Tantalum Surface Mount Capacitors

Automotive Grade

One world. One KEMET.

Electronic Components
KEMET
CHARGED.

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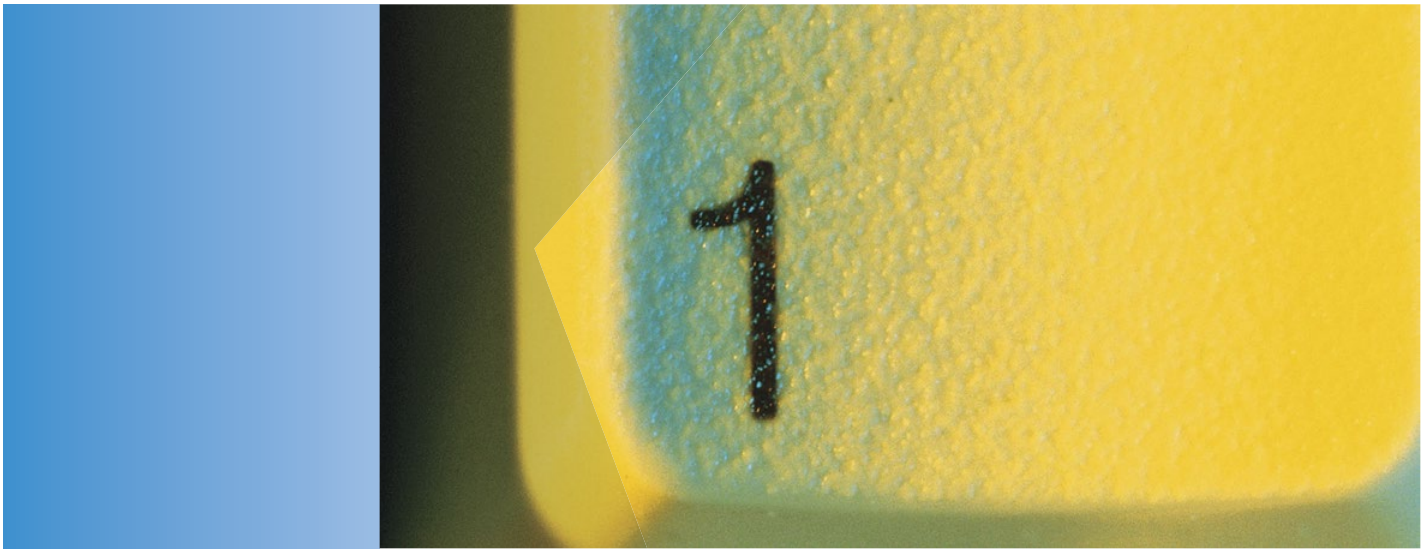


One world. One source. One KEMET.

When you partner with KEMET, our entire global organization provides you with the coordinated service you need. No bouncing from supplier to supplier. No endless phone calls and web browsing. We're your single, integrated source for electronic component solutions worldwide.

Less hassles. More solutions.

Our commitment to product quality and on-time delivery has helped customers succeed for over 90 years. There's a reason KEMET components can be found in defense and aerospace equipment. Our reputation is built on a history of consistency, reliability and service.

The "Easy-to-Buy-From" company.

KEMET offers a level of responsiveness that far surpasses any other supplier. Our passion for customer service is evident throughout our global sales organization, which offers localized support bolstered by our worldwide logistics capabilities. Whether you need rush samples, technical assistance, in-person consultation, accelerated custom design, design collaboration or prototype services, we have a solution.

Made for you.

When you need custom products delivered on a tight schedule, you can trust KEMET. Get direct design consultation from global experts, who help you get the job done on time and within budget.

Working for a better world.

KEMET is dedicated to economically, environmentally and socially sustainable development. We've adopted the Electronic Industry Code of Conduct (EICC) to address all aspects of corporate responsibility. Our manufacturing facilities have won numerous environmental excellence awards and recognitions, and our supply chain is certified. We believe doing the right thing is in everyone's interest.

About KEMET.

KEMET Corporation is a leading global supplier of electronic components. We offer our customers the broadest selection of capacitor technologies in the industry across multiple dielectrics, along with an expanding range of electromechanical devices, and electromagnetic compatibility solutions. Our vision is to be the preferred supplier of electronic component solutions for customers demanding the highest standards of quality, delivery and service.

T491 Industrial Grade MnO_2 Series

Overview

The KEMET T491 Series, designed specifically for today's highly automated surface mount processes and equipment, is the leading choice for surface mount designs. The T491 combines KEMET's proven solid tantalum technology, acclaimed and respected throughout the world, with the latest in materials, processes and automation, resulting in unsurpassed total performance and value. This product meets or exceeds the requirements of EIA standard 535BAAC. The physical outline and dimensions of this serie conform to this global standard. Five low profiles case sizes are available The T491 standard terminations are available in 100% matte tin and provide excellent wetting characteristics and compatibility with today's surface mount solder systems. Tin/lead (Sn/Pb) terminations are available upon request for any part number. Gold-plated terminations are also available for use with conductive epoxy attachment processes. The symmetrical terminations offer total compliancy to provide the thermal and mechanical stress relief required with today's technology. Standard packaging of these devices is tape and reel in accordance with EIA 481–1. This system provides perfect compatibility with all tape-fed placement units.

Benefits

- Meets or exceeds EIA Standard 535BAAC
- Taped and reeled per EIA 481–1
- Symmetrical, compliant terminations
- Optional gold-plated terminations
- Laser-marked case
- 100% surge current test on C, D, E, U, V, X sizes
- Halogen-free epoxy
- Capacitance values of 0.1 µF to 470 µF
- Tolerances of ±10% and ±20%
- Voltage rating of 6.3 – 50 VDC
- Extended range values
- Low profile case sizes
- RoHS Compliant and lead-free terminations
- Operating temperature range of -55ºC to +125ºC

Applications

Typical applications include decoupling and filtering in automotive end applications such as DC/DC converters, portable electronics, telecommunications, and control units.

Environmental Compliance

RoHS Compliant (6/6) according to Directive 2002/95/EC when ordered with 100% Sn solder.

RoHS Compliant

SPICE

For a detailed analysis of specific part numbers, please visit www.kemet.com for a free download of KEMET's SPICE software. The KEMET SPICE program is freeware intended to aid design engineers in analyzing the performance of these capacitors over frequency, temperature, ripple, and DC bias conditions.

Ordering Information

T	491	X	157	K	020	A	T	AUTO	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Failure Rate/ Design	Lead Material	C-Spec 1	Packaging (C-Spec)
T = Tantalum	Industrial	A, B, C, D, E, S, T, U, V, X	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	2R5 = 2.5 V 003 = 3 V 004 = 4 V 006 = 6.3 V 010 = 10 V 016 = 16 V 020 = 20 V 025 = 25 V 035 = 35 V 050 = 50 V	A = N/A	T = 100% Matte Tin (Sn) Plated* H = Standard Solder Coated (SnPb 5% Pb minimum) G = Gold Plated (A, B, C, D, X only) N = Non-Magnetic 100% Tin (Sn) M = Non-Magnetic (SnPb)	AUTO = Automotive Grade (AUTO = AEC–Q200 Certification)	Blank = 7" Reel 7280 = 13" Reel

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 125°C
Rated Capacitance Range	0.1 – 470 µF @ 120 Hz/25°C
Capacitance Tolerance	K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	6.3 – 50 V
DF (120 Hz)	Refer to Part Number Electrical Specification Table
ESR (100 kHz)	Refer to Part Number Electrical Specification Table
Leakage Current	≤ 0.01 CV (µA) at rated voltage after 5 minutes

Qualification

Test	Condition		Characteristics			
Endurance	85°C @ rated voltage, 2,000 hours 125°C @ 2/3 rated voltage, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Storage Life	125°C @ 0 volts, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Thermal Shock	MIL–STD–202, Method 107, Condition B, mounted, -55C° to 125° C, 1,000 cycles		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Temperature Stability	Extreme temperature exposure at a succession of continuous steps at +25°C, -55°C, +25°C, +85°C, +125°C, +25°C.			+25°C	-55°C	+85°C	+125°C
		Δ C/C		IL*	±10%	±10%	±20%
		DF		IL	IL	1.5 x IL	1.5 x IL
		DCL		IL	n/a	10 x IL	12 x IL
Surge Voltage	25°C and 85°C, 1.32 x rated voltage 1,000 cycles (125°C, 1.2 x rated voltage).		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		
			ESR	Within initial limits		
Mechanical Shock/Vibration	MIL–STD–202, Method 213, Condition I, 100 G peak MIL–STD–202, Method 204, Condition D, 10 Hz to 2,000 Hz, 20 G peak		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		

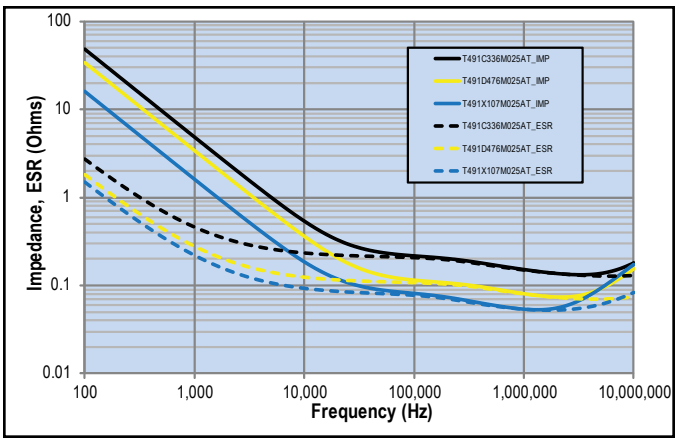
**IL = Initial limit*

Certification

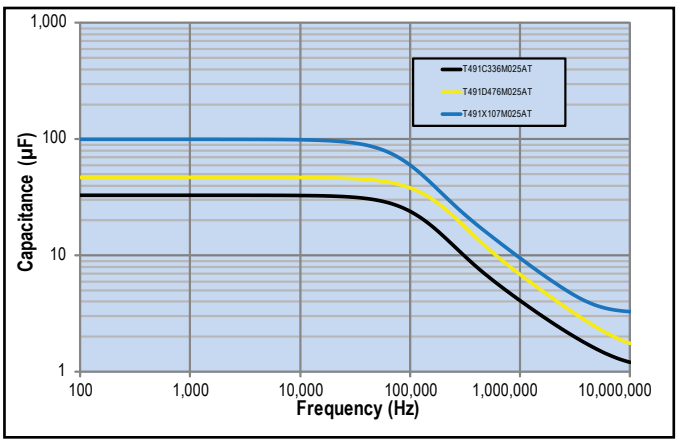
KEMET's Internal Qualification Plan for this Tantalum series of capacitors follows AEC–Q200 guidelines. Standard catalog part types ordered without a specific automotive designator, i.e., suffix AUTO or four digit customer specific designator (C-Spec), are not considered KEMET Automotive Grade tantalum capacitors.

Electrical Characteristics

ESR vs. Frequency

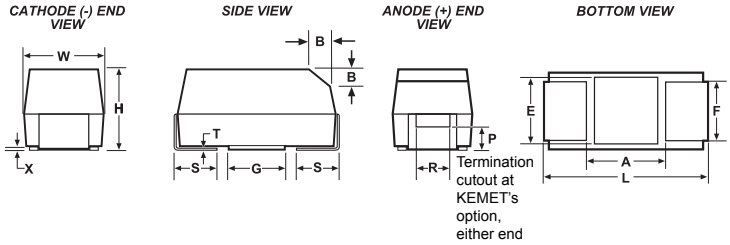


Capacitance vs. Frequency



Dimensions – Millimeters (Inches)

Metric will govern



Case Size		Component												
KEMET	EIA	L*	W*	H*	F* ±0.1 ±(.004)	S* ±0.3 ±(.012)	B* ±0.15 (Ref) ±.006	X (Ref)	P (Ref)	R (Ref)	T (Ref)	A (Min)	G (Ref)	E (Ref)
A	3216–18	3.2 ± 0.2 (.126 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.2 (.047)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.4 (.016)	0.4 (.016)	0.13 (.005)	0.8 (.31)	1.1 (.043)	1.3 (.051)
B	3528–21	3.5 ± 02 (.138 ± .008)	2.8 ± 0.2 (.110 ± .008)	1.9 ± 0.2 (.075 ± .008)	2.2 (.087)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.5 (.020)	1.0 (.039)	0.13 (.005)	1.1 (0.043)	1.8 (.071)	2.2 (.087)
C	6032–28	6.0 ± 0.3 (.236 ± .03)	3.2 ± 0.3 (.126 ± .012)	2.5 ± 0.3 (.098 ± .012)	2.2 (.087)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	2.5(.098)	2.8 (.110)	2.4 (.094)
D	7343–31	7.3 ± 0.3 (.287 ± .012)	4.3 ± 0.3 (.169 ± .012)	2.8 ± 0.3 (.110 ± .012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
X	7343–43	7.3 ± 0.3 (.287 ± .012)	4.3 ± 0.3 (.169 ± .012)	4.0 ± 0.3 (.157 ± .012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	1.7 (.067)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
E	7360-38	7.3 ± 0.3 (.287 ± .012)	6.0± 0.3 (.236 ± .012)	3.6 ± 0.2 (.142 ± .008)	4.1 (.161)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
S	3216–12	3.2 ± 0.2 (.126 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.2 (.047)	1.2 (.047)	0.8 (.031)	n/a	0.05 (.002)	n/a	n/a	0.13 (.005)	0.8 (.031)	1.1 (.043)	1.3 (.051)
T	3528–12	3.5 ± 0.2 (.138 ± .008)	2.8 ± 0.2 (.110 ± .008)	1.2 (.047)	2.2 (.087)	0.8 (.031)	n/a	0.05 (.002)	n/a	n/a	0.13 (.005)	1.1 (.043)	1.8 (.071)	2.2 (.087)
U	6032–15	6.0 ± 0.3 (.236 ± .012)	3.2 ± 0.2 (.110 ± .008)	1.5 (.059)	2.2 (.087)	1.3 (.051)	n/a	0.05 (.002)	n/a	n/a	0.13 (.005)	2.5(.098)	2.8 (.110)	2.4 (.094)
V	7343–20	7.3 ± 0.3 (287 ± .012)	4.3 ± 0.3 (.169 ± .012)	2.0 (.079)	2.4 (.094)	1.3 (.051)	n/a	0.05 (.002)	n/a	n/a	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)

Notes: (Ref) – Dimensions provided for reference only. No dimensions are provided for B, P or R because low profile cases do not have a bevel or a notch.
** MIL–PRF–55365/8 specified dimensions*

Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	Ω @ 20°C 100 kHz Max
6.3	2.2	A/3216-18	T491A225(1)006A(2)AUTO	0.5	6	8
6.3	3.3	A/3216-18	T491A335(1)006A(2)AUTO	0.5	6	8
6.3	4.7	A/3216-18	T491A475(1)006A(2)AUTO	0.5	6	6
6.3	6.8	A/3216-18	T491A685(1)006A(2)AUTO	0.5	6	6
6.3	6.8	B/3528-21	T491B685(1)006A(2)AUTO	0.5	6	3.5
6.3	10	A/3216-18	T491A106(1)006A(2)AUTO	0.6	6	4
6.3	10	B/3528-21	T491B106(1)006A(2)AUTO	0.6	6	3.5
6.3	15	A/3216-18	T491A156(1)006A(2)AUTO	0.9	6	3.5
6.3	15	B/3528-21	T491B156(1)006A(2)AUTO	0.9	6	3.5
6.3	15	C/6032-28	T491C156(1)006A(2)AUTO	0.9	6	1.8
6.3	22	A/3216-18	T491A226(1)006A(2)AUTO	1.4	6	4
6.3	22	B/3528-21	T491B226(1)006A(2)AUTO	1.4	6	3.5
6.3	22	C/6032-28	T491C226(1)006A(2)AUTO	1.4	6	1.8
6.3	33	A/3216-18	T491A336(1)006A(2)AUTO	2.1	12	2.5
6.3	33	B/3528-21	T491B336(1)006A(2)AUTO	2.1	6	3
6.3	33	C/6032-28	T491C336(1)006A(2)AUTO	2.1	6	1.8
6.3	47	A/3216-18	T491A476(1)006A(2)AUTO	3.0	12	3.5
6.3	47	B/3528-21	T491B476(1)006A(2)AUTO	3.0	6	2
6.3	47	C/6032-28	T491C476(1)006A(2)AUTO	3.0	6	1.6
6.3	47	D/7343-31	T491D476(1)006A(2)AUTO	3.0	6	0.8
6.3	68	A/3216-18	T491A686(1)006A(2)AUTO	4.3	30	4
6.3	68	B/3528-21	T491B686(1)006A(2)AUTO	4.3	8	0.9
6.3	68	C/6032-28	T491C686(1)006A(2)AUTO	4.3	6	1.2
6.3	68	D/7343-31	T491D686(1)006A(2)AUTO	4.3	6	0.8
6.3	100	B/3528-21	T491B107(1)006A(2)AUTO	6.3	15	3.0
6.3	100	C/6032-28	T491C107(1)006A(2)AUTO	6.3	8	0.9
6.3	100	D/7343-31	T491D107(1)006A(2)AUTO	6.3	8	0.8
6.3	150	C/6032-28	T491C157(1)006A(2)AUTO	9.5	8	1.2
6.3	150	D/7343-31	T491D157(1)006A(2)AUTO	9.5	8	0.7
6.3	220	C/6032-28	T491C227(1)006A(2)AUTO	14	10	1.2
6.3	220	D/7343-31	T491D227(1)006A(2)AUTO	14	8	0.7
6.3	220	X/7343-43	T491X227(1)006A(2)AUTO	14	8	0.7
6.3	330	D/7343-31	T491D337(1)006A(2)AUTO	20.8	8	0.4
6.3	330	X/7343-43	T491X337(1)006A(2)AUTO	20.8	8	0.4
6.3	330	E/7360-38	T491E337(1)006A(2)AUTO	20.8	8	0.5
6.3	470	X/7343-43	T491X477(1)006A(2)AUTO	29.6	10	0.4
6.3	470	E/7360-38	T491E477(1)006A(2)AUTO	29.6	10	0.4
10	1.5	A/3216-18	T491A155(1)010A(2)AUTO	0.5	6	8
10	2.2	A/3216-18	T491A225(1)010A(2)AUTO	0.5	6	8
10	2.2	B/3528-21	T491B225(1)010A(2)AUTO	0.5	6	3.5
10	3.3	A/3216-18	T491A335(1)010A(2)AUTO	0.5	6	6
10	4.7	A/3216-18	T491A475(1)010A(2)AUTO	0.5	6	5
10	4.7	B/3528-21	T491B475(1)010A(2)AUTO	0.5	6	3.5
10	6.8	A/3216-18	T491A685(1)010A(2)AUTO	0.7	6	4
10	6.8	B/3528-21	T491B685(1)010A(2)AUTO	0.7	6	3.5
10	10	A/3216-18	T491A106(1)010A(2)AUTO	1.0	6	4
10	10	B/3528-21	T491B106(1)010A(2)AUTO	1.0	6	3.5
10	10	C/6032-28	T491C106(1)010A(2)AUTO	1.0	6	1.8
10	15	A/3216-18	T491A156(1)010A(2)AUTO	1.5	8	6
10	15	B/3528-21	T491B156(1)010A(2)AUTO	1.5	6	2.8
10	15	C/6032-28	T491C156(1)010A(2)AUTO	1.5	6	1.8
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	Ω @ 20°C 100 kHz Max
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Roll Over for Order Info.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	Ω @ 20°C 100 kHz Max
10	22	A/3216-18	T491A226(1)010A(2)AUTO	2.2	8	6.0
10	22	B/3528-21	T491B226(1)010A(2)AUTO	2.2	6	2.4
10	22	C/6032-28	T491C226(1)010A(2)AUTO	2.2	6	1.8
10	33	B/3528-21	T491B336(1)010A(2)AUTO	3.3	6	1.8
10	33	C/6032-28	T491C336(1)010A(2)AUTO	3.3	6	1.6
10	33	D/7343-31	T491D336(1)010A(2)AUTO	3.3	6	0.8
10	47	B/3528-21	T491B476(1)010A(2)AUTO	4.7	8	1
10	47	C/6032-28	T491C476(1)010A(2)AUTO	4.7	6	1.2
10	47	D/7343-31	T491D476(1)010A(2)AUTO	4.7	6	0.8
10	68	C/6032-28	T491C686(1)010A(2)AUTO	6.8	6	1.2
10	68	D/7343-31	T491D686(1)010A(2)AUTO	6.8	6	0.8
10	100	C/6032-28	T491C107(1)010A(2)AUTO	10.0	8	1.2
10	100	D/7343-31	T491D107(1)010A(2)AUTO	10.0	8	0.7
10	150	C/6032-28	T491C157(1)010A(2)AUTO	15.0	10	0.9
10	150	D/7343-31	T491D157(1)010A(2)AUTO	15.0	8	0.7
10	150	X/7343-43	T491X157(1)010A(2)AUTO	15.0	8	0.7
10	220	D/7343-31	T491D227(1)010A(2)AUTO	22.0	8	0.5
10	220	X/7343-43	T491X227(1)010A(2)AUTO	22.0	8	0.5
10	330	D/7343-31	T491D337(1)010A(2)AUTO	33	10	0.5
10	330	X/7343-43	T491X337(1)010A(2)AUTO	33	10	0.5
10	330	E/7360-38	T491E337(1)010A(2)AUTO	33	10	0.5
10	470	X/7343-43	T491X477(1)010A(2)AUTO	47	10	0.2
16	1	A/3216-18	T491A105(1)016A(2)AUTO	0.5	4	10
16	1.5	A/3216-18	T491A155(1)016A(2)AUTO	0.5	6	8
16	2.2	A/3216-18	T491A225(1)016A(2)AUTO	0.5	6	6
16	3.3	A/3216-18	T491A335(1)016A(2)AUTO	0.5	6	5
16	3.3	B/3528-21	T491B335(1)016A(2)AUTO	0.5	6	3.5
16	4.7	A/3216-18	T491A475(1)016A(2)AUTO	0.8	6	4
16	4.7	B/3528-21	T491B475(1)016A(2)AUTO	0.8	6	3.5
16	4.7	C/6032-28	T491C475(1)016A(2)AUTO	0.8	6	2.4
16	6.8	A/3216-18	T491A685(1)016A(2)AUTO	1.1	6	3.5
16	6.8	B/3528-21	T491B685(1)016A(2)AUTO	1.1	6	2.5
16	6.8	C/6032-28	T491C685(1)016A(2)AUTO	1.1	6	1.9
16	10	A/3216-18	T491A106(1)016A(2)AUTO	1.6	8	7
16	10	B/3528-21	T491B106(1)016A(2)AUTO	1.6	6	2.8
16	10	C/6032-28	T491C106(1)016A(2)AUTO	1.6	6	1.8
16	15	B/3528-21	T491B156(1)016A(2)AUTO	2.4	6	2.5
16	15	C/6032-28	T491C156(1)016A(2)AUTO	2.4	6	1.8
16	22	B/3528-21	T491B226(1)016A(2)AUTO	3.5	6	2.2
16	22	C/6032-28	T491C226(1)016A(2)AUTO	3.5	6	1.6
16	22	D/7343-31	T491D226(1)016A(2)AUTO	3.5	6	0.8
16	33	C/6032-28	T491C336(1)016A(2)AUTO	5.3	6	1.2
16	33	D/7343-31	T491D336(1)016A(2)AUTO	5.3	6	0.8
16	47	C/6032-28	T491C476(1)016A(2)AUTO	7.5	6	1.2
16	47	D/7343-31	T491D476(1)016A(2)AUTO	7.5	6	0.8
16	68	C/6032-28	T491C686(1)016A(2)AUTO	11	6	1.2
16	68	D/7343-31	T491D686(1)016A(2)AUTO	11	6	0.7
16	100	D/7343-31	T491D107(1)016A(2)AUTO	16.0	8	0.7
16	100	X/7343-43	T491X107(1)016A(2)AUTO	16.0	8	0.7
16	150	X/7343-43	T491X157(1)016A(2)AUTO	24.0	8	0.5
20	0.68	A/3216-18	T491A684(1)020A(2)AUTO	0.5	4	12
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	Ω @ 20°C 100 kHz Max
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	Ω @ 20°C 100 kHz Max
20	1	A/3216-18	T491A105(1)020A(2)AUTO	0.5	4	9
20	1.5	A/3216-18	T491A155(1)020A(2)AUTO	0.5	6	6.5
20	2.2	A/3216-18	T491A225(1)020A(2)AUTO	0.5	6	7
20	2.2	B/3528-21	T491B225(1)020A(2)AUTO	0.5	6	3.5
20	3.3	A/3216-18	T491A335(1)020A(2)AUTO	0.7	6	4.5
20	3.3	B/3528-21	T491B335(1)020A(2)AUTO	0.7	6	3
20	4.7	A/3216-18	T491A475(1)020A(2)AUTO	0.9	6	4
20	4.7	B/3528-21	T491B475(1)020A(2)AUTO	0.9	6	3
20	4.7	C/6032-28	T491C475(1)020A(2)AUTO	0.9	6	2.4
20	6.8	A/3216-18	T491A685(1)020A(2)AUTO	1.4	8	6
20	6.8	B/3528-21	T491B685(1)020A(2)AUTO	1.4	6	2.5
20	6.8	C/6032-28	T491C685(1)020A(2)AUTO	1.4	6	1.9
20	10	C/6032-28	T491C106(1)020A(2)AUTO	2.0	6	1.8
20	15	C/6032-28	T491C156(1)020A(2)AUTO	3.0	6	1.7
20	15	D/7343-31	T491D156(1)020A(2)AUTO	3.0	6	1
20	22	D/7343-31	T491D226(1)020A(2)AUTO	4.4	6	0.8
20	33	C/6032-28	T491C336(1)020A(2)AUTO	6.6	6	1.2
20	33	D/7343-31	T491D336(1)020A(2)AUTO	6.6	6	0.8
20	47	D/7343-31	T491D476(1)020A(2)AUTO	9.4	6	0.7
20	47	X/7343-43	T491X476(1)020A(2)AUTO	9.4	6	0.8
20	68	X/7343-43	T491X686(1)020A(2)AUTO	13.6	6	0.7
20	100	E/7360-38	T491E107(1)020A(2)AUTO	20.0	8	0.5
25	0.33	A/3216-18	T491A334(1)025A(2)AUTO	0.5	4	15
25	0.47	A/3216-18	T491A474(1)025A(2)AUTO	0.5	4	14
25	0.68	A/3216-18	T491A684(1)025A(2)AUTO	0.5	4	10
25	1	A/3216-18	T491A105(1)025A(2)AUTO	0.5	4	8
25	1	B/3528-21	T491B105(1)025A(2)AUTO	0.5	4	5
25	1.5	A/3216-18	T491A155(1)025A(2)AUTO	0.5	6	7.5
25	1.5	B/3528-21	T491B155(1)025A(2)AUTO	0.5	6	5
25	2.2	A/3216-18	T491A225(1)025A(2)AUTO	0.6	6	7
25	2.2	B/3528-21	T491B225(1)025A(2)AUTO	0.6	6	4.5
25	2.2	C/6032-28	T491C225(1)025A(2)AUTO	0.6	6	3.5
25	3.3	A/3216-18	T491A335(1)025A(2)AUTO	0.8	6	7
25	3.3	B/3528-21	T491B335(1)025A(2)AUTO	0.8	6	3.5
25	3.3	C/6032-28	T491C335(1)025A(2)AUTO	0.8	6	2.5
25	4.7	C/6032-28	T491C475(1)025A(2)AUTO	1.2	6	2.4
25	6.8	B/3528-21	T491B685(1)025A(2)AUTO	1.7	8	2.8
25	6.8	C/6032-28	T491C685(1)025A(2)AUTO	1.7	6	1.9
25	6.8	D/7343-31	T491D685(1)025A(2)AUTO	1.7	6	1.2
25	10	C/6032-28	T491C106(1)025A(2)AUTO	2.5	6	1.5
25	10	D/7343-31	T491D106(1)025A(2)AUTO	2.5	6	1
25	15	C/6032-28	T491C156(1)025A(2)AUTO	3.8	6	1.5
25	15	D/7343-31	T491D156(1)025A(2)AUTO	3.8	6	1
25	22	C/6032-28	T491C226(1)025A(2)AUTO	5.5	6	1.4
25	22	D/7343-31	T491D226(1)025A(2)AUTO	5.5	6	0.8
25	33	D/7343-31	T491D336(1)025A(2)AUTO	8.3	6	0.7
25	33	X/7343-43	T491X336(1)025A(2)AUTO	8.3	6	0.7
25	47	D/7343-31	T491D476(1)025A(2)AUTO	11.8	10	0.7
25	47	X/7343-43	T491X476(1)025A(2)AUTO	11.8	6	0.7
25	68	X/7343-43	T491X686(1)025A(2)AUTO	17.0	8	0.7
35	0.1	A/3216-18	T491A104(1)035A(2)AUTO	0.5	4	20
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	Ω @ 20°C 100 kHz Max
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

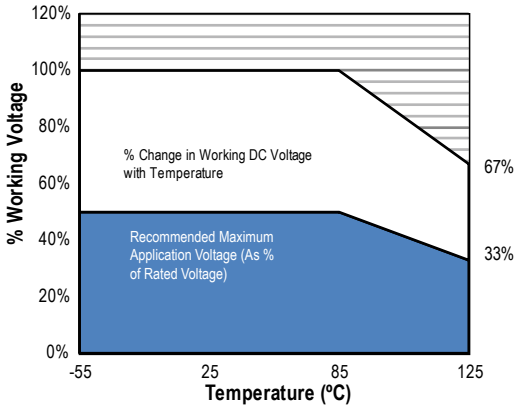
Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	Ω @ 20°C 100 kHz Max
35	0.15	A/3216-18	T491A154(1)035A(2)AUTO	0.5	4	19
35	0.22	A/3216-18	T491A224(1)035A(2)AUTO	0.5	4	18
35	0.33	A/3216-18	T491A334(1)035A(2)AUTO	0.5	4	15
35	0.47	A/3216-18	T491A474(1)035A(2)AUTO	0.5	4	12
35	0.47	B/3528-21	T491B474(1)035A(2)AUTO	0.5	4	8
35	0.68	A/3216-18	T491A684(1)035A(2)AUTO	0.5	4	8
35	0.68	B/3528-21	T491B684(1)035A(2)AUTO	0.5	4	6.5
35	1	A/3216-18	T491A105(1)035A(2)AUTO	0.5	4	7.5
35	1	B/3528-21	T491B105(1)035A(2)AUTO	0.5	4	5
35	1.5	B/3528-21	T491B155(1)035A(2)AUTO	0.5	6	5
35	1.5	C/6032-28	T491C155(1)035A(2)AUTO	0.5	6	4.5
35	2.2	B/3528-21	T491B225(1)035A(2)AUTO	0.8	6	4.0
35	2.2	C/6032-28	T491C225(1)035A(2)AUTO	0.8	6	3.5
35	3.3	B/3528-21	T491B335(1)035A(2)AUTO	1.2	6	3.5
35	3.3	C/6032-28	T491C335(1)035A(2)AUTO	1.2	6	2.5
35	4.7	B/3528-21	T491B475(1)035A(2)AUTO	1.6	6	3.1
35	4.7	C/6032-28	T491C475(1)035A(2)AUTO	1.6	6	2.2
35	4.7	D/7343-31	T491D475(1)035A(2)AUTO	1.6	6	1.5
35	6.8	D/7343-31	T491D685(1)035A(2)AUTO	2.4	6	1.3
35	6.8	V/7343-20	T491V685(1)035A(2)AUTO	2.4	6	1.2
35	10	C/6032-28	T491C106(1)035A(2)AUTO	3.5	6	1.6
35	10	D/7343-31	T491D106(1)035A(2)AUTO	3.5	6	1
35	10	V/7343-20	T491V106(1)035A(2)AUTO	3.5	6	2
35	15	D/7343-31	T491D156(1)035A(2)AUTO	5.3	6	0.8
35	15	X/7343-43	T491X156(1)035A(2)AUTO	5.3	6	0.9
35	22	D/7343-31	T491D226(1)035A(2)AUTO	7.7	6	0.7
35	22	X/7343-43	T491X226(1)035A(2)AUTO	7.7	6	0.7
35	33	X/7343-43	T491X336(1)035A(2)AUTO	11.6	6	0.6
35	47	X/7343-43	T491X476(1)035A(2)AUTO	16.5	8	0.6
35	47	E/7360-38	T491E476(1)035A(2)AUTO	16.5	10	0.5
50	0.1	A/3216-18	T491A104(1)050A(2)AUTO	0.5	4	20
50	0.15	A/3216-18	T491A154(1)050A(2)AUTO	0.5	4	15
50	0.15	B/3528-21	T491B154(1)050A(2)AUTO	0.5	4	16
50	0.22	A/3216-18	T491A224(1)050A(2)AUTO	0.5	4	18
50	0.22	B/3528-21	T491B224(1)050A(2)AUTO	0.5	4	14
50	0.33	B/3528-21	T491B334(1)050A(2)AUTO	0.5	4	10
50	0.47	B/3528-21	T491B474(1)050A(2)AUTO	0.5	4	9
50	0.47	C/6032-28	T491C474(1)050A(2)AUTO	0.5	4	8
50	0.68	B/3528-21	T491B684(1)050A(2)AUTO	0.5	4	8
50	0.68	C/6032-28	T491C684(1)050A(2)AUTO	0.5	4	7
50	1	C/6032-28	T491C105(1)050A(2)AUTO	0.5	4	5.5
50	1.5	C/6032-28	T491C155(1)050A(2)AUTO	0.8	6	4.5
50	1.5	D/7343-31	T491D155(1)050A(2)AUTO	0.8	6	3.5
50	2.2	D/7343-31	T491D225(1)050A(2)AUTO	1.1	6	2.5
50	3.3	D/7343-31	T491D335(1)050A(2)AUTO	1.7	6	2
50	4.7	D/7343-31	T491D475(1)050A(2)AUTO	2.4	6	1.4
50	6.8	D/7343-31	T491D685(1)050A(2)AUTO	3.4	6	1
50	6.8	X/7343-43	T491X685(1)050A(2)AUTO	3.4	6	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	Ω @ 20°C 100 kHz Max
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Recommended Voltage Derating Guidelines

	-55°C to 85°C	85°C to 125°C
% Change in Working DC Voltage with Temperature	V_R	67% of V_R
Recommended Maximum Application Voltage	50% of V_R	33% 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 which 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. See the Reverse Voltage section for allowable limits.

