



信昌電子陶瓷股份有限公司
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Messrs. : _____

Date : _____

APPROVAL SHEET

Product Name : High Reliability Multilayer Ceramic Chip Capacitors

Part No. : FR Series

Description : Size 0603~2225, C0G/X7R, 25Vdc to 4000Vdc

PREPARED BY	APPROVED BY

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SPECIFICATION

FOR

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SPEC. No. : <u>FR-000-001-02</u>
DATE :

DRAWN BY	CHECEKED BY	APPROVED BY
Angel Liu	Yvens Chou	Ryan Chen



1. INTRODUCTION

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used.

PDC high capacitance MLCC offers low ESR and excellent frequency characteristics to be suited for coupling and decoupling applications in circuit. The high dielectric constant materials X7R are used for this series product.

2. FEATURES

- a. Realize high capacitance in small size.
- b. Capacitor with lead-free termination (pure Tin).
- c. RoHS compliant.
- d. HALOGEM compliant.
- e. Surface mount suited for wave and reflow soldering.
- f. High reliability and no polarity.
- g. Excellent in high frequency characteristic.

3. APPLICATIONS

- a. Digital circuit coupling or decoupling applications.
- b. For high frequency and high-density type power suppliers.
- c. For bypassing.
- d. Ideal for smoothing circuits.
- e. DC to DC converter.

4. HOW TO ORDER

FR	31	X	471	K	251	P	X	G
PDC Family	Size	Dielectric	Capacitance	Tolerance	Rated voltage	Packaging	Thickness	Control Code
Table1.	Table2	Table3	Table4	Table5	Table6	Table7	Table8	Table9

Table 1 PDC family	
Code	Description
FR	High Quality Equipment Capacitor.

Table 2 Size					
Code	Description	Code	Description	Code	Description
15	0402 (1005)	32	1210 (3225)	52	2211 (5728)
18	0603 (1608)	42	1808 (4520)	55	2220 (5750)
21	0805 (2012)	43	1812 (4532)	56	2225 (5763)
31	1206 (3216)	46	1825 (4563)		

Table 3 Dielectric Material Characteristics			
Code	Description	Code	Description
N	C0G	X	X7R
B	X5R	F	Y5V

Table 4 Table 4 Capacitance Rule Code			
Code	Description	Code	Description
R47	0.47pF	102	102=10x10 ² =1000pF
OR5	0.5pF	104	104=10x10 ⁴ =100nF
100	100=10x10 ⁰ =10pF	106	106=10x10 ⁶ =10μF

Table 5 Tolerance					
Code	Description	Code	Description	Code	Description
A	±0.05 pF	I	-10% ~ 0%	Q	±0.03 pF
B	±0.10 pF	J	±5 %	Z	-20% ~ +80%
C	±0.25 pF	K	±10 %	L	+5% ~ +15% (conform Table10 "X" code)
D	±0.50 pF	L	0% ~ +10%		
F	±1 %	M	±20 %		
G	±2 %	N	-5% ~ +10%		
H	±3 %	P	±0.02 pF		

Table 6 Rated voltage					
Code	Description	Code	Description	Code	Description
6R3	6.3VDC	201	200VDC	152	1500VDC
100	10VDC	251	250VDC	202	2000VDC
160	16VDC	401	400VDC	302	3000VDC
250	25VDC	501	500VDC	402	4000VDC
500	50VDC	631	630VDC	502	5000VDC
101	100VDC	102	1000VDC	602	6000VDC

Table 7 Packaging Type			
Code	Description	Code	Description
B	Bulk	T	Tray package
E	Tape and 7" Reel, Embossed Tape	P	Tape and 7" Reel, Paper Tape
K	Tape and 10" Reel, Embossed Tape	D	Tape and 10" Reel, Paper Tape
L	Tape and 13" Reel, Embossed Tape	G	Tape and 13" Reel, Paper Tape

Table 8 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

Table 9 Special Control Code	
Code	Description
G	RoHS Compliant
Q	Surface Coating (size 1206~2225)

5. EXTERNAL DIMENSIONS

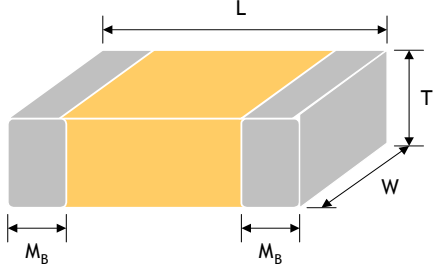
Size Inch (mm)	L (mm)	W (mm)	Code / T (mm)	M _B (mm)	
0603 (1608)	1.60±0.15	0.80±0.15	See No.4 Reference Table 8	0.40±0.15	
0805 (2012)	2.00±0.20	1.25±0.20		0.50±0.20	
1206 (3216)	3.20±0.20	1.60±0.20		0.60±0.20	
1210 (3225)	3.20±0.30	2.50±0.30		0.75±0.35	
1808 (4520)	4.50±0.40	2.00±0.25		0.75±0.35	
1812 (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	

Fig.5-1 The outline of MLCC

6. GENERAL ELECTRICAL DATA

Dielectric	C0G	X7R						
Size	0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225	0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225						
Rated voltage (WVDC)	25V, 50V, 100V, 200V, 250V, 500V, 630V, 1000V, 1500V, 2000V, 3000V, 4000V	25V, 50V, 100V, 200V, 250V, 500V, 630V, 1000V, 1500V, 2000V, 3000V, 4000V						
Capacitance range*	0.5pF ~ 330nF	100pF ~ 22μF						
Capacitance tolerance	Reference to Table5	Reference to Table5						
Tan δ	<table border="1"> <thead> <tr> <th>Cap. Rang</th> <th>Q Spec.</th> </tr> </thead> <tbody> <tr> <td>Cap<30pF:</td> <td>Q≥400+20C</td> </tr> <tr> <td>Cap≥30pF:</td> <td>Q≥1000</td> </tr> </tbody> </table>	Cap. Rang	Q Spec.	Cap<30pF:	Q≥400+20C	Cap≥30pF:	Q≥1000	≤ 2.5%
Cap. Rang	Q Spec.							
Cap<30pF:	Q≥400+20C							
Cap≥30pF:	Q≥1000							
Capacitance & Tan δ Test Condition	<p>Measured at the condition of 30~70% related humidity.</p> <p>For 25°C at ambient temperature</p> <table border="1"> <thead> <tr> <th>Cap. Rang</th> <th>Test Condition</th> </tr> </thead> <tbody> <tr> <td>Cap≤1000pF</td> <td>1.0±0.2Vrms, 1.0MHz±10%</td> </tr> <tr> <td>Cap>1000pF,</td> <td>1.0±0.2Vrms, 1.0kHz±10%</td> </tr> </tbody> </table>	Cap. Rang	Test Condition	Cap≤1000pF	1.0±0.2Vrms, 1.0MHz±10%	Cap>1000pF,	1.0±0.2Vrms, 1.0kHz±10%	<p>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.</p> <p>1.0±0.2Vrms, 1.0kHz±10% for C≤10μF; 0.5±0.2Vrms, 120Hz±20% for C>10μF, at 25°C ambient temperature</p>
Cap. Rang	Test Condition							
Cap≤1000pF	1.0±0.2Vrms, 1.0MHz±10%							
Cap>1000pF,	1.0±0.2Vrms, 1.0kHz±10%							
Insulation resistance at Ur	≥100GΩ or R•C≥ 500Ω•F whichever is smaller	≥10GΩ or R•C≥100Ω•F whichever is smaller						
Operating temperature	-55 to +125°C							
Capacitance characteristic	±30ppm / °C	±15%						
Termination	Cu (or Ag)/Ni/Sn (lead-free termination)							

7.CAPACITANCE RANGE(Con.)

7-1. C0G

Dimension		0603					0805							
Cap(pF)	code	25V	50V	100V	200V	250V	25V	50V	100V	200V	250V	500V	630V	1000V
0.5	0R5	S	S	S	S	S	A	A	A	A	A	A	A	
0.6	0R6	S	S	S	S	S	A	A	A	A	A	A	A	
0.7	0R7	S	S	S	S	S	A	A	A	A	A	A	A	
0.8	0R8	S	S	S	S	S	A	A	A	A	A	A	A	
0.9	0R9	S	S	S	S	S	A	A	A	A	A	A	A	
1.0	1R0	S	S	S	S	S	A	A	A	A	A	A	A	
1.2	1R2	S	S	S	S	S	A	A	A	A	A	A	A	
1.5	1R5	S	S	S	S	S	A	A	A	A	A	A	A	C
1.8	1R8	S	S	S	S	S	A	A	A	A	A	A	A	C
2.2	2R2	S	S	S	S	S	A	A	A	A	A	A	A	C
2.7	2R7	S	S	S	S	S	A	A	A	A	A	A	A	C
3.3	3R3	S	S	S	S	S	A	A	A	A	A	A	A	C
3.9	3R9	S	S	S	S	S	A	A	A	A	A	A	A	C
4.7	4R7	S	S	S	S	S	A	A	A	A	A	A	A	C
5.0	5R0	S	S	S	S	S	A	A	A	A	A	A	A	C
5.6	5R6	S	S	S	S	S	A	A	A	A	A	A	A	C
6.8	6R8	S	S	S	S	S	A	A	A	A	A	A	A	C
8.2	8R2	S	S	S	S	S	A	A	A	A	A	A	A	C
10	100	S	S	S	S	S	A	A	A	A	A	A	A	C
12	120	S	S	S	S	S	A	A	A	A	A	A	A	C
15	150	S	S	S	S	S	A	A	A	A	A	A	A	C
18	180	S	S	S	S	S	A	A	A	A	A	A	A	C
22	220	S	S	S	S	S	A	A	A	A	A	A	A	C
27	270	S	S	S	S	S	A	A	A	A	A	A	A	C
33	330	S	S	S	S	S	A	A	A	A	A	A	A	C
39	390	S	S	S	S	S	A	A	A	A	A	A	A	C
47	470	S	S	S	S	S	A	A	A	A	A	A	A	C
56	560	S	S	S	S	S	A	A	A	A	A	A	A	C
68	680	S	S	S	S	S	A	A	A	A	A	A	A	C
82	820	S	S	S	S	S	A	A	A	A	A	X	X	C
100	101	S	S	S	S	S	A	A	A	A	X	X	X	C
120	121	S	S	S	S	S	A	A	A	A	X	C	C	C
150	151	S	S	S	S	S	A	A	A	X	X	C	C	C
180	181	S	S	S	S	S	A	A	A	X	C	C	C	C
220	221	S	S	S	S	S	A	A	A	C	C	C	C	C
270	271	S	S	S	B	B	A	A	A	C	C	C	C	C
330	331	S	S	S	B	B	A	A	A	C	C	C	C	C
390	391	S	S	S	B	B	X	X	X	C	C	C	C	
470	471	S	S	S	B	B	X	X	X	C	C	C	C	
560	561	S	S	S	B	B	X	X	X	C	C	C	C	
680	681	S	S	S	B	B	X	X	X	C	C	C	C	
820	821	S	S	S	B	B	X	X	X	C	C	C	C	
1000	102	S	S	S			X	X	X	C	C	C	C	
1200	122	B	B				X	X	X	C	C	C	C	
1500	152						X	X	X	C	C	C	C	
1800	182						X	X	X	C	C	C	C	
2200	222						X	X	X	C	C	C	C	
2700	272						C	C	C	C	C			
3300	332						C	C	C	C	C			
3900	392						C	C	C					
4700	472						C	C	C					
5600	562						C	C	C					
6800	682						C	C	C					
8200	822						C	C						
10000	103						C	C						

