

KEMET Ordering Information

T	409	G	225	K	004	A	H	4252
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Failure Rate/Design	Lead Material	Surge
T = Tantalum	CWR 09 Established Reliability	A = 1005 B = 1505 C = 2005 D = 1510 E = 2010 F = 2214 G = 2711 H = 2915	First two digits represent significant figures. Third digit specifies number of zeros.	J = ±5% K = ±10% M = ±20%	004 = 4 V 006 = 6.3 V 010 = 10 V 015 = 15 V 020 = 20 V 025 = 25 V 035 = 35 V 050 = 50 V	Weibull A = non-ER B = (0.1%/1,000 hours) C = (0.01%/1,000 hours) D = (0.001%/1,000 hours) Exponential M = (1.0%/1,000 hours) P = (0.1%/1,000 hours) R = (0.01%/1,000 hours) S = (0.001%/1,000 hours)	C = Hot Solder Dipped H = Standard Solder Coated (SnPb 5% Pb minimum) B = Gold Plated K = Solder Fused	4250 = 25°C after Weibull 4251 = -55°C and 85°C after Weibull 4252 = -55°C and 85°C before Weibull

Defense MIL-PRF-55365/4 Ordering Information

CWR09	J	H	105	K	C	A
Capacitor Style	Voltage	Termination Finish	Capacitance Code (pF)	Capacitance Tolerance	Reliability Level	Surge Current Option
Per MIL-PRF-55365/4	C = 4 V D = 6 V F = 10 V H = 15 V J = 20 V K = 25 V M = 35 V N = 50 V	B = Gold Plated C = Hot solder dipped H = Solder Plated K = Solder fused	First two digits represent significant figures. Third digit specifies number of zeros.	J = ±5% K = ±10% M = ±20%	Weibull A = non-ER B = (0.1%/1,000 hours) C = (0.01%/1,000 hours) D = (0.001%/1,000 hours) Exponential M = (1.0%/1,000 hours) P = (0.1%/1,000 hours) R = (0.01%/1,000 hours) S = (0.001%/1,000 hours)	A = +25°C after Weibull B = -55°C +85°C after Weibull C = -55°C +85°C before Weibull

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 125°C
Rated Capacitance Range	0.1 – 100 µF @ 120 Hz/25°C
Capacitance Tolerance	J Tolerance (5%), K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	4 – 50 V
DF (120 Hz)	Refer to Part Number Electrical Specification Table
ESR (100 kHz)	Refer to Part Number Electrical Specification Table
Leakage Current	≤ 0.01 CV (µA) at Rated Voltage after 5 minutes

Qualification

Test	Condition	Characteristics					
Endurance	85°C @ rated voltage, 2,000 hours 125°C @ 2/3 rated voltage, 2,000 hours	Δ C/C	Within ±10% of initial value				
		DF	Within initial limits				
		DCL	Within 1.25 x initial limit				
		ESR	Within initial limits				
Storage Life	125°C @ 0 Volts, 2,000 hours	Δ C/C	Within ±10% of initial value				
		DF	Within initial limits				
		DCL	Within 1.25 x initial limit				
		ESR	Within initial limits				
Thermal Shock	MIL-STD-202, Method 107, Condition B, mounted, -55°C to 125°C, 1,000 cycles	Δ C/C	Within ±5% of initial value				
		DF	Within initial limits				
		DCL	Within 1.25 x initial limit				
		ESR	Within initial limits				
Temperature Stability	Extreme temperature exposure at a succession of continuous steps at +25°C, -55°C, +25°C, +85°C, +125°C, +25°C	+25°C	-55°C	+85°C	+125°C		
		Δ C/C	IL*	±10%	±10%	±20%	
		DF	IL	IL	1.5 x IL	1.5 x IL	
		DCL	IL	n/a	10 x IL	12 x IL	
		Surge Voltage	25°C and 85°C, 1.32 x rated voltage 1,000 cycles (125°C, 1.2 x rated voltage)	Δ C/C	Within ±5% of initial value		
				DF	Within initial limits		
DCL	Within initial limits						
ESR	Within initial limits						
Mechanical Shock/Vibration	MIL-STD-202, Method 213, Condition I, 100 G Peak MIL-STD-202, Method 204, Condition D, 10 Hz to 2,000 Hz, 20 G peak	Δ C/C	Within ±10% of initial value				
		DF	Within initial limits				
		DCL	Within initial limits				
Additional qualification tests per MIL-PRF-55365/4	Please contact KEMET for more information.						

