



# INDUSTRIAL APPLICATION GUIDE

ANTENNAS | CERAMIC CAPACITORS | CONNECTORS | CRYSTALS | DIODES | FILM CAPACITORS | INDUCTORS  
| MULTILAYER VARISTORS | NTC THERMISTORS | POLYMER CAPACITORS | POWER SEMICONDUCTORS |  
PULSE SUPERCAPACITOR | TANTALUM CAPACITORS



## ABOUT KYOCERA AVX



## 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, 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 industrial 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).

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# INDUSTRIAL

## PRODUCT SELECTION GUIDE



### ANTENNAS



#### ON BOARD

Standard SMT antennas using different technologies for easy implementation and fast time-to-market. Ceramic, PCB-based, stamped metal, patch.

Bands	Frequency
GSM, 3G, LTE /4G, WIFI, BT, GNSS ISM LPWAN, 5G	433, 868 MHz 700 MHz – 2.7 GHz 5.1 – 5.9 GHz; 20 – 67 GHz



#### OFF BOARD

Standard antennas using different technologies for easy implementation and fast time-to-market. FPC and PCB with cable. Different connectors: w.fl or u.fl compatible, SMA, MMCX.

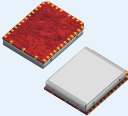
Bands	Frequency
GSM, 3G, LTE /4G, WIFI, BT, GNSS ISM LPWAN, 5G	433, 868 MHz 700 MHz – 2.7 GHz 5.1 – 5.9 GHz; 20 – 67 GHz



#### EXTERNAL

Standard and custom external antennas covering a wide range of applications. Cabled, direct connection, screw mounted, magnet mounted. Indoors and outdoors use. Ruggedized mechanics for critical environment.

Bands	Frequency
GSM, 3G, LTE /4G, WIFI, BT, GNSS ISM LPWAN, 5G	433, 868 MHz 700 MHz – 2.7 GHz 5.1 – 5.9 GHz; 20 – 67 GHz

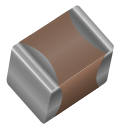


#### CUSTOMER SPECIFIC

Custom antennas in different manufacturing technologies: LDS, two-shot molding, insert molding. Smart antennas for high performance applications Active Steering Antenna technology embedded in LoRa module. Testing services: simulations and measurements in anechoic.

Bands	Frequency
GSM, 3G, LTE /4G, WIFI, BT, GNSS ISM LPWAN, 5G	433, 868 MHz 700 MHz – 2.7 GHz 5.1 – 5.9 GHz; 20 – 67 GHz

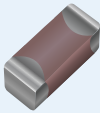
### CERAMIC CAPACITORS



#### SMT CERAMIC CAPACITORS

Ceramic capacitors exhibit low ESR / ESL and excellent EMI filtering capabilities. NP0 parts are suitable for use in MHz range with very stable characteristics. X7R/X5R parts are suitable for use in general kHz range. High temperature dielectric parts are suitable for +150/250 °C applications.

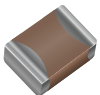
Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +125/150/250 °C	01005 - 3640	4V - 5000V	0.1pF - 100µF



#### FLEXITERM® AND FLEXISAFE CAPACITORS

FLEXITERM® flexible termination technology for ceramic capacitors provides superior resistance to mechanical and thermal stress and is available in a number of ranges. FLEXISAFE capacitors are designed specifically for safety critical applications utilizing FLEXITERM® layer in conjunction with the cascade design structure to provide components with an industry leading set of safety features.

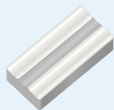
Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +125/150 °C	0603 - 2225	10V - 5000V	10pF - 22µF



#### ESD SAFE™ CAPACITORS

The ESD-Safe™ series is an enhanced MLC capacitor with X7R dielectric designed specifically for general ESD protection. Capacitors are utilized for ESD protection of I/O gates and could be used on nearly every pin of an electronic module. Their use averages the voltage that the wiring harness can be charged to and the module voltage.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +125 °C	0603 - 1206	25V - 100V	4.7nF - 2.2µF



#### LOW INDUCTANCE CAPACITORS

The low inductance and high performance decoupling series are designed for operating frequencies of 300MHz or greater, high speed buses and low voltages. The lower the ESL of a capacitor, the faster that energy can be transferred to a load.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +85/105/125 °C	0204 - 0612	4V - 50V	1nF - 3.3µF



