# Conformal Coated Tantalum Capacitors

## ELECTRICAL PERFORMANCE CHARACTERISTICS

| ITEM | PERFORMANCE CHARACTERISTICS | |
|---|---|---|
| Category temperature range | -55 °C to +85 °C (to +125 °C with voltage derating) | |
| Capacitance tolerance | ± 20 %, ± 10 %, tested via bridge method, at 25 °C, 120 Hz | |
| Dissipation factor | Limits per Standard Ratings table. Tested via bridge method, at 25 °C, 120 Hz | |
| ESR | Limits per Standard Ratings table. Tested via bridge method, at 25 °C, 100 kHz | |
| Leakage current | After application of rated voltage applied to capacitors for 5 min using a steady source of power with 1 kΩ resistor in series with the capacitor under test, leakage current at 25 °C is not more than 0.01 CV or 0.5 µA, whichever is greater. *Note that the leakage current varies with temperature and applied voltage. See graph below for the appropriate adjustment factor.* | |
| Capacitance change by temperature | For capacitance value ≤ 300 µF<br>+12 % max. (at +125 °C)<br>+10 % max. (at +85 °C)<br>-10 % max. (at -55 °C) | For capacitance value > 300 µF<br>+20 % max. (at +125 °C)<br>+15 % max. (at +85 °C)<br>-15 % max. (at -55 °C) |
| Reverse voltage | Capacitors are capable of withstanding peak voltages in the reverse direction equal to:<br>10 % of the DC rating at +25 °C<br>5 % of the DC rating at +85 °C<br>1 % of the DC rating at +125 °C<br>Vishay does not recommend intentional or repetitive application of reverse voltage. | |
| Ripple current | For maximum ripple current values (at 25 °C) refer to relevant datasheet. If capacitors are to be used at temperatures above +25 °C, the permissible RMS ripple current (or voltage) shall be calculated using the derating factors:<br>1.0 at +25 °C<br>0.9 at +85 °C<br>0.4 at +125 °C | |

| Maximum operating and surge voltages vs. temperature | +85 °C | | +125 °C | |
|---|---|---|---|---|
| | RATED VOLTAGE (V) | SURGE VOLTAGE (V) | CATEGORY VOLTAGE (V) | SURGE VOLTAGE (V) |
| | 2.0 | 2.7 | 1.3 | 1.7 |
| | 4.0 | 5.2 | 2.7 | 3.4 |
| | 6.3 | 8.0 | 4.0 | 5.0 |
| | 10 | 13 | 7.0 | 8.0 |
| | 15 / 16 | 20 | 10 | 12 |
| | 20 | 26 | 13 | 16 |
| | 25 | 32 | 17 | 20 |
| | 35 | 46 | 23 | 28 |
| | 40 | 52 | 26 | 31 |
| | 50 | 65 | 33 | 40 |
| | 50 (1) | 60 | 33 | 40 |
| | 63 (2) | 75 | 42 | 50 |
| | 75 (2) | 75 | 50 | 50 |

| Recommended voltage derating guidelines (below 85 °C) | VOLTAGE RAIL (V) | CAPACITOR VOLTAGE RATING (V) |
|---|---|---|
| | ≤ 3.3 | 6.3 |
| | 5 | 10 |
| | 10 | 20 |
| | 12 | 25 |
| | 15 | 35 |
| | 24 | 50 or series configuration |
| | 28 | 63 or series configuration |
| | ≥ 32 | 75 or series configuration |

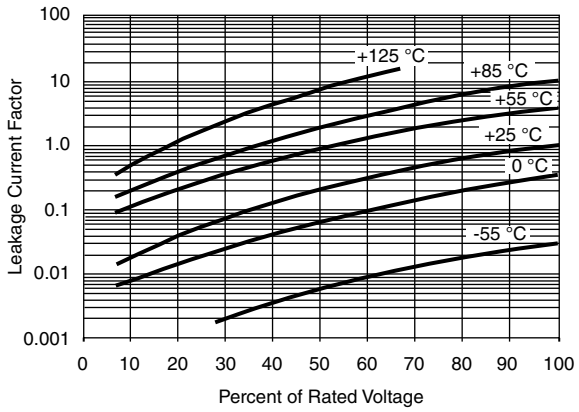
**Notes**

- All information presented in this document reflects typical performance characteristics
- For more information about recommended voltage derating see: www.vishay.com/doc?40246

(1) Capacitance value 15 µF and higher

(2) For 597D only

## TYPICAL LEAKAGE CURRENT TEMPERATURE FACTOR




**Notes**

- **At +25 °C**, the leakage current shall not exceed the value listed in the Standard Ratings table
- **At +85 °C**, the leakage current shall not exceed 10 times the value listed in the Standard Ratings table
- **At +125 °C**, the leakage current shall not exceed 12 times the value listed in the Standard Ratings table