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

KEMET Series and Case Code	EIA Case Code	Maximum Power Dissipation (P max) mWatts @ 25°C with +20°C Rise
A	3216–18	75
B	3528–21	85
C	6032–28	110
D	7343–31	150
X	7343–43	165
E	7360–38	200
S	3216–12	60
T	3528–12	70
U	6032–15	90
V	7343–20	125
T510X	7343–43	270
T510E	7360–38	285

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

Temperature Compensation Multipliers for Maximum Power Dissipation		
≤ 25°C	85°C	125°C
1.00	0.90	0.40

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)

Reverse Voltage

Solid tantalum capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. The positive terminal is identified on the capacitor body by a stripe plus in some cases a beveled edge. A small degree of transient reverse voltage is permissible for short periods per the table. The capacitors should not be operated continuously in reverse mode, even within these limits.

Temperature	Permissible Transient Reverse Voltage
25°C	15% of Rated Voltage
85°C	5% of Rated Voltage
125°C	1% of Rated Voltage

Table 2 – Land Dimensions/Courtyard

KEMET	Metric Size Code	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B: Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
Case	EIA	W	L	S	V1	V2	W	L	S	V1	V2	W	L	S	V1	V2
A	3216–18	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
B	3528–21	2.35	2.21	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
C	6032–25	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
D	7343–31	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
L	6032-19	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
M	3528-15	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
H	7360-20	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
E[1]	7360–38	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
Q	7343-12	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
R[2]	2012-12	1.05	1.83	0.15	4.82	2.50	0.93	1.50	0.22	3.72	2.00	0.83	1.12	0.38	2.86	1.74
S[2]	3216–12	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
T	3528–12	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
U	6032–15	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
V	7343–20	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
W	7343–15	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
X[1]	7343–43	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
Y[1]	7343–40	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84

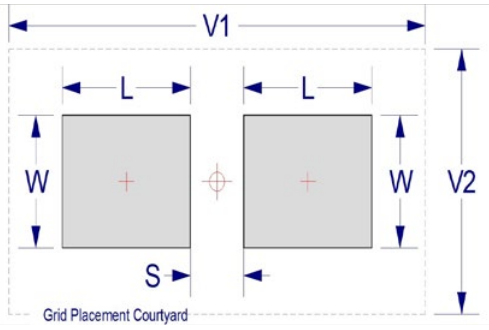
Density Level A: *For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes.*

Density Level B: *For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.*

Density Level C: *For high component desity product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC standard 7351 (IPC–7351).*

[1] Height of these chips may create problems in wave soldering.

[2] Land pattern geometry is too small for silkscreen outline.



Soldering Process

KEMET's families of surface mount capacitors are compatible with wave (single or dual), convection, IR, or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J–STD–020D standard for moisture sensitivity testing. The devices can safely withstand a maximum of three reflow passes at these conditions.

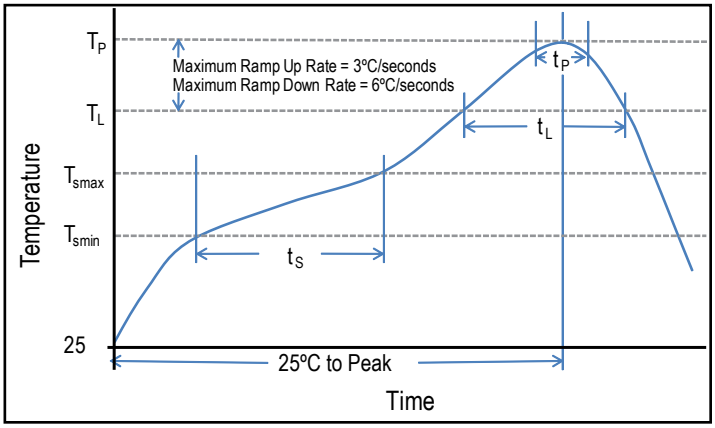
Please note that although the X/7343–43 case size can withstand wave soldering, the tall profile (4.3 mm maximum) dictates care in wave process development.

Hand soldering should be performed with care due to the difficulty in process control. If performed, care should be taken to avoid contact of the soldering iron to the molded case. The iron should be used to heat the solder pad, applying solder between the pad and the termination, until reflow occurs. Once reflow occurs, the iron should be removed immediately. "Wiping" the edges of a chip and heating the top surface is not recommended.

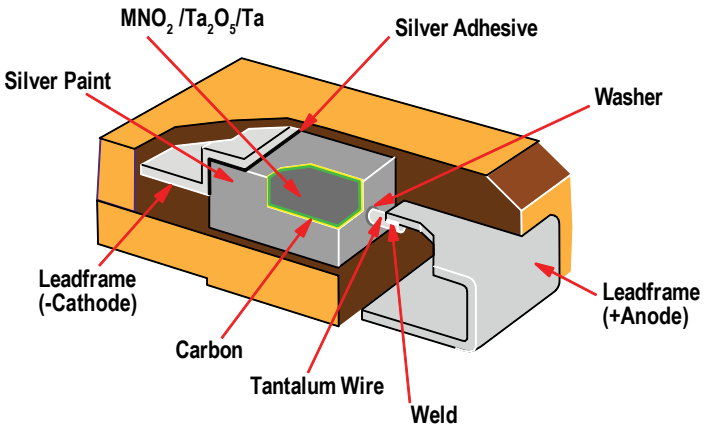
During typical reflow operations, a slight darkening of the gold-colored epoxy may be observed. This slight darkening is normal and not harmful to the product. Marking permanency is not affected by this change.

Profile Feature	SnPb Assembly	Pb-Free Assembly
Preheat/Soak		
Temperature Minimum (T_{Smin})	100°C	150°C
Temperature Maximum (T_{Smax})	150°C	200°C
Time (t_s) from T_{smin} to T_{smax})	60 – 120 seconds	60 – 120 seconds
Ramp-up Rate (T_L to T_P)	3°C/seconds maximum	3°C/seconds maximum
Liquidous Temperature (T_L)	183°C	217°C
Time Above Liquidous (t_L)	60 – 150 seconds	60 – 150 seconds
Peak Temperature (T_P)	220°C* 235°C**	250°C* 260°C**
Time within 5°C of Maximum Peak Temperature (t_P)	20 seconds maximum	30 seconds maximum
Ramp-down Rate (T_P to T_L)	6°C/seconds maximum	6°C/seconds maximum
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum

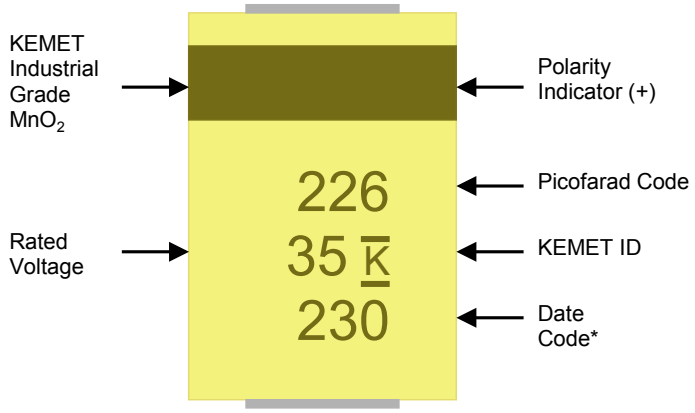
Note: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.
**Case Size D, E, P, Y, and X*
***Case Size A, B, C, H, I, K, M, R, S, T, U, V, W, and Z*



Construction

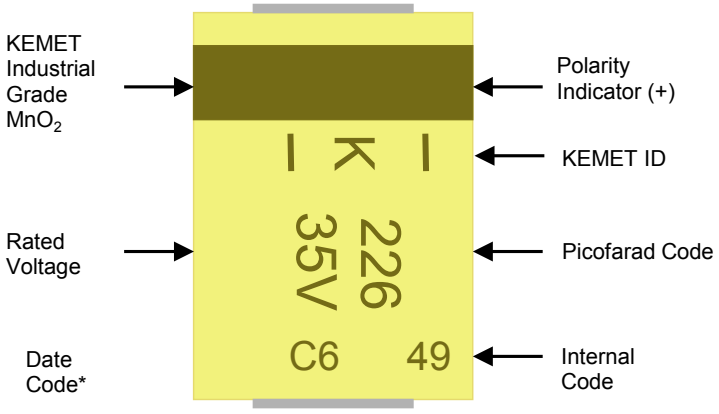


Capacitor Marking



* 230 = 30th week of 2012

C, D, X Case Sizes



Date Code *	
1st digit = Last number of Year	9 = 2009 0 = 2010 1 = 2011 2 = 2012 3 = 2013 4 = 2014
2nd and 3rd digit = Week of the Year	01 = 1st week of the Year to 52 = 52nd week of the Year

Date Code*		
Year	Month	
X = 2009	1 = Jan	7 = Jul
A = 2010	2 = Feb	8 = Aug
B = 2011	3 = Mar	9 = Spt
C = 2012	4 = Apr	O = Oct
D = 2013	5 = May	N = Nov
E = 2014	6 = Jun	D = Dec

Storage

Tantalum chip capacitors should be stored in normal working environments. While the chips 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 40ºC 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 chip stock should be used promptly, preferably within three years of receipt.

T494 Industrial Grade Low ESR MnO_2 Series

Overview

The KEMET T494 Series is a lower ESR version of the popular T491 Series, designed specifically for today's highly automated surface mount processes and equipment. The T494 combines KEMET's proven solid tantalum technology, acclaimed and respected throughout the world, with the latest in materials, processes and automation, resulting in unsurpassed total performance and value. This product meets or exceeds the requirements of EIA Standard 535BAAC. The T494 standard terminations are available in 100% matte tin and provide excellent wetting characteristics and compatibility with today's surface mount solder systems. Tin/lead (Sn/Pb) terminations are available upon request for any part number. Gold-plated terminations are also available for use with conductive epoxy attachment processes.

Standard packaging of these devices is tape and reel in accordance with EIA 481–1. This system provides perfect compatibility with all tape-fed placement units.

Benefits

- Meets or exceeds EIA standard 535BAAC
- Taped and reeled per EIA 481–1
- Symmetrical, compliant terminations
- Optional gold-plated terminations
- Laser-marked case
- 100% surge current test on C, D, E, U, V, X sizes
- Halogen-free epoxy
- Capacitance values of 0.1 µF to 1,000 µF
- Tolerances of ±10% and ±20%
- Voltage rating of 2.5 – 50 VDC
- Extended range values
- Low profile case sizes
- RoHS Compliant and lead-free terminations
- Operating temperature range of -55˚C to +125˚C

Applications

Typical applications include decoupling and filtering in industrial and automotive end applications, such as DC/DC converters, portable electronics, telecommunications, and control units.

Environmental Compliance

RoHS Compliant (6/6) according to Directive 2002/95/EC when ordered with 100% Sn solder.

RoHS Compliant

SPICE

For a detailed analysis of specific part numbers, please visit www.kemet.com for a free download of KEMET's SPICE software. The KEMET SPICE program is freeware intended to aid design engineers in analyzing the performance of these capacitors over frequency, temperature, ripple, and DC bias conditions.

Ordering Information

T	494	T	336	M	004	A	T	AUTO	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Failure Rate/ Design	Lead Material	C-Spec 1	Packaging (C-Spec)
T = Tantalum	Industrial - Low ESR	A, B, C, D, E, S, T, U, V, X	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	2R5 = 2.5 V 003 = 3 V 004 = 4 V 006 = 6.3 V 010 = 10 V 016 = 16 V 020 = 20 V 025 = 25 V 035 = 35 V 050 = 50 V	A = N/A	T = 100% Matte Tin (Sn) Plated H = Standard Solder Coated (SnPb 5% Pb minimum) G = Gold Plated (A, B, C, D, X only)	AUTO = Automotive Grade (AUTO = AEC–Q200 Certification)	Blank = 7" Reel 7280 = 13" Reel

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 125°C
Rated Capacitance Range	0.1 – 1,000 µF @ 120 Hz/25°C
Capacitance Tolerance	K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	2.5 – 50 V
DF (120 Hz)	Refer to Part Number Electrical Specification Table
ESR (100 kHz)	Refer to Part Number Electrical Specification Table
Leakage Current	≤ 0.01 CV (µA) at rated voltage after 5 minutes

Qualification

Test	Condition		Characteristics			
Endurance	85°C @ rated voltage, 2,000 hours 125°C @ 2/3 rated voltage, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Storage Life	125°C @ 0 volts, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Thermal Shock	MIL–STD–202, Method 107, Condition B, mounted, -55C° to 125° C, 1000 cycles		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Temperature Stability	Extreme temperature exposure at a succession of continuous steps at +25°C, -55°C, +25°C, +85°C, +125°C, +25°C.		+25°C	-55°C	+85°C	+125°C
		Δ C/C	IL*	±10%	±10%	±20%
		DF	IL	IL	1.5 x IL	1.5 x IL
		DCL	IL	n/a	10 x IL	12 x IL
Surge Voltage	25°C and 85°C, 1.32 x rated voltage 1,000 cycles (125°C, 1.2 x rated voltage).		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		
			ESR	Within initial limits		
Mechanical Shock/Vibration	MIL–STD–202, Method 213, Condition I, 100 G peak MIL–STD–202, Method 204, Condition D, 10 Hz to 2,000 Hz, 20 G peak		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		

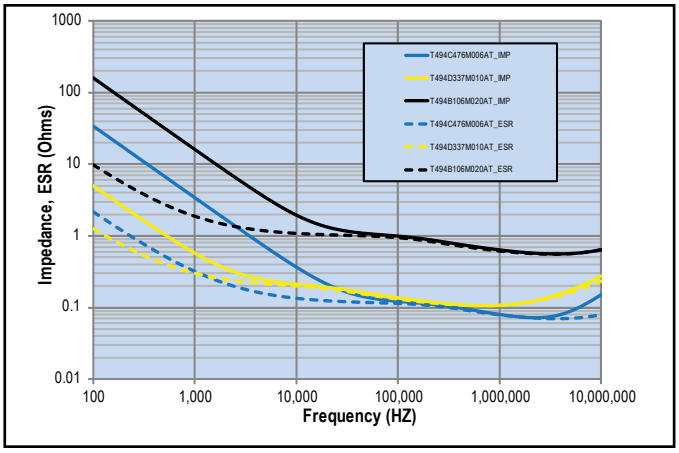
**IL = Initial limit*

Certification

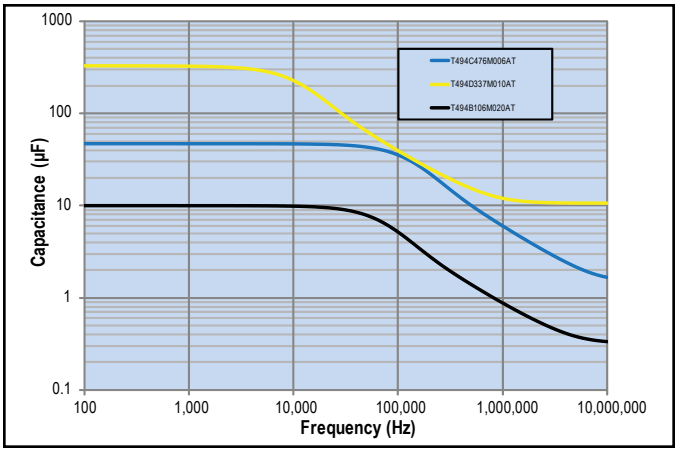
KEMET's Internal Qualification Plan for this Tantalum series of capacitors follows AEC–Q200 guidelines. Standard catalog part types ordered without a specific automotive designator, i.e., suffix AUTO or four digit customer specific designator (C-Spec), are not considered KEMET Automotive Grade tantalum capacitors.

Electrical Characteristics

ESR vs. Frequency

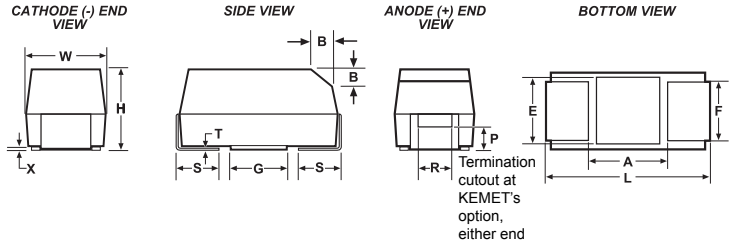


Capacitance vs. Frequency



Dimensions – Millimeters (Inches)

Metric will govern



Case Size		Component												
KEMET	EIA	L*	W*	H*	F* ±0.1 ±(.004)	S* ±0.3 ±(.012)	B* ±0.15 (Ref) ±.006	X (Ref)	P (Ref)	R (Ref)	T (Ref)	A (Min)	G (Ref)	E (Ref)
A	3216–18	3.2 ± 0.2 (.126 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.2 (.047)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.4 (.016)	0.4 (.016)	0.13 (.005)	0.8 (.31)	1.1 (.043)	1.3 (.051)
B	3528–21	3.5 ± 02 (138 ± .008)	2.8 ± 0.2 (.110 ± .008)	1.9 ± 0.2 (.075 ± .008)	2.2 (.087)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.5 (.020)	1.0 (.039)	0.13 (.005)	1.1 (0.043)	1.8 (.071)	2.2 (.087)
C	6032–28	6.0 ± 0.3 (.236 ± .03)	3.2 ± 0.3 (.126 ± .012)	2.5 ± 0.3 (.098 ± .012)	2.2 (.087)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	2.5(.098)	2.8 (.110)	2.4 (.094)
D	7343–31	7.3 ± 0.3 (287 ± .012)	4.3 ± 0.3 (.169 ± .012)	2.8 ± 0.3 (.110 ± .012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
X	7343–43	7.3 ± 0.3 (.287 ± .012)	4.3 ± 0.3 (.169 ± .012)	4.0 ± 0.3 (.157 ± .012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	1.7 (.067)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
E	7360–38	7.3 ± 0.3 (.287 ± .012)	6.0± 0.3 (.236 ± .012)	3.6 ± 0.2 (.142 ± .008)	4.1 (.161)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
S	3216–12	3.2 ± 0.2 (.126 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.2 (.047)	1.2 (.047)	0.8 (.031)	N/A	0.05 (.002)	N/A	N/A	0.13 (.005)	0.8 (.031)	1.1 (.043)	1.3 (.051)
T	3528–12	3.5 ± 0.2 (.138 ± .008)	2.8 ± 0.2 (.110 ± .008)	1.2 (.047)	2.2 (.087)	0.8 (.031)	N/A	0.05 (.002)	N/A	N/A	0.13 (.005)	1.1 (.043)	1.8 (.071)	2.2 (.087)
U	6032–15	6.0 ± 0.3 (236 ± .012)	3.2 ± 0.2 (.110 ± .008)	1.5 (.059)	2.2 (.087)	1.3 (.051)	N/A	0.05 (.002)	N/A	N/A	0.13 (.005)	2.5(.098)	2.8 (.110)	2.4 (.094)
V	7343–20	7.3 ± 0.3 (287 ± .012)	4.3 ± 0.3 (.169 ± .012)	2.0 (.079)	2.4 (.094)	1.3 (.051)	N/A	0.05 (.002)	N/A	N/A	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)

Notes: (Ref) – Dimensions provided for reference only. No dimensions provided for B, P or R because low profile cases do not have a bevel or a notch.
** MIL–PRF–55365/8 specified dimensions*

Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µA @ 20°C Max/5 Min	% @ 20°C 120 Hz Max	Ω @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	Reflow Temp ≤ 260°C
6.3	2.2	A/3216-18	T494A225(1)006A(2)AUTO	0.5	6	6	3536	1
6.3	3.3	A/3216-18	T494A335(1)006A(2)AUTO	0.5	6	6	3536	1
6.3	4.7	A/3216-18	T494A475(1)006A(2)AUTO	0.5	6	3.5	4629	1
6.3	6.8	A/3216-18	T494A685(1)006A(2)AUTO	0.5	6	2	6124	1
6.3	6.8	B/3528-21	T494B685(1)006A(2)AUTO	0.5	6	1.2	8416	1
6.3	10	A/3216-18	T494A106(1)006A(2)AUTO	0.6	6	2	6124	1
6.3	10	B/3528-21	T494B106(1)006A(2)AUTO	0.6	6	1	9220	1
6.3	15	A/3216-18	T494A156(1)006A(2)AUTO	0.9	6	2	6124	1
6.3	15	B/3528-21	T494B156(1)006A(2)AUTO	0.9	6	0.7	11019	1
6.3	15	C/6032-28	T494C156(1)006A(2)AUTO	0.9	6	0.6	13540	1
6.3	22	A/3216-18	T494A226(1)006A(2)AUTO	1.4	6	3	5000	1
6.3	22	B/3528-21	T494B226(1)006A(2)AUTO	1.4	6	0.6	11902	1
6.3	22	C/6032-28	T494C226(1)006A(2)AUTO	1.4	6	0.5	14832	1
6.3	33	A/3216-18	T494A336(1)006A(2)AUTO	2.1	12	2	6124	1
6.3	33	B/3528-21	T494B336(1)006A(2)AUTO	2.1	6	0.6	11902	1
6.3	33	C/6032-28	T494C336(1)006A(2)AUTO	2.1	6	0.3	19149	1
6.3	47	B/3528-21	T494B476(1)006A(2)AUTO	3.0	6	0.5	13038	1
6.3	47	C/6032-28	T494C476(1)006A(2)AUTO	3.0	6	0.25	20976	1
6.3	47	D/7343-31	T494D476(1)006A(2)AUTO	3.0	6	0.22	26112	1
6.3	68	A/3216-18	T494A686(1)006A(2)AUTO	4.3	30	3	5000	1
6.3	68	B/3528-21	T494B686(1)006A(2)AUTO	4.3	8	0.65	11435	1
6.3	68	C/6032-28	T494C686(1)006A(2)AUTO	4.3	6	0.2	23452	1
6.3	68	D/7343-31	T494D686(1)006A(2)AUTO	4.3	6	0.2	27386	1
6.3	100	C/6032-28	T494C107(1)006A(2)AUTO	6.3	8	0.3	19149	1
6.3	100	D/7343-31	T494D107(1)006A(2)AUTO	6.3	8	0.15	31623	1
6.3	150	C/6032-28	T494C157(1)006A(2)AUTO	9.5	8	0.3	19149	1
6.3	150	D/7343-31	T494D157(1)006A(2)AUTO	9.5	8	0.15	31623	1
6.3	220	D/7343-31	T494D227(1)006A(2)AUTO	13.9	8	0.15	31623	1
6.3	220	X/7343-43	T494X227(1)006A(2)AUTO	13.9	8	0.15	33166	1
6.3	330	D/7343-31	T494D337(1)006A(2)AUTO	20.8	8	0.15	31623	1
6.3	330	X/7343-43	T494X337(1)006A(2)AUTO	20.8	8	0.15	33166	1
6.3	330	E/7360-38	T494E337(1)006A(2)AUTO	20.8	8	0.25	28284	1
6.3	470	X/7343-43	T494X477(1)006A(2)AUTO	29.6	10	0.1	40620	1
6.3	470	E/7360-38	T494E477(1)006A(2)AUTO	29.6	10	0.2	31623	1
10	1.5	A/3216-18	T494A155(1)010A(2)AUTO	0.5	6	6	3536	1
10	2.2	A/3216-18	T494A225(1)010A(2)AUTO	0.5	6	6	3536	1
10	2.2	B/3528-21	T494B225(1)010A(2)AUTO	0.5	6	1.5	7528	1
10	3.3	A/3216-18	T494A335(1)010A(2)AUTO	0.5	6	4	4330	1
10	4.7	A/3216-18	T494A475(1)010A(2)AUTO	0.5	6	3	5000	1
10	4.7	B/3528-21	T494B475(1)010A(2)AUTO	0.5	6	1.5	7528	1
10	6.8	A/3216-18	T494A685(1)010A(2)AUTO	0.7	6	3	5000	1
10	6.8	B/3528-21	T494B685(1)010A(2)AUTO	0.7	6	1.2	8416	1
10	10	A/3216-18	T494A106(1)010A(2)AUTO	1.0	6	1.8	6455	1
10	10	B/3528-21	T494B106(1)010A(2)AUTO	1.0	6	0.8	10308	1
10	10	C/6032-28	T494C106(1)010A(2)AUTO	1.0	6	0.6	13540	1
10	15	A/3216-18	T494A156(1)010A(2)AUTO	1.5	8	4	4330	1
10	15	B/3528-21	T494B156(1)010A(2)AUTO	1.5	6	0.7	11019	1
10	15	C/6032-28	T494C156(1)010A(2)AUTO	1.5	6	0.5	14832	1
VDC	µF	KEMET/EIA	(See below for part options)	µA @ 20°C Max/5 Min	% @ 20°C 120 Hz Max	Ω @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	Moisture Sensitivity

(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, G = Gold 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.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µA @ 20°C Max/5 Min	% @ 20°C 120 Hz Max	Ω @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	Reflow Temp ≤ 260°C
10	22	A/3216-18	T494A226(1)010A(2)AUTO	2.2	8	4	4330	1
10	22	B/3528-21	T494B226(1)010A(2)AUTO	2.2	6	0.7	11019	1
10	22	C/6032-28	T494C226(1)010A(2)AUTO	2.2	6	0.4	16583	1
10	33	B/3528-21	T494B336(1)010A(2)AUTO	3.3	6	1.4	7792	1
10	33	C/6032-28	T494C336(1)010A(2)AUTO	3.3	6	0.3	19149	1
10	33	D/7343-31	T494D336(1)010A(2)AUTO	3.3	6	0.25	24495	1
10	47	B/3528-21	T494B476(1)010A(2)AUTO	4.7	8	0.65	11435	1
10	47	C/6032-28	T494C476(1)010A(2)AUTO	4.7	6	0.3	19149	1
10	47	D/7343-31	T494D476(1)010A(2)AUTO	4.7	6	0.22	26112	1
10	68	C/6032-28	T494C686(1)010A(2)AUTO	6.8	6	0.3	19149	1
10	68	D/7343-31	T494D686(1)010A(2)AUTO	6.8	6	0.2	27386	1
10	100	C/6032-28	T494C107(1)010A(2)AUTO	10.0	8	0.2	23452	1
10	100	D/7343-31	T494D107(1)010A(2)AUTO	10.0	8	0.15	31623	1
10	150	D/7343-31	T494D157(1)010A(2)AUTO	15.0	8	0.15	31623	1
10	150	X/7343-43	T494X157(1)010A(2)AUTO	15.0	8	0.15	33166	1
10	220	D/7343-31	T494D227(1)010A(2)AUTO	22.0	8	0.15	31623	1
10	220	X/7343-43	T494X227(1)010A(2)AUTO	22.0	8	0.15	33166	1
10	330	X/7343-43	T494X337(1)010A(2)AUTO	33.0	10	0.1	40620	1
10	330	E/7360-38	T494E337(1)010A(2)AUTO	33.0	10	0.25	28284	1
16	1	A/3216-18	T494A105(1)016A(2)AUTO	0.5	4	6	3536	1
16	1.5	A/3216-18	T494A155(1)016A(2)AUTO	0.5	6	6	3536	1
16	2.2	A/3216-18	T494A225(1)016A(2)AUTO	0.5	6	4	4330	1
16	3.3	A/3216-18	T494A335(1)016A(2)AUTO	0.5	6	4	4330	1
16	3.3	B/3528-21	T494B335(1)016A(2)AUTO	0.5	6	2	6519	1
16	4.7	A/3216-18	T494A475(1)016A(2)AUTO	0.8	6	3	5000	1
16	4.7	B/3528-21	T494B475(1)016A(2)AUTO	0.8	6	1.5	7528	1
16	4.7	C/6032-28	T494C475(1)016A(2)AUTO	0.8	6	1	10488	1
16	6.8	A/3216-18	T494A685(1)016A(2)AUTO	1.1	6	3	5000	1
16	6.8	B/3528-21	T494B685(1)016A(2)AUTO	1.1	6	1.2	8416	1
16	6.8	C/6032-28	T494C685(1)016A(2)AUTO	1.1	6	0.8	11726	1
16	10	A/3216-18	T494A106(1)016A(2)AUTO	1.6	8	3	5000	1
16	10	B/3528-21	T494B106(1)016A(2)AUTO	1.6	6	0.8	10308	1
16	10	C/6032-28	T494C106(1)016A(2)AUTO	1.6	6	0.6	13540	1
16	15	C/6032-28	T494C156(1)016A(2)AUTO	2.4	6	0.4	16583	1
16	22	B/3528-21	T494B226(1)016A(2)AUTO	3.5	6	1	9220	1
16	22	C/6032-28	T494C226(1)016A(2)AUTO	3.5	6	0.35	17728	1
16	22	D/7343-31	T494D226(1)016A(2)AUTO	3.5	6	0.25	24495	1
16	33	D/7343-31	T494D336(1)016A(2)AUTO	5.3	6	0.25	24495	1
16	47	C/6032-28	T494C476(1)016A(2)AUTO	7.5	6	0.5	14832	1
16	47	D/7343-31	T494D476(1)016A(2)AUTO	7.5	6	0.2	27386	1
16	68	D/7343-31	T494D686(1)016A(2)AUTO	10.9	6	0.15	31623	1
16	100	D/7343-31	T494D107(1)016A(2)AUTO	16.0	8	0.15	31623	1
16	100	X/7343-43	T494X107(1)016A(2)AUTO	16.0	8	0.15	33166	1
16	150	X/7343-43	T494X157(1)016A(2)AUTO	24.0	8	0.15	33166	1
20	0.68	A/3216-18	T494A684(1)020A(2)AUTO	0.5	4	8	3062	1
20	1	A/3216-18	T494A105(1)020A(2)AUTO	0.5	4	5.5	3693	1
20	1.5	A/3216-18	T494A155(1)020A(2)AUTO	0.5	6	4.5	4082	1
20	2.2	A/3216-18	T494A225(1)020A(2)AUTO	0.5	6	4	4330	1
VDC	µF	KEMET/EIA	(See below for part options)	µA @ 20°C Max/5 Min	% @ 20°C 120 Hz Max	Ω @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	Moisture Sensitivity