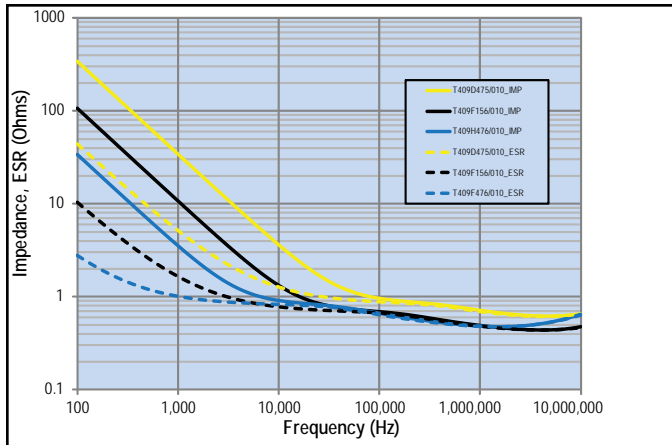
*IL = Initial limit

Certification

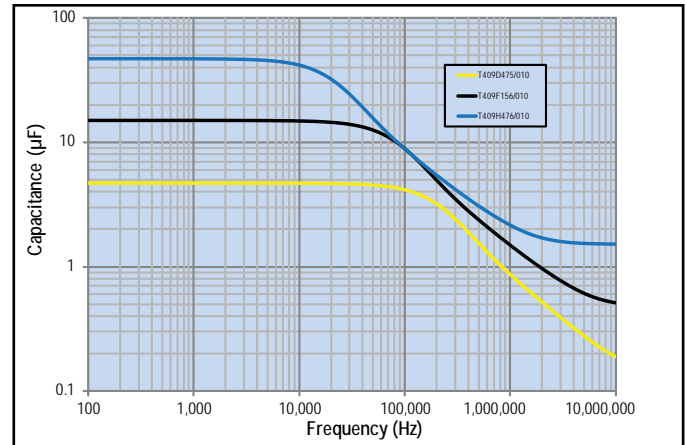
MIL-PRF-55365/4

Electrical Characteristics

ESR vs. Frequency

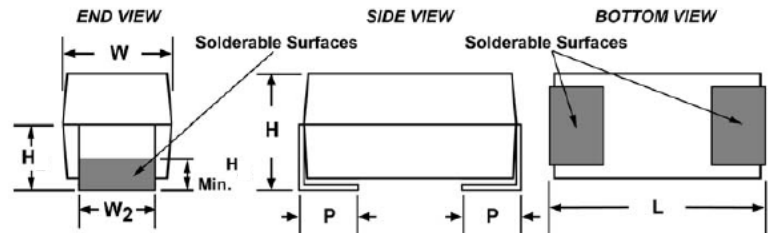


Capacitance vs. Frequency



Dimensions – Millimeters (Inches)

Metric will govern



Case Size		Component			
KEMET	L* +/- 0.38 (.015)	W* +/- 0.38 (.015)	H* +/- 0.38 (.015)	P +.025(.010), -.013(.005)	W ₂
A	2.54 (.100)	1.27 (.050)	1.27 (.050)	0.76 (.030)	1.27 +/- 0.13 (.050 +/- .005)
B	3.81 (.150)	1.27 (.050)	1.27 (.050)	0.76 (.030)	1.27 +/- 0.13 (.050 +/- .005)
C	5.08 (.200)	1.27 (.050)	1.27 (.050)	0.76 (.030)	1.27 +/- 0.13 (.050 +/- .005)
D	3.81 (.150)	2.54 (.100)	1.27 (.050)	0.76 (.030)	2.41 +.13, -.25 (.095 +.005, -.010)
E	5.08 (.200)	2.54 (.100)	1.27 (.050)	0.76 (.030)	2.41 +.13, -.25 (.095 +.005, -.010)
F	5.59 (.220)	3.43 (.135)	1.78 (.070)	0.76 (.030)	3.30 +/- 0.13 (.130 +/- .005)
G	6.73 (.265)	2.79 (.110)	2.79 (.110)	1.27 (.050)	2.67 +/- 0.13 (.105 +/- .005)
H	7.24 (.285)	3.81 (.150)	2.79 (.110)	1.27 (.050)	3.68 +.013, -.051 (.145 + .005, - .020)

