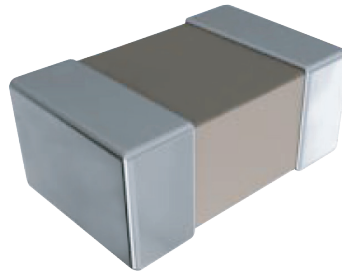


Multilayer Ceramic Chip Capacitors (G Series)



Features

- A wide selection of sizes is available: 0402-2225
- High capacitance in given case size
- Capacitor with lead-free termination
- RoHS & HALOGEN compliant

Applications

- General digital circuits
- Power supply bypass capacitors
- Consumer electronics
- Telecommunications
- DC to DC converters

Size 0402~2225, C0G/X7R, 100Vdc~630Vdc

Product Overview

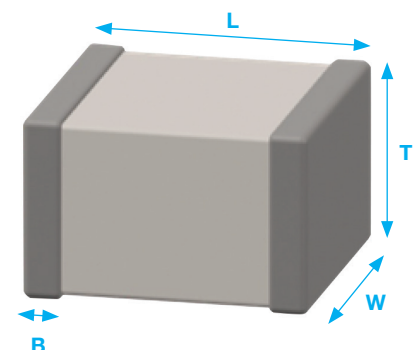
UTC's multilayer ceramic chip capacitors, available in bulk or tape & reel packages, are ideally suited for thick-film hybrid circuits and automatic surface mounting on any printed circuit board. The nickel-barrier terminations consist of a nickel barrier layer over the copper metallization, finished by an electroplated solder tin layer to ensure good solderability. The nickel barrier layer in the terminations prevents the dissolution of the termination during extended immersion in molten solder at elevated solder temperatures.

How to Order

G	B	1812	X7R	102	K	W	T	-X
Series	Rated Voltage	Size Inch	Dielectric	Capacitance	Tolerance	Termination	Packaging	Special code
G=MLCC General Type (Mid-Voltage)	B=100 R=200 H=250 N=400 S=500 K=630	0402 0603 0805 1206 1210 1808 1812 1825 2220 2225	C0G X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 0R5=0.5pF 1R0=1.0pF 100=10x100=10pF	A=±0.05pF B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20% Z=-20%+80%	W= Cu/Ni/Sn B=Soft termination	T= Tape & Reel	-X

Thickness Description

Code	Description	Code	Description	Code	Description
A	0.60 ± 0.10 mm	I	1.25 ± 0.20 mm	Q	0.50 +0.02/-0.05 mm
B	0.8 + 0.15/-0.10 mm	J	1.15 ± 0.15 mm	R	3.10 ± 0.30 mm
C	1.25 ± 0.10 mm	K	0.50 ± 0.20 mm	S	0.80 ± 0.07 mm
D	1.40 ± 0.15 mm	L	0.30 ± 0.03 mm	T	0.85 ± 0.10 mm
E	1.60 ± 0.20 mm	M	0.95 ± 0.10 mm	U	0.50 ± 0.10 mm
F	2.00 ± 0.20 mm	N	0.50 ± 0.05 mm	V	0.20 ± 0.02 mm
G	2.50 ± 0.30 mm	O	3.50 ± 0.20 mm	X	0.80 ± 0.10 mm
H	2.80 ± 0.30 mm	P	1.60 +0.3/-0.10 mm	Z	0.25 ± 0.03 mm



Thickness Description

Size Inch (mm)	L (mm)	W (mm)	Code / T (mm)	M _g (mm)
0402(1005)	1.00±0.10	0.50±0.10	Reference to Thickness Description	0.25 +0.05/-0.10
	1.00±0.20 ^{#1}	0.50±0.20 ^{#1}		
0603(1608)	1.60±0.15	0.80±0.15		0.40±0.15
0805(2012)	2.00±0.20	1.25±0.20		0.50±0.20
1206(3216)	3.20±0.20	1.60±0.20		0.60±0.20
	3.20 +0.30/-0.10 ^{#2}	1.60 +0.30/-0.10 ^{#2}		
1210(3225)	3.20±0.30	2.50±0.30		0.75±0.35
1808(4520)	4.50±0.40	2.00±0.25		0.75±0.35
1812(4532)	4.50±0.40	3.20±0.30		0.75±0.35
1825(4563)	4.50±0.40	6.30±0.40		0.75±0.35
2220(5750)	5.70±0.40	5.00±0.40		0.85±0.35
2225(5763)	5.70±0.40	6.30±0.40		0.85±0.35

#1. For 0402 size K thickness products. | #2. For 1206 size P thickness products.

Dielectric Properties & Electrical Summary

Dielectric	C0G	X7R
Size	0402, 0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225	0402, 0603, 0805, 1206, 1210, 1812, 1825, 2220, 2225
Rated voltage (WVDC)	100V, 200V, 250V, 400V, 500V, 630V	100V, 200V, 250V, 400V, 500V, 630V
Capacitance range*	0.5 pF ~ 100 nF	100pF ~ 10uF
Capacitance tolerance**	B(±0.1pF), C(±0.25pF), D(±0.5pF) F(±1%), G(±2%) J(±5%), K(±10%)	J(±5%), K(±10%), M(±20%)
Tan δ*	Cap.<30pF : Q>400+20C Cap.≥30pF : Q≥1000	≤2.5 % ~ ≤10%
Operating temperature	-55 to +125°C	-55 to +125°C
Capacitance characteristic	±30ppm/°C	±15%
Termination	Cu/Ni/Sn (lead-free termination)	

* Measured at the condition of 30~70% related humidity.

C0G : Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap.≤1000pF and 1.0±0.2Vrms, 1.0KHz±10% for Cap.>1000pF, at 25°C ambient temperature. X7R : Apply 1.0±0.2Vrms, 1.0KHz±10%, at 25°C ambient temperature.

