T510 Series Automotive Grade Multiple Anode Low ESR MnO, KEN



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. This series is classified as MSL (Moisture Sensitivity Level) 1 under J STD 020: unlimited floor life time at ≤30°C/85% RH.

Benefits

- Complies with AEC-Q200
- Meets or exceeds EIA standard 535BAAC
- Taped and reeled per EIA 481
- · 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 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 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.

T2055 T510 AUTO • 7/15/2015



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

Т	510	X	477	M	006	Α	T	A030	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VDC)	Failure Rate/ Design	Termination Finish	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 = 4 006 = 6.3 010 = 10 015 = 15 020 = 20 025 = 25 035 = 35 050 = 50	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 = AUTO grade product 030 = Maximum ESR in $m\Omega$ at room temperature (30 $m\Omega$)	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			Charact	teristics			
			Δ C/C	Within ±10% of initial value				
Endurance	85°C @ rated voltage, 2,000 hours		DF	Within initial limits				
Endurance	125°C @ 2/3 rated voltage, 2,000 hours		DCL	Within 1.25	cinitial limit			
		ESR	Within initial	limits				
			Δ C/C	Within ±10%	of initial value			
Ctorogo Life	125°C @ 0 volto 2 000 hours		DF	Within initial	limits			
Storage Life	125°C @ 0 volts, 2,000 hours		DCL	Within 1.25	cinitial limit			
			ESR	Within initial	limits			
Thermal Shock			Δ C/C	Within ±5% of initial value				
	MIL-STD-202, Method 107, Condition B, moun	DF	Within initial limits					
Thermal Shock	125° C, 1,000 cycles	DCL	Within 1.25	cinitial limit				
			ESR	Within initial limits				
			+25°C	-55°C	+85°C	+125°C		
Temperature Stability	Extreme temperature exposure at a succession of continuous steps at +25°C,	Δ C/C	IL*	±10%	±10%	±20%		
Temperature Stability	-55°C, +25°C, +85°C, +125°C, +25°C	DF	IL	IL	1.5 x IL	1.5 x IL		
		DCL	IL	n/a	10 x IL	12 x IL		
			Δ C/C	Δ C/C Within ±5% of initial value				
Surge Voltage	85°C, 1.32 x rated voltage 1,000 cycles		DF	Within initial limits Within initial limits				
Surge voltage	(125°C, 1.2 x rated voltage)		DCL					
			ESR	Within initial limits				
	MIL-STD-202, Method 213, Condition I, 100 G	peak	Δ C/C	Within ±10%	of initial value			
Mechanical Shock/Vibration	MIL-STD-202, Method 204, Condition D, 10 Hz		DF	Within initial	Within initial limits			
	20 G peak		DCL	Within initial	Within initial limits			

^{*}IL = Initial limit

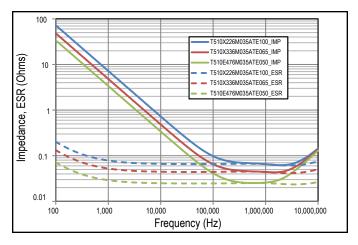
Certification

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.

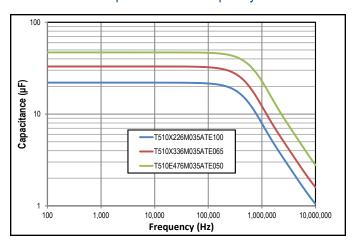


Electrical Characteristics

Impedance, ESR vs. Frequency

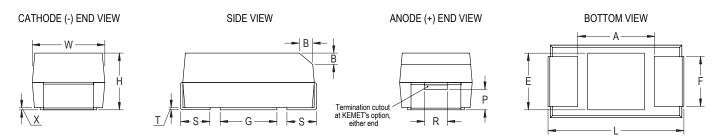


Capacitance vs. Frequency



Dimensions – Millimeters (Inches)

Metric will govern



Case	Size	Component												
KEMET	EIA	L	W	Н	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)
Х	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)
		72.02	00.00	3.6 ±0.2 (0.142 ±0.008)		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.



Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR		mum Allo pple Curr		Maximum Operating Temp	MSL
VDC @ 85°C	μF	KEMET/EIA	(See below for part options)	μΑ @ +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ +20°C 100 kHz Max	mA @ +25°C 100 kHz	mA @ +85°C 100 kHz	mA @ +125°C 100 kHz	°C	Reflow Temp ≤ 260°C
4	680	X/7343-43	T510X687(1)004A(2)A030	27.2	6.0	30	3000	2700	1200	125	1
4	1000	X/7343-43	T510X108(1)004A(2)A035	40.0	6.0	35	2777	2499	1111	125	1
4	1000	E/7360-38	T510E108(1)004A(2)A018	40.0	6.0	18	3979	3581	1592	125	1
6.3	470	X/7343-43	T510X477(1)006A(2)A030	29.6	6.0	30	3000	2700	1200	125	1
6.3	680	X/7343-43	T510X687(1)006A(2)A023	42.8	6.0	23	3426	3083	1370	125	1
6.3	680	E/7360-38	T510E687(1)006A(2)A023	42.8	6.0	23	3520	3168	1408	125	1
10	330	X/7343-43	T510X337(1)010A(2)A035	33.0	6.0	35	2777	2499	1111	125	1
16	150	X/7343-43	T510X157(1)016A(2)A040	24.0	6.0	40	2598	2338	1039	125	1
16	220	X/7343-43	T510X227(1)016A(2)A040	35.2	10.0	40	2598	2338	1039	125	1
20	100	X/7343-43	T510X107(1)020A(2)A035	20.0	8.0	35	2777	2499	1111	125	1
20	100	X/7343-43	T510X107(1)020A(2)A040	20.0	6.0	40	2598	2338	1039	125	1
20	100	X/7343-43	T510X107(1)020A(2)A045	20.0	6.0	45	2449	2204	980	125	1
25	68	X/7343-43	T510X686(1)025A(2)A045	17.0	8.0	45	2449	2204	980	125	1
25	100	E/7360-38	T510E107(1)025A(2)A050	25.0	8.0	50	2387	2148	955	125	1
35	22	X/7343-43	T510X226(1)035A(2)A100	7.7	6.0	100	1643	1479	657	125	1
35	22	X/7343-43	T510X226(1)035A(2)A080	7.7	6.0	80	1837	1653	735	125	1
35	22	X/7343-43	T510X226(1)035A(2)A060	7.7	6.0	60	2121	1909	848	125	1
35	33	X/7343-43	T510X336(1)035A(2)A065	11.6	6.0	65	2038	1834	815	125	1
35	47	X/7343-43	T510X476(1)035A(2)A055	16.5	8.0	55	2216	1994	886	125	1
35	47	X/7343-43	T510X476(1)035A(2)A065	16.5	8.0	65	2038	1834	815	125	1
35	47	E/7360-38	T510E476(1)035A(2)A050	16.5	8.0	50	2387	2148	955	125	1
50	10	X/7343-43	T510X106(1)050A(2)A090	5.0	8.0	90	1732	1559	693	125	1
50	10	X/7343-43	T510X106(1)050A(2)A120	5.0	8.0	120	1500	1350	600	125	1
50	22	X/7343-43	T510X226(1)050A(2)A100	11.0	8.0	100	1643	1479	657	125	1
VDC @ 85°C	μF	KEMET/EIA	(See below for part options)	μΑ @ +20°C Max/5 Min	% @ +20°C 120 Hz Max	mΩ @ +20°C 100 kHz Max	mA @ +25°C 100 kHz	mA @ +85°C 100 kHz	mA @ +125°C 100 kHz	°C	Reflow Temp ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR		ximum Allow Ripple Curre		Maximum Operating Temp	MSL

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

Refer to Ordering Information for additional detail.

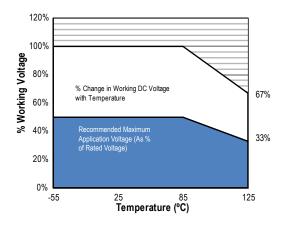
Higher voltage ratings and tighter tolerance product including ESR may be substituted within the same size at KEMET's option. Voltage substitution will be marked with the higher voltage rating. Substitutions can include better than series.

