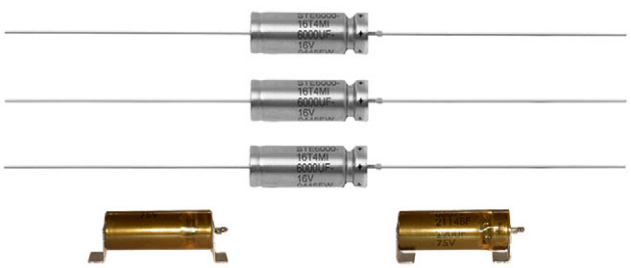
SuperTan® Wet Tantalum Capacitors With Hermetic Seal, Extended Range



LINKS TO ADDITIONAL RESOURCES

3D Models

PERFORMANCE CHARACTERISTICS

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

Capacitance Tolerance: at 120 Hz, +25 °C.
± 20 % standard. ± 10 % available as special.

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

Life Test: capacitors are capable of withstanding a 2000 h life test at a temperature of +85 °C at the applicable rated DC working voltage.

FEATURES

Pb-free Available

RoHS* Available

Vishay SuperTan® Extended (STE) represents a major breakthrough in wet tantalum capacitor technology. Its unique cathode system, also used in the ST, provides the highest capacitance per unit volume available. The STE combines the inherent reliability of wet tantalum with the capacitance stability of solid tantalum, and there are no circuit impedance restrictions. The range is exceptionally well suited for low voltage filtering and energy storage applications. Ideal for designs targeting the military and aerospace industry.

The SuperTan® Extended (STE) is housed in an all tantalum, hermetically sealed case and is manufactured to withstand high stress and hazardous environments.

- Terminations:
  - axial through-hole, SMD outward L-leaded and SMD inward L-leaded
  - standard tin / lead (SnPb), 100 % tin (RoHS-compliant) available
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

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

STE	6000	16	T4	M	I (1)	E3 (2)
TYPE	CAPACITANCE µF	DC VOLTAGE RATING AT +85 °C	CASE CODE	CAPACITANCE TOLERANCE	INSULATING SLEEVE	TERMINATION
				M = ± 20 % K = ± 10 %	I = insulated X = uninsulated	**Axial through-hole** E3 = 100 % tin termination (RoHS-compliant) Blank = SnPb termination (standard design) **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

Notes

- Packaging: The use of formed plastic trays for packing bulk components is standard. Tape and reel cannot be used due to unit weight

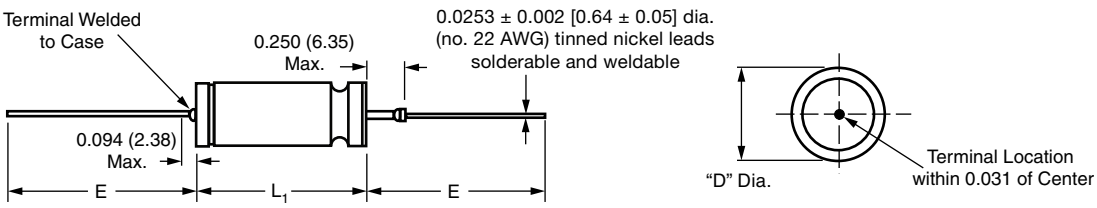
(1) Contact marketing for SMD capacitors availability

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

For technical questions, contact: tantalum@vishay.com

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AXIAL PRODUCT DIMENSIONS in inches [millimeters]



