

T550 Axial Polymer Hermetic Seal (PHS) 105°C and DLA Series

Overview

The KEMET T550 Series Polymer Hermetic Seal (PHS) is a tantalum capacitor with a Ta anode and Ta₂O₅ dielectric. A conductive organic polymer replaces the traditionally used MnO₂ or wet electrolyte as the cathode plate of the capacitor. This results in very low ESR and improved capacitance retention at high frequency and low temperature. The T550 Series PHS also exhibits a benign failure mode which eliminates the case breach that can occur in wet tantalum types. Additionally, this part may be operated at voltages up to 80% of rated voltage with equivalent or better reliability than traditional MnO₂ or wet

tantalum capacitors operated at 50% of rated voltage. T550 Series PHS also offers higher ripple current handling capability and a lower ESR range than wet tantalums. With reduced ESR and enhanced capacitance retention at higher frequencies and low temperatures, the T550 Series PHS provides the highest total capacitance and the most economical solution for high power applications, all within an approximately 25% lighter package than the equivalent wet tantalum capacitor.

Benefits

- Includes F-Tech anode which eliminates hidden defects in the dielectric
- 100% Simulated Breakdown Screening
- Maximum operating temperature of +105°C
- Meets all requirements of DLA Drawing 13030
- Polymer cathode technology
- Extremely low ESR
- High frequency capacitance retention
- Low temperature capacitance retention
- 100% accelerated steady state aging (240 hours)
- 100% surge current tested, 10 cycles +25°C
- Volumetrically efficient
- Non-ignition failure mode
- Approximately 25% lighter than equivalent wet tantalum
- Case dimensions equivalent to MIL-PRF-39006/22/25/30/31



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Applications

Typical applications include high voltage power management such as buck/boost converters, filtering, hold-up capacitors, and other high ripple current applications.

Ordering Information

T	550	B	107	M	025	A	T	4251	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VDC)	Product Level	Termination Finish	Surge Option	Packaging
T = Tantalum	550 = Polymer hermetic seal	B	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	006 = 6.3 008 = 8 015 = 15 025 = 25 040 = 40 050 = 50 060 = 60 075 = 75 100 = 100	A = N/A B* = DLA 13030 Standard reliability T* = DLA 13030 High reliability	T = 100% Tin (Sn)-plated H = Tin/lead (SnPb) solder-coated (5% Pb minimum)	Blank = 25°C ±5°C, 10 cycles, after constant voltage conditioning (KEMET standard) 4251 = 10 cycles, -55°C and +85°C after constant voltage conditioning 4252 = 10 cycles, -55°C and +85°C before constant voltage conditioning	Blank = Sleeved 0100 = Unsleeved 7200 = Tape & Reel 7293 & 7443 = Ammo

* Only available on select parts. Refer to part number table for details.

Ordering Information – DLA Series

13030	-01	K	A	S	L	B
Drawing Number	Dash Number	Capacitance Tolerance	Surge Current Testing	Insulation	Lead Length	Product Level
	See Part Number Table	K = ±10% M = ±20%	A = +25°C ±5°C, 10 cycles, after constant voltage conditioning (KEMET standard) B = -55°C, -5°C, +0°C and +85°C ±5°C; after constant voltage conditioning. C = -55°C, -5°C, +0°C and +85°C ±5°C; before constant voltage conditioning.	S = Sleeved U = Unsleeved	L = 1.50 inches (standard)	B = Standard reliability T = High reliability

* Standard terminations for DLA PN's is "H" (SnPb)

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 105°C
Rated Capacitance Range	20 µF to 820 µF at 120 Hz/25°C *
Capacitance Tolerance	K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	6 – 100 V
DF (120 Hz at 25°C)	Refer to Part Number Electrical Specification Table
ESR (100 kHz at 25°C)	Refer to Part Number Electrical Specification Table
Leakage Current	Refer to Part Number Electrical Specification Table (at rated voltage up to +85°C and 78% of rated voltage applied at 105°C)
Packaging	According MIL-PRF-39006

KEMET does not recommend storage above 85°C.

* Additional case sizes and capacitance/voltage are under development.