Table 1 – Ratings & Part Number Reference

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	MIL-C-55365/4 Part Number	DC Leakage	DF	ESR	Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	(See below for part options)	µA +20°C Max/5 Min	+20°C 120Hz % Max	+20°C 100 kHz Ohms	Reflow Temperature ≤ 260°C
4	2.2	A/1005	T409A225(1)004(2)(3)(4)	CWR09C(3)225(1)(2)(5)	1	6.0	8.0	1
4	4.7	B/1505	T409B475(1)004(2)(3)(4)	CWR09C(3)475(1)(2)(5)	1.0	6.0	8.0	1
4	6.8	C/2005	T409C685(1)004(2)(3)(4)	CWR09C(3)685(1)(2)(5)	1.0	6.0	5.5	1
4	10	D/1510	T409D106(1)004(2)(3)(4)	CWR09C(3)106(1)(2)(5)	1.0	8.0	4.0	1
4	15	E/2010	T409E156(1)004(2)(3)(4)	CWR09C(3)156(1)(2)(5)	1.0	8.0	3.5	1
4	33	F/2214	T409F336(1)004(2)(3)(4)	CWR09C(3)336(1)(2)(5)	2.0	8.0	2.2	1
4	68	G/2711	T409G686(1)004(2)(3)(4)	CWR09C(3)686(1)(2)(5)	3.0	10.0	1.1	1
4	100	H/2915	T409H107(1)004(2)(3)(4)	CWR09C(3)107(1)(2)(5)	4.0	10.0	0.9	1
6	1.5	A/1005	T409A155(1)006(2)(3)(4)	CWR09D(3)155(1)(2)(5)	1.0	6.0	8.0	1
6	3.3	B/1505	T409B335(1)006(2)(3)(4)	CWR09D(3)335(1)(2)(5)	1.0	6.0	8.0	1
6	4.7	C/2005	T409C475(1)006(2)(3)(4)	CWR09D(3)475(1)(2)(5)	1.0	6.0	5.5	1
6	6.8	D/1510	T409D685(1)006(2)(3)(4)	CWR09D(3)685(1)(2)(5)	1.0	6.0	4.5	1
6	10	E/2010	T409E106(1)006(2)(3)(4)	CWR09D(3)106(1)(2)(5)	1.0	8.0	3.5	1
6	22	F/2214	T409F226(1)006(2)(3)(4)	CWR09D(3)226(1)(2)(5)	2.0	8.0	2.2	1
6	47	G/2711	T409G476(1)006(2)(3)(4)	CWR09D(3)476(1)(2)(5)	3.0	10.0	1.1	1
6	68	H/2915	T409H686(1)006(2)(3)(4)	CWR09D(3)686(1)(2)(5)	4.0	10.0	0.9	1
10	1	A/1005	T409A105(1)010(2)(3)(4)	CWR09F(3)105(1)(2)(5)	1.0	6.0	10.0	1
10	2.2	B/1505	T409B225(1)010(2)(3)(4)	CWR09F(3)225(1)(2)(5)	1.0	6.0	8.0	1
10	3.3	C/2005	T409C335(1)010(2)(3)(4)	CWR09F(3)335(1)(2)(5)	1.0	6.0	5.5	1
10	4.7	D/1510	T409D475(1)010(2)(3)(4)	CWR09F(3)475(1)(2)(5)	1.0	6.0	4.5	1
10	6.8	E/2010	T409E685(1)010(2)(3)(4)	CWR09F(3)685(1)(2)(5)	1.0	6.0	3.5	1
10	15	F/2214	T409F156(1)010(2)(3)(4)	CWR09F(3)156(1)(2)(5)	2.0	8.0	2.5	1
10	33	G/2711	T409G336(1)010(2)(3)(4)	CWR09F(3)336(1)(2)(5)	3.0	10.0	1.1	1
10	47	H/2915	T409H476(1)010(2)(3)(4)	CWR09F(3)476(1)(2)(5)	5.0	10.0	0.9	1
15	0.68	A/1005	T409A684(1)015(2)(3)(4)	CWR09H(3)684(1)(2)(5)	1.0	6.0	12.0	1
15	1.5	B/1505	T409B155(1)015(2)(3)(4)	CWR09H(3)155(1)(2)(5)	1.0	6.0	8.0	1
15	2.2	C/2005	T409C225(1)015(2)(3)(4)	CWR09H(3)225(1)(2)(5)	1.0	6.0	5.5	1
15	3.3	D/1510	T409D335(1)015(2)(3)(4)	CWR09H(3)335(1)(2)(5)	1.0	6.0	5.0	1
15	4.7	E/2010	T409E475(1)015(2)(3)(4)	CWR09H(3)475(1)(2)(5)	1.0	6.0	4.0	1
15	10	F/2214	T409F106(1)015(2)(3)(4)	CWR09H(3)106(1)(2)(5)	2.0	6.0	2.5	1
15	22	G/2711	T409G226(1)015(2)(3)(4)	CWR09H(3)226(1)(2)(5)	4.0	6.0	1.1	1
15	33	H/2915	T409H336(1)015(2)(3)(4)	CWR09H(3)336(1)(2)(5)	5.0	8.0	0.9	1
20	0.47	A/1005	T409A474(1)020(2)(3)(4)	CWR09J(3)474(1)(2)(5)	1.0	8.0	14.0	1
20	0.68	B/1505	T409B684(1)020(2)(3)(4)	CWR09J(3)684(1)(2)(5)	1.0	6.0	10.0	1
20	1	B/1505	T409B105(1)020(2)(3)(4)	CWR09J(3)105(1)(2)(5)	1.0	6.0	12.0	1
20	1.5	C/2005	T409C155(1)020(2)(3)(4)	CWR09J(3)155(1)(2)(5)	1.0	6.0	6.0	1
20	2.2	D/1510	T409D225(1)020(2)(3)(4)	CWR09J(3)225(1)(2)(5)	1.0	6.0	5.0	1
20	3.3	E/2010	T409E335(1)020(2)(3)(4)	CWR09J(3)335(1)(2)(5)	1.0	6.0	4.0	1
20	6.8	F/2214	T409F685(1)020(2)(3)(4)	CWR09J(3)685(1)(2)(5)	2.0	6.0	2.4	1
20	15	G/2711	T409G156(1)020(2)(3)(4)	CWR09J(3)156(1)(2)(5)	3.0	6.0	1.1	1
20	22	H/2915	T409H226(1)020(2)(3)(4)	CWR09J(3)226(1)(2)(5)	4.0	6.0	0.9	1
25	0.33	A/1005	T409A334(1)025(2)(3)(4)	CWR09K(3)334(1)(2)(5)	1.0	6.0	15.0	1
25	0.68	B/1505	T409B684(1)025(2)(3)(4)	CWR09K(3)684(1)(2)(5)	1.0	6.0	7.5	1
25	1	C/2005	T409C105(1)025(2)(3)(4)	CWR09K(3)105(1)(2)(5)	1.0	6.0	6.5	1
25	1.5	D/1510	T409D155(1)025(2)(3)(4)	CWR09K(3)155(1)(2)(5)	1.0	6.0	6.5	1
25	2.2	E/2010	T409E225(1)025(2)(3)(4)	CWR09K(3)225(1)(2)(5)	1.0	6.0	3.5	1
25	4.7	F/2214	T409F475(1)025(2)(3)(4)	CWR09K(3)475(1)(2)(5)	2.0	6.0	2.5	1
25	6.8	G/2711	T409G685(1)025(2)(3)(4)	CWR09K(3)685(1)(2)(5)	2.0	6.0	1.2	1
25	10	G/2711	T409G106(1)025(2)(3)(4)	CWR09K(3)106(1)(2)(5)	3.0	6.0	1.4	1
VDC	µF	KEMET/EIA	(See below for part options)	(See below for part options)	µA +20°C Max/5 Min	+20°C 120Hz % Max	+20°C 100 kHz Ohms	Reflow Temperature ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	MIL-C-55365/4 Part Number	DC Leakage	DF	ESR	Moisture Sensitivity

