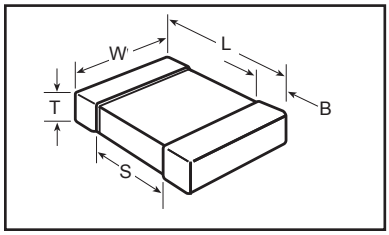
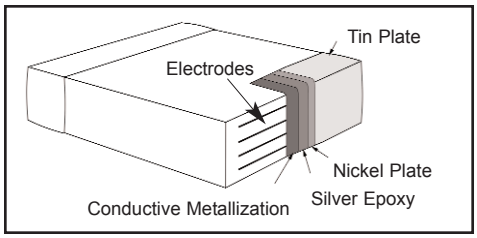
Surface Mount Ceramic Chip Capacitors / *FT-CAP* / Flexible Terminations

Outline Drawing





The FT-CAP is a surface mount multi-layer ceramic capacitor that incorporates a unique and flexible termination system. Integrated with KEMET's standard termination materials, a conductive 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 directs board flex stress away from the ceramic body and into the termination area. As a result, this termination system mitigates the risk of low-IR or short-circuit failures associated with board flex. The FT-CAP complements our current "Open Mode" and "Flexible Electrode (FE-CAP)" products 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) ± 0.15 (.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

See Capacitance Value Table next page for thickness dimension.

Ordering Information

C 0603 X 224 K 3 R A C

Style
C - Ceramic

Size Code
See dimension table

Specification
X - Flexible Termination

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)

Capacitance Tolerance
K = ±10%; M = ±20%; J = ±5%

Voltage
9 = 6.3V, 8 = 10V, 4 = 16V, 3 = 25V,
5 = 50V, 1 = 100V, 2 = 200V

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

Failure Rate Level
A = Not Applicable

End Metallization
C = Standard (Tin-plate)