(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, G = Gold 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.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µA @ 20°C Max/5 Min	% @ 20°C 120 Hz Max	Ω @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	Reflow Temp ≤ 260°C
20	2.2	B/3528-21	T494B225(1)020A(2)AUTO	0.5	6	1.5	7528	1
20	3.3	A/3216-18	T494A335(1)020A(2)AUTO	0.7	6	4	4330	1
20	3.3	B/3528-21	T494B335(1)020A(2)AUTO	0.7	6	1.3	8086	1
20	4.7	A/3216-18	T494A475(1)020A(2)AUTO	0.9	6	3	5000	1
20	4.7	B/3528-21	T494B475(1)020A(2)AUTO	0.9	6	1	9220	1
20	4.7	C/6032-28	T494C475(1)020A(2)AUTO	0.9	6	0.6	13540	1
20	6.8	A/3216-18	T494A685(1)020A(2)AUTO	1.4	8	3	5000	1
20	6.8	B/3528-21	T494B685(1)020A(2)AUTO	1.4	6	1	9220	1
20	6.8	C/6032-28	T494C685(1)020A(2)AUTO	1.4	6	0.6	13540	1
20	10	C/6032-28	T494C106(1)020A(2)AUTO	2.0	6	0.5	14832	1
20	15	C/6032-28	T494C156(1)020A(2)AUTO	3.0	6	0.4	16583	1
20	15	D/7343-31	T494D156(1)020A(2)AUTO	3.0	6	0.35	20702	1
20	22	D/7343-31	T494D226(1)020A(2)AUTO	4.4	6	0.3	22361	1
20	33	D/7343-31	T494D336(1)020A(2)AUTO	6.6	6	0.25	24495	1
20	47	D/7343-31	T494D476(1)020A(2)AUTO	9.4	6	0.275	23355	1
20	47	X/7343-43	T494X476(1)020A(2)AUTO	9.4	6	0.175	30706	1
20	68	X/7343-43	T494X686(1)020A(2)AUTO	13.6	6	0.2	28723	1
20	100	E/7360-38	T494E107(1)020A(2)AUTO	20.0	8	0.3	25820	1
25	0.33	A/3216-18	T494A334(1)025A(2)AUTO	0.5	4	10	2739	1
25	0.47	A/3216-18	T494A474(1)025A(2)AUTO	0.5	4	9	2887	1
25	0.68	A/3216-18	T494A684(1)025A(2)AUTO	0.5	4	6	3536	1
25	1	A/3216-18	T494A105(1)025A(2)AUTO	0.5	4	4	4330	1
25	1	B/3528-21	T494B105(1)025A(2)AUTO	0.5	4	2	6519	1
25	1.5	A/3216-18	T494A155(1)025A(2)AUTO	0.5	6	3	5000	1
25	1.5	B/3528-21	T494B155(1)025A(2)AUTO	0.5	6	1.5	7528	1
25	2.2	A/3216-18	T494A225(1)025A(2)AUTO	0.6	6	3	5000	1
25	2.2	B/3528-21	T494B225(1)025A(2)AUTO	0.6	6	1.2	8416	1
25	2.2	C/6032-28	T494C225(1)025A(2)AUTO	0.6	6	2.2	7071	1
25	3.3	A/3216-18	T494A335(1)025A(2)AUTO	0.8	6	3	5000	1
25	3.3	B/3528-21	T494B335(1)025A(2)AUTO	0.8	6	2	6519	1
25	3.3	C/6032-28	T494C335(1)025A(2)AUTO	0.8	6	1.2	9574	1
25	4.7	C/6032-28	T494C475(1)025A(2)AUTO	1.2	6	0.6	13540	1
25	6.8	B/3528-21	T494B685(1)025A(2)AUTO	1.7	8	2	6519	1
25	6.8	C/6032-28	T494C685(1)025A(2)AUTO	1.7	6	0.6	13540	1
25	6.8	D/7343-31	T494D685(1)025A(2)AUTO	1.7	6	0.45	18257	1
25	10	C/6032-28	T494C106(1)025A(2)AUTO	2.5	6	0.6	13540	1
25	10	D/7343-31	T494D106(1)025A(2)AUTO	2.5	6	0.4	19365	1
25	15	C/6032-28	T494C156(1)025A(2)AUTO	3.8	6	0.9	11055	1
25	15	D/7343-31	T494D156(1)025A(2)AUTO	3.8	6	0.35	20702	1
25	22	C/6032-28	T494C226(1)025A(2)AUTO	5.5	6	1	10488	1
25	22	D/7343-31	T494D226(1)025A(2)AUTO	5.5	6	0.3	22361	1
25	33	D/7343-31	T494D336(1)025A(2)AUTO	8.3	6	0.4	19365	1
25	33	X/7343-43	T494X336(1)025A(2)AUTO	8.3	6	0.3	23452	1
25	47	D/7343-31	T494D476(1)025A(2)AUTO	11.8	10	0.2	27386	1
25	47	X/7343-43	T494X476(1)025A(2)AUTO	11.8	6	0.3	23452	1
25	68	X/7343-43	T494X686(1)025A(2)AUTO	17.0	8	0.3	23452	1
35	0.1	A/3216-18	T494A104(1)035A(2)AUTO	0.5	4	10	2739	1
35	0.15	A/3216-18	T494A154(1)035A(2)AUTO	0.5	4	6	3536	1
VDC	µF	KEMET/EIA	(See below for part options)	µA @ 20°C Max/5 Min	% @ 20°C 120 Hz Max	Ω @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	Moisture Sensitivity

(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, G = Gold 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.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µA @ 20°C Max/5 Min	% @ 20°C 120 Hz Max	Ω @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	Reflow Temp ≤ 260°C
35	0.22	A/3216-18	T494A224(1)035A(2)AUTO	0.5	4	6	3536	1
35	0.33	A/3216-18	T494A334(1)035A(2)AUTO	0.5	4	6	3536	1
35	0.47	A/3216-18	T494A474(1)035A(2)AUTO	0.5	4	4	4330	1
35	0.47	B/3528-21	T494B474(1)035A(2)AUTO	0.5	4	2.5	5831	1
35	0.68	A/3216-18	T494A684(1)035A(2)AUTO	0.5	4	6	3536	1
35	0.68	B/3528-21	T494B684(1)035A(2)AUTO	0.5	4	2.5	5831	1
35	1	A/3216-18	T494A105(1)035A(2)AUTO	0.5	4	6	3536	1
35	1	B/3528-21	T494B105(1)035A(2)AUTO	0.5	4	2	6519	1
35	1.5	B/3528-21	T494B155(1)035A(2)AUTO	0.5	6	3	5323	1
35	1.5	C/6032-28	T494C155(1)035A(2)AUTO	0.5	6	2.5	6633	1
35	2.2	C/6032-28	T494C225(1)035A(2)AUTO	0.8	6	1.5	8563	1
35	3.3	C/6032-28	T494C335(1)035A(2)AUTO	1.2	6	0.8	11726	1
35	4.7	C/6032-28	T494C475(1)035A(2)AUTO	1.6	6	0.7	12536	1
35	4.7	D/7343-31	T494D475(1)035A(2)AUTO	1.6	6	0.7	14639	1
35	6.8	D/7343-31	T494D685(1)035A(2)AUTO	2.4	6	0.5	17321	1
35	10	D/7343-31	T494D106(1)035A(2)AUTO	3.5	6	0.4	19365	1
35	10	V/7343-20	T494V106(1)035A(2)AUTO	3.5	6	0.8	12500	1
35	15	D/7343-31	T494D156(1)035A(2)AUTO	5.3	6	0.35	20702	1
35	15	X/7343-43	T494X156(1)035A(2)AUTO	5.3	6	0.3	23452	1
35	22	X/7343-43	T494X226(1)035A(2)AUTO	7.7	6	0.3	23452	1
35	33	X/7343-43	T494X336(1)035A(2)AUTO	11.6	6	0.6	16583	1
35	47	E/7360-38	T494E476(1)035A(2)AUTO	16.5	10	0.3	25820	1
50	0.1	A/3216-18	T494A104(1)050A(2)AUTO	0.5	4	10	2739	1
50	0.15	A/3216-18	T494A154(1)050A(2)AUTO	0.5	4	10	2739	1
50	0.15	B/3528-21	T494B154(1)050A(2)AUTO	0.5	4	10	2915	1
50	0.22	A/3216-18	T494A224(1)050A(2)AUTO	0.5	4	12	2500	1
50	0.22	B/3528-21	T494B224(1)050A(2)AUTO	0.5	4	10	2915	1
50	0.33	B/3528-21	T494B334(1)050A(2)AUTO	0.5	4	2.5	5831	1
50	0.47	B/3528-21	T494B474(1)050A(2)AUTO	0.5	4	2	6519	1
50	0.47	C/6032-28	T494C474(1)050A(2)AUTO	0.5	4	1.8	7817	1
50	0.68	B/3528-21	T494B684(1)050A(2)AUTO	0.5	4	3	5323	1
50	0.68	C/6032-28	T494C684(1)050A(2)AUTO	0.5	4	1.6	8292	1
50	1	C/6032-28	T494C105(1)050A(2)AUTO	0.5	4	1.6	8292	1
50	1.5	C/6032-28	T494C155(1)050A(2)AUTO	0.8	6	1.5	8563	1
50	1.5	D/7343-31	T494D155(1)050A(2)AUTO	0.8	6	1	12247	1
50	2.2	D/7343-31	T494D225(1)050A(2)AUTO	1.1	6	0.8	13693	1
50	3.3	D/7343-31	T494D335(1)050A(2)AUTO	1.7	6	0.8	13693	1
50	4.7	D/7343-31	T494D475(1)050A(2)AUTO	2.4	6	0.6	15811	1
50	6.8	D/7343-31	T494D685(1)050A(2)AUTO	3.4	6	0.7	14639	1
50	6.8	X/7343-43	T494X685(1)050A(2)AUTO	3.4	6	0.5	18166	1
VDC	µF	KEMET/EIA	(See below for part options)	µA @ 20°C Max/5 Min	% @ 20°C 120 Hz Max	Ω @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum). Designates Termination Finish.
Refer to Ordering Information for additional detail.
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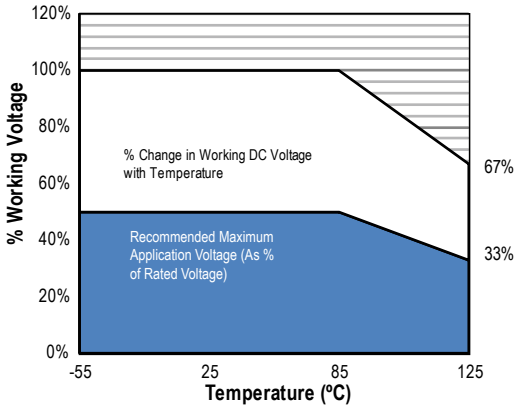
Recommended Voltage Derating Guidelines

	-55°C to 85°C	85°C to 125°C
% Change in Working DC Voltage with Temperature	V_R	67% of V_R
Recommended Maximum Application Voltage	50% of V_R	33% 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 which 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. See the Reverse Voltage section for allowable limits.

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

KEMET Series and Case Code	EIA Case Code	Maximum Power Dissipation (P max) mWatts @ 25°C with +20°C Rise
A	3216–18	75
B	3528–21	85
C	6032–28	110
D	7343–31	150
X	7343–43	165
E	7360–38	200
S	3216–12	60
T	3528–12	70
U	6032–15	90
V	7343–20	125
T510X	7343–43	270
T510E	7360–38	285

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

Temperature Compensation Multipliers for Maximum Power Dissipation		
≤ 25°C	85°C	125°C
1.00	0.90	0.40

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)

Reverse Voltage

Solid tantalum capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. The positive terminal is identified on the capacitor body by a stripe plus in some cases a beveled edge. A small degree of transient reverse voltage is permissible for short periods per the table. The capacitors should not be operated continuously in reverse mode, even within these limits.

Temperature	Permissible Transient Reverse Voltage
25°C	15% of Rated Voltage
85°C	5% of Rated Voltage
125°C	1% of Rated Voltage

Table 2 – Land Dimensions/Courtyard

KEMET	Metric Size Code	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B: Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
Case	EIA	W	L	S	V1	V2	W	L	S	V1	V2	W	L	S	V1	V2
A	3216–18	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
B	3528–21	2.35	2.21	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
C	6032–25	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
D	7343–31	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
L	6032-19	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
M	3528-15	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
H	7360-20	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
E[1]	7360–38	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
Q	7343-12	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
R[2]	2012-12	1.05	1.83	0.15	4.82	2.50	0.93	1.50	0.22	3.72	2.00	0.83	1.12	0.38	2.86	1.74
S[2]	3216–12	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
T	3528–12	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
U	6032–15	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
V	7343–20	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
W	7343–15	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
X[1]	7343–43	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
Y[1]	7343–40	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84

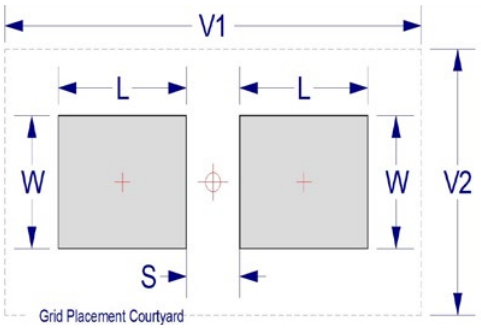
Density Level A: *For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes.*

Density Level B: *For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.*

Density Level C: *For high component desity product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC standard 7351 (IPC–7351).*

[1] Height of these chips may create problems in wave soldering.

[2] Land pattern geometry is too small for silkscreen outline.



Soldering Process

KEMET's families of surface mount capacitors are compatible with wave (single or dual), convection, IR, or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J–STD–020D standard for moisture sensitivity testing. The devices can safely withstand a maximum of three reflow passes at these conditions.

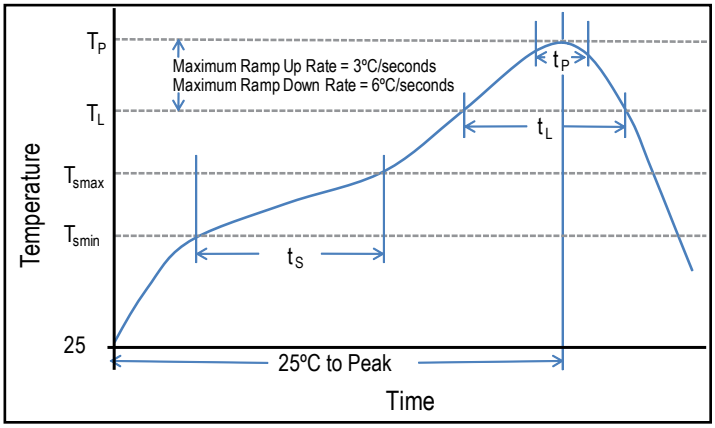
Please note that although the X/7343–43 case size can withstand wave soldering, the tall profile (4.3 mm maximum) dictates care in wave process development.

Hand soldering should be performed with care due to the difficulty in process control. If performed, care should be taken to avoid contact of the soldering iron to the molded case. The iron should be used to heat the solder pad, applying solder between the pad and the termination, until reflow occurs. Once reflow occurs, the iron should be removed immediately. "Wiping" the edges of a chip and heating the top surface is not recommended.

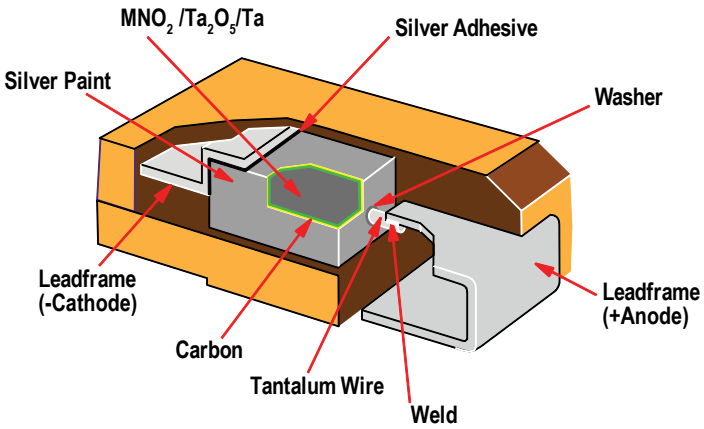
During typical reflow operations, a slight darkening of the gold-colored epoxy may be observed. This slight darkening is normal and not harmful to the product. Marking permanency is not affected by this change.

Profile Feature	SnPb Assembly	Pb-Free Assembly
Preheat/Soak		
Temperature Minimum (T_{Smin})	100°C	150°C
Temperature Maximum (T_{Smax})	150°C	200°C
Time (t_s) from T_{smin} to T_{smax})	60 – 120 seconds	60 – 120 seconds
Ramp-up Rate (T_L to T_P)	3°C/seconds maximum	3°C/seconds maximum
Liquidous Temperature (T_L)	183°C	217°C
Time Above Liquidous (t_L)	60 – 150 seconds	60 – 150 seconds
Peak Temperature (T_P)	220°C* 235°C**	250°C* 260°C**
Time within 5°C of Maximum Peak Temperature (t_P)	20 seconds maximum	30 seconds maximum
Ramp-down Rate (T_P to T_L)	6°C/seconds maximum	6°C/seconds maximum
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum

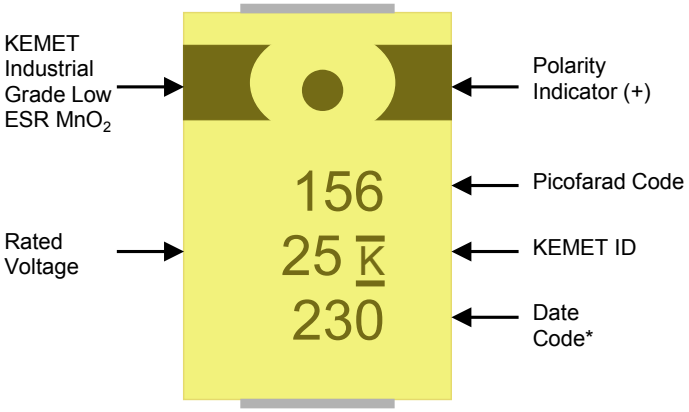
Note: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.
**Case Size D, E, P, Y, and X*
***Case Size A, B, C, H, I, K, M, R, S, T, U, V, W, and Z*



Construction



Capacitor Marking



* 230 = 30th week of 2012

Date Code *	
1st digit = Last number of Year	9 = 2009 0 = 2010 1 = 2011 2 = 2012 3 = 2013 4 = 2014
2nd and 3rd digit = Week of the Year	01 = 1st week of the Year to 52 = 52nd week of the Year

Storage

Tantalum chip capacitors should be stored in normal working environments. While the chips 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 40ºC 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 chip stock should be used promptly, preferably within three years of receipt.

T489 Low DC Leakage MnO_2 Series

Overview

The KEMET T489 Series provides DC leakage current that is 25% lower than the commercial T491 Series. The T489 series also offers improved reliability, low ESR options and meets or exceeds the requirements of EIA standard 535BAAC. The T489 standard terminations are available in 100% matte tin and provide excellent wetting characteristics and compatibility with today's surface mount solder systems. Tin/lead (Sn/Pb) terminations are available upon request for any part number. Gold-plated terminations are also available for use with conductive epoxy attachment processes. Standard packaging of these devices is tape and reel in accordance with EIA 481–1. This system provides perfect compatibility with all tape-fed placement units.

Benefits

- DC Leakage at 0.0075 CV
- Improved reliability: 0.50%/1,000 hours, 85°C, Rated Voltage
- Low ESR options available
- Meets or exceeds EIA standard 535BAAC
- Taped and reeled per EIA 481–1
- Symmetrical, compliant terminations
- Laser-marked case
- Halogen-free epoxy
- Capacitance values of 0.1 µF to 470 µF
- Tolerances of ±10% and ±20%
- Voltage rating of 6.3-50 VDC
- RoHS Compliant and lead-free terminations
- Operating temperature range of -55˚C to +125˚C

Applications

Typical applications include decoupling and filtering in industrial and automotive high end applications.

Environmental Compliance

RoHS Compliant (6/6) according to Directive 2002/95/EC when ordered with 100% Sn solder.

RoHS Compliant

SPICE

For a detailed analysis of specific part numbers, please visit www.kemet.com for a free download of KEMET's SPICE software. The KEMET SPICE program is freeware intended to aid design engineers in analyzing the performance of these capacitors over frequency, temperature, ripple, and DC bias conditions.

Ordering Information

T	489	B	156	M	16	A	T	A800	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Failure Rate/ Design	Lead Material	C-Spec	Packaging (C-Spec)
T = Tantalum	Low DC Leakage Series	A, B, C, D, X	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	006 = 6.3 V 010 = 10 V 016 = 16 V 020 = 20 V 025 = 25 V 035 = 35 V 050 = 50 V	A = N/A	T = 100% matte tin (Sn) plated H = Standard solder coated (SnPb 5% Pb minimum) G = Gold plated	A = Automotive grade 800 = ESR value (800 = 800 mΩ)	Blank = 7" Reel 7280 = 13" Reel

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 125°C
Rated Capacitance Range	0.10 µF to 470 µF @ 120 Hz/25°C
Capacitance Tolerance	K Tolerance (±10%), M Tolerance (±20%)
Rated Voltage Range	6.3 – 50 V
DF (120 Hz)	Refer to Part Number Electrical Specification
ESR (100 kHz)	Refer to Part Number Electrical Specification
Leakage Current	≤ 0.0075 CV (µA) at rated voltage after 5 minutes
Reliability	0.50%/1,000 hours at 85°C, V_R with 0.1 Ω series resistance

Qualification

Test	Condition		Characteristics			
Endurance	85°C @ rated voltage, 2,000 hours 125°C @ 2/3 rated voltage, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Storage Life	125°C @ 0 volts, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Thermal Shock	MIL–STD–202, Method 107, Condition B, mounted, -55C° to 125° C, 1,000 cycles		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Temperature Stability	Extreme temperature exposure at a succession of continuous steps at +25°C, -55°C, +25°C, +85°C, +125°C, +25°C			+25°C	-55°C	+85°C	+125°C
		Δ C/C		IL*	±10%	±10%	±20%
		DF		IL	IL	1.5 x IL	1.5 x IL
		DCL		IL	n/a	10 x IL	12 x IL
Surge Voltage	25°C and 85°C, 1.32 x rated voltage 1,000 cycles (125°C, 1.2 x rated voltage)		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		
			ESR	Within initial limits		
Mechanical Shock/Vibration	MIL–STD–202, Method 213, Condition I, 100 G peak. MIL–STD–202, Method 204, Condition D, 10 Hz to 2,000 Hz, 20 G peak		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		

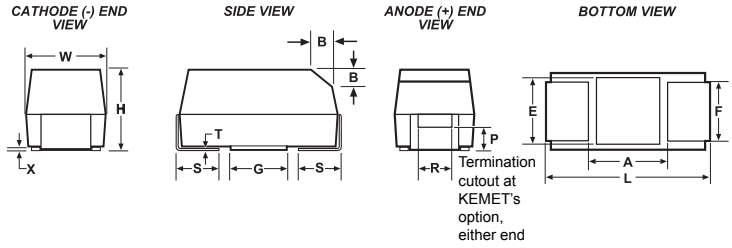
**IL = Initial limit*

Certification

KEMET's Internal Qualification Plan for this Tantalum series of capacitors follows AEC–Q200 guidelines. Standard catalog part types ordered without a specific automotive designator, i.e., suffix AUTO or four digit customer specific designator (C-Spec), are not considered KEMET Automotive Grade tantalum capacitors.

Dimensions – Millimeters (Inches)

Metric will govern



Case Size		Component												
KEMET	EIA	L*	W*	H*	F* ±0.1 ±(.004)	S* ±0.3 ±(.012)	B* ±0.15 (Ref) ±.006	X (Ref)	P (Ref)	R (Ref)	T (Ref)	A (Min)	G (Ref)	E (Ref)
A	3216–18	3.2 ±0.2 (0.126 ±0.008)	1.6 ±0.2 (0.063 ±0.008)	1.6 ±0.2 (0.063 ±0.008)	1.2 (.047)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.4 (.016)	0.4 (.016)	0.13 (.005)	0.8 (.31)	1.1 (.043)	1.3 (.051)
B	3528–21	3.5 ±02 (0.138 ±0.008)	2.8 ±0.2 (0.110 ±0.008)	1.9 ±0.2 (0.075 ±0.008)	2.2 (.087)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.5 (.020)	1.0 (.039)	0.13 (.005)	1.1 (0.043)	1.8 (.071)	2.2 (.087)
C	6032–28	6.0 ±0.3 (0.236 ±0.03)	3.2 ±0.3 (0.126 ±0.012)	2.5 ±0.3 (0.098 ±0.012)	2.2 (.087)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	2.5(.098)	2.8 (.110)	2.4 (.094)
D	7343–31	7.3 ±0.3 (0.287 ±0.012)	4.3 ±0.3 (0.169 ±0.012)	2.8 ±0.3 (0.110 ±0.012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
X	7343–43	7.3 ±0.3 (0.287 ±0.012)	4.3 ±0.3 (0.169 ±0.012)	4.0 ±0.3 (0.157 ±0.012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	1.7 (.067)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)

** MIL–PRF–55365/8 specified dimensions*

Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	Standard ESR		Low ESR	
VDC	µF	KEMET/EIA	(See below for part options)	µA @ +25°C Max/5 Minutes	% @ +25°C 120 Hz Maximum	mΩ +25°C 100 kHz Max	E-Spec Code	mΩ +25°C 100 kHz Max	E-Spec Code
6.3	10	B/3528-21	T489B106(1)006A(2)(3)	0.6	6.0	3000	A3K0		
6.3	15	A/3216-18	T489A156(1)006A(2)(3)	0.9	6.0	1500	A2K0	1500	A1K5
6.3	22	B/3528-21	T489B226(1)006A(2)(3)	1.4	6.0	2000	A2K0		
6.3	47	B/3528-21	T489B476(1)006A(2)(3)	3.0	6.0	1620	A1K6	500	A500
6.3	100	C/6032-29	T489C107(1)006A(2)(3)	6.3	6.0	440	A440		
6.3	150	D/7343-31	T489D157(1)006A(2)(3)	9.5	6.0	400	A400	150	A150
6.3	220	D/7343-31	T489D227(1)006A(2)(3)	13.9	8.0	360	A360	150	A150
6.3	470	X/7343-43	T489X477(1)006A(2)(3)	29.6	8.0	250	A250	200	A200
10	2.2	A/3216-18	T489A225(1)010A(2)(3)	0.5	6.0	7000	A7K0		
10	4.7	A/3216-18	T489A475(1)010A(2)(3)	0.5	6.0	2900	A2K9		
10	6.8	A/3216-18	T489A685(1)010A(2)(3)	0.7	6.0	2650	A2K6		
10	6.8	B/3528-21	T489B685(1)010A(2)(3)	0.7	6.0	3000	A3K0		
10	10	A/3216-18	T489A106(1)010A(2)(3)	1.0	6.0	2200	A2K2	1800	A1K8
10	15	B/3528-21	T489B156(1)010A(2)(3)	1.5	6.0	2030	A2K0		
10	22	B/3528-21	T489B226(1)010A(2)(3)	2.2	6.0	1880	A1K8	700	A700
10	33	B/3528-21	T489B336(1)010A(2)(3)	3.3	6.0	1000	A1K0	650	A650
10	33	C/6032-28	T489C336(1)010A(2)(3)	3.3	6.0	590	A590		
10	47	C/6032-28	T489C476(1)010A(2)(3)	4.7	6.0	540	A540		
10	47	D/7343-31	T489D476(1)010A(2)(3)	4.7	6.0	400	A400		
10	68	C/6032-28	T489C686(1)010A(2)(3)	6.8	6.0	490	A490		
10	100	C/6032-28	T489C107(1)010A(2)(3)	10.0	8.0	500	A500	200	A200
10	100	D/7343-31	T489D107(1)010A(2)(3)	10.0	6.0	440	A440	150	A150
10	150	D/7343-31	T489D157(1)010A(2)(3)	15.0	8.0	400	A400	150	A150
10	220	D/7343-31	T489D227(1)010A(2)(3)	22.0	8.0	500	A500		
10	330	X/7343-43	T489X337(1)010A(2)(3)	33.0	8.0	300	A300		
16	1	A/3216-18	T489A105(1)016A(2)(3)	0.5	6.0	10000	A10K		
16	2.2	A/3216-18	T489A225(1)016A(2)(3)	0.5	6.0	4550	A4K5	3500	A3K5
16	3.3	B/3528-21	T489B335(1)016A(2)(3)	0.5	6.0	4500	A4K5		
16	4.7	B/3528-21	T489B475(1)016A(2)(3)	0.8	6.0	3160	A3K1		
16	6.8	B/3528-21	T489B685(1)016A(2)(3)	1.1	6.0	2650	A2K6		
16	10	B/3528-21	T489B106(1)016A(2)(3)	1.6	6.0	2200	A2K2		
16	10	C/6032-28	T489C106(1)016A(2)(3)	1.6	6.0	2000	A2K0		
16	15	B/3528-21	T489B156(1)016A(2)(3)	2.4	6.0	2030	A2K0	800	A800
16	22	B/3528-21	T489B226(1)016A(2)(3)	3.5	6.0	1100	A1K1	600	A600
16	22	C/6032-28	T489C226(1)016A(2)(3)	3.5	6.0	700	A700	350	A350
16	33	C/6032-28	T489C336(1)016A(2)(3)	5.3	6.0	590	A590		
16	47	C/6032-28	T489C476(1)016A(2)(3)	7.5	6.0	540	A540	350	A350
16	47	D/7343-31	T489D476(1)016A(2)(3)	7.5	6.0	540	A540	200	A200
16	68	D/7343-31	T489D686(1)016A(2)(3)	10.9	6.0	490	A490	150	A150
16	100	D/7343-31	T489D107(1)016A(2)(3)	16.0	6.0	440	A440	150	A150
16	150	X/7343-44	T489X157(1)016A(2)(3)	24.0	12.0	700	A700	150	A150
20	1	A/3216-18	T489A105(1)020A(2)(3)	0.5	4.0	6630	A6K6		
20	1.5	A/3216-18	T489A155(1)020A(2)(3)	0.5	6.0	5460	A5K4		
20	2.2	A/3216-18	T489A225(1)020A(2)(3)	0.5	6.0	4550	A4K5		
20	3.3	A/3216-18	T489A335(1)020A(2)(3)	0.7	6.0	3740	A3K7	3500	A3K5
20	3.3	B/3528-21	T489B335(1)020A(2)(3)	0.7	6.0	3740	A3K7		
20	4.7	B/3528-21	T489B475(1)020A(2)(3)	0.9	6.0	3160	A3K1		
20	6.8	B/3528-21	T489B685(1)020A(2)(3)	1.4	6.0	2650	A2K6		
20	6.8	C/6032-28	T489C685(1)020A(2)(3)	1.4	6.0	2000	A2K0		
20	10	B/3528-21	T489B106(1)020A(2)(3)	2.0	6.0	2200	A2K2	1000	A1K0
VDC	µF	KEMET/EIA	(See below for part options)	µA @ +25°C Max/5 Minutes	% @ +25°C 120 Hz Maximum	mΩ +25°C 100 kHz Max	E-Spec Code	mΩ +25°C 100 kHz Max	E-Spec Code
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	Standard ESR		Low ESR	

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum). Designates Termination Finish.

