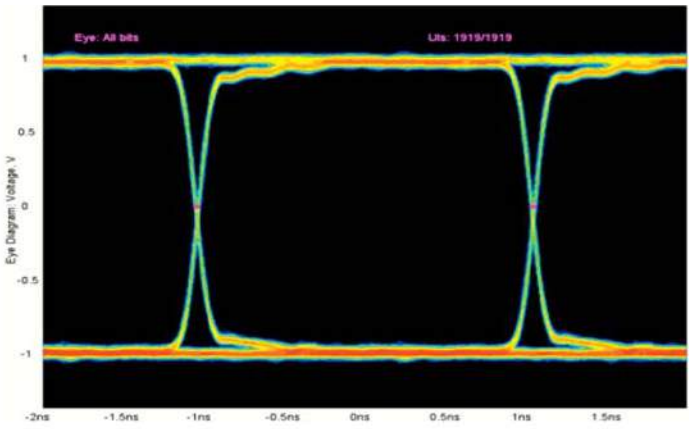
Size (EIA)	0402
Length (L)	1.00 ±0.10 (0.040 ± 0.004)
Width (W)	0.50 ±0.10 (0.020 ±0.004)
Max Thickness (T)	0.35 (0.014)
Terminal (t)	0.25±0.15 (0.010±0.006)

EYE DIAGRAM - USB-HS (480MHZ) TEST

No Part

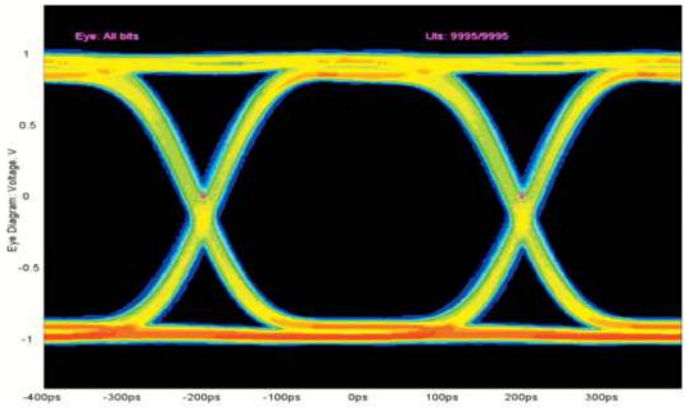


VCASH4AG160R8MATWA

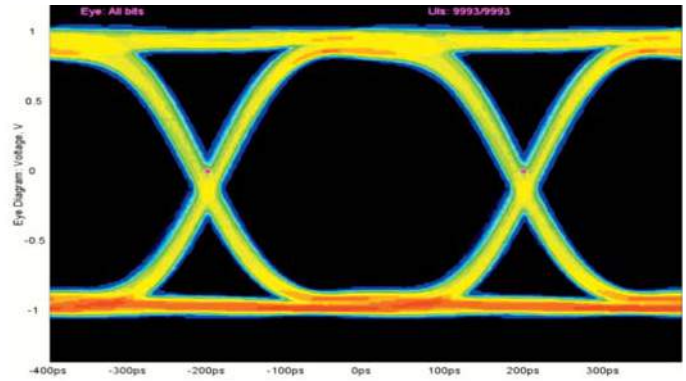


EYE DIAGRAM - PCI-E (2.5GHZ) TEST

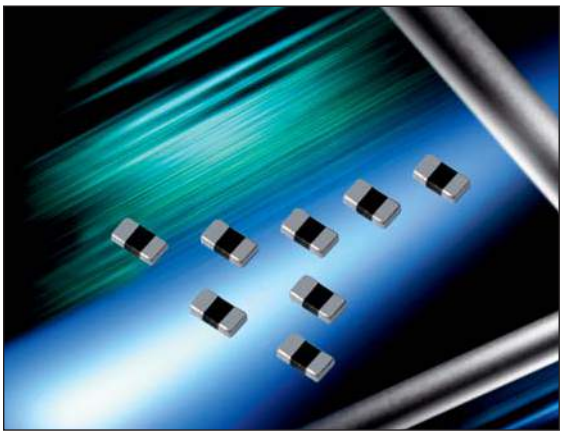
No Part



VCASH4AG160R8MATWA



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GENERAL DESCRIPTION

The Controlled Capacitance TransGuard is an application specific bi-directional transient voltage suppressor developed for use in mixed signal environments. The Controlled Cap MLV has three purposes: 1) reduce emissions from a high speed ASIC, 2) prevent induced E fields from conducting into the IC, and 3) clamp transient voltages

By controlling capacitance of the MLV, the center frequency and 20db range for filtering purposes can be targeted. A Controlled Cap MLV can greatly improve overall system EMC performance and reduce system size.

GENERAL CHARACTERISTICS

- Operating Teperature: -55°C to +125°C
- Working Voltage: 22, 26Vdc
- Case Size: 0603

FEATURES

- Single Chip Solution
- Tageted EMI/RFI Filtering
- 20dB Range for tiltering purposes
- Improves system EMC performance
- Very fast response to ESD
- 25kV ESD

APPLICATIONS

- EMI TVS Module Control
- High Speed ASICS
- Mixed Signal Environment
- Sensors
- and more

RoHS COMPLIANT

HOW TO ORDER

VCAC	0603	22	A	470	N	R	P
Varistor Chip Automotive Capacitance	**Chip Size** 0402 0603	**Working Voltage** 09 = 9V 17 = 17V 22 = 22V 26 = 26V 30 = 30V	**Energy Rating** X = 0.05J A = 0.1J B = 0.2J C = 0.3J	**Capacitance** 330 = 33pF 380 = 38pF 470 = 47pF 820 = 82pF 102 = 1000pF	**Tolerance** N = ±30% M = ±20%	**Packaging** R = 4k pcs D = 7" reel (1,000 pcs) R = 7" reel (4,000 pcs) T = 13" reel (10,000 pcs) W = 7" Reel (10,000 pcs 0402 only)	**Termination** P = Ni Barrier/ 100% Sn (matte)

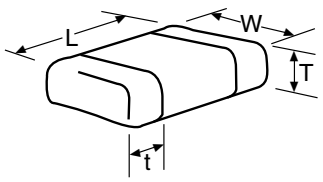
AVX Part Number	V_W (DC)	V_W (AC)	V_B	V_C	I_L	E_T	I_P	Cap	Cap Tolerance	Case Size
VCAC060309B102N	9.0	6.4	12.7±15%	22	25	0.2	120	1000	±30%	0603
VCAC060317X330M	17	12	27±20%	52	10	0.05	2	33	±20%	0603
VCAC060322A470N	22	17	32.5±25%	50	10	0.1	30	47	30%	0603
VCAC060326C820M	26	20	36.0±15%	67	10	0.3	30	82	20%	0603
VCAC040230X380N	30	21	41±10%	67	5	0.05	10	38	±30%	0402

V_W(DC)	DC Working Voltage [V]	I_L	Maximum leakage current at the working voltage [µA]
V_W(AC)	AC Working Voltage [V]	E_T	Transient Energy Rating [J, 10x1000µS]
V_B	Breakdown Votage [V @ 1mA$_{DC}$]	I_P	Peak Current Rating [A, 8x20µS]
V_C	Clamping Votage [V @ 1A]	Cap	Capacitance [pF] @ 1KHz specified and 0.5V_{RMS}

0603 Discrete Dimensions

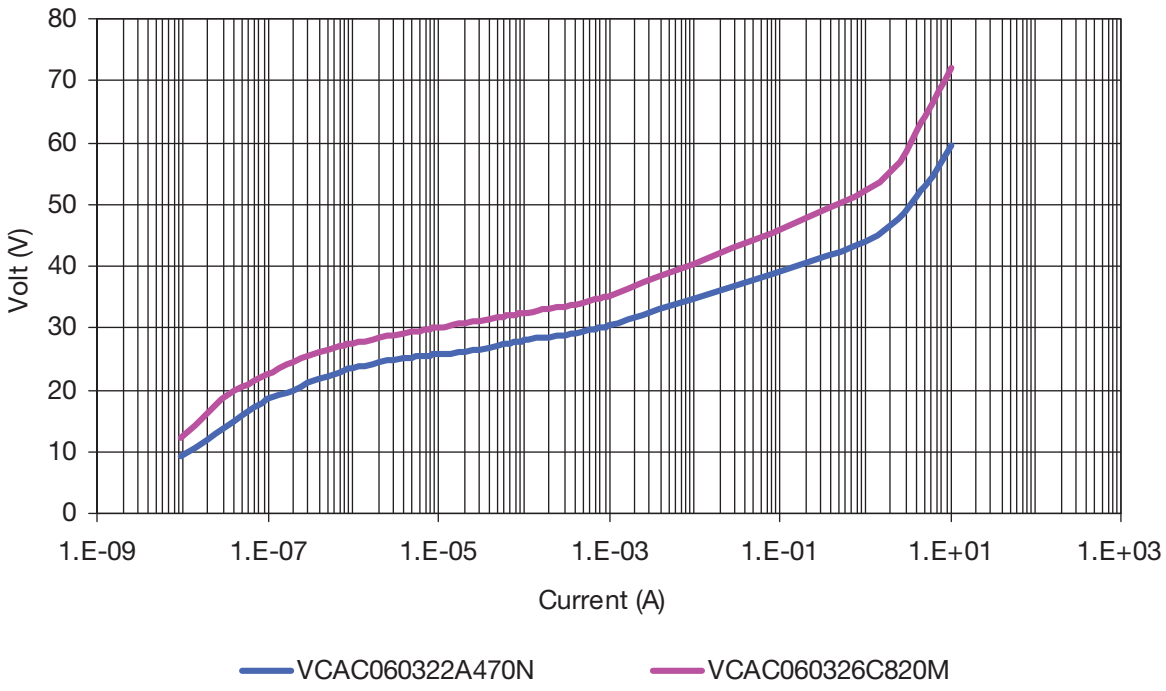
mm (inches)

Size (EIA)	Length (L)	Width (W)	Max Thickness (T)	Land Length (t)
0402	1.00±0.10 (0.040±0.004)	0.50±0.10 (0.020±0.004)	0.60 (0.024)	0.25±0.15 (0.010±0.006)
0603	1.60±0.15 (0.063±0.006)	0.80±0.15 (0.031±0.006)	0.90 (0.035)	0.35±0.15 (0.014±0.006)

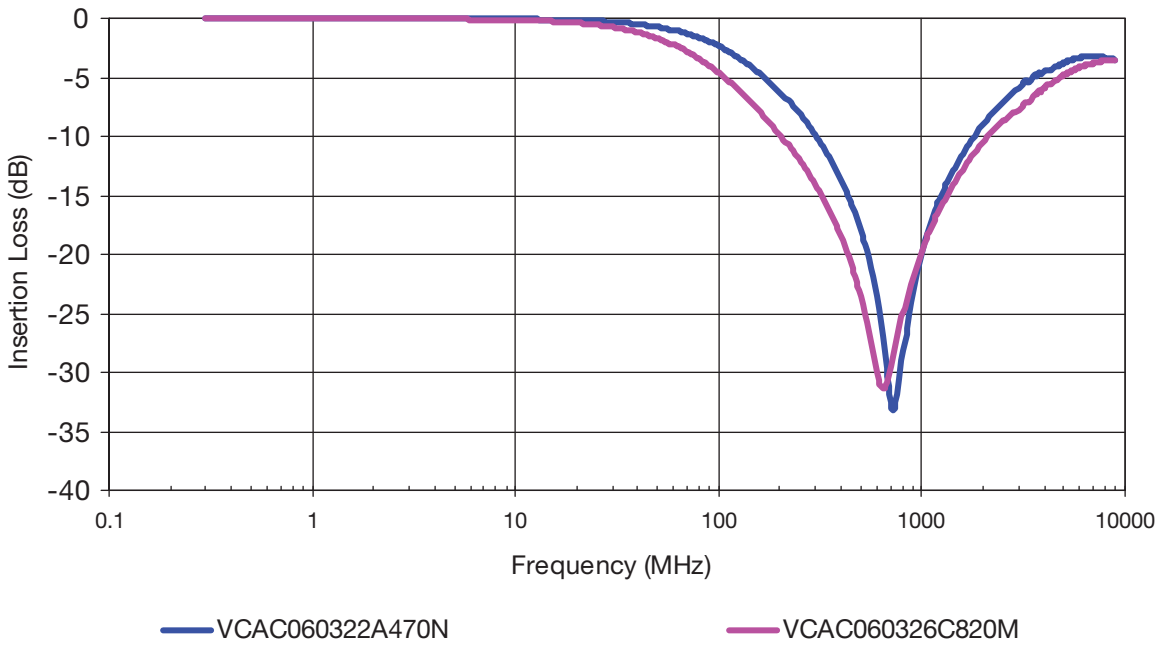


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V-I Curve



S21



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Miniature AC Varistors (MAV)
Low Power AC Circuit Protection and DC Datalines



AVX Miniature AC Varistors are designed for use in low power AC circuit protection. MAV series devices are an ideal solution to transient suppression in LC resonant circuits intended for signal & power transfer. The AVX part provides low loss in the resonant circuit yet is able to clamp large amounts of transients in a bi-directional manner.

The ability to handle large transients makes the MAV series useful in low power AC circuit protection and the AEC Q200 qualification allows for use in automotive applications.

Low capacitance makes these parts useful also for higher DC voltage data lines and other capacitance sensitive applications.

FEATURES

- 110 Pk-Pk @ 125kHz capability
- AEC Q200 qualified
- ESD rated to 25kV (HBM ESD Level 6)
- EMI/RFI attenuation in off state
- Bi-Directional protection

APPLICATIONS

- LC resonant circuits
- AC sampling circuitry
- Transformer secondaries
- GFI modules
- Immobilizers
- Keyless entry
- Data lines
- Capacitance sensitive applications

AND MORE

GENERAL CHARACTERISTICS

- Operating Temperature: -55 to +125ºC
- Working Voltage: 70Vdc / 52Vac
- Case Size: 0402, 0603, 0405 2xArray

HOW TO ORDER

MAV	002	0	W	P
Series	**Size**	**Capacitance**	**Packaging**	**Termination**
	001 = 0603 002 = 0405 004 = 0402	0 = Low	D = 7" reel (1,000 pcs) R = 7" reel (4,000 pcs) T = 13" reel (10,000 pcs) W = 7" Reel (10,000 pcs 0402 only)	P = Plated Sn over Ni barrier

RoHS COMPLIANT

ANTENNAGUARD CATALOG PART NUMBERS/ELECTRICAL VALUES

AVX Part Number	V_W (DC)	V_W (AC)	V_B	V_C	I_{VC}	E_T	I_P	I_L	Cap	Elements
MAV0010_P	70	52	120 ±15%	225	1	0.015	2	10	22pF Max	1
MAV0020_P	70	52	120 ±15%	225	1	0.020	3	10	8pF Max	2
MAV0040_P	70	52	120 ± 15%	225	1	0.020	1	10	6pF Max	1

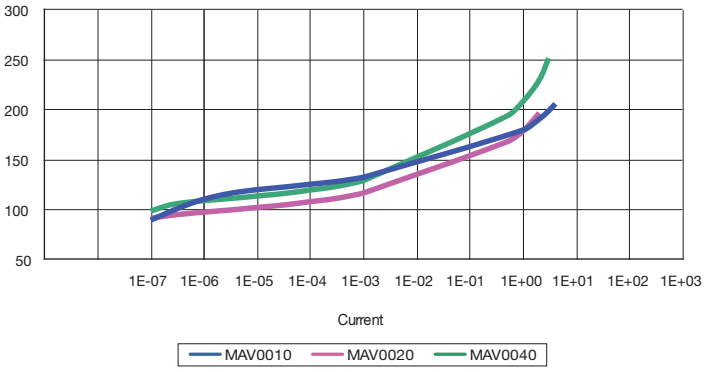
└ Packaging Code

V_W (DC)	DC Working Voltage [V]
V_W (AC)	AC Working Voltage [V]
V_B	Breakdown Voltage [V @ 1mA$_{DC}$]
V_C	Clamping Voltage [V @ I_{VC}]
I_L	Maximum leakage current at the working voltage [µA]
E_T	Transient Energy Rating [J, 10x100µS]
I_P	Peak Current Rating [A, 8x10µS]
Cap	Maximum capacitance @ 1MHz and 0.5V$_{RMS}$

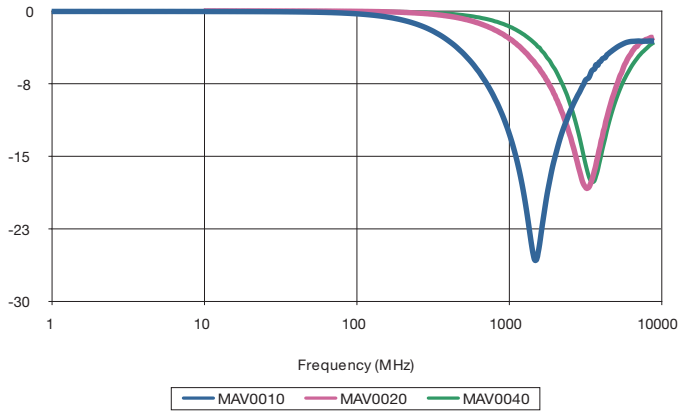
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TYPICAL PERFORMANCE CURVES

Voltage/Current Characteristics

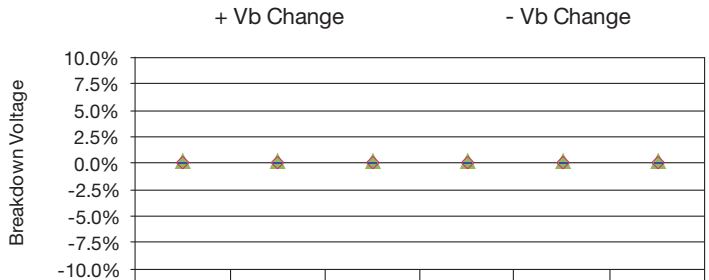


Transmission Characteristics

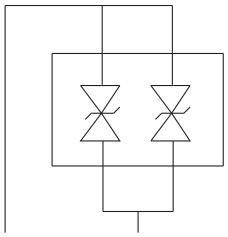


TYPICAL PERFORMANCE CURVES

Impact of AC Voltage on Breakdown Voltage
Parallel 110VPP @ 125 kHz

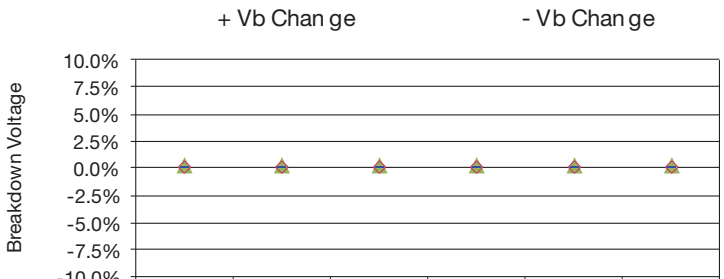


	10 min	60 min	120 min	10 min	60 min	120 min
– Max	0.3%	0.6%	0.4%	0.3%	0.5%	0.3%
◇ Min	0.2%	0.2%	0.2%	0.2%	0.1%	0.0%
▲ Average	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%

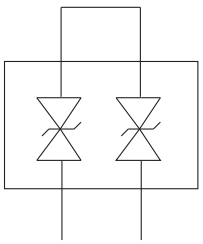


Apply 110V pp
125KHz Sine wave
(Parallel)

Impact of AC Voltage on Breakdown Voltage
Series 110VPP @ 125 kHz



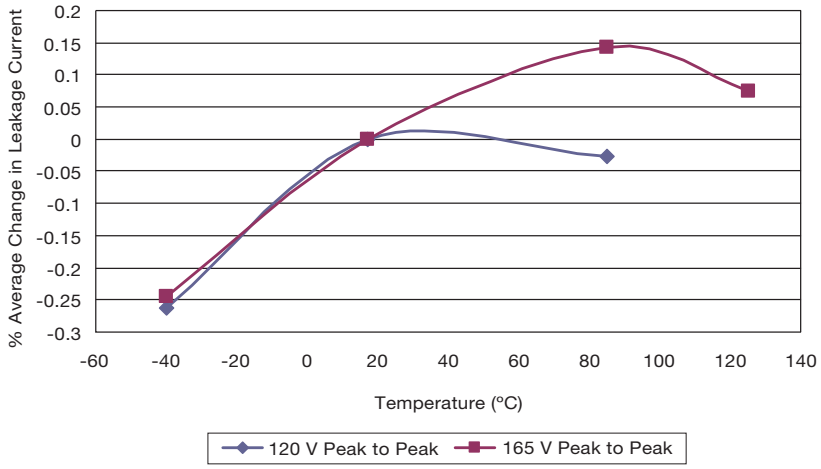
	10 min	60 min	120 min	10 min	60 min	120 min
– Max	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
◇ Min	0.2%	0.2%	0.2%	-0.2%	0.2%	0.2%
▲ Average	0.3%	0.3%	0.3%	0.2%	0.3%	0.2%



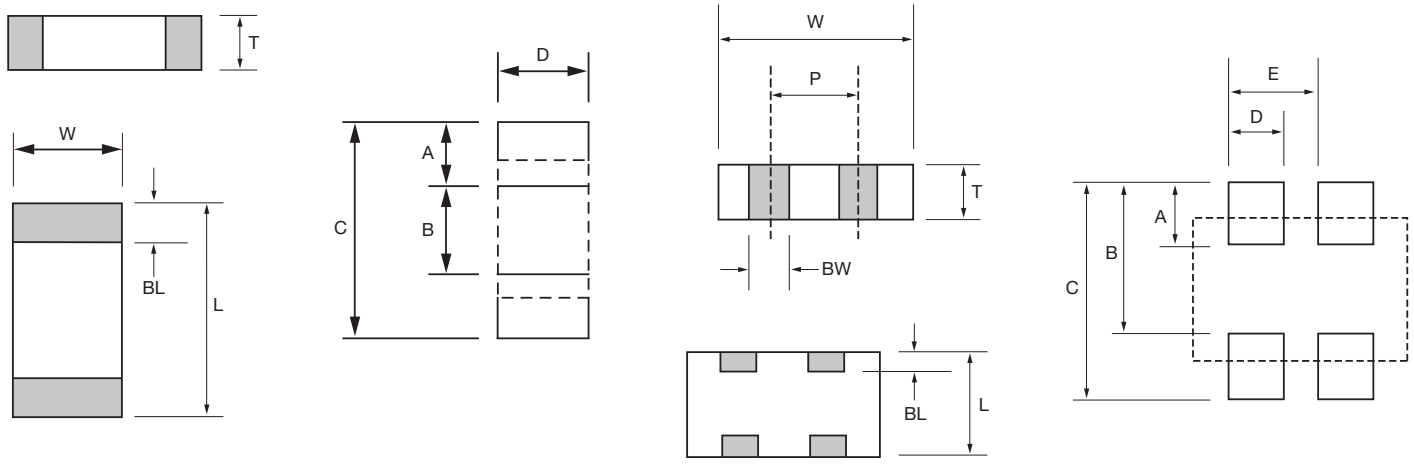
Apply 110V pp
125KHz Sine wave
(Series)

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IMPACT OF AC VOLTAGE ON LEAKAGE CURRENT

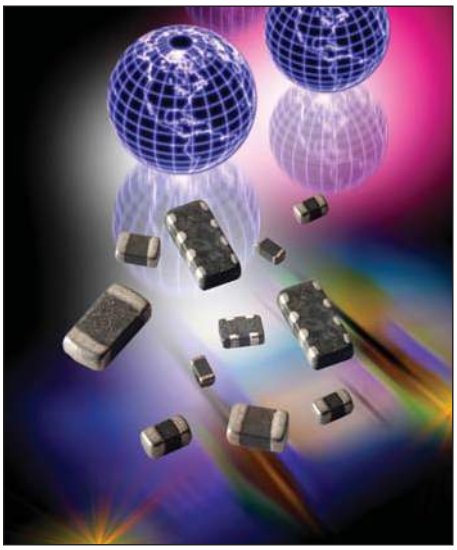


PHYSICAL DIMENSIONS AND RECOMMENDED PAD LAYOUT



L	W	T	BW	BL	P	A	B	C	D	E
MAV0010										
1.60 ± 0.15 (0.063±0.006)	0.80 ± 0.15 (0.032±0.006)	0.90 Max (0.035) Max	N/A	0.35 ± 0.15 (0.014±0.006)	N/A	0.89 (0.035)	0.76 (0.030)	2.54 (0.100)	0.76 (0.030)	N/A
MAV0020										
1.00 ± 0.15 (0.039±0.006)	1.37 ± 0.15 (0.054±0.006)	0.66 Max (0.026) Max	0.36 ± 0.10 (0.014±0.004)	0.20 ± 0.10 (0.008±0.004)	0.64 REF (0.025)REF	0.46 (0.018)	0.74 (0.029)	1.20 (0.047)	0.30 (0.012)	0.64 (0.025)
MAV0040										
1.00±0.10 (0.040±0.004)	0.50±0.10 (0.020±0.004)	0.60 Max (0.024) Max	N/A	0.25±0.15 (0.010±0.006)	N/A	0.61 (0.024)	0.51 (0.020)	1.70 (0.067)	0.51 (0.020)	N/A

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AVX High Temperature Multi-Layer Varistors are designed for underhood applications. Products have been tested, qualified, and specified to 150ºC. The MLV advantage is EMI/RFI attenuation in the off state. This allows designers the ability to combine the circuit protection and EMI/RFI attenuation function into a single highly reliable device.

FEATURES

- Operating Temperature: -55ºC to +150ºC
- AEC Q200 qualified
- ESD rating to 25kV contact
- EMI/RFI attenuation in off state
- Excellent current and energy handling

APPLICATIONS

- Under hood
- Down Hole Drilling
- High temperature applications
- Communication Bus
- Sensors
- RF Circuits
- Capacitance sensitive applications

AND MORE

CAN HIGH TEMPERATURE SERIES

HOW TO ORDER

CAN	AT	01	R	P
Type	**Series**	**Case Size**	**Packaging**	**Termination**
Controlled Area Network Varistor	Automotive High Temperature	01 = 0603 02 = 0405 2-Element 04 = 0612 4-Element	D = 7" (1000 pcs) R = 7" (4,000 pcs) T = 13" (10,000pcs)	P = Ni Barrier/ 100% Sn (matte)

RoHS COMPLIANT

AVX Part Number	V_W (DC)	V_W (AC)	V_B	I_L	E_T	I_P	Cap	Case Size	Elements
CANAT01--	≤ 18	≤ 14	120	10	0.015	4	22	0603	1
CANAT02--	≤ 18	≤ 14	70	10	0.015	4	22	0405	2
CANAT04--	≤ 18	≤ 14	100	10	0.015	4	22	0612	4

V_W(DC) DC Working Voltage [V]
V_W(AC) AC Working Voltage [V]
V_B Breakdown Votage [V @ 1mA$_{DC}$]
V_C Clamping Votage [V @ IVC]
I_L Maximum leakage current at the working voltage [µA]
E_T Transient Energy Rating [J, 10x1000µS]
I_P Peak Current Rating [A, 8x20µS]
Cap Capacitance [pF] @ 1KHz specified and 0.5VRMS

ANTENNAGUARD HIGH TEMPERATURE SERIES

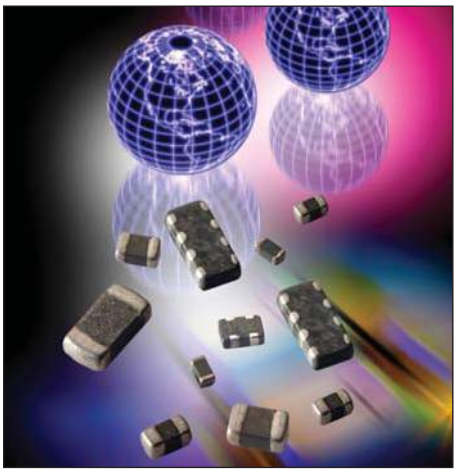
HOW TO ORDER

VCAT	06	AG	18	120	Y	A	T	1	A
Type	**Case Size**	**Varistor Series**	**Working Voltage**	**Cap**	**Non-Std. Cap Tolerance**	**N/A**	**Termination Finish**	**Reel Size**	**Reel Quantity**
High Temperature	04 = 0402 06 = 0603	AntennaGuard	18 = 18Vdc				P = Ni Barrier/ 100% Sn	1 = 7" 3 = 13"	A = 4000 or 10,000

AVX Part Number	V_W (DC)	V_W (AC)	I_L	Cap	Cap Tolerance	Case Size
VCAT06AG18120YAT--	≤ 18	≤ 14	10	12	+4, -2pF	0603

V_W(DC) DC Working Voltage [V]
V_W(AC) AC Working Voltage [V]
I_L Maximum leakage current at the working voltage [µA]
Cap Capacitance [pF] @ 1KHz specified and 0.5VRMS

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AVX High Temperature Low Leakage Multi-Layer Varistors are designed for under-hood and high temperature applications where low leakage component is required Parts are tested, qualified and specified to 150ºC.

The MLV advantage is EMI/RFI attenuation in the off state. This allows designers the ability to to combine the circuit protection and EMI/RFI attenuation function into a single highly reliable device.

FEATURES

- Rated at 150°C
- AEC Q200 qualified
- ESD rating to 25kV (HBM ESD Level 6)
- EMI/RFI attenuation in off state
- Very Low Leakage

APPLICATIONS

- Under hood
- High temperature applications
- Bus Interface Protection
- CAN Bus
- BCM, TCU
- Capacitance sensitive applications

AND MORE

GENERAL CHARACTERISTICS

- Operating Temperature: -55ºC to 150ºC

COMMUNICATION BUS - HIGH TEMPERATURE LOW LEAKAGE VARISTOR

HOW TO ORDER

CAN	ATL	07	R	P
Type	**Series**	**Case Size**	**Packaging**	**Termination**
Controlled Area Network Varistor	Automotive High Temperature Low Leakage	07 = 0603	D = 7" (1000 pcs) R = 7" (4,000 pcs) T = 13" (10,000pcs)	P = Ni Barrier/100% Sn

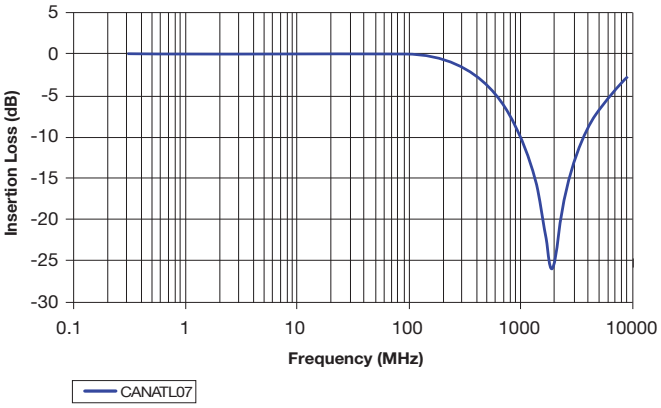
RoHS COMPLIANT

PN	V_W(DC)	V_W(AC)	V_B	V_C	I_{VC}	I_L	E_T	I_P	Typ Cap	Cap Tol	Freq	V_{Jump}	$P_{Diss\ max}$
CANATL07	32	25	61±15%	120	1	<1	0.05	5	10	±50%	M	27.5	0.003

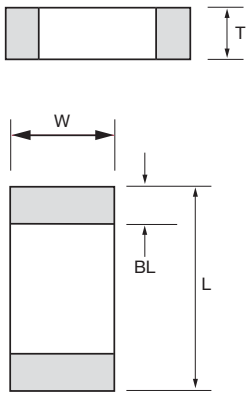
V_W(DC)	DC Working Voltage [V]
V_W(AC)	AC Working Voltage [V]
V_B	Breakdown Votage [V @ 1mA$_{DC}$, 25ºC]
V_C	Clamping Votage [V @ I_{VC}]
I_{VC}	Test Current for VC [A, 8x20µs]
I_L	Maximum leakage current at the working voltage, 25ºC [µA]
E_T	Transient Energy Rating [J, 10x1000µS]
I_P	Peak Current Rating [A, 8x20µS]
Cap	Capacitance [pF] @ 1KHz specified and 0.5V_{RMS}
V_{Jump}	Jump Start [V, 5 min]
P_{DISS}	Max Power Dissipation [W]

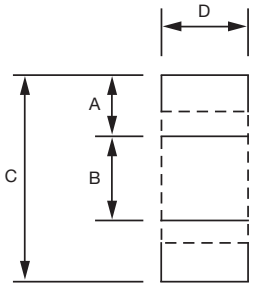
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S21 CHARACTERISTICS



PHYSICAL DIMENSIONS AND RECOMMENDED PAD LAYOUT





0603 Discrete Dimensions

mm (inches)

L	W	T	BL
1.60±0.15 (0.063±0.006)	0.80±0.15 (0.032±0.006)	0.90 MAX (0.035 MAX)	0.35±0.15 (0.014±0.006)

0603 Soldering Pad

mm (inches)

A	B	C	D
0.89 (0.035)	0.76 (0.030)	2.54 (0.100)	0.76 (0.030)

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AVX Radial Leaded Multi-Layer Varistors are AEC-Q200 Qualified and are designed for durability in harsh environments or applications where leaded component is prefered. The MLV advantage is bi-directional transient voltage protection and EMI/RFI attenuation in the off state. This allows designers to combine the circuit protection and EMI/RFI attenuation function into a single highly reliable device.

FEATURES

- AEC Q200 qualified
- ESD rated to 25kV (HBM ESD Level 6)
- EMI/RFI attenuation in off state
- Excellent current and energy handling

APPLICATIONS

- Harsh environment
- Inductive switching
- DC Motors
- Water pump
- Fuel pump
- Relays

AND MORE

GENERAL CHARACTERISTICS

- Operating Temperatures: -55ºC to +125ºC
- Working Voltage: 18-48Vdc

HOW TO ORDER

VR20	AS	18	F	390	R	TR2
AVX Style VR20	**Series** AS = Automotive	**Voltage** 18 = 18V 26 = 26V 48 = 48V	**Energy** F = 0.7J H = 1.2J J = 1.6J	**Clamping Voltage** 390 = 42V 540 = 54V 560 = 60V 101 = 100V	**Leads** R = RoHS Compliant	**Packaging** Blank = Bulk TR1 = T&R Standard 1 TR2 = T&R Standard 2

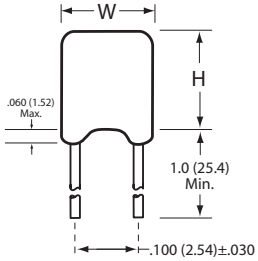
RoHS COMPLIANT

ELECTRICAL CHARACTERISTICS

AVX Part Number	$V_{W\,DC}$	$V_{W\,AC}$	V_B	V_C	I_{VC}	I_L	E_T	E_{LD}	I_P	Cap	Freq	V_{JUMP}	P_{DISS}
VR20AS18J390	18.0	13.0	25.5±10%	42	5	10	1.6	3	500	3100	K	27.5	0.030
VR20AS26F540	26.0	18.0	33.0±10%	54	1	15	0.7	1.5	200	600	K	27.5	0.008
VR20AS26H560	26.0	18.0	34.5±10%	60	5	10	1.2	3	300	1200	K	27.5	0.018
VR20AS48H101	48.0	34.0	62.0±10%	100	1	10	1.2	–	250	500	K	48	0.022

V_W(DC)	DC Working Voltage [V]	E_t	Transient Energy Rating [J, 10x1000µS]
V_W(AC)	AC Working Voltage [V]	E_{LD}	Load Dump Energy (x10) [J]
V_B	Typical Breakdown Votage [V @ 1mA$_{DC}$]	I_P	Peak Current Rating [A, 8x20µS]
V_C	Clamping Voltage [V @ I_N]	Cap	Typical capacitance [pF] @ frequency specified and 0.5V$_{RMS}$
I_{VC}	Test Current for V_C	V_{Jump}	Jump Start (V)
I_L	Maximum leakage current at the working voltage [µA]	P_{DISS}	Power Dissipation (W)

PHYSICAL DIMENSIONS



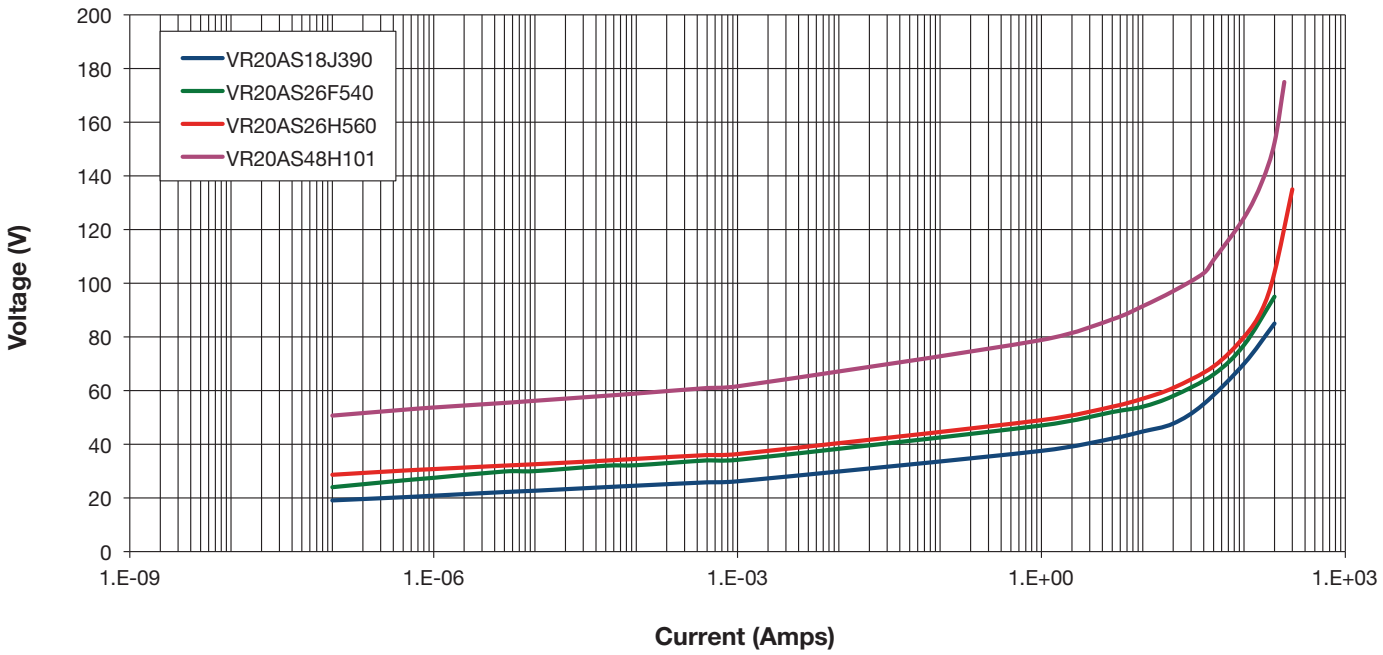
mm (inches)

AVX Style	Width (W	Height (H)	Thickness (T)	Lead Spacing	Lead Diameter
VR20	5.59 Max (0.220)	5.08 Max (0.200)	3.175 Max (0.125)	2.54 (0.100)	0.508) (0.020

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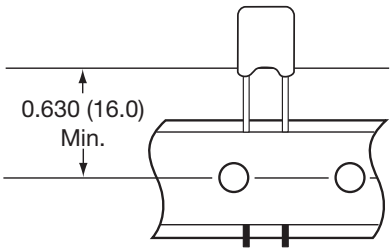
TYPICAL PERFORMANCE CURVES

Typical Voltage Current Characteristics

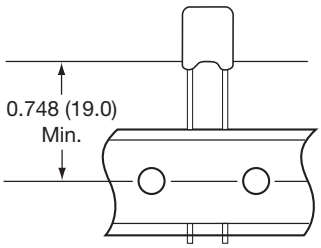


TAPE & REEL PACKAGING OPTIONS

TR1
Tape & Reel Standard 1



TR2
Tape & Reel Standard 2



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Radial Leaded High Temperature Automotive
150ºC Rated Radial Leaded TransGuard®



AVX High Temperature Multi-Layer Varistors are designed for underhood applications. Products have been tested, qualified, and specified to 150ºC. The Radial Leaded TransGuard is built for durability in harsh environments. The MLV advantage is EMI/RFI attenuation in the off state. This allows designers to combine the circuit protection and EMI/RFI attenuation function into a single highly reliable device.

FEATURES

- Rated at 150ºC
- AEC Q200 qualified
- ESD rated to 25kV (HBM ESD Level 6)
- EMI/RFI attenuation in off state
- Excellent current and energy handling

APPLICATIONS

- Under hood
- Down Hole Drilling
- DC Motors
- Relays
- Inductive Loads
- High Temperature/Harsh environment

AND MORE

GENERAL CHARACTERISTICS

- Operating Temperatures: -55ºC to +150ºC
- Working Voltage: 14-48Vdc

HOW TO ORDER

VR15	AT	18	A	650	R	TR2
AVX Style	**Series**	**Voltage**	**Energy**	**Clamping Voltage**	**Leads**	**Packaging**
VR15 VR20	AT = 150ºC Automotive	14 = 14V 18 = 18V 26 = 26V 48 = 48V	A = 0.1J D = 0.4J S = 2.0J	580 = 60V 650 = 67V 101 = 100V 151 = 150V	R = RoHS Compliant	Blank = Bulk TR1 = T&R Standard 1 TR2 = T&R Standard 2

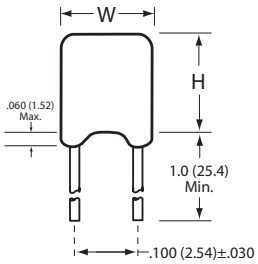
RoHS COMPLIANT

ELECTRICAL CHARACTERISTICS

AVX Part Number	$V_{W\,DC}$	$V_{W\,AC}$	V_B	V_C	I_{VC}	I_L	ET	ELD	IP	Cap	Freq	V_{JUMP}	P_{DISS}
VR15AT14A580	14.0	10.0	34.5±10%	60	1	10	0.1	0.15	30	120	K	27.5	0.002
VR15AT18A650	18.0	13.0	41.0±10%	67	1	10	0.1	0.15	30	90	M	29	0.002
VR20AT26D101	26.0	18.0	62.0±10%	100	1	10	0.4	1.5	100	225	K	48	0.008
VR20AT48S151	48.0	34.0	100.0±10%	150	1	10	2.0	3.5	250	275	K	48	0.040

V_W(DC)	DC Working Voltage [V]
V_W(AC)	AC Working Voltage [V]
V_B	Typical Breakdown Votage [V @ 1mA$_{DC}$]
V_C	Clamping Voltage [V @ I_{IV}]
I_{VC}	Test Current for V_C
I_L	Maximum leakage current at the working voltage [µA]
E_t	Transient Energy Rating [J, 10x1000µS]
E_{LD}	Load Dump Energy (x10) [J]
I_P	Peak Current Rating [A, 8x20µS]
Cap	Typical capacitance [pF] @ frequency specified and 0.5V_{RMS}
V_{Jump}	Jump Start (V)
P_{DISS}	Power Dissipation (W)

PHYSICAL DIMENSIONS



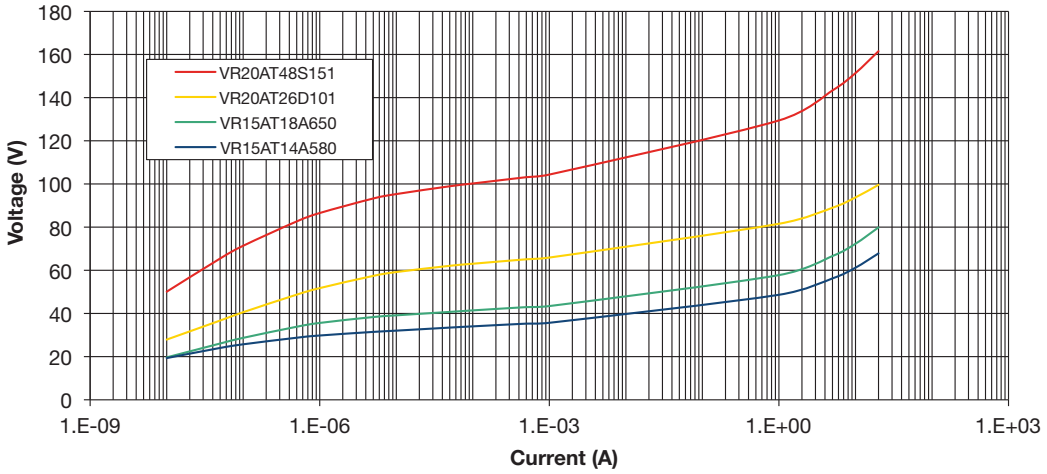
mm (inches)

AVX Style	Width (W	Height (H)	Thickness (T)	Lead Spacing	Lead Diameter
VR15	4.32 Max. (0.170)	3.81 Max. (0.150)	2.54 Max. (0.100)	2.54 (0.100)	0.508 (0.020)
VR20	5.59 Max (0.220)	5.08 Max (0.200)	3.175 Max (0.125)	2.54 (0.100)	0.508) (0.020

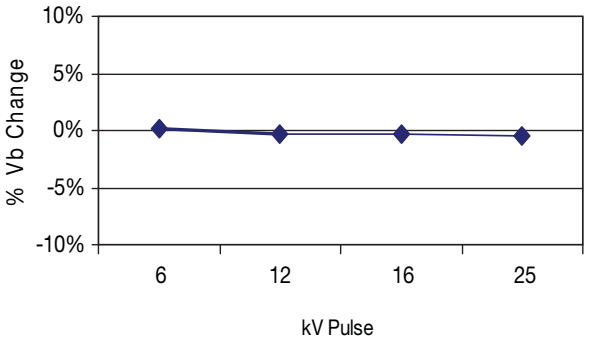
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TYPICAL PERFORMANCE CURVES

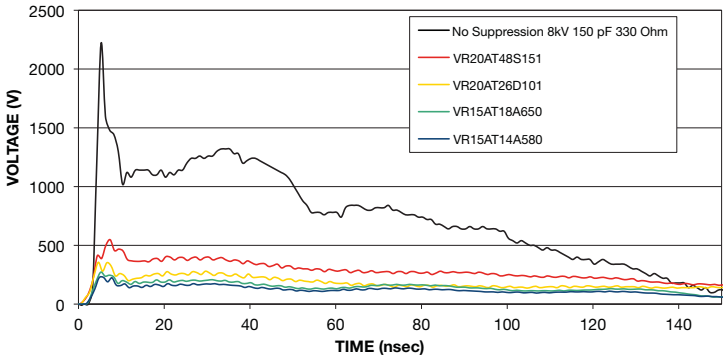
Typical Voltage Current Characteristics



AEC-Q200-002 ESD Characteristics



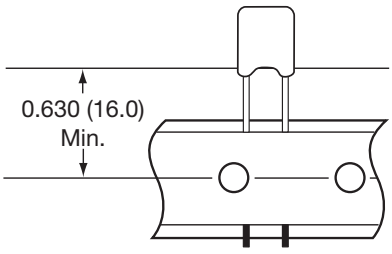
ESD Wave Absorption Characteristics



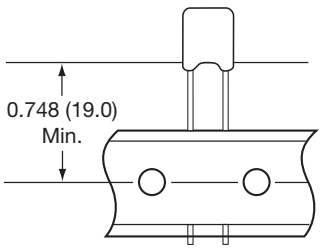
8 kV ESD Vc
(150pF/330ohm IEC Network)

TAPE & REEL PACKAGING OPTIONS

TR1
Tape & Reel Standard 1



TR2
Tape & Reel Standard 2



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GENERAL DESCRIPTION

AVX's radial leaded CapGuard™ products are designed to provide both transient voltage protection and EMI/RFI suppression for electronic circuits. CapGuards™ are ideally suited to filter out EMI/RFI noise generated by switch mode power supplies or motors on DC lines or I/O lines in electronic circuits. With multilayer varistor (MLV) utilized in CapGuard product, effective transient voltage protection is achieved to protect sensitive electronics from high voltage transients. The capacitor, on the other hand, absorbs high frequency noise on the line. The MLCC capacitors are designed with temperature stable X7R dielectric, allowing for wide temperature use with good capacitance stability.

GENERAL CHARACTERISTICS

- Operating Temperature: -55 to +125ºC
- Working Voltage: 26Vdc, 45Vdc
- Capacitance: 0.47µF, 1µF

FEATURES

- High Capacitance / EMI Filtering
- Bi-Directional Protection
- AEC Q200 qualified
- Multiple Strike Capability
- Radial, epoxy encapsulated

APPLICATIONS

- EMI filtering with surge protection
- DC motors
- Inductive switching
- Relays
- Power supplies
- I/O Ports
- and more

HOW TO ORDER

CG	21	AS	26	F	474	M	R	TR1
Series	**Size** 20 21	**Automotive Series**	**Working Voltage** 26 = 26Vdc 45 = 45Vdc	**Energy** K = 0.6J F = 0.7J	**Capacitance** 474 = 0.47µF 105 = 1.0µF	**Tolerance** M = ±20%	**Leads** R = RoHS Compliant	**Packaging** Blank = Bulk TR1 = T&R Standard 1 TR2 = T&R Standard 2

RoHS COMPLIANT

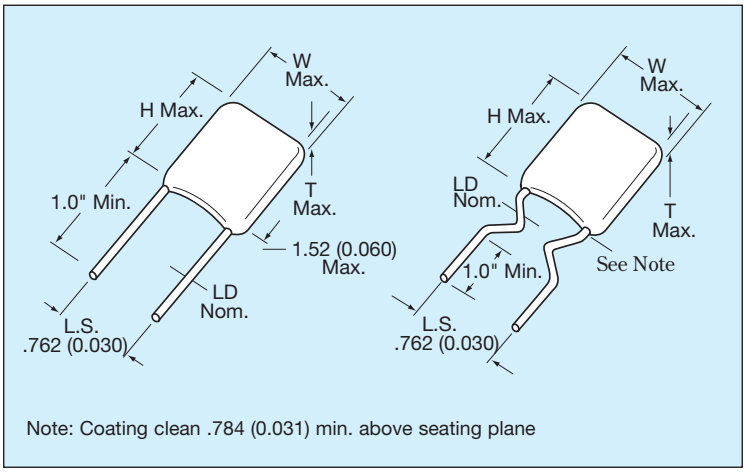
ELECTRICAL CHARACTERISTICS

AVX Part Number	$V_{W\,DC}$	$V_{W\,AC}$	V_B	V_C	I_{VC}	I_L	E_T	E_{LD}	I_P	Cap	Tol	V_{JUMP}
CG21AS26F474MR	26.0	18.0	33.0±10%	54	1	15	0.7	1.5	200	0.47	±20%	27.5
CG21AS26F105MR	26.0	18.0	33.0±10%	54	1	15	0.7	1.5	200	1	±20%	27.5
CG21AS45K474MR	45.0	35.0	56.0±10%	90	1	15	0.6	1.25	200	0.47	±20%	48
CG21AS45K105MR	45.0	35.0	56.0±10%	90	1	15	0.6	1.25	200	1	±20%	48

V_W(DC)	DC Working Voltage [V]
V_W(AC)	AC Working Voltage [V]
V_B	Typical Breakdown Votage [V @ 1mA$_{DC}$]
V_C	Clamping Voltage [V @ I_{IV}]
I_{VC}	Test Current for V_C
I_L	Maximum leakage current at the working voltage [µA]
E_t	Transient Energy Rating [J, 10x1000µS]
E_{LD}	Load Dump Energy (x10) [J]
I_P	Peak Current Rating [A, 8x20µS]
Cap	Typical capacitance [pF] @ frequency specified and 0.5V_{RMS}
Tol	Capacitance tolerance [%] from Typ value
V_{Jump}	Jump Start (V)

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PHYSICAL DIMENSIONS

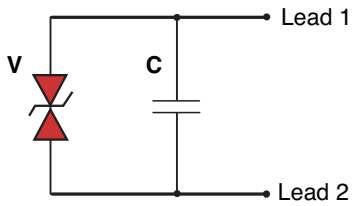


Drawings are for illustrative purposes only.
Actual lead form shape could vary within stated tolerances based on body size.

mm (inches)

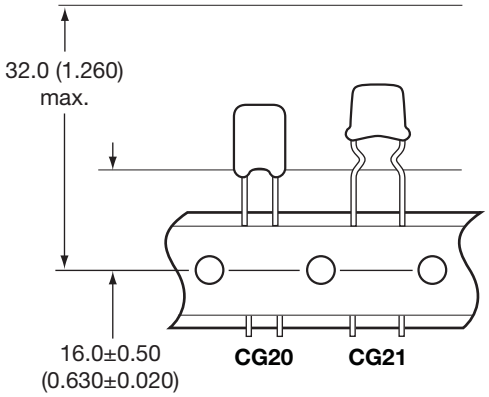
AVX Style	Width (W	Height (H)	Thickness (T)	Lead Spacing	Lead Diameter
CG20	5.99 Max. (0.236)	7.49 Max. (0.295)	4.5 Max. (0.177)	2.54 (0.100)	0.508 (0.020)
CG21	5.99 Max (0.236)	7.49 Max (0.295)	4.5 Max (0.177)	5.08 (0.200)	0.508 (0.020)

Schematic Diagram

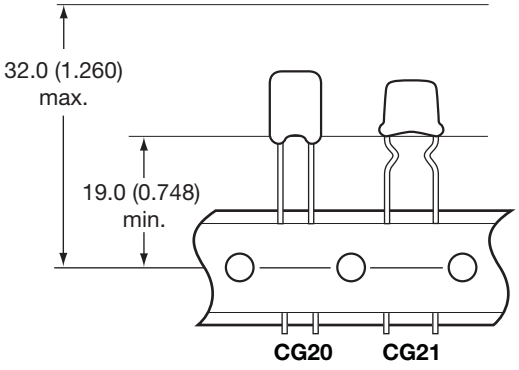


TAPE & REEL PACKAGING OPTIONS

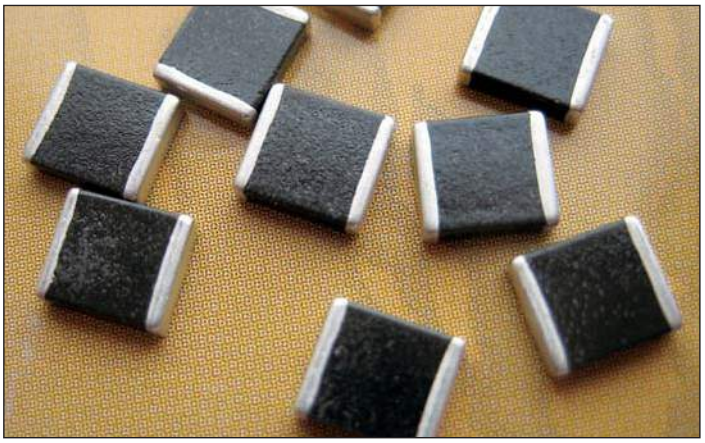
TR1
Tape & Reel Standard 1



TR2
Tape & Reel Standard 2



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GENERAL DESCRIPTION

The Glass Encapsulated TransGuard® Automotive Series are zinc oxide (ZnO) based ceramic semiconductor devices with non-linear, bi-directional voltage-current characteristics.

