KEMET Organic Capacitor (KO-CAP®) – Space Grade

T583 Polymer Electrolytic for Space Applications

Overview

The KEMET Organic Capacitor (KO-CAP) is a solid electrolytic capacitor with a conductive polymer cathode capable of delivering very low ESR and improved capacitance retention at high frequencies.

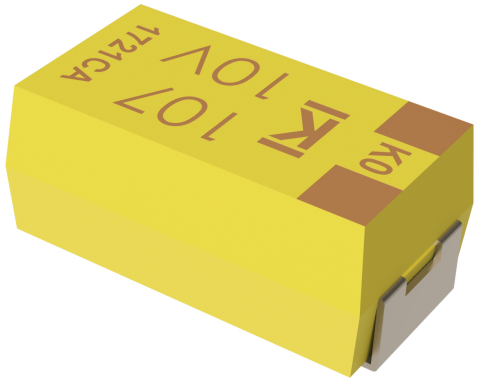
KO-CAP combines the low ESR of multilayer ceramic, the high capacitance of aluminum high ripple current capabilities, electrolytic and the volumetric efficiency of tantalum into a single surface mount package.

Unlike liquid electrolyte-based capacitors, KO-CAP has a very long operational life and KEMET's Space Grade series of capacitors are suitable for use by customers in high reliability space applications.

KEMET T583 series is supported by the 3012/005 ESCC detail specification and it is included in the ESCIES, European Preferred Parts List (EPPL).

Benefits

- Operating temperature range of −55°C to +105°C
- Capacitance values of 33 to 150 µF
- Voltage rating of 6 – 16 VDC
- High frequency capacitance retention
- High ripple capability
- ESCC Detail Specification No. 3012/005
- Ultra low ESR designed parts
- Volumetrically efficient
- EIA standard case sizes



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Applications

Typical applications include decoupling and filtering in space applications.

K-SIM

For a detailed analysis of specific part numbers, please visit ksim.kemet.com to access KEMET's K-SIM software. KEMET K-SIM is designed to simulate behavior of components with respect to frequency, ambient temperature, and DC bias levels.

Ordering Information

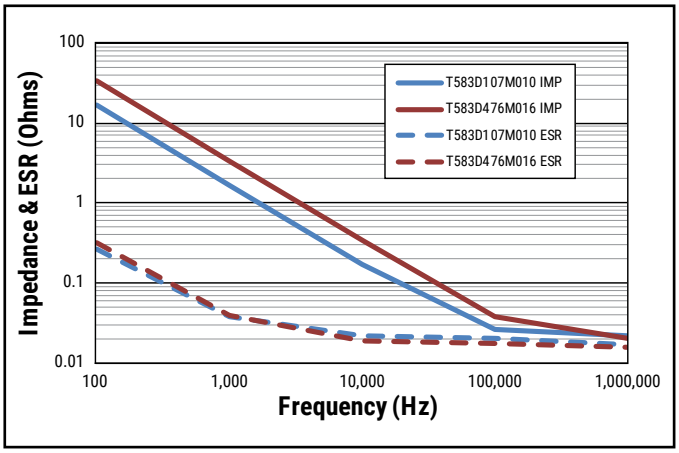
T	583	D	157	M	006	B	H	E030	P	0	0	0
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage	Screening Level	Lead Material	ESR		LAT/ Serialization	Package	Other
T = Tantalum	583 = Polymer space grade	D	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	006 = 6.3 V 010 = 10 V 016 = 16 V	B = B level C = C level A = N/A (Not for flight parts)	H = Standard solder coated (SnPb 5% Pb minimum)	E = ESR Last three digits specify ESR in mΩ (030 = 30 mΩ)		0 = N/A/not serialized 1 = N/A/ serialized 2 = LAT1/not serialized 3 =LAT1/ serialized 4 = LAT2/ not serialized 5 =LAT2/ serialized 6 = LAT3/not serialized 7 = LAT3/ serialized	0 = 7" Reel 1 = Bulk bag 2 = Waffle	0 = N/A 1 = CSI