7.CAPACITANCE RANGE(Con.)

7-1. C0G

Dimension		1206											1210										
Cap(pF)	code	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V
1.2	1R2	X	X	X																			
1.5	1R5	X	X	X	X	X	X	X	X	X													
1.8	1R8	X	X	X	X	X	X	X	X	X													
2.2	2R2	X	X	X	X	X	X	X	X	X													
2.7	2R7	X	X	X	X	X	X	X	X	X													
3.3	3R3	X	X	X	X	X	X	X	X	X													
3.9	3R9	X	X	X	X	X	X	X	X	X													
4.7	4R7	X	X	X	X	X	X	X	X	X													
5.0	5R0	X	X	X	X	X	X	X	X	X													
5.6	5R6	X	X	X	X	X	X	X	X	X													
6.8	6R8	X	X	X	X	X	X	X	X	X													
8.2	8R2	X	X	X	X	X	X	X	X	X													
10	100	X	X	X	X	X	X	X	X	X	E	M	M	M	M	M	M	M	M	M	M	M	F
12	120	X	X	X	X	X	X	X	X	X	E	M	M	M	M	M	M	M	M	M	M	M	F
15	150	X	X	X	X	X	X	X	X	X	E	M	M	M	M	M	M	M	M	M	M	M	F
18	180	X	X	X	X	X	X	X	X	X	E	M	M	M	M	M	M	M	M	M	M	M	F
22	220	X	X	X	X	X	X	X	X	X	E	M	M	M	M	M	M	M	M	M	M	M	F
27	270	X	X	X	X	X	X	X	X	X	E	M	M	M	M	M	M	M	M	M	M	M	F
33	330	X	X	X	X	X	X	X	M	M	E	M	M	M	M	M	M	M	M	M	M	M	F
39	390	X	X	X	X	X	X	X	M	M	E	M	M	M	M	M	M	M	M	M	M	M	F
47	470	X	X	X	X	X	X	M	M	M	E	M	M	M	M	M	M	M	M	M	M	M	F
56	560	X	X	X	X	X	X	M	C	C	E	M	M	M	M	M	M	M	M	C	C	C	F
68	680	X	X	X	X	X	X	M	C	C	E	M	M	M	M	M	M	M	M	C	C	C	F
82	820	X	X	X	X	X	X	C	C	C	E	M	M	M	M	M	M	M	M	C	C	C	F
100	101	X	X	X	X	X	X	C	C	C		M	M	M	M	M	M	M	C	C	C	C	F
120	121	X	X	X	X	X	X	C	E	E		M	M	M	M	M	M	M	C	C	C	C	F
150	151	X	X	X	X	X	X	C	E	E		M	M	M	M	M	M	M	C	E	E	E	F
180	181	X	X	X	X	X	X	E	E	E		M	M	M	M	M	M	M	C	E	E	E	F
220	221	X	X	X	X	X	X	E	E	E		M	M	M	M	M	M	M	E	E	E	E	F
270	271	X	X	X	X	M	M	M	E	E	E		M	M	M	M	M	M	E	E	E	E	G
330	331	X	X	X	X	M	M	M	E	E	E		M	M	M	M	M	M	E	E	E	E	
390	391	X	X	X	X	M	M	M	E	E	E		M	M	M	M	M	M	E	E	E	E	
470	471	X	X	X	M	M	M	M	E	E	E		M	M	M	M	M	M	E	E	E	E	
560	561	X	X	X	M	C	C	C	E				M	M	M	M	M	M	E	E	E	E	
680	681	X	X	X	M	C	C	C	E				M	M	M	M	M	M	E	E	E	E	
820	821	X	X	X	M	E	E	E	E				M	M	M	M	M	M	E	E	E	E	
1000	102	X	X	X	M	E	E	E	E				M	M	M	C	C	C	C	E	F	F	
1200	122	X	X	X	M	E	E	E	E				M	M	M	C	C	C	C	E	F	F	
1500	152	X	X	X	C	E	E	E					M	M	M	C	C	C	C	F	G	G	
1800	182	X	X	X	C	E	E	E					M	M	M	C	C	C	C	G	G	G	
2200	222	X	X	X	C	E	E	E					M	M	M	C	C	C	C	G			
2700	272	X	X	X	C	E	E	E					M	M	M	C	C	C	C	G			
3300	332	X	X	X	C	E	E	E					M	M	M	C	C	C	C	G			
3900	392	X	X	X	E	E	E	E					M	M	M	C	C	C	C	G			
4700	472	X	X	X	E	E	E	E					M	C	C	C	C	C	C				
5600	562	X	X	X	E	E	E	E					M	C	C	C	C	C	C				
6800	682	M	M	M	E	E	E						M	E	E	E	E	E	E				
8200	822	C	C	C	E	E							M	E	E	E	E	E	E				
10000	103	C	C	C	E	E							M	E	E	F	F	F	F				
12000	123	P	P	P									C	E	E	F	F	F	F				
15000	153	P	P	P									C	E	F	G	G	G	G				
18000	183	P	P										F	F	G	G	G	G					
22000	223	P	P										F	F	G	G	G						
27000	273												F	G	G	G	G						
33000	333												F	G	G	G	G						
39000	393												G	G	G								
47000	473												G	G	G								
56000	563												G	G									
68000	683												G	G									

7. CAPACITANCE RANGE (Con.)

7-1. C0G

Dimension		1808											1812										
Cap(pF)	code	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V
2.2	2R2	C	C	C	C	C	C	C	C	C	C	C											
2.7	2R7	C	C	C	C	C	C	C	C	C	C	C											
3.3	3R3	C	C	C	C	C	C	C	C	C	C	C											
3.9	3R9	C	C	C	C	C	C	C	C	C	C	C											
4.7	4R7	C	C	C	C	C	C	C	C	C	C	C											
5.0	5R0	C	C	C	C	C	C	C	C	C	C	C											
5.6	5R6	C	C	C	C	C	C	C	C	C	C	C											
6.8	6R8	C	C	C	C	C	C	C	C	C	C	C											
8.2	8R2	C	C	C	C	C	C	C	C	C	C	C											
10	100	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
12	120	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
15	150	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
18	180	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
22	220	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
27	270	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
33	330	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
39	390	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
47	470	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
56	560	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
68	680	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
82	820	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
100	101	C	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	C
120	121	C	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	C
150	151	C	C	C	C	C	C	C	C	F	F	F	C	C	C	C	C	C	C	C	C	C	C
180	181	C	C	C	C	C	C	C	C	F	F	F	C	C	C	C	C	C	C	C	C	C	F
220	221	C	C	C	C	C	C	C	C	F	F	F	C	C	C	C	C	C	C	C	C	C	F
270	271	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	C	C	F	F	F
330	331	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	C	C	F	F	F
390	391	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	C	C	F	F	F
470	471	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	C	F	F	F	F
560	561	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	C	F	F	F	F
680	681	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	C	F	F	F	F
820	821	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	F	F	F	F	G
1000	102	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	F	F	F	F	G
1200	122	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	F	F	F	F	
1500	152	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	F	F	F	F	
1800	182	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	F	F	F	F	
2200	222	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	F	F	F	F	
2700	272	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	F	G	G	G	
3300	332	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	F	G	G	G	
3900	392	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	G				
4700	472	C	C	C	C	C	F	F	F	F	F	F	C	C	C	C	C	C	G				
5600	562	C	C	C	E	E	F	F	F	F	F	F	C	C	C	C	C	C	G				
6800	682	C	C	C	E	E	F	F	F	F	F	F	C	C	C	C	C	C					
8200	822	C	C	E	F	F	F	F	F	F	F	F	C	C	C	C	C	C					
10000	103	C	C	E	F	F	F	F	F	F	F	F	C	C	C	C	C	C					
12000	123	E	E	F	F	F	F	F	F	F	F	F	C	C	C	E	E	E	E				
15000	153	E	E	F	F	F	F	F	F	F	F	F	C	C	C	E	E	E	E				
18000	183	F	F	F	F	F	F	F	F	F	F	F	C	C	E	F	F	F	F				
22000	223	F	F	F	F	F	F	F	F	F	F	F	C	C	E	F	F	F	F				
27000	273	F	F	F	F	F	F	F	F	F	F	F	C	C	F	G	G	G	G				
33000	333	F	F	F	F	F	F	F	F	F	F	F	C	C	F	G	G	G	G				
39000	393	F	F	F	F	F	F	F	F	F	F	F	F	F	G	G	G	G					
47000	473	F	F	F	F	F	F	F	F	F	F	F	F	F	G	G	G	G					
56000	563	F	F	F	F	F	F	F	F	F	F	F	G	G	G	G	G	G					
68000	683	F	F	F	F	F	F	F	F	F	F	F	G	G	G	G	G	G					
82000	823	F	F	F	F	F	F	F	F	F	F	F	G	G	G	G	G	G					
100000	104	F	F	F	F	F	F	F	F	F	F	F	G	G	G	G	G	G					
120000	124	F	F	F	F	F	F	F	F	F	F	F	G	G	G	G	G	G					
150000	154	F	F	F	F	F	F	F	F	F	F	F	G	G	G	G	G	G					

7.CAPACITANCE RANGE(Con.)