** Preconditioning for Class II MLCC : Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement.

Capacitance Range C0G

Cap(pF)	Dimension code	0402			0603			0805					1206				
		100V	200V	250V	100V	200V	250V	100V	200V	250V	500V	630V	100V	200V	250V	500V	630V
0.5	0R5	N	N	N	S	S	S	A	A	A	A	A					
1.0	1R0	N	N	N	S	S	S	A	A	A	A	A					
1.2	1R2	N	N	N	S	S	S	A	A	A	A	A	X			X	
1.5	1R5	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
1.8	1R8	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
2.2	2R2	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
2.7	2R7	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
3.3	3R3	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
3.9	3R9	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
4.7	4R7	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
5.6	5R6	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
6.8	6R8	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
8.2	8R2	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
10	100	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
12	120	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
15	150	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
18	180	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
22	220	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
27	270	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
33	330	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
39	390	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
47	470	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
56	560	N	N	N	S	S	S	A	A	A	A	A	X	X	X	X	X
68	680	N	N		S	S	S	A	A	A	A	A	X	X	X	X	X
82	820	N	N		S	S	S	A	A	A	X	X	X	X	X	X	X
100	101	N	N		S	S	S	A	A	X	X	X	X	X	X	X	X
120	121	N			S	S	S	A	A	X	C	C	X	X	X	X	X
150	151	N			S	S	S	A	X	X	C	C	X	X	X	X	X
180	181	N			S	S	S	A	X	C	C	C	X	X	X	X	X
220	221	N			S	S	S	A	C	C	C	C	X	X	X	X	X
270	271				S	B	B	A	C	C	C	C	X	X	M	M	M
330	331				S	B	B	A	C	C	C	C	X	X	M	M	M
390	391				S	B	B	X	C	C	C	C	X	X	M	M	M
470	471				S	B	B	X	C	C	I	I	X	M	M	M	M
560	561				S	B	B	X	C	C	I	I	X	M	C	C	C
680	681				S	B	B	X	C	C	I	I	X	M	C	C	C
820	821				S	B	B	X	C	C	I	I	X	M	E	E	E
1000	102				S	B	B	X	C	C	I	I	X	M	E	E	E
1200	122				B	B	B	X	C	C	I	I	X	M	E	E	E
1500	152				B	B	B	X	C	C	I	I	X	C	E	E	E
1800	182				B	B	B	X	C	C	I	I	X	C	E	E	E
2200	222				B	B	B	X	C	C	I	I	M	C	E	E	E
2700	272							C	C/I	C/I			M	C	E	E	E
3300	332							C	I	I			C	C	E	E	E
3900	392							C	I	I			C	E	E	E	E
4700	472							C	I	I			C	E	E	E	E
5600	562							C					E	E	E	E	E
6800	682							C					E	E	E	E	C/E
8200	822							C					E	E	E	E	E
10000	103							C					E	E	E	E	E
12000	123							C					P				
15000	153							C					P				
18000	183							C					P				
22000	223							C					P				
27000	273																
33000	333																

Capacitance Range (Con.) C0G

Dimension		1210					1808					1812				
Cap(pF)	code	100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 V	500 V	630 V
2.2	2R2						C	C	C	C	C					
2.7	2R7						C	C	C	C	C					
3.3	3R3						C	C	C	C	C					
3.9	3R9						C	C	C	C	C					
4.7	4R7						C	C	C	C	C					
5.6	5R6						C	C	C	C	C					
6.8	6R8						C	C	C	C	C					
8.2	8R2						C	C	C	C	C					
10	100	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
12	120	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
15	150	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
18	180	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
22	220	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
27	270	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
33	330	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
39	390	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
47	470	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
56	560	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
68	680	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
82	820	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
100	101	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
120	121	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
150	151	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
180	181	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
220	221	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C
270	271	M	M	M	M	M	C	C	C	F	F	C	C	C	C	C
330	331	M	M	M	M	M	C	C	C	F	F	C	C	C	C	C
390	391	M	M	M	M	M	C	C	C	F	F	C	C	C	C	C
470	471	M	M	M	M	M	C	C	C	F	F	C	C	C	C	C
560	561	M	M	M	M	M	C	C	C	F	F	C	C	C	C	C
680	681	M	M	M	M	M	C	C	C	F	F	C	C	C	C	C
820	821	M	M	M	M	M	C	C	C	F	F	C	C	C	C	C
1000	102	M	C	C	C	C	C	C	C	F	F	C	C	C	C	C
1200	122	M	C	C	C	C	C	C	C	F	F	C	C	C	C	C
1500	152	M	C	C	C	C	C	C	C	F	F	C	C	C	C	C
1800	182	M	C	C	C	C	C	C	C	F	F	C	C	C	C	C
2200	222	M	C	C	C	C	C	C	C	F	F	C	C	C	C	C
270 0	272	M	C	C	C	C	C	C	C	F	F	C	C	C	C	C
3300	332	M	C	C	C	C	C	C	C	F	F	C	C	C	C	C
3900	392	M	C	C	C	C	C	C	C			C	C	C	C	C
4700	472	M	E/C	E/C	C	C	C	C	C			C	C	C	C	C
560 0	562	C	E/C	E/C	C	C	C	E	E			C	C	C	C	C
6800	682	C	E	E	E/C	E/C	C	E	E			C	C	C	C	C
8200	822	C	E	E	E	E	E	F	F			C	C	C	C	C
100 00	103	E	F	F	F	F	E	F	F			C	C	C	C	C
120 00	123	E	C/E/F	C/E/F	F	F						C	E	E	E	E
150 00	153	F	C/E/F	C/E/F	G	G						C	E	E	E	E
180 00	183	F/G	E/F/G	E/F	G	G						E	F	F	F	F
220 00	223	F/G	E/F/G	E/F	G	G						E	F	F	F	F
270 00	273	F	F	F	G	G						F	G	G		
330 00	333	F	F/G	F/G	G	G						F				
390 00	393	F	F	F								G				
470 00	473	F	F	F								G				
560 00	563											G				
680 00	683											G				
820 00	823											G				
100 000	104											G				

Capacitance Range (Con.) C0G

Dimension		1825					2220					2225				
Cap(pF)	code	100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 V	500 V	630 V	100 V	200 V	250 V	500 V	630 V
10	100	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
12	120	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
15	150	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
18	180	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
22	220	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
27	270	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
33	330	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
39	390	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
47	470	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
56	560	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
68	680	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
82	820	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
100	101	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
120	121	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
150	151	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
180	181	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
220	221	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
270	271	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
330	331	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
390	391	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
470	471	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
560	561	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
680	681	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
820	821	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
100 0	102	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
120 0	122	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
150 0	152	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
180 0	182	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
220 0	222	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
270 0	272	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
330 0	332	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
390 0	392	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
470 0	472	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
560 0	562	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
680 0	682	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
820 0	822	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
100 00	103	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
120 00	123	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
150 00	153	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
180 00	183	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
220 00	223	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
270 00	273	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
330 00	333	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
390 00	393	F	F	F	G	G	F	F	F	G	F	F	F	F	F	F
470 00	473	F	F	F			F	G	G	G	F	F	F	F	F	F
560 00	563	F	G	G			F	G	G		G	F	G	G	G	G
680 00	683	F	G	G			F	G	G		H	F	G	G	G	G
820 00	823	G					G				H	F	G	G	G	
100000	104	G					G				H	G	G	G		
120000	124															
150000	154															
180000	184															
220000	224															