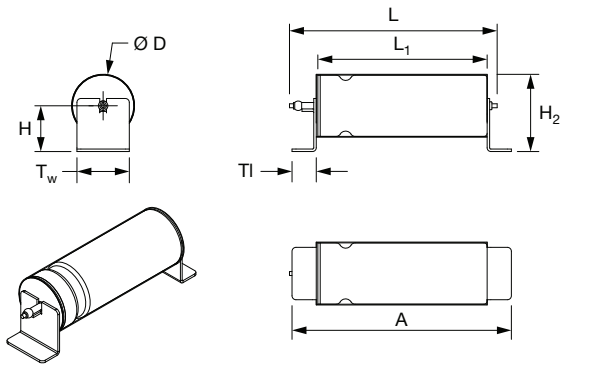
CASE CODE	D ± 0.016 [0.41]	MAX. INSULATED (DIA.)	L_1 + 0.031 / - 0.016 [+ 0.79 / - 0.41] UNINSULATED	E ± 0.250 [6.35] MAX.
T1	0.188 [4.78]	0.219 [5.56]	0.453 [11.51]	1.500 [38.10]
T2	0.281 [7.14]	0.312 [7.92]	0.641 [16.28]	2.250 [57.15]
T3	0.375 [9.52]	0.406 [10.31]	0.766 [19.46]	2.250 [57.15]
T4	0.375 [9.52]	0.406 [10.31]	1.062 [26.97]	2.250 [57.15]

Notes

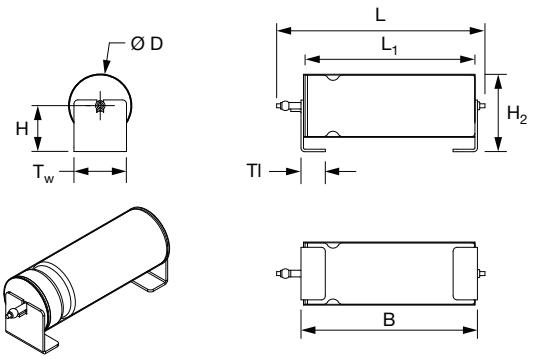
- Material at egress is tantalum
- Insulation sleeving will lap over the ends of the capacitor case
- Approx. weight:
  T1: 2.3 g, T2: 5.7 g
  T3: 9.4 g, T4: 14.8 g

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.)	L_1	H (max.)	H_2 (max.)	Tl (max.)	T_w ± 0.008	A (max.)	B (max.)	LP H (max.)	LP H_2 (max.)
T1	0.228 [5.8]	0.705 [17.9]	0.469 + 0.031 / - 0.016 [11.91 + 0.79 / - 0.41]	0.177 [4.5]	0.296 [7.5]	0.157 [4.0]	0.158 [4.0]	0.773 [19.6]	0.513 [13.0]		
T2	0.316 [8.0]	0.903 [22.9]	0.668 + 0.012 / - 0.12 [16.97 + 0.30 / - 0.30]	0.212 [5.4]	0.374 [9.5]	0.157 [4.0]	0.217 [5.5]	1.001 [25.4]	0.720 [18.3]		
L2	0.316 [8.0]	1.257 [31.9]	1.022 + 0.012 / - 0.12 [25.96 + 0.30 / - 0.30]	0.212 [5.38]	0.374 [9.49]	0.157 [3.98]	0.217 [5.5]	1.354 [34.3]	1.074 [27.2]		
T3	0.397 [10.1]	1.051 [26.7]	0.806 + 0.012 / - 0.12 [20.47 + 0.30 / - 0.30]	0.280 [7.1]	0.492 [12.5]	0.157 [4.0]	0.331 [8.4]	1.143 [29.0]	0.858 [21.8]		
T4	0.397 [10.1]	1.343 [34.1]	1.062 + 0.031 / - 0.016 [26.97 + 0.79 / - 0.41]	0.295 [7.5]	0.492 [12.5]	0.157 [4.0]	0.331 [8.4]	1.432 [36.4]	1.140 [29.0]	0.225 [5.8]	0.421 [10.7]

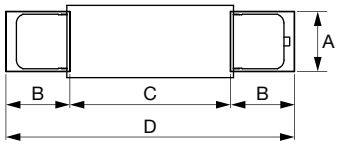
Note

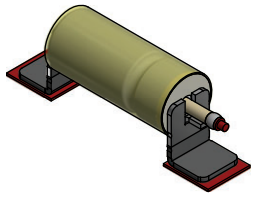
- Use appropriate adhesive between capacitor body and the board for improved mechanical strength

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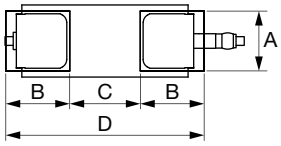
PAD DIMENSIONS in inches [millimeters]

