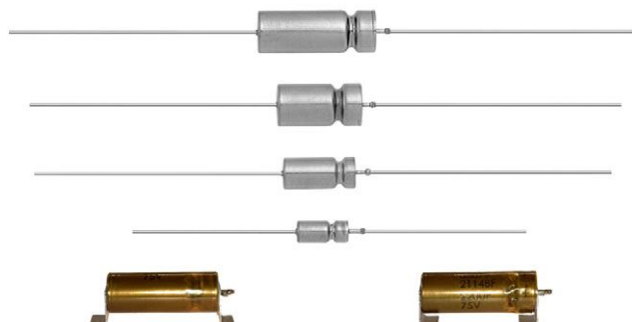


# Wet Tantalum Capacitors, Extended Capacitance, Tantalum Case With Glass-to-Tantalum Hermetic Seal for -55 °C to +125 °C



## LINKS TO ADDITIONAL RESOURCES



## PERFORMANCE CHARACTERISTICS

Refer to: Typical Performance Characteristics

**Operating Temperature:** -55 °C to +85 °C  
(to +125 °C with voltage derating)

**Capacitance Tolerance:**  $\pm 10 \%$ ,  $\pm 20 \%$  standard

**DC Leakage Current (DCL Max.):** at +25 °C and above:  
leakage current shall not exceed the values listed in the Standard Ratings table.

## FEATURES

- Enhanced performance, high reliability design
- Terminations: axial, standard tin / lead (Sn / Pb), 100 % tin (RoHS-compliant) available
- Model T16 tantalum-case electrolytic capacitors provide all the advantages of Vishay's SuperTan® series devices, while offering improved reverse voltage and vibration capability
- Increased thermal shock capability of 300 cycles
- Designed for the avionics and aerospace applications
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS\***  
Available

**HALOGEN  
FREE  
GREEN  
(5-2008)  
Available**

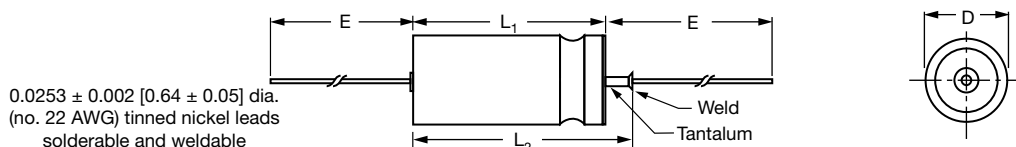
## Note

\* 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								
T16	D	227	M	100	E <sup>(1)</sup>	Z	S <sup>(2)</sup>	S
MODEL	CASE CODE	CAPACITANCE	CAPACITANCE TOLERANCE	DC VOLTAGE RATING AT +85 °C	TERMINATION AND PACKAGING	RELIABILITY / SHOCK / VIBRATION LEVEL	INSULATING SLEEVE	ESR
	See Ratings and Case Codes Table.	This is expressed in picofarads. The first two digits are the significant figures. The third is the number of zeros to follow.	K = $\pm 10 \%$ M = $\pm 20 \%$	This is expressed in volts. To complete the three-digit block, zeros precede the voltage rating.	E = axial, tin / lead, bulk C = axial, 100 % tin, bulk J = SMD, outside bend, tin / lead K = SMD, outside bend, 100 % tin L = SMD, inside bend, tin / lead M = SMD, inside bend, 100 % tin	Z = standard H = high	S = sleeved U = unsleeved	S = standard

## Notes

- Packaging: the use of formed plastic trays for packaging these axial lead components is standard. Tape and reel is not available due to the unit weight
- (1) J, K, L, M are available in T4. For all other case sizes, check with marketing
- (2) Sleeve on J, K, L, M terminations shall be Kapton only