Capacitance Range (Con.) X7R

Dimension		0402				0603				0805			1206			
Cap(pF)	code	100V	100V	200V	250V	100V	200V	250V	500V	630V	100V	200V	250V	500V	450V	630V
100	101	N	S	B	B	X	X	X	X	X	X	C	C	C		C
120	121	N	S	B	B	X	X	X	X	X	X	C	C	C		C
150	151	N	S	B	B	X	X	X	X	X	X	C	C	C		C
180	181	N	S	B	B	X	X	X	X	X	X	C	C	C		C
220	221	N	S	B	B	X	X	X	X	X	X	C	C	C		C
270	271	N	S	B	B	X	X	X	X	X	X	C	C	C		C
330	331	N	S	B	B	X	X	X	X	X	X	C	C	C		C
390	391	N	S	B	B	X	X	X	X	X	X	C	C	C		C
470	471	N	S	B	B	X	X	X	X	X	X	C	C	C		C
560	561	N	S	B	B	X	X	X	X	X	X	C	C	C		C
680	681	N	S	B	B	X	X	X	X	X	X	C	C	C		C
820	821	N	S	B	B	X	X	X	X	X	X	C	C	C		C
1000	102	N	S	B	B	X	X	X	X	X	X	C	C	C		C
1200	122	N	S	B	B	X	X	X	X	X	X	C	C	C		C
1500	152	N	S	B	B	X	X	X	X	X	X	C	C	C		C
1800	182	N	S	B	B	X	X	X	X	X	X	C	C	C		C
2200	222	N	S	B	B	X	X	X	X	X	X	C	C	C		C
2700	272	N	S	B	B	X	X	X	X	X	X	C	C	C		C
3300	332	N	S	B	B	X	X	X	X	X	X	C	C	C		C
3900	392	N	S	B	B	X	X	X	X	X	X	C	C	C		C
4700	472	N	S	B	B	X	X	X	C	C	X	C	C	C		C
5600	562		S	B	B	X	X	X	C	C	X	C	C	C		C
6800	682		S	B	B	X	X	X	C	C	X	C	C	C		C
8200	822		S	B	B	X	X	X	C	C	X	C	C	C		C
10000	103		S	B	B	X	C	C	C	C	X	C	C	C		C
12000	123		B			X	C	C	C	C	X	C	C	C		C
15000	153		B			X	C	C	C	C	X	C	C	C		C
18000	183		B			X	C	C	C	C	X	C	C	C		C
22000	223		B			X	C	C	C	C	X	C	C	E		E
27000	273		B			C	C	C	C	C	X	C	C	E		E
33000	333		B			C	C	C	C		X	E	E	E		E
39000	393		B			C	C	C			X	E	E	E		E
47000	473		B			C	C	C			X	E	E	E		E
56000	563		B			C	C	C			X	E	E	E		E
68000	683		B			C	C	C			X	E	E		E	
82000	823		B			C	C				C	E	E		E	
100000	104		B			C	C				C	E	E		E	
120000	124					I					C	E	E			
150000	154					I					E	E	E			
180000	184					I					E	E	E			
220000	224					I					E	E	E			
270000	274					I					E					
330000	334					I					E					
390000	394					I					E					
470000	474					I					E					
560000	564										P					
680000	684										P					
820000	824										P					
1000000	105					I					P					
1200000	125					I					E/P					
1500000	155										E/P					
1800000	185										P					
2200000	225										P					

Capacitance Range (Con.) X7R

Dimension		1210						1808		1812					
Cap(pF)	code	100V	200V	250V	405V	500V	630V	500V	630V	100V	200V	250V	450V	500V	630V
100	101														
120	121														
150	151							C	C						
180	181							C	C						
220	221	M	M	M		C	C	C	C						
270	271	M	M	M		C	C	C	C	C	C	C	C	C	C
330	331	M	M	M		C	C	C	C	C	C	C	C	C	C
390	391	M	M	M		C	C	C	C	C	C	C	C	C	C
470	471	M	M	M		C	C	C	C	C	C	C	C	C	C
560	561	M	M	M		C	C	C	C	C	C	C	C	C	C
680	681	M	M	M		C	C	C	C	C	C	C	C	C	C
820	821	M	M	M		C	C	C	C	C	C	C	C	C	C
1000	102	M	M	M		C	C	C	C	C	C	C	C	C	C
1200	122	M	M	M		C	C	C	C	C	C	C	C	C	C
1500	152	M	M	M		C	C	C	C	C	C	C	C	C	C
1800	182	M	M	M		C	C	C	C	C	C	C	C	C	C
2200	222	M	M	M		C	C	C	C	C	C	C	C	C	C
2700	272	M	M	M		C	C	C	C	C	C	C	C	C	C
3300	332	M	M	M		C	C	C	C	C	C	C	C	C	C
3900	392	M	M	M		C	C	C	C	C	C	C	C	C	C
4700	472	M	M	M		C	C	C	C	C	C	C	C	C	C
5600	562	M	M	M		C	C	F	F	C	C	C	C	C	C
6800	682	M	M	M		C	C	F	F	C	C	C	C	C	C
8200	822	M	M	M		C	C	F	F	C	C	C	C	C	C
10000	103	M	M	M		C	C	F	F	C	C	C	C	C	C
12000	123	M	M	M		C	C	F	F	C	C	C	C	C	C
15000	153	M	M	M		C	C	F	F	C	C	C	C	C	C
18000	183	M	M	M		C	C	F	F	C	C	C	C	C	C
22000	223	M	M	M		C	C	F	F	C	C	C	C	C	C
27000	273	M	M	M		E	E	F	F	C	C	C	C	C	C
33000	333	M	M	M		E	E	F	F	C	C	C	C	C	C
39000	393	M	M	M		E	E	F	F	C	C	C	C	C	C
47000	473	M	C	C		E	E	F	F	C	C	C	C	C	C
56000	563	M	C	E		E	E	F	F	C	C	C	F	F	F
68000	683	M	E	E		F/E	F/E	F	F	C	C	C	F	F	F
82000	823	M	E	E		F	F	F	F	C	C	C	F	F	F
100000	104	M	E	E		F	F			C	C	C	F	F	F
120000	124	M	E	E	G	G	G			C	C	C	G	G	G
150000	154	C	G	G	G	G	G			C	F	F	G	G	G
180000	184	C	G	G	G					C	F	F	G	G	G
220000	224	C	G	G	G					C	F	F	G	G	G
270000	274	E	G	G	G					C	F	F	G	G	
330000	334	E	G	G	G					C	F	F	G	G	
390000	394	G	G	G						C	F	F	G	G	
470000	474	G	G	G						F	F	F	G	G	
560000	564	G	G	G						F	G	G	G		
680000	684	F	G	G						F	G	G	G		
820000	824	F								F	G	G	H		
820000	824	F								F	G	G	H		
1000000	105	F								F	G	G	H		
1200000	125	F/G								C					
1500000	155	G								C					
1800000	185	G								E					
2200000	225	G								E					
2700000	275	G								F					
3300000	335	G								F					
3900000	395	G								F					
4700000	475	G								G					