- (1) To complete KEMET/CWR part number, insert M for ±20%, K for ±10%, or J for ±5%. Designates capacitance tolerance.
- (2) To complete KEMET/CWR part number, insert B (0.1%/1,000 Hours), C (0.01%/1,000 Hours), D (0.001%/1,000 Hours) or A = N/A. Designates reliability level.
- (3) To complete KEMET/CWR part number, insert B = Gold Plated, C = Hot solder dipped, H = Solder plated or K = Solder Fused. Designates termination finish.
- (4) To complete KEMET part number, insert 4250 = +25°C after Weibull, 4251 = -55°C +85°C after Weibull, or 4252 = -55°C +85°C before Weibull. Designates surge current option.
- (5) To complete CWR part number, insert A = +25°C after Weibull, B = -55°C +85°C after Weibull, or C = -55°C +85°C before Weibull. Designates surge current option. Refer to Ordering Information for additional detail.

Table 1 – Ratings & Part Number Reference cont'd

Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	MIL-C-55365/4 Part Number	DC Leakage	DF	ESR	Moisture Sensitivity
VDC	µF	KEMET/EIA	(See below for part options)	(See below for part options)	µA +20°C Max/5 Min	+20°C 120Hz % Max	+20°C 100 kHz Ohms	Reflow Temperature ≤ 260°C
25	15	H/2915	T409H156(1)025(2)(3)(4)	CWR09K(3)156(1)(2)(5)	4.0	6.0	1.0	1
35	0.22	A/1005	T409A224(1)035(2)(3)(4)	CWR09M(3)224(1)(2)(5)	1.0	6.0	18.0	1
35	0.47	B/1505	T409B474(1)035(2)(3)(4)	CWR09M(3)474(1)(2)(5)	1.0	6.0	10.0	1
35	0.68	C/2005	T409C684(1)035(2)(3)(4)	CWR09M(3)684(1)(2)(5)	1.0	6.0	8.0	1
35	1	D/1510	T409D105(1)035(2)(3)(4)	CWR09M(3)105(1)(2)(5)	1.0	6.0	6.5	1
35	1.5	E/2010	T409E155(1)035(2)(3)(4)	CWR09M(3)155(1)(2)(5)	1.0	6.0	4.5	1
35	3.3	F/2214	T409F335(1)035(2)(3)(4)	CWR09M(3)335(1)(2)(5)	1.0	6.0	2.5	1
35	4.7	G/2711	T409G475(1)035(2)(3)(4)	CWR09M(3)475(1)(2)(5)	2.0	6.0	1.5	1
35	6.8	H/2915	T409H685(1)035(2)(3)(4)	CWR09M(3)685(1)(2)(5)	3.0	6.0	1.3	1
50	0.1	A/1005	T409A104(1)050(2)(3)(4)	CWR09N(3)104(1)(2)(5)	1.0	6.0	22.0	1
50	0.15	A/1005	T409A154(1)050(2)(3)(4)	CWR09N(3)154(1)(2)(5)	1.0	6.0	17.0	1
50	0.22	B/1505	T409B224(1)050(2)(3)(4)	CWR09N(3)224(1)(2)(5)	1.0	6.0	14.0	1
50	0.33	B/1505	T409B334(1)050(2)(3)(4)	CWR09N(3)334(1)(2)(5)	1.0	6.0	12.0	1
50	0.47	C/2005	T409C474(1)050(2)(3)(4)	CWR09N(3)474(1)(2)(5)	1.0	6.0	8.0	1
50	0.68	D/1510	T409D684(1)050(2)(3)(4)	CWR09N(3)684(1)(2)(5)	1.0	6.0	7.0	1
50	1	E/2010	T409E105(1)050(2)(3)(4)	CWR09N(3)105(1)(2)(5)	1.0	6.0	6.0	1
50	1.5	F/2214	T409F155(1)050(2)(3)(4)	CWR09N(3)155(1)(2)(5)	1.0	6.0	4.0	1
50	2.2	F/2214	T409F225(1)050(2)(3)(4)	CWR09N(3)225(1)(2)(5)	2.0	6.0	2.5	1
50	3.3	G/2711	T409G335(1)050(2)(3)(4)	CWR09N(3)335(1)(2)(5)	2.0	6.0	2.0	1
50	4.7	H/2915	T409H475(1)050(2)(3)(4)	CWR09N(3)475(1)(2)(5)	3.0	6.0	1.5	1
VDC	µF	KEMET/EIA	(See below for part options)	(See below for part options)	µA +20°C Max/5 Min	+20°C 120Hz % Max	+20°C 100 kHz Ohms	Reflow Temperature ≤ 260°C
Rated Voltage	Rated Cap	Case Code/ Case Size	KEMET Part Number	MIL-C-55365/4 Part Number	DC Leakage	DF	ESR	Moisture Sensitivity

(1) To complete KEMET/CWR part number, insert M for ±20%, K for ±10%, or J for ±5%. Designates capacitance tolerance.

