T521 High Voltage Polymer Electrolytic, 12.5 – 75 VDC

Electronic Components KEMET CHARGED.

KOCAP Polymer Capacitors

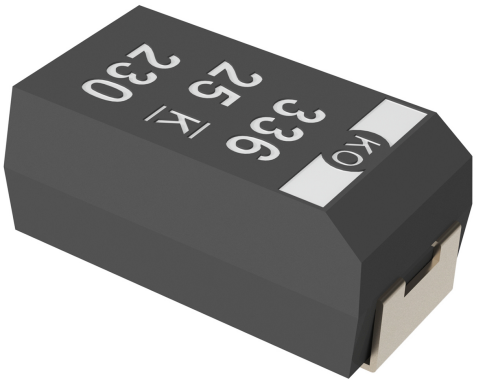
Overview

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 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 high ripple current capabilities.

The T521 High Voltage Polymer Electrolytic is designed for higher application voltages than the T520 KO-CAP. Developed for use on 12, 24, 28 and 48 volt DC voltage rails. The low ESR of the T521 provides high ripple current capability. KO-CAP's long-life reliability enables the T521 to be an ideal alternative to liquid-based electrolytic capacitors.

Benefits

- Low ESR
- Volumetrically efficient
- Stable temperature characteristics
- High ripple current capability
- High reliability
- 100% surge current tested
- Low profile design
- Halogen-free Epoxy/RoHS Compliant



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Applications

Typical applications include DC/DC converters, power supply input and higher voltage applications such as 12 V to 50 V power input rails in the military/aerospace and industrial markets.

Environmental Compliance

RoHS Compliant (6/6) according to Directive 2002/95/EC when ordered with 100% Sn or Ni-Pd-Au

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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

Ordering Information

T	521	V	226	M	025	A	T	E060	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VDC)	Failure Rate/ Design	Termination Finish	ESR Code	Packaging (C-Spec)
T = Tantalum	521 = High Voltage Polymer	B T D Q V W X	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	12R = 12.5 016 = 16 020 = 20 025 = 25 035 = 35 050 = 50 063 = 63 075 = 75	A = N/A	T = 100% Matte Tin (Sn) plated H = Tin/Lead (SnPb) solder coated (5% Pb minimum) P = Ni/Pd/Au plated	E = ESR Last three digits specify ESR in mΩ. (060 = 60 mΩ)	Blank = 7" Reel 7280 = 13" Reel

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	−55°C to 105°C/125°C (Refer to part number for maximum temperature rating)
Rated Capacitance Range	4.7 – 330 µF at 120 Hz/25°C
Capacitance Tolerance	M Tolerance (20%)
Rated Voltage Range	12.5 – 75 V
DF (120 Hz)	≤ 10% - Refer to Part Number Electrical Specification Table
ESR (100 kHz)	Refer to Part Number Electrical Specification Table
Leakage Current	≤ 0.1 CV (µA) at rated voltage after 5 minutes

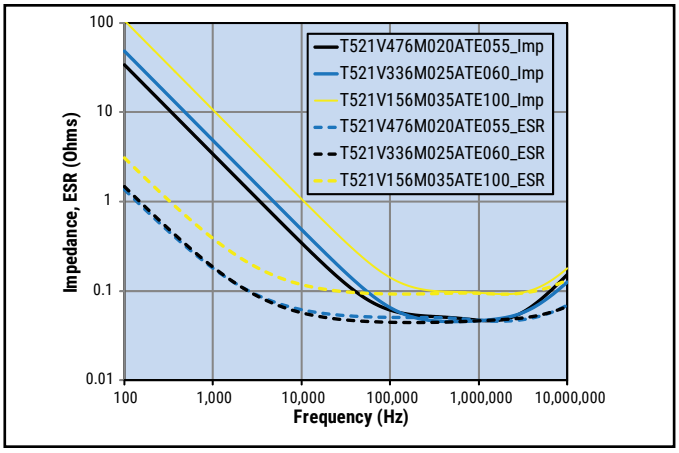
Qualification

Test	Condition		Characteristics			
Endurance	105°C at rated voltage, 2,000 hours 125°C at 2/3 rated voltage, 2,000 hours**		Δ C/C	Within −20%/+10% of initial value		
			DF	Within initial limits		
			DCL	IL at 105°C, 2 x IL at 125°C		
			ESR	2 x Initial Limit		
Storage Life	105°C at 0 volts, 2,000 hours 125°C at 0 voltage, 2,000 hours**		Δ C/C	Within −20%/+10% of initial value		
			DF	Within initial limits		
			DCL	IL at 105°C, 2 x IL at 125°C		
			ESR	2 x Initial Limit		
Humidity	60°C, 90% RH, 500 hours, No Load		Δ C/C	Within −5%/+35% of initial value		
			DF	Within initial limits		
			DCL	Within 3.0 x initial limit		
Temperature Stability	Extreme temperature exposure at a succession of continuous steps at +25°C, −55°C, +25°C, +85°C, +105°/125°C, +25°C		+25°C	−55°C	+85°C	+105°/125°C
		Δ C/C	IL*	±20%	±20%	±30%
		DF	IL	IL	1.2 x IL	1.5 x IL
		DCL	IL	N/A	10 x IL	10 x IL
Surge Voltage	105°C, 1.32 x rated voltage, 33 Ω Resistance, 1,000 cycles		Δ C/C	Within −20%/+10% 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		

