



New Product Bulletin

Tin/Lead “L” Termination Ceramic Chip Capacitors

KEMET's line of Tin/Lead termination commercial MLCC surface mount capacitors is designed to meet the needs of commercial, high reliability, and military customer applications where Tin/Lead plating is required. As the bulk of the electronics industry rapidly marches to RoHS compliance, KEMET realizes the importance of providing the Tin/Lead terminated products for our valued high reliability and military customers.

KEMET Tin/Lead MLCC surface mount capacitors are available in standard EIA case sizes from 0402 to 2225 and standard capacitance values in X5R, X7R, and COG dielectrics. Voltage ratings range from 6.3V to 200V. KEMET's Tin/Lead electroplating process is designed to meet a 5% minimum lead content in the termination of the component. To order the Tin/Lead terminations, indicate an "L" in the 14th digit of the part number. For additional dielectrics and voltage ratings please contact the factory or local Sales personnel.

Applications

- Military Products
- Space Quality Products
- High Reliability Telecommunication Equipment

Outline Drawing

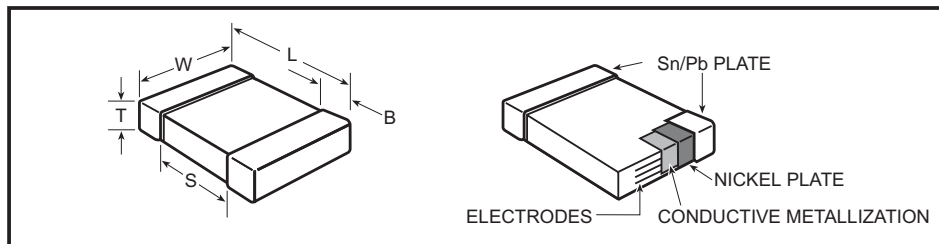


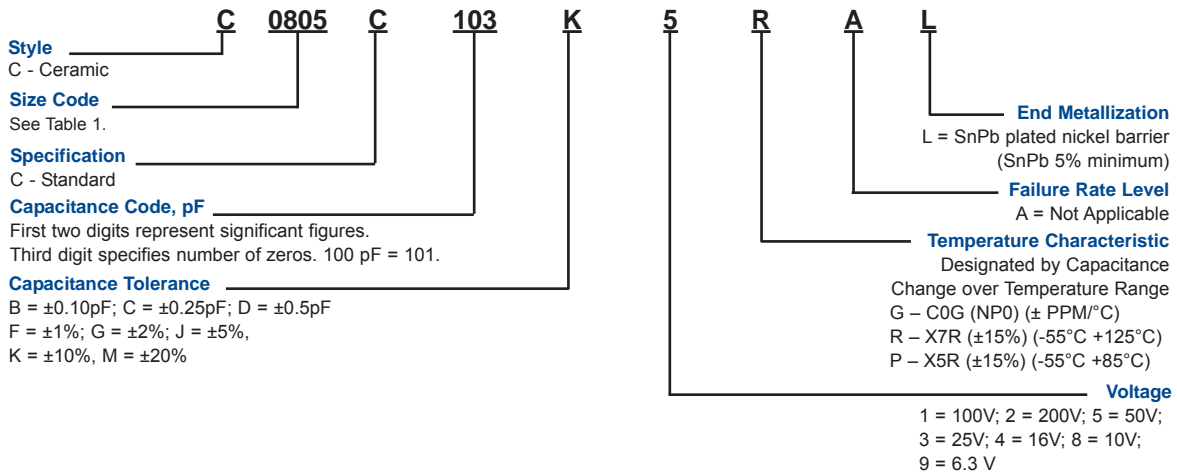
Table 1 – Dimensions - Millimeters (Inches)

