Tantalum & Polymer Tantalum Capacitors

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Technical Standards and Benefits
V2.0

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Technical support: through online services, seminars, PCNs,
quality management and much more.

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We are the only Top Broad Liner in worldwide who generate round about one third of our turnover with Passive Components. Furthermore we have the biggest buying quantities of Passive Components in Europe. Our focus is a comprehensive product portfolio combined with high quality and technical standards. Our business partners are the worldwide leading manufacturers of all particular components. In the range of Tantalum and Niobium Capacitors as well as Polymer Tantalum Capacitors we work together with AVX, Samsung, Vishay and Panasonic.

Your Demand – Our Implicitness
We understand our position as the interface between the manufacturer and the customer.

- Guaranteed up to the Minute Information
  Our intensive cooperation with the manufacturers guarantees an ideal flow of information - from changes of the specifications up to long-term developments of the technologies or the products themselves. This detailed knowledge is one benefit for our customers referring standard products as well as for Design-in solutions.

- Focus on Services
  Our customers’ benefits are „tailor-made solutions from one hand“ with a broad range of products, high security of delivery and transparent prize creation via VMI and flexible DI solutions for calculation of processing costs.

- Individual Requirements
  Our excellent technical competence qualifies us as a trustful business partner in all questions of development and technology.

- Advantages for International Customers
  Our logistic department offers innovative and flexible solutions for supply chain management with customized logistics systems. As a result our customers will get the best economical solutions, high delivery security and a maximum of availability.
Our key customers list includes leading companies in the Industrial Electronics, Automotive, Consumer Electronics, Telecommunications, Industrial and Medical market.
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<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
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</tr>
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<td>Leaded Capacitors</td>
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<td></td>
<td></td>
<td></td>
<td>Niobium Capacitors</td>
</tr>
</tbody>
</table>

### Information

#### Headquarters
- **USA**: No. 1 Tantalum Capacitor Manufacturer Worldwide
- **USA**: TOP5 Tantalum Capacitor Manufacturer Worldwide
- **Korea**: TOP5 Tantalum Capacitor Manufacturer Worldwide
- **Japan**: Market leader Polymer Tantalum

#### Strength
- High product quality
- Innovative products
- High voltage Polymer Tantalum Capacitors
- AEC-Q200 available
- Innovative Products
- Wide product portfolio
- AEC-Q200 qualification
- Good product quality
- Wide product portfolio in Polymer Products
- AEC-Q200 qualification

#### Rutronik

#### Focus Products
- Polymer Tantalum Capacitors
- High Reliability e.g. Automotive, High Temperature (up to 200°C)
- Low ESR, Ultra Low ESR etc.
- Polymer Tantalum Capacitors
- High Reliability e.g. Automotive, High Temperature (up to 200°C)
- Low ESR, Ultra Low ESR etc.
- D & E case sizes
- Polymer Tantalum Capacitors
- Standards (Commodities) without specific requirements
- Polymer Tantalum Capacitors

#### Applications
- Automotive (Sensors, door control, tire pressure monitoring, climate control)
- Industry (Power supply, automatic door lock, fire detectors)
- Measuring (Positioning systems, flow meter, gas monitor)
- Lighting (LED headlamp, traffic lights, display & signs)
- Medical engineering (hearing aid device, heart pacemaker, handheld devices)

#### Advantages for the customer
- Stock & Availability
- Important partnership and strategic long-term cooperation
- Linemanagement established
- Sales & Technical Support located in Europe
- Important partnership and strategic long-term cooperation
- Linemanagement established
- Sales Support located in Europe
- Important partnership and strategic long-term cooperation
- Sales & Technical Support located in Europe
- Japanese manufacturer
- 15 years experience in Polymer Tantalum Capacitors
- 4 Polymer Capacitor Technologies available
- Sales & Technical Support located in Europe
# Tantalum Capacitors

