

## Overview

The KEMET T550 Polymer Hermetic Seal (PHS) Series is a tantalum capacitor with a Ta anode and Ta<sub>2</sub>O<sub>5</sub> dielectric. A conductive organic polymer replaces the traditionally used MnO<sub>2</sub> 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 PHS Series 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 MnO<sub>2</sub> or wet tantalum capacitors operated at 50% of rated voltage.

T550 PHS Series 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 PHS Series 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

- +105°C maximum operating temperature
- Capacitance: 20 µF to 820 µF
- Voltage rating of 6 VDC – 75 VDC
- Polymer cathode technology
- ≤ 0.0075 CV (µA) at rated voltage after 5 minutes
- Extremely low ESR
- High frequency capacitance retention
- Low temperature capacitance retention
- 100% accelerated steady state aging
- 100% surge current tested
- 100% Simulated Breakdown Screening™
- Volumetric efficiency
- Use of up to 80% of rated voltage
- Non-ignition failure mode
- Approximately 25% lighter than equivalent wet tantalum
- Case dimensions equivalent to MIL-PRF-39006/25

## 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	Voltage	Failure Rate/Design	Lead Material	Surge Option
T = Tantalum	550 = Polymer Hermetic Seal	B	First two digits represent significant figures. Third digit specifies number of zeros.	K = $\pm 10\%$ M = $\pm 20\%$	006 = 6.3 V 008 = 8 V 015 = 15 V 025 = 25 V 040 = 40 V 050 = 50 V 060 = 60 V 075 = 75 V	A = N/A	T = 100% tin (Sn) plated H = Tin/lead (SnPb) solder coated (5% Pb minimum)	4250 surge current, 10 cycles +25°C  4251 surge current, 10 cycles, -55°C and +85°C

## Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 105°C *
Rated Capacitance Range	20 $\mu$ F to 820 $\mu$ F @ 120 Hz/25°C *
Capacitance Tolerance	K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	6 – 75 V
DF (120 Hz @ 25°C)	Refer to Part Number Electrical Specification Table
ESR (100 kHz @ 25°C)	Refer to Part Number Electrical Specification Table
Leakage Current	Refer to Part Number Electrical Specification Table (@ 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.

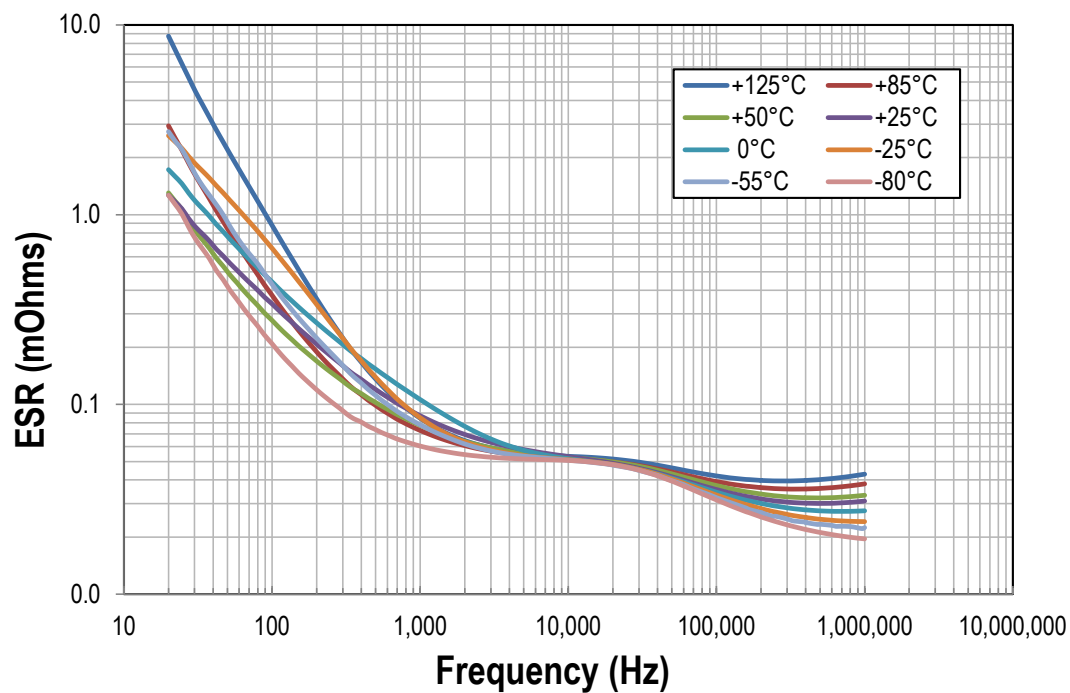
\* Additional case sizes, capacitance/voltage and operating temperature under development.

