

## Overview

The KEMET UltraDip III capacitors offer the advantages of solid tantalum construction and a "fail-safe" insertion mechanism. The three-leaded design (the anode is in the center) enables operators to insert the capacitors into printed circuit boards correctly without having to visually determine polarity. This time-saving device also eliminates board damage that may result from incorrect insertion. The UltraDip III features a capacitance range of 0.1 to 680  $\mu\text{F}$  at 3 to 50 VDC. These miniature, dipped solid tantalum capacitors are encased in a tough plastic barrier coating

that maintains the precise lead wire spacing within  $\pm 0.015$  inch. The gold color epoxy permits laser markings with outstanding permanency and legibility. All case sizes are printed with capacitance, voltage and vendor identification. The UltraDip III exhibits low DC leakage, ESR and impedance and maintains excellent temperature stability. These capacitors may be ordered with precut leads (see drawing for lengths) or in KEMET capacitor ARIS packaging (leads taped and on reels) for high speed automatic insertion equipment.

## Benefits

- Taped and reeled per EIA Specification RS-468
- Laser-marked case
- Capacitance values of 0.1 – 680  $\mu\text{F}$
- Tolerances of  $\pm 20\%$  and  $\pm 10\%$  (special order only)
- Voltage rating of 3 – 50 VDC
- Case sizes: A, B, C, D, E, F, G, H, J, K, L, M

## Applications

Typical applications include filtering, bypassing, coupling, blocking, and RC timing circuits or other applications that can benefit from compactness.



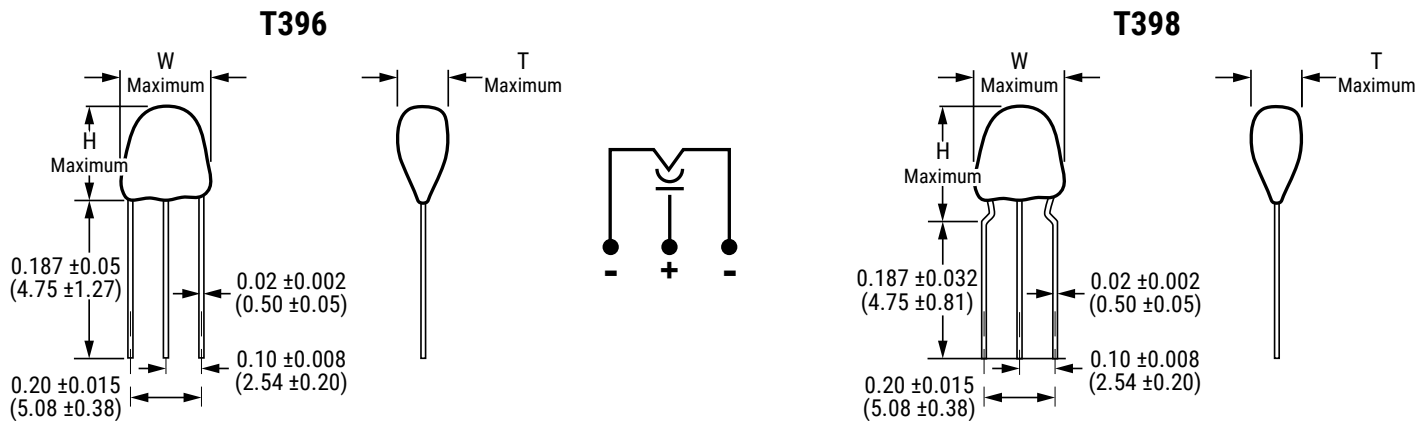
## Ordering Information

T	39X	A	105	M	035	A	S	
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VDC)	Failure Rate	Termination Finish	Packaging
T = Tantalum	T396 Straight Leads T398 Lead Standoff	A, B, C, D, E, F, G, H, J, K, L, M	First two digits represent significant figures. Third digit specifies number of zeros to follow.	M = $\pm 20\%$ K = $\pm 10\%$ (Special order only)	003 = 3 006 = 6 010 = 10 016 = 16 020 = 20 025 = 25 035 = 35 050 = 50	Not Applicable	S = Standard T = 100% Sn (tin)	Blank = Bulk 7301 = Tape & Reel 7305 = Ammo

## Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 125°C
Rated Capacitance Range	0.1 – 680 µF at 120 Hz/25°C
Capacitance Tolerance	M tolerance ±20% (standard), K tolerance ±10% (special order only)
Rated Voltage Range	3 – 50 V
DF (120 Hz at 25°C)	Refer to Part Number Electrical Specification Table
Leakage Current	Refer to Part Number Electrical Specification Table at rated voltage up to 85°C

## Dimensions – Millimeters (Inches)



Case Size	Both		T396	T398
	W Width	T Thickness	H Height	H Height
A	0.280 (7.1)	0.190 (4.8)	0.310 (7.9)	0.355 (9.0)
B	0.280 (7.1)	0.190 (4.8)	0.320 (8.1)	0.365 (9.3)
C	0.280 (7.1)	0.200 (5.1)	0.360 (9.1)	0.390 (9.9)
D	0.280 (7.1)	0.200 (5.1)	0.370 (9.4)	0.390 (9.9)
E	0.280 (7.1)	0.230 (5.8)	0.380 (9.7)	0.415 (10.5)
F	0.280 (7.1)	0.240 (6.1)	0.410 (10.4)	0.430 (10.9)
G	0.280 (7.1)	0.250 (6.3)	0.420 (10.7)	0.440 (11.2)
H	0.280 (7.1)	0.270 (6.9)	0.420 (10.7)	0.440 (11.2)
J	0.300 (7.6)	0.300 (7.6)	0.460 (11.7)	0.480 (12.2)
K	0.340 (8.6)	0.340 (8.6)	0.500 (12.7)	0.500 (12.7)
L	0.340 (8.6)	0.340 (8.6)	0.560 (14.2)	0.560 (14.2)
M	0.360 (9.1)	0.360 (9.1)	0.620 (15.7)	0.620 (15.7)