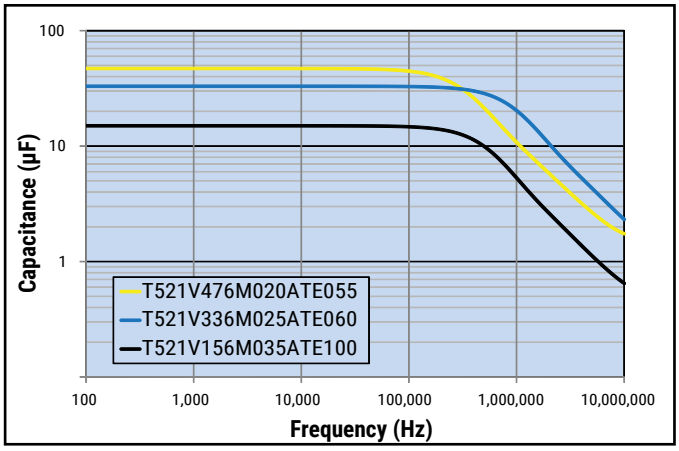
**IL = Initial limit*
***Refer to part number specifications for individual temperature classification.*

Electrical Characteristics

ESR vs. Frequency

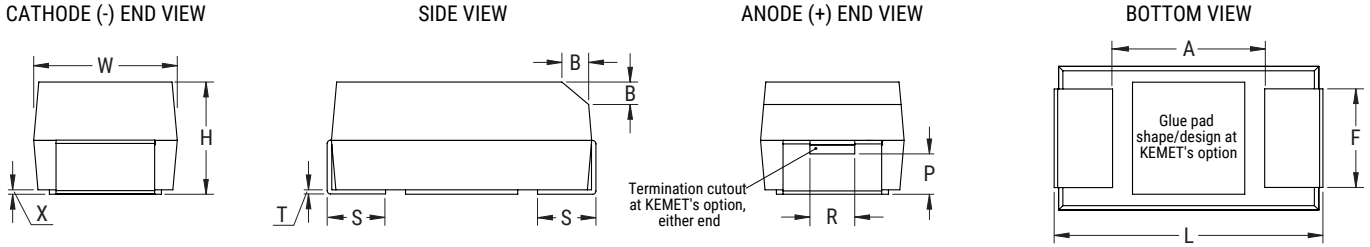


Capacitance vs. Frequency



Dimensions – Millimeters (Inches)

Metric will govern



Case Size		Component Dimensions											Total Weight
KEMET	EIA	L	W	H	F ±0.1 ±(0.004)	S ±0.3 ±(0.012)	B ±0.15 (Ref) ±0.006	X (Ref)	P (Ref)	R (Ref)	T (Ref)	A (Minimum)	(mg)
B	3528–21	3.5±0.2 (0.138±0.008)	2.8±0.2 (0.110±0.008)	1.9±0.1 (0.075±0.004)	2.2 (0.087)	0.8 (0.031)	0.4 (0.016)	0.10±0.10 (0.004±0.004)	0.5 (0.020)	1.0 (0.039)	0.13 (0.005)	1.1 (0.043)	94.85
T	3528–12	3.5±0.2 (0.138±0.008)	2.8±0.2 (0.110±0.008)	1.1±0.1 (0.043±0.004)	2.2 (0.087)	0.8 (0.031)	N/A	0.05 (0.002)	N/A	N/A	0.13 (0.005)	1.1 (0.043)	54.84
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 (0.094)	1.3 (0.051)	0.5 (0.020)	0.10±0.10 (0.004±0.004)	0.9 (0.035)	1.0 (0.039)	0.13 (0.005)	3.8 (0.150)	434.83
Q	7343–12	7.3±0.3 (0.287±0.012)	4.3±0.3 (0.169±0.012)	1.1±0.1 (0.043±0.004)	2.4 (0.094)	1.3 (0.051)	N/A	0.05 (0.002)	N/A	N/A	0.13 (0.005)	3.8 (0.150)	170.35
V	7343–20	7.3±0.3 (0.287±0.012)	4.3±0.3 (0.169±0.012)	1.9±0.1 (0.075±0.004)	2.4 (0.094)	1.3 (0.051)	N/A	0.05 (0.002)	N/A	N/A	0.13 (0.005)	3.8 (0.150)	274.30
W	7343–15	7.3±0.3 (0.287±0.012)	4.3±0.3 (0.169±0.012)	1.4±0.1 (0.055±0.004)	2.4 (0.094)	1.3 (0.051)	N/A	0.05 (0.002)	N/A	N/A	0.13 (0.005)	3.8 (0.150)	222.95
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 (0.094)	1.3 (0.051)	0.5 (0.020)	0.10±0.10 (0.004±0.004)	1.7 (0.067)	1.0 (0.039)	0.13 (0.005)	3.8 (0.150)	553.96

Notes: (Ref) – Dimensions provided for reference only. For low profile cases, no dimensions are provided for B, P or R because these cases do not have a bevel or a notch.
These weights are provided as reference. If exact weights are needed, please contact your KEMET Sales Representative