**AXIAL DIMENSIONS** in inches [millimeters]


CASE CODE		D	L <sub>1</sub>	L <sub>2</sub> (max.)	E	WEIGHT (g) (max.)
TYPE T16	ST					
A	T1	0.188 ± 0.016 [4.78 ± 0.41]	0.453 + 0.031 / - 0.016 [11.51 + 0.79 / - 0.41]	0.734 [18.64]	1.500 ± 0.250 [38.10 ± 6.35]	2.6
B	T2	0.281 ± 0.016 [7.14 ± 0.41]	0.641 + 0.031 / - 0.016 [16.28 + 0.79 / - 0.41]	0.922 [23.42]	2.250 ± 0.250 [57.15 ± 6.35]	6.2
E	L2	0.281 ± 0.016 [7.14 ± 0.41]	1.008 + 0.031 / - 0.016 [25.60 + 0.79 / - 0.41]	1.171 [29.75]	2.250 [57.15]	7.84
C	T3	0.375 ± 0.016 [9.52 ± 0.41]	0.766 + 0.031 / - 0.016 [19.46 + 0.79 / - 0.41]	1.047 [26.59]	2.250 ± 0.250 [57.15 ± 6.35]	11.6
D	T4	0.375 ± 0.016 [9.52 ± 0.41]	1.062 + 0.031 / - 0.016 [26.97 + 0.79 / - 0.41]	1.343 [34.11]	2.250 ± 0.250 [57.15 ± 6.35]	17.7

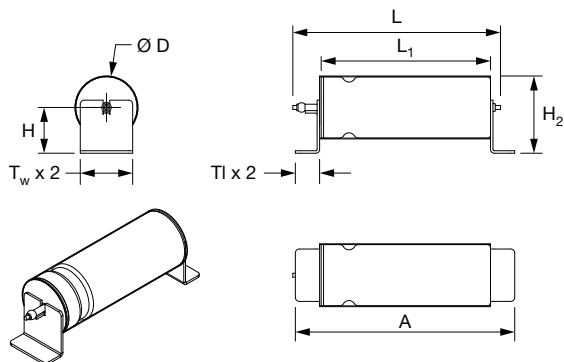
**Note**

- For insulated parts, add 0.015" [0.38 mm] to the diameter. The insulation shall lap over the ends of the capacitor body

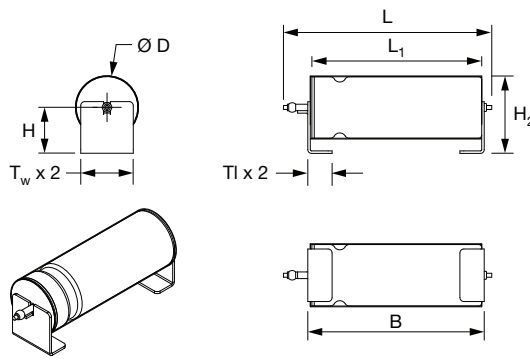
**SMD PRODUCT DIMENSIONS** in inches [millimeters]

**Styles J, K**

Term. code	Solder type
J	SnPb
K	100 % tin (RoHS-compliant)


**Styles L, M**

Term. code	Solder type
L	SnPb
M	100 % tin (RoHS-compliant)



CASE CODE		A (max.)	B (max.)	TI (max.)	H (max.)	Tw ± 0.008	H <sub>2</sub> (max.)	L (max.)	L <sub>1</sub>	D (max.)
TYPE T16	ST									
A	T1	0.773 [19.6]	0.513 [13.0]	0.157 [4.0]	0.177 [4.5]	0.158 [4.0]	0.296 [7.5]	0.705 [17.9]	0.469 + 0.031 / - 0.016 [11.91 + 0.79 / - 0.41]	0.228 [5.8]
B	T2	1.001 [25.4]	0.720 [18.3]	0.157 [4.0]	0.212 [5.4]	0.225 [5.7]	0.374 [9.5]	0.903 [22.9]	0.668 + 0.012 / - 0.12 [16.97 + 0.30 / - 0.30]	0.316 [8.0]
E	L2	1.354 [34.3]	1.074 [27.2]	0.157 [3.98]	0.212 [5.38]	0.225 [5.7]	0.374 [9.49]	1.257 [31.9]	1.022 + 0.012 / - 0.12 [25.96 + 0.30 / - 0.30]	0.316 [8.0]
C	T3	1.143 [29.0]	0.858 [21.8]	0.157 [4.0]	0.280 [7.1]	0.331 [8.4]	0.492 [12.5]	1.051 [26.7]	0.806 + 0.012 / - 0.12 [20.47 + 0.30 / - 0.30]	0.397 [10.1]
D	T4	1.432 [36.4]	1.140 [29.0]	0.157 [4.0]	0.295 [7.5]	0.331 [8.4]	0.492 [12.5]	1.343 [34.1]	1.062 + 0.031 / - 0.016 [26.97 + 0.79 / - 0.41]	0.397 [10.1]