7-1. C0G

Dimension		1825											2220											
Cap(pF)	code	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	4000V
10	100	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F		
12	120	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F		
15	150	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F		
18	180	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F		
22	220	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F		
27	270	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
33	330	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
39	390	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
47	470	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
56	560	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
68	680	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
82	820	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
100	101	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
120	121	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
150	151	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
180	181	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
220	221	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	F	
270	271	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	F	G	
330	331	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	G	G	
390	391	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	G		
470	471	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	G		
560	561	E	E	E	E	E	E	E	F	F	F	F	E	E	E	E	E	E	F	F	F	G		
680	681	E	E	E	E	E	E	E	F	F	F	G	E	E	E	E	E	E	F	F	F	G		
820	821	E	E	E	E	E	E	E	F	F	F	G	E	E	E	E	E	E	F	F	F	G		
1000	102	E	E	E	E	E	E	E	F	F	F	G	E	E	E	E	E	E	F	F	F	G		
1200	122	E	E	E	E	E	E	E	F	F	F	G	E	E	E	E	E	E	G	G	G	G		
1500	152	E	E	E	E	E	E	E	F	G	G	G	E	E	E	E	E	E	G	G	G	G		
1800	182	E	E	E	E	E	E	E	F	G	G	G	E	E	E	E	E	E	G	G	G	G		
2200	222	E	E	E	E	E	E	E	F	G	G	G	E	E	E	E	E	E	G	G	G	G		
2700	272	E	E	E	E	E	E	E	F	G	G	G	E	E	E	E	E	E	G	G	G	G		
3300	332	E	E	E	E	E	E	E	F	G	G		E	E	E	E	E	E	G	G	G			
3900	392	E	E	E	E	E	E	E	G	G	G		E	E	E	E	E	E	G	G	G			
4700	472	E	E	E	E	E	E	E	G	G	G		E	E	E	E	E	E	G	G	G			
5600	562	E	E	E	E	E	E	E	G	G	G		E	E	E	E	E	E	G	G	G			
6800	682	E	E	E	E	E	E	E	G	G	G		E	E	E	E	E	E	G	G	G			
8200	822	E	E	E	E	E	E	E	G	G	G		E	E	E	E	E	E	G	G	G			
10000	103	E	E	E	E	E	E	E	G				E	E	E	E	E	E	G					
12000	123	E	E	E	E	E	E	E	G				E	E	E	E	E	E	G					
15000	153	E	E	E	E	E	E	E					E	E	E	E	E	E						
18000	183	E	E	E	E	E	E	E					E	E	E	E	E	E						
22000	223	E	E	E	E	E	E	E					E	E	E	E	E	E						
27000	273	E	E	E	E	E	F	F					E	E	E	E	E	F	F					
33000	333	E	E	E	E	E	F	F					E	E	E	F	F	F	F					
39000	393	E	E	E	F	F	G	G					E	E	E	F	F	G	G					
47000	473	E	E	E	F	F	G	G					E	E	E	G	G	G	G					
56000	563	E	E	F	G	G	G	G					E	E	F	G	G	G	G					
68000	683	E	E	F	G	G	G	G					F	F	F	G	G	G						
82000	823	F	F	G	G	G							G	G	G	G	G							
100000	104	G	G	G	G	G							G	G	G	G	G							
120000	124	G	G	G									G	G	G									
150000	154	G	G										G	G	G									
180000	184												G	G	G									
220000	224												G	G										
270000	274												G	G										

7.CAPACITANCE RANGE(Con.)

7-1. C0G

Dimension		2225											
Cap(pF)	code	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	4000V
10	100	E	E	E	E	E	E	E	F	F	F	F	
12	120	E	E	E	E	E	E	E	F	F	F	F	
15	150	E	E	E	E	E	E	E	F	F	F	F	
18	180	E	E	E	E	E	E	E	F	F	F	F	
22	220	E	E	E	E	E	E	E	F	F	F	F	
27	270	E	E	E	E	E	E	E	F	F	F	F	F
33	330	E	E	E	E	E	E	E	F	F	F	F	F
39	390	E	E	E	E	E	E	E	F	F	F	F	F
47	470	E	E	E	E	E	E	E	F	F	F	F	F
56	560	E	E	E	E	E	E	E	F	F	F	F	F
68	680	E	E	E	E	E	E	E	F	F	F	F	F
82	820	E	E	E	E	E	E	E	F	F	F	F	F
100	101	E	E	E	E	E	E	E	F	F	F	F	F
120	121	E	E	E	E	E	E	E	F	F	F	F	F
150	151	E	E	E	E	E	E	E	F	F	F	F	F
180	181	E	E	E	E	E	E	E	F	F	F	F	F
220	221	E	E	E	E	E	E	E	F	F	F	F	F
270	271	E	E	E	E	E	E	E	F	F	F	F	G
330	331	E	E	E	E	E	E	E	F	F	F	F	
390	391	E	E	E	E	E	E	E	F	F	F	F	
470	471	E	E	E	E	E	E	E	F	F	F	F	
560	561	E	E	E	E	E	E	E	F	F	F	F	
680	681	E	E	E	E	E	E	E	F	F	F	F	
820	821	E	E	E	E	E	E	E	F	G	G	G	
1000	102	E	E	E	E	E	E	E	F	G	G	G	
1200	122	E	E	E	E	E	E	E	F	G	G	G	
1500	152	E	E	E	E	E	E	E	F	G	G	G	
1800	182	E	E	E	E	E	E	E	F	G	G	G	
2200	222	E	E	E	E	E	E	E	F	G	G	G	
2700	272	E	E	E	E	E	E	E	F	G	G	G	
3300	332	E	E	E	E	E	E	E	F	G	G	G	
3900	392	E	E	E	E	E	E	E	F	G	G		
4700	472	E	E	E	E	E	E	E	F	G	G		
5600	562	E	E	E	E	E	E	E	G	G	G		
6800	682	E	E	E	E	E	E	E	G	G	G		
8200	822	E	E	E	E	E	E	E	G	G	G		
10000	103	E	E	E	E	E	E	E	G	G	G		
12000	123	E	E	E	E	E	E	E	G				
15000	153	E	E	E	E	E	E	E					
18000	183	E	E	E	E	E	E	E					
22000	223	E	E	E	E	E	E	E					
27000	273	E	E	E	E	E	E	E					
33000	333	E	E	E	E	E	E	E					
39000	393	E	E	E	F	F	F	F					
47000	473	E	E	E	F	F	F	F					
56000	563	E	E	E	G	G	G	G					
68000	683	E	E	F	G	G	G	G					
82000	823	F	F	F	G	G	G	G					
100000	104	F	F	G	G	G	G						
120000	124	G	G	G	G	G							
150000	154	G	G	G	G	G							
180000	184	G	G	G									
220000	224	G	G	G									
270000	274	G	G										
330000	334	G	G										

7.CAPACITANCE RANGE(Con.)

7-2. X7R

Dimension		0603					0805							
Cap(pF)	code	25V	50V	100V	200V	250V	25V	50V	100V	200V	250V	500V	630V	1000V
100	101	S	S	S	B	B	X	X	X	X	X	X	X	X
120	121	S	S	S	B	B	X	X	X	X	X	X	X	X
150	151	S	S	S	B	B	X	X	X	X	X	X	X	X
180	181	S	S	S	B	B	X	X	X	X	X	X	X	X
220	221	S	S	S	B	B	X	X	X	X	X	X	X	X
270	271	S	S	S	B	B	X	X	X	X	X	X	X	X
330	331	S	S	S	B	B	X	X	X	X	X	X	X	X
390	391	S	S	S	B	B	X	X	X	X	X	X	X	X
470	471	S	S	S	B	B	X	X	X	X	X	X	X	X
560	561	S	S	S	B	B	X	X	X	X	X	X	X	X
680	681	S	S	S	B	B	X	X	X	X	X	X	X	X
820	821	S	S	S	B	B	X	X	X	X	X	X	X	X
1000	102	S	S	S	B	B	X	X	X	X	X	X	X	X
1200	122	S	S	S	B	B	X	X	X	X	X	X	X	X
1500	152	S	S	S	B	B	X	X	X	X	X	X	X	C
1800	182	S	S	S	B	B	X	X	X	X	X	X	X	C
2200	222	S	S	S	B	B	X	X	X	X	X	X	X	C
2700	272	S	S	S	B	B	X	X	X	X	X	X	X	C
3300	332	S	S	S	B	B	X	X	X	X	X	X	X	C
3900	392	S	S	S	B	B	X	X	X	X	X	X	X	C
4700	472	S	S	S	B	B	X	X	X	X	X	C	C	C
5600	562	S	S	S	B	B	X	X	X	X	X	C	C	C
6800	682	S	S	S	B	B	X	X	X	X	X	C	C	C
8200	822	S	S	S	B	B	X	X	X	C	C	C	C	C
10000	103	S	S	S	B	B	X	X	X	C	C	C	C	
12000	123	S	S	B	B	B	X	X	X	C	C	C	C	
15000	153	S	S	B	B	B	X	X	X	C	C	C	C	
18000	183	S	S	B			X	X	X	C	C	C	C	
22000	223	S	S	B			X	X	X	C	C	C	C	
27000	273	S	S	B			X	X	C	C	C			
33000	333	S	B	B			X	X	C	C	C			
39000	393	S	B	B			X	X	C	C				
47000	473	S	B	B			X	X	C	C				
56000	563	S	B	B			X	X	C	C				
68000	683	S	B	B			X	X	C	C				
82000	823	S	B				X	X	C					
100000	104	S	B				X	X	C					
120000	124						X	C	C					
150000	154						C	C	C					
180000	184						C	C	C					
220000	224						C	C	C					
270000	274						C	I	C					
330000	334						C	I	C					
390000	394						C	I	C					
470000	474						C	I	I					
560000	564						C	I						
680000	684						C	I						
820000	824						C	I						
1000000	105						C	I						

7.CAPACITANCE RANGE(Con.)