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	MSL	Maximum Operating Temp
VDC at 105°C	µF	KEMET/EIA	(See below for part options)	µA at 25°C Maximum/ 5 Minutes	% at 25°C 120 Hz Maximum	mΩ at 25°C 100 kHz Maximum	mA at +45°C 100 kHz	Reflow Temp ≤ 260°C	°C
12.5	47	T/3528-12	T521T476M12RA(1)E090	58.8	8	90	1080	3	105
16	10	B/3528-21	T521B106M016A(1)E100	16.0	8	100	1100.0	3	125
16	15	B/3528-21	T521B156M016A(1)E090	24.0	8	90	1200.0	3	105
16	33	Q/7343-12	T521Q336M016A(1)E040	52.8	10	40	2500.0	3	105
16	22	B/3528-21	T521B226M016A(1)E090	35.2	8	90	1200.0	3	105
16	33	T/3528-12	T521T336M016A(1)E045	52.8	8	45	1500.0	3	105
16	33	T/3528-12	T521T336M016A(1)E050	52.8	10	50	1400.0	3	105
16	47	W/7343-15	T521W476M016A(1)E040	75.2	10	40	2100.0	3	105
16	47	W/7343-15	T521W476M016A(1)E045	75.2	10	45	2000.0	3	105
16	47	V/7343-20	T521V476M016A(1)E040	75.2	10	40	2200.0	3	105
16	47	V/7343-20	T521V476M016A(1)E055	75.2	10	55	1800.0	3	105
16	47	V/7343-20	T521V476M016A(1)E070	75.2	10	70	1600.0	3	105
16	47	V/7343-20	T521V476M016A(1)E080	75.2	10	80	1500.0	3	105
16	47	D/7343-31	T521D476M016A(1)E040	75.2	10	40	2400.0	3	105
16	47	D/7343-31	T521D476M016A(1)E045	75.2	10	45	2200.0	3	105
16	47	D/7343-31	T521D476M016A(1)E055	75.2	10	55	2000.0	3	105
16	47	D/7343-31	T521D476M016A(1)E070	75.2	10	70	1800.0	3	105
16	47	D/7343-31	T521D476M016A(1)E090	75.2	10	90	1600.0	3	105
16	68	V/7343-20	T521V686M016A(1)E040	108.8	10	40	2200.0	3	105
16	68	V/7343-20	T521V686M016A(1)E050	108.8	10	50	1900.0	3	105
16	68	V/7343-20	T521V686M016A(1)E090	108.8	10	90	1400.0	3	105
16	100	V/7343-20	T521V107M016A(1)E050	160.0	10	50	1900.0	3	125
16	100	D/7343-31	T521D107M016A(1)E050	160.0	10	50	2100.0	3	105
16	150	D/7343-31	T521D157M016A(1)E050	240.0	10	50	2100.0	3	105
16	150	D/7343-31	T521D157M016A(1)E040	240.0	10	40	2400.0	3	105
16	150	X/7343-43	T521X157M016A(1)E080	240.0	10	80	1800.0	3	105
16	220	X/7343-43	T521X227M016A(1)E035	352.0	10	35	2700.0	3	125
16	220	X/7343-43	T521X227M016A(1)E050	352.0	10	50	2200.0	3	125
16	330	X/7343-43	T521X337M016A(1)E025	528.0	10	25	3100.0	3	125
16	330	X/7343-43	T521X337M016A(1)E050	528.0	10	50	2200.0	3	125
20	10	B/3528-21	T521B106M020A(1)E100	20.0	8	100	1100.0	3	105
20	15	B/3528-21	T521B156M020A(1)E090	30.0	10	90	1200.0	3	105
20	22	B/3528-21	T521B226M020A(1)E090	44.0	8	90	1200.0	3	105
20	22	V/7343-20	T521V226M020A(1)E090	44.0	10	90	1400.0	3	125
20	47	W/7343-15	T521W476M020A(1)E040	94.0	9	40	2100.0	3	105
20	47	W/7343-15	T521W476M020A(1)E045	94.0	9	45	2000.0	3	105
20	47	V/7343-20	T521V476M020A(1)E090	94.0	10	90	1400.0	3	125
20	47	V/7343-20	T521V476M020A(1)E080	94.0	10	80	1500.0	3	125
20	47	V/7343-20	T521V476M020A(1)E055	94.0	10	55	1800.0	3	125
20	47	D/7343-31	T521D476M020A(1)E055	94.0	10	55	2000.0	3	125
20	47	D/7343-31	T521D476M020A(1)E040	94.0	10	40	2400.0	3	125
20	100	V/7343-20	T521V107M020A(1)E055	200.0	10	55	1800.0	3	125
20	100	D/7343-31	T521D107M020A(1)E055	200.0	10	55	2000.0	3	105
25	10	B/3528-21	T521B106M025A(1)E100	25.0	8	100	1100.0	3	105
25	10	T/3528-12	T521T106M025A(1)E100	25.0	8	100	1000.0	3	125
25	10	T/3528-12	T521T106M025A(1)E060	25.0	8	60	1300.0	3	125
VDC at 105°C	µF	KEMET/EIA	(See below for part options)	µA at 25°C Maximum/ 5 Minutes	% at 25°C 120 Hz Maximum	mΩ at 25°C 100 kHz Maximum	mA at +45°C 100 kHz	Reflow Temp ≤ 260°C	°C
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	MSL	Maximum Operating Temp

