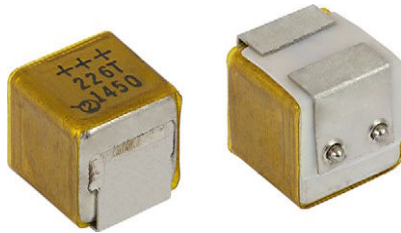


Solid Tantalum SMD Capacitors TANTAMOUNT™, Hi-Rel COTS, Low ESR, Metal Case



PERFORMANCE CHARACTERISTICS

Operating Temperature: -55 °C to +125 °C
(above 85 °C, voltage derating is required)

Capacitance Range: 22 µF to 330 µF

Capacitance Tolerance: ± 10 %, ± 20 %

Voltage Rating: 16 V_{DC} to 50 V_{DC}

FEATURES

- High reliability; burn-in at a minimum of rated DC voltage for a minimum of 40 h
- Surge current testing per MIL-PRF-55365 option available
- Low ESR
- Lead (Pb)-free terminations available (tin / lead terminations are under development)
- Mounting: surface-mount
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS*
Available

HALOGEN

FREE

GREEN

(5-2008)

Available

Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

ORDERING INFORMATION							
T25	D	226	K	050	E	S	A
TYPE	CASE CODE	CAPACITANCE	CAPACITANCE TOLERANCE	DC VOLTAGE RATING AT +85 °C	TERMINATION / PACKAGING (available options are series dependent)	RELIABILITY GRADE	SURGE CURRENT OPTION
See Ratings and Case Codes table	This is expressed in pF. The first two digits are the significant figures. The third is the number of zeros to follow.	K = ± 10 % M = ± 20 %	This is expressed in volts. To complete the three-digit block, zeros precede the voltage rating. A decimal point is indicated by an "R" (6R3 = 6.3 V).	C = 100 % tin / 7" (178 mm), reel H = 100 % tin / 7" (178 mm), 1/2 reel E = Sn / Pb solder / 7" (178 mm) reel L = Sn / Pb solder / 7" (178 mm), 1/2 reel	S = 40 h burn-in Z = non ER	A = 10 cycles at +25 °C B = 10 cycles at -55 °C / +85 °C C = 10 cycles at -55 °C / +85 °C (before burn-in) S = 3 cycles at 25 °C Z = no surge current	

DIMENSIONS in inches [millimeters]							
CASE CODE	L (MAX.)	L1	W	H	P	Tw	WEIGHT g (AVERAGE)
D	0.326 [8.5]	0.283 ± 0.008 [7.2 ± 0.2]	0.275 ± 0.008 [7.0 ± 0.2]	0.291 ± 0.008 [7.4 ± 0.2]	0.098 ± 0.008 [2.5 ± 0.2]	0.197 ± 0.008 [5.0 ± 0.2]	1.80

RATINGS AND CASE CODES					
μF	16 V	20 V	25 V	35 V	50 V
22					D
33					
47					
68				D ⁽¹⁾	
100			D ⁽¹⁾		
150					
220		D ⁽¹⁾			
330	D				

Note

⁽¹⁾ Preliminary values, contact factory for availability

MARKING		VOLTAGE CODE	
		V	CODE
		16	C
		20	D
		25	E
		35	V
		50	T

STANDARD RATINGS						
CAPACITANCE (μF)	CASE CODE	PART NUMBER	MAX. DCL AT +25 °C (μA)	MAX. DF AT +25 °C (%)	MAX. ESR AT +25 °C 100 kHz (m Ω)	MAX. RIPPLE 100 kHz I_{RMS} (A)
16 V_{DC} AT +85 °C; 10 V_{DC} AT +125 °C						
330	D	T25D337(1)016(2)(3)(4)	52.8	14	180	1.5
20 V_{DC} AT +85 °C; 13 V_{DC} AT +125 °C						
220	D ⁽¹⁾	T25D227(1)020(2)(3)(4)		In development		
25 V_{DC} AT +85 °C; 17 V_{DC} AT +125 °C						
100	D ⁽¹⁾	T25D107(1)025(2)(3)(4)		In development		
35 V_{DC} AT +85 °C; 23 V_{DC} AT +125 °C						
68	D ⁽¹⁾	T25D686(1)035(2)(3)(4)		In development		
50 V_{DC} AT +85 °C; 33 V_{DC} AT +125 °C						
22	D	T25D226(1)050(2)(3)(4)	11	6	500	0.9