7-2. X7R

Dimension		1206										1210									
Cap(pF)	code	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V
100	101	X	X	X	C	C	C	C	C	C											
120	121	X	X	X	C	C	C	C	C	C											
150	151	X	X	X	C	C	C	C	C	C											
180	181	X	X	X	C	C	C	C	C	C											
220	221	X	X	X	C	C	C	C	C	C	M	M	M	M	M	C	C	C	E	E	
270	271	X	X	X	C	C	C	C	C	C	M	M	M	M	M	C	C	C	E	E	
330	331	X	X	X	C	C	C	C	C	C	M	M	M	M	M	C	C	C	E	E	
390	391	X	X	X	C	C	C	C	C	C	M	M	M	M	M	C	C	C	E	E	
470	471	X	X	X	C	C	C	C	C	C	M	M	M	M	M	C	C	C	E	E	
560	561	X	X	X	C	C	C	C	C	C	M	M	M	M	M	C	C	C	E	E	
680	681	X	X	X	C	C	C	C	C	C	M	M	M	M	M	C	C	C	E	E	
820	821	X	X	X	C	C	C	C	C	C	M	M	M	M	M	C	C	C	E	E	
1000	102	X	X	X	C	C	C	C	C	C	M	M	M	M	M	C	C	C	E	E	
1200	122	X	X	X	C	C	C	C	C	E	E	M	M	M	M	M	C	C	C	F	F
1500	152	X	X	X	C	C	C	C	C	E	E	M	M	M	M	M	C	C	C	F	F
1800	182	X	X	X	C	C	C	C	C	E	E	M	M	M	M	M	C	C	C	F	F
2200	222	X	X	X	C	C	C	C	C	E	E	M	M	M	M	M	C	C	C	F	F
2700	272	X	X	X	C	C	C	C	C	E	E	M	M	M	M	M	C	C	C	G	G
3300	332	X	X	X	C	C	C	C	C	E	E	M	M	M	M	M	C	C	C	G	G
3900	392	X	X	X	C	C	C	C	C	E		M	M	M	M	M	C	C	E	G	G
4700	472	X	X	X	C	C	C	C	C	E		M	M	M	M	M	C	C	E	G	G
5600	562	X	X	X	C	C	C	C	C			M	M	M	M	M	C	C	E	G	G
6800	682	X	X	X	C	C	C	C	C			M	M	M	M	M	C	C	E	G	G
8200	822	X	X	X	C	C	C	C	C			M	M	M	M	M	C	C	E	G	G
10000	103	X	X	X	C	C	C	C	C			M	M	M	M	M	C	C	E		
12000	123	X	X	X	C	C	C	C	E			M	M	M	M	M	C	C	E		
15000	153	X	X	X	C	C	C	C	E			M	M	M	M	M	C	C	E		
18000	183	X	X	X	C	C	C	C	E			M	M	M	M	M	C	C	E		
22000	223	X	X	X	C	C	E	E	E			M	M	M	M	M	C	C	E		
27000	273	X	X	X	C	C	E	E				M	M	M	M	M	E	E	E		
33000	333	X	X	X	E	E	E	E				M	M	M	M	M	E	E	E		
39000	393	X	X	X	E	E	E	E				M	M	M	M	M	E	E	F		
47000	473	X	X	X	E	E	E	E				M	M	M	C	C	E	E	G		
56000	563	X	X	X	E	E						M	M	M	C	C	E	E	G		
68000	683	X	X	X	E	E						M	M	M	E	E	F	F	G		
82000	823	X	X	C	E	E						M	M	M	E	E	G	G			
100000	104	X	X	C	E	E						M	M	M	E	E	G	G			
120000	124	X	X	C								M	M	M	E	E	G	G			
150000	154	M	M	E								M	M	C	G	G	G	G			
180000	184	M	M	E								M	M	C	G	G					
220000	224	M	M	E								M	M	C	G	G					
270000	274	M	C	E								M	M	E	G	G					
330000	334	M	C	E								M	C	E	G	G					
390000	394	J	P	E								M	C	G	G	G					
470000	474	J	P	E								M	C	G	G	G					
560000	564	J	P	P								C	C	G	G	G					
680000	684	J	P	P								C	C	F	G	G					
820000	824	J	P	P								C	C	F							
1000000	105	J	P	P								C	C	F							
1200000	125	P	P	P								C	G	G							
1500000	155	P	P									E	G	G							
1800000	185	P	P									E	G	G							
2200000	225	P	P									E	G	G							
2700000	275											E	G	G							
3300000	335											E	G	G							
3900000	395											F	G								
4700000	475											F	G								

7.CAPACITANCE RANGE(Con.)

7-2. X7R

Dimension		1808												1812											
Cap(pF)	code	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	4000V	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	4000V
150	151	C	C	C	C	C	C	C	C	C	C	C	F												
180	181	C	C	C	C	C	C	C	C	C	C	C	F												
220	221	C	C	C	C	C	C	C	C	C	C	C	F												
270	271	C	C	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	E	F
330	331	C	C	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	E	F
390	391	C	C	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	E	F
470	471	C	C	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	E	F
560	561	C	C	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	E	F
680	681	C	C	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	F	F
820	821	C	C	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	F	F
1000	102	C	C	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	F	F
1200	122	C	C	C	C	C	C	C	C	F	F	F		C	C	C	C	C	C	C	C	C	C	F	G
1500	152	C	C	C	C	C	C	C	C	F	F	F		C	C	C	C	C	C	C	C	C	C	F	G
1800	182	C	C	C	C	C	C	C	C	F	F	F		C	C	C	C	C	C	C	C	C	E	E	G
2200	222	C	C	C	C	C	C	C	C	F	F	F		C	C	C	C	C	C	C	C	C	E	E	G
2700	272	C	C	C	C	C	C	C	C	F	F			C	C	C	C	C	C	C	C	C	E	E	G
3300	332	C	C	C	C	C	C	C	C	F	F			C	C	C	C	C	C	C	C	C	F	F	G
3900	392	C	C	C	C	C	C	C	C	F	F			C	C	C	C	C	C	C	C	C	F	F	G
4700	472	C	C	C	C	C	C	C	C	F	F			C	C	C	C	C	C	C	C	C	F	F	G
5600	562	C	C	C	C	C	F	F	F	F	F			C	C	C	C	C	C	C	C	C	G	G	
6800	682	C	C	C	C	C	F	F	F	F	F			C	C	C	C	C	C	C	C	C	G	G	
8200	822	C	C	C	C	C	F	F	F					C	C	C	C	C	C	C	C	C	G	G	
10000	103	C	C	C	C	C	F	F	F					C	C	C	C	C	C	C	E	G	G		
12000	123	E	E	E	E	E	F	F	F					C	C	C	C	C	C	C	F				
15000	153	E	E	E	E	E	F	F	F					C	C	C	C	C	C	C	F				
18000	183	E	E	E	E	E	F	F	F					C	C	C	C	C	C	C	G				
22000	223	E	E	E	E	E	F	F	F					C	C	C	C	C	C	C	G				
27000	273	E	E	E	E	E	F	F	F					C	C	C	C	C	C	C	G				
33000	333	E	E	E	E	E	F	F	F					C	C	C	C	C	C	C	G				
39000	393	E	E	E	E	E	F	F	F					C	C	C	C	C	C	C	G				
47000	473	E	E	E	E	E	F	F	F					C	C	C	C	C	C	C	G				
56000	563	E	E	E	E	E	F	F	F					C	C	C	C	F	F	G					
68000	683	E	E	E	E	E	F	F						C	C	C	C	F	F	G					
82000	823	E	E	E	E	E	F	F						C	C	C	C	F	F	G					
100000	104	E	E	E	E	E								C	C	E	C	C	F	F	G				
120000	124	E	E	E	E	E								C	C	E	C	C	G	G					
150000	154	E	E	E	E	E								C	C	E	F	F	G	G					
180000	184	E	E	E	F	F								C	C	E	F	F	G	G					
220000	224	E	E	E										C	C	E	F	F	G	G					
270000	274	F	F	F										C	C	E	F	F	G						
330000	334	F	F	F										C	C	E	F	F	G						
390000	394	F	F	F										C	C	E	F	F	G						
470000	474	F	F											C	C	E	F	F	G						
560000	564	F	F											C	C	F	G	G							
680000	684	F	F											C	F	F	G	G							
820000	824													C	F	F	G	G							
1000000	105													C	F	F	G	G							
1200000	125													C	F	F									
1500000	155													C	F	F									
1800000	185													E	F	F									
2200000	225													E	F	G									
2700000	275													F	F	G									
3300000	335													F	F	G									
3900000	395													F	F	G									
4700000	475													G	G	G									
5600000	565													G	G	G									
6800000	685													G	G										
8200000	825													G	G										
10000000	106													G	G										

7.CAPACITANCE RANGE(Con.)