They have the advantage of offering bi-directional overvoltage protection as well as EMI/RFI attenuation in a single SMT package. The Automotive Series high current and high energy handling capability make them well suited for protection against automotive related transients.

These large case size parts extend TransGuard range into high energy applications. In addition the glass encapsulation provides enhanced resistance against harsh environment or process such as acidic environment, salts or chlorite flux.

GENERAL CHARACTERISTICS

- Operating Temperature: -55ºC to 125ºC
- Case Size: 1206-2200
- Working Voltage: 16-65Vdc
- Energy: 07-12J
- Peak Current: 200-2000A

FEATURES

- High Reliability
- High Energy Absorption (Load Dump)
- High Current Handling
- Bi-Directional protection
- EMI/RFI attenuation in off-state
- Multi-strike capability
- Sub 1nS response to ESD strike
- AEC Q200 Qualified

APPLICATIONS

- Various Automotive Applications
- Internal Combustion Engine (ICE) Vehicles
- Hybrid Electric Vehicles (HEV)
- Plug-in Hybrid Electric Vehicles (PHEV)
- Commercial Vehicles
- Sensors
- LIN BUS
- ECU
- DC Motor
- Relays
- and more
- Applications where Glass Encapsulation is needed for Harsh Environment/Acid-

HOW TO ORDER

V	G	AS	1812	16	P	400	R	P
Varistor	**Glass Encapsulate Chip**	**Automotive Series**	**Chip Size** 1206 1210 1812 2220 3220	**Working Voltage** 16 = 16Vdc 18 = 18Vdc 22 = 22Vdc 26 = 26Vdc 30 = 30Vdc 31 = 31Vdc 34 = 34Vdc 42 = 42Vdc 48 = 48Vdc 60 = 60Vdc 65 = 65Vdc	**Engergy Rating** D = 0.4J F = 0.7J H = 1.2J J = 1.6J K = 0.6J N = 1.1J S = 2.0J P = 2.5-3.7J U = 4.0-5.0J Y = 6.5-12J	**Clamping Voltage** 390 = 40V 400 = 42V 440 = 44V 490 = 49V 540 = 54V 560 = 60V 570 = 57V 650 = 65V 770 = 77V 900 = 90V 101 = 100V 121 = 120V 131 = 135V	**Package** D = 7" reel R = 7" reel T = 13" reel	**Termination** P = Ni/Sn plated

PHYSICAL DIMENSIONS: mm (inches)

Size (EIA)	Length (L)	Width (W)	Max Thickness (T)	Land Length (t)
1206	3.20±0.20 (0.126±0.008)	1.60±0.20 (0.063±0.008)	1.70 (0.067)	0.94 max. (0.037 max.)
1210	3.20±0.20 (0.126±0.008)	2.49±0.20 (0.098±0.008)	1.70 (0.067)	0.14 max. (0.045 max.)
1812	4.50±0.30 (0.177±0.012)	3.20±0.30 (0.126±0.012)	2.00 (0.079)	1.00 max. (0.040 max.)
2220	5.70±0.40 (0.224±0.016)	5.00±0.40 (0.197±0.016)	2.50 (0.098)	1.00 max. (0.040 max.)
3220	8.20±0.40 (0.323±0.016)	5.00±0.40 (0.197±0.016)	2.50 max. (0.098 max.)	1.30 max. (0.051 max.)

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ELECTRIAL CHARACTERISTICS

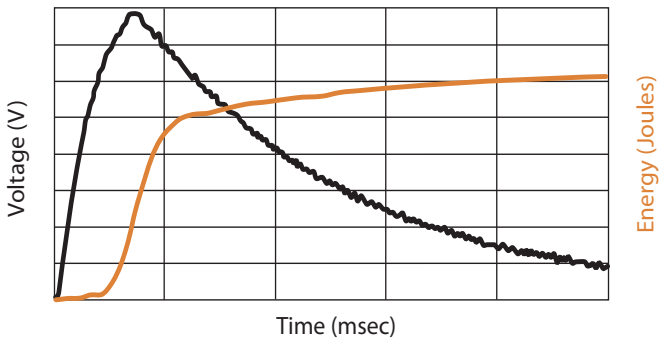
AVX PN	V_W (DC)	V_W (AC)	V_B	V_C	I_{VC}	I_L	E_T	E_{LD}	I_P	Cap	Freq	V_{Jump}	$P_{Diss, MAX}$
VGAS120616K390	16	11	24.5±10%	40	1	15	0.6	1.5	200	900	K	27.5	0.01
VGAS120616N390	16	11	24.5±10%	40	1	15	1.1	2	200	1300	K	27.5	0.01
VGAS121016S390	16	14	24.5±10%	40	2.5	15	2.0	5.00	500	3000	K	27.5	0.01
VGAS121016J400	16	13	25.5±10%	42	5	10	1.6	3	500	3100	K	27.5	0.03
VGAS181216P390	16	11	24.5±10%	40	5	15	2.9	10	1000	7000	K	27.5	0.07
VGAS181216P400	16	11	24.5±10%	42	5	10	2.9	10	1000	5000	K	27.5	0.07
VGAS222016Y390	16	11	24.5±10%	40	10	15	10.2	45	1500	20000	K	27.5	0.08
VGAS222016Y400	16	11	24.5±10%	42	10	10	7.2	25	1500	13000	K	27.5	0.10
VGAS120618D400	18	13	25.5±10%	42	1	15	0.4	1.5	150	1200	K	27.5	0.008
VGAS121018J400	18	13	25.5±10%	42	5	15	1.6	3.0	500	2300	K	27.5	0.03
VGAS181218P440	18	14	27.5±10%	44	5	15	2.9	6	800	5000	K	27.5	0.05
VGAS222022Y490	22	17	30±10%	49	10	15	6.8	25	1200	12000	K	27.5	0.03
VGAS120626F540	26	18	33.0±10%	54	1	15	0.7	1.5	200	600	K	27.5	0.008
VGAS121026H560	26	18	34.5±10%	60	5	15	1.2	3	300	1200	K	27.5	0.018
VGAS181226P570	26	23	35.0±10%	57	5	15	2.5	8	600	3000	K	30	0.015
VGAS222026Y570	26	23	35±10%	57	10	15	6.8	25	1100	7000	K	30	0.03
VGAS322026Z570	26	23	35+/-10%	57	10	15	13.0	50	1800	15000	K	30	0.04
VGAS121030H620	30	21	41.0±10%	67	5	15	1.2	3	280	1850	K	30	0.018
VGAS181231P650	31	25	39.0±10%	65	5	15	3.7	8	800	2600	K	30	0.06
VGAS120634N770	34	30	47±10%	77	1.0	15	1.1	1.50	200	500	K	47	0.02
VGAS121034S770	34	30	47.0±10%	77	2.5	15	2	3	400	1000	K	48	0.04
VGAS181234U770	34	30	47.0±10%	77	5	15	5	6.1	800	1500	K	48	0.08
VGAS222034Y770	34	30	47.0±10%	77	10	15	12	25	2000	6300	K	48	0.24
VGAS181242U900	42	35	56.0±10%	90	5	15	4.0	6	500	1200	K	48	0.015
VGAS222042Y900	42	37	56±10%	90	10	15	12	24	1000	5000	K	48	0.06
VGAS121048H101	48	34	62.0±10%	100	5	15	1.2	-	250	500	K	48	0.022
VGAS181256U111	56	40	68±10%	110	5.0	15	4.8	-	500	1100	K	48	0.04
VGAS121060J121	60	42	76.0±10%	120	5	15	1.5	-	250	400	K	48	0.03
VGAS121065P131	65	50	82.0±10%	135	2.5	15	2.7	-	350	600	K	48	0.05
VGAS181265U131	65	50	82±10%	135	5.0	15	4.5	-	400	800	K	48	0.03
VGAS222065Y131	65	50	82±10%	135	10	15	6.5	-	1100	3000	K	48	0.06
VGAS181285U161	85	60	100±10%	165	5.0	15	4.5	-	400	500	K	48	0.04

V_W(DC)	DC Working Voltage [V]	E_T	Transient Energy Rating [J, 10x1000µS]
V_W(AC)	AC Working Voltage [V]	E_{LD}	Load Dump Energy (x10) [J]
V_B	Typical Breakdown Votage [V @ 1mA$_{DC}$, 25°C]	I_P	Peak Current Rating [A, 8x20µS]
V_C	Clamping Voltage [V @ I_{VC}]	Cap	Typical capacitance [pF] @ frequency specified and 0.5V_{RMS}, 25°C, M = 1MHz, K = 1kHz
I_{VC}	Test Current for V_C [A, 8x20µs]		
I_L	Maximum leakage current at the working voltage, 25°C [µA]	V_{Jump}	Jump Start [V, 5 min]
		P_{DISS}	Power Dissipation [W]

AUTOMOTIVE SERIES – LOAD DUMP TEST

According to ISO DP7637 rev 2 Pulse 5

Automotive Load Dump Pulse (According to ISO 7637 Pulse 5)

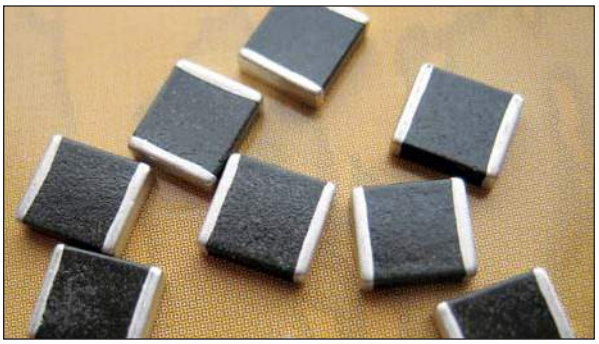


When using the test method indicated below, the amount of Energy dissipated by the varistor must not exceed the Load Dump Energy value specified in the product table.

12V SYSTEMS

VGAS181216P400	0.5Ω	1Ω	4Ω
100ms	46	52	72
200ms	37	41	59
400ms	32	35	51
VGAS222016Y400	0.5Ω	1Ω	4Ω
100ms	53	60	77
200ms	50	55	73
400ms	47	50	66

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The glass encapsulation process ensures high insulation resistance values after reflow soldering and excellent SMT compatibility.

This protection ensures reliability and acid-resistance against harsh environment like chlorite flux.

FEATURES

- High Reliability
- High Energy Absorption (Load Dump)
- High Current Handling
- AEC Q200 Qualified
- Bi-Directional protection
- EMI/RFI attenuation
- Multi-strike capability
- Sub 1nS response to ESD strike

APPLICATIONS

- DC motor including water pump
- Seatbelt pretensioner system
- Regenerative braking
- Electric drive
- Engine start/stop transition circuitry

And more

GENERAL CHARACTERISTICS

Operating Temperature: -55ºC to 125ºC

HOW TO ORDER

VJ	14	MA	0160	K	BA
Varistor Termination VJ = Ni Barrier/100% Sn VC = Hybrid AgPdPt	**Chip Size** 20 = 1206 13 = 1210 14 = 1812 15 = 2220 32 = 3220	**Series Code** MA/PA/QA = Automotive	**Operating Voltage** AC or DC	**1mA Voltage Tolerance** K = ±10%	**Packaging** BA = Tape & Reel

RoHS COMPLIANT

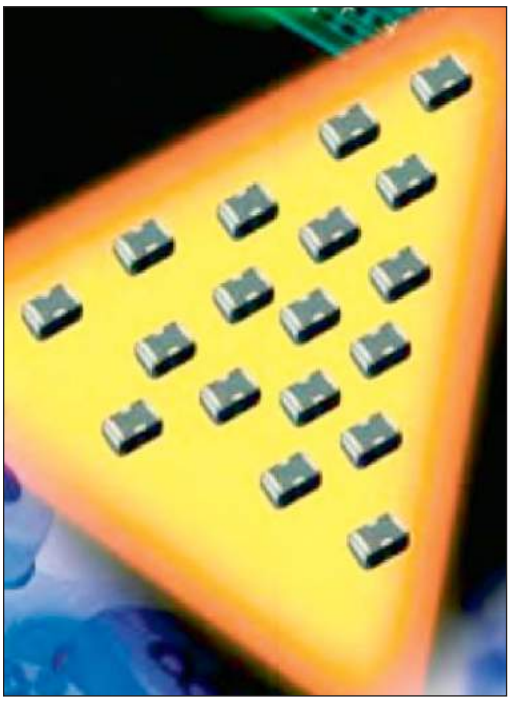
ELECTRICAL CHARACTERISTICS

AVX PN	Case	V_W (DC)	V_W (AC)	V_B	V_C	I_{VC}	I_L	E_T	E_{LD}	I_P	Cap	Freq	V_{Jump}	$P_{Diss, MAX}$
VJ20MA0160K	1206	16	14	24.5±10%	40	1	20	0.6	1.5	200	900	K	24.5	0.008
VJ20PA0160K	1206	16	14	24.5±10%	40	1	20	1.1	2	300	1100	K	24.5	0.008
VJ13MA0160K	1210	16	14	24.5±10%	40	2.5	20	1.6	3	400	1800	K	24.5	0.010
VJ13PA0160K	1210	16	14	24.5±10%	40	2.5	20	2	5	500	2300	K	24.5	0.010
VJ14MA0160K	1812	16	14	24.5±10%	40	5	20	2.4	6	800	5000	K	25.5	0.015
VJ14PA0160K	1812	16	14	24.5±10%	40	5	20	2.9	10	1000	6200	K	25.5	0.015
VJ15MA0160K	2220	16	14	24.5±10%	40	10	20	5.8	12	1200	11000	K	25.5	0.030
VJ15PA0160K	2220	16	14	24.5±10%	40	10	20	7.2	25	1500	16000	K	25.5	0.030
VJ15QA0160K	2220	16	14	24.5±10%	40	10	20	7.5	35	1800	25000	K	25.5	0.030
VJ32PA0160K	3220	16	14	24.5±10%	40	10	20	13.8	50	2000	30000	K	24.5	0.040
VJ20PA0220K	1206	22	17	30±10%	49	1	20	1	2	250	1000	K	26	0.008
VJ13PA0220K	1210	22	17	30±10%	49	2.5	20	1.7	5	400	2000	K	26	0.010
VJ14PA0220K	1812	22	17	30±10%	49	5	20	2.5	10	700	5000	K	26	0.015
VJ15PA0220K	2220	22	17	30±10%	49	10	20	6.8	25	1200	15000	K	26	0.030
VJ32PA0220K	3220	22	17	30±10%	49	10	20	13	50	2000	25000	K	26	0.040
VJ20PA0260K	1206	26	23	35±10%	57	1	20	1	2	200	600	K	30	0.008
VJ13PA0260K	1210	26	23	35±10%	57	2.5	20	1.7	5	300	1200	K	30	0.010
VJ14PA0260K	1812	26	23	35±10%	57	5	20	2.5	10	600	3000	K	30	0.015
VJ15PA0260K	2220	26	23	35±10%	57	10	20	6.8	25	1100	7000	K	30	0.030
VJ32PA0260K	3220	26	23	35±10%	57	10	20	13	50	1800	15000	K	30	0.040
VJ20PA0340K	1206	34	30	47±10%	77	1	20	1.5	1.5	200	300	K	47	0.008
VJ13PA0340K	1210	34	30	47±10%	77	2.5	20	3.5	3	350	650	K	47	0.010
VJ14PA0340K	1812	34	30	47±10%	77	5	20	5	6	600	1800	K	47	0.015
VJ15MA0340K	2220	34	30	47±10%	77	10	20	10	12	1000	4000	K	47	0.030
VJ15PA0340K	2220	34	30	47±10%	77	10	20	12	25	1200	7000	K	47	0.030
VJ32PA0340K	3220	34	30	47±10%	77	10	20	13	50	2000	10000	K	47	0.040

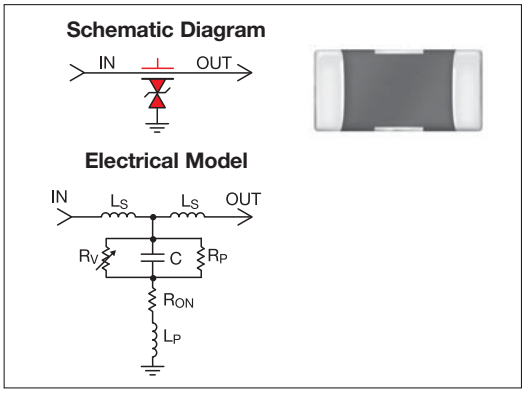
V_W(DC) DC Working Voltage [V]
V_W(AC) AC Working Voltage [V]
V_B Typical Breakdown Votage [V @ 1mA$_{DC}$, 25°C]
V_C Clamping Voltage [V @ I_{VC}]
I_{VC} Test Current for V_C [A, 8x20µs]
I_L Maximum leakage current at the working voltage, 25°C [µA]
E_T Transient Energy Rating [J, 10x1000µS]
E_{LD} Load Dump Energy (x10) [J]
I_P Peak Current Rating [A, 8x20µS]
Cap Typical capacitance [pF] @ frequency specified and 0.5V_{RMS}, 25°C, M = 1MHz, K = 1kHz
V_{Jump} Jump Start [V, 5 min]
P_{DISS} Power Dissipation [W]

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Automotive TransFeed Varistors
Multilayer Varistor with Enhanced EMI Filtering



AVX has combined the best electrical characteristics of its TransGuard® Transient Voltage Suppressors (TVS) and its Feedthru Capacitors into a single chip for state-of-the-art overvoltage circuit protection and EMI reduction over a broad range of frequencies. This unique combination of multilayer ceramic construction in a feedthru configuration gives the circuit designer a single 0805 chip that responds to transient events faster than any TVS device on the market today, and provides significant EMI attenuation when in the off-state.



Automotive TransFeeds are designed for automotive applications and are AEC-Q 200 qualified.

The reduction in parallel inductance, typical of the feedthru chip construction when compared to the construction of standard TVS or ceramic capacitor chips, gives the TransFeed product two very important electrical advantages: (1) faster "turn-on" time. Calculated response times of <200 pSec are not unusual with this device, and measured response times range from 200 – 250 pSec. The TransFeed "turn-on" characteristic is less than half that of an equivalent TransGuard® part — and TransGuards® clamp transient voltages faster than any other bipolar TVS solution such as diodes; (2) the second electrical advantage of lower parallel inductance, coupled with optimal series inductance, is the enhanced attenuation characteristics of the TransFeed product. Not only is there significantly greater attenuation at a higher self-resonance frequency, but the roll-off characteristic becomes much flatter, resulting in EMI filtering over a much broader frequency spectrum. Typical applications include filtering/protection on Microcontroller I/O Lines, Interface I/O Lines, Power Line Conditioning and Power Regulation.

TYPICAL APPLICATIONS

- Drive by Wire
- Dimming Mirror Circuit
- Filtering/protection on Microcontroller I/O lines
- Filtering/protection on Interface I/O lines
- Power Line Conditioning
- Power Regulation
- LCD Dashboard driver

Where designers are concerned with both transient voltage protection and EMI attenuation, either due to the electrical performance of their circuits or due to required compliance to specific EMC regulations, the TransFeed product is an ideal choice.

GENERAL CHARACTERISTICS

- Operting Teperature: -55°C to +125°C
- Working Voltage: 5.6Vdc - 26Vdc
- Case Size: 0805
- Energy Rating: 0.05 - 0.3J
- Current: 20 - 120A
- Max Feedthru Current: 0.5 - 1A

FEATURES

- Bi-directional TVS
- Narrow band, high attenuation filter
- EMI Filtering over broader frequency range
- Fastest Response Time to ESD Strikes
- AEC-Q 200 Qualified

HOW TO ORDER

V	2	AF	1	05	A	150	Y	2	E	D	P
Varistor	**Chip Size** 2 = 0805	**Automotive Feedthru Varistor**	**No. of Elements**	**Voltage** 05 = 5.6VDC 09 = 9.0VDC 14 = 14.0VDC 18 = 18.0VDC 26 = 26.0VDC	**Energy Rating** X = 0.05J A = 0.1J C = 0.3J	**Varistor Clamping Voltage** 150 = 18V 200 = 22V 300 = 32V 400 = 42V 500 = 50V 600 = 60V	**Capacitance Tolerance** Y = +100/-50%	**DC Resistance** 1 = 0.150 Ohms 2 = 0.200 Ohms 3 = 0.250 Ohms	**Feedthru Current** D = 0.5 A E = 0.75 A F = 1.0 A G = 0.2 or 0.3 A	**Packaging Code Pcs./Reel** D = 7" (1000) R = 7" (4000) T = 13" (10,000)	**Termination Finish** P = Ni/Sn (Plated)

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

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TRANSFEED ELECTRICAL SPECIFICATIONS

AVX Part Number	Working Voltage (DC)	Working Voltage (AC)	Breakdown Voltage	Clamping Voltage	Maximum Leakage Current	Transient Energy Rating	Peak Current Rating	Typical Cap	DC Resistance	Maximum Feedthru Current	Jump Start Voltage
V2AF105A150Y2E _ _	5.6	4.0	8.5±20%	18	35	0.10	30	800	0.200	0.75	–
V2AF105C150Y1F _ _	5.6	4.0	8.5±20%	18	35	0.30	120	2500	0.150	1.00	–
V2AF109A200Y2E _ _	9.0	6.4	12.7±15%	22	25	0.10	30	575	0.200	0.75	–
V2AF109C200Y1F _ _	9.0	6.4	12.7±15%	22	25	0.30	120	1800	0.150	1.00	–
V2AF114A300Y2E _ _	14.0	10.0	18.5±12%	32	15	0.10	30	300	0.200	0.75	27.5
V2AF114C300Y1F _ _	14.0	10.0	18.5±12%	32	15	0.30	120	900	0.150	1.00	27.5
V2AF118A400Y2E _ _	18.0	13.0	25.5±10%	42	10	0.10	30	200	0.200	0.75	27.5
V2AF118C400Y1F _ _	18.0	13.0	25.5±10%	42	10	0.30	120	500	0.150	1.00	27.5
V2AF118X500Y3D _ _	18.0	13.0	25.5±10%	50	10	0.05	20	75	0.250	0.50	27.5
V2AF126C600Y2F_ _	26.0	18.0	34.5±10%	60	10	0.3	80	250	0.2	0.75	27.5

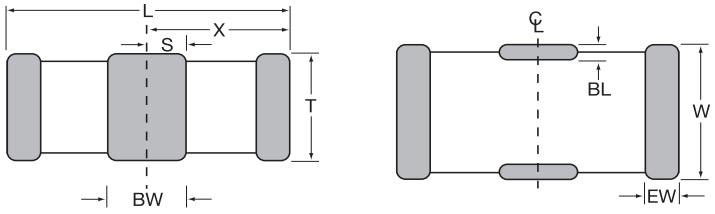
Termination Finish Code
Packaging Code

V_W (DC)	DC Working Voltage (V)	E_T	Transient Energy Rating (J, 10x1000µS)
V_W (AC)	AC Working Voltage (V)	I_P	Peak Current Rating (A, 8x20µS)
V_B	Typical Breakdown Voltage (V @ 1mA$_{DC}$)	Cap	Typical Capacitance (pF) @ 1MHz and 0.5 V
V_B Tol	V_B Tolerance is ± from Typical Value	DCR	DC Resistance (Ohms)
V_C	Clamping Voltage (V @ 1A 8x20µS)	I_{FT}	Maximum Feedthru Current (A)
I_L	Maximum Leakage Current at the Working Voltage (µA)	V_{JUMP}	Jump Start Voltage (V, 5 min)

DIMENSIONS

mm (inches)

	L	W	T	BW	BL	EW	X	S
0805	2.01 ± 0.20 (0.079 ± 0.008)	1.25 ± 0.20 (0.049 ± 0.008)	1.143 Max. (0.045 Max.)	0.46 ± 0.10 (0.018 ± 0.004)	0.18 + 0.25 -0.08 (0.007 + 0.010 -0.003)	0.25 ± 0.13 (0.010 ± 0.005)	1.02 ± 0.10 (0.040 ± 0.004)	0.23 ± 0.05 (0.009 ± 0.002)

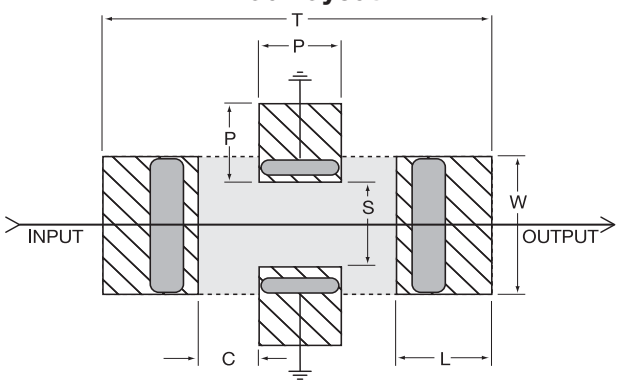


RECOMMENDED SOLDER PAD LAYOUT (Typical Dimensions)

mm (inches)

	T	P	S	W	L	C
0805	3.45 (0.136)	0.51 (0.020)	0.76 (0.030)	1.27 (0.050)	1.02 (0.040)	0.46 (0.018)

4 Pad Layout



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PERFORMANCE CHARACTERISTICS – FEEDTHRU VARISTORS

AVX Multilayer Feedthru Varistors (MLVF) are an ideal choice for system designers with transient strike and broadband EMI/RFI concerns.

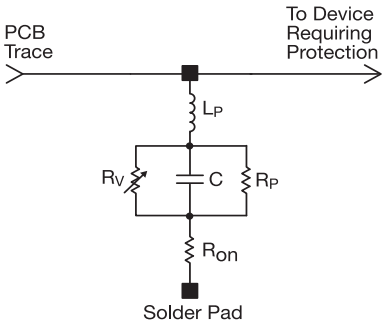
Feedthru Varistors utilize a ZnO varistor material and the electrode pattern of a feedthru capacitor. This combination allows the package advantage of the feedtaru and material advantages of the ZnO dielectric to be optimized.

ZnO MLV Feedthrus exhibit electrical and physical advantages over standard ZnO MLVs. Among them are:

1. Faster Turn on Time
2. Broadband EMI attenuation
3. Small size (relative to discrete MLV and EMI filter schemes)

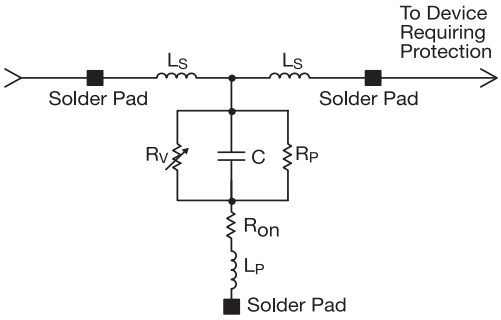
The electrical model for a ZnO MLV and a ZnO Feedthru MLV are shown below. The key difference in the model for the Feedthru is a transformation in parallel to series inductance. The added series inductance helps lower the injected transient peak current (by $2\pi fL$) resulting in an additional benefit of a lower clamping voltage. The lowered parallel inductance decreases the turn on time for the varistor to <250ps.

Discrete MLV Model



Where: R_V = Voltage Variable resistance (per VI curve)
R_p ≥ 10^{12} Ω
C = defined by voltage rating and energy level
R_{on} = turn on resistance
L_p = parallel body inductance

Discrete MLVF Model



Where: R_V = Voltage Variable resistance (per VI curve)
R_p = Body IR
C = defined by voltage rating and energy level
R_{on} = turn on resistance
L_p = minimized parallel body inductance
L_S = series body inductance

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APPLICATIONS

- EMI Suppression
- Broadband I/O Filtering
- Vcc Line Conditioning

FEATURES

- Small Size
- Low ESR
- Ultra-fast Response Time
- Broad S21 Characteristics

MARKET SEGMENTS

- Computers
- Automotive
- Power Supplies
- Multimedia Add-On Cards
- Bar Code Scanners
- Remote Terminals
- Medical Instrumentation
- Test Equipment
- Transceivers
- Cellular Phones / Pagers

TYPICAL CIRCUITS REQUIRING TRANSIENT VOLTAGE PROTECTION AND EMI FILTERING

The following applications and schematic diagrams show where TransFeed TVS/ EMI filtering devices might be used:

- System Board Level Interfaces: (Fig. 1)
  - Digital to RF
  - Analog to Digital
  - Digital to Analog
- Voltage Regulation (Fig. 2)
- Power Conversion Circuits (Fig. 3)
- GaAs FET Protection (Fig. 4)

Fig. 1 – System Interface

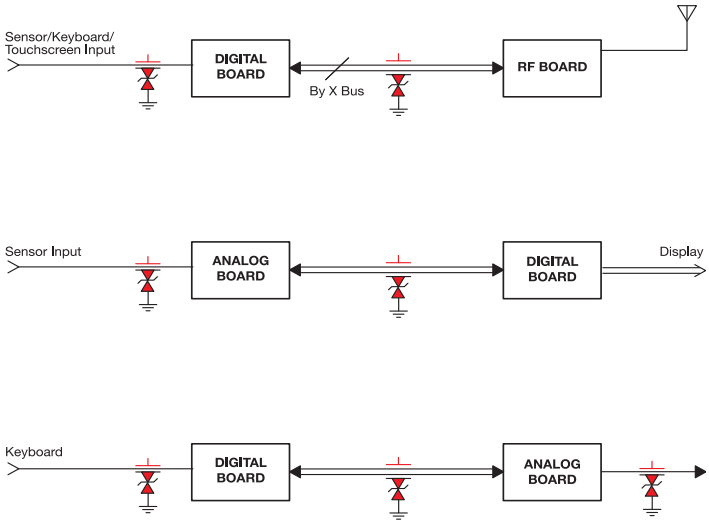


Fig. 2 – Voltage Regulators

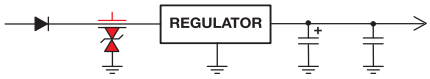


Fig. 3 – Power Conversion Circuits/Power Switching Circuits

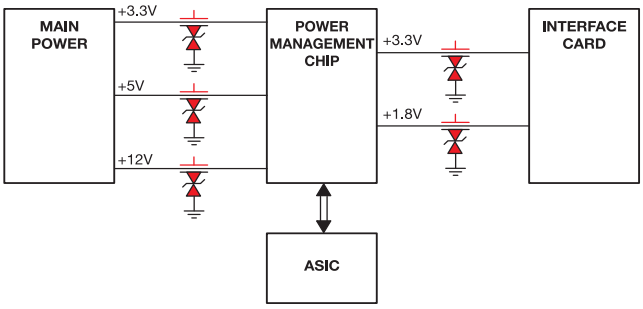
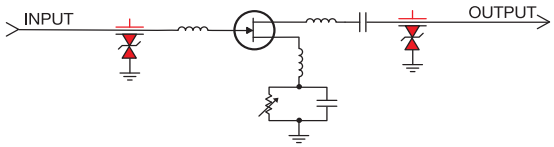


Fig. 4 – GaAs FET Protection

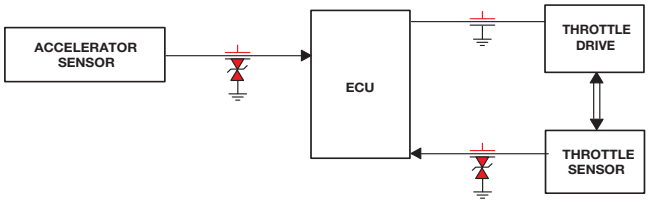


SPECIFICATION COMPARISON

MLVF 0805	PARAMETER	MLV 0805
5ph	L_S typical	N/A
<600nh	L_p typical	<1.5nh
<0.025Ω	R_{on} typical	<0.1Ω
100pf to 2.5nf	C typical	100pf to 5.5nf
see VI curves	R_V typical	see VI curves
>0.25 x 10^{12}Ω	R_p typical	>1 x 10^{12}Ω
<250ps	Typical turn on time Typical frequency response	<500ps

A comparison table showing typical element parameters and resulting performance features for MLV and MLVF is shown above.

Fig. 5 – Automotive TransFeed - Throttle by Wire



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Chip thermistors are a high quality and low cost devices especially developed for surface mounting applications. They are widely used for temperature compensation but can also achieve temperature control of printed circuits.

A nickel barrier metallization provides outstanding qualities of solderability and enables this chip to meet the requirements of the most severe soldering processes. Parts are complying to AEC-Q200 requirements.

APPLICATIONS

- LCD compensation
- CD/DVD players
- Heating systems
- Air-conditioning systems
- Compensation of pressure sensors
- Temperature control of Switch Mode Power Supplies
- Protection of power transistors in various electronic circuits

AND MORE

GENERAL CHARACTERISTICS

Types	NB21	NB12	NB20
Maximum dissipation at 25°C	0.07 W	0.12 W	0.24 W
Thermal dissipation factor	1 mW/°C	2 mW/°C	4 mW/°C
Thermal time constant	4s	5s	7s

HOW TO ORDER

NB20 — **Type**
NB = Ni Barrier/100% Sn
NB21 = 0603
NB12 = 0805
NB20 = 1206

K 0 — **Material Code**
K

0103 — **Resistance**
10,000 Ω

M — **Tolerance**
M (±20%)
J (±5%)
K (±10%)

BA — **Suffix: Packaging**
– –: Bulk

0603, 0805
BB: Cardboard tape (180mm diam. reel)
BF: Cardboard tape (1/2 reel)
BD: Cardboard tape (330mm diam. reel)

1206
BA: Plastic tape (180mm diam. reel)
BE: Plastic tape (1/2 reel)
BC: Plastic tape (330mm diam. reel)

RoHS COMPLIANT

TABLE OF VALUES (Min/Max)

NB 21 – IEC SIZE : 0603

Types	Rn at 25°C (Ω)	Material Code	B (K) (ΔB/B (1) ± 5% (2) ± 3%)	α at 25°C (%/°C)
NB 21 KC 0 470 NB 21 KC 0 471	47 470	KC	3470 ± 5%	– 3.9
NB 21 MC 0 102	1,000	MC	3910 ± 3%	– 4.4
NB 21 J 0 472	4,700	J	3480 ± 3%	– 3.9
NB 21 J 5 0682 NB 21 J 5 0103	6,800 10,000	J5	3630 ± 3%	– 4.0
NB 21 K 0 0103 NB 21 K 0 0153	10,000 15,000	K	3630 ± 3%	– 4.2
NB 21 L 0 0223	22,000	L	3790 ± 3%	– 4.4
NB 21 M 0 0333 NB 21 M 0 0473	33,000 47,000	M	3950 ± 3%	– 4.6
NB 21 L 2 0683	68,000	L2	3805 ± 3%	– 4.1
NB 21 N 0 0683	68,000	N	4080 ± 3%	– 4.6
NB 21 N 5 0104	100,000	N5	4160 ± 3%	– 4.7
NB 21 P 0 0154	150,000	P	4220 ± 3%	– 4.7
NB 21 Q 0 0334 NB 21 Q 0 0474	330,000 470,000	Q	4300 ± 3%	– 4.7

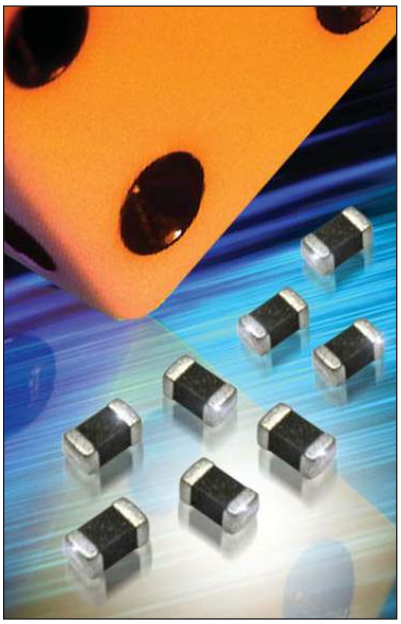
NB12 – IEC SIZE : 0805

Types	Rn at 25°C (Ω)	Material Code	B (K) (ΔB/B (1) ± 5% (2) ± 3%)	α at 25°C (%/°C)
NB 12 KC 0 180 NB 12 KC 0 101	18 100	KC	3470 ± 5%	– 3.9
NB 12 MC 0 121 NB 12 MC 0 332	120 3,300	MC	3910 ± 3%	– 4.4
NB 12 J 0 0332 NB 12 J 0 0562	3,300 5,600	J	3480 ± 3%	– 3.9
NB 12 K 0 0682 NB 12 K 0 0103	6,800 10,000	K	3630 ± 3%	– 4.0
NB 12 L 0 0123 NB 12 L 0 0153	12,000 15,000	L	3790 ± 3%	– 4.2
NB 12 M 0 0183 NB 12 M 0 0333	18,000 33,000	M	3950 ± 3%	– 4.4
NB 12 N 0 0393 NB 12 N 0 0563	39,000 56,000	N	4080 ± 3%	– 4.6
NB 12 L 2 0683	68,000	L2	3805 ± 3%	– 4.1
NB 12 N 5 0683 NB 12 N 5 0823	68,000 82,000	N5	4160 ± 3%	– 4.7
NB 12 P 0 0104	100,000	P	4220 ± 3%	– 4.7
NB 12 SC 0104	100,000	SC	4500 ± 3%	– 4.8
NB 12 P 0 0124 NB 12 P 0 0184	120,000 180,000	P	4220 ± 3%	– 4.7
NB 12 Q 0 0224 NB 12 Q 0 0274	220,000 270,000	Q	4300 ± 3%	– 4.7
NB 12 R 0 0105	1,000,000	R	4400 ± 3%	– 4.8

NB20 – IEC SIZE : 1206

Types	Rn at 25°C (Ω)	Material Code	B (K) (ΔB/B (1) ± 5% (2) ± 3%)	α at 25°C (%/°C)
NB 20 MC 0 221 NB 20 MC 0 102	220 1,000	MC	3910 ± 3%	– 4.4
NB 20 J 0 0472 NB 20 J 0 0682	4,700 6,800	J	3480 ± 3%	– 3.9
NB 20 J 5 0822	8,200	J5	3480 ± 3%	– 3.9
NB 20 K 0 0103 NB 20 K 0 0123	10,000 12,000	K	3630 ± 3%	– 4.0
NB 20 L 0 0153 NB 20 L 0 0223	15,000 22,000	L	3790 ± 3%	– 4.2
NB 20 M 0 0273 NB 20 M 0 0473	27,000 47,000	M	3950 ± 3%	– 4.4
NB 20 N 0 0563 NB 20 N 0 0823	56,000 82,000	N	4080 ± 3%	– 4.6
NB 20 N 5 0104	100,000	N5	4160 ± 3%	– 4.7
NB 20 P 0 0124 NB 20 P 0 0224	120,000 220,000	P	4220 ± 3%	– 4.7
NB 20 Q 0 0274 NB 20 Q 0 0564	270,000 560,000	Q	4300 ± 3%	– 4.7
NB 20 R 0 0684 NB 20 R 0 0105	680,000 1,000,000	R	4400 ± 3%	– 4.8

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Chip thermistors are a high quality and low cost devicess especially developed for surface mounting applications. They are widely used for temperature compensation but can also achieve temperature control of printed circuits.

The Silver - palladium - platinum termination allows using the components for hybrid assembly using conductive epoxy or wire bonding. Parts are not suitable for lead free soldering process. Parts are complying to AEC-Q200 requirements.

APPLICATIONS

- LCD compensation
- CD players
- Heating systems
- Air-conditioning systems
- Compensation of pressure sensors
- Temperature control of Switch Mode Power Supplies
- Protection of power transistors in various electronic circuits

AND MORE

GENERAL CHARACTERISTICS

Types	NC12	NC20
Maximum dissipation at 25ºC	0.12 W	0.24 W
Thermal dissipation factor	2 mW/ºC	4 mW/ºC
Thermal time constant	5s	7s

HOW TO ORDER

NC20 — **Type**
NC = AgPdPt
NC12 = 0805
NC20 = 1206

K 0 — **Material Code**
K

0103 — **Resistance**
10,000 Ω

M — **Tolerance**
M (±20%)
J (±5%)
K (±10%)

BA — **Suffix: Packaging**
– –: Bulk

0805	1206
BB: Cardboard tape (180mm diam. reel)	BA: Plastic tape (180mm diam. reel)
BF: Cardboard tape (1/2 reel)	BE: Plastic tape (1/2 reel)
BD: Cardboard tape (330mm diam. reel)	BC: Plastic tape (330mm diam. reel)

RoHS COMPLIANT

TABLE OF VALUES (Min/Max)

NC12 – IEC SIZE : 0805

Types	Rn at 25°C (Ω)	Material Code	B (K) (ΔB/B (1) ± 5% (2) ± 3%)	α at 25°C (%/°C)
NC 12 KC 0 180 NC 12 KC 0 101	18 100	KC	3470 ± 5%	– 3.9
NC 12 MC 0 121 NC 12 MC 0 332	120 3,300	MC	3910 ± 3%	– 4.4
NC 12 J 0 0332 NC 12 J 0 0562	3,300 5,600	J	3480 ± 3%	– 3.9
NC 12 K 0 0682 NC 12 K 0 0123	6,800 12,000	K	3630 ± 3%	– 4.0
NC 12 L 0 0153 NC 12 L 0 0183	15,000 18,000	L	3790 ± 3%	– 4.2
NC 12 M 0 0223 NC 12 M 0 0393	22,000 39,000	M	3950 ± 3%	– 4.4
NC 12 N 0 0473 NC 12 N 0 0563	47,000 56,000	N	4080 ± 3%	– 4.6
NC 12 L 2 0683	68,000	L2	3805 ± 3%	– 4.1
NC 12 N 0 0823	82,000	N	4080 ± 3%	– 4.6
NC 12 P 0 0104 NC 12 P 0 0184	100,000 180,000	P	4220 ± 3%	– 4.7
NC 12 Q 0 0224	220,000	Q	4300 ± 3%	-4.7

NC20 – IEC SIZE : 1206

Types	Rn at 25°C (Ω)	Material Code	B (K) (ΔB/B (1) ± 5% (2) ± 3%)	α at 25°C (%/°C)
NC 20 KC 0 100 NC 20 KC 0 101	10 100	KC	3470 ± 5%	– 3.9
NC 20 MC 0 121 NC 20 MC 0 152	120 1,500	MC	3910 ± 3%	– 4.4
NC 20 I 0 0182 NC 20 I 0 0332	1,800 3,300	I	3250 ± 5%	– 3.7
NC 20 J 0 0392 NC 20 J 0 0682	3,900 6,800	J	3480 ± 3%	– 3.9
NC 20 K 0 0822 NC 20 K 0 0153	8,200 15,000	K	3630 ± 3%	– 4.0
NC 20 L 0 0183 NC 20 L 0 0223	18,000 22,000	L	3790 ± 3%	– 4.2
NC 20 M 0 0273 NC 20 M 0 0473	27,000 47,000	M	3950 ± 3%	– 4.4
NC 20 N 0 0563 NC 20 N 0 0104	56,000 100,000	N	4080 ± 3%	– 4.6
NC 20 P 0 0124 NC 20 P 0 0224	120,000 220,000	P	4220 ± 3%	– 4.7
NC 20 Q 0 0274 NC 20 Q 0 0474	270,000 470,000	Q	4300 ± 3%	– 4.7
NC 20 R 0 0564 NC 20 R 0 0105	560,000 1,000,000	R	4400 ± 3%	– 4.8

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AVX offers wide range of disc thermistors for wide range of applications. AVX has the ability to offer also customized versions to meet specific requirements. Parts are complying to AEC-Q200 requirements.

- ND: epoxy-phenolic resin coating
  NE: epoxy resin coating
  (recommended for severe mounting conditions)
- Leads: Radial copper wire tinned
- NR: uncoated leadless disc (please contact factory)

APPLICATIONS

- Commodity Product: 2 families ND or NE: general purpose
- Alarm and temperature measurement application
- Temperature regulation application
- Level detection application
- Compensation application

HOW TO ORDER

ND06	P0	0103	K	– –
Type	**Material Code**	**Resistance** 10KΩ	**Tolerance** K (±10%)	**Packaging** Bulk

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

PERFORMANCE CHARACTERISTICS

Types	General purpose		
	ND03 or NE03	**ND06 or NE06**	**ND09 or NE09**
Climatic category			
Operating Temperature	-55 to +150°C	-55 to +150°C	-55 to +150°C
Tolerance on Rn (25°C)	330Ω to 1MΩ: ± 5, 10, 20% 1500Ω to 150 kΩ: ± 3%	±5%, ±10%, ±20%	±5%, ±10%, ±20%
Maximum dissipation at 25°C	0.25 W	0.71 W	0.9 W
Thermal dissipation factor	5 mW/°C	7.1 mW/°C	9 mW/°C
Thermal time constant	10 s	22 s	30 s
Response time	< 3s		

OPTIONS

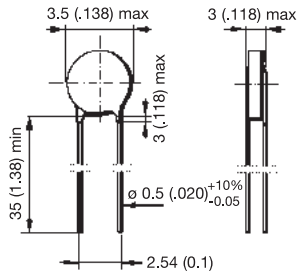
Consult factory for availability of options:

- other nominal resistance values
- other tolerances
- alternative lead materials or lengths
- controlled dimensions
- leadless discs

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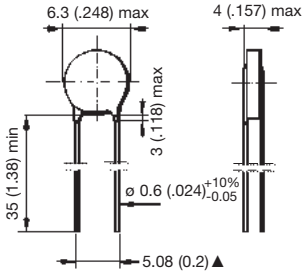
TABLE OF VALUES

ND03/NE03



Part Number	Rn at 25°C (Ω)	Material Code	B (K) (ΔB/B(1) ± 5% (2) ± 3%)	α at 25°C (%/°C)
N_03I00331 N_03I00471	330 470	I	3250 (1)	– 3.7
N_03J00681 N_03J00102	680 1,000	J	3480 (2)	– 3.9
N_03K00152 N_03K00222	1,500 2,200	K	3630 (2)	– 4.0
N_03L00272 N_03L00332	2,700 3,300	L	3790 (2)	– 4.2
N_03M00472 N_03M00682	4,700 6,800	M	3950 (2)	– 4.4
N_03N00103 N_03N00153	10,000 15,000	N	4080 (2)	– 4.6
N_03P00223 N_03P00333	22,000 33,000	P	4220 (2)	– 4.7
N_03Q00473 N_03Q00683	47,000 68,000	Q	4300 (2)	– 4.7
N_03R00104 N_03R00154	100,000 150,000	R	4400 (2)	– 4.8
N_03S00224	220,000	S	4520 (2)	– 5.0
N_03T00334 N_03T00474	330,000 470,000	T	4630 (2)	– 5.1
N_03U00105	1,000,000	U	4840 (2)	– 5.3

ND06/NE06



Part Number	Rn at 25°C (Ω)	Material Code	B (K) (ΔB/B(1) ± 5% (2) ± 3%)	α at 25°C (%/°C)
N_06J00151 N_06J00221	150 220	J	3480 (2)	– 3.9
N_06K00331 N_06K00471	330 470	K	3630 (2)	– 4.0
N_06L00681 N_06L00102	680 1,000	L	3790 (2)	– 4.2
N_06M00152	1,500	M	3950 (2)	– 4.4
N_06N00222 N_06N00332	2,200 3,300	N	4080 (2)	– 4.6
N_06P00472 N_06P00682 N_06P00103	4,700 6,800 10,000	P	4220 (2)	– 4.7
N_06Q00153 N_06Q00223	15,000 22,000	Q	4300 (2)	– 4.7
N_06R00333	33,000	R	4400 (2)	– 4.8
N_06S00473 N_06S00683	47,000 68,000	S	4520 (2)	– 5.0
N_06T00104	100,000	T	4630 (2)	– 5.1
N_06U00154 N_06U00224 N_06U00334	150,000 220,000 330,000	U	4840 (2)	– 5.3

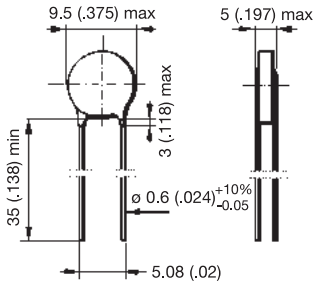
For other resistance values, please consult us.

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TABLE OF VALUES

ND09/NE09/NV09

ND09/NE09



Part Number	Rn at 25°C (Ω)	Material Code	B (K) (ΔB/B (1) ± 5% (2) ± 3%)	α at 25°C (%/°C)
N_09J00680 N_09J00101	68 100	J	3480 (2)	– 3.9
N_09K00151 N_09K00221	150 220	K	3630 (2)	– 4.0
N_09L00331	330	L	3790 (2)	– 4.2
N_09M00471 N_09M00681	470 680	M	3950 (2)	– 4.4
N_09N00102 N_09N00152	1,000 1,500	N	4080 (2)	– 4.6
N_09P00222 N_09P00332	2,200 3,300	P	4220 (2)	– 4.7
N_09Q00472 N_09Q00682	4,700 6,800	Q	4300 (2)	– 4.7
N_09R00103 N_09R00153	10,000 15,000	R	4400 (2)	– 4.8
N_09S00223	22,000	S	4520 (2)	– 5.0
N_09T00333 N_09T00473	33,000 47,000	T	4630 (2)	– 5.1
N_09U00683 N_09U00104 N_09U00154	68,000 100,000 150,000	U	4840 (2)	– 5.3

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PACKAGING FOR AUTOMATIC INSERTION

PACKAGING AND KINK SUFFIXES

Tables below indicate the suffixes to specify when ordering to get the required kink and packaging. For devices on tape, it is necessary to specify the height (H or Ho) which is the distance between the tape axis (sprocket holes axis) and the seating plane on the printed circuit board. The following types can be ordered on tape either in AMMOPACK (fan folder) or on REEL in accordance with IEC 286-2.

– Straight leads:

H represents the distance between the sprocket holes axis and the bottom plane of component body (base of resin or base of stand off).

– Kinked leads and flat leads:

Ho represents the distance between the sprocket holes axis and the base on the knee (kinked leads) or the bottom of the flat part (flat leads).