**Table 1 - Ratings and Part Number Reference**

Rated Voltage	Rated Capacitance	Case Code Case Size	KEMET Part Number	DC Leakage	DF % at 25°C
(V) 85°C	µF			µA at 25°C Maximum/5 Minutes	120 Hz Maximum
3	4.7	A	T39(1)A475(2)003A(3)	0.5	5
3	6.8	A	T39(1)A685(2)003A(3)	0.5	5
3	10.0	A	T39(1)A106(2)003A(3)	0.5	6
3	15.0	B	T39(1)B156(2)003A(3)	0.5	6
3	22.0	C	T39(1)C226(2)003A(3)	0.5	6
3	33.0	D	T39(1)D336(2)003A(3)	0.8	6
3	47.0	E	T39(1)E476(2)003A(3)	1.1	6
3	68.0	F	T39(1)F686(2)003A(3)	1.6	6
3	100.0	G	T39(1)G107(2)003A(3)	2.4	8
3	150.0	H	T39(1)H157(2)003A(3)	3.6	8
3	220.0	J	T39(1)J227(2)003A(3)	5.3	8
3	330.0	K	T39(1)K337(2)003A(3)	7.9	8
3	470.0	L	T39(1)L477(2)003A(3)	10.0	9
3	680.0	M	T39(1)M687(2)003A(3)	10.0	9
6	3.3	A	T39(1)A335(2)006A(3)	0.5	5
6	4.7	A	T39(1)A475(2)006A(3)	0.5	5
6	6.8	A	T39(1)A685(2)006A(3)	0.5	5
6	10.0	B	T39(1)B106(2)006A(3)	0.5	6
6	15.0	C	T39(1)C156(2)006A(3)	0.7	6
6	22.0	D	T39(1)D226(2)006A(3)	1.1	6
6	33.0	E	T39(1)E336(2)006A(3)	1.6	6
6	47.0	F	T39(1)F476(2)006A(3)	2.3	6
6	68.0	G	T39(1)G686(2)006A(3)	3.3	6
6	100.0	H	T39(1)H107(2)006A(3)	4.8	8
6	150.0	J	T39(1)J157(2)006A(3)	7.2	8
6	220.0	K	T39(1)K227(2)006A(3)	10.0	8
6	330.0	L	T39(1)L337(2)006A(3)	10.0	8
10	2.2	A	T39(1)A225(2)010A(3)	0.5	5
10	3.3	A	T39(1)A335(2)010A(3)	0.5	5
10	4.7	A	T39(1)A475(2)010A(3)	0.5	5
10	6.8	B	T39(1)B685(2)010A(3)	0.5	5
10	10.0	C	T39(1)C106(2)010A(3)	0.8	6
10	15.0	E	T39(1)E156(2)010A(3)	1.2	6
10	22.0	E	T39(1)E226(2)010A(3)	1.8	6
10	33.0	F	T39(1)F336(2)010A(3)	2.6	6
10	47.0	H	T39(1)H476(2)010A(3)	3.8	6
10	68.0	H	T39(1)H686(2)010A(3)	5.4	6
10	100.0	J	T39(1)J107(2)010A(3)	8.0	8
10	150.0	K	T39(1)K157(2)010A(3)	10.0	8
10	220.0	L	T39(1)L227(2)010A(3)	10.0	8
16	1.5	A	T39(1)A155(2)016A(3)	0.5	5
16	2.2	A	T39(1)A225(2)016A(3)	0.5	5
16	3.3	A	T39(1)A335(2)016A(3)	0.5	5
16	4.7	B	T39(1)B475(2)010A(3)	0.6	5
16	6.8	C	T39(1)C685(2)016A(3)	0.9	5
(V) 85°C	µF	Case Code Case Size	KEMET Part Number	µA at 25°C Maximum/5 Minutes	120 Hz Maximum
Rated Voltage	Rated Capacitance			DC Leakage	DF % at 25°C

(1) To complete KEMET Part Number, insert Series Designation as follows: "6" - T396, "8" - T398.

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

(3) To complete KEMET part number, insert S = Standard coated or T=100% Sn (tin). Designates termination finish.

Higher voltage/tighter capacitance tolerance products may be substituted for an order within the same case size at KEMET's option.

