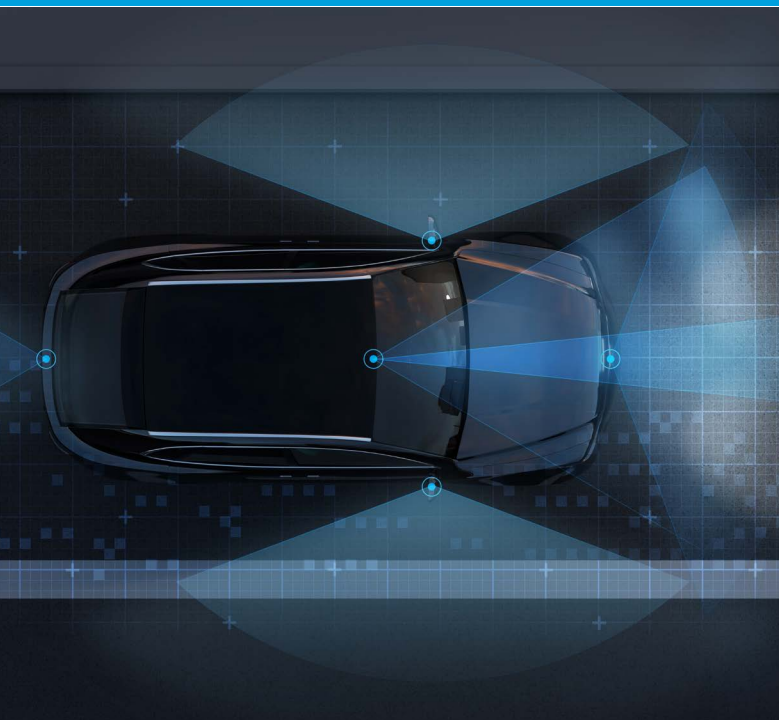




# AUTOMOTIVE APPLICATIONS GUIDE

ANTENNAS | CERAMIC CAPACITORS | CONNECTORS | CRYSTALS | FILM CAPACITORS | MULTILAYER VARISTORS | NIOBIUM OXIDE | NTC THERMISTORS | POLYMER CAPACITORS | TANTALUM CAPACITORS





### FILM CAPACITORS



#### FILM CHIP CAPACITORS

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

Series	Operating Temp	Range
PPS	+125°C	16V – 50V   1nF – 180nF
PEN	+125°C	25V – 630V   0.01µF – 4.7µF
PEN-HT	+125°C	63V – 630V   0.01µF – 4.7µF



#### MEDIUM POWER FILM & DC LINK FILM CAPACITORS

FFV, FFLI and Custom parts are medium power film capacitors for DC filtering, high rms current and high temperature automotive applications. FAV series are high reactive energy tuning capacitors for HEV/EV battery charging applications.

FHC DC link capacitors are designed for use in conjunction with HEV/EV vehicles IGBT modules.

Series	Operating Temp	Range
FFV Series (PET/PPY)	+105°C	300V – 1900V   22µF – 400µF
FFLI (PPY)	+95°C	800V – 1400V   105µF – 3mF
Custom Parts (PPY)	+105°C	75V – 1400V   300µF – 1.5mF
FHC (PPY)	+105°C	410V – 900V   410µF – 900µF

### LEADED CERAMIC CAPACITORS



#### RADIAL

KYOCERA AVX leaded MLCCs offer excellent mechanical shock and vibration resistance in harsh environment applications, exceptional thermal resistance, and proven reliability and quality. Both dipped and molded configurations available.

Dielectric	Operating Temp	Range
NP0	+125°C	50V – 200V   1pF – 8200pF
X7R	+125°C	50V – 100V   470pF – 10µF
X7R High Voltage	+125°C	1000V – 3000V   470pF – 10nF
X8R	+150°C	50V   1nF – 330nF



#### AXIAL

Axial version of the leaded epoxy coated capacitors. Both dipped and molded configurations available.

Dielectric	Operating Temp	Range
X7R	+125°C	50V   10nF – 4.7µF

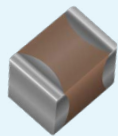
### NIOBIUM OXIDE CAPACITORS



Niobium OxiCap® capacitors offer unique features - high reliability, non-burn and non-smoke technology, more resistance to overvoltage breakdown, lower recommended derating, and high resistance failure mode. OxiCap® capacitors suits application where reliability and safety is of primary focus.