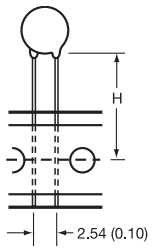
• Reel & Ammopack

millimeters (inches)

Types	Suffix	H or Ho	Leads	Quantity/Size	Packaging
ND/NE 03 & NJ28 NP30	CA	16 ± 0.5 (0.630 ± 0.020)	Straight	2000/3000	AMMOPACK
	CB	16 ± 0.5 (0.630 ± 0.020)	Straight	2000/3000	REEL
	CC	19.5 ± 0.5 (0.768 ± 0.020)	Straight	2000/3000	AMMOPACK
	CD	19.5 ± 0.5 (0.768 ± 0.020)	Straight	2000/3000	REEL
ND/NE 06/09	DA	16 ± 0.5 (0.630 ± 0.020)	Straight	1500	AMMOPACK
	DB	16 ± 0.5 (0.630 ± 0.020)	Straight	1500	REEL
	DC	19.5 ± 0.5 (0.768 ± 0.020)	Straight	1500	AMMOPACK
	DD	19.5 ± 0.5 (0.768 ± 0.020)	Straight	1500	REEL
	DL	16 ± 0.5 (0.630 ± 0.020)	Kinked	1500	AMMOPACK
	DM	16 ± 0.5) (0.630 ± 0.020)	Kinked	1500	REEL
	DN	19.5 ± 0.5 (0.768 ± 0.020)	Kinked	1500	AMMOPACK
	DP	19.5 ± 0.5 (0.768 ± 0.020)	Kinked	1500	REEL

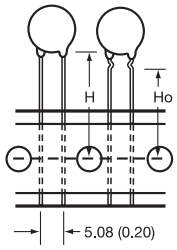
NTC

Type ND03 NE03 NJ28 NP30



NTC

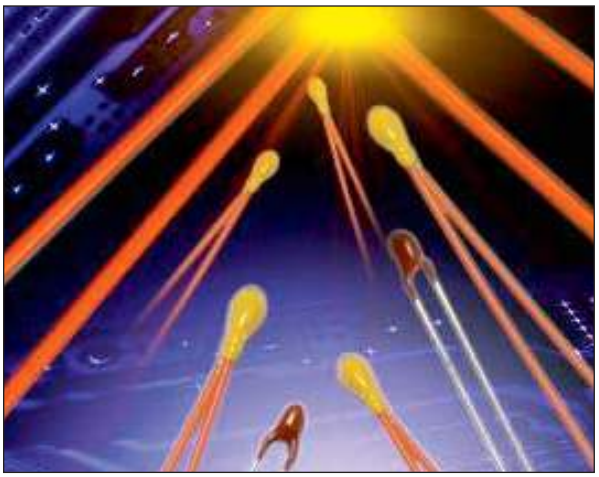
Types ND/NE 06/09



• Bulk

Type	Quantity/box
ND/NE03	3000
ND/NE06	1500
ND/NE09	1500
NI24 NJ28 NK20	1000

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High precision resistance and an outstanding ability to reproduce the sensibility index B, make these ranges of products the types of thermistors ideal for temperature measurement applications.

Leaded or unleaded, these small size and rapid response time thermistors are able to meet the most accurate requirements. Parts are complying to AEC-Q200 requirements.

FEATURES

- Small size
- Tight tolerance
- High precision

APPLICATIONS

- Engine Control Systems
- Airbag Sensor & Control Systems
- ABS/ESP Systems

AND MORE

HOW TO ORDER

NJ28	MA	0502	F	– –
Type	**Material Code** MA (See table below)	**Resistance** 5KΩ	**Tolerance** F (±1%)	**Packaging** Bulk

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

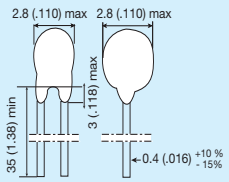
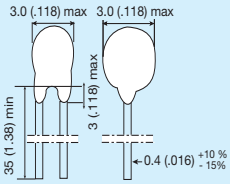
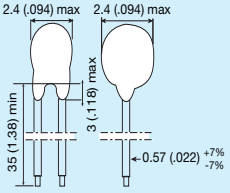
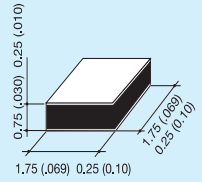
Types	NJ 28	NP 30	NI 24	NK 20
Finish	Coated chip with phenolic resin + varnish + tinned copper wires	Coated chip with epoxy + tinned copper wires	Coated chip with epoxy AWG30 PFA insulated leads + Silver plated nickel wires	Chip
DIMENSIONS: millimeters (inches)				
Marking	On packaging only			
Operating temperature	-55°C to +150°C			
Tolerance on Rn (25°C)	±1%, ±2%, ±3%			
Maximum dissipation at 25°C	Will depend on operating conditions			
Thermal dissipation factor*	3 mW/°C	4 mW/°C	1.5 mW/°C	2 mW/°C
Thermal time constant	8 s	9 s	16 s	6 s
Response time	< 2 s			

TABLE OF VALUES

NJ28 • NP30 • NI24 • NK200				
Types	**Rn at 25°C (Ω)**	**Material Code**	**B (K) ($\Delta B/B$ (1) ± 5% (2) ± 3%)**	**α at 25°C (%/°C)**
N_ _ _ KA 0202	2,000	KA	3625 ± 1%	– 4.1
N_ _ _ MA 0302	3,000	MA	3960 ± 0.5%	– 4.5
N_ _ _ MA 0502	5,000	MA	3960 ± 0.5%	– 4.5
N_ _ _ MA 0103	10,000	MA	3960 ± 0.5%	– 4.5
N_ _ _ NA 0103	10,000	NA	4100 ± 1%	– 4.6
N_ _ _ PA 0203	20,000	PA	4235 ± 1%	– 4.8
N_ _ _ QA 0503	50,000	QA	4250 ± 1%	– 4.8
N_ _ _ RA 0104	100,000	RA	4380 ± 1%	– 4.9

OPTIONS

Consult factory for availability of options:

- other nominal resistance values
- other tolerances
- alternative lead materials or lengths
- controlled dimensions

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INTERCONNECT PRODUCTS

AVX has been producing technology leading connectors for over 60 years. At the heart of our expertise is our industry proven contact technology and innovative manufacturing process that provide a total solution for our customers.

AVX also has manufacturing and design capabilities to offer custom interconnect solutions for the automotive industry.

Some of our innovative products:

- CUSTOM AUTOMOTIVE CONNECTORS
  Designed in close cooperation with our customers. Connectors are qualified and manufactured in accordance with automotive regulations and customer's requirements.
- DISCRETE WIRE IDC CONNECTORS
  Provides gas-tight and reliable wire-to-board connection based on AVX patented technology.
- FFC/FPC SECURE LOCKING CONNECTORS
  Connector series that offers reliable and secure connections for automotive applications as a result of our unique secure locking feature.

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AVX Interconnect has been producing custom automotive connectors for over 20 years. Core to our technical and performance advantages are our proven contact technologies and innovative manufacturing capabilities. Combined, AVX's custom capabilities manufacture some of the most complex and leading edge automotive connectors available today.

Automotive electronics and systems are more complex and are constantly pushing the interconnect and total system integration development. One example is the growth of a complete Mechatronics solution. This process combines not only the connector functionality, but also integrates mechanical and electrical components such as bushings, buss bars. Lead frames, gaskets and electrolytic capacitors. At the system level, connector pin counts have increased to over 200 contacts making connector design, manufacturing and placement very critical and precise. Laser welding of contacts and components are becoming very common processes to achieve the necessary results. New materials and processes are being developed to provide pure bondable surfaces for wire bonding.

Core to AVX's contact technology offering is our industry proven Compliant or Press-fit Pin PCB termination that was developed and patented in the 1970's. This solder less process provides a gas tight connection of the connector pin within the plated through hole in the PCB. The breadth of our automotive qualified pin range provides design flexibilities based on hole size, PCB thickness, operating temperature ranges and current carrying capabilities just to name a few.

FEATURES

- Solder technology
- Stitching technology
- Press-fit Technology (VARIPINTM)
- Insulation Displacement Contact Technology (IDC)
- Compression Contact Technology
- Over molded lead frames
- Bondable surfaces
- Mechatronic parts combined with additional features as sealing, integrated busbar, shunts, capacitors, filters and other components

APPLICATIONS

- Engine Control Systems
- Airbag Sensor & Control Systems
- ABS/ESP Systems
- Gearshift systems
- Hybrid-Electrical devices
- Comfort electronics
- Sensors
- Driver Assist Systems

AND MORE

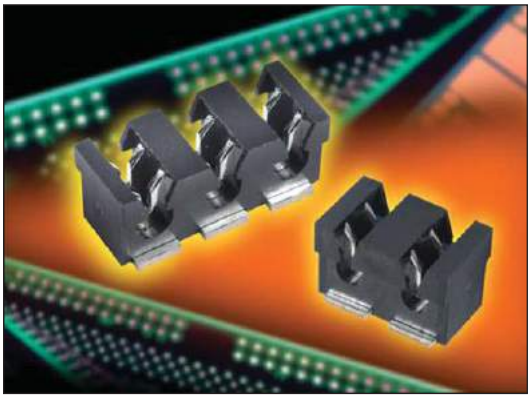


HOW TO ORDER

To prepare an offer according to your exact requirements, please provide us details of your application and requirements. Our engineering team would provide assistance with designing the reliable interconnect solution based on specified requirements.

RoHS COMPLIANT

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The 917X series of surface mount Insulation Displacement Connectors (IDC) were developed to meet the harsh automotive and industrial market applications for connecting individual wires directly to a PCB ranging from 14 AWG to 28 AWG. This industry proven contact system has been tested to automotive levels of shock, vibration, and temperature cycling to prove their reliability and robustness. The simplicity of inserting a wire into the connector with a small tool allows a wide range of devices to be connected to the PCB without soldering. In SSL applications specifically, these connectors are used to bring power and signal onto the PCB or are used to daisy chain multiple boards together in a long string. While the IDC contact provides a gas-tight connection to conductor of the wire, the housing has been designed to grab the insulation of the wire to provide a positive strain relief even in the harshest conditions. In case of repair, the wires can be removed and replace up to three times.

The 9176 series accepts 18 AWG to 24 AWG wires with an insulation diameter ranging from 1.1mm to 2.1mm. These dual contact connectors support a 10 amp current rating with two large SMT solder tails per wire to provide maximum stability on the PCB. Available in 1p-3p configuration, these connectors can be end stackable for higher pin counts. The 9176 series also comes with optional locking strain relief caps that act as the termination tool for severe vibration applications.

APPLICATIONS

- Connecting discrete wire components directly to the PCB
- Bringing power and signals onto a PCB
- Daisy chaining PCB's together to create a continuous string of boards
- Application Notes: refer to 201-01-124

FEATURES AND BENEFITS

- IDC contact provides a gas-tight connection to the PCB for long term reliability
- Connector housing captures the wire insulation for positive strain relief
- Tested to automotive levels on shock, vibration and temperature cycling for reliability
- Low and high volume assembly tools to match production volumes
- Reduced total applied cost versus solder or crimp processes
- Optional thru and end caps lock in place to provide maximum strain relief
- High temperature insulator capable to 260ºC reflow soldering processes

ELECTRICAL

- Current Rating: 10 Amp / Contact
- Voltage Rating: 300 VAC

ENVIRONMENTAL

- Operating Temperature: -40ºC to +125ºC

MECHANICAL

- Insulator Material: Nylon 46: UL94V0
- Contact Material: Phosphor Bronze
- Plating: Tin over Nickel
- Durability: 3 Cycles

HOW TO ORDER

00 — **Prefix**

9176 — **Series**

00X — **Number of Ways**
001 = 1
002 = 2
003 = 3

0XX — **Wire Gauge Size**

Code	Accepted Wire Gauge	Wire Insulation	Cap Code Pages 21-22
001	18 Gauge Stranded	Ø 1.6-2.1	021
011	20 Gauge Solid or Stranded	Ø 1.6-2.1	021
022	22 Gauge Solid or Stranded	Ø 1.1-1.6	016
032	24 Gauge Solid or Stranded	Ø 1.1-1.6	016

X — **Insulator Color**
9 = UL White
8 = UL Black
Special Order

06 — **Plating Option**
06 = Pure Tin all over

RoHS COMPLIANT

Certification: UL File #E90723

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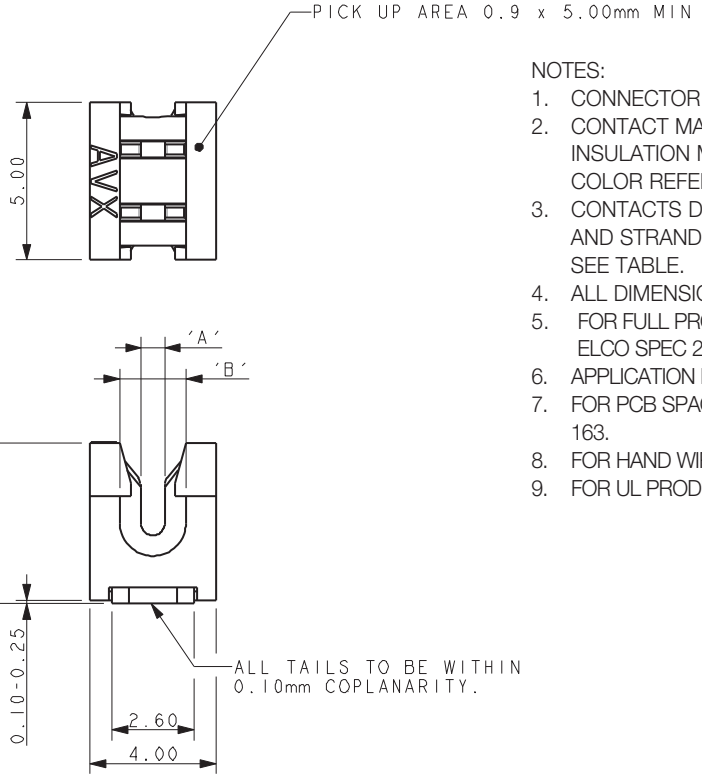
CONNECTOR/TOOLING PART NUMBER MATRIX

SERIES 9176 IDC					HAND INSERTION TOOLING*			ACCESSORY CAPS	
AWG	Wire Insulation	Positions	Color	Part Number	Plastic (medium volume)	Metal (high volume)	Mass Termination	Through Wire	Wire Stop
18	Ø 1.6 - 2.1	1p	Black	009176001001806	069176701601000	069176701701000	N/A	609176001021000	609176001021099
18	Ø 1.6 - 2.1	1p	White	009176001001906	069176701601000	069176701701000	N/A	609176001021100	609176001021199
18	Ø 1.6 - 2.1	2p	Black	009176002001806	069176701601000	069176701701000	069176701701002	609176002021000	609176002021099
18	Ø 1.6 - 2.1	2p	White	009176002001906	069176701601000	069176701701000	069176701701002	609176002021100	609176002021199
18	Ø 1.6 - 2.1	3p	Black	009176003001806	069176701601000	069176701701000	069176701701003	609176003021000	609176003021099
18	Ø 1.6 - 2.1	3p	White	009176003001906	069176701601000	069176701701000	069176701701003	609176003021100	609176003021199
20	Ø 1.6 - 2.1	1p	Black	009176001011806	069176701601000	069176701701000	N/A	609176001021000	609176001021099
20	Ø 1.6 - 2.1	1p	White	009176001011906	069176701601000	069176701701000	N/A	609176001021100	609176001021199
20	Ø 1.6 - 2.1	2p	Black	009176002011806	069176701601000	069176701701000	069176701701002	609176002021000	609176002021099
20	Ø 1.6 - 2.1	2p	White	009176002011906	069176701601000	069176701701000	069176701701002	609176002021100	609176002021199
20	Ø 1.6 - 2.1	3p	Black	009176003011806	069176701601000	069176701701000	069176701701003	609176003021000	609176003021099
20	Ø 1.6 - 2.1	3p	White	009176003011906	069176701601000	069176701701000	069176701701003	609176003021100	609176003021199
22	Ø 1.1 - 1.6	1p	Black	009176001022806	069176701602000	069176701702000	N/A	609176001016000	609176001016099
22	Ø 1.1 - 1.6	1p	White	009176001022906	069176701602000	069176701702000	N/A	609176001016100	609176001016199
22	Ø 1.1 - 1.6	2p	Black	009176002022806	069176701602000	069176701702000	069176701702002	609176002016000	609176002016099
22	Ø 1.1 - 1.6	2p	White	009176002022906	069176701602000	069176701702000	069176701702002	609176002016100	609176002016199
22	Ø 1.1 - 1.6	3p	Black	009176003022806	069176701602000	069176701702000	069176701702003	609176003016000	609176003016099
22	Ø 1.1 - 1.6	3p	White	009176003022906	069176701602000	069176701702000	069176701702003	609176003016100	609176003016199
24	Ø 1.1 - 1.6	1p	White	009176001032106	069176701602000	069176701702000	N/A	609176001016100	609176001016199
24	Ø 1.1 - 1.6	1p	Black	009176001032806	069176701602000	069176701702000	N/A	609176001016000	609176001016099
24	Ø 1.1 - 1.6	1p	White	009176001032906	069176701602000	069176701702000	N/A	609176001016100	609176001016199
24	Ø 1.1 - 1.6	2p	Black	009176002032806	069176701602000	069176701702000	069176701702002	609176002016000	609176002016099
24	Ø 1.1 - 1.6	2p	White	009176002032906	069176701602000	069176701702000	069176701702002	609176002016100	609176002016199
24	Ø 1.1 - 1.6	3p	Black	009176003032806	069176701602000	069176701702000	069176701702003	609176003016000	609176003016099
24	Ø 1.1 - 1.6	3p	White	009176003032906	069176701602000	069176701702000	069176701702003	609176003016100	609176003016199

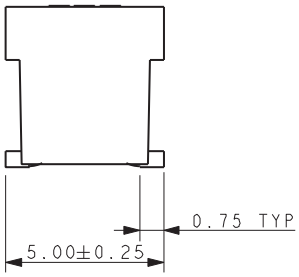
*** Hand Insertion Tooling - Universal Hand Tool 067000773001000; Consult Application Notes 201-01-124**

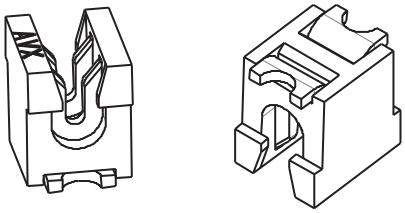
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18-24 AWG 1 WAY IDC CONNECTOR



NOTES:
1. CONNECTOR FOR IDC WIRE TO BOARD CONNECTION.
2. CONTACT MATERIAL: PHOSPHOR BRONZE.
   INSULATION MATERIAL: HIGH TEMPERATURE NYLON 46.
   COLOR REFER TO PAGE 140.
3. CONTACTS DESIGNED TO ACCEPT BETWEEN 20AWG AND 24AWG SOLID AND STRANDED WIRES. 18AWG WILL ONLY ACCEPT STRANDED WIRES, SEE TABLE.
4. ALL DIMENSIONS FOR REFERENCE UNLESS OTHERWISE STATED.
5. FOR FULL PRODUCT SPECIFICATION ON STANDARD CONNECTORS REFER TO ELCO SPEC 201-01-106
6. APPLICATION NOTES 201-01-124.
7. FOR PCB SPACE RESTRICTED BY WIRE ASSEMBLY TOOLING REFER TO PAGE 163.
8. FOR HAND WIRE ASSEMBLY TOOLING REFER TO PAGE 163.
9. FOR UL PRODUCT CODES UL REFERENCE E90723 (US AND CANADA).

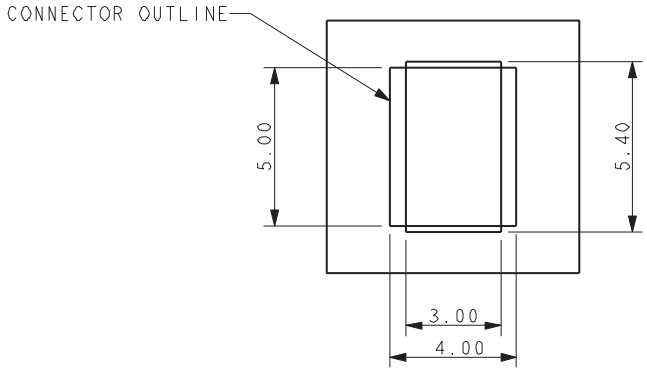




Code	Accepted Wire Gauge	A	Wire Insulation	B
001	18AWG Stranded	0.72	Ø 1.6-2.1	2.1
011	20AWG Solid and Stranded	0.60	Ø 1.6-2.1	2.1
022	22AWG Solid and Stranded	0.47	Ø 1.1-1.6	1.6
032	24AWG Solid and Stranded	0.37	Ø 1.1-1.6	1.6

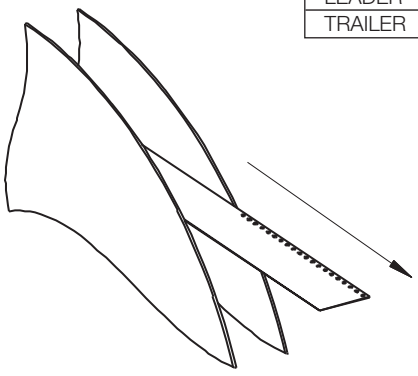
SMT PCB LAYOUT

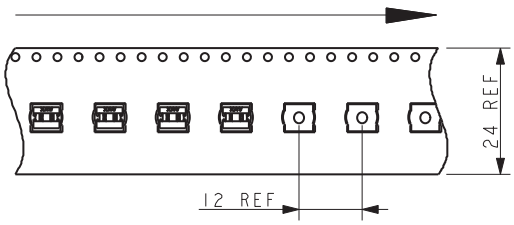
PURE TIN PADS



PACKING DETAILS

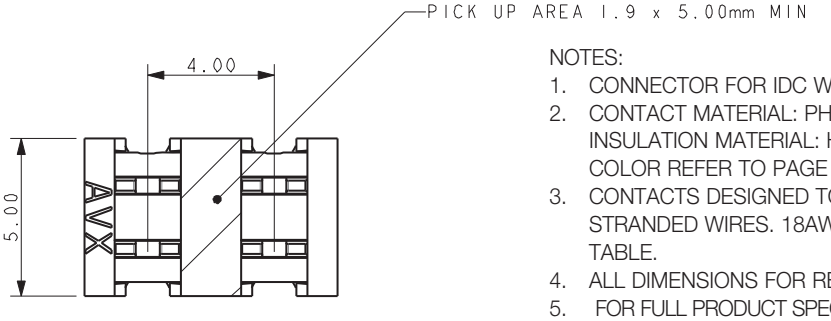
REEL QTY	1000
LEADER	480MM
TRAILER	120MM



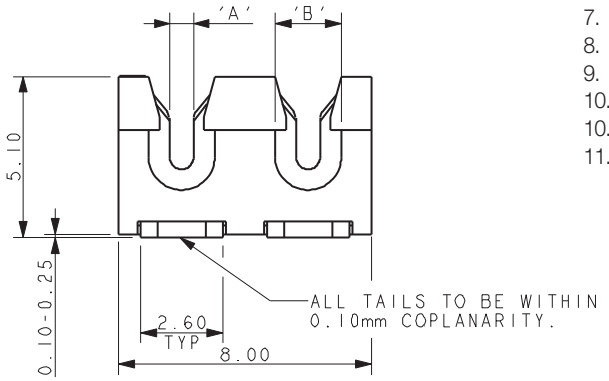


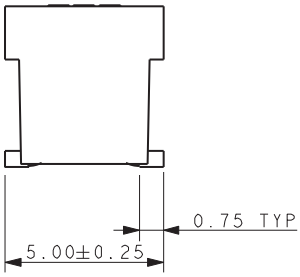
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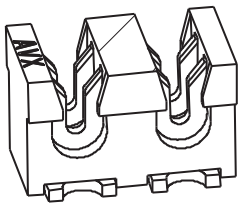
18-24 AWG 2 WAY IDC CONNECTOR

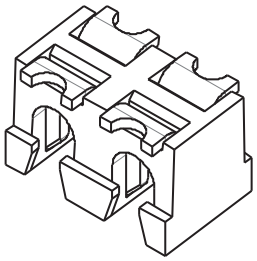


NOTES:
1. CONNECTOR FOR IDC WIRE TO BOARD CONNECTION.
2. CONTACT MATERIAL: PHOSPHOR BRONZE.
   INSULATION MATERIAL: HIGH TEMPERATURE NYLON 46.
   COLOR REFER TO PAGE 140.
3. CONTACTS DESIGNED TO ACCEPT BETWEEN 20AWG AND 24AWG SOLID AND STRANDED WIRES. 18AWG WILL ONLY ACCEPT STRANDED WIRES, SEE TABLE.
4. ALL DIMENSIONS FOR REFERENCE UNLESS OTHERWISE STATED.
5. FOR FULL PRODUCT SPECIFICATION ON STANDARD CONNECTORS REFER TO ELCO SPEC 201-01-106. UL COMPONENTS REFER TO ELCO SPECIFICATION 201-01-106UL.
6. APPLICATION NOTES 201-01-124.
7. FOR PCB SPACE RESTRICTED BY WIRE ASSEMBLY TOOLING REFER TO PAGE 23.
8. FOR HAND WIRE ASSEMBLY TOOLING REFER TO PAGE 163.
9. FOR PRESS WIRE ASSEMBLY TOOLING REFER TO PAGE 164.
10. FOR ACCESSORY CAPS REFER TO PAGE 161 AND 162.
10. FOR UL PRODUCT CODES UL REFERENCE E90723 (US AND CANADA).
11. ALL DIMENSIONS ±0.20 TOLERANCE SPECIFIED.





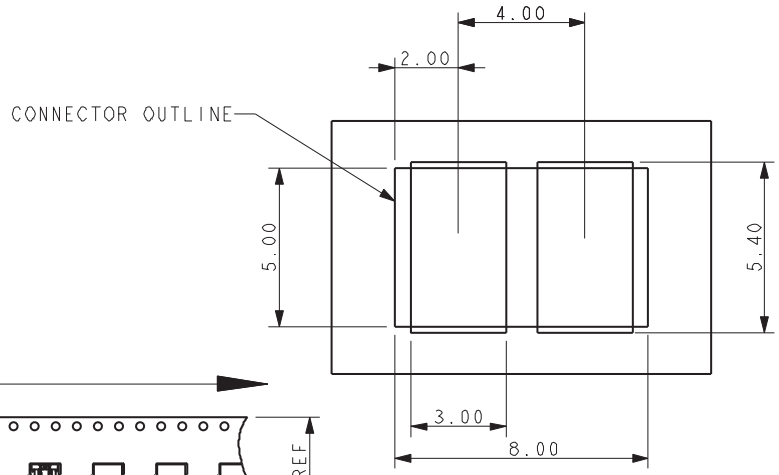




Code	Accepted Wire Gauge	A	Wire Insulation	B
001	18AWG Stranded	0.72	Ø 1.6-2.1	2.1
011	20AWG Solid and Stranded	0.60	Ø 1.6-2.1	2.1
022	22AWG Solid and Stranded	0.47	Ø 1.1-1.6	1.6
032	24AWG Solid and Stranded	0.37	Ø 1.1-1.6	1.6

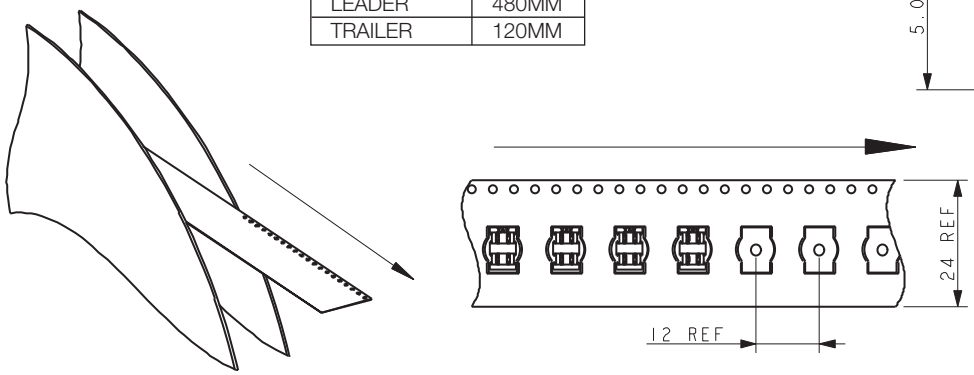
SMT PCB LAYOUT

PURE TIN PADS



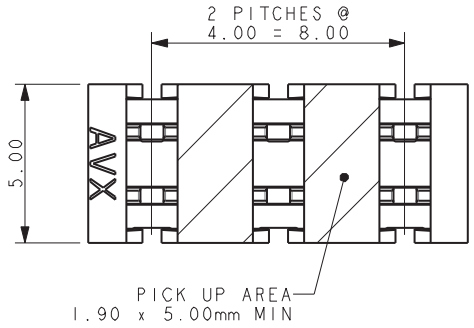
PACKING DETAILS

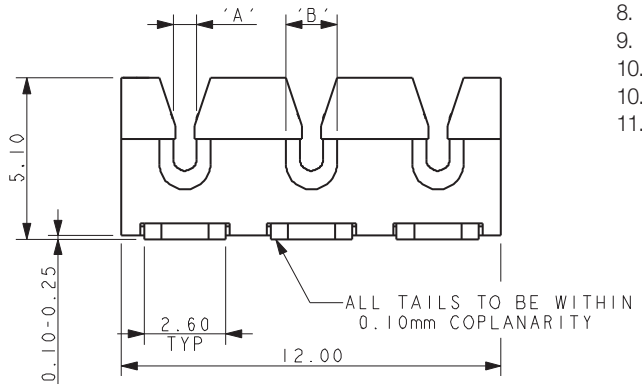
REEL QTY	1000
LEADER	480MM
TRAILER	120MM



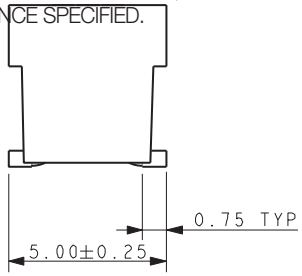
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18-24 AWG 3 WAY IDC CONNECTOR

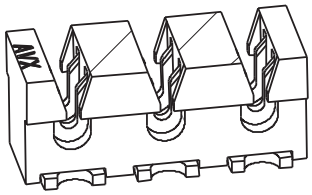


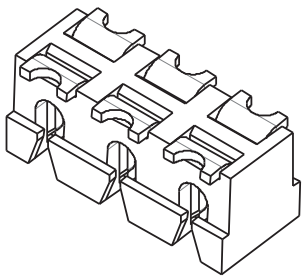


NOTES:
1. CONNECTOR FOR IDC WIRE TO BOARD CONNECTION.
2. CONTACT MATERIAL: PHOSPHOR BRONZE.
   INSULATION MATERIAL: HIGH TEMPERATURE NYLON 46.
   COLOR REFER TO PAGE 140.
3. CONTACTS DESIGNED TO ACCEPT BETWEEN 20AWG AND 24AWG SOLID AND STRANDED WIRES. 18AWG WILL ONLY ACCEPT STRANDED WIRES, SEE TABLE.
4. ALL DIMENSIONS FOR REFERENCE UNLESS OTHERWISE STATED.
5. FOR FULL PRODUCT SPECIFICATION ON STANDARD CONNECTORS REFER TO ELCO SPEC 201-01-106. UL COMPONENTS REFER TO ELCO SPECIFICATION 201-01-106UL.
6. APPLICATION NOTES 201-01-124.
7. FOR PCB SPACE RESTRICTED BY WIRE ASSEMBLY TOOLING REFER TO PAGE 23.
8. FOR HAND WIRE ASSEMBLY TOOLING REFER TO PAGE 163.
9. FOR PRESS WIRE ASSEMBLY TOOLING REFER TO PAGE 164.
10. FOR ACCESSORY CAPS REFER TO PAGE 161 AND 162.
10. FOR UL PRODUCT CODES UL REFERENCE E90723 (US AND CANADA).
11. ALL DIMENSIONS ±0.20 TOLERANCE SPECIFIED.



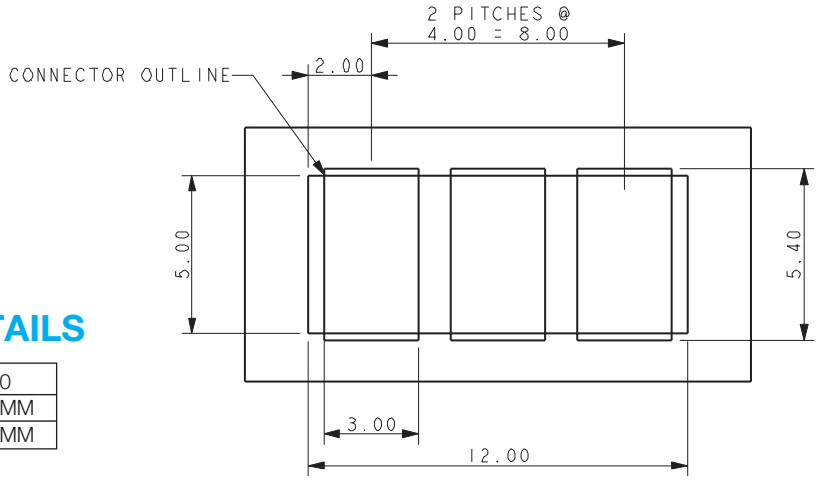
Code	Accepted Wire Gauge	A	Wire Insulation	B
001	18AWG Stranded	0.72	Ø 1.6-2.1	2.1
011	20AWG Solid and Stranded	0.60	Ø 1.6-2.1	2.1
022	22AWG Solid and Stranded	0.47	Ø 1.1-1.6	1.6
032	24AWG Solid and Stranded	0.37	Ø 1.1-1.6	1.6





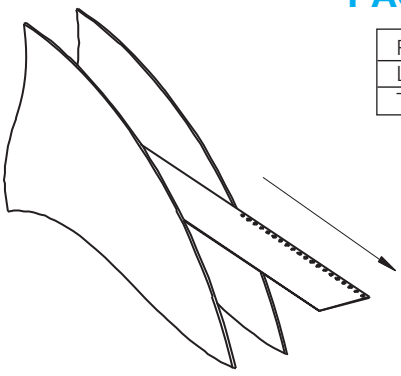
SMT PCB LAYOUT

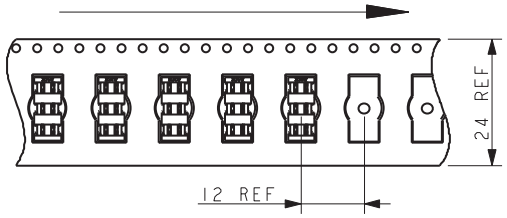
PURE TIN PADS



PACKING DETAILS

REEL QTY	1000
LEADER	480MM
TRAILER	120MM

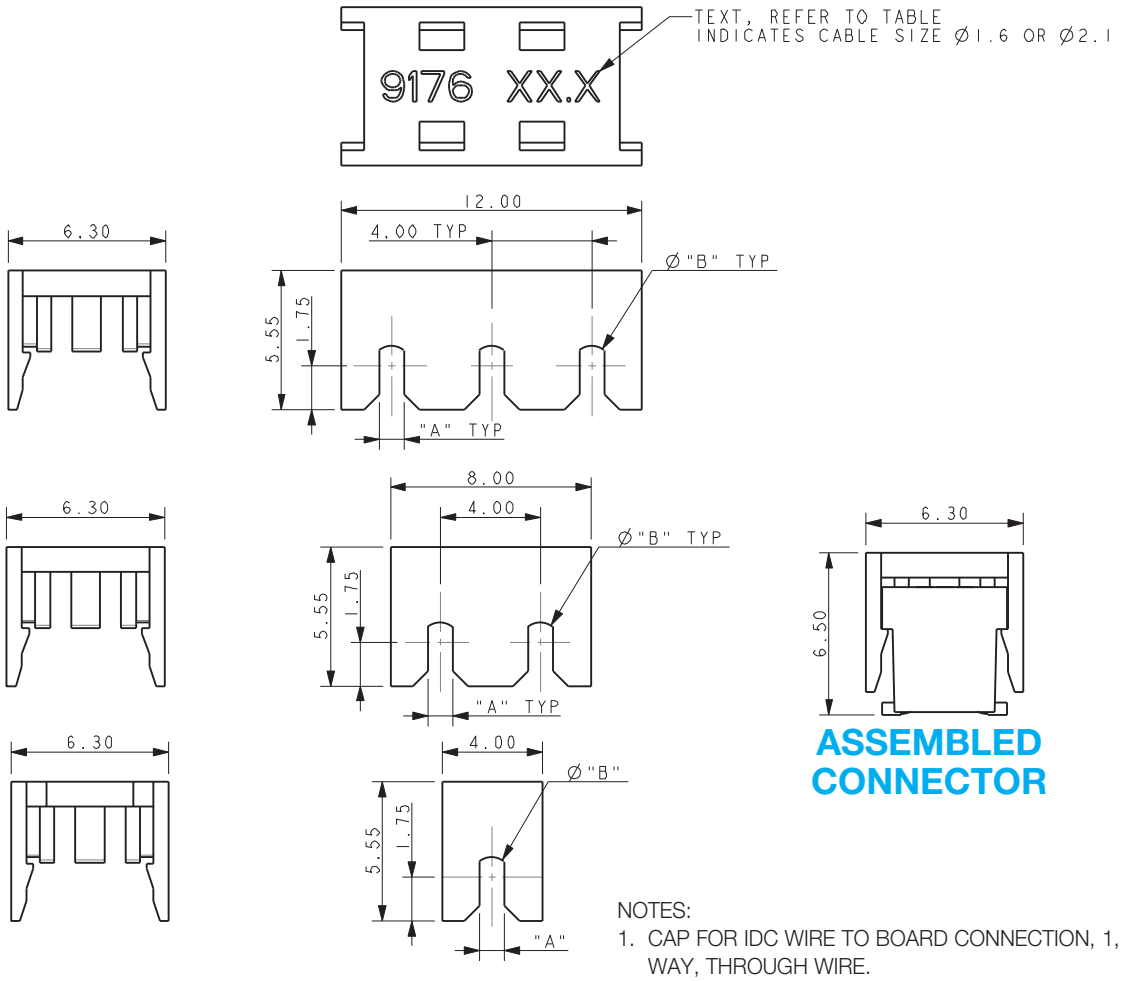




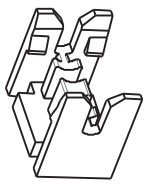
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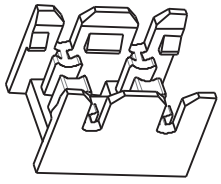
60-9176-00X-0XX-X00

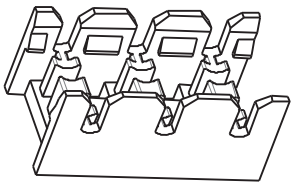
ACCESSORY CAP – THROUGH WIRE



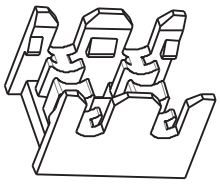
ASSEMBLED CONNECTOR

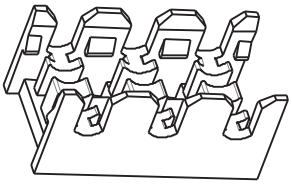

60-9176-001-016-X00


60-9176-002-016-X00


60-9176-003-016-X00


60-9176-001-021-X00


60-9176-002-021-X00


60-9176-003-021-X00

NOTES:
1. CAP FOR IDC WIRE TO BOARD CONNECTION, 1, 2 AND 3 WAY, THROUGH WIRE.
2. FOR USE WITH STANDARD 9176 IDC CONNECTORS, SEE PAGE 157 FOR THE CORRECT PART CODE TO MATCH WIRE.
3. CAP MATERIAL: GLASS FILLED NYLON 46, FOR COLORS SEE TABLE BELOW.
4. DIMENSIONS A, B AND TEXT, SEE TABLE BELOW.
5. CAPS DESIGNED TO ACCOMMODATE WIRE INSULATION DIAMETERS 1.1MM TO 1.6MM AND 1.6MM TO 2.1MM.
6. ALL DIMENSIONS SHOWN ARE REFERENCE DIMENSIONS.
7. PACKED IN BAGS, 1000 PIECES PER BAG.
8. ONE WAY CAP ASSEMBLY AID, REFER TO PAGE 165.
9. ALL DIMENSIONS ±0.20 TOLERANCE SPECIFIED.

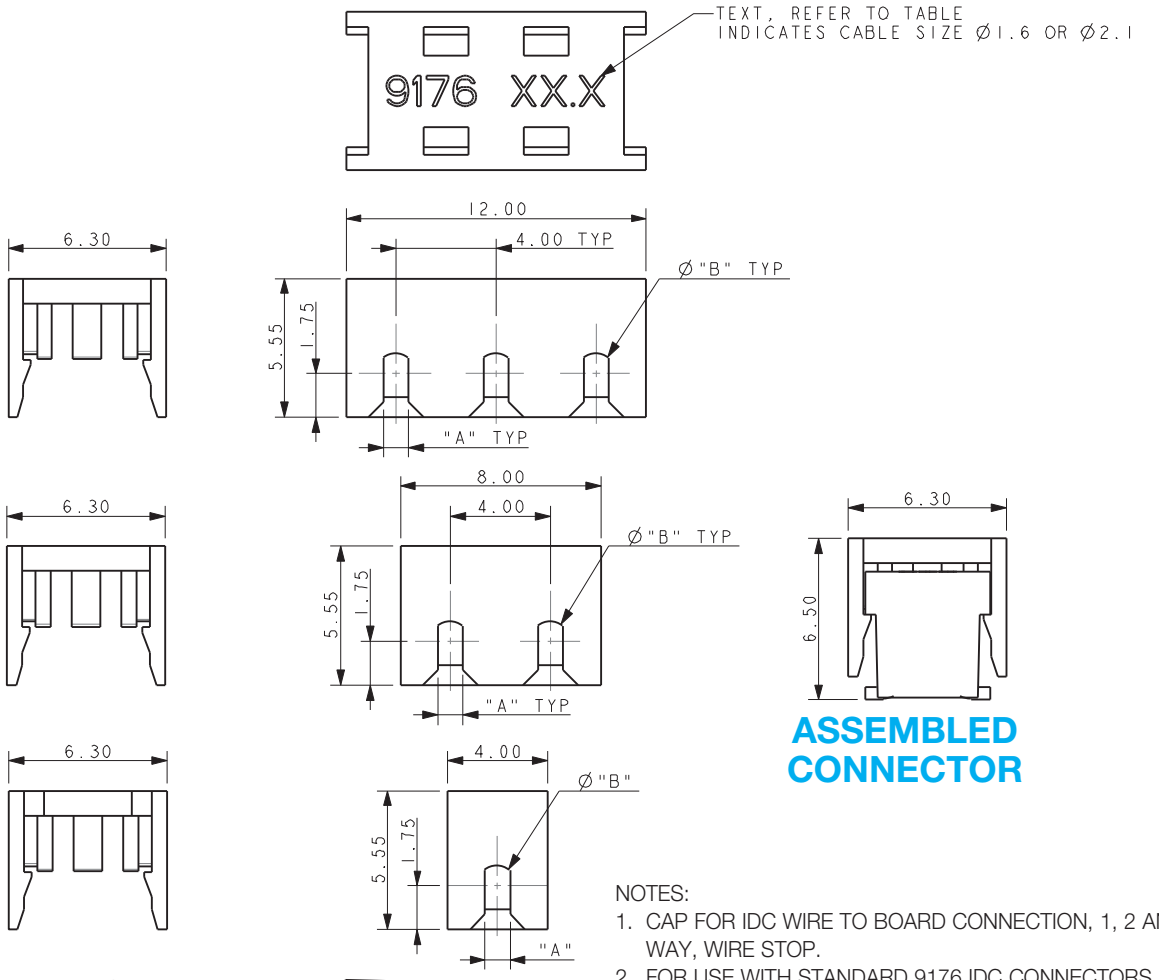
Code	Slot A	Diameter B	Text
016	1.00	1.60	Ø1.6
021	1.50	2.10	Ø2.1

Color	X00
Black	000
White	100

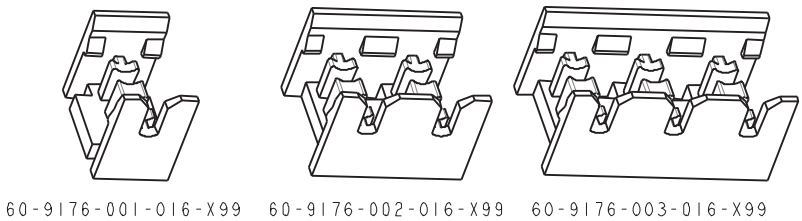
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60-9176-00X-0XX-X99

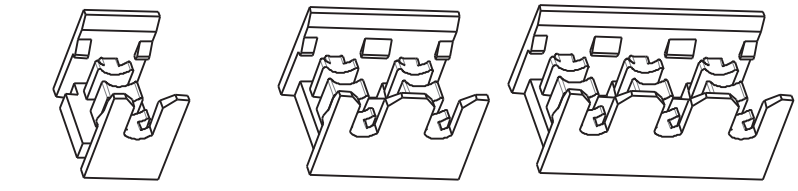
ACCESSORY CAP – WIRE STOP



ASSEMBLED CONNECTOR



60-9176-001-016-X99 60-9176-002-016-X99 60-9176-003-016-X99



60-9176-001-021-X99 60-9176-002-021-X99 60-9176-003-021-X99

NOTES:

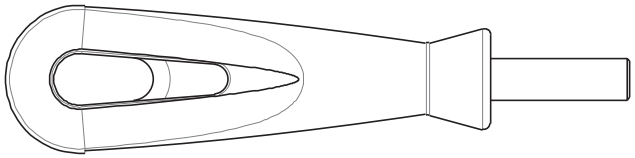
1. CAP FOR IDC WIRE TO BOARD CONNECTION, 1, 2 AND 3 WAY, WIRE STOP.
2. FOR USE WITH STANDARD 9176 IDC CONNECTORS, SEE PAGE 157 FOR THE CORRECT PART CODE TO MATCH WIRE.
3. CAP MATERIAL: GLASS FILLED NYLON 46, FOR COLORS SEE TABLE BELOW.
4. DIMENSIONS A, B AND TEXT, SEE TABLE BELOW.
5. CAPS DESIGNED TO ACCOMMODATE WIRE INSULATION DIAMETERS 1.1MM TO 1.6MM AND 1.6MM TO 2.1MM.
6. ALL DIMENSIONS SHOWN ARE REFERENCE DIMENSIONS.
7. PACKED IN BAGS, 1000 PIECES PER BAG.
8. ONE WAY CAP ASSEMBLY AID, REFER TO PAGE 165.
9. ALL DIMENSIONS ±0.20 TOLERANCE SPECIFIED.

Code	Slot A	Diameter B	Text
016	1.00	1.60	Ø1.6
021	1.50	2.10	Ø2.1

Color	X00
Black	000
White	100

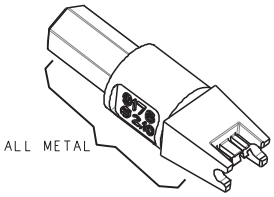
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HAND INSERTION TOOLING FOR SINGLE 18/24 GAUGE WIRE



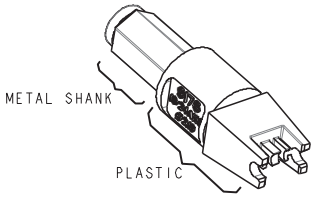
UNIVERSAL HANDLE

Details	Tool Part Number
6.35 A/F HEX BIT HOLDER	06 7000 7730 01 000



HIGH PRODUCTION
Metal

Max Insulation Dia	Tool Part Number
Ø2.10	06 9176 7017 01 000
Ø1.60	06 9176 7017 02 000

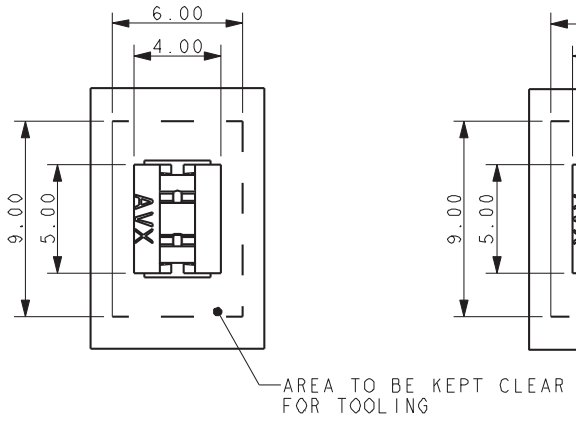


MEDIUM PRODUCTION
Metal/Plastic

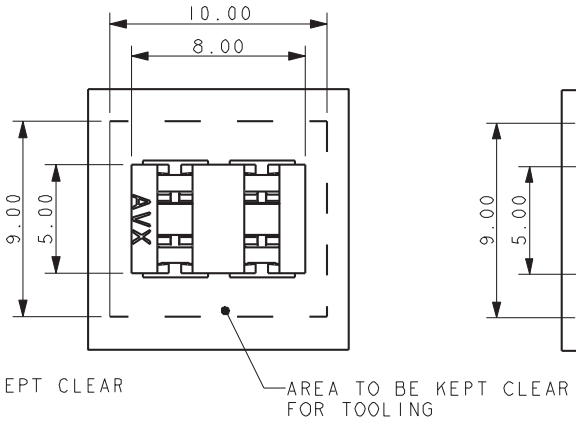
Max Insulation Dia	Tool Part Number
Ø2.10	06 9176 7016 01 000
Ø1.60	06 9176 7016 02 000

CLEARANCE AREA ON PCB FOR HAND TOOLING

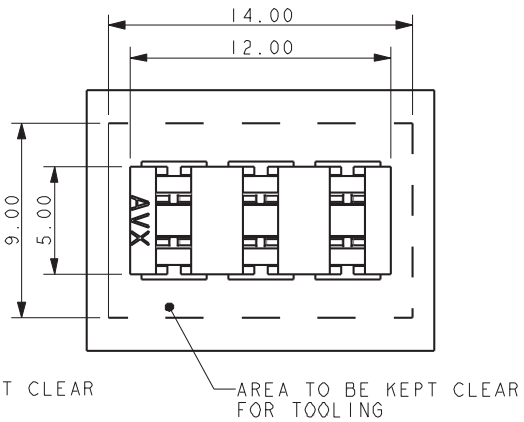
1 WAY



2 WAY



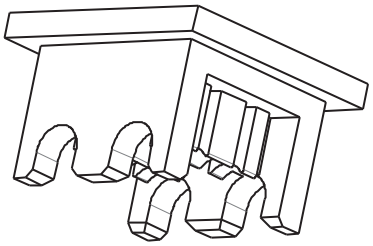
3 WAY



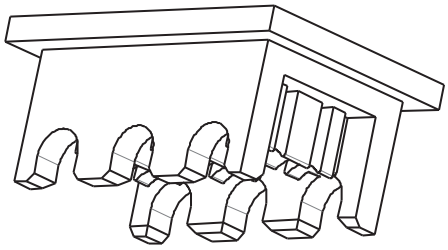
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INSERTION TOOLING
REQUIRES HAND PRESS WITH FLAT ROCK PLATES

2 WAY



3 WAY

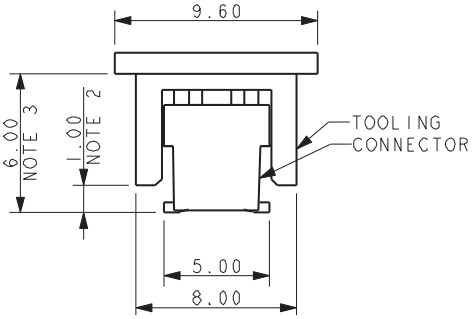


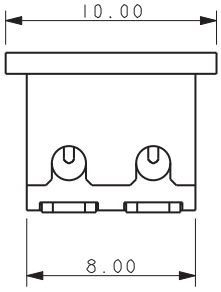
HIGH PRODUCTION
Metal

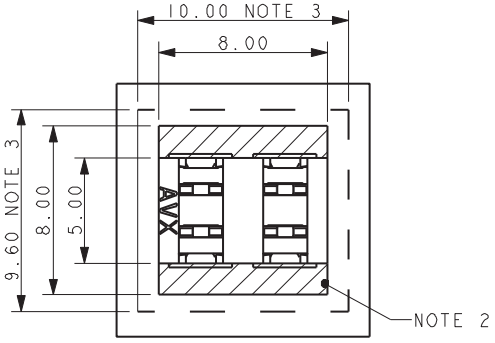
No. of Ways	Max Insulation Dia	Tool Part Number
2	Ø2.10	06 9176 7017 01 002
	Ø1.60	06 9176 7017 02 002
3	Ø2.10	06 9176 7017 01 003
	Ø1.60	06 9176 7017 02 003

PCB RESTRICTED AREAS FOR PRESS ASSEMBLY TOOLING

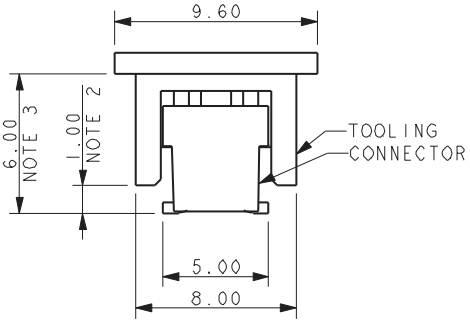
2 WAY

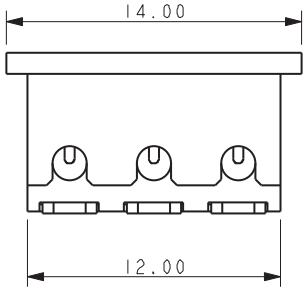


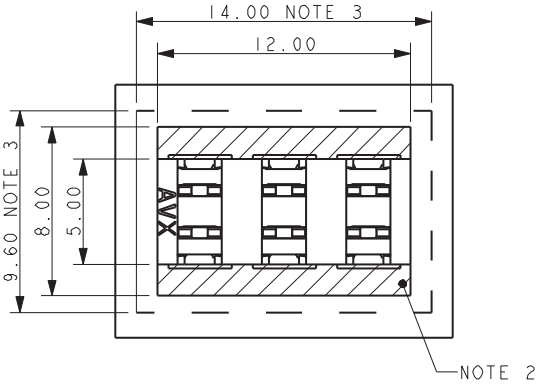




3 WAY



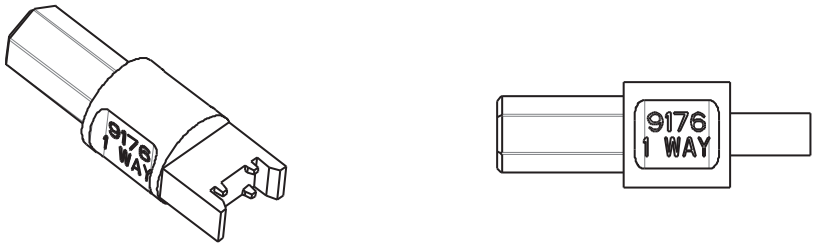




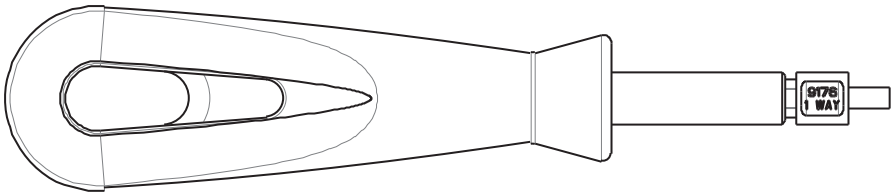
NOTES:
1. DIMENSIONS SHOWN ARE REFERENCE DIMENSIONS.
2. MAXIMUM COMPONENT HEIGHT 1.00MM IN THIS AREA.
3. MAXIMUM COMPONENT HEIGHT 6.00MM IN THIS AREA.
4. THE SAME RESTRICTIONS APPLY TO ALL WIRE INSULATION DIAMETERS.
5. 2 AND 3 WAY TOOLS ONLY, FOR USE UNDER HAND PRESS WITH FLAT PLATES.
6. FOR HAND TOOLING REFER TO PAGE 163.
7. ALL DIMENSIONS ±0.20 UNLESS TOLERANCE SPECIFIED.