(3) To complete KEMET part number, insert the ESR specification code.

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.

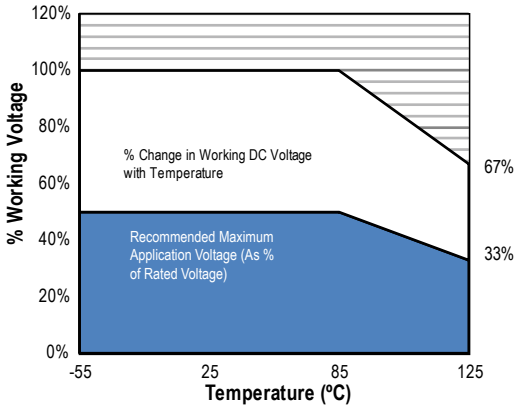
Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	Standard ESR		Low ESR	
VDC	µF	KEMET/EIA	(See below for part options)	µA @ +25°C Max/5 Minutes	% @ +25°C 120 Hz Maximum	mΩ +25°C 100 kHz Max	E-Spec Code	mΩ +25°C 100 kHz Max	E-Spec Code
20	10	C/6032-28	T489C106(1)020A(2)(3)	2.0	6.0	800	A800	500	A500
20	15	C/6032-28	T489C156(1)020A(2)(3)	3.0	6.0	720	A720	400	A400
20	22	D/7343-31	T489D226(1)020A(2)(3)	4.4	6.0	650	A650	300	A300
20	33	C/6032-28	T489C336(1)020A(2)(3)	6.6	6.0	590	A590	300	A300
20	33	D/7343-31	T489D336(1)020A(2)(3)	6.6	6.0	590	A590	250	A250
20	47	D/7343-31	T489D476(1)020A(2)(3)	9.4	6.0	540	A540	200	A200
20	68	D/7343-31	T489D686(1)020A(2)(3)	13.6	6.0	490	A490	200	A200
20	100	X/7343-43	T489X107(1)020A(2)(3)	20.0	6.0	300	A300	150	A150
25	0.47	A/3216-18	T489A474(1)025A(2)(3)	0.5	4.0	9530	A9K5	7000	A7K0
25	0.68	A/3216-18	T489A684(1)025A(2)(3)	0.5	4.0	7980	A7K9		
25	1	A/3216-18	T489A105(1)025A(2)(3)	0.5	4.0	6630	A6K6		
25	2.2	B/3528-21	T489B225(1)025A(2)(3)	0.6	6.0	4550	A4K5		
25	3.3	B/3528-21	T489B335(1)025A(2)(3)	0.8	6.0	3740	A3K7	2000	A2K0
25	4.7	B/3528-21	T489B475(1)025A(2)(3)	1.2	6.0	3160	A3K1	1000	A1K0
25	6.8	B/3528-21	T489B685(1)025A(2)(3)	1.7	6.0	1500	A1K5	1000	A1K0
25	6.8	C/6032-28	T489C685(1)025A(2)(3)	1.7	6.0	1070	A1K0	600	A600
25	10	C/6032-28	T489C106(1)025A(2)(3)	2.5	6.0	800	A800	600	A600
25	10	D/7343-31	T489D106(1)025A(2)(3)	2.5	6.0	1200	A1K2		
25	15	C/6032-28	T489C156(1)025A(2)(3)	3.8	6.0	720	A720		
25	15	D/7343-31	T489D156(1)025A(2)(3)	3.8	6.0	720	A720	300	A300
25	22	D/7343-31	T489D226(1)025A(2)(3)	5.5	6.0	650	A650	300	A300
25	33	D/7343-31	T489D336(1)025A(2)(3)	8.3	6.0	590	A590	400	A400
25	47	D/7343-31	T489D476(1)025A(2)(3)	11.8	6.0	540	A540	250	A250
35	0.1	A/3216-18	T489A104(1)035A(2)(3)	0.5	4.0	20000	A20K		
35	0.22	A/3216-18	T489A224(1)035A(2)(3)	0.5	4.0	13710	A13K		
35	0.33	A/3216-18	T489A334(1)035A(2)(3)	0.5	4.0	11280	A11K		
35	1	A/3216-18	T489A105(1)035A(2)(3)	0.5	4.0	6630	A6K6	3000	A3K0
35	1	B/3528-21	T489B105(1)035A(2)(3)	0.5	4.0	3400	A3K4	2000	A2K0
35	1.5	B/3528-21	T489B155(1)035A(2)(3)	0.5	6.0	5460	A5K4	2500	A2K5
35	2.2	B/3528-21	T489B225(1)035A(2)(3)	0.8	6.0	4550	A4K5	2000	A2K0
35	3.3	B/3528-21	T489B335(1)035A(2)(3)	1.2	6.0	3740	A3K7		
35	3.3	C/6032-28	T489C335(1)035A(2)(3)	1.2	6.0	1840	A1K8	800	A800
35	4.7	C/6032-28	T489C475(1)035A(2)(3)	1.6	6.0	1410	A1K4	600	A600
35	6.8	C/6032-28	T489C685(1)035A(2)(3)	2.4	6.0	1070	A1K0	600	A600
35	6.8	D/7343-31	T489D685(1)035A(2)(3)	2.4	6.0	1300	A1K3		
35	10	C/6032-28	T489C106(1)035A(2)(3)	3.5	6.0	800	A800	600	A600
35	10	D/7343-31	T489D106(1)035A(2)(3)	3.5	6.0	800	A800	400	A400
35	15	D/7343-31	T489D156(1)035A(2)(3)	5.3	6.0	720	A720	350	A350
35	22	D/7343-31	T489D226(1)035A(2)(3)	7.7	6.0	650	A650	300	A300
50	0.22	A/3216-18	T489A224(1)050A(2)(3)	0.5	4.0	7500	A7K5	7000	A7K0
50	0.33	A/3216-18	T489A334(1)050A(2)(3)	0.5	4.0	7000	A7K0		
50	0.68	B/3528-21	T489B684(1)050A(2)(3)	0.5	4.0	4000	A4K0	2000	A2K0
50	1	C/6032-28	T489C105(1)050A(2)(3)	0.5	4.0	3000	A3K0		
50	1.5	C/6032-28	T489C155(1)050A(2)(3)	0.8	6.0	2500	A2K5	1500	A1K5
50	2.2	C/6032-28	T489C225(1)050A(2)(3)	1.1	6.0	1700	A1K7	1000	A1K0
50	2.2	D/7343-31	T489D225(1)050A(2)(3)	1.1	4.5	2000	A2K0	1200	A1K2
50	3.3	D/7343-31	T489D335(1)050A(2)(3)	1.7	4.5	1100	A1K1	800	A800
50	4.7	D/7343-31	T489D475(1)050A(2)(3)	2.4	4.5	900	A900	600	A600
50	6.8	D/7343-31	T489D685(1)050A(2)(3)	3.4	4.5	700	A700		
VDC	µF	KEMET/EIA	(See below for part options)	µA @ +25°C Max/5 Minutes	% @ +25°C 120 Hz Maximum	mΩ +25°C 100 kHz Max	E-Spec Code	mΩ +25°C 100 kHz Max	E-Spec Code
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	Standard ESR		Low ESR	

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum). Designates Termination Finish.
(3) To complete KEMET part number, insert the ESR specification code.
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.

Recommended Voltage Derating Guidelines

	-55°C to 85°C	85°C to 125°C
% Change in Working DC Voltage with Temperature	V_R	67% of V_R
Recommended Maximum Application Voltage	50% of V_R	33% 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 which 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. See the Reverse Voltage section for allowable limits.

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

KEMET Series and Case Code	EIA Case Code	Maximum Power Dissipation (P max) mWatts @ 25°C with +20°C Rise
A	3216–18	75
B	3528–21	85
C	6032–28	110
D	7343–31	150
X	7343–43	165
E	7360–38	200
S	3216–12	60
T	3528–12	70
U	6032–15	90
V	7343–20	125
T510X	7343–43	270
T510E	7360–38	285

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

Temperature Compensation Multipliers for Maximum Power Dissipation		
≤ 25°C	85°C	125°C
1.00	0.90	0.40

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)

Reverse Voltage

Solid tantalum capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. The positive terminal is identified on the capacitor body by a stripe plus in some cases a beveled edge. A small degree of transient reverse voltage is permissible for short periods per the table. The capacitors should not be operated continuously in reverse mode, even within these limits.

Temperature	Permissible Transient Reverse Voltage
25°C	15% of Rated Voltage
85°C	5% of Rated Voltage
125°C	1% of Rated Voltage

Table 2 – Land Dimensions/Courtyard

KEMET	Metric Size Code	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B: Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
Case	EIA	W	L	S	V1	V2	W	L	S	V1	V2	W	L	S	V1	V2
A	3216–18	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
B	3528–21	2.35	2.21	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
C	6032–25	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
D	7343–31	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
L	6032-19	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
M	3528-15	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
H	7360-20	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
E[1]	7360–38	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
Q	7343-12	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
R[2]	2012-12	1.05	1.83	0.15	4.82	2.50	0.93	1.50	0.22	3.72	2.00	0.83	1.12	0.38	2.86	1.74
S[2]	3216–12	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
T	3528–12	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
U	6032–15	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
V	7343–20	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
W	7343–15	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
X[1]	7343–43	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
Y[1]	7343–40	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84

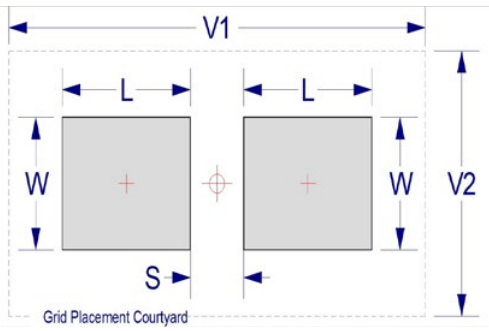
Density Level A: *For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes.*

Density Level B: *For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.*

Density Level C: *For high component desity product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC standard 7351 (IPC–7351).*

[1] Height of these chips may create problems in wave soldering.

[2] Land pattern geometry is too small for silkscreen outline.



Soldering Process

KEMET's families of surface mount capacitors are compatible with wave (single or dual), convection, IR, or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J–STD–020D standard for moisture sensitivity testing. The devices can safely withstand a maximum of three reflow passes at these conditions.

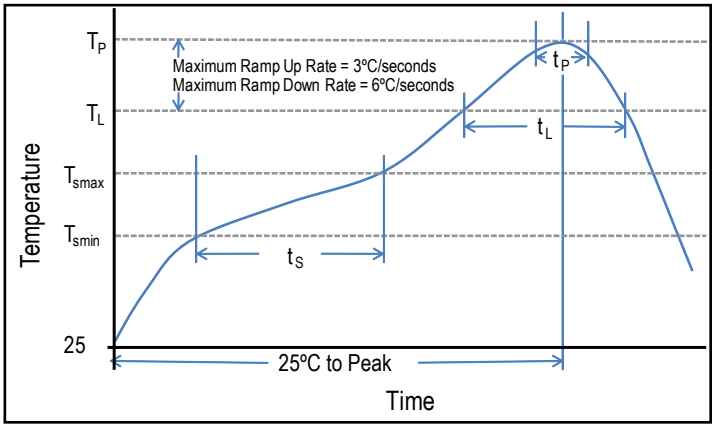
Please note that although the X/7343–43 case size can withstand wave soldering, the tall profile (4.3 mm maximum) dictates care in wave process development.

Hand soldering should be performed with care due to the difficulty in process control. If performed, care should be taken to avoid contact of the soldering iron to the molded case. The iron should be used to heat the solder pad, applying solder between the pad and the termination, until reflow occurs. Once reflow occurs, the iron should be removed immediately. "Wiping" the edges of a chip and heating the top surface is not recommended.

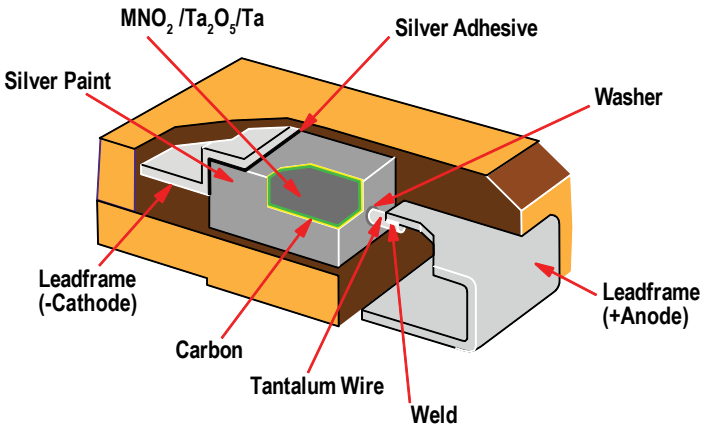
During typical reflow operations, a slight darkening of the gold-colored epoxy may be observed. This slight darkening is normal and not harmful to the product. Marking permanency is not affected by this change.

Profile Feature	SnPb Assembly	Pb-Free Assembly
Preheat/Soak		
Temperature Minimum (T_{Smin})	100°C	150°C
Temperature Maximum (T_{Smax})	150°C	200°C
Time (t_s) from T_{smin} to T_{smax})	60 – 120 seconds	60 – 120 seconds
Ramp-up Rate (T_L to T_P)	3°C/seconds maximum	3°C/seconds maximum
Liquidous Temperature (T_L)	183°C	217°C
Time Above Liquidous (t_L)	60 – 150 seconds	60 – 150 seconds
Peak Temperature (T_P)	220°C* 235°C**	250°C* 260°C**
Time within 5°C of Maximum Peak Temperature (t_P)	20 seconds maximum	30 seconds maximum
Ramp-down Rate (T_P to T_L)	6°C/seconds maximum	6°C/seconds maximum
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum

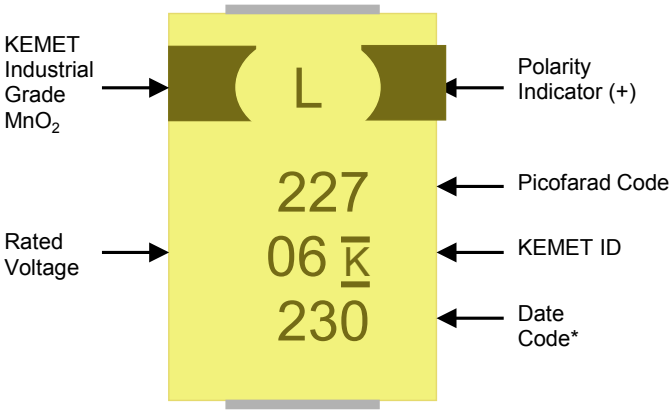
Note: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.
**Case Size D, E, P, Y, and X*
***Case Size A, B, C, H, I, K, M, R, S, T, U, V, W, and Z*



Construction



Capacitor Marking



* 230 = 30th week of 2012

Date Code *	
1st digit = Last number of Year	9 = 2009 0 = 2010 1 = 2011 2 = 2012 3 = 2013 4 = 2014
2nd and 3rd digit = Week of the Year	01 = 1st week of the Year to 52 = 52nd week of the Year

Storage

Tantalum chip capacitors should be stored in normal working environments. While the chips 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 40ºC 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 chip stock should be used promptly, preferably within three years of receipt.

T495 Surge Robust Low ESR MnO_2 Series

Overview

The low ESR, surge-robust T495 Automotive Series is designed for demanding applications that require high surge current and high ripple current capability. This series builds upon the proven capabilities of our industrial grade tantalum chip capacitors to offer several advantages such as low ESR, high ripple current capability, excellent capacitance stability, and improved resistance to high in-rush currents. These benefits are achieved though a combination of proprietary design, materials, and process parameters as well as high-stress, low impedance electrical conditioning performed prior to screening.

Benefits

- Meets or exceeds EIA standard 535BAAC
- Taped and reeled per EIA 481–1
- High surge current capability
- Optional gold-plated terminations
- High ripple current capability
- 100% surge current test on C, D, E, U, V, X sizes
- 100% steady-state accelerated aging
- Capacitance values of 0.1 µF to 680 µF
- Tolerances of ±10% and ±20%
- Voltage rating of 6.3 – 50 VDC
- Extended range values
- Available tested to DSCC 95158
- RoHS Compliant and lead-free terminations
- Operating temperature range of -55˚C to +125˚C

Applications

Typical applications include decoupling and filtering in industrial and automotive end applications, such as DC/DC converters, portable electronics, telecommunications, and control units requiring high ripple current capability.

Environmental Compliance

RoHS Compliant (6/6) according to Directive 2002/95/EC when ordered with 100% Sn solder.

RoHS Compliant

SPICE

For a detailed analysis of specific part numbers, please visit www.kemet.com for a free download of KEMET's SPICE software. The KEMET SPICE program is freeware intended to aid design engineers in analyzing the performance of these capacitors over frequency, temperature, ripple, and DC bias conditions.

Ordering Information

T	495	X	107	M	010	A	T	A080	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Failure Rate/ Design	Lead Material	ESR	Packaging (C-Spec)
T = Tantalum	Surge Robust Low ESR	A, B, C, D, E, T, V, X	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	2R5 = 2.5 V 004 = 4 V 006 = 6.3 V 010 = 10 V 016 = 16 V 020 = 20 V 025 = 25 V 035 = 35 V 050 = 50 V	A = N/A	T = 100% Matte Tin (Sn) Plated H = Standard Solder Coated (SnPb 5% Pb minimum) G = Gold Plated (A, B, C, D, X only) N = Non-Magnetic 100% Tin (Sn) M = Non-Magnetic (SnPb)	A = ESR Last three digits specify ESR in mΩ (080 = 80 mΩ)	Blank = 7" Reel 7280 = 13" Reel

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 125°C
Rated Capacitance Range	0.47 – 680 µF @ 120 Hz/25°C
Capacitance Tolerance	K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	6.3 – 50 V
DF (120 Hz)	Refer to Part Number Electrical Specification Table
ESR (100 kHz)	Refer to Part Number Electrical Specification Table
Leakage Current	≤ 0.01 CV (µA) at rated voltage after 5 minutes

Qualification

Test	Condition		Characteristics			
Endurance	85°C @ rated voltage, 2,000 hours 125°C @ 2/3 rated voltage, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Storage Life	125°C @ 0 volts, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Thermal Shock	MIL–STD–202, Method 107, Condition B, mounted, -55C° to 125° C, 1000 cycles		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Temperature Stability	Extreme temperature exposure at a succession of continuous steps at +25°C, -55°C, +25°C, +85°C, +125°C, +25°C.			+25°C	-55°C	+85°C	+125°C
		Δ C/C		IL*	±10%	±10%	±20%
		DF		IL	IL	1.5 x IL	1.5 x IL
		DCL		IL	n/a	10 x IL	12 x IL
Surge Voltage	25°C and 85°C, 1.32 x rated voltage 1,000 cycles (125°C, 1.2 x rated voltage).		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		
			ESR	Within initial limits		
Mechanical Shock/Vibration	MIL–STD–202, Method 213, Condition I, 100 G peak MIL–STD–202, Method 204, Condition D, 10 Hz to 2,000 Hz, 20 G peak		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		

**IL = Initial limit*

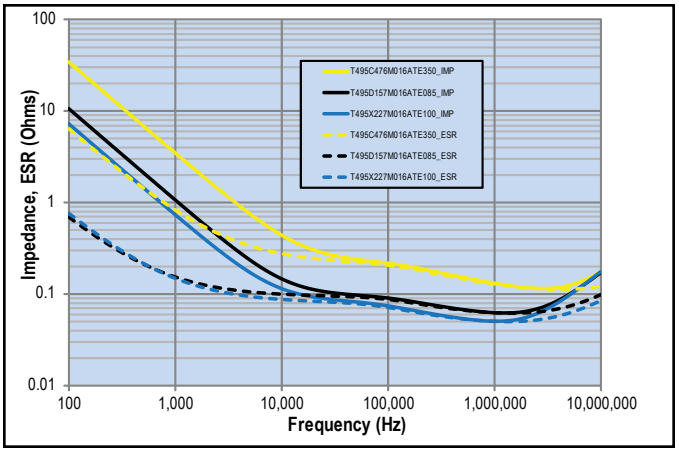
Certification

KEMET's Internal Qualification Plan for this Tantalum series of capacitors follows AEC–Q200 guidelines. Standard catalog part types ordered without a specific automotive designator, i.e., suffix AUTO or four digit customer specific designator (C Spec), are not considered KEMET Automotive Grade tantalum capacitors.

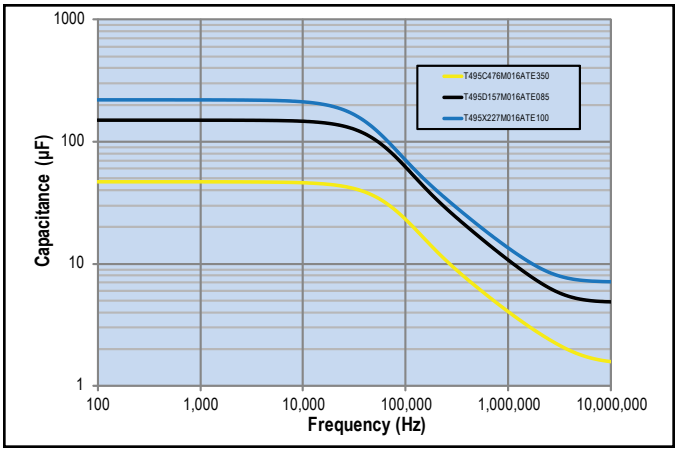
DSCC Drawing 95158

Electrical Characteristics

ESR vs. Frequency

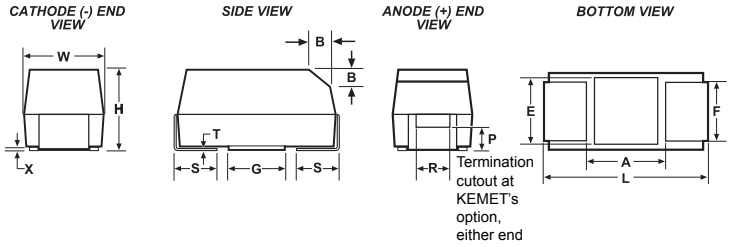


Capacitance vs. Frequency



Dimensions – Millimeters (Inches)

Metric will govern



Case Size		Component												
KEMET	EIA	L*	W*	H*	F* ±0.1 ±(.004)	S* ±0.3 ±(.012)	B* ±0.15 (Ref) ±.006	X (Ref)	P (Ref)	R (Ref)	T (Ref)	A (Min)	G (Ref)	E (Ref)
A	3216–18	3.2 ± 0.2 (.126 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.2 (.047)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.4 (.016)	0.4 (.016)	0.13 (.005)	0.8 (.31)	1.1 (.043)	1.3 (.051)
B	3528–21	3.5 ± 02 (.138 ± .008)	2.8 ± 0.2 (.110 ± .008)	1.9 ± 0.2 (.075 ± .008)	2.2 (.087)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.5 (.020)	1.0 (.039)	0.13 (.005)	1.1 (0.043)	1.8 (.071)	2.2 (.087)
C	6032–28	6.0 ± 0.3 (.236 ± .03)	3.2 ± 0.3 (.126 ± .012)	2.5 ± 0.3 (.098 ± .012)	2.2 (.087)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	2.5(.098)	2.8 (.110)	2.4 (.094)
D	7343–31	7.3 ± 0.3 (.287 ± .012)	4.3 ± 0.3 (.169 ± .012)	2.8 ± 0.3 (.110 ± .012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
X	7343–43	7.3 ± 0.3 (.287 ± .012)	4.3 ± 0.3 (.169 ± .012)	4.0 ± 0.3 (.157 ± .012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	1.7 (.067)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
E	7360–38	7.3 ± 0.3 (.287 ± .012)	6.0± 0.3 (.236 ± .012)	3.6 ± 0.2 (.142 ± .008)	4.1 (.161)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
T	3528–12	3.5 ± 0.2 (.138 ± .008)	2.8 ± 0.2 (.110 ± .008)	1.2 (.047)	2.2 (.087)	0.8 (.031)	N/A	0.05 (.002)	N/A	N/A	0.13 (.005)	1.1 (.043)	1.8 (.071)	2.2 (.087)
V	7343–20	7.3 ± 0.3 (.287 ± .012)	4.3 ± 0.3 (.169 ± .012)	2.0 (.079)	2.4 (.094)	1.3 (.051)	N/A	0.05 (.002)	N/A	N/A	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)

Notes: (Ref) – Dimensions provided for reference only. No dimensions provided for B, P or R because low profile cases do not have a bevel or a notch.
** MIL–PRF–55365/8 specified dimensions*

Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
6.3	2.2	A/3216-18	T495A225(1)006A(2)A5K0	0.5	6	5000	122	110	49	1
6.3	3.3	A/3216-18	T495A335(1)006A(2)A3K0	0.5	6	3000	158	142	63	1
6.3	4.7	A/3216-18	T495A475(1)006A(2)A3K5	0.5	6	3500	146	131	58	1
6.3	6.8	A/3216-18	T495A685(1)006A(2)A2K0	0.5	6	2000	194	175	78	1
6.3	10	A/3216-18	T495A106(1)006A(2)A2K0	0.6	6	2000	194	175	78	1
6.3	10	B/3528-21	T495B106(1)006A(2)A1K0	0.6	6	1000	292	263	117	1
6.3	15	A/3216-18	T495A156(1)006A(2)A2K0	0.9	6	2000	194	175	78	1
6.3	22	A/3216-18	T495A226(1)006A(2)A1K5	1.4	6	1500	224	202	90	1
6.3	22	B/3528-21	T495B226(1)006A(2)A500	1.4	6	500	412	371	165	1
6.3	22	C/6032-28	T495C226(1)006A(2)A380	1.4	6	380	538	484	215	1
6.3	33	A/3216-18	T495A336(1)006A(2)A1K0	2.1	12	1000	274	247	110	1
6.3	33	B/3528-21	T495B336(1)006A(2)A600	2.1	6	600	376	338	150	1
6.3	33	C/6032-28	T495C336(1)006A(2)A350	2.1	6	350	561	505	224	1
6.3	47	B/3528-21	T495B476(1)006A(2)A500	3.0	6	500	412	371	165	1
6.3	68	B/3528-21	T495B686(1)006A(2)A500	4.3	8	500	412	371	165	1
6.3	68	C/6032-28	T495C686(1)006A(2)A400	4.3	6	400	524	472	210	1
6.3	68	D/7343-31	T495D686(1)006A(2)A180	4.3	4	180	913	822	365	1
6.3	100	B/3528-21	T495B107(M)006A(2)A700	6.3	15	700	348	313	139	1
6.3	100	C/6032-28	T495C107(1)006A(2)A150	6.3	8	150	856	770	342	1
6.3	100	D/7343-31	T495D107(1)006A(2)A150	6.3	8	150	1000	900	400	1
6.3	100	D/7343-31	T495D107(1)006A(2)A130	6.3	8	130	1074	1019	679	1
6.3	150	D/7343-31	T495D157(1)006A(2)A100	9.5	6	100	1225	1103	490	1
6.3	150	D/7343-31	T495D157(1)006A(2)A125	9.5	6	125	1095	986	438	1
6.3	150	X/7343-43	T495X157(1)006A(2)A100	9.5	6	100	1285	1157	514	1
6.3	220	C/6032-28	T495C227(1)006A(2)A225	13.9	10	225	699	629	280	1
6.3	220	D/7343-31	T495D227(1)006A(2)A100	13.9	8	100	1225	1103	490	1
6.3	220	X/7343-43	T495X227(1)006A(2)A100	13.9	8	100	1285	1157	514	1
6.3	330	D/7343-31	T495D337(1)006A(2)A100	20.8	8	100	1225	1103	490	1
6.3	330	X/7343-43	T495X337(1)006A(2)A100	20.8	8	100	1285	1157	514	1
6.3	470	D/7343-31	T495D477(1)006A(2)A150	29.6	12	150	1000	900	400	1
6.3	470	X/7343-43	T495X477(1)006A(2)A100	29.6	10	100	1285	1157	514	1
6.3	680	X/7343-43	T495X687(1)006A(2)A100	42.8	12	100	1285	1157	514	1
10	1.5	A/3216-18	T495A155(1)010A(2)A5K0	0.5	6	5000	122	110	49	1
10	2.2	A/3216-18	T495A225(1)010A(2)A2K0	0.5	6	2000	194	175	78	1
10	3.3	A/3216-18	T495A335(1)010A(2)A5K5	0.5	6	5500	117	105	47	1
10	4.7	A/3216-18	T495A475(1)010A(2)A2K0	0.5	6	2000	194	175	78	1
10	4.7	B/3528-21	T495B475(1)010A(2)A1K5	0.5	6	1500	238	214	95	1
10	6.8	A/3216-18	T495A685(1)010A(2)A2K0	0.7	6	1800	204	184	82	1
10	6.8	B/3528-21	T495B685(1)010A(2)A1K2	0.7	6	1200	266	239	106	1
10	6.8	B/3528-21	T495B685(1)010A(2)A1K1	0.7	6	1100	278	264	176	1
10	10	A/3216-18	T495A106(1)010A(2)A2K0	1.0	6	2000	194	175	78	1
10	10	B/3528-21	T495B106(1)010A(2)A1K2	1.0	6	1200	266	239	106	1
10	10	C/6032-28	T495C106(1)010A(2)A400	1.0	6	400	524	472	210	1
10	15	A/3216-18	T495A156(1)010A(2)A1K8	1.5	6	1800	204	184	82	1
10	15	B/3528-21	T495B156(1)010A(2)A900	1.5	6	900	307	276	123	1
10	15	C/6032-28	T495C156(1)010A(2)A475	1.5	6	475	481	433	192	1
10	22	A/3216-18	T495A226(1)010A(2)A1K5	2.2	8	1500	224	202	90	1
10	22	B/3528-21	T495B226(1)010A(2)A1K5	2.2	6	2300	192	173	77	1
10	22	C/6032-28	T495C226(1)010A(2)A380	2.2	6	380	538	484	215	1
10	22	C/6032-28	T495C226(1)010A(2)A350	2.2	6	350	561	505	224	1
10	22	C/6032-28	T495C226(1)010A(2)A245	2.2	6	245	670	636	423	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Roll Over for Order Info.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
10	33	B/3528-21	T495B336(1)010A(2)A650	3.3	6	650	362	326	145	1
10	33	C/6032-28	T495C336(1)010A(2)A380	3.3	6	380	538	484	215	1
10	33	C/6032-28	T495C336(1)010A(2)A300	3.3	6	300	606	545	242	1
10	47	B/3528-21	T495B476(1)010A(2)A650	4.7	6	650	362	326	145	1
10	47	C/6032-28	T495C476(1)010A(2)A300	4.7	6	300	606	545	242	1
10	47	D/7343-31	T495D476(1)010A(2)A080	4.7	4	80	1369	1232	548	1
10	47	D/7343-31	T495D476(1)010A(2)A200	4.7	4	200	866	779	346	1
10	68	D/7343-31	T495D686(1)010A(2)A100	6.8	6	100	1225	1103	490	1
10	68	X/7343-43	T495X686(1)010A(2)A150	6.8	4	150	1049	944	420	1
10	68	B/3528-21	T495B686(M)010A(2)A900	6.8	10	900	307	276	123	1
10	68	C/6032-28	T495C686(1)010A(2)A200	6.8	6	200	742	668	297	1
10	68	D/7343-31	T495D686(1)010A(2)A080	6.8	6	80	1369	1232	548	1
10	100	D/7343-31	T495D107(1)010A(2)A080	10.0	8	80	1369	1232	548	1
10	100	D/7343-31	T495D107(1)010A(2)A100	10.0	8	100	1225	1103	490	1
10	100	X/7343-43	T495X107(1)010A(2)A150	10.0	6	150	1049	944	420	1
10	100	X/7343-43	T495X107(1)010A(2)A100	10.0	6	100	1285	1157	514	1
10	150	D/7343-31	T495D157(1)010A(2)A100	15.0	8	100	1225	1103	490	1
10	150	X/7343-43	T495X157(1)010A(2)A100	15.0	8	100	1285	1157	514	1
10	220	D/7343-31	T495D227(1)010A(2)A100	22.0	8	100	1225	1103	490	1
10	220	D/7343-31	T495D227(1)010A(2)A125	22.0	8	125	1095	986	438	1
10	220	X/7343-43	T495X227(1)010A(2)A100	22.0	8	100	1285	1157	514	1
10	330	D/7343-31	T495D337(1)010A(2)A100	33.0	10	100	1225	1103	490	1
10	330	D/7343-31	T495D337(1)010A(2)A125	33.0	10	125	1095	986	438	1
10	330	D/7343-31	T495D337(1)010A(2)A150	33.0	10	150	1000	900	400	1
10	330	X/7343-43	T495X337(1)010A(2)A100	33.0	10	100	1285	1157	514	1
10	470	X/7343-43	T495X477(1)010A(2)A100	47.0	10	100	1285	1157	514	1
10	470	X/7343-43	T495X477(1)010A(2)A200	47.0	10	200	908	817	363	1
16	1	A/3216-18	T495A105(1)016A(2)A5K0	0.5	6	5000	122	110	49	1
16	1.5	A/3216-18	T495A155(1)016A(2)A5K0	0.5	6	5000	122	110	49	1
16	2.2	A/3216-18	T495A225(1)016A(2)A2K5	0.5	6	2500	173	156	69	1
16	3.3	A/3216-18	T495A335(1)016A(2)A3K0	0.5	6	3000	158	142	63	1
16	3.3	B/3528-21	T495B335(1)016A(2)A2K0	0.5	6	2000	206	185	82	1
16	4.7	A/3216-18	T495A475(1)016A(2)A2K0	0.8	6	2000	194	175	78	1
16	4.7	B/3528-21	T495B475(1)016A(2)A1K5	0.8	6	1500	238	214	95	1
16	6.8	B/3528-21	T495B685(1)016A(2)A1K2	1.1	6	1200	266	239	106	1
16	10	B/3528-21	T495B106(1)016A(2)A1K6	1.6	6	1600	230	207	92	1
16	10	B/3528-21	T495B106(1)016A(2)A2K5	1.6	6	2500	184	166	74	1
16	10	C/6032-28	T495C106(1)016A(2)A450	1.6	8	450	494	445	198	1
16	15	A/3216-18	T495A156(1)016A(2)A2K5	2.4	8	2500	173	156	69	1
16	15	B/3528-21	T495B156(1)016A(2)A800	2.4	6	800	326	293	130	1
16	15	C/6032-28	T495C156(1)016A(2)A400	2.4	6	400	524	497	262	1
16	22	B/3528-21	T495B226(1)016A(2)A700	3.5	6	700	348	313	139	1
16	22	C/6032-28	T495C226(1)016A(2)A350	3.5	6	350	561	505	224	1
16	33	B/3528-21	T495B336(1)016A(2)A350	5.3	6	350	493	444	197	1
16	33	C/6032-28	T495C336(1)016A(2)A300	5.3	6	300	606	545	242	1
16	33	D/7343-31	T495D336(1)016A(2)A200	5.3	6	200	866	779	346	1
16	47	C/6032-28	T495C476(1)016A(2)A350	7.5	6	350	561	505	224	1
16	47	D/7343-31	T495D476(1)016A(2)A100	7.5	6	100	1225	1162	775	1
16	47	D/7343-31	T495D476(1)016A(2)A150	7.5	6	150	1000	900	400	1
16	47	D/7343-31	T495D476(1)016A(2)A180	7.5	6	180	913	822	365	1
16	47	D/7343-31	T495D476(1)016A(2)A300	7.5	6	800	433	390	173	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
16	68	C/6032-28	T495C686(1)016A(2)A250	10.9	6	250	663	597	265	1
16	68	D/7343-31	T495D686(1)016A(2)A150	10.9	6	150	1000	900	400	1
16	68	X/7343-43	T495X686(1)016A(2)A150	10.9	8	150	1049	944	420	1
16	100	D/7343-31	T495D107(1)016A(2)A100	16.0	8	100	1225	1162	775	1
16	100	D/7343-31	T495D107(1)016A(2)A150	16.0	8	150	1000	900	400	1
16	100	X/7343-43	T495X107(1)016A(2)A100	16.0	8	100	1285	1157	514	1
16	150	D/7343-31	T495D157(1)016A(2)A130	24.0	8	130	1074	967	430	1
16	150	D/7343-31	T495D157(1)016A(2)A150	24.0	8	150	1000	900	400	1
16	150	X/7343-43	T495X157(1)016A(2)A100	24.0	8	100	1285	1157	514	1
16	220	X/7343-43	T495X227(1)016A(2)A100	35.2	8	100	1285	1157	514	1
20	1	A/3216-18	T495A105(1)020A(2)A5K0	0.5	4	5000	122	110	49	1
20	1.5	A/3216-18	T495A155(1)020A(2)A4K5	0.5	6	4500	129	116	52	1
20	2.2	A/3216-18	T495A225(1)020A(2)A3K0	0.5	6	3000	158	142	63	1
20	2.2	B/3528-21	T495B225(1)020A(2)A1K5	0.5	6	1500	238	214	95	1
20	3.3	B/3528-21	T495B335(1)020A(2)A1K5	0.7	6	1500	238	214	95	1
20	4.7	A/3216-18	T495A475(1)020A(2)A2K0	0.9	6	2000	194	175	78	1
20	4.7	B/3528-21	T495B475(1)020A(2)A1K0	0.9	6	1000	292	263	117	1
20	6.8	B/3528-21	T495B685(1)020A(2)A1K0	1.4	6	1000	292	263	117	1
20	6.8	C/6032-28	T495C685(1)020A(2)A480	1.4	6	480	479	431	192	1
20	10	B/3528-21	T495B106(1)020A(2)A1K0	2.0	6	1000	292	263	117	1
20	10	C/6032-28	T495C106(1)020A(2)A475	2.0	6	475	481	433	192	1
20	15	C/6032-28	T495C156(1)020A(2)A400	3.0	6	400	524	472	210	1
20	15	D/7343-31	T495D156(1)020A(2)A275	3.0	4	275	739	665	296	1
20	22	D/7343-31	T495D226(1)020A(2)A180	4.4	4	180	913	822	365	1
20	33	D/7343-31	T495D336(1)020A(2)A200	6.6	6	200	866	779	346	1
20	33	X/7343-43	T495X336(1)020A(2)A200	6.6	8	200	908	817	363	1
20	47	D/7343-31	T495D476(1)020A(2)A250	9.4	6	250	775	698	310	1
20	47	X/7343-43	T495X476(1)020A(2)A150	9.4	4	150	1049	944	420	1
20	47	X/7343-43	T495X476(1)020A(2)A100	9.4	4	100	1285	1219	812	1
20	68	D/7343-31	T495D686(1)020A(2)A300	13.6	8	300	707	636	283	1
20	68	X/7343-43	T495X686(1)020A(2)A120	13.6	6	120	1173	1056	469	1
20	100	X/7343-43	T495X107(1)020A(2)A150	20.0	8	150	1049	944	420	1
25	1	A/3216-18	T495A105(1)025A(2)A5K0	0.5	4	5000	122	110	49	1
25	1.5	B/3528-21	T495B155(1)025A(2)A1K5	0.5	6	1500	238	214	95	1
25	2.2	B/3528-21	T495B225(1)025A(2)A1K2	0.6	6	1200	266	239	106	1
25	2.2	C/6032-28	T495C225(1)025A(2)A1K3	0.6	6	1300	291	262	116	1
25	3.3	B/3528-21	T495B335(1)025A(2)A1K2	0.8	6	1200	266	239	106	1
25	3.3	C/6032-28	T495C335(1)025A(2)A750	0.8	6	750	383	345	153	1
25	4.7	B/3528-21	T495B475(1)025A(2)A1K0	1.2	6	1000	292	263	117	1
25	4.7	C/6032-28	T495C475(1)025A(2)A575	1.2	6	575	437	393	175	1
25	6.8	B/3528-21	T495B685(1)025A(2)A1K5	1.7	6	1500	238	214	95	1
25	6.8	C/6032-28	T495C685(1)025A(2)A500	1.7	6	500	469	422	188	1
25	10	C/6032-28	T495C106(1)025A(2)A450	2.5	6	450	494	445	198	1
25	10	D/7343-31	T495D106(1)025A(2)A125	2.5	6	1200	354	319	142	1
25	15	C/6032-28	T495C156(1)025A(2)A300	3.8	6	300	606	545	242	1
25	15	D/7343-31	T495D156(1)025A(2)A275	3.8	6	275	739	665	296	1
25	15	X/7343-43	T495X156(1)025A(2)A200	3.8	4	200	908	817	363	1
25	22	C/6032-28	T495C226(1)025A(2)A900	5.5	6	900	350	315	140	1
25	22	D/7343-31	T495D226(1)025A(2)A200	5.5	6	200	866	779	346	1
25	22	X/7343-43	T495X226(1)025A(2)A230	5.5	4	230	847	762	339	1
25	33	D/7343-31	T495D336(1)025A(2)A200	8.3	6	200	866	779	346	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Table 1 – Ratings & Part Number Reference cont'd

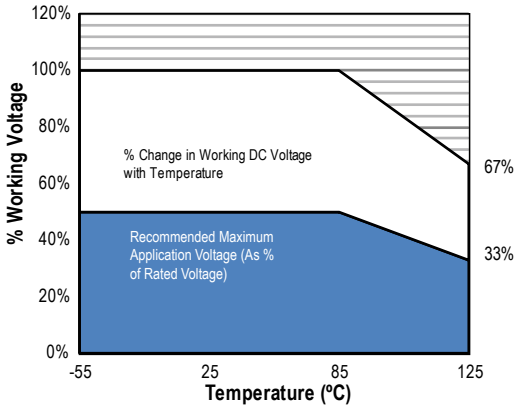
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
25	33	X/7343-43	T495X336(1)025A(2)A200	8.3	4	200	908	817	363	1
25	47	D/7343-31	T495D476(1)025A(2)A120	11.8	10	120	1118	1006	447	1
25	47	D/7343-31	T495D476(1)025A(2)A150	11.8	10	150	1000	900	400	1
25	47	D/7343-31	T495D476(1)025A(2)A250	11.8	10	250	775	735	490	1
25	47	X/7343-43	T495X476(1)025A(2)A120	11.8	6	120	1173	1056	469	1
25	47	X/7343-43	T495X476(1)025A(2)A100	11.8	6	100	1285	1157	514	1
25	68	D/7343-31	T495D686(1)025A(2)A200	17.0	10	200	866	779	346	1
25	68	X/7343-43	T495X686(1)025A(2)A200	17.0	8	200	908	817	363	1
25	100	X/7343-43	T495X107(1)025A(2)A150	25.0	10	150	1049	944	420	1
35	0.33	A/3216-18	T495A334(1)035A(2)A7K0	0.5	4	7000	104	94	42	1
35	0.47	A/3216-18	T495A474(1)035A(2)A7K0	0.5	4	7000	104	94	42	1
35	0.47	B/3528-21	T495B474(1)035A(2)A2K5	0.5	4	2500	184	166	74	1
35	0.68	A/3216-18	T495A684(1)035A(2)A6K0	0.5	4	6000	112	101	45	1
35	1	A/3216-18	T495A105(1)035A(2)A7K0	0.5	4	7000	104	94	42	1
35	1	B/3528-21	T495B105(1)035A(2)A2K0	0.5	4	2000	206	185	82	1
35	1.5	B/3528-21	T495B155(1)035A(2)A2K0	0.5	6	2000	206	185	82	1
35	2.2	B/3528-21	T495B225(1)035A(2)A2K0	0.8	6	2000	206	185	82	1
35	2.2	C/6032-28	T495C225(1)035A(2)A750	0.8	6	750	383	345	153	1
35	3.3	B/3528-21	T495B335(1)035A(2)A1K0	1.2	6	1000	292	263	117	1
35	3.3	C/6032-28	T495C335(1)035A(2)A600	1.2	6	600	428	385	171	1
35	4.7	B/3528-21	T495B475(1)035A(2)A1K0	1.6	6	1000	292	263	117	1
35	4.7	C/6032-28	T495C475(1)035A(2)A700	1.6	6	700	396	356	158	1
35	4.7	D/7343-31	T495D475(1)035A(2)A300	1.6	6	300	707	636	283	1
35	6.8	C/6032-28	T495C685(1)035A(2)A350	2.4	6	350	561	505	224	1
35	6.8	D/7343-31	T495D685(1)035A(2)A400	2.4	6	400	612	551	245	1
35	6.8	X/7343-43	T495X685(1)035A(2)A300	2.4	4	300	742	668	297	1
35	10	D/7343-31	T495D106(1)035A(2)A250	3.5	6	250	775	698	310	1
35	10	D/7343-31	T495D106(1)035A(2)A260	3.5	6	260	760	720	480	1
35	10	X/7343-43	T495X106(1)035A(2)A260	3.5	4	260	797	717	319	1
35	15	D/7343-31	T495D156(1)035A(2)A260	5.3	6	260	760	684	304	1
35	15	X/7343-43	T495X156(1)035A(2)A260	5.3	6	260	797	717	319	1
35	22	D/7343-31	T495D226(1)035A(2)A200	7.7	6	200	866	779	346	1
35	22	D/7343-31	T495D226(1)035A(2)A260	7.7	6	260	760	684	304	1
35	22	X/7343-43	T495X226(1)035A(2)A200	7.7	6	200	908	817	363	1
35	22	X/7343-43	T495X226(1)035A(2)A260	7.7	6	260	797	717	319	1
35	33	D/7343-31	T495D336(1)035A(2)A300	11.6	6	300	707	636	283	1
35	33	X/7343-43	T495X336(1)035A(2)A260	11.6	6	260	797	717	319	1
35	47	X/7343-43	T495X476(1)035A(2)A300	16.5	8	300	742	668	297	1
50	1	C/6032-28	T495C105(1)050A(2)A1K6	0.5	4	1600	262	236	105	1
50	1.5	C/6032-28	T495C155(1)050A(2)A1K5	0.8	6	1500	271	244	108	1
50	2.2	D/7343-31	T495D225(1)050A(2)A800	1.1	6	800	433	390	173	1
50	3.3	D/7343-31	T495D335(1)050A(2)A700	1.7	6	700	463	417	185	1
50	4.7	D/7343-31	T495D475(1)050A(2)A300	2.4	6	300	707	636	283	1
50	4.7	X/7343-43	T495X475(1)050A(2)A300	2.4	4	300	742	704	469	1
50	6.8	D/7343-31	T495D685(1)050A(2)A400	3.4	6	400	612	551	245	1
50	10	X/7343-43	T495X106(1)050A(2)A300	5.0	6	300	742	668	297	1
50	15	X/7343-43	T495X156(1)050A(2)A300	7.5	8	300	742	668	297	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Roll Over for Order Info.

Recommended Voltage Derating Guidelines

	-55°C to 85°C	85°C to 125°C
% Change in Working DC Voltage with Temperature	V_R	67% of V_R
Recommended Maximum Application Voltage	50% of V_R	33% 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 which 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. See the Reverse Voltage section for allowable limits.

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

KEMET Series and Case Code	EIA Case Code	Maximum Power Dissipation (P max) mWatts @ 25°C with +20°C Rise
A	3216–18	75
B	3528–21	85
C	6032–28	110
D	7343–31	150
X	7343–43	165
E	7360–38	200
S	3216–12	60
T	3528–12	70
U	6032–15	90
V	7343–20	125
T510X	7343–43	270
T510E	7360–38	285

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

Temperature Compensation Multipliers for Maximum Power Dissipation		
≤ 25°C	85°C	125°C
1.00	0.90	0.40

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)

Reverse Voltage

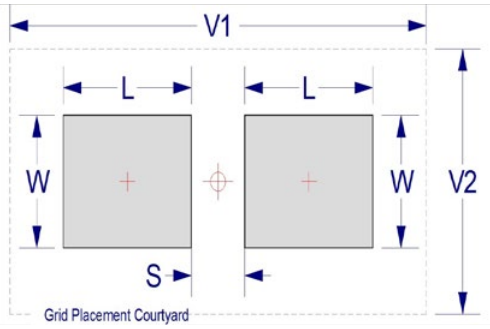
Solid tantalum capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. The positive terminal is identified on the capacitor body by a stripe plus in some cases a beveled edge. A small degree of transient reverse voltage is permissible for short periods per the table. The capacitors should not be operated continuously in reverse mode, even within these limits.

Temperature	Permissible Transient Reverse Voltage
25°C	15% of Rated Voltage
85°C	5% of Rated Voltage
125°C	1% of Rated Voltage

Table 2 – Land Dimensions/Courtyard

KEMET	Metric Size Code	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B: Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
Case	EIA	W	L	S	V1	V2	W	L	S	V1	V2	W	L	S	V1	V2
A	3216–18	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
B	3528–21	2.35	2.21	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
C	6032–25	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
D	7343–31	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
L	6032-19	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
M	3528-15	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
H	7360-20	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
E[1]	7360–38	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
Q	7343-12	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
R[2]	2012-12	1.05	1.83	0.15	4.82	2.50	0.93	1.50	0.22	3.72	2.00	0.83	1.12	0.38	2.86	1.74
S[2]	3216–12	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
T	3528–12	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
U	6032–15	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
V	7343–20	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
W	7343–15	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
X[1]	7343–43	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
Y[1]	7343–40	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84

Density Level A: *For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes.*
Density Level B: *For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.*
Density Level C: *For high component desity product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC standard 7351 (IPC–7351).*
[1] Height of these chips may create problems in wave soldering.
[2] Land pattern geometry is too small for silkscreen outline.



Soldering Process

KEMET's families of surface mount capacitors are compatible with wave (single or dual), convection, IR, or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J–STD–020D standard for moisture sensitivity testing. The devices can safely withstand a maximum of three reflow passes at these conditions.

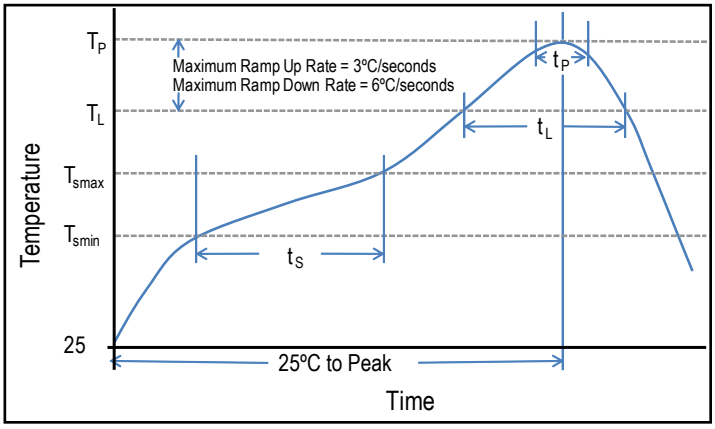
Please note that although the X/7343–43 case size can withstand wave soldering, the tall profile (4.3 mm maximum) dictates care in wave process development.

Hand soldering should be performed with care due to the difficulty in process control. If performed, care should be taken to avoid contact of the soldering iron to the molded case. The iron should be used to heat the solder pad, applying solder between the pad and the termination, until reflow occurs. Once reflow occurs, the iron should be removed immediately. "Wiping" the edges of a chip and heating the top surface is not recommended.

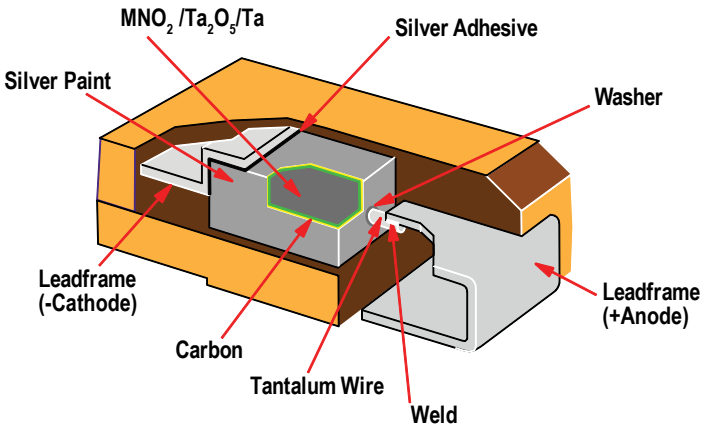
During typical reflow operations, a slight darkening of the gold-colored epoxy may be observed. This slight darkening is normal and not harmful to the product. Marking permanency is not affected by this change.

Profile Feature	SnPb Assembly	Pb-Free Assembly
Preheat/Soak		
Temperature Minimum (T_{Smin})	100°C	150°C
Temperature Maximum (T_{Smax})	150°C	200°C
Time (t_s) from T_{smin} to T_{smax})	60 – 120 seconds	60 – 120 seconds
Ramp-up Rate (T_L to T_P)	3°C/seconds maximum	3°C/seconds maximum
Liquidous Temperature (T_L)	183°C	217°C
Time Above Liquidous (t_L)	60 – 150 seconds	60 – 150 seconds
Peak Temperature (T_P)	220°C* 235°C**	250°C* 260°C**
Time within 5°C of Maximum Peak Temperature (t_P)	20 seconds maximum	30 seconds maximum
Ramp-down Rate (T_P to T_L)	6°C/seconds maximum	6°C/seconds maximum
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum

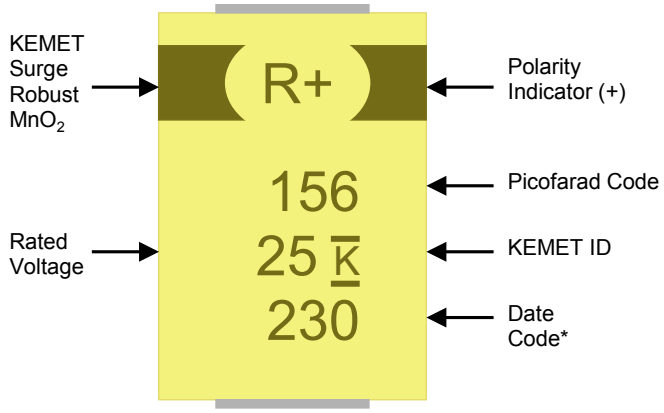
Note: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.
**Case Size D, E, P, Y, and X*
***Case Size A, B, C, H, I, K, M, R, S, T, U, V, W, and Z*



Construction

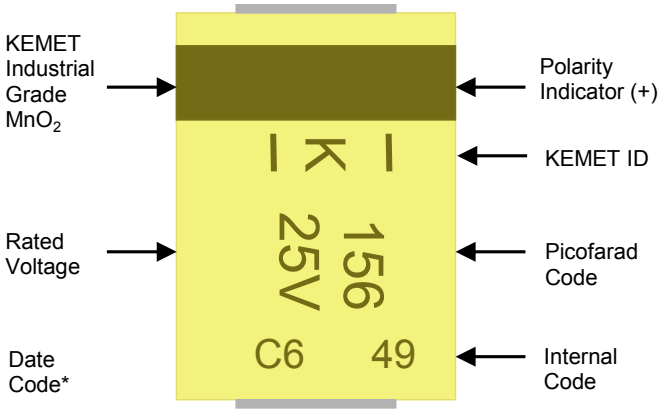


Capacitor Marking



* 230 = 30th week of 2012

C, D, X Case Sizes



Date Code *	
1st digit = Last number of Year	9 = 2009 0 = 2010 1 = 2011 2 = 2012 3 = 2013 4 = 2014
2nd and 3rd digit = Week of the Year	01 = 1st week of the Year to 52 = 52nd week of the Year

Date Code*		
Year	Month	
X = 2009	1 = Jan	7 = Jul
A = 2010	2 = Feb	8 = Aug
B = 2011	3 = Mar	9 = Spt
C = 2012	4 = Apr	O = Oct
D = 2013	5 = May	N = Nov
E = 2014	6 = Jun	D = Dec

Storage

Tantalum chip capacitors should be stored in normal working environments. While the chips 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 40ºC 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 chip stock should be used promptly, preferably within three years of receipt.

T498 150°C Rated MnO_2 Series

Overview

The KEMET T498 Series is a high temperature product that offers optimum performance characteristics in applications with operating temperatures up to 150°C. Advanced materials and testing allow this series to perform with a reliability level of 0.5%/1,000 hours at rated voltage and temperature. The T498 Series is available in five standard EIA case sizes with RoHS compliant terminations as standard.

Applications

Typical applications include decoupling and filtering in industrial and automotive end applications such as DC/DC converters, portable electronics, telecommunications, and control units operating at temperatures up to 150°C.

Benefits

- Meets or exceeds EIA standard 535BAAC
- Taped and reeled per EIA 481–1
- Symmetrical, compliant terminations
- Optional gold-plated terminations
- Laser-marked case
- 100% surge current testing
- Complies with AEC–Q200
- Capacitance values of 0.47 µF to 220 µF
- Tolerances of ±10% and ±20%
- Voltage rating of 6-50 VDC
- 100% steady-state accelerated aging
- Temperature/voltage derating is 2/3 at 150°C
- RoHS Compliant and lead-free terminations standard
- Operating temperature range of -55˚C to +150˚C

Environmental Compliance

RoHS Compliant (6/6) according to Directive 2002/95/EC when ordered with 100% Sn solder.

RoHS Compliant

SPICE

For a detailed analysis of specific part numbers, please visit www.kemet.com for a free download of KEMET's SPICE software. The KEMET SPICE program is freeware intended to aid design engineers in analyzing the performance of these capacitors over frequency, temperature, ripple, and DC bias conditions.

Ordering Information

T	498	X	227	M	010	A	T	E500	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Failure Rate/ Design	Lead Material	ESR	Packaging (C-Spec)
T = Tantalum	High Temperature 150°C	A, B, C, D, X	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	006 = 6.3 V 010 = 10 V 015 = 15 V 020 = 20 V 025 = 25 V 035 = 35 V 050 = 50 V	A = N/A	T = 100% Matte Tin (Sn) Plated G = Gold Plated	E = ESR Last three digits specify ESR in mΩ (500 = 500 mΩ)	Blank = 7" Reel 7280 = 13" Reel

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 150°C
Rated Capacitance Range	0.33 – 220 µF @ 120 Hz/25°C
Capacitance Tolerance	K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	6 – 50 V
DF (120 Hz)	Refer to Part Number Electrical Specification Table
ESR (100 kHz)	Refer to Part Number Electrical Specification Table
Leakage Current	≤ 0.01 CV (µA) at rated voltage after 5 minutes

Qualification

Test	Condition		Characteristics			
Endurance	150°C @ 2/3 rated voltage, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Storage Life	150°C @ 0 volts, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Thermal Shock	MIL–STD–202, Method 107, Condition B, mounted, -55°C to 150°C, 1,000 cycles		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Temperature Stability	Extreme temperature exposure at a succession of continuous steps at +25ºC, -55ºC, +25ºC, +85ºC, +150ºC, +25ºC			+25°C	-55°C	+85°C	+150°C
		Δ C/C		IL*	±10%	±10%	±20%
		DF		IL	IL	1.5 x IL	1.5 x IL
		DCL		IL	n/a	10 x IL	12 x IL
Surge Voltage	25°C and 85°C, 1.32 x rated voltage 1,000 cycles (150°C, 1.2 x rated voltage)		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		
			ESR	Within initial limits		
Mechanical Shock/Vibration	MIL–STD–202, Method 213, Condition I, 100 G peak MIL–STD–202, Method 204, Condition D, 10 Hz to 2,000 Hz, 20 G peak		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		

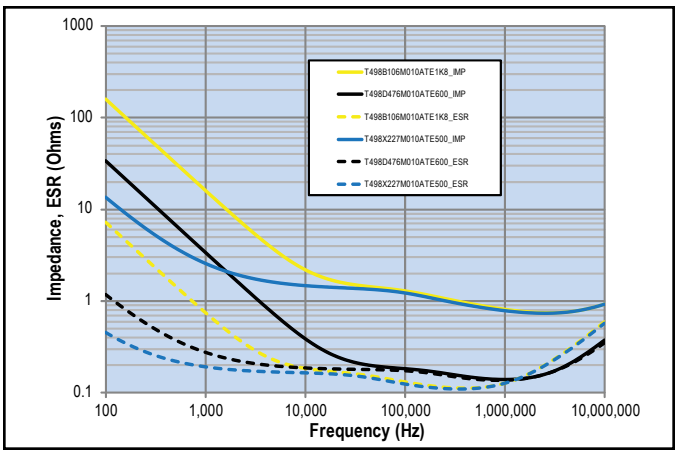
**IL = Initial Limit*

Certification

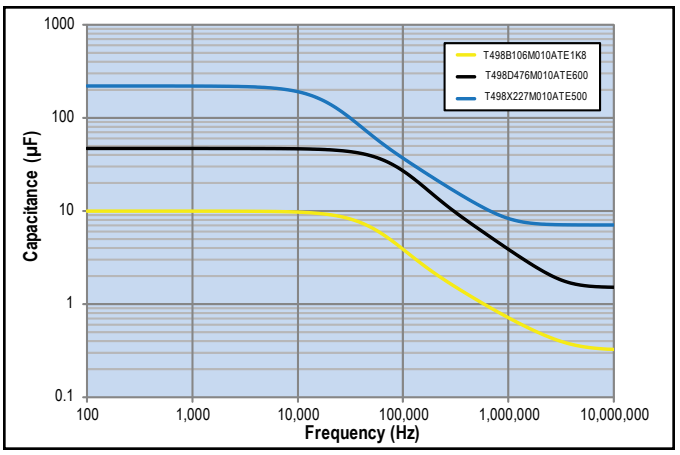
KEMET's Internal Qualification Plan for this Tantalum series of capacitors follows AEC–Q200 guidelines.

