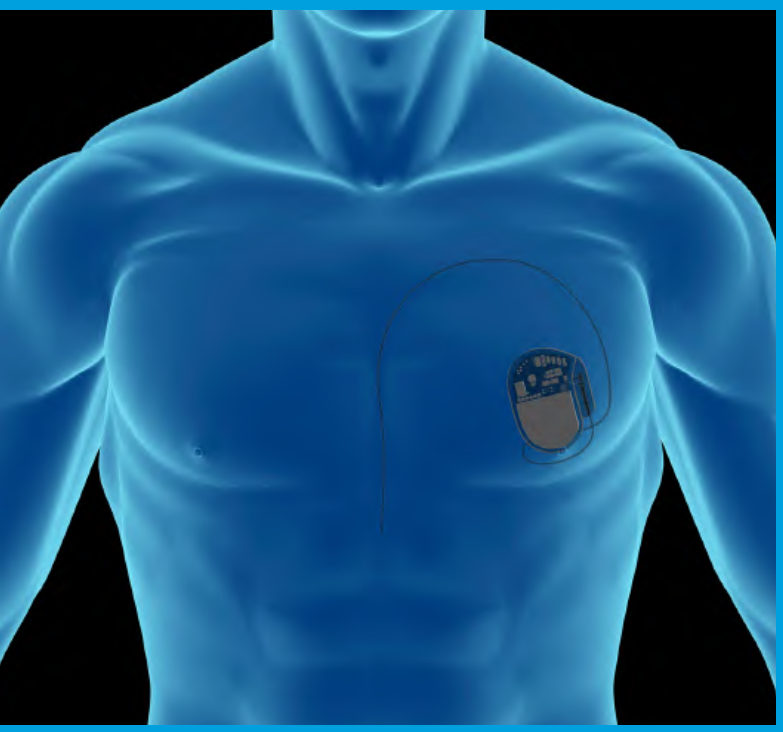
KYOCERA AVX

MEDICAL PRODUCTS APPLICATION GUIDE



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ELECTRICAL COMPONENTS FOR MEDICAL APPLICATIONS

KYOCERA AVX has over 20 years experience supplying capacitors, filters, and other components to the medical device industry. We offer industry leading technology and reliability, and have a deep understanding of the requirements of the medical electronics industry. Our quality systems lead the industry and support customer-specific change control, documentation, specification, and testing procedures. We have a broad range of solutions for Class 3 devices that meet the strictest requirements, and we offer cost-effective components for Class 1 and Class 2 that allow you to satisfy FDA requirements for your systems.

APPLICATION SPECIFIC DEVICES

HIGH RELIABILITY UP-SCREENING

WIDEST TESTING CAPABILITY IN THE INDUSTRY

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.

MEDICAL DIVISION

PRODUCTS

TANTALUM CAPACITORS

TAZ Series | T4Z Series

The TAZ medical series is a Mn02 molded surface mount tantalum.

- **TAZ HRC5000** – **(Critical)** The TAZ Medical Grade series is designed for use in critical medical applications. KYOCERA AVX's original tantalum medical specification which establishes reliability for tantalum capacitors using design/process change controls, statistical screening, Weibull burn-in, maverick piece/lot screening, DPA and lot conformance testing.
- **T4Z HRC4000** – **(Non-Critical)** The T4Z Medical Grade series is designed for use in non-critical medical applications. The T4Z product line is based on the MIL-PRF55365 case sizes A-H. These components are manufactured and tested in KYOCERA AVX's high reliability tantalum capacitor plant in Biddeford, Maine which is ISO 13485

PRODUCT HIGHLIGHTS

- Molded cases based on MIL-PRF-55365 case sizes
- Voltage range from 4v to 50v
- Capacitance up to 330µF
- Lowest DC leakage in the industry
- Ultra high reliability
- 100% tin, gold, and tin/lead terminations available
- Manufactured in ISO 13485 facility

APPLICATIONS

- Filtering
- Pacing
- Hold Up
- Charging

CRITICAL

- Implanted life-sustaining devices
- Implanted devices intended to be operable for 1+ years where the KYOCERA AVX component can have an impact on the battery life of the device

NON-CRITICAL

- External devices
- Implanted non-life-sustaining devices intended to be operable for <1 year

TBC Microchip Series

The TBC medical series are the smallest surface mount tantalum capacitors on the market.

- **TBC HRC5000** – **(Critical)** The TBC Medical Grade series is designed for use in critical medical applications. KYOCERA AVX's original tantalum medical specification which establishes reliability for tantalum capacitors using design/process change controls, statistical screening, Weibull burn-in, maverick piece/lot screening, DPA and lot conformance testing.
- **TBC HRC6000** – **(Critical)** The TBC Medical Grade series is designed for use in critical medical applications. KYOCERA AVX's next generation medical specification uses fundamental elements of the HRC5000 specification and adds recent developments incorporated into the KYOCERA AVX proprietary Q Process. This effectively removes components that may experience parametric shifts through customer processing or display instability through life testing.