## Qualification

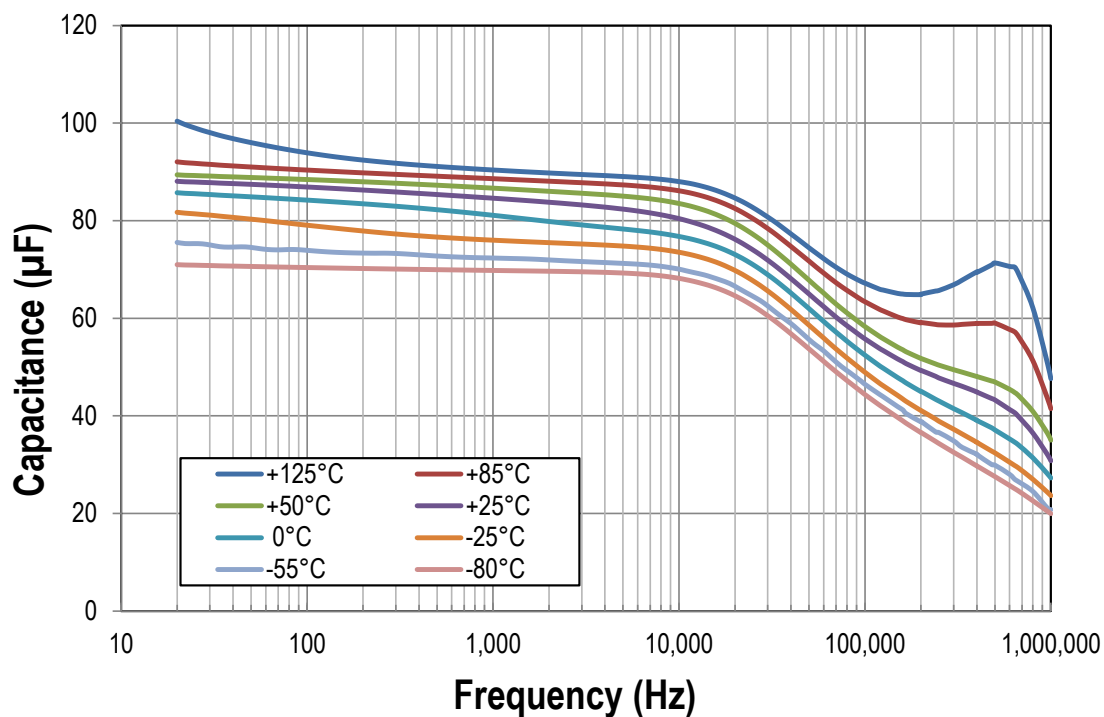
Test Performed	Method Reference	Test Conditions
Reliability and Environmental Tests		
AC Ripple Life at 85°C	MIL-PRF-39006	85°C, 40 kHz ripple current, 2,000 hours
85°C Life	MIL-PRF-39006	85°C, rated voltage, 2,000 hours
105°C Life		105°C, 0.78 x rated voltage, 2,000 hours
Surge Voltage	MIL-PRF-39006	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, Method 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

## Electrical Characteristics

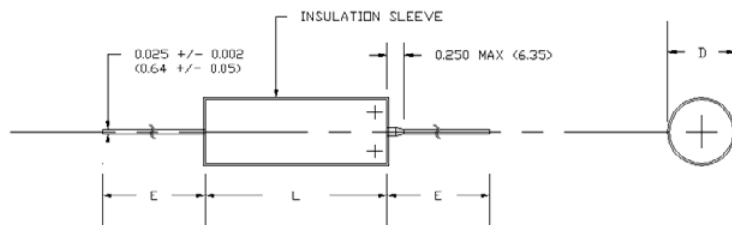
### ESR vs. Frequency



### Capacitance vs. Frequency



## Dimensions – Millimeters



		Uninsulated Case		Insulated Case	
Case Code	MIL-PRF-39006/22/25/30/31 Case Size	L +0.031(0.79) -0.016(0.41)	D ±0.016(0.41)	D Maximum	E ±0.25(6.35)
B	T2	0.641(16.28)	0.281(7.14)	0.312(7.92)	*1.50(38.10)

\* Lead length of 2.25" available upon request

### Table 1 – Ratings & Part Number Reference

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

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

(2) To complete KEMET part number, insert T = 100% Matte Tin (Sn) Plated, H = Standard Solder coated (SnPb 5% Pb minimum). Designates termination finish. 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. Substitutions can include better than series.

<sup>1</sup> 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.