⁽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 (SnPb). Designates Termination Finish.



Recommended Voltage Derating Guidelines

	-55°C to 85°C	85°C to 125°C
% Change in Working DC Voltage with Temperature		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.

· · · · · · · · · · · · · · · · · · ·	Temperature Compensation Multipliers for Maximum Ripple Current							
T ≤ 25°C	T ≤ 85°C	T ≤ 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) R = ESR at specified frequency (ohms)
Z = Impedance at specified frequency (ohms)

P max = maximum power dissipation (watts)

KEMET Series and Case Code	EIA Case Code	Maximum Power Dissipation (P max) mWatts @ 25°C w/+20°C Rise
Α	3216–18	75
В	3528–21	85
С	6032–28	110
D	7343–31	150
Х	7343–43	165
Е	7360–38	200
S	3216–12	60
Т	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.



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.

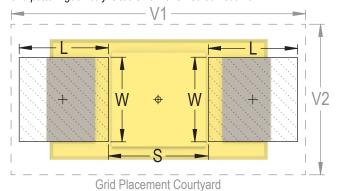
Temperature	Permissible Transient Reverse Voltage
25°C	15% of Rated Voltage
85°C	5% of Rated Voltage
125°C	1% of Rated Voltage

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
E¹	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
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

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).

² Land pattern geometry is too small for silkscreen outline.



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



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.

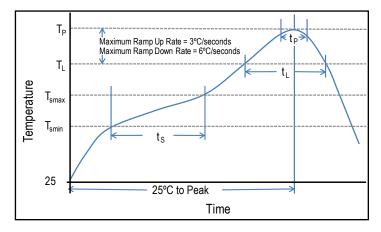
During typical reflow operations, a slight darkening of the gold-colored epoxy may be observed. This slight darkening is normal and not harmful to the product. Marking permanency is not affected by this change.

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

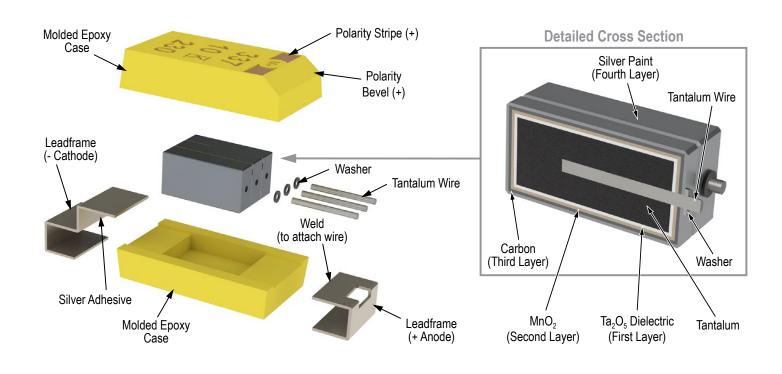


Storage

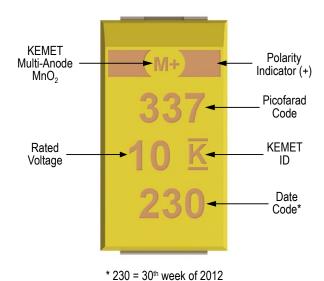
Tantalum chip capacitors should be stored in normal working environments. While the chips themselves are quite robust in other environments, solderability will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage. In addition, packaging materials will 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.



