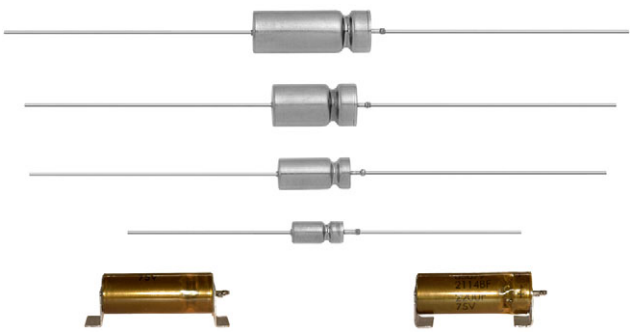
Wet Tantalum Ultra High Capacitance, Tantalum Case With Glass-to-Tantalum Hermetic Seal for -55 °C to +125 °C



FEATURES

- Enhanced performance, high reliability design
- Terminations:
  - axial through-hole, SMD outward L-leaded and SMD inward L-leaded
  - standard tin / lead (SnPb), 100 % tin 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

Pb-free Available

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

LINKS TO ADDITIONAL RESOURCES

3D Models

PERFORMANCE CHARACTERISTICS

Refer to: Typical Performance Characteristics

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

Capacitance Tolerance: ± 10 %, ± 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.

ORDERING INFORMATION

T16	D	227	M	100	E (1)	Z	S (2)	S
MODEL	CASE CODE	CAPACITANCE	CAPACITANCE TOLERANCE	DC VOLTAGE RATING AT +85 °C	TERMINATION	RELIABILITY / SHOCK / VIBRATION LEVEL	INSULATING SLEEVE	ESR
T16 T18	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 = ± 10 % M = ± 20 %	This is expressed in volts. To complete the three-digit block, zeros precede the voltage rating.	**Axial through-hole** E = tin / lead C = 100 % tin **SMD, outward L-leaded** J = tin / lead K = 100 % tin **Low profile, SMD, outward L-leaded** P = tin / lead R = 100 % tin **SMD, inward L-leaded** L = tin / lead M = 100 % tin **Low profile, SMD, inward L-leaded** S = tin / lead T = 100 % tin	Z = standard H = high	S = sleeved U = unsleeved	S = standard L = low

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

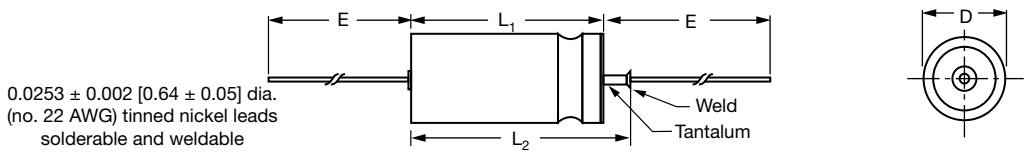
(1) Contact marketing for SMD capacitors availability

(2) Capacitors with SMD terminations are available only with high temperature (Kapton) film insulation

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AXIAL PRODUCT DIMENSIONS in inches [millimeters]



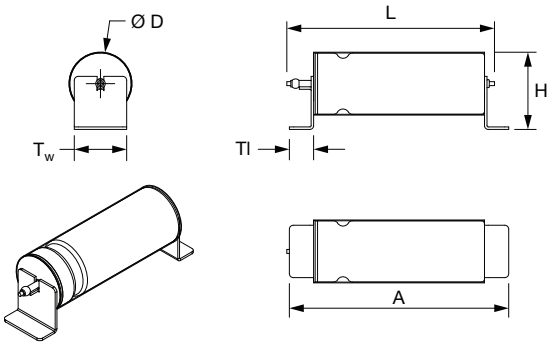
CASE CODE		D ± 0.016 [0.41]	L_1 + 0.031 [0.79] - 0.016 [0.41]	L_2 (max.)	E ± 0.250 [6.35]	WEIGHT (g) (max.)
TYPE T16 / T18	ST					
A	T1	0.188 [4.78]	0.453 [11.51]	0.734 [18.64]	1.500 [38.10]	2.6
B	T2	0.281 [7.14]	0.641 [16.28]	0.922 [23.42]	2.250 [57.15]	6.2
E	L2	0.281 [7.14]	1.008 [25.60]	1.171 [29.75]	2.250 [57.15]	7.84
C	T3	0.375 [9.52]	0.766 [19.46]	1.047 [26.59]	2.250 [57.15]	11.6
D	T4	0.375 [9.52]	1.062 [26.97]	1.343 [34.11]	2.250 [57.15]	17.7

Note

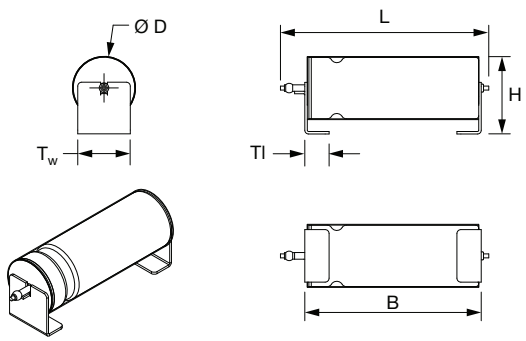
- For insulated parts, add 0.015" [0.38 mm] to the diameter. The insulation shall lap over the ends of the capacitor body