**Table 1 - Ratings and Part Number Reference cont.**

Rated Voltage	Rated Capacitance	Case Code Case Size	KEMET Part Number	DC Leakage	DF % at 25°C
(V) 85°C	µF			µA at 25°C Maximum/5 Minutes	120 Hz Maximum
16	10.0	E	T39(1)E106(2)016A(3)	1.3	6
16	15.0	E	T39(1)E156(2)016A(3)	1.8	6
16	22.0	F	T39(1)F226(2)016A(3)	2.6	6
16	33.0	H	T39(1)H336(2)016A(3)	4.0	6
16	47.0	J	T39(1)J476(2)016A(3)	5.6	6
16	68.0	K	T39(1)K686(2)016A(3)	8.2	6
16	100.0	L	T39(1)L107(2)016A(3)	10.0	8
16	150.0	M	T39(1)M157(2)016A(3)	10.0	8
20	1.0	A	T39(1)A105(2)020A(3)	0.5	3
20	1.5	A	T39(1)A155(2)020A(3)	0.5	5
20	2.2	A	T39(1)A225(2)020A(3)	0.5	5
20	3.3	B	T39(1)B335(2)020A(3)	0.5	5
20	4.7	C	T39(1)C475(2)020A(3)	0.8	5
20	6.8	D	T39(1)D685(2)020A(3)	1.1	5
20	10.0	E	T39(1)E106(2)020A(3)	1.6	6
20	15.0	F	T39(1)F156(2)020A(3)	2.4	6
20	22.0	G	T39(1)G226(2)020A(3)	3.5	6
20	33.0	J	T39(1)J336(2)020A(3)	5.3	6
20	47.0	K	T39(1)K476(2)020A(3)	7.5	6
20	68.0	L	T39(1)L686(2)020A(3)	10.0	6
20	100.0	M	T39(1)M107(2)020A(3)	10.0	8
25	1.0	A	T39(1)A105(2)025A(3)	0.5	3
25	1.5	A	T39(1)A155(2)025A(3)	0.5	5
25	2.2	B	T39(1)B225(2)025A(3)	0.5	5
25	3.3	B	T39(1)B335(2)025A(3)	0.7	5
25	4.7	C	T39(1)C475(2)025A(3)	0.9	5
25	6.8	E	T39(1)E685(2)025A(3)	1.4	5
25	10.0	E	T39(1)E106(2)025A(3)	2.0	6
25	15.0	G	T39(1)G156(2)025A(3)	3.0	6
25	22.0	H	T39(1)H226(2)025A(3)	4.4	6
25	33.0	J	T39(1)J336(2)025A(3)	6.6	6
25	47.0	K	T39(1)K476(2)025A(3)	9.4	6
25	68.0	L	T39(1)L686(2)025A(3)	10.0	6
35	0.10	A	T39(1)A104(2)035A(3)	0.5	3
35	0.15	A	T39(1)A154(2)035A(3)	0.5	3
35	0.22	A	T39(1)A224(2)035A(3)	0.5	3
35	0.33	A	T39(1)A334(2)035A(3)	0.5	3
35	0.47	A	T39(1)A474(2)035A(3)	0.5	3
35	0.68	A	T39(1)A684(2)035A(3)	0.5	3
35	1.0	A	T39(1)A105(2)035A(3)	0.5	3
35	1.5	B	T39(1)B155(2)035A(3)	0.5	5
35	2.2	C	T39(1)C225(2)035A(3)	0.6	5
35	3.3	D	T39(1)D335(2)035A(3)	0.9	5
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(V) 85°C	µF	Case Code Case Size	KEMET Part Number	µA at 25°C Maximum/5 Minutes	120 Hz Maximum
Rated Voltage	Rated Capacitance			DC Leakage	DF % at 25°C

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

(3) To complete KEMET part number, insert S = Standard coated or T=100% Sn (tin). Designates termination finish.

Higher voltage/tighter capacitance tolerance products may be substituted for an order within the same case size at KEMET's option.

**Table 1 - Ratings and Part Number Reference cont.**

Rated Voltage	Rated Capacitance	Case Code Case Size	KEMET Part Number	DC Leakage	DF % at 25°C
(V) 85°C	µF			µA at 25°C Maximum/5 Minutes	120 Hz Maximum
35	10.0	G	T39(1)G106(2)035A(3)	2.8	6
35	15.0	J	T39(1)J156(2)035A(3)	4.2	6
35	22.0	K	T39(1)K226(2)035A(3)	6.2	6
35	33.0	L	T39(1)L336(2)035A(3)	9.2	6
35	47.0	M	T39(1)M476(2)035A(3)	10.0	6
50	0.10	A	T39(1)A104(2)050A(3)	0.5	3
50	0.15	A	T39(1)A154(2)050A(3)	0.5	3
50	0.22	A	T39(1)A224(2)050A(3)	0.5	3
50	0.33	A	T39(1)A334(2)050A(3)	0.5	3
50	0.47	B	T39(1)B474(2)050A(3)	0.5	3
50	0.68	B	T39(1)B684(2)050A(3)	0.5	3
50	1.0	B	T39(1)B105(2)050A(3)	0.5	3
50	1.5	E	T39(1)E155(2)050A(3)	0.6	5
50	2.2	E	T39(1)E225(2)050A(3)	0.9	5
50	3.3	F	T39(1)F335(2)050A(3)	1.3	5
50	4.7	G	T39(1)G475(2)050A(3)	1.9	5
50	6.8	J	T39(1)J685(2)050A(3)	2.7	5
50	10.0	K	T39(1)K106(2)050A(3)	4.0	6
50	15.0	L	T39(1)L156(2)050A(3)	6.0	6
50	22.0	M	T39(1)M226(2)050A(3)	8.8	6
(V) 85°C	µF	Case Code Case Size	KEMET Part Number	µA at 25°C Maximum/5 Minutes	120 Hz Maximum
Rated Voltage	Rated Capacitance			DC Leakage	DF % at 25°C