Qualification

Test Performed	Method Reference	Test Conditions
Reliability and Environmental Tests		
AC Ripple Life at 85°C	MIL-PRF-39006	85°C, 40 kHz ripple current, 2,000 hours
85°C Life	MIL-PRF-39006	85°C, rated voltage, 2,000 hours
105°C Life	KEMET Standard	105°C, 0.78 x rated voltage, 2,000 hours
Surge Voltage	MIL-PRF-39006	85°C, 1.15 x rated voltage, 1,000 cycles, except delta cap shall be +10%/-20%
Surge Current	MIL-PRF-39003	+25 °C, 10 cycles (Option A), Option B available
Low Temperature Storage	MIL-PRF-39006	-62°C for 72 hours followed by 1 hour at 125°C
Reverse Voltage	KEMET Catalog	1 V for 8 hours maximum at 25°C, 1 V for 2 hours maximum at 70°C
Physical, Mechanical and Process Tests		
Visual and Mechanical Examination (Internal and External)	MIL-PRF-39006	Case dimensions, marking
Terminal Strength	MIL-PRF-39006	Pull test and wire lead bend test
Resistance to Solvents	MIL-PRF-39006	Immersion in (3) solvents
Resistance to Soldering Heat	MIL-PRF-39006	Immersed to within 0.05 inch of capacitor body
Solderability	MIL-PRF-39006	Depth of insertion in flux and solder to within 0.062 inch of welded joint
Shock and Vibration	MIL-STD-202, Methods 213, 204	Shock Method 213, Condition I, 100 g peak, Vibration Method 204, Condition D, 20 g peak
Barometric Pressure (Reduced)	MIL-PRF-39006	150,000 feet for 5 minutes, voltage applied for 1 minute
Salt Atmosphere (Corrosion)	MIL-PRF-39006	Subjected to fine mist of salt solution
Moisture Resistance	MIL-PRF-39006	65°C at 6 volts
Dielectric Withstanding Voltage	MIL-PRF-39006	2,000 VDC, 60 seconds, sleeving examined for evidence of breakdown
Insulation Resistance	MIL-PRF-39003	500 VDC, 1 minute, insulation resistance not less than 1,000 MΩ
Electrical Characterization		
Temperature Stability	Reference MIL-PRF-39006	-55°C to 105°C
Frequency Scan	KEMET Standard	Impedance, ESR and capacitance versus frequency

Qualification – DLA Approval Inspection

Inspection	Test Name	DLA Requirement Paragraph	SS/Lot
Group I	Shock (Specified Pulse) ¹	3.3.4	6 per case size
	Vibration, High Frequency ¹	3.3.5	
	Thermal Shock	3.3.6	
	Salt Atmosphere	3.3.7	
Group II	Solderability	3.3.8	12
	Terminal Strength	3.3.9	
	Surge Voltage ²	3.3.10	
	Moisture Resistance	3.3.11	
	Dielectric Withstanding Voltage	3.3.12	
	Insulation Resistance	3.3.13	
	Low Temperature (Storage)	3.3.14	
Group III	Stability at Low and High Temperatures	3.3.15	13
	Reverse Voltage	3.3.23	12 per condition
Group IV	Life at 85°C	3.3.16	102
Group V	AC Ripple Life at 85°C	3.3.18	8 per case size
Group VI	Life at 105°C	3.3.17	40
	Barometric Pressure	3.3.20	
Group VII	Resistance to Solvents	3.3.21	6
	Resistance to Soldering Heat	3.3.22	

¹ No failures for mechanical shock or vibration tests shall be permitted.

² Surge voltage change in capacitance limits are wider than those in some subsequent tests.

It may be necessary to perform initial measurements again, prior to the individual tests of Group II.