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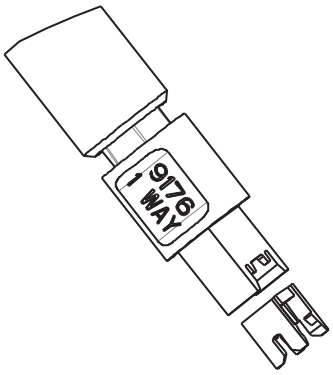
HAND INSERTION TOOLING
FOR ONE WAY CAP INSERTION



06-9176-7028-01-000

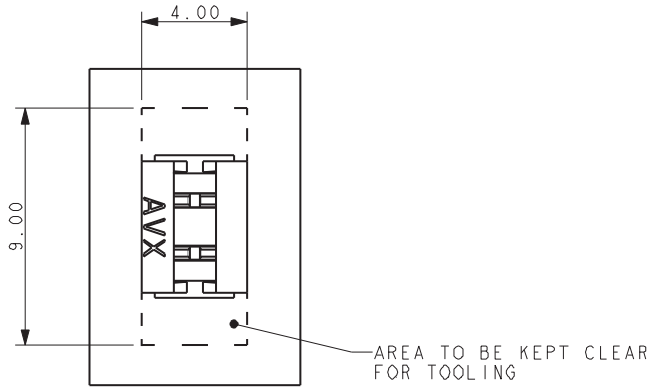


TO BE USED WITH 06-7000-7730-01-000
UNIVERSAL HANDLE



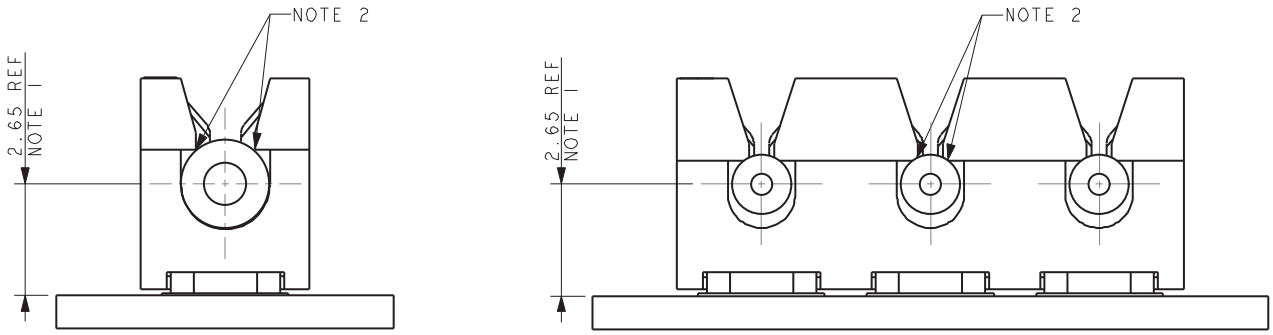
FOR ASSEMBLY INSTRUCTION REFER TO 201-01-124 APPLICATION NOTES

CLEARANCE AREA ON PCB FOR HAND TOOLING

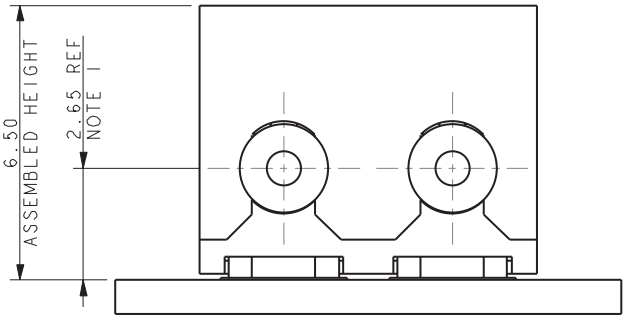


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ASSEMBLED CONNECTOR



STANDARD CONNECTOR



CONNECTOR WITH CAP

NOTES:
1. ASSEMBLED HEIGHTS INCLUDE 0.10MM ALLOWANCE FOR PAD AND SOLDER THICKNESS. NO ALLOWANCE HAS BEEN MADE FOR ANY SOLDER RESIST OR OTHER FEATURES.
2. WHEN THE WIRE IS ASSEMBLED THE INSULTATION SHOULD BE TRAPPED BY THESE EDGES.

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Single IDC Contact 22-28 AWG: WTB
9176-400



The 917X series of surface mount Insulation Displacement Connectors (IDC) were developed to meet the harsh automotive and industrial market applications for connecting individual wires directly to a PCB ranging from 14 AWG to 28 AWG. This industry proven contact system has been tested to automotive levels of shock, vibration, and temperature cycling to prove their reliability and robustness. This new single contact was developed as a standalone component to enhance the application uses with the IDC technology. The simplicity of inserting a wire into an SMT contact with a small tool or optional retention / termination cap allows a wide range of devices to be connected to the PCB without soldering. In SSL applications specifically, these contacts are used to bring power and signal onto the PCB or are used to daisy chain multiple boards together in a long string. While the IDC contact provides a gas-tight connection to conductor of the wire, the optional cap provides a positive strain relief even in the harshest conditions. In case of repair, the wires can be removed and replace up to three times.

The single 9176-400 series contact and cap accepts 22 AWG to 28 AWG wires with an insulation diameter ranging from 1.0mm to 1.5mm. These dual beam contacts support a 6 amp current rating with a large SMT solder base to provide maximum stability on the PCB. The optional locking strain relief cap acts as the termination tool for severe vibration applications.

APPLICATIONS

- Connecting discrete wire components directly to the PCB
- Bringing power and signals onto a PCB
- Daisy chaining PCB's together to create a continuous string of boards
- Application notes: refer to 201-01-124

FEATURES AND BENEFITS

- IDC contact is supplied in T&R pockets for standard SMT placement
- IDC contact provides a gas-tight connection to the PCB for long term reliability
- Optional termination cap provides additional strain relief for severe environments
- Tested to automotive levels on shock, vibration and temperature cycling for reliability
- Reduced total applied cost versus solder or crimp processes
- Individual contacts can be located anywhere on the PCB based on specific application

ELECTRICAL

- Current Rating: 6 Amps/Contact
- Voltage Rating: Dependant on component proximity

ENVIRONMENTAL

- Operating Temperature: -40ºC to +125ºC

MECHANICAL

- Insulator Material: Nylon 46: UL94V0
- Contact Material: Phosphor Bronze
- Plating: Tin over Nickel
- Durability: 3 Cycles

HOW TO ORDER – CONTACT OPTIONS

70 — **Prefix**
70 = Contact

9176 — **Series**

001 — **Number of Ways**

Code	No of Ways	Details
001	1	Page 311

4XX — **Wire Gauge Size**

Code	Accepted Wire Gauge
422	22 Gauge Solid or Stranded
432	24 Gauge Solid or Stranded
442	26 Gauge Solid or Stranded
443	28 Gauge Solid or Stranded

006 — **Plating Option**
006 = Pure Tin all over

HOW TO ORDER – CAP OPTIONS

60 — **Prefix**
60 = Cap

9176 — **Series**

001 — **Number of Ways**

Code	No of Ways	Details
001	1	Page 163

415 — **Wire Gauge Size**

Code	Wire Insulation
415	Ø 0.75-1.5

X00 — **Insulator Color**

Code	Color	Application
000	Black	Industrial
100	White	Lighting

RoHS COMPLIANT

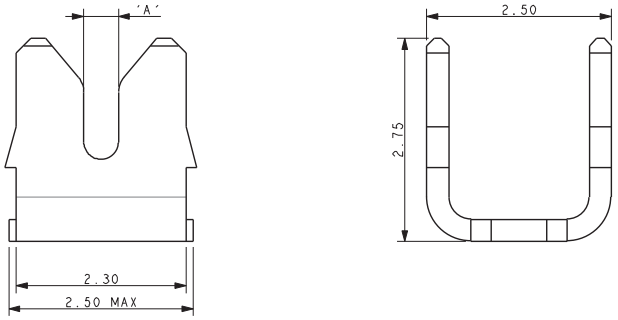
CONNECTOR/TOOLING PART NUMBER MATRIX

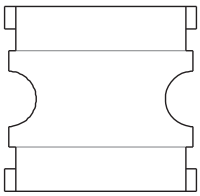
SERIES 9176-500 IDC				HAND INSERTION TOOLING*		ACCESSORY CAPS		
AWG	Wire Insulation	Positions	Part Number	Plastic (medium volume)	Metal (high volume)	Cap Application Tool	White	Black
22	Ø 1.0 - 1.5	1p	709176001422006	069176702201000	069176702101000	069176702301000	609176001415100	609176001415000
24	Ø 1.0 - 1.5	1p	709176001432006	069176702201000	069176702101000	069176702301000	609176001415100	609176001415000
26	Ø 0.7 - 1.0	1p	709176001443006	069176702201000	069176702101000	069176702301000	609176001415100	609176001415000
28	Ø 0.7 - 1.0	1p	709176001443006	069176702201000	069176702101000	069176702301000	609176001415100	609176001415000
* Hand Insertion Tooling and Cap Application - Universal Hand Tool 067000773001000; Consult Application Notes 201-01-124								

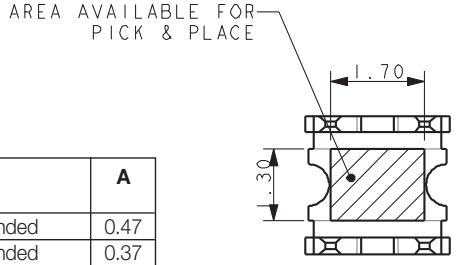
Certification: UL File #E90723

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CONTACT DETAILS





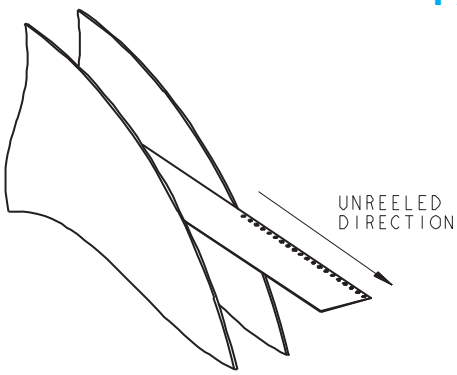


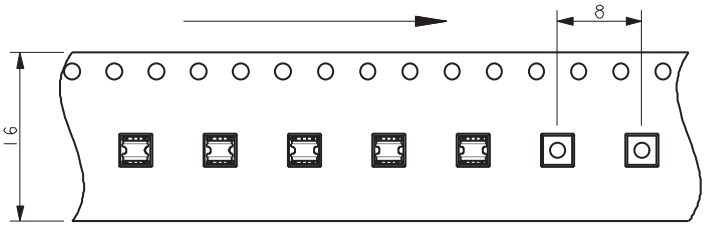
Code	Accepted Wire Gauge	A
422	22AWG Solid or Stranded	0.47
432	24AWG Solid or Stranded	0.37
442	28AWG Solid or Stranded	0.28
443	26-28AWG Solid or Stranded	0.20

NOTES:
1. CONNECTOR FOR IDC WIRE TO BOARD CONNECTION.
2. CONTACT MATERIAL: PHOSPHOR BRONZE.
3. CONTACT PLATING: PURE TIN.
4. CONNECTOR DESIGNED TO ACCEPT BETWEEN 22AWG AND 28AWG SOLID AND STRANDED WIRE, SEE TABLE.
5. ALL DIMENSIONS ±0.20 UNLESS TOLERANCED.
6. FOR FULL PRODUCT SPECIFICATION REFER TO ELCO SPEC 201-01-126 AND APPLICATION NOTES 201-01-124.
7. SMT PCB LAYOUT, REFER TO PAGE 160.
8. PACKING IN TAPE AND REEL, QUANTITY 2000 PER REEL.
9. WHEN REQUIRED, MATCHING CAP DETAILS ON DRAWING 60-9176-001-4XX-X06S.
10. ASSEMBLY TOOLING ON PAGE 162 FOR WIRE INTO CONTACT AND PAGE 161 FOR CAP.
11. UL REFERENCE E90723, THIS UL REFERENCE ALSO APPLIES WHEN COMBINED WITH AVX SPECIFIED OPTIONAL CAP.

PACKING DETAILS

REEL QTY	2 000
LEADER	480MM
TRAILER	120MM



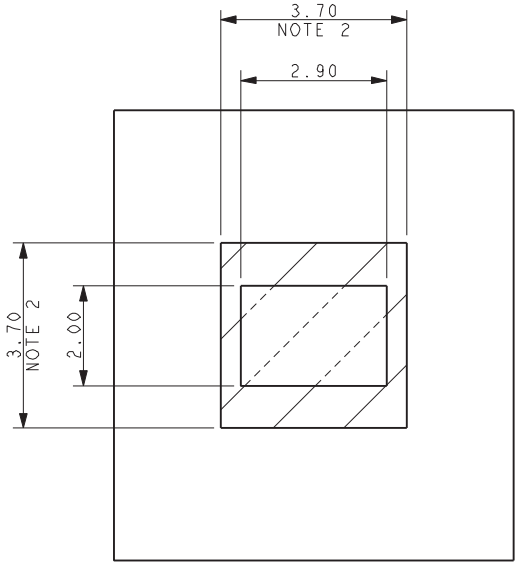


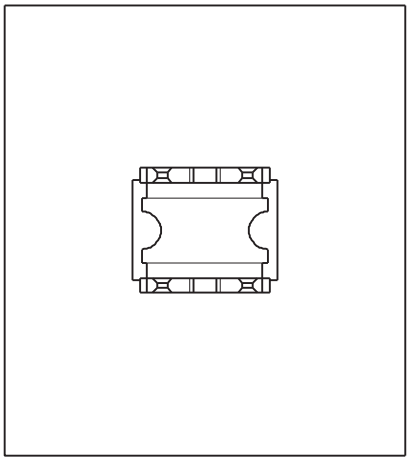
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22-28 AWG IDC WIRE TO BOARD CONNECTOR
SINGLE CONTACT

SMT PCB LAYOUT

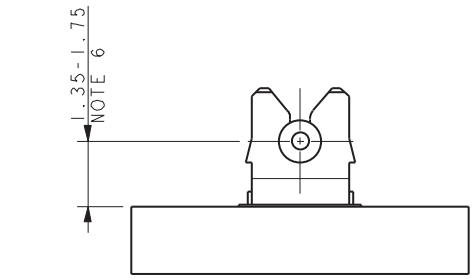
PURE TIN PADS

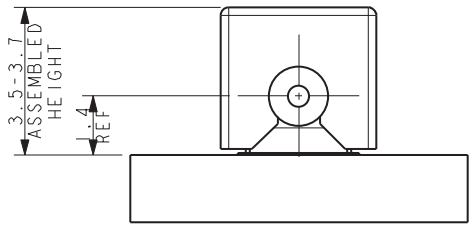


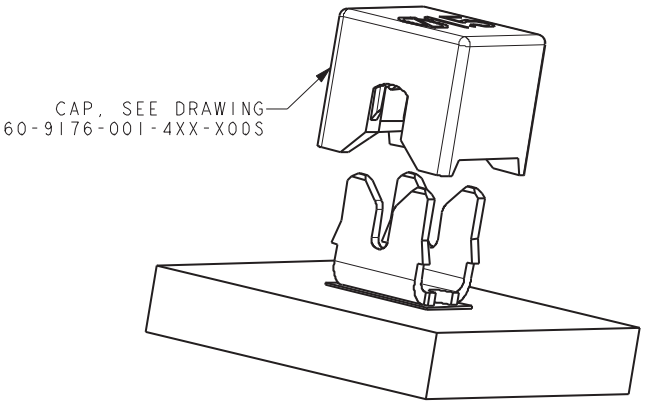


ORIENTATION OF CONTACT ON PAD

ASSEMBLED/INSTALLED PRODUCTS



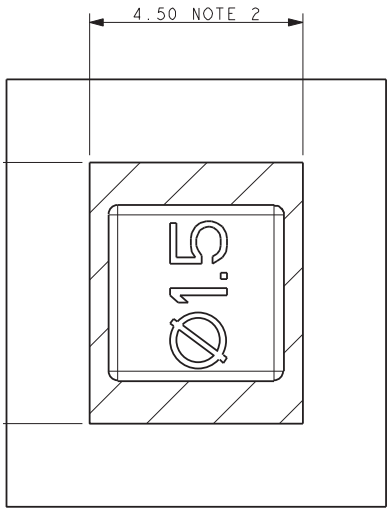




NOTES:
1. CONNECTOR CAN BE USED WITH CONTACT ONLY OR WITH OPTIONAL CAP.
2. OUTLINE OF CAP WHERE USED.
3. FOR FULL PRODUCT SPECIFICATION REFER TO ELCO SPEC 201-01-126 AND APPLICATION NOTES 201-01-124.
4. ALL DIMENSIONS ±0.20 UNLESS TOLERANCED.
5. ASSEMBLY TOOLING ON PAGE 162 FOR WIRE INTO CONTACT AND PAGE 161 FOR CAP.
6. WIRE CENTER LINE HEIGHT ABOVE THE PCB. THIS INCLUDES AN ALLOWANCE OF 0.10MM FOR SOLDER AND 0.035MM FOR PAD THICKNESS. NO ALLOWANCE HAS BEEN MADE FOR SOLDER RESIST OR OTHER FEATURES.

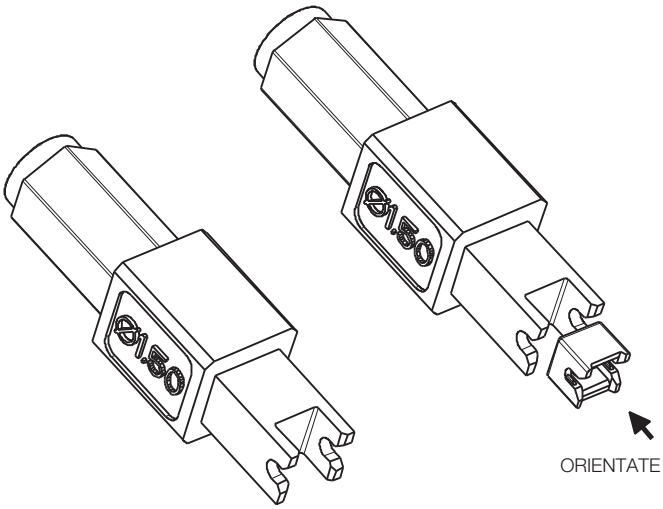
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ASSEMBLY TOOLING – CAP USED



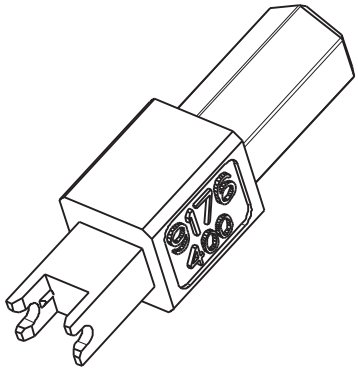
NOTES:
1. ASSEMBLY TOOLING FOR CAP.
2. MINIMUM AREA OF PCB TO BE KEPT CLEAR OF COMPONENTS, TRACKS PERMISSIBLE.
3. WIRE AND CAP INSERTED IN ONE OPERATION.
4. REFER TO APPLICATION NOTE 201-01-124 FOR FURTHER INFORMATION.
5. REFER TO PAGE 162 FOR ASSEMBLY WITHOUT CAP.

CAP APPLICATION TOOL – PLASTIC
06-9176-7023-01-000

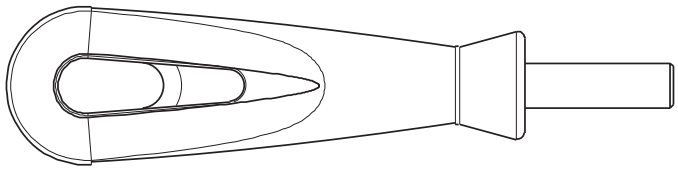


ORIENTATE CAP IN TOOL

METAL TOOL – HIGH VOLUME
06-9176-7024-01-000



UNIVERSAL HANDLE
06-7000-7730-01-000

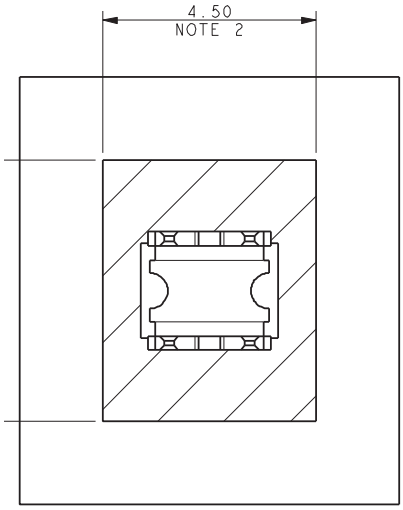


CONNECTOR/TOOLING PART NUMBER MATRIX

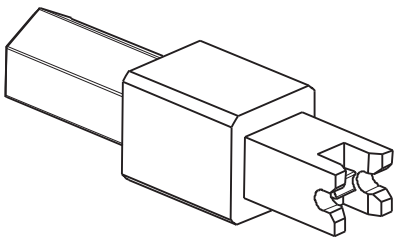
SERIES 9176-400 IDC				HAND INSERTION TOOLING*		ACCESSORY CAPS		
AWG	Wire Insulation	Positions	Part Number	Plastic (medium volume)	Metal (high volume)	Cap Application Tool	White	Black
22	Ø 1.0 - 1.5	1p	709176001422006	069176702201000	069176702101000	069176702301000	609176001415100	609176001415000
24	Ø 1.0 - 1.5	1p	709176001432006	069176702201000	069176702101000	069176702301000	609176001415100	609176001415000
26	Ø 0.7 - 1.0	1p	709176001443006	069176702201000	069176702101000	069176702301000	609176001415100	609176001415000
28	Ø 0.7 - 1.0	1p	709176001443006	069176702201000	069176702101000	069176702301000	609176001415100	609176001415000
* Hand Insertion Tooling and Cap Application - Universal Hand Tool 067000773001000; Consult Application Notes 201-01-124								

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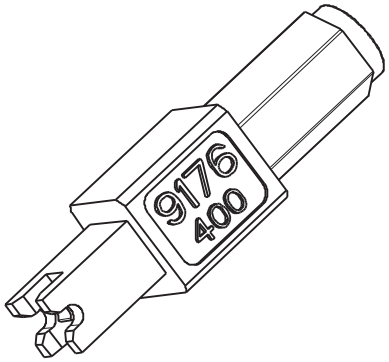
ASSEMBLY TOOLING – CAP NOT USED
WIRE ONTO CONTACT



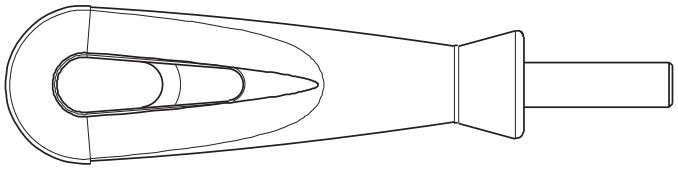
METAL TOOL
HIGH VOLUME
06-9176-7021-01-000



PLASTIC TOOL
LOW/MEDIUM VOLUME
06-9176-7022-01-000



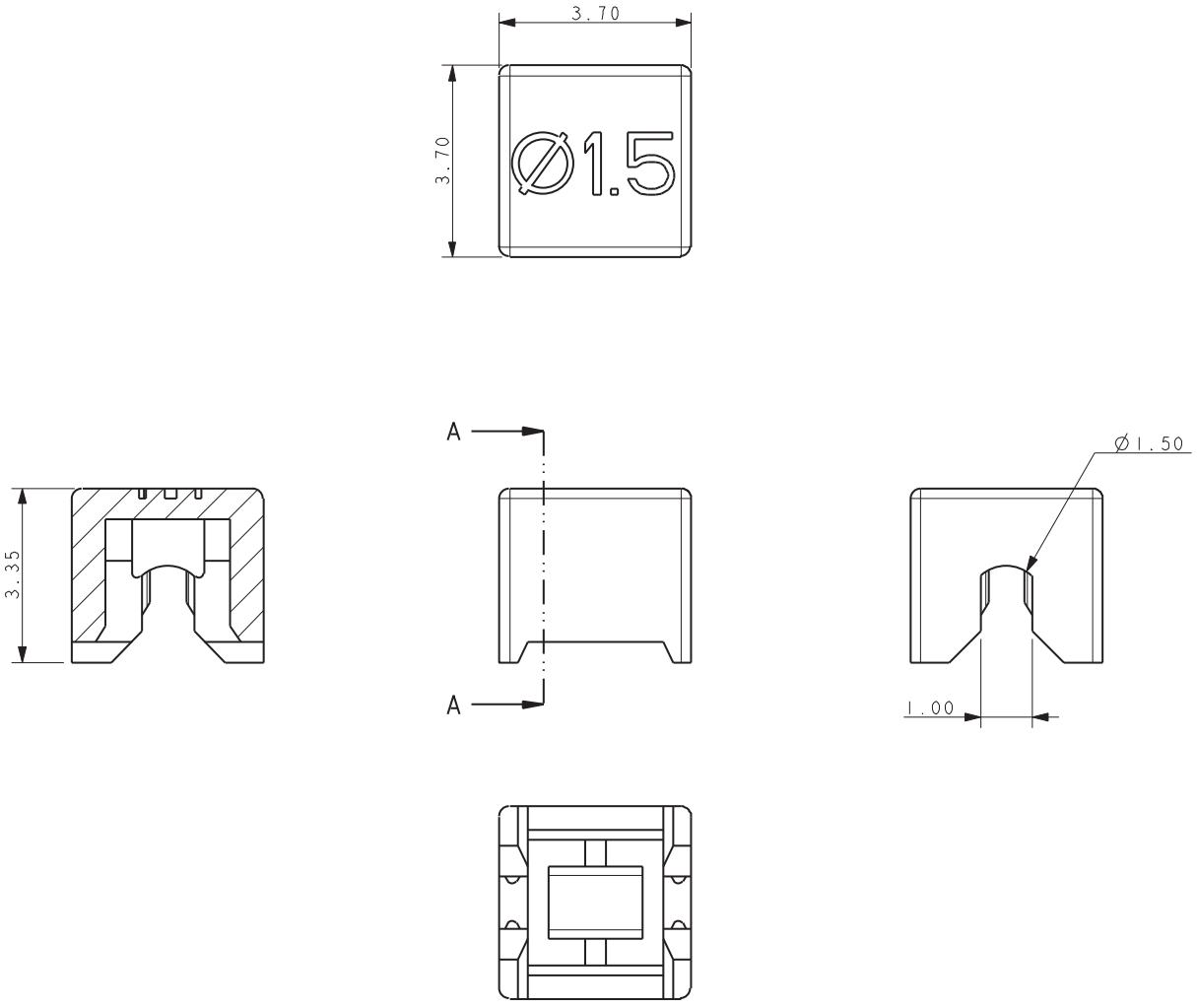
UNIVERSAL HANDLE
06-7000-7730-01-000



NOTES:
1. ASSEMBLY TOOLING FOR CONTACT ONLY. NO CAP USED.
2. MINIMUM AREA OF PCB TO BE KEPT CLEAR OF COMPONENTS, TRACKS PERMISSIBLE.
3. REFER TO APPLICATION NOTE 201-01-124 FOR FURTHER INFORMATION.
4. INSERT CORRECT TOOL INTO HANDLE, MAGNETIC RETENTION.
5. REFER TO PAGE 161 FOR ASSEMBLY WITH CAP.

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CAP DETAILS



NOTES:
1. CAP FOR IDC WIRE TO BOARD CONNECTION.
2. CAP MATERIAL: GLASS FILLED NYLON 46, COLOR SEE PAGE 158.
3. CAPS DESIGNED TO ACCOMMODATE WIRE INSULATION DIAMETERS 0.75MM TO 1.5MM.
4. ALL DIMENSIONS ±0.20 UNLESS TOLERANCED.
5. FOR FULL PRODUCT SPECIFICATION REFER TO ELCO SPEC 201-01-126, APPLICATION NOTES 201-01-124.
6. PACKING IN BAGS, QUANTITY 2000 PER BAG.
7. FOR INSTALATION DETAILS REFER TO DRAWING 70-9176-001-4XX-006S.

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Standard IDC Contact 18-24 AWG: WTB
9176-500



The 917X series of surface mount Insulation Displacement Connectors (IDC) were developed to meet the harsh automotive and industrial market applications for connecting individual wires directly to a PCB ranging from 14 AWG to 28 AWG. This industry proven contact system has been tested to automotive levels of shock, vibration, and temperature cycling to prove their reliability and robustness. This new single contact was developed as a standalone component to enhance the application uses with the IDC technology. The simplicity of inserting a wire into an SMT contact with a small tool or optional retention / termination cap allows a wide range of devices to be connected to the PCB without soldering. In SSL applications specifically, these contacts are used to bring power and signal onto the PCB or are used to daisy chain multiple boards together in a long string. While the IDC contact provides a gas-tight connection to conductor of the wire, the optional cap provides a positive strain relief even in the harshest conditions. In case of repair, the wires can be removed and replace up to three times.

The single 9176 series contact and cap accepts 18 AWG to 24 AWG wires with an insulation diameter ranging from 1.1mm to 2.1mm. These dual beam contacts support a 10 amp current rating with a large SMT solder base to provide maximum stability on the PCB. The optional locking strain relief cap acts as the termination tool for severe vibration applications.

APPLICATIONS

- Connecting discrete wire components directly to the PCB
- Bringing power and signals onto a PCB
- Daisy chaining PCB's together to create a continuous string of boards
- Application notes: refer to 201-01-124

FEATURES AND BENEFITS

- IDC contact is supplied in T&R pockets for standard SMT placement
- IDC contact provides a gas-tight connection to the PCB for long term reliability
- Optional termination cap provides additional strain relief for severe environments
- Tested to automotive levels on shock, vibration and temperature cycling for reliability
- Reduced total applied cost versus solder or crimp processes
- Individual contacts can be located anywhere on the PCB based on specific application

ELECTRICAL

- Current Rating: 10 Amps/Contact
- Voltage Rating: Dependant on component proximity

ENVIRONMENTAL

- Operating Temperature: -40ºC to +125ºC

MECHANICAL

- Insulator Material: Nylon 46: UL94V0
- Contact Material: Phosphor Bronze
- Plating: Tin over Nickel
- Durability: 3 Cycles

HOW TO ORDER – CONTACT OPTIONS

70 — **Prefix**: 70 = Contact

9176 — **Series**

001 — **Number of Ways**: 001 = 1

5XX — **Wire Gauge Size**

Code	Accepted Wire Gauge
501	18 Gauge Stranded
511	20 Gauge Solid or Stranded
522	22 Gauge Solid or Stranded
532	24 Gauge Solid or Stranded

006 — **Plating Option**: 006 = Pure Tin all over

HOW TO ORDER – CAP OPTIONS

60 — **Prefix**: 60 = Cap

9176 — **Series**

001 — **Number of Ways**: 001 = 1

5XX — **Wire Gauge Size**

Code	Wire Insulation (AWG)
516	1.1-1.6 (22-24)
521	1.6-2.1 (18-20)

X00 — **Insulator Color**

Code	Color	Application
000	Black	Industrial
100	White	Lighting

RoHS COMPLIANT

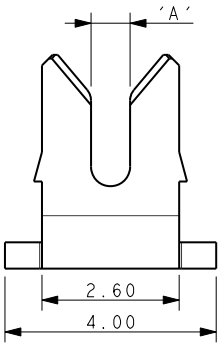
CONNECTOR/TOOLING PART NUMBER MATRIX

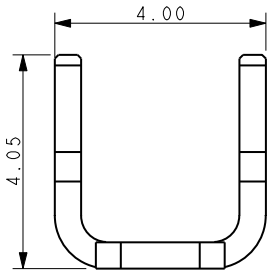
SERIES 9176-500 IDC				HAND INSERTION TOOLING*		ACCESSORY CAPS		
AWG	Wire Insulation	Positions	Part Number	Plastic (medium volume)	Metal (high volume)	Cap Application Tool	White	Black
18	Ø 1.6 - 2.1	1p	709176001501006	069176702001000	069176701901000	069176701801000	609176001521100	609176001521000
20	Ø 1.6 - 2.1	1p	709176001511006	069176702001000	069176701901000	069176701801000	609176001521100	609176001521000
22	Ø 1.1 - 1.6	1p	709176001522006	069176702002000	069176701902000	069176701801000	609176001516100	609176001516000
24	Ø 1.1 - 1.6	1p	709176001532006	069176702002000	069176701902000	069176701801000	609176001516100	609176001516000
* Hand Insertion Tooling and Cap Application - Universal Hand Tool 067000773001000; Consult Application Notes 201-01-124								

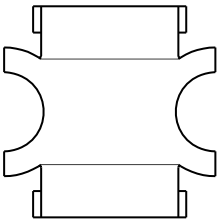
Certification: UL File #E90723

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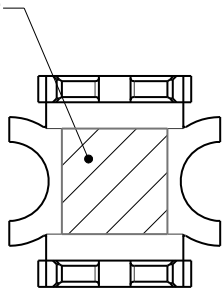
CONTACT DETAILS







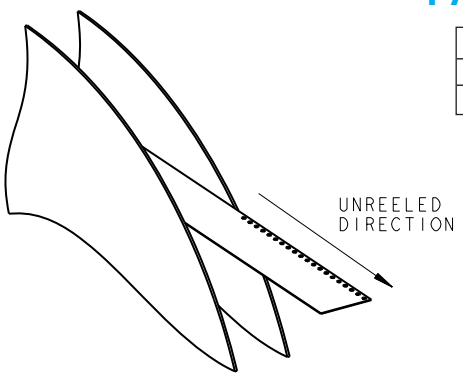
Code	Accepted Wire Gauge	A
501	18 AWG Stranded	0.72
511	20 AWG Solid and Stranded	0.60
522	22 AWG Solid and Stranded	0.47
532	24 AWG Solid and Stranded	0.37

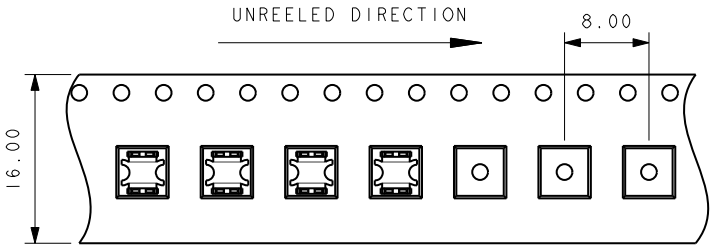


NOTES:
1. CONNECTOR FOR IDC WIRE TO BOARD CONNECTION.
2. CONTACT MATERIAL: PHOSPHOR BRONZE.
3. CONTACT PLATING: PURE TIN.
4. CONNECTOR DESIGNED TO ACCEPT BETWEEN 18 AND 24 GAUGE STRANDED WIRE. SEE TABLE.
5. ALL DIMENSIONS FOR REFERENCE UNLESS OTHERWISE STATED.
6. FOR FULL PRODUCT SPECIFICATION REFER TO ELCO SPEC 201-01-106 AND APPLICATION NOTES 201-01-124.
7. SMT PCB LAYOUT, REFER TO PAGE 159.
8. PACKING IN TAPE AND REEL, QUANTITY 1000 PER REEL.
9. WHEN REQUIRED, MATCHING CAP DETAILS ON DRAWING 60-9176-001-5XX-X00S.
10. ASSEMBLY TOOLING ON PAGE 160 (WITH CAP AND WITHOUT CAP).

PACKING DETAILS

REEL QTY	1000
LEADER	480MM
TRAILER	120MM



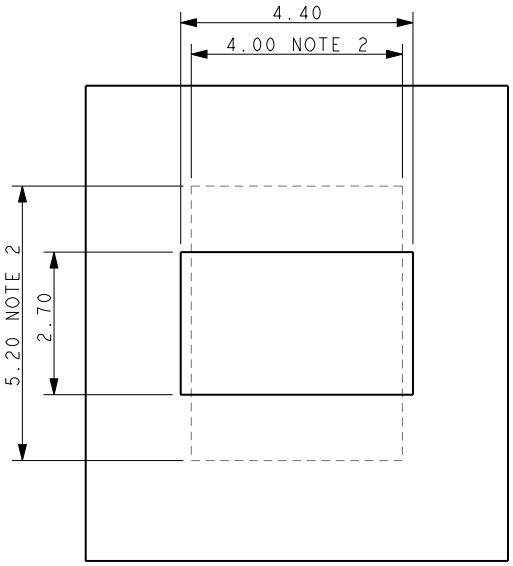


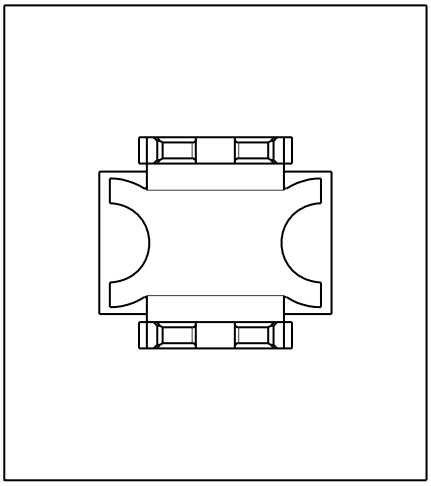
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18-24 AWG IDC WIRE TO BOARD CONNECTOR
SINGLE CONTACT

SMT PCB LAYOUT

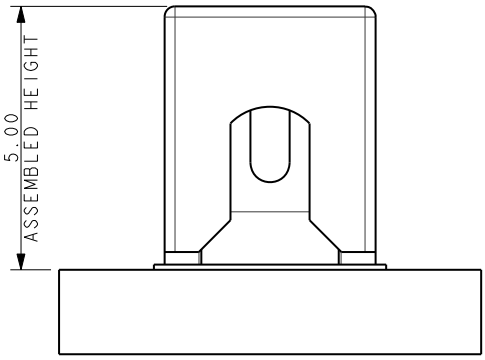
PURE TIN PADS

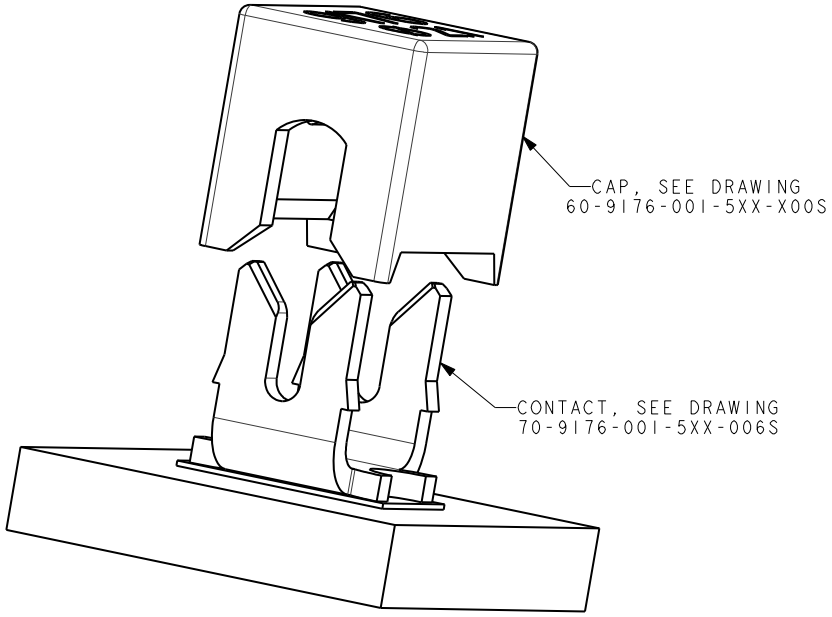




ORIENTATION OF CONTACT ON PAD

ASSEMBLED/INSTALLED PRODUCTS

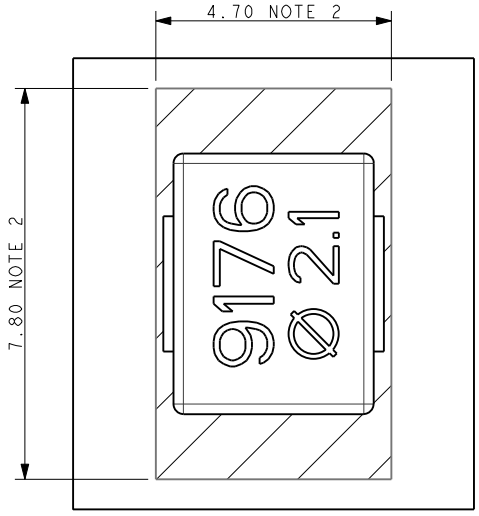




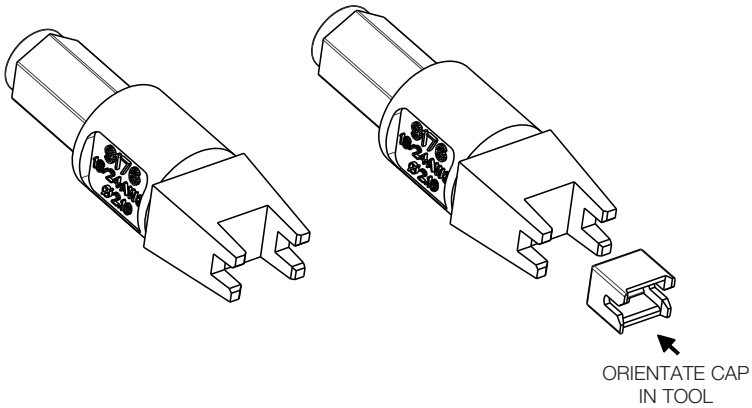
NOTES:
1. CONNECTOR CAN BE USED WITH CONTACT ONLY OR WITH OPTIONAL CAP.
2. OUTLINE OF CAP WHEN USED.
3. FOR FULL PRODUCT SPECIFICATION REFER TO ELCO SPEC 201-01-106 AND 201-01-124.
4. DIMENSIONS SHOWN ARE REFERENCED DIMENSIONS.
5. ASSEMBLY TOOLING ON PAGE 160 (WITH CAP AND WITHOUT CAP).

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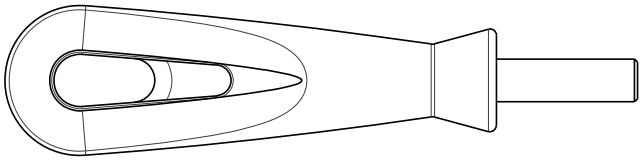
ASSEMBLY TOOLING – CAP USED



CAP APPLICATION TOOL
06-9176-7018-01-000

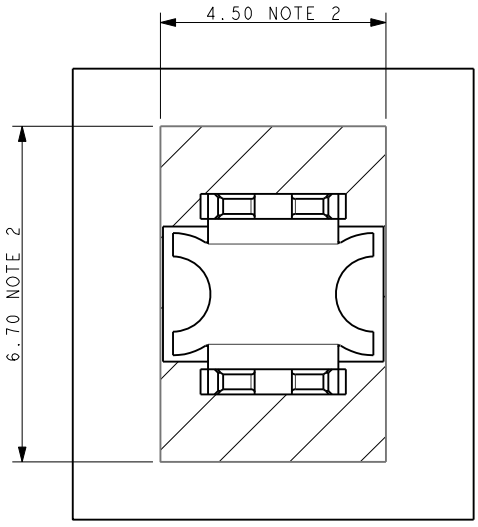


UNIVERSAL HANDLE
06 7000 7730 01 000

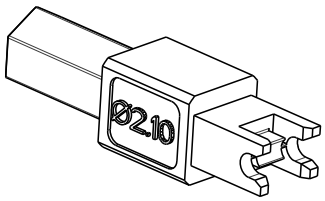


NOTES:
1. ASSEMBLY TOOLING FOR CAP.
2. AREA OF PCB TO BE KEPT CLEAR OF COMPONENTS, TACKS PERMISSIBLE.
3. WIRE AND CAP INSERTED IN ONE OPERATION.
4. REFER TO APPLICATION NOTE 201-01-124 FOR FURTHER INFORMATION.
5. REFER BELOW WHEN CONTACT USED WITHOUT CAP.

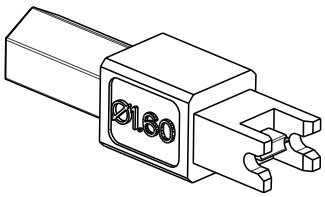
ASSEMBLY TOOLING – CAP NOT USED
WIRE ONTO CONTACT



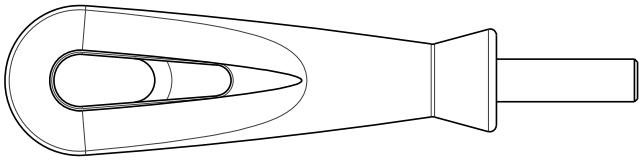
2.1 WIRE (18-20 AWG)
06-9176-7019-01-000
06-9176-7020-01-000



1.6 WIRE (22-24 AWG)
06-9176-7019-02-000
06-9176-7020-02-000



UNIVERSAL HANDLE
06 7000 7730 01 000

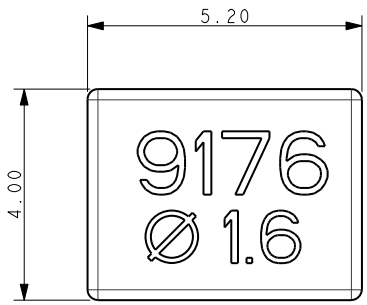


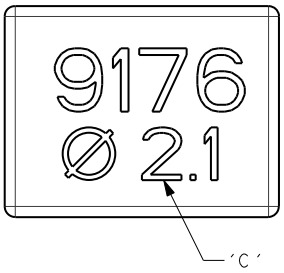
NOTES:
1. ASSEMBLY TOOLING FOR CONTACT ONLY, NO CAP USED.
2. MINIMUM AREA OF PCB TO BE KEPT CLEAR OF COMPONENTS, TRACK PERMISSIBLE.
3. REFER TO TABLE FOR CORRECT TOOL/WIRE COMBINATION.
4. REFER TO APPLICATION NOTE 201-01-124 FOR FURTHER INFORMATION.

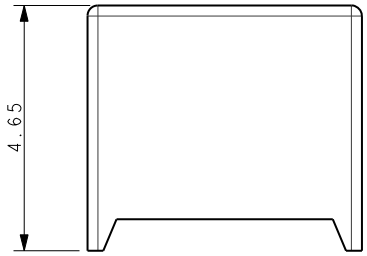
Wire Guage	Wire Insulation ø	Metal Tool High Volume	Plastic Tool Small to Medium Volume	Handle
22-24 AWG	1.10 to 1.60	06-9176-7019-02-000	06-9176-7020-02-000	06-7000-7730-01-000
18-20 AWG	1.60 to 2.10	06-9176-7019-01-000	06-9176-7020-01-000	06-7000-7730-01-000

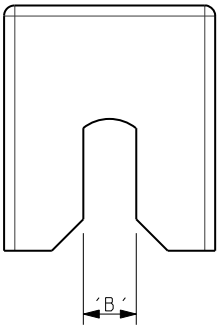
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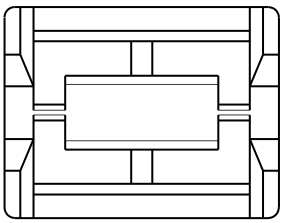
CAP DETAILS







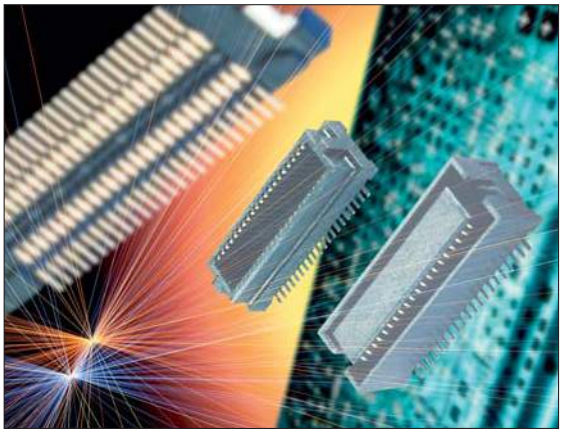




Code	Insulator Diameter (AWG)	B	Text C
516	1.1 to 1.6 (22-24)	1.00	Ø 1.6
521	1.6 to 2.1 (18-20)	1.50	Ø 2.1

NOTES:
1. CAP FOR IDC WIRE TO BOARD CONNECTION.
2. CAP MATERIAL: GLASS FILLED NYLON 46, COLOR SEE PAGE 157.
3. CAPS DESIGNED TO ACCOMMODATE WIRE INSULATION DIAMETERS 1.1MM TO 2.1MM.
4. ALL DIMENSIONS FOR REFERENCE UNLESS OTHERWISE STATED.
5. FOR FULL PRODUCT SPECIFICATION REFER TO ELCO SPEC 201-01-106, APPLICATION NOTES 201-01-124.
6. PACKING IN BAGS, QUANTITY 1000 PER BAG.
7. FOR INSTALATION DETAILS REFER TO DRAWING 70-9176-001-XX-006S.

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AVX/Kyocera board to board connectors provide reliable Vertical-to-Vertical board connection with stacking heights from 3 to 9mm. The patented twin-rib structure provides high retention force, self-cleaning on unmating and extremely high reliability.

Series 5608 offers floating plug design, mated connector can be moved ±0.4mm in X, Y directions and 0 to 1.0mm in mating direction, which allows the tolerance in mounting.

APPLICATIONS

- Automotive Audio/Visual Electronics
- Satellite Navigation Systems
- In-cabin applications

HOW TO ORDER – PLUG

14	5046	XXX	X	XX	829+
Prefix	**Series**	**Number of Positions**	**Type**	**Stack Height**	**Plating**
			0 = Without metal tab 1 = With metal tab 5 = Without metal tab, with vacuum tape 6 = With metal tab, with vacuum tape	30: H = 3.0mm 35: H = 3.5mm 40: H = 4.0mm 45: H = 4.5mm	829+ = Au metal tab Sn/Cu

14	5608	XXX	XXX	861+
Prefix	**Series**	**Number of Positions**	**Stacking Height**	**Plating**
			001: H = 5mm 000: H = 9mm 010: H = 9mm with slit	861+ = Au

HOW TO ORDER – RECEPTACLE

24	5046	XXX	X	00	829+
Prefix	**Series**	**Number of Positions**	**Type**	**Variation**	**Plating**
			0 = Without metal tab 1 = With metal tab 5 = Without metal tab, with vacuum tape 6 = With metal tab, with vacuum tape	00 = Standard	829+ = Au metal tab Sn/Cu

24	5608	XXX	XXX	861+
Prefix	**Series**	**Number of Positions**	**Stacking Height**	**Plating**
			000: H = 9mm 001: H = 5mm	861+ = Au

CHARACTERISTICS

Series	5046	5608
Operating Temperature	-25ºC to +85ºC	-40ºC to +100ºC
Stacking Height	3 / 3.5 / 4 / 4.5mm	5 / 9mm
Stacking Direction	Vertical to Vertical	Vertical to Vertical
Pitch	0.5mm	0.8mm
Rated Current	AC/DC 0.4A	AC/DC 0.5A
Rated Voltage	AC/DC 50V	AC/DC 50V
Withstand Voltage	AC 500Vrms/min.	AC 500Vrms/min.