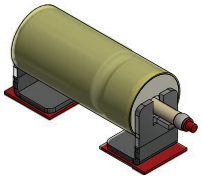




STYLE J, K, P, R

CASE CODE	A (min.)	B (nom.)	C (nom.)	D (nom.)
T1	0.173 [4.40]	0.185 [4.70]	0.465 [11.80]	0.835 [21.20]
T2	0.232 [5.90]	0.185 [4.70]	0.650 [16.50]	1.020 [25.90]
T3	0.346 [8.80]	0.185 [4.70]	0.783 [19.90]	1.154 [29.30]
T4	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.)
T1	0.173 [4.40]	0.185 [4.70]	0.205 [5.20]	0.575 [14.60]
T2	0.232 [5.90]	0.185 [4.70]	0.390 [9.90]	0.760 [19.30]
T3	0.346 [8.80]	0.185 [4.70]	0.527 [13.39]	0.897 [22.79]
T4	0.346 [8.80]	0.185 [4.70]	0.800 [20.32]	1.170 [29.72]

RATINGS AND CASE CODES

µF	10 V	16 V	25 V	30 V	35 V	50 V	60 V	75 V	100 V	125 V
18										T1 (1)
22									T1	
56								T1		T2 (1)
68							T1			
86									T2 (1)	
110						T1				
150									T2	T3 (1)
180					T1 (1)			T2		
220				T1 (1)			T2	T2	T3	T4
240										T4
270			T1 (1)							
300									T4	
330									T4	
400									T4	
430		T1 (1)								
470						T2		T3	T4	
520						T2				
560							T3	T3		
600						T2				
660								T4		
680	T1 (1)				T2					
750						T4	T4	T4		
820				T2						

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RATINGS AND CASE CODES

µF	10 V	16 V	25 V	30 V	35 V	50 V	60 V	75 V	100 V	125 V
900						T3				
950						T3				
1000			T2			T4	T4	T4		
1200		T2 (1)				T4	T4	T4		
1500					T3 (1)	T3 / T4				
1800				T3 (1)			T4			
2000	T2 (1)									
2200			T3 (1)			T4				
2800					T4					
3300		T3		T4						
4000			T4							
4700	T3									
6000		T4								
10 000	T4									

Note

(1) Preliminary rating. Contact marketing for availability

STANDARD RATINGS

CAPACITANCE (µF)	VOLTAGE	CASE CODE	PART NUMBER (1)	MAX. ESR AT +25 °C 120 Hz (Ω)	TYP. ESR AT +25 °C 1 kHz (Ω)	MAX. DCL AT +25 °C (µA)	MAX. DCL AT +85 °C / +125 °C (µA)	MAX. CAPACITANCE CHANGE AT -55 °C (%)	MAX. CAPACITANCE CHANGE AT +85 °C (%)	MAX. CAPACITANCE CHANGE AT +125 °C (%)	MAX. IMP. AT -55 °C 120 Hz (Ω)	AC RIPPLE 85 °C 40 kHz mA RMS
10 V_{DC} AT +85 °C; 7 V_{DC} AT +125 °C												
680	***10***	***T1***					***Preliminary value, contact marketing***					
2000	***10***	***T2***					***Preliminary value, contact marketing***					
4700	10	T3	STE4700-10T3MI	0.35	< 0.200	16	100	-80	10	20	3.50	4000
10 000	10	T4	STE10000-10T4MI	0.25	< 0.100	25	150	-85	20	35	3.00	5000
16 V_{DC} AT +85 °C; 11 V_{DC} AT +125 °C												
430	***16***	***T1***					***Preliminary value, contact marketing***					
1200	***16***	***T2***					***Preliminary value, contact marketing***					
3300	16	T3	STE3300-16T3MI	0.35	< 0.200	16	100	-80	10	15	3.50	4000
6000	16	T4	STE6000-16T4MI	0.30	< 0.150	25	150	-80	15	20	3.00	4500
25 V_{DC} AT +85 °C; 15 V_{DC} AT +125 °C												
270	***25***	***T1***					***Preliminary value, contact marketing***					
1000	25	T2	STE1000-25T2MI	0.80	< 0.600	7.5	75	-70	6	10	7.00	2250
2200	***25***	***T3***					***Preliminary value, contact marketing***					
4000	25	T4	STE4000-25T4MI	0.35	< 0.150	25	125	-80	15	20	5.00	4250
30 V_{DC} AT +85 °C; 20 V_{DC} AT +125 °C												
220	***30***	***T1***					***Preliminary value, contact marketing***					
820	30	T2	STE820-30T2MI	1.00	< 0.600	3.5	18	-75	12	20	20.00	1650
1800	***30***	***T3***					***Preliminary value, contact marketing***					
3300	30	T4	STE3300-30T4MI	0.35	< 0.200	25	125	-80	20	25	4.00	2750
35 V_{DC} AT +85 °C; 22 V_{DC} AT +125 °C												
180	***35***	***T1***					***Preliminary value, contact marketing***					
680	35	T2	STE680-35T2MI	0.95	< 0.500	5	25	-75	16	20	16.00	2500
1500	***35***	***T3***					***Preliminary value, contact marketing***					
2800	35	T4	STE2800-35T4MI	0.35	< 0.200	25	125	-80	20	30	4.50	4000