Capacitance Range (Con.) X7R

Dimension		1825					2220					2225				
Cap(pF)	code	100V	200V	250V	500V	630V	100V	200V	250V	500V	630V	100V	200V	250V	500V	630V
1000	102	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
1200	122	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
1500	152	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
1800	182	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
2200	222	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
2700	272	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
3300	332	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
3900	392	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
4700	472	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
5600	562	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
6800	682	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
8200	822	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
10000	103	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
12000	123	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
15000	153	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
18000	183	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
22000	223	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
27000	273	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
33000	333	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
39000	393	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
47000	473	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
56000	563	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
68000	683	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
82000	823	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
100000	104	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
120000	124	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
150000	154	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
180000	184	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
220000	224	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
270000	274	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
330000	334	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
390000	394	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
470000	474	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
560000	564	F	F	F	G	G	F	F	F	G	G	F	F	F	F	F
680000	684	F	F	F			F	F	F	G	G	F	F	F		
820000	824	F	F	F			F	F	F	H	H	F	F	F		
1000000	105	F	F	F			F	F	F	H	H	F	F	F		
1200000	125	F	G				F	G	G			F	G	G		
1500000	155	F	G				F	G	G			F	G	G		
1800000	185	F	G				F	G	G			F	G	G		
2200000	225	F	G				F	G	G			F	G	G		
2700000	275	F					F					F				
3300000	335	F					F					F				
3900000	395	F					F					F				
4700000	475	F					F					F				
5600000	565	F					F					F				
6800000	685	F					F					F				
8200000	825	G					G					G				
10000000	106	G					G					G				

* M Tolerance only

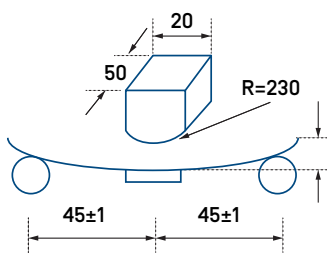
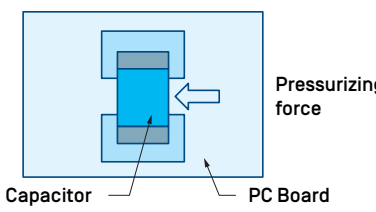
Reliability test conditions and requirements

No.	Item	Test Condition	Requirements																		
1.	Visual and Dimensions		* No remarkable defect. * Dimensions to confirm to individual specification sheet.6.3V																		
2.	Capacitance	▪ Class I : C0G	▪ Shall not exceed the limits given in the detailed spec.																		
3.	Q/ D.F. (Tangent of loss angle)	<ul style="list-style-type: none"> ▪ Class I : C0G Cap.≤1000pF, 1.0±0.2Vrms, 1MHz±10%.Cap.>1000pF, 1.0±0.2Vrms, 1KHz±10%. ▪ Class II : (X7R) 1.0±0.2Vrms, 1KHz±10%. 	<table border="1"> <thead> <tr> <th>Dielectric</th> <th>Q/D.F.</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Class I (C0G)</td> <td>Q≥1000</td> <td>Cap.≥30pF</td> </tr> <tr> <td>Q≥400+20C</td> <td>Cap.<30pF</td> </tr> <tr> <td rowspan="4">Class II</td> <td>D.F.≤2.5%</td> <td>X7R items</td> </tr> <tr> <td>D.F.≤3.5%</td> <td>X7R 0603≥0.047μF, 0805=0.1μF, 1206≥0.47μF</td> </tr> <tr> <td>D.F.≤5.0%</td> <td>X7R 0603≥0.068μF, 0805>0.1μF All Y5V items</td> </tr> <tr> <td>D.F.≤10.0%</td> <td>X7R 0805>0.22μF</td> </tr> </tbody> </table>	Dielectric	Q/D.F.	Remark	Class I (C0G)	Q≥1000	Cap.≥30pF	Q≥400+20C	Cap.<30pF	Class II	D.F.≤2.5%	X7R items	D.F.≤3.5%	X7R 0603≥0.047μF, 0805=0.1μF, 1206≥0.47μF	D.F.≤5.0%	X7R 0603≥0.068μF, 0805>0.1μF All Y5V items	D.F.≤10.0%	X7R 0805>0.22μF	
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				Q≥400+20C	Cap.<30pF																
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D.F.≤10.0%	X7R 0805>0.22μF																				
4.	Temperature Coefficient (Temperature characteristic of capacitance)	<ul style="list-style-type: none"> ▪ With no electrical load. <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp.</th> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>C0G</td> <td>-55~125°C at 25°C</td> <td>C0G</td> <td>Within ±30ppm/°C</td> </tr> <tr> <td>X7R</td> <td>-55~125°C at 25°C</td> <td>X7R</td> <td>Within ±15%</td> </tr> </tbody> </table>	T.C.	Operating Temp.	T.C.	Capacitance Change	C0G	-55~125°C at 25°C	C0G	Within ±30ppm/°C	X7R	-55~125°C at 25°C	X7R	Within ±15%							
T.C.	Operating Temp.	T.C.	Capacitance Change																		
C0G	-55~125°C at 25°C	C0G	Within ±30ppm/°C																		
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5.	Insulation Resistance	<table border="1"> <thead> <tr> <th>Rated Vol.(V)</th> <th>Apply Voltage</th> <th>Charge Time</th> </tr> </thead> <tbody> <tr> <td>≤100</td> <td>1 times of U_R</td> <td>Max. 120 sec.</td> </tr> <tr> <td>200≤V≤500</td> <td>1 times of U_R</td> <td>60 sec.</td> </tr> <tr> <td>>500</td> <td>500Vdc</td> <td>60 sec.</td> </tr> </tbody> </table>	Rated Vol.(V)	Apply Voltage	Charge Time	≤100	1 times of U _R	Max. 120 sec.	200≤V≤500	1 times of U _R	60 sec.	>500	500Vdc	60 sec.	<table border="1"> <thead> <tr> <th>Dielectric</th> <th>Requirements</th> </tr> </thead> <tbody> <tr> <td>Class I</td> <td>≥10GΩ or RxC≥500Ω-F, whichever is smaller</td> </tr> <tr> <td>Class II</td> <td>≥10GΩ or RxC≥100Ω-F, whichever is smaller</td> </tr> </tbody> </table>	Dielectric	Requirements	Class I	≥10GΩ or RxC≥500Ω-F, whichever is smaller	Class II	≥10GΩ or RxC≥100Ω-F, whichever is smaller
		Rated Vol.(V)	Apply Voltage	Charge Time																	
		≤100	1 times of U _R	Max. 120 sec.																	
200≤V≤500	1 times of U _R	60 sec.																			
>500	500Vdc	60 sec.																			
Dielectric	Requirements																				
Class I	≥10GΩ or RxC≥500Ω-F, whichever is smaller																				
Class II	≥10GΩ or RxC≥100Ω-F, whichever is smaller																				
6.	Solderability	<ul style="list-style-type: none"> ▪ Solder temperature : 235±5°C for (0402~1210). ▪ Solder temperature : 245±5°C for (1808~2225). ▪ Dipping time : 2±0.5 sec. 	▪ 75% min. coverage of all metalized area.																		
7.	Dielectric Strength (Voltage proof)	<table border="1"> <thead> <tr> <th>Rated Vol.(V)</th> <th>Condition</th> </tr> </thead> <tbody> <tr> <td>≤100</td> <td>2.5 times of U_R</td> </tr> <tr> <td>100<V≤250</td> <td>2.0 times of U_R</td> </tr> <tr> <td>250<V≤500</td> <td>1.5 times of U_R</td> </tr> <tr> <td>=630</td> <td>1.2 times of U_R</td> </tr> </tbody> </table>	Rated Vol.(V)	Condition	≤100	2.5 times of U _R	100<V≤250	2.0 times of U _R	250<V≤500	1.5 times of U _R	=630	1.2 times of U _R	<ul style="list-style-type: none"> ▪ No evidence of damage or flashover during test. 								
		Rated Vol.(V)	Condition																		
		≤100	2.5 times of U _R																		
		100<V≤250	2.0 times of U _R																		
		250<V≤500	1.5 times of U _R																		
		=630	1.2 times of U _R																		
<ul style="list-style-type: none"> ▪ Duration : 1 to 5 sec. ▪ Charge and discharge current less than 50mA. 																					
<ul style="list-style-type: none"> ▪ Solder temperature : 260±5°C. ▪ Dipping time : 10±1 sec. ▪ Preheating : 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. ▪ Before initial measurement (Class II only) : Perform 150 +0/-10°C for 1 hr and then set for 48±4 hrs at room temp. ▪ Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II). 																					
<ul style="list-style-type: none"> ▪ No remarkable damage. ▪ Cap. Change : C0G : Within ±2.5% or ±0.25pF, whichever is larger. X7R : Within ±7.5%. ▪ Q/D.F. & I.R. : To meet the initial requirement. ▪ 25% max. leaching on each edge. 																					
8.	Resistance to Soldering Heat	<ul style="list-style-type: none"> ▪ Solder temperature : 260±5°C. ▪ Dipping time : 10±1 sec. ▪ Preheating : 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. ▪ Before initial measurement (Class II only) : Perform 150 +0/-10°C for 1 hr and then set for 48±4 hrs at room temp. ▪ Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II). 	<ul style="list-style-type: none"> ▪ No remarkable damage. ▪ Cap. Change : C0G : Within ±2.5% or ±0.25pF, whichever is larger. X7R : Within ±7.5%. ▪ Q/D.F. & I.R. : To meet the initial requirement. ▪ 25% max. leaching on each edge. 																		