  The need for typical 50% derating of the capacitor's rated voltage can be relaxed – 20% derating in filtering applications and 0% for pacing, hold up, & charging.
- **T4C HRC4000** – **(Non-Critical)** The T4C medical series are the smallest surface mount tantalum capacitors on the market and are designed for applications other than implantable/life support. These parts use KYOCERA AVX's HRC4000 medical specification which was designed to meet low leakage requirements and are processed using KYOCERA AVX's patented Q-Process which includes 125°C burn-in and statistical screening methods for high reliability assurance.

PRODUCT HIGHLIGHTS

- 0603 to 1411 case sizes
- Voltage range from 4v to 40v
- Capacitance up to 47µF
- Lowest DC leakage in the industry
- Ultra high reliability
- 100% tin, gold, and tin/lead terminations available
- HRC5000 & HRC6000 Manufactured in ISO 13485 facility

APPLICATIONS

- Filtering
- Pacing
- Hold Up
- Charging

CRITICAL

- Implanted life-sustaining devices
- Implanted devices intended to be operable for 1+ years where the KYOCERA AVX component can have an impact on the battery life of the device

NON-CRITICAL

- External devices
- Implanted non-life-sustaining devices intended to be operable for <1 year

TANTALUM CAPACITORS

T4J SERIES

The T4J medical series are designed for applications other than implantable/life support utilizing KYOCERA AVX's **HRC4000** medical specification. These parts are designed to meet low leakage requirements and are processed using KYOCERA AVX's patented Q-Process which includes 125°C burn-in and statistical screening methods for high reliability assurance.

PRODUCT HIGHLIGHTS
- Basic reliability better than 0.1%/1000 hours
- Molded cases based on EIA case sizes
- Voltage range from 6.3v to 50v
- Capacitance ranges from 0.47µF to 10µF
- Custom DCL/ESR options on selected parts

APPLICATIONS
- Filtering
- Hold Up
- Charging

NON-CRITICAL
- External devices
- Implanted non-life-sustaining devices intended to be operable for <1 year

TCP SERIES

KYOCERA AVX designs & manufactures custom multi-capacitor modules using our medical implantable range of tantalum capacitors as sub-components. These modules can improve overall device size efficiency, and minimize placement cost. These are offered using our traditional **HRC5000** or the new **HRC6000** series.

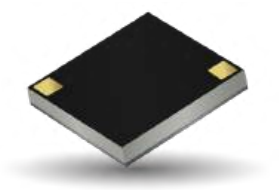
PRODUCT HIGHLIGHTS
- Improved volumetric efficiency & total assembly cost
- Testing performed on completed module to insure medical grade performance
- Modules offered in standard 2, 4, and 6 capacitor designs
- Custom designs are available to meet specific
- Circuit layouts
- Manufactured in ISO 13485 facility

APPLICATIONS
- Filtering
- Pacing
- Hold Up
- Charging

CRITICAL
- Implanted life-sustaining devices
- Implanted devices intended to be operable for 1+ years where the KYOCERA AVX component can have an impact on the battery life of the device

THIN FILM PRODUCTS

PMC SERIES THIN FILM RESISTOR NETWORKS



KYOCERA AVX custom thin film resistors are designed and tested for medical implantable and life sustaining applications. Methods and protocols include 100% automated electrical testing, life tests, MIL-883 visual inspection, design & process controls, reliability screening, and lot conformance testing.

PRODUCT HIGHLIGHTS

- Low TCR & VCR
- Tolerances up to ±0.1%
- Resistance range from 5 to 50 mOhm
- Laser Trimmable
- Voltage up to 2000V
- Surface mount, wire bonded, ball grid array, land grid array
- High stability
- Parts can be free of nickel or other magnetic materials

APPLICATIONS

- Implantable medical systems
- High voltage resistor networks
- Medical power applications which require extremely high accuracy

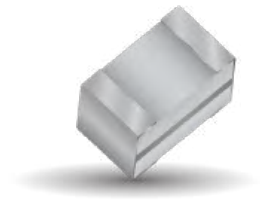
CRITICAL

- Implanted life-sustaining devices
- Implanted devices intended to be operable for 1+ years where the KYOCERA AVX component can have an impact on the battery life of the device

NON-CRITICAL

- External devices
- Implanted non-life-sustaining devices intended to be operable for <1 year

Accu-P® THIN FILM CAPACITORS



KYOCERA AVX's **PD-025** specification was developed to describe the requirements for Accu-P® MP series thin film chip capacitors intended for medical implantable applications. This document includes design/process change controls, qualification, IPT & LAT testing, life test, DPA and electrical tests.