SMD PRODUCT DIMENSIONS in inches [millimeters]

Outward L-Leaded Terminations



Inward L-Leaded Terminations



TERMINATIONS		J, K, L, M, P, R, S, T					J, K, P, R	L, M, S, T	P, R, S, T
CASE CODE		D (max.)	L (max.)	H (max.)	Tl (max.)	T_w ± 0.008	A (max.)	B (max.)	LP H (max.)
TYPE T16 / T18	ST								
A	T1	0.228 [5.8]	0.705 [17.9]	0.296 [7.5]	0.157 [4.0]	0.158 [4.0]	0.773 [19.6]	0.513 [13.0]	
B	T2	0.300 [7.6]	0.903 [22.9]	0.374 [9.5]	0.157 [4.0]	0.217 [5.5]	1.001 [25.4]	0.720 [18.3]	
E	L2	0.300 [7.6]	1.257 [31.9]	0.374 [9.5]	0.157 [4.0]	0.217 [5.5]	1.354 [34.3]	1.074 [27.2]	
C	T3	0.397 [10.1]	1.051 [26.7]	0.492 [12.5]	0.157 [4.0]	0.331 [8.4]	1.143 [29.0]	0.858 [21.8]	
D	T4	0.397 [10.1]	1.343 [34.1]	0.492 [12.5]	0.157 [4.0]	0.331 [8.4]	1.432 [36.4]	1.140 [29.0]	0.421 [10.7]

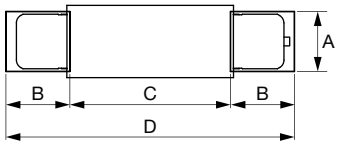
Note

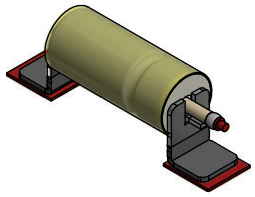
- Use appropriate adhesive between capacitor body and the board for improved mechanical strength

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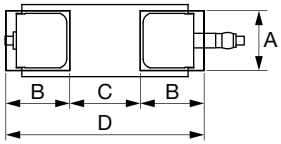
PAD DIMENSIONS in inches [millimeters]

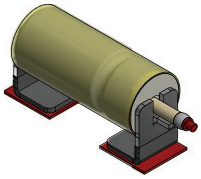




STYLE J, K, P, R

CASE CODE	A (min.)	B (nom.)	C (nom.)	D (nom.)
A	0.173 [4.40]	0.185 [4.70]	0.465 [11.80]	0.835 [21.20]
B	0.232 [5.90]	0.185 [4.70]	0.650 [16.50]	1.020 [25.90]
E	0.232 [5.90]	0.185 [4.70]	1.003 [25.48]	1.373 [34.88]
C	0.346 [8.80]	0.185 [4.70]	0.783 [19.90]	1.154 [29.30]
D	0.346 [8.80]	0.185 [4.70]	1.059 [26.90]	1.429 [36.30]





STYLE L, M, S, T

CASE CODE	A (min.)	B (nom.)	C (nom.)	D (nom.)
A	0.173 [4.40]	0.185 [4.70]	0.205 [5.20]	0.575 [14.60]
B	0.232 [5.90]	0.185 [4.70]	0.390 [9.90]	0.760 [19.30]
E	0.232 [5.90]	0.185 [4.70]	0.743 [18.88]	1.113 [28.28]
C	0.346 [8.80]	0.185 [4.70]	0.527 [13.39]	0.897 [22.79]
D	0.346 [8.80]	0.185 [4.70]	0.800 [20.32]	1.170 [29.72]

RATINGS AND CASE CODES TYPE T16

µF	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						

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RATINGS AND CASE CODES TYPE T18

µF	50 V	60 V	75 V	100 V	125 V
22				A	
86				B	
110	A				
120					C
150					C
180			B		
220				C	
240					D
400				D	
470			C	D	
750			D		
900	C				
940			D		
1000		D	D		
1200		D	D		

STANDARD RATINGS TYPE T16

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_{RMS})
					+25 °C	+85 °C / +125 °C	-55 °C	+85 °C	+125 °C	
25 V_{DC} AT 85 °C, 15 V_{DC} 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_{DC} AT 85 °C, 20 V_{DC} 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_{DC} AT 85 °C, 30 V_{DC} 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