## 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.

Temperature Compensation Multipliers for Maximum Power Dissipation (P max)		
T ≤ 45°C	45°C < T ≤ 85°C	85°C < T ≤ 105°C
1.00	0.50	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)

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

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

## Reverse Voltage

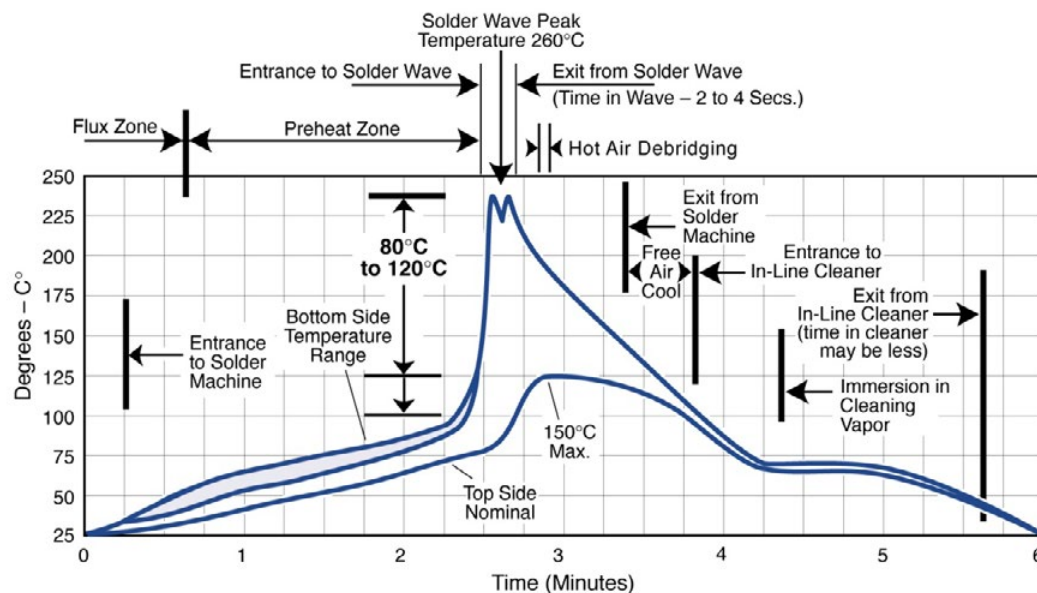
Solid tantalum polymer capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. A small reverse voltage is permissible for time periods per the below table.

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

T550 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 T550 tantalum capacitors.

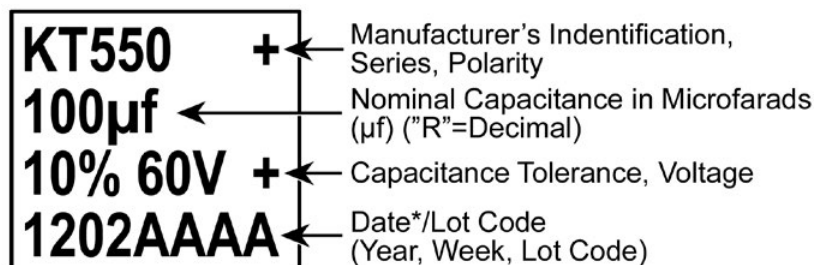
## Packaging

Case Size		Pieces per Tray
KEMET	EIA	
B	T2	20

## Weight

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

## Capacitor Marking



\* 1st & 2nd digit = Year

3rd & 4th digit = Week

## 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.



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Beijing, China  
Tel: 86-10-5829-1711

Shanghai, China  
Tel: 86-21-6447-0707

Taipei, Taiwan  
Tel: 886-2-27528585

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Tel: 65-6586-1900

Penang, Malaysia  
Tel: 60-4-6430200

Bangalore, India  
Tel: 91-806-53-76817

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## Other KEMET Resources

Tools	
Resource	Location
Configure A Part: CapEdge	<a href="http://capacitoredge.kemet.com">http://capacitoredge.kemet.com</a>
SPICE & FIT Software	<a href="http://www.kemet.com/spice">http://www.kemet.com/spice</a>
Search Our FAQs: KnowledgeEdge	<a href="http://www.kemet.com/keask">http://www.kemet.com/keask</a>
Electrolytic LifeCalculator	<a href="http://www.kemet.com:8080/elc">http://www.kemet.com:8080/elc</a>

Product Information	
Resource	Location
Products	<a href="http://www.kemet.com/products">http://www.kemet.com/products</a>
Technical Resources (Including Soldering Techniques)	<a href="http://www.kemet.com/technicalpapers">http://www.kemet.com/technicalpapers</a>
RoHS Statement	<a href="http://www.kemet.com/rohs">http://www.kemet.com/rohs</a>
Quality Documents	<a href="http://www.kemet.com/qualitydocuments">http://www.kemet.com/qualitydocuments</a>

Product Request	
Resource	Location
Sample Request	<a href="http://www.kemet.com/sample">http://www.kemet.com/sample</a>
Engineering Kit Request	<a href="http://www.kemet.com/kits">http://www.kemet.com/kits</a>

Contact	
Resource	Location
Website	<a href="http://www.kemet.com">www.kemet.com</a>
Contact Us	<a href="http://www.kemet.com/contact">http://www.kemet.com/contact</a>
Investor Relations	<a href="http://www.kemet.com/ir">http://www.kemet.com/ir</a>
Call Us	1-877-MyKEMET
Twitter	<a href="http://twitter.com/kemetcapacitors">http://twitter.com/kemetcapacitors</a>

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Although KEMET designs and manufactures its products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

Although all product-related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated or that other measures may not be required.