Reliability test conditions and requirements

9.	Temperature Cycle (Rapid change of temperature)	<ul style="list-style-type: none"> Conduct the five cycles according to the temperatures and time. 	<ul style="list-style-type: none"> No remarkable damage. Cap. change : C0G : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever is larger. X7R : Within $\pm 7.5\%$. Q/D.F. : C0G : To meet the initial requirement. X7R, Y5V : D.F. $\leq 150\%$ of initial requirement. I.R. : To meet the initial requirement. 															
		<table border="1"> <thead> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30\pm3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30\pm3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Before initial measurement (Class II only) : Perform 150 +0/-10°C for 1 hr and then set for 48\pm4 hrs at room temp. Measurement to be made after keeping at room temp. for 24\pm2 hrs (Class I) or 48\pm4 hrs (Class II). 		Step	Temp.(°C)	Time(min.)	1	Min. operating temp. +0/-3	30 \pm 3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30 \pm 3	4	Room temp.	2~3
Step	Temp.(°C)	Time(min.)																
1	Min. operating temp. +0/-3	30 \pm 3																
2	Room temp.	2~3																
3	Max. operating temp. +3/-0	30 \pm 3																
4	Room temp.	2~3																
10.	Humidity (Damp Heat) Steady State	<ul style="list-style-type: none"> Test temp. : 40\pm2°C. Humidity : 90~95%RH. Test time : 500 +24/-0 hrs. Measurement to be made after keeping at room temp. for 24\pm2 hrs (Class I) or 48\pm4 hrs (Class II). 	<ul style="list-style-type: none"> No remarkable damage. Cap. change : C0G : Within $\pm 5.0\%$ or $\pm 0.5\text{pF}$, whichever is larger. X7R : Within $\pm 12.5\%$. Q/D.F. : C0G : Cap.$>$30pF, Q\geq350; 10pF\leqCap.\leq30pF, Q\geq275+2.5C; Cap.$<$10pF, Q\geq200+10C. X7R : D.F.\leq200% of initial requirement. I.R. (Class I) : $\geq 10\text{G}\Omega$ or RxC$\geq 500\Omega\text{-F}$, whichever is smaller. I.R. (Class II) : $\geq 1\text{G}\Omega$ or RxC$\geq 10\Omega\text{-F}$, whichever is smaller. 															
11.	Humidity (Damp Heat) Load	<ul style="list-style-type: none"> Test temp. : 40\pm2°C. Humidity : 90~95% RH. Test time : 500 +24/-0hrs. To apply voltage : Rated voltage (Max. 500Vdc). Measurement to be made after keeping at room temp. for 24\pm2 hrs (Class I) or 48\pm4 hrs (Class II). 	<ul style="list-style-type: none"> No remarkable damage. Cap. change : C0G : Within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever is larger. X7R : Within $\pm 12.5\%$. Q/D.F. : C0G : Cap.$\geq 30\text{pF}$, Q≥ 200; Cap.$<$30pF, Q$\geq 100+10/3\text{C}$. X7R : D.F.$\leq 200\%$ of initial requirement. I.R. : $\geq 500\text{M}\Omega$ or RxC$\geq 25\Omega\text{-F}$, whichever is smaller. X7R 100V : $\geq 500\text{M}\Omega$ or RxC$\geq 5\Omega\text{-F}$, whichever is smaller. 															
12.	High Temperature Load (Endurance)	<ul style="list-style-type: none"> Test temp. : C0G, X7R : 125\pm3°C. 	<ul style="list-style-type: none"> No remarkable damage. Cap. change : C0G : Within $\pm 3.0\%$ or $\pm 0.3\text{pF}$, whichever is larger. X7R : Within $\pm 12.5\%$. Q/D.F. : C0G : Cap.$>$30pF, Q≥ 350; 10pF\leqCap.$\leq 30\text{pF}$, Q$\geq 275+2.5\text{C}$; Cap.$<$10pF, Q$\geq 200+10\text{C}$. X7R : D.F.$\leq 200\%$ of initial requirement. I.R. : $\geq 1\text{G}\Omega$ or RxC$\geq 50\Omega\text{-F}$, whichever is smaller. X7R 100V : $\geq 1\text{G}\Omega$ or RxC$\geq 10\Omega\text{-F}$, whichever is smaller. 															
		<table border="1"> <thead> <tr> <th>Dielectric</th> <th>Rated Vol.(V)</th> <th>Apply Voltage</th> </tr> </thead> <tbody> <tr> <td rowspan="4">C0G X7R</td> <td>≤ 100</td> <td>2.0 times of U_R</td> </tr> <tr> <td>$200 \leq V \leq 500$</td> <td>1.5 times of U_R</td> </tr> <tr> <td>400V~450V</td> <td>1.2 times of U_R</td> </tr> <tr> <td>$= 630$</td> <td>1.2 times of U_R</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Exception items : <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated Voltage</th> </tr> </thead> <tbody> <tr> <td>01005</td> <td>X5R</td> <td>10V</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Test time : 1000 +24/-0 hrs. Measurement to be made after keeping at room temp. for 24\pm2 hrs (Class I) or 48\pm4 hrs (Class II). 		Dielectric	Rated Vol.(V)	Apply Voltage	C0G X7R	≤ 100	2.0 times of U_R	$200 \leq V \leq 500$	1.5 times of U_R	400V~450V	1.2 times of U_R	$= 630$	1.2 times of U_R	Size	Dielectric	Rated Voltage
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	$= 630$	1.2 times of U_R																
Size	Dielectric	Rated Voltage																
01005	X5R	10V																

