KEMET

CHARGED.™

Tantalum Surface Mount Organic T520
SAMPLE KIT

Product-ID: T520-Kemet

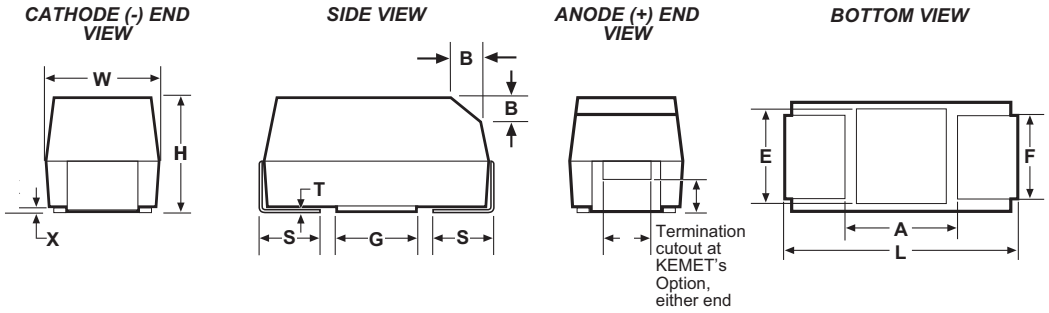
KEMET CONDUCTIVE POLYMER CHIP CAPACITORS

T520 Series - KO Cap

FEATURES

- Polymer Cathode Technology
- Low ESR
- High Frequency Cap Retention
- No-Ignition Failure Mode
- Use Up to 90% of Rated Voltage (10% Derating) for part types ≤ 10 Volts
- Halogen Free Epoxy
- 100% Accelerated Steady State Aging
- Volumetrically Efficient
- Use Up to 80% of Rated Voltage (20% Derating) for part types > 10 Volts
- Capacitance 15 to 1000µF (±20%)
- Voltage 2V to 25V
- EIA Standard Case Sizes
- 100% Surge Current Tested
- Operating Temperature -55ºC to +105ºC
- Self Healing Mechanism
- RoHS Compiant & Leadfree Terminations (see www.kemet.com for lead transition)

OUTLINE DRAWING



DIMENSIONS - MILLIMETERS

Case Size											
KEMET	EIA	L	W	H	F ± 0.1	S ± 0.3	X(Ref)	T(Ref)	A(Min)	G(ref)	E(ref)
A	3216-18	3.2 ± 0.2	1.6 ± 0 2	1.6 ± 0.2	1.2	0 8	0.10 ± 0.10	0.13	0.8	1.1	1.3
T	3528-12	3.5 ± 0.2	2.8 ± 0 2	1.2 max	2.2	0 8	0.05	0.13	1.1	1.8	2.2
M	3528-15	3.5 ± 0.2	2.8 ± 0 2	1.5 max	2.2	0 8	0.11	0.13	2.1	1.8	2.2
B	3528-21	3.5 ± 0.2	2.8 ± 0 2	1.9 ± 0.1	2.2	0 8	0.10 ± 0.10	0.13	1.1	1.8	2.2
U	6032-15	6.0 ± 0.3	3.2 ± 0 3	1.5 max	2.2	1 3	0.05	0.13	3.1	2.8	2.4
L	6032-19	6.0 ± 0.3	3.2 ± 0 3	1.9 max	2.2	1 3	0.10 ± 0.10	0.13	2.5	2.8	2.4
C	6032-28	6.0 ± 0.3	3.2 ± 0 3	2.5 ± 0.3	2.2	1 3	0.10 ± 0.10	0.13	2.5	2.8	2.4
W	7343-15	7.3 ± 0.3	4.3 ± 0 3	1.5 max	2.4	1 3	0.05	0.13	3.8	3.5	3.5
V	7343-20	7.3 ± 0.3	4.3 ± 0 3	1.9 max	2.4	1 3	0.05	0.13	3.8	3.5	3.5
D	7343-31	7.3 ± 0.3	4.3 ± 0 3	2.8 ± 0.3	2.4	1 3	0.10 ± 0.10	0.13	3.8	3.5	3.5
Y	7343-40	7.3 ± 0.3	4.3 ± 0 3	4.0 max	2.4	1 3	0.10 ± 0.10	0.13	3.8	3.5	3.5
X	7343-43	7.3 ± 0.3	4.3 ± 0 3	4.0 ± 0.3	2.4	1 3	0.10 ± 0.10	0.13	3.8	3.5	3.5

T520 ORDERING INFORMATION

T 520 V 157 M 006 A T E015

Tantalum

Series
T520 - Low ESR Polymer

Case Size
A, T, B, C, V, W, D, Y, X

Capacitance Picofarad Code
First two digits represent significant figures.
Third digit specifies number of zeros to follow.

ESR

Lead Material
T - 100% Tin (Sn) Plated
H - Tin/Lead (SnPb 5% Pb minimum)

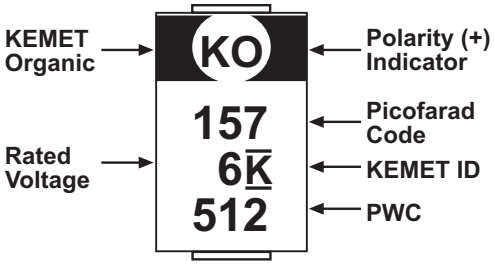
Failure Rate
A - Not Applicable

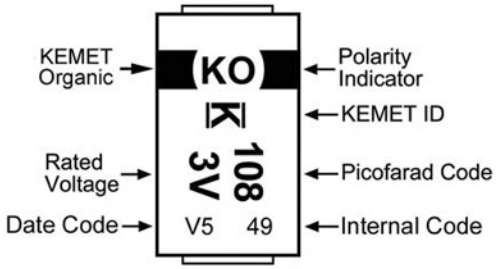
Voltage
Note: 006 = 6.3 volts

Capacitance Tolerance
M = ± 20%

***See www.kemet.com for Pb Free transition information.**

COMPONENT MARKING





Date Code:

Year	Month	
S = 2004	1 = January	7 = July
T = 2005	2 = February	8 = August
U = 2006	3 = March	9 = September
V = 2007	4 = April	O = October
W = 2008	5 = May	N = November
X = 2009	6 = June	D = December

512 = 12th week of 2005

CONDUCTIVE POLYMER CHIP CAPACITORS
T520 Series - KO Cap

KEMET CHARGED.

T520 RATINGS & PART NUMBER REFERENCE

Rated Voltage (V)	Rated Capacitance (µF)	Case Code/ Case Size	KEMET Part Number	DC Leakage µA @ 20°C max/ 5min	DF% @ 20°C 120 Hz Max	ESR mΩ @ 20°C 100 kHz Max	Maximum allowable ripple current (mArms) 100kHz*	MSL Reflow Temp ≤ 260ºC
2	470	V/7343-19	T520V477M002A(1)E040	94	10	40	2200	3
2.5	47	A/3216-18	T520A476M2R5A(1)E090	12	8	90	1100	
	56	T/3528-12	T520T566M2R5A(1)E040	14	6	40	1600	
	56	T/3528-12	T520T566M2R5A(1)E070	14	8	70	1200	
	68	A/3216-18	T520A686M2R5A(1)E070	17	8	70	1300	
	68	A/3216-18	T520A686M2R5A(1)E080	17	8	80	1200	
	100	T/3528-12	T520T107M2R5A(1)E040	25	8	40	1600	
	100	T/3528-12	T520T107M2R5A(1)E070	25	8	70	1200	
	100	B/3528-20	T520B107M2R5A(1)E025	25	8	25	2300	
	100	B/3528-20	T520B107M2R5A(1)E035	25	8	35	1900	
	100	B/3528-20	T520B107M2R5A(1)E040	25	8	40	1800	
	100	B/3528-20	T520B107M2R5A(1)E070	25	8	70	1300	
	150	U/6032-15	T520U157M2R5A(1)E055	38	8	55	1600	
	220	B/3528-20	T520B227M2R5A(1)E015	55	8	15	2900	
	220	B/3528-20	T520B227M2R5A(1)E018	55	8	15	2900	
	220	B/3528-20	T520B227M2R5A(1) E021	55	8	21	2500	
	220	B/3528-20	T520B227M2R5A(1)E025	55	8	25	2300	
	220	B/3528-20	T520B227M2R5A(1)E030	55	8	30	2100	
	220	B/3528-20	T520B227M2R5A(1)E035	55	8	35	1900	
	220	B/3528-20	T520B227M2R5A(1) E055	55	8	55	1500	
	220	B/3528-20	T520B227M2R5A(1)E070	55	8	70	1300	
	220	U/6032-15	T520U227M2R5A(1)E055	55	8	55	1600	
	220	C/6032-28	T520C227M2R5A(1)E025	55	8	25	2600	
	220	C/6032-28	T520C227M2R5A(1)E045	55	8	45	1900	
	220	W/7343-15	T520W227M2R5A(1) E025	55	8	25	2200	
	220	V/7343-19	T520V227M2R5A(1)E007	55	10	7	5200	
	220	V/7343-19	T520V227M2R5A(1)E009	55	10	9	4600	
	220	V/7343-19	T520V227M2R5A(1)E012	55	10	12	3900	
	220	V/7343-19	T520V227M2R5A(1)E015	55	10	15	3500	
	220	V/7343-19	T520V227M2R5A(1)E025	55	10	25	2700	
	220	V/7343-19	T520V227M2R5A(1)E045	55	10	45	2000	
	220	D/7343-31	T520D227M2R5A(1)E007	55	10	7	5700	
	220	D/7343-31	T520D227M2R5A(1)E040	55	10	40	2400	
	330	B/3528-20	T520B337M2R5A(1)E045	83	8	45	1700	
	330	B/3528-20	T520B337M2R5A(1)E070	83	8	70	1300	
	330	C/6032-28	T520C337M2R5A(1)E015	83	8	15	3300	
	330	C/6032-28	T520C337M2R5A(1)E018	83	8	18	3000	
	330	C/6032-28	T520C337M2R5A(1)E025	83	8	25	2600	
	330	C/6032-28	T520C337M2R5A(1)E045	83	8	45	1900	3
	330	L/6032-20	T520L337M2R5A(1)E009	83	10	9	4100	
	330	L/6032-20	T520L337M2R5A(1)E012	83	10	12	3500	
	330	L/6032-20	T520L337M2R5A(1)E025	83	10	25	2400	
	330	W/7343-15	T520W337M2R5A(1)E015	83	10	15	2800	
	330	W/7343-15	T520W337M2R5A(1)E025	83	10	25	2200	
	330	W/7343-15	T520W337M2R5A(1)E040	83	10	40	1700	
	330	V/7343-19	T520V337M2R5A(1)E006	83	10	6	5600	
	330	V/7343-19	T520V337M2R5A(1)E007	83	10	7	5200	
	330	V/7343-19	T520V337M2R5A(1)E009	83	10	9	4600	
	330	V/7343-19	T520V337M2R5A(1)E012	83	10	12	3900	
	330	V/7343-19	T520V337M2R5A(1)E015	83	10	15	3500	
	330	V/7343-19	T520V337M2R5A(1)E018	83	10	18	3200	
	330	V/7343-19	T520V337M2R5A(1)E025	83	10	25	2700	
	330	V/7343-19	T520V337M2R5A(1)E040	83	10	40	2200	
	330	D/7343-31	T520D337M2R5A(1)E006	83	10	6	6100	
	330	D/7343-31	T520D337M2R5A(1)E007	83	10	7	5700	
	470	V/7343-19	T520V477M2R5A(1)E007	118	10	7	5200	
	470	V/7343-19	T520V477M2R5A(1)E009	118	10	9	4600	
	470	V/7343-19	T520V477M2R5A(1)E012	118	10	12	3900	
	470	V/7343-19	T520V477M2R5A(1)E015	118	10	15	3500	
	470	V/7343-19	T520V477M2R5A(1)E018	118	10	18	3200	
	470	C/6032-28	T520C477M2R5A(1)E025	118	8	25	2600	
	470	C/6032-28	T520C477M2R5A(1)E045	118	8	45	1900	
	470	D/7343-31	T520D477M2R5A(1)E006	118	10	6	6100	
	470	D/7343-31	T520D477M2R5A(1)E007	118	10	7	5700	
	470	D/7343-31	T520D477M2R5A(1)E009	118	10	9	5000	
	680	D/7343-31	T520D687M2R5A(1)E010	170	10	10	4700	
	680	D/7343-31	T520D687M2R5A(1)E015	170	10	15	3900	
	680	D/7343-31	T520D687M2R5A(1)E040	170	10	40	2400	
	680	Y/7343-40	T520Y687M2R5A(1)E015	170	10	15	4000	
	680	Y/7343-40	T520Y687M2R5A(1)E025	170	10	25	3100	
	1000	D/7343-31	T520D108M2R5A(1)E015	250	8	15	3900	
	1000	D/7343-31	T520D108M2R5A(1)E030	250	10	30	2700	
	1000	Y/7343-40	T520Y108M2R5A(1)E010	250	10	10	4900	
	1000	Y/7343-40	T520Y108M2R5A(1)E015	250	10	15	4000	
	1000	Y/7343-40	T520Y108M2R5A(1)E025	250	10	25	3100	
	1000	X/7343-43	T520X108M2R5A(1)E010	250	10	10	5000	

*100kHz to 500kHz, 45º C

(1) To complete KEMET part number, insert letter designation for lead material from page 50. Higher voltage ratings and tighter tolerance product may be substituted with the same size at KEMET's option.Voltage substitutions will be marked with the higher voltage rating.

Rated Voltage (V)	Rated Capacitance (µF)	Case Code/ Case Size	KEMET Part Number	DC Leakage µA @ 20°C max/ 5min	DF% @ 20°C 120 Hz Max	ESR mΩ @ 20°C 100 kHz Max	Maximum allowable ripple current (mArms) 100kHz*	MSL Reflow Temp ≤ 260ºC
3	100	B/3528-20	T520B107M003A(1)E025	30	8	25	2300	
	100	B/3528-20	T520B107M003A(1)E035	30	8	35	1900	
	100	B/3528-20	T520B107M003A(1)E040	30	8	40	1800	
	100	B/3528-20	T520B107M003A(1)E070	30	8	70	1300	
	150	B/3528-20	T520B157M003A(1)E035	45	8	35	1900	
	150	B/3528-20	T520B157M003A(1)E040	45	8	40	1800	
	150	B/3528-20	T520B157M003A(1)E070	45	8	70	1300	
	330	V/7343-19	T520V337M003A(1)E009	99	10	9	4600	3
	330	V/7343-19	T520V337M003A(1)E012	99	10	12	3900	
	330	V/7343-19	T520V337M003A(1)E015	99	10	15	3500	
	330	V/7343-19	T520V337M003A(1)E025	99	10	25	2700	
	680	D/7343-31	T520D687M003A(1)E015	204	10	15	3900	
	680	D/7343-31	T520D687M003A(1)E040	204	10	40	2400	
	1000	X/7343-43	T520X108M003A(1)E015	300	10	15	4100	
	1000	X/7343-43	T520X108M003A(1)E030	300	10	30	2900	
4	15	T/3528-12	T520T156M004A(1)E100	6	8	100	1000	
	33	A/3216-18	T520A336M004A(1)E070	13	8	70	1300	
	33	A/3216-18	T520A336M004A(1)E080	13	8	80	1200	
	47	A/3216-18	T520A476M004A(1)E070	19	8	70	1300	
	47	A/3216-18	T520A476M004A(1)E080	19	8	80	1200	
	47	T/3528-12	T520T476M004A(1)E070	19	8	70	1200	
	68	T/3528-12	T520T686M004A(1)E070	27	8	70	1200	
	68	B/3528-20	T520B686M004A(1)EO25	27	8	25	2300	
	68	B/3528-20	T520B686M004A(1)E035	27	8	35	1900	
	68	B/3528-20	T520B686M004A(1)E040	27	8	40	1800	
	68	B/3528-20	T520B686M004A(1)E070	27	8	70	1300	
	68	U/6032-15	T520U686M004A(1)E055	27	8	55	1600	
	100	A/3216-18	T520A107M004A(1) E200	40	8	200	700	
	100	T/3528-12	T520T107M004A(1)E070	40	8	70	1200	
	100	T/3528-12	T520T107M004A(1)E150	40	8	150	800	
	100	B/3528-20	T520B107M004A(1)E025	40	8	25	2300	
	100	B/3528-20	T520B107M004A(1)E035	40	8	35	1900	
	100	B/3528-20	T520B107M004A(1)E040	40	8	40	1800	
	100	B/3528-20	T520B107M004A(1)E070	40	8	70	1300	
	100	U/6032-15	T520U107M004A(1)E055	40	8	55	1600	
	150	B/3528-20	T520B157M004A(1)E015	60	8	15	2900	
	150	B/3528-20	T520B157M004A(1)E018	60	8	18	2700	
	150	B/3528-20	T520B157M004A(1)E035	60	8	35	1900	
	150	B/3528-20	T520B157M004A(1)E040	60	8	40	1800	
	150	B/3528-20	T520B157M004A(1)E070	60	8	70	1300	
	150	U/6032-15	T520U157M004A(1)E055	60	8	55	1600	
	150	C/6032-28	T520C157M004A(1)E015	60	8	15	3300	
	150	C/6032-28	T520C157M004A(1)E025	60	8	25	2600	3
	150	C/6032-28	T520C157M004A(1)E045	60	8	45	1900	
	150	C/6032-28	T520C157M004A(1)E100	60	8	100	1300	
	150	V/7343-19	T520V157M004A(1)E007	60	10	7	5200	
	150	V/7343-19	T520V157M004A(1)E009	60	10	9	4600	
	150	V/7343-19	T520V157M004A(1)E012	60	10	12	3900	
	150	V/7343-19	T520V157M004A(1)E015	60	10	15	3500	
	150	V/7343-19	T520V157M004A(1)E025	60	10	25	2700	
	150	D/7343-31	T520D157M004A(1)E007	60	10	7	5700	
	220	B/3528-20	T520B227M004A(1)E035	88	8	35	1900	
	220	B/3528-20	T520B227M004A(1)E045	88	8	45	1700	
	220	B/3528-20	T520B227M004A(1)E070	88	8	70	1300	
	220	C/6032-28	T520C227M004A(1)E015	88	8	15	3300	
	220	C/6032-28	T520C227M004A(1)E018	88	8	18	3000	
	220	C/6032-28	T520C227M004A(1)E025	88	8	25	2600	
	220	C/6032-28	T520C227M004A(1)E045	88	8	45	1900	
	220	C/6032-28	T520C227M004A(1)E055	88	8	55	1700	
	220	L/6032-20	T520L227M004A(1)E012	88	8	12	3500	
	220	L/6032-20	T520L227M004A(1)E025	88	10	25	2400	
	220	W/7343-15	T520W227M004A(1)E040	88	10	40	1700	
	220	V/7343-19	T520V227M004A(1)E007	88	10	7	5200	
	220	V/7343-19	T520V227M004A(1)E009	88	10	9	4600	
	220	V/7343-19	T520V227M004A(1)E012	88	10	12	3900	
	220	V/7343-19	T520V227M004A(1)E015	88	10	15	3500	
	220	V/7343-19	T520V227M004A(1)E018	88	10	18	3200	
	220	V/7343-19	T520V227M004A(1)E025	88	10	25	2700	
	220	V/7343-19	T520V227M004A(1)E040	88	10	40	2200	
	220	V/7343-19	T520V227M004A(1)E045	88	10	45	2000	

*100kHz to 500kHz, 45º C

(1) To complete KEMET part number, insert letter designation for lead material from page 50. Higher voltage ratings and tighter tolerance product may be substituted with the same size at KEMET's option.Voltage substitutions will be marked with the higher voltage rating.