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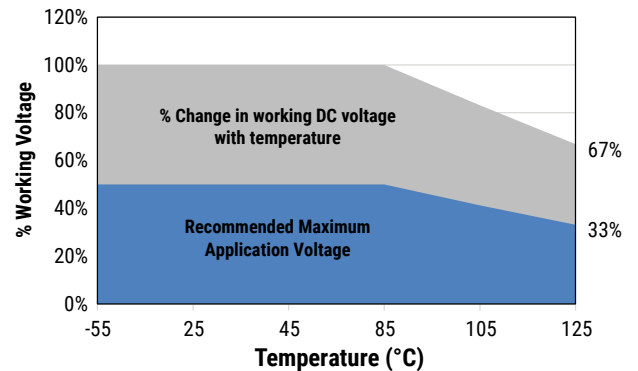
(2) To complete KEMET or military part number, insert M - 20%, K - ±10%. Designates Capacitance tolerance.

(3) To complete KEMET part number, insert S = Standard coated or T=100% Sn (tin). Designates termination finish.

Higher voltage/tighter capacitance tolerance products may be substituted for an order within the same case size at KEMET's option.

## Recommended Voltage Derating Guidelines

	-55°C to 85°C	85°C to 125°C
% Change in working DC voltage with temperature	$V_R$	66% 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 that may be applied is limited by following criteria:

1. Dissipated power must not exceed the limits specified for the Series.
2. The positive peak AC voltage plus the DC bias voltage, if any, must not exceed the DC voltage rating of the capacitor.
3. The negative peak AC voltage in combination with bias voltage, if any, must not exceed the allowable limits specified for reverse voltage.

Thermal capacities for the various case sizes have been determined empirically and are listed below. The “ripple voltage” permissible may be calculated from the impedance and ESR data shown in the respective product section.

Temperature Compensation Multipliers for Maximum Power Dissipation		
$T \leq 25^\circ\text{C}$	$T \leq 85^\circ\text{C}$	$T \leq 125^\circ\text{C}$
1.00	0.90	0.40

$T$  = 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 Size	Maximum Power Dissipation (Pmax) Watts at 25°C
A	0.040
B	0.050
C	0.060
D	0.065
E	0.070
F	0.080
G	0.090
H	0.100
J	0.110
K	0.120
L	0.130
M	0.140

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

$$I(\text{max}) = \sqrt{P_{\text{max}}/R}$$

$$E(\text{max}) = Z \sqrt{P_{\text{max}}/R}$$

$I$  = rms ripple current (amperes)

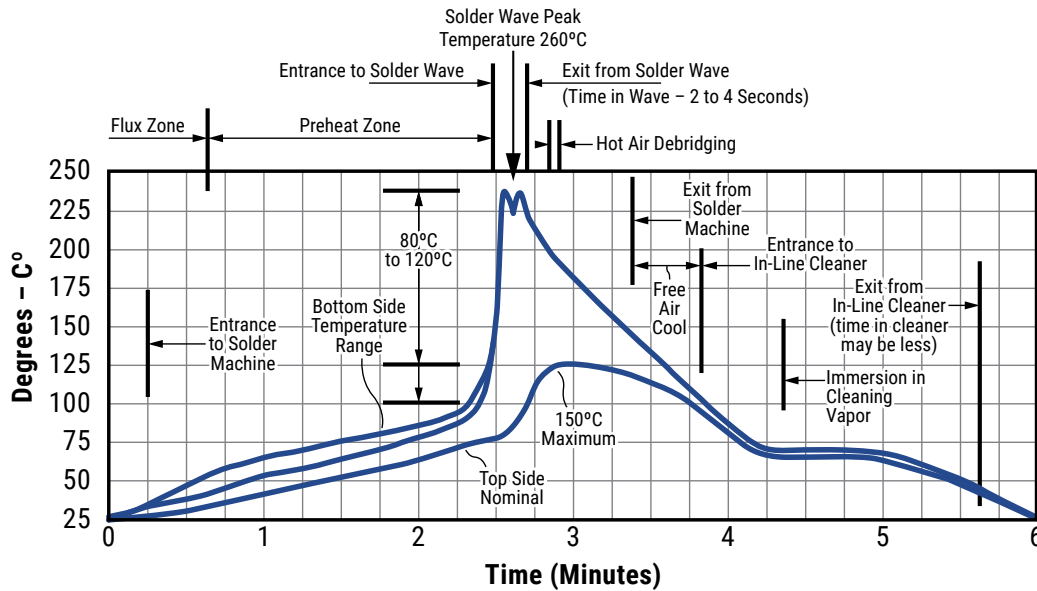
$E$  = rms ripple voltage (volts)