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

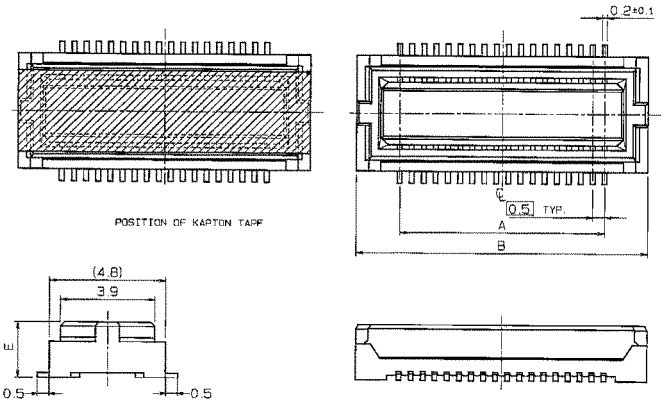
CHARACTERISTICS

Series	Pin Count									
Number	20	30	40	50	60	70	80	90	100	120
5046	■	■	■	■	■	■	■	■	■	■
5608	■			■	■		■			

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5046 PLUG

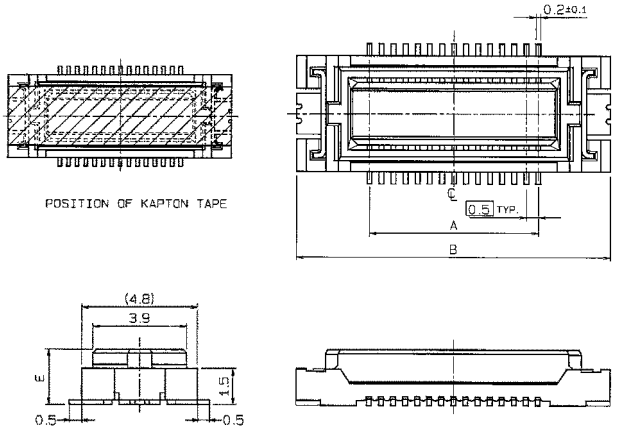
Without Metal Tab



No. of Positions	A	B	No. of Positions	A	B
20	4.5	8.1	80	19.5	23.1
30	7.0	10.6	90	22.0	25.6
40	9.5	13.1	100	24.5	28.1
50	12.0	15.6	110	27.0	30.6
60	14.5	18.1	120	29.5	33.1
70	17.0	20.6			

Stacking Height	E
H = 3.0	2.3
H = 3.5	2.8
H = 4.0	3.3
H = 4.5	3.8

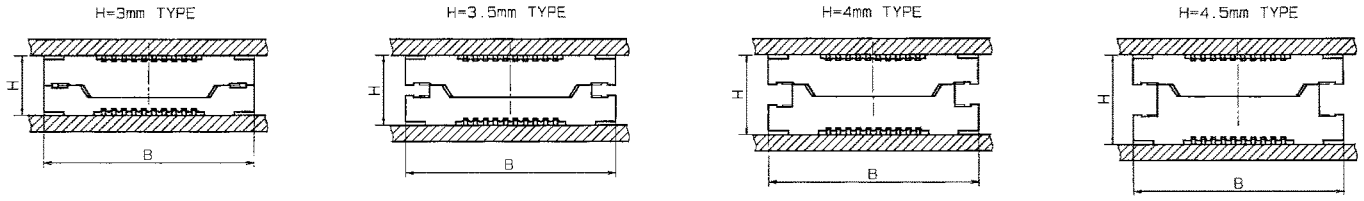
With Metal Tab



No. of Positions	A	B	C	No. of Positions	A	B	C
20	4.5	10.5	7.7	80	19.5	25.5	22.7
30	7.0	13.0	10.2	90	22.0	28.0	25.2
40	9.5	15.5	12.7	100	24.5	30.5	27.7
50	12.0	18.0	15.2	110	27.0	33.0	30.2
60	14.5	20.5	17.7	120	29.5	35.5	32.7
70	17.0	23.0	20.2				

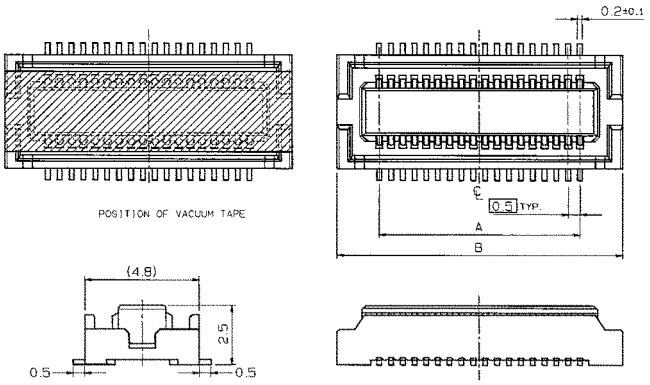
Stacking Height	E
H = 3.0	2.3
H = 3.5	2.8
H = 4.0	3.3
H = 4.5	3.8

STACKING HEIGHT



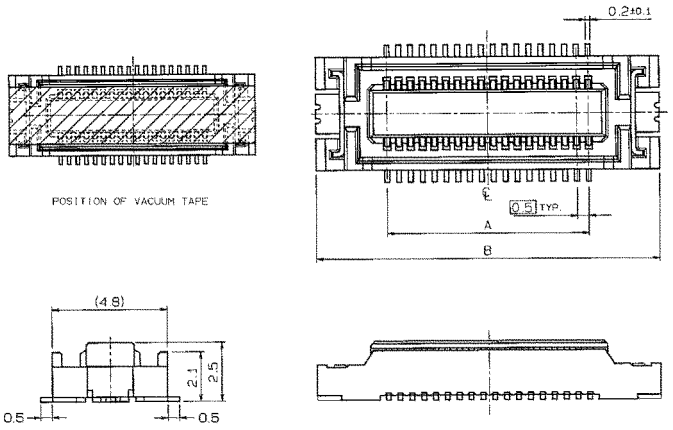
5046 RECEPTACLE

Without Metal Tab



No. of Positions	A	B	No. of Positions	A	B
20	4.5	8.1	80	19.5	23.1
30	7.0	10.6	90	22.0	25.6
40	9.5	13.1	100	24.5	28.1
50	12.0	15.6	110	27.0	30.6
60	14.5	18.1	120	29.5	33.1
70	17.0	20.6			

With Metal Tab

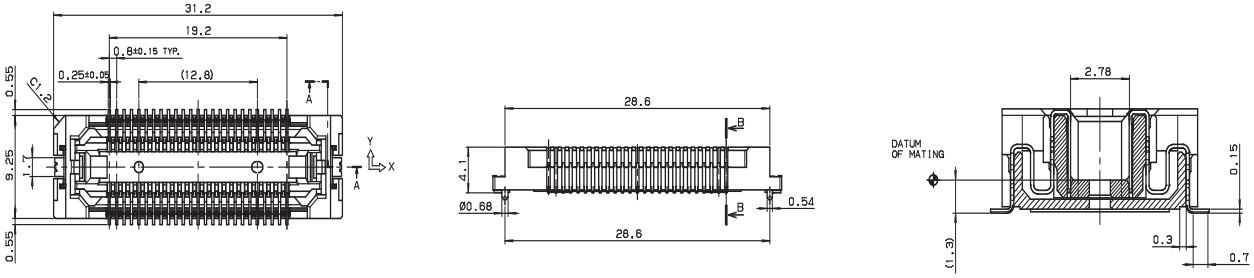


No. of Positions	A	B	C	No. of Positions	A	B	C
20	4.5	10.5	7.7	80	19.5	25.5	22.7
30	7.0	13.0	10.2	90	22.0	28.0	25.2
40	9.5	15.5	12.7	100	24.5	30.5	27.7
50	12.0	18.0	15.2	110	27.0	33.0	30.2
60	14.5	20.5	17.7	120	29.5	35.5	32.7
70	17.0	23.0	20.2				

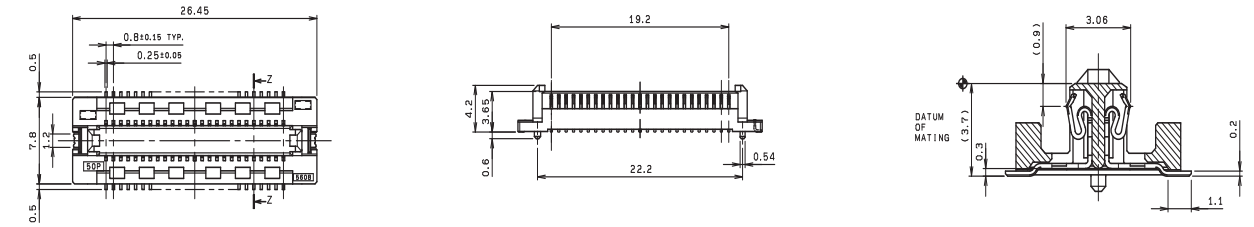
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5608 SERIES - H = 5.0MM, 50 POS ONLY

Plug

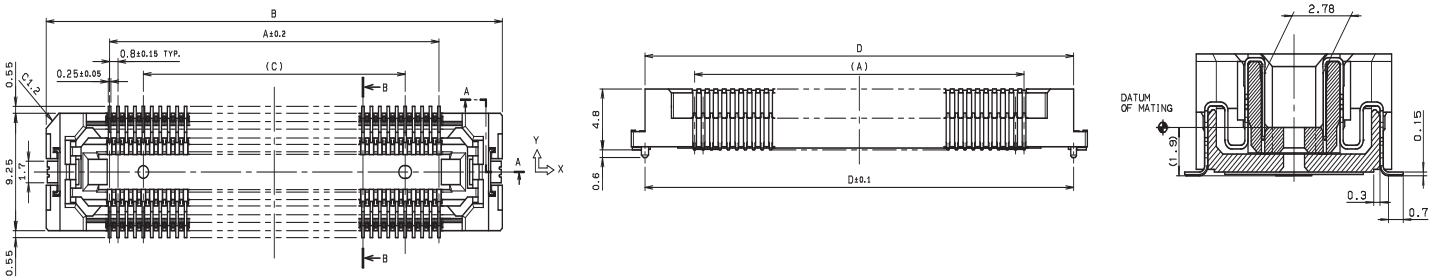


Receptacle

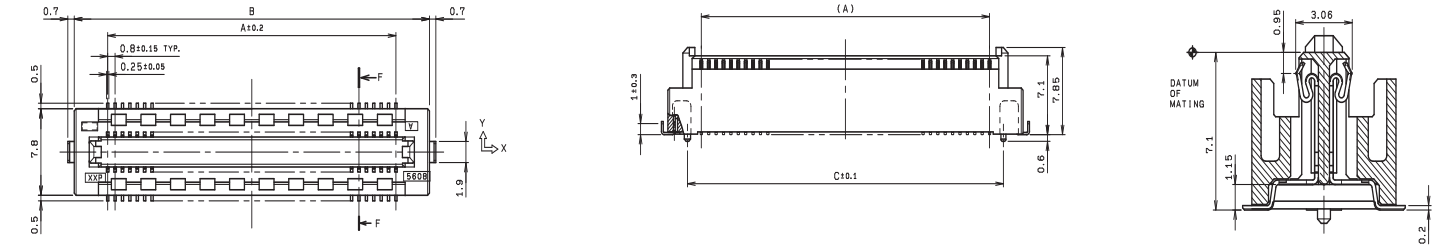


5608 SERIES - H = 9.0MM (20, 60, 80 POS)

Plug



Receptacle



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FPC/FFC connectors are fast becoming the default method of connecting systems and clusters within the cabin of the passenger and commercial vehicle, offering savings in size and weight and providing more flexibility to the design engineers.

Secure locking AVX/Kyocera FPC/FFC connectors allow accurate positioning of cable in connector and one cable specification for all. Once closed, accidental removal is almost impossible.

APPLICATIONS

- Automotive Audio/Visual Electronics
- Satellite Navigation Systems
- In-cabin applications
- Sealed control units

HOW TO ORDER

04	6288	0XX	000	846+
Prefix	Series	Number of Positions		Plating 846+ = Au

04	6801	6XX	111	846+
Prefix	Series	Number of Positions		Plating 846+ = Au

04	6251	0XX	010	846+
Prefix	Series	Number of Positions		Plating 846+ = Au

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

CHARACTERISTICS

Series	6288	6801	6251
Operating Temperature	-40ºC to +105ºC	-40ºC to +105ºC	-40ºC to +105ºC
Profile Height	2.0mm	5.5mm	5.45mm
Contact Location	Bottom	Single-Sided	Single-Sided
Pitch	0.5mm	0.5mm	0.5mm
Rated Current	AC/DC 0.4A	DC 0.4A	DC 0.4A
Rated Voltage	AC/DC 50V	DC 50V	DC 50V
Withstand Voltage	AC 200Vrms/min.	AC 200Vrms/min.	AC 200Vrms/min.
FPC Thickness	0.3mm	0.3mm	0.3mm

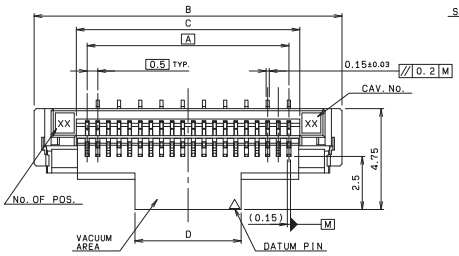
CHARACTERISTICS

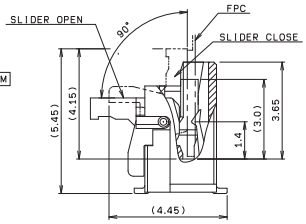
Series	Pin Count																								
Number	8	10	11	12	15	16	20	22	24	26	28	30	36	40	41	45	48	50	54	55	60	64	68	70	80
6288	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■
6801												■		■				■							
6251		■				■						■	■	■		■		■			■	■			

■ Available

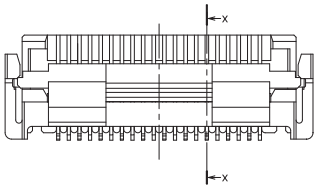
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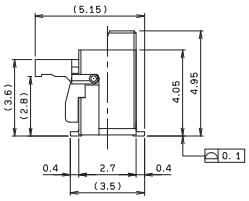
6251 SERIES



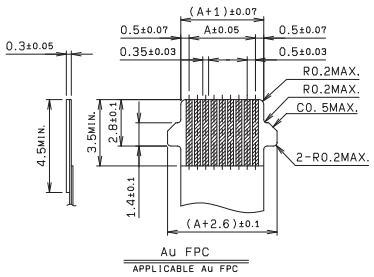


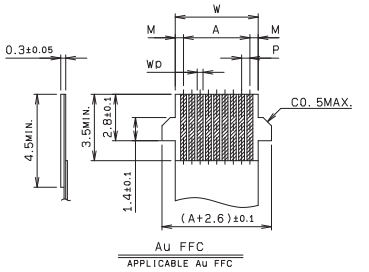
No. of Positions	A	B	C	D
10	4.5	9.5	5.6	3.0
16	7.5	12.5	8.6	4.0
30	14.5	19.5	15.6	7.0
33	16.0	21.0	17.1	8.5
40	19.5	24.5	20.6	8.0
45	22.0	27.5	23.1	10.5
50	24.5	29.5	25.6	13.0
60	29.5	24.5	30.6	18.0
64	31.5	36.5	32.6	20.0



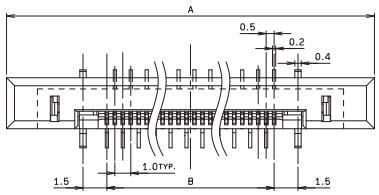


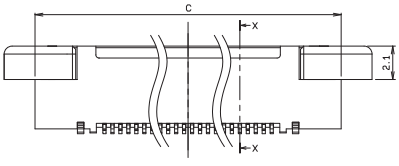
No. of Positions	X	Y	Z
10	11.5	---	24.0
16	11.5	---	24.0
30	14.2	28.4	32.0
33	14.2	28.4	32.0
40	20.2	40.4	44.0
45	20.2	40.4	44.0
50	20.2	40.4	44.0
60	26.2	52.4	56.0
65	26.2	52.4	56.0

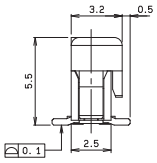


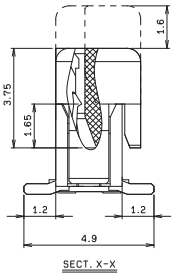


6801 SERIES



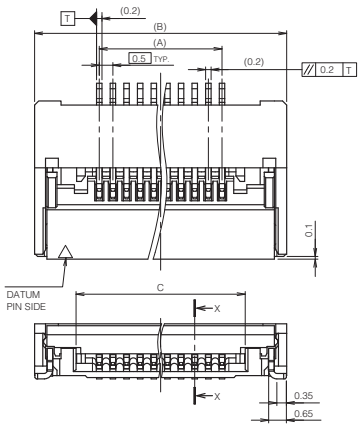


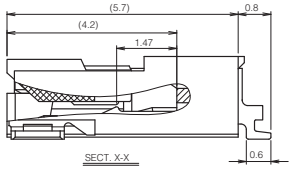


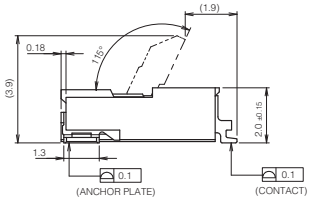


No. of Positions	A	B	C
30	27.1	14.5	23.2
40	32.1	19.5	28.22
50	37.1	24.5	33.22

6288 SERIES



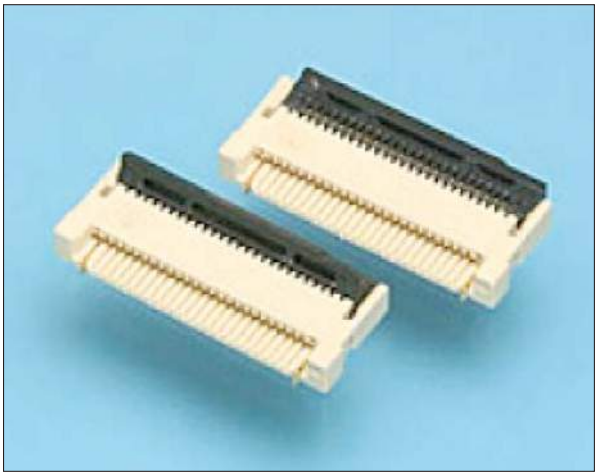




No. of Positions	A	B	C	D	E
8	3.5	8.2	5.2	6.0	9.6
9	4.0	8.7	5.7	6.5	10.1
10	4.5	9.2	6.2	7.0	10.6
11	5.0	9.7	6.7	7.5	11.1
12	5.5	10.2	7.2	8.0	11.6
13	6.0	10.7	7.7	8.5	12.1
14	6.5	11.2	8.2	9.0	12.6
15	7.0	11.7	8.7	9.5	13.1
16	7.5	12.2	9.2	10.0	13.6
17	8.0	12.7	9.7	10.5	14.1
18	8.5	13.2	10.2	11.0	14.6
19	9.0	13.7	10.7	11.5	15.1
20	9.5	14.2	11.2	12.0	15.6
21	10.0	14.7	11.7	12.5	16.1
22	10.5	15.2	12.2	13.0	16.6
23	11.0	15.7	12.7	13.5	17.1
24	11.5	16.2	13.2	14.0	17.6
25	12.0	16.7	13.7	14.5	18.1
26	12.5	17.2	14.2	15.0	18.6
27	13.0	17.7	14.7	15.5	19.1
28	13.5	18.2	15.2	16.0	19.6
29	14.0	18.7	15.7	16.5	20.1
30	14.5	19.2	16.2	17.0	20.6
31	15.0	19.7	16.7	17.5	21.1
32	15.5	20.2	17.2	18.0	21.6
33	16.0	20.7	17.7	18.5	22.1
34	16.5	21.2	18.2	19.0	22.6

No. of Positions	A	B	C	D	E
35	17.0	21.7	18.7	19.5	23.1
36	17.5	22.2	19.2	20.0	23.6
37	18.0	22.7	19.7	20.5	24.1
38	18.5	23.2	20.2	21.0	24.6
39	1900	23.7	20.7	21.5	25.1
40	19.5	24.2	21.2	22.0	25.6
41	20.2	24.7	21.7	22.5	26.1
42	20.5	25.2	22.2	23.0	26.6
43	21.0	25.7	22.7	23.5	27.1
44	21.5	26.2	23.2	24.0	27.6
45	22.0	26.7	23.7	24.5	28.1
46	22.5	27.2	24.2	25.0	28.6
47	230	27.7	24.7	25.5	29.1
48	23.5	28.2	25.2	26.0	29.6
49	24.0	28.7	25.7	26.5	30.1
50	24.5	29.2	26.2	27.0	30.6
51	25.0	29.7	26.7	27.5	31.1
52	25.5	30.2	27.2	28.0	31.6
53	26.0	30.7	27.7	28.5	32.1
54	26.5	31.2	28.2	29.0	32.6
55	27.0	31.7	28.7	29.5	33.1
56	27.5	32.2	29.2	30.0	33.6
57	28.0	32.7	29.7	30.5	34.1
58	28.5	33.2	30.2	31.0	34.6
59	29.0	33.7	30.7	31.5	35.1
60	29.5	34.2	31.2	32.0	35.6

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FPC/FFC connectors are fast becoming the default method of connecting systems and clusters within the cabin of the passenger and commercial vehicle, offering savings in size and weight and providing more flexibility to the design engineers.

High speed series connector has contacts with proprietary adjusted impedance and is capable of the maximum speed of 3.75Gbps. Improvement in the differential impedance characteristics supports high-speed differential transmission in the connection in drivers such as DVD players and recorders, car navigation systems, flat screen panels.

FEATURES

- 3.75Gbps
- Metal locking device and notched FFC/FPC
- Locked actuator is highly resistant to external stress
- Back flip lock
- Highly accurate impedance matching through dedicated contacts for connection of signals and groundings

APPLICATIONS

- Automotive Audio/ Visual Electronics
- Satellite Navigation Systems
- In-cabin applications

HOW TO ORDER

04	6882	X	XX	X	XX	846+
Prefix	Series	Tail Dust Cover 1 = Without 3 = With	Number of Positions	Base Pin Position 0 = Normal 1 = Reverse	Pin Assign Code	Plating 846+ = Au

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

RoHS COMPLIANT

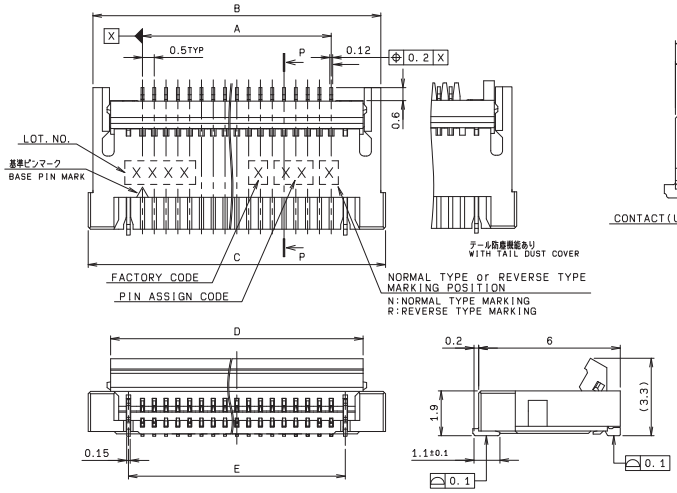
CHARACTERISTICS

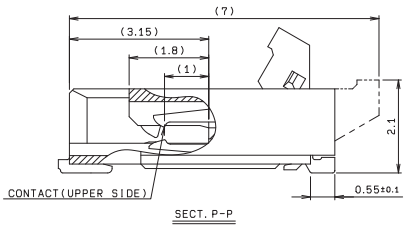
Series	6882
Operating Temperature	-40ºC to +85ºC
Profile Height	2.1mm
Contact Location	Top
Pitch	0.5mm
Rated Current	AC/DC 0.4A
Rated Voltage	AC/DC 50V
Characteristics Impedance	100Ω±15% (Tr: 70ps)
FPC Thickness	0.3mm

CHARACTERISTICS

Series Number	Pin Count			
	24	30	41	51
6882				

6882 SERIES

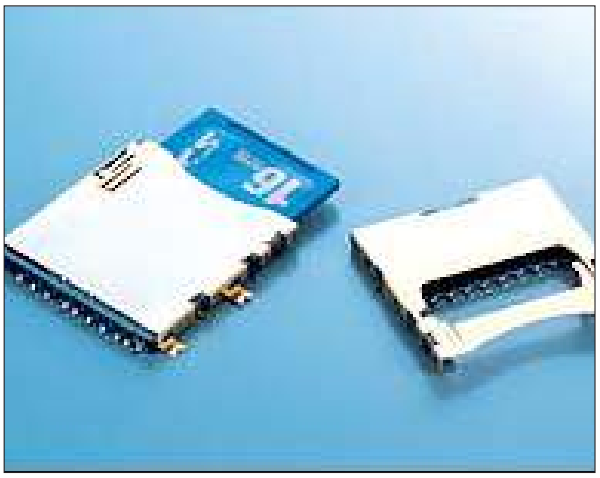




No. of Positions	A	B	C	D	E
24	11.5	15.7	16.1	14.2	12.7
30	14.5	18.7	19.1	17.2	1.7
41	20.0	24.2	24.6	22.7	21.2
51	25.0	29.2	29.6	27.7	26.2

No. of Positions	F	G	H
24	14.2	28.4	32.0
30	14.2	28.4	32.0
41	20.2	40.4	44.0
51	20.2	40.4	44.0

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Series 5738 is SDIO connector complying with SDIO specifications defined by SDA I/O working group that recommends SD memory cards

Connectors are equipped with the write protection switch for SD card and the card detection switch.

Connectors are push-push type with spring eject mechanism.

APPLICATIONS

- Automotive Audio/Visual Electronics
- Satellite Navigation Systems
- In-cabin applications

CHARACTERISTICS

Series	5738
Operating Temperature	-25ºC to +90ºC
Positions	9
Height	2.7 / 2.8 / 2.9mm
Pitch	2.5mm
Rated Current	AC/DC 0.5A
Rated Voltage	AC/DC 5V
Withstand Voltage	AC 500Vrms/min.

HOW TO ORDER

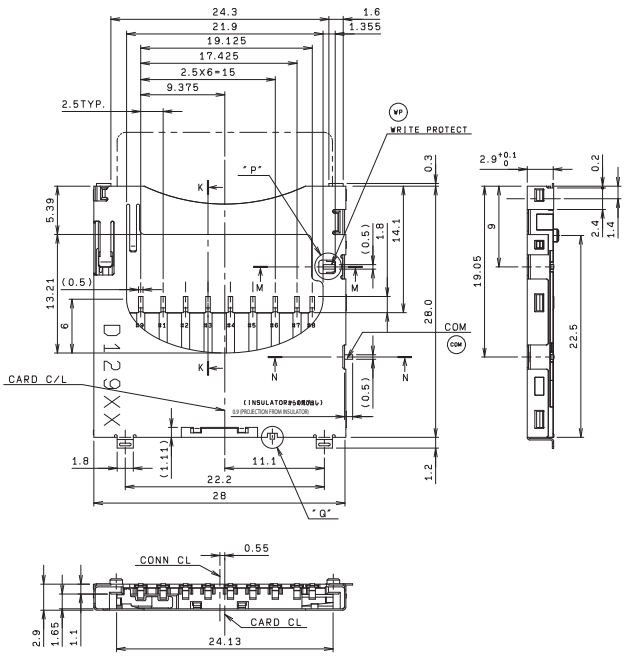
Part Number	Height	Mounting	Tail	Type	Type	Plating
14 5738 009 220 859+	2.7	Reverse	Outer	Push	Push	Contacts and Terminations – Au Shield Plate – Ni
14 5738 009 784 859+	2.8	Normal	Inner	Push	Push	Contacts and Terminations – Au Shield Plate – Ni
14 5738 009 302 859+	2.9	Normal	Inner	Push	Push	Contacts and Terminations – Au Shield Plate – Ni

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT

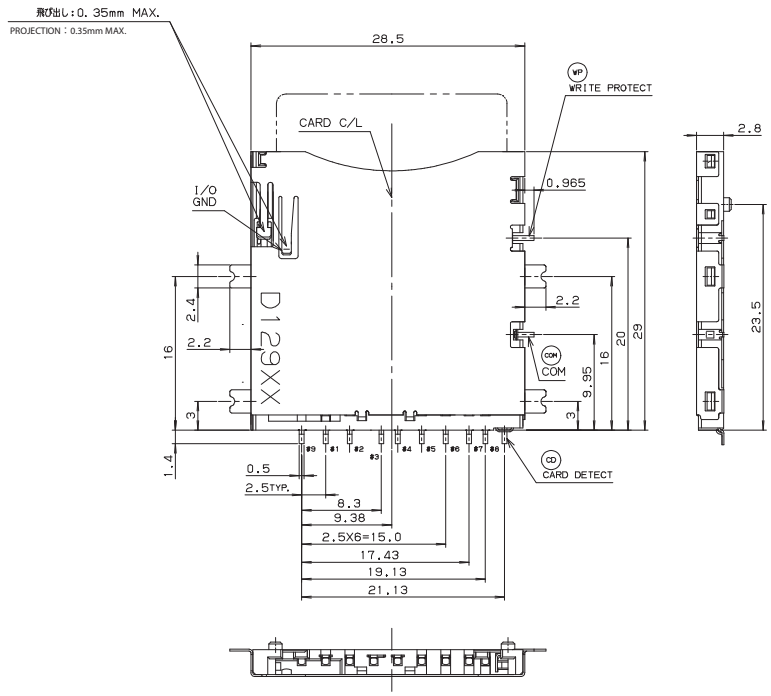
RoHS COMPLIANT

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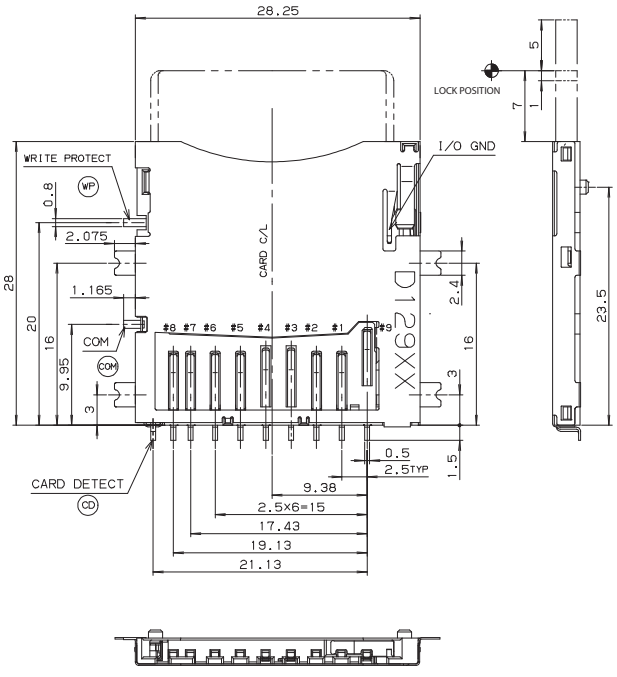
Normal type, Inner tail, H=2.9mm



Normal type, Outer tail, H=2.8mm



Reverse type, Outer tail H=2.7mm



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TIMING DEVICES

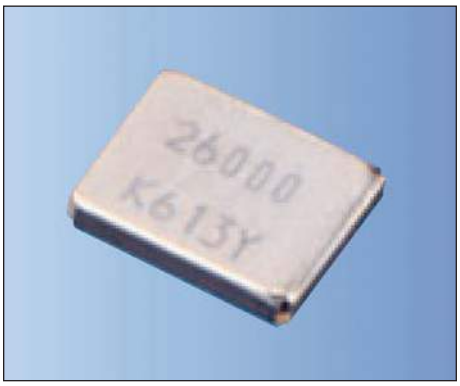
AVX/Kyocera offers precision crystal units, clock oscillators, TCXO and resonators for automotive applications. These ceramic based devices offer high reliability, small dimensions and excellent temperature cycling performance.

KYOCERA

CRYSTAL DEVICE CORPORATION

AVX®

www.EngineeringEBooksPdf.com



2.0×1.6mm for Automotive

FEATURES

- Crystal unit for Consumer Products
- Ultra-miniature and low profile (2.0×1.6×0.40mm)
- Ceramic package
- Reflow compatible
- AEC-Q200 qualified (Please contact us for Automotive use)

APPLICATIONS

- Digital Electronics
- Consumer Products
- Mobile Communications, Bluetooth®, Wireless LAN
- Car Electronics

*Bluetooth® Trademarks are owned by Bluetooth SIG Inc.

HOW TO ORDER

CX2016DB	27000	D0	G	XX	–
Series	Frequency	Load Capacitance D0 = 8pF	Frequency Tolerance G = ±15x10^{-6}	Operating Temp. | Frequency Temp. Stability PN = -40 to +85ºC | ±25ppm SS = -40 to +125ºC | ±50ppm	Individual Specification

RoHS COMPLIANT

Packaging (Tape & Reel 1000/ 3000 / 12000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	16000 to 60000		kHz	
Overtone Order	OT	Fundamental		–	
Load Capacitance	CL	8		pF	Please contact us for other Load Capacitance
Frequency Tolerance	f_{tol}	±15		x10^{-6}	25ºC±3ºC
Motional Series Resistance	R1	Table 1		ohm	
Drive Level	DL	Table 2		µW	
Storage Temp. Range	T_{stg}	-40 to +85	-40 to +125	ºC	
Operating Temp. Range	T_{use}	-40 to +125		ºC	
Frequency Temp. Characteristics	f_{tem}	±25	±50	x10^{-6}	Freq. deviation from the value at 25ºC

*Please contact us for other specifications.

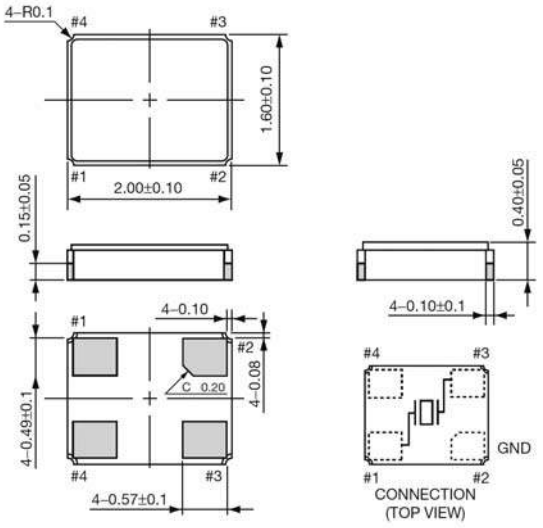
TABLE 1
MOTIONAL SERIES RESISTANCE

Frequency Range	Motional Series Resistance
16000≤f_nom<18000kHz	200Ω max.
18000≤f_nom<26000kHz	150Ω max.
26000≤f_nom<40000kHz	60Ω max.
40000≤f_nom≤60000kHz	50Ω max.

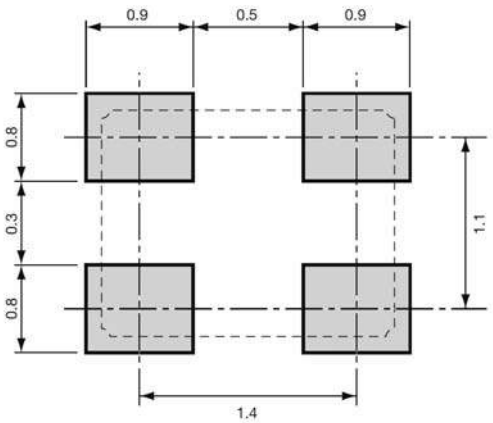
TABLE 2
LEVEL OF DRIVE

Frequency Range	Level of Drive
16000≤f_nom≤60000kHz	10µW (100µW max.)

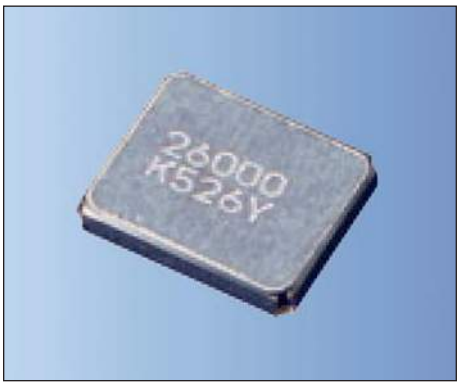
DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



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2.5×2.0mm for Automotive

FEATURES

- Crystal unit for Consumer Products
- Ceramic package
- Reflow compatible
- AEC-Q200 qualified
  (Please contact us for Automotive use)

APPLICATIONS

- Digital Electronics
- Consumer Products
- Mobile Communications, Bluetooth®, Wireless LAN
- Car Electronics

*Bluetooth® Trademarks are owned by Bluetooth SIG Inc.

HOW TO ORDER

CX2520DB	27000	D0	G	XX	–
Series	Frequency	Load Capacitance D0 = 8pF	Frequency Tolerance G = ±15x10^{-6}	Operating Temp. | Frequency Temp. Stability PN = -40 to +85ºC | ±25ppm SS = -40 to +125ºC | ±50ppm	Individual Specification

RoHS COMPLIANT

Packaging (Tape & Reel 1000 / 3000 / 12000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	12000 to 54000		kHz	
Overtone Order	OT	Fundamental		–	
Load Capacitance	CL	8		pF	Please contact us for other Load Capacitance
Frequency Tolerance	f_{tol}	±15		x10^{-6}	25ºC±3ºC
Motional Series Resistance	R1	Table 1		ohm	
Drive Level	DL	Table 2		µW	
Storage Temp. Range	T_{stg}	-40 to +85	-40 to +125	ºC	
Operating Temp. Range	T_{use}	-40 to +125		ºC	
Frequency Temp. Characteristics	f_{tem}	±25	±50	x10^{-6}	Freq. deviation from the value at 25ºC

*Please contact us for other specifications.

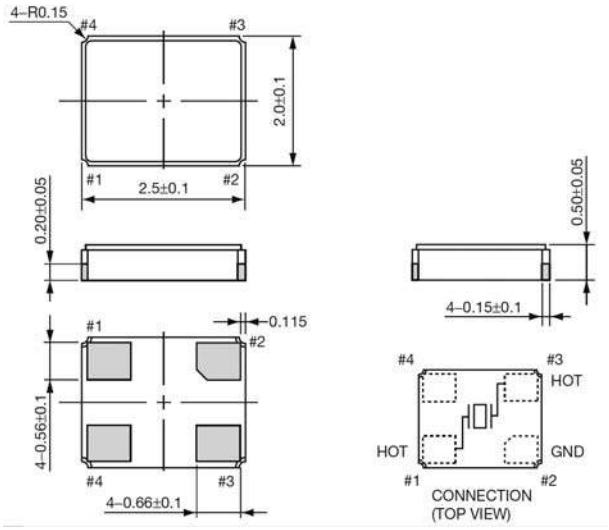
TABLE 1
MOTIONAL SERIES RESISTANCE

Frequency Range	Motional Series Resistance
12000≤f_nom<16000kHz	150Ω max.
16000≤f_nom<26000kHz	80Ω max.
26000≤f_nom<30000kHz	60Ω max.
30000≤f_nom≤54000kHz	50Ω max.

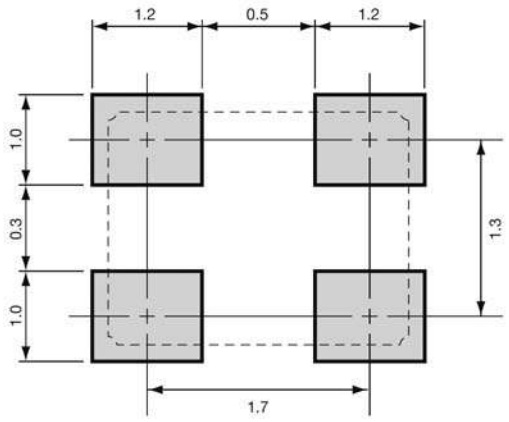
TABLE 2
LEVEL OF DRIVE

Frequency Range	Level of Drive
12000≤f_nom≤54000kHz	10µW (100µW max.)

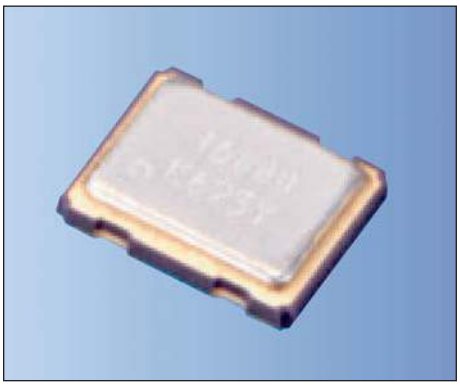
DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



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3.2×2.5mm for Automotive

FEATURES

- Crystal unit for automotive electronics
- Improved solderability
- Improved mounting stability with 4 terminals
- Improved anti-noise performance with GND terminal
- Using ceramic package resulting in high reliability
- Small and low profile
- Improved rust prevention performance
- Reflow compatible
- Highly reliable solder junction (3000 heat cycles –40 to +125°C)
- AEC-Q200 qualified

APPLICATIONS

- ECU
- TPMS
- High-Speed Automotive Network

HOW TO ORDER

CX3225SA	12000	D0	P	XX	–
Series	Frequency	Load Capacitance D0 = 8pF	Frequency Tolerance P = ±50x10^{-6}	Operating Temp. | Frequency Temp. Stability SS = -40 to +125ºC | ±50ppm TW = -40 to +150ºC | ±200ppm	Individual Specification

RoHS COMPLIANT

Packaging (Tape & Reel 1000 / 3000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	8000 to 54000		kHz	
Overtone Order	OT	Fundamental		–	
Load Capacitance	CL	8		pF	Please contact us for other Load Capacitance
Frequency Tolerance	f_{tol}	±50		x10^{-6}	25ºC±3ºC
Motional Series Resistance	R1	Table 1		ohm	
Drive Level	DL	Table 2		µW	
Storage Temp. Range	T_{stg}	-40 to +125	-40 to +150	ºC	
Operating Temp. Range	T_{use}	-40 to +150		ºC	
Frequency Temp. Characteristics	f_{tem}	±50	±200	x10^{-6}	Freq. deviation from the value at 25ºC

*Please contact us for other specifications.

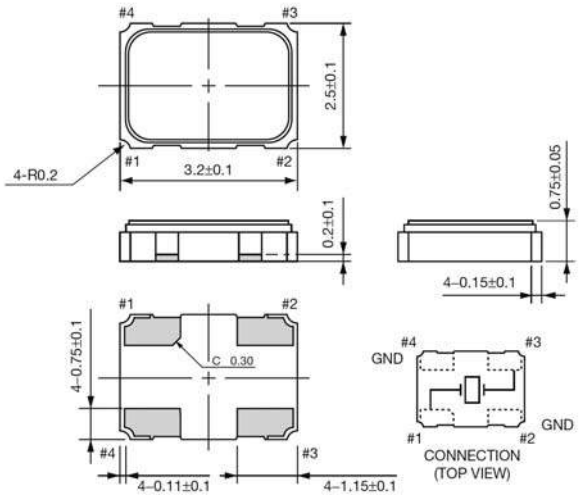
TABLE 1
MOTIONAL SERIES RESISTANCE

Frequency Range	Motional Series Resistance
8000≤f_nom< 9800kHz	500Ω max.
9800≤f_nom<13560kHz	200Ω max.
13560≤f_nom<16000kHz	100Ω max.
16000≤f_nom<20000kHz	60Ω max.
20000≤f_nom≤54000kHz	50Ω max.

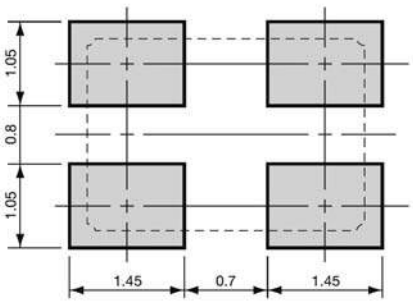
TABLE 2
LEVEL OF DRIVE

Frequency Range	Level of Drive
8000≤f_nom≤54000kHz	10µW (200µW max.)

DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



www.EngineeringEBooksPdf.com



3.2×2.5mm for Automotive

FEATURES

- Crystal unit for Consumer Products
- Miniature and low profile (3.2×2.5×0.55mm)
- Ceramic package
- Reflow compatible
- AEC-Q200 qualified
  (Please contact us for Automotive use)

APPLICATIONS

- Digital Electronics
- Consumer Products
- Car Electronics
- Mobile Communications, Bluetooth®, Wireless LAN

*Bluetooth® Trademarks are owned by Bluetooth SIG Inc.

HOW TO ORDER

CX3225SB	12000	D0	G	XX	–
Series	Frequency	Load Capacitance D0 = 8pF	Frequency Tolerance G = ±15x10^{-6}	Operating Temp. | Frequency Temp. Stability PN = -40 to +85ºC | ±25ppm SS = -40 to +125ºC | ±50ppm	Individual Specification

RoHS COMPLIANT

Packaging (Tape & Reel 1000 / 3000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	12000 to 54000		kHz	
Overtone Order	OT	Fundamental		–	
Load Capacitance	CL	8		pF	Please contact us for other Load Capacitance
Frequency Tolerance	f_{tol}	±15		x10^{-6}	25ºC±3ºC
Motional Series Resistance	R1	Table 1		ohm	
Drive Level	DL	Table 2		µW	
Storage Temp. Range	T_{stg}	-40 to +85	-40 to +125	ºC	
Operating Temp. Range	T_{use}	-40 to +125		ºC	
Frequency Temp. Characteristics	f_{tem}	±25	±50	x10^{-6}	Freq. deviation from the value at 25ºC

*Please contact us for other specifications.

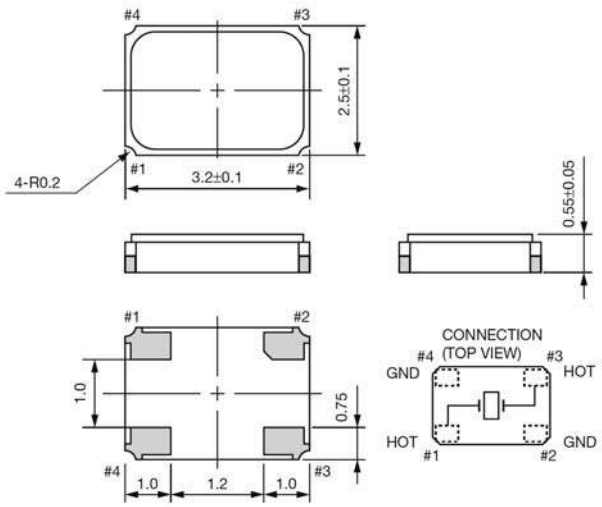
TABLE 1
MOTIONAL SERIES RESISTANCE

Frequency Range	Motional Series Resistance
12000≤f_nom<13000kHz	150Ω max.
13000≤f_nom<20000kHz	80Ω max.
20000≤f_nom≤54000kHz	50Ω max.

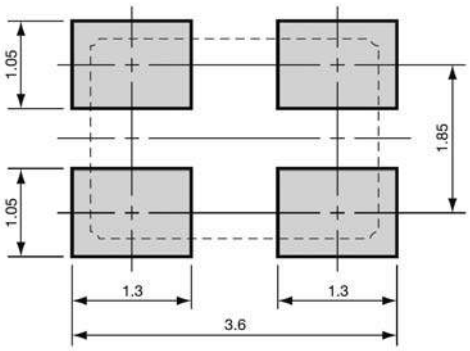
TABLE 2
LEVEL OF DRIVE

Frequency Range	Level of Drive
12000≤f_nom≤54000kHz	10µW (100µW max.)

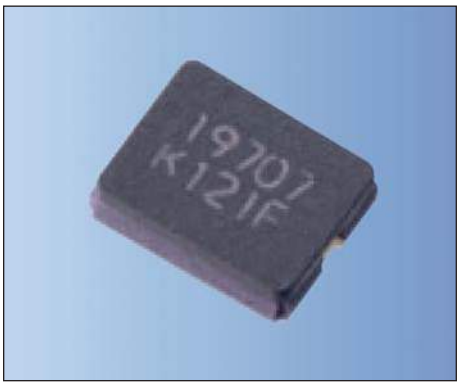
DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



www.EngineeringEBooksPdf.com



3.2×2.5mm for Automotive

FEATURES

- Crystal unit for automotive electronics
- Small and low profile (3.2×2.5×0.85mm)
- Ceramic package
- Reflow compatible
- Acceptable heat cycle solder junction for3000 cycle (–40 to +125°C)
- AEC-Q200 qualified

APPLICATIONS

- ECU
- TPMS
- High-Speed Automotive Network

HOW TO ORDER

CX3225GA	16000	D0	P	XX	–
Series	Frequency	Load Capacitance D0 = 8pF	Frequency Tolerance P = ±50x10^{-6}	Operating Temp. | Frequency Temp. Stability SS = -40 to +125ºC | ±50ppm TW = -40 to +150ºC | ±200ppm	Individual Specification

RoHS COMPLIANT

Packaging (Tape & Reel 3000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	8000 to 54000		kHz	
Overtone Order	OT	Fundamental		–	
Load Capacitance	CL	8		pF	Please contact us for other Load Capacitance
Frequency Tolerance	f_{tol}	±50		x10^{-6}	25ºC±3ºC
Motional Series Resistance	R1	Table 1		ohm	
Drive Level	DL	Table 2		µW	
Storage Temp. Range	T_{stg}	-40 to +125	-40 to +150	ºC	
Operating Temp. Range	T_{use}	-40 to +150		ºC	
Frequency Temp. Characteristics	f_{tem}	±50	±200	x10^{-6}	Freq. deviation from the value at 25ºC

*Please contact us for other specifications.

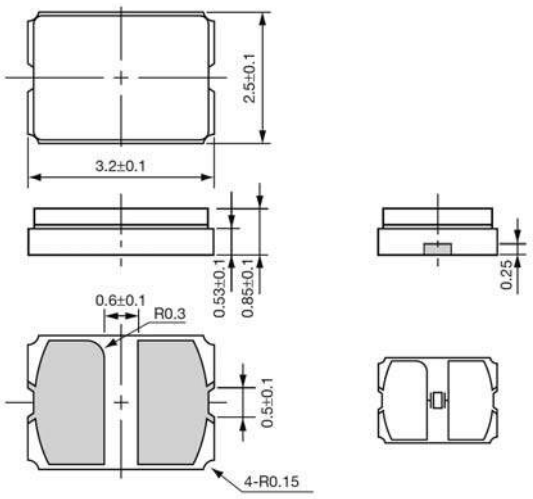
TABLE 1
MOTIONAL SERIES RESISTANCE

Frequency Range	Motional Series Resistance
8000≤f_nom< 9800kHz	500Ω max.
9800≤f_nom<13560kHz	200Ω max.
13560≤f_nom<16000kHz	120Ω max.
16000≤f_nom≤54000kHz	100Ω max.

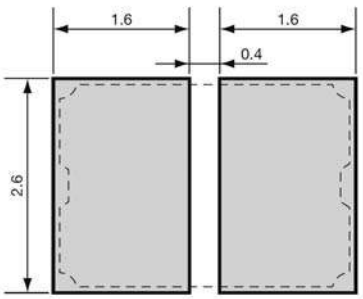
TABLE 2
LEVEL OF DRIVE

Frequency Range	Level of Drive
8000≤f_nom≤54000kHz	10µW (200µW max.)

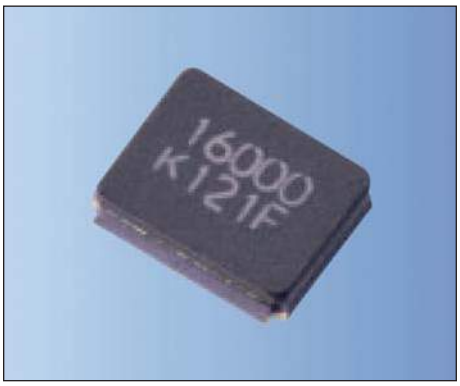
DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



www.EngineeringEBooksPdf.com



3.2×2.5mm for Automotive

FEATURES

- Crystal unit for automotive electronics
- Small and low profile (3.2×2.5×0.80mm)
- Ceramic package
- Reflow compatible
- AEC-Q200 qualified

APPLICATIONS

- ECU
- High-Speed Automotive Network

HOW TO ORDER

CX3225CA	16000	D0	P	XX	–
Series	Frequency	Load Capacitance D0 = 8pF	Frequency Tolerance P = ±50x10^{-6}	Operating Temp. | Frequency Temp. Stability SS = -40 to +125ºC | ±50ppm TW = -40 to +150ºC | ±200ppm	Individual Specification

RoHS COMPLIANT

Packaging (Tape & Reel 3000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	9800 to 54000		kHz	
Overtone Order	OT	Fundamental		–	
Load Capacitance	CL	8		pF	Please contact us for other Load Capacitance
Frequency Tolerance	f_{tol}	±50		x10^{-6}	25ºC±3ºC
Motional Series Resistance	R1	Table 1		ohm	
Drive Level	DL	Table 2		µW	
Storage Temp. Range	T_{stg}	-40 to +125	-40 to +150	ºC	
Operating Temp. Range	T_{use}	-40 to +150		ºC	
Frequency Temp. Characteristics	f_{tem}	±50	±200	x10^{-6}	Freq. deviation from the value at 25ºC

*Please contact us for other specifications.