CONDUCTIVE POLYMER CHIP CAPACITORS
T520 Series - KO Cap

T520 RATINGS & PART NUMBER REFERENCE

Rated Voltage (V)	Rated Capacitance (µF)	Case Code/ Case Size	KEMET Part Number	DC Leakage µA @ 20°C max/ 5min	DF% @ 20°C 120 Hz Max	ESR mΩ @ 20°C 100 kHz Max	Maximum allowable ripple current (mArms) 100kHz*	MSL Reflow Temp ≤ 260ºC
4	220	D/7343-31	T520D227M004A(1)E006	88	10	6	6100	3
	220	D/7343-31	T520D227M004A(1)E007	88	10	7	5700	
	220	D/7343-31	T520D227M004A(1)E012	88	10	12	4300	
	220	D/7343-31	T520D227M004A(1)E065	88	10	65	1900	
	330	C/6032-28	T520C337M004A(1)E025	132	8	25	2600	
	330	V/7343-19	T520V337M004A(1)E007	132	10	7	5200	
	330	V/7343-19	T520V337M004A(1)E009	132	10	9	4600	
	330	V/7343-19	T520V337M004A(1)E012	132	10	12	3900	
	330	V/7343-19	T520V337M004A(1)E018	132	10	18	3200	
	330	V/7343-19	T520V337M004A(1)E025	132	10	25	2700	
	330	V/7343-19	T520V337M004A(1)E040	132	10	40	2200	
	330	D/7343-31	T520D337M004A(1)E006	132	10	6	6100	
	330	D/7343-31	T520D337M004A(1)E007	132	10	7	5700	
	330	D/7343-31	T520D337M004A(1)E009	132	10	9	5000	
	330	D/7343-31	T520D337M004A(1)E012	132	10	12	4300	
	330	D/7343-31	T520D337M004A(1)E015	132	10	15	3900	
	330	D/7343-31	T520D337M004A(1)E040	132	10	40	2400	
	330	D/7343-31	T520D337M004A(1)E045	132	8	45	2200	
	470	D/7343-31	T520D477M004A(1)E010	188	10	10	4700	
	470	D/7343-31	T520D477M004A(1)E012	188	10	12	4300	
	470	D/7343-31	T520D477M004A(1)E015	188	10	15	3900	
	470	D/7343-31	T520D477M004A(1)E018	188	10	18	3500	
	470	D/7343-31	T520D477M004A(1)E025	188	10	25	3000	
	470	D/7343-31	T520D477M004A(1)E040	188	10	40	2400	
	680	D/7343-31	T520D687M004A(1)E012	272	10	12	4300	
	680	D/7343-31	T520D687M004A(1)E015	272	10	15	3900	
	680	D/7343-31	T520D687M004A(1)E025	272	10	25	3000	
	680	Y/7343-40	T520Y687M004A(1)E010	272	10	10	4900	
	680	Y/7343-40	T520Y687M004A(1)E015	272	10	15	4000	
	680	Y/7343-40	T520Y687M004A(1)E025	272	10	25	3100	
	680	X/7343-43	T520X687M004A(1)E010	272	10	10	5000	
	680	X/7343-43	T520X687M004A(1)E015	272	10	15	4100	
	680	X/7343-43	T520X687M004A(1)E035	272	10	35	2700	
6.3	15	T/3528-12	T520T156M006A(1)E100	9.5	8	100	1000	3
	22	A/3216-18	T520A226M006A(1)E090	14	8	90	1100	
	22	A/3216-18	T520A226M006A(1)E100	14	8	100	1100	
	33	A/3216-18	T520A336M006A(1)E070	21	8	70	1300	
	33	A/3216-18	T520A336M006A(1)E080	21	8	80	1200	
	33	A/3216-18	T520A336M006A(1)E120	21	8	120	1000	
	33	T/3528-12	T520T336M006A(1)E070	21	8	70	1200	
	33	B/3528-20	T520B336M006A(1)E025	21	8	25	2300	
	33	B/3528-20	T520B336M006A(1)E035	21	8	35	1900	
	33	B/3528-20	T520B336M006A(1)E040	21	8	40	1800	
	33	B/3528-20	T520B336M006A(1)E070	21	8	70	1300	
	33	C/6032-28	T520C336M006A(1)E100	21	8	100	1300	
	47	T/3528-12	T520T476M006A(1)E040	30	8	40	1600	
	47	T/3528-12	T520T476M006A(1)E070	30	8	70	1200	
	47	B/3528-20	T520B476M006A(1)E025	30	8	25	2300	
	47	B/3528-20	T520B476M006A(1)E035	30	8	35	1900	
	47	B/3528-20	T520B476M006A(1)E040	30	8	40	1800	
	47	B/3528-20	T520B476M006A(1)E070	30	8	70	1300	
	68	T/3528-12	T520T686M006A(1)E070	43	8	70	1200	
	68	T/3528-12	T520T686M006A(1)E150	43	8	150	800	
	68	B/3528-20	T520B686M006A(1)E025	43	8	25	2300	
	68	B/3528-20	T520B686M006A(1)E035	43	8	35	1900	
	68	B/3528-20	T520B686M006A(1)E040	43	8	40	1800	
	68	B/3528-20	T520B686M006A(1)E070	43	8	70	1300	
	68	U/6032-15	T520U686M006A(1)E055	43	8	55	1600	
	68	U/6032-15	T520U686M006A(1)E070	43	8	70	1400	
	68	C/6032-28	T520C686M006A(1) E100	43	8	100	1300	
	100	B/3528-20	T520B107M006A(1)E015	63	8	15	2900	
	100	B/3528-20	T520B107M006A(1)E018	63	8	18	2700	
	100	B/3528-20	T520B107M006A(1)E040	63	8	40	1800	
	100	B/3528-20	T520B107M006A(1)E045	63	8	45	1700	
	100	B/3528-20	T520B107M006A(1)E070	63	8	70	1300	
	100	U/6032-15	T520U107M006A(1)E055	63	8	55	1600	
	100	W/7343-15	T520W107M006A(1)E040	63	10	40	1700	
	100	V/7343-19	T520V107M006A(1)E007	63	10	7	5200	
	100	V/7343-19	T520V107M006A(1)E009	63	10	9	4600	
	100	V/7343-19	T520V107M006A(1)E012	63	10	12	3900	
	100	V/7343-19	T520V107M006A(1)E015	63	10	15	3500	
	100	V/7343-19	T520V107M006A(1)E045	63	10	45	2000	
	100	C/6032-28	T520C107M006A(1)E025	63	8	25	2600	
	100	C/6032-28	T520C107M006A(1)E045	63	8	45	1900	

*100kHz to 500kHz, 45º C

(1) To complete KEMET part number, insert letter designation for lead material from page 50. Higher voltage ratings and tighter tolerance product may be substituted with the same size at KEMET's option.Voltage substitutions will be marked with the higher voltage rating.

Rated Voltage (V)	Rated Capacitance (µF)	Case Code/ Case Size	KEMET Part Number	DC Leakage µA @ 20°C max/ 5min	DF% @ 20°C 120 Hz Max	ESR mΩ @ 20°C 100 kHz Max	Maximum allowable ripple current (mArms) 100kHz*	MSL Reflow Temp ≤ 260ºC
6.3	120	B/3528-20	T520B127M006A(1)E035	76	8	35	1900	3
	150	B/3528-20	T520B157M006A(1)E025	95	8	25	2300	
	150	B/3528-20	T520B157M006A(1)E035	95	8	35	1900	
	150	B/3528-20	T520B157M006A(1)E045	95	8	45	1700	
	150	B/3528-20	T520B157M006A(1)E070	95	8	70	1300	
	150	M/3528-15	T520M157M006A(1)E150	95	10	150	700	
	150	M/3528-15	T520M157M006A(1)E200	95	8	200	600	
	150	C/6032-28	T520C157M006A(1)E025	95	8	25	2600	
	150	C/6032-28	T520C157M006A(1)E045	95	8	45	1900	
	150	U/6032-15	T520U157M006A(1)E045	95	8	45	1700	
	150	U/6032-15	T520U157M006A(1)E055	95	8	55	1600	
	150	L/6032-20	T520L157M006A(1)E012	95	8	12	3500	
	150	L/6032-20	T520L157M006A(1)E025	95	10	25	2400	
	150	W/7343-15	T520W157M006A(1)E025	95	10	25	2200	
	150	W/7343-15	T520W157M006A(1)E040	95	10	40	1700	
	150	V/7343-19	T520V157M006A(1)E007	95	10	7	5200	
	150	V/7343-19	T520V157M006A(1)E009	95	10	9	4600	
	150	V/7343-19	T520V157M006A(1)E012	95	10	12	3900	
	150	V/7343-19	T520V157M006A(1)E015	95	10	15	3500	
	150	V/7343-19	T520V157M006A(1)E025	95	10	25	2700	
	150	V/7343-19	T520V157M006A(1)E040	95	10	40	2200	
	150	V/7343-19	T520V157M006A(1)E045	95	10	45	2000	
	150	D/7343-31	T520D157M006A(1)E006	95	10	6	6100	
	150	D/7343-31	T520D157M006A(1)E007	95	10	7	5700	
	150	D/7343-31	T520D157M006A(1)E015	95	10	15	3900	
	150	D/7343-31	T520D157M006A(1)E025	95	10	25	3000	
	150	D/7343-31	T520D157M006A(1)E055	95	10	55	2000	
	220	C/6032-28	T520C227M006A(1)E015	139	8	15	3300	
	220	C/6032-28	T520C227M006A(1)E018	139	8	18	3000	
	220	C/6032-28	T520C227M006A(1)E025	139	8	25	2600	
	220	C/6032-28	T520C227M006A(1)E045	139	8	45	1900	
	220	V/7343-19	T520V227M006A(1)E007	139	10	7	5200	
	220	V/7343-19	T520V227M006A(1)E009	139	10	9	4600	
	220	V/7343-19	T520V227M006A(1)E012	139	10	12	3900	
	220	V/7343-19	T520V227M006A(1)E015	139	10	15	3500	
	220	V/7343-19	T520V227M006A(1)E025	139	10	25	2700	
	220	V/7343-19	T520V227M006A(1)E040	139	10	40	2200	
	220	D/7343-31	T520D227M006A(1)E006	139	10	6	6100	
	220	D/7343-31	T520D227M006A(1)E007	139	10	7	5700	
	220	D/7343-31	T520D227M006A(1)E009	139	10	9	5000	
	220	D/7343-31	T520D227M006A(1)E015	139	10	15	3900	
	220	D/7343-31	T520D227M006A(1)E018	139	10	18	3500	
	220	D/7343-31	T520D227M006A(1)E025	139	10	25	3000	
	220	D/7343-31	T520D227M006A(1)E040	139	10	40	2400	
	220	D/7343-31	T520D227M006A(1)E050	139	10	50	2100	
	330	V/7343-19	T520V337M006A(1)E015	208	10	15	3500	
	330	V/7343-19	T520V337M006A(1)E018	208	10	18	3200	
	330	V/7343-19	T520V337M006A(1)E025	208	10	25	2700	
	330	V/7343-19	T520V337M006A(1)E040	208	10	40	2200	
	330	V/7343-19	T520V337M006A(1)E045	208	10	45	2000	
	330	D/7343-31	T520D337M006A(1)E009	208	10	9	5000	
	330	D/7343-31	T520D337M006A(1)E010	208	10	10	4700	
	330	D/7343-31	T520D337M006A(1)E015	208	10	15	3900	
	330	D/7343-31	T520D337M006A(1)E018	208	10	18	3500	
	330	D/7343-31	T520D337M006A(1)E025	208	10	25	3000	
	330	D/7343-31	T520D337M006A(1)E040	208	10	40	2400	
	330	D/7343-31	T520D337M006A(1)E045	208	10	45	2200	
	330	Y/7343-40	T520Y337M006A(1)E015	208	10	15	4000	
	330	Y/7343-40	T520Y337M006A(1)E025	208	10	25	3100	
	330	Y/7343-40	T520Y337M006A(1)E040	208	10	40	2500	
	470	Y/7343-40	T520Y477M006A(1)E010	296	10	10	4900	
	470	Y/7343-40	T520Y477M006A(1)E015	296	10	15	4000	
	470	Y/7343-40	T520Y477M006A(1)E018	296	10	18	3700	
	470	Y/7343-40	T520Y477M006A(1)E025	296	10	25	3100	
	470	Y/7343-40	T520Y477M006A(1)E035	296	10	35	2600	
	470	D/7343-31	T520D477M006A(1)E025	296	10	25	3000	
	470	D/7343-31	T520D477M006A(1)E030	296	10	30	2700	
	470	X/7343-43	T520X477M006A(1)E010	296	10	10	5000	
	470	X/7343-43	T520X477M006A(1)E018	296	10	18	3700	
	470	X/7343-43	T520X477M006A(1)E035	296	10	35	2700	
	470	X/7343-43	T520X477M006A(1)E040	296	10	40	2500	

*100kHz to 500kHz, 45º C

(1) To complete KEMET part number, insert letter designation for lead material from page 50. Higher voltage ratings and tighter tolerance product may be substituted with the same size at KEMET's option.Voltage substitutions will be marked with the higher voltage rating.

CONDUCTIVE POLYMER CHIP CAPACITORS
T520 Series - KO Cap

KEMET CHARGED.

T520 RATINGS & PART NUMBER REFERENCE

Rated Voltage (V)	Rated Capacitance (µF)	Case Code/ Case Size	KEMET Part Number	DC Leakage µA @ 20°C max/ 5min	DF% @ 20°C 120 Hz Max	ESR mΩ @ 20°C 100 kHz Max	Maximum allowable ripple current (mArms) 100kHz*	MSL Reflow Temp ≤ 260ºC
8	33	T/3528-12	T520T336M008A(1)E070	26	8	70	1200	3
	33	T/3528-12	T520T336M008A(1)E080	26	8	80	1100	
	33	B/3528-20	T520B336M008A(1)E025	26	8	25	2300	
	33	B/3528-20	T520B336M008A(1)E035	26	15	35	1900	
	33	B/3528-20	T520B336M008A(1)E040	26	8	40	1800	
	33	B/3528-20	T520B336M008A(1)E070	26	8	70	1300	
	33	U/6032-15	T520U336M008A(1)E070	26	8	70	1400	
	47	B/3528-20	T520B476M008A(1)E035	38	8	35	1900	
	47	B/3528-20	T520B476M008A(1)E070	38	8	70	1300	
	82	C/6032-28	T520C826M008A(1)E025	82	8	66	1600	
	82	C/6032-28	T520C826M008A(1)E045	82	8	66	1600	
	150	D/7343-31	T520D157M008A(1)E025	120	10	25	3000	
	150	D/7343-31	T520D157M008A(1)E040	120	10	40	2400	
	150	D/7343-31	T520D157M008A(1)E055	120	10	55	2000	
	150	V/7343-19	T520V157M008A(1)E040	120	10	40	2200	
10	10	A/3216-18	T520A106M010A(1)E080	10	8	80	1200	3
	15	A/3216-18	T520A156M010A(1)E080	15	8	80	1200	
	22	A/3216-18	T520A226M010A(1)E080	22	8	80	1200	
	33	T/3528-12	T520T336M010A(1)E040	33	8	40	1600	
	33	T/3528-12	T520T336M010A(1)E070	33	8	70	1200	
	33	T/3528-12	T520T336M010A(1)E080	33	8	80	1100	
	33	B/3528-20	T520B336M010A(1)E025	33	10	25	2300	
	33	B/3528-20	T520B336M010A(1)E035	33	8	35	1900	
	33	B/3528-20	T520B336M010A(1)E040	33	8	40	1800	
	33	B/3528-20	T520B336M010A(1)E070	33	8	70	1300	
	33	U/6032-15	T520U336M010A(1)E070	33	8	70	1400	
	47	B/3528-20	T520B476M010A(1)E035	47	8	35	1900	
	47	B/3528-20	T520B476M010A(1)E070	47	8	70	1300	
	47	U/6032-15	T520U476M010A(1)E055	47	8	55	1600	
	47	C/6032-28	T520C476M010A(1)E100	47	8	100	1300	
	68	U/6032-15	T520U686M010A(1)E055	68	8	55	1600	
	68	W/7343-15	T520W686M010A(1)E025	68	10	25	2200	
	68	W/7343-15	T520W686M010A(1)E040	68	10	40	1700	
	68	C/6032-28	T520C686M010A(1)E045	68	8	45	1900	
	68	V/7343-19	T520V686M010A(1)E025	68	10	25	2700	
	68	V/7343-19	T520V686M010A(1)E040	68	10	40	2200	
	68	V/7343-19	T520V686M010A(1)E045	68	10	45	2000	
	68	V/7343-19	T520V686M010A(1)E060	68	10	60	1800	
	68	V/7343-19	T520V686M010A(1)E100	68	10	100	1400	
	68	D/7343-31	T520D686M010A(1)E100	68	10	100	1500	
	100	C/6032-28	T520C107M010A(1)E025	100	8	25	2600	
	100	C/6032-28	T520C107M010A(1)E045	100	8	45	1900	
	100	L/6032-20	T520L107M010A(1)E025	100	10	25	2400	
	100	W/7343-15	T520W107M010A(1)E040	100	10	40	1700	
	100	V/7343-19	T520V107M010A(1)E018	100	10	18	3200	
	100	V/7343-19	T520V107M010A(1)E025	100	10	25	2700	
	100	V/7343-19	T520V107M010A(1)E045	100	10	45	2000	
	100	V/7343-19	T520V107M010A(1)E050	100	10	50	1900	
	100	D/7343-31	T520D107M010A(1)E018	100	10	18	3500	
	100	D/7343-31	T520D107M010A(1)E055	100	10	55	2000	
	100	D/7343-31	T520D107M010A(1)E080	100	10	80	1700	
	150	C/6032-28	T520C157M010A(1)E055	150	8	55	1700	
	150	V/7343-19	T520V157M010A(1)E018	150	10	18	3200	
	150	V/7343-19	T520V157M010A(1)E025	150	10	25	2700	
	150	V/7343-19	T520V157M010A(1)E040	150	10	40	2200	
	150	D/7343-31	T520D157M010A(1) E015	150	10	15	3900	
	150	D/7343-31	T520D157M010A(1) E018	150	10	18	3500	
	150	D/7343-31	T520D157M010A(1)E025	150	10	25	3000	
	150	D/7343-31	T520D157M010A(1)E040	150	10	40	2400	
	150	D/7343-31	T520D157M010A(1)E055	150	10	55	2000	
	150	Y/7343-40	T520Y157M010A(1) E015	150	10	15	4000	
	150	Y/7343-40	T520Y157M010A(1) E018	150	10	18	3700	
	150	Y/7343-40	T520Y157M010A(1) E025	150	10	25	3100	
	220	V/7343-19	T520V227M010A(1) E045	220	10	45	2000	
	220	Y/7343-40	T520Y227M010A(1)E040	220	10	40	2500	
	220	D/7343-31	T520D227M010A(1)E018	220	10	18	3500	
	220	D/7343-31	T520D227M010A(1)E025	220	10	25	3000	
	220	D/7343-31	T520D227M010A(1)E040	220	10	40	2400	
	330	Y/7343-40	T520Y337M010A(1)E015	330	10	15	4000	
	330	Y/7343-40	T520Y337M010A(1)E035	330	10	35	2600	
	330	X/7343-43	T520X337M010A(1)E010	330	10	10	5000	
	330	X/7343-43	T520X337M010A(1)E025	330	10	25	3100	
	330	X/7343-43	T520X337M010A(1)E040	330	10	40	2500	

*100kHz to 500kHz, 45º C

(1) To complete KEMET part number, insert letter designation for lead material from page 50. Higher voltage ratings and tighter tolerance product may be substituted with the same size at KEMET's option.Voltage substitutions will be marked with the higher voltage rating.

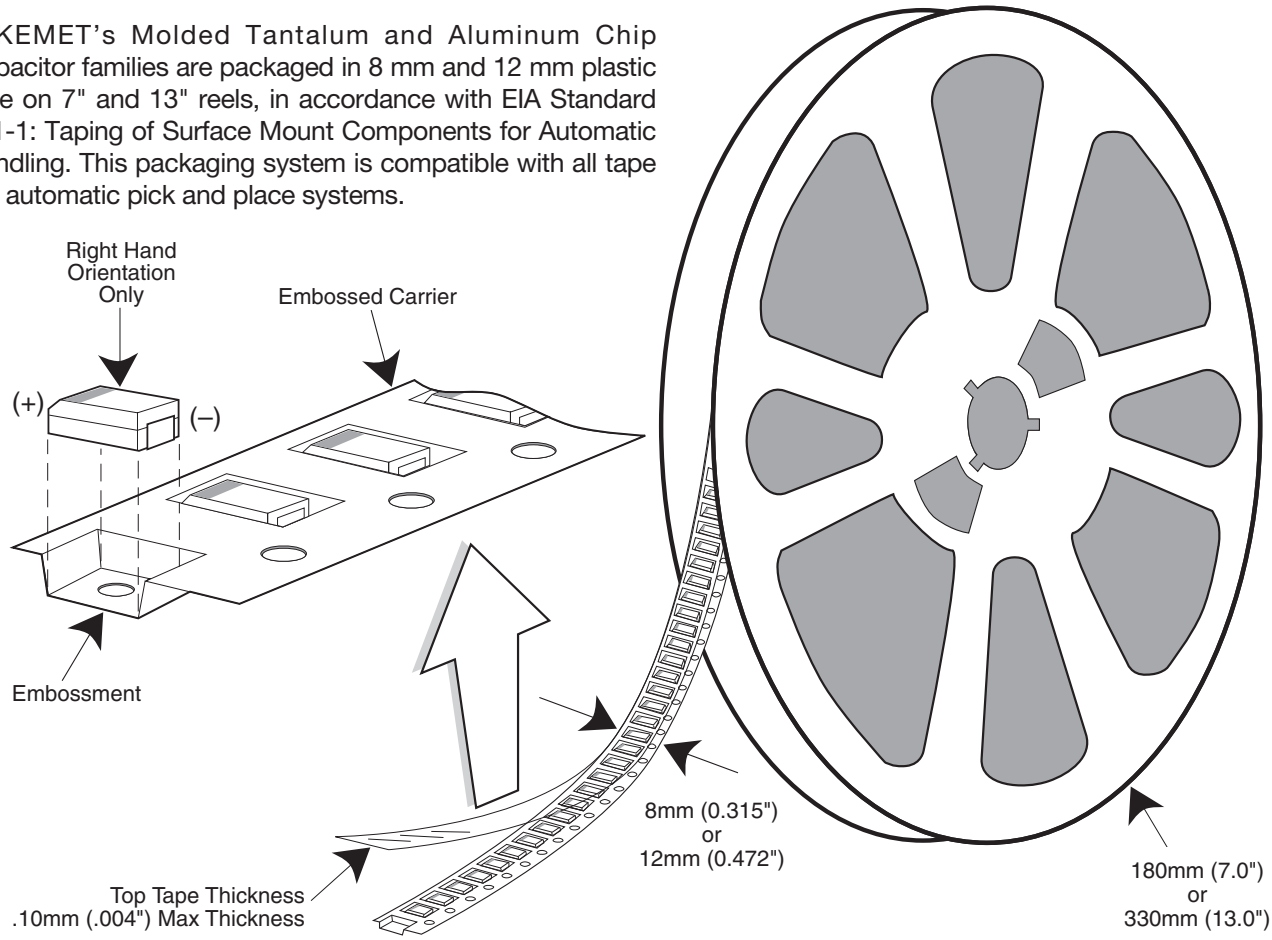
Rated Voltage (V)	Rated Capacitance (µF)	Case Code/ Case Size	KEMET Part Number	DC Leakage µA @ 20°C max/ 5min	DF% @ 20°C 120 Hz Max	ESR mΩ @ 20°C 100 kHz Max	Maximum allowable ripple current (mArms) 100kHz*	MSL Reflow Temp ≤ 260ºC
12.5	10	T/3528-12	T520T106M12RA(1)E150	13	8	150	800	3
	15	T/3528-12	T520T156M12RA(1)E080	19	8	80	1100	
16	10	B/3528-20	T520B106M016A(1)E100	16	8	100	1100	3
	22	C/6032-28	T520C226M016A(1)E080	35	8	80	1400	
	33	W/7343-15	T520W336M016A(1)E045	53	10	60	1400	
	33	V/7343-19	T520V336M016A(1)E045	53	10	45	2000	
	33	V/7343-19	T520V336M016A(1)E060	53	10	60	1800	
	33	V/7343-19	T520V336M016A(1)E070	53	10	70	1600	
	47	W/7343-15	T520W476M016A(1)E045	75	10	45	1600	
	47	V/7343-19	T520V476M016A(1)E045	75	10	45	2000	
16	47	V/7343-19	T520V476M016A(1)E070	76	10	70	1600	3
	47	D/7343-31	T520D476M016A(1)E035	75	10	35	2500	
	47	D/7343-31	T520D476M016A(1)E070	75	10	70	1800	
	68	D/7343-31	T520D686M016A(1)E050	109	10	50	2100	
	150	X/7343-43	T520X157M016A(1)E040	240	10	40	2500	
	22	V/7343-19	T520V226M020A(1)E040	44	10	40	2200	
20	22	V/7343-19	T520V226M020A(1)E045	44	10	45	2000	3
	22	V/7343-19	T520V226M020A(1)E090	44	10	90	1400	
	15	V/7343-19	T520V156M025A(1)E090	38	10	90	1400	
25	15	D/7343-31	T520D156M025A(1)E060	38	10	60	1900	3
	15	D/7343-31	T520D156M025A(1)E080	38	10	80	1700	

*100kHz to 500kHz, 45º C

(1) To complete KEMET part number, insert letter designation for lead material from page 50. Higher voltage ratings and tighter tolerance product may be substituted with the same size at KEMET's option.Voltage substitutions will be marked with the higher voltage rating.