Other part number options:
1 - Standard with tin terminations (14th character = T). Tin/lead terminations is also available (14th character = H).
Also available on large (13 inch) reels. Add 7280 to the end of the part number.
Higher voltage ratings and tighter tolerance product including ESR may be substituted within the same size at KEMET's option. Voltage substitutions 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	MSL	Maximum Operating Temp
VDC at 105°C	µF	KEMET/EIA	(See below for part options)	µA at 25°C Maximum/ 5 Minutes	% at 25°C 120 Hz Maximum	mΩ at 25°C 100 kHz Maximum	mA at +45°C 100 kHz	Reflow Temp ≤ 260°C	°C
25	15	V/7343-20	T521V156M025A(1)E090	37.5	10	90	1400.0	3	105
25	15	V/7343-20	T521V156M025A(1)E040	37.5	10	40	2200.0	3	105
25	22	V/7343-20	T521V226M025A(1)E040	55.0	10	40	2200.0	3	105
25	22	V/7343-20	T521V226M025A(1)E045	55.0	10	45	2000.0	3	105
25	22	V/7343-20	T521V226M025A(1)E060	55.0	10	60	1800.0	3	105
25	22	V/7343-20	T521V226M025A(1)E090	55.0	10	90	1400.0	3	105
25	33	V/7343-20	T521V336M025A(1)E060	82.5	10	60	1800.0	3	105
25	33	V/7343-20	T521V336M025A(1)E040	82.5	10	40	2200.0	3	105
25	33	D/7343-31	T521D336M025A(1)E040	82.5	10	40	2400.0	3	105
25	33	D/7343-31	T521D336M025A(1)E060	82.5	10	60	1900.0	3	105
25	68	D/7343-31	T521D686M025A(1)E070	170.0	10	70	1800.0	3	105
25	100	D/7343-31	T521D107M025A(1)E040	250.0	10	40	2400.0	3	105
25	100	D/7343-31	T521D107M025A(1)E060	250.0	10	60	1900.0	3	105
25	100	X/7343-43	T521X107M025A(1)E030	250.0	10	30	2900.0	3	105
25	100	X/7343-43	T521X107M025A(1)E060	250.0	10	60	2000.0	3	105
35	6.8	T/3528-12	T521T685M035APE090	23.8	10	90	1100.0	3	125
35	10	V/7343-20	T521V106M035A(1)E120	35.0	10	120	1200.0	3	125
35	15	V/7343-20	T521V156M035A(1)E100	52.5	10	100	1400.0	3	125
35	15	V/7343-20	T521V156M035A(1)E125	52.5	10	125	1200.0	3	125
35	22	D/7343-31	T521D226M035A(1)E040	77.0	10	40	2400.0	3	125
35	22	D/7343-31	T521D226M035A(1)E060	77.0	10	60	1900.0	3	125
35	33	D/7343-31	T521D336M035A(1)E065	115.5	10	65	1900.0	3	125
35	47	X/7343-43	T521X476M035A(1)E030	164.5	10	30	2900.0	3	125
35	47	X/7343-43	T521X476M035A(1)E070	164.5	10	70	1900.0	3	125
50	5.6	D/7343-31	T521D565M050A(1)E070	28	10	70	1800	3	125
50	5.6	D/7343-31	T521D565M050A(1)E090	28	10	90	1600	3	125
50	5.6	V/7343-20	T521V565M050A(1)E070	28	10	70	1800	3	125
50	5.6	V/7343-20	T521V565M050A(1)E090	28	10	90	1600	3	125
50	6.8	D/7343-31	T521D685M050A(1)E070	34.0	10	70	1800.0	3	125
50	6.8	D/7343-31	T521D685M050A(1)E090	34.0	10	90	1600.0	3	125
50	6.8	V/7343-20	T521V685M050A(1)E070	34.0	10	70	1800.0	3	125
50	6.8	V/7343-20	T521V685M050A(1)E090	34.0	10	90	1600.0	3	125
50	10	D/7343-31	T521D106M050A(1)E090	50.0	10	90	1600.0	3	125
50	10	D/7343-31	T521D106M050A(1)E120	50.0	10	120	1369.0	3	125
50	10	V/7343-20	T521V106M050A(1)E090	50.0	10	90	1600.0	3	125
50	18	D/7343-31	T521D186M050A(1)E090	90.0	10	90	1600.0	3	125
50	18	X/7343-43	T521X186M050A(1)E070	90.0	10	70	1900.0	3	125
50	18	X/7343-43	T521X186M050A(1)E050	90.0	10	50	2200.0	3	125
50	18	X/7343-43	T521X186M050A(1)E035	90.0	10	35	2700.0	3	125
50	22	D/7343-31	T521D226M050A(1)E090	110.0	10	90	1600.0	3	125
50	22	X/7343-43	T521X226M050A(1)E075	110.0	10	75	1815.0	3	125
50	22	X/7343-43	T521X226M050A(1)E050	110.0	10	50	2200.0	3	125
50	33	X/7343-43	T521X336M050A(1)E075	165.0	10	75	1815.0	3	125
50	33	X/7343-43	T521X336M050A(1)E050	165.0	10	50	2200.0	3	125
63	4.7	D/7343-31	T521D475M063A(1)E300	29.6	10	300	900.0	3	125
63	4.7	D/7343-31	T521D475M063A(1)E075	29.6	10	75	1700.0	3	125
VDC at 105°C	µF	KEMET/EIA	(See below for part options)	µA at 25°C Maximum/ 5 Minutes	% at 25°C 120 Hz Maximum	mΩ at 25°C 100 kHz Maximum	mA at +45°C 100 kHz	Reflow Temp ≤ 260°C	°C
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	MSL	Maximum Operating Temp

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Also available on large (13 inch) reels. Add 7280 to the end of the part number.
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Table 1 – Ratings & Part Number Reference cont'd