Electrical Characteristics

ESR vs. Frequency

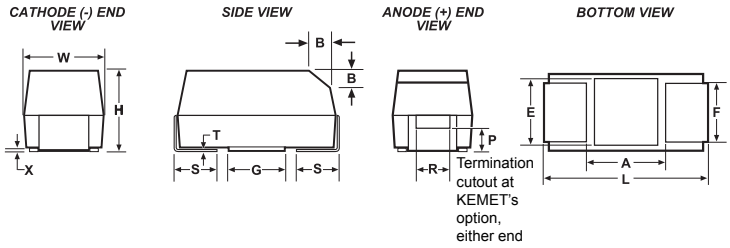


Capacitance vs. Frequency



Dimensions – Millimeters (Inches)

Metric will govern



Case Size		Component												
KEMET	EIA	L*	W*	H*	F* ±0.1 ±(.004)	S* ±0.3 ±(.012)	B* ±0.15 (Ref) ±.006	X (Ref)	P (Ref)	R (Ref)	T (Ref)	A (Min)	G (Ref)	E (Ref)
A	3216–18	3.2 ± 0.2 (.126 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.2 (.047)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.4 (.016)	0.4 (.016)	0.13 (.005)	0.8 (.31)	1.1 (.043)	1.3 (.051)
B	3528–21	3.5 ± 02 (.138 ± .008)	2.8 ± 0.2 (.110 ± .008)	1.9 ± 0.2 (.075 ± .008)	2.2 (.087)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.5 (.020)	1.0 (.039)	0.13 (.005)	1.1 (0.043)	1.8 (.071)	2.2 (.087)
C	6032–28	6.0 ± 0.3 (.236 ± .03)	3.2 ± 0.3 (.126 ± .012)	2.5 ± 0.3 (.098 ± .012)	2.2 (.087)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	2.5(.098)	2.8 (.110)	2.4 (.094)
D	7343–31	7.3 ± 0.3 (.287 ± .012)	4.3 ± 0.3 (.169 ± .012)	2.8 ± 0.3 (.110 ± .012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
X	7343–43	7.3 ± 0.3 (.287 ± .012)	4.3 ± 0.3 (.169 ± .012)	4.0 ± 0.3 (.157 ± .012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	1.7 (.067)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)

Notes: (Ref) – Dimensions provided for reference only. No dimensions provided for B, P or R because low profile cases do not have a bevel or a notch.
** MIL-PRF-55365/8 specified dimensions*

Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
4	150	D/7343-31	T498D157(1)004A(2)E600	6.0	6.0	600	500	450	200	1
6.3	2.2	A/3216-18	T498A225(1)006A(2)E6K5	0.5	4.5	6500	107	96	43	1
6.3	3.3	A/3216-18	T498A335(1)006A(2)E4K6	0.5	4.5	4600	128	115	51	1
6.3	4.7	A/3216-18	T498A475(1)006A(2)E3K6	0.5	4.5	3600	144	130	58	1
6.3	6.8	A/3216-18	T498A685(1)006A(2)E2K9	0.5	4.5	2900	161	145	64	1
6.3	6.8	B/3528-21	T498B685(1)006A(2)E2K7	0.5	4.5	2700	177	159	71	1
6.3	10	A/3216-18	T498A106(1)006A(2)E2K7	0.6	4.5	2700	167	150	67	1
6.3	10	B/3528-21	T498B106(1)006A(2)E2K1	0.6	4.5	2100	201	181	80	1
6.3	15	B/3528-21	T498B156(1)006A(2)E1K8	0.9	4.5	1800	217	195	87	1
6.3	15	C/6032-28	T498C156(1)006A(2)E1K7	0.9	4.5	1700	254	229	102	1
6.3	22	B/3528-21	T498B226(1)006A(2)E1K5	1.4	4.5	1500	238	214	95	1
6.3	22	C/6032-28	T498C226(1)006A(2)E1K3	1.4	4.5	1300	291	262	116	1
6.3	33	B/3528-21	T498B336(1)006A(2)E1K7	2.1	6.0	1700	224	202	90	1
6.3	33	C/6032-28	T498C336(1)006A(2)E1K1	2.1	4.5	1100	316	284	126	1
6.3	47	C/6032-28	T498C476(1)006A(2)E800	3.0	4.5	800	371	334	148	1
6.3	47	D/7343-31	T498D476(1)006A(2)E800	3.0	4.5	800	433	390	173	1
6.3	68	C/6032-28	T498C686(1)006A(2)E800	4.3	4.5	800	371	334	148	1
6.3	68	D/7343-31	T498D686(1)006A(2)E600	4.3	4.5	600	500	450	200	1
6.3	100	D/7343-31	T498D107(1)006A(2)E600	6.3	6.0	600	500	450	200	1
6.3	150	D/7343-31	T498D157(1)006A(2)E500	9.5	6.0	500	548	493	219	1
10	1.5	A/3216-18	T498A155(1)010A(2)E6K5	0.5	4.5	6500	107	96	43	1
10	2.2	A/3216-18	T498A225(1)010A(2)E4K6	0.5	4.5	4600	128	115	51	1
10	3.3	A/3216-18	T498A335(1)010A(2)E3K6	0.5	4.5	3600	144	130	58	1
10	4.7	A/3216-18	T498A475(1)010A(2)E2K9	0.5	4.5	2900	161	145	64	1
10	4.7	B/3528-21	T498B475(1)010A(2)E2K7	0.5	4.5	2700	177	159	71	1
10	6.8	A/3216-18	T498A685(1)010A(2)E2K7	0.7	4.5	2700	167	150	67	1
10	6.8	B/3528-21	T498B685(1)010A(2)E2K1	0.7	4.5	2100	201	181	80	1
10	10	B/3528-21	T498B106(1)010A(2)E1K8	1.0	4.5	1800	217	195	87	1
10	10	C/6032-28	T498C106(1)010A(2)E1K7	1.0	4.5	1700	254	229	102	1
10	15	B/3528-21	T498B156(1)010A(2)E1K5	1.5	4.5	1500	238	214	95	1
10	15	C/6032-28	T498C156(1)010A(2)E1K8	1.5	4.5	1800	247	222	99	1
10	22	B/3528-21	T498B226(1)010A(2)E1K5	2.2	6.0	1500	238	214	95	1
10	22	C/6032-28	T498C226(1)010A(2)E1K1	2.2	4.5	1100	316	284	126	1
10	33	C/6032-28	T498C336(1)010A(2)E900	3.3	4.5	900	350	315	140	1
10	33	D/7343-31	T498D336(1)010A(2)E800	3.3	4.5	800	433	390	173	1
10	47	C/6032-28	T498C476(1)010A(2)E800	4.7	4.5	800	371	334	148	1
10	47	D/7343-31	T498D476(1)010A(2)E600	4.7	4.5	600	500	450	200	1
10	68	D/7343-31	T498D686(1)010A(2)E600	6.8	4.5	600	500	450	200	1
10	100	D/7343-31	T498D107(1)010A(2)E600	10.0	6.0	600	500	450	200	1
10	150	X/7343-43	T498X157(1)010A(2)E500	15.0	6.0	500	574	517	230	1
10	220	X/7343-43	T498X227(1)010A(2)E500	22.0	9.0	500	574	517	230	1
16	1	A/3216-18	T498A105(1)016A(2)E6K5	0.5	3.0	6500	107	96	43	1
16	1.5	A/3216-18	T498A155(1)016A(2)E5K2	0.5	4.5	5200	120	108	48	1
16	2.2	A/3216-18	T498A225(1)016A(2)E4K3	0.5	4.5	4300	132	119	53	1
16	3.3	A/3216-18	T498A335(1)016A(2)E3K4	0.5	4.5	3400	149	134	60	1
16	3.3	B/3528-21	T498B335(1)016A(2)E3K0	0.5	4.5	3000	168	151	67	1
16	4.7	A/3216-18	T498A475(1)016A(2)E3K0	0.8	4.5	3000	158	142	63	1
16	4.7	B/3528-21	T498B475(1)016A(2)E2K1	0.8	4.5	2100	201	181	80	1
16	6.8	A/3216-18	T498A685(1)016A(2)E2K6	1.1	4.5	2600	170	153	68	1
16	6.8	B/3528-21	T498B685(1)016A(2)E1K8	1.1	4.5	1800	217	195	87	1
16	6.8	C/6032-28	T498C685(1)016A(2)E1K7	1.1	4.5	1700	254	229	102	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Roll Over for Order Info.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
16	10	B/3528-21	T498B106(1)016A(2)E2K8	1.6	4.5	2800	174	157	70	1
16	10	C/6032-28	T498C106(1)016A(2)E1K4	1.6	4.5	1400	280	252	112	1
16	15	C/6032-28	T498C156(1)016A(2)E1K1	2.4	4.5	1100	316	284	126	1
16	22	C/6032-28	T498C226(1)016A(2)E1K0	3.5	4.5	1000	332	299	133	1
16	22	D/7343-31	T498D226(1)016A(2)E800	3.5	4.5	800	433	390	173	1
16	33	C/6032-28	T498C336(1)016A(2)E900	5.3	4.5	900	350	315	140	1
16	33	D/7343-31	T498D336(1)016A(2)E600	5.3	4.5	600	500	450	200	1
16	47	C/6032-28	T498C476(1)016A(2)E800	7.5	4.5	800	371	334	148	1
16	47	D/7343-31	T498D476(1)016A(2)E600	7.5	4.5	600	500	450	200	1
16	68	D/7343-31	T498D686(1)016A(2)E600	10.9	4.5	600	500	450	200	1
20	0.68	A/3216-18	T498A684(1)020A(2)E7K8	0.5	3.0	7800	98	88	39	1
20	1	A/3216-18	T498A105(1)020A(2)E5K9	0.5	3.0	5900	113	102	45	1
20	1.5	A/3216-18	T498A155(1)020A(2)E5K2	0.5	4.5	5200	120	108	48	1
20	2.2	B/3528-21	T498B225(1)020A(2)E3K6	0.5	4.5	3600	154	139	62	1
20	3.3	B/3528-21	T498B335(1)020A(2)E2K7	0.7	4.5	2700	177	159	71	1
20	4.7	B/3528-21	T498B475(1)020A(2)E1K9	0.9	4.5	1900	212	191	85	1
20	4.7	C/6032-28	T498C475(1)020A(2)E1K7	0.9	4.5	1700	254	229	102	1
20	6.8	C/6032-28	T498C685(1)020A(2)E1K3	1.4	4.5	1300	291	262	116	1
20	10	C/6032-28	T498C106(1)020A(2)E1K1	2.0	4.5	1100	316	284	126	1
20	15	C/6032-28	T498C156(1)020A(2)E1K0	3.0	4.5	1000	332	299	133	1
20	15	D/7343-31	T498D156(1)020A(2)E900	3.0	4.5	900	408	367	163	1
20	22	D/7343-31	T498D226(1)020A(2)E700	4.4	4.5	700	463	417	185	1
20	33	D/7343-31	T498D336(1)020A(2)E600	6.6	4.5	600	500	450	200	1
25	0.47	A/3216-18	T498A474(1)025A(2)E8K5	0.5	3.0	8500	94	85	38	1
25	0.68	A/3216-18	T498A684(1)025A(2)E6K5	0.5	3.0	6500	107	96	43	1
25	1	A/3216-18	T498A105(1)025A(2)E5K2	0.5	3.0	5200	120	108	48	1
25	1.5	B/3528-21	T498B155(1)025A(2)E4K2	0.5	4.5	4200	142	128	57	1
25	2.2	B/3528-21	T498B225(1)025A(2)E3K0	0.6	4.5	3000	168	151	67	1
25	3.3	C/6032-28	T498C335(1)025A(2)E2K0	0.8	4.5	2000	235	212	94	1
25	4.7	C/6032-28	T498C475(1)025A(2)E1K6	1.2	4.5	1600	262	236	105	1
25	6.8	C/6032-28	T498C685(1)025A(2)E1K4	1.7	4.5	1400	280	252	112	1
25	6.8	D/7343-31	T498D685(1)025A(2)E1K1	1.7	4.5	1100	369	332	148	1
25	10	C/6032-28	T498C106(1)025A(2)E1K1	2.5	4.5	1100	316	284	126	1
25	10	D/7343-31	T498D106(1)025A(2)E1K0	2.5	4.5	1000	387	348	155	1
25	15	D/7343-31	T498D156(1)025A(2)E700	3.8	4.5	700	463	417	185	1
25	22	D/7343-31	T498D226(1)025A(2)E600	5.5	4.5	600	500	450	200	1
25	33	D/7343-31	T498D336(1)025A(2)E600	8.3	6.0	600	500	450	200	1
35	0.1	A/3216-18	T498A104(1)035A(2)E28K	0.5	3.0	28000	52	47	21	1
35	0.15	A/3216-18	T498A154(1)035A(2)E23K	0.5	3.0	23000	57	51	23	1
35	0.22	A/3216-18	T498A224(1)035A(2)E15K	0.5	3.0	15000	71	64	28	1
35	0.33	A/3216-18	T498A334(1)035A(2)E11K	0.5	3.0	11000	83	75	33	1
35	0.47	A/3216-18	T498A474(1)035A(2)E10K	0.5	3.0	10000	87	78	35	1
35	0.47	B/3528-21	T498B474(1)035A(2)E8K0	0.5	3.0	8000	103	93	41	1
35	0.68	B/3528-21	T498B684(1)035A(2)E5K5	0.5	3.0	5500	124	112	50	1
35	1	A/3216-18	T498A105(1)035A(2)E10K	0.5	4.0	10000	87	78	35	1
35	1	B/3528-21	T498B105(1)035A(2)E4K4	0.5	3.0	4400	139	125	56	1
35	1.5	C/6032-28	T498C155(1)035A(2)E3K3	0.5	4.5	3300	183	165	73	1
35	2.2	C/6032-28	T498C225(1)035A(2)E2K2	0.8	4.5	2200	224	202	90	1
35	3.3	C/6032-28	T498C335(1)035A(2)E1K7	1.2	4.5	1700	254	229	102	1
35	4.7	C/6032-28	T498C475(1)035A(2)E1K3	1.6	4.5	1300	291	262	116	1
35	4.7	D/7343-31	T498D475(1)035A(2)E1K0	1.6	4.5	1000	387	348	155	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
35	6.8	D/7343-31	T498D685(1)035A(2)E900	2.4	4.5	900	408	367	163	1
35	10	D/7343-31	T498D106(1)035A(2)E700	3.5	4.5	700	463	417	185	1
35	15	D/7343-31	T498D156(1)035A(2)E700	5.3	6.0	700	463	417	185	1
35	15	X/7343-43	T498X156(1)035A(2)E500	5.3	4.5	500	574	517	230	1
35	22	D/7343-31	T498D226(1)035A(2)E700	7.7	6.0	700	463	417	185	1
35	22	X/7343-43	T498X226(1)035A(2)E500	7.7	4.5	500	574	517	230	1
35	33	X/7343-43	T498X336(1)035A(2)E500	11.6	6.0	500	574	517	230	1
35	47	X/7343-43	T498X476(1)035A(2)E500	16.5	6.0	500	574	517	230	1
50	0.1	A/3216-18	T498A104(1)050A(2)E27K	0.5	3.0	27000	53	48	21	1
50	0.15	B/3528-21	T498B154(1)050A(2)E22K	0.5	3.0	22000	62	56	25	1
50	0.22	B/3528-21	T498B224(1)050A(2)E15K	0.5	3.0	15000	75	68	30	1
50	0.33	B/3528-21	T498B334(1)050A(2)E11K	0.5	3.0	11000	88	79	35	1
50	0.47	C/6032-28	T498C474(1)050A(2)E6K5	0.5	3.0	6500	130	117	52	1
50	0.68	C/6032-28	T498C684(1)050A(2)E5K5	0.5	3.0	5500	141	127	56	1
50	1	C/6032-28	T498C105(1)050A(2)E3K3	0.5	3.0	3300	183	165	73	1
50	1.5	D/7343-31	T498D155(1)050A(2)E2K8	0.8	4.5	2800	231	208	92	1
50	2.2	D/7343-31	T498D225(1)050A(2)E2K0	1.1	4.5	2000	274	247	110	1
50	3.3	D/7343-31	T498D335(1)050A(2)E1K1	1.7	4.5	1100	369	332	148	1
50	4.7	D/7343-31	T498D475(1)050A(2)E900	2.4	4.5	900	408	367	163	1
50	6.8	D/7343-31	T498D685(1)050A(2)E700	3.4	6.0	700	463	417	185	1
50	6.8	X/7343-43	T498X685(1)050A(2)E500	3.4	4.5	500	574	517	230	1
50	10	X/7343-43	T498X106(1)050A(2)E1K0	5.0	4.5	1000	406	365	162	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). Designates Termination Finish.

Refer to Ordering Information for additional detail.

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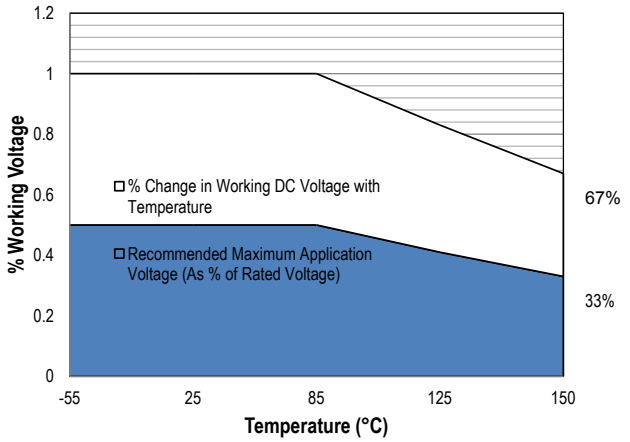
Recommended Voltage Derating Guidelines

Rated Voltage	Working Voltage		Recommended Application Voltage (for maximum reliability)	
	85°C	150°C	85°C	150°C
6.3	6.3	4.22	3.15	2.08
10	10	6.70	5	3.30
16	16	10.72	8	5.28
20	20	13.40	10	6.60
25	25	16.75	12.5	8.25
35	35	23.45	17.5	11.55
50	50	33.50	25	16.50



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 which 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. See the Reverse Voltage section for allowable limits.

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

KEMET Series and Case Code	EIA Case Code	Maximum Power Dissipation (P max) mWatts @ 25°C with +20°C Rise
A	3216–18	75
B	3528–21	85
C	6032–28	110
D	7343–31	150
X	7343–43	165
E	7360–38	200
S	3216–12	60
T	3528–12	70
U	6032–15	90
V	7343–20	125
T510X	7343–43	270
T510E	7360–38	285

Temperature Compensation Multipliers for Maximum Power Dissipation			
≤ 25°C	85°C	125°C	150°C
1.00	0.90	0.40	0.30

T= Environmental Temperature

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

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)

Reverse Voltage

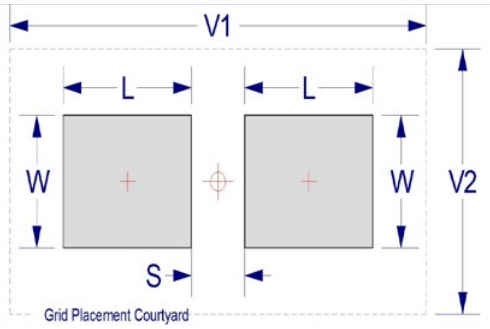
Solid tantalum capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. The positive terminal is identified on the capacitor body by a stripe plus in some cases a beveled edge. A small degree of transient reverse voltage is permissible for short periods per the table. The capacitors should not be operated continuously in reverse mode, even within these limits.

Temperature	Permissible Transient Reverse Voltage
25°C	15% of Rated Voltage
85°C	5% of Rated Voltage
125°C	1% of Rated Voltage

Table 2 – Land Dimensions/Courtyard

KEMET	Metric Size Code	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B: Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
Case	EIA	W	L	S	V1	V2	W	L	S	V1	V2	W	L	S	V1	V2
A	3216–18	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
B	3528–21	2.35	2.21	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
C	6032–25	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
D	7343–31	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
L	6032-19	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
M	3528-15	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
H	7360-20	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
E[1]	7360–38	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
Q	7343-12	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
R[2]	2012-12	1.05	1.83	0.15	4.82	2.50	0.93	1.50	0.22	3.72	2.00	0.83	1.12	0.38	2.86	1.74
S[2]	3216–12	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
T	3528–12	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
U	6032–15	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
V	7343–20	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
W	7343–15	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
X[1]	7343–43	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
Y[1]	7343–40	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84

Density Level A: *For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes.*
Density Level B: *For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.*
Density Level C: *For high component desity product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC standard 7351 (IPC–7351).*
[1] Height of these chips may create problems in wave soldering.
[2] Land pattern geometry is too small for silkscreen outline.



Soldering Process

KEMET's families of surface mount capacitors are compatible with wave (single or dual), convection, IR, or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J–STD–020D standard for moisture sensitivity testing. The devices can safely withstand a maximum of three reflow passes at these conditions.

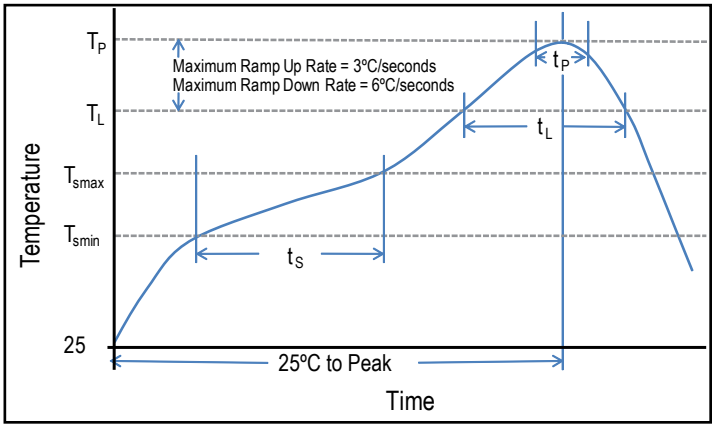
Please note that although the X/7343–43 case size can withstand wave soldering, the tall profile (4.3 mm maximum) dictates care in wave process development.

Hand soldering should be performed with care due to the difficulty in process control. If performed, care should be taken to avoid contact of the soldering iron to the molded case. The iron should be used to heat the solder pad, applying solder between the pad and the termination, until reflow occurs. Once reflow occurs, the iron should be removed immediately. "Wiping" the edges of a chip and heating the top surface is not recommended.

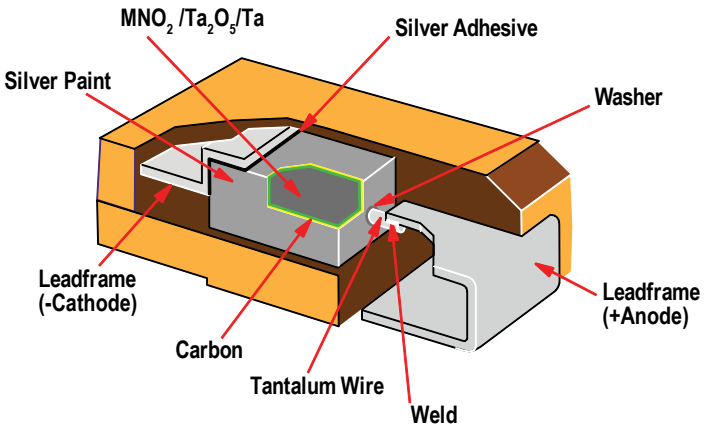
During typical reflow operations, a slight darkening of the gold-colored epoxy may be observed. This slight darkening is normal and not harmful to the product. Marking permanency is not affected by this change.

Profile Feature	SnPb Assembly	Pb-Free Assembly
Preheat/Soak		
Temperature Minimum (T_{Smin})	100°C	150°C
Temperature Maximum (T_{Smax})	150°C	200°C
Time (t_s) from T_{smin} to T_{smax})	60 – 120 seconds	60 – 120 seconds
Ramp-up Rate (T_L to T_P)	3°C/seconds maximum	3°C/seconds maximum
Liquidous Temperature (T_L)	183°C	217°C
Time Above Liquidous (t_L)	60 – 150 seconds	60 – 150 seconds
Peak Temperature (T_P)	220°C* 235°C**	250°C* 260°C**
Time within 5°C of Maximum Peak Temperature (t_P)	20 seconds maximum	30 seconds maximum
Ramp-down Rate (T_P to T_L)	6°C/seconds maximum	6°C/seconds maximum
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum

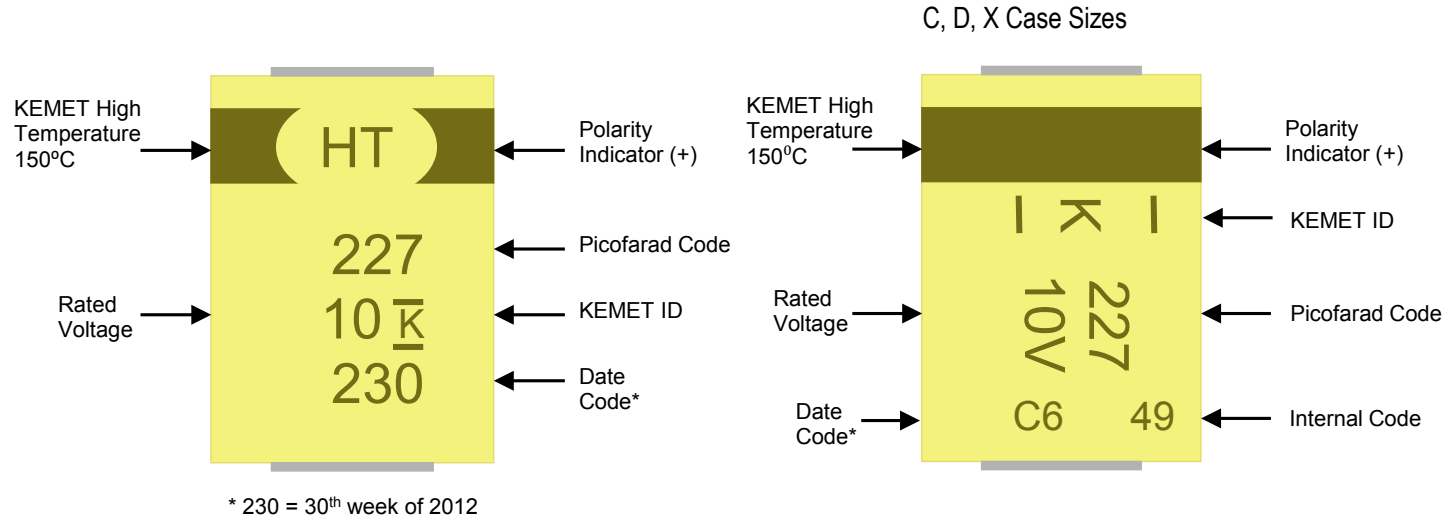
Note: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.
**Case Size D, E, P, Y, and X*
***Case Size A, B, C, H, I, K, M, R, S, T, U, V, W, and Z*



Construction



Capacitor Marking



* 230 = 30th week of 2012

Date Code *	
1st digit = Last number of Year	9 = 2009 0 = 2010 1 = 2011 2 = 2012 3 = 2013 4 = 2014
2nd and 3rd digit = Week of the Year	01 = 1st week of the Year to 52 = 52nd week of the Year

Date Code*		
Year	Month	
X = 2009	1 = Jan	7 = Jul
A = 2010	2 = Feb	8 = Aug
B = 2011	3 = Mar	9 = Spt
C = 2012	4 = Apr	O = Oct
D = 2013	5 = May	N = Nov
E = 2014	6 = Jun	D = Dec

Storage

Tantalum chip capacitors should be stored in normal working environments. While the chips 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 chip stock should be used promptly, preferably within three years of receipt.

T499 175°C Rated MnO_2 Series

Overview

The KEMET T499 Series is a high-temperature product that offers optimum performance characteristics in applications with operating temperatures up to 175°C. Advanced materials and testing allow this series to perform with a reliability level of 0.5%/1,000 hours at rated voltage and temperature. This series is available in five standard EIA case sizes with RoHS Compliant terminations as standard.

Applications

Typical applications include decoupling and filtering in industrial and automotive end applications, such as DC/DC converters, portable electronics, telecommunications, and control units operating at temperatures up to 175°C.

Benefits

- Meets or exceeds EIA Standard 535BAAC
- Taped and reeled per EIA 481–1
- Symmetrical, compliant terminations
- Optional gold-plated terminations
- Laser-marked case
- 100% surge current testing
- Complies with AEC–Q200
- Capacitance values of 0.15 µF to 220 µF
- Tolerances of ±10% and ±20%
- Voltage rating of 6 to 50 VDC
- 100% steady-state accelerated aging
- Voltage derating is 1/2 at 175°C
- RoHS Compliant and lead-free terminations standard
- Operating temperature range of -55˚C to +175˚C

Environmental Compliance

RoHS Compliant (6/6) according to Directive 2002/95/EC when ordered with 100% Sn solder.

RoHS Compliant

SPICE

For a detailed analysis of specific part numbers, please visit www.kemet.com for a free download of KEMET's SPICE software. The KEMET SPICE program is freeware intended to aid design engineers in analyzing the performance of these capacitors over frequency, temperature, ripple, and DC bias conditions.

Ordering Information

T	499	X	227	M	010	A	T	E500	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Failure Rate/ Design	Lead Material	ESR	Packaging (C-Spec)
T = Tantalum	High Temperature 175°C	A, B, C, D, X	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	006 = 6.3 V 010 = 10 V 015 = 15 V 020 = 20 V 025 = 25 V 035 = 35 V 050 = 50 V	A = N/A	T = 100% Matte Tin (Sn) Plated G = Gold Plated	E = ESR Last three digits specify ESR in mΩ (500 = 500 mΩ)	Blank = 7" Reel 7280 = 13" Reel

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 175°C
Rated Capacitance Range	0.15 – 220 µF @ 120 Hz/25°C
Capacitance Tolerance	K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	6 – 50 V
DF(120 Hz)	Refer to Part Number Electrical Specification Table
ESR (100 kHz)	Refer to Part Number Electrical Specification Table
Leakage Current	≤ 0.01 CV (µA) at rated voltage after 5 minutes

Qualification

Test	Condition		Characteristics			
Endurance	175°C @ 1/2 rated voltage, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Storage Life	175°C @ 0 volts, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Thermal Shock	MIL–STD–202, Method 107, Condition B, mounted, -55°C to 150°C, 1,000 cycles		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Temperature Stability	Extreme temperature exposure at a succession of continuous steps at +25°C, -55°C, +25°C, +85°C, +150°C, +25°C			+25°C	-55°C	+85°C	+175°C
		Δ C/C		IL*	±10%	±10%	±30%
		DF		IL	IL	1.5 x IL	1.5 x IL
		DCL		IL	n/a	10 x IL	12 x IL
Surge Voltage	25°C and 85°C, 1.32 x rated voltage 1,000 cycles (150°C, 1.2 x rated voltage)		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		
			ESR	Within initial limits		
Mechanical Shock/Vibration	MIL–STD–202, Method 213, Condition I, 100 G peak MIL–STD–202, Method 204, Condition D, 10 Hz to 2,000 Hz, 20 G peak		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		

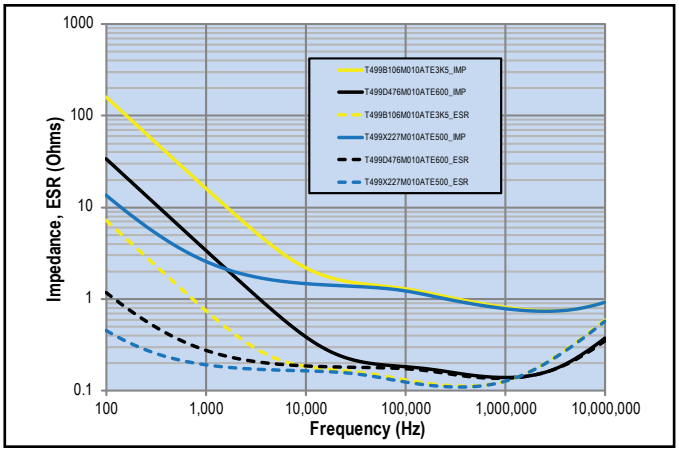
**IL = Initial Limit*

Certification

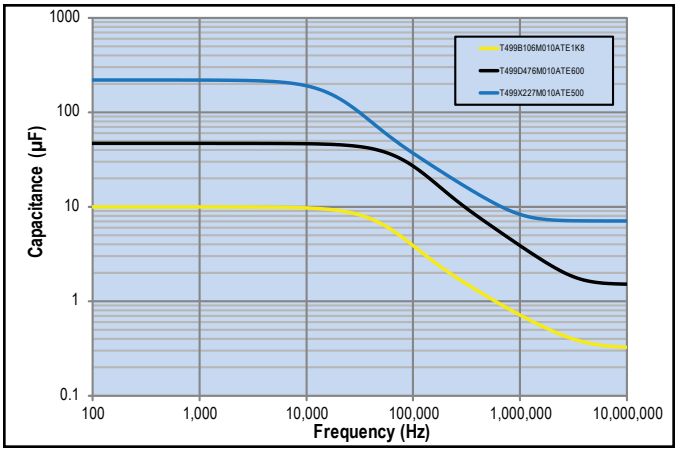
KEMET's Internal Qualification Plan for this Tantalum series of capacitors follows AEC–Q200 guidelines.