Reliability test conditions and requirements

No.	Item	Test Condition	Requirements						
13.	Resistance to Flexure of Substrate (Substrate bending test)	<ul style="list-style-type: none"> The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm. 	<ul style="list-style-type: none"> No remarkable damage. <table border="1"> <thead> <tr> <th>Dielectric</th> <th>Cap. Change</th> </tr> </thead> <tbody> <tr> <td>Class I (C0G)</td> <td>Within ±3.0% or ±2.0pF, whichever is larger</td> </tr> <tr> <td>Class II (X7R)</td> <td>Within ±12.5%</td> </tr> </tbody> </table> <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test)</p>	Dielectric	Cap. Change	Class I (C0G)	Within ±3.0% or ±2.0pF, whichever is larger	Class II (X7R)	Within ±12.5%
Dielectric	Cap. Change								
Class I (C0G)	Within ±3.0% or ±2.0pF, whichever is larger								
Class II (X7R)	Within ±12.5%								
14.	Adhesive Strength of Termination (Robustness of termination)	<ul style="list-style-type: none"> Capacitors mounted on a substrate. A force of 5N(≤0603) or 10N(>0603) applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 second. 	<ul style="list-style-type: none"> No remarkable damage or removal of the terminations. 						
15.	Vibration Resistance	<ul style="list-style-type: none"> Vibration frequency : 10~55 Hz/min. Total amplitude : 1.5mm. Test time : 6 hrs. (Two hrs each in three mutually perpendicular directions) Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II). 	<ul style="list-style-type: none"> No remarkable damage. Cap. change and Q/D.F. : To meet the initial spec. 						

Package Dimension and Quantity

Size	EIA Size Code	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
0402(1005)	0.50±0.05	10k	50k	-	-
	0.50 +0.02/-0.05	10k	50k	-	-
	0.50±0.20	10k	-	-	-
0603(1608)	0.50±0.10	4k	-	-	-
	0.80±0.07	4k	15k	-	-
	0.80 +0.15/-0.10	4k	15k	-	-
0805(2012)	0.50±0.10	4k	15k	-	-
	0.60±0.10	4k	15k	-	-
	0.80±0.10	4k	15k	-	-
	0.85±0.10	4k	15k	-	-
	1.25±0.10	-	-	3k	10k
	1.25±0.20	-	-	3k	10k
1206(3216)	0.80±0.10	4k	15k	-	-
	0.85±0.10	4k	15k	-	-
	0.95±0.10	-	-	3k	10k
	1.15±0.15	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	10k
	1.60 +0.30/-0.10	-	-	2k	9k
1210(3225)	0.85±0.10	-	-	3k	10k
	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
	2.00±0.20	-	-	1k	6k
	2.50±0.30	-	-	1k	6k
1808(4520)	1.25±0.10	-	-	2k	10k
	1.60±0.20	-	-	2k	8k
	2.00±0.20	-	-	1k	6k
1812(4532)	1.25±0.10	-	-	1k	5k
	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	3k
	2.80±0.30	-	-	0.5k	-
1825(4563)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-
	2.80±0.30	-	-	0.5k	-
2220(5750)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-
	2.80±0.30	-	-	0.5k	-
2225(5763)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-
	2.80±0.30	-	-	0.5k	-