7-2. X7R

Dimension		1825												2211	
Cap(pF)	code	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	4000V	3000V	4000V
270	271												F	F	F
330	331												F	F	F
390	391												F	F	F
470	471												F	F	F
560	561												F	F	F
680	681												F	F	F
820	821												F	F	F
1000	102	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	G	G	G
1500	152	F	F	F	F	F	F	F	F	F	F	F	G	G	G
1800	182	F	F	F	F	F	F	F	F	F	F	F	G	G	G
2200	222	F	F	F	F	F	F	F	F	F	F	F		G	
2700	272	F	F	F	F	F	F	F	F	F	F	F		G	
3300	332	F	F	F	F	F	F	F	F	F	F	F		G	
3900	392	F	F	F	F	F	F	F	F	F	F	F			
4700	472	F	F	F	F	F	F	F	F	F	F	F			
5600	562	F	F	F	F	F	F	F	F	F	F	G			
6800	682	F	F	F	F	F	F	F	F	F	F	G			
8200	822	F	F	F	F	F	F	F	F	F	F	G			
10000	103	F	F	F	F	F	F	F	F	F	F	G			
12000	123	F	F	F	F	F	F	F	F	G	G	H			
15000	153	F	F	F	F	F	F	F	F	G	G	H			
18000	183	F	F	F	F	F	F	F	F	G	G	H			
22000	223	F	F	F	F	F	F	F	F	G	G				
27000	273	F	F	F	F	F	F	F	F	H	H				
33000	333	F	F	F	F	F	F	F	F	H	H				
39000	393	F	F	F	F	F	F	F	F	H	H				
47000	473	F	F	F	F	F	F	F	F	H	H				
56000	563	F	F	F	F	F	F	F	F	H	H				
68000	683	F	F	F	F	F	F	F	F						
82000	823	F	F	F	F	F	F	F	G						
100000	104	F	F	F	F	F	F	F	G						
120000	124	F	F	F	F	F	F	F	H						
150000	154	F	F	F	F	F	F	F	H						
180000	184	F	F	F	F	F	F	F	H						
220000	224	F	F	F	F	F	F	F	H						
270000	274	F	F	F	F	F	F	F	H						
330000	334	F	F	F	F	F	F	F	H						
390000	394	F	F	F	F	F	F	F	F						
470000	474	F	F	F	F	F	F	F	F						
560000	564	F	F	F	F	F	G	G							
680000	684	F	F	F	F	F	G	G							
820000	824	F	F	F	F	F	H	H							
1000000	105	F	F	F	F	F									
1200000	125	F	F	F	G	G									
1500000	155	F	F	F	G	G									
1800000	185	F	F	F	G	G									
2200000	225	F	F	F	G	G									
2700000	275	F	F	F	H	H									
3300000	335	F	F	F											
3900000	395	F	F	F											
4700000	475	F	F	G											
5600000	565	G	G	G											
6800000	685	G	G	G											
8200000	825	G	G	G											
10000000	106	G	G	G											

7.CAPACITANCE RANGE(Con.)

7-2. X7R

Dimension		2220											2225												
Cap(pF)	code	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	4000V	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	4000V
100	101																								
120	121																								
150	151																								
180	181																								
220	221																								
270	271												F												F
330	331												F												F
390	391												F												F
470	471												F												F
560	561												F												F
680	681												F												F
820	821												F												F
1000	102	F	F	F	F	F	F	F	F	F	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	G	F	F	F	F	F	F	F	F	F	F	F	G
1500	152	F	F	F	F	F	F	F	F	F	F	F	G	F	F	F	F	F	F	F	F	F	F	F	G
1800	182	F	F	F	F	F	F	F	F	F	F	F	G	F	F	F	F	F	F	F	F	F	F	F	G
2200	222	F	F	F	F	F	F	F	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	F	F	F	F	F	F	F	
3300	332	F	F	F	F	F	F	F	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	F	F	F	F	F	F	F	
4700	472	F	F	F	F	F	F	F	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	F	F	F	F	F	F	F	G
6800	682	F	F	F	F	F	F	F	F	F	F	G		F	F	F	F	F	F	F	F	F	F	F	G
8200	822	F	F	F	F	F	F	F	F	F	G	G		F	F	F	F	F	F	F	F	F	F	F	G
10000	103	F	F	F	F	F	F	F	F	G	G	G		F	F	F	F	F	F	F	F	F	F	F	G
12000	123	F	F	F	F	F	F	F	F	G	G	H		F	F	F	F	F	F	F	F	G	G	G	
15000	153	F	F	F	F	F	F	F	F	G	G	H		F	F	F	F	F	F	F	F	G	G	G	
18000	183	F	F	F	F	F	F	F	F	H	H	H		F	F	F	F	F	F	F	F	G	G	H	
22000	223	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	G	G		
27000	273	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	G	G		
33000	333	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	G	G		
39000	393	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	G	H		
47000	473	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	G	H		
56000	563	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	G	H		
68000	683	F	F	F	F	F	F	F	G					F	F	F	F	F	F	F	F	G			
82000	823	F	F	F	F	F	F	F	G					F	F	F	F	F	F	F	F	G			
100000	104	F	F	F	F	F	F	F	G					F	F	F	F	F	F	F	F	G	G		
120000	124	F	F	F	F	F	F	F	G					F	F	F	F	F	F	F	F	H			
150000	154	F	F	F	F	F	F	F	H					F	F	F	F	F	F	F	F	H			
180000	184	F	F	F	F	F	F	F	H					F	F	F	F	F	F	F	F	H			
220000	224	F	F	F	F	F	F	F	H					F	F	F	F	F	F	F	F	H			
270000	274	F	F	F	F	F	F	F	H					F	F	F	F	F	F	F	F	H			
330000	334	F	F	F	F	F	F	F	H					F	F	F	F	F	F	F	F	H			
390000	394	F	F	F	F	F	F	F	H					F	F	F	F	F	F	F	F	H			
470000	474	F	F	F	F	F	F	F						F	F	F	F	F	F	F	F				
560000	564	F	F	F	F	F	G	G						F	F	F	F	F	F	F	F				
680000	684	F	F	F	F	F	G	G						F	F	F	F	F	F	F	F				
820000	824	F	F	F	F	F	H	H						F	F	F	F	F	F	F	G	G			
1000000	105	F	F	F	F	F	H	H						F	F	F	F	F	F	G	G				
1200000	125	F	F	F	G	G								F	F	F	G	G	H	H					
1500000	155	F	F	F	G	G								F	F	F	G	G	H	H					
1800000	185	F	F	F	G	G								F	F	F	G	G							
2200000	225	F	F	F	G	G								F	F	F	G	G							
2700000	275	F	F	F	H	H								F	F	F	G	G							
3300000	335	F	F	F										F	F	F	H	H							
3900000	395	F	F	F										F	F	F	H	H							
4700000	475	F	F	F										F	F	G									
5600000	565	F	F	F										F	F	F									
6800000	685	F	F	F										F	F	F									
8200000	825	G	G	G										G	G	G									
10000000	106	G	G	G										G	G	G									
12000000	126	H	H											H	H										
15000000	156	H	H											H	H										
18000000	186	H	H											H	H										
22000000	226	H	H											H	H										