Electrical Characteristics

ESR vs. Frequency

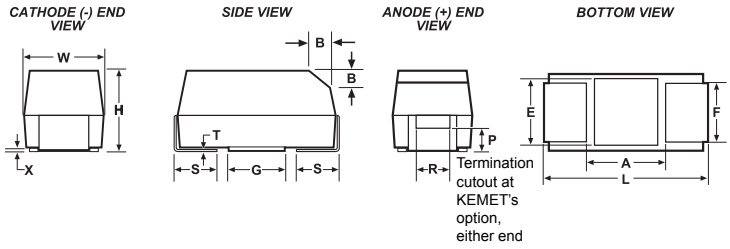


Capacitance vs. Frequency



Dimensions – Millimeters (Inches)

Metric will govern



Case Size		Component												
KEMET	EIA	L*	W*	H*	F* ±0.1 ±(.004)	S* ±0.3 ±(.012)	B* ±0.15 (Ref) ±.006	X (Ref)	P (Ref)	R (Ref)	T (Ref)	A (Min)	G (Ref)	E (Ref)
A	3216–18	3.2 ±0.2 (0.126 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.2 (.047)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.4 (.016)	0.4 (.016)	0.13 (.005)	0.8 (.31)	1.1 (.043)	1.3 (.051)
B	3528–21	3.5 ±02 (0.138 ±0.008)	2.8 ± 0.2 (.110 ± .008)	1.9 ± 0.2 (.075 ± .008)	2.2 (.087)	0.8 (.031)	0.4 (.016)	0.10 ± 0.10 (.004 ± .004)	0.5 (.020)	1.0 (.039)	0.13 (.005)	1.1 (0.043)	1.8 (.071)	2.2 (.087)
C	6032–28	6.0 ±0.3 (0.236 ±0.03)	3.2 ± 0.3 (.126 ± .012)	2.5 ± 0.3 (.098 ± .012)	2.2 (.087)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	2.5(.098)	2.8 (.110)	2.4 (.094)
D	7343–31	7.3 ±0.3 (0.287 ±0.012)	4.3 ± 0.3 (.169 ± .012)	2.8 ± 0.3 (.110 ± .012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	0.9 (.035)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
X	7343–43	7.3 ±0.3 (0.287 ±0.012)	4.3 ± 0.3 (.169 ± .012)	4.0 ± 0.3 (.157 ± .012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	1.7 (.067)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)

Notes: (Ref) – Dimensions provided for reference only. No dimensions provided for B, P or R because low profile cases do not have a bevel or a notch.
** MIL-PRF-55365/8 specified dimensions*

Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
6.3	10	B/3528-21	T499B106(1)006A(2)E3K5	0.6	6	3500	156	140	62	1
6.3	15	B/3528-21	T499B156(1)006A(2)E3K5	0.9	6	3500	156	140	62	1
6.3	22	C/6032-28	T499C226(1)006A(2)E1K8	1.4	6	1800	247	222	99	1
6.3	33	B/3528-21	T499B336(1)006A(2)E3K0	2.1	6	3000	168	151	67	1
6.3	47	C/6032-28	T499C476(1)006A(2)E1K8	3.0	6	1800	247	222	99	1
6.3	100	D/7343-31	T499D107(1)006A(2)E800	6.3	8	800	433	390	173	1
10	1.5	A/3216-18	T499A155(1)010A(2)E8K0	0.5	6	8000	97	87	39	1
10	2.2	A/3216-18	T499A225(1)010A(2)E8K0	0.5	6	8000	97	87	39	1
10	3.3	A/3216-18	T499A335(1)010A(2)E6K0	0.5	6	6000	112	101	45	1
10	4.7	A/3216-18	T499A475(1)010A(2)E6K0	0.5	6	6000	112	101	45	1
10	4.7	B/3528-21	T499B475(1)010A(2)E3K5	0.5	6	3500	156	140	62	1
10	6.8	A/3216-18	T499A685(1)010A(2)E6K0	0.7	6	6000	112	101	45	1
10	6.8	B/3528-21	T499B685(1)010A(2)E3K5	0.7	6	3500	156	140	62	1
10	10	B/3528-21	T499B106(1)010A(2)E3K5	1.0	6	3500	156	140	62	1
10	10	C/6032-28	T499C106(1)010A(2)E1K8	1.0	6	1800	247	222	99	1
10	15	B/3528-21	T499B156(1)010A(2)E3K5	1.5	6	3500	156	140	62	1
10	15	C/6032-28	T499C156(1)010A(2)E1K8	1.5	6	1800	247	222	99	1
10	22	B/3528-21	T499B226(1)010A(2)E3K0	2.2	6	3000	168	151	67	1
10	22	C/6032-28	T499C226(1)010A(2)E1K8	2.2	6	1800	247	222	99	1
10	33	C/6032-28	T499C336(1)010A(2)E1K8	3.3	6	1800	247	222	99	1
10	33	D/7343-31	T499D336(1)010A(2)E1K6	3.3	6	1600	306	275	122	1
10	47	D/7343-31	T499D476(1)010A(2)E800	4.7	6	800	433	390	173	1
10	100	D/7343-31	T499D107(1)010A(2)E700	10.0	8	700	463	417	185	1
10	220	X/7343-43	T499X227(1)010A(2)E500	22.0	8	500	574	517	230	1
16	1	A/3216-18	T499A105(1)016A(2)E10K	0.5	4	10000	87	78	35	1
16	1.5	A/3216-18	T499A155(1)016A(2)E8K0	0.5	6	8000	97	87	39	1
16	2.2	A/3216-18	T499A225(1)016A(2)E6K0	0.5	6	6000	112	101	45	1
16	3.3	A/3216-18	T499A335(1)016A(2)E500	0.5	6	500	387	348	155	1
16	3.3	B/3528-21	T499B335(1)016A(2)E3K5	0.5	6	3500	156	140	62	1
16	4.7	B/3528-21	T499B475(1)016A(2)E6K0	0.8	6	6000	119	107	48	1
16	6.8	A/3216-18	T499A685(1)016A(2)E7K0	1.1	6	7000	104	94	42	1
16	6.8	B/3528-21	T499B685(1)016A(2)E3K5	1.1	6	3500	156	140	62	1
16	6.8	C/6032-28	T499C685(1)016A(2)E1K8	1.1	6	1800	247	222	99	1
16	10	B/3528-21	T499B106(1)016A(2)E3K5	1.6	6	3500	156	140	62	1
16	10	C/6032-28	T499C106(1)016A(2)E1K8	1.6	6	1800	247	222	99	1
16	15	C/6032-28	T499C156(1)016A(2)E1K8	2.4	6	1800	247	222	99	1
16	22	C/6032-28	T499C226(1)016A(2)E1K6	3.5	6	1600	262	236	105	1
16	22	D/7343-31	T499D226(1)016A(2)E800	3.5	6	800	433	390	173	1
16	33	D/7343-31	T499D336(1)016A(2)E800	5.3	6	800	433	390	173	1
16	47	D/7343-31	T499D476(1)016A(2)E800	7.5	6	800	433	390	173	1
16	100	X/7343-43	T499X107(1)016A(2)E300	16.0	6	300	742	668	297	1
20	0.68	A/3216-18	T499A684(1)020A(2)E12K	0.5	4	12000	79	71	32	1
20	1	A/3216-18	T499A105(1)020A(2)E10K	0.5	4	10000	87	78	35	1
20	1.5	A/3216-18	T499A155(1)020A(2)E8K0	0.5	6	8000	97	87	39	1
20	2.2	B/3528-21	T499B225(1)020A(2)E3K5	0.5	6	3500	156	140	62	1
20	3.3	B/3528-21	T499B335(1)020A(2)E3K5	0.7	6	3500	156	140	62	1
20	4.7	B/3528-21	T499B475(1)020A(2)E3K5	0.9	6	3500	156	140	62	1
20	4.7	C/6032-28	T499C475(1)020A(2)E2K4	0.9	6	2400	214	193	86	1
20	6.8	C/6032-28	T499C685(1)020A(2)E1K9	1.4	6	1900	241	217	96	1
20	10	C/6032-28	T499C106(1)020A(2)E1K8	2.0	6	1800	247	222	99	1
20	15	C/6032-28	T499C156(1)020A(2)E1K7	3.0	6	1700	254	229	102	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Roll Over for Order Info.

Table 1 – Ratings & Part Number Reference cont'd

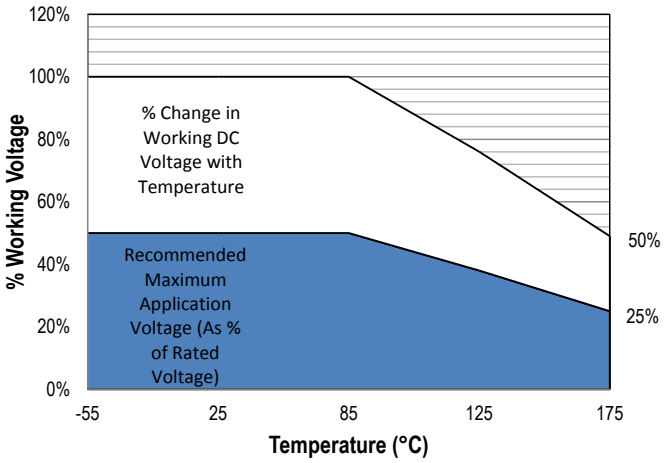
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
20	15	D/7343-31	T499D156(1)020A(2)E1K0	3.0	6	1000	387	348	155	1
20	22	D/7343-31	T499D226(1)020A(2)E800	4.4	6	800	433	390	173	1
25	0.47	A/3216-18	T499A474(1)025A(2)E14K	0.5	4	14000	73	66	29	1
25	0.68	A/3216-18	T499A684(1)025A(2)E10K	0.5	4	10000	87	78	35	1
25	1	A/3216-18	T499A105(1)025A(2)E8K0	0.5	4	8000	97	87	39	1
25	1.5	A/3216-18	T499A155(1)025A(2)E5K0	0.5	6	5000	122	110	49	1
25	2.2	B/3528-21	T499B225(1)025A(2)E4K5	0.6	6	4500	137	123	55	1
25	3.3	C/6032-28	T499C335(1)025A(2)E2K5	0.8	6	2500	210	189	84	1
25	4.7	C/6032-28	T499C475(1)025A(2)E2K4	1.2	6	2400	214	193	86	1
25	6.8	C/6032-28	T499C685(1)025A(2)E1K9	1.7	6	1900	241	217	96	1
25	6.8	D/7343-31	T499D685(1)025A(2)E1K1	1.7	6	1100	369	332	148	1
25	10	C/6032-28	T499C106(1)025A(2)E1K5	2.5	6	1500	271	244	108	1
25	10	D/7343-31	T499D106(1)025A(2)E1K0	2.5	6	1000	387	348	155	1
25	15	D/7343-31	T499D156(1)025A(2)E1K0	3.8	6	1000	387	348	155	1
25	22	D/7343-31	T499D226(1)025A(2)E800	5.5	6	800	433	390	173	1
25	33	D/7343-31	T499D336(1)025A(2)E700	8.3	6	700	463	417	185	1
35	0.15	A/3216-18	T499A154(1)035A(2)E19K	0.5	4	19000	63	57	25	1
35	0.22	A/3216-18	T499A224(1)035A(2)E18K	0.5	4	18000	65	59	26	1
35	0.33	A/3216-18	T499A334(1)035A(2)E15K	0.5	4	15000	71	64	28	1
35	0.47	B/3528-21	T499B474(1)035A(2)E8K0	0.5	4	8000	103	93	41	1
35	0.68	B/3528-21	T499B684(1)035A(2)E6K5	0.5	4	6000	119	107	48	1
35	1	A/3216-18	T499A105(1)035A(2)E10K	0.5	4	10000	87	78	35	1
35	1	B/3528-21	T499B105(1)035A(2)E5K0	0.5	4	5000	130	117	52	1
35	1.5	C/6032-28	T499C155(1)035A(2)E4K5	0.5	6	4500	156	140	62	1
35	2.2	C/6032-28	T499C225(1)035A(2)E3K5	0.8	6	3500	177	159	71	1
35	3.3	C/6032-28	T499C335(1)035A(2)E2K5	1.2	6	2500	210	189	84	1
35	4.7	C/6032-28	T499C475(1)035A(2)E2K5	1.6	6	2500	210	189	84	1
35	6.8	D/7343-31	T499D685(1)035A(2)E1K3	2.4	6	1300	340	306	136	1
35	10	D/7343-31	T499D106(1)035A(2)E1K0	3.5	6	1000	387	348	155	1
35	22	X/7343-43	T499X226(1)035A(2)E700	7.7	6	700	486	437	194	1
35	33	X/7343-43	T499X336(1)035A(2)E600	11.6	6	600	524	472	210	1
50	3.3	D/7343-31	T499D335(1)050A(2)E2K0	1.7	6	2000	274	247	110	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Roll Over for Order Info.

Recommended Voltage Derating Guidelines

Rated Voltage	Working Voltage		Recommended Application Voltage (for maximum reliability)	
	85°C	175°C	85°C	175°C
6.3	6.3	3.15	3.15	1.58
10	10	5.00	5	2.50
16	16	8.00	8	4.00
20	20	10.00	10	5.00
25	25	12.50	12.5	6.25
35	35	17.50	17.5	8.75
50	50	25.00	25	12.50



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 which 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. See the Reverse Voltage section for allowable limits.

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

KEMET Series and Case Code	EIA Case Code	Maximum Power Dissipation (P max) mWatts @ 25°C with +20°C Rise
A	3216–18	75
B	3528–21	85
C	6032–28	110
D	7343–31	150
X	7343–43	165
E	7360–38	200
S	3216–12	60
T	3528–12	70
U	6032–15	90
V	7343–20	125
T510X	7343–43	270
T510E	7360–38	285

Temperature Compensation Multipliers for Maximum Power Dissipation			
≤ 25°C	85°C	125°C	175°C
1.00	0.90	0.40	0.20

T= Environmental Temperature

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

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)

Reverse Voltage

Solid tantalum capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. The positive terminal is identified on the capacitor body by a stripe plus in some cases a beveled edge. A small degree of transient reverse voltage is permissible for short periods per the table. The capacitors should not be operated continuously in reverse mode, even within these limits.

Temperature	Permissible Transient Reverse Voltage
25°C	15% of Rated Voltage
85°C	5% of Rated Voltage
125°C	1% of Rated Voltage

Table 2 – Land Dimensions/Courtyard

KEMET	Metric Size Code	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B: Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
Case	EIA	W	L	S	V1	V2	W	L	S	V1	V2	W	L	S	V1	V2
A	3216–18	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
B	3528–21	2.35	2.21	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
C	6032–25	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
D	7343–31	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
L	6032-19	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
M	3528-15	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
H	7360-20	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
E[1]	7360–38	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
Q	7343-12	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
R[2]	2012-12	1.05	1.83	0.15	4.82	2.50	0.93	1.50	0.22	3.72	2.00	0.83	1.12	0.38	2.86	1.74
S[2]	3216–12	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
T	3528–12	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
U	6032–15	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
V	7343–20	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
W	7343–15	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
X[1]	7343–43	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
Y[1]	7343–40	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84

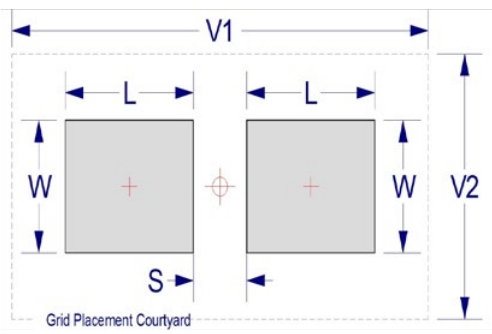
Density Level A: *For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes.*

Density Level B: *For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.*

Density Level C: *For high component desity product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC standard 7351 (IPC–7351).*

[1] Height of these chips may create problems in wave soldering.

[2] Land pattern geometry is too small for silkscreen outline.



Soldering Process

KEMET's families of surface mount capacitors are compatible with wave (single or dual), convection, IR, or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J–STD–020D standard for moisture sensitivity testing. The devices can safely withstand a maximum of three reflow passes at these conditions.

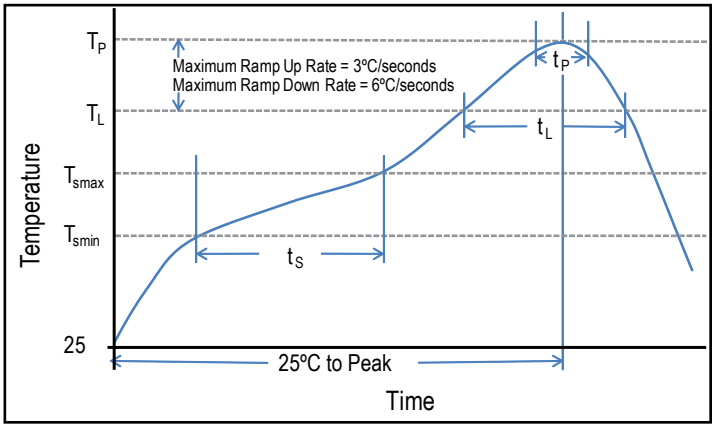
Please note that although the X/7343–43 case size can withstand wave soldering, the tall profile (4.3 mm maximum) dictates care in wave process development.

Hand soldering should be performed with care due to the difficulty in process control. If performed, care should be taken to avoid contact of the soldering iron to the molded case. The iron should be used to heat the solder pad, applying solder between the pad and the termination, until reflow occurs. Once reflow occurs, the iron should be removed immediately. "Wiping" the edges of a chip and heating the top surface is not recommended.

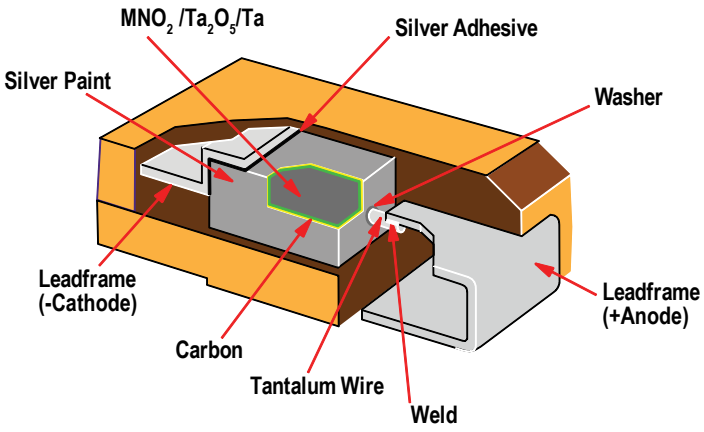
During typical reflow operations, a slight darkening of the gold-colored epoxy may be observed. This slight darkening is normal and not harmful to the product. Marking permanency is not affected by this change.

Profile Feature	SnPb Assembly	Pb-Free Assembly
Preheat/Soak		
Temperature Minimum (T_{Smin})	100°C	150°C
Temperature Maximum (T_{Smax})	150°C	200°C
Time (t_s) from T_{smin} to T_{smax})	60 – 120 seconds	60 – 120 seconds
Ramp-up Rate (T_L to T_P)	3°C/seconds maximum	3°C/seconds maximum
Liquidous Temperature (T_L)	183°C	217°C
Time Above Liquidous (t_L)	60 – 150 seconds	60 – 150 seconds
Peak Temperature (T_P)	220°C* 235°C**	250°C* 260°C**
Time within 5°C of Maximum Peak Temperature (t_P)	20 seconds maximum	30 seconds maximum
Ramp-down Rate (T_P to T_L)	6°C/seconds maximum	6°C/seconds maximum
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum

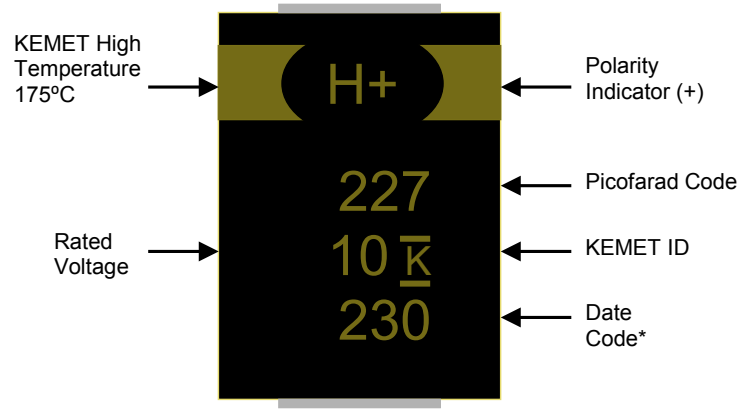
Note: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.
**Case Size D, E, P, Y, and X*
***Case Size A, B, C, H, I, K, M, R, S, T, U, V, W, and Z*

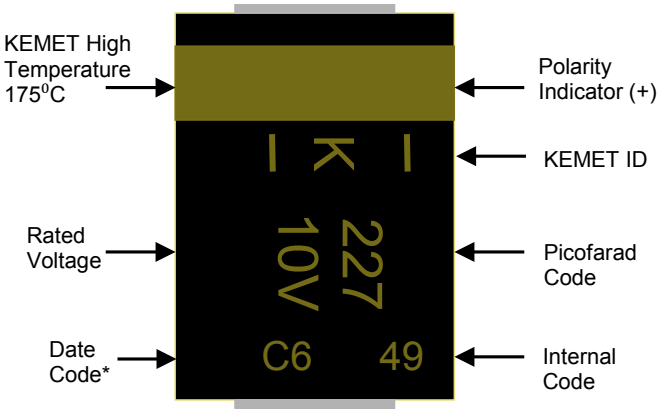


Construction



Capacitor Marking





* 230 = 30th week of 2012

Date Code *	
1st digit = Last number of Year	9 = 2009 0 = 2010 1 = 2011 2 = 2012 3 = 2013 4 = 2014
2nd and 3rd digit = Week of the Year	01 = 1st week of the Year to 52 = 52nd week of the Year

Date Code*		
Year	Month	
X = 2009	1 = Jan	7 = Jul
A = 2010	2 = Feb	8 = Aug
B = 2011	3 = Mar	9 = Spt
C = 2012	4 = Apr	O = Oct
D = 2013	5 = May	N = Nov
E = 2014	6 = Jun	D = Dec

Storage

Tantalum chip capacitors should be stored in normal working environments. While the chips 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 40ºC 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 chip stock should be used promptly, preferably within three years of receipt.

T510 Multiple Anode Low ESR MnO_2 Series

Overview

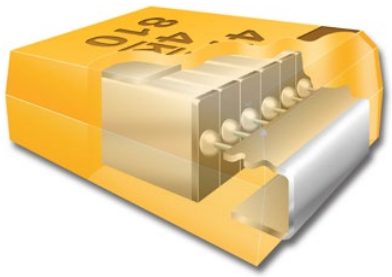
The low ESR, surge-robust T510 Series is designed for demanding applications that require high surge current and high ripple current capability. This series builds upon the proven capabilities of our industrial grade tantalum chip capacitors to offer several advantages such as low ESR, high ripple current capability, excellent capacitance stability, and improved resistance to high in-rush currents. These benefits are achieved though the utilization of multiple anodes as well as high-stress, low impedance electrical conditioning performed prior to screening.

Benefits

- Meets or exceeds EIA standard 535BAAC
- Taped and reeled per EIA 481–1
- High surge current capability
- Optional gold-plated terminations
- High ripple current capability
- 100% surge current test
- 100% steady-state accelerated aging
- Capacitance values of 10 µF to 1,000 µF
- Tolerances of ±10% and ±20%
- Voltage rating of 4 to 50 VDC
- Case sizes E and X
- ESR as low as 18 mΩ
- RoHS Compliant and lead-free terminations
- Operating temperature range of -55˚C to +125˚C

Applications

Typical applications include decoupling and filtering in industrial and automotive end applications, such as DC/DC converters, portable electronics, telecommunications, and control units requiring high ripple current capability.



Environmental Compliance

RoHS Compliant (6/6) according to Directive 2002/95/EC when ordered with 100% Sn solder.

RoHS Compliant

SPICE

For a detailed analysis of specific part numbers, please visit www.kemet.com for a free download of KEMET's SPICE software. The KEMET SPICE program is freeware intended to aid design engineers in analyzing the performance of these capacitors over frequency, temperature, ripple, and DC bias conditions.

Ordering Information

T	510	X	477	M	006	A	T	A030	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Failure Rate/ Design	Lead Material	ESR	Packaging (C-Spec)
T = Tantalum	Multiple Anode Low ESR	E, X	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	004 = 4 V 006 = 6.3 V 010 = 10 V 015 = 15 V 020 = 20 V 025 = 25 V 035 = 35 V 050 = 50 V	A = N/A	T = 100% Matte Tin (Sn) Plated* H = Standard Solder Coated (SnPb 5% Pb minimum) G = Gold Plated (A, B, C, D, X only)	A = ESR Last three digits specify ESR in mΩ (030 = 030 mΩ)	Blank = 7" Reel 7280 = 13" Reel

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 125°C
Rated Capacitance Range	10 – 1,000 µF @ 120 Hz/25°C
Capacitance Tolerance	K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	4 – 50 V
DF (120 Hz)	Refer to Part Number Electrical Specification Table
ESR (100 kHz)	Refer to Part Number Electrical Specification Table
Leakage Current	≤ 0.01 CV (µA) at rated voltage after 5 minutes

Qualification

Test	Condition		Characteristics			
Endurance	85°C @ rated voltage, 2,000 hours 125°C @ 2/3 rated voltage, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Storage Life	125°C @ 0 volts, 2,000 hours		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Thermal Shock	MIL–STD–202, Method 107, Condition B, mounted, -55C° to 125° C, 1,000 cycles		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within 1.25 x initial limit		
			ESR	Within initial limits		
Temperature Stability	Extreme temperature exposure at a succession of continuous steps at +25°C, -55°C, +25°C, +85°C, +125°C, +25°C			+25°C	-55°C	+85°C	+125°C
		Δ C/C		IL*	±10%	±10%	±20%
		DF		IL	IL	1.5 x IL	1.5 x IL
		DCL		IL	n/a	10 x IL	12 x IL
Surge Voltage	25°C and 85°C, 1.32 x rated voltage 1,000 cycles (125°C, 1.2 x rated voltage)		Δ C/C	Within ±5% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		
			ESR	Within initial limits		
Mechanical Shock/Vibration	MIL–STD–202, Method 213, Condition I, 100 G peak MIL–STD–202, Method 204, Condition D, 10 Hz to 2,000 Hz, 20 G peak		Δ C/C	Within ±10% of initial value		
			DF	Within initial limits		
			DCL	Within initial limits		

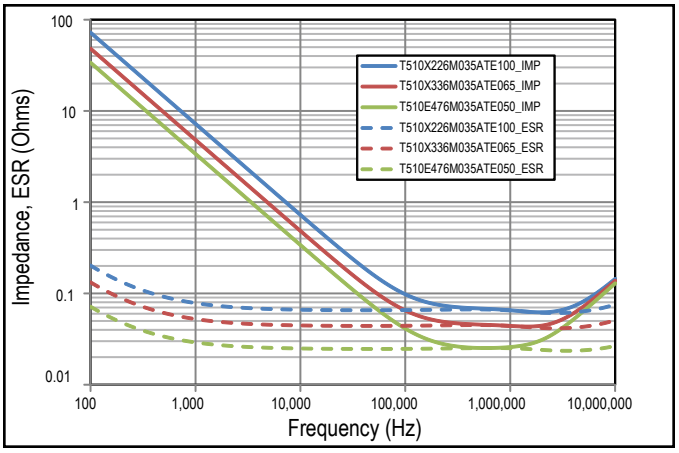
**IL = Initial limit*

Certification

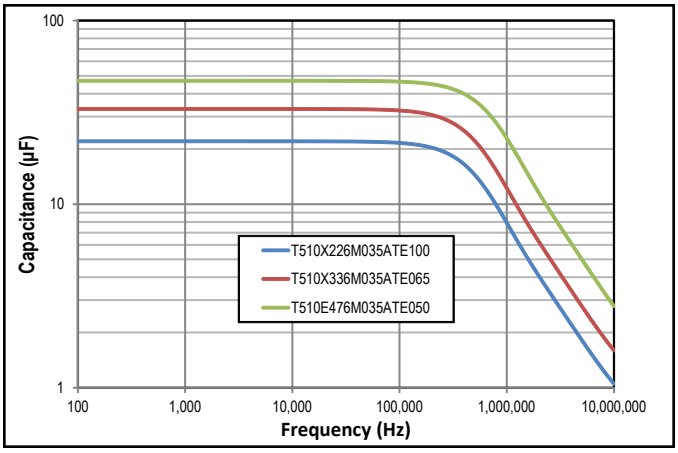
KEMET's Internal Qualification Plan for this Tantalum series of capacitors follows AEC–Q200 guidelines. Standard catalog part types ordered without a specific automotive designator, i.e., suffix AUTO or four digit customer specific designator (C-Spec), are not considered KEMET Automotive Grade tantalum capacitors.