Tape & Reel Packaging

KEMET's Molded Tantalum and Aluminum Chip Capacitor families are packaged in 8 mm and 12 mm plastic tape on 7" and 13" reels, in accordance with EIA Standard 481-1: Taping of Surface Mount Components for Automatic Handling. This packaging system is compatible with all tape fed automatic pick and place systems.



Labeling: Bar code labeling (standard or custom) shall be on the side of the reel opposite the sprocket holes. Refer to EIA-556.

QUANTITIES PACKAGED PER REEL

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	7260 38	12	500	2,000

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

Tantalum Surface Mount Organic T520

No.	Ordercode	Size Code	Volt	Cap.	Tol.	ESR
1	T520V477M002ATE040	V	2V	470uF	±20%	40mOhm
2	T520T107M2R5ATE070	T	2.5V	100uF	±20%	70mOhm
3	T520W227M2R5ATE025	W	2.5V	220uF	±20%	25mOhm
4	T520V477M2R5ATE007	V	2.5V	470uF	±20%	7mOhm
5	T520D108M2R5ATE030	D	2.5V	1000uF	±20%	30mOhm
6	T520Y687M004ATE010	Y	4V	680uF	±20%	10mOhm
7	T520Y477M006ATE010	Y	6V	470uF	±20%	10mOhm
8	T520D157M010ATE015	D	10V	150uF	±20%	15mOhm
9	T520D157M010ATE018	D	10V	150uF	±20%	18mOhm
10	T520Y157M010ATE018	Y	10V	150uF	±20%	18mOhm
11	T520X337M010ATE010	X	10V	330uF	±20%	10mOhm
12	T520D686M016ATE050	D	16V	68uF	±20%	50mOhm
13	T520V226M020ATE040	V	20V	22uF	±20%	40mOhm
14	T520D156M025ATE060	D	25V	15uF	±20%	60mOhm

KEMET

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Aluminum Organic Polymer Chip A700
SAMPLE KIT

Product-ID: A700-Kemet

ALUMINUM ORGANIC CAPACITORS
A700 Series

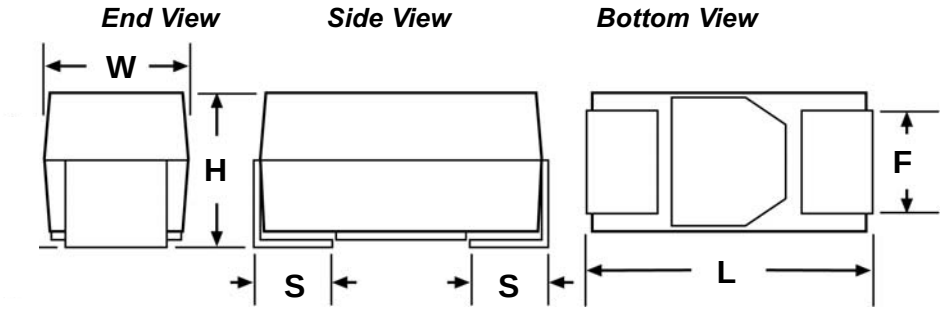
APPLICATIONS

- Input/Output Filters for voltage regulators, converters, and SMPS
- Battery Decoupling (portable, handheld electronics)
- Power Decoupling (Procesor, Transmitter circuits)
- Bulk Capacitor Requirements

FEATURES

- Polymer Cathode Technology
- Extremely Low ESR
- High Frequency Capacitance Retention
- Non-ignition Failure Mode
- Capacitance: 22 to 470 µF
- Self-healing Mechanism
- -55° to +125°C Capability
- No temperature voltage Derating Up To 125°C
- Robust to Surface Mount Process
- 100% Accelerated Steady State Aging
- Pb Free and RoHS Compliant
- Solid-state Technology
- Molded Case with Wraparound Termination
- Voltage: 2 to 10V
- No Reformation Required
- EIA Standard Case Size
- No Dry-out Related Failure Mechanism

OUTLINE DRAWING



DIMENSIONS - MILLIMETERS

Case Size		L	W	H	F ±0.1	S ±0.2
KEMET	EIA					
V	7343-20	7.3 ± 0.3	4.3 ± 0.3	1.9 ± 0.1	2.4	1.3
D	7343-31	7.3 ± 0.3	4.3 ± 0.3	2.8 ± 0.3	2.4	1.3
X	7343-43	7.3 ± 0.3	4.3 ± 0.3	4.0 ± 0.3	2.4	1.3

Note that glue pad shape may differ at KEMET's discretion.

A700 ORDERING INFORMATION

A 700 V 476 M 006 A T E018

Aluminum

Series
700 Chip

Case Size
V,D,X

Capacitance Picofarad Code
First two digits represent significant figures. Third digit specifies number of zeros.

Capacitance Tolerance
M = ±20%

Voltage
As Shown

Failure Rate Level
A = Not Applicable

Lead Material
T = 100% Tin (Sn) Plated

ESR

A700 RATINGS & PART NUMBER REFERENCE

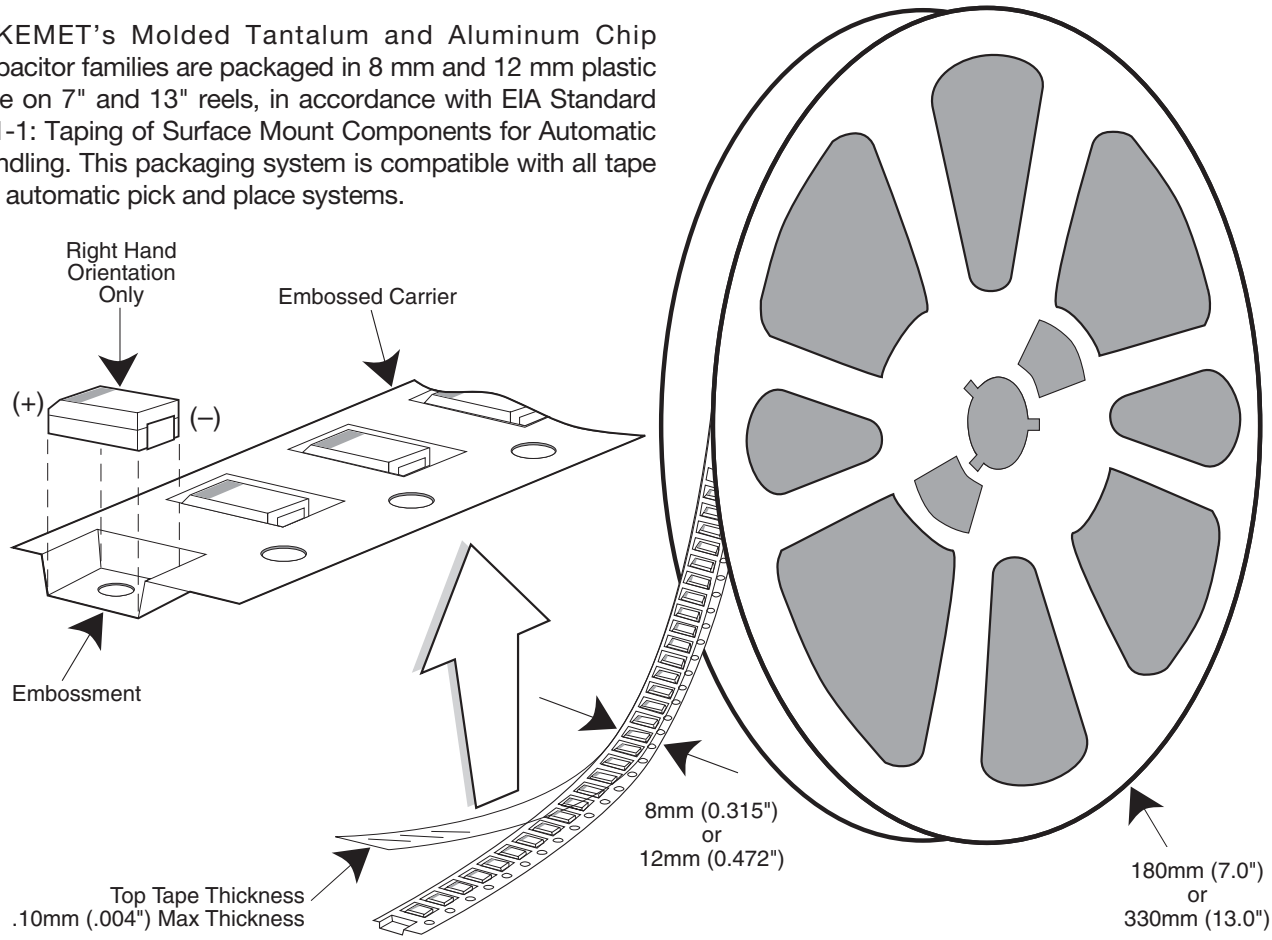
KEMET Part Number	Case Size	Cap µF	DCL @V_R	DF @ 120 Hz	ESR 100 kHz (mΩ)	Ripple Current (Arms) @ 100kHz w/ΔT=+20°C @ -55°C to 125°C
2 Volt Rating @ 125°C						
A700V107M002ATE018	V/7343-20	100.0	12.0 µA	6%	18	3.9
A700V107M002ATE025	V/7343-20	100.0	12.0 µA	6%	25	3.3
A700V107M002ATE028	V/7343-20	100.0	12.0 µA	6%	28	3.1
A700V127M002ATE018	V/7343-20	120.0	14.4 µA	6%	18	3.9
A700V127M002ATE025	V/7343-20	120.0	14.4 µA	6%	25	3.3
A700V127M002ATE028	V/7343-20	120.0	14.4 µA	6%	28	3.1
A700V157M002ATE009	V/7343-20	150.0	18.0 µA	6%	9	5.4
A700V157M002ATE018	V/7343-20	150.0	18.0 µA	6%	18	3.9
A700V157M002ATE025	V/7343-20	150.0	18.0 µA	6%	25	3.3
A700V157M002ATE028	V/7343-20	150.0	18.0 µA	6%	28	3.1
A700D187M002ATE015	D/7343-31	180.0	21.6 µA	6%	15	4.1
A700D187M002ATE018	D/7343-31	180.0	21.6 µA	6%	18	3.7
A700V227M002ATE009	V/7343-20	220.0	26.4µA	6%	9	5.5
A700D227M002ATE015	D/7343-31	220.0	26.4 µA	6%	15	4.1
A700D227M002ATE018	D/7343-31	220.0	26.4 µA	6%	18	3.7
A700X277M002ATE010	X/7343-43	270.0	32.4 µA	6%	10	4.7
A700X277M002ATE012	X/7343-43	270.0	32.4µA	6%	12	4.3
A700X277M002ATE015	X/7343-43	270.0	32.4 µA	6%	15	3.9
A700V337M002ATE006	V/7343-20	330.0	39.6µA	6%	6	6.7
A700V337M002ATE009	V/7343-20	330.0	39.6µA	6%	9	5.5
A700D337M002ATE007	D/7343-31	330.0	39.6µA	6%	7	6.0
A700X337M002ATE010	X/7343-43	330.0	39.6 µA	6%	10	4.7
A700X337M002ATE015	X/7343-43	330.0	39.6 µA	6%	15	3.9
A700X397M002ATE010	X/7343-43	390.0	46.8 µA	6%	10	4.7
A700X397M002ATE015	X/7343-43	390.0	46.8 µA	6%	15	3.9
A700X477M002ATE010	X/7343-43	470.0	56.4 µA	6%	10	4.7
A700X477M002ATE015	X/7343-43	470.0	56.4 µA	6%	15	3.9
2.5 Volt Rating @ 125°C						
A700V826M2R5ATE018	V/7343-20	82.0	12.3 µA	6%	18	3.9
A700V826M2R5ATE025	V/7343-20	82.0	12.3 µA	6%	25	3.3
A700V826M2R5ATE028	V/7343-20	82.0	12.3 µA	6%	28	3.1
A700D157M2R5ATE015	D/7343-31	150.0	22.5 µA	6%	15	4.1
A700D157M2R5ATE018	D/7343-31	150.0	22.5 µA	6%	18	3.7
A700D187M2R5ATE015	D/7343-31	180.0	27.0 µA	6%	15	4.1
A700D187M2R5ATE018	D/7343-31	180.0	27.0 µA	6%	18	3.7
A700X227M2R5ATE010	X/7343-43	220.0	33.0 µA	6%	10	4.7
A700X227M2R5ATE015	X/7343-43	220.0	33.0 µA	6%	15	3.9
A700X337M2R5ATE010	X/7343-43	330.0	49.5 µA	6%	10	4.7
A700X337M2R5ATE015	X/7343-43	330.0	49.5 µA	6%	15	3.9
A700X477M2R5ATE010	X/7343-43	470.0	70.5	6%	10	4.7
4 Volt Rating @ 125°C						
A700V826M004ATE018	V/7343-20	82.0	19.7 µA	6%	18	3.9
A700V826M004ATE025	V/7343-20	82.0	19.7 µA	6%	25	3.3
A700V826M004ATE028	V/7343-20	82.0	19.7 µA	6%	28	3.1
A700D127M004ATE015	D/7343-31	120.0	28.8 µA	6%	15	4.1
A700D127M004ATE018	D/7343-31	120.0	28.8 µA	6%	18	3.7
A700D157M004ATE015	D/7343-31	150.0	36.0 µA	6%	15	4.1
A700D157M004ATE018	D/7343-31	150.0	36.0 µA	6%	18	3.7
A700D187M004ATE015	D/7343-31	180.0	43.2 µA	6%	15	4.1
A700D187M004ATE018	D/7343-31	180.0	43.2 µA	6%	18	3.7
A700X187M004ATE010	X/7343-43	180.0	43.2 µA	6%	10	4.7
A700X187M004ATE015	X/7343-43	180.0	43.2µA	6%	15	3.9
A700D227M004ATE009	X/7343-43	220.0	52.8 µA	6%	9	5.3
A700X227M004ATE009	X/7343-43	220.0	52.8 µA	6%	9	5.3
A700X227M004ATE010	X/7343-43	220.0	52.8 µA	6%	10	4.7
A700X227M004ATE015	X/7343-43	220.0	52.8 µA	6%	15	3.9
A700X277M004ATE010	X/7343-43	270.0	64.8 µA	6%	10	4.7
A700X277M004ATE015	X/7343-43	270.0	64.8 µA	6%	15	3.9
A700X337M004ATE010	X/7343-43	330.0	79.2 µA	6%	10	4.7
A700X337M004ATE015	X/7343-43	330.0	79.2 µA	6%	15	3.9

ALUMINUM ORGANIC CAPACITORS
A700 Series

KEMET Part Number	Case Size	Cap µF	DCL @V_R	DF @ 120 Hz	ESR 100 kHz (mΩ)	Ripple Current (Arms) @ 100kHz w/ΔT=+20°C @ -55°C to 125°C
6.3 Volt Rating @ 125°C						
A700V226M006ATE028	V/7343-20	22.0	5.5 µA	6%	28	3.1
A700V226M006ATE045	V/7343-20	22.0	5.5 µA	6%	45	2.4
A700V336M006ATE018	V/7343-20	33.0	8.3 µA	6%	18	3.9
A700V336M006ATE025	V/7343-20	33.0	8.3 µA	6%	25	3.3
A700V336M006ATE028	V/7343-20	33.0	8.3 µA	6%	28	3.1
A700V476M006ATE018	V/7343-20	47.0	11.8 µA	6%	18	3.9
A700V476M006ATE025	V/7343-20	47.0	11.8 µA	6%	25	3.3
A700V476M006ATE028	V/7343-20	47.0	11.8 µA	6%	28	3.1
A700V566M006ATE018	V/7343-20	56.0	14.1 µA	6%	18	3.9
A700V566M006ATE025	V/7343-20	56.0	14.1 µA	6%	25	3.3
A700V566M006ATE028	V/7343-20	56.0	14.1 µA	6%	28	3.1
A700V686M006ATE018	V/7343-20	68.0	17.1 µA	6%	18	3.9
A700V686M006ATE025	V/7343-20	68.0	17.1 µA	6%	25	3.3
A700V686M006ATE028	V/7343-20	68.0	17.1 µA	6%	28	3.1
A700V826M006ATE018	V/7343-20	82.0	20.7 µA	6%	18	3.9
A700V826M006ATE025	V/7343-20	82.0	20.7 µA	6%	25	3.3
A700V826M006ATE028	V/7343-20	82.0	20.7 µA	6%	28	3.1
A700D107M006ATE015	D/7343-31	100.0	25.2 µA	6%	15	4.1
A700D107M006ATE018	D/7343-31	100.0	25.2 µA	6%	18	3.7
A700D127M006ATE012	D/7343-31	120.0	30.2 µA	6%	12	4.6
A700D127M006ATE015	D/7343-31	120.0	30.2 µA	6%	15	4.1
A700D127M006ATE018	D/7343-31	120.0	30.2 µA	6%	18	3.7
A700X157M006ATE010	X/7343-43	150.0	37.8 µA	6%	10	4.7
A700X157M006ATE012	X/7343-43	150.0	37.8µA	6%	12	4.3
A700X157M006ATE015	X/7343-43	150.0	37.8 µA	6%	15	3.9
A700X187M006ATE010	X/7343-43	180.0	45.4 µA	6%	10	4.7
A700X187M006ATE015	X/7343-43	180.0	45.4 µA	6%	15	3.9
A700X227M006ATE015	X/7343-43	220.0	55.4 µA	6%	15	3.9
8 Volt Rating @ 125°C						
A700V226M008ATE028	V/7343-20	22.0	7.0 µA	6%	28	3.1
A700V226M008ATE045	V/7343-20	22.0	7.0 µA	6%	45	2.4
A700V336M008ATE018	V/7343-20	33.0	10.6 µA	6%	18	3.9
A700V336M008ATE025	V/7343-20	33.0	10.6 µA	6%	25	3.3
A700V336M008ATE028	V/7343-20	33.0	10.6 µA	6%	28	3.1
A700D566M008ATE015	D/7343-31	56.0	17.9 µA	6%	15	4.1
A700D566M008ATE018	D/7343-31	56.0	17.9 µA	6%	18	3.7
A700D686M008ATE015	D/7343-31	68.0	21.8 µA	6%	15	4.1
A700D686M008ATE018	D/7343-31	68.0	21.8 µA	6%	18	3.7
A700X107M008ATE010	X/7343-43	100.0	32.0 µA	6%	10	4.7
A700X107M008ATE012	X/7343-43	100.0	32.0 µA	6%	12	4.3
A700X107M008ATE015	X/7343-43	100.0	32.0 µA	6%	15	3.9
10 Volt Rating @ 125°C						
A700V226M010ATE028	V/7343-20	22.0	8.8 µA	6%	28	3.1
A700V336M010ATE018	V/7343-20	33.0	13.2 µA	6%	18	3.9
A700V336M010ATE025	V/7343-20	33.0	13.2 µA	6%	25	3.3
A700V336M010ATE028	V/7343-20	33.0	13.2µA	6%	28	3.1
A700D566M010ATE015	D/7343-31	56.0	22.4 µA	6%	15	4.1
A700D566M010ATE018	D/7343-31	56.0	22.4 µA	6%	18	3.7
A700D686M010ATE015	D/7343-31	68.0	27.2 µA	6%	15	4.1
A700D686M010ATE018	D/7343-31	68.0	27.2 µA	6%	18	3.7
A700X107M010ATE010	X/7343-43	100.0	40.0 µA	6%	10	4.7
A700X107M010ATE015	X/7343-43	100.0	40.0 µA	6%	15	3.9
A700X127M010ATE010	X/7343-43	120.0	48.0 µA	6%	10	4.7
A700X127M010ATE015	X/7343-43	120.0	48.0 µA	6%	15	3.9
A700X157M010ATE010	X/7343-43	150.0	60.0 µA	6%	10	4.7
A700X157M010ATE015	X/7343-43	150.0	60.0 µA	6%	15	3.9
12.5 Volt Rating @ 125°C						
A700V106M12RATE040	V/7343-20	10.0	70.5 µa	6%	40	2.6
A700V106M12RATE060	V/7343-20	10.0	5.0 µA	6%	60	2.1
A700V156M12RATE040	V/7343-20	15.0	7.5 µA	6%	40	2.6
A700V226M12RATE030	V/7343-20	22.0	11.0 µA	6%	30	3.0
A700D476M12RATE025	D/7343-31	47.0	55.4 µA	6%	25	3.2
A700X107M12RATE015	X/7343-43	100.0	55.4 µA	6%	15	3.9
16 Volt Rating @ 125°C						
A700V685M016ATE070	V/7343-20	6.8	4.3 µA	6%	70	1.9
A700V825M016ATE045	V/7343-20	8.2	5.2 µA	6%	45	2.4
A700V106M016ATE045	V/7343-20	10.0	6.4 µA	6%	45	2.4
A700D226M016ATE018	V/7343-31	22.0	14.1 µA	6%	18	3.7
A700D226M016ATE025	V/7343-31	22.0	14.1 µA	6%	25	3.2

Tape & Reel Packaging

KEMET's Molded Tantalum and Aluminum Chip Capacitor families are packaged in 8 mm and 12 mm plastic tape on 7" and 13" reels, in accordance with EIA Standard 481-1: Taping of Surface Mount Components for Automatic Handling. This packaging system is compatible with all tape fed automatic pick and place systems.