$P_{\text{max}}$  = maximum power dissipation (watts)

$R$  = ESR at specified frequency (ohms)

$Z$  = Impedance at specified frequency (ohms)

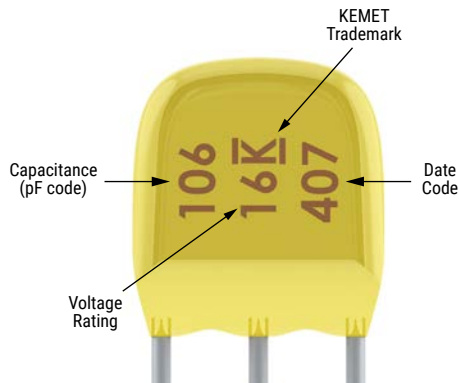
## Optimum Solder Wave Profile



## Mounting

All encased capacitors will pass the Resistance to Soldering Heat Test of MIL-STD-202, Method 210, Condition C. This test simulates wave solder of topside board mount product. This demonstration of resistance to solder heat is in accordance with what is believed to be the industry standard. More severe treatment must be considered reflective of an improper soldering process. The above figure is a recommended solder wave profile for both axial and radial leaded solid tantalum capacitors. Table 2 – Performance & Reliability: Test Methods and Conditions

## Capacitor Marking



## Storage

Tantalum molded radial/axial capacitors should be stored in normal working environments. KEMET recommends that maximum storage temperature not exceed 40°C and maximum storage humidity not exceed 60% RH. Storage at high temperature may cause a small, temporary increase in leakage current (measured under standard conditions), but the original value is usually restored within a few minutes after application of rated voltage. Storage at high humidity may increase capacitance and dissipation factor. Solderability will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage. For optimized solderability capacitors stock should be used promptly, preferably within three years of receipt.

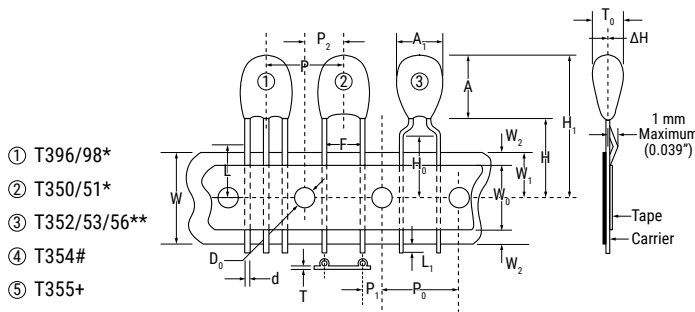
## Tape & Reel Packaging Information

**Table 2 – Packaging Quantity**

Case Size	Standard Bulk Quantity	Standard Reel Quantity	Reel C-Spec	Ammo Pack Quantity
A/B	1,000	1,500	C-7301/7303	2,000
C	500	1,500	C-7301/7303	2,000
D/E/F	500	1,000	C-7301/7303	1,500
G	500	1,000	C-7301/7303	2,000
H	500	800	C-7301/7303	2,000
J	250	800	C-7301/7303	1,600
K	250	500	C-7301/7303	800
L/M	250	500	C-7301/7303	500