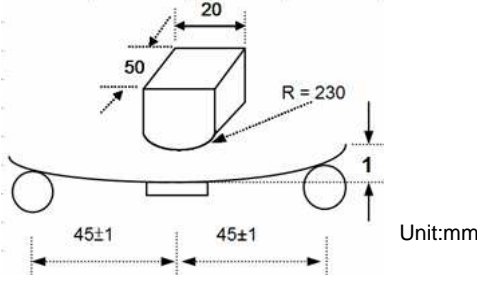
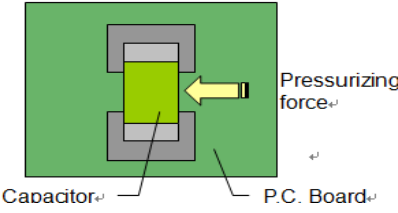
8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																										
1.	Visual and Dimensions	---	<ul style="list-style-type: none"> * No remarkable defect. * Dimensions to confirm to individual specification sheet. 																										
2.	Capacitance	Class I: C0G	<ul style="list-style-type: none"> * Shall not exceed the limits given in the detailed spec. <table border="1"> <thead> <tr> <th>Dielectric</th> <th>Rated vol.(V)</th> <th>Q/D.F.</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Class I</td> <td rowspan="2">All</td> <td>Q\geq1000</td> <td>Cap\geq30pF</td> </tr> <tr> <td>Q\geq400+20C</td> <td>Cap$<$30pF</td> </tr> <tr> <td rowspan="3">Class II</td> <td rowspan="2">25V</td> <td>D.F. $<$ 3.5%</td> <td></td> </tr> <tr> <td>D.F. $<$ 2.5%</td> <td></td> </tr> <tr> <td>\geq50</td> <td>D.F. $<$ 3.0%</td> <td>0603\geq0.047μF; 0805\geq0.18μF, 1206\geq0.47μF</td> </tr> </tbody> </table>	Dielectric	Rated vol.(V)	Q/D.F.	Remark	Class I	All	Q \geq 1000	Cap \geq 30pF	Q \geq 400+20C	Cap $<$ 30pF	Class II	25V	D.F. $<$ 3.5%		D.F. $<$ 2.5%		\geq 50	D.F. $<$ 3.0%	0603 \geq 0.047 μ F; 0805 \geq 0.18 μ F, 1206 \geq 0.47 μ F							
Dielectric	Rated vol.(V)	Q/D.F.		Remark																									
Class I	All	Q \geq 1000	Cap \geq 30pF																										
		Q \geq 400+20C	Cap $<$ 30pF																										
Class II	25V	D.F. $<$ 3.5%																											
		D.F. $<$ 2.5%																											
	\geq 50	D.F. $<$ 3.0%	0603 \geq 0.047 μ F; 0805 \geq 0.18 μ F, 1206 \geq 0.47 μ F																										
3.	Q/ D.F. (Dissipation Factor)	Cap \leq 1000pF, 1.0 \pm 0.2Vrms, 1MHz \pm 10% Cap $>$ 1000pF, 1.0 \pm 0.2Vrms, 1KHz \pm 10% Class II: (X7R) 1.0 \pm 0.2Vrms, 1.0kHz \pm 10% for C \leq 10 μ F 0.5 \pm 0.2Vrms, 120Hz \pm 20% for C $>$ 10 μ F																											
4.	Temperature Coefficient	With no electrical load. <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> </thead> <tbody> <tr> <td>C0G</td> <td>-55~125$^{\circ}$C at 25$^{\circ}$C</td> </tr> <tr> <td>X7R</td> <td>-55~125$^{\circ}$C at 25$^{\circ}$C</td> </tr> </tbody> </table>	T.C.	Operating Temp	C0G	-55~125 $^{\circ}$ C at 25 $^{\circ}$ C	X7R	-55~125 $^{\circ}$ C at 25 $^{\circ}$ C	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>C0G</td> <td>Within \pm30ppm/$^{\circ}$C</td> </tr> <tr> <td>X7R</td> <td>Within \pm15%</td> </tr> </tbody> </table>	T.C.	Capacitance Change	C0G	Within \pm 30ppm/ $^{\circ}$ C	X7R	Within \pm 15%														
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6.	Solderability	<ul style="list-style-type: none"> * Solder temperature: 235\pm5$^{\circ}$C for (0603~1210) * Solder temperature: 245\pm5$^{\circ}$C for (1808~2225) * Dipping time: 2\pm0.5 sec. 	75% min. coverage of all metalized area.																										
7.	Dielectric Strength	<table border="1"> <thead> <tr> <th>Rated vol.(V)</th> <th>Condition</th> </tr> </thead> <tbody> <tr> <td>\leq 250</td> <td>2 times of U_R</td> </tr> <tr> <td>250<V\leq500</td> <td>1.5 times of U_R</td> </tr> <tr> <td>630\leqV\leq3000V</td> <td>1.2 times of U_R</td> </tr> <tr> <td>3000<V\leq5000V</td> <td>1.1 times of U_R</td> </tr> <tr> <td>>5000V</td> <td>1.0 times of U_R</td> </tr> </tbody> </table> <ul style="list-style-type: none"> * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA. 	Rated vol.(V)	Condition	\leq 250	2 times of U _R	250<V \leq 500	1.5 times of U _R	630 \leq V \leq 3000V	1.2 times of U _R	3000<V \leq 5000V	1.1 times of U _R	>5000V	1.0 times of U _R	<ul style="list-style-type: none"> * No evidence of damage or flashover during test. 														
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8.	Resistance to Soldering Heat	<ul style="list-style-type: none"> * Solder temperature: 260\pm5$^{\circ}$C * Dipping time: 10\pm1 sec * Preheating: 120 to 150$^{\circ}$C for 1 minute before immerse the capacitor in a eutectic solder. * Before initial measurement (Class II only): Perform 150+0/-10$^{\circ}$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). 	<ul style="list-style-type: none"> * No remarkable damage. <table border="1"> <thead> <tr> <th>Dielectric</th> <th>Cap Change</th> <th>Q/D.F. & IR</th> </tr> </thead> <tbody> <tr> <td>Class I(C0G)</td> <td>Within \pm2.5% or \pm0.25pF whichever is larger.</td> <td rowspan="2">To meet Initial requirement</td> </tr> <tr> <td>Class II(X7R)</td> <td>within \pm7.5%</td> </tr> </tbody> </table> <ul style="list-style-type: none"> * 25% max. leaching on each edge. 	Dielectric	Cap Change	Q/D.F. & IR	Class I(C0G)	Within \pm 2.5% or \pm 0.25pF whichever is larger.	To meet Initial requirement	Class II(X7R)	within \pm 7.5%																		
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9.	Temperature Cycle	<ul style="list-style-type: none"> * Conduct the five cycles according to the temperatures and time. <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. ($^{\circ}$C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating emp. +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$^{\circ}$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. ($^{\circ}$ C)	Time (min.)	1	Min. operating emp. +0/-3	30 \pm 3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30 \pm 3	4	Room temp.	2~3	<ul style="list-style-type: none"> * No remarkable damage. <table border="1"> <thead> <tr> <th>Dielectric</th> <th>I.R</th> <th>Cap Change</th> <th>Q/D.F</th> </tr> </thead> <tbody> <tr> <td>Class I(C0G)</td> <td rowspan="2">To meet Initial requirement</td> <td>Within \pm2.5% or \pm0.25pF whichever is larger.</td> <td>\leq 1.0(Q) \times Initial requirement</td> </tr> <tr> <td>Class II(X7R)</td> <td>within \pm7.5%</td> <td>\leq 1.5(D.F.) \times Initial requirement</td> </tr> </tbody> </table>	Dielectric	I.R	Cap Change	Q/D.F	Class I(C0G)	To meet Initial requirement	Within \pm 2.5% or \pm 0.25pF whichever is larger.	\leq 1.0(Q) \times Initial requirement	Class II(X7R)	within \pm 7.5%	\leq 1.5(D.F.) \times Initial requirement
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8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																															
10.	Humidity (Damp Heat) Steady State	* Test temp.: 40±2°C * Humidity: 90~95%RH * Test time: 500+24/-0 hrs. * Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).	* No remarkable damage. <table border="1"> <thead> <tr> <th>Dielectric</th> <th>I.R</th> <th>Cap Change</th> <th colspan="2">Q/D.F</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Class I(C0G)</td> <td rowspan="2">≥1G_Ω or RxC≥50Ω-F whichever is smaller.</td> <td rowspan="2">within ±5.0% or ± 0.5pF whichever is larger</td> <td>Cap ≥30pF</td> <td>Q≥350;</td> </tr> <tr> <td>10pF ≤ Cap < 30pF</td> <td>Q≥275+2.5C</td> </tr> <tr> <td>Class II(X7R)</td> <td>.</td> <td>within ±12.5%</td> <td colspan="2">D.F. ≤ 200% × Initial requirement</td> </tr> </tbody> </table>	Dielectric	I.R	Cap Change	Q/D.F		Class I(C0G)	≥1G _Ω or RxC≥50Ω-F whichever is smaller.	within ±5.0% or ± 0.5pF whichever is larger	Cap ≥30pF	Q≥350;	10pF ≤ Cap < 30pF	Q≥275+2.5C	Class II(X7R)	.	within ±12.5%	D.F. ≤ 200% × Initial requirement																															
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11.	Humidity (Damp Heat) Load	* Test temp.: 85±2°C * Humidity: 85% RH * Test time: 500+24/-0hrs. * To apply voltage: rated voltage (Max.:100Vdc) * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	* No remarkable damage. <table border="1"> <thead> <tr> <th>Dielectric</th> <th>I.R</th> <th>Cap Change</th> <th colspan="2">Q/D.F</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Class I(C0G)</td> <td rowspan="2">≥1G_Ω or RxC≥50Ω-F whichever is smaller.</td> <td rowspan="2">within ±7.5% or ±0.75pF whichever is larger</td> <td>Cap ≥30pF</td> <td>Q≥350;</td> </tr> <tr> <td>10pF ≤ Cap < 30pF</td> <td>Q≥275+2.5C</td> </tr> <tr> <td>Class II(X7R)</td> <td>.</td> <td>within ±12.5%</td> <td colspan="2">D.F. ≤ 200% × Initial requirement</td> </tr> </tbody> </table>	Dielectric	I.R	Cap Change	Q/D.F		Class I(C0G)	≥1G _Ω or RxC≥50Ω-F whichever is smaller.	within ±7.5% or ±0.75pF whichever is larger	Cap ≥30pF	Q≥350;	10pF ≤ Cap < 30pF	Q≥275+2.5C	Class II(X7R)	.	within ±12.5%	D.F. ≤ 200% × Initial requirement																															
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12.	High Temperature Load (Endurance)	* Test temp.: C0G, X7R: 125±3°C <table border="1"> <thead> <tr> <th>Dielectric</th> <th>Rated vol.(V)</th> <th>Apply Voltage</th> </tr> </thead> <tbody> <tr> <td rowspan="3">C0G, X7R</td> <td>≤ 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> Exception item (X7R only): <table border="1"> <thead> <tr> <th>Rated vol.(V)</th> <th>Size</th> <th>Cap. Range</th> <th>Apply Voltage</th> </tr> </thead> <tbody> <tr> <td rowspan="6">100</td> <td>0805</td> <td>≥ 124</td> <td rowspan="6">1.5 times of U_R</td> </tr> <tr> <td>1206</td> <td rowspan="5">≥ 105</td> </tr> <tr> <td>1210</td> </tr> <tr> <td>1812</td> </tr> <tr> <td>1825</td> </tr> <tr> <td>2220</td> </tr> <tr> <td rowspan="5">200 & 250</td> <td>2225</td> <td rowspan="5">≥ 105</td> </tr> <tr> <td>1210</td> <td>> 224</td> </tr> <tr> <td>1812</td> <td>> 474</td> </tr> <tr> <td>1825</td> <td rowspan="2">≥ 105</td> </tr> <tr> <td>2220</td> </tr> <tr> <td>2225</td> <td></td> </tr> </tbody> </table> * Test time: 1000+24/-0 hrs. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	Dielectric	Rated vol.(V)	Apply Voltage	C0G, X7R	≤ 250	2.0 times of U _R	250 <V ≤ 500	1.5 times of U _R	= 630	1.2 times of U _R	Rated vol.(V)	Size	Cap. Range	Apply Voltage	100	0805	≥ 124	1.5 times of U _R	1206	≥ 105	1210	1812	1825	2220	200 & 250	2225	≥ 105	1210	> 224	1812	> 474	1825	≥ 105	2220	2225		* No remarkable damage. <table border="1"> <thead> <tr> <th>Dielectric</th> <th>I.R</th> <th>Cap Change</th> <th>Q/D.F</th> </tr> </thead> <tbody> <tr> <td>Class I(C0G)</td> <td>≥1G_Ω or RxC≥50Ω-F whichever is smaller.</td> <td>within ± 3.0% or ± 0.3pF whichever is larger</td> <td rowspan="2">D.F. ≤ 200% × Initial requirement</td> </tr> <tr> <td>Class II(X7R)</td> <td>.</td> <td>within ±12.5%</td> </tr> </tbody> </table>	Dielectric	I.R	Cap Change	Q/D.F	Class I(C0G)	≥1G _Ω or RxC≥50Ω-F whichever is smaller.	within ± 3.0% or ± 0.3pF whichever is larger	D.F. ≤ 200% × Initial requirement	Class II(X7R)	.	within ±12.5%
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8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements						
13	Resistance to Flexure of Substrate	<p>* 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.</p>  <p>Unit:mm</p>	<p>* No remarkable damage.</p> <table border="1"> <thead> <tr> <th>Dielectric</th> <th>Cap Change</th> </tr> </thead> <tbody> <tr> <td>Class I(C0G)</td> <td>within $\pm 3.0\%$ or $\pm 0.3\text{pF}$ whichever is larger</td> </tr> <tr> <td>Class II(X7R)</td> <td>within $\pm 12.5\%$</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 $\pm 3.0\%$ or $\pm 0.3\text{pF}$ whichever is larger	Class II(X7R)	within $\pm 12.5\%$
Dielectric	Cap Change								
Class I(C0G)	within $\pm 3.0\%$ or $\pm 0.3\text{pF}$ whichever is larger								
Class II(X7R)	within $\pm 12.5\%$								
14.	Adhesive Strength of Termination	<p>* 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.</p> 	<p>* No remarkable damage or removal of the terminations.</p>						
15.	Vibration Resistance	<p>* Vibration frequency: 10~55 Hz/min. * Total amplitude: 1.5mm * Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)</p>	<p>* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.</p>						