<table>
<thead>
<tr>
<th>Type</th>
<th>Standard</th>
<th>Low Profile/Miniaturized</th>
<th>Low ESR</th>
<th>Ultra Low ESR Multianode</th>
<th>Microchips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applications</td>
<td>Multipurpose Application</td>
<td>High Performance (SMPS/Filter)</td>
<td>Mobile Devices, Medical, Modules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitance</td>
<td>0.1µF - 2200µF</td>
<td>0.1µF - 220µF</td>
<td>0.15µF - 1500µF</td>
<td>10µF - 2200µF</td>
<td>0.1µF - 330µF</td>
</tr>
<tr>
<td>Tolerance</td>
<td>10%, 20%</td>
<td>10%, 20%</td>
<td>10%, 20%</td>
<td>10%, 20%</td>
<td>10%, 20%</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>2.5V - 75V</td>
<td>2.5V - 75V</td>
<td>2.5V - 75V</td>
<td>2.5V - 50V</td>
<td>2V - 50V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-55°C to +125°C</td>
<td>-55°C to +125°C</td>
<td>-55°C to +125°C</td>
<td>-55°C to +125°C</td>
<td>-55°C to +125°C</td>
</tr>
<tr>
<td>Reliability</td>
<td></td>
<td></td>
<td></td>
<td>1% per 1000 hours at 85°C, VR with 0.1Ω/V series impedance, 60% confidence level</td>
<td></td>
</tr>
<tr>
<td>Benefit</td>
<td>High Volumetric Efficiency</td>
<td>Environmentally Friendly</td>
<td>3x Reflow 260°C Compatible</td>
<td>World's smallest SMD Tantalum Capacitor</td>
<td>No reduction in performance</td>
</tr>
</tbody>
</table>

## Leaded Tantalum Capacitors

<table>
<thead>
<tr>
<th>Type</th>
<th>Dipped Radial Capacitors</th>
<th>Molded Axial Capacitors</th>
<th>Molded Radial Capacitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applications</td>
<td>Multipurpose Application</td>
<td>For use in miniature and subminiature applications</td>
<td>Multipurpose Application</td>
</tr>
<tr>
<td>Capacitance</td>
<td>0.10µF - 680µF</td>
<td>0.10µF - 68µF</td>
<td>0.10µF - 330µF</td>
</tr>
<tr>
<td>Tolerance</td>
<td>10% 20% (5% on demand)</td>
<td>10% 20%</td>
<td>10% 20%</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>3 - 50Vdc for continuous operation at +85°C</td>
<td>4 - 50Vdc for continuous operation at +85°C</td>
<td>6.3 - 50Vdc for continuous operation at +85°C</td>
</tr>
<tr>
<td>Operating Temp.</td>
<td>-55 to +85°C (to +125°C with voltage derating)</td>
<td>-55 to +85°C (to +125°C with voltage derating)</td>
<td>-55 to +85°C (to +125°C with voltage derating)</td>
</tr>
<tr>
<td>Reliability</td>
<td>1% per 1000 hours at 85°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefit</td>
<td>Different lead space and lead length are available</td>
<td>Low leakage current and impedance</td>
<td>Four case sizes precisely molded with a flame retardant epoxy resin</td>
</tr>
</tbody>
</table>

- Precision molded for use in high speed automatic insertion applications
- Tapered nose identifies positive polarity
- Low leakage current
- Low impedance
- The world’s smallest SMD Tantalum capacitor (down to 0201 size)
- High frequency operation with temperature and voltage stability
- No reduction in performance
- More robust against higher thermo-mechanical stresses during assembly process
- Better electrical strength through thicker dielectric layer
- AEC-Q200 qualified
- High temperature operation and higher basic reliability for optimal performance
- Big range for non-standard usage
- Volumetric efficiency and capacity per case
- Very good ripple current treatment
- Non-burn safe technology
- Environmentally friendly
- Multi-anode construction
- Super low ESR
- Non-burn safe technology
- The world’s smallest SMD Tantalum capacitor (down to 0201 size)
- High frequency operation with temperature and voltage stability
- No reduction in performance
### Polymer Tantalum Capacitors