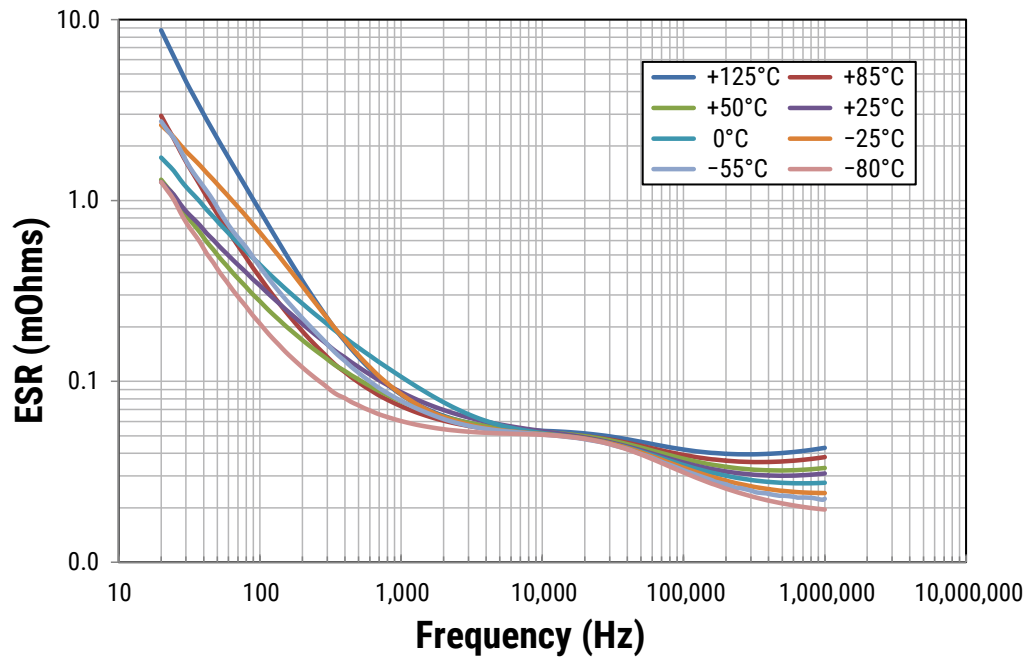
Product Level:

Inspection of product for delivery shall consist of:

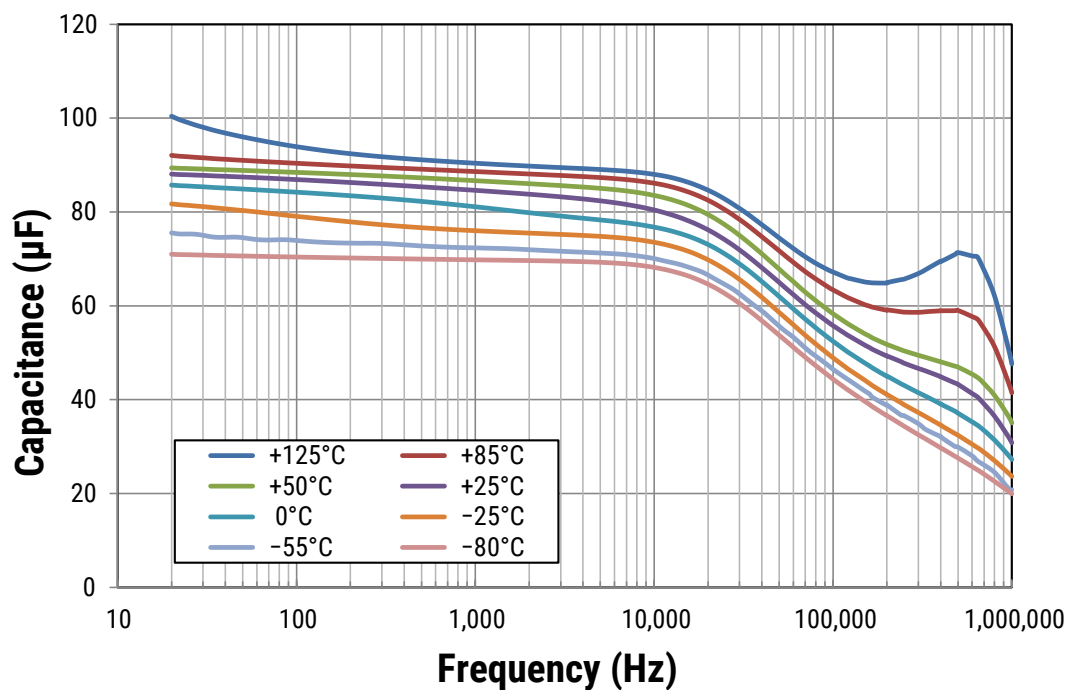
B level	Group A inspection specified in Drawing 13030
T level	Group A and group B inspections specified in Drawing 13030