#### LEADED CERAMIC CAPACITORS

Designed for use in applications where leaded component is preferred, and available in radial and axial epoxy or plastic mold encapsulation for harsh environment. Parts offer low ESR / ESL and excellent reliability, available with NP0, X7R and X8R/X8L dielectrics.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +125/150 °C	Radial, Axial	50V - 3000V	1pF - 10µF

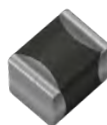


#### SMPS MLC CAPACITORS

Stacked ceramic capacitors in a number of standard & bespoke packages. Parts offer higher current handling capabilities, excellent high frequency performance and low ESR/ESL compared to other technologies. Parts are suitable for harsh vibration and high temperature applications.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +125/150/200 °C	Stacked	25V - 5000V	100pF - 1300µF

### CIRCUIT PROTECTION



#### MULTILAYER VARISTORS

Varistors provide reliable bi-dimensional circuit protection from voltage transients caused by ESD, inductive switching, lighting, etc. Parts offer multiples strike capability, high reliability and also provide EMI/RFI filtering in the off-state. Available in wide range of components to suit various application needs - from high energy to low capacitance or ultra-low leakage.

Op. Temp.	Case Size	Voltage	Energy
-55 °C to +125/150/175 °C	0201 - 3220, Radial, Axial	3.0 - 385V	up to 13.8J



# INDUSTRIAL

## PRODUCT SELECTION GUIDE



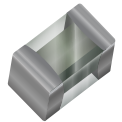
### CIRCUIT PROTECTION CONTINUED



#### NTC THERMISTORS

NTC Thermistors are widely used for temperature measurement or temperature compensation. Parts offer fast thermal response, excellent reliability in SMT, leaded, and leadless configuration. High accuracy series available with tolerances from  $\pm 1\%$ .

Op. Temp.	Case Size	Resistance	B25/55
-55 °C to +150 °C	0603 - 1206, Radial	10 $\Omega$ - 1M $\Omega$	3250 - 4840K



#### FUSES

The Accu-Guard® series of fast acting fuses is based on thin-film techniques. This technology provides a level of control on the component electrical and physical characteristics that is generally not possible with standard fuse technologies.

Op. Temp.	Case Size	Voltage	Current Rating
-55 °C to +125 °C	0402 - 1206	16 - 63V	0.028 - 5A

### CONNECTORS



#### BOARD-TO-BOARD

**1-Piece** connector include compression stacking with robust contacts and card edge connectors for perpendicular and coplanar mating and industry standard PCI Express® M.2.

**2-Piece** connector offer wide variety options for vertical or parallel connection, low profile, and space-saving types with wide range of stacking heights to specialized solutions for end to end mating of PCB boards designed for the LED lighting strips.

Op. Temp.	Positions	Pitch	Current Rating	Voltage Rating
+85 / 105/ 125°C	1 - 140	0.35 - 4mm	0.3 - 3A	50 - 300VAC

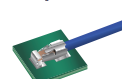


#### WIRE-TO-BOARD

**1-Piece** interconnect system provides discrete wire-to-board connections for power, ground and leaded devices. Includes popular Insulation Displacement with excellent shock and vibration resistance, Poke-Home and Strip (naked) Contacts with simple wire insertion.

**2-Piece** interconnect system provides high density and multipurpose solution including 2.54mm pitch and miniature 2-pin wire connectors.

Op. Temp.	Positions	Wire Gauge	Current Rating	Voltage Rating
+85 / 105/ 125°C	1 - 40	12 - 32AWG	1 - 20A	30 - 600VAC



#### WIRE-TO-WIRE

**1-Piece** discrete through wire and junction box connectors based on industry proven IDC, Crimped and Poke-Home Contact technologies.

**2-Piece** connector provides high density and multipurpose solution with 2.54mm pitch.

Op. Temp.	Positions	Wire Gauge	Current Rating	Voltage Rating
+125 / 130 °C	1 - 8	12 - 26AWG	3 - 15A	300 - 600VAC



#### FFC/FPC

Compact, space saving connectors with narrow-pitch and low-profile for products requiring high-speed data transmission. Available in wide variety of types including one-touch lock, sliding ZIF or Non-ZIF.