Labeling: Bar code labeling (standard or custom) shall be on the side of the reel opposite the sprocket holes. Refer to EIA-556.

QUANTITIES PACKAGED PER REEL

Case Code		Tape Width-mm	7" Reel*	13" Reel*
KEMET	EIA			
R	2012-12	8	2,500	10,000
S	3216-12	8	2,500	10,000
T	3528-12	8	2,500	10,000
U	6032-15	12	1,000	5,000
W	7343-15	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	7260-38	12	500	2,000

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

Aluminum Organic Polymer Chip A700

No.	Ordercode	Size Code	Volt	Cap.	Tol.	ESR
1	A700D337M002ATE007	D	2V	330uF	±20%	7mOhm
2	A700X477M002ATE007	X	2V	470uF	±20%	7mOhm
3	A700X227M2R5ATE010	X	2.5V	220uF	±20%	10mOhm
4	A700D227M004ATE009	D	4V	220uF	±20%	9mOhm
5	A700X337M004ATE010	X	4V	330uF	±20%	10mOhm
6	A700V107M006ATE015	V	6V	100uF	±20%	15mOhm
7	A700D157M006ATE010	D	6V	150uF	±20%	10mOhm
8	A700X187M006ATE010	X	6V	180uF	±20%	10mOhm
9	A700X107M008ATE010	X	8V	100uF	±20%	10mOhm
10	A700X157M010ATE010	X	10V	150uF	±20%	10mOhm
11	A700X107M012ATE015	X	12V	100uF	±20%	15mOhm
12	A700V226M12RATE030	V	12.5V	22uF	±20%	30mOhm
13	A700D476M12RATE025	D	12.5V	47uF	±20%	25mOhm
14	A700D226M016ATE025	D	16V	22uF	±20%	25mOhm

KEMET

CHARGED.™

High Capacitance
SAMPLE KIT

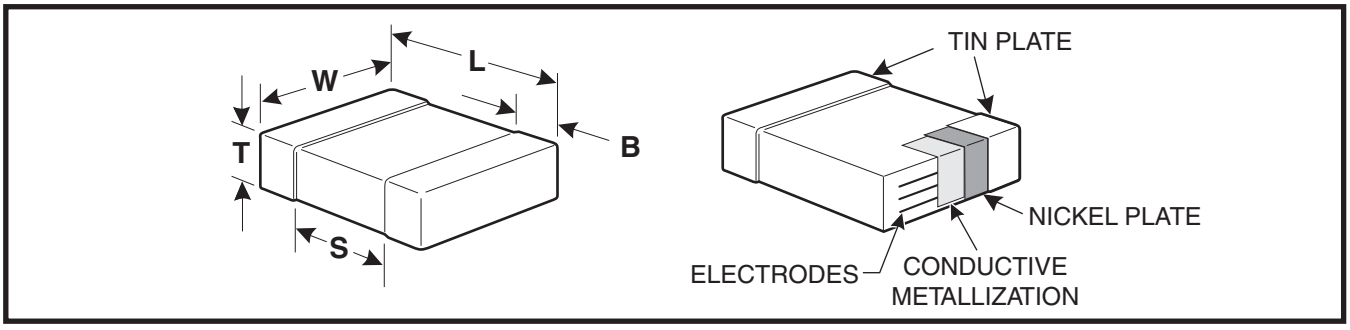
Product-ID: HC-Kemet

CERAMIC CHIP CAPACITORS

FEATURES

- C0G (NP0), X7R, X5R, Z5U and Y5V Dielectrics
- 10, 16, 25, 50, 100 and 200 Volts
- Standard End Metalization: Tin-plate over nickel barrier
- Available Capacitance Tolerances: ±0.10 pF; ±0.25 pF; ±0.5 pF; ±1%; ±2%; ±5%; ±10%; ±20%; and +80%-20%
- Tape and reel packaging per EIA481-1. (See page 92 for specific tape and reel information.) Bulk Cassette packaging (0402, 0603, 0805 only) per IEC60286-6 and EIAJ 7201.
- RoHS Compliant

CAPACITOR OUTLINE DRAWINGS



DIMENSIONS—MILLIMETERS AND (INCHES)

EIA SIZE CODE	METRIC SIZE CODE	L - LENGTH	W - WIDTH	T THICKNESS	B - BANDWIDTH	S SEPARATION minimum	MOUNTING TECHNIQUE
0201*	0603	0.6 (.024) ± .03 (.001)	0.3 ± (.012) ± .03 (.001)	See page 78 for thickness dimensions.	0.15 (.006) ± .05 (.002)	N/A	Solder Reflow
0402*	1005	1.0 (.04) ± .05 (.002)	0.5 (.02) ± .05 (.002)		0.20 (.008) -.40 (.016)	0.3 (.012)	
0603	1608	1.6 (.063) ± .15 (.006)	0.8 (.032) ± .15 (.006)		0.35 (.014) ± .15 (.006)	0.7 (.028)	Solder Wave + or Solder Reflow
0805*	2012	2.0 (.079) ± .20 (.008)	1.25 (.049) ± .20 (.008)		0.50 (.02) ± .25 (.010)	0.75 (.030)	
1206*	3216	3.2 (.126) ± .20 (.008)	1.6 (.063) ± .20 (.008)		0.50 (.02) ± .25 (.010)	N/A	
1210*	3225	3.2 (.126) ± .20 (.008)	2.5 (.098) ± .20 (.008)		0.50 (.02) ± .25 (.010)	N/A	
1808	4520	4.5 (.177) ± .30 (.012)	2.0 (.079) ± .20 (.008)		0.60 (.024) ± .35 (.014)	N/A	Solder Reflow
1812	4532	4.5 (.177) ± .30 (.012)	3.2 (.126) ± .30 (.012)		0.60 (.024) ± .35 (.014)	N/A	
1825*	4564	4.5 (.177) ± .30 (.012)	6.4 (.252) ± .40 (.016)		0.60 (.024) ± .35 (.014)	N/A	
2220	5650	5.6 (.220) ± .40 (.016)	5.0 (.197) ± .40 (.016)		0.60 (.024) ± .35 (.014)	N/A	
2225	5664	5.6 (.220) ± .40 (.016)	6.3 (.248) ± .40 (.016)		0.60 (.024) ± .35 (.014)	N/A	

* Note: Indicates EIA Preferred Case Sizes (Tightened tolerances apply for 0402, 0603, and 0805 packaged in bulk bassette, see page 96.)
+ For extended value 1210 case size - solder reflow only.

CAPACITOR ORDERING INFORMATION (Standard Chips - For Military see page 87)

C 0805 C 103 K 5 R A C*

CERAMIC

SIZE CODE

SPECIFICATION
C - Standard

CAPACITANCE CODE
Expressed in Picofarads (pF)
First two digits represent significant figures.
Third digit specifies number of zeros. (Use 9 for 1.0 through 9.9pF. Use 8 for 0.5 through 0.99pF)
(Example: 2.2pF = 229 or 0.50 pF = 508)

CAPACITANCE TOLERANCE
B – ±0.10pF J – ±5%
C – ±0.25pF K – ±10%
D – ±0.5pF M – ±20%
F – ±1% P – (GMV) – special order only
G – ±2% Z – +80%, -20%

VOLTAGE
1 - 100V 3 - 25V
2 - 200V 4 - 16V
5 - 50V 8 - 10V
6 - 35V 9 - 6.3V
7 - 4V

TEMPERATURE CHARACTERISTIC
Designated by Capacitance Change Over Temperature Range
G – C0G (NP0) (±30 PPM/°C)
R – X7R (±15%) (-55°C + 125°C)
P– X5R (±15%) (-55°C + 85°C)
U – Z5U (+22%, -56%) (+10°C + 85°C)
V – Y5V (+22%, -82%) (-30°C + 85°C)

FAILURE RATE LEVEL
A- Not Applicable

END METALLIZATION
C-Standard (Tin-plated nickel barrier)

*** Part Number Example: C0805C103K5RAC (14 digits - no spaces)**

C0G CAPACITANCE RANGE – 1210, 1812, 1825, 2220, 2225

Cap pF	Cap Code	Cap Tolerance	C1210*						C1812*			C1825*			C2220			C2225		
			10V	16V	25V	50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V
0.5-2.4	508-249	D	FB	FB	FB	FB	FB	FB												
2.7-9.1	279-919	D K,M	FB	FB	FB	FB	FB	FB												
10.0-13.0	100-130	D J,K,M	FB	FB	FB	FB	FB	FB												
15.0-24.0	150-240	D G,J,K,M	FB	FB	FB	FB	FB	FB												
27.0-51.0	270-510	D,F,G,J,K,M	FB	FB	FB	FB	FB	FB												
56.0-82.0	560-820	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
91.0-360.0	910-361	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
390.0	391	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
430.0	431	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
470.0	471	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
510.0	511	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
560.0	561	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
620.0	621	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
680.0	681	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
750.0	751	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
820.0	821	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
910.0	911	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
1,000.0	102	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
1,100.0	112	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
1,200.0	122	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
1,300.0	132	F,G,J,K,M	FB	FB	FB	FB	FB	FC												
1,500.0	152	F,G,J,K,M	FB	FB	FB	FB	FB	FE	GB	GB	GB									
1,600.0	162	F,G,J,K,M	FB	FB	FB	FB	FB	FE												
1,800.0	182	F,G,J,K,M	FB	FB	FB	FB	FB	FE	GB	GB	GB									
2,000.0	202	F,G,J,K,M	FB	FB	FB	FB	FB	FE												
2,200.0	222	F,G,J,K,M	FB	FB	FB	FB	FC	FG	GB	GB	GB									
2,400.0	242	F,G,J,K,M	FB	FB	FB	FB	FC	FC												
2,700.0	272	F,G,J,K,M	FB	FB	FB	FB	FC	FC	GB	GB	GB									
3,000.0	302	F,G,J,K,M	FB	FB	FB	FB	FC	FF												
3,300.0	332	F,G,J,K,M	FB	FB	FB	FB	FF	FF	GB	GB	GB									
3,600.0	362	F,G,J,K,M	FB	FB	FB	FB	FF	FF												
3,900.0	392	F,G,J,K,M	FB	FB	FB	FB	FF	FF	GB	GB	GB	HB	HB	HB						
4,300.0	432	F,G,J,K,M	FB	FB	FB	FB	FF	FF												
4,700.0	472	F,G,J,K,M	FF	FF	FF	FF	FG	FG	GB	GB	GD	HB	HB	HB				KB	KB	KB
5,100.0	512	F,G,J,K,M	FB	FB	FB	FB	FG	FG												
5,600.0	562	F,G,J,K,M	FB	FB	FB	FB	FG	FG	GB	GB	GH	HB	HB	HB				KB	KB	KB
6,200.0	622	F,G,J,K,M	FB	FB	FB	FB	FG													
6,800.0	682	F,G,J,K,M	FB	FB	FB	FB	FG		GB	GB	GJ	HB	HB	HB	JB	JB		KB	KB	KB
7,500.0	752	F,G,J,K,M	FC	FC	FC	FC	FC													
8,200.0	822	F,G,J,K,M	FC	FC	FC	FC	FC		GB	GH		HB	HB	HB	JB	JB		KB	KB	KB
9,100.0	912	F,G,J,K,M	FE	FE	FE	FE	FE													
10,000.0	103	F,G,J,K,M	FF	FF	FF	FF	FF		GB	GH		HB	HB	HE	JB	JB		KB	KB	KB
12,000.0	123	F,G,J,K,M	FG	FG	FG	FG	FB		GB	GG		HB	HB	HE	JB	JB		KB	KB	KB
15,000.0	153	F,G,J,K,M	FG	FG	FG	FG	FB		GB	GB		HB	HB		JB	JB		KB	KB	KE
18,000.0	183	F,G,J,K,M	FB	FB	FB	FB	FB		GB	GB		HB	HE		JB	JB		KB	KB	
22,000.0	223	F,G,J,K,M	FB	FB	FB	FB	FB		GB	GB		HB	HE		JB	JB		KB	KB	
27,000.0	273	F,G,J,K,M	FB	FB	FB	FB	FB		GB	GB		HB	HF		JB	JB		KB	KE	
33,000.0	333	F,G,J,K,M	FB	FB	FB	FB	FB		GB	GB					JB	JB		KB		
47,000.0	473	F,G,J,K,M	FB	FB	FB	FB	FE		GB	GB					JB	JB				
56,000.0	563	F,G,J,K,M	FB	FB	FB	FB	FF		GB	GB					JB	JB				
68,000.0	683	F,G,J,K,M	FB	FB	FB	FC	FG		GB	GB					JB	JB				
82,000.0	823	F,G,J,K,M	FC	FC	FC	FC	FH		GB	GB					JB	JB				
100,000.0	104	F,G,J,K,M	FE	FE	FE	FG	FM+		GB	GD					JB	JB				
120,000.0	124	F,G,J,K,M	FG	FG	FG	FH			GB	GH					JB	JB				
150,000.0	154	F,G,J,K,M	FH	FH	FH	FM+			GD	GN					JB	JB				
220,000.0	224	F,G,J,K,M	FK+	FK+	FK+				GK						JB	JD				
270,000.0	274	F,G,J,K,M													JB	JF				
330,000.0	334	F,G,J,K,M													JD	JH				
470,000.0	474	F,G,J,K,M													JG					
560,000.0	564	F,G,J,K,M																		

X7R CAPACITANCE RANGE – 0402, 0603, 0805, 1206

Cap pF	Cap Code	Cap Tol	C0402					C0603							C0805							C1206						
			6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	100V	200V	6.3V	10V	16V	25V	50V	100V	200V	6.3V	10V	16V	25V	50V	100V	200V
150	151	J, K, M	BB	BB	BB	BB	BB																					
180	181	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
220	221	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
270	271	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
330	331	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
390	391	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
470	471	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
560	561	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
680	681	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
820	821	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
1,000	102	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
1,200	122	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
1,500	152	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
1,800	182	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
2,200	222	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
2,700	272	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
3,300	332	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
3,900	392	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
4,700	472	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
5,600	562	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
6,800	682	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
8,200	822	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
10,000	103	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
12,000	123	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
15,000	153	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB
18,000	183	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB
22,000	223	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB
27,000	273	J, K, M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EB	EB
33,000	333	J, K, M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EB	EB
39,000	393	J, K, M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EC	EB
47,000	473	J, K, M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DE	DG	EB	EB	EB	EB	EB	EC	ED
56,000	563	J, K, M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE	DG	EB	EB	EB	EB	EB	EB	ED
68,000	683	J, K, M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	ED
82,000	823	J, K, M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	ED
100,000	104	J, K, M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	EM
120,000	124	J, K, M						CB	CB	CB		CB			DC	DC	DC	DC	DD	DG		EC	EC	EC	EC	EC	EC	EM
150,000	154	J, K, M						CB	CB	CB		CD			DC	DC	DC	DC	DD			EC	EC	EC	EC	EC	EC	EG
180,000	184	J, K, M						CB	CB	CB					DC	DC	DC	DC	DD			EC	EC	EC	EC	EC	EC	
220,000	224	J, K, M						CB	CB	CB	CD				DC	DC	DC	DC	DD	DG		EC	EC	EC	EC	EC	EC	
270,000	274	J, K, M						CB	CB	CB					DD	DD	DD	DD				EB	EB	EB	EB	EC	EM	
330,000	334	J, K, M						CB	CB	CB					DD	DD	DD	DD	DD			EB	EB	EB	EB	EC	EG	
390,000	394	J, K, M						CB	CB	CB					DG	DG	DG	DG	DE			EB	EB	EB	EB	EC	EG	
470,000	474	J, K, M						CB	CB	CB					DD	DD	DD	DD	DE			EC	EC	EC	EC	EC	EG	
560,000	564	J, K, M													DD	DD	DD	DG	DH			ED	ED	ED	ED	EC		
680,000	684	J, K, M													DD	DD	DD	DG	DH			EE	EE	EE	EE	ED		
820,000	824	J, K, M													DD	DD	DD	DG				EF	EF	EF	EF	ED		
1,000,000	105	J, K, M						CC*	CC*	CC*					DD	DD	DD	DG				EF	EF	EF	EG	ED		
1,200,000	125	J, K, M													DE	DE	DE					ED	ED	ED	EG	EH		
1,500,000	155	J, K, M													DG	DG	DG					EF	EF	EF	EG	EH		
1,800,000	185	J, K, M													DG	DG	DG					EF	EF	EF		EH		
2,200,000	225	J, K, M													DG	DG	DG					ED	ED	ED	EF	EH		
2,700,000	275	J, K, M																				EN	EN	EN				
3,300,000	335	J, K, M																				ED	ED	ED	EH			
3,900,000	395	J, K, M																				EF	EF	EF				
4,700,000	475	J, K, M																				EF+	EF+	EF+	EH+			
5,600,000	565	J, K, M																				EH+	EH+	EH+				
6,800,000	685	J, K, M																				EH+	EH+	EH+				
8,200,000	825	J, K, M																				EH+	EH+	EH+				
10,000,000	106	J, K, M																				EH+	EH+	EH+				

* Capacitance K or M. ontact KEMET Sales Rep for J tolerance availability. +_ Reflow Only.
NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.

Improved product with higher ratings and tighter capacitance tolerance product may be substituted within the same size (length, width, and thickness) at KEMET's option.
Reels with such substitutions will be marked with the improved KEMET part numbers.

See page 78 for Thickness Code Reference Chart.

X7R CAPACITANCE RANGE – 1210, 1808, 1812, 1825, 2220, 2225

Cap pF	Cap Code	Cap Tol.	C1210							C1808			C1812				C1825			C2220				C2225		
			6.3V	10V	16V	25V	50V	100V	200V	50V	100V	200V	25V	50V	100V	200V	50V	100V	200V	25V	50V	100V	200V	50V	100V	200V
2,200	222	J,K,M	FB	FB	FB	FB	FB	FB	FB																	
2,700	272	J,K,M	FB	FB	FB	FB	FB	FB	FB																	
3,300	332	J,K,M	FB	FB	FB	FB	FB	FB	FB																	
3,900	392	J,K,M	FB	FB	FB	FB	FB	FB	FB																	
4,700	472	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD														
5,600	562	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD														
6,800	682	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
8,200	822	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
10,000	103	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
12,000	123	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
15,000	153	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
18,000	183	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
22,000	223	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	HB	HB	HB							
27,000	273	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	HB	HB	HB							
33,000	333	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	HB	HB	HB							
39,000	393	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	HB	HB	HB							
47,000	473	J,K,M	FB	FB	FB	FB	FB	FB	FC	LD	LD		GB	GB	GB	GB	HB	HB	HB					KC	KC	KC
56,000	563	J,K,M	FB	FB	FB	FB	FB	FB	FC	LD	LD		GB	GB	GB	GB	HB	HB	HB					KC	KC	KC
68,000	683	J,K,M	FB	FB	FB	FB	FB	FB	FC	LD			GB	GB	GB	GB	HB	HB	HB					KC	KC	KC
82,000	823	J,K,M	FB	FB	FB	FB	FB	FC	FF	LD			GB	GB	GB	GB	HB	HB	HB				JC	KC	KC	KC
100,000	104	J,K,M	FB	FB	FB	FB	FB	FD	FG	LD			GB	GB	GB	GB	HB	HB	HB				JC	KC	KC	KC
120,000	124	J,K,M	FB	FB	FB	FB	FB	FD		LD			GB	GB	GB	GB	HB	HB	HB				JC	KC	KC	KC
150,000	154	J,K,M	FC	FC	FC	FC	FC	FD		LD			GB	GB	GB	GE	HB	HB	HB				JC	KC	KC	KC
180,000	184	J,K,M	FC	FC	FC	FC	FC	FD		LD			GB	GB	GB	GF	HB	HB	HB				JC	KC	KC	KC
220,000	224	J,K,M	FC	FC	FC	FC	FC	FD					GB	GB	GB	GG	HB	HB	HB				JC	KC	KC	KC
270,000	274	J,K,M	FC	FC	FC	FC	FC	FD					GB	GB	GG	GG	HB	HB	HB	JC	JC	JC	JC	KB	KC	KC
330,000	334	J,K,M	FD	FD	FD	FD	FD	FD					GB	GB	GG	GG	HB	HB	HB	JC	JC	JC	JC	KB	KC	KC
390,000	394	J,K,M	FD	FD	FD	FD	FD						GB	GB	GG	GG	HB	HB	HD	JC	JC	JC	JC	KB	KC	KC
470,000	474	J,K,M	FD	FD	FD	FD	FD	FD					GB	GB	GG	GJ	HB	HB	HD	JC	JC	JC	JC	KB	KC	KD
560,000	564	J,K,M	FD	FD	FD	FD	FD						GC	GC	GG		HB	HD	HD	JC	JC	JC	JD	KB	KC	KD
680,000	684	J,K,M	FD	FD	FD	FD	FD						GC	GC	GG		HB	HD	HD	JC	JC	JD	JD	KB	KC	KD
820,000	824	J,K,M	FF	FF	FF	FF	FF						GE	GE	GG		HB		HF	JC	JC	JF	JF	KB	KC	KE
1,000,000	105	J,K,M	FH	FH	FH	FH	FH	FM					GE	GE	GG		HB		HF	JC	JC	JF	JF	KB	KD	KE
1,200,000	125	J,K,M	FH	FH	FH	FH	FG										HB			JC	JC			KB		KE
1,500,000	155	J,K,M	FH	FH	FH	FH	FG										HC			JC	JC			KC		
1,800,000	185	J,K,M	FH	FH	FH	FH	FG										HD			JD	JD			KD		
2,200,000	225	J,K,M	FJ	FJ	FJ	FJ	FG	FT*							GO°		HF			JF	JF			KD		
2,700,000	275	J,K,M	FE	FE	FE																					
3,300,000	335	J,K,M	FF	FF	FF	FM	FM																			
3,900,000	395	J,K,M	FG	FG	FG																					
4,700,000	475	J,K,M	FC+	FC+	FC+	FG+	FS+						GK*	GK*												
5,600,000	565	J,K,M	FF+	FF+	FF+																					
6,800,000	685	J,K,M	FG+	FG+	FG+	FM+																				
8,200,000	825	J,K,M	FH+	FH+	FH+																					
10,000,000	106	J,K,M	FH+	FH+	FH+	FS+							GK*							JF	JO					
12,000,000	126	J,K,M																								
15,000,000	156	J,K,M																			JO					
18,000,000	186	J,K,M																								
22,000,000	226	J,K,M	FS+	FS+																JO						
47,000,000	476	M	FS+																							

*** Capacitance tolerance K or M. Contact your local KEMET Sales Rep for J tolerance availablity.** **+ Reflow Only** **° M tolerance only**
NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.
50 Volt Ceramic Chips can be used for 63 volt applications.