Electrical Characteristics

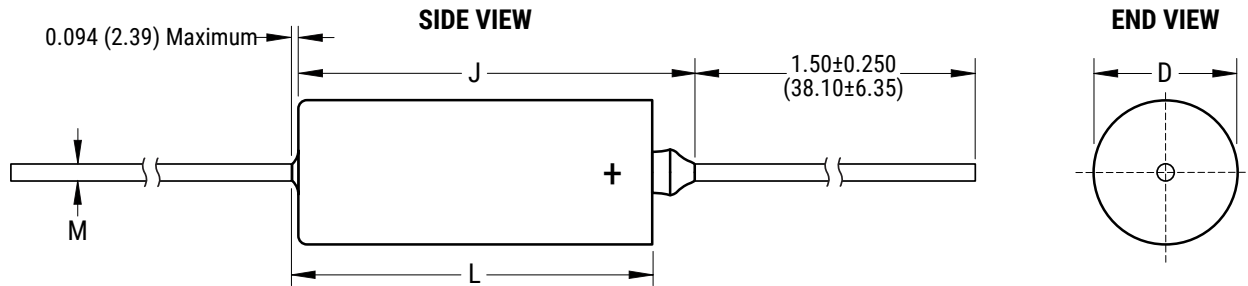
ESR vs. Frequency



Capacitance vs. Frequency



Dimensions – Inches (Millimeters)



Case Code	Case Size	Uninsulated Case				Insulated Case	
	MIL-PRF-39006	L ±0.031 (0.79)	D +0.016 (0.41) -0.015 (0.38)	M ±0.002 (0.05)	J max	D +0.016 (0.41) -0.015 (0.38)	L ± 0.031 (0.79)
B	T2	0.650 (16.51)	0.279 (7.09)	0.025 (0.64)	0.822 (20.88)	0.289 (7.34)	0.686 (17.42)

Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Capacitance	Case Size	KEMET Part Number	DLA Drawing Number	DC Leakage	DF	Maximum ESR	Ripple Current
(V) 85°C	µF	KEMET/EIA	(See below for part options)	(See below for part options)	µA at 25°C Maximum/5 Minutes	% at 25°C 120 Hz Max	mΩ at 25°C 100 kHz	mArms at 85°C/40 kHz
6	140	B	T550B147(1)006A(3)	N/A	6.3	5.0	120	1510
6	820	B	T550B827(1)006A(3)	N/A	36.9	5.0	90	1750
8	220	B	T550B227(1)008A(3)	N/A	13.2	5.0	120	1510
8	680	B	T550B687(1)008A(3)	N/A	40.8	5.0	90	1750
10	100	B	T550B107(1)010A(3)	N/A	7.5	5.0	140	1400
10	180	B	T550B187(1)010A(3)	N/A	13.5	5.0	110	1580
10	560	B	T550B567(1)010A(3)	N/A	42.0	5.0	90	1750
15	70	B	T550B706(1)015A(3)	N/A	7.9	5.0	140	1400
15	120	B	T550B127(1)015A(3)	N/A	13.5	5.0	110	1580
15	390	B	T550B397(1)015A(3)	N/A	43.9	5.0	90	1750
25	50	B	T550B506(1)025A(3)	N/A	9.4	5.0	170	1275
25	100	B	T550B107(1)025(2)(3)	13030-01(1)(4)(5)L(6)	18.8	5.0	190	1200
30	40	B	T550B406(1)030A(3)	N/A	9.0	5.0	170	1275
30	68	B	T550B686(1)030A(3)	N/A	15.3	5.0	140	1400
35	330	B	T550B337(1)035A(3)	N/A	86.6	10.0	180	1240
40	100	B	T550B107(1)040(2)(3)	13030-02(1)(4)(5)L(6)	30.0	5.0	150	1350
40	120	B	T550B127(1)040(2)(3)	13030-03(1)(4)(5)L(6)	36.0	5.0	120	1510
50	25	B	T550B256(1)050A(3)	N/A	9.4	5.0	170	1275
50	47	B	T550B476(1)050A(3)	N/A	17.6	5.0	150	1350
50	100	B	T550B107(1)050(2)(3)	13030-04(1)(4)(5)L(6)	37.5	5.0	130	1450
50	120	B	T550B127(1)050(2)(3)	13030-05(1)(4)(5)L(6)	45.0	5.0	90	1750
60	20	B	T550B206(1)060A(3)	N/A	9.0	5.0	200	1175
60	39	B	T550B396(1)060A(3)	N/A	17.6	5.0	160	1310
60	100	B	T550B107(1)060(2)(3)	13030-06(1)(4)(5)L(6)	45.0	5.0	100	1660
75	75	B	T550B756(1)075(2)(3)	13030-07(1)(4)(5)L(6)	42.2	5.0	110	1580
100	25	B	T550B256(1)100(2)(3)	13030-08(1)(4)(5)L(6)	18.8	5.0	190	1200

(1) To complete KEMET part number, insert M for ±20% or K for ±10%. Designates capacitance tolerance.