**Note**

- Use appropriate adhesive between capacitor body and the board for improved mechanical strength



RATINGS AND CASE CODES							
$\mu\text{F}$	25 V	30 V	50 V	60 V	75 V	100 V	125 V
10							A
15						A	
33					A		
47				A			B
68			A			B	
82							C
90							E
100		A					C
110					B		
120	A					E	
150				B		C	D
220			B		E	D	
250					E		
330					C		
370				E			
390				C			
450			E				
470		B	C		D		
560	B			D			
680		D	D				
950		E					
1000		C					
1100	E						
1200	C						
1500		D					
1800	D						



## STANDARD RATINGS

CAPACITANCE AT +25 °C 120 Hz (μF)	CASE CODE	PART NUMBER	MAX. ESR AT +25 °C 120 Hz (Ω)	MAX. IMP. AT -55 °C 120 Hz (Ω)	MAX. DCL (μA) AT		MAX. CAPACITANCE CHANGE (%)			AC RIPPLE +85 °C 40 kHz (mA <sub>RMS</sub> )
					+25 °C	+85 °C AND +125 °C	-55 °C	+85 °C	+125 °C	
25 V <sub>DC</sub> AT 85 °C, 15 V <sub>DC</sub> AT 125 °C										
120	A	T16A127(1)025(2)(3)(4)(5)	1.30	25	1	5	-42	8	12	1250
560	B	T16B567(1)025(2)(3)(4)(5)	0.83	12	2	10	-65	14	18	2000
1100	E	T16E118(1)025(2)(3)(4)(5)	0.50	7	3	25	-60	20	45	3200
1200	C	T16C128(1)025(2)(3)(4)(5)	0.65	7	5	20	-70	15	20	2400
1800	D	T16D188(1)025(2)(3)(4)(5)	0.50	7	6	25	-72	15	20	3000
30 V <sub>DC</sub> AT 85 °C, 20 V <sub>DC</sub> AT 125 °C										
100	A	T16A107(1)030(2)(3)(4)(5)	1.30	25	1	5	-38	8	12	1200
470	B	T16B477(1)030(2)(3)(4)(5)	0.85	15	2	10	-65	14	18	1800
680	D	T16D687(1)030(2)(3)(4)(5)	0.70	8	5	40	-58	10	20	2700
950	E	T16E957(1)030(2)(3)(4)(5)	0.50	7	5	30	-55	18	35	3200
1000	C	T16C108(1)030(2)(3)(4)(5)	0.70	7	7	25	-70	15	25	2200
1500	D	T16D158(1)030(2)(3)(4)(5)	0.60	6	12	35	-72	15	25	2900
50 V <sub>DC</sub> AT 85 °C, 30 V <sub>DC</sub> AT 125 °C										
68	A	T16A686(1)050(2)(3)(4)(5)	1.50	35	1	5	-25	8	15	1050
220	B	T16B227(1)050(2)(3)(4)(5)	0.90	17.5	2	10	-50	8	15	1800
450	E	T16E457(1)050(2)(3)(4)(5)	0.60	9	3	25	-45	12	30	2900
470	C	T16C477(1)050(2)(3)(4)(5)	0.75	10	3	25	-45	8	15	2100
680	D	T16D687(1)050(2)(3)(4)(5)	0.70	8	5	40	-58	10	20	2700
60 V <sub>DC</sub> AT 85 °C, 40 V <sub>DC</sub> AT 125 °C										
