



Application Notes for Tantalum Solid Electrolytic Capacitor with Conductive Polymer Type TCD

1. Operating voltage

Temperature derating is as follows.

Conditions of Use	-55°C to 85°C	85°C to 105°C
Maximum derating required for the actual voltage of products with UR ≤ 10V used in the filter circuit	90%UR	72%UR
Maximum derating required for actual voltage of UR ≥ 10V products	80%UR	64%UR

UR: Rated Voltage

2. Application that contain AC Voltage

Special attention to the following 3 items.

- (1) The sum of the DC bias voltage and the positive peak value of the AC voltage should not exceed the rated voltage.
- (2) Reverse voltage should not exceed the allowable values of the negative peak AC voltage.
- (3) Ripple voltage should not exceed the allowable values.

3. Reverse voltage

Special attention to the polar character. Reverse Voltage should not be applied.

4. Permissible ripple current

The permissible ripple current and voltage at about 100 kHz or higher can be determined by the following formula from the permissible power loss for each case code (Pmax value) shown in Table 1 and the specified ESR value. However, when the expected operating temperature is higher than room temperature, determine the permissible values multiplying the Pmax value by the specified multiplier (Table 2). For the permissible values at different frequencies, consult our Sales Department.

$$P = I^2 \times ESR \text{ or } P = \frac{E^2 \times ESR}{Z^2}$$

$$\text{Permissible ripple current } I_{max} = \sqrt{\frac{P_{max}}{ESR}} \quad (\text{Arms})$$

$$\text{Permissible ripple voltage } E_{max} = \sqrt{\frac{P_{max}}{ESR}} \times Z = I_{max} \times Z \quad (V_{rms})$$

I_{max}: Permissible ripple current at regulated frequency (Arms : RMS value)
 E_{max}: Permissible ripple voltage at regulated frequency (Vrms : RMS value)
 P_{max}: Permissible power loss (W)
 ESR: Specified ESR value at regulated frequency (Ω)
 Z : Impedance at regulated frequency (Ω)

Table 1 Permissible power loss for each case code

Case Code	Pmax (W)
D	0.225

Note: Above values are measured at 0.8t glass epoxy board mounting in free air and may be changed depending on the kind of board, packing density, and air convection condition. Please consult us if calculated power loss value is equal to or greater than above list of Pmax value.

Table 2 Pmax multiplier at each operating temperature

Temperature	25°C	85°C	125°C
Derating factor	1.0	0.9	0.4

5. Non Polar Connection

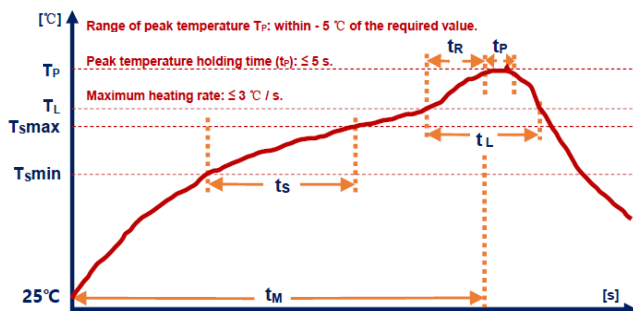
The capacitor cannot be used as a non-polar unit.

6. Soldering

6.1 Soldering

- (1) Reflow Soldering

The peak setting temperature TP of SMT should be ≤ 250 °C, and the holding time within the range of 0 °C ~ - 5 °C of the peak temperature TP should be ≤ 5s.



Solder type		Lead free solder
Min	Minimum preheating temperature	150°C
TS Max	Maximum preheating temperature	200°C
tS	Preheating time	60~120s
TL ~ TP	Heating rate	≤3°C/s
TL	Melting point of solder paste	217°C
tL	Melting time of solder paste	60~150s
TP	Peak temperature	250°C
tP	Holding time of peak temperature	≤10s ≤3s or 5s
TP ~ TL	Cooling rate	s ≤6°C/s
tM	Time from 25 °C to peak temperature	≤8 min

- (2) Manual welding

If manual welding is required under special circumstances, the power of electric iron should be ≤ 60W, the temperature should be ≤ 350 °C, and the welding time should be ≤ 5s. It is forbidden for the iron head to directly contact the product body, and the solder should be melted to make it contact with the capacitor pin for welding.

- (3) Please consult us for other methods.

7. Solvent cleaning

Cleaning by organic solvent may damage capacitor's appearance and performance. However, our capacitors are not effected even when soaked at 20-30°C 2-propanol for 5 minutes. When introducing new cleaning methods or changing the cleaning term, please consult us.

8. Storage

Capacitors should be tightly sealed in moisture prevention bag and stored with supplied reel. After unpacking, capacitors should be used within the floor life listed in Table 3.
Moisture Sensitivity Level : Table 3 shows the moisture sensitivity level and the floor life of the dampproof wrapping products.

Table 3 MSL&Floor Life

JEDEC MSL	Floor Life
3	168hrs.(7days)
	Less than 30°C/60%RH

(Reference IPC/JEDEC J-STD-020C July 2004)

9. Inapplicable circuits

The capacitors may cause nonconformity if they are used on the following circuits.

- (1) High-impedance voltage holding circuits
- (2) Coupling circuits
- (3) Time constant circuits
- (4) Circuits significantly affected by leakage current

If a short circuit occurs, the capacitors may generate heat or smoke depending on the short-circuit current. When designing a circuit, take the instructions stated herein into consideration, and take as much redundant measures as possible.

10. Additional Notes

Wear-out failure (Lifetime)

When the operating time exceeded the specified guarantee time of Endurance and Damp heat, the electric characteristics changes significantly and the open circuit might be caused by the degradation of electrolyte.

Please note that the electric characteristics of capacitance and ESR might change within the specified range in specifications when it used under the condition of electric and mechanical performance.

These application notes are prepared based on the technical report RCR-2368B "Guideline of notabilia for fixed tantalum electrolytic capacitors with solid electrolyte for use in electronic equipment" issued by Japan Electronics and Information Technology Industries Association. For the details of the instructions (explanation, reasons and concrete examples), please refer to this guideline, or consult our Sales Department.



MATSUO ELECTRIC CO., LTD.

Please feel free to ask our Sales Department for more information on Tantalum Solid Electrolytic Capacitor with Conductive Polymer.

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