Notes

- Part number definitions:
 - Capacitance tolerance: K, M
 - Termination and packaging: C, H, E, L
 - Reliability level: S, Z
 - Surge current: A, B, S, C, Z
- ⁽¹⁾ Rating in development, contact factory for availability



VOLTAGE DERATING GUIDELINES (below +85 °C)	
VOLTAGE RAIL (V)	CAPACITOR RATED VOLTAGE (V)
3.3	6.3
5	10
10	20
12	25
15	35
≥ 24	50 or series configuration

Note

- For more information about recommended voltage derating see technical note www.vishay.com/doc?40246

CARRIER TAPE DIMENSIONS in inches [millimeters]					
TYPE	CASE CODE	TAPE WIDTH W (mm)	P ₁	K ₀ MAX.	B ₁ MAX.
T25	D	16	0.476 ± 0.004 [12.0 ± 0.1]	0.3 [7.86]	0.45 [11.3]

POWER DISSIPATION	
CASE CODE	MAXIMUM PERMISSIBLE POWER DISSIPATION AT +25 °C (W) IN FREE AIR
D	0.408

STANDARD PACKAGING QUANTITY		
CASE CODE	UNITS PER REEL	
	7" FULL REEL	7" HALF REEL
D	100	50

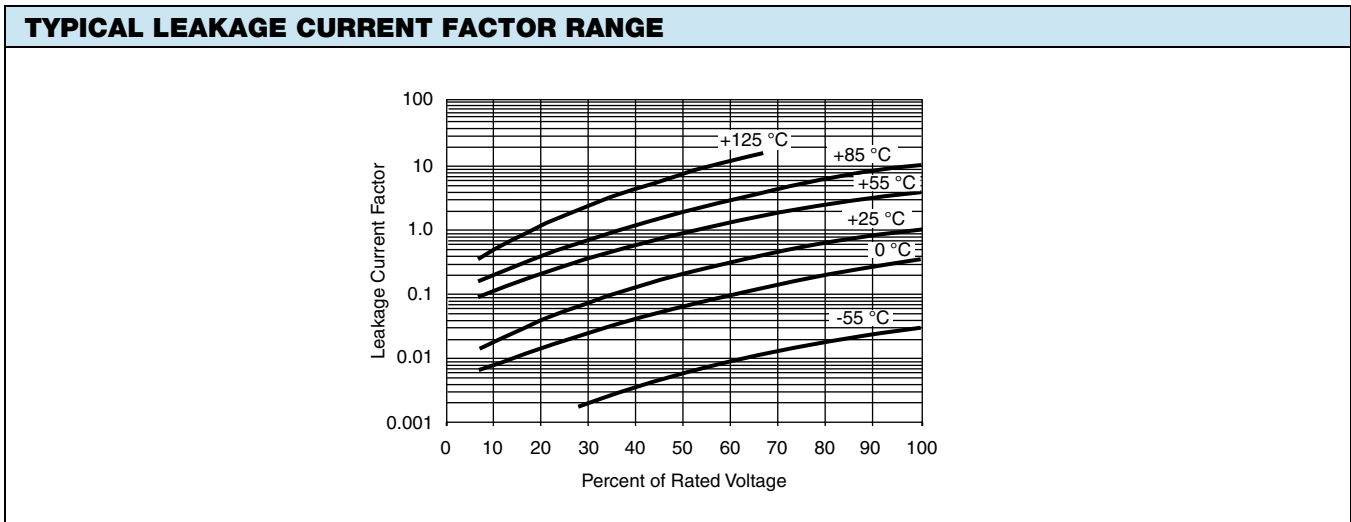
CAPACITOR ELECTRICAL PERFORMANCE CHARACTERISTICS									
ITEM	PERFORMANCE CHARACTERISTICS								
Category temperature range	-55 °C to +85 °C (to +125 °C with voltage derating)								
Capacitance tolerance	± 20 %, ± 10 %, tested via bridge method, at +25 °C, 120 Hz								
Dissipation factor	Limit 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 described in Standard Ratings table. <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	<table border="0"> <tr> <td>+12 % max. (at +125 °C)</td> <td>For capacitance value > 300 μF</td> </tr> <tr> <td>+10 % max. (at +85 °C)</td> <td>+20 % max. (at +125 °C)</td> </tr> <tr> <td>-10 % max. (at -55 °C)</td> <td>+15 % max. (at +85 °C)</td> </tr> <tr> <td></td> <td>-15 % max. (at -55 °C)</td> </tr> </table>	+12 % max. (at +125 °C)	For capacitance value > 300 μF	+10 % max. (at +85 °C)	+20 % max. (at +125 °C)	-10 % max. (at -55 °C)	+15 % max. (at +85 °C)		-15 % max. (at -55 °C)
+12 % max. (at +125 °C)	For capacitance value > 300 μF								
+10 % max. (at +85 °C)	+20 % max. (at +125 °C)								
-10 % max. (at -55 °C)	+15 % max. (at +85 °C)								
	-15 % 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 Vishay does not recommend intentional or repetitive application of reverse voltage.								
Ripple current and temperature derating	For maximum permissible ripple current (I _{RMS}) or / and voltage (V _{RMS}) please refer to product datasheet and Guide to Application. 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								