Performance Characteristics

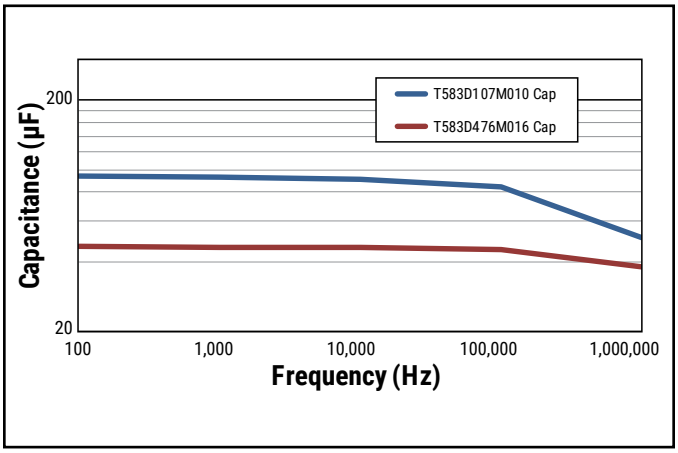
Item	Performance Characteristics
Operating Temperature	−55° C to 105° C
Rated Capacitance Range	33 – 150 µF at 120 Hz/25°C
Capacitance Tolerance	M Tolerance (20%)
Rated Voltage Range	6.3 – 16 V
DF (120 Hz)	Refer to Part Number Electrical Specification Table
ESR (100 kHz)	Refer to Part Number Electrical Specification Table
Leakage Current	≤ 0.1CV (µA) at rated voltage after 5 minutes

Electrical Characteristics

Impedance, ESR vs. Frequency

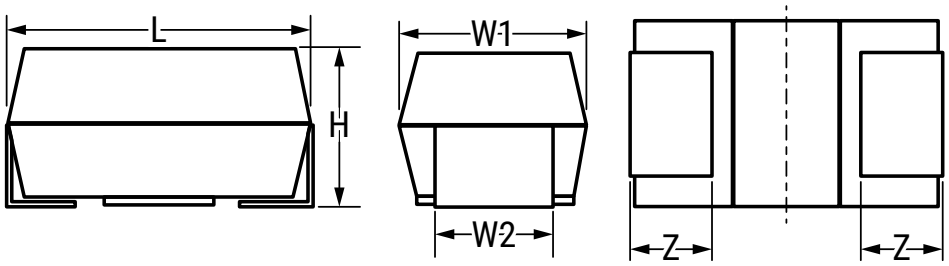


Capacitance vs. Frequency



Dimensions – Millimeters

Metric will govern



KEMET	EIA	L		H		W1		W2		Z		Typical Weight
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	(mg)
D	7343-31	7	7.6	2.5	3.1	4	4.6	2.3	2.5	1	1.6	352.36

Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Ripple Current (T amp ≤ +45°C)	MSL	Maximum Operating Temperature
V at 105°C	µF	KEMET/EIA	(See below for part options)	µA at +25°C maximum /5 minutes	% at +20°C 120 Hz maximum	mΩ at +25°C 100 kHz maximum	100 kHz 25°C	Reflow temperature ≤ 260°C	°C
6.3	100	D/7343–31	T583D107M006(1)HE045P(2)	63	10	45	2.2	3	105
6.3	150	D/7343–31	T583D157M006(1)HE045P(2)	94.5	10	45	2.2	3	105
6.3	150	D/7343–31	T583D157M006(1)HE055P(2)	94.5	10	55	2	3	105
10	68	D/7343–31	T583D686M010(1)HE045P(2)	68	10	45	2.2	3	105
10	68	D/7343–31	T583D686M010(1)HE060P(2)	68	10	60	1.9	3	105
10	68	D/7343–31	T583D686M010(1)HE100P(2)	68	10	100	1.5	3	105
10	100	D/7343–31	T583D107M010(1)HE055P(2)	100	10	55	2	3	105
10	100	D/7343–31	T583D107M010(1)HE080P(2)	100	10	80	1.7	3	105
16	33	D/7343–31	T583D336M016(1)HE060P(2)	52.8	10	60	1.9	3	105
16	33	D/7343–31	T583D336M016(1)HE070P(2)	52.8	10	70	1.8	3	105
16	47	D/7343–31	T583D476M016(1)HE070P(2)	75.2	10	70	1.8	3	105

(1) To complete KEMET part number, insert B, C or A. Designates screening level.
(2) To complete KEMET part number, insert 0, 1, 2, 3, 4, 5, 6 or 7. Designates LAT/Serialization options.
KEMET customer may require a Lot Acceptance Testing report according to ESCC requirements.
LAT 3 = 10 Pieces
LAT 2 = 26 Pieces
LAT 1 = 34 Pieces

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 ≤ 45°C	45°C < T ≤ 85°C	85°C < T ≤ 105°C
1.00	0.70	0.25

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.