Metric Code	EIA Size Code	L - Length	W - Width	B - Bandwidth	Band Separation
1005	0402	1.0 (.04) ± .05 (.002)	0.5 (.02) ± .05 (.002)	0.20 (0.008) -0.40 (0.016)	0.3 (.012)
1608	0603	1.6 (.063) ± 0.15 (.006)	0.8 (.032) ± 0.15 (.006)	0.35 (.014) ± 0.15 (.006)	0.7 (.028)
2012	0805	2.0 (0.079) ± 0.2 (0.008)	1.2 (0.049) ± 0.2 (0.008)	0.5 (0.02) ± 0.25 (0.010)	0.75 (0.030)
3216	1206	3.2 (0.126) ± 0.2 (0.008)	1.6 (0.063) ± 0.2 (0.008)	0.5 (0.02) ± 0.25 (0.010)	N/A
3225	1210	3.2 (0.126) ± 0.2 (0.008)	2.5 (0.098) ± 0.2 (0.008)	0.5 (0.02) ± 0.25 (0.010)	N/A
4532	1812	4.5 (0.177) ± 0.3 (0.012)	3.2 (0.126) ± 0.3 (0.012)	0.6 (0.024) ± 0.35 (0.014)	N/A
4564	1825	4.5 (0.177) ± 0.3 (0.012)	6.4 (0.250) ± 0.4 (0.016)	0.6 (0.024) ± 0.35 (0.014)	N/A
5650	2220	5.6 (.220) ± 0.4 (.016)	5.0 (.197) ± 0.4 (.016)	0.6 (0.024) ± .35 (0.014)	N/A
5664	2225	5.6 (.220) ± 0.4 (.016)	6.3 (.248) ± 0.4 (.016)	0.6 (0.024) ± .35 (0.014)	N/A

Note: For thickness dimensions, see Tables 2 and 3.



Capacitor Ordering Information



General Performance Characteristics & Electrical Parameters

EIA Case Sizes	0402, 0603, 0805, 1206, 1210, 1812, 1825, 2220, 2225
Capacitance Range	0.5pF – 47.0µF
Test Parameters	Capacitance and Dissipation Factor measured at: C0G – 1kHz and 1 Vrms if capacitance 1000pF and 1MHz and 1 Vrms if capacitance ≤1000pF. X7R – 1kHz and 1 Vrms if capacitance ≤10µF and 120Hz and 0.5 Vrms if capacitance >10µF.
Operating Temperature Range	X7R/C0G: -55°C to +125°C; X5R: -55°C to +85°C; with no bias capacitance shift limited to ±15% over that range.
Capacitance Tolerances	B = ±.10pF; C = ± 0.25pF; D = ±0.5pF; F = ±1%; G = ±2%; J = ±5%, K = ±10%, M = ±20%
Aging Rate	C0G – 0% maximum; X7R – 2.0% maximum % capacitance loss/decade hour; X5R – 5.0%
Voltage Rating	6.3; 10; 16; 25; 50; 100; 200 Volts
25°C IR @ Rated Voltage	500MΩ–µF or 50GΩ, whichever is less
Dielectric Strength (DWV)	2.5 times rated DC voltage

Marking

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

Soldering Process

The 0402 size is suitable for solder reflow only. The 0603, 0805 and 1206 sizes are suitable for either reflow or wave soldering. Sizes 1210 and larger should be limited to reflow soldering only.

Recommended Solder Pad Dimensions

Chip Size	T - Total Length		S - Separation		W - Pad Width		L - Pad Length	
	mm	in.	mm	in.	mm	in.	mm	in.
0402	2.14	0.084	0.28	0.011	0.74	0.029	0.93	0.037
0603	2.78	0.109	0.68	0.027	1.08	0.043	1.05	0.041
0805	3.30	0.130	0.70	0.028	1.60	0.063	1.30	0.051
1206	4.50	0.177	1.50	0.059	2.00	0.079	1.50	0.059
1210	4.50	0.177	1.50	0.059	2.90	0.114	1.50	0.059
1812	5.90	0.232	2.30	0.091	3.70	0.146	1.80	0.071
1825	5.90	0.232	2.30	0.091	6.90	0.272	1.80	0.071
2220	7.00	0.275	3.30	0.13	5.50	0.216	1.85	0.073
2225	7.00	0.275	3.30	0.13	6.80	0.268	1.85	0.073