PRODUCT HIGHLIGHTS

- 0603 case sizes
- Voltage range from 10v to 100v
- Capacitance range from 0.05 pF to 47 pF
- Tight capacitance tolerance (±0.01pF)
- Tin/lead & RoHS compliant terminations available
- Low ESR, High Q at very high frequencies
- Low lot to lot variability
- High stability with respect to temperature, time, frequency, and voltage variation

APPLICATIONS

- Embedded medical systems
- Medical systems featuring RF signals
- Medical power applications which require extremely high accuracy

CRITICAL

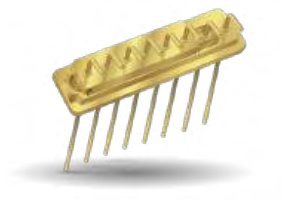
- Implanted life-sustaining devices
- Implanted devices intended to be operable for 1+ years where the KYOCERA AVX component can have an impact on the battery life of the device

NON-CRITICAL

- External devices
- Implanted non-life-sustaining devices intended to be operable for <1 year

EMI FILTERS & FEEDTHROUGHS

FILTERED FEEDTHROUGH ASSEMBLIES



KYOCERA AVX Filters offers custom and semi-custom configured filtered feedthrough assemblies. These products are available for both high and low voltage applications and have fast rise time pulse capabilities on high voltage product with complete in house custom testing available. The designs include polyamide and solder-attached methods for cost competitive solutions.

PRODUCT HIGHLIGHTS

- Custom designs
- Low and high voltage designs
- Multiple cost effective lead attachment methods
- Hermetically sealed

APPLICATIONS

- Electromagnetic interference (EMI) passive filtering

CRITICAL

- Implanted life-sustaining devices

NON-CRITICAL

- External devices
- Implanted non-life-sustaining devices intended to be operable for <1 year

DISCOIDAL FILTER ELEMENTS & ARRAYS

KYOCERA AVX Filters offers custom capacitor arrays to include linear and circular configurations with multi-hole designs. These products have both high and low voltage capabilities for many medical implantable applications.

KYOCERA AVX Filters also offers custom discoidal capacitors for multiple medical filtering applications, including implantable devices.

PRODUCT HIGHLIGHTS

- Custom designs
- Low and high voltage designs
- Low inductance for high frequency performance
- Low ESR

APPLICATIONS

- Electromagnetic interference (EMI) passive filtering

CRITICAL

- Implanted life-sustaining devices

NON-CRITICAL

- External devices
- Implanted non-life-sustaining devices intended to be operable for <1 year

CONNECTORS

KYOCERA AVX's medical connectors are based on industry proven contact technology to provide robust and performance driven solutions to meet application specific requirements. Please contact KYOCERA AVX for information on medically qualified connectors.

9257 SERIES – I/O CONNECTORS

KYOCERA AVX has been providing robust and reliable compression connectors in mission critical applications for over 25 years. With eight unique configurations, these high performance gold plated beryllium copper contact systems outperform competition in the harshest environmental conditions. Typical applications include: disposable medical cartridges, portable patient monitoring platforms, pluggable modules and docking or cradle charging solutions.

PRODUCT HIGHLIGHTS

- Custom medical specification
- Plug & socket
- 8, 12, & 16 positions
- Pitch: 0.5mm and 1.25mm
- 0.5 & 1.0 amp/contact
- 5k mating cycles
- No latching required

APPLICATIONS

- Signal and data transmission

CRITICAL

- Implanted life-sustaining devices

NON-CRITICAL

- External devices
- Implanted non-life-sustaining devices intended to be operable for <1 year

9155 SERIES – PLUGGABLE MODULE / BATTERY CONNECTORS

This range of miniaturized input/output connectors pack medical and industrial level performance in a consumer packaged product. Based on high performance contact materials and industry proven contact geometries, these cable-to-board connectors maximize performance and durability in applications demanding up to 5000 mating cycles.

PRODUCT HIGHLIGHTS

- Custom medical specification
- 8 styles; horizontal, vertical & single contact
- Number of positions range from 1 to 8
- Pitch: 2.0mm, 2.5mm, & 3.0mm
- 3 amps/contact
- 5k mating cycles
- End-to-end stackable
- Various plating options
- -40°C to +125°C

APPLICATIONS

- Power / recharge
- Signal transmission
- Docking / cradle ports

CRITICAL

- Implanted life-sustaining devices

NON-CRITICAL

- External devices
- Implanted non-life-sustaining devices intended to be operable for <1 year

STAY CONNECTED!

Tools Available Online:

- **DATASHEETS & CATALOGS**
- **3D MODELS**
- **VIDEOS**
- **APPLICATION & PRODUCT GUIDE**
- **PART NUMBER INFORMATION**

TO LEARN MORE OR FOR CONTACT INFORMATION, VISIT **WWW.KYOCERA-AVX.COM**

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