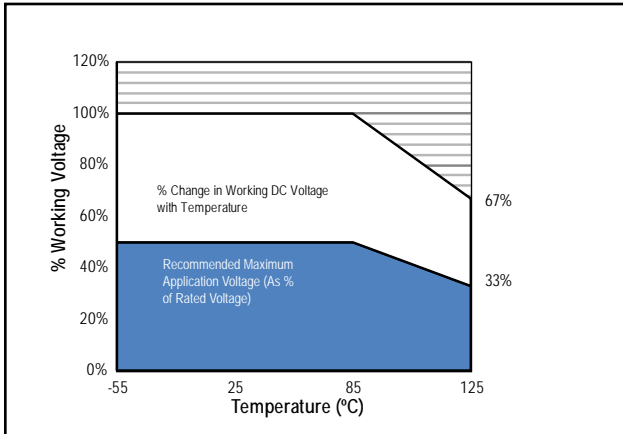
(2) To complete KEMET/CWR part number, insert B (0.1%/1,000 Hours), C (0.01%/1,000 Hours), D (0.001%/1,000 Hours) or A = N/A. Designates reliability level.

(3) To complete KEMET/CWR part number, insert B = Gold Plated, C = Hot solder dipped, H = Solder plated or K = Solder Fused. Designates termination finish.

(4) To complete KEMET part number, insert 4250 = +25°C after Weibull, 4251 = -55°C +85°C after Weibull, or 4252 = -55°C +85°C before Weibull. Designates surge current option.

(5) To complete CWR part number, insert A = +25°C after Weibull, B = -55°C +85°C after Weibull, or C = -55°C +85°C before Weibull. Designates surge current option. Refer to Ordering Information for additional detail.

Recommended Voltage Derating Guidelines



Ripple Current/Ripple Voltage

Case Code		Maximum Power Dissipation (P max) mWatts @ 25°C with +20°C Rise
KEMET	EIA	
A	1005	50
B	1505	70
C	2005	75
D	1510	80
E	2010	90
F	2214	100
G	2711	125
H	2915	150

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

T = Environmental Temperature

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

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

$$E(max) = \sqrt{P_{max} \cdot R}$$

I = rms ripple current (amperes)

E = rms ripple voltage (volts)

P max = maximum power dissipation (watts)

R = ESR at specified frequency (ohms)

Reverse Voltage

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

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

Table 2 – Land Dimensions/Courtyard

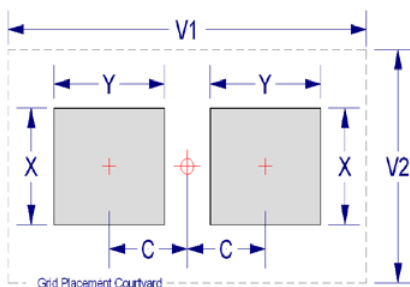
KEMET	Metric Size Code	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B: Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
		X	Y	C	V1	V2	X	Y	C	V1	V2	X	Y	C	V1	V2
Case	EIA															
A ¹	1005	1.45	2.15	1.20	5.60	2.70	1.35	1.85	1.05	4.50	2.20	1.25	1.55	0.90	3.60	1.90
B	1505	1.45	2.30	1.75	6.80	2.70	1.35	1.90	1.65	5.70	2.20	1.25	1.55	1.55	4.90	1.92
C	2005	1.45	2.30	2.40	8.10	2.70	1.35	1.90	2.30	7.00	2.20	1.25	1.55	2.15	6.10	1.90
D	1510	2.60	2.30	1.75	6.80	4.00	2.45	1.90	1.65	5.70	3.50	2.35	1.55	1.55	4.90	3.20
E	2010	2.60	2.30	2.40	8.10	4.00	2.45	1.90	2.30	7.00	3.50	2.35	1.55	2.15	6.10	3.20
F	2214	3.50	2.30	2.65	8.60	4.90	3.35	1.90	2.55	7.50	4.40	3.25	1.55	2.45	6.70	4.10
G	2711	2.85	2.80	2.95	9.70	4.20	2.75	2.40	2.85	8.60	3.70	2.65	2.05	2.75	7.80	3.40
H	2915	3.85	2.80	3.20	10.20	5.20	3.75	2.40	3.10	9.10	4.70	3.65	2.05	3.00	8.30	4.40

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 density 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 Land pattern geometry is too small for silkscreen outline.



Soldering Process

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

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 occurred, the iron should be removed immediately. "Wiping" the edges of a chip and heating the top surface is not recommended.

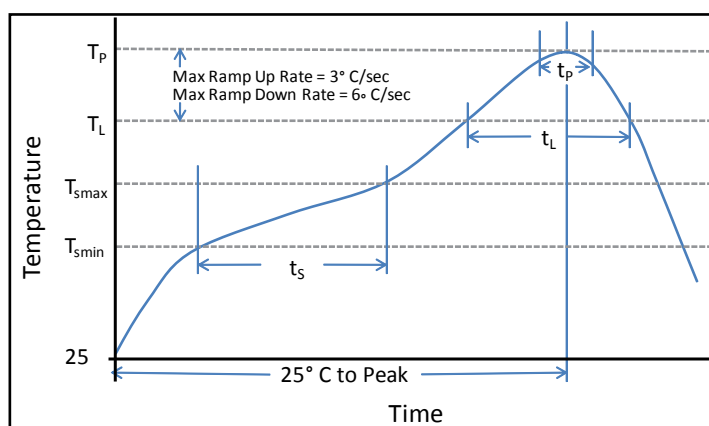
During typical reflow operations, a slight darkening of the gold-colored epoxy may be observed. This slight darkening is normal and is not harmful to the product. Marking permanency is not affected by this change.