CAPACITOR ELECTRICAL PERFORMANCE CHARACTERISTICS				
ITEM	PERFORMANCE CHARACTERISTICS			
Maximum operating voltage	OPERATING TEMPERATURE			
	+85 °C		+125 °C	
	RATED VOLTAGE (V)	SURGE VOLTAGE (V)	RATED VOLTAGE (V)	SURGE VOLTAGE (V)
	16	20	10	12
	20	26	13	16
	25	32	17	20
	35	46	23	28
	50	65	33	40

Note

- All information presented in this document reflects typical performance characteristics



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

CAPACITOR PERFORMANCE CHARACTERISTICS			
ITEM	CONDITION	POST TEST PERFORMANCE	
Surge voltage	85 °C, 1000 successive test cycles at 1.3 of rated voltage in series with a 1 kΩ resistor at the rate of 30 s ON, 30 s OFF, MIL-PRF-55365	Capacitance change	Within ± 10 % of initial
		Dissipation factor	Not to exceed initial
		Leakage current	Not to exceed initial
Life test at +85 °C	2000 h application of rated voltage at 85 °C, MIL-STD-202 method 108	Capacitance change	Within ± 10 % of initial
		Leakage current	Not to exceed 125 % of initial
Life test at +125 °C	1000 h application of 2/3 rated voltage at 125 °C, MIL-STD-202 method 108	Capacitance change	Within ± 20 % of initial
		Leakage current	Not to exceed 125 % of initial