<table>
<thead>
<tr>
<th>Type</th>
<th>Standard</th>
<th>Undertab</th>
<th>Multianode</th>
<th>High Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applications</td>
<td>Set Top Box, Smart Meter, Power supply, Infotainment, Audio / Video equipment</td>
<td>Set Top Box, Smart Meter, Power supply, Infotainment, Audio / Video equipment</td>
<td>Telecommunication routers, Basestations with high power DC/DCs</td>
<td>Automotive Applications</td>
</tr>
<tr>
<td>Capacitance</td>
<td>0.47μF - 470μF</td>
<td>2.2μF - 470μF</td>
<td>10μF - 1000μF</td>
<td>47μF - 680μF</td>
</tr>
<tr>
<td>ESR values</td>
<td>down to 5mΩhmm</td>
<td>down to 6 mΩhmm</td>
<td>down to 10 mΩhmm</td>
<td>down to 9 mΩhmm</td>
</tr>
<tr>
<td>Tolerance</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>2.5V - 125V</td>
<td>2.5V - 10V</td>
<td>4V - 100V</td>
<td>2.5V - 10V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-55°C to +125°C</td>
<td>-55°C to +105°C</td>
<td>-55°C to +105°C</td>
<td>-55°C to +125°C</td>
</tr>
<tr>
<td>Reliability</td>
<td>1% per 1000 hours at 85°C</td>
<td>1% per 1000 hours at 85°C</td>
<td>1% per 1000 hours at 85°C</td>
<td>1% per 1000 hours at 85°C</td>
</tr>
<tr>
<td>Benefit</td>
<td>extremely Low ESR, only 20 % voltage derating, Conductive polymer electrode reduces ignition failure mode</td>
<td>Conductive polymer electrode reduces ignition failure mode, Lower ESR, Undertab terminations layout: - High Volumetric Efficiency - High PCB assembly density - High capacitance in smaller dimensions</td>
<td>Conductive polymer multianode, Extremely Low ESR, Reduced ignition failure mode, 3x reflow 260°C compatible, Volumetric efficiency, High frequency capacitance retention</td>
<td>only 20% voltage derating, meets requirements of AEC-Q200</td>
</tr>
</tbody>
</table>

**High Performance**
- High Reliability
- High Temperature
- High quality industrial or automotive
  - High end and high temperature industrial or automotive

**Conformal Coated**
- High Reliability
- Standard
- Low ESR
- Multianode

**Niobium**
- High Reliability
- Standard Low Profile/Miniaturized Low ESR Ultra Low ESR
- High Reliability
- High Temperature Standard Low ESR normal Multianode

**Applications**
- Set Top Box, Smart Meter, Power supply, Infotainment, Audio / Video equipment
- High Reliability
- High temperature industrial or automotive

**Characteristics**
- Capacitance: 0.47μF - 470μF, 2.2μF - 470μF, 10μF - 1000μF, 47μF - 680μF
- ESR values: down to 5mΩhmm, down to 6 mΩhmm, down to 10 mΩhmm, down to 9 mΩhmm
- Tolerance: 20%, 20%, 20%, 20%
- Rated Voltage: 2.5V - 125V, 2.5V - 10V, 4V - 100V, 2.5V - 10V
- Operating Temperature: -55°C to +125°C, -55°C to +105°C, -55°C to +105°C, -55°C to +125°C
- Reliability: 1% per 1000 hours at 85°C, 1% per 1000 hours at 85°C, 1% per 1000 hours at 85°C, 1% per 1000 hours at 85°C

**Benefit**
- More robust against higher thermo-mechanical stresses during assembly process
- Better electrical strength through thicker dielectric layer
- AEC-Q200 qualified
- High temperature operation and higher basic reliability for optimal performance
- AEC-Q200 qualified
- Big range for non standard usage
- Volumetric efficiency and capacity per case
- Very good ripple current treatment
- Non-burn safe technology
- Multi-anode construction
- Super low ESR
- Non-burn safe technology
- High Volumetric Efficiency
- High PCB assembly density
- High capacitance in smaller dimensions
- Conductive polymer multianode
- Extremely Low ESR
- Reduced ignition failure mode
- 3x reflow 260°C compatible
- Volumetric efficiency
- High frequency capacitance retention
- AEC-Q200 qualified
Tantalum & Polymer Tantalum Capacitors

A Tantalum Polymer capacitor basically consists as well as a conventional Tantalum capacitor of a sintered Tantalum block. (Anode)

The dielectric is Tantalum pentoxide (Ta2O5) which is used as an isolating layer.