Electrical Characteristics

Impedance, ESR vs. Frequency

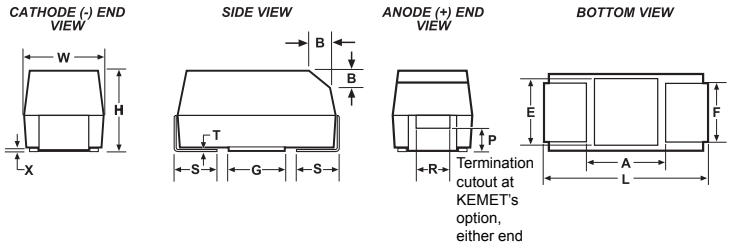


Capacitance vs. Frequency



Dimensions – Millimeters (Inches)

Metric will govern



Case Size		Component												
KEMET	EIA	L*	W*	H*	F* ±0.1 ±(.004)	S* ±0.3 ±(.012)	B* ±0.15 (Ref) ±.006	X (Ref)	P (Ref)	R (Ref)	T (Ref)	A (Min)	G (Ref)	E (Ref)
X	7343–43	7.3 ±0.3 (0.287 ±0.012)	4.3 ±0.3 (0.169 ±0.012)	4.0 ±0.3 (0.157 ±0.012)	2.4 (.094)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	1.7 (.067)	1.0 (.039)	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)
E	7360–38	7.3 ±0.3 (0.287 ±0.012)	6.0±0.3 (0.236 ±0.012)	3.6 ±0.2 (0.142 ±0.008)	4.1 (.161)	1.3 (.051)	0.5 (.020)	0.10 ± 0.10 (.004 ± .004)	n/a	n/a	0.13 (.005)	3.8 (.150)	3.5 (.138)	3.5 (.138)

Notes: (Ref) – Dimensions provided for reference only. No dimensions are provided for B, P or R because low profile cases do not have a bevel or a notch.
** MIL–PRF–55365/8 specified dimensions*

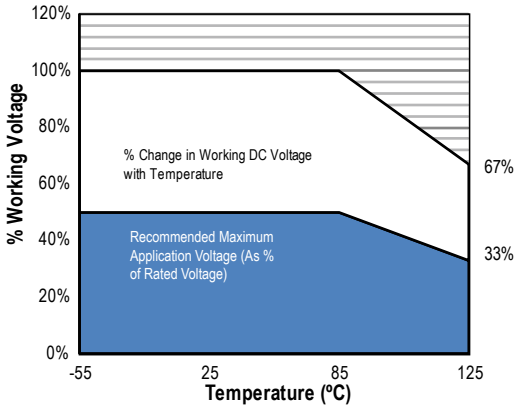
Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
4	680	X/7343-43	T510X687(1)004A(2)A030	27.2	6.0	30	3000	2700	1200	1
4	1000	X/7343-43	T510X108(1)004A(2)A035	40.0	6.0	35	2777	2499	1111	1
4	1000	E/7360-38	T510E108(1)004A(2)A018	40.0	6.0	18	3979	3581	1592	1
6.3	470	X/7343-43	T510X477(1)006A(2)A030	29.6	6.0	30	3000	2700	1200	1
6.3	680	X/7343-43	T510X687(1)006A(2)A023	42.8	6.0	23	3426	3083	1370	1
6.3	680	E/7360-38	T510E687(1)006A(2)A023	42.8	6.0	23	3520	3168	1408	1
10	330	X/7343-43	T510X337(1)010A(2)A035	33.0	6.0	35	2777	2499	1111	1
16	150	X/7343-43	T510X157(1)016A(2)A040	24.0	6.0	40	2598	2338	1039	1
16	220	X/7343-43	T510X227(1)016A(2)A040	35.2	10.0	40	2598	2338	1039	1
20	100	X/7343-43	T510X107(1)020A(2)A035	20.0	8.0	35	2777	2499	1111	1
20	100	X/7343-43	T510X107(1)020A(2)A040	20.0	6.0	40	2598	2338	1039	1
20	100	X/7343-43	T510X107(1)020A(2)A045	20.0	6.0	45	2449	2204	980	1
25	68	X/7343-43	T510X686(1)025A(2)A045	17.0	8.0	45	2449	2204	980	1
25	100	E/7360-38	T510E107(1)025A(2)A050	25.0	8.0	50	2387	2148	955	1
35	22	X/7343-43	T510X226(1)035A(2)A100	7.7	6.0	100	1643	1479	657	1
35	22	X/7343-43	T510X226(1)035A(2)A080	7.7	6.0	80	1837	1653	735	1
35	22	X/7343-43	T510X226(1)035A(2)A060	7.7	6.0	60	2121	1909	848	1
35	33	X/7343-43	T510X336(1)035A(2)A065	11.6	6.0	65	2038	1834	815	1
35	47	X/7343-43	T510X476(1)035A(2)A055	16.5	8.0	55	2216	1994	886	1
35	47	X/7343-43	T510X476(1)035A(2)A065	16.5	8.0	65	2038	1834	815	1
35	47	E/7360-38	T510E476(1)035A(2)A050	16.5	8.0	50	2387	2148	955	1
50	10	X/7343-43	T510X106(1)050A(2)A120	5.0	8.0	120	1500	1350	600	1
50	22	X/7343-43	T510X226(1)050A(2)A100	11.0	8.0	100	1643	1479	657	1
VDC	µF	KEMET/EIA	(See below for part options)	µAmps +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ 20°C 100 kHz Max	(mA) 100 kHz 25°C	(mA) 100 kHz +85°C	(mA) 100 kHz +125°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current			Moisture Sensitivity

(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, G = Gold Plated, H = Standard Solder coated (SnPb 5% Pb minimum), N = Non-Magnetic 100% Tin (Sn), M = Non-Magnetic (SnPb). 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.

Recommended Voltage Derating Guidelines

	-55°C to 85°C	85°C to 125°C
% Change in Working DC Voltage with Temperature	V_R	67% of V_R
Recommended Maximum Application Voltage	50% of V_R	33% 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 which 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. See the Reverse Voltage section for allowable limits.

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

KEMET Series and Case Code	EIA Case Code	Maximum Power Dissipation (P max) mWatts @ 25°C w/+20°C Rise
A	3216–18	75
B	3528–21	85
C	6032–28	110
D	7343–31	150
X	7343–43	165
E	7360–38	200
S	3216–12	60
T	3528–12	70
U	6032–15	90
V	7343–20	125
T510X	7343–43	270
T510E	7360–38	285

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

Temperature Compensation Multipliers for Maximum Power Dissipation		
≤ 25°C	85°C	125°C
1.00	0.90	0.40

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)

Reverse Voltage

Solid tantalum capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. The positive terminal is identified on the capacitor body by a stripe plus in some cases a beveled edge. A small degree of transient reverse voltage is permissible for short periods per the table. The capacitors should not be operated continuously in reverse mode, even within these limits.

Temperature	Permissible Transient Reverse Voltage
25°C	15% of Rated Voltage
85°C	5% of Rated Voltage
125°C	1% of Rated Voltage

Table 2 – Land Dimensions/Courtyard

KEMET	Metric Size Code	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B: Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
Case	EIA	W	L	S	V1	V2	W	L	S	V1	V2	W	L	S	V1	V2
A	3216–18	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
B	3528–21	2.35	2.21	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
C	6032–25	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
D	7343–31	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
L	6032-19	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
M	3528-15	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
H	7360-20	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
E[1]	7360–38	4.25	2.77	3.67	10.22	7.30	4.13	2.37	3.87	9.12	6.80	4.03	1.99	4.03	8.26	6.54
Q	7343-12	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
R[2]	2012-12	1.05	1.83	0.15	4.82	2.50	0.93	1.50	0.22	3.72	2.00	0.83	1.12	0.38	2.86	1.74
S[2]	3216–12	1.35	2.20	0.62	6.02	2.80	1.23	1.80	0.82	4.92	2.30	1.13	1.42	0.98	4.06	2.04
T	3528–12	2.35	2.20	0.92	6.32	4.00	2.23	1.80	1.12	5.22	3.50	2.13	1.42	1.28	4.36	3.24
U	6032–15	2.35	2.77	2.37	8.92	4.50	2.23	2.37	2.57	7.82	4.00	2.13	1.99	2.73	6.96	3.74
V	7343–20	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
W	7343–15	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
X[1]	7343–43	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84
Y[1]	7343–40	2.55	2.77	3.67	10.22	5.60	2.43	2.37	3.87	9.12	5.10	2.33	1.99	4.03	8.26	4.84

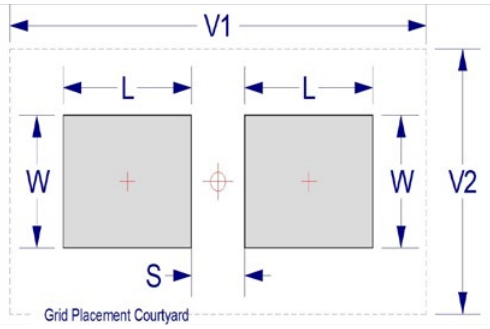
Density Level A: *For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes.*

Density Level B: *For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.*

Density Level C: *For high component desity product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC standard 7351 (IPC–7351).*

[1] Height of these chips may create problems in wave soldering.

[2] Land pattern geometry is too small for silkscreen outline.



Soldering Process

KEMET's families of surface mount capacitors are compatible with wave (single or dual), convection, IR, or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J–STD–020D standard for moisture sensitivity testing. The devices can safely withstand a maximum of three reflow passes at these conditions.

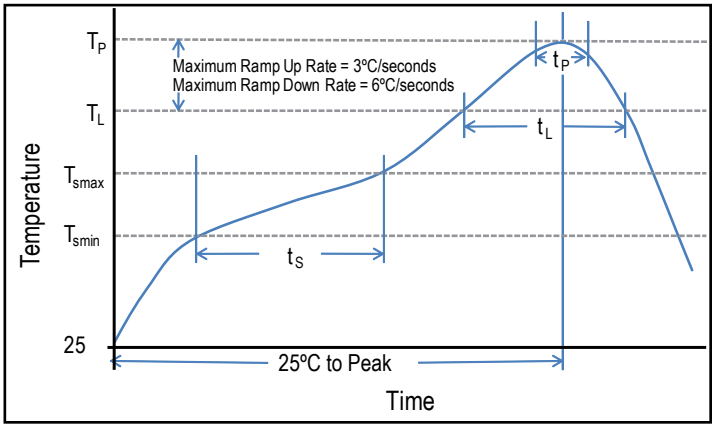
Please note that although the X/7343–43 case size can withstand wave soldering, the tall profile (4.3 mm maximum) dictates care in wave process development.

Hand soldering should be performed with care due to the difficulty in process control. If performed, care should be taken to avoid contact of the soldering iron to the molded case. The iron should be used to heat the solder pad, applying solder between the pad and the termination, until reflow occurs. Once reflow occurs, the iron should be removed immediately. "Wiping" the edges of a chip and heating the top surface is not recommended.

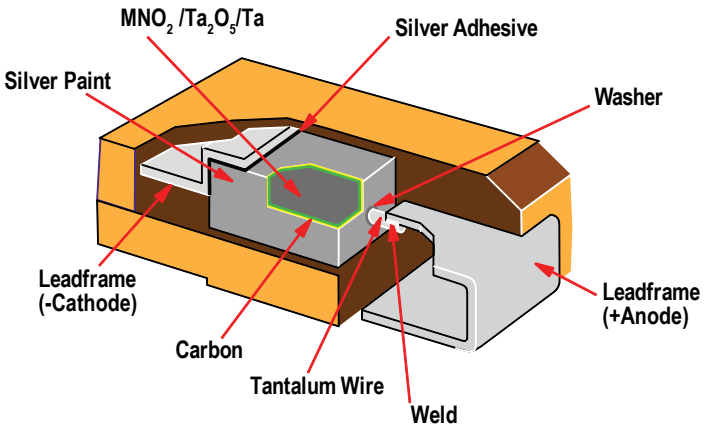
During typical reflow operations, a slight darkening of the gold-colored epoxy may be observed. This slight darkening is normal and not harmful to the product. Marking permanency is not affected by this change.

Profile Feature	SnPb Assembly	Pb-Free Assembly
Preheat/Soak		
Temperature Minimum (T_{Smin})	100°C	150°C
Temperature Maximum (T_{Smax})	150°C	200°C
Time (t_s) from T_{smin} to T_{smax})	60 – 120 seconds	60 – 120 seconds
Ramp-up Rate (T_L to T_P)	3°C/seconds maximum	3°C/seconds maximum
Liquidous Temperature (T_L)	183°C	217°C
Time Above Liquidous (t_L)	60 – 150 seconds	60 – 150 seconds
Peak Temperature (T_P)	220°C* 235°C**	250°C* 260°C**
Time within 5°C of Maximum Peak Temperature (t_P)	20 seconds maximum	30 seconds maximum
Ramp-down Rate (T_P to T_L)	6°C/seconds maximum	6°C/seconds maximum
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum

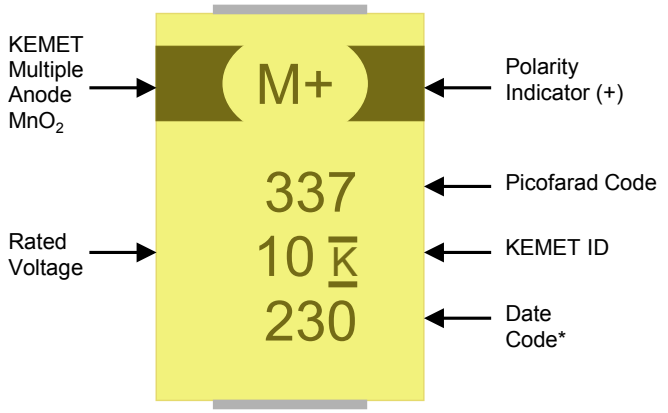
Note: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.
**Case Size D, E, P, Y, and X*
***Case Size A, B, C, H, I, K, M, R, S, T, U, V, W, and Z*



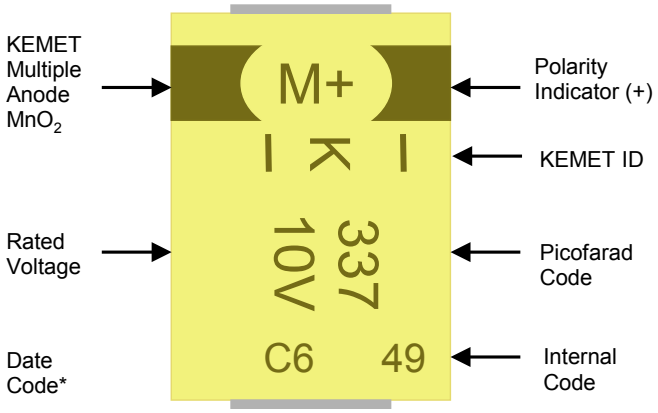
Construction



Capacitor Marking



* 230 = 30th week of 2012



Date Code *	
1st digit = Last number of Year	9 = 2009 0 = 2010 1 = 2011 2 = 2012 3 = 2013 4 = 2014
2nd and 3rd digit = Week of the Year	01 = 1st week of the Year to 52 = 52nd week of the Year

Date Code*		
Year	Month	
X = 2009	1 = Jan	7 = Jul
A = 2010	2 = Feb	8 = Aug
B = 2011	3 = Mar	9 = Spt
C = 2012	4 = Apr	O = Oct
D = 2013	5 = May	N = Nov
E = 2014	6 = Jun	D = Dec

Storage

Tantalum chip capacitors should be stored in normal working environments. While the chips 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 chip stock should be used promptly, preferably within three years of receipt.

Tape & Reel Packaging Information

KEMET's molded tantalum and aluminum chip capacitor families are packaged in 8 and 12 mm plastic tape on 7" and 13" reels in accordance with *EIA Standard 481–1*: Embossed Carrier Taping of Surface Mount Components for Automatic Handling. This packaging system is compatible with all tape-fed automatic pick-and-place systems.

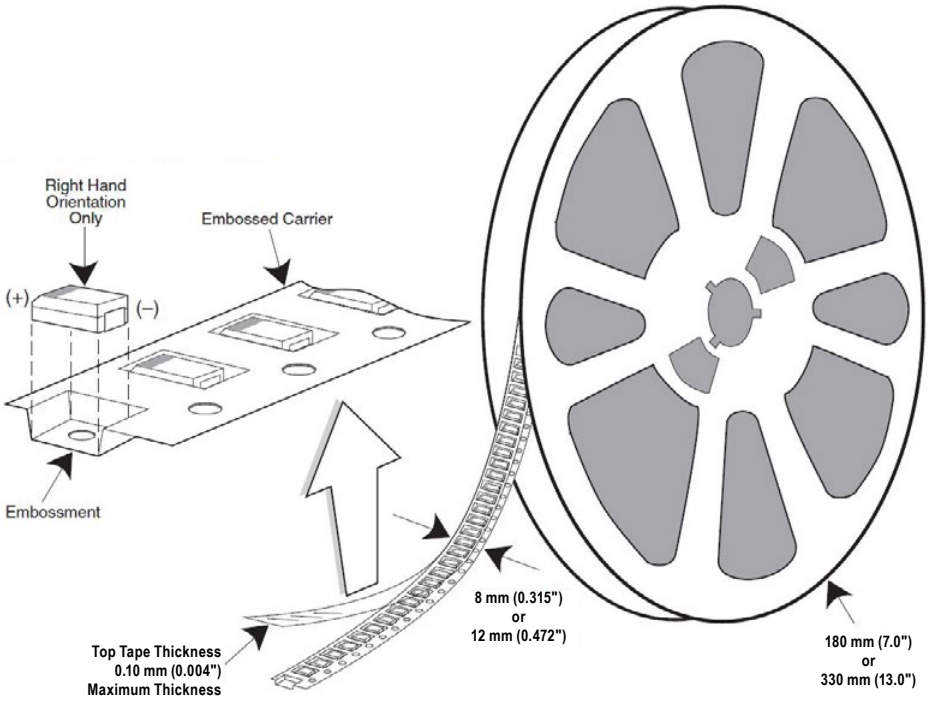


Table 3 – Packaging Quantity

Case Code		Tape Width (mm)	7" Reel*	13" Reel*
KEMET	EIA			
I	3216-10	8	3,000	12,000
S	3216-12	8	2,500	10,000
T	3528-12	8	2,500	10,000
M	3528-15	8	2,000	8,000
U	6032-15	12	1,000	5,000
L	6032-19	12	1,000	5,000
W	7343-15	12	1,000	3,000
Z	7343-17	12	1,000	3,000
V	7343-20	12	1,000	3,000
A	3216-18	8	2,000	9,000
B	3528-21	8	2,000	8,000
C	6032-28	12	500	3,000
D	7343-31	12	500	2,500
Y	7343-40	12	500	2,000
X	7343-43	12	500	2,000
E/T428P	7360-38	12	500	2,000
H	7360-20	12	1,000	2,500

** No C-Spec required for 7" reel packaging. C-7280 required for 13" reel packaging.*

Figure 1 – Embossed (Plastic) Carrier Tape Dimensions

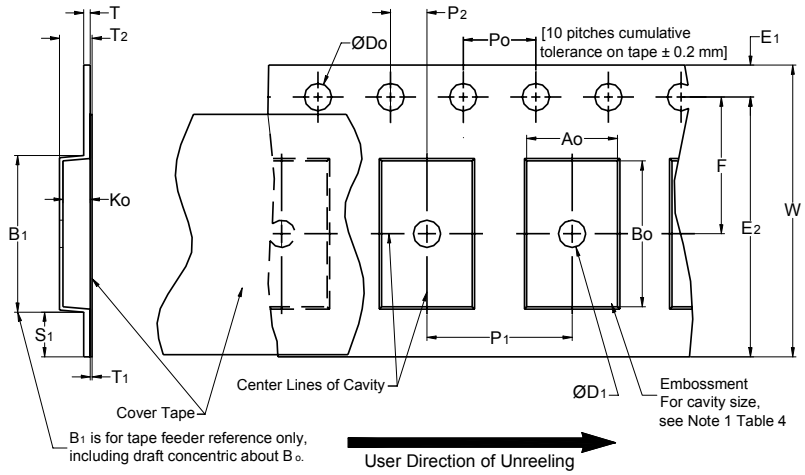


Table 4 – Embossed (Plastic) Carrier Tape Dimensions

Metric will govern

Constant Dimensions — Millimeters (Inches)									
Tape Size	D_0	D_1 Minimum Note 1	E_1	P_0	P_2	R Reference Note 2	S_1 Minimum Note 3	T Maximum	T_1 Maximum
8 mm	1.5 +0.10/-0.0 (0.059 +0.004/-0.0)	1.0 (0.039)	1.75 ±0.10 (0.069 ±0.004)	4.0 ±0.10 (0.157 ±0.004)	2.0 ±0.05 (0.079 ±0.002)	25.0 (0.984)	0.600 (0.024)	0.600 (0.024)	0.100 (0.004)
12 mm		1.5 (0.059)				30 (1.181)			
16 mm									

Variable Dimensions — Millimeters (Inches)								
Tape Size	Pitch	B_1 Maximum Note 4	E_2 Minimum	F	P_1	T_2 Maximum	W Maximum	A_0,B_0 & K_0
8 mm	Single (4 mm)	4.35 (0.171)	6.25 (0.246)	3.5 ±0.05 (0.138 ±0.002)	4.0 ±0.10 (0.157 ±0.004)	2.5 (0.098)	8.3 (0.327)	Note 5
12 mm	Single (4 mm) & Double (8 mm)	8.2 (0.323)	10.25 (0.404)	5.5 ±0.05 (0.217 ±0.002)	8.0 ±0.10 (0.315 ±0.004)	4.6 (0.181)	12.3 (0.484)	
16 mm	Triple (12 mm)	12.1 (0.476)	14.25 (0.561)	5.5 ±0.05 (0.217 ±0.002)	8.0 ±0.10 (0.315 ±0.004)	4.6 (0.181)	16.3 (0.642)	

1. The embossment hole location shall be measured from the sprocket hole controlling the location of the embossment. Dimensions of embossment location and hole location shall be applied independent of each other.

2. The tape, with or without components, shall pass around R without damage (see Figure 5).

3. If S_1 < 1.0 mm, there may not be enough area for cover tape to be properly applied (see EIA Standard 481–D, paragraph 4.3, section b).

4. B_1 dimension is a reference dimension for tape feeder clearance only.

5. The cavity defined by A_0, B_0 and K_0 shall surround the component with sufficient clearance that:

(a) the component does not protrude above the top surface of the carrier tape.

(b) the component can be removed from the cavity in a vertical direction without mechanical restriction, after the top cover tape has been removed.

(c) rotation of the component is limited to 20° maximum for 8 and 12 mm tapes and 10° maximum for 16 mm tapes (see Figure 2).

(d) lateral movement of the component is restricted to 0.5 mm maximum for 8 mm and 12 mm wide tape and to 1.0 mm maximum for 16 mm tape (see Figure 3).

(e) see Addendum in EIA Standard 481–D for standards relating to more precise taping requirements.

Packaging Information Performance Notes

1. Cover Tape Break Force: 1.0 Kg minimum.
2. Cover Tape Peel Strength: The total peel strength of the cover tape from the carrier tape shall be:

Tape Width	Peel Strength
8 mm	0.1 to 1.0 Newton (10 to 100 gf)
12 and 16 mm	0.1 to 1.3 Newton (10 to 130 gf)

The direction of the pull shall be opposite the direction of the carrier tape travel. The pull angle of the carrier tape shall be 165° to 180° from the plane of the carrier tape. During peeling, the carrier and/or cover tape shall be pulled at a velocity of 300 ±10 mm/minute.
3. Labeling: Bar code labeling (standard or custom) shall be on the side of the reel opposite the sprocket holes. *Refer to EIA Standards 556 and 624.*

Figure 2 – Maximum Component Rotation

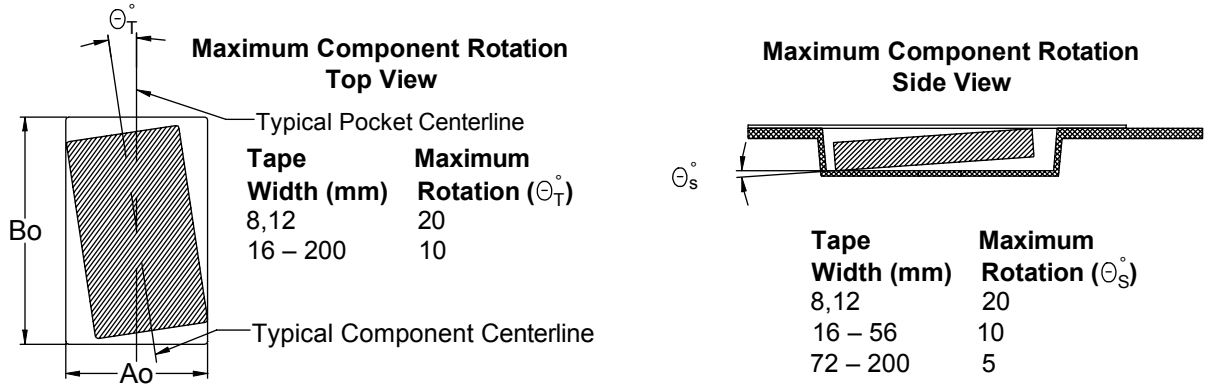


Figure 3 – Maximum Lateral Movement

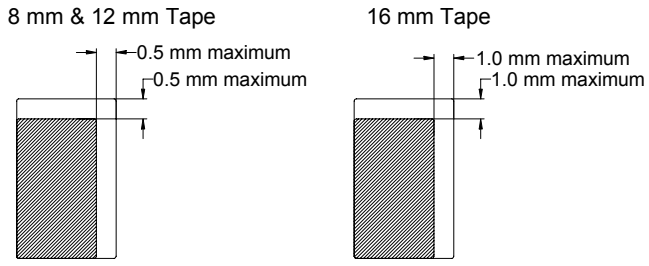


Figure 4 – Bending Radius

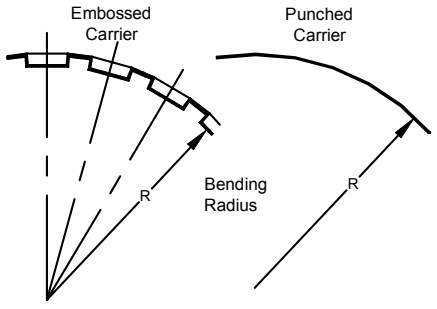
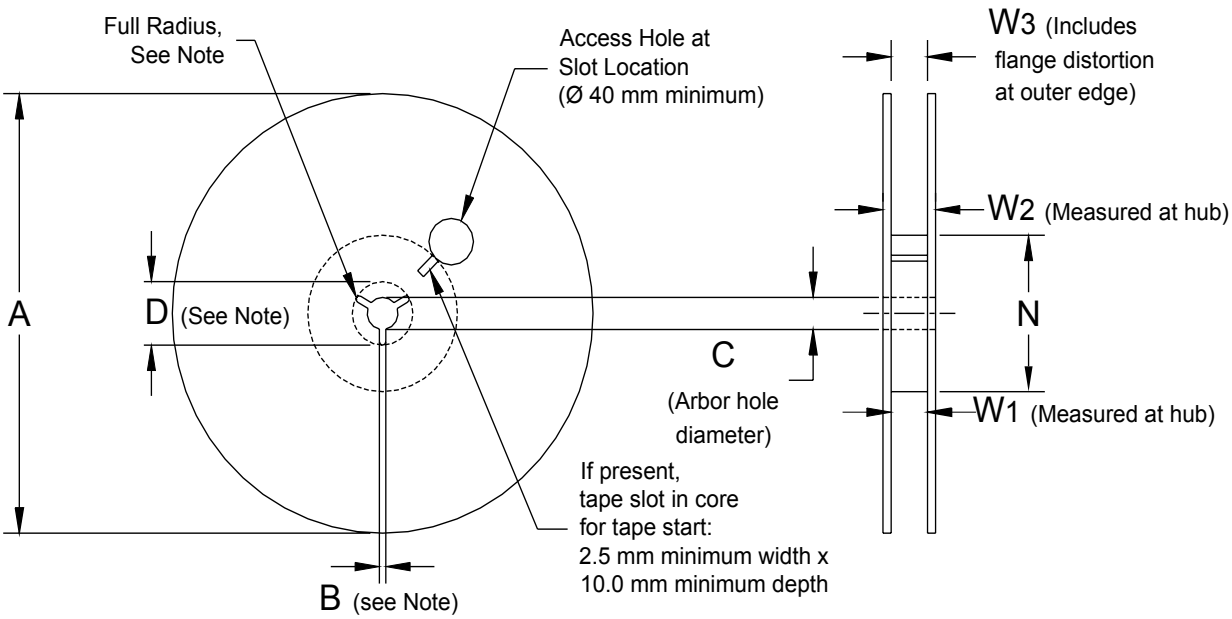


Figure 5 – Reel Dimensions



Note: Drive spokes optional; if used, dimensions B and D shall apply.

Table 5 – Reel Dimensions

Metric will govern

Constant Dimensions — Millimeters (Inches)				
Tape Size	A	B Minimum	C	D Minimum
8 mm	178 ±0.20 (7.008 ±0.008) or 330 ±0.20 (13.000 ±0.008)	1.5 (0.059)	13.0 +0.5/-0.2 (0.521 +0.02/-0.008)	20.2 (0.795)
12 mm				
16 mm				

Variable Dimensions — Millimeters (Inches)				
Tape Size	N Minimum	W_1	W_2 Maximum	W_3
8 mm	50 (1.969)	8.4 +1.5/-0.0 (0.331 +0.059/-0.0)	14.4 (0.567)	Shall accommodate tape width without interference
12 mm		12.4 +2.0/-0.0 (0.488 +0.078/-0.0)	18.4 (0.724)	
16 mm		16.4 +2.0/-0.0 (0.646 +0.078/-0.0)	22.4 (0.882)	

Figure 6 – Tape Leader & Trailer Dimensions

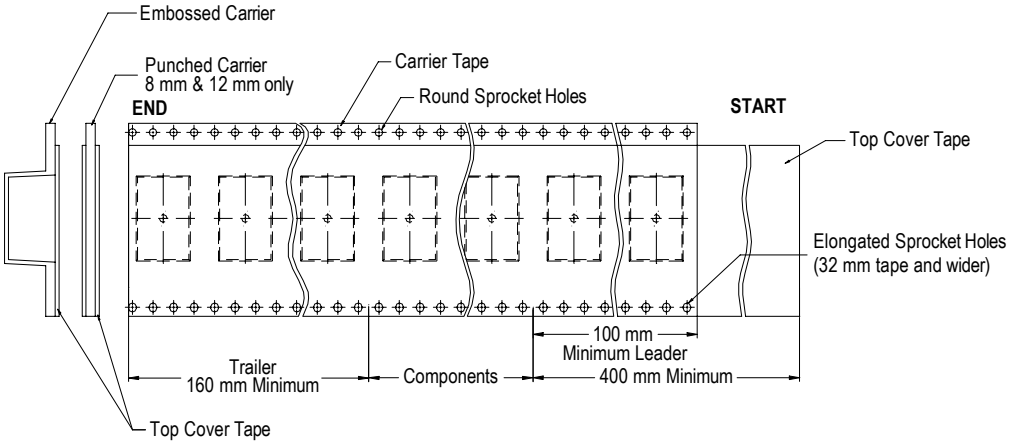
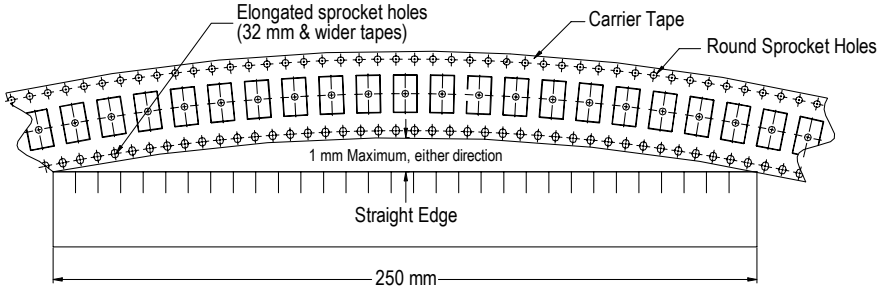


Figure 7 – Maximum Camber



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