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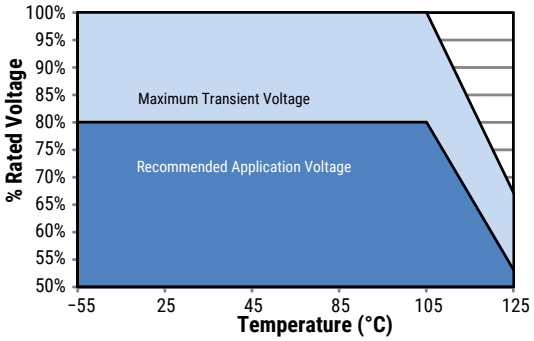
VDC at 105°C	µF	KEMET/EIA	(See below for part options)	µA at 25°C Maximum/ 5 Minutes	% at 25°C 120 Hz Maximum	mΩ at 25°C 100 kHz Maximum	mA at +45°C 100 kHz	Reflow Temp ≤ 260°C	°C
63	10	X/7343-43	T521X106M063A(1)E050	63.0	10	50	2200.0	3	125
63	15	X/7343-43	T521X156M063A(1)E035	94.5	10	35	2600.0	3	125
63	15	X/7343-43	T521X156M063A(1)E150	94.5	10	150	1300.0	3	125
75	4.7	D/7343-31	T521D475M075A(1)E075	35.3	10	75	1700.0	3	125
75	10	X/7343-43	T521X106M075A(1)E050	75	10	50	2200	3	125
75	15	X/7343-43	T521X156M075A(1)E035	112.5	10	35	2600	3	125
VDC at 105°C	µF	KEMET/EIA	(See below for part options)	µA at 25°C Maximum/ 5 Minutes	% at 25°C 120 Hz Maximum	mΩ at 25°C 100 kHz Maximum	mA at +45°C 100 kHz	Reflow Temp ≤ 260°C	°C
Rated Voltage	Rated Capacitance	Case Code/ Case Size	KEMET Part Number	DC Leakage	DF	ESR	Maximum Allowable Ripple Current	MSL	Maximum Operating Temp

Other part number options:
1 - Standard with tin terminations (14th character = T). Tin/lead terminations is also available (14th character = H).
Also available on large (13 inch) reels. Add 7280 to the end of the part number.
Higher voltage ratings and tighter tolerance product including ESR may be substituted within the same size at KEMET's option. Voltage substitutions will be marked with the higher voltage rating. Substitutions can include better than series.

Derating Guidelines

Voltage Rating	Maximum Recommended Steady State Voltage	Maximum Recommended Transient Voltage (1 ms – 1 µs)
−55°C to 105°C		
12.5 V ≤ V_R ≤ 75 V	80% of V_R	V_R
105°C to 125°C		
12.5 V ≤ V_R ≤ 75 V	54% of V_R	67% of V_R

V_R = Rated Voltage



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 ≤ 125°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.

Case Code	EIA Case Code	Maximum Power Dissipation (P max) mWatts at 45°C with +30°C Rise
T	3528-12	105
B	3528-21	127
W	7343-15	180
V	7343-20	187
D	7343-31	225
Q	7343-12	170
X	7343-43	247

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

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.

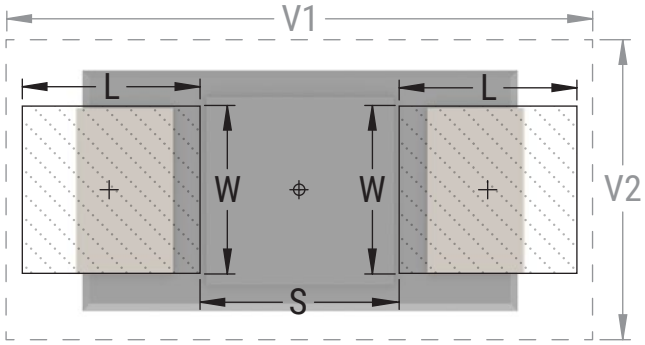
Temperature	Permissible Transient Reverse Voltage
25°C	15% of Rated Voltage
55°C	10% of Rated Voltage
85°C	5% of Rated Voltage
105°C	3% of Rated Voltage
125°C*	1% of Rated Voltage

**For series rated to 125°C*

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
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
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
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
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
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

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.



Grid Placement Courtyard

Soldering Process

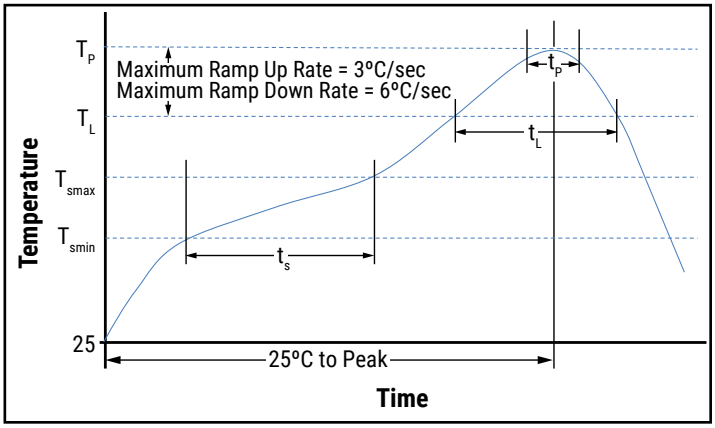
KEMET's families of surface mount capacitors are compatible with wave (single or dual), convection, IR, or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile 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.

