



# HIGH TEMPERATURE APPLICATIONS

| CERAMIC CAPACITORS | TANTALUM CAPACITORS | POLYMER CAPACITORS |  
| EMI FILTERS | VARISTORS | THERMISTORS |



# HIGH TEMPERATURE OVERVIEW



## ABOUT KYOCERA AVX

KYOCERA AVX is a worldwide leading supplier of passive electronic components, connectors, passive and active antennas, sensors and control units. KYOCERA AVX offers a wide range of components manufactured to the highest quality and reliability standards.

Our products include ceramic, solid electrolytic and film capacitors, pulse supercapacitors, varistors, thermistors, filters, inductors, diodes, antennas, connectors, sensors and control units. Our worldwide manufacturing capability includes facilities located in seventeen countries on four continents, allowing us to continue meeting customer needs on a global basis.

KYOCERA AVX is committed to supporting the needs of its customers for applications today and in the future. Together with continuous quality improvement process, KYOCERA AVX components provide reliable solutions for consumer application needs.

As a technology leader, KYOCERA AVX will continue to add to its product portfolio on a regular basis. Details of new devices being offered and their specifications will be shown on the KYOCERA AVX website: [WWW.KYOCERA-AVX.COM](http://WWW.KYOCERA-AVX.COM).

	AUTOMOTIVE					ENERGY								AVIONICS / NAUTICAL / AEROSPACE					
	Under Hood	Hybrid / Electric Vehicles	Engine Controls	Sensors	Timing Circuits	Down-hole Drilling	Down-hole Logging	Seismic	Geothermal	Wind / Solar	Sensors	Industrial	Timing Circuits	Transducer	Engine Controls	Air / Sea / Spacecraft	Satellites	Flap / Brake Controls	Timing Circuits
Ceramic Capacitors																			
Tantalum Capacitors																			
Polymer Capacitors																			
EMI Filters																			
Multilayer Varistors																			
NTC Thermistors																			

TEMPERATURE	PRODUCT	STATUS
300°C	<b>Ceramic</b> (Chip/Stacked)	In Development
250°C	<b>Ceramic Chip</b> (AT Series) • <b>Ceramic</b> (Custom Modules)	Available
230°C	<b>Solid Tantalum</b> (THH Series) • <b>Wet Tantalum</b> (TWA-X)	Available
200°C	<b>Stacked Ceramic</b> (SMX Series, SXP Series, XH Series – Under Range Extension) <b>Wet Tantalum</b> (TWA-Y Series, TWC-Y Series, TWM-Y Series) • <b>Solid Tantalum</b> (THJ+ Series) <b>Ceramic</b> (Custom Modules) • <b>Ceramic Chip</b> (AT Series) <b>EMI Filters</b> (High Temperature Solder-In) • <b>Multilayer Varistors</b>	Available
175°C	<b>Solid Tantalum</b> (THJ Series) • <b>Multilayer Varistors</b> • <b>Wet Tantalum</b> (TWD Series) <b>RF Ceramic Capacitors</b> (AQ Series)	Available
150°C	<b>Polymer Capacitor</b> (TCO Series) • <b>NTC Thermistors</b> <b>Chip/Leaded Ceramic</b> (X8R Series, X8L Series) • <b>Multilayer Varistors</b>	Available

# HIGH TEMPERATURE PRODUCT SELECTION GUIDE



## TANTALUM CAPACITORS

+175°C		<b>THJ &amp; THJ+   SMD CAPACITOR</b> <ul style="list-style-type: none"> <li>• Small size, fast pick &amp; place ready</li> <li>• Stable negative temperature operation</li> <li>• 3x reflow +260°C and RoHS compliant</li> <li>• Gold plated termination for hybrid assembly</li> </ul>	<b>Oper. Temp:</b> -55°C to +175°C (THJ) -55°C to +200°C (THJ+)
			<b>Case Size:</b> 1206 – 2917
+200°C			<b>Voltage:</b> 6.3V – 50V
			<b>Capacitance:</b> 0.1µF – 220µF

+175°C		<b>TWD SERIES   WET TANTALUM</b> <ul style="list-style-type: none"> <li>• Hermetically sealed axial leaded case</li> <li>• Extreme high capacitance values</li> <li>• Surge resistant</li> <li>• T4 standard case size per M39006</li> <li>• Meets shock &amp; vibration per MIL-STD-202, Method 213 &amp; 204</li> <li>• Endurance up to 10,000 hours on selected codes</li> <li>• Suitable for automatic mounting &amp; soldering</li> </ul>	<b>Oper. Temp:</b> -55°C to +175°C
			<b>Case Size:</b> T4
			<b>Voltage:</b> 3V – 10V
			<b>Capacitance:</b> 25mF – 100mF