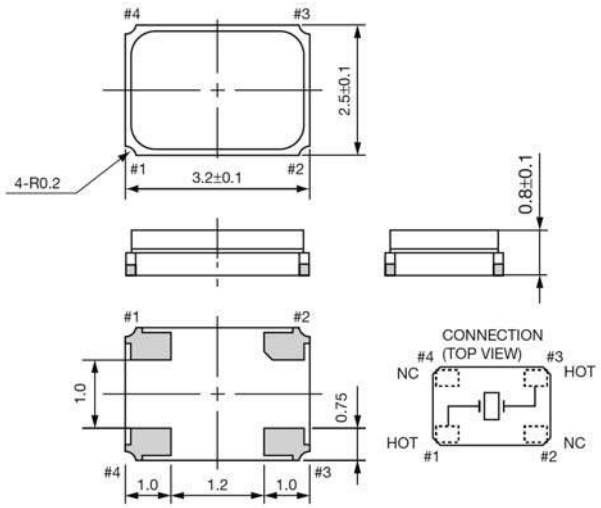
TABLE 1
MOTIONAL SERIES RESISTANCE

Frequency Range	Motional Series Resistance
9800≤f_nom<13560kHz	200Ω max.
13560≤f_nom<16000kHz	120Ω max.
16000≤f_nom≤54000kHz	100Ω max.

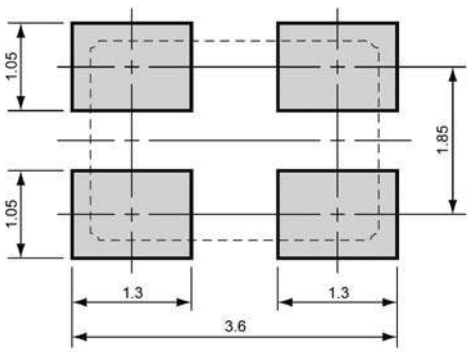
TABLE 2
LEVEL OF DRIVE

Frequency Range	Level of Drive
9800≤f_nom≤54000kHz	10µW (200µW max.)

DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



www.EngineeringEBooksPdf.com



5.0×3.2mm for Automotive

FEATURES

- Crystal unit for automotive electronics
- Improved solderability
- Using ceramic package resulting in high reliability
- Small and low profile
- Improved rust prevention performance
- Reflow compatible
- AEC-Q200 qualified

APPLICATIONS

- ECU
- TPMS
- High-Speed Automotive Network

HOW TO ORDER

CX5032SA	08000	H0	P	XX	–
Series	Frequency	Load Capacitance 12 pF	Frequency Tolerance P = ±50x10^{-6}	Operating Temp. | Frequency Temp. Stability SS = -40 to +125ºC | ±50ppm TW = -40 to +150ºC | ±150ppm	Individual Specification

RoHS COMPLIANT

Packaging (Tape & Reel 1000 / 5000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	8000 to 40000		kHz	
Overtone Order	OT	Fundamental		–	
Load Capacitance	CL	12		pF	Please contact us for other Load Capacitance
Frequency Tolerance	f_{tol}	±50		x10^{-6}	25ºC±3ºC
Motional Series Resistance	R1	Table 1		ohm	
Drive Level	DL	Table 2		µW	
Storage Temp. Range	T_{stg}	-40 to +125	-40 to +150	ºC	
Operating Temp. Range	T_{use}	-40 to +150		ºC	
Frequency Temp. Characteristics	f_{tem}	±50	±150	x10^{-6}	Freq. deviation from the value at 25ºC

*Please contact us for other specifications.

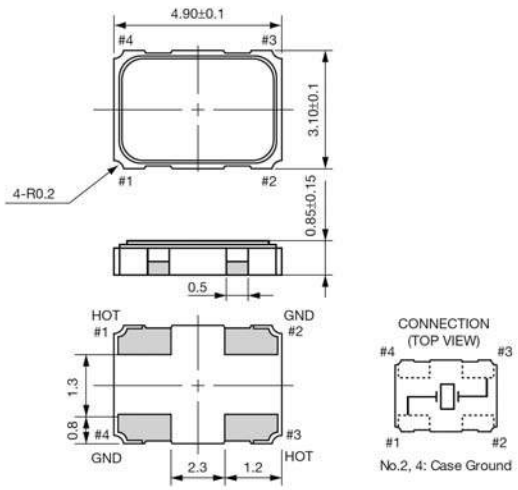
TABLE 1
MOTIONAL SERIES RESISTANCE

Frequency Range	Motional Series Resistance
8000≤f_nom< 9000kHz	200Ω max.
9000≤f_nom<12000kHz	150Ω max.
12000≤f_nom<20000kHz	100Ω max.
20000≤f_nom≤40000kHz	50Ω max.

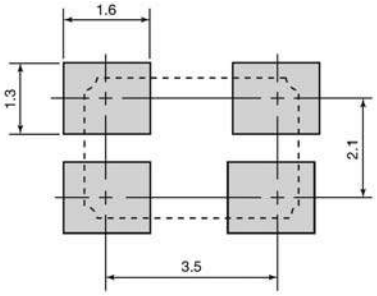
TABLE 2
LEVEL OF DRIVE

Frequency Range	Level of Drive
8000≤f_nom≤40000kHz	10µW (100µW max.)

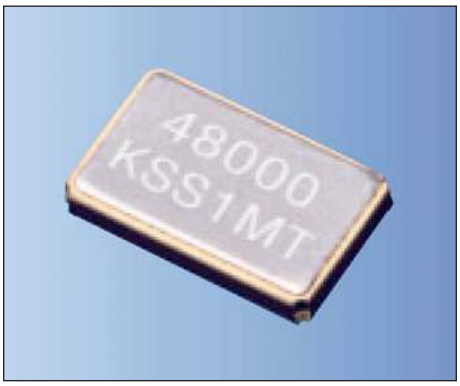
DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



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5.0×3.2mm for Automotive

FEATURES

- Reference frequency for telecommunication systems
- Reflow compatible
- Using ceramic package resulting in high reliability
- AEC-Q200 qualified
  (Please contact us for Automotive use)

APPLICATIONS

- Mobile Communications, Bluetooth®, Wireless LAN
- Car Electronics

*Bluetooth® Trademarks are owned by Bluetooth SIG Inc.

HOW TO ORDER

CX5032SB	26000	H0	F	XX	–
Series	Frequency	Load Capacitance 12 pF	Frequency Tolerance F = ±10x10^{-6}	Operating Temp. | Frequency Temp. Stability PN = -40 to +85ºC | ±25ppm SS = -40 to +125ºC | ±50ppm	Individual Specification

RoHS COMPLIANT

Packaging (Tape & Reel 1000 / 5000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	9800 to 50000		kHz	
Overtone Order	OT	Fundamental		–	
Load Capacitance	CL	12		pF	Please contact us for other Load Capacitance
Frequency Tolerance	f_{tol}	±10		x10^{-6}	25ºC±3ºC
Motional Series Resistance	R1	Table 1		ohm	
Drive Level	DL	Table 2		µW	
Storage Temp. Range	T_{stg}	-40 to +85	-40 to +125	ºC	
Operating Temp. Range	T_{use}	-40 to +125		ºC	
Frequency Temp. Characteristics	f_{tem}	±25	±50	x10^{-6}	Freq. deviation from the value at 25ºC

*Please contact us for other specifications.

TABLE 1
MOTIONAL SERIES RESISTANCE

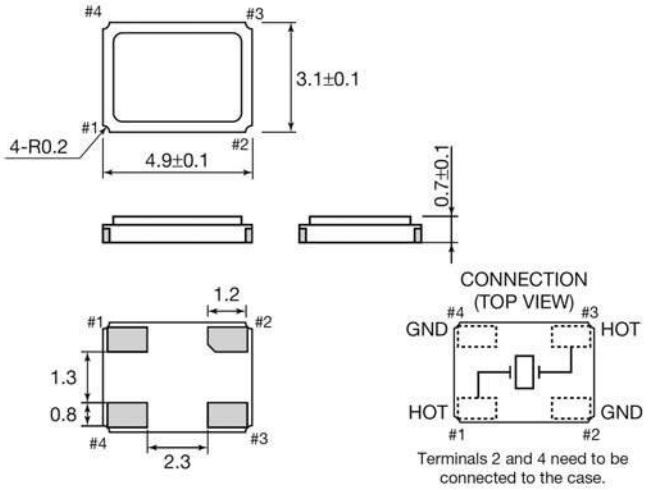
Frequency Range	Motional Series Resistance
9800≤f_nom<10000kHz	150Ω max.
10000≤f_nom<12000kHz	80Ω max.
12000≤f_nom<26000kHz	50Ω max.
26000≤f_nom≤50000kHz	40Ω max.
*50≤f_nom≤80 (MHz)	80Ω max.

*3rd Overtone

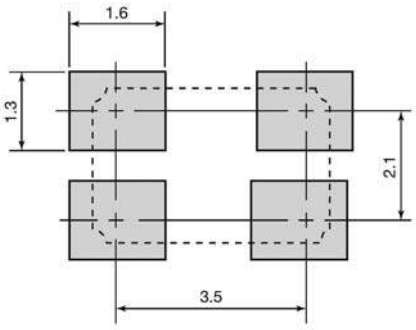
TABLE 2
LEVEL OF DRIVE

Frequency Range	Level of Drive
9800≤f_nom≤50000kHz	10µW (100µW max.)
50≤f_nom≤80 (MHz)	

DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



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5.0×3.2mm for Automotive

FEATURES

- Crystal unit for automotive electronics
- Small and low profile (5.0×3.2×1.3mm)
- Ceramic package
- Reflow compatible
- AEC-Q200 qualified

APPLICATIONS

- ECU

HOW TO ORDER

CX5032GA	08000	H0	Q	XX	–
Series	Frequency	Load Capacitance H0 = 12pF	Frequency Tolerance Q = ±100x10^{-6}	Operating Temp. | Frequency Temp. Stability SS = -40 to +125ºC | ±50ppm TW = -40 to +150ºC | ±150ppm	Individual Specification

RoHS COMPLIANT

Packaging (Tape & Reel 1000 / 3000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	8000 to 40000		kHz	
Overtone Order	OT	Fundamental		–	
Load Capacitance	CL	12		pF	Please contact us for other Load Capacitance
Frequency Tolerance	f_{tol}	±100		x10^{-6}	25ºC±3ºC
Motional Series Resistance	R1	Table 1		ohm	
Drive Level	DL	Table 2		µW	
Storage Temp. Range	T_{stg}	-40 to +125	-40 to +150	ºC	
Operating Temp. Range	T_{use}	-40 to +150		ºC	
Frequency Temp. Characteristics	f_{tem}	±50	±200	x10^{-6}	Freq. deviation from the value at 25ºC

*Please contact us for other specifications.

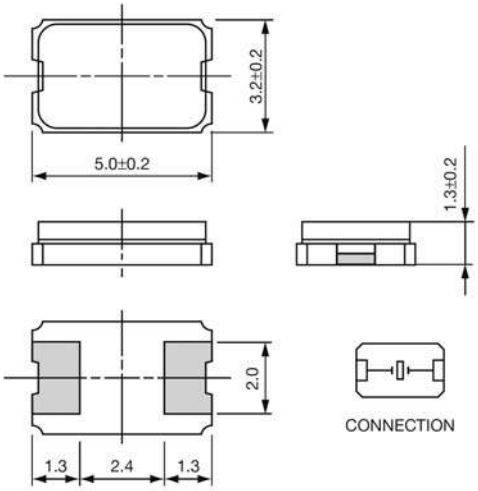
TABLE 1
MOTIONAL SERIES RESISTANCE

Frequency Range	Motional Series Resistance
8000≤f_nom< 9500kHz	300Ω max.
9500≤f_nom<10000kHz	200Ω max.
10000≤f_nom<14000kHz	150Ω max.
14000≤f_nom<20000kHz	100Ω max.
20000≤f_nom<30000kHz	70Ω max.
30000≤f_nom≤40000kHz	50Ω max.

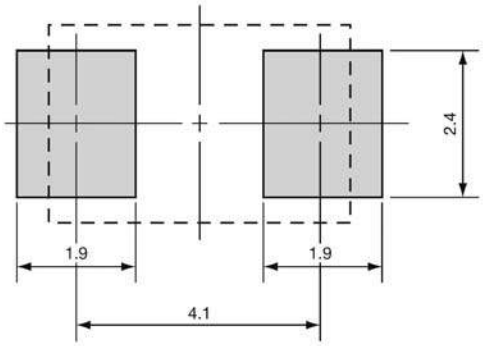
TABLE 2
LEVEL OF DRIVE

Frequency Range	Level of Drive
8000≤f_nom<16000kHz	10µW (500µW max.)
16000≤f_nom<25000kHz	10µW (300µW max.)
25000≤f_nom≤40000kHz	10µW (100µW max.)

DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



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3.2×1.5mm for Automotive

FEATURES

- Small, Low Profile
- Ceramic Package
- Reflow Compatible

APPLICATIONS

- Consumer/ Mobile Equipment

HOW TO ORDER

ST3215SB	32768	XX	H	P	W	–
Series	Frequency	Load Capacitance	Frequency Tolerance	Operating Temp. Range	Frequency Temp. Stability	Individual Specification
		H5 = 12.5 pF Std. E0 = 9.0 pF C0 = 7.0 pF B0 = 6.0 pF A0 = 5.0 pF Z0 = 4.0 pF	H = ±20x10^{-6}	P = -40 to +85°C	W ±200x10^{-6}	

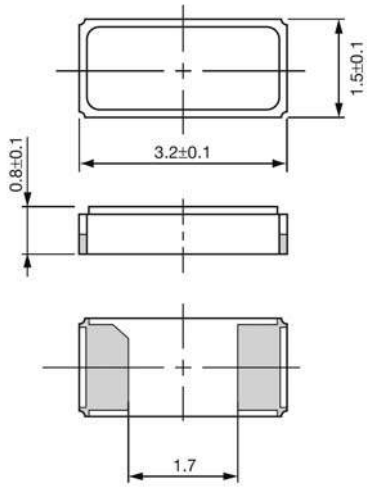
RoHS COMPLIANT

Packaging (Tape & Reel 3000 / 10000 pcs. / reel)

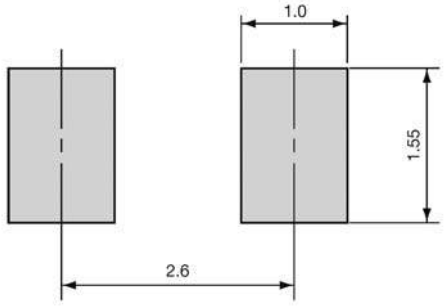
SPECIFICATIONS

Item	Symbol	Specification	Units	Remarks
Nominal Frequency	f_{nom}	32.768	kHz	
Frequency Tolerance	f_{tol}	±100	x10^{-6}	25ºC±3ºC
Turnover Temperature	Ti	+25±5	°C	
Parabolic Coefficient	B	-0.04 max.	x10^{-6}/°C^2	
Motional Resistance	R1	70 max.	k-ohm	
Motional Capacitance	C1	3.7 typ.	fF	
Shunt Capacitance	C0	0.9 typ.	pF	
Load Capacitance	CL	4.0 / 5.0 / 6.0 / 7.0 / 9.0 / 12.5	pF	Please contact us
Drive Level	DL	0.1	µW	0.5 max.
Operating Temp. Range	T_{use}	-40 to +85	°C	
Storage Temp. Range	T_{stg}	-55 to +85	°C	
Frequency Aging	f_{age}	±3	x10^{-6}	

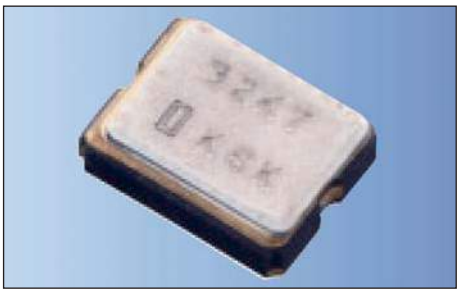
DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



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CMOS / 1.8V, 2.5V, 3.3V, 5.0V Compatible / 2.5×2.0mm

FEATURES

- Miniature ceramic package
  2.5 (L) ×2.0 (W) ×0.7 (H) mm (Typ.)
- Highly reliable with seam welding
- CMOS output
- Supply voltage 1.8 / 2.5 / 3.3 / 5.0V
  Wide operating voltage range 1.6 to 5.5V
- Low current consumption

APPLICATIONS

- Watches

HOW TO ORDER

KC2520M	32K7680	C	M	3	E	00
Type 2.5×2.0mm SMD	**Output Frequency** 32.768kHz	**Output Type** CMOS	**Supply Voltage** 1.8V, 2.5V, 3.3V, 5.0V Compatible	**Frequency Tolerance** See Specifications	**Symmetry/ INH Function** 45 / 55%, Stand-by	**Customer Special Model Suffix** STD Specification is "00"

RoHS COMPLIANT

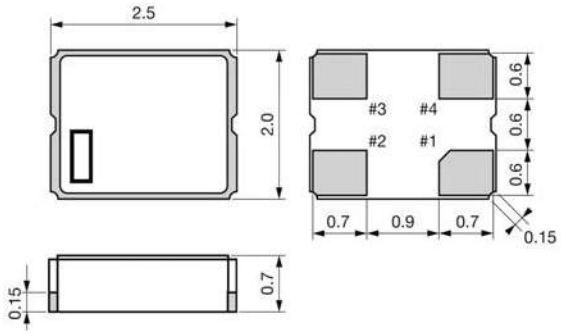
Packaging (Tape & Reel 2000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Conditions	Specifications		Units
			Min.	Max.	
Output Frequency Range	fo		32.768		**kHz**
Frequency Tolerance		Initial (25°C), Stability (-40 to 125°C), Voltage change	-90	+90	x10^{-6}
	f_{tol}	Aging (@ 1year)	-3	+3	
		Other (load change, shock and vibration)	-4	+4	
Storage Temperature Range	T_{stg}		-55	+125	°C
Operating Temperature Range	T_{use}		-40	+125	°C
Max. Supply Voltage	—		-0.3	+7.0	V
Supply Voltage VCC			+1.6	+5.5	V
Current Consumption (Maximum Loaded/ 1.6≤VCC≤2.0V)	ICC		—	150	µA
Current Consumption (Maximum Loaded/ 2.0<VCC≤2.8V)			—	158	
Current Consumption (Maximum Loaded/ 2.8≤VCC≤3.63V)			—	163	
Current Consumption (Maximum Loaded/ 3.63≤VCC≤5.5V)			—	175	
Stand-by Current	I_{std}		—	10	µA
Symmetry	SYM	@ 50% VCC	45	55	%
Rise/ Fall Time (10% VCC to 90% VCC Maximum Loaded)	tr/ tf		—	50	ns
Low Level Output Voltage	V_{OL}	I_{OL} = 0.8mA	—	10% VCC	V
High Level Output Voltage	V_{OH}	I_{OH} = -0.8mA	90% VCC	—	
Output Load	L_CMOS	CMOS Output	—	15	pF
Low Level Input Voltage	V_{IL}		—	30% VCC	V
High Level Input Voltage	V_{IH}		70% VCC	—	
Disable Time	t_{dis}		—	100	ns
Enable Time	t_{ena}		—	2	ms
Start-up Time	t_{str}	@ Minimum operating voltage to be 0 sec.	—	5	ms

Note: All electrical characteristics are defined at the maximum load and operating temperature range.

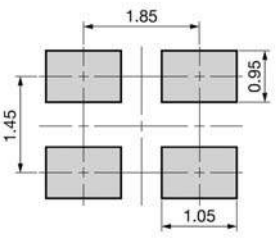
DIMENSIONS (Unit: mm)



Plating: Ni+Au
Tolerance: ±0.1range.

Pad Connections	
#1	INH
#2	Case GND
#3	Output
#4	VCC
INH Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

RECOMMENDED LAND PATTERN (Unit: mm)



Note: A capacitor of value 0.01µF between V_{CC} and GND is recommended.

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CMOS / 3.3V Typ. / 3.2×1.5mm

FEATURES

- Output frequency: 32.768kHz
- Miniature and Low profile ceramic package
- Low current consumption: 0.35μ A Typ (3.3V, Disable)
- Wide operating voltage range 1.5V to 3.6V
- CMOS output
- Output enable

APPLICATIONS

- W-LAN etc.

HOW TO ORDER

KC3215A	32768	C	33	A	A	E	00
Type	Output Frequency	Output Type	Supply Voltage 33 = 3.3V	Frequency Tolerance A = 5±23×10⁻⁶	Freq. Temp. Chrst. A = +10/-120×10⁻⁶	Output Waveform Symmetric E = 45 to 55%	Customer Special Model Suffix 00 = STD Specification

RoHS COMPLIANT

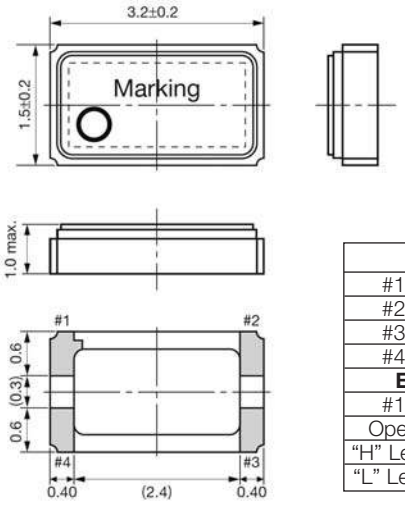
Packaging (Tape & Reel 3000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Conditions	Specifications			Units
			Min.	Typ.	Max.	
Output Frequency Range	fo	Standard Frequency	–	32.768	–	kHz
Frequency Tolerance	fo	after 2 times Reflow, V_{CC} = 3.3V, Ta = 25±2°C	-18	+5	+28	×10⁻⁶
Frequency Temperature Characteristics	fo-Tc	Ta = -20 to +70°C (+25°C is reference)	-120	–	+10	×10⁻⁶
Frequency Voltage Coefficient	fo-V	Ta = +25±2°C	-2.0º	–	2.0	×10⁻⁶/V
Frequency Aging	F_{age}	Per Year	-3.0	–	3.0	×10⁻⁶
Storage Temperature	T_{stg}		-55	–	+125	°C
Operating Temperature	T_{use}		-40	–	+85	°C
Supply Voltage	V_{DD}		1.5	–	3.6	V
Interface Power Supply Voltage	V_{IO}		1.5	–	3.6	V
Current Consumption	I_{CC}	No load, V_{DD} = 3.3V, V_{IO} = 3.3V	–	–	1.5	μA
		load: 15pF, V_{DD} = 3.3V, V_{IO} = 3.3V	–	–	4.2	μA
Symmetry	SYM	@ 50% V_{IO}	45	–	55	%
Rise/ Fall Time	tr/ tf	load: 15pF, 20% V_{IO} to 80% V_{IO}	–	–	50	ns
Low Output Voltage	V_{OL}	I_{OL} = +0.4mA	–	–	0.4	V
High Output Voltage	V_{OH}	I_{OH} = -0.4mA	V_{IO}-0.4	–	–	V
CMOS Load	L_CMOS	CMOS Output	–	–	15	pF
Disable Delay Time	t_{dis}		–	–	1.0	μs
Start-up Time	t_{str}	Time at minimum Supply voltage to be 0 s	–	–	0.6	sec

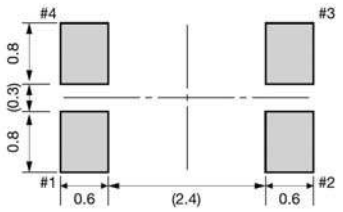
*Unless otherwise stated, characteristics(specifications) shown in the above table are based on the rated operating temperature and voltage condition.
*Please contact us for other specifications.

DIMENSIONS (Unit: mm)



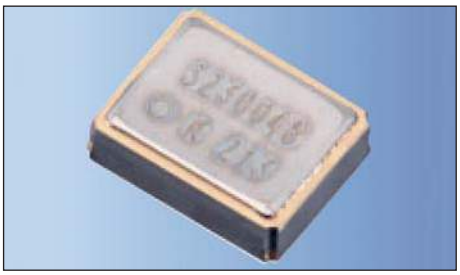
Pad Connections	
#1	V_{IO}
#2	GND
#3	Output
#4	V_{DD}
Enable / Disable Function	
#1	#3 (Output)
Open	High Z (No-Oscillation)
"H" Level	Active
"L" Level	High Z (No-Oscillation)

RECOMMENDED LAND PATTERN (Unit: mm)



Note: A capacitor of value 0.01μF between Vcc and GND is recommended.

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CMOS / 3.0V Typ./ 3.2×2.5mm

FEATURES

- Miniature SMD type (3.2×2.5×1.0mm)
- Built-in 32.768kHz D-TCXO
- High frequency stability: ±5.0x10^{-6} / -40 to +85°C
- Low supply current: 1.5µA typ
  (V_{DD} = 3.0V, Output at no load)
- Temperature compensated voltage
  Range: 2.0V to 5.5V

APPLICATIONS

- High accuracy time references
- Microcontroller with built in RTC

RoHS COMPLIANT

HOW TO ORDER:

Frequency Tolerance (vs Temp.): ±3.8×10^{-6} / -10°C to 60°C

KT3225T	32768	D	G	R	30	T	XX
Series	Output Frequency	Frequency Stability: A = No Temp. Compensated, D = ±3.8×10^{-6}, E = ±5.0×10^{-6}	Lower Temperature: A = -40°C, G = -10°C	Upper Temperature: W = +85°C, R = +60°C	Supply Voltage: 30 = 3.0V, 33 = 3.3V, 50 = 5.0V	Initial Frequency Tolerance: A = 5±5x10^{-6}, B = 0±5x10^{-6}, T = TCXO	Option Code

Frequency Tolerance (vs Temp.) : ±5.0×10^{-6} / -40°C to 85°C

KT3225T	32768	E	A	W	30	T	XX
Series	Output Frequency	Frequency Stability: A = No Temp. Compensated, D = ±3.8×10^{-6}, E = ±5.0×10^{-6}	Lower Temperature: A = -40°C, G = -10°C	Upper Temperature: W = +85°C, R = +60°C	Supply Voltage: 30 = 3.0V, 33 = 3.3V, 50 = 5.0V	Initial Frequency Tolerance: A = 5±5x10^{-6}, B = 0±5x10^{-6}, T = TCXO	Option Code

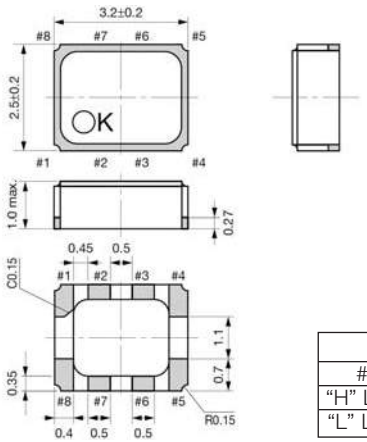
Packaging (Tape & Reel 3000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Conditions	Specifications Min.	Typ.	Max.	Units
Nominal Frequency	$f_{\_nom}$		–	32.768	–	kHz
Oscillation Output Voltage	V_{DD}		1.3	3.0	5.5	V
Temperature Compensated Voltage	V_{TEM}		2.0	3.0	5.5	V
Storage Temperature	$T_{\_stg}$		-40	+25	+85	°C
Operating Temperature	$T_{\_use}$		-40	+25	+85	°C
Frequency Tolerance	–	Ta = 25±2°C	-3.0	–	+3.0	×10^{-6}
Frequency Stability vs Temp.	fo-Tc	E: Ta = -40 to +85°C	-5.0	–	+5.0	×10–6
Frequency Stability vs Supply Voltage	df / fo	V_{DD} = 2.0 to 5.5V, Ta = 25±2°C	-1.0	–	+1.0	×10^{-6} / V
Frequency Aging	$f_{\_age}$		-3.0	–	+3.0	×10^{-6}
Low Level Output Voltage	V_{OL}	IOL = +1.0mA, V_{DD} = 3V	0.0	–	0.8	V
High Level Output Voltage	V_{OH}	IOH = -1.0mA, VDD = 3 V	2.2	–	3.0	V
Low Level Input Voltage	V_{IL}	CLKOE pin	0.0	–	0.2×V_{DD}	V
High Level Input Voltage	V_{IH}	CLKOE pin	0.8×V_{DD}	–	5.5	V
DUTY Ratio	Duty	CL =1 5pF	40	–	60	%
Rise Time	tr	20%V_{DD} → 80%V_{DD}, CL = 15pF, V_{DD} = 3V	–	–	100	nsec
Fall Time	tf	80%V_{DD} → 20%V_{DD}, CL=15pF, V_{DD} = 3V	–	–	100	nsec
Start-up Time	$t_{\_str}$	Ta = 25°C	–	–	1.0	sec
		Ta = -40 to 85°C	–	–	3.0	sec
Power Supply Current 1	$I_{CC}1$	CLKOE = V_{SS}, V_{DD} = 3V	–	0.6	2.0	µA
Power Supply Current 2	$I_{CC}2$	CLKOE = V_{DD}, V_{DD} = 3V, Output at no load	–	1.5	4.0	µA
		CLKOE = V_{DD}, V_{DD} = 3V, CL = 15pF	–	2.7	5.5	µA
Output Load Condition	L_CMOS	CMOS Output	–	–	15.0	pF

*Please contact us for other specifications.

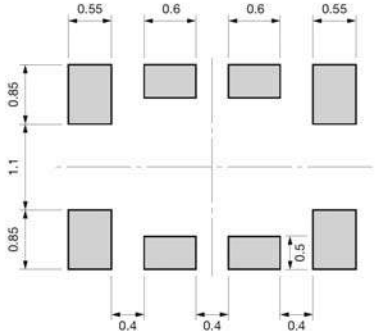
DIMENSIONS (Unit: mm)



Pin No	Function
#1	CLKOE
#2	N.C
#3	N.C
#4	V_{SS}
#5	CLKOUT
#6	N.C
#7	N.C
#8	V_{DD}

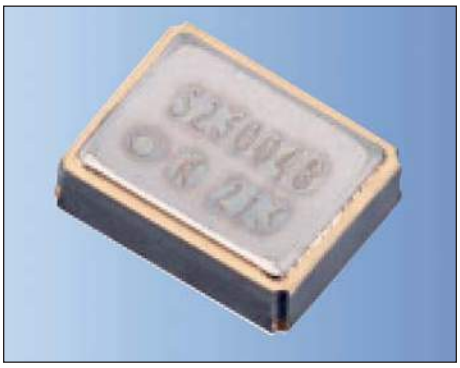
Enable / Disable Function	
#1	#5 (Output)
"H" Level	Oscillation
"L" Level	High Z

RECOMMENDED LAND PATTERN (Unit: mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

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CMOS / 3.0V Typ. / 3.2×2.5mm

FEATURES

- Miniature SMD type (3.2×2.5×1.0mm)
- Built-in 32.768kHz D-TCXO
- Excellent frequency stability: ±5.0x10^{-6}/ -40 to +85°C
- Low supply current: 0.6µA typ (V_{DD} = 3.0V)
- Temperature compensated voltage range: 2.0V to 5.5V
- Time keeping voltage range: 1.3V to 5.5V
- I²C-BUS interface voltage range: 1.5V to 5.5V
- I²C-BUS serial interface type: 400kHz high speed type
- Frequency selection function: 32.768kHz, 1024Hz, 32Hz, 1Hz
- Voltage detection function: 2.0V temp. compensated voltage detection 1.5V Low Voltage Detection
- Various functions including full calender, alarm and timer

APPLICATIONS

- High accuracy time references

RoHS COMPLIANT

HOW TO ORDER:

Frequency Tolerance (vs Temp.): ±3.8×10^{-6} / -10°C to 60°C

KR3225Y	32768	D	G	R	30	T	XX
Series	Output Frequency	Frequency Stability: A = No Temp. Compensated, D = ±3.8×10^{-6}, E = ±5.0×10^{-6}	Lower Temperature: A = -40°C, G = -10°C	Upper Temperature: W = +85°C, R = +60°C	Supply Voltage: 30 = 3.0V, 33 = 3.3V, 50 = 5.0V	Initial Frequency Tolerance: A = 5±5×10^{-6}, B = 0±5×10^{-6}, T = TCXO	Option Code

Frequency Tolerance (vs Temp.) : ±5.0×10^{-6} / -40°C to 85°C

KR3225Y	32768	E	A	W	30	T	XX
Series	Output Frequency	Frequency Stability: A = No Temp. Compensated, D = ±3.8×10^{-6}, E = ±5.0×10^{-6}	Lower Temperature: A = -40°C, G = -10°C	Upper Temperature: W = +85°C, R = +60°C	Supply Voltage: 30 = 3.0V, 33 = 3.3V, 50 = 5.0V	Initial Frequency Tolerance: A = 5±5×10^{-6}, B = 0±5×10^{-6}, T = TCXO	Option Code

Packaging (Tape & Reel 3000 pcs. / reel)

SPECIFICATIONS

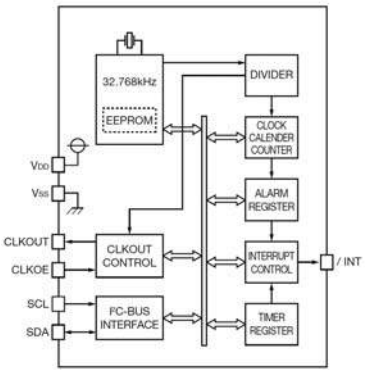
Item	Symbol	Conditions	Specifications Min.	Typ.	Max.	Units
Nominal Frequency	f_nom		—	32.768	—	kHz
Time Keeping Voltage	V_{DD}	—	1.3	3.0	5.5	V
Temperature Compensation Voltage	V_{TEM}	—	2.0	3.0	5.5	V
Interface Voltage	V_{INT}	—	1.5	3.0	5.5	V
Operationg Temperature Range	T_use	No condensation	-40	+25	+85	°C
Frequency Stability vs. Temp.	fo-Tc	E: Ta = -40 to +85°C	-5.0	—	+5.0	×10^{-6}
Start up Time	t_str	Ta = 25°C	—	—	1.0	sec
		Ta = -40 to +85°C	—	—	3.0	sec
Power Supply Current 1	Icc1	SCL = SDA = / INT = V_{DD}, CLKOE = V_{SS}				
		CLKOUT Non-operating output	—	0.6	2.0	µA
		VDD = 3V				
Power Supply Current 2	Icc2	SCL = SDA = / INT = V_{DD}, CLKOE = V_{DD}				
		CLKOUT output 32.768kHz, V_{DD} = 3V	—	1.5	4.0	µA
		Output at no load				
		SCL = SDA = / INT = V_{DD}, CLKOE = V_{DD}	—	2.7	5.5	µA
		CLKOUT output 32.768kHz, V_{DD} = 3V				
		CL = 15pF				
Low Voltage Detection Voltage	V_{DET}		1.3	1.4	1.5	V

*Please contact us for other specifications.

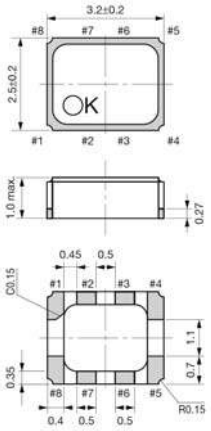
PIN FUNCTIONS

Pin Name	I/O	Function
CLKOE	I	Input to control the output mode of the CLKOUT
/INT	O	Outputs for alarm signals, timer signals,timer update signals and other signals
Vss	—	Pin connected to ground
CLKOUT	O	32.768kHz signal output (CMOS output)
SCL	I	Serial clock input for I²C BUS communications
SDA	I/O	Serial data input output for I²C BUS communications
V_{DD}	—	This pin is connected to a positive power supply

BLOCK DIAGRAM

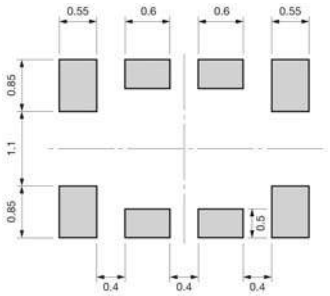


DIMENSIONS (Unit: mm)



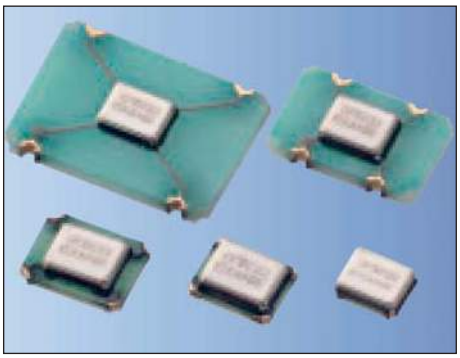
Pin No	Function
#1	CLKOE
#2	/ INT
#3	N.C
#4	Vss
#5	CLKOUT
#6	SCL
#7	SDA
#8	V_{DD}

RECOMMENDED LAND PATTERN (Unit: mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

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CMOS / 1.8V, 2.5V, 3.3V Compatible / 2.0×1.6, 2.5×2.0, 3.2×2.5, 5.0×3.2, 7.0×5.0mm

FEATURES

- Frequency Range 1.5 to 80MHz
- CMOS output
- Wide Supply Voltage 1.6 to 3.63V
- Low current consumption
- Option: Low Phase Noise Version

TABLE 1

Freq. Tol.		Operating Temperature Range (°C)	Note
Code	× 10^{-6}		
G	± 50	-40 to +85	With only certain frequencies
6	± 50	-40 to +105	

HOW TO ORDER

MC2520K — **Type**
2.0×1.6mm = MC2016K
2.5×2.0mm = MC2520K
3.2×2.5mm = MC3225K
5.0×3.2mm = MC5032K
7.0×5.0mm = MC7050K

25.0000 — **Output Frequency**
25.0000 = 25MHz

C — **Load Capacitance**
C = CMOS

1 — **Supply Voltage**
1 = 1.8V/ 2.5V/ 3.3V Multi Voltage (Version E : Standard)
2 = 2.5V (Version N : Low Phase Noise)
3 = 3.3V (Version N : Low Phase Noise)

G — **Frequency Tolerance**
See Table 1

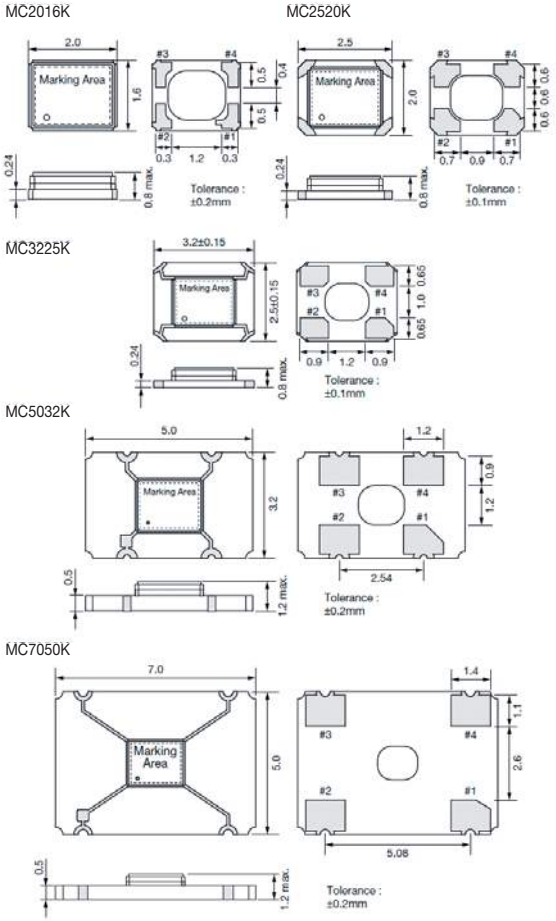
E — **Symmetry/ INH Function**
E = 45/ 55%, Stand-by
N = 45/ 55%, Stand-by, Low Phase Noise

00 — **Customer Special Model Suffix**
00 = STD Specification

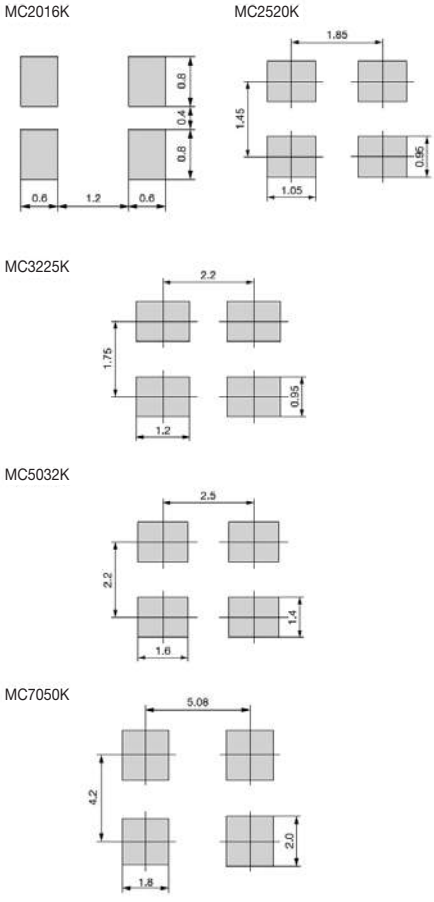
Packaging Tape & Reel
MC 7050K/ MC5032K: 1000 pcs/ reel
MC 3225K/ MC2520K/ MC2016K: 2000 pcs/ reel

RoHS COMPLIANT

DIMENSIONS (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)



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SPECIFICATIONS

Item	Symbol	Conditions		Version E (Standard) Min.	Version E (Standard) Max.	Version N (Low Phase Noise) Min.	Version N (Low Phase Noise) Max.	Units
Output Frequency Range Note1	fo			1.5	80	1.5	80	MHz
Frequency Tolerance	f_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1 year @25°C), Shock and vibration	Op. Temp.: -10 to +70°C/ -40 to +85°C/ -40 to +105°C	-50	+50	-50	+50	$\times 10^{-6}$
Frequency Aging	f_age	@25°C First year		-3	+3	-3	+3	$\times 10^{-6}$/y
Storage Temperature Range	T_stg			-55	+125	-55	+125	°C
Operating Temperature Range	T_use			-10	+70	-10	+70	°C
				-40	+85	-40	+85	
				-40	+105	-40	+105	
Max. Supply Voltage	—			-0.3	+4.0	-0.3	+4.0	V
Supply Voltage	Vcc	Code ④: 1		+1.60	+3.63	—	—	V
		Code ④: 2		—	—	+2.25	+2.75	
		Code ④: 3		—	—	+2.97	+3.63	
Current Consumption (Maximum Loaded/ 1.5≤F0<24MHz)	Icc	E: 1.6≤VCC≤2.25V		—	2.5	—	—	mA
		E: 2.25<VCC≤2.8V/ N: 2.25≤VCC≤2.75V		—	3.0	—	4	
		E: 2.8<VCC≤3.63V/ N: 2.97≤VCC≤3.63V		—	3.5	—	6	
Current Consumption (Maximum Loaded/ 24≤F0≤40MHz)		E: 1.6≤VCC≤2.25V		—	3.5	—	—	
		E: 2.25<VCC≤2.8V/ N: 2.25≤VCC≤2.75V		—	4.5	—	5	
		E: 2.8<VCC≤3.63V/ N: 2.97≤VCC≤3.63V		—	5.0	—	7	
Current Consumption (Maximum Loaded/ 40<F0≤62.5MHz)		E: 1.6≤VCC≤2.25V		—	5.0	—	—	
		E: 2.25<VCC≤2.8V/ N: 2.25≤VCC≤2.75V		—	5.5	—	8	
		E: 2.8<VCC≤3.63V/ N: 2.97≤VCC≤3.63V		—	6.0	—	11	
Current Consumption (Maximum Loaded/ 62.5<F0≤80MHz)		E: 1.6≤VCC≤2.25V		—	6.0	—	—	
		E: 2.25<VCC≤2.8V/ N: 2.25≤VCC≤2.75V		—	6.5	—	14	
		E: 2.8<VCC≤3.63V/ N: 2.97≤VCC≤3.63V		—	8.0	—	18	
Stand-by Current	I_std			—	5	—	5	µA
Symmetry	SYM	@50% VCC		45	55	45	55	%
Rise/ Fall Time (10% to 90% Output Level)	tr/tf	E: 1.6≤VCC≤2.25V		—	6	—	—	ns
		E: 2.25<VCC≤2.8V/ N: 2.25≤VCC≤2.75V		—	5	—	6	
		E: 2.8<VCC≤3.63V/ N: 2.97≤VCC≤3.63V		—	4.5	—	5	
Low Level Output Voltage	VOL	IOL = 4mA		—	10% Vcc	—	10% Vcc	V
High Level Output Voltage	VOH	IOH = -4mA		90% Vcc	—	90% Vcc	—	V
Output Load	L_CMOS			15 Note 2		15 Note 2		pF
Low Level Input Voltage	VIL			—	30% Vcc	—	30% Vcc	V
High Level Input Voltage	VIH			70% Vcc	—	70% Vcc	—	V
Disable Time	t_dis			—	200	—	150	ns
Enable Time	t_ena			—	5	—	5	ms
Start-up Time	t_str	@ Minimum operating voltage to be 0 sec.		—	3	—	5	ms
1 Sigma Jitter	JSigma	Measured with Wavecrest SIA–3000		—	5	—	4	ps
Peak to Peak Jitter	JPK-PK			—	50	—	40	ps
Phase Jitter	JPhase	BW: 12kHz to 20MHz		—	1.0	—	0.5	ps
Phase Noise	—	@25MHz	@10Hz offset	-89		-92		dBc/Hz
			@100Hz offset	-119		-126		
			@1kHz offset	-143		-151		
			@10kHz offset	-157		-160		
			@100kHz offset	-160		-167		
			@1MHz offset	-162		-170		
			@10MHz offset	-162		-170		

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Note1: Please contact us for inquiry about operating temperature range, available frequencies and other conditions.
Note2: Please contact us for Output Load 30pF.

Pad Connections	
#1	Enable/ Disable
#2	Case GND
#3	Output
#4	VCC

INH Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

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1.6×1.2mm

FEATURES

- 1612 Ultra-miniature SMD type
- Freq. temp. characteristics.
  ±2.0×10–6/ –30 to +85°C
  ±0.5×10–6/ –30 to +85°C (for GPS)
- 1.68 to 3.63V drive available
- Reflow compatible
- Operating Temp. -40 to +105°C (Option)

APPLICATIONS

- Mobile Communications, W-LAN
- Low power radio communications
- GPS Unit

HOW TO ORDER

KT1612A	26000	A	C	W	18	T	XX
Series	Output Frequency	Freq. Temp. Chrst. A = ±0.5×10⁻⁶ B = ±1.0×10⁻⁶ C = ±1.5×10⁻⁶ D = ±2.0×10⁻⁶	Lower Operating Temp. C = -30°C E = -20°C G = -10°C	Upper Operating Temp. W = +85°C V = +80°C U = +75°C	Supply Voltage 18 = 1.8V 28 = 2.8V 30 = 3.0V 33 = 3.3V	Voltage Control Function T = TCXO Other* = VCTCXO *Customer Spec.	Option Code

RoHS COMPLIANT

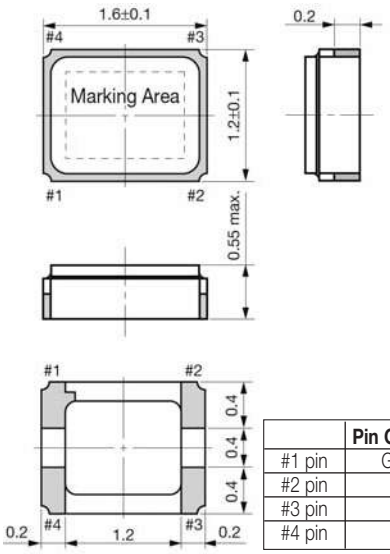
Packaging (Tape & Reel 18000 pcs./ reel)

SPECIFICATIONS

Item	Symbol	Conditions	Specifications		Units
			Min.	Max.	
Output Frequency Range	fo		10	52	MHz
Frequency Tolerance		vs Temperature	-0.5/-2	+0.5/+2	×10⁻⁶
	f_tol	vs Load	-0.2	+0.2	
		vs Voltage	-0.2	+0.2	
Frequency Aging	f_age	Per Year	-1	+1	×10⁻⁶
Storage Temperature Range	T_stg		-40	+85	°C
Operating Temperature Range	T_use		-30	+85	°C
Voltage Control Range	f_cont	Positive	±8	±15	×10⁻⁶
Supply Voltage	Vcc		1.68	3.63	V
Output Level	Vpp	Clipped Sine*, Load: 10k ohm / / 10pF	0.8	—	Vp-p
Current Consumption	Icc		—	2	mA
Harmonics	—		—	–5	dBc

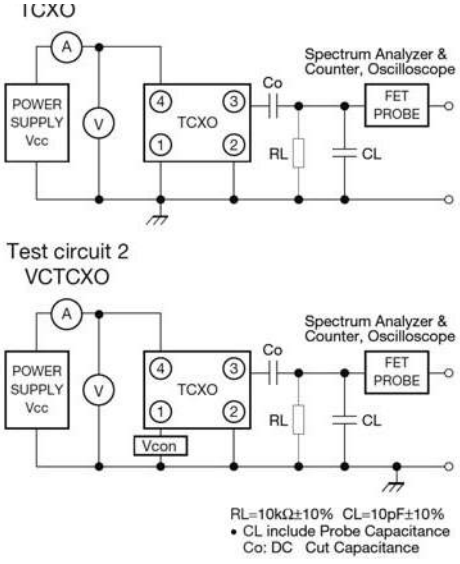
*A DC-cut capacitor is not embedded in this crystal oscillator. Connect a DC-cut capacitor (≥1nF) to the line-out terminal of the oscillator.
*Please contact us for other specifications.

DIMENSIONS (Unit: mm)

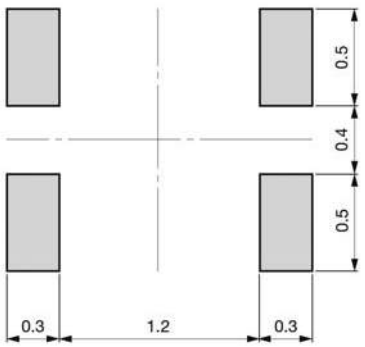


	Pin Configuration
#1 pin	GND/ Vcon
#2 pin	GND
#3 pin	OUTPUT
#4 pin	Vcc

TEST CIRCUIT



RECOMMENDED LAND PATTERN (Unit: mm)



Note: A capacitor of value 0.01µF between Vcc and GND is recommended.

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2.0×1.6mm

FEATURES

- Miniature SMD type (2.0×1.6×0.8mm)
- Freq. temp. characteristics:
  ±2.0×10^{-6}/-30 to +85°C
  ±0.5×10^{-6}/-30 to +85°C (for GPS)
- 1.68 to 3.63V available
- Reflow compatible
- Operating Temp. -40 to +105°C (Option)
- Ultra low supply current 600µA typ.
  Conditions of 26MHz and 0.4Vp-p (Option)

APPLICATIONS

- Mobile Communications, W-LAN
- Low power radio communications
- GPS Unit

HOW TO ORDER

KT2016K	26000	A	C	W	18	T	XX
Series	Output Frequency	Freq. Temp. Chrst. A = ±0.5×10^{-6} B = ±1.0×10^{-6} C = ±1.5×10^{-6} D = ±2.0×10^{-6}	Lower Operating Temp. C = -30°C E = -20°C G = -10°C	Upper Operating Temp. W = +85°C V = +80°C U = +75°C	Supply Voltage 18 = 1.8V 28 = 2.8V 30 = 3.0V 33 = 3.3V	Voltage Control Function T = TCXO Other* = VCTCXO *Customer Spec.	Option Code

RoHS COMPLIANT

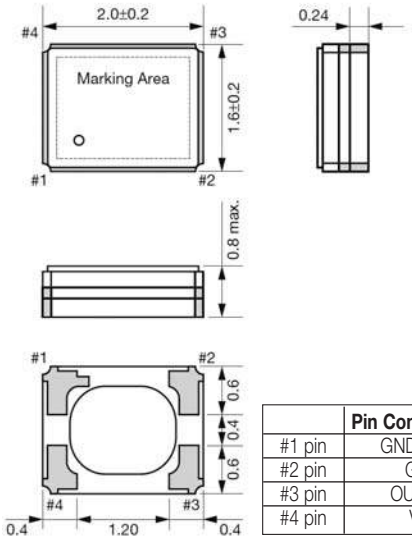
Packaging (Tape & Reel 15000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Conditions	Specifications		Units
			Min.	Max.	
Output Frequency Range	fo		10	52	MHz
Frequency Tolerance		vs Temperature	-0.5/-2	+0.5/+2	×10^{-6}
	f_tol	vs Load	-0.2	+0.2	
		vs Voltage	-0.2	+0.2	
Frequency Aging	f_age	Per Year	-1	+1	×10^{-6}
Storage Temperature Range	T_stg		-40	+85	°C
Operating Temperature Range	T_use		-30	+85	°C
Voltage Control Range	f_cont	Positive	±8	±15	×10^{-6}
Supply Voltage	Vcc		1.68	3.63	V
Output Level	Vpp	Clipped Sine*, Load: 10k ohm / / 10pF	0.8	—	Vp-p
Current Consumption	Icc		—	2	mA
Harmonics	—		—	–5	dBc

*A DC-cut capacitor is not embedded in this crystal oscillator. Connect a DC-cut capacitor (≥1nF) to the line-out terminal of the oscillator.
*Please contact us for other specifications.