Construction



Capacitor Marking



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



Tape & Reel Packaging Information

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

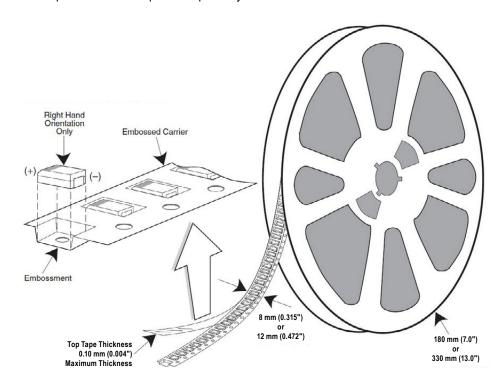


Table 3 – Packaging Quantity

Case Code		Tape Width (mm)	7" Reel*	13" Reel*	
KEMET	EIA				
S	3216-12	8	2,500	10,000	
Т	3528-12	8	2,500	10,000	
М	3528-15	8	2,000	8,000	
U	6032-15	12	1,000	5,000	
L	6032-19	12	1,000	3,000	
W	7343-15	12	1,000	3,000	
Z	7343-17	12	1,000	3,000	
V	7343-20	12	1,000	3,000	
Α	3216-18	8	2,000	9,000	
В	3528-21	8	2,000	8,000	
С	6032-28	12	500	3,000	
D	7343-31	12	500	2,500	
Q	7343-12	12	1,000	3,000	
Y	7343-40	12	500	2,000	
Х	7343-43	12	500	2,000	
E/T428P	7360-38	12	500	2,000	
Н	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

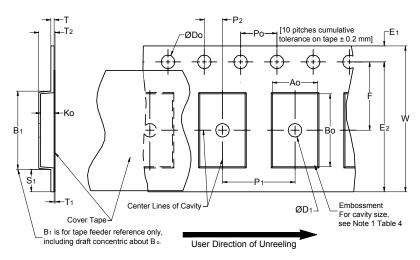


Table 4 – Embossed (Plastic) Carrier Tape Dimensions

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		1.0 (0.039)			2.0 ±0.05	25.0 (0.984)			
12 mm	1.5 +0.10/-0.0 (0.059 +0.004/-0.0)	1.5	1.75 ±0.10 (0.069 ±0.004)	4.0 ±0.10 (0.157 ±0.004)	(0.079 ±0.002)	30	0.600 (0.024)	0.600 (0.024)	0.100 (0.004)
16 mm	(3.2.2.2.2.00 // 0.0)	(0.059)	(31232 20100 1)	(3.1.31 20.00 1)	2.0 ±0.1 (0.079 ±0.059)	(1.181)	(3:32:)	(3:32:)	

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)	2.0 ±0.05 or 4.0 ±0.10 (0.079 ±0.002 or 0.157 ±0.004)	2.5 (0.098)	8.3 (0.327)	
12 mm	Single (4 mm) & Double (8 mm)	8.2 (0.323)	10.25 (0.404)	5.5 ±0.05 (0.217 ±0.002)	2.0 ±0.05 (0.079 ±0.002) or 4.0 ±0.10 (0.157 ±0.004) or 8.0 ±0.10 (0.315 ±0.004)	4.6 (0.181)	12.3 (0.484)	Note 5
16 mm	Triple (12 mm)	12.1 (0.476)	14.25 (0.561)	7.5±0.10 (0.295 ±0.004)	4.0 ±0.10 (0.157 ±0.004) to 12.0 ±0.10 (0.472 ±0.004)	8.0 (0.315)	16.3 (0.642)	

- 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 4).
- 3. If S₁ < 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, 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

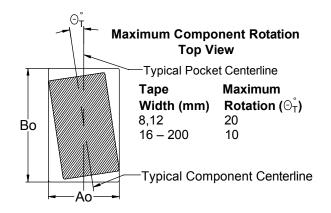
- 1. Cover Tape Break Force: 1.0 Kg minimum.
- 2. Cover Tape Peel Strength: The total peel strength of the cover tape from the carrier tape shall be:

