



## COTS Tantalum Capacitors

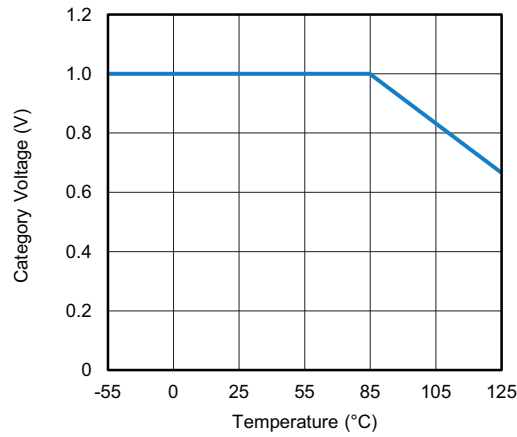
ELECTRICAL PERFORMANCE CHARACTERISTICS				
ITEM	PERFORMANCE CHARACTERISTICS			
Category temperature range	-55 °C to +85 °C (to +125 °C with voltage derating)			
Capacitance tolerance	± 20 %, ± 10 %, tested via bridge method, at 25 °C, 120 Hz			
Dissipation factor	Limit per Standard Ratings table. Tested via bridge method, at 25 °C, 120 Hz			
ESR	Limit 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. <i>Note that the leakage current varies with temperature and applied voltage. See graph below for the appropriate adjustment factor.</i>			
Capacitance change by temperature	+15 % max. (at +125 °C) +10 % max. (at +85 °C) -10 % max. (at -55 °C)			
Reverse voltage	Capacitors are capable of withstanding peak voltages in the reverse direction equal to: 10 % of the DC rating at +25 °C 5 % of the DC rating at +85 °C 1 % of the DC rating at +125 °C 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: 1.0 at +25 °C 0.9 at +85 °C 0.4 at +125 °C			
Maximum operating and surge voltages vs. temperature	<b>+85 °C</b>		<b>+125 °C</b>	
	<b>RATED VOLTAGE (V)</b>	<b>SURGE VOLTAGE (V)</b>	<b>CATEGORY VOLTAGE (V)</b>	<b>SURGE VOLTAGE (V)</b>
	4.0	5.2	2.7	3.4
	6.3	8.0	4.0	5.0
	10	13	7.0	8.0
	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 <sup>(1)</sup>	60	33	40
63	75	42	50	
75	75	50	50	
Recommended voltage derating guidelines (below 85 °C) <sup>(2)</sup>	<b>VOLTAGE RAIL (V)</b>		<b>CAPACITOR VOLTAGE RATING (V)</b>	
	≤ 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**

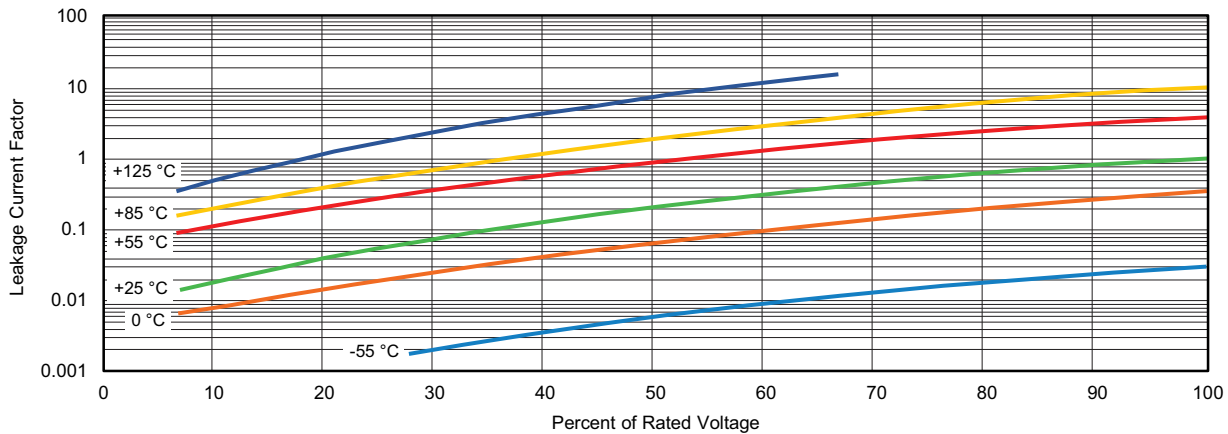
- All information presented in this document reflects typical performance characteristics
- For more information about recommended voltage derating see: [www.vishay.com/doc?40246](http://www.vishay.com/doc?40246)
- <sup>(1)</sup> Capacitance value 15 μF and higher
- <sup>(2)</sup> For temperatures above +85 °C the same voltage derating ratio is recommended, but with respect to category voltage: up to +85 °C: category voltage = rated voltage; at +125 °C: category voltage = 2/3 of rated voltage, between these temperatures it decreases linearly - see graph below