Note

(1) Part numbers shown are for units with ± 20 % capacitance tolerance and insulated capacitors.
For units with ± 10 % capacitance tolerance change the letter “M” to “K”.
For units without insulation, substitute “X” for “I”

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STANDARD RATINGS

CAPACITANCE (µF)	VOLTAGE	CASE CODE	PART NUMBER [1]	MAX. ESR AT +25 °C 120 Hz (Ω)	TYP. ESR AT +25 °C 1 kHz (Ω)	MAX. DCL AT		MAX. CAPACITANCE CHANGE AT			MAX. IMP. AT -55 °C 120 Hz (Ω)	AC RIPPLE 85 °C 40 kHz mA RMS
						+25 °C (µA)	+85 °C / +125 °C (µA)	-55 °C (%)	+85 °C (%)	+125 °C (%)		
50 V_{DC} AT +85 °C; 30 V_{DC} AT +125 °C												
110	50	T1	STE110-50T1MI	1.60	< 1.000	2	7.5	-40	10	15	40.00	1500
470	50	T2	STE470-50T2MI	0.90	< 0.600	5	50	-60	8	12	12.00	2000
520	50	T2	STE520-50T2MI	1.00	< 0.600	3	15	-80	12	18	20.00	1700
600	50	T2	STE600-50T2MI	1.00	< 0.600	5	25	-80	12	18	20.00	1700
750	50	T4	STE750-50T4MI	0.50	< 0.400	20	120	-35	10	15	6.50	3500
900	50	T3	STE900-50T3MI	0.90	< 0.300	15	125	-75	20	20	10.00	2500
950	50	T3	STE950-50T3MI	0.90	< 0.300	15	125	-75	20	20	10.00	2500
1000	50	T4	STE1000-50T4MI	0.50	< 0.300	20	120	-40	10	15	5.50	3500
1200	50	T4	STE1200-50T4MI	0.80	< 0.350	25	250	-75	25	35	8.00	2750
1500	50	T3	STE1500-50T3MI	1.00	< 0.300	25	130	-85	25	30	8.00	2400
1500	50	T4	STE1500-50T4MI	0.40	< 0.215	15	110	-70	20	20	6.00	3500
2200	50	T4	STE2200-50T4MI	0.60	< 0.400	25	125	-80	25	30	4.50	3000
60 V_{DC} AT +85 °C; 40 V_{DC} AT +125 °C												
68	60	T1	STE68-60T1MI	1.50	< 0.600	1.5	7.5	-30	10	12	40.00	1400
220	60	T2	STE220-60T2MI	0.90	< 0.400	3	30	-45	10	15	16.00	2000
560	60	T3	STE560-60T3MI	0.90	< 0.300	20	120	-70	12	15	10.00	2500
750	60	T4	STE750-60T4MI	0.50	< 0.400	20	120	-35	10	15	6.50	3500
1000	60	T4	STE1000-60T4MI	0.50	< 0.300	20	120	-40	10	15	5.50	3500
1200	60	T4	STE1200-60T4MI	0.50	< 0.300	20	200	-70	15	20	6.00	3500
1800	60	T4	STE1800-60T4MI	0.50	< 0.300	25	250	-75	25	25	6.00	3000
75 V_{DC} AT +85 °C; 50 V_{DC} AT +125 °C												
56	75	T1	STE56-75T1MI	1.60	< 0.800	1.5	7.5	-30	8	10	40.00	1750
180	75	T2	STE180-75T2MI	1.50	< 0.500	5	25	-35	15	20	30.00	2000
220	75	T2	STE220-75T2MI	1.00	< 0.800	5	50	-40	10	15	16.00	1750
470	75	T3	STE470-75T3MI	0.60	< 0.325	25	100	-45	10	25	10.00	3000
560	75	T3	STE560-75T3MI	0.90	< 0.550	25	150	-60	10	15	10.00	2800
660	75	T4	STE660-75T4MI	0.70	< 0.450	12	120	-70	30	40	10.00	2750
750	75	T4	STE750-75T4MI	0.50	< 0.400	20	120	-35	10	15	6.50	3500
1000	75	T4	STE1000-75T4MI	0.50	< 0.400	20	160	-70	20	40	6.50	3500
1200	75	T4	STE1200-75T4MI	0.80	< 0.350	25	250	-75	25	35	8.00	2750