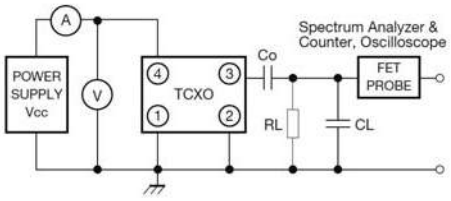
DIMENSIONS (Unit: mm)



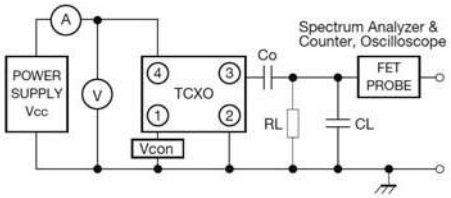
	Pin Configuration
#1 pin	GND/ Vcon
#2 pin	GND
#3 pin	OUTPUT
#4 pin	Vcc

TEST CIRCUIT

Test circuit 1
TCXO

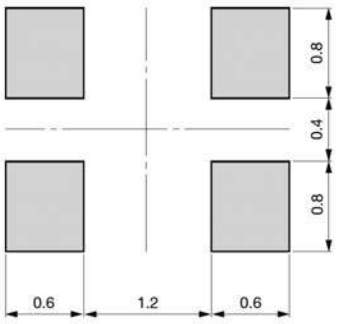


Test circuit 2
VCTCXO



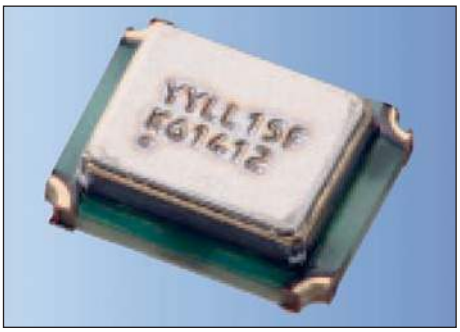
RL=10kΩ±10% CL=10pF±10%
• CL include Probe Capacitance
Co: DC Cut Capacitance

RECOMMENDED LAND PATTERN (Unit: mm)



Note: A capacitor of value 0.01µF between Vcc and GND is recommended.

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2.5×2.0mm

FEATURES

- Miniature SMD type (2.5×2.0×0.8mm)
- Freq. temp. characteristics.
  ±2.0×10–6/ –30 to +85°C
  ±0.5×10–6/ –30 to +85°C (for GPS)
- 1.68 to 3.63V drive available
- Reflow compatible
- Operating Temp. –40 to +105°C (Option)
- Ultra low supply current 600µA typ.
  Conditions of 26MHz and 0.4Vp-p
  (Option)

APPLICATIONS

- Mobile Communications, W-LAN
- Low power radio communications
- GPS Unit

HOW TO ORDER

KT2520K	26000	A	C	W	18	T	XX
Series	Output Frequency	Freq. Temp. Chrst. A = ±0.5×10^{-6} B = ±1.0×10^{-6} C = ±1.5×10^{-6} D = ±2.0×10^{-6}	Lower Operating Temp. C = -30°C E = -20°C G = -10°C	Upper Operating Temp. W = +85°C V = +80°C U = +75°C	Supply Voltage 18 = 1.8V 28 = 2.8V 30 = 3.0V 33 = 3.3V	Voltage Control Function T = TCXO Other* = VCTCXO *Customer Spec.	Option Code

RoHS COMPLIANT

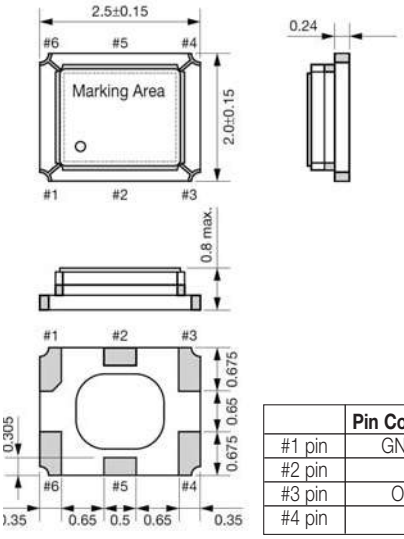
Packaging (Tape & Reel 18000 pcs./ reel)

SPECIFICATIONS

Item	Symbol	Conditions	Specifications		Units
			Min.	Max.	
Output Frequency Range	fo		10	52	MHz
Frequency Tolerance		vs Temperature	-0.5/-2	+0.5/+2	×10^{-6}
	f_tol	vs Load	-0.2	+0.2	
		vs Voltage	-0.2	+0.2	
Frequency Aging	f_age	Per Year	-1	+1	×10^{-6}
Storage Temperature Range	T_stg		-40	+85	°C
Operating Temperature Range	T_use		-30	+85	°C
Voltage Control Range	f_cont	Positive	±8	±15	×10^{-6}
Supply Voltage	Vcc		1.68	3.63	V
Output Level	Vpp	Clipped Sine*, Load: 10k ohm / / 10pF	0.8	—	Vp-p
Current Consumption	Icc		—	2	mA
Harmonics	—		—	–5	dBc

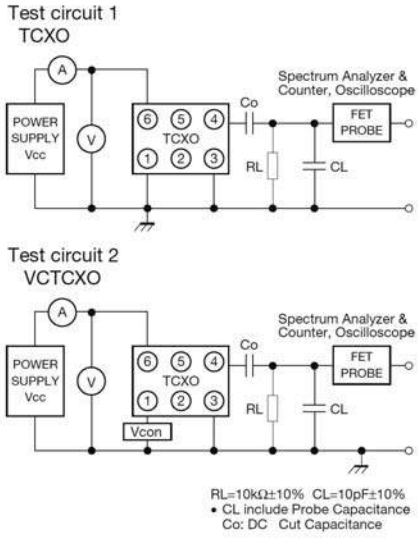
*A DC-cut capacitor is not embedded in this crystal oscillator. Connect a DC-cut capacitor (≥1nF) to the line-out terminal of the oscillator.
*Please contact us for other specifications.

DIMENSIONS (Unit: mm)

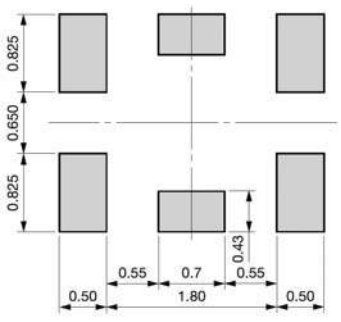


	Pin Configuration
#1 pin	GND/ Vcon
#2 pin	GND
#3 pin	OUTPUT
#4 pin	N.C.

TEST CIRCUIT

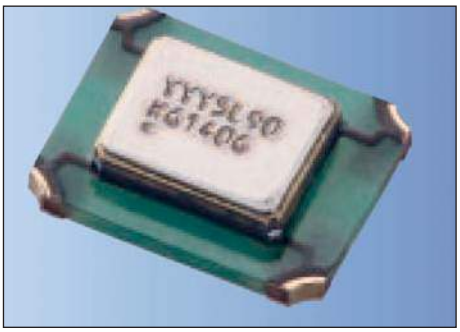


RECOMMENDED LAND PATTERN (Unit: mm)



Note: A capacitor of value 0.01µF between Vcc and GND is recommended.

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3.2×2.5mm

FEATURES

- Miniature SMD type (3.2×2.5×0.8mm)
- Freq. temp. characteristics
  ±2.0×10^{-6}/-30 to +85°C
  ±0.5×10^{-6}/-30 to +85°C (for GPS)
- 1.68 to 3.63V drive available
- Reflow compatible
- Operating Temp. -40 to +105°C (Option)
- Ultra low supply current 600μA typ.
  Conditions of 26MHz and 0.4Vp-p
  (Option)

APPLICATIONS

- Mobile Communications, W-LAN
- Low power radio communications
- GPS Unit

HOW TO ORDER

KT3225K	26000	A	C	W	18	T	XX
Series	Output Frequency	Freq. Temp. Chrst. A = ±0.5×10^{-6} B = ±1.0×10^{-6} C = ±1.5×10^{-6} D = ±2.0×10^{-6}	Lower Operating Temp. C = -30°C E = -20°C G = -10°C	Upper Operating Temp. W = +85°C V = +80°C U = +75°C	Supply Voltage 18 = 1.8V 28 = 2.8V 30 = 3.0V 33 = 3.3V	Voltage Control Function T = TCXO Other* = VCTCXO *Customer Spec.	Option Code

RoHS COMPLIANT

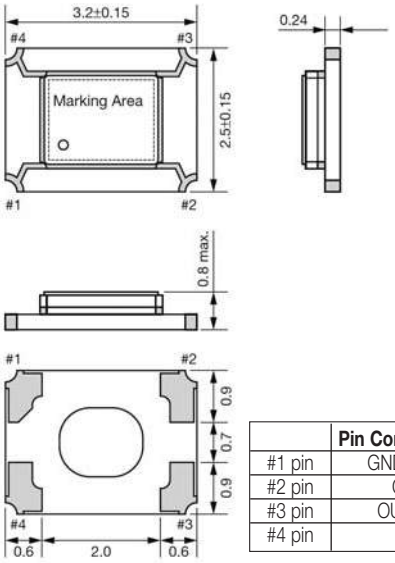
Packaging (Tape & Reel 15000 pcs. / reel)

SPECIFICATIONS

Item	Symbol	Conditions	Specifications		Units
			Min.	Max.	
Output Frequency Range	fo		10	52	MHz
Frequency Tolerance		vs Temperature	-0.5/-2	+0.5/+2	×10^{-6}
	f_tol	vs Load	-0.2	+0.2	
		vs Voltage	-0.2	+0.2	
Frequency Aging	f_age	Per Year	-1	+1	×10^{-6}
Storage Temperature Range	T_stg		-40	+85	°C
Operating Temperature Range	T_use		-30	+85	°C
Voltage Control Range	f_cont	Positive	±8	±15	×10^{-6}
Supply Voltage	Vcc		1.68	3.63	V
Output Level	Vpp	Clipped Sine*, Load: 10k ohm / / 10pF	0.8	—	Vp-p
Current Consumption	Icc		—	2	mA
Harmonics	—		—	–5	dBc

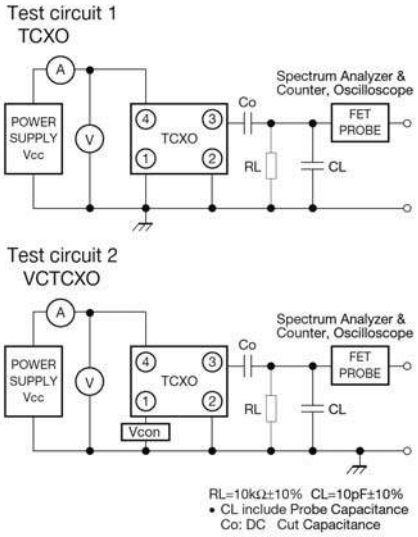
*A DC-cut capacitor is not embedded in this crystal oscillator. Connect a DC-cut capacitor (≥1nF) to the line-out terminal of the oscillator.
*Please contact us for other specifications.

DIMENSIONS (Unit: mm)

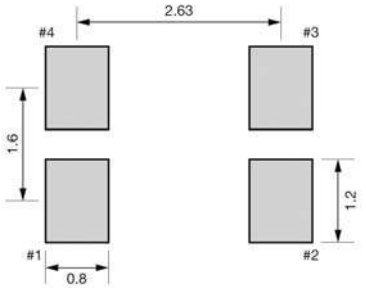


	Pin Configuration
#1 pin	GND/ Vcon
#2 pin	GND
#3 pin	OUTPUT
#4 pin	Vcc

TEST CIRCUIT

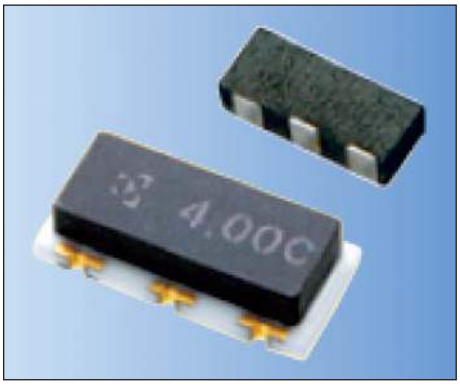


RECOMMENDED LAND PATTERN (Unit: mm)



Note: A capacitor of value 0.01μF between Vcc and GND is recommended.

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FEATURES

- Miniature & low profile
  PBRV (LxWxH: 7.4x3.4x2.0mm typ)
  PRQV (LxWxH: 3.2x1.3x1.0mm typ)
- Rectangular shape allows easy pick and placement
- Component cost and space saving
- High density mounting possible
- Reflow solderable & washable
- High reliability, high temperature operation
- AEC-Q200 certified

APPLICATIONS

- Automotive
- Airbag System
- ECU
- ABS

GENERAL CHARACTERISTICS

Operating Temperature:
-40ºC to +85ºC (X)
-40ºC to +125ºC (Y)
-40ºC to +150ºC (Z)

HOW TO ORDER

PBRV	15.00	M	R	50	Y	000
Series	**Frequency** in MHz	**Type**	**Packaging Stability** R = Tape & Reel (Null) = Bulk	**Frequency Tolerance at 25°C** 10 = ±0.1% 20 = ±0.2% 30 = ±0.3% 40 = ±0.4% 50 = ±0.5% 70 = ±0.7%	**Operating Temperature** X = -40°C to +85°C Y = -40°C to +125°C Z = -40°C to +150°C	**Unique Code**

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT
RoHS COMPLIANT

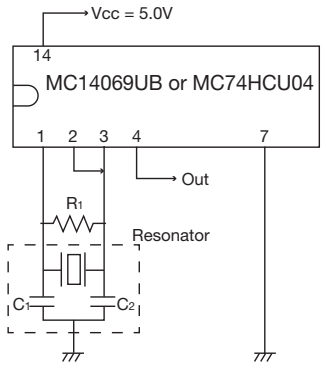
PRQV	8.00	C	R	50	10	Y	000
Series	**Frequency** in MHz	**Type**	**Packaging Stability** R = Tape & Reel (Null) = Bulk	**Frequency Tolerance at 25°C** 30 = ±0.3% 40 = ±0.4% 50 = ±0.5% 60 = ±0.6%	**Bult-in Capacitance** 10 = 10pF	**Operating Temperature** X = -40°C to +85°C Y = -40°C to +125°C Z = -40°C to +150°C	**Unique Code**

SPECIFICATIONS

Series	Frequency Range (MHz)	Frequency Tolerance (25ºC)	Temperature Stability
PBRV-M	4.00 to 8.00	±0.5% (op. ±0.3%)	Y: ±0.5% (-40ºC to +125ºC) Z: ±0.5% (-40ºC to +150ºC)
	8.01 to 20.00	±0.7% (op. ±0.5%)	Y: ±0.1% (-40ºC to +125ºC) Z: ±0.2% (-40ºC to +150ºC)
PRQV	8.00 to 20.00	±0.5% (op. ±0.3%)	Y: ±0.5% (-40ºC to +125ºC) Z: ±0.5% (-40ºC to +150ºC)

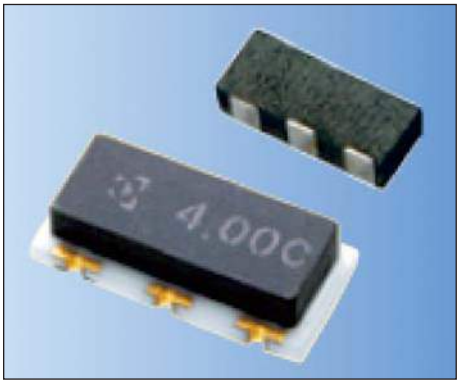
Aging for 10 years is within ±0.3% from the initial frequency at 25ºC. Please contact AVX for products without built-in capacitors.

TEST CIRCUIT



PBRV-M Type
R_1 = 1Ω
C_1-C_2 = 15pF (4.00 to 8.00MHz) IC: MC14069UB
C_1-C_2 = 10pF (8.01 to 20.0MHz) IC: MC74HCU04
PRQV-M Type
R_1 = 1Ω
C_1-C_2 = 10pF (8.01 to 20.0MHz) IC: MC74HCU04
*C_1, C_2 are for reference.

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FEATURES

- Crystal unit for automotive electronics
  PBRV (LxWxH: 7.4x3.4x2.0mm)
  PRQV (LxWxH: 3.2x1.3x1.0mm)
- Improved frequency tolerance for CAN BUS automotive application
- Ceramic package
- Product with lead free terminations
- Reflow compatible
- AEC-Q200 certified

APPLICATIONS

- General Electronics Applications

GENERAL CHARACTERISTICS

Operating Temperature:
-40ºC to +85ºC (X)
-40ºC to +125ºC (Y)
-40ºC to +150ºC (Z)

HOW TO ORDER

PBRV — **Series**

15.00 — **Frequency** in MHz

M — **Type**

R — **Packaging Stability**
R = Tape & Reel
(Null) = Bulk

10 — **Frequency Tolerance at 25°C**
10 = ±0.1%

Y — **Operating Temperature**
X = -40°C to +85°C
Y = -40°C to +125°C
Z = -40°C to +150°C

000 — **Unique Code**

LEAD-FREE
LEAD-FREE COMPATIBLE COMPONENT
RoHS COMPLIANT

PRQV — **Series**

8.00 — **Frequency** in MHz

C — **Type**

R — **Packaging Stability**
R = Tape & Reel
(Null) = Bulk

15 — **Frequency Tolerance at 25°C**
15 = ±0.15%

10 — **Bult-in Capacitance**
10 = 10pF

Y — **Operating Temperature**
X = -40°C to +85°C
Y = -40°C to +125°C
Z = -40°C to +150°C

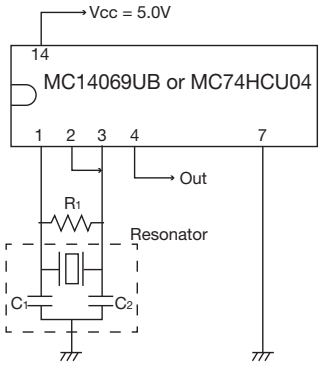
000 — **Unique Code**

SPECIFICATIONS

Series		PBRV-M		PRQV-C
Operating Temp. Range		-40ºC to +125ºC	-40ºC to +125ºC	-40ºC to +125ºC
Frequency Range		4.0 to 7.9MHz	8.0 to 20.0MHz	8.0 to 20.0MHz
Frequency Tolerance	Initial Temperature	±0.3%	±0.2%	±0.25%
	Aging	±0.1%	±0.1%	±0.05%
Total Frequency Tolerance		±0.4%	±0.3%	±0.03%

Please refer to the specification sheet of each product for information including detail dimensions.
Aging for 10 years is within ±0.3% from the initial frequency at 25ºC.

TEST CIRCUIT



PBRV-M Type
R_1 = 1Ω
C_1-C_2 = 15pF (4.00 to 8.00MHz) IC: MC14069UB
C_1-C_2 = 10pF (8.01 to 20.0MHz) IC: MC74HCU04
PRQV-M Type
R_1 = 1Ω
C_1-C_2 = 10pF (8.01 to 20.0MHz) IC: MC74HCU04

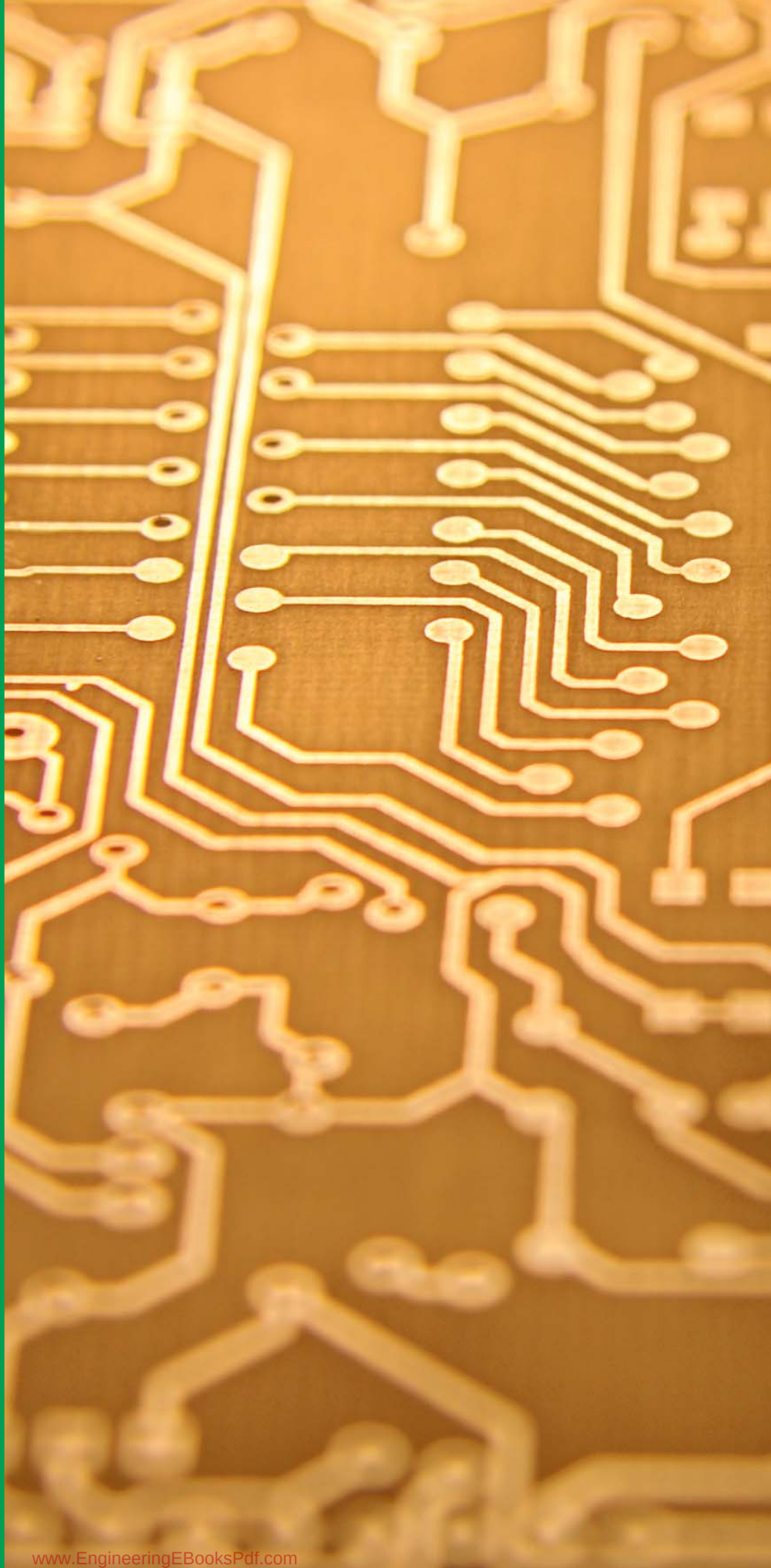
*C_1, C_2 are for reference.

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APPLICATIONS

The following applications and diagrams show where AVX products can be used in automotive applications.

- AVX Transient Protection and EMI Filtering
- AVX FLEXITERM® & FLEXISAFE™ Capacitors
- AVX Tantalum and Niobium Oxide Capacitors
- AVX Broadband SMT EMI Filters
- Communication BUS - LIN, CAN, FlexRay
- Body Modules - Electric Power Steering
- Body Modules - LED Door Light
- Body Modules - Seat Motor Circuit
- Convenience and Comfort - Keyless Entry
- Convenience and Comfort - Pre-amplifier
- Hybrid and Electric - DC Link Capacitors for Decoupling
- Timing - Capacitor Arrays for Improved Crystal Pullability



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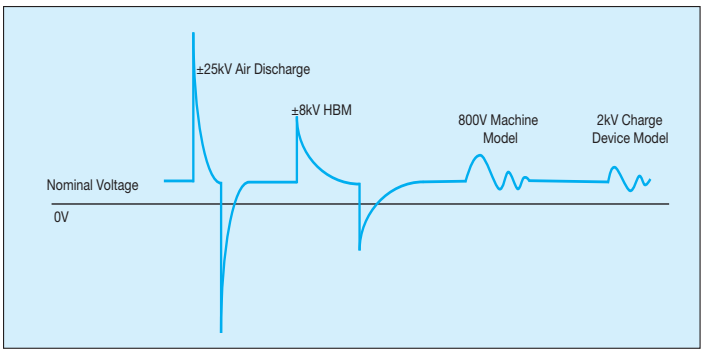
AUTOMOTIVE TRANSIENTS

Todays automobiles are using new technologies based on electronics systems connected by wide variety of networks to provide increased safety, convenience and comfort, to reduce emissions, increase fuel efficiency and more.

During the lifetime these systems are subjected to many overvoltage transient surges. To ensure safe and reliable function it is necessary to protect these sensitive systems against overvoltage surges.

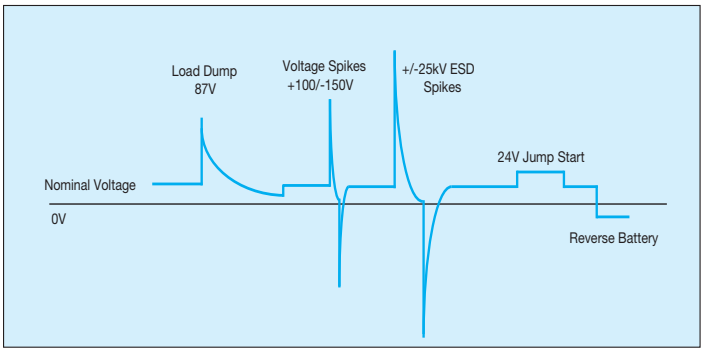
Automotive Power Rail Transients

The transients on automotive power rails are usually medium to high energy transients and are caused by engine start such as Jump start (connecting other cars battery to jump start the engine), Load Dump (sudden load disconnect from alternator) or inductive switching (caused by DC motors on/off switching - e.g. window lifter, wipers, adaptive headlights). These transients are typically bi-directional.



Automotive Data Line Transients

Data lines connecting the automotive systems need to be protected against various ESD pulses to ensure sensitive electronics protection. These transients are mainly caused by human interaction with the electronics systems (controls, buttons, ports) or by interaction between systems due to different charge build up. These transients are typically bi-directional and very fast.



AVX MULTILAYER VARISTORS

The EMC requirements of today's automotive electronics are a natural fit for the use of AVX MultiLayer Varistors (MLVs).

AVX AUTOMOTIVE VARISTORS ADVANTAGES

- AEC-Q200 qualified
- Bi-directional protection
- Compact footprint
- Very fast response - sub ns
- EMI/RFI filtering in the off state
- Multiple strikes capability
- No derating over operating temperature range (-55°C to +125°C, 150°C available)
- RoHS compliant
- Optional hybrid termination (Pd/Ag) available

AVX Automotive Series Varistors provide reliable protection against automotive related transients - such as Load Dump, Jump Start and ESD to protect the growing number of electronics systems used in automotive applications. Transient examples:

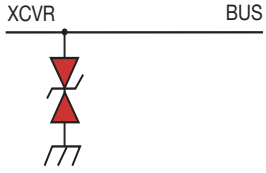
Load dump (ISO 7637-2-5)	AEC-Q200-002	CI-220
Jump Start	ISO 10605	CI-260
ISO 7637 Pulse 1-3	ISO 16750-2	IEC 61000-4-2, etc.

The parts offer fast turn on time, bi-directional protection, excellent multiple strikes capability and in addition also EMI/RFI filtering in the off-state that can improve overall system EMC performance.

High power MLV designs have been revised and miniaturized to allow efficient protection of today's most widely used communication bus designs.

When used in communication bus designs, MLVs can save approximately 90% of the board area involved with diode/EMC cap solutions. In addition, MLVs offer a FIT rate <0.1, an ability to be used at temperatures up to 150°C and a fast turn on time.

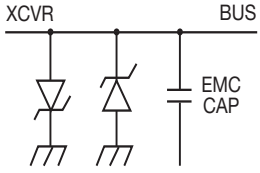
MultiLayer Varistors (MLVs)



MLV PROTECTION METHOD
SINGLE COMPONENT SOLUTION

TVS & EMI

TVS Diodes



DIODE PROTECTION METHOD
THREE COMPONENT SOLUTION

TVS + EMI

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MLVs have traditionally been used in inductively generated automotive transient suppression applications such as motors, relays and latches. MLVs offer a large in rush current capability in a small package, high-energy transient suppression and a broad and definable off state bulk EMC capacitance. These, coupled with an extremely low FIT rate and excellent process capability makes MLVs a common device in today's intermediate to high power automotive circuit protection.

AUTOMOTIVE COMMUNICATION BUS

AVX varistors are ideal choice for automotive circuit protection thanks to wide range of automotive qualified parts covering wide range of applications from low capacitance components for high speed data lines/RF circuits up to high energy varistors for load dump and jump start requirements on power lines or low speed data lines such as LIN Bus. AVX also offers automotive varistors for targeted and enhanced EMI filtering that help to improve overall EMC system performance.

Automotive electronic systems are connected by various network systems depending on the data speed requirements. Most common networks include:

LIN (LOCAL INTERCONNECT NETWORK)

LIN Bus operates at slower data speeds up to 20kbps and provides reliable low cost automotive networking. Typical applications are e.g. window lifter, door lock, seat controls, mirror controls, wipers, rain sensors etc.

CAN (CONTROLLER AREA NETWORK)

CAN Bus is a vehicle bus standard designed to allow microcontrollers and devices to communicate with each other within a vehicle without a host computer. CAN Bus supports data speeds up to 1Mbps. Typical applications are ECU connection to transmission, door locks, adaptive headlights, climate control, etc.

MOST (MEDIA ORIENTED SYSTEMS TRANSPORT)

MOST is standard for high-bandwidth automotive multimedia networking. This network provides excellent Quality of Service and seamless connectivity for audio/video streaming through variety of multimedia interfaces such as DVD player, head set, voice control.

FLEXRAY

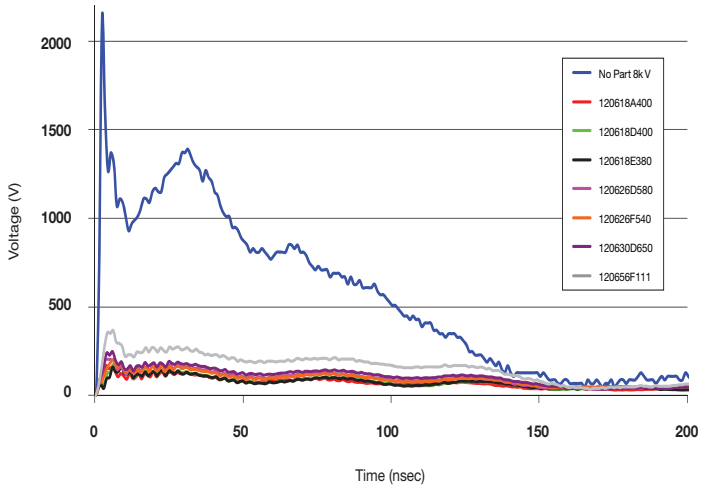
FlexRay is an automotive network communications protocol to govern on-board automotive computing. It is designed to be faster and more reliable than CAN and TTP intended for drive-by-wire applications.

Example of suitable AVX series based on data speed and line type is shown below:

SERIES	BUS	DATA SPEED	
Sub pF AntennaGuard Automotive Series	HDMI	3.2 Gbps	**High Speed**
	1394a	400 Mbps	
AG/Sub pF AG Automotive Series,	MOST	45 Mbps	
Miniature AC	TTP	25 Mbps	
FlexRay	FlexRay	10 Mbps	**Data**
CAN, FlexRay, AG Series	TTCAN	1 Mbps	
	CAN	1 Mbps - 50 Kbps	
TransGuard® Automotive Series,	Safe-by-Wire	150 Kbps	
StaticGuard Automotive Series,			
Radial Varistor	LIN	<20 Kbps	**Low Speed**
TransGuard® Automotive Series, StaticGuard Automotive Series, Radial Varistor, Miniature MAC, TransFeed Automotive Series	ALL		**Power Line**
TransFeed Automotive Series, Controlled Capacitance	10-100 Mbps		**Cutoff Frequency**

AVX VARISTORS ESD RESPONSE EXAMPLES

8 kV ESD Vc
(150pF/300ohm IEC Network)



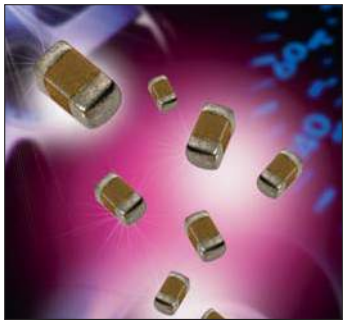
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AUTOMOTIVE MLCC CAPACITORS

MLCC Capacitors are the passive glue that holds automotive electronic module together. AVX offers a broad range of AEC Q200 Qualified MLCCs ranging general purpose NP0, X7R dielectrics to high temperature 150°C X8R and X8L devices and high voltage capacitors.

A comparison between commercial and AutoGrade MLCCs is shown below:





COMMERCIAL VS AUTOMOTIVE MLCC PROCESS COMPARISON

	Commercial	Automotive
Administrative	Standard Part Numbers. No restriction on who purchases these parts.	Specific Automotive Part Number. Used to control supply of product to Automotive customers.
Design	Minimum ceramic thickness of 0.020"	Minimum Ceramic thickness of 0.029" (0.74mm) on all X7R product.
Dicing	Side & End Margins = 0.003" min	Side & End Margins = 0.004" min Cover Layers = 0.005" min
Lot Qualification (Destructive Physical Analysis - DPA)	As per EIA RS469	Increased sample plan – stricter criteria.
Visual/Cosmetic Quality	Standard process and inspection	100% inspection
Application Robustness	Standard sampling for accelerated wave solder on X7R dielectrics	Increased sampling for accelerated wave solder on X7R and NP0 followed by lot by lot reliability testing.

HIGH TEMPERATURE X8R AND X8L AUTOMOTIVE CAPACITORS

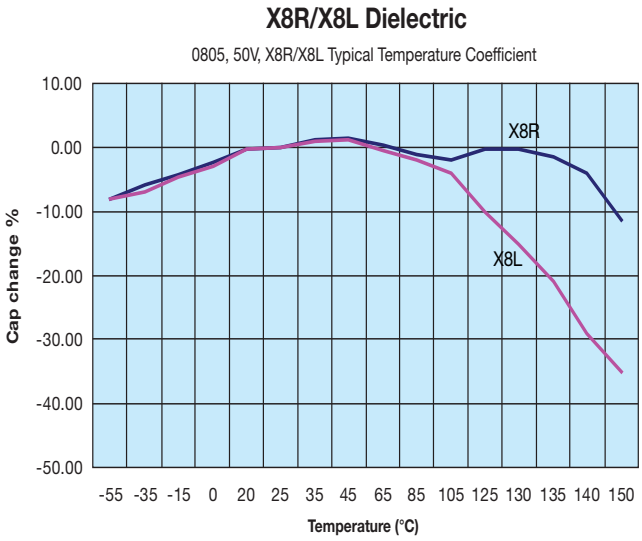
The need for high temperature MLCC has been driven by customer requirements for reliable parts that operate at elevated temperatures.

AVX X8R and X8L capacitors provide a highly reliable solution with low loss (low ESR/ESL) compared to other technologies and stable capacitance over temperature.

X8R material has capacitance variation of ±15% between -55ºC and +150ºC. The X8L material has capacitance variation of ±15% between -55ºC to 125ºC and +15/-40% from +125ºC to +150ºC.

They are ideal for automotive on engine applications such as under the hood sensors, water pump, motor control, temperature regulation and also for hybrid automotive applications such as battery controls, inverter/converter circuits.

Optional termination systems - FLEXITERM® and conductive epoxy for hybrid applications are available and provide enhanced resistance to temperature cycling and mechanical damage (board flexure).



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FLEXITERM® - HARSH ENVIRONMENT CAPACITORS

Automobiles place large amounts of stress on electronic circuits and those stress levels are increasing due to greater acceptance of modules in underhood applications Many components may be subject to severe flexing and vibration when used in various under the hood automotive and other harsh environment applications.

With increased requirements from the automotive industry for additional component robustness, AVX recognized the need to produce a MLCC with enhanced mechanical strength.

To satisfy the requirement for enhanced mechanical strength, AVX had to find a way of ensuring electrical integrity is maintained whilst external forces are being applied to the component. It was found that the structure of the termination needed to be flexible and as a solution AVX developed FLEXITERM®. FLEXITERM® is designed to enhance the mechanical flexure and temperature cycling performance of a standard ceramic capacitor with an X7R, X8L and X8R dielectric.

AVX FLEXITERM® MLCCs provides for board flexure of up to 5mm of without internal cracks. FLEXITERMS® are used in high thermal cycle, high vibration and high process package stress applications. Beyond 5mm, the capacitor will generally fail open. The industry standard for flexure is 2mm minimum.

A performance comparison by dielectric and case size for MLCCs with and without FLEXITERM® is shown below:

APPLICATIONS

High Flexure Stress Circuit Boards

- e.g. Depanelization: Components near edges of board

Variable Temperature Applications

- Soft termination offers improved reliability performance in applications where there is temperature variation
- e.g. All kind of engine sensors: Direct connection to battery rail

Automotive Applications

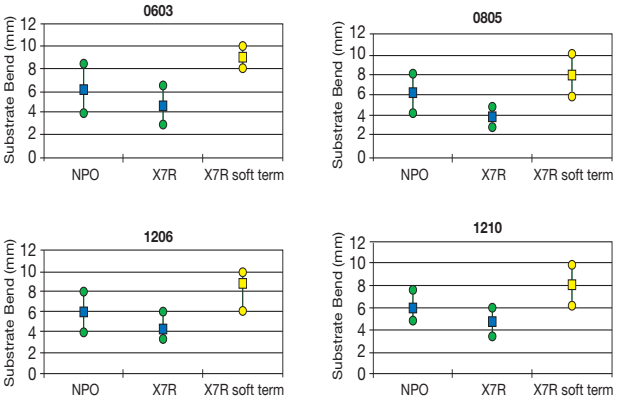
- Improved reliability
- Excellent mechanical performance and thermo mechanical performance

PRODUCT ADVANTAGES

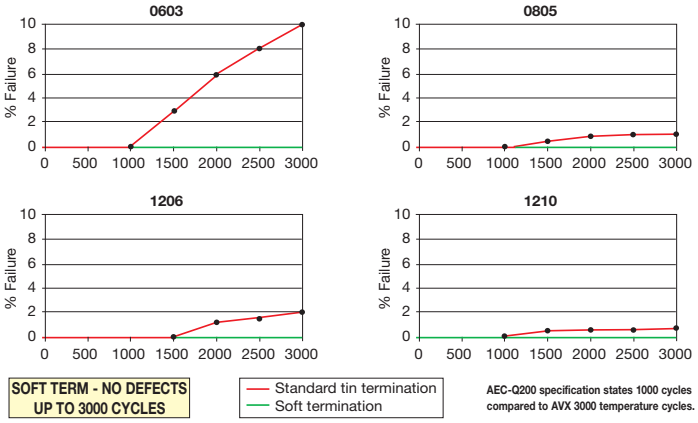
- Flexible termination system
- Reduction in circuit board flex failures
- High mechanical performance able to withstand, 5mm bend test guaranteed
- Generally open failure mode beyond 5mm flexure
- Increased temperature cycling performance:
  - 0% failures up to 3000 cycles
  - No ESR change up to 3000 cycles

BOARD BEND TEST RESULTS

AEC-Q200 Vrs AVX FLEXITERM® Bend Test



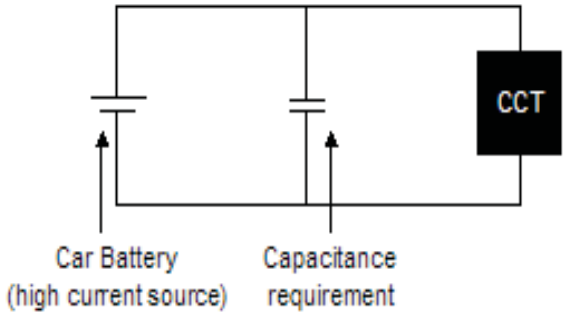
BEYOND 1000 CYCLES: TEMPERATURE CYCLE TEST RESULTS



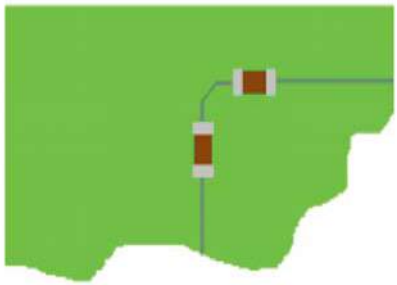
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HARSH ENVIRONMENT SIGNAL LINE CAPACITORS – FLEXISAFE

Automotive module manufacturers must take precautions against a shorted capacitor from battery to ground on every module produced. Commonly designers will place two MLCCs in series to avert a board fire in case one of the MLCCs becomes a short.



Need for capacitance from Battery to Ground



Two MLCCs in series

Though two MLCCs in series solves the problem of one capacitor shorting many disadvantages are created.

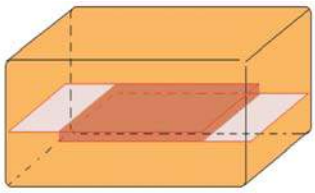
Among them are:

- Increased board space used
- Extra pick & place time
- Extra solder joint
- Increased series resistance
- Increased series inductance

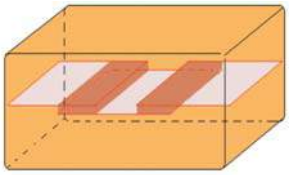
FLEXISAFE Capacitors are an ideal choice for use in Power at all times (PAAT)/terminal 30 applications.

FLEXISAFE capacitors have the flexure advantages of FLEXITERM® capacitors and the fail safe mechanisms of two capacitors in series inside the single MLCC body.

A cut away view of the FLEXISAFE internal electrode structure and a frequency response comparison between two standard MLCCs and a FLEXISAFE are shown below.

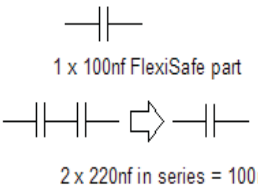


Standard MLCC Design



FLEXISAFE Design

FLEXISAFE offers lower inductance than 2 capacitors in series.



2x 220nF in Series	FLEXISAFE 100nF
1.579nH	0.855nH
1.450nH	0.783nH
1.405nH	0.764nH
1.408nH	0.858nH

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TANTALUM AND NIOBIUM OXIDE CAPACITORS FOR AUTOMOTIVE APPLICATIONS



To meet the demanding performance and harsh environmental conditions of automotive applications, AVX developed professional-grade tantalum capacitors that ensure long-term electrical performance stability. The professional tantalum technology satisfies the automotive industry needs for rugged capacitors that maintain high-performance standards under electrical and mechanical stress. Technical improvements have been made that strengthen the structure of the capacitor and give it more robust performance in a variety of applications.

Tantalum and Niobium Oxide Capacitors are ideal capacitors for use in automobile modules Vcc filtering and supply circuits. Tantalum and Niobium oxide capacitors offer excellent stability and ESR over temperature and load conditions and Niobium Oxide capacitors offer added advantages of fail safe operation when used up to the category voltage.

AUTOMOTIVE GRADE TANTALUM ADVANTAGES

The primary benefits of using professional automotive grade tantalum over standard reliability consumer electronic tantalum include:

- The formation ratio of professional tantalum capacitors, (which is the ratio between voltage used for electrolytical creation of dielectrics and rated voltage), is more than 3.0. This results in thicker and higher quality dielectrics.
- The conservative design rules are followed both in design and manufacturing Strict quality control limits are applied and additional testing is performed. Devices are screened for hard surge current, undergo extended electrical testing, and burn-in processes are used to achieve and verify high robustness.

The key characteristics of professional tantalums are enhanced reliability (max 0.5%/1000 hours) and reduced leakage current of up to 75% less than standard tantalum capacitors. Professional tantalum capacitors are available both in standard and low equivalent series resistance (ESR) options, which make them suitable for a wide range of automotive control circuits in applications such as engine control units, anti-lock brake systems, motor-driven power steering systems, electronic gearboxes and tire-pressure monitoring sensors.

Ultra Low ESR high-performance tantalum capacitors

High-performance, low ESR capacitors combine the robust, reliable and proven tantalum technology (max 0.5%/1000 hours) with an innovative multi-anode construction. These high performance tantalum capacitors utilize several cores in parallel combination, which pushes ESR levels down to only 18mΩ, depending on device selected. Such ESR levels enable professional tantalum capacitors to be used in DC/DC converters in various automotive applications, including airbag modules, controlled area networks, power supply modules, and engine control modules.

High temperature tantalum capacitors

Standard tantalum capacitor technologies typically have a temperature range of -55°C to +125°C. Modern automotive electronics placed near heat sources such as engines, headlights, gearboxes or AC circuits, must operate at temperatures up to 150°C or even 175°C. With an operating temperature range of -55°C to +175°C, these tantalum capacitors meet the temperature requirement, while offering enhanced reliability (failure rate max 0.5%/1000 hours) and higher category voltage at 125°C (78% of rated voltage) than consumer grade devices have (typically 66 % of Vr). The category voltage, which is the maximum working voltage when actual operating temperature is considered, is 50% of rated voltage at 175°C.

Robust Niobium Oxide capacitors

Capacitors that use niobium oxide powder as the main material for the anode electrode have an extraordinary robustness against overloading thanks to advantages of pure material: ignition energy up to 200 times higher than pure tantalum part and much lower burning rate than pure metal materials such as tantalum or niobium. Niobium oxide capacitors will not burn at temperatures up to their category voltage and even if a failure occurs caused by too high voltage or current surge, it is typically the least problematic: high resistance (usually between 20 to 200kΩ) with no loss of capacitance, thus a niobium oxide capacitor will continue to provide full functionality, although at the expense of increased leakage current.

Niobium oxide capacitors have an excellent reliability, measured by failure rate of max 0.5%/1000hours. Lower ESR niobium oxide capacitors offer even more reliability with a failure rate of max 0.2%/1000 hours.

The low ESR niobium oxide capacitors are suitable for applications with rail voltages of up to 8V, such as in-cabin entertainment systems, seat position modules, and airbag controls.

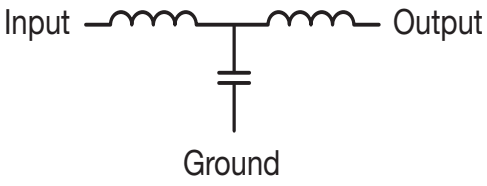
OxiCap® offer noise free performance important for absolute sound quality and exhibit very good stability of electrical parameters over temperature which is preferred advantage for car audio devices.

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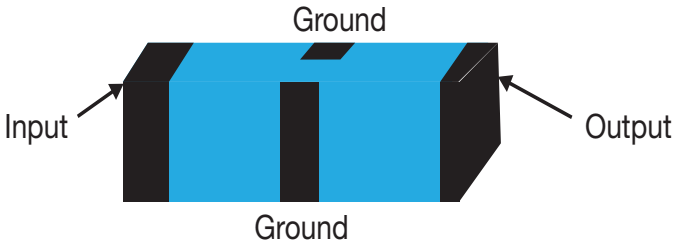
EMI FEEDTHRU FILTER CAPACITORS – BROADBAND EMI FILTERS

Many times designers will try to control EMI with multiple discreet inductors and capacitors to form a filter. These filters tend to be large, have a wide range of filtering based upon individual component tolerances and parasitics and tend to be effected greatly by temperature. AVX offers a single component solution - broadband EMI Feedthru Filter Capacitors for power and signal use.

They are many times called an LC T filters though the series inductance is achieved through non ferrous materials. These filters are made out of NP0 and X7R dielectrics with RoHS terminations.



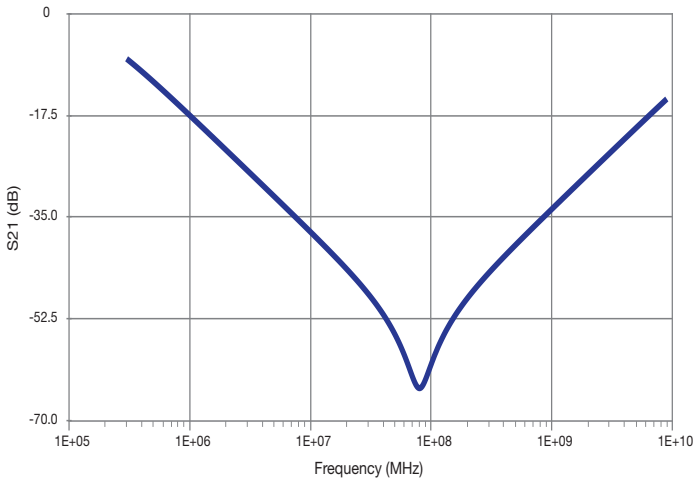
SMT FeedThrus have an input and output terminals and two center tap ground terminals midway along the body as shown in the figure.

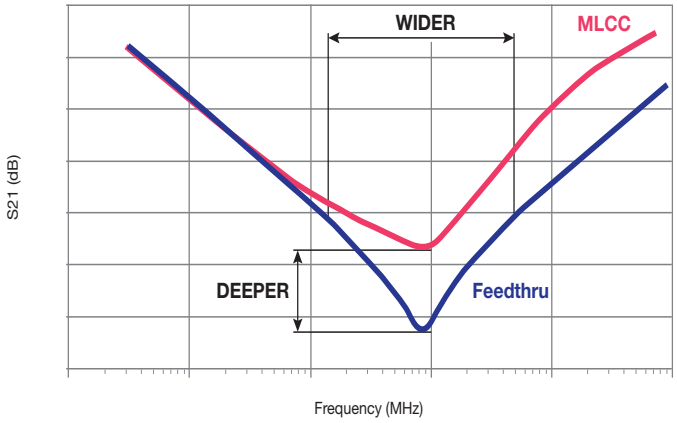


EMI FEEDTHRU FILTER CAPACITORS FEATURES

EMI FeedThru Filter Capacitors are attractive to use because of their small size, simplicity of implementation, high reliability and low cost. These devices are a broadband EMI filter capable of > 30 dB of attenuation across RF spectrums of greater than 300 MHz wide. Further, these filters are available in 50mA, 300mA, 500mA, 1,2,3,4 and 5 Amp ratings to cover all applications from signal lines, I/Os and power lines.

An example of one filters forward transmission loss curve (S21) is shown below:

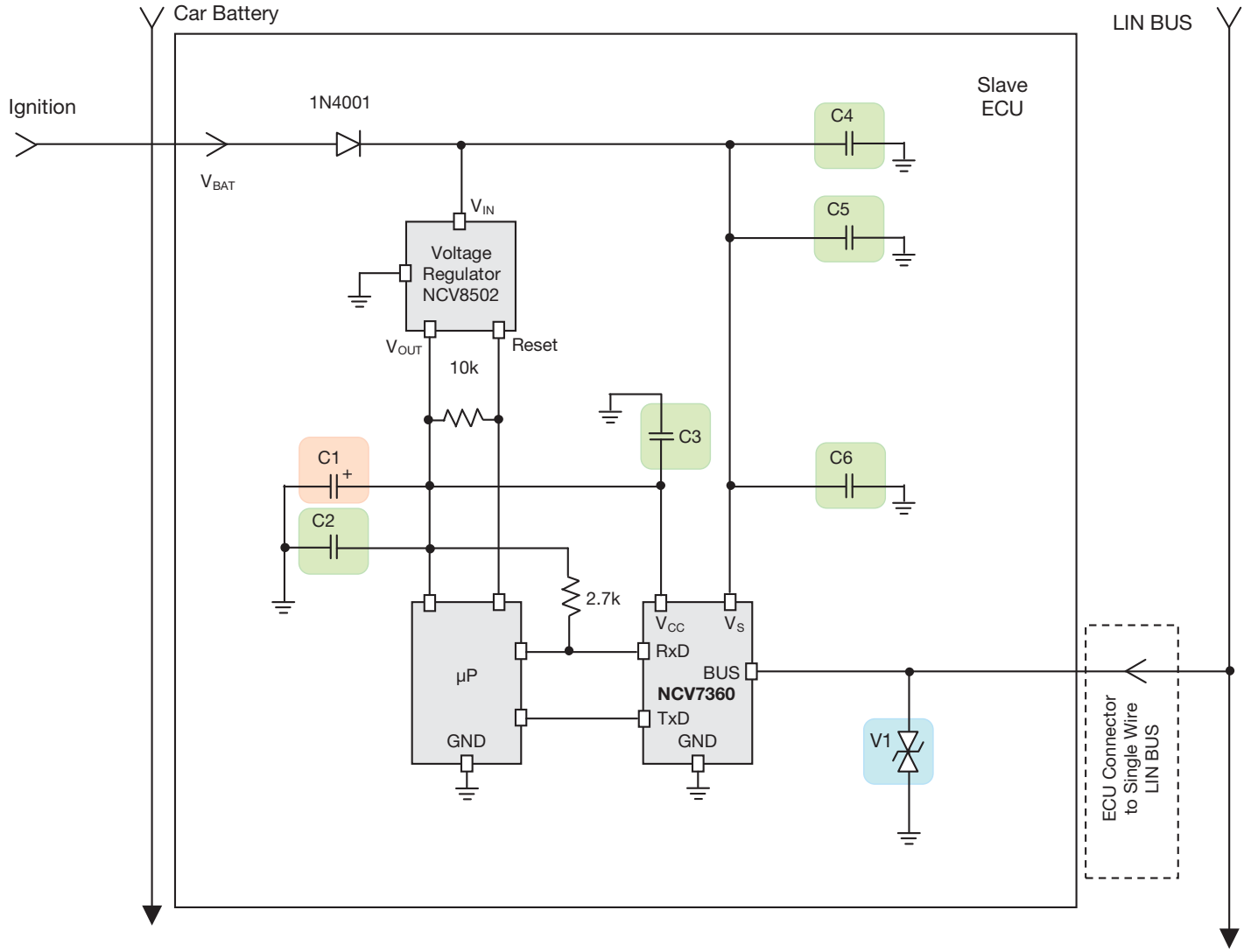




AVX SMT EMI FeedThru Filter Capacitors replace discrete LC T filters made from ferrite bead or inductor and capacitor. EMI FeedThru Filter Capacitors can save over 75% the board space and offer a broad spectrum signal or power line EMI filter in a small package.