RoHS Compliant

X7R Capacitance Range

Cap pF	Cap Code	Cap Tol.	C0603							C0805							C1206							C1210						
			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
180	181	K,M,J	CB	CB	CB	CB	CB	CB	CB																					
220	221	K,M,J	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
270	271	K,M,J	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
330	331	K,M,J	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
390	391	K,M,J	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
470	471	K,M,J	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
560	561	K,M,J	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
680	681	K,M,J	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
820	821	K,M,J	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC														
1,000	102	K,M,J	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB							
1,200	122	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB							
1,500	152	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB							
1,800	182	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB							
2,200	222	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
2,700	272	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
3,300	332	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
3,900	392	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
4,700	472	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
5,600	562	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
6,800	682	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
8,200	822	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
10,000	103	K,M,J	CB	CB	CB	CB	CB	CB	CC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
12,000	123	K,M,J	CB	CB	CB	CB	CB	CC		DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
15,000	153	K,M,J	CB	CB	CB	CB	CB	CC		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
18,000	183	K,M,J	CB	CB	CB	CB	CB	CC		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
22,000	223	K,M,J	CB	CB	CB	CB	CB	CC		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
27,000	273	K,M,J	CB	CB	CB	CB	CB	CC		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
33,000	333	K,M,J	CB	CB	CB	CB	CB	CC		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EB	EB	FB	FB	FB	FB	FB	FB	FB
39,000	393	K,M,J	CB	CB	CB	CB	CB	CC		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EC	EB	FB	FB	FB	FB	FB	FB	FB
47,000	473	K,M,J	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	K,M,J	CB	CB	CB	CB	CC			DD	DD	DD	DD	DD	DE	DG	EB	EB	EB	EB	EB	EB	ED	FB	FB	FB	FB	FB	FB	FC
68,000	683	K,M,J	CB	CB	CB	CB	CC			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	ED	FB	FB	FB	FB	FB	FB	FC
82,000	823	K,M,J	CB	CB	CB	CB	CC			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	ED	FB	FB	FB	FB	FC	FC	FF
100,000	104	K,M,J	CB	CB	CB	CB	CC			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	EM	FB	FB	FB	FB	FB	FD	FG
120,000	124	K,M,J	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	K,M,J	CB	CB	CB		CD			DC	DC	DC	DC	DD			EC	EC	EC	EC	EC	EC	EG	FC	FC	FC	FC	FC	FD	
180,000	184	K,M,J	CB	CB	CB					DC	DC	DC	DC	DD			EC	EC	EC	EC	EC	EC		FC	FC	FC	FC	FC	FD	
220,000	224	K,M,J	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	K,M,J	CB	CB	CB					DD	DD	DD	DD				EB	EB	EB	EB	EC	EM		FC	FC	FC	FC	FC	FD	
330,000	334	K,M,J	CB	CB	CB					DE	DE	DE	DE				EB	EB	EB	EB	EC	EG		FD	FD	FD	FD	FD	FD	
390,000	394	K,M,J	CB	CB	CB					DG	DG	DG	DG				EB	EB	EB	EB	EG	EG		FD	FD	FD	FD	FD		
470,000	474	K,M,J	CB	CB	CB					DG	DG	DG	DG	DE			EC	EC	EC	EC	EC	EG		FD	FD	FD	FD	FD	FD	
560,000	564	K,M,J								DG	DG	DG	DG				ED	ED	ED	ED	EC			FD	FD	FD	FD	FD		
680,000	684	K,M,J								DG	DG	DG		DJ			EE	EE	EE	EE	ED			FD	FD	FD	FD	FD		
820,000	824	K,M,J								DG	DG	DG					EF	EF	EF	EF				FF	FF	FF	FF	FF		
1,000,000	105	K,M,J								DG	DG	DG	DJ				EE	EE	EF	EG	ED			FH	FH	FH	FH	FH	FM	
1,200,000	125	K,M,J								DE	DE	DE					ED	ED	ED	EG				FH	FH	FH	FH	FH		
1,500,000	155	K,M,J								DG	DG	DG					EF	EF	EF	EG				FH	FH	FH	FH	FH		
1,800,000	185	K,M,J								DG	DG	DG					EF	EF	EF					FH	FH	FH	FH	FH		
2,200,000	225	K,M,J								DG	DG	DG					EG	EG	EG	EF	EH						FJ	FG		
2,700,000	275	K,M,J															EN	EN	EK											
3,300,000	335	K,M,J															ED	ED	ED									FM		
3,900,000	395	K,M,J															EL	EL	EL											
4,700,000	475	K,M,J															EM	EM	EM	EH				FC	FC	FC	FG	FS		
5,600,000	565	K,M,J															EH	EH	EH											
6,800,000	685	K,M,J															EH	EH	EH								FM			
8,200,000	825	K,M,J															EH	EH	EH											
10,000,000	106	K,M,J															EH	EH	EH					FH	FH	FH	FS			