KEMET Series and Case Code	EIA Case Code	Maximum Power Dissipation (Pmax) mWatts at 25°C with +20°C Rise
D	7343–31	225

Using the Pmax of the device, the maximum allowable rms ripple current or voltage may be determined.

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

I = rms ripple current (amperes)
E = rms ripple voltage (volts)
Pmax = maximum power dissipation (watts)
R = ESR at specified frequency (ohms)
Z = Impedance at specified frequency (ohms)

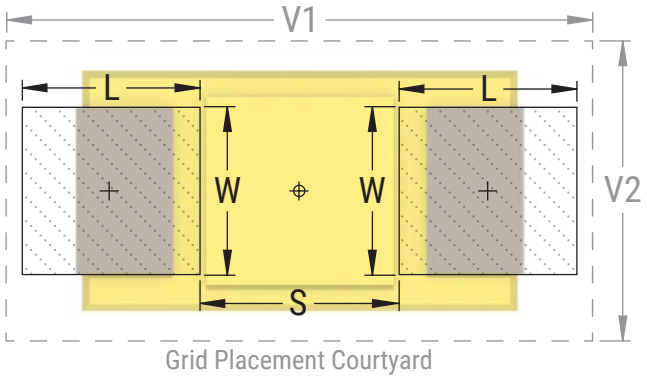
Reverse Voltage

Polymer electrolytic capacitors are polar devices and may be permanently damaged or destroyed if connected in the wrong polarity. These devices will withstand a small degree of transient voltage reversal for short periods as shown in the below table.

Temperature	Permissible Transient Reverse Voltage
25°C	15% of rated voltage
55°C	10% of rated voltage
85°C	5% of rated voltage
105°C	3% 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
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



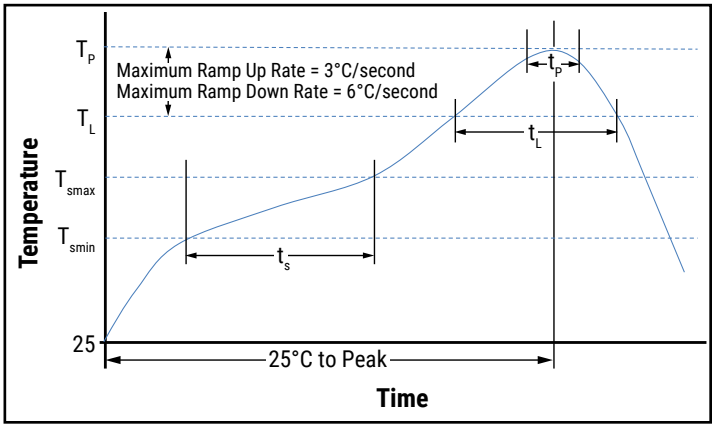
Soldering Process

KEMET's families of surface mount tantalum 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.

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.

Profile Feature	SnPb Assembly
Preheat/Soak	
Temperature minimum (T_{Smin})	100°C
Temperature maximum (T_{Smax})	150°C
Time (t_s) from T_{smin} to T_{smax}	60 – 120 seconds
Ramp-up rate (T_L to T_P)	3°C/seconds maximum
Liquidous temperature (T_L)	183°C
Time above liquidous (t_L)	60 – 150 seconds
Peak temperature (T_P)	220°C
Time within 5°C of maximum peak temperature (t_P)	20 seconds maximum
Ramp-down rate (T_P to T_L)	6°C/seconds maximum
Time 25°C to peak temperature	6 minutes maximum

Note 1: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.