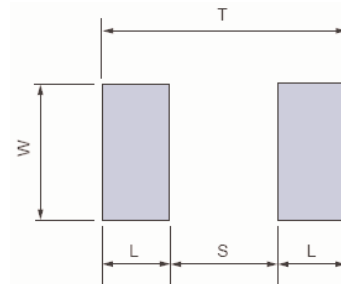


Table 2- C0G Dielectric Capacitance Values

Cap pF	Cap Code	Cap Tol.	C1210*			C1812*			C1825*			C2220			C2225			
			50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V	
10	100	D	J,K,M	FB	FB	FB												
12	120	D	J,K,M	FB	FB	FB												
15	150	D	G,J,K,M	FB	FB	FB												
18	180	D	G,J,K,M	FB	FB	FB												
22	220	D	G,J,K,M	FB	FB	FB												
27	270	D,F,G,J,K,M	F	FB	FB	FB												
33	330	D,F,G,J,K,M	F	FB	FB	FB												
39	390	D,F,G,J,K,M	F	FB	FB	FB												
47	470	D,F,G,J,K,M	F	FB	FB	FB												
56	560	F,G,J,K,M	F	FB	FB	FB												
68	680	F,G,J,K,M	F	FB	FB	FB												
82	820	F,G,J,K,M	F	FB	FB	FB												
100	101	F,G,J,K,M	F	FB	FB	FB												
120	121	F,G,J,K,M	F	FB	FB	FB												
150	131	F,G,J,K,M	F	FB	FB	FB												
180	181	F,G,J,K,M	F	FB	FB	FB												
220	221	F,G,J,K,M	F	FB	FB	FB												
270	271	F,G,J,K,M	F	FB	FB	FB												
330	331	F,G,J,K,M	F	FB	FB	FB												
390	391	F,G,J,K,M	F	FB	FB	FB												
470	471	F,G,J,K,M	F	FB	FB	FB	GB	GB	GB									
560	561	F,G,J,K,M	F	FB	FB	FB	GB	GB	GB									
680	681	F,G,J,K,M	F	FB	FB	FB	GB	GB	GB									
820	821	F,G,J,K,M	F	FB	FB	FB	GB	GB	GB									
1000	102	F,G,J,K,M	F	FB	FB	FB	GB	GB	GB									
1200	122	F,G,J,K,M	F	FB	FB	FB	GB	GB	GB									
1500	152	F,G,J,K,M	F	FB	FE	FE	GB	GB	GB									
1800	182	F,G,J,K,M	F	FB	FE	FE	GB	GB	GB									
2200	222	F,G,J,K,M	F	FB	FC	FC	GB	GB	GB									
2700	272	F,G,J,K,M	F	FB	FC	FC	GB	GB	GB									
3300	332	F,G,J,K,M	F	FB	FF	FF	GB	GB	GB									
3900	392	F,G,J,K,M	F	FB	FF	FF	GB	GB	GB	HB	HB	HB						
4700	472	F,G,J,K,M	F	FB	FF	FF	GB	GB	GD	HB	HB	HB				KB	KB	KB
5600	562	F,G,J,K,M	F	FB	FF	FF	GB	GB	GH	HB	HB	HB				KB	KB	KB
6800	682	F,G,J,K,M	F	FB	FG	FG	GB	GB	GJ	HB	HB	HB	JB	JB		KB	KB	KB
8200	822	F,G,J,K,M	F	FB	FC	FC	GB	GB		HB	HB	HB	JB	JB		KB	KB	KB
10000	103	F,G,J,K,M	F	FB	FF	FF	GB	GD		HB	HB	HE	JB	JB		KB	KB	KB
12000	123	F,G,J,K,M	F	FB	FG	FG	GB	GD		HB	HB	HE	JB	JB		KB	KB	KB
15000	153	F,G,J,K,M	F	FB						HB	HB		JB	JB		KB	KB	KE
18000	183	F,G,J,K,M	F	FB						HB	HB		JB	JB		KB	KB	
22000	223	F,G,J,K,M	F	FB						HB	HE		JB			KB	KB	
27000	273	F,G,J,K,M	F	FB						HB	HE		JB			KB	KB	
33000	333	F,G,J,K,M	F	FB												KB		

* EIA preferred chip sizes

See Thickness Code Table on page 8 for ceramic chip thickness dimensions.