Improved product with higher ratings and tighter capacitance tolerance product may be substituted within the same size (length, width, and thickness) at KEMET's option. Reels with such substitutions will be marked with the improved KEMET part numbers.

Y5V CAPACITANCE RANGE

Cap pF	Cap Code	Cap Tol.	C0402*			C0603*				C0805*					C1206*					C1210*				
			6.3V	10V	16V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
22,000	223	Z	BB	BB	BB	CB	CB	CB	CB					DC					EB					
27,000	273	Z	BB	BB	BB	CB	CB	CB	CB					DC					EB					
33,000	333	Z	BB	BB	BB	CB	CB	CB	CB					DC					EB					
39,000	393	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
47,000	473	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
56,000	563	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
68,000	683	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
82,000	823	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
100,000	104	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
120,000	124	Z				CC	CC	CC	CC	DC	DC	DC	DC											
150,000	154	Z				CC	CC	CC	CC	DC	DC	DC	DC											
180,000	184	Z				CC	CC	CC	CC	DC	DC	DC	DC											
220,000	224	Z	BB			CC	CC	CC	CC	DC	DC	DC	DC	DD	EC	EC	EC	EC		FD	FD	FD	FD	FD
270,000	274	Z				CC	CC	CC	CC	DC	DC	DC	DC		EB	EB	EB	EB		FD	FD	FD	FD	FD
330,000	334	Z				CC	CC	CC	CC	DC	DC	DC	DC		EB	EB	EB	EB		FD	FD	FD	FD	FD
390,000	394	Z				CC	CC	CC		DC	DC	DC	DC		EB	EB	EB	EB		FD	FD	FD	FD	FD
470,000	474	Z	BB			CC	CC	CC		DC	DC	DC	DC		EC	EC	EC	EC		FD	FD	FD	FD	FD
560,000	564	Z				CC	CC			DD	DD	DD	DD		EB	EB	EB	EB		FD	FD	FD	FD	FD
680,000	684	Z				CC	CC			DE	DE	DE	DE		EB	EB	EB	EB		FD	FD	FD	FD	FD
820,000	824	Z				CC	CC			DG	DG	DG	DG		EB	EB	EB	EB		FF	FF	FF	FF	FF
1,000,000	105	Z	BB			CC	CC			DG	DG	DG	DG		EG	EG	EG	EG		FH	FH	FH	FH	FH
1,200,000	125	Z								DC	DC	DC			EC	EC	EC			FD	FD	FD		
1,500,000	155	Z								DC	DC	DC			EC	EC	EC			FD	FD	FD		
1,800,000	185	Z								DD	DD	DD			EC	EC	EC			FD	FD	FD		
2,200,000	225	Z								DD	DD	DD			EE	EE	EE			FD	FD	FD		
3,300,000	335	Z								DE	DE	DH			EF	EF	EF			FE	FE	FE		
4,700,000	475	Z								DH	DH	DH			EM	EM	EM			FG	FG	FG		
5,600,000	565	Z								DH	DH				EJ	EJ	EJ			FG	FG	FG		
6,800,000	685	Z								DH	DH				EJ	EJ				FH	FH	FH		
10,000,000	106	Z								DH	DH				EJ	EJ				FH	FH	FH		
15,000,000	156	Z																		FH	FH	FH		
22,000,000	226	Z													EH					FT	FT	FM		

NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.
50 Volt Ceramic Chips can be used for 63 volt applications.
*** EIA preferred chip sizes**

+ Reflow only

See page 78 for Thickness Code Reference Chart

X5R CAPACITANCE RANGE

Cap pF	Cap Code	Cap Tol.	0201		C0402*				C0603*				C0805*					C1206*					C1210*					
			6.3V	16V	4V	6.3V	10V	16V	6.3V	10V	16V	25V	4V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	35V	50V
10,000	103	K,M		AA~																								
12,000	123	K,M				BB	BB	BB																				
15,000	153	K,M				BB	BB	BB																				
18,000	183	K,M				BB	BB	BB																				
22,000	223	K,M				BB	BB	BB																				
27,000	273	K,M				BB	BB	BB																				
33,000	333	K,M				BB	BB	BB																				
39,000	393	K,M				BB	BB	BB																				
47,000	473	K,M				BB	BB	BB																				
56,000	563	K,M				BB	BB	BB																				
68,000	683	K,M				BB	BB	BB																				
82,000	823	K,M				BB	BB	BB																				
100,000	104	K,M	AA~			BB	BB	BB																				
120,000	124	K,M																										
150,000	154	K,M																										
180,000	184	K,M																										
220,000	224	K,M				BB																						
270,000	274	K,M							CC	CC	CC										EB							
330,000	334	K,M							CC	CC	CC										EB							
390,000	394	K,M							CC	CC	CC										EB							
470,000	474	K,M							CC	CC	CC						DC				EC							
560,000	564	K,M							CC	CC	CC						DD				ED							
680,000	684	K,M							CC	CC	CC						DE				EE							
820,000	824	K,M							CC	CC	CC						DF				EF							
1,000,000	105	K,M				BB	BB		CC	CC	CC	CD		DG	DG	DG	DG				ED				FH+	FH+		FH+
1,200,000	125	K,M												DD	DD	DD					EC				FD+	FD+		
1,500,000	155	K,M												DC	DC	DC		EC	EC	EC	EC				FD+	FD+		
1,800,000	185	K,M												DD	DD	DD		EC	EC	EC	EC				FD+	FD+		
2,200,000	225	K,M				BB°			CC+	CC+	CC+			DD	DK	DD		EE	EE	EE	EE				FG+	FG+		
2,700,000	275	K,M																EF	EF	EF	EF				FG+	FG+		
3,300,000	335	K,M			BB°				CC+°					DF	DF	DH		EH	EH	EH	EH		FG+	FG+	FG+	FG+		
4,700,000	475	K,M			BB°				CC+	CC+				DH	DH	DH	DG	EH	EH	EH	EH	EH°	FG+	FG+	FG+	FG+		
5,600,000	565	K,M																					FG+	FG+	FG+	FG+		
6,800,000	685	K,M																ED	ED	EH			FG+	FG+	FG+	FG+		
8,200,000	825	K,M																ED	ED	EH			FG+	FG+	FG+	FG+		
10,000,000	106	K,M							CD°+					DK+	DK+	DK+		EH	EH	EH	EH+		FT+	FT+	FO+	FH+	FT°+	
12,000,000	126	K,M																					FD+	FD+	FG+			
15,000,000	156	K,M																					FG+	FG+	FL+			
18,000,000	186	K,M																					FG+	FG+	FH+			
22,000,000	226	K,M												DH+°				EH+	EH+°				FH+	FH+	FJ+			
27,000,000	276	K,M																										
33,000,000	336	K,M																										
39,000,000	396	K,M																										
47,000,000	476	K,M											DJ°+	DK°+				EH°+	EH°+				FQ°+	FQ+°	FQ°+			
100,000,000	107	K,M																EH°+					FQ°+					

NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.

+Reflow only ° Available M ±20% tolerance only

Improved product with higher ratings and tighter capacitance tolerance product may be substituted within the same size (length, width, and thickness) at KEMET's option. Reels with such substitutions will be marked with the improved KEMET part numbers.

Z5U CAPACITANCE RANGE

(KEMET's Z5U also meets Y5V Characteristics)

Cap pF	Cap Code	Cap Tol.	C0805*		C1206*		C1210*		C1812*		C1825*		C2225	
			50V	100V	50V	100V	50V	100V	50V	100V	50V	100V	50V	100V
6,800	682	M,Z	DC	DC										
8,200	822	M,Z	DC	DC										
10,000	103	M,Z	DC	DC	EB	EB								
12,000	123	M,Z	DC		EB	EB								
15,000	153	M,Z	DC		EB	EB								
18,000	183	M,Z	DC		EB	EB								
22,000	223	M,Z	DC		EB	EB								
27,000	273	M,Z	DC		EB	EB								
33,000	333	M,Z	DC		EB	EB								
39,000	393	M,Z	DD		EB	EC								
47,000	473	M,Z	DD		EB	EC	FB	FB						
56,000	563	M,Z	DD		EB	EB	FB	FB						
68,000	683	M,Z	DD		EB	EB	FB	FB						
82,000	823	M,Z	DD		EB	EB	FB	FC	GB	GB				
100,000	104	M,Z	DD		EB	EB	FB	FD	GB	GB				
120,000	124	M,Z			EC		FB	FD	GB	GB				
150,000	154	M,Z			EC		FC	FD	GB	GB				
180,000	184	M,Z			EC		FC		GB		HB	HB		
220,000	224	M,Z			EC		FC		GB		HB	HB		
270,000	274	M,Z					FC		GB		HB	HB		
330,000	334	M,Z					FD		GB		HB	HB	KB	KC
390,000	394	M,Z					FD		GB		HB	HD	KB	KC
470,000	474	M,Z					FD		GB		HB		KB	KC
560,000	564	M,Z					FD		GC		HB		KB	
680,000	684	M,Z					FD		GC		HB		KB	
820,000	824	M,Z					FF		GE		HB		KB	
1,000,000	105	M,Z					FH		GE		HB		KB	
1,200,000	125	M,Z									HB		KB	
1,500,000	155	M,Z									HB		KC	
1,800,000	185	M,Z									HB		KD	
2,200,000	225	M,Z									HB		KD	
2,700,000	275	M,Z											KD	

NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.
50 Volt Ceramic Chips can be used for 63 volt applications.
*** EIA preferred chip sizes**

See page 78 for Thickness Code Reference Chart.

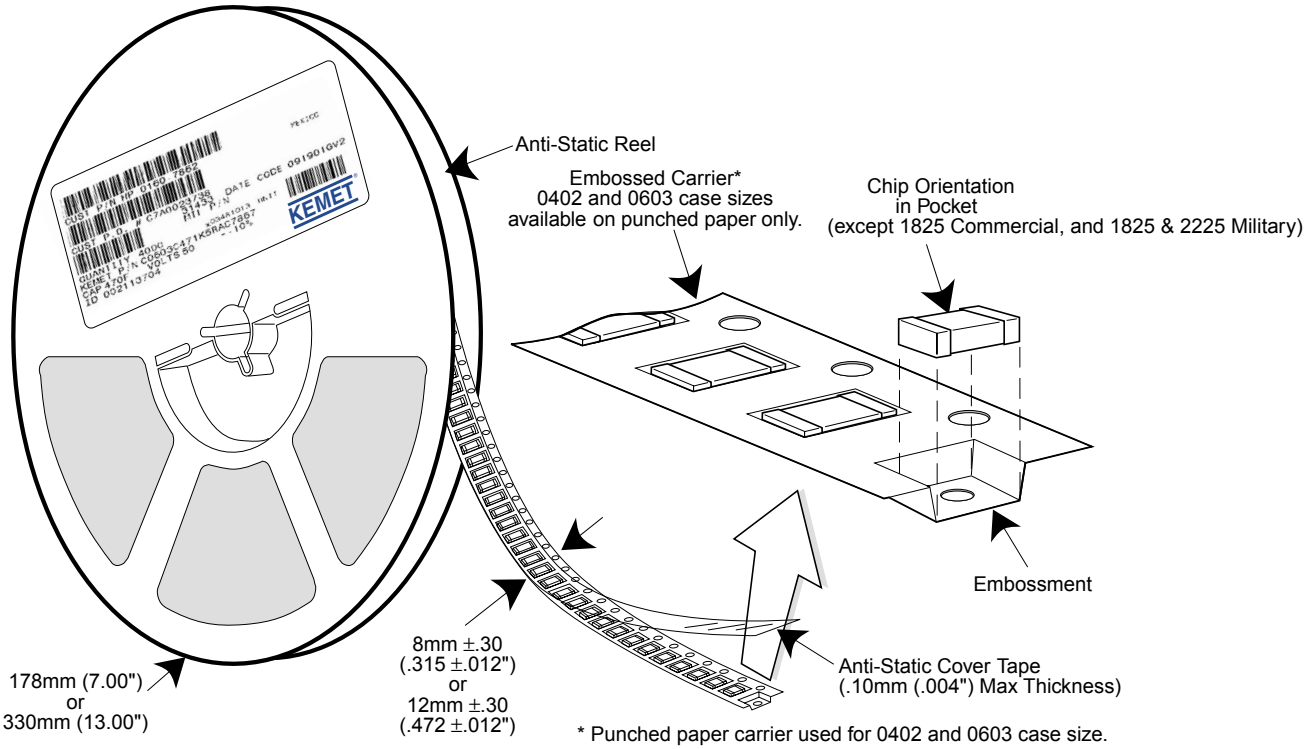
Thickness Code Reference Chart
Packaging Quantity Based on Finished Chip Thickness Specifications

Thickness Code	Chip Size	Chip Thickness Range (mm)	Qty per Reel 7" Plastic	Qty per Reel 13" Plastic	Qty per Reel 7" Paper	Qty per Reel 13" Paper	Qty per Bulk Cassette
AA	0201	0.30 ± 0.03	N/A	N/A	15,000	N/A	N/A
BB	0402	0.50 ± 0.05	N/A	N/A	10,000	50,000	50,000
CB	0603	0.80 ± 0.07	N/A	N/A	4,000	10,000	15,000
CC	0603	0.80 ± 0.10	N/A	N/A	4,000	10,000	N/A
CD	0603	0.80 ± 0.15	N/A	N/A	4,000	10,000	N/A
DB	0805	0.60 ± 0.10	N/A	N/A	4,000	10,000	10,000
DC	0805	0.78 ± 0.10	N/A	N/A	4,000	10,000	N/A
DD	0805	0.90 ± 0.10	N/A	N/A	4,000	10,000	N/A
DE	0805	1.00 ± 0.10	2,500	10,000	N/A	N/A	N/A
DF	0805	1.10 ± 0.10	2,500	10,000	N/A	N/A	N/A
DG	0805	1.25 ± 0.15	2,500	10,000	N/A	N/A	N/A
DH	0805	1.25 ± 0.20	2,500	10,000	N/A	N/A	N/A
DJ	0805	1.25 ± 0.20	3,000	N/A	N/A	N/A	N/A
DK	0805	1.25 ± 0.15	3,000	N/A	N/A	N/A	N/A
DL	0805	0.95 ± 0.10	4,000	10,000	N/A	N/A	N/A
EB	1206	0.78 ± 0.10	4,000	10,000	4,000	10,000	N/A
EC	1206	0.90 ± 0.10	4,000	10,000	N/A	N/A	N/A
ED	1206	1.00 ± 0.10	2,500	10,000	N/A	N/A	N/A
EE	1206	1.10 ± 0.10	2,500	10,000	N/A	N/A	N/A
EF	1206	1.20 ± 0.15	2,500	10,000	N/A	N/A	N/A
EG	1206	1.60 ± 0.15	2,000	8,000	N/A	N/A	N/A
EH	1206	1.60 ± 0.20	2,000	8,000	N/A	N/A	N/A
EJ	1206	1.70 ± 0.20	2,000	8,000	N/A	N/A	N/A
EK	1206	0.80 ± 0.10	2,000	8,000	N/A	N/A	N/A
EL	1206	1.15 ± 0.15	2,000	8,000	N/A	N/A	N/A
EM	1206	1.25 ± 0.15	2,500	10,000	N/A	N/A	N/A
EN	1206	0.95 ± 0.10	4,000	10,000	N/A	N/A	N/A
FB	1210	0.78 ± 0.10	4,000	10,000	N/A	N/A	N/A
FC	1210	0.90 ± 0.10	4,000	10,000	N/A	N/A	N/A
FD	1210	0.95 ± 0.10	4,000	10,000	N/A	N/A	N/A
FE	1210	1.00 ± 0.10	2,500	10,000	N/A	N/A	N/A
FF	1210	1.10 ± 0.10	2,500	10,000	N/A	N/A	N/A
FG	1210	1.25 ± 0.15	2,500	10,000	N/A	N/A	N/A
FH	1210	1.55 ± 0.15	2,000	8,000	N/A	N/A	N/A
FJ	1210	1.85 ± 0.20	2,000	8,000	N/A	N/A	N/A
FK	1210	2.10 ± 0.20	2,000	8,000	N/A	N/A	N/A
FL	1210	1.40 ± 0.15	2,000	8,000	N/A	N/A	N/A
FM	1210	1.70 ± 0.20	2,000	8,000	N/A	N/A	N/A
FN	1210	1.85 ± 0.20	2,000	8,000	N/A	N/A	N/A
FO	1210	1.50 ± 0.20	2,000	8,000	N/A	N/A	N/A
FP	1210	1.60 ± 0.20	2,000	8,000	N/A	N/A	N/A
FQ	1210	2.50 ± 0.22	1,500	N/A	N/A	N/A	N/A
FR	1210	2.25 ± 0.20	2,000	8,000	N/A	N/A	N/A
FS	1210	2.50 ± 0.20	1,000	4,000	N/A	N/A	N/A
FT	1210	1.90 ± 0.20	1,500	4,000	N/A	N/A	N/A
LD	1808	0.90 ± 0.10	4,000	10,000	N/A	N/A	N/A
GB	1812	1.00 ± 0.10	1,000	4,000	N/A	N/A	N/A
GC	1812	1.10 ± 0.10	1,000	4,000	N/A	N/A	N/A
GD	1812	1.25 ± 0.15	1,000	4,000	N/A	N/A	N/A
GE	1812	1.30 ± 0.10	1,000	4,000	N/A	N/A	N/A
GF	1812	1.50 ± 0.10	1,000	4,000	N/A	N/A	N/A
GG	1812	1.55 ± 0.10	1,000	4,000	N/A	N/A	N/A
GH	1812	1.40 ± 0.15	1,000	4,000	N/A	N/A	N/A
GJ	1812	1.70 ± 0.15	1,000	4,000	N/A	N/A	N/A
GK	1812	1.60 ± 0.20	1,000	4,000	N/A	N/A	N/A
GL	1812	1.90 ± 0.20	1,000	4,000	N/A	N/A	N/A
GM	1812	2.00 ± 0.20	1,000	4,000	N/A	N/A	N/A
GN	1812	1.70 ± 0.20	1,000	4,000	N/A	N/A	N/A
GO	1812	2.50 ± 0.20	500	N/A	N/A	N/A	N/A
HB	1825	1.10 ± 0.15	1,000	4,000	N/A	N/A	N/A
HC	1825	1.15 ± 0.15	1,000	4,000	N/A	N/A	N/A
HD	1825	1.30 ± 0.15	1,000	4,000	N/A	N/A	N/A
HE	1825	1.40 ± 0.15	1,000	4,000	N/A	N/A	N/A
HF	1825	1.50 ± 0.15	1,000	4,000	N/A	N/A	N/A
JB	2220	1.00 ± 0.15	1,000	4,000	N/A	N/A	N/A
JC	2220	1.10 ± 0.15	1,000	4,000	N/A	N/A	N/A
JD	2220	1.30 ± 0.15	1,000	4,000	N/A	N/A	N/A
JE	2220	1.40 ± 0.15	1,000	4,000	N/A	N/A	N/A
JF	2220	1.50 ± 0.15	1,000	4,000	N/A	N/A	N/A
JG	2220	1.70 ± 0.15	1,000	4,000	N/A	N/A	N/A
JH	2220	1.80 ± 0.15	1,000	4,000	N/A	N/A	N/A
JO	2220	2.40 ± 0.15	500	2,000	N/A	N/A	N/A
KB	2225	1.00 ± 0.15	1,000	4,000	N/A	N/A	N/A
KC	2225	1.10 ± 0.15	1,000	4,000	N/A	N/A	N/A
KD	2225	1.30 ± 0.15	1,000	4,000	N/A	N/A	N/A
KE	2225	1.40 ± 0.15	1,000	4,000	N/A	N/A	N/A

This chart refers to ceramic chip thickness codes on pages 73 – 76.
Note: TU suffix represents tape and reel packaging of unmarked components.
Note: TM suffix represents tape and reel packaging of marked components.
Cases sizes ≤1210 are 8mm tape with 4mm pitch and Case Sizes >1210 are 12mm tape and 8mm pitch.