+200°C		<b>TWA-Y, TWC-Y, TWM-Y SERIES   WET TANTALUM</b> <ul style="list-style-type: none"> <li>• Hermetically sealed axial leaded case (TWA / TWC) &amp; module (TWM)</li> <li>• T1–T4 standard case sizes per M39006</li> <li>• Surge resistant</li> <li>• Meets shock &amp; vibration per MIL-STD-202, Method 213 &amp; 204</li> <li>• Capable of continuous operation at 200°C with derating</li> </ul>	<b>Oper. Temp:</b> -55°C to +200°C
			<b>Case Size:</b> T1 – T4
			<b>Voltage:</b> 6V – 125V
			<b>Capacitance:</b> 6.8µF – 4700µF (TWA/TWC) 9000µF (TWM)

+230°C		<b>TWA-X SERIES   WET TANTALUM</b> <ul style="list-style-type: none"> <li>• Hermetically sealed axial leaded case</li> <li>• T4 standard case size per M39006</li> <li>• Surge resistant</li> <li>• Meets shock &amp; vibration per MIL-STD-202, Method 213 &amp; 204</li> <li>• Capable of continuous operation at 230°C with derating</li> </ul>	<b>Oper. Temp:</b> -55°C to +230°C
			<b>Case Size:</b> T4
			<b>Voltage:</b> 75V – 125V
			<b>Capacitance:</b> 220µF – 400µF

+230°C		<b>THH SERIES   HERMETICALLY SEALED SMD CAPACITOR</b> <ul style="list-style-type: none"> <li>• Ceramic case hermetic packaging</li> <li>• Superior stability when exposed to high temperatures, high humidity, and ambient atmosphere</li> <li>• Large case sizes including CTC-21D provide high capacitance values</li> <li>• Extended lifespan to 10,000 hours at 200°C and 50% derating</li> </ul>	<b>Oper. Temp:</b> -55°C to +230°C
			<b>Case Size:</b> 9 (CTC-21D), I
			<b>Voltage:</b> 16V – 50V
			<b>Capacitance:</b> 6.8µF – 100µF

# POLYMER CAPACITORS

<b>+150°C</b>		<b>TCO SERIES   SMD CAPACITOR</b> <ul style="list-style-type: none"> <li>• Conductive polymer electrode</li> <li>• Robust design for automotive applications (meets AEC-Q200)</li> <li>• -55 to +150°C operation temperature</li> <li>• DCL 0.1 CV</li> <li>• 3x reflow 260°C compatible</li> </ul>	<b>Oper. Temp:</b> -55°C to +150°C
			<b>Case Size:</b> 2917
			<b>Voltage:</b> 50V
			<b>Capacitance:</b> 10µF

# EMI FILTERS

<b>+200°C</b>		<b>EMI FILTERS   HIGH TEMPERATURE SOLDER-IN</b> <ul style="list-style-type: none"> <li>• High temperature construction withstands 400°C installation temperatures</li> <li>• Features rugged monolithic discoidal MIL-C-123 capacitor construction</li> <li>• Glass hermetic seal on one end with epoxy seal on the opposite end</li> <li>• High purity gold plating provides excellent solderability or compatibility with thermal and ultrasonic wire bonding</li> <li>• Custom design available, multiple filter arrays</li> </ul>	<b>Oper. Temp:</b> -55°C to +200°C
			<b>Voltage:</b> 50V – 300V
			<b>Capacitance:</b> 10pF – 1.4mF

# CIRCUIT PROTECTION

<b>+150°C</b>		<b>VARISTORS   SMT HIGH TEMPERATURE</b> <ul style="list-style-type: none"> <li>• Bi-directional TVS protection + EMI filtering</li> <li>• No power derating over operating temperature range (150/175°C)</li> <li>• VTA7 Series capable of 200°C operation - contact factory for details</li> <li>• Discrete, 2 and 4 element components</li> <li>• From high energy to low capacitance options</li> <li>• AEC-Q200 Qualified</li> <li>• Unsurpassed reliability compared to TVS diode options</li> </ul>	<b>Oper. Temp:</b> -55°C to +150/175/200°C
			<b>Case Size:</b> 0603 – 3220
			<b>Voltage:</b> 14V – 32V
			<b>Capacitance:</b> 12pF – 15nF
<b>+175°C</b>			<b>Energy:</b> 0.015J – 13J
<b>+200°C</b>			

<b>+150°C</b>		<b>VARISTORS   RADIAL HIGH TEMPERATURE</b> <ul style="list-style-type: none"> <li>• Epoxy encapsulated for harsh environment</li> <li>• EMI/RFI attenuation in off state</li> <li>• Excellent current and energy handling</li> <li>• AEC-Q200 Qualified</li> <li>• Circuit protection &amp; EMI/RFI attenuation function into a single device</li> <li>• Ni/Sn leads, optional Ni free wires upon request</li> <li>• ESD rated to 25kV (HBM ESD Level 6)</li> </ul>	<b>Oper. Temp:</b> -55°C to +150°C
			<b>Case Size:</b> VR15, VR20
			<b>Voltage:</b> 14V – 48V
			<b>Energy:</b> 0.1J – 2.0J
			<b>Peak Current:</b> 30A – 120A