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

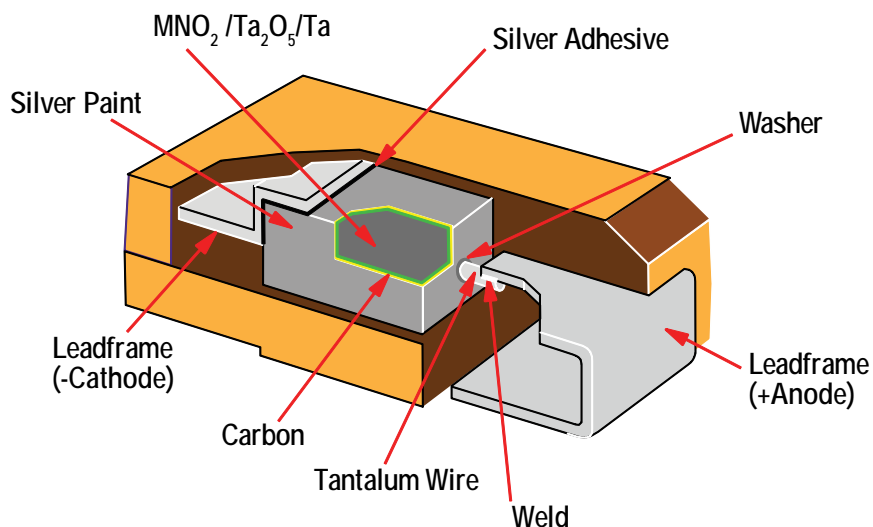
Note: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow.

*Case Size G, H and X

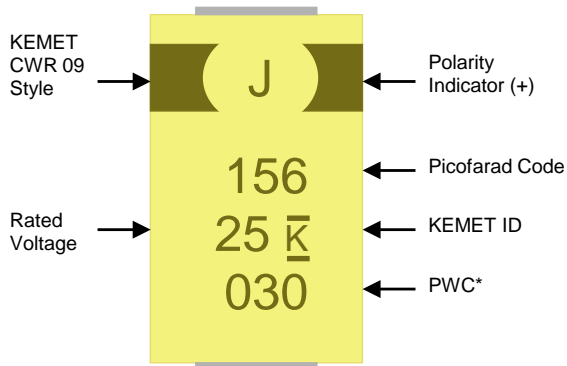
**Case Size A, B, C, D, E and F



Construction



Capacitor Marking



* 030 = 30th week of 2010

Storage

Tantalum chip capacitors should be stored in normal working environments. While the chips themselves are quite robust in other environments, solderability will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage. In addition, packaging materials will be degraded by high temperature - reels may soften or warp, and tape peel force may increase. KEMET recommends that maximum storage temperature not exceed 40°C, and maximum storage humidity not exceed 60% relative humidity. Temperature fluctuations should be minimized to avoid condensation on the parts, and atmospheres should be free of chlorine and sulphur bearing compounds. For optimized solderability, chip stock should be used promptly, preferably within three years of receipt.

Tape & Reel Packaging Information

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

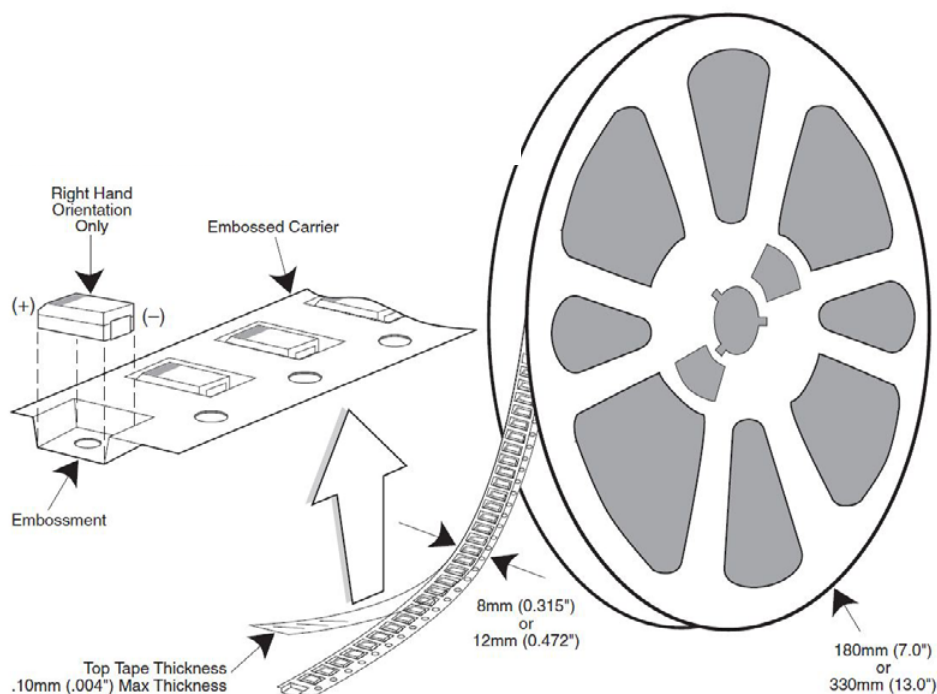


Table 3 – Packaging Quantity

Case Code		Tape Width (mm)	7" Reel*	13" Reel*
KEMET	EIA			
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	5,000
W	7343-15	12	1,000	3,000
Z	7343-17	12	1,000	3,000
V	7343-20	12	1,000	3,000
A	3216-18	8	2,000	9,000
B	3528-21	8	2,000	8,000
C	6032-28	12	500	3,000
D	7343-31	12	500	2,500
Y	7343-40	12	500	2,000
X	7343-43	12	500	2,000
E/428P	7260-38	12	500	2,000