Tape & Reel Packaging

KEMET offers Multilayer Ceramic Chip Capacitors packaged in 8mm and 12mm plastic tape on 7" and 13" reels in accordance with EIA standard 481-1: Taping of surface mount components for automatic handling. This packaging system is compatible with all tape fed automatic pick and place systems. See page 78 for details on reeling quantities for commercial chips and page 87 for MIL-PRF-55681 chips.



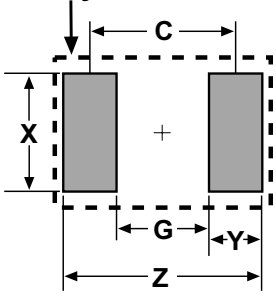
* Punched paper carrier used for 0402 and 0603 case size.

Case Sizes ≤ 1210 are 8 mm tape with 4 mm pitch.
Case Sizes >1210 are 12 mm tape with 8 mm pitch.

Note: TU suffix represents tape and reel packaging of unmarked components.
TM suffix represents tape and reel packaging of marked components.

SURFACE MOUNT LAND DIMENSIONS - CERAMIC CHIP CAPACITORS - MM

Grid Placement Courtyard



	Reflow Solder					Wave Solder				
Dimension	**Z**	**G**	**X**	**Y(ref)**	**C(ref)**	**Z**	**G**	**X**	**Y(ref)**	**Smin**
0402	2.14	0.28	0.74	0.93	1.21	Not Recommended				
0603	2.78	0.68	1.08	1.05	1.73	3.18	0.68	0.80	1.25	1.93
0805	3.30	0.70	1.60	1.30	2.00	3.70	0.70	1.10	1.50	2.20
1206	4.50	1.50	2.00	1.50	3.00	4.90	1.50	1.40	1.70	3.20
1210	4.50	1.50	2.90	1.50	3.00	4.90	1.50	2.00	1.70	3.20
1812	5.90	2.30	3.70	1.80	4.10	Not Recommended				
1825	5.90	2.30	6.90	1.80	4.10					
2220	7.00	3.30	5.50	1.85	5.15					
2225	7.00	3.30	6.80	1.85	5.15					

Calculation Formula
Z = Lmin + 2Jt + Tt
G = Smax - 2Jh -Th
X = Wmin + 2Js + Ts
Tt, Th, Ts = Combined tolerances

CE HIGH CAPACITANCE

No.	Ordercode	Casesize	Volt	Cap.	Tol.	Dielec.
1	C0402C335M7PAC	0402	4V	3.3uF	±20%	X5R
2	C0402C475M7PAC	0402	4V	4.7uF	±20%	X5R
3	C0805C476M7PAC	0805	4V	47uF	±20%	X5R
4	C0402C225M9PAC	0402	6.3V	2.2uF	±20%	X5R
5	C0603C106M9PAC	0603	6.3V	10uF	±20%	X5R
6	C1206C476M9PAC	1206	6.3V	47uF	±20%	X5R
7	C1210C107M9PAC	1210	6.3V	100uF	±20%	X5R
8	C1206C226M8PAC	1206	10V	22uF	±20%	X5R
9	C2220C226K4RAC	2220	16V	22uF	±10%	X7R
10	C1210C476M4PAC	1210	16V	47uF	±20%	X5R
11	C1206C475M5PAC	1206	50V	4.7uF	±20%	X5R
12	C1825C225K5RAC	1825	50V	2.2uF	±10%	X7R
13	C1210C225M1RAC	1210	100V	2.2uF	±20%	X7R

KEMET

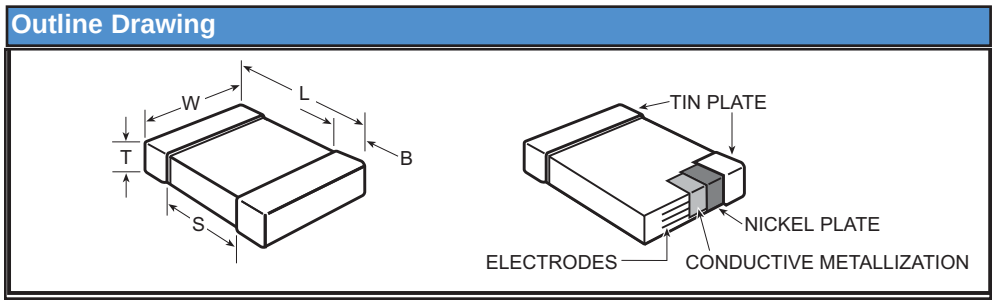
CHARGED.™

FlexDesign
SAMPLE KIT

Product-ID: FD-Kemet

Fail-Safe Floating Electrode MLCC / *FE-CAP* / X7R Dielectric

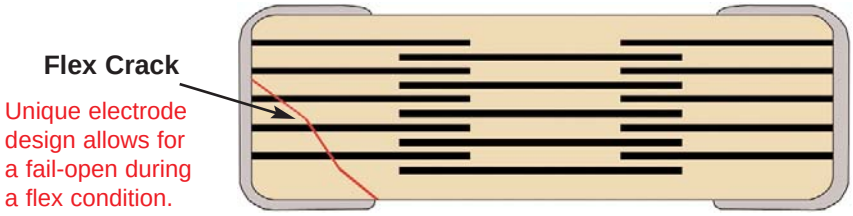
Outline Drawing



Product Description

The FE-CAP is a SMD MLCC which utilizes a floating internal electrode design, wherein the electrodes are configured to form multiple capacitors in series within a single MLCC package. This not only yields improved voltage and ESD performance over standard designs, but also mitigates the risk of low-IR or short-circuit failures that can occur due to board flex. Combined with the stability of an X7R dielectric, the FE-CAP complements KEMET's Open Mode Devices by providing a fail-safe design optimized for low- to mid-range capacitance values.

FE-CAP Internal Design



Dimensions – Millimeters (Inches)

EIA Size Code	Metric Size Code	L Length	W Width	B Bandwidth	S Separation
0402	1005	1.0 (.04) ± 0.05 (.002)	0.5 (.02) ± 0.05 (.002)	0.20 (.008) -0.40 (.016)	0.30 (.012)
0603	1608	1.6 (.063) ± 0.15 (.006)	0.8 (.032) ± 0.15 (.006)	0.35 (.014) ± 0.15 (.006)	0.70 (.028)
0805	2012	2.0 (.079) ± 0.20 (.008)	1.25 (.049) ± 0.20 (.008)	0.05 (.02) ± 0.25 (.010)	0.75 (.030)
1206	3216	3.2 (.126) ± 0.20 (.008)	1.6 (.063) ± 0.20 (.008)	0.50 (.02) ± .25 (.010)	N/A
1210	3225	3.2 (.126) ± 0.20 (.008)	2.5 (.098) ± 0.20 (.008)	0.50 (.02) ± .25 (.010)	N/A
1812	4532	4.5 (.177) ± 0.30 (.012)	3.2 (.126) ± 0.30 (.012)	0.60 (.024) ± .35 (.014)	N/A

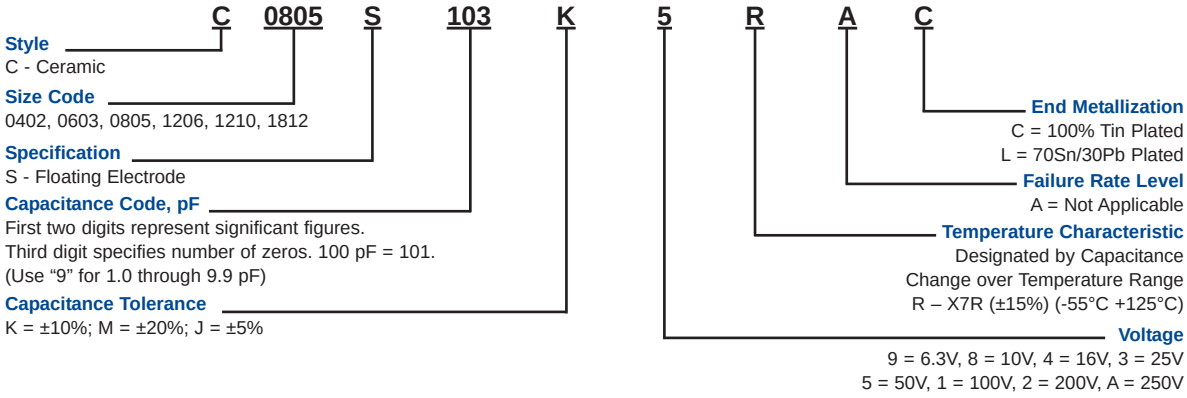
Refer to standard thickness dimensions and table located in the F3102 SMT catalog on pages 73, 74, and 77.

RoHS Compliant

X7R Capacitance Range

CAP (pF)	CAP (nF)	CAP CODE	0402					0603							0805								1206								1210								1812				
			6.3	10	16	25	50	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	250	6.3	10	16	25	50	100	200	250	6.3	10	16	25	50	100	200	250	25	50	100	200	250
150	0.15	151	■	■	■	■	■																																				
180	0.18	181	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																					
220	0.22	221	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																					
270	0.27	271	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																					
330	0.33	331	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																					
390	0.39	391	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																					
470	0.47	471	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																					
560	0.56	561	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																					
680	0.68	681	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																					
820	0.82	821	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																					
1000	1.00	102	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■													
1200	1.2	122						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■													
1500	1.5	152						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■													
1800	1.8	182						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■													
2200	2.2	222						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
2700	2.7	272						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
3300	3.3	332						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
3900	3.9	392						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
4700	4.7	472						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
5600	5.6	562						■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
6800	6.8	682						■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
8200	8.2	822						■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
10000	10	103						■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
12000	12	123						■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
15000	15	153						■	■	■	■	■			■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
18000	18	183						■	■	■	■	■			■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
22000	22	223						■	■	■	■	■			■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
27000	27	273													■	■	■	■	■				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
33000	33	333													■	■	■	■	■				■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■
39000	39	393													■	■	■	■	■				■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■
47000	47	473													■	■	■	■	■				■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■
56000	56	563													■	■	■	■	■				■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■
68000	68	683																					■	■	■	■	■				■	■	■	■	■	■			■	■	■	■	■	■
82000	82	823																					■	■	■	■	■				■	■	■	■	■	■			■	■	■	■	■	■
100000	100	104																					■	■	■	■	■				■	■	■	■	■	■			■	■	■			
120000	120	124																					■	■	■	■	■				■	■	■	■	■				■	■	■			
150000	150	154																													■	■	■	■	■				■	■	■			
180000	180	184																													■	■	■	■	■				■	■				
220000	220	224																													■	■	■	■	■				■	■				

Ordering Information



Electrical Parameters

As detailed in the KEMET Surface Mount Catalog F3102 for X7R, with following specific requirements based on room temperature (25°C) parameters:

- Operating Range: -55°C to +125°C, with no-bias capacitance shift limited to ± 15% over that range.
- Insulation Resistance (IR) measured after 2 minutes at rated voltage @ 25°C: Limit is 1,000 megohm microfarads or 100 gigohm, whichever is less.
- Capacitance and Dissipation Factor (DF) measured at 1kHz and 1 Vrms.
  DF Limits are:

50 - 250 Volts	2.5%
16 - 25 Volts	3.5%
6.3 - 10 Volts	5.0%

Soldering Process

These components are suitable for reflow and wave soldering. All parts incorporate the standard KEMET barrier layer of pure nickel, with an overplate of pure tin to provide excellent solderability as well as resistance to leaching.

Marking

These chips will be supplied unmarked. If required, they can be laser-marked as an extra option. Details on the marking format are included in KEMET Surface Mount catalog F3102.

Qualification/Certification

AEC-Q200 Rev. C - Automotive
RoHS 6 - 100% tin termination

In general, the information in the KEMET Surface Mount catalog F3102 applies to these capacitors. The information in this bulletin supplements that in the catalog.

RoHS Compliant KEMET CHARGED.

FEATURES

KEMET's Open Mode Ceramic Surface Mount Capacitor is designed to significantly minimize the probability of a low IR or Short Circuit Condition when forced to failure in a board flex situation. This reduces the potential for causing catastrophic failures. This product is RoHS Compliant.

Applications:
- Input side filtering (power plane/bus)
- High current applications (battery line)
- Circuits that cannot be fused to open when short circuits occur due to flex cracks

Markets:
- *Automotive*
  - All applications connected directly to the battery
  - Conversion to 42V power system
- *Power Conversion*
  - Raw power input side filtering

OUTLINE DRAWING

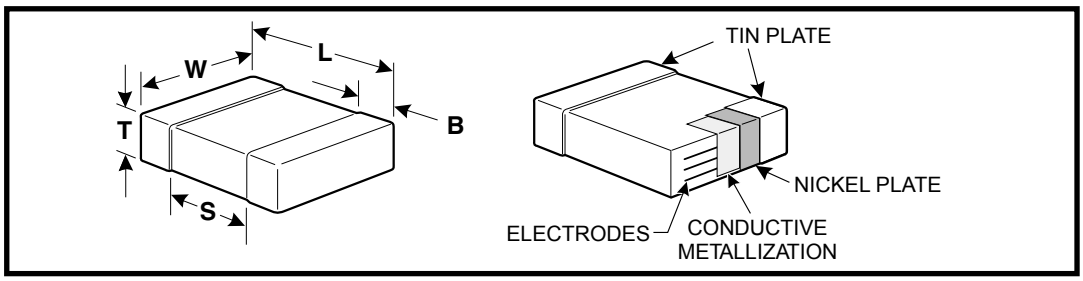


TABLE 1 - DIMENSIONS - MILLIMETERS (INCHES)

Metric Size Code	EIA Size Code	L - Length	W - Width	B - Bandwidth	Separation
2012	0805	2.0 (.079) ± .20 (.008)	1.25 (.049) ± 0.2 (.008)	0.50 (.02) ± .25 (.010)	0.75 (.030)
3216	1206	3.2 (.126) ± .20 (.008)	1.6 (.063) ± 0.2 (.008)	0.50 (.02) ± .25 (.010)	N/A
3225	1210	3.2 (.126) ± .20 (.008)	2.5 (.098) ± 0.2 (.008)	0.50 (.02) ± .25 (.010)	N/A
4532	1812	4.5 (.177) ± 0.3 (.012)	3.2 (.126) ± 0.3 (.012)	0.60 (.024) ± .35 (.014)	N/A

Note: For thickness dimensions, see Table 2.

CAPACITOR ORDERING INFORMATION

C 1812 F 105 K 1 R A C

Style
C - Ceramic

Size Code
0805, 1206, 1210, 1812

Specification
F - Open-Mode

Capacitance Code, pF
First two digits represent significant figures.
Third digit specifies number of zeros. 100 pF = 101.
(Use "9" for 1.0 through 9.9 pF)
(Use "8" for 0.1 through .99 pF)

Capacitance Tolerance
K = ±10% M = ±20%

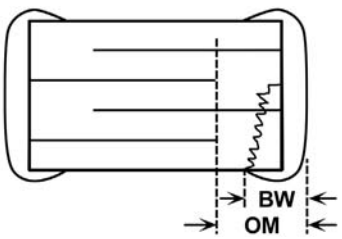
End Metallization
C = 100% Tin Plated
L = 70Sn/30Pb Plated

Failure Rate Level
A = Not Applicable

Temperature Characteristic
Designated by Capacitance Change over Temperature Range
R – X7R (±15%) (-55°C +125°C)

Voltage
2 = 200V 5 = 50V
1 = 100V 3 = 25V
4 = 16V

OPEN-MODE INTERNAL DESIGN



The open-mode dimension (OM) exceeds the termination bandwidth dimensions: OM >BW

CERAMIC OPEN MODE CAPACITORS

TABLE 2
X7R DIELECTRIC CAPACITANCE RANGE AND THICKNESS TARGETS (mm)

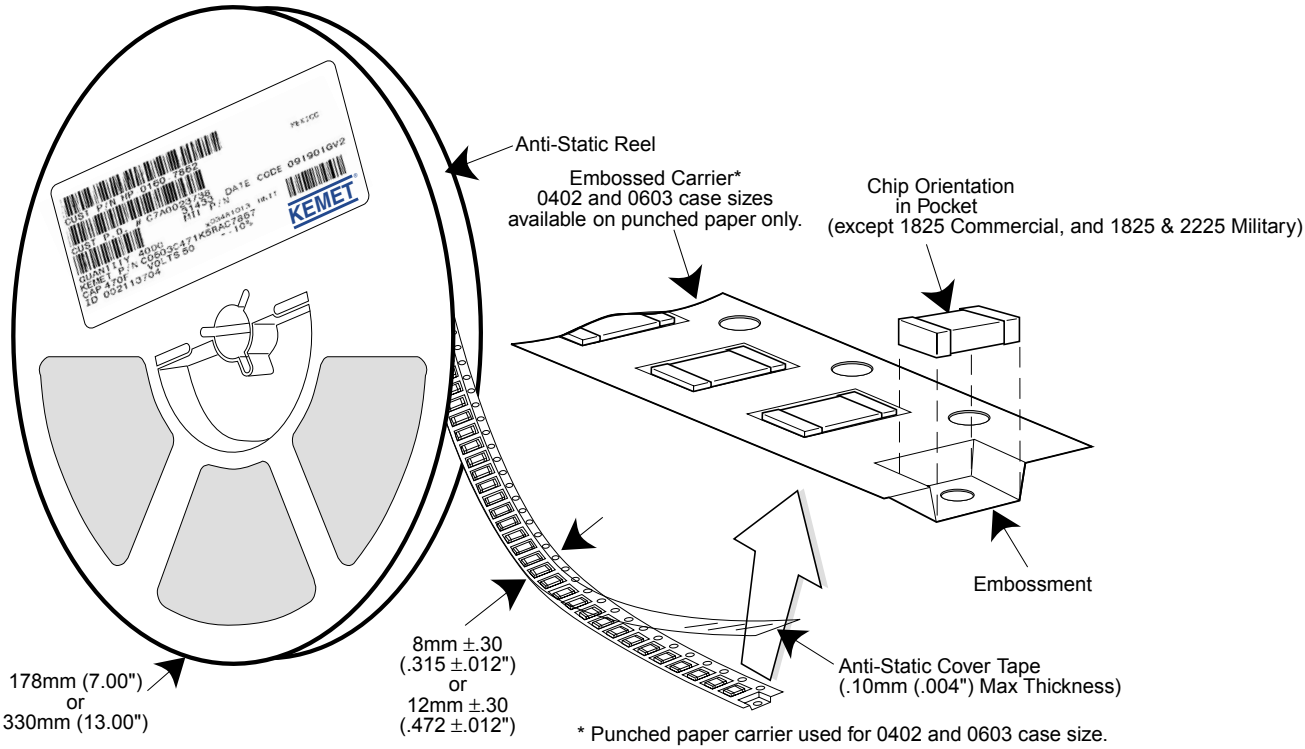
Cap Code	0805					1206					1210					1812			
	16V	25V	50V	100V	200V	16V	25V	50V	100V	200V	16V	25V	50V	100V	200V	25V	50V	100V	200V
102	DD	DD	DD	DD	DD														
122	DD	DD	DD	DD	DD														
152	DD	DD	DD	DD	DD														
182	DD	DD	DD	DD	DD														
222	DD	DD	DD	DD	DD														
272	DD	DD	DD	DD	DD														
332	DD	DD	DD	DD	DD														
392	DD	DD	DD	DD	DD														
472	DD	DD	DD	DD	DD														
562	DD	DD	DD	DD	DD														
682	DD	DD	DD	DD	DD														
822	DD	DD	DD	DD	DD														
103	DD	DD	DD	DD	DD														
123	DD	DD	DD	DD	DG														
153	DD	DD	DD	DD	DG														
183	DD	DD	DD	DD						EC									
223	DD	DD	DD	DG						EC									
273	DD	DD	DD	DG						EC									
333	DD	DD	DD	DG						EC									
393	DD	DD	DD	DG						EC									
473	DD	DD	DD	DE		EC	EC	EC	EC	EG									GB
563	DD	DD	DD			EC	EC	EC	EC	EG									GB
683	DD	DD	DG	DG		EC	EC	EC	EC	EG					FD				GB
823	DD	DD	DG			EC	EC	EC	EC	EG					FD				GB
104	DG	DG	DG			EC	EC	EC	EC	EG	FD	FD	FD	FD	FG	GB	GB	GB	GB
124	DG	DG				EC	EC	EC	EC		FD	FD	FD	FD	FG	GB	GB	GB	GB
154	DG	DG				EC	EC	EC	EG		FD	FD	FD	FD	FH	GB	GB	GB	GB
184	DG	DG				EC	EC	EC	EG		FD	FD	FD	FD	FH	GB	GB	GB	GB
224	DG	DD	DG			EC	EC	EC	ED		FD	FD	FD	FG	FJ	GB	GB	GB	GC
274	DD	DD				EC	EC	EC			FD	FD	FD	FG		GB	GB	GB	GF
334	DG	DG				EG	EG	EG	EG		FD	FD	FD	FH		GB	GB	GB	GK
394	DG	DG				EG	EG				FD	FD	FG	FH		GB	GB	GB	GL
474	DE	DG				EG	EG	EC			FD	FD	FG	FJ		GB	GB	GC	
564						EG					FD	FD	FG	FR		GB	GB	GD	
684	DG					EG					FD	FG	FH	FR		GD	GD	GF	
824						EG					FD	FG	FJ			GD	GD	GK	
105						EG	EC	EH			FD	FH	FJ	FQ		GN	GN	GM	
125											FG								
155											FH								
185											FH								
225						EC	EH				FJ		FM						
475						EH					FG	FM							
685												FQ							

THICKNESS AND PACKAGING INFORMATION

Thickness Code	Series	Dimension	7" Reel Qty.	13" Reel Qty.
DD	0805	.90 ± .10	4000	10000
DE	0805	1.00 ± .10	2500	10000
DG	0805	1.25 ± .15	2500	10000
EC	1206	.90 ± .10	4000	10000
ED	1206	1.00 ± .10	2500	10000
EG	1206	1.60 ± .15	2000	8000
EH	1206	1.60 ± .20	2000	8000
FD	1210	.95 ± .10	4000	10000
FG	1210	1.25 ± .15	2500	10000
FH	1210	1.55 ± .15	2000	8000
FJ	1210	1.85 ± .20	2000	8000
FM	1210	1.70 ± .20	2000	8000
FR	1210	2.25 ± .20	2000	8000
FQ	1210	2.5 ± .20	1500	8000
GB	1812	1.0 ± .10	1000	4000
GC	1812	1.1 ± .10	1000	4000
GD	1812	1.25 ± .15	1000	4000
GF	1812	1.50 ± .15	1000	4000
GK	1812	1.60 ± .20	1000	4000
GL	1812	1.90 ± .20	1000	4000
GM	1812	2.00 ± .20	1000	4000
GN	1812	1.70 ± .20	1000	4000

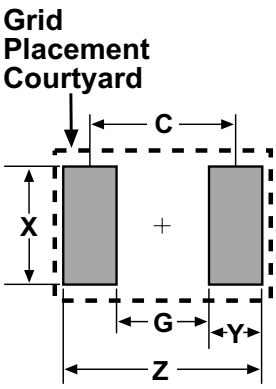
Tape & Reel Packaging

KEMET offers Multilayer Ceramic Chip Capacitors packaged in 8mm and 12mm plastic tape on 7" and 13" reels in accordance with EIA standard 481-1: Taping of surface mount components for automatic handling. This packaging system is compatible with all tape fed automatic pick and place systems. See page 78 for details on reeling quantities for commercial chips and page 87 for MIL-PRF-55681 chips.