## ENVIRONMENTAL PERFORMANCE CHARACTERISTICS

| ITEM | CONDITION | POST TEST PERFORMANCE | |
|---|---|---|---|
| Surge voltage | Post application of surge voltage (as specified in the table above) in series with a 33 Ω resistor at the rate of 30 s ON, 30 s OFF, for 1000 successive test cycles at 85 °C<br>MIL-PRF-55365 | Capacitance change<br>Dissipation factor<br>Leakage current | Within ± 10 % of initial value<br>Initial specified limit<br>Initial specified limit |
| Life test at +85 °C | 2000 h application of rated voltage at 85 °C<br>MIL-STD-202, method 108 | Capacitance change<br>Dissipation factor<br>Leakage current | Within ± 10 % of initial value<br>Initial specified limit<br>Shall not exceed 125 % of initial limit |
| Life test at +125 °C | 1000 h application 2/3 of rated voltage at 125 °C<br>MIL-STD-202, method 108 | Capacitance change:<br>Cap. ≤ 600 µF<br>Cap. > 600 µF<br>Dissipation factor<br>Leakage current | <br>Within ± 10 % of initial value<br>Within ± 20 % of initial value<br>Initial specified limit<br>Shall not exceed 125 % of initial limit |
| Humidity test | At 40 °C / 90 % RH, 1000 h, no voltage applied<br>MIL-STD-202, method 103 | Capacitance change:<br>Cap. ≤ 600 µF<br>Cap. > 600 µF<br>Dissipation factor<br>Leakage current | <br>Within ± 10 % of initial value<br>Within ± 20 % of initial value<br>Not to exceed 150 % of initial limit<br>Shall not exceed 200 % of initial limit |
| Moisture resistance | MIL-STD-202, method 106, 20 cycles | Capacitance change:<br>Cap. ≤ 600 µF<br>Cap. > 600 µF<br>Dissipation factor<br>Leakage current | <br>Within ± 15 % of initial value<br>Within ± 20 % of initial value<br>Shall not exceed 150 % of initial limit<br>Shall not exceed 200 % of initial limit |
| Thermal shock | At -55 °C / +125 °C, for 5 cycles,<br>30 min at each temperature<br>MIL-STD-202, method 107 | Capacitance change:<br>Cap. ≤ 600 µF<br>Cap. > 600 µF<br>Dissipation factor<br>Leakage current | <br>Within ± 10 % of initial value<br>Within ± 20 % of initial value<br>Initial specified limit<br>Initial specified limit |

| MECHANICAL PERFORMANCE CHARACTERISTICS | | |
|---|---|---|
| **ITEM** | **CONDITION** | **POST TEST PERFORMANCE** |
| Terminal strength / Shear force test | Apply a pressure load of 5 N for 10 s ± 1 s horizontally to the center of capacitor side body AEC-Q200-006 | Capacitance change: Within ± 10 % of initial value<br>Dissipation factor: Initial specified limit<br>Leakage current: Initial specified limit<br>There shall be no mechanical or visual damage to capacitors post-conditioning. |
| Vibration | MIL-STD-202, method 204, condition D,<br>10 Hz to 2000 Hz, 20 *g* peak, 8 h, at rated voltage | Electrical measurements are not applicable, since the same parts are used for shock (specified pulse) test.<br>There shall be no mechanical or visual damage to capacitors post-conditioning. |
| Shock<br>(specified pulse) | MIL-STD-202, method 213, condition I,<br>100 *g* peak | Capacitance change:<br>Cap. ≤ 600 µF: Within ± 10 % of initial value<br>Cap. > 600 µF: Within ± 20 % of initial value<br>Dissipation factor: Initial specified limit<br>Leakage current: Initial specified limit<br>There shall be no mechanical or visual damage to capacitors post-conditioning. |
| Resistance to solder heat | MIL-STD-202, method 210, condition J (SnPb terminations) and K (lead (Pb)-free terminations), one heat cycle | Capacitance change: Within ± 10 % of initial value<br>Dissipation factor: Initial specified limit<br>Leakage current: Initial specified limit |
| Solderability | EIA / IPC / JEDEC J-STD-002<br>Test B (SnPb) and B1 (lead (Pb)-free).<br>Preconditioning per category C.<br>Capacitors with SnPb and lead (Pb)-free terminations are backward and forward compatible.<br>Does not apply to gold terminations. | Solder coating of all capacitors shall meet specified requirements.<br>There shall be no mechanical or visual damage to capacitors post-conditioning. |
| Flammability | Encapsulation materials meet UL 94 V-0 with an oxygen index of 32 % | |