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

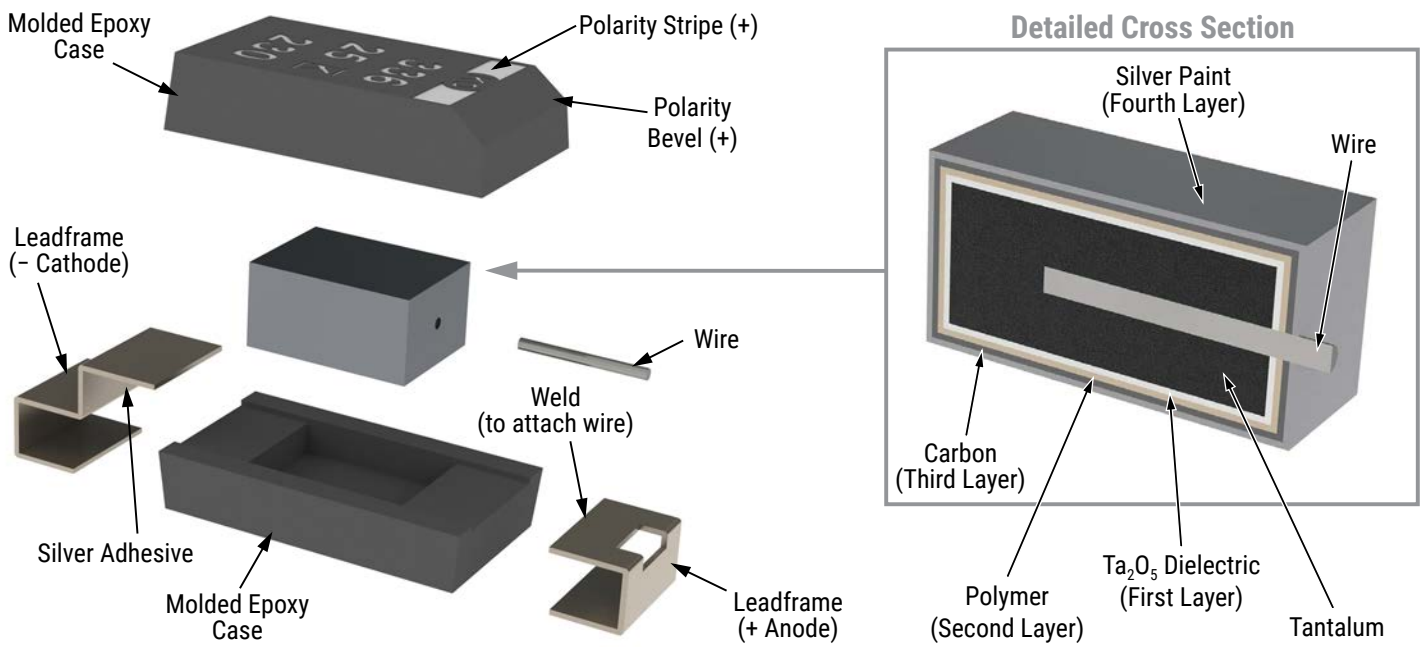
Note: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.
**Case Size D, E, P, Y, and X*
***Case Size A, B, C, H, I, K, M, R, S, T, U, V, W, and Z*



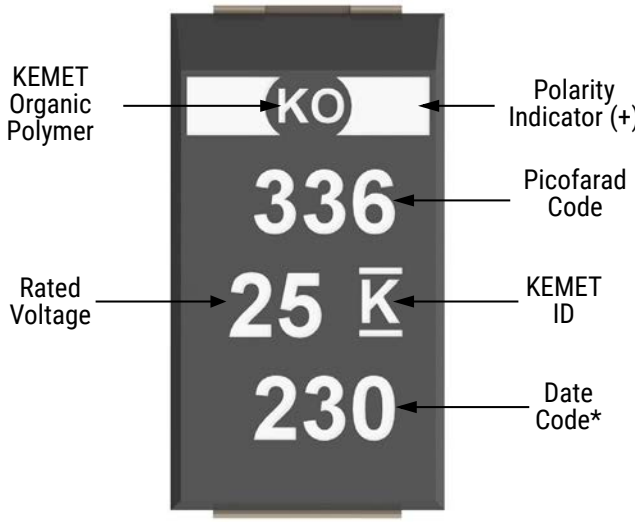
Storage

All KO-CAP series are shipped in moisture barrier bags with a desiccant and moisture indicator card. These series are classified as MSL3 (Moisture Sensitivity Level 3). Product contained within the moisture barrier bags should be stored in normal working environments with temperatures not to exceed 40°C and humidity not in excess of 90% RH.

Construction



Capacitor Marking



* 230 = 30th week of 2012

Date Code *	
1st digit = Last number of Year	2 = 2012 3 = 2013 4 = 2014 5 = 2015 6 = 2016 7 = 2017
2nd and 3rd digit = Week of the Year	01 = 1st week of the Year to 52 = 52nd 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.