(2) To complete KEMET part number, insert A = N/A, B = standard reliability, or T = high reliability.

(3) To complete KEMET part number, insert T = 100% Matte Tin (Sn) Plated, H = Standard Solder coated (SnPb 5% Pb minimum). Designates termination finish.

(4) To complete the DLA PIN number, insert the surge current testing option, A = 25°C after voltage aging, B = -55°C +0°C and +85°C after voltage aging or C = -55°C +0°C and +85°C before voltage aging

(5) To complete the DLA PIN number, insert the insulation option. S = Sleeved, U = Un sleeved.

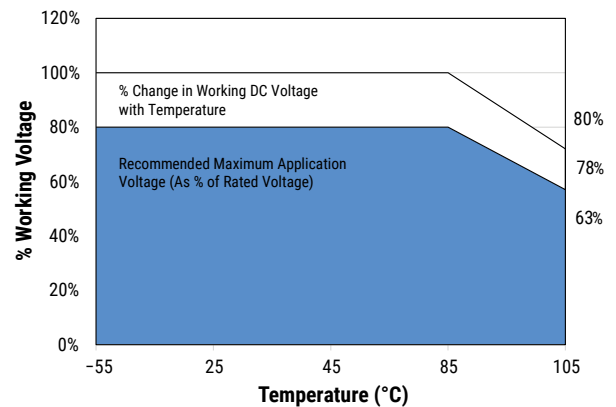
(6) To complete the DLA PIN number, insert the product level option. B = standard reliability or T = high reliability.

Refer to Ordering Information for additional detail.

Higher voltage ratings and tighter tolerance product including ESR may be substituted within the same size at KEMET's option. Voltage substitution will be marked with the higher voltage rating. The 85°C 40 kHz ripple limit is based on the maximum allowed power at 85°C and the maximum expected ESR at 40 kHz. For this calculation, the 100 kHz ESR limit is multiplied by a factor of 1.3 to account for the frequency dependence of ESR.

Recommended Voltage Derating Guidelines

	-55°C to 85°C	85°C to 105°C
% Change in Working DC Voltage with Temperature	V_R	78% of V_R
Recommended Maximum Application Voltage (As % of Rated Voltage)	80% of V_R	63% of V_R



Ripple Current/Ripple Voltage

Permissible AC ripple voltage and current are related to equivalent series resistance (ESR) and the power dissipation capabilities of the device. Permissible AC ripple voltage that may be applied is limited by two criteria:

1. The positive peak AC voltage plus the DC bias voltage, if any, must not exceed the DC voltage rating of the capacitor.
2. The negative peak AC voltage in combination with bias voltage, if any, must not exceed the allowable limits specified for reverse voltage.

The maximum power dissipation by case size can be determined using the below left table. The maximum power dissipation rating stated in the table must be reduced with increasing environmental operating temperatures. Refer to the below right table for temperature compensation requirements.

Case Code		Maximum Power Dissipation (P_{max}) mWatts at 25°C with +60°C Rise
KEMET	MIL-PRF-39006/22/ 25/30/31 Case Size	
B	T2	715

Temperature Compensation Multipliers for Maximum Power Dissipation (P_{max})		
$T \leq 45^\circ\text{C}$	$45^\circ\text{C} < T \leq 85^\circ\text{C}$	$85^\circ\text{C} < T \leq 105^\circ\text{C}$
1.00	0.70	0.10

T = Environmental Temperature

Using the P_{max} of the device, the maximum allowable rms ripple current or voltage may be determined.

$$I(max) = \sqrt{P_{max}/R}$$

$$E(max) = Z \sqrt{P_{max}/R}$$

I = rms ripple current (amperes)