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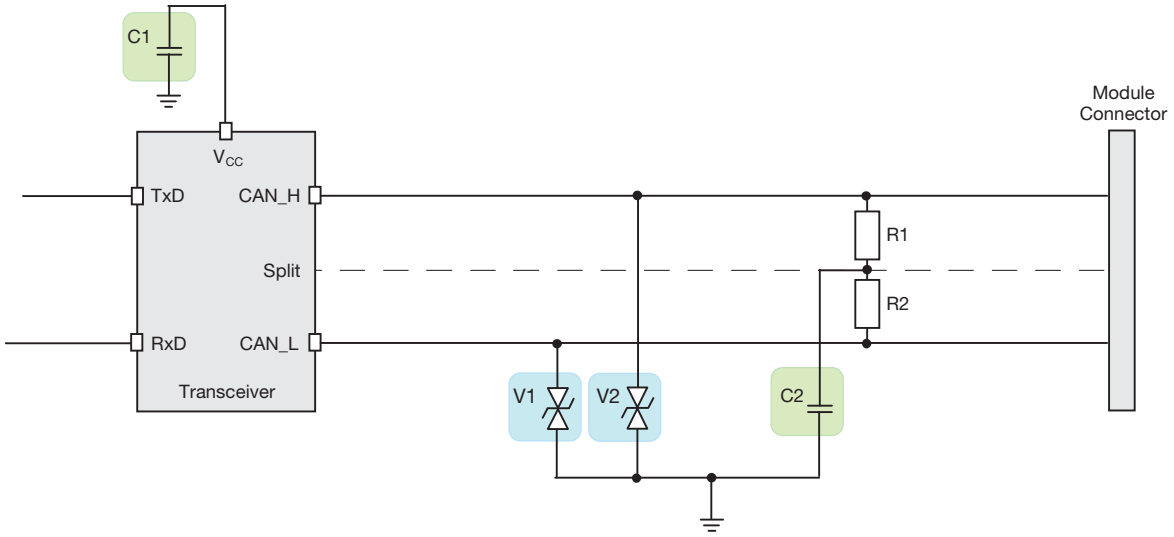
LIN BUS



Component	Product	AVX Part number	Specification
C1	Niobium Oxide Cap	NOSB226M006S0600	B case, 6.3Vdc, 22µF, low ESR
C2	Ceramic Capacitor	0805ZC104M4T2A	0805, X7R, 10Vdc, 0.1µF
C3, C6	Ceramic Capacitor	0805ZC473M4T2A	0805, X7R, 10Vdc, 0.047µF
C4	Ceramic Capacitor	12105C225M4Z2A	1210, X7R, 50Vdc, 2.2µF, FLEXITERM®
C5	Ceramic Capacitor	08055C104M4Z2A	0805, X7R, 50Vdc, 0.1µF, FLEXITERM®
V1	Multilayer Varistor	VCAS080518C400RP	0805, 18Vdc, 0.3J, 120A, 550pF typ

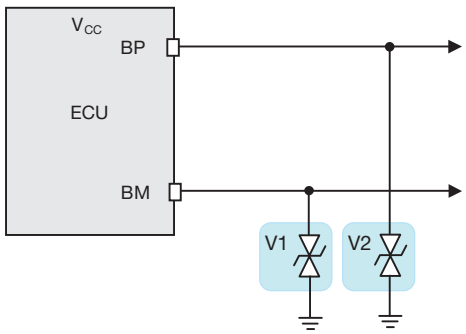
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CAN BUS



Component	Product	AVX Part number	Specification
C1	Ceramic Capacitor	08055C104M4T2A	0805, X7R, 50Vdc, 0.1µF
C2	Ceramic Capacitor	12061C393M4T2A	1206, X7R, 100Vdc, 0.039µF
V1, V2	Multilayer Varistor	CAN0001RP	0603, 18Vdc, 0.015J, 4A, 22pF max
(V1+V2)	Multilayer Varistor	CAN0002RP	0405 Dual Array, 0.015J, 4A, 22pF max

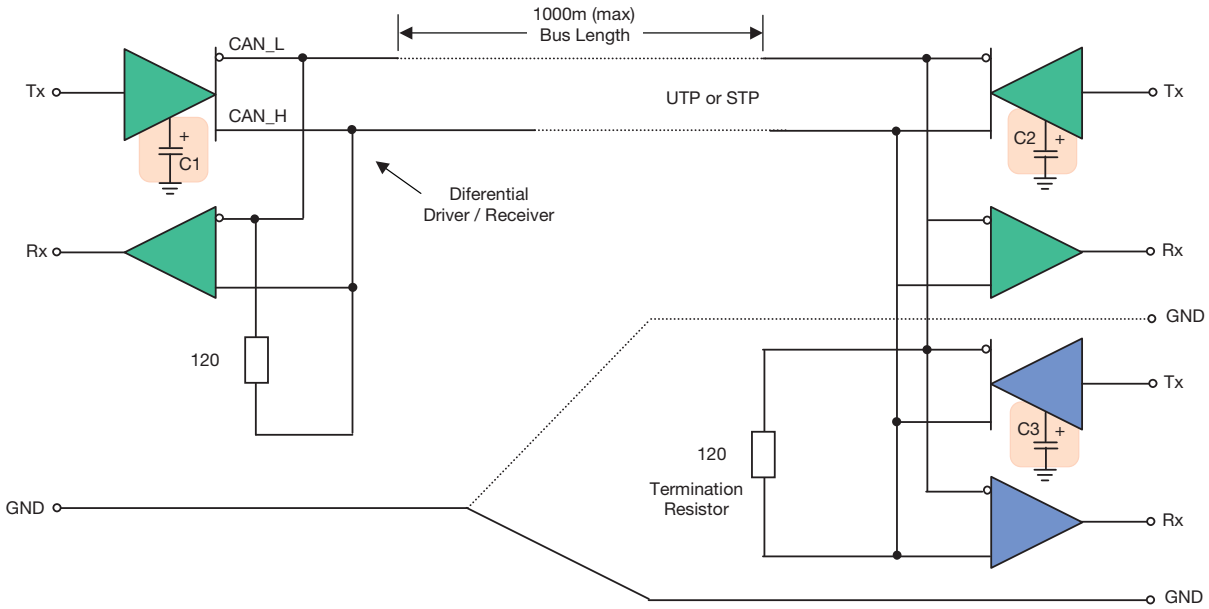
FLEXRAY



Component	Product	AVX Part number	Specification
V1, V2	Multilayer Varistor	FLX0005WP	0402, 18Vdc, 0.02J, 4A, 17pF max

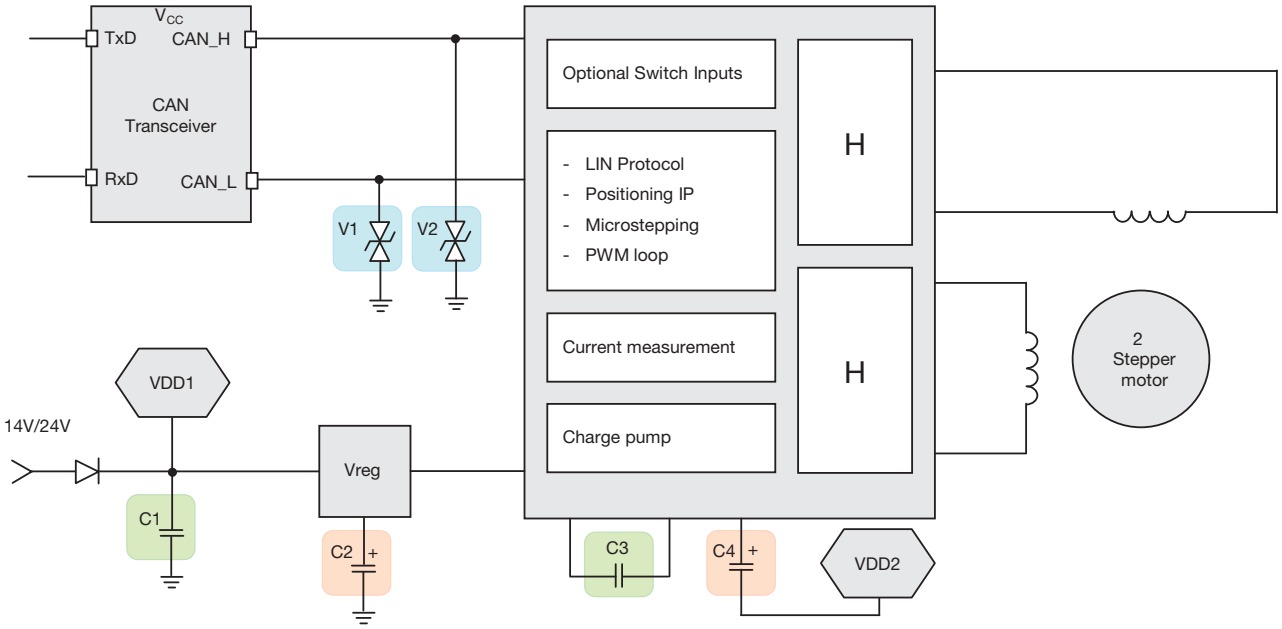
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CAN BUS



Component	Product	AVX Part number	Specification
C1, C2, C3	Tantalum Capacitor	TRJB475M035RRJ	B case, 35V, 4.7µF

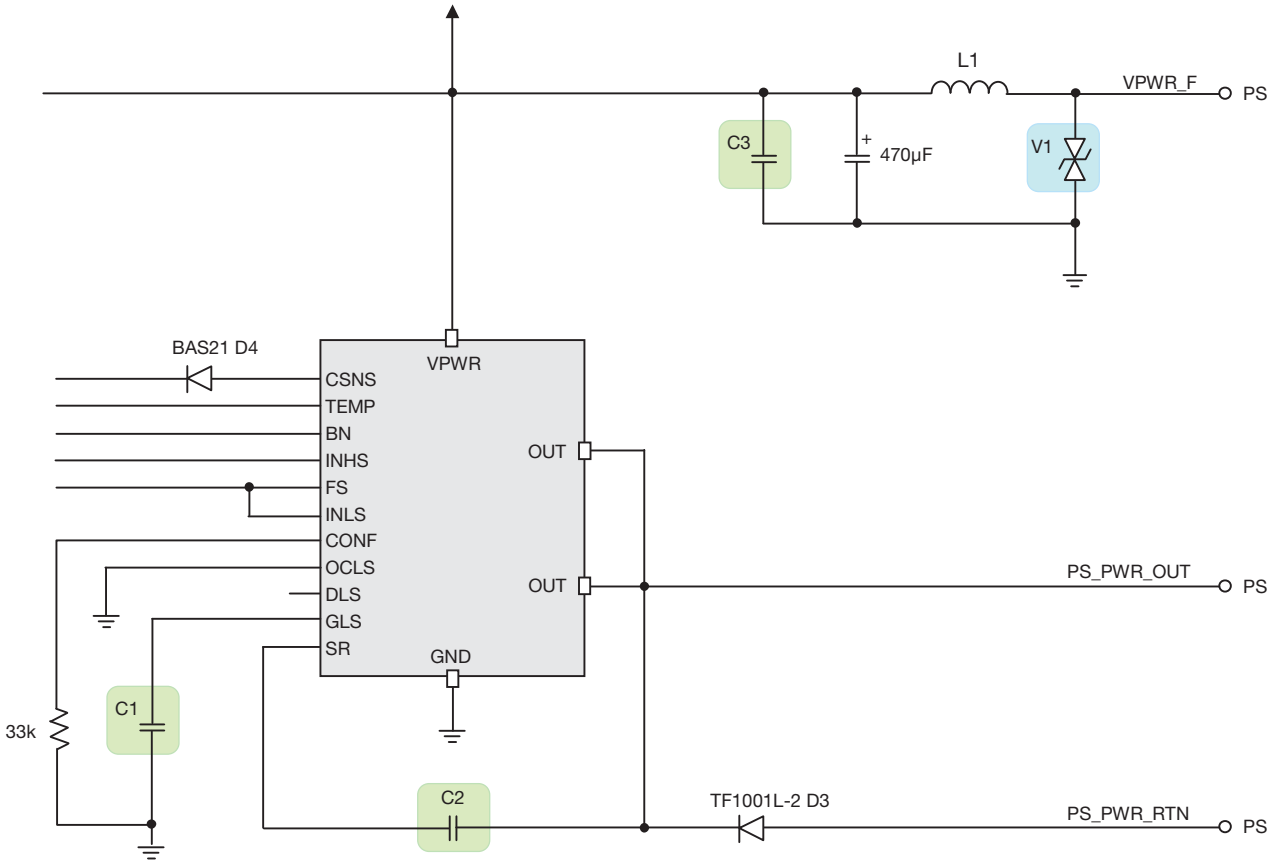
ADAPTIVE DIRECTIONAL HEADLIGHTS



Component	Product	AVX Part number	Specification
C1	Ceramic Capacitor	FS055C104M4Z2A	0805, X7R, 50Vdc, 0.1µF, FLEXISAFE™
C2	Niobium Oxide Cap	NOJC476M010RWJ	C case, 10Vdc, 47µF
C3	Ceramic Capacitor	08055C473K4T2A	0805, X7R, 50Vdc, 0.047µF
C4	Niobium Oxide Cap	NOSB226M006R0600	B case, 6.3Vdc, 22µF, low ESR
V1, V2	Multilayer Varistor	CAN0005WP	0402, 18Vdc, 0.05J, 10A, 37pF max

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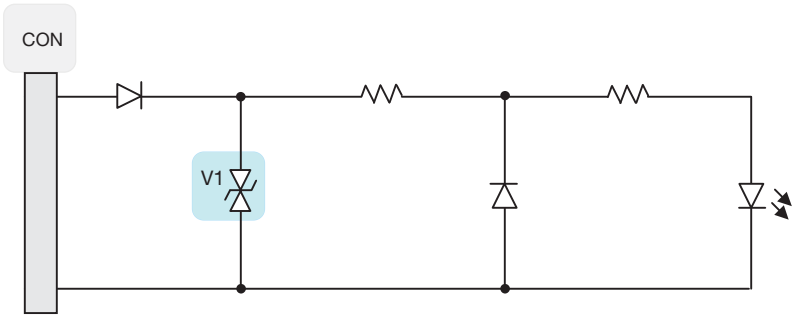
ELECTRIC POWER STEERING



Component	Product	AVX Part number	Specification
C1	Ceramic Capacitor	08055C472M4T2A	0805, X7R, 50Vdc, 4.7nF
C2	Ceramic Capacitor	08055C104M4T2A	0805, X7R, 50Vdc, 0.1µF
C3	Ceramic Capacitor	FS055C104M4Z2A	0805, X7R, 50Vdc, 0.1µF, FLEXISAFE™
V1	Multilayer Varistor	VCAS121018J390RP	1210, 18Vdc, 1.5J, 500A, 3100pF typ

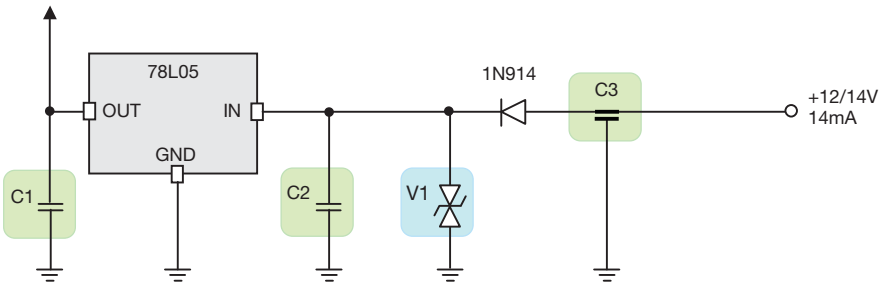
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LED DOOR LAMP



Component	Product	AVX Part number	Specification
V1	Multilayer Varistor	VCAS120618D400RP	1206, 18Vdc, 0.4J, 150A, 900pF typ
CON	IDC Connector	009176002011106	IDC connector, 2 pos, AWG 20, 10A/contact

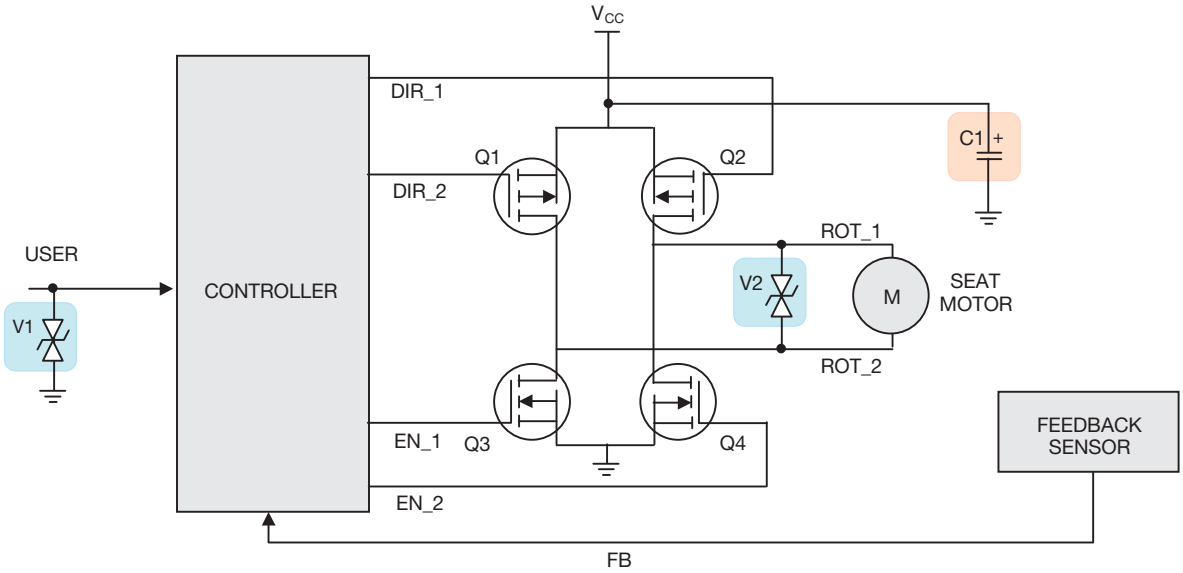
VOLTAGE REGULATOR



Component	Product	AVX Part number	Specification
C1	Ceramic Capacitor	08053C104M4T2A	0805, X7R, 25Vdc, 0.1µF
C2	Ceramic capacitor	08055C104M4T2A	0805, X7R, 50Vdc, 0.1µF
C3	FeedThru Capacitor	W2F15C10284T1A	0805, X7R, 50Vdc, 1nF
V1	Multilayer Varistor	VCAS080518C400DP	0805, 18Vdc, 0.3J, 120A, 550pF typ

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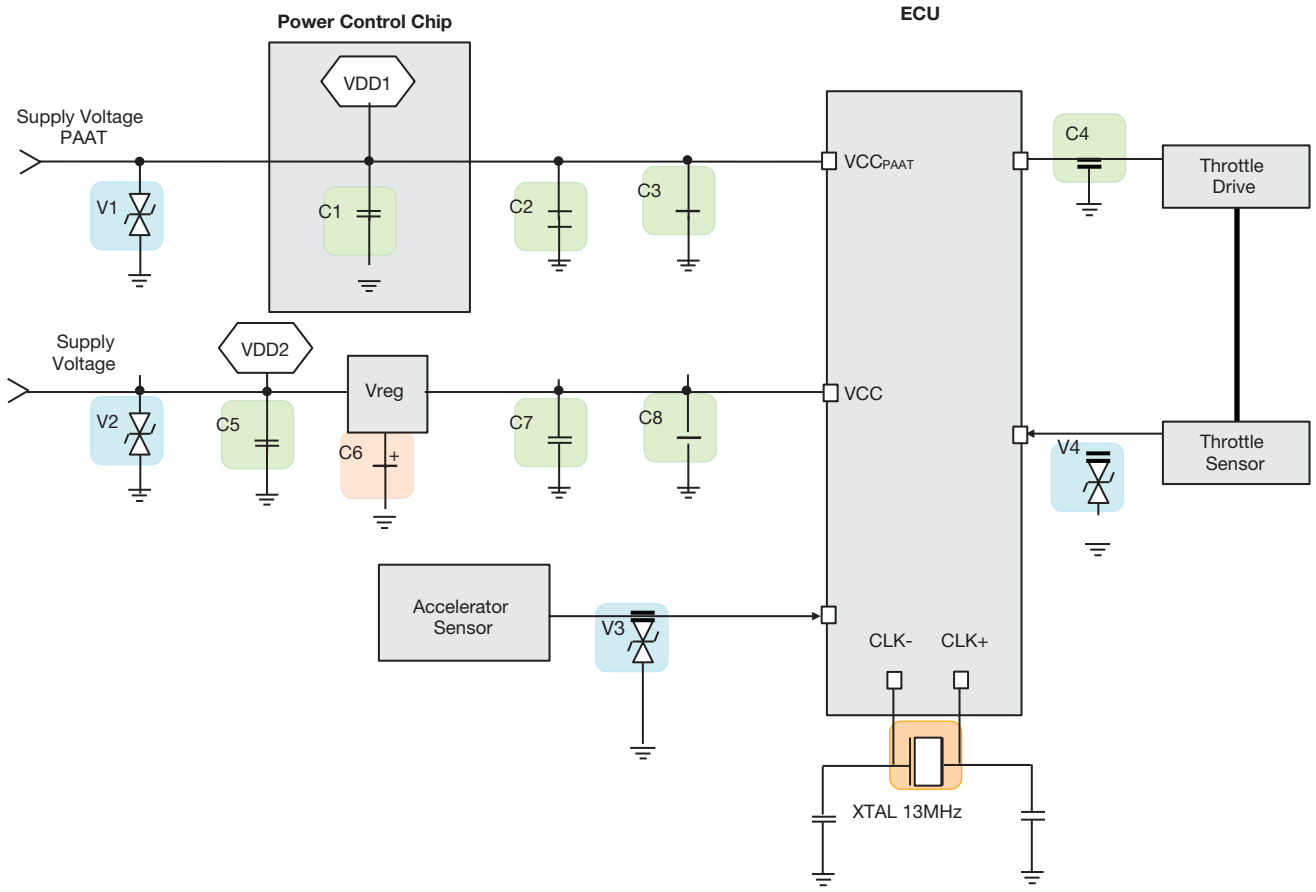
SEAT MOTOR CIRCUIT



Component	Product	AVX Part number	Specification
C1	Tantalum Capacitor	TRME107M020R0045	E case, 20Vdc, 100µF, ultra low ESR
V1	Multilayer Varistor	VCAS040218X400WP	0402, 18Vdc, 0.05J, 20A, 65pF typ
V2	Multilayer Varistor	VCAS121018J390RP	1210, 18Vdc, 1.5J, 500A, 3100 pF typ

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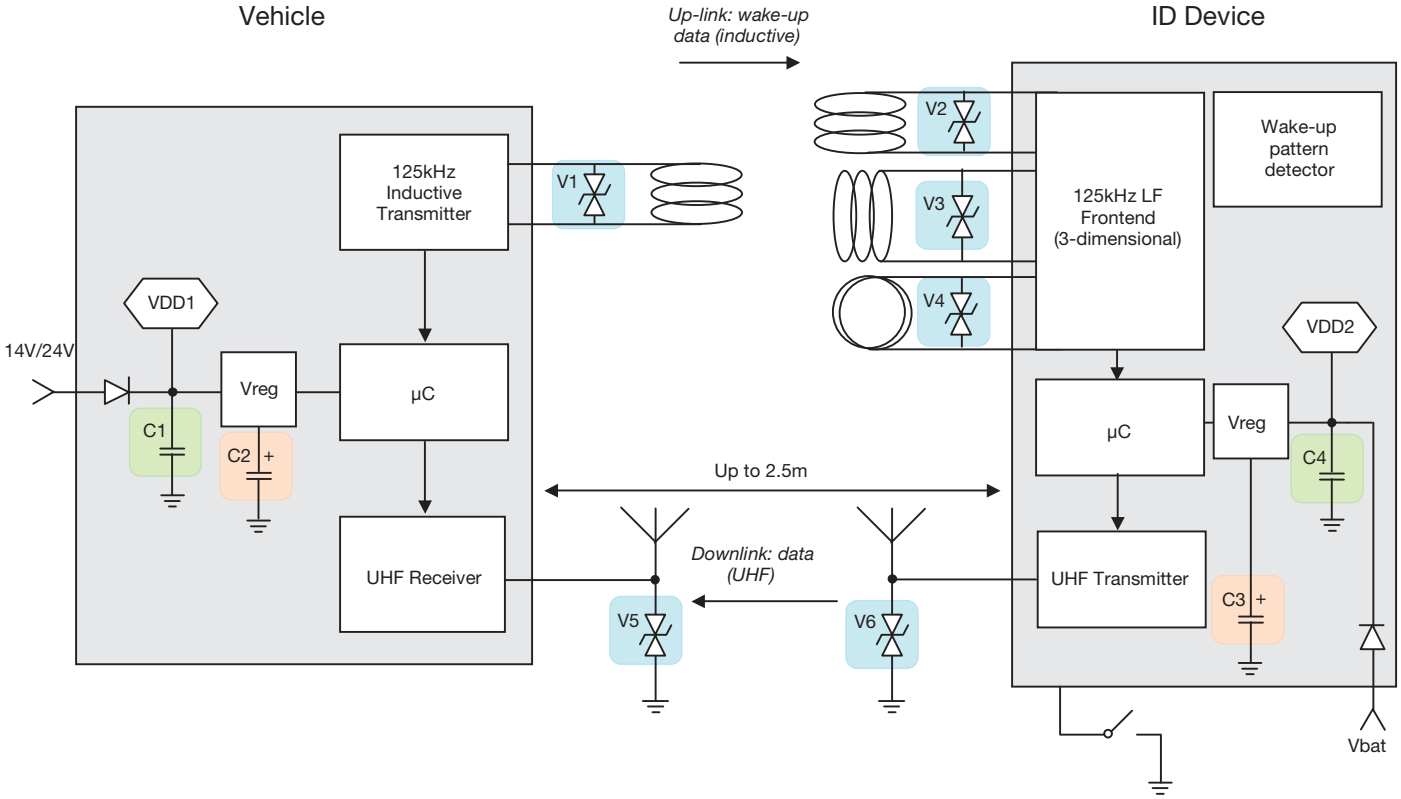
DRIVE BY WIRE – THROTTLE



Component	Product	AVX Part number	Specification
C1	Ceramic Capacitor	FS055C104M4ZA	0805, X7R, 50Vdc, 0.1µF, FLEXISAFE™
C2	Ceramic Capacitor	06035C103K4ZA	0603, X7R, 50Vdc, 0.01µF, FLEXITERM®
C3	Ceramic Capacitor	06035A100K4TA	0603, NP0, 50Vdc, 10pF
C4	Feedthru Capacitor	W2F15C22284T1A	0805, X7R, 50Vdc, 2.2nF
C5	Ceramic Capacitor	FS055C104M4ZA	0805, X7R, 50Vdc, 0.1µF, FLEXISAFE™
C6	Tantalum Capacitor	TRME476M025R0065	E case, 25Vdc, 47µF, low ESR
C7	Ceramic Capacitor	06035C103K4Z2A	0603, X7R, 50Vdc, 0.01µF, FLEXITERM®
C8	Ceramic Capacitor	06035C102K4Z2A	0603, X7R, 50Vdc, 1nF, FLEXITERM®
V1, V2	Multilayer Varistor	VCAS080518C400DP	0805, 18Vdc, 0.3J, 120A, 550pF typ
V3, V4	TransFeed	V2AF118X500Y3DDP	0805, 18Vdc, 0.05J, 20A, 75pF typ
XTAL	Crystal Unit	CX5032SB	4.9x3.1x0.7mm typ, 9.8 - 49 MHz

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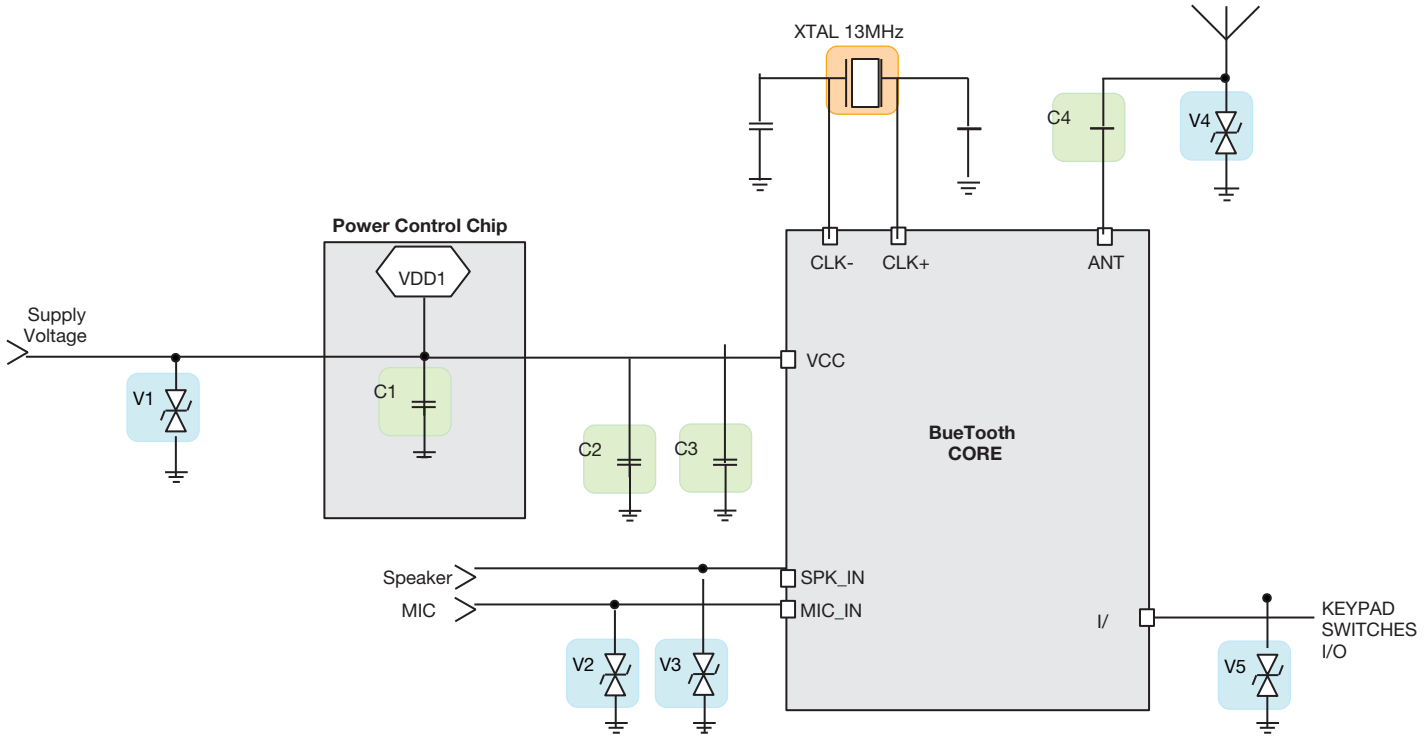
KEYLESS ENTRY



Component	Product	AVX Part number	Specification
C1	Ceramic Capacitor	FS055C104M4ZA	0805, X7R, 50Vdc, 0.1µF, FLEXISAFE™
C2	Niobium Oxide Cap	NOJC476M010RWJ	C case, 10Vdc, 47µF
C3	Niobium Oxide Cap	NOSB226M006R0600	B case, 6.3Vdc, 22µF, low ESR
C4	Ceramic Capacitor	08055C104K4Z2A	0805, X7R, 50Vdc, 0.1µF, FLEXITERM®
V1, V2, V3, V4	Multilayer Varistor	MAV0010DP	0603, 52Vac, 110 Pk-Pk @ 125kHz, 0.015J, 2A, 22pF Max
V5, V6	Multilayer Varistor	VCAS04AG183R0YATWA	0402, 18Vdc, 3pF Max

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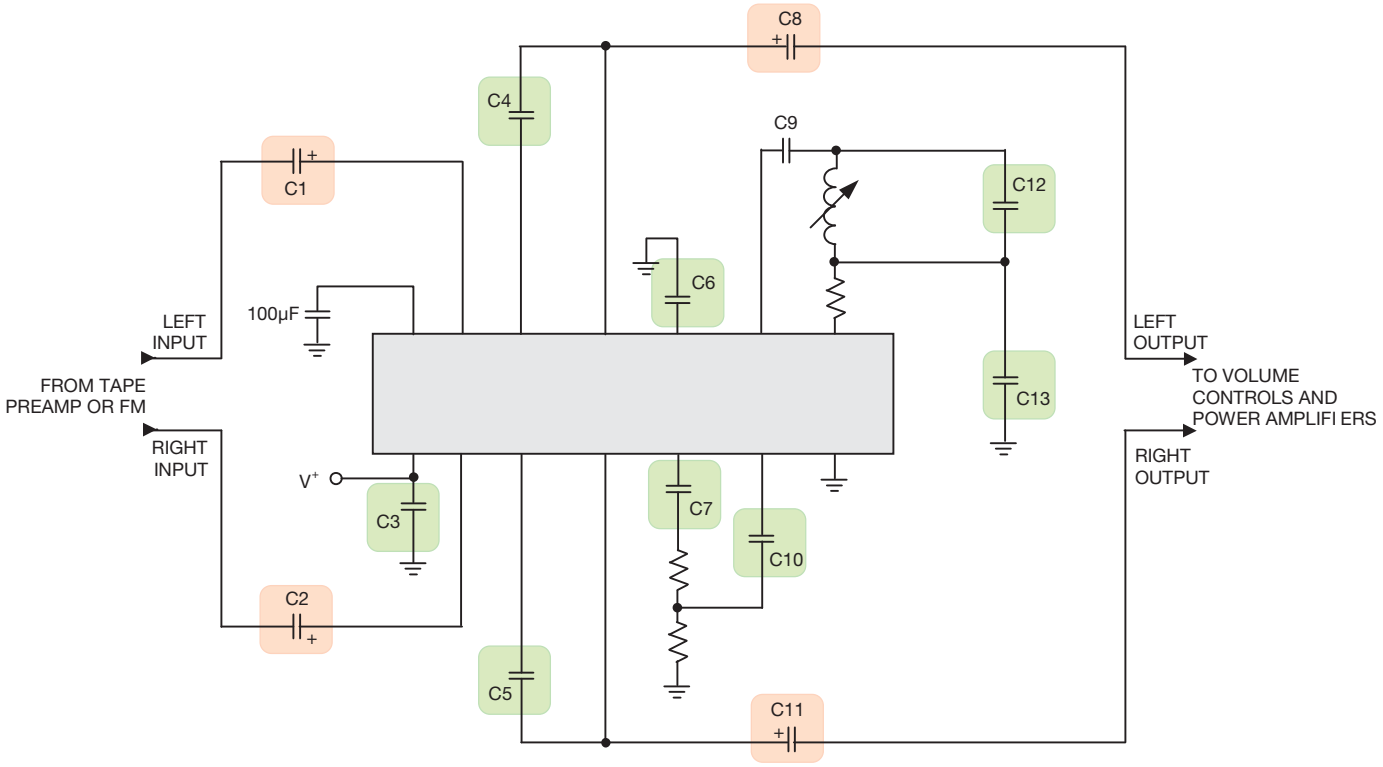
BLUETOOTH



Component	Product	AVX Part number	Specification
C1	Ceramic Capacitor	FS055C104M4ZA	0805, X7R, 50Vdc, 0.1µF, FLEXISAFE™
C2	Ceramic Capacitor	06035C103K4ZA	0603, X7R, 50Vdc, 0.01µF, FLEXITERM®
C3	Ceramic Capacitor	06035A100K4TA	0603, NP0, 50Vdc, 10pF
C4	Ceramic Capacitor	06035A6R8CAT2A	0603, NP0, 50Vdc, 6.8pF
V1	Multilayer Varistor	VCAS080518C400DP	0805, 18Vdc, 0.3J, 120A, 550pF typ
V2, V3	Multilayer Varistor	VCAS060314A300DP	0603, 14Vdc, 0.1J, 30A, 350pF typ
V4	Multilayer Varistor	VCAS06AG183R0YAT3A	0603, 18Vdc, 3pF max
V5	Multilayer Varistor	VCAS040218X400WP	0402, 18Vdc, 0.05J, 20A, 65pF typ
XTAL	Crystal Unit	CX5032SB	4.9x3.1x0.7mm typ, 9.8 - 49 MHz

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PRE-AMPLIFIER



Component	Product	AVX Part number	Specification
C1, C2, C8, C11	Niobium Oxide Cap	NOJP106M004RWJ	P case, 4Vdc, 10µF, low profile
C3, C7, C13	Ceramic Capacitor	06035C104M4T2A	0603, X7R, 50Vdc, 0.1µF
C4, C5	Ceramic Capacitor	06033C332K4T2A	0603, X7R, 25Vdc, 3.3nF
C6	Ceramic Capacitor	08053C105M4T2A	0805, X7R, 25Vdc, 1µF
C9	Ceramic Capacitor	06033C473M4T2A	0603, X7R, 25Vdc, 0.047µF
C10	Ceramic Capacitor	04023C102M4T2A	0402, X7R, 25Vdc, 1nF
C12	Ceramic Capacitor	06033C153K4T2A	0603, X7R, 25Vdc, 0.015µF

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MEDIUM POWER FILM CAPACITORS FOR HIGH CURRENT DESIGN & CAPACITANCE VALUE DESIGN

The purpose of capacitors in electric vehicles is to prevent ripple currents from reaching back to the power source, and to smooth out DC bus voltage variations. Capacitors are also used to protect semiconductors – originally thyristors, but now IGBTs.

Metallised film has become the capacitor technology of choice for electric vehicle and other medium and high power applications. There are several reasons for this.

FILM ADVANTAGES

- Self healing
- High rms current capabilities up to 1Arms per µF
- Overvoltage withstanding up to 2 times the rated voltage
- Handle voltage reversal
- High peak current capabilities
- No acid inside
- Long lifetime
- No storage problem

One major advantage is the ability of film capacitors to overcome internal defects. The latest dielectric films used for DC filter capacitors are coated with a very thin metallic layer. In the case of any defect, the metal evaporates and therefore isolates or fuses the defect, effectively self-healing the capacitor. The total capacitance is divided into elementary cells (sometimes several million) protected by fuse gate. If there is a weak point, the particular cell where the weak point is located will be insulated by fuses blowing up. Capacitance decreases as function of the ratio between elementary cell surface and total surface of capacitor, so there is no complete failure and no short circuit, only a minimal capacitance decrease which can be useful as a measure of ageing.

Metallised film capacitors from AVX are designed to meet CEI 1071 standards. This means they are able to handle multiple voltage surges of up to twice the rated voltage, without significantly decreasing product lifetime. It also means the designer need only account for nominal voltage requirements when specifying the system. Metallised film capacitors also offer significant space savings when compared to devices manufactured using other technologies – such as aluminium electrolytic - if high RMS current handling is a requirement.

AVX has significant experience in developing power capacitors for automotive application, dating back to 1995. Currently the company offers a range of metallised film devices based on cylindrical (puck) or flat bobbin modular building blocks. This approach has several benefits. Firstly, the arrangement of the capacitors can be optimised to suit the available space, resulting in great volumetric efficiency. Second, the arrays are current- and inductancebalanced by AVX and suffer no expansion problems across a temperature range of -55 to +125degC. Lastly, because the individual capacitor building blocks are manufactured on process-controlled, automated lines, quality and cost-effectiveness are assured.

MEDIUM POWER FILM CAPACITORS FOR HIGH CURRENT DESIGN & CAPACITANCE VALUE DESIGN

DC link filter: high current and capacitance value design

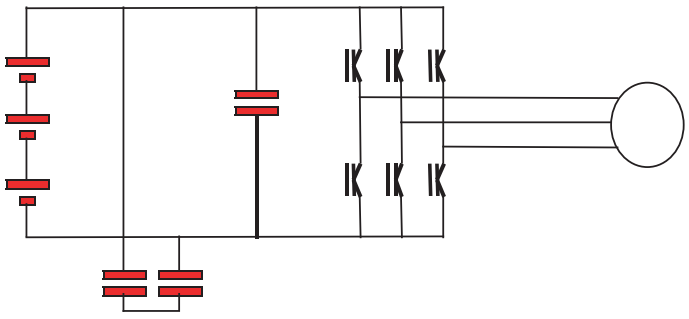
In an electric car or fork lift truck where energy is supplied by batteries the capacitor will be used as for decoupling. Film capacitors are particularly well suited for this use, since the main criteria for DC link application is the device's RMS current withstanding capability.

If we take an electric car in account as example:

Film capacitor
Working voltage: 120VDC
Ripple voltage allowed: 4VRMS
Rms current: 80 ARMS @ 20 kHz
Minimum capacitance value will be:

$$C = \frac{Irms}{Uripple \times 2 \times \delta \times f} = 159\mu F$$

Therefore we see it is much better to use a much lower rated film device, saving cost and space.



Comparison with Electrolytic Capacitor

If we take in account 20mA per µF for example, in order to handle 80 Arms, capacitance value minimum would be:

$$C = \frac{80}{0.02} = 4000\mu F$$

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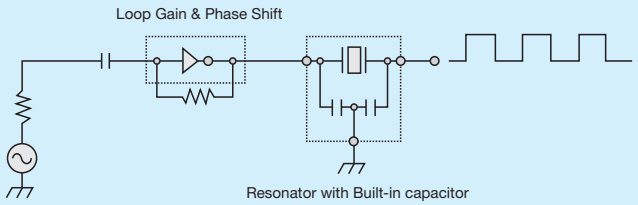
RESONATORS AND CRYSTALS

AVX/Kyocera is a leading timing device manufacturer of both ceramic & crystal timing device production the world.
Our main timing device products include resonators and crystals.

RESONATORS AND CRYSTALS COMPARISON

A resonator is a clock-pulse generator for electrical vibrations, like a crystal but with ceramic substrate.
Below you can see the differences between a resonator and a quartz crystal. In the picture you can also see the main field of application.
According to any customers requirement AVX/Kyocera can offer best solution from various kind of timing device product line up.

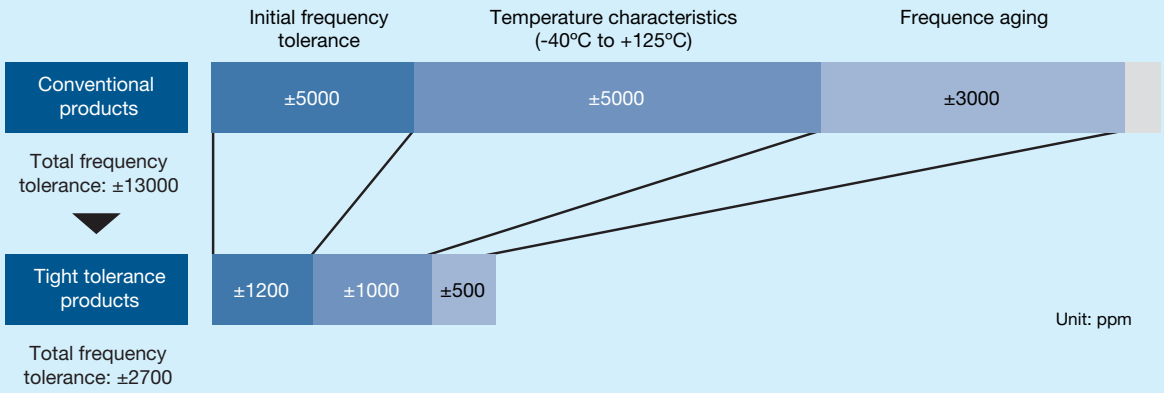
Type	Ceramic Resonator	Quartz Crystal
Frequency range	2.0 – 20 MHz	3.5 – 54 MHz
Size	Small	Big
Rise Time	Quick (about 100 times faster)	Slow
Element	Ceramic	Crystal
Tolerance	±0.2% to ±1.3%	±20 ppm to ±250 ppm
Capacitance	Integrated	External
Drive Level	No problem	Need to take care
Price/Costs	Not expensive	Expensive



Correct Loop Gain and Phase Shift leads to a proper clock-signal

RESONATOR TOLERANCES

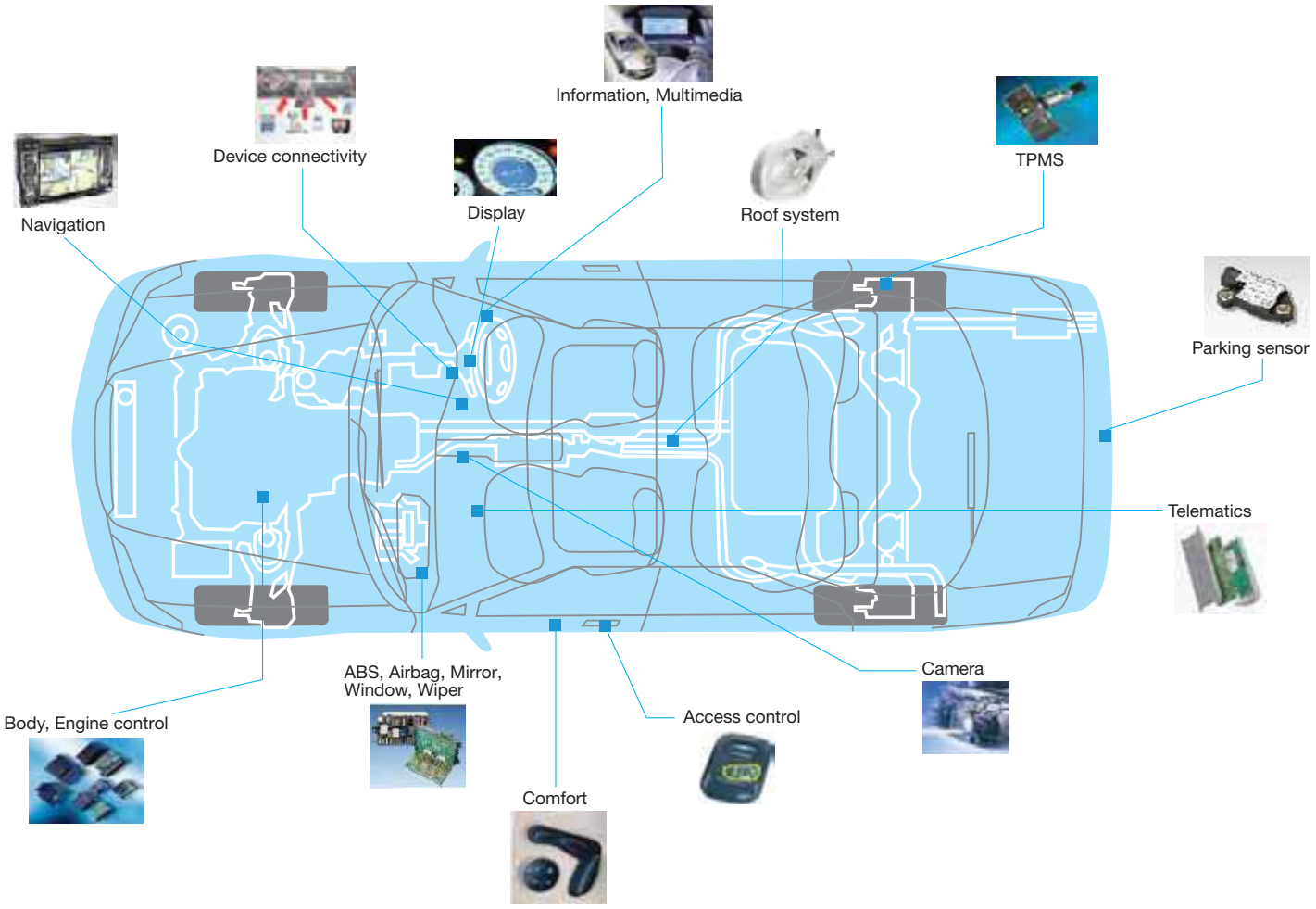
Crystal offers more precise tolerances (20ppm to 250ppm) but for many applications a resonator is the right choice, because it is cheaper than a quartz crystal.
Picture below shows the development of resonator tolerances.

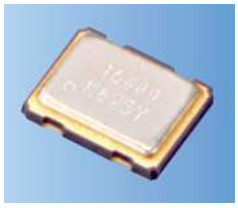


Tolerance evaluation of resonators in the last few years

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TIMING DEVICES IN AUTOMOTIVE APPLICATIONS



			
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AVX CORPORATION

AVX Corporation is a leading passive and interconnect components manufacturer. AVX automotive products offer reliable solutions for automotive applications.

- QUALITY
  AVX Automotive components are manufactured to the highest quality standards in accordance with automotive industry requirements.
- DESIGN KITS
  AVX offers automotive design kits for select product series to support the design process. Individual component samples are also available.
- MANUFACTURING LOCATIONS
  AVX/Kyocera provides a global manufacturing base, ensuring on-time delivery and a stable supply of the components to our customers around the world.

ANTICIPATING & ADAPTING

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AVX QUALITY POLICY

AVX, with AVX Sales and Marketing support, will be recognized by our customers as a “preferred” supplier for the quality and reliability of our products and services. AVX has adopted a Quality policy based on continuous improvement, the satisfaction of our customers, collaborators, partners and shareholders.

The objectives and measures are:

- To satisfy the customer's needs and requirements by supplying competitive and reliable products with:
  – zero defect, zero claim
  – 100 % on time delivery.
- To control all processes and improve performance:
  – maximize productivity and yield,
  – reduce non quality cost,
  – monitor process indicators.
- To manage this policy, AVX promotes:
  – empowerment and responsibility of all the staff,
  – involvement of our suppliers and partners,
  – a Quality Management System meeting ISO 9001, ISO/TS 16949 standards, customers and AVX requirements

Quality is measured by the level of our customer's satisfaction.

ISO/TS 16949

AUTOMOTIVE QUALIFICATION PROCESS

For automotive qualification process, AVX can provide needed qualification data and reports for its automotive parts to the customers. Main types of data reports requested by automotive customers are:

PPAP (Production Part Approval Process)

Production Part Approval Process is one of the key requirements for the automotive industry. Report is intended as an industry guideline that details the specific reports and documentation necessary to gain part approval in the automotive industry. The PPAP is governed by the PPAP manual published by the AIAG (Automotive Industry Action Group.) The PPAP level defines the details that are included in the report.

IMDS (International Material Data System)

The International Material Data System is a collective, computer-based material data system used to manage environmentally relevant aspects of the different parts used in vehicles. It has been adopted as the global standard for reporting material content in the automotive industry.

RELIABILITY

AVX regimented in-process testing for automotive components and strict sample criteria ensure all the components conform to the to the international standards such as AEC Q200 and all customer specifics requirements.

Together with continuous quality improvement process AVX components provide reliable solution for automotive application needs.

ENVIRONMENTAL

RoHS COMPLIANT

Protecting the environment is becoming more and more necessary every day. Therefore, this is a duty of the Company to its employees, neighbours, customers and the next generations.

AVX Policy is implemented with an environmental management system according to ISO 14001 standard and international standards.

AVX parts conform to the RoHS and REACH directives.

AVX parts are Hg Free and do not contain any hazardous substances such as Mercury, Cadmium, Hexavalent Chromium, Polybrominated Biphenyls or Polybrominated Diphenyl Ethers.

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AVX/Kyocera Manufacturing Locations



AVX

01 Sun Valley, California
02 Colorado Springs, Colorado
03 Juarez, Mexico
04 San Salvador, El Salvador
05 Olean, New York
06 Huntington Station, New York
07 Biddeford, Maine
08 Conway, South Carolina
09 Myrtle Beach, South Carolina
10 Jacksonville, Florida
11 Coleraine, Northern Ireland
12 Saint Apollinaire, France
13 Betzdorf, Germany
14 Lanskroun, Czech Republic
15 Uherske Hradiste, Czech Republic
16 Jerusalem, Israel
17 Penang, Malaysia
18 Tianjin, China

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