The next layer is, in opposite to the conventional Tantalum technology, a high conductive Polymer. (Cathode)
This organic material enables an enormous improvement of the capacitor's performance.

Tantalum Polymer Capacitors are opening up opportunities for designers to shrink the size of their products and add new functionality in a wide range of applications. This technology enables to reduce the overall number of parts required, due to its lower ESR and increasing layout flexibility.
The Electronic Industry had and still has to handle the sophisticated requirements of the customers. The applications are getting more and more powerful, smaller and of higher quality. That’s the reason why also Tantalum and Polymer Tantalum Capacitors have always to improve their technical parameters to satisfy the constantly changing requirements of the applications. According to this changes there are three main developments within this capacitor-family noticeable:

- Small case sizes and low profile series for space-saving layout
- Lower ESR-values (series resistance) for higher pulse frequencies
- Higher capacities for known case sizes for more powerful applications

Such products will only be achievable by the use of improved raw materials and clever designs but also by total new material technologies. For example the volumetric efficiency of the tantalum powder has steadily increased over time, which allows the production of larger and larger capacitances with the same physical volume.

New methods of development establish new possibilities such as the multi-anode configuration of capacitors. Furthermore, the usage of new materials provided capacitors with new features. One example is the Polymer Tantalum Capacitor, where a high conductive cathode is used to achieve extremely low ESR values.

Because of the close partnership with the worldwide leading manufacturers we are in a position to offer our customers the ideal range of capacitor technology for their applications from a technical as well as cost-effective view - every time.
Voltage Derating

**Parameters Sensitive to Derating**

There are three main parameters sensitive to the level of derating (ratio between applied voltage and rated voltage of the capacitor): Steady State Failure Rate, Dynamic Failure Rate (resistance to surge current / low external resistance) and DCL at application voltage.

**Reliability of failure rate**

Steady State Failure Rate

Both Tantalum and Niobium Oxide dielectric have essentially no wear out mechanism and in certain circumstances are capable of limited self healing. However, random failures can occur in operation. The failure rate of Tantalum capacitors will decrease with time and not increase as with other electrolytic capacitors and other electronic components. – see Fig. 1.

The useful life reliability of the tantalum capacitors in steady state is affected by three factors. The equation from which the failure rate can be calculated is:

\[ F = F_V \cdot F_T \cdot F_R \cdot F_B \]

where:

- \( F_V \) - correction factor due to operating voltage/
  voltage derating – see Fig. 2.
- \( F_T \) - correction factor due to operating temperature – see Fig. 3.
- \( F_R \) - correction factor due to circuit series resistance
- \( F_B \) - basic failure rate level

Base failure rate

Standard Tantalum conforms to Level M reliability (i.e. 1%/1000 hrs) or better at rated voltage, 85°C and 0.1Ω/volt circuit impedance.

**Dynamic Failure Rate (Surge Current)**

Protection against uneven current surges in low impedance circuits is the most important factor to consider an appropriate derating factor of tantalum capacitor. The worst case of current surge in the application should not exceed the design and screened current of the capacitor specified by the manufacturer.

Current through capacitor

The maximum surge current (transient) through the capacitor in a circuit is defined by two factors:

a) Power supply output

The current developed during power up (charging, transient) through the capacitor depends on the power supply:

\[ I = C_X \cdot \frac{dV}{dt} \] [a]

where:

- \( C_X \) = capacitance of the capacitor
- \( dV/dt \) = voltage gradient

(how fast the power supply can ramp the voltage)
b) Ohm’s law
\[ I = \frac{V}{R} \]  
where:
V = application voltage
R = total resistance of the circuit

The actual current through the capacitor is defined by the lower value calculated from equations [a] and [b].

Solid Tantalum capacitors have a limited ability to withstand voltage and current surges. Such current surges can cause a capacitor to fail. The expected failure rate cannot be calculated by a simple formula as in the case of steady-state reliability. The table below summarizes the result of trials made by one of our manufacturers.