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

Figure 1 – Embossed (Plastic) Carrier Tape Dimensions

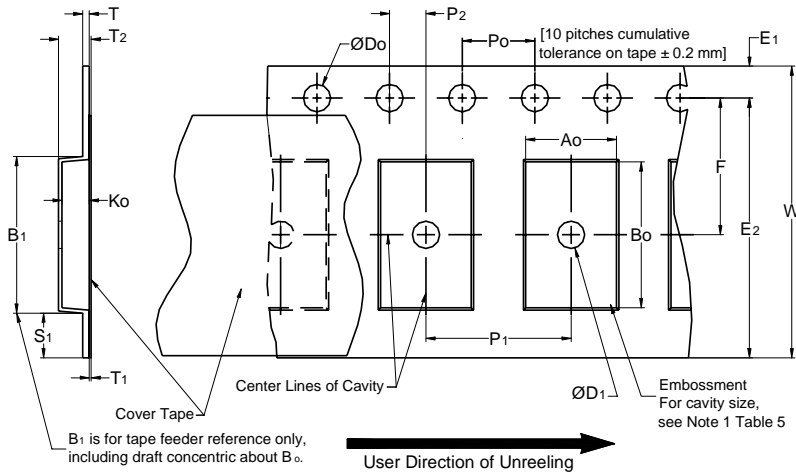


Table 4 – Embossed (Plastic) Carrier Tape Dimensions

Metric will govern

Constant Dimensions — Millimeters (Inches)									
Tape Size	D ₀	D ₁ Minimum Note 1	E ₁	P ₀	P ₂	R Ref. Note 2	S ₁ Minimum Note 3	T Maximum	T ₁ Maximum
8 mm	1.5 +0.10/-0.0 (0.059 +0.004/-0.0)	1.0 (0.039)	1.75 ±0.10 (0.069 ±0.004)	4.0 ±0.10 (0.157 ±0.004)	2.0 ±0.05 (0.079 ±0.002)	25.0 (0.984)	0.600 (0.024)	0.600 (0.024)	0.100 (0.004)
12 mm		1.5 (0.059)				30 (1.181)			
16 mm									
Variable Dimensions — Millimeters (Inches)									
Tape Size	Pitch	B ₁ Maximum Note 4	E ₂ Minimum	F	P ₁	T ₂ Maximum	W Maximum	A ₀ , B ₀ & K ₀	
8 mm	Single (4 mm)	4.35 (0.171)	6.25 (0.246)	3.5 ±0.05 (0.138 ±0.002)	4.0 ±0.10 (0.157 ±0.004)	2.5 (0.098)	8.3 (0.327)	Note 5	
12 mm	Single (4 mm) & Double (8 mm)	8.2 (0.323)	10.25 (0.404)	5.5 ±0.05 (0.217 ±0.002)	8.0 ±0.10 (0.315 ±0.004)	4.6 (0.181)	12.3 (0.484)		
16 mm	Triple (12 mm)	12.1 (0.476)	14.25 (0.561)	5.5 ±0.05 (0.217 ±0.002)	8.0 ±0.10 (0.315 ±0.004)	4.6 (0.181)	16.3 (0.642)		

- 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.
 - The tape with or without components shall pass around R without damage (see Figure 5).
 - 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).
 - B₁ dimension is a reference dimension for tape feeder clearance only.
 - The cavity defined by A₀, B₀ and K₀ shall surround the component with sufficient clearance that:
 - the component does not protrude above the top surface of the carrier tape.
 - the component can be removed from the cavity in a vertical direction without mechanical restriction, after the top cover tape has been removed.
 - rotation of the component is limited to 20° maximum for 8 and 12 mm tapes and 10° maximum for 16 mm tapes (see Figure 3).
 - 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 4).
- 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