Series	Operating Temp	Range
NOJ	+105°C	1.8V – 10V   4.7µF – 1000µF
NOS	+125°C	1.8V – 8V   10µF – 1000µF
NOM	+125°C	1.8V – 6.3V   220µF – 680µF

### SMT CERAMIC CAPACITORS

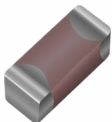


#### TIN TERMINATION

KYOCERA AVX Ceramic Capacitors exhibit low parasitics and excellent EMI filtering capabilities. KYOCERA AVX MLC Capacitors are available in wide range of values, styles, voltage ratings and dielectrics.

Ultra Low ESR NP0 - "U" dielectric parts are designed for RF applications requiring ultra-low ESR. NP0 parts are suitable for use in MHz range with very stable characteristics. X7R parts are suitable for use in general kHz range. X8R / X8L parts are designed for high temperature applications up to +150°C.

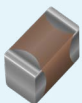
Dielectric	Operating Temp	Range
NP0 Ultra Low ESR	+125°C	50V – 200V   0.2pF – 1.0nF
NP0	+125°C	25V – 1kV   1pF – 47nF
X7R / S / T	+125°C	4V – 500V   220pF – 22µF
X7R High Voltage	+125°C	600V – 3000V   100pF – 0.15µF
X8R / L	+150°C	25V – 100V   330pF – 10µF
X8G	+150°C	25V – 100V   1pF – 470pF



#### FLEXITERM®

FLEXITERM® MLC Capacitors equipped with an KYOCERA AVX flexible termination system. They have superior resistance to both mechanical stress (board flexure - 5mm bend test guaranteed) and thermal stress (increased temperature cycling performance, 3000 cycles and beyond).

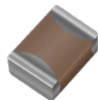
Dielectric	Operating Temp	Range
X7R	+125°C	16V – 200V   270pF – 22µF
X7R High Voltage	+125°C	600V – 3000V   100pF – 0.15µF
X8R / L	+150°C	25V – 100V   330pF – 10µF



#### FLEXISAFE

Specifically designed with an industry leading set of safety features for safety critical applications. Combines FLEXITERM® layer in conjunction with the cascade design.

Dielectric	Operating Temp	Range
X7R	+125°C	16V – 100V   1nF – 470nF



#### ESD SAFE

Enhanced MLC capacitor designed specifically for general ESD protection.

Dielectric	Operating Temp	Range
X7R	+125°C	25V – 100V   4.7nF – 2.2µF

# AUTOMOTIVE

## PRODUCT SELECTION GUIDE



### ANTENNAS



#### ON BOARD

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

Bands	Frequency
GSM, 3G, LTE /4G, WiFi, BT, V2X, GNSS, UHF, ISM, LPWAN, Satellite, 5G	433, 868 MHz 700 MHz – 2.7 GHz 5.1 – 5.9 GHz; 20 – 67 GHz



#### EXTERNAL

Roof mounted, shark fin, aftermarket antennas. Waterproof IP67/68. PPAP documentation available.

Bands	Frequency
GSM, 3G, LTE /4G, WiFi, BT, V2X, GNSS, UHF, ISM, LPWAN, Satellite, 5G	433, 868 MHz 700 MHz – 2.7 GHz 5.1 – 5.9 GHz; 20 – 67 GHz



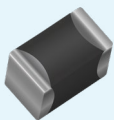
#### CUSTOMER SPECIFIC

Custom antennas in different manufacturing technologies: LDS, two-shot molding, insert molding.

Testing services: simulations and measurements in Automotive Chamber

Bands	Frequency
GSM, 3G, LTE /4G, WiFi, BT, V2X, GNSS, UHF, ISM, LPWAN, Satellite, 5G	433, 868 MHz 700 MHz – 2.7 GHz 5.1 – 5.9 GHz; 20 – 67 GHz

### CIRCUIT PROTECTION



#### AUTO SERIES MULTILAYER VARISTORS

Reliable bi-directional protection from voltage transients (ESD, inductive switching, automotive transients, etc). Multiple strike capability, high reliability, and EMI/RFI filtering in the off-state.