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	.30 ± .03	N/A	N/A	15,000	N/A	N/A
BB	0402	.50 ± .05	N/A	N/A	10,000	50,000	50,000
CB	0603	.80 ± .07	N/A	N/A	4,000	10,000	15,000
CC	0603	.80 ± .10	N/A	N/A	4,000	10,000	N/A
CD	0603	.80 ± .15	N/A	N/A	4,000	10,000	N/A
DB	0805	.60 ± .10	N/A	N/A	N/A	N/A	10,000
DC	0805	.78 ± .10	4,000	10,000	4,000	10,000	N/A
DD	0805	.90 ± .10	4,000	10,000	N/A	N/A	N/A
DE	0805	1.00 ± .10	2,500	10,000	N/A	N/A	N/A
DF	0805	1.10 ± .10	2,500	10,000	N/A	N/A	N/A
DG	0805	1.25 ± .15	2,500	10,000	N/A	N/A	N/A
DH	0805	1.25 ± .20	2,500	10,000	N/A	N/A	N/A
DJ	0805	1.25 ± .20	3,000	10,000	N/A	N/A	N/A
DK	0805	1.25 ± .15	3,000	10,000	N/A	N/A	N/A
EB	1206	.78 ± .10	4,000	10,000	4,000	10,000	N/A
EC	1206	.90 ± .10	4,000	10,000	N/A	N/A	N/A
ED	1206	1.00 ± .10	2,500	10,000	N/A	N/A	N/A
EE	1206	1.10 ± .10	2,500	10,000	N/A	N/A	N/A
EF	1206	1.20 ± .15	2,500	10,000	N/A	N/A	N/A
EG	1206	1.60 ± .15	2,000	8,000	N/A	N/A	N/A
EH	1206	1.60 ± .20	2,000	8,000	N/A	N/A	N/A
EJ	1206	1.70 ± .20	2,000	8,000	N/A	N/A	N/A
EK	1206	.80 ± .10	2,000	8,000	N/A	N/A	N/A
EL	1206	1.15 ± .15	2,000	8,000	N/A	N/A	N/A
EM	1206	1.25 ± .15	2,500	10,000	N/A	N/A	N/A
EN	1206	0.95 ± .10	4,000	10,000	N/A	N/A	N/A
FB	1210	.78 ± .10	4,000	10,000	N/A	N/A	N/A
FC	1210	.90 ± .10	4,000	10,000	N/A	N/A	N/A
FD	1210	.95 ± .10	4,000	10,000	N/A	N/A	N/A
FE	1210	1.00 ± .10	2,500	10,000	N/A	N/A	N/A
FF	1210	1.10 ± .10	2,500	10,000	N/A	N/A	N/A
FG	1210	1.25 ± .15	2,500	10,000	N/A	N/A	N/A
FH	1210	1.55 ± .15	2,000	8,000	N/A	N/A	N/A
FJ	1210	1.85 ± .20	2,000	8,000	N/A	N/A	N/A
FK	1210	2.10 ± .20	2,000	8,000	N/A	N/A	N/A
FL	1210	1.40 ± .15	2,000	8,000	N/A	N/A	N/A
FM	1210	1.70 ± .20	2,000	8,000	N/A	N/A	N/A
FN	1210	1.85 ± .20	2,000	8,000	N/A	N/A	N/A
FO	1210	1.50 ± .20	2,000	8,000	N/A	N/A	N/A
FP	1210	1.60 ± .20	2,000	8,000	N/A	N/A	N/A
FQ	1210	2.5 ± .20	1,500	8,000	N/A	N/A	N/A
FR	1210	2.25 ± .20	2,000	8,000	N/A	N/A	N/A
FS	1210	2.50 ± .20	1,000	4,000	N/A	N/A	N/A
FT	1210	1.90 ± .20	1,500	4,000	N/A	N/A	N/A
GB	1812	1.00 ± .10	1,000	4,000	N/A	N/A	N/A
GC	1812	1.10 ± .10	1,000	4,000	N/A	N/A	N/A
GD	1812	1.25 ± .15	1,000	4,000	N/A	N/A	N/A
GE	1812	1.30 ± .10	1,000	4,000	N/A	N/A	N/A
GF	1812	1.50 ± .10	1,000	4,000	N/A	N/A	N/A
GG	1812	1.55 ± .10	1,000	4,000	N/A	N/A	N/A
GH	1812	1.40 ± .15	1,000	4,000	N/A	N/A	N/A
GJ	1812	1.70 ± .15	1,000	4,000	N/A	N/A	N/A
GK	1812	1.60 ± .20	1,000	4,000	N/A	N/A	N/A
GL	1812	1.90 ± .20	1,000	4,000	N/A	N/A	N/A
GM	1812	2.00 ± .20	1,000	4,000	N/A	N/A	N/A
GN	1812	1.70 ± .20	1,000	4,000	N/A	N/A	N/A
HB	1825	1.10 ± .15	1,000	4,000	N/A	N/A	N/A
HC	1825	1.15 ± .15	1,000	4,000	N/A	N/A	N/A
HD	1825	1.30 ± .15	1,000	4,000	N/A	N/A	N/A
HE	1825	1.40 ± .15	1,000	4,000	N/A	N/A	N/A
HF	1825	1.50 ± .15	1,000	4,000	N/A	N/A	N/A
JB	2220	1.00 ± .15	1,000	4,000	N/A	N/A	N/A
JC	2220	1.10 ± .15	1,000	4,000	N/A	N/A	N/A
JD	2220	1.30 ± .15	1,000	4,000	N/A	N/A	N/A
JE	2220	1.40 ± .15	1,000	4,000	N/A	N/A	N/A
JF	2220	1.50 ± .15	1,000	4,000	N/A	N/A	N/A
KB	2225	1.00 ± .15	1,000	4,000	N/A	N/A	N/A
KC	2225	1.10 ± .15	1,000	4,000	N/A	N/A	N/A
KD	2225	1.30 ± .15	1,000	4,000	N/A	N/A	N/A
KE	2225	1.40 ± .15	1,000	4,000	N/A	N/A	N/A

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 500 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 case size - 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.

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.