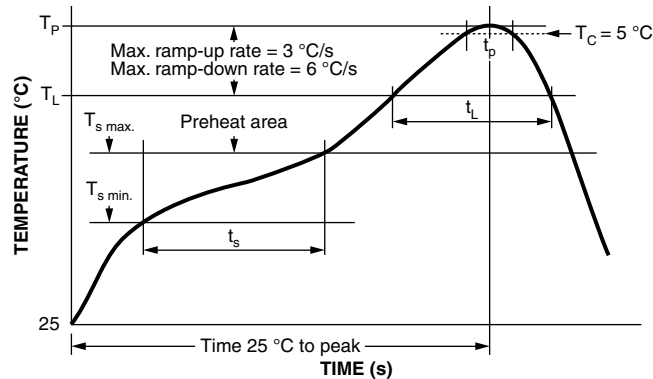


CAPACITOR ENVIRONMENTAL CHARACTERISTICS		
ITEM	CONDITION	POST TEST PERFORMANCE
Moisture resistance	MIL-STD-202, method 106, at rated voltage.	Capacitance change Cap. \leq 600 μ F Within \pm 10 % of initial value Cap. $>$ 600 μ F Within \pm 20 % of initial value Dissipation factor Initial specified value or less Leakage current Initial specified value or less
Thermal shock	Capacitors are subjected to 6 cycles per MIL-STD-202 method 107 of the following: -55 °C (+0 °C, -6 °C) for 30 min, then +25 °C (+3 °C, -3 °C) for 5 min, then +85 °C (+4 °C, -5 °C) for 40 min, then +125 °C (+4 °C, -0 °C) for 30 min, then +25 °C (+3 °C, -3 °C) for 5 min	Capacitance change Cap. Within \pm 15 % of initial Dissipation factor Initial specified value or less Leakage current Initial specified value multiplied by 12 or less
Salt atmosphere (corrosion)	Test per MIL-202, method 101, condition B (48 h). 5 % salt solution applying.	No harmful or extensive corrosion, = 90 % protection of exposed metallic surfaces by finish, markings legible, = 10 % corrosion of the terminal hardware or mounting.

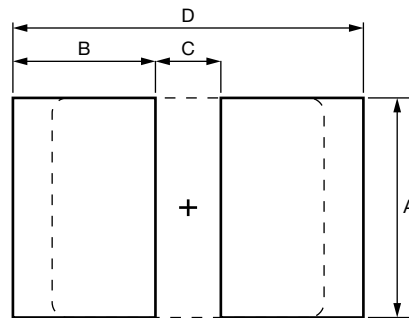
MECHANICAL PERFORMANCE CHARACTERISTICS		
TEST CONDITION	CONDITION	POST TEST PERFORMANCE
Shear test	Apply a pressure load of 5 N for 10 s \pm 1 s horizontally to the center of capacitor side body. AEC-Q200-006	There shall be no visual damage when viewed at 20 x magnification and the component shall meet the original electrical requirements.
Vibration	MIL-STD-202, method 204, condition D, 10 Hz to 2000 Hz, 20 g peak	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 Within \pm 10 % of initial Dissipation factor Initial specified value or less Leakage current Initial specified value or less There shall be no mechanical or visual damage to capacitors post-conditioning.
Resistance to soldering heat	MIL-STD-202, method 210, condition J, except with only one heat cycle.	Capacitance change Within \pm 10 % of initial Dissipation factor Initial specified value or less Leakage current Initial specified value or less There shall be no mechanical or visual damage to capacitors post-conditioning.
Solderability	MIL-STD-202, method 208, ANSI/J-STD-002, test B. Applies only to solder and tin plated terminations. Does not apply to gold terminations.	All terminations shall exhibit a continuous solder coating free from defects for a minimum of 95 % of the critical area of any individual lead.
Resistance to solvent	MIL-STD-202, method 215	Marking has to remain legible, no degradation of the can material.
Sleeving	MIL-PRF-39003, paragraph 3.22: apply a DC potential of 2000 V.	Maximum leakage of 20 μ A is allowed between the capacitor case and the fixture.
Seal	MIL-STD-202, method 112, condition A or D	There shall be no visual leakage.

RECOMMENDED REFLOW PROFILES

Capacitors should withstand reflow profile as per J-STD-020 standard



PROFILE FEATURE	SnPb EUTECTIC ASSEMBLY	LEAD (Pb)-FREE ASSEMBLY
Preheat / soak		
Temperature min. ($T_{s \text{ min.}}$)	100 °C	150 °C
Temperature max. ($T_{s \text{ max.}}$)	150 °C	200 °C
Time (t_s) from ($T_{s \text{ min.}}$ to $T_{s \text{ max.}}$)	60 s to 120 s	60 s to 120 s
Ramp-up		
Ramp-up rate (T_L to T_P)	3 °C/s max.	3 °C/s max.
Liquidus temperature (T_L)	183 °C	217 °C
Time (t_L) maintained above T_L	60 s to 150 s	60 s to 150 s
Peak package body temperature (T_P)	220	250
Time (t_p) within 5 °C of the specified classification temperature (T_C)	20 s	30 s
Time 25 °C to peak temperature	6 min max.	8 min max.
Ramp-down		
Ramp-down rate (T_P to T_L)	6 °C/s max.	6 °C/s max.
Time 25 °C to peak temperature	6 min max.	8 min max.

PAD DIMENSIONS in inches [millimeters]


CASE CODE	A (MIN.)	B (NOM.)	C (NOM.)	D (NOM.)
D	0.276 [7]	0.178 [4.5]	0.079 [2]	0.433 [11]



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.