9. PACKAGE DIMENSION AND QUANTITY

Size	Thickness (mm)	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
0402 (1005)	0.50±0.05	10k	50K	-	-
0603 (1608)	0.80±0.07	4k	15k	-	-
	0.80+0.15/-0.10	4k	15k		
0805 (2012)	0.60±0.10	4k	15k	-	-
	0.80±0.10	4k	15k	-	-
	1.25±0.10	-	-	3k	10k
	1.25±0.20	-	-	3k	-
1206 (3216)	0.80±0.10	4k	15k	-	-
	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
1210 (3225)	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
	2.50±0.30	-	-	1k	-
1808 (4520)	1.25±0.10	-	-	2k	-
	1.60±0.20	-	-	2k	-
	2.00±0.20	-	-	1k	-
1812 (4532)	1.25±0.10	-	-	1k	-
	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±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

9. PACKAGE DIMENSION AND QUANTITY

9.1. EMBOSSED TAPE DIMENSIONS

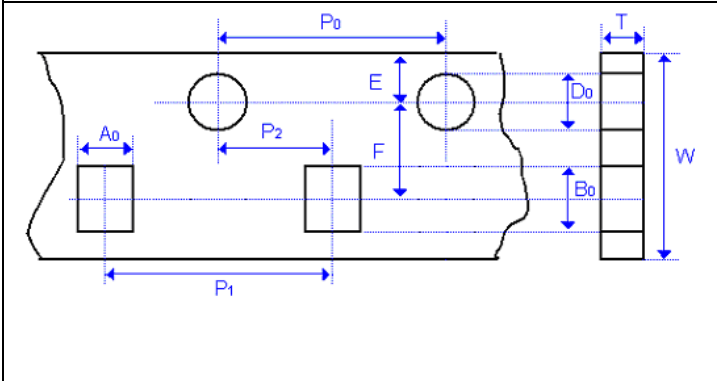


Fig. 9.1 The dimension of paper tape

9.2. EMBOSSED TAPE DIMENSIONS

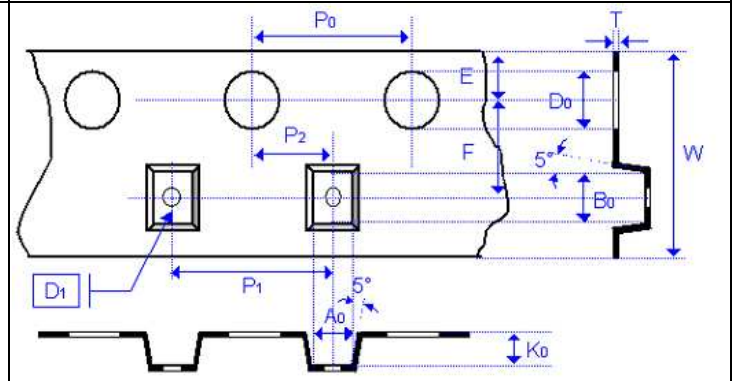


Fig. 9.2 The dimension of plastic tape

Size	0603		0805		1206		
Chip Thickness	0.80 ± 0.07	$0.80 + 0.15 / - 0.10$	0.80 ± 0.10	1.25 ± 0.10 1.25 ± 0.20	0.80 ± 0.10	0.95 ± 0.10 1.25 ± 0.10	1.60 ± 0.20 $1.60 + 0.3 / - 0.1$
A_0	$1.00 + 0.05 / - 0.10$	$1.02 + 0.05 / - 0.10$	1.50 ± 0.10	<1.65	2.00 ± 0.10	<2.00	<2.00
B_0	1.80 ± 0.10	1.80 ± 0.10	2.30 ± 0.10	<2.40	3.50 ± 0.10	<3.60	<3.70
T	0.95 ± 0.05	0.97 ± 0.05	0.95 ± 0.05	0.23 ± 0.05	0.95 ± 0.05	0.23 ± 0.05	0.23 ± 0.05
K_0	-	-	-	<2.50	-	<2.50	<2.50
W	8.00 ± 0.10	8.00 ± 0.10	8.00 ± 0.10	8.00 ± 0.10	8.00 ± 0.10	8.00 ± 0.10	8.00 ± 0.10
P_0	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10
$10 \times P_0$	40.00 ± 0.20	40.00 ± 0.20	40.00 ± 0.20	40.00 ± 0.20	40.00 ± 0.20	40.00 ± 0.20	40.00 ± 0.20
P_1	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10
P_2	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05
D_0	1.55 ± 0.05	1.55 ± 0.05	1.55 ± 0.05	$1.50 \pm 0.10 / - 0$	1.55 ± 0.05	$1.50 \pm 0.10 / - 0$	$1.50 \pm 0.10 / - 0$
D_1	-	-	-	1.00 ± 0.10	-	1.00 ± 0.10	1.00 ± 0.10
E	1.75 ± 0.05	1.75 ± 0.05	1.75 ± 0.05	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	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05	3.50 ± 0.05
Unit:	mm	mm	mm	mm	mm	mm	mm

Size	1210		1808		1812	
Chip Thickness	0.95 ± 0.10 1.25 ± 0.10 1.60 ± 0.20	2.50 ± 0.30	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
A_0	<3.05	<3.10	<2.50	<2.50	<3.90	<3.90
B_0	<3.80	<4.00	<5.30	<5.30	<5.30	<5.30
T	0.23 ± 0.05	0.23 ± 0.05	0.25 ± 0.05	0.25 ± 0.05	0.25 ± 0.05	0.25 ± 0.05
K_0	<2.50	<3.50	<2.50	<2.50	<2.50	<3.00
W	8.00 ± 0.10	8.00 ± 0.10	12.0 ± 0.20	12.0 ± 0.20	12.0 ± 0.20	12.0 ± 0.20
P_0	4.00 ± 0.100	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10
$10 \times P_0$	40.00 ± 0.20	40.0 ± 0.10	40.0 ± 0.20	40.0 ± 0.20	40.00 ± 0.20	40.00 ± 0.20
P_1	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.10	8.00 ± 0.10	8.00 ± 0.10
P_2	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05
D_0	$1.50 \pm 0.10 / - 0$	$1.50 \pm 0.10 / - 0$	$1.50 \pm 0.10 / - 0$	$1.50 \pm 0.10 / - 0$	$1.50 \pm 0.10 / - 0$	$1.50 \pm 0.10 / - 0$
D_1	1.00 ± 0.10	1.00 ± 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	3.50 ± 0.05	3.50 ± 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

9. PACKAGE DIMENSION AND QUANTITY

Size	1825		2220		2225	
Chip Thickness	1.60±0.20 2.00±0.20	2.50±0.30	1.40±0.15 1.60±0.20 2.00±0.20	2.50±0.30	1.60±0.20 2.00±0.20	2.50±0.30
A ₀	<6.80	<6.80	<5.80	<5.80	<6.80	<6.80
B ₀	<5.30	<5.30	<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	0.30±0.10	0.30±0.10
K ₀	<2.50	<3.10	<2.50	<3.10	<2.50	<3.10
W	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20
P ₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP ₀	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P ₁	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P ₂	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D 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	1.50+0.10/-0
D ₁	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±0.1	1.75±0.10	1.75±0.1	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

9.3. REEL DIMENSIONS

Size	0402, 0603, 0805, 1206, 1210			1808,1812, 1825, 2220,2225
Reel size	7"	7"	13"	7"
C	13.0 +0.5/-0.2	13.0 +0.5/-0.2	13.0 +0.5/-0.2	13.0 +0.5/-0.2
W ₁	8.4 +1.5/-0	12.4 +2.0/-0	8.4 +1.5/-0	8.4 +1.5/-0
A	178.0 ±0.10	178.0 ±0.10	330.0 ±1.0	178.0 ±0.10
N	60.0 +1.0/-0	80.0 ±1.0	100 ±1.0	60.0 +1.0/-0

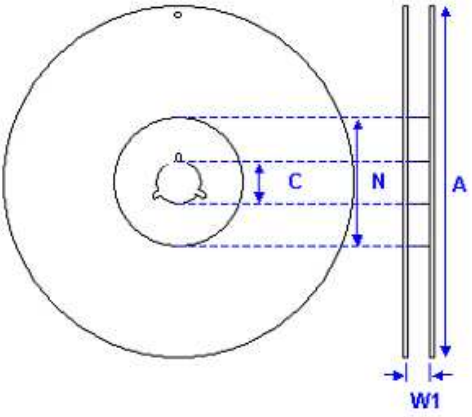


Fig. 4 The dimension of reel

10. APPLICATION 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.

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.