As can clearly be seen from the results of this experiment, the more derating applied by the user, the less likely the probability of a surge failure occurring.

**DCL - leakage current in the application**
The leakage current drops rapidly below the value corresponding to the rated voltage VR when reduced voltages are applied.

DCL value can typically drop to one range lower value if 50% derating is used – see Fig. 4.

**Recommended Voltage Derating Guidelines**

<table>
<thead>
<tr>
<th>Capacitance and Voltage</th>
<th>Number of units tested</th>
<th>50% derating applied</th>
<th>No derating applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>47μF 16V</td>
<td>1,547,587</td>
<td>0.03%</td>
<td>1.1%</td>
</tr>
<tr>
<td>100μF 10V</td>
<td>632,876</td>
<td>0.01%</td>
<td>0.5%</td>
</tr>
<tr>
<td>22μF 25V</td>
<td>2,256,258</td>
<td>0.05%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

Standard conditions: for example: output filters

<table>
<thead>
<tr>
<th>Capacitor Voltage Rating</th>
<th>Operating Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>2.5</td>
</tr>
<tr>
<td>6.3</td>
<td>3.6</td>
</tr>
<tr>
<td>10</td>
<td>6.0</td>
</tr>
<tr>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>35</td>
<td>24</td>
</tr>
<tr>
<td>50</td>
<td>28</td>
</tr>
<tr>
<td>66</td>
<td>36</td>
</tr>
</tbody>
</table>

Severe conditions: for example: input filters

<table>
<thead>
<tr>
<th>Capacitor Voltage Rating</th>
<th>Operating Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>2.5</td>
</tr>
<tr>
<td>6.3</td>
<td>3.3</td>
</tr>
<tr>
<td>10</td>
<td>5.0</td>
</tr>
<tr>
<td>16</td>
<td>8.0</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>25</td>
<td>12</td>
</tr>
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<td>35</td>
<td>15</td>
</tr>
<tr>
<td>50</td>
<td>24</td>
</tr>
<tr>
<td>63</td>
<td>31</td>
</tr>
</tbody>
</table>

However for tantalum polymer capacitors and capacitors made from niobium oxide, the failure-rate has less dependence on applied voltage and have different derating requirements.

Hence a minimum derating of 20% is sufficient in all applications.

Example: typical DCL of 10V capacitor used at different operating voltage.

<table>
<thead>
<tr>
<th>Operating Voltage (V)</th>
<th>Typical DCL (μA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10V rail</td>
<td>10μA</td>
</tr>
<tr>
<td>5V rail</td>
<td>2.5μA</td>
</tr>
<tr>
<td>3.3V rail</td>
<td>1.5μA</td>
</tr>
</tbody>
</table>

Voltage derating is necessary for all tantalum, niobium and polymer capacitors to prevent failure due to excess current availability.
Comparison of Tantalum & Multilayer Ceramic Capacitors

Introduction
In many business fields like measurement, automotive and industry electronics, there are more often intentions to replace tantalum capacitors through MLCC’s. However the replacement is not always an ideal solution, because the capacitors have built-in specific kinds of features suitable for desired equipments.

There are significant differences in constructions between multilayer ceramic (MLC) and tantalum capacitors. The ceramic MLC chip is a ceramic block with end metallizations applied to the opposing end termination faces (T1 & T2). This creates wrap-around metal pads on the adjacent faces, and these pads are soldered directly to the printed circuit board (PCB) along the bottom of the chip.

The active element of the tantalum capacitor is a metal-dominated structure that is encased in plastic, with leadframes extending out from the plastic to allow a leadframe wrap-under (T1 & T2), which creates metal pads along the bottom of the package to facilitate the soldering to the PCB.

Parasitic ESR and ESL
Both of these capacitors have parasitic ESL and ESR, simply because of the physics involved in manufacturing the devices. Both technologies have a finite length and width of conductor in which the conduction currents flow through, therefore they both have inductance (ESL).