Unit : pcs

Packaging Dimensions & Part Count

EMBOSSED TAPE DIMENSIONS

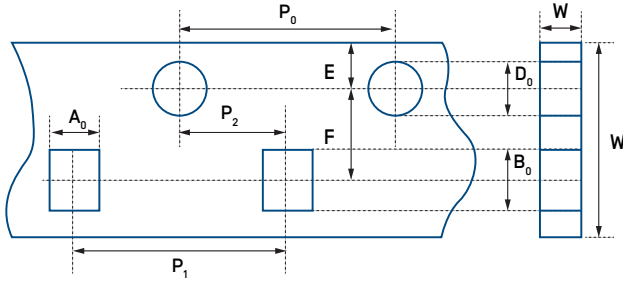


Fig. 9.1 The dimension of paper tape

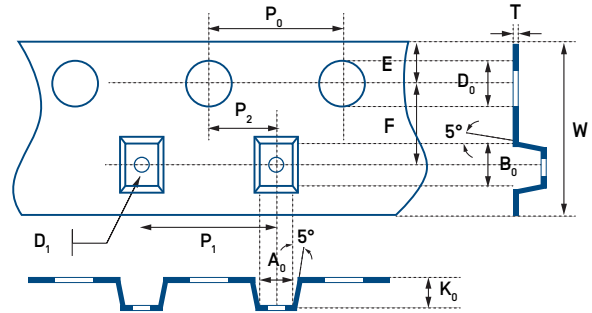


Fig. 9.2 The dimension of plastic tape

Size	0402	0603	0805	
Chip Thickness	0.50±0.05 0.50±0.10	0.80±0.07 0.80 +0.15/-0.1	0.80±0.10	1.25±0.10 1.25±0.20
A₀	0.70±0.20	1.05 ±0.30	1.50±0.20	<1.80
B₀	1.20±0.20	1.80±0.30	2.30±0.20	<2.70
T	≤0.80	≤1.20	0.95±0.05	0.23±0.05
K₀	-	-	-	<2.50
W	8.00±0.30	8.00±0.30	8.00±0.10	8.00±0.10
P₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP₀	40.00±0.10	40.00±0.20	40.00±0.20	40.00±0.20
P₁	2.00±0.05	4.00±0.10	4.00±0.10	4.00±0.10
P₂	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D₀	1.50+0.1/-0	1.50+0.1/-0	1.50+0.10/-0	1.50+0.10/-0
D₁	-	-	-	1.00±0.10
E	1.75±0.10	1.75±0.10	1.75±0.05	1.75±0.10
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05
Unit :	mm	mm	mm	mm

Size	1206			1210	
Chip Thickness	0.80±0.10	0.95±0.10 1.25±0.10	1.60±0.20 1.60 +0.30/-0.10	1.25±0.10 1.60±0.20	2.50±0.30
A₀	2.00±0.10	<2.00	<2.50	<3.05	<3.20
B₀	3.50±0.50	<3.70	<4.00	<3.80	<4.00
T	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05
K₀	-	<2.50	<2.50	<2.50	<3.50
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP₀	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P₁	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
P₂	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D₀	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0
D₁	-	1.00±0.10	1.50±0.10	1.50±0.10	1.00±0.10
E	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10
F	3.50±0.05	3.50±0.05	5.50±0.05	5.50±0.05	3.50±0.05
Unit :	mm	mm	mm	mm	mm

Packaging Dimensions & Part Count

Size	1808		1812		1825	
Chip Thickness	1.25±0.10 1.60±0.20	2.00±0.20	1.25±0.10 1.60±0.20 2.00±0.20	2.50±0.30 2.80±0.30	1.60±0.20 2.00±0.20	2.50±0.30 2.80±0.30
A₀	<2.50	<2.50	<3.90	<3.90	<6.80	<6.80
B₀	<5.30	<5.30	<5.30	<5.30	<5.30	<5.30
T	0.25±0.05	0.25±0.05	0.25±0.05	0.25±0.05	0.30±0.10	0.30±0.10
K₀	<2.50	<2.50	<2.50	<3.00	<2.50	<3.10
W	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20
P₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP₀	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P₁	4.00±0.10	4.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P₂	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D₀	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0
D₁	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10
E	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10
F	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05
Unit :	mm	mm	mm	mm	mm	mm

Size	2220		2225	
Chip Thickness	1.40±0.15 1.60±0.20 2.00±0.20	2.50±0.30 2.80±0.30	1.60±0.20 2.00±0.20	2.50±0.30 2.80±0.30
A₀	<5.80	<6.80	<6.80	<6.80
B₀	<6.50	<6.50	<6.50	<6.50
T	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10
K₀	<2.50	<3.10	<2.50	<3.10
W	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20
P₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP₀	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P₁	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P₂	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D₀	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0
D₁	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10
E	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10
F	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05
Unit :	mm	mm	mm	mm

Packaging Dimensions & Part Count

REEL DIMENSIONS

Size	01005	0201, 0402, 0603, 0805, 1206, 1210		1808, 1812, 1825, 2220, 2225
Reel size	7	7	13	7
C	13.0 ±0.05	13.0 +0.5/-0.2	13.0 +0.5/-0.2	13.0 +0.7/-0.3
W1	8.4 +1.5	8.4 +1.5	8.4 +1.5	12.4 +2.0/-0
W	14.4max	14.4max	14.4max	shall accommodate tape width without interference
A	178.0 ±0.20	178.0 ±0.20	330.0 ±1.0	178.0 ±0.20
N	60.0 +1.0/-0	60.0 +1.0/-0	100 ±1.0	60.0 +1.0/-0

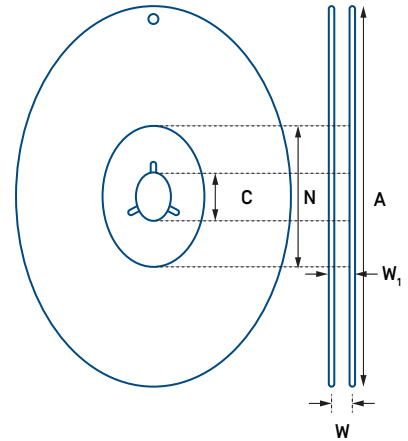


Fig. 9.3 The dimension of reel

Applications Notes

Storage

To prevent the damage of solderability of terminations, the following storage conditions are recommended :

- Indoors under 5 ~ 40°C and 20% ~ 70% RH.
- No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine.
- Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as is practicable. Taped product should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The product is recommended to be used within 12 months after shipment and checked the solderability before use.