## CATEGORY VOLTAGE VS. TEMPERATURE



## 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	MIL-PRF-55365 1000 successive test cycles at 85 °C 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	Capacitance change Dissipation factor Leakage current	Within ± 10 % of initial value Initial specified limit Initial specified limit
Life test at +85 °C	MIL-STD-202, method 108 1000 h application of rated voltage at 85 °C	Capacitance change Dissipation factor Leakage current	Within ± 10 % of initial value Initial specified limit Shall not exceed 125 % of initial limit
Life test at +125 °C	MIL-STD-202, method 108 1000 h application 2/3 of rated voltage at 125 °C	Capacitance change Dissipation factor Leakage current	Within ± 10 % of initial value Initial specified limit Shall not exceed 125 % of initial limit
Moisture resistance	MIL-STD-202, method 106, 20 cycles	Capacitance change Dissipation factor Leakage current	Within ± 15 % of initial value Shall not exceed 150 % of initial limit Shall not exceed 200 % of initial limit
Stability at low and high temperatures	MIL-PRF-55365	Delta cap limit at -55 °C, 85 °C is ± 10 % of initial value Delta cap limit at 125 °C is ± 15 % of initial value Delta cap at step 3 and final step 25 °C is ± 10 % DCL at 85 °C: 10 x initial specified value DCL at 125 °C: 12 x initial specified value DCL at 25 °C: initial specified value at RV	
Thermal shock	MIL-STD-202, method 107 At -55 °C / +125 °C, for 5 cycles, 30 min at each temperature	Capacitance change Dissipation factor Leakage current	Within ± 10 % of initial value Initial specified limit 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	Capacitance change Dissipation factor Leakage current	Within ± 10 % of initial value Initial specified limit Initial specified limit
Vibration	MIL-STD-202, method 204, condition D, 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. There shall be no mechanical or visual damage to capacitors post-conditioning.	
Shock (specified pulse)	MIL-STD-202, method 213, condition I, 100 g peak	Capacitance change Dissipation factor Leakage current	Within ± 10 % of initial value Initial specified limit Initial specified limit
Resistance to soldering heat	MIL-STD-202, method 210, condition J (leadbearing capacitors) and K (lead (Pb)-free capacitors), one heat cycle	Capacitance change Dissipation factor Leakage current	Within ± 10 % of initial value Initial specified limit Initial specified limit
Solderability	MIL-STD-202, method 208, ANSI/J-STD-002, test B (leadbearing) and B1 (lead (Pb)-free). Preconditioning per category C (category E - optional). Does not apply to gold terminations. Lead (Pb)-free and leadbearing capacitors are backward and forward compatible	Solder coating of all capacitors shall meet specified requirements. There shall be no mechanical or visual damage to capacitors post-conditioning.	
Resistance to solvents	MIL-STD-202, method 215	There shall be no mechanical or visual damage to capacitors post-conditioning. Body marking shall remain legible.	
Flammability	Encapsulation materials meet UL 94 V-0 with an oxygen index of 32 %		