Note

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

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STANDARD RATINGS TYPE T16

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_{RMS})
					+25 °C	+85 °C / +125 °C	-55 °C	+85 °C	+125 °C	
60 V_{DC} AT 85 °C, 40 V_{DC} 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_{DC} AT 85 °C, 50 V_{DC} 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_{DC} AT 85 °C, 65 V_{DC} 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_{DC} AT 85 °C, 85 V_{DC} 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:
  (1) Capacitance tolerance: K, M
  (2) Termination / packaging: C = 100 % tin, bulk; E = standard, tin / lead, bulk; J = SMD, outside bend, tin / lead; K = SMD, outside bend, 100 % tin; P = SMD, low profile outside bend, tin / lead; R = SMD, low profile outside bend, 100 % tin; L = SMD, inside bend, tin / lead; M = SMD, inside bend, 100 % tin; S = SMD, low profile inside bend, tin / lead; T = SMD, low profile inside bend, 100 % tin
  (3) Reliability level: Z = standard (non-ER / 500 *g* / 50 *g* / 53.79 *g*); H = high (non-ER / 500 *g* / 80 *g* / 53.79 *g*)
  (4) Insulating sleeve: S = sleeved; U = unsleeved
  (5) ESR: S = standard

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STANDARD RATINGS TYPE T18

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 AT (%)			AC RIPPLE +85 °C 40 kHz (mA_{RMS})
					+25 °C	+85 °C / +125 °C	-55 °C	+85 °C	+125 °C	
50 V_{DC} AT 85 °C, 30 V_{DC} AT 125 °C										
110	A	T18A117(1)050(2)(3)(4)S	1.80	40.00	2	7.5	-40	14	16	1200
900	C	T18C907(1)050(2)(3)(4)S	0.90	10.00	15	125	-75	20	20	2100
60 V_{DC} AT 85 °C, 40 V_{DC} AT 125 °C										
1000	D	T18D108(1)060(2)(3)(4)S	0.50	5.50	20	120	-60	10	15	2800
1200	D	T18D128(1)060(2)(3)(4)S	0.50	6.00	25	200	-70	20	30	2800
75 V_{DC} AT 85 °C, 50 V_{DC} AT 125 °C										
180	B	T18B187(1)075(2)(3)(4)S	1.50	30.00	5	25	-35	15	20	1500
180	B	T18B187(1)075(2)(3)(4)L	0.75	30.00	5	25	-35	15	20	2200
470	C	T18C477(1)075(2)(3)(4)S	0.60	10.00	25	250	-45	10	25	3000
750	D	T18D757(1)075(2)(3)(4)S	0.50	6.50	20	120	-45	12	15	2800
940	D	T18D947(1)075(2)(3)(4)S	0.50	8.00	20	200	-60	12	20	2800
1000	D	T18D108(1)075(2)(3)(4)S	0.50	8.00	20	200	-60	12	20	2800
1000	D	T18D108(1)075(2)(3)(4)L	0.35	8.00	20	200	-60	12	20	3500
1200	D	T18D128(1)075(2)(3)(4)S	0.50	8.00	30	250	-70	20	30	2800
100 V_{DC} AT 85 °C, 65 V_{DC} AT 125 °C										
22	A	T18A226(1)100(2)(3)(4)S	3.00	100.00	1	5	-15	6	12	950
86	B	T18B866(1)100(2)(3)(4)S	1.60	30.00	2	20	-20	6	12	1400
220	C	T18C227(1)100(2)(3)(4)S	1.40	18.00	5	25	-55	10	15	1800
400	D	T18D407(1)100(2)(3)(4)S	0.70	10.00	15	120	-50	8	15	2500
470	D	T18D477(1)100(2)(3)(4)S	0.70	10.00	25	250	-50	10	25	2500
125 V_{DC} AT 85 °C, 85 V_{DC} AT 125 °C										
120	C	T18C127(1)125(2)(3)(4)S	1.80	40.00	3	25	-45	5	12	2100
150	C	T18C157(1)125(2)(3)(4)S	2.00	25.00	7	50	-45	8	15	1500
240	D	T18D247(1)125(2)(3)(4)S	0.80	20.00	15	150	-35	6	12	2400

Note

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

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TYPICAL PERFORMANCE CHARACTERISTICS OF T16 / T18 CAPACITORS

ELECTRICAL CHARACTERISTICS	
ITEM	**PERFORMANCE CHARACTERISTICS**
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. (for T18 DC potential will be maximum of 1.5 V)
Surge voltage	The surge voltage shall be in accordance with MIL-PRF-39006. The DC rated surge voltage is the maximum voltage to which the capacitors can be subjected under any conditions, including transients and peak ripple. The DC surge voltage is 115 % of the rated DC voltage, unless otherwise specified. For 125 V ratings and ratings above 1000 µF, the applicable surge voltage is the rated DC voltage. Post-test requirements: after the test, the capacitors shall meet the following requirements: a) DC leakage: shall not exceed the specified value in the catalog b) Capacitance change: shall be within +5 %, -20 % (-35 % for capacitance above 1000 µF) of the initial measured value

PERFORMANCE CHARACTERISTICS	
ITEM	**PERFORMANCE CHARACTERISTICS**
Life testing	Capacitors shall be capable of withstanding a 2000 h life test at a temperature +85 °C at rated voltage, or a 1000 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

ENVIRONMENTAL CHARACTERISTICS		
ITEM	**CONDITION**	**COMMENTS**
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

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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	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 µF), capacitance tolerance letter, rated voltage, date code, lot symbol and Vishay trademark.

SELECTOR GUIDES	
Tantalum Selector Guide	www.vishay.com/doc?49054
Parameter Comparison Guide	www.vishay.com/doc?42088

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