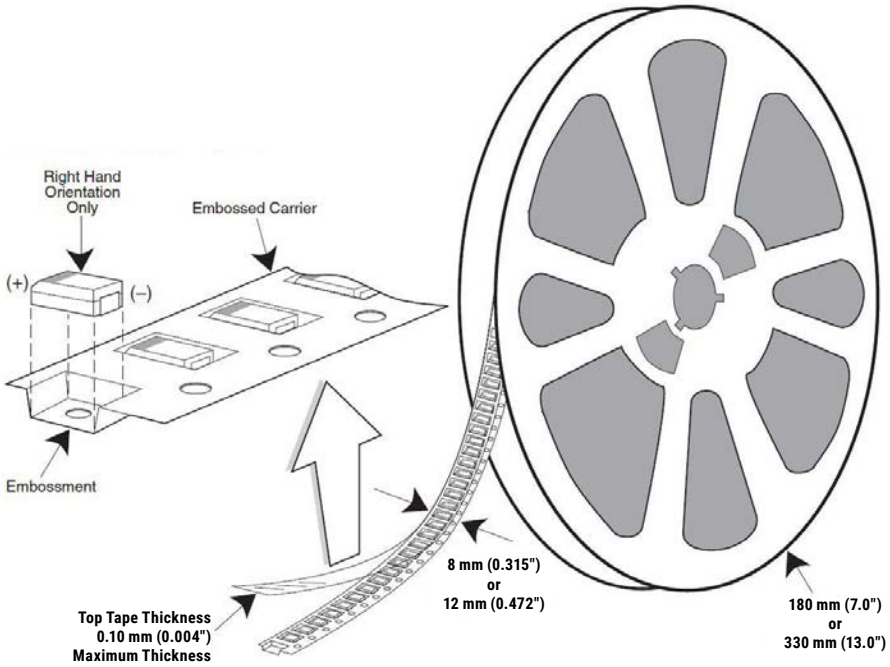


Table 3 – Packaging Quantity

Case Code		Tape Width (mm)	7" Reel*	13" Reel*
KEMET	EIA			
R	2012-12	8	2,500	10,000
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	3,000
W	7343-15	12	1,000	3,000
Z	7343-17	12	1,000	3,000
Q	7343-12	12	1,000	3,000
V	7343-19	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	3,000

** No C-Spec required for 7" reel packaging. C-7280 required for 13" reel packaging.*
** A case with black epoxy only available in 7" reel*

Figure 1 – Embossed (Plastic) Carrier Tape Dimensions

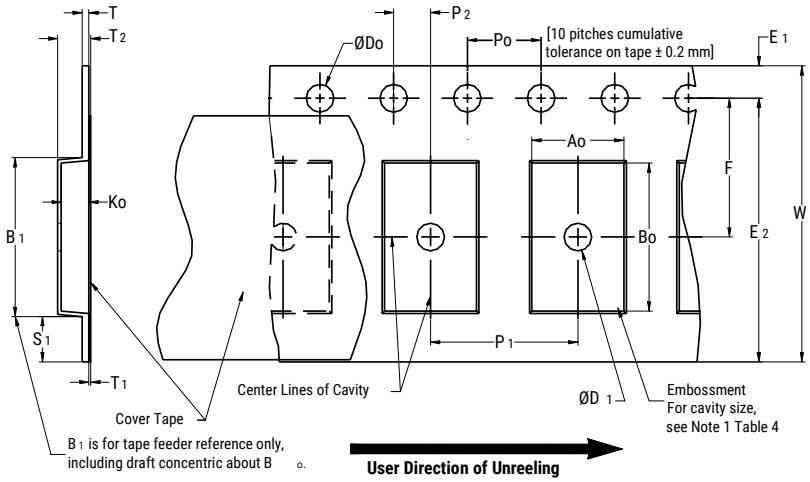


Table 4 – Embossed (Plastic) Carrier Tape Dimensions

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					2.0±0.1 (0.079±0.059)				

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)	
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)	

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 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