47	A	T16A476(1)060(2)(3)(4)(5)	2.00	44	1	5	-25	8	12	1050
150	B	T16B157(1)060(2)(3)(4)(5)	1.10	20	2	10	-40	8	15	1800
370	E	T16E377(1)060(2)(3)(4)(5)	0.60	9	3	25	-33	9	20	2900
390	C	T16C397(1)060(2)(3)(4)(5)	0.90	15	3	25	-45	8	15	2100
560	D	T16D567(1)060(2)(3)(4)(5)	0.80	10	5	40	-58	8	15	2700
75 V <sub>DC</sub> AT 85 °C, 50 V <sub>DC</sub> AT 125 °C										
33	A	T16A336(1)075(2)(3)(4)(5)	2.50	66	1	5	-25	5	9	1050
110	B	T16B117(1)075(2)(3)(4)(5)	1.30	24	2	10	-35	6	10	1650
220	E	T16E227(1)075(2)(3)(4)(5)	0.80	12	5	30	-30	6	15	2500
250	E	T16E257(1)075(2)(3)(4)(5)	0.80	12	5	30	-30	6	15	2500
330	C	T16C337(1)075(2)(3)(4)(5)	1.00	12	3	30	-45	6	10	2100
470	D	T16D477(1)075(2)(3)(4)(5)	0.90	12	5	50	-50	6	10	2700
100 V <sub>DC</sub> AT 85 °C, 65 V <sub>DC</sub> AT 125 °C										
15	A	T16A156(1)100(2)(3)(4)(5)	3.50	125	1	5	-18	3	10	1050
68	B	T16B686(1)100(2)(3)(4)(5)	2.10	37	2	10	-30	4	12	1650
120	E	T16E127(1)100(2)(3)(4)(5)	1.00	20.5	3	25	-30	4	12	2200
150	C	T16C157(1)100(2)(3)(4)(5)	1.60	22	3	25	-35	6	12	2100
220	D	T16D227(1)100(2)(3)(4)(5)	1.20	15	5	50	-40	6	12	2700
125 V <sub>DC</sub> AT 85 °C, 85 V <sub>DC</sub> AT 125 °C										
10	A	T16A106(1)125(2)(3)(4)(5)	5.50	175	1	5	-15	3	10	1050
47	B	T16B476(1)125(2)(3)(4)(5)	2.30	47	2	10	-25	5	12	1650
82	C	T16C826(1)125(2)(3)(4)(5)	1.80	40	3	25	-35	5	12	1950
90	E	T16E906(1)125(2)(3)(4)(5)	1.30	25	5	25	-25	4	15	2000
100	C	T16C107(1)125(2)(3)(4)(5)	1.80	35	3	25	-35	5	12	2100
150	D	T16D157(1)125(2)(3)(4)(5)	1.60	20	5	50	-35	6	12	2700

## Note

- Part number definitions:
  - Capacitance tolerance: K, M
  - Termination / packaging: C = 100 % tin, bulk; E = standard, tin / lead, bulk; J = SMD, outside bend, tin / lead; K = SMD, outside bend, 100 % tin; L = SMD, inside bend, tin / lead; M = SMD, inside bend, 100 % tin
  - Reliability level: Z = standard (non-ER / 500 g / 50 g / 53.79 g); H = high (non-ER / 500 g / 80 g / 53.79 g)
  - Insulating sleeve: S = sleeved; U = unsleeved
  - ESR: S = standard