<b>+150°C</b>		<b>THERMISTORS   NTC SMT</b> <ul style="list-style-type: none"> <li>• Wide resistance range</li> <li>• Fast thermal response</li> <li>• Ni Barrier/100% Sn and AgPdPt termination options</li> <li>• Custom high reliability testing available</li> <li>• AEC-Q200 Qualified</li> </ul>	<b>Oper. Temp:</b> -55°C to +150°C
			<b>Case Size:</b> 0603 – 1206
			<b>Resistance:</b> 10Ω – 1MΩ
			<b>B Value (25/28):</b> 3250K – 4500K

<b>+150°C</b>		<b>THERMISTORS   NTC LEADED AND LEADLESS</b> <ul style="list-style-type: none"> <li>• Leadless metallized disc or high accuracy chip</li> <li>• Leaded disc or high accuracy bead NTC</li> <li>• Various coating options and configurations</li> <li>• Fast response, excellent reliability</li> <li>• Custom high reliability testing available</li> <li>• AEC-Q200 Qualified</li> </ul>	<b>Oper. Temp:</b> -55°C to +150°C
			<b>Head Size:</b> 2.4mm – 9mm
			<b>Resistance:</b> 68Ω – 1MΩ
			<b>B Value (25/28):</b> 3250K – 4500K
			<b>Tolerance:</b> From +/- 1%

# CERAMIC CAPACITORS

+150°C		<b>X8R/X8L DIELECTRIC   SMT MLC CAPACITORS</b> <ul style="list-style-type: none"> <li>• Excellent reliability and Low ESR / ESL</li> <li>• Tin solder finish</li> <li>• FLEXITERM® available</li> <li>• Epoxy termination for hybrid available</li> <li>• AEC-Q200 Qualified</li> </ul>	Oper. Temp: -55°C to +150°C
			Case Size: 0603 – 1206
			Voltage: 25V – 100V
			Capacitance: 330pF – 10µF
+150°C		<b>X8R DIELECTRIC   LEADED MLC CAPACITORS</b> <ul style="list-style-type: none"> <li>• Designed for use in applications up to 150°C</li> <li>• Excellent reliability and Low ESR / ESL</li> <li>• Radial and Axial epoxy encapsulated for harsh environments</li> <li>• AEC-Q200 Qualified</li> </ul>	Oper. Temp: -55°C to +150°C
			Case Size: Radial, Axial
			Voltage: 50V, 100V
			Capacitance: 1000pF – 330nF
+175°C		<b>AQ SERIES   SMT RF MLC CAPACITORS</b> <ul style="list-style-type: none"> <li>• High current carrying capabilities; High quality factors</li> <li>• Very low ESR; Very high series resonance</li> <li>• Excellent stress stability</li> </ul>	Oper. Temp: -55°C to +175°C
			Case Size: 0605 – 1210
			Voltage: 150V – 500V
			Capacitance: 0.1pF – 330pF
+200°C		<b>SMX STYLE   STACKED MLC CAPACITORS</b> <ul style="list-style-type: none"> <li>• Excellent capacitance retention with frequency</li> <li>• Low ESR / ESL</li> <li>• Excellent high frequency performance</li> <li>• Low DC leakage current</li> <li>• Higher current handling capabilities</li> </ul>	Oper. Temp: -55°C to +200°C
			Case Size: SMX 1 – 6
			Voltage: 25V – 500V
			Capacitance: 3900pF – 270nF
+200°C		<b>SXP STYLE   SMPS MLC CAPACITORS</b> <ul style="list-style-type: none"> <li>• Low ESR, Low ESL, Low DC leakage</li> <li>• Excellent high frequency performance</li> <li>• Suited for high temperature applications up to 200°C</li> <li>• Excellent mechanical protection for extreme harsh environments</li> </ul>	Oper. Temp: -55°C to +200°C
			Case Size: SXP 1 – 4
			Voltage: 50V, 100V
			Capacitance: 100pF – 12µF
+200°C		<b>CUSTOM MODULE   MLC CAPACITORS</b> <ul style="list-style-type: none"> <li>• Custom lead configurations: Bespoke packaging options</li> <li>• Unique geometries</li> <li>• Wide voltage and capacitance range</li> <li>• Different dielectric options available</li> </ul>	Oper. Temp: -55°C to +200/250°C
			Case Size: Custom
+250°C			Voltage: 50V, 100V
			Capacitance: 1000pF – 330nF
+200°C		<b>AT SERIES   HIGH TEMPERATURE SMT MLC CAPACITORS</b> <ul style="list-style-type: none"> <li>• High insulation resistance</li> <li>• Very low ESR/ESL</li> <li>• High volumetric efficiency</li> <li>• Temp Coefficient: COG (NPO), VHT (X7R)</li> <li>• Life tested to 1,000 hours @ 200% rated voltage and +250°C</li> </ul>	Oper. Temp: -55°C to +200/250°C
			Case Size: 0805 – 2225
+250°C			Voltage: 16V – 25V
			Capacitance: 100pF – 1µF



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