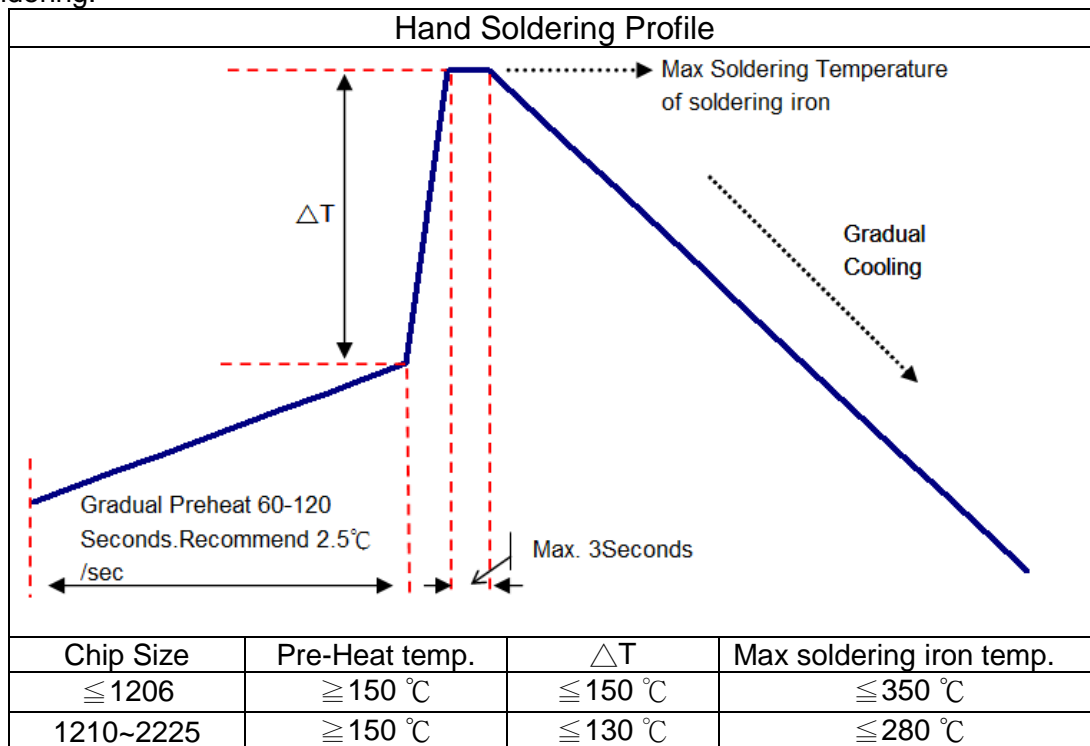
PREHEAT

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.

SOLDERING

Use mildly activated rosin RA and RMA 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:



*Soldering iron tip diameter $\leq 1.0\text{ mm}$ 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.

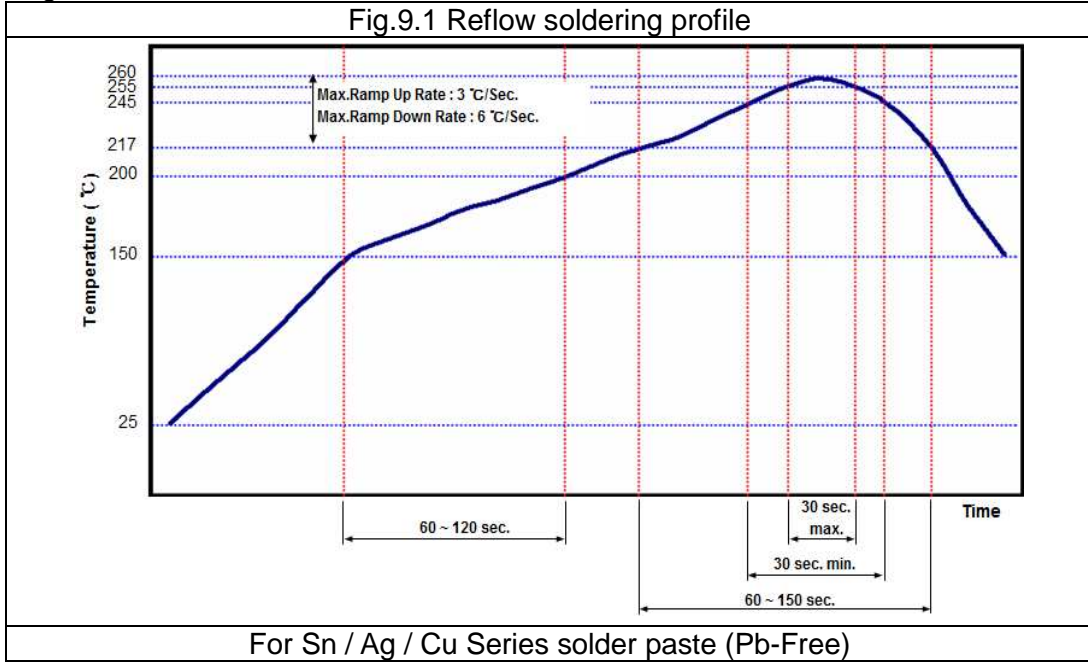
*The tip of iron should not contact the ceramic body directly.

*The Capacitors shall be cooled gradually at room temperature after soldering.

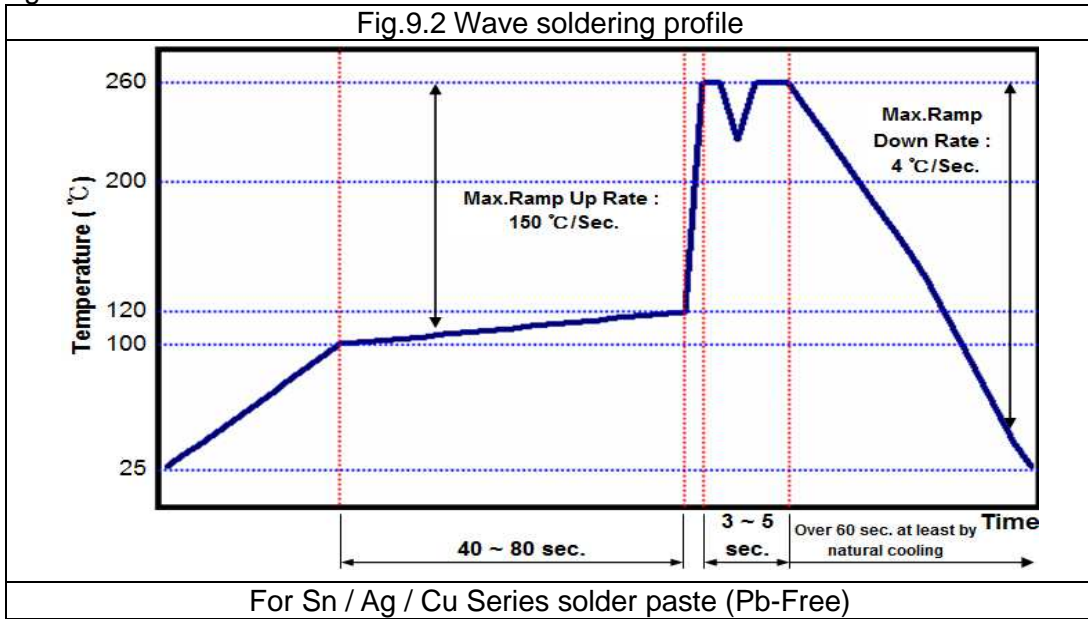
*Forced air cooling is not allowed.

10. APPLICATION NOTES

b.) Reflow soldering:



c.) Wave soldering:



Soldering conditions:

Class I:

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
0402 (1005)	Class I – C0G	All	X	○
0603 (1608)	Class I - C0G	All	○	○
0805 (2012)	Class I - C0G	All	○	○
1206 (3216)	Class I - C0G	All	○	○
≥ 1210 (3225)	Class I - C0G	All	X	○

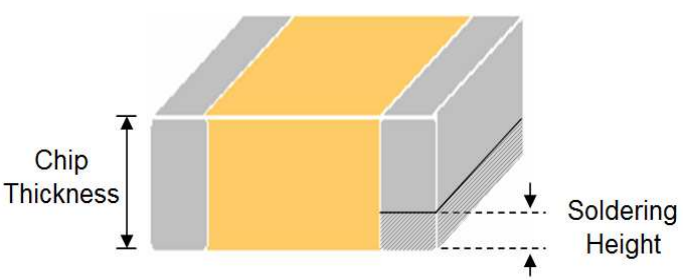
10. APPLICATION NOTES

Soldering conditions:

Class II:

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
0402 (1005)	Class II - X7R	All	X	○
0603 (1608)	Class II - X7R	Cap. < 2.2 μ F	○	○
		Cap. \geq 2.2 μ F	X	○
0805 (2012)	Class II - X7R	Cap. < 4.7 μ F	○	○
		Cap. \geq 4.7 μ F	X	○
1206 (3216)	Class II - X7R	Cap. < 4.7 μ F	○	○
		Cap. \geq 4.7 μ F	X	○
\geq 1210 (3225)	Class II - X7R	All	X	○

Soldering height:

<p>The solder climbing minimum height is suggesting to 25% of chip thickness or 500μm 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.