Case Sizes ≤ 1210 are 8 mm tape with 4 mm pitch.
Case Sizes > 1210 are 12 mm tape with 8 mm pitch
Note: TU suffix represents tape and reel packaging of marked components.
TM suffix represents tape and reel packaging of marked components.

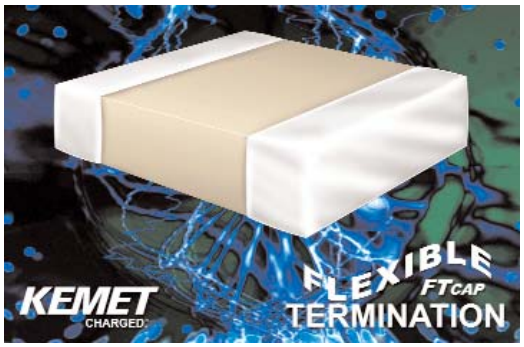
SURFACE MOUNT LAND DIMENSIONS - CERAMIC CHIP CAPACITORS - MM



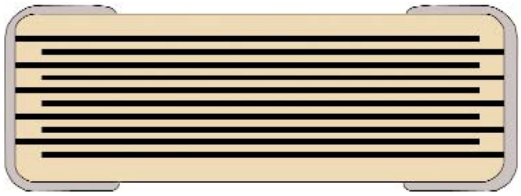
	Reflow Solder					Wave Solder				
Dimension	Z	G	X	Y(ref)	C(ref)	Z	G	X	Y(ref)	Smin
0402	2.14	0.28	0.74	0.93	1.21	Not Recommended				
0603	2.78	0.68	1.08	1.05	1.73	3.18	0.68	0.80	1.25	1.93
0805	3.30	0.70	1.60	1.30	2.00	3.70	0.70	1.10	1.50	2.20
1206	4.50	1.50	2.00	1.50	3.00	4.90	1.50	1.40	1.70	3.20
1210	4.50	1.50	2.90	1.50	3.00	4.90	1.50	2.00	1.70	3.20
1812	5.90	2.30	3.70	1.80	4.10	Not Recommended				
1825	5.90	2.30	6.90	1.80	4.10					
2220	7.00	3.30	5.50	1.85	5.15					
2225	7.00	3.30	6.80	1.85	5.15					

Calculation Formula
Z = Lmin + 2Jt + Tt
G = Smax - 2Jh -Th
X = Wmin + 2Js + Ts
Tt, Th, Ts = Combined tolerances

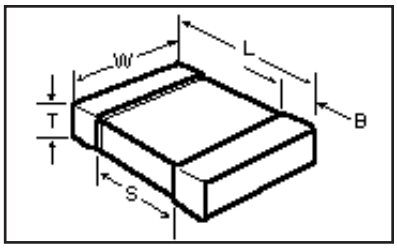
Surface Mount Ceramic Chip Capacitors / *FT-CAP* / Flexible Terminations

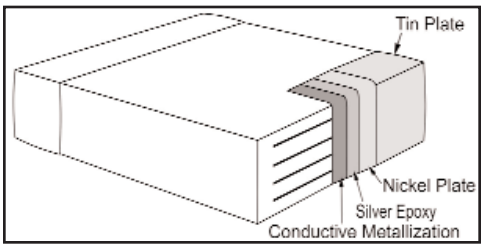


Standard Electrode Internal Design



Outline Drawing





The “Flexible Termination (FT-CAP)” capacitor is a surface mount multi-layer ceramic capacitor that incorporates a unique, flexible termination system that is integrated with standard termination materials. A conductive silver epoxy is utilized between the conductive metallization and nickel barrier finish in order to establish pliability while maintaining terminal strength, solderability and electrical performance. This technology was developed to address the primary failure mode of MLCC’s, flex cracks, which are typically the result of excessive shear stresses produced during board flexure. Flexible termination technology directs board flex stress away from the ceramic body and into the conductive epoxy area, therefore mitigating flex cracks which can result in low-IR or short-circuit failures. The FT-CAP offers up to 5mm of flex-bend capability, complementing our current "Open Mode","Floating Electrode (FE-CAP)"and “Floating Electrode with Flexible Termination (FF-CAP)” product lines by providing our customers with a complete portfolio of flex solutions.

Dimensions – Millimeters (Inches)

EIA Size Code	Metric Size Code	L Length	W Width	B Bandwidth	S Separation
0603	1608	1.6 (.063) ± 0.20 (.008)	0.8 (.031) ± 0.15 (.006)	0.35 (.014) ± 0.15 (.006)	0.70 (.028)
0805	2012	2.1 (.083) ± 0.30 (.012)	1.25 (.049) ± 0.20 (.008)	0.50 (.020) ± 0.25 (.010)	0.75 (.030)
1206	3216	3.3 (.130) ± 0.30 (.012)	1.6 (.063) ± 0.20 (.008)	0.50 (.020) ± 0.25 (.010)	-
1210	3225	3.4 (.134) ± 0.40 (.016)	2.5 (.098) ± 0.20 (.008)	0.50 (.020) ± 0.25 (.010)	-
1808	4520	4.7 (.185) ± 0.50 (.020)	2.0 (.079) ± 0.20 (.008)	0.60 (.024) ± 0.35 (.014)	-
1812	4532	4.6 (.181) ± 0.40 (.016)	3.2 (.126) ± 0.30 (.021)	0.60 (.024) ± 0.35 (.014)	-
1825	4564	4.6 (.181) ± 0.40 (.016)	6.4 (.250) ± 0.40 (.016)	0.60 (.024) ± 0.35 (.014)	-
2220	5650	5.9 (.232) ± 0.75 (.030)	5.0 (.197) ± 0.40 (.016)	0.60 (.024) ± 0.35 (.014)	-
2225	5664	5.9 (.232) ± 0.75 (.030)	6.4 (.250) ± 0.40 (.016)	0.60 (.024) ± 0.35 (.014)	-

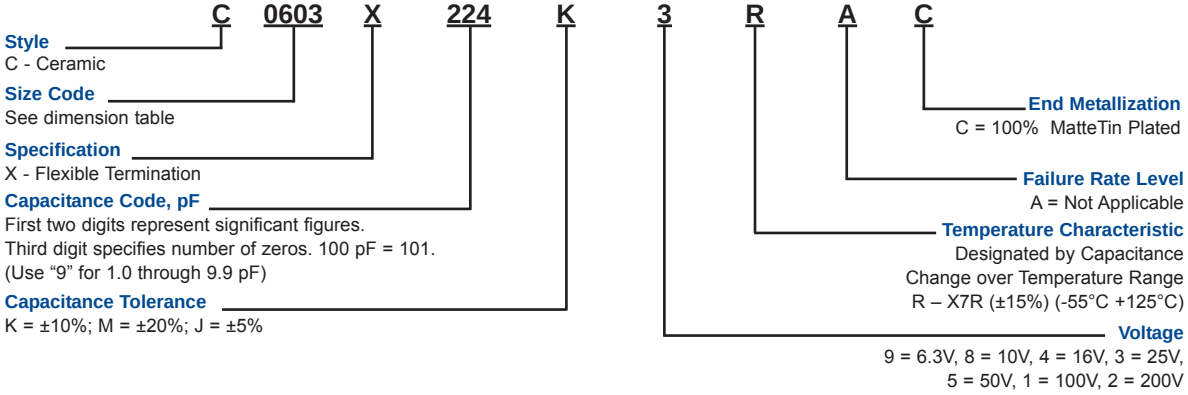
See “Capacitance Range” tables next page for capacitor chip thickness code specification. Capacitor chip thickness dimensions are detailed in the “Thickness Code Reference Chart” on page 5.

RoHS Compliant

Qualification/Certification

Automotive Grade Available: AEC-Q200 Rev. C
RoHS-PRC (6/6) - 100% matte tin termination

Ordering Information



Electrical Parameters

As detailed in the KEMET Surface Mount Catalog F3102 for X7R, with following specific requirements based on room temperature (25°C) parameters:

- Operating Range: -55°C to +125°C, with no-bias capacitance shift limited to ± 15% over that range.
- Insulation Resistance (IR) measured after 2 minutes at rated voltage @ 25°C: Limit is 1000 megohm microfarads or 100,000 MΩ, whichever of the two is smaller.
- Capacitance and Dissipation Factor (DF) measured under the following conditions:
  1kHz and 1 Vrms if capacitance ≤ 10µF
  120Hz and 0.5 Vrms if capacitance > 10µF

- DF Limits are:

50 - 200 Volts	2.5%
16 - 25 Volts	3.5%
6.3/10 Volts	5.0%

Soldering Process

All parts incorporate the standard KEMET barrier layer of pure nickel, with an overplate of pure tin to provide excellent solderability as well as resistance to leaching. The recommended techniques are as follows:

- 1210-2225 case sizes - Solder Reflow
- 0603/0805/1206 case sizes – Solder Wave/Solder Reflow

Marking

These chips will be supplied unmarked. If required, they can be laser-marked as an extra option. Details on the marking format are included in KEMET Surface Mount catalog F3102.

In general, the information in the KEMET Surface Mount catalog F3102 applies to these capacitors. The information in this bulletin supplements that in the catalog.

RoHS Compliant KEMET CHARGED.

Product Availability - 0603 thru 1210 Case Sizes

FT-CAP / FLEXIBLE TERMINATION / X7R DIELECTRIC (0603 - 1210 Case Sizes)

Cap pF	Cap Code	Series	C0603X							C0805X							C1206X							C1210X						
		Voltage	6.3V	10V	16V	25V	50V	100V	200V	6.3V	10V	16V	25V	50V	100V	200V	6.3V	10V	16V	25V	50V	100V	200V	6.3V	10V	16V	25V	50V	100V	200V
		Voltage Code	9	8	4	3	5	1	2	9	8	4	3	5	1	2	9	8	4	3	5	1	2	9	8	4	3	5	1	2
		Cap Tolerance	Product Availability and Chip Thickness Codes - See "ThicknessCodeReferenceChart"																											
180	181	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
220	221	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
270	271	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
330	331	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
390	391	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
470	471	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
560	561	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
680	681	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
820	821	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
1,000	102	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB							
1,200	122	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB							
1,500	152	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB							
1,800	182	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB							
2,200	222	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
2,700	272	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
3,300	332	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
3,900	392	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
4,700	472	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
5,600	562	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
6,800	682	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
8,200	822	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
10,000	103	J,K,M	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
12,000	123	J,K,M	CB	CB	CB	CB	CB	CB	[illegible]	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
15,000	153	J,K,M	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
18,000	183	J,K,M	CB	CB	CB	CB	CB	CB	[illegible]	DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
22,000	223	J,K,M	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
27,000	273	J,K,M	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
33,000	333	J,K,M	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
39,000	393	J,K,M	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EC	EB	FB	FB	FB	FB	FB	FB	FB
47,000	473	J,K,M	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DE	DG	EB	EB	EB	EB	EB	EC	ED	FB	FB	FB	FB	FB	FB	FC
56,000	563	J,K,M	CB	CB	CB	CB	CB	[illegible]	[illegible]	DD	DD	DD	DD	DD	DE	DG	EB	EB	EB	EB	EB	EB	ED	FB	FB	FB	FB	FB	FB	FC
68,000	683	J,K,M	CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	ED	FB	FB	FB	FB	FB	FB	FC
82,000	823	J,K,M	CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	ED	FB	FB	FB	FB	FB	FC	FF
100,000	104	J,K,M	CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	EM	FB	FB	FB	FB	FB	FD	FG
120,000	124	J,K,M	CB	CB	CB	CB	CB			DC	DC	DC	DC	DD	DG		EC	EC	EC	EC	EC	EC	EM	FB	FB	FB	FB	FB	FD	
150,000	154	J,K,M	CB	CB	CB	CD	CD			DC	DC	DC	DC	DD	DG		EC	EC	EC	EC	EC	EC	EG	FC	FC	FC	FC	FC	FD	
180,000	184	J,K,M	CB	CB	CB					DC	DC	DC	DC	DD	DG		EC	EC	EC	EC	EC	EC		FC	FC	FC	FC	FC	FD	
220,000	224	J,K,M	CB	CB	CB	CD				DC	DC	DC	DC	DD	DG		EC	EC	EC	EC	EC	EC		FC	FC	FC	FC	FC	FD	
270,000	274	J,K,M	CB	CB	CB					DD	DD	DD	DD	DD			EB	EB	EB	EB	EC	EM		FC	FC	FC	FC	FC	FD	
330,000	334	J,K,M	CB	CB	CB					DD	DD	DD	DD	DD			EB	EB	EB	EB	EC	EG		FD	FD	FD	FD	FD	FD	
390,000	394	J,K,M	CB	CB	CB					DG	DG	DG	DG	DE			EB	EB	EB	EB	EC	EG		FD	FD	FD	FD	FD	FD	
470,000	474	J,K,M	CB	CB	CB					DD	DD	DD	DD	DE			EC	EC	EC	EC	EC	EG		FD	FD	FD	FD	FD	FD	
560,000	564	J,K,M								DD	DD	DD	DG	DH			ED	ED	ED	ED	EC			FD	FD	FD	FD	FD	FF	
680,000	684	J,K,M								DD	DD	DD	DG	DH			EE	EE	EE	EE	ED			FD	FD	FD	FD	FD	FG	
820,000	824	J,K,M								DD	DD	DD	DG				EF	EF	EF	EF	ED			FF	FF	FF	FF	FF	FL	
1,000,000	105	J,K,M								DD	DD	DD	DG				EF	EF	EF	EG	ED			FH	FH	FH	FH	FH	FM	
1,200,000	125	J,K,M								DE	DE	DE					ED	ED	ED	EG	EH			FH	FH	FH	FH	FG		
1,500,000	155	J,K,M								DG	DG	DG					EF	EF	EF	EG	EH			FH	FH	FH	FH	FG		
1,800,000	185	J,K,M								DG	DG	DG					EF	EF	EF	EF	EH			FH	FH	FH	FH	FG		
2,200,000	225	J,K,M								DG	DG	DG					ED	ED	ED	EF	EH			FJ	FJ	FJ	FJ	FG		
2,700,000	275	J,K,M															EN	EN	EN	EH				FE	FE	FE	FG	FH		
3,300,000	335	J,K,M															ED	ED	ED	EH				FF	FF	FF	FM	FM		
3,900,000	395	J,K,M															EF	EF	EF	EH				FG	FG	FG	FG	FK		
4,700,000	475	J,K,M															EF	EF	EF	EH				FC	FC	FC	FG	FS		
5,600,000	565	J,K,M															EH	EH	EH					FF	FF	FF	FH			
6,800,000	685	J,K,M															EH	EH	EH					FG	FG	FG	FM			
8,200,000	825	J,K,M															EH	EH	EH					FH	FH	FH	FK			
10,000,000	106	J,K,M															EH	EH	EH					FH	FH	FH	FS			
12,000,000	126	J,K,M																												
15,000,000	156	J,K,M																												
18,000,000	186	J,K,M																												
22,000,000	226	J,K,M																						FS	FS					
Cap pF	Cap Code	Voltage Code	9	8	4	3	5	1	2	9	8	4	3	5	1	2	9	8	4	3	5	1	2	9	8	4	3	5	1	2
		Voltage	6.3V	10V	16V	25V	50V	100V	200V	6.3V	10V	16V	25V	50V	100V	200V	6.3V	10V	16V	25V	50V	100V	200V	6.3V	10V	16V	25V	50V	100V	200V
		Series	C0603X							C0805X							C1206X							C1210X						

Product Availablity - 1808 thru 2225 Case Sizes

FT-CAP / FLEXIBLE TERMINATION / X7R DIELECTRIC (1808 - 2225 Case Sizes)

Cap pF	Cap Code	Series	C1808X				C1812X				C1825X			C2220X				C2225X		
		Voltage	50V	100V	200V	250V	25V	50V	100V	200V	50V	100V	200V	25V	50V	100V	200V	50V	100V	200V
		Voltage Code	5	1	2	A	3	5	1	2	5	1	2	3	5	1	2	5	1	2
		Cap Tolerance	Product Availability and Chip Thickness Codes - See "ThicknessCodeReferenceChart"																	
2,200	222	J,K,M																		
2,700	272	J,K,M																		
3,300	332	J,K,M																		
2,900	392	J,K,M																		
4,700	472	J,K,M	LD	LD	LD															
5,600	562	J,K,M	LD	LD	LD															
6,800	682	J,K,M	LD	LD	LD		GB	GB	GB	GB										
8,200	822	J,K,M	LD	LD	LD		GB	GB	GB	GB										
10,000	103	J,K,M	LD	LD	LD		GB	GB	GB	GB										
12,000	123	J,K,M	LD	LD	LD		GB	GB	GB	GB										
15,000	153	J,K,M	LD	LD	LD		GB	GB	GB	GB										
18,000	183	J,K,M	LD	LD	LD		GB	GB	GB	GB										
22,000	223	J,K,M	LD	LD			GB	GB	GB	GB	HB	HB	HB							
27,000	273	J,K,M	LD	LD			GB	GB	GB	GB	HB	HB	HB							
33,000	333	J,K,M	LD	LD			GB	GB	GB	GB	HB	HB	HB							
39,000	393	J,K,M	LD	LD			GB	GB	GB	GB	HB	HB	HB							
47,000	473	J,K,M	LD	LD			GB	GB	GB	GB	HB	HB	HB					KC	KC	KC
56,000	563	J,K,M	LD	LD			GB	GB	GB	GB	HB	HB	HB					KC	KC	KC
68,000	683	J,K,M	LD				GB	GB	GB	GB	HB	HB	HB					KC	KC	KC
82,000	823	J,K,M	LD				GB	GB	GB	GB	HB	HB	HB	JC	JC	JC	JC	KC	KC	KC
100,000	104	J,K,M	LD				GB	GB	GB	GB	HB	HB	HB	JC	JC	JC	JC	KC	KC	KC
120,000	124	J,K,M	LD				GB	GB	GB	GB	HB	HB	HB	JC	JC	JC	JC	KC	KC	KC
150,000	154	J,K,M	LD				GB	GB	GB	GE	HB	HB	HB	JC	JC	JC	JC	KC	KC	KC
180,000	184	J,K,M	LD				GB	GB	GB	GF	HB	HB	HB	JC	JC	JC	JC	KC	KC	KC
220,000	224	J,K,M					GB	GB	GB	GG	HB	HB	HB	JC	JC	JC	JC	KC	KC	KC
270,000	274	J,K,M					GB	GB	GG	GG	HB	HB	HB	JC	JC	JC	JC	KB	KC	KC
330,000	334	J,K,M					GB	GB	GG	GG	HB	HB	HB	JC	JC	JC	JC	KB	KC	KC
390,000	394	J,K,M					GB	GB	GG	GG	HB	HB	HD	JC	JC	JC	JC	KB	KC	KC
470,000	474	J,K,M					GB	GB	GG	GJ	HB	HB	HD	JC	JC	JC	JC	KB	KC	KD
560,000	564	J,K,M					GC	GC	GG		HB	HD	HD	JC	JC	JC	JD	KB	KC	KD
680,000	684	J,K,M					GC	GC	GG		HB	HD	HD	JC	JC	JD	JD	KB	KC	KD
820,000	824	J,K,M					GE	GE	GG		HB	HF	HF	JC	JC	JF	JF	KB	KC	KE
1,000,000	105	J,K,M					GE	GE	GG		HB	HF	HF	JC	JC	JF	JF	KB	KD	KE
1,200,000	125	J,K,M									HB			JC	JC			KB	KE	KE
1,500,000	155	J,K,M									HC			JC	JC			KC		
1,800,000	185	J,K,M									HD			JD	JD			KD		
2,200,000	225	J,K,M									HF			JF	JF			KD		
2,700,000	275	J,K,M																		
3,300,000	335	J,K,M																		
3,900,000	395	J,K,M																		
4,700,000	475	J,K,M					GK	GK												
5,600,000	565	J,K,M																		
6,800,000	685	J,K,M																		
8,200,000	825	J,K,M																		
10,000,000	106	J,K,M					GK							JF	JO					
12,000,000	126	J,K,M																		
15,000,000	156	J,K,M												JO						
18,000,000	186	J,K,M																		
22,000,000	226	J,K,M												JO						
Cap pF	Cap Code	Voltage Code	5	1	2	A	3	5	1	2	5	1	2	3	5	1	2	5	1	2
		Voltage	50V	100V	200V	250V	25V	50V	100V	200V	50V	100V	200V	25V	50V	100V	200V	50V	100V	200V
		Series	C1808X				C1812X				C1825X			C2220X				C2225X		