Op. Temp.	Positions	Pitch
+85 / 105 / 125°C	3 - 100	0.2 - 12mm



#### SPECIALTY

KYOCERA AVX offers wide range of additional connector types for various applications such as:

Memory Card & SIM | Input/Output | Shunt Connectors | DIN | Single Pair Ethernet | RF Connectors | Branch Connectors and more.

### CRYSTALS

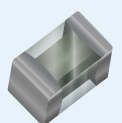


#### CRYSTALS

KAVX is a leading manufacturer in developing cutting edge crystal products, offering ultra miniature, high accuracy, and wide operating temperature range devices with high frequency options and a variety of output types. These products include crystal units, clock oscillators, voltage controlled crystal oscillators, and temperature compensated crystal oscillators.

Clock Osc.	Crystal Units	Vcxo	Tcxo
1.5 - 80 MHz	8 - 60 MHz	8 - 60 MHz	8 - 60 MHz

### DIODES



#### GIGUARD

Utilizing the latest in TVS Technology combined with a unique leadless package, the new GiGuard series of ESD Suppression Diodes offers clamping voltages below 12V and cap values as low as 0.3pF. This combination of excellence both protects sensitive ICs during ESD events and preserves the integrity of the protected high speed signals. The GG Series fits perfectly onto the same PCB solder pads as standard EIA 0201/0402 components.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +125°C	0201 - 0603	3.3V - 12V	0.3pF - 32pF

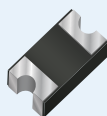


#### TV DIODES

Bi-directional and uni-directional TVS diodes in industry standard SMAJ (400W), SMBJ (600W), and SMCJ (1500W) sizes. Parts offer low leakage, flat clamping, and are halogen free with lead-free termination.

Op. Temp.	Case Size	Voltage	Power
-55 °C to +150 °C	SMA, SMB, SMC	5 - 440 V	400 - 1500W

### DIODES CONTINUED

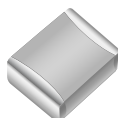


#### SCHOTTKY DIODES

Schottky rectifier diodes offer unique lead-less chip packaging technology with top-bottom symmetry for fewer mounting problems, better heat transfer and current handling capability (compared to SOD devices). Parts offer low forward voltage, high current capability, and low power loss/high efficiency.

Op. Temp.	Case Size	Max Reverse Voltage	Max Forward Current
-55 °C to +125 °C	0603 - 3220	20V - 200V	0.1 - 100A

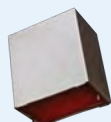
### FILM CAPACITORS



#### FILM CHIP

The self healing property of film dielectric provides an open failure mode capacitor with excellent reliability. The intrinsic characteristic of film provides a capacitor which exhibits low DC Bias, no piezo effect and low ESR / ESL and dissipation factor with excellent thermal behavior and thermal shock resistance.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +125 °C	1206 - 6054	16V - 630V	1nF - 4.7μF



#### MEDIUM POWER

Medium power film capacitors are used for DC & AC filtering, protection, discharge and tuning. Parts offer high rms current, high temperature up to 105°C and use dry segmented metallization for controlled self-healing. Parts are qualified to the highest International Railway Industry Standard (IRIS).

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +105 °C	Radial, Axial	75V - 3kV	0.01μF - 25500μF



#### HIGH POWER

High power film capacitors are used for DC filtering and discharge applications. Parts offer high peak current, high energy options and low ESR / ESL compared to other technologies. Parts are impregnated with vegetable oil and incorporate controlled self-healing technology. Parts are qualified to the highest International Railway Industry Standard (IRIS).

Op. Temp.	Case Size	Voltage	Capacitance
-55°C to +85 °C	Rectangular Stainless Steel	1.5kV - 100kV	130μF - 40mF

### INDUCTORS



#### POWER AND RF INDUCTORS

Surface mount power inductors for applications ranging from power supply to power converters. Core types include ferrite and pressed iron powder with topologies including: non-shielded, shielded, pressed iron powder, ferrite coated and wire-wound chip inductors. RF Inductors include MLO™, Thin Film, Air Core, Wire Wound Ceramic and Multilayer Ceramic. Parts offer high Q, high current, excellent SRF and excellent reliability.