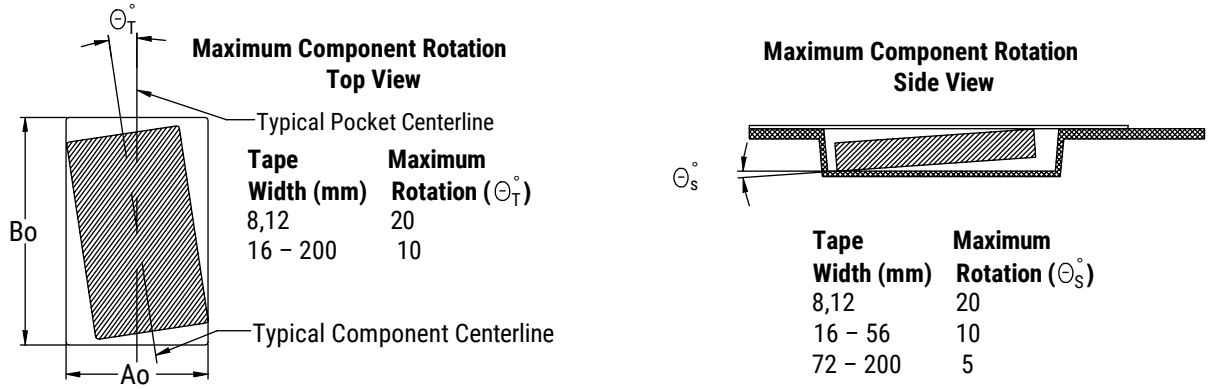


Figure 3 – Maximum Lateral Movement

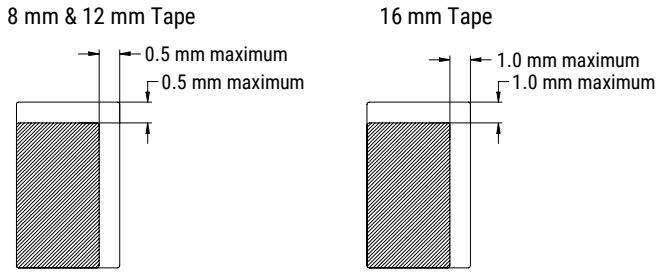


Figure 4 – Bending Radius

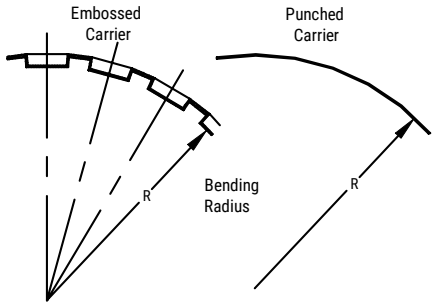
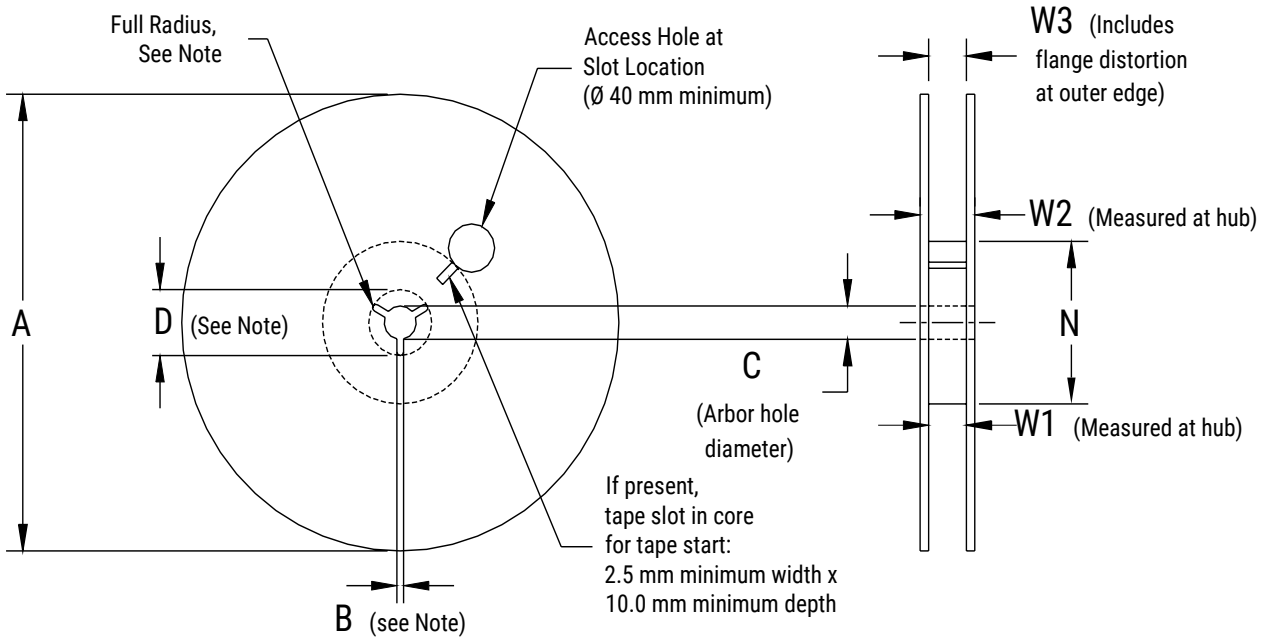


Figure 5 – Reel Dimensions



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

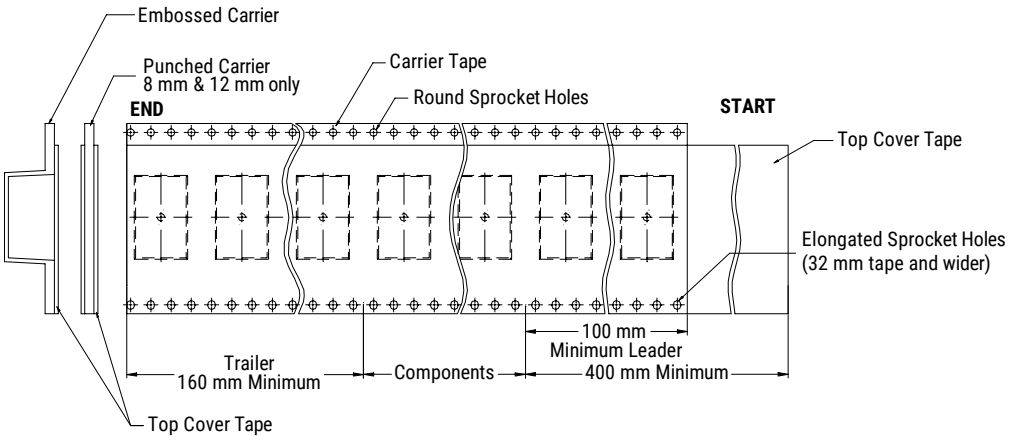
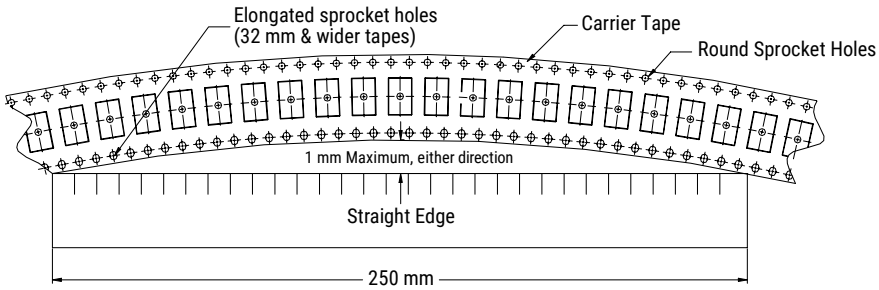


Figure 7 – Maximum Camber



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