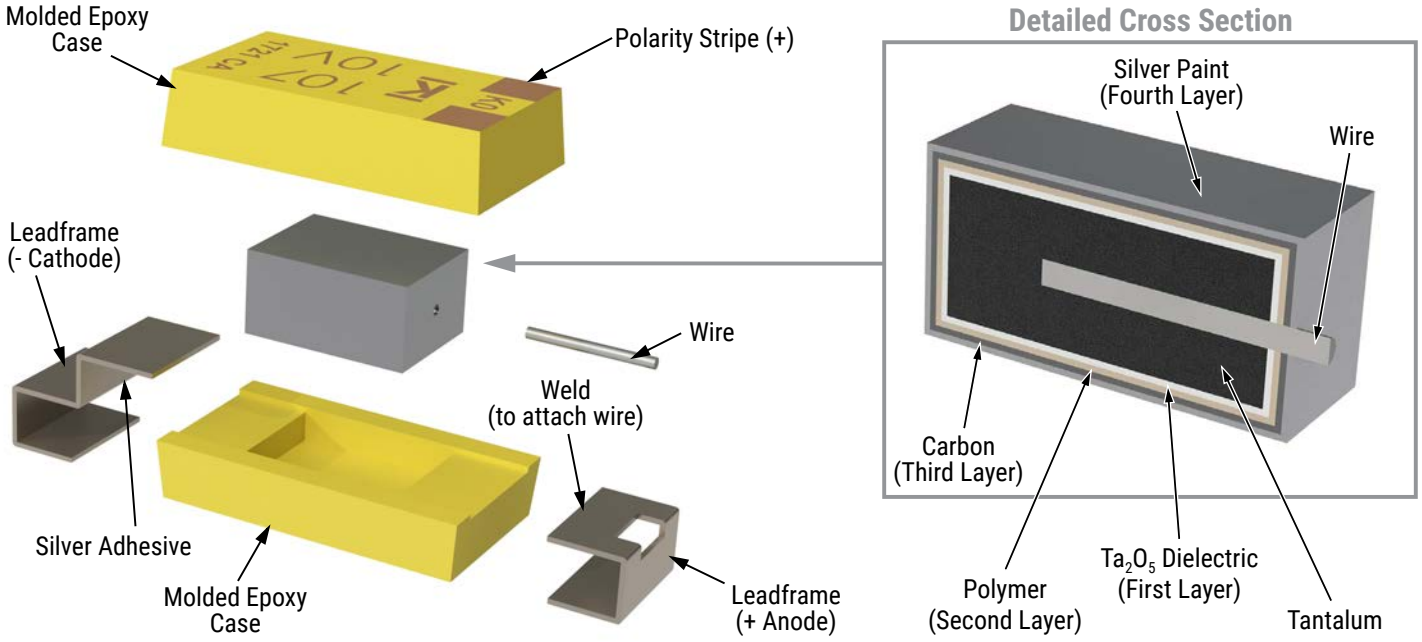
Storage

All KO-Cap series are shipped in moisture barrier bags (MBBs) with desiccant and humidity indicator card (HIC). These parts are classified as MSL3 (Moisture Sensitivity Level 3) per IPC/JEDEC J–STD–020 and packaged per IPC/JEDEC J–STD–033 MSL3 specifies a floor time of 168H at 30°C maximum temperature and 60% relative humidity. Unused capacitors should be sealed in a MBB with fresh desiccant.

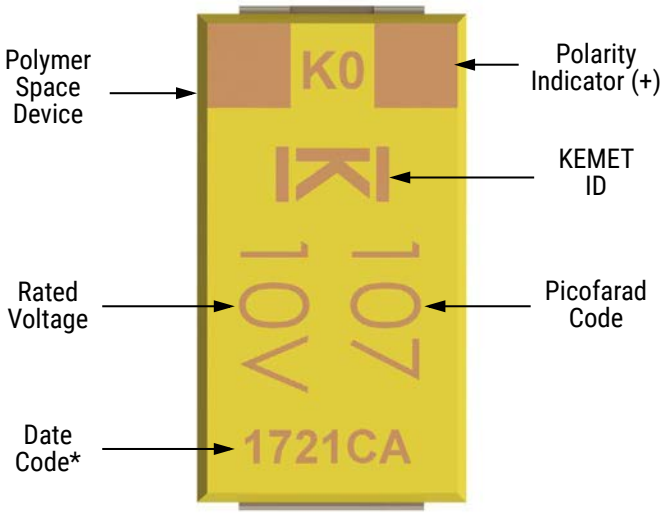
Calculated shelf life in sealed bag:
- 12 months from bag seal date in a storage environment of < 40°C and humidity < 90% RH
- 24 months from bag seal date in a storage environment of < 30°C and humidity < 70% RH

If baking is required, refer to IPC/JEDEC J–STD–033 for bake procedure.