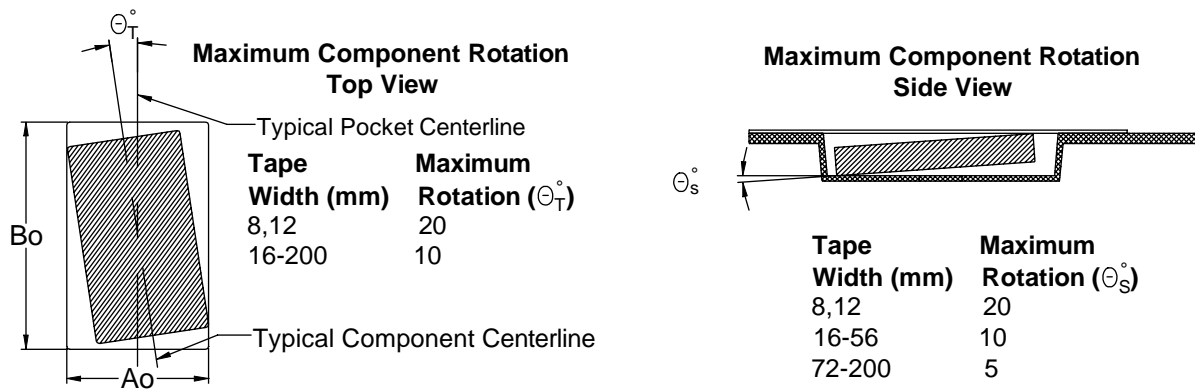


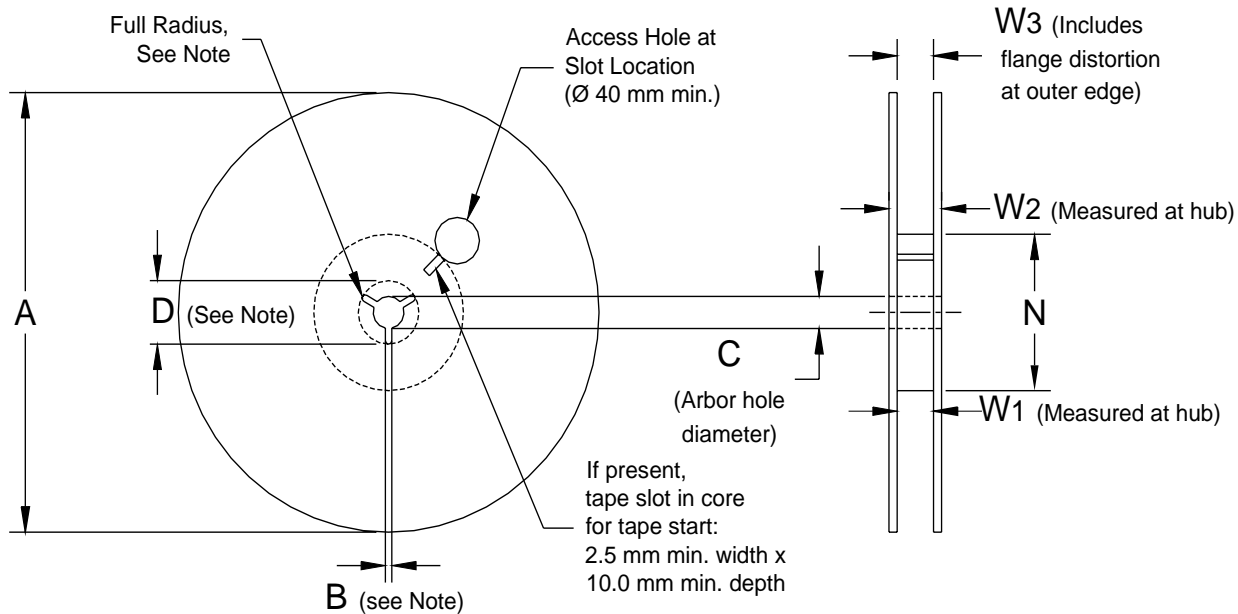
Figure 3 – Maximum Lateral Movement



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

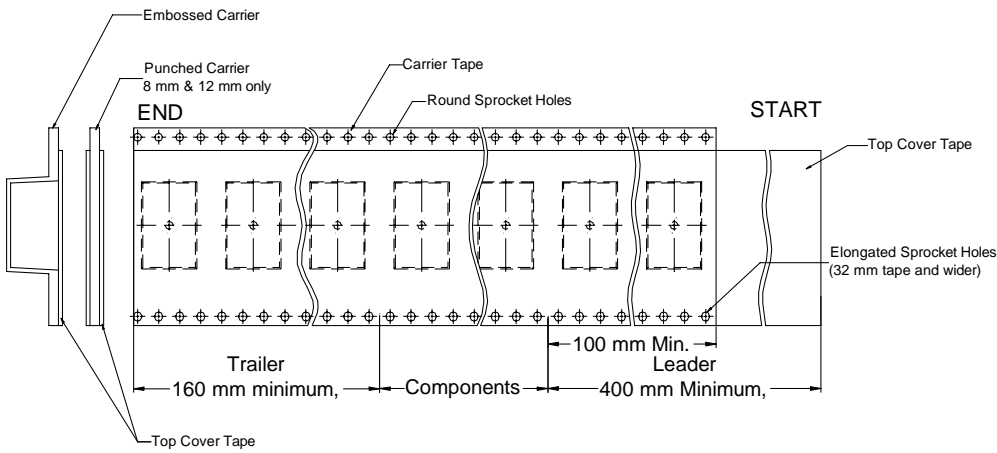
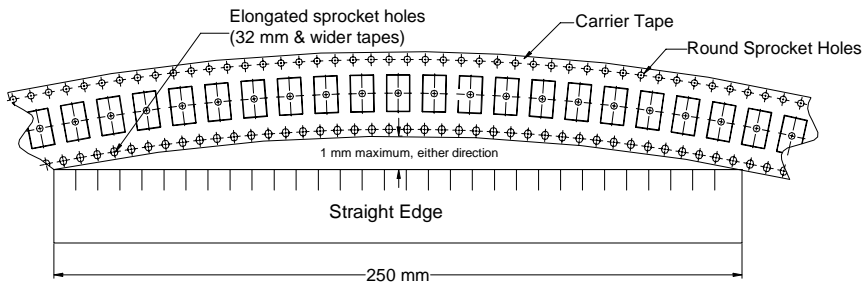


Figure 7 – Maximum Camber



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