E = rms ripple voltage (volts)

P_{max} = maximum power dissipation (watts)

R = ESR at specified frequency (ohms)

Z = Impedance at specified frequency (ohms)

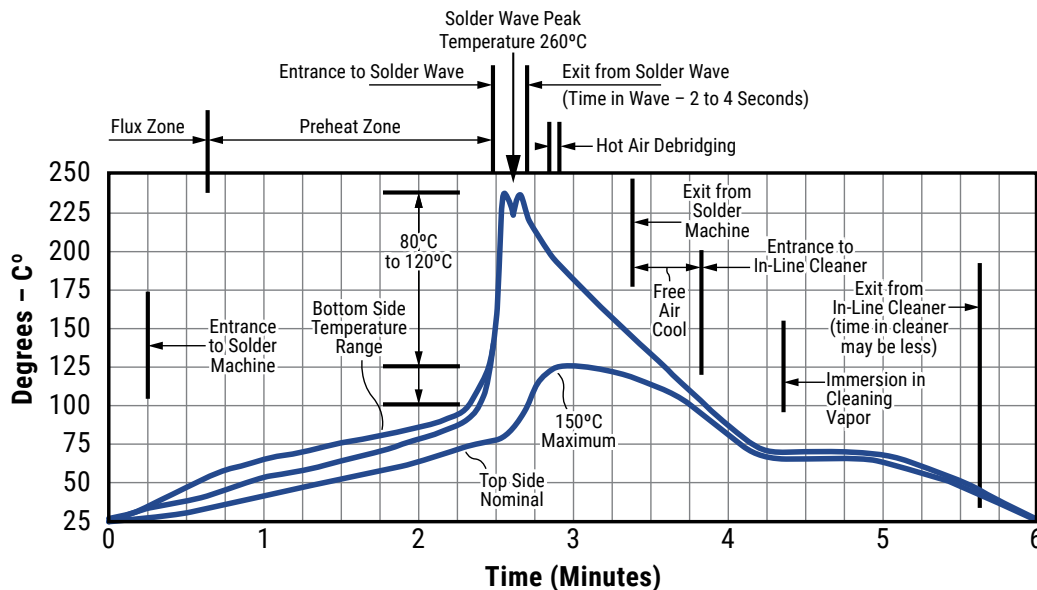
The maximum power dissipation rating must be reduced with increasing environmental operating temperatures. Refer to the Temperature Compensation Multiplier table for details.

Reverse Voltage

Solid tantalum polymer capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. A small reverse voltage is permissible for time periods per the below table. KEMET can offer lower capacitance in this voltage with higher reverse voltage capability. In addition, we continue to improve our capability for this characteristic.

Temperature	Permissible Reverse Voltage
25°C	1 V for 8 hours Maximum
70°C	1 V for 2 hours Maximum