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



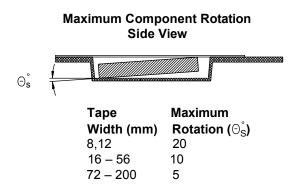


Figure 3 – Maximum Lateral Movement

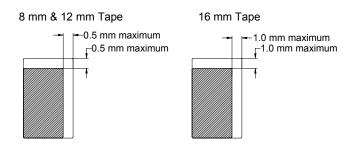


Figure 4 – Bending Radius

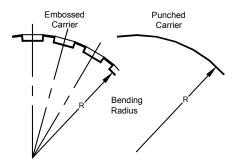
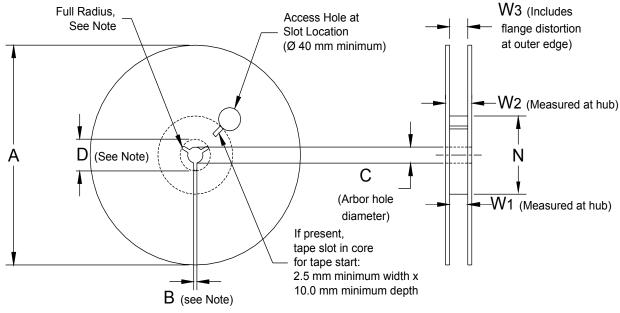




Figure 5 – Reel Dimensions



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)		13.0 +0.5/-0.2 (0.521 +0.02/-0.008)	20.2 (0.795)					
12 mm	or	1.5 (0.059)							
16 mm	330 ±0.20 (13.000 ±0.008)	,	,						
	Variable Dimensions — Millimeters (Inches)								
Tape Size	N Minimum	W_1	W ₂ Maximum	W_3					
8 mm		8.4 +1.5/-0.0 (0.331 +0.059/-0.0)	14.4 (0.567)						
12 mm	50 (1.969)	12.4 +2.0/-0.0 (0.488 +0.078/-0.0)	18.4 (0.724)	Shall accommodate tape width without interference					
16 mm	. ,	16.4 +2.0/-0.0 (0.646 +0.078/-0.0)	22.4 (0.882)						



Figure 6 – Tape Leader & Trailer Dimensions

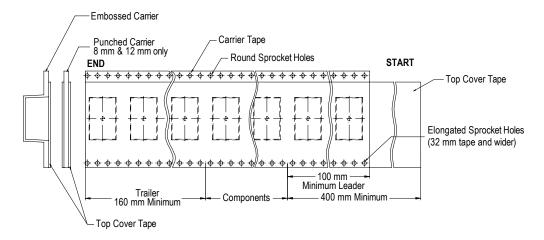
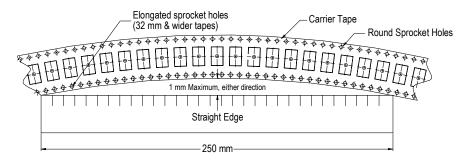


Figure 7 – Maximum Camber





KEMET Corporation World Headquarters

2835 KEMET Way Simpsonville, SC 29681

Mailing Address: P.O. Box 5928 Greenville, SC 29606

www.kemet.com Tel: 864-963-6300 Fax: 864-963-6521

Corporate Offices Fort Lauderdale, FL Tel: 954-766-2800

North America

Southeast

Lake Mary, FL Tel: 407-855-8886

Northeast

Wilmington, MA Tel: 978-658-1663

Central

Novi, MI

Tel: 248-994-1030

West

Milpitas, CA Tel: 408-433-9950

Mexico

Guadalajara, Jalisco Tel: 52-33-3123-2141

Europe

Southern Europe Sasso Marconi, Italy Tel: 39-051-939111

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Central Europe Landsberg, Germany Tel: 49-8191-3350800

Kamen, Germany Tel: 49-2307-438110

Northern Europe

Wyboston, United Kingdom Tel: 44-1480-273082

Espoo, Finland Tel: 358-9-5406-5000

Asia

Northeast Asia

Hong Kong Tel: 852-2305-1168

Shenzhen, China Tel: 86-755-2518-1306

Beijing, China

Tel: 86-10-5877-1075

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

Seoul, South Korea Tel: 82-2-6294-0550

Taipei, Taiwan Tel: 886-2-27528585

Southeast Asia

Singapore

Tel: 65-6701-8033

Penang, Malaysia Tel: 60-4-6430200

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

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Офис по работе с юридическими лицами:

105318, г. Москва, ул. Щербаковская д. 3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru moschip.ru_6 moschip.ru_4 moschip.ru_9