Soldering

Use mildly activated rosin fluxes do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips, and substrate.

a.) Hand soldering :

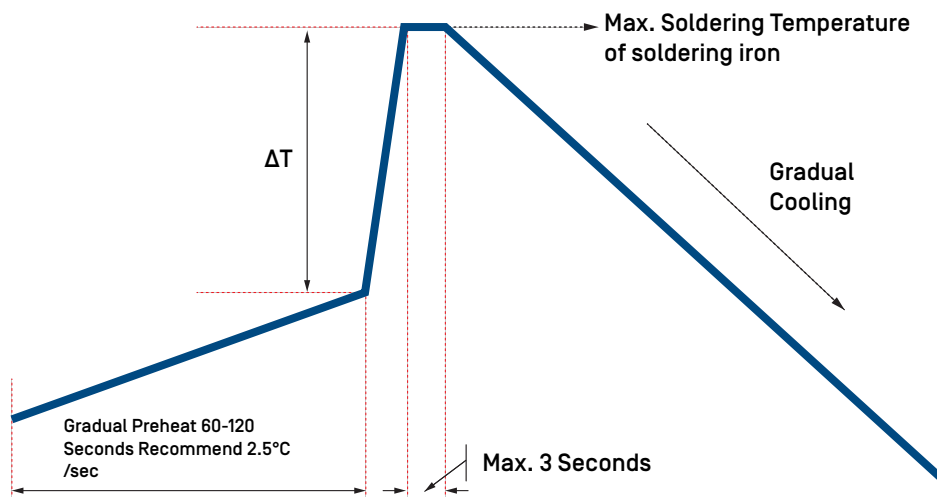
Handling

Chip capacitors are dense, hard, brittle, and abrasive materials. They are liable to suffer mechanical damage, in the form of cracks or chips. Chip Capacitors should be handled with care to avoid contamination or damage. To use vacuum or plastic tweezers to pick up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine. with the ceramic capacitor body or termination.

Preheat

- In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required.
- The rate of preheat should not exceed 3°C per second.

Fig. 10.1 Hand Soldering Profile



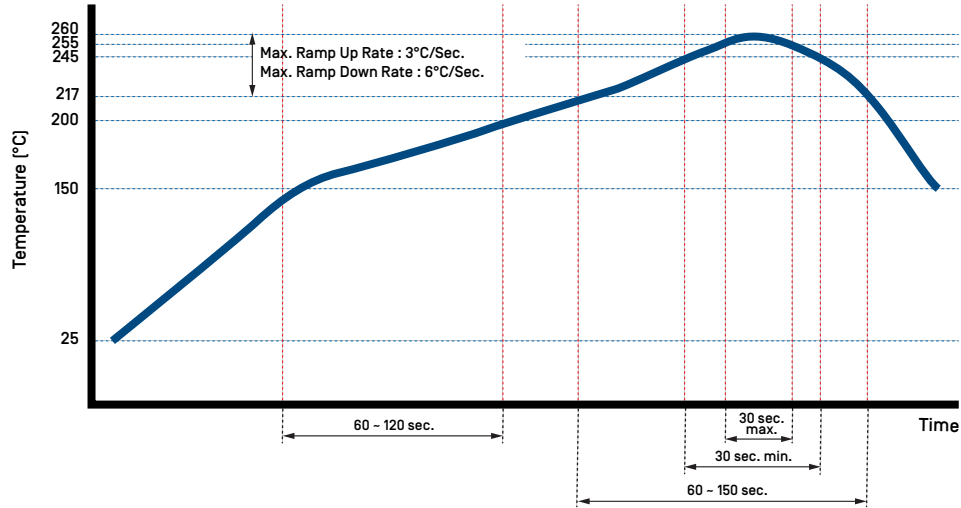
Chip Size	Pre-Heat temp.	ΔT	Max. soldering iron temp.
≤1206	≥150°C	≤150°C	≤350°C
1210~2225	≥150°C	≤130°C	≤280°C

- Soldering iron tip diameter ≤1.0 mm and wattage max. 20W.
- The Capacitors shall be pre-heated and that the temperature gradient between the devices and the tip of the soldering iron.
- The required amount of solder shall be melted on the soldering tip.
- The tip of iron should not contact the ceramic body directly.
- The Capacitors shall be cooled gradually at room temperature after soldering.
- Forced air cooling is not allowed.

Applications Notes

b.) Reflow soldering :

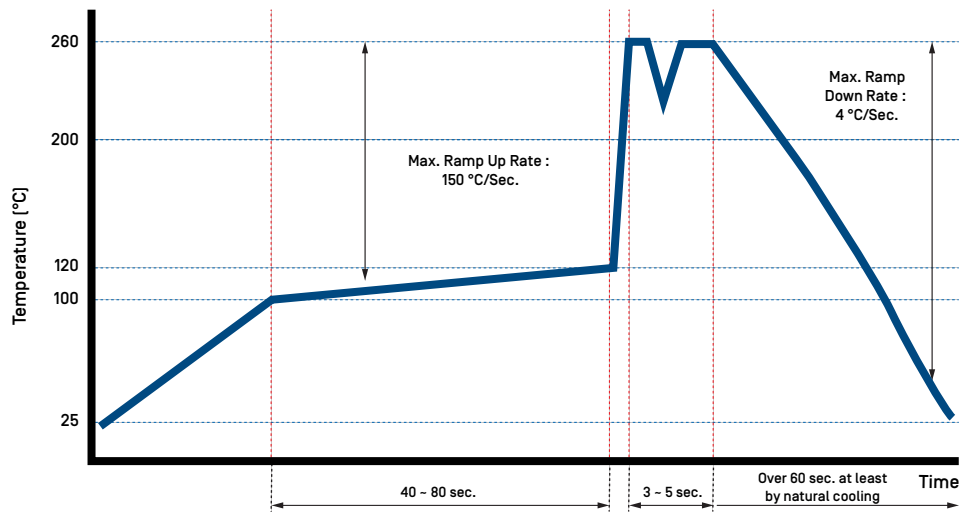
Fig. 10.2 Reflow soldering profile



For Sn/Ag/Cu Series solder paste (Pb-Free)

c.) Wave soldering :

Fig. 10.3 Wave soldering profile



For Sn/Ag/Cu Series solder paste (Pb-Free)

Soldering conditions :

Class I :

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
≤0402 (1005)	Class I	All	X	○
0603 (1608)	Class I	All	○	○
0805 (2012)	Class I	All	○	○
1206 (3216)	Class I	All Thickness >0.95mm	○	○
≥1210 (3225)	Class I	All	X	○
Coating Products	All	mm	X	○

Applications Notes

Soldering conditions :

Class I :

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
≤0402 (1005)	Class II	All	X	○
0603 (1608)	Class II	Cap. <2.2μF	○	○
		Cap. ≥2.2μF	X	○
0805 (2012)	Class II	Thickness ≤ 0.95mm	○	○
		Thickness > 0.95mm	X	○
1206 (3216)	Class II	Thickness ≤ 0.95mm	○	○
		Thickness > 0.95mm	X	○
≥1210 (3225)	Class II	All	X	○
Coating Products	All	All	X	○

Soldering height :

<p>The solder climbing minimum height is suggesting to 25% of chip thickness or 500um whichever is less. (Reference from IPC-610E)</p>	
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Cooling

After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint.

Cleaning

All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors such as component mix, flux, and solder paste and assembly method. The ability of the cleaning system to remove flux residues and contamination from under the chips is very important.