Construction



Capacitor Marking



* 1721 = 21st week of 2017,
Last two digits represent lot code

Date Code*	
1st and 2nd digit = Year	15 = 2015 16 = 2016 17 = 2017 18 = 2018
3rd and 4th digit = Week of the Year	01 = 1st week of the year to 52 = 52nd week of the year
Last two digits represent lot code.	

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*: Embossed Carrier Taping of Surface Mount Components for Automatic Handling. This packaging system is compatible with all tape-fed automatic pick-and-place systems.

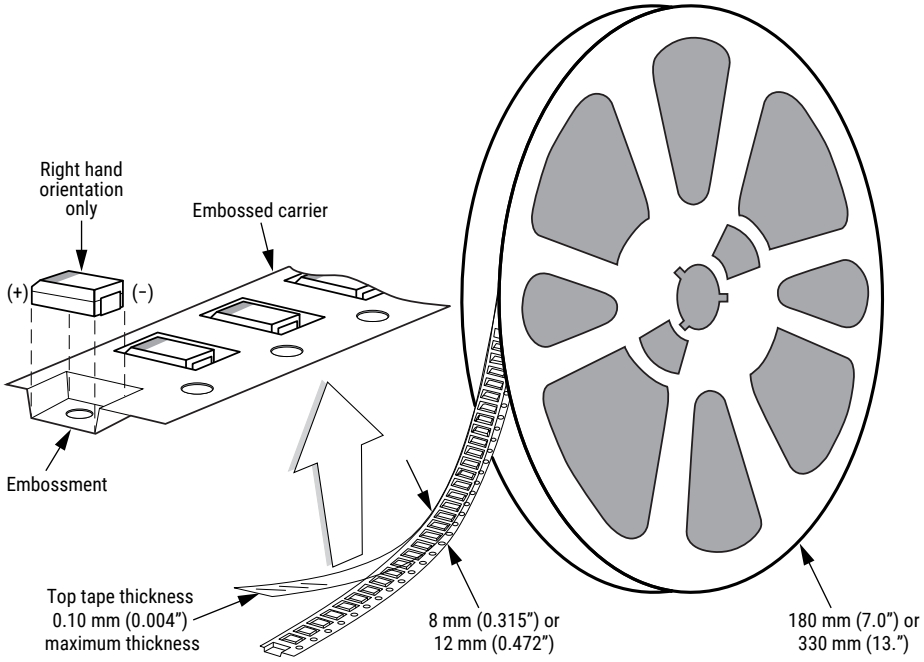


Table 3 – Packaging Quantity

Case Code		Tape Width (mm)	7" Reel
KEMET	EIA		
D	7343-31	12	500

Figure 1 – Embossed (Plastic) Carrier Tape Dimensions

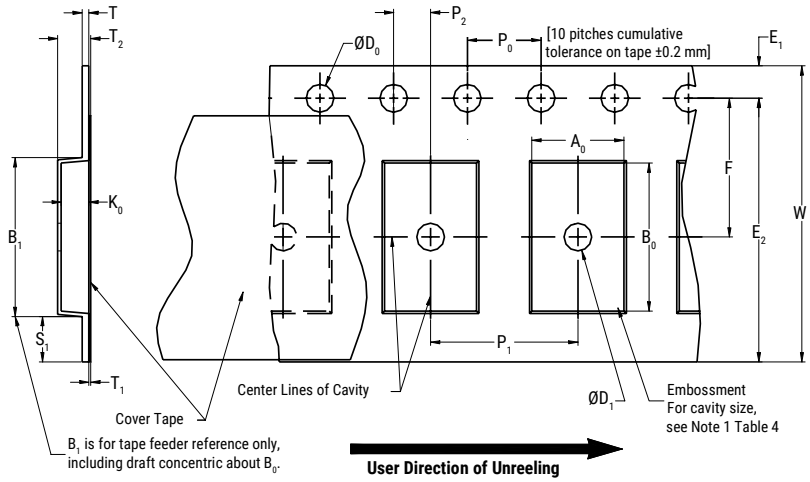


Table 4 – Embossed (Plastic) Carrier Tape Dimensions

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)			

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)	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)	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)	

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 4).