Op. Temp.	Inductance	Tolerance	Current
-40 °C to +85/105 /125/155 °C	0.3nH - 10,000μH	±0.05nH to ±30%	0.02A - 120A

### NIOBIUM OXIDE CAPACITORS



#### NIOBIUM OXIDE CAPACITORS

OxiCap® is an alternative technology to tantalum ones. The capacitors are made from oxide niobium materials and offers superior reliability with the same form, case size, and technical performance as standard tantalum capacitors. OxiCap® offers non-burn and non smoke safety technology, high resistance to overvoltage breakdown.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +105/125 °C	1206 - 2924	1.8V - 10V	2.2μF - 1000μF

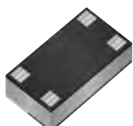
### RF PRODUCTS



#### RF FILTERS

Low Pass, Band Pass, High Pass, Broadband, and SAW Filters for frequencies from 500 kHz to 26 GHz. Thin Film and MLO™ technology filters suitable for WiMAX, WiBro, Mobile, GPS, and WLAN applications. Low profile MLO™ Duplexers for W/CDMA, GSM, 4G, Bluetooth W-LAN, GPS, and SAW Duplexers and Quadplexers for 4G and 5G.

Operating Temperature	Filtering Frequency
-55/-40 °C to +85 °C	500kHz - 26GHz



#### RF COUPLERS

High directivity and 3dB 90° couplers based on thin-film and multilayer organic technology with excellent high frequency performance, offering high directivity, low insertion loss, high isolation and rugged construction for reliable automatic assembly. Used for balance amplifiers and signal distribution in wireless communications.

Operating Temperature	Filtering Frequency
-55/-40 °C to +85 °C	40MHz - 6GHz

### SUPERCAPACITORS



#### CYLINDRICAL SUPERCAPACITORS

The SCC and SCM series of cylindrical electrochemical double-layer capacitors offers excellent pulse power handling characteristics based on the combination of very high capacitance and very low ESR. Used by themselves or in conjunction with primary or secondary batteries, they provide extended back up time, longer battery life, and provide instantaneous power pulses as needed. Offers great solutions to Hold Up, Energy Harvesting, and Pulse Power Applications.

Op. Temp.	Voltage	Capacitance
-40 to +65/85 °C	2.3V - 9V	0.33F - 3000F

### TANTALUM CAPACITORS



#### SMT SOLID ELECTROLYTIC CAPACITORS

High capacitance in small case size are available as standard MnO<sub>2</sub> chip or Multinode. Wide temperature range, long operational life, high reliability and stable electrical performance over lifetime. Excellent resistance against thermo-mechanical shocks, no piezo effect and low ESR.

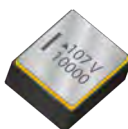
Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +125/135/175/200 °C	0402 - 5831	2.5V - 50V	0.1µF - 3300µF



#### LEADED TANTALUM

Tantalum capacitors with dipped resin encapsulation and radial lead wire terminations for through hole assembly. Low leakage current, very small physical sizes and excellent temperature stability.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +125 °C	Radial	6.3V - 50V	0.1µF - 330µF



#### WET AND HERMETIC SOLID CAPACITORS

Wet tantalum and solid hermetic capacitors are suited for high performance demanded applications. Wet tantalum are available as a single axial design or as a module for even higher CV. Hermetic ones (as polymer or MnO<sub>2</sub>), comes with improved reliability and operation temperature range. Super capacitor is sharing wet tantalum capacitors internal design and offer high capacitance above a classic super capacitors temperature operation range. Parts are hermetically sealed and available in various reliability ranges from CotsPlus, Mil, DLA up to space level.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +105/125/150 °C	0402 - 2924	2.5V - 125V	0.47µF - 1500µF



#### TANTALUM MICROCHIP

Solid tantalum electrolytic capacitors are conformal coated chip capacitors with very high volumetric efficiency and industrial smallest SMD case size down to 0402 and with low profile options below 0.5mm. Parts have no piezo effect and have high reliability.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +125 °C	0402 - 1210	2V - 35V	0.1µF - 220µF



#### POLYMER CAPACITORS

KYOCERA AVX Polymer technology targets general and specific market requirements with high capacitance in small and low profiles, lowest ESR, stability of performance in time.

Op. Temp.	Case Size	Voltage	Capacitance
-55 °C to +105/125/150 °C	0402 - 2924	2.5V - 125V	0.47µF - 1500µF

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