Case Sizes	Operating Temp	Range
0201 – 3220 Radial, Axial	+125/150/175°C	3.3 – 85V   0.8pF – 4.7µF

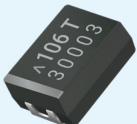


#### NTC THERMISTORS

Parts are AEC-Q200 qualified and offer fast thermal response, excellent reliability in SMT, leaded and leadless configuration. High accuracy series available with tolerances from ±1%. Customized solutions are available.

Case Sizes	Operating Temp	Range
0603 – 1206 Radial	+150°C	10Ω – 1MΩ B25/85: 3250 – 4840K

### CONDUCTIVE POLYMER CAPACITORS



Automotive polymer series of low ESR capacitors. Qualified in accordance with AEC-Q200.

Series	Operating Temp	Range
TCQ	+105/125°C	2.5V – 50V   10µF – 470µF
TCO	+150°C	50V   10µF

### CONNECTORS



#### IDC

Provides reliable "Gas Tight" wire-to-board connections for high temperature, shock and vibration applications. Can also be used with Press-Fit pin technology as 1-piece solution to replace costly 2-piece connector solution.

Range
IDC : AWG 12 – 28, SMT and PTH IDC Press-Fit : AWG 18 – 24



#### CUSTOM AUTO CONNECTORS

Advanced component, process and automation technology provides high pin and component (Mechatronics) count connector and module solutions for emerging automotive systems, engine management, braking, steering, safety, environmental, etc.

Range
Based on customer requirements



#### B2B AND FFC/FPC CONNECTORS

Board-to-Board connectors, including types with floating structure absorbing vibrations and mirror misalignment with high contact reliability.

FFC/FPC narrow pitch and low profile SMT and PTH connectors supporting high speed data transition.

Range
B2B: 2 – 140 Positions, 0.35 – 2.54mm Pitch FFC/FPC: 3 – 100 Positions, 0.20 – 12.0mm Pitch

### CRYSTALS



#### CLOCK OSCILLATORS AND CRYSTAL UNITS

Ultra miniature, high accuracy and wide operating temperature range devices with high frequency options and a variety of output types.

Range
Clock Oscillators: 1.5 – 80MHz Crystal Units: 8 – 60MHz

### TANTALUM CAPACITORS



KYOCERA AVX automotive tantalum capacitors offer excellent parameters stability over lifetime, resistance against thermo-mechanical stresses, and high surge robustness. Capacitors are available in both standard and low ESR options. They are also available in a high temperature series up to +175°C which makes them suitable for a wide range of automotive control circuits in applications such as engine control units, ABS systems, MDPS, electronic gearboxes, TPMS, etc.

Series	Operating Temp	Range
TAJ/F93	+125°C	4V – 50V   0.22µF – 680µF
TAJ/F93	+125°C	4V – 50V   0.22µF – 680µF
TPC/F91	+125°C	6.3V – 50V   0.22µF – 680µF
TPC/F91	+125°C	6.3V – 50V   0.22µF – 680µF
TRJ/F97	+125°C	4V – 50V   0.1µF – 680µF
TRJ/F97	+125°C	4V – 50V   0.1µF – 680µF
TRM	+125°C	2.5V – 50V   4.7µF – 1500µF
TMJ	+125°C	6.3V – 50V   0.22µF – 680µF
F98-AJ6	+125°C	6.3V – 16V   4.7µF – 47µF
F97-HT3	+135°C	6.3V – 35V   0.33µF – 68µF
THJ +175°C	+175°C	6.3V – 50V   0.1µF – 220µF

### THIN FILM CAPACITORS



Very low-loss (high-Q) SMT capacitors, especially for the wireless communications market at frequencies up to and above 5.8GHz. Accu-P® is unique in its ability to offer very low capacitance values (0.05 pF) and ultra tight capacitance tolerances (±0.01 pF).

Series	Operating Temp	Range
Accu-P®	+125°C	10 – 200V   0.05pF – 68pF

## 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 super capacitors, varistors, thermistors, filters, inductors, diodes, antennas, connectors, crystals, 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).

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