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Messrs. : 一般共用

Date : 2016 / 11 / 17

# APPROVAL SHEET

Product Name : Anti-Bend General Purpose Multilayer Ceramic Chip Capacitors

Part No. : FP Series

Description : Anti-Bend , Size 0603~2225 , C0G/X7R , 25~4000V

PREPARED BY	APPROVED BY

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# SPECIFICATION

FOR

Product Name : Anti-Bend General Purpose Multilayer Ceramic Chip Capacitors  
Part No. : FP Series  
Description : Anti-Bend , Size 0603~2225 , C0G/X7R , 25~4000V

SPEC. No.	: <u>FP-000-001-02</u>
DATE	: <u>2016 / 11 / 17</u>

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# 1. INTRODUCTION

POSPERITY Multilayer Ceramic Chip Capacitors supplied in bulk or tape & reel package are ideally suitable for thick-film hybrid circuits and automatic surface mounting on any printed circuit boards.

FP series use a special material between nickel-barrier and ceramic body. It provides excellent performance to against bending stress occurred during process and provide more security for PCB process.

The nickel-barrier terminations are consisted of a nickel barrier layer over the silver metallization and then finished by electroplated solder layer to ensure the terminations have good solderability. The nickel barrier layer in terminations prevents the dissolution of termination when extended immersion in molten solder at elevated solder temperature.

# 2. FEATURES

- a. High performance to withstanding 5mm of substrate bending test guarantee.
- b. A wide selection of sizes is available.
- c. High capacitance in given case size.
- d. Capacitor with lead-free termination (pure Tin).
- e. Reduction in PCB bend failure.
- f. High reliability and stability.
- g. RoHS & HALOGEN compliant.

# 3. APPLICATIONS

- a. For general digital circuit.
- b. For power supply bypass capacitors.
- c. For consumer electronics.
- d. For telecommunication.
- e. DC to DC converter

# 4. HOW TO ORDER

FP	32	X	225	K	101	E	G	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				
FP	Anti-Bend General Purpose Product				

Table 2		General Purpose			
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 <sup>2</sup> =1000pF
OR5	0.5pF	104	104=10x10 <sup>4</sup> =100nF
100	100=10x10 <sup>0</sup> =10pF	106	106=10x10 <sup>6</sup> =10μF

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

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		

## 5. EXTERNAL DIMENSIONS

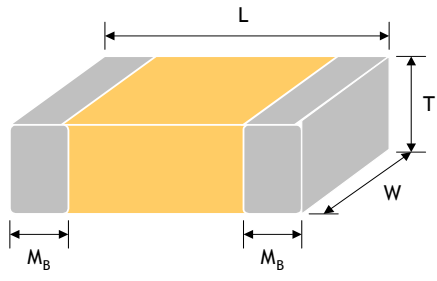
Size Inch (mm)	L (mm)	W (mm)	Code / T (mm)	M <sub>B</sub> (mm)	
0603 (1608)	1.60±0.20	0.80±0.15	See No.4 Reference Table 8	0.40±0.15	
0805 (2012)	2.10±0.20	1.25±0.20		0.50±0.20	
1206 (3216)	3.30±0.30	1.60+0.30/-0.10		0.60±0.20	
1210 (3225)	3.30±0.40	2.50±0.30		0.75±0.35	
1808 (4520)	4.60±0.50	2.00±0.20		0.75±0.35	
1812 (4532)	4.60±0.50	3.20±0.30		0.75±0.35	
1825 (4563)	4.60±0.50	6.30±0.40		0.75±0.35	
2220 (5750)	5.70±0.50	5.00±0.40		0.85±0.35	
2225 (5763)	5.70±0.50	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, 1KV, 1.5KV, 2KV, 3KV, 4KV		25V, 50V, 100V, 200V, 250V, 500V, 630V, 1KV, 1.5KV, 2KV, 3KV, 4KV	
Capacitance range	0.5pF ~ 330nF		100pF ~ 22μF	
Capacitance tolerance	Reference to Table5		Reference to Table5	
Tan δ	Cap. Rang	Q Spec.	Rated Volt.	D.F. Spec.
	Cap<30pF:	Q≥400+20C	25V	≤ 3.5%
	Cap≥30pF:	Q≥1000	≥ 50V	≤ 2.5%
Capacitance & Tan δ Test Condition	For 25°C at 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.	
	Cap. Rang	Test Condition	Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature.	
	Cap≤1000pF	1.0±0.2Vrms, 1.0MHz±10%		
Cap>1000pF	1.0±0.2Vrms, 1.0kHz±10%			
Insulation resistance	≥100GΩ or R•C≥ 500Ω-F whichever is smaller		≥10GΩ or R•C≥100Ω-F whichever is smaller	
Operating temperature	- 55 to + 125 °C			
Temperature coefficient	±30ppm / °C		±15%	
Termination	Cu / Ag polymer / Ni / Sn (lead-free termination)			