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 (see Figure 2).

(d) lateral movement of the component is restricted to 0.5 mm maximum for 8 mm and 12 mm wide 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 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

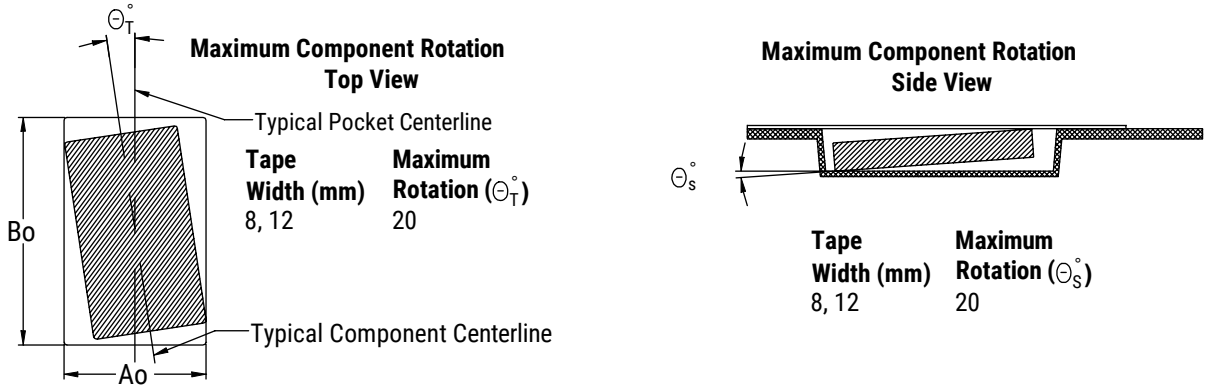


Figure 3 – Maximum Lateral Movement

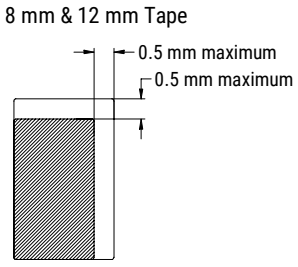


Figure 4 – Bending Radius