100 V_{DC} AT +85 °C; 65 V_{DC} AT +125 °C												
22	100	T1	STE22-100T1MI	3.00	< 1.500	1	5	-15	4	10	100.00	1200
86	***100***	***T2***	***Preliminary value, contact marketing***									
150	100	T2	STE150-100T2MI	1.20	< 1.000	6	60	-30	10	15	20.00	1750
220	100	T3	STE220-100T3MI	1.40	< 0.200	5	25	-55	10	15	18.00	2500
300	100	T4	STE300-100T4MI	0.70	< 0.400	10	120	-40	6	12	15.00	3000
330	100	T4	STE330-100T4MI	0.80	< 0.450	6	60	-45	7	20	10.00	3600
400	100	T4	STE400-100T4MI	0.70	< 0.400	10	120	-40	6	12	15.00	3000
470	100	T4	STE470-100T4MI	0.70	< 0.450	25	250	-50	10	25	15.00	3000
125 V_{DC} AT +85 °C; 85 V_{DC} AT +125 °C												
18	***125***	***T1***	***Preliminary value, contact marketing***									
56	***125***	***T2***	***Preliminary value, contact marketing***									
150	***125***	***T3***	***Preliminary value, contact marketing***									
220	125	T4	STE220-125T4MI	0.80	< 0.600	15	150	-35	6	12	20.00	2500
240	125	T4	STE240-125T4MI	0.80	< 0.600	15	150	-35	6	12	20.00	2500

Note

[1] Part numbers shown are for units with ± 20 % capacitance tolerance and insulated capacitors.
For units with ± 10 % capacitance tolerance change the letter “M” to “K”.
For units without insulation, substitute “X” for “I”

For technical questions, contact: tantalum@vishay.com

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TYPICAL PERFORMANCE CHARACTERISTICS OF STE 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	There shall be no continuous reverse voltage. Transient reverse voltage surges are acceptable under the following conditions: a) The peak reverse voltage is equal to or less than 1.5 V and the product of the peak current times the duration of the reverse transient is 0.05 As or less b) The repetition rate of the reverse voltage surges is less than 10 Hz
Surge voltage	Surge voltage shall be in accordance with MIL-PRF-39006 and Table I of DLA 10004. 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.

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 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

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	Test condition I (100 *g*)
Vibration, high frequency	MIL-STD-202, method 204	Test condition D (20 *g* peak)
Thermal shock	MIL-STD-202, method 107	Test condition A, 30 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	Test 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 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

For technical questions, contact: tantalum@vishay.com

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