The ESR of MLCC’s is typically lower than that of similar value tantalum. The ratio of this parasitic is typically 1:100. Using conductive polymers in place of the traditional MnO2 cathode reduces this ratio down to 1:10 and, in some cases approaching unity – see Fig. 1.

Temperature Coefficient of capacitance
The allowable change in capacitance for two of the ceramic dielectrics and for tantalum within their temperature ranges are all within a ±15% window – see Fig. 2.

For filtering applications, they are very similar, as deviations within 20% will have little impact on circuit. For power supplies that are always in the temperature range above 20°C, the higher capacitance from the tantalum could result in lowered impedance and improved performance.

Viewing these same considerations for decoupling of hot microprocessors or decoupling applications, the higher capacitance at elevated temperatures makes the tantalum response more desirable.
DC bias Dependency
The specified capacitance of MLCC's are related to a specific metering voltage, usually 1V with a frequency of 1 kHz. If there will be a DC voltage applied, the capacitance of the ceramic capacitor will decrease. This effect is called DC bias.

Tantalum capacitors do not change capacitance with applied DC bias.

Since almost all capacitors are operated with a DC voltage involved, this is a very important feature to keep in mind when designing a circuit – see Fig. 4:

It should be noted that the temperature and DC bias effects are cumulative and not exclusively independent.

Piezoelectric noise
Due to the fact that the ceramic material is crystal based it has a potential for piezoelectric noise. In the case of the capacitor mechanically fixed on the board, any mechanical stress created in the part by the board can generate unwanted electrical noise. This is especially important for high-gain amplifiers.

Tantalum capacitors have no piezoelectric effect - see Fig. 5

Flex cracks
The most reported cause for failure of ceramic chips today is flex cracking.

The larger the capacitor chip, the greater possibility for cracking. The larger capacitor chips afford the largest capacitance. Replacing tantalum capacitors usually requires the largest ceramic capacitance available. This creates a self-feeding cycle of failure.

Tantalum capacitors are not affected by mechanical stress.

Summary
There is no simple answer to the question of whether you can replace a tantalum with a ceramic or the other way around. The parameters that the capacitor will see during its lifetime need to be examined carefully. The benefits of the technologies are listed in the table below.

<table>
<thead>
<tr>
<th>Important Parameter</th>
<th>Tantalum</th>
<th>Ceramic</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESR</td>
<td></td>
<td></td>
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<tr>
<td>Volumetric efficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wide temperature range</td>
<td></td>
<td></td>
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<tr>
<td>Low inductance</td>
<td></td>
<td></td>
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<tr>
<td>DC bias</td>
<td></td>
<td></td>
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<tr>
<td>Piezoelectric</td>
<td></td>
<td></td>
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<tr>
<td>High frequency filtering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flex cracks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figures are only examples. For specific part number please contact Rutronik.*
Cathode is made of Polymer instead of Magnesium dioxide (MnO2) as usual.

Advantages
- Lowest ESR down to 5 mOhm
- Reduced danger of ignition
- Better capacitance retention
- 3x reflow 260°C compatible
- Only 20% voltage derating
- Very low ESR (10 - 12 mOhms)
- Reduced ignition failure mode
- 3x reflow 260°C compatible
- High frequency capacitance retention
- Only 20% voltage derating
- Very low ESR (12 – 140 mOhms)
- High ripple current
- Better stability at humidity load
- 100% hard surge testing

Applications
- Power Supply
- PC motherboards
- Laptops + charging stations
- Mobile phones
- Telecommunication / base stations
- Power supply
- Automotive industries
Automotive Solutions

Higher reliability with our manufacturers’ solutions
For high reliability and optimal performances in automotive applications, tantalum capacitors have to achieve special requirements:
- High continuous operating temp.
- High basic reliability
- More robust against more severe working conditions
- High endurance

Example for several automotive applications
- Exterior systems
- Powertrain
- EC glasses
- Electronics
- Mirrors
- Vehicle assembly
- All wheel drive
- Interior systems
- Metal forming