Table 3- X7R Dielectric Capacitance Values

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	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
180	181	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
220	221	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
270	271	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
330	331	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
390	391	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
470	471	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
560	561	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
680	681	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
820	821	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
1,000	102	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
1,200	122	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
1,500	152	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
1,800	182	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
2,200	222	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
2,700	272	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
3,300	332	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
3,900	392	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
4,700	472	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
5,600	562	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
6,800	682	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
8,200	822	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
10,000	103	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
12,000	123	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
15,000	153	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
18,000	183	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
22,000	223	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
27,000	273	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
33,000	333	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
39,000	393	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
47,000	473	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
56,000	563	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
68,000	683	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
82,000	823	K,M,J	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB	CB
100,000	104	K,M,J	BB	BB	BB	BB	BB	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#	CB#
120,000	124	K,M,J						CB#	CB#	CB#																		
150,000	154	K,M,J						CB#	CB#	CB#																		
180,000	184	K,M,J						CB#	CB#	CB#																		
220,000	224	K,M,J						CB#	CB#	CB#																		
270,000	274	K,M,J						CB	CB	CB																		
330,000	334	K,M,J						CB	CB	CB																		
390,000	394	K,M,J						CB	CB	CB																		
470,000	474	K,M,J						CB	CB	CB																		
560,000	564	K,M,J																										
680,000	684	K,M,J																										
820,000	824	K,M,J																										
1,000,000	105	K,M,J																										
1,200,000	125	K,M,J																										
1,500,000	155	K,M,J																										
1,800,000	185	K,M,J																										
2,200,000	225	K,M,J																										
2,700,000	275	K,M,J																										
3,300,000	335	K,M,J																										
3,900,000	395	K,M,J																										
4,700,000	475	K,M,J																										
5,600,000	565	K,M,J																										
6,800,000	685	K,M,J																										
8,200,000	825	K,M,J																										
10,000,000	106	K,M,J																										

* EIA preferred chip sizes
 # X7R Dielectric - Extended Range Values or Voltages-Cap and DF measured @ 0.5 Vrms.
 See Thickness Code Table on page 8 for ceramic chip thickness dimensions.

Table 3- X7R Dielectric Capacitance Values

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

* EIA preferred chip sizes
X7R Dielectric - Extended Range Values or Voltages-Cap and DF measured @ 0.5 Vrms.
See Thickness Code Table on page 8 for ceramic chip thickness dimensions.

Table 3- X5R Dielectric Capacitance Values

Cap pF	Cap Code	Cap Tol.	C0402*			C0603*			C0805*				C1206*				C1210*				
			6.3V	10V	16V	6.3V	10V	16V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	50V
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	BB	BB	BB																
120,000	124	K,M	BB																		
150,000	154	K,M	BB																		
180,000	184	K,M	BB																		
220,000	224	K,M	BB																		
270,000	274	K,M	BB			CC	CC	CC						EB							
330,000	334	K,M	BB			CC	CC	CC						EB							
390,000	394	K,M	BB			CC	CC	CC						EB							
470,000	474	K,M	BB			CC	CC	CC			DC			EC							
560,000	564	K,M	BB			CC	CC	CC			DD			ED							
680,000	684	K,M	BB			CC	CC	CC			DE			EE							
820,000	824	K,M	BB			CC	CC	CC			DF			EF							
1,000,000	105	K,M	BB			CC	CC	CC			DG			EH				FH+	FH+	FH+	
1,200,000	125	K,M				CC	CC		DD	DD	DD			EC				FD+	FD+		
1,500,000	155	K,M				CC	CC		DE	DE	DE		EC	EC	EC	EC		FD+	FD+		
1,800,000	185	K,M				CC	CC		DH	DH	DH		EC	EC	EC	EC		FD+	FD+		
2,200,000	225	K,M				CC	CC		DD	DD	DD		EE	EE	EE	EE		FG+	FG+		
2,700,000	275	K,M				CD			DD	DD	DD		EF	EF	EF	EF		FG+	FG+		
3,300,000	335	K,M				CD			DE	DE	DH		EH	EH	EH	EH		FH+	FH+		
4,700,000	475	K,M				CD			DH	DH	DH		EH	EH	EH	EH	FK+	FK+	FK+	FK+	
5,600,000	565	K,M							DG	DG											
6,800,000	685	K,M							DG	DG			EK	EK	EH		FJ+	FJ+	FJ+	FJ+	
8,200,000	825	K,M							DG	DG			EK	EK	EH		FK+	FK+	FK+	FK+	
10,000,000	106	K,M							DJ	DJ			EL	EL	EH		FK+	FK+	FK+	FK+	
12,000,000	126	K,M											EH	EG			FD+	FD+	FG+		
15,000,000	156	K,M											EH	EG			FD+	FD+	FL+		
18,000,000	186	K,M											EH	EG			FL+	FL+	FH+		
22,000,000	226	K,M											EH	EG			FH+	FH+	FJ+		
27,000,000	276	K,M															FM+				
33,000,000	336	K,M															FM+				
39,000,000	396	K,M															FM+				
47,000,000	476	K,M															FM+				

* EIA preferred chip sizes

See Thickness Code Table on page 8 for ceramic chip thickness dimensions.

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
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	2.50 ± .20	1,000	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
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