**Figure 1**



- ① T396/98\*
- ② T350/51\*
- ③ T352/53/56\*\*
- ④ T354#
- ⑤ T355+

Dimension	Symbol	Nominal mm (inch)		Tolerance mm (inch)	
Body Height (1)	A	17.0 (0.67)		Maximum	
Body Width (1)	A <sub>1</sub>	10.2 (0.40)		Maximum	
Sprocket Hole Diameter	D <sub>0</sub>	4.0 (0.157)		±0.3 (±0.012)	
Lead Diameter	d	0.51 (0.020) or 0.64 (0.025)		±0.05 (±0.002)	
Lead Center (4)	F	See Note Below			
Component Base to Tape Center (4)	H	C-7301 16.0 (0.630)	C-7303 18.0 (0.709)	C-7301 ±0.5 (±0.02)	C-7303 Minimum
Lead Standoff Height	H <sub>0</sub>	C-7301 16.0 (0.630)	C-7303 18.0 (0.709)	C-7301 ±0.5 (±0.02)	C-7303 Minimum
Component Height Above Tape Center	H <sub>1</sub>	32.25 (1.270)		Maximum	
Component Alignment Front to Rear	ΔH	0		±2.0 (0.079)	
Cut Out Length	L	11.0 (0.433)		Maximum	
Lead Protrusion	L <sub>1</sub>	2.0 (0.079)		Maximum	
Component Pitch (5)	P	12.7 (0.500)		±1.0 (±0.039)	
Sprocket Hole Pitch (2)	P <sub>0</sub>	12.7 (0.500)		±0.03 (±0.012)	
Sprocket Hole Center to Lead Center (3) (4)	P <sub>1</sub>	See Note Below		±0.7 (±0.028)	
Sprocket Hole Center to Component Center (5)	P <sub>2</sub>	See Note Below			
Body Thickness	T <sub>0</sub>	10.2 (0.400)		Maximum	
Total Tape Thickness	T	0.7 (0.28)		±0.02 (±0.008)	
Carrier Tape Width	W	18.0 (0.709)		+1.0/-0.5 (+0.039/-0.020)	
Hold-Down Tape Width	W <sub>0</sub>	15 mm (0.561) or 6 mm (0.236)		+1.0/-0.8 (+0.039/-0.031)	
Sprocket Hole Location	W <sub>1</sub>	9.0 (0.354)		+0.075/-0.5 (+0.030/-0.020)	
Hold-Down Tape Location	W <sub>2</sub>	12.0 (0.472)		Maximum	

**Notes:**

- (1) See Dimensions table for specific values per case size.
- (2) Cumulative pitch error ±1.0 mm (0.039) maximum in 20 consecutive sprocket hole locations.
- (3) Measured at bottom of standoff.
- (4) P<sub>1</sub> and F measured at egress from carrier tape.
- (5) P and P<sub>2</sub> measured at egress from carrier tape.

\* Lead spacings are 2.5 mm (0.098") center to center (T350 A-H)

\*\* Lead spacings are 5.0 mm (0.197") center to center

# Lead spacings are 6.35 mm (0.25") center to center

+ Lead spacings are 3.18 mm (0.125") center to center

F Dimensions:	P <sub>1</sub> Dimensions:
0.100" ±0.015	Lead Spacing
0.125" ±0.015	0.100" - 0.200 ±0.028"
0.200" ±0.015	0.125" - 0.187 ±0.028"
0.250" ±0.015"	0.200" - 0.150 ±0.028"
0.100" ±0.015 (3 leaded)	0.250" - 0.125 ±0.028"
	0.100" - 0.100 ±0.028" (3 leaded)

## KEMET Electronics Corporation Sales Offices

For a complete list of our global sales offices, please visit [www.kemet.com/sales](http://www.kemet.com/sales).

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