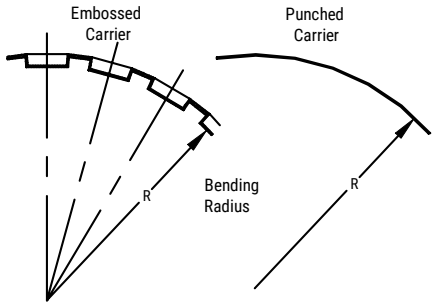
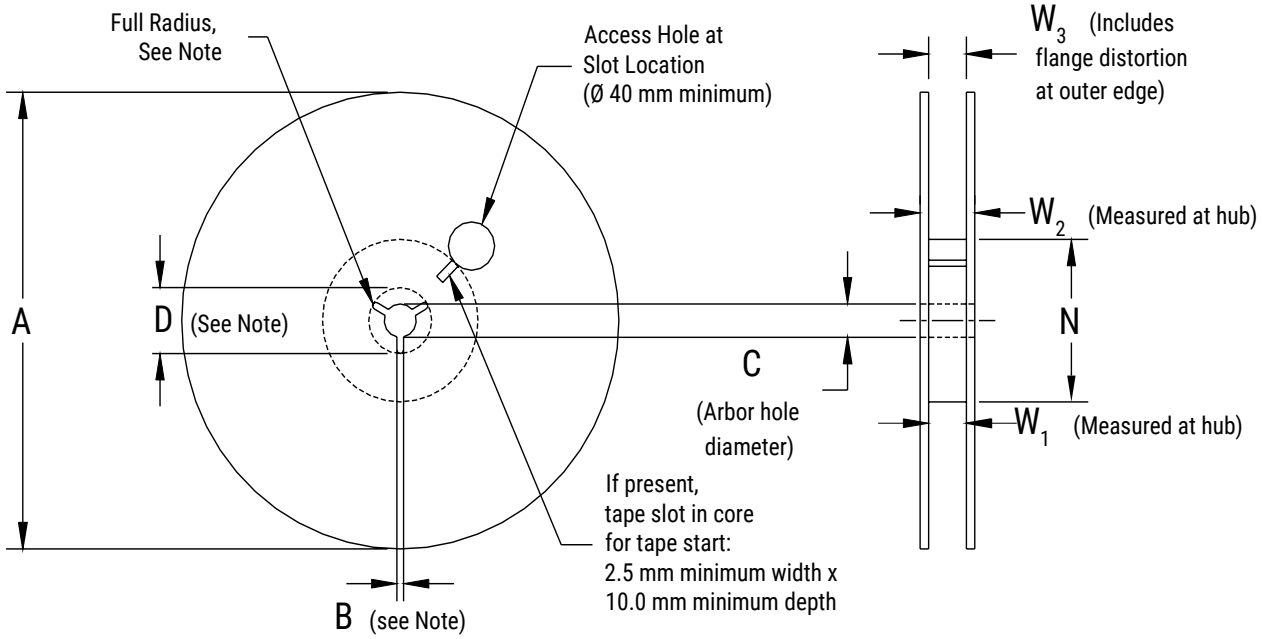


Figure 5 – Reel Dimensions



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				
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)	

Figure 6 – Tape Leader & Trailer Dimensions

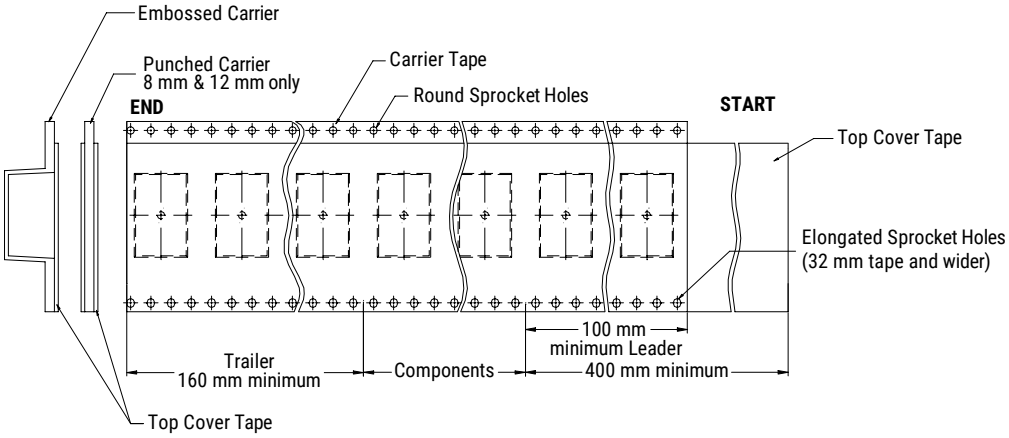
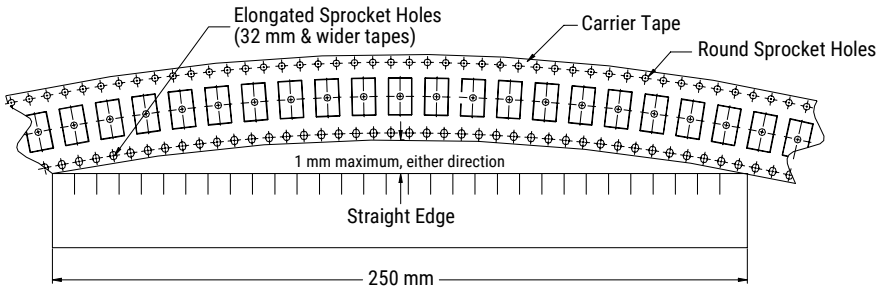


Figure 7 – Maximum Camber



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