Revision 0 / 2009 .08/21

Thickness Code Reference Chart

Chip Size	Thickness Code	Chip Thickness Range (mm)	Qty per Reel 7" Plastic	Qty per Reel 13" Plastic	Qty per Reel 7" Paper	Qty per Reel 13" Paper	Qty per Bulk Cassette
0603	CB	0.80 ± 0.07	-	-	4,000	10,000	15,000
0603	CC	0.80 ± 0.10	-	-	4,000	10,000	-
0603	CD	0.80 ± 0.15	-	-	4,000	10,000	-
0805	DB	0.60 ± 0.10	-	-	4,000	10,000	10,000
0805	DC	0.78 ± 0.10	-	-	4,000	10,000	-
0805	DD	0.90 ± 0.10	-	-	4,000	10,000	-
0805	DE	1.00 ± 0.10	2,500	10,000	-	-	-
0805	DF	1.10 ± 0.10	2,500	10,000	-	-	-
0805	DG	1.25 ± 0.15	2,500	10,000	-	-	-
0805	DH	1.25 ± 0.20	2,500	10,000	-	-	-
0805	DL	0.95 ± 0.10	4,000	10,000	-	-	-
1206	EB	0.78 ± 0.10	4,000	10,000	4,000	10,000	-
1206	EC	0.90 ± 0.10	4,000	10,000	-	-	-
1206	ED	1.00 ± 0.10	2,500	10,000	-	-	-
1206	EE	1.10 ± 0.10	2,500	10,000	-	-	-
1206	EF	1.20 ± 0.15	2,500	10,000	-	-	-
1206	EG	1.60 ± 0.15	2,000	8,000	-	-	-
1206	EH	1.60 ± 0.20	2,000	8,000	-	-	-
1206	EJ	1.70 ± 0.20	2,000	8,000	-	-	-
1206	EK	0.80 ± 0.10	2,000	8,000	-	-	-
1206	EM	1.25 ± 0.15	2,500	10,000	-	-	-
1206	EN	0.95 ± 0.10	4,000	10,000	-	-	-
1210	FB	0.78 ± 0.10	4,000	10,000	-	-	-
1210	FC	0.90 ± 0.10	4,000	10,000	-	-	-
1210	FD	0.95 ± 0.10	4,000	10,000	-	-	-
1210	FE	1.00 ± 0.10	2,500	10,000	-	-	-
1210	FF	1.10 ± 0.10	2,500	10,000	-	-	-
1210	FG	1.25 ± 0.15	2,500	10,000	-	-	-
1210	FH	1.55 ± 0.15	2,000	8,000	-	-	-
1210	FJ	1.85 ± 0.20	2,000	8,000	-	-	-
1210	FK	2.10 ± 0.20	2,000	8,000	-	-	-
1210	FL	1.40 ± 0.15	2,000	8,000	-	-	-
1210	FM	1.70 ± 0.20	2,000	8,000	-	-	-
1210	FN	1.85 ± 0.20	2,000	8,000	-	-	-
1210	FO	1.50 ± 0.20	2,000	8,000	-	-	-
1210	FP	1.60 ± 0.20	2,000	8,000	-	-	-
1210	FR	2.25 ± 0.20	2,000	8,000	-	-	-
1210	FS	2.50 ± 0.20	1,000	4,000	-	-	-
1210	FT	1.90 ± 0.20	1,500	4,000	-	-	-
1632	MA	0.80 ± 0.10	4,000	10,000	-	-	-
1808	LD	0.90 ± 0.10	2,500	10,000	-	-	-
1808	LA	1.40 ± 0.15	1,000	4,000	-	-	-
1808	LB	1.60 ± 0.15	1,000	4,000	-	-	-
1808	LC	2.00 ± 0.15	1,000	4,000	-	-	-
1812	GB	1.00 ± 0.10	1,000	4,000	-	-	-
1812	GC	1.10 ± 0.10	1,000	4,000	-	-	-
1812	GD	1.25 ± 0.15	1,000	4,000	-	-	-
1812	GE	1.30 ± 0.10	1,000	4,000	-	-	-
1812	GF	1.50 ± 0.10	1,000	4,000	-	-	-
1812	GG	1.55 ± 0.10	1,000	4,000	-	-	-
1812	GH	1.40 ± 0.15	1,000	4,000	-	-	-
1812	GJ	1.70 ± 0.15	1,000	4,000	-	-	-
1812	GK	1.60 ± 0.20	1,000	4,000	-	-	-
1812	GL	1.90 ± 0.20	1,000	4,000	-	-	-
1812	GM	2.00 ± 0.20	1,000	4,000	-	-	-
1812	GN	1.70 ± 0.20	1,000	4,000	-	-	-
1812	GO	2.50 ± 0.20	500	-	-	-	-
1825	HB	1.10 ± 0.15	1,000	4,000	-	-	-
1825	HC	1.15 ± 0.15	1,000	4,000	-	-	-
1825	HD	1.30 ± 0.15	1,000	4,000	-	-	-
1825	HE	1.40 ± 0.15	1,000	4,000	-	-	-
1825	HF	1.50 ± 0.15	1,000	4,000	-	-	-
1825	HG	1.60 ± 0.20	1,000	4,000	-	-	-
2220	JB	1.00 ± 0.15	1,000	4,000	-	-	-
2220	JC	1.10 ± 0.15	1,000	4,000	-	-	-
2220	JD	1.30 ± 0.15	1,000	4,000	-	-	-
2220	JE	1.40 ± 0.15	1,000	4,000	-	-	-
2220	JF	1.50 ± 0.15	1,000	4,000	-	-	-
2220	JP	1.60 ± 0.20	1,000	4,000	-	-	-
2220	JG	1.70 ± 0.15	1,000	4,000	-	-	-
2220	JH	1.80 ± 0.15	1,000	4,000	-	-	-
2220	JO	2.40 ± 0.15	500	2,000	-	-	-
2225	KB	1.00 ± 0.15	1,000	4,000	-	-	-
2225	KC	1.10 ± 0.15	1,000	4,000	-	-	-
2225	KD	1.30 ± 0.15	1,000	4,000	-	-	-
2225	KE	1.40 ± 0.15	1,000	4,000	-	-	-
2225	KF	1.60 ± 0.20	1,000	4,000	-	-	-

Tech Topics
April 2008

Flex Crack Mitigation

by Bill Sloka, Ceramic Technical Consultant

As part of continuous process improvement at KEMET, most failure modes caused by the capacitor manufacturing process have been systematically eliminated. Today these capacitor manufacturing-related defects are now at a parts-per-billion (PPB) level. Pareto analysis of customer complaints indicates that the #1 failure mode is IR failure due to flex cracks.

Flex Cracks

Flex cracks have been known in PCB manufacturing for quite some time. Flex cracks are created in capacitors when board flex stress / bending stress is applied to a circuit board with ceramic components already affixed to the PCB. As the ceramic capacitor is inherently hard, non-elastic, and brittle (relative to the PCB), any bending of the board creates stress, and that stress can be transmitted through the solder joint, directly to the ceramic body. This stress must be relieved somehow – and this stress relief can result in the creation of a board flex crack (See Figure 1).

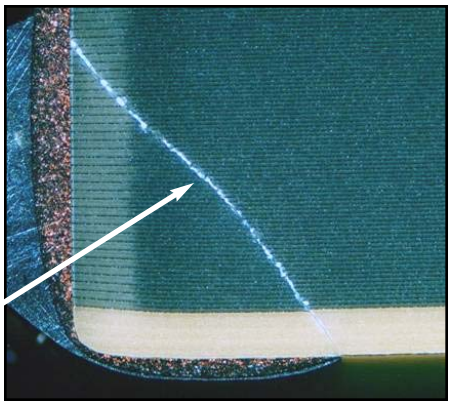


Figure 1. Typical Flex Crack

In PCB assembly, some of the sources of this stress include the following:

- *Connector Assembly/Connector Use* – MLCC's placed close to connectors are particularly susceptible to board flex stress (See Figure 2).

- *Depanelization* – where many small boards are assembled as one large panel that must then be separated, especially when MLCC's are located close to the edge of the PCB (See Figure 3).

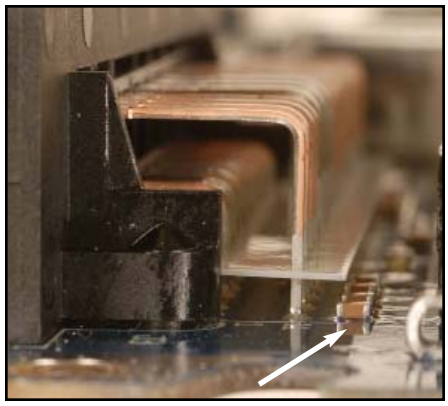


Figure 2. Filter capacitor very near to thru-hole connector.

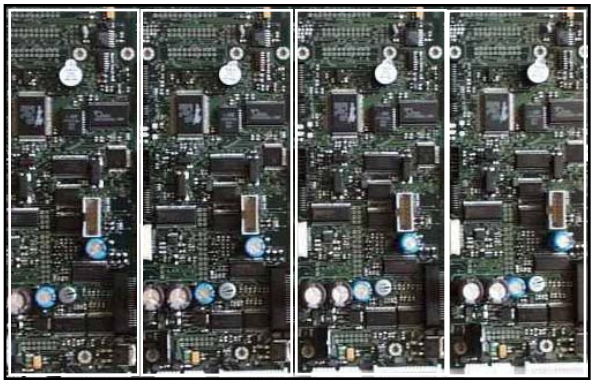


Figure 3. Board singulation can flex stress ceramic capacitors near board edge.

- *Box build* – assembly of a final product can involve stresses as boards are fitted together – particularly given the demands for today's thinner product offerings.

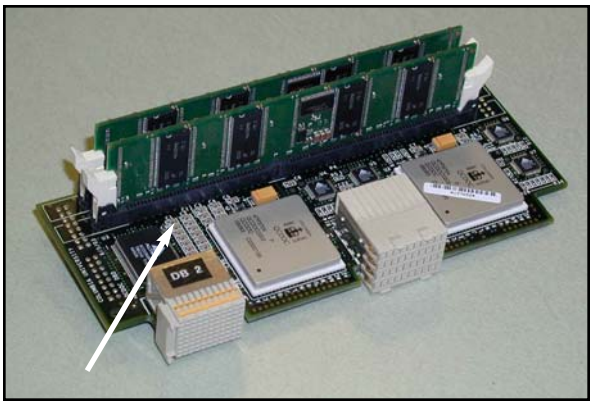


Figure 4. Parts located near connectors can be susceptible to board flex stress.

PCB assembly continues to evolve, and by carefully understanding and controlling the board assembly process, the occurrence of board flex stress can be reduced. However, these board flex stresses have not been eliminated – and in many cases the worst-case scenario is a resultant short circuit which leads to field failure. KEMET now offers a portfolio of engineered solutions to mitigate the effects of board flex stress. By creating solutions that lend themselves to open failure mode rather than short circuit failure mode, KEMET is offering a measure of protection for customers who know that short circuit failure is not an option.

FAQ's and Definitions

The following statements are based on extensive industry research, whitepapers, and presentations. All of these questions are answered assuming the customer is using a standard, 2-terminal MLCC.

1. *Does a flex crack always lead to failure?* Answer – no; as with all cracks in MLCC's, there needs to be some type of ionic penetration or humidity along the crack path which allows current to flow between electrode plates of opposite polarity, in order for the chip to fail. (See Figure 5).

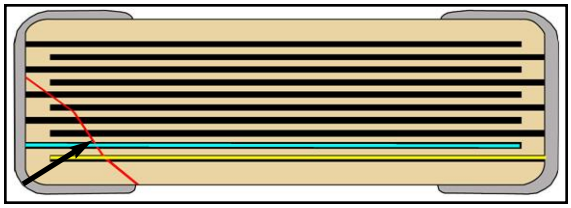


Figure 5. Yellow electrode represents (+); blue electrode represents (-); flex crack leads to short circuit.

2. *Does it matter which direction the board is flexed?* Answer – no; our studies have shown that a board bent "up" or "down" leads to the formation of a board flex crack that looks the same regardless of board bend direction, all other factors being equal.

3. *Does a Flex Crack always have the same crack signature?* Answer – yes. There is a distinctive crack signature for board flex cracks – it always starts near the edge of the termination margin, and usually extends upwards toward the termination face. The flex crack signature is distinctly different than other crack signatures in MLCC's. (See Figure 6)

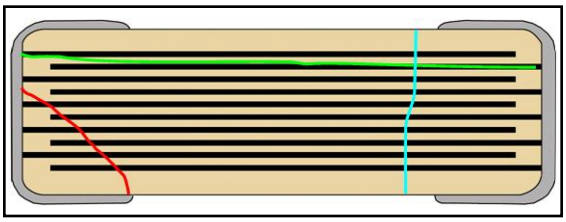


Figure 6. Red crack represents flex crack; green crack represents typical thermal shock crack; blue crack represents mechanical damage.

4. Are there PCB assembly process parameters that can be modified to reduce the risk of board flex cracks? Answer – yes. Studies have shown that by minimizing the amount of solder (size of solder fillet), and minimizing chip size (smaller chips are inherently more robust than larger chips), the chances of failure due to board flex cracking can be reduced.

5. Are there ways to place parts away from "problem areas" on the PCB? Answer – yes. By placing parts parallel to the edge of the PCB, as far away from the edge of the PCB as practical, and as far away from thru-hole connectors/screws/etc., manufacturers can reduce their risk of MLCC board flex cracks.

6. Does KEMET ever ship capacitors with flex cracks, while still in the tape & reel? Answer – no, flex cracks can only occur post solder attach.

Board Flex Crack Solutions at KEMET

If board flex stress cannot be eliminated, there are several options available that offer methods to mitigate the risk associated with board flex cracks. In order to offer a cost-effective solution, there are several options available, based on the capacitance value selected.

- For ***low*** capacitance values, KEMET offers the Floating Electrode (FE-CAP) design. This is also known in the industry as a Serial Cap design, as the Floating Electrode part contains two parts in series, within a singular capacitor body. In Automotive (Clamp 30) designs, sometimes 2 distinct capacitors will be used in series on the PCB – the FE-CAP gives a designer this "two parts in series" - within a singular capacitor. This solution works by eliminating the short-circuit path between electrodes of opposite polarity (See Figure 7). Due to the sacrifice of active area necessitated by the creation of two serial capacitors, the Floating Electrode solution can only be used for lower capacitance values. To order this device, simply place an S for "Serial Cap" in the 6th digit of the KEMET part number.
  - For customers desiring an additional mode of protection, KEMET now offers the FF-CAP (Floating Electrode + Flexible Termination – see Flexible Termination description later in this paper). To order this device, place a "Y" in the 6th digit of the KEMET part number.

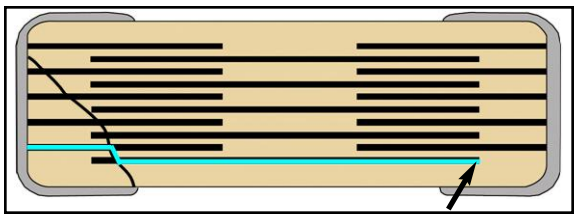


Figure 7. Flex crack does not complete circuit - no short circuit failure.

- For ***mid*** capacitance values, KEMET offers the Open Mode solution. The Open Mode device creates a safe zone on both ends of the capacitor (See Figure 8), so that only the innermost portion of the capacitor is active area. Any board flex crack that occurs (remember, this crack always starts within the end termination) can only cross electrodes of like polarity; thus eliminating the possibility of a short-circuit failure from a board flex crack. As with the FE-CAP, active area has been sacrificed in order to create the safe zones on both ends of the chip; thus, the Open Mode solution is only applicable for mid capacitance values. To order this device, place an "F" for "Fail Open" in the 6th digit of the KEMET part number. Open Mode can be ordered with Flexible Termination by changing the 6th digit of the KEMET Part Number to a "D".

Figure 8. Blue represents (-), Yellow represents (+), flex crack only crosses electrode of like polarity.

- Finally, for ***high*** capacitance values (also called HiCV in the industry), KEMET offers the Flexible Termination (FT-CAP). KEMET applies a special conductive silver epoxy on both end terminations, between the copper/electrode interface and the nickel/tin plating. This special epoxy layer is essentially a tear-away solution, providing a path of least resistance for board flex stress. This solution acts to steer the potential flex crack away from the ceramic body, into the more benign area of the termination (See Figure 9). Technically, Flexible Termination can be applied to any commercial SMD (Surface Mount) product, but due to additional manufacturing costs (primarily materials and labor), the Flexible Termination is more cost effective when used on HiCV devices. KEMET's Flexible Termination offers up to 5mm of board bend stress capability. To order this device, place an X for "Flexible Termination" in the 6th digit of the KEMET part number.

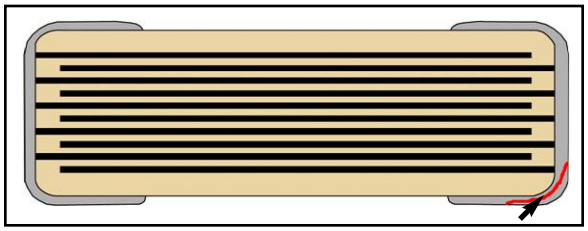


Figure 9. Flexible termination moves flex cracks to the end termination, away from the ceramic body.

Availability

All solutions mentioned above are available today from KEMET. As Automotive is a primary market focus for these Flex Crack solutions, KEMET has qualified all of the solutions per AEC-Q200 (documentation available upon request). For more specific information, including available capacitance values, sample requests, datasheets, etc., please visit our website:

http://www.kemet.com/flex

Conclusion

Board flex cracks have been around since the inception of SMT processing, and still represent a significant headache as measured by customer complaints, field failures, etc. By selecting an appropriate board flex mitigation product, designers now have an option when board flex stresses cannot be eliminated from the PCB manufacturing process.

References

"Capacitance Monitoring While Flex Testing", 1997, Jim Bergenthal and John D. Prymak, F-2110, KEMET Electronics Corporation

CE FLEXDESIGN

No.	Ordercode	Casesize	Cap.	Tol.	Volt	Technology	Dielec.
1	C0603S221J2RAC	0603	220pF	±5%	200V	Floating Electrode	X7R
2	C0603S222J2RAC	0603	2.2nF	±5%	200V	Floating Electrode	X7R
3	C0603S472J2RAC	0603	4.7nF	±5%	200V	Floating Electrode	X7R
4	C0805S223K1RAC	0805	22nF	±10%	100V	Floating Electrode	X7R
5	C0805F223K3RAC	0805	22nF	±10%	25V	Open Mode	X7R
6	C0805S473K5RAC	0805	47nF	±10%	50V	Floating Electrode	X7R
7	C0805F473K3RAC	0805	47nF	±10%	25V	Open-Mode	X7R
8	C0603X473K1RAC	0603	47nF	±10%	100V	Flexible Termination	X7R
9	C1210S563K5RAC	1210	56nF	±10%	50V	Floating Electrode	X7R
10	C0805S104K5RAC	0805	100nF	±10%	50V	Floating Electrode	X7R
11	C0805F104K3RAC	0805	100nF	±10%	25V	Open Mode	X7R
12	C1206X124K2RAC	1206	120nF	±10%	200V	Flexible Termination	X7R
13	C0805F224K3RAC	0805	220nF	±10%	25V	Open-Mode	X7R
14	C0805X224K1RAC	0805	220nF	±10%	100V	Flexible Termination	X7R
15	C0805F474K3RAC	0805	470nF	±10%	25V	Open Mode	X7R
16	C0603X474K4RAC	0603	470nF	±10%	16V	Flexible Termination	X7R
17	C0805X474K5RAC	0805	470nF	±10%	50V	Flexible Termination	X7R
18	C1206X474K1RAC	1206	470nF	±10%	100V	Flexible Termination	X7R
19	C0805X105K3RAC	0805	1uF	±10%	25V	Flexible Termination	X7R
20	C1210X105K1RAC	1210	1uF	±10%	100V	Flexible Termination	X7R
21	C1206F225K4RAC	1206	2.2uF	±10%	16V	Open Mode	X7R
22	C0805X225K4RAC	0805	2.2uF	±10%	16V	Flexible Termination	X7R
23	C1206X225K5RAC	1206	2.2uF	±10%	50V	Flexible Termination	X7R
24	C1206F475K4RAC	1206	4.7uF	±10%	16V	Open Mode	X7R
25	C1206X475K3RAC	1206	4.7uF	±10%	25V	Flexible Termination	X7R
26	C1210X475K5RAC	1210	4.7uF	±10%	50V	Flexible Termination	X7R
27	C1206X106K4RAC	1206	10uF	±10%	16V	Flexible Termination	X7R
28	C1210X106K3RAC	1210	10uF	±10%	25V	Flexible Termination	X7R