Car applications requirements
1. Harsh environment conditions
   a. Wide temperature range
   b. High humidity, dust
2. Harsh electrical requirements
   a. Voltage & current spikes
   b. High electrostatic
3. Increasingly strict requirements
   a. 10 years guarantee
   b. 150,000 miles
   c. < 10 ppm failures
   d. Lead-free
4. Production certified with TS16949 and ISO 9001
5. All capacitors certified with AECQ200
New 125V Tantalum Polymer SMD Capacitors Surpass Previous 100V Milestone

The new surface-mount chip capacitors have surpassed previous milestones with the introduction of the new TCJ 100V and 125V to provide excellent capacitance and ultra-low ESR in a compact case size also in the reduced ignition failure mode solution. In addition, due to the nature of polymer capacitors surge robustness, lower derating of 20% can be used. Nevertheless, due to maximum achievable breakdown voltage, working voltage of tantalum-polymer capacitors was limited up until now.

The continuous AVX development proved conductive polymer ability to increase the rated voltage up to 125V, extending the application voltage up to 100V. This significantly widens the working range of tantalum capacitors for a wide array of high-voltage applications, including telecommunications equipment, base stations, switching hubs, router and line filters, DC/DC converters in LED TVs, Notebook power supplies, and a host industrial applications.

The new, high-voltage TCJ Series tantalum polymer capacitors allow design engineers to reduce the number of components on the board, providing much greater layout flexibility than comparable aluminum electrolytic capacitors and enabling the devices they’re designed into, such as LCD monitors and LED TVs, to become even sleeker and more compact.

Features:
- Long lifetime because of a solid electrolyte (Polymer)
- High nominal voltage range (up to 125V)
- Voltage range: 2.5 - 125V
- Only 20% voltage derating has to be considered
- Conductive polymer electrode reduces ignition failure mode because of an efficient self-healing mechanism
- 3x reflow 260°C compatible
- High reliability
- Capacity range 0.47 - 470µF
- No piezo effect
- Stable frequency characteristics
- Low ESR / High ripple current
- 17 case sizes available

TPS Series:

Low ESR Tantalum Capacitors

- Low ESR series of robust Mn02 solid electrolyte capacitors
- General purpose SMT chip tantalum series
- Voltage range: up to 50V
- Temperature range: -55°C to +125°C
- Power supply applications; sensor applications, smart meter, fire detectors

A specific range of the TPS series meets the requirements of AEC-Q200, called TPS Automotive series.

For further information, please contact Rutronik.

TRJ Series:

Professional Tantalum Chip Capacitor

- 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, medical, and other high-end applications

Applications

- Automotive ECU
- ABS
- Airbag systems
- Avionics
- Industrial control units
Highlights

TP3 Series

Automotive Grade Tantalum Chip Capacitors

The automotive-grade TP3 features a robust construction and low ESR for engine controls and safety systems. 100 % surge current tested, the capacitor is available in the industry-standard A to E case sizes.

- Robust construction
- Low ESR
- 100% Surge current tested (B, C, D & E case sizes)
- Industry-standard case sizes A to E (EIA 535BAAC dimensions)
- Capacity range: 0.1µF – 470µF
- Voltage range: 4V – 50V
- AEC-Q200 qualified

Applications
- Automotive
- Engine controls
- Safety systems
- High-end automation
- High-end industrial
- Robotics

TR3 and 293D Series

Solid Tantalum Chip Capacitors

- Available in B, C, D, E, V, and W case sizes
- Very Low ESR
- Robust design
- Meets the derating requirements of 50 % rated voltage in +28 V and +35 V applications
- Devices in the C, D, and E case codes are 100 % surge current tested
- Voltage range from 4 V to 75 V
- Temperature range of –55 °C to +85 °C, to +125 °C with voltage derating
- Meet the new EIA-717 international qualification specification in addition to EIA 535BAAC and IEC QC300801/US0001
- Compatible with high-volume pick-and-place equipment to simplify assembly market

Applications
- Decoupling in 75 V applications and power supplies at +28 V and DC/DC conversion at +35 V
- Sensor, industrial control, and airborne applications, in addition to telecommunications base stations
Our Portfolio. Unique.

Order online and receive personalised on-site support.

More information at:
www.rutronik24.com