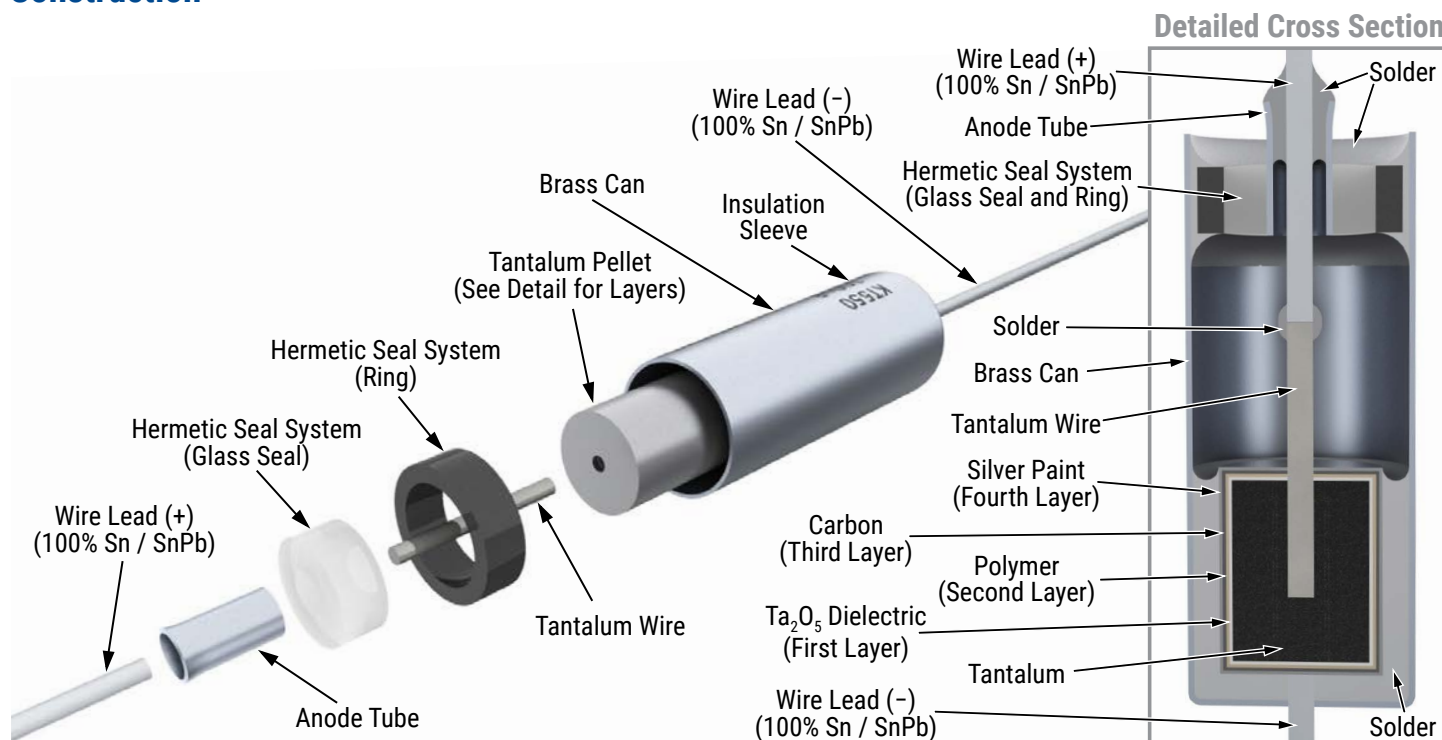
Optimum Solder Wave Profile



Mounting

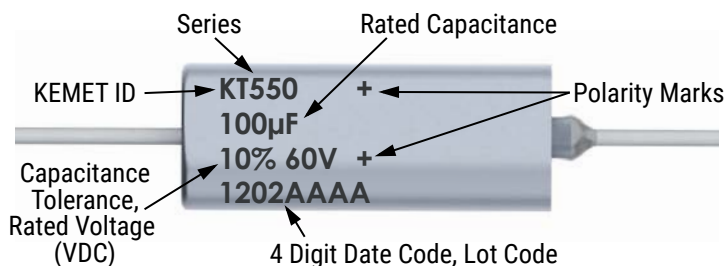
All encased capacitors will pass the Resistance to Soldering Heat Test of MIL-STD-202, Method 210, Condition C. This test simulates wave solder of topside board mount product. This demonstration of resistance to solder heat is in accordance with what is believed to be the industry standard. More severe treatment must be considered reflective of an improper soldering process. The above figure is a recommended solder wave profile for both axial and radial leaded solid tantalum capacitors.

Construction



Capacitor Marking

B Case



Date Code	3 Digit	4 Digit
Year	5 = 2015	15 = 2015
	6 = 2016	16 = 2016
	7 = 2017	17 = 2017
	8 = 2018	18 = 2018
	9 = 2019	19 = 2019
Week	01 = 1 st week of the year to 52 = 52 nd week of the year	

Storage

Tantalum hermetically sealed capacitors should be stored in normal working environments. While the capacitors themselves are quite robust in other environments, solderability will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage. In addition, packaging materials will be degraded by high temperature – reels may soften or warp and tape peel force may increase. KEMET recommends that maximum storage temperature not exceed 40°C and maximum storage humidity not exceed 60% relative humidity. Temperature fluctuations should be minimized to avoid condensation on the parts and atmospheres should be free of chlorine and sulphur bearing compounds. For optimized solderability capacitors stock should be used promptly, preferably within three years of receipt.

Packaging

Case Size		Pieces per Tray
KEMET	EIA	
B	T2	20

Weight

Case Size		Average Weight (grams)
KEMET	EIA	
B	T2	3.63

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