**TYPICAL PERFORMANCE CHARACTERISTICS OF T16 CAPACITORS**

<b>ELECTRICAL CHARACTERISTICS</b>	
<b>ITEM</b>	<b>PERFORMANCE CHARACTERISTICS</b>
Operating temperature range	-55 °C to +85 °C (to +125 °C with voltage derating)
Capacitor tolerance	± 20 %, ± 10 % at 120 Hz, at +25 °C
Capacitor change by temperature	Limit per Standard Ratings table
ESR	Limit per Standard Ratings table, at +25 °C, 120 Hz
Impedance	Limit per Standard Ratings table, at -55 °C, 120 Hz
DCL (leakage current)	Limit per Standard Ratings table
AC ripple current	Limit per Standard Ratings table, at +85 °C and 40 kHz
Reverse voltage	Reverse voltage shall be in accordance with MIL-PRF-39006, paragraphs 3.23 and 4.8.19.
Surge voltage	Surge voltage shall be in accordance with MIL-PRF-39006 and Table II of DLA 13017. The DC rated surge voltage is the maximum voltage to which the capacitors can be subjected under any conditions including transients and peak ripple at the highest line voltage. The DC surge voltage is 115 % of rated DC voltage. After the test, the capacitors shall meet the following requirements: a) DC leakage shall not exceed the specified value in catalog b) Capacitance shall be within +5 %, -20 % of initial value c) ESR shall not exceed the specified value in catalog

<b>PERFORMANCE CHARACTERISTICS</b>	
<b>ITEM</b>	<b>PERFORMANCE CHARACTERISTICS</b>
Life testing	Capacitors shall be capable of withstanding a 2000 h life test at a temperature +85 °C at rated voltage, or a 2000 h life test at 125 °C test at derated voltage. After the test, the capacitors shall meet the following requirements: a) DC leakage at 85 °C and 125 °C shall not exceed 125 % of the specified value b) DC leakage at 25 °C shall not exceed the specified value c) Capacitance shall be within +10 %, -20 % of initial value d) ESR shall not exceed 200 % of the specified value

<b>ENVIRONMENTAL CHARACTERISTICS</b>		
<b>ITEM</b>	<b>CONDITION</b>	<b>COMMENTS</b>
Seal	MIL-PRF-39006	When the capacitors are tested as specified in MIL-PRF-39006, there shall be no evidence of leakage.
Moisture resistance	MIL-PRF-39006	Moisture resistance shall be in accordance with MIL-PRF-39006. Number of cycles: 10 continuous cycles
Barometric pressure (reduced)	MIL-STD-202, method 105, condition E	Altitude 150 000 feet

**MECHANICAL CHARACTERISTICS**

ITEM	TEST METHOD	CONDITION
Shock (specified pulse)	MIL-STD-202, method 213	Codes Z and H = test condition D (500 g)
Vibration, high frequency	MIL-STD-202, method 204	Code Z = test condition E (50 g peak) Code H = test condition H (80 g peak)
Random vibration	MIL-STD-202, method 214	Codes Z and H = test condition II-K (53.79 g RMS)
Thermal shock	MIL-STD-202, method 107	Codes Z and H = test condition A, 300 cycles
Solderability	MIL-STD-202, method 208	ANSI/J-STD-002, test A Solderability shall be in accordance with MIL-PRF-39006.
Terminal strength	MIL-STD-202, method 211	Terminal strength shall be in accordance with MIL-PRF-39006.
Resistance to solder heat	MIL-STD-202, method 210, condition C	The capacitors shall meet the requirements of MIL-PRF-39006.
Terminals	MIL-STD-1276	Terminals shall be as specified in MIL-STD-1276. The length and diameter of the terminals shall be as specified in Dimensions table. All terminals shall be permanently secured internally and externally, as applicable. All external joints shall be welded.
Marking	MIL-STD-1285	Marking of capacitors conforms to method I of MIL-STD-1285 and include capacitance (in $\mu\text{F}$ ), capacitance tolerance letter, rated voltage, date code, lot symbol and Vishay trademark.

**SELECTOR GUIDES**

Tantalum Selector Guide	<a href="http://www.vishay.com/doc?49054">www.vishay.com/doc?49054</a>
Parameter Comparison Guide	<a href="http://www.vishay.com/doc?42088">www.vishay.com/doc?42088</a>



## 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.