# 7. CAPACITANCE RANGE

## 7-1. C0G

Dimension		0603					0805							1206													
Cap (pF)	Code Voltage	25V	50V	100V	200V	250V	25V	50V	100V	200V	250V	400V	500V	630V	1KV	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV
0.5	0R5	S	S	S	S	S	A	A	A	A	A	A	A	A													
0.6	0R6	S	S	S	S	S	A	A	A	A	A	A	A	A													
0.7	0R7	S	S	S	S	S	A	A	A	A	A	A	A	A													
0.8	0R8	S	S	S	S	S	A	A	A	A	A	A	A	A													
0.9	0R9	S	S	S	S	S	A	A	A	A	A	A	A	A													
1.0	1R0	S	S	S	S	S	A	A	A	A	A	A	A	A													
1.2	1R2	S	S	S	S	S	A	A	A	A	A	A	A	A		X	X	X									
1.5	1R5	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
1.8	1R8	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
2.2	2R2	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
2.7	2R7	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
3.3	3R3	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
3.9	3R9	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
4.7	4R7	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
5.0	5R0	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
5.6	5R6	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
6.8	6R8	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
8.2	8R2	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X
10	100	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
12	120	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
15	150	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
18	180	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
22	220	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
27	270	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
33	330	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
39	390	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
47	470	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
56	560	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
68	680	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
82	820	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	E
100	101	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	
120	121	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	
150	151	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	M	M	M
180	181	S	S	S	S	S	A	A	A	A	A	A	A	A	C	X	X	X	X	X	X	X	X	X	M	M	M
220	221	S	S	S	S	S	A	A	A	A	A	A	A	A	C	X	X	X	X	X	X	X	X	X	M	C	C
270	271	S	S	S	S	S	A	A	A	A	A	A	A	A	C	X	X	X	X	X	X	X	X	X	M	C	C
330	331	S	S	S	S	S	A	A	A	A	A	A	A	A	C	X	X	X	X	X	X	X	X	X	C	E	E
390	391	S	S	S	S	S	A	A	A	A	A	A	A	A		X	X	X	X	X	X	X	X	X	C	E	E
470	471	S	S	S	S	S	A	A	A	X	X	X	X	X		X	X	X	X	X	X	X	X	X	C	E	E
560	561	S	S	S	S	S	A	A	A	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	
680	681	S	S	S	S	S	A	A	A	X	X	X	X	X		X	X	X	X	X	X	X	X	X	E		
820	821	S	S	S	S	S	A	A	X	M	M	M	M	M		X	X	X	X	X	X	X	X	X	E		
1000	102	S	S	S			X	X	X	M	M	M	M	M		X	X	X	X	X	X	X	X	X	E		
1200	122	S	S				X	X	M	C	C	C	C	C		X	X	X	X	X	X	X	X	X	E		
1500	152						X	X	M	C	C	C	C	C		X	X	X	M	M	M	M	M				
1800	182						M	M	M	C	C	C	C	C		X	X	X	M	M	M	M	M				
2200	222						M	M	C	C	C	C	C	C		X	X	M	C	C	C	C	C				
2700	272						C	C	C	C	C					X	X	M	C	C	C	C	C				
3300	332						C	C	C	C						M	M	C	C	C	C	C	C				
3900	392						C	C	C							M	M	C	E	E	E	E	E				
4700	472						C	C	C							C	C	C	E	E	E	E	E				
5600	562						C	C	C							C	C	E	E	E	E	E	E				
6800	682						C	C	C							C	C	E	E	E	E	E					
8200	822						C	C								E	E	E	E	E							
10000	103						C	C								E	E	E	E	E							
12000	123															E	E	E									
15000	153															E	E	E									
18000	183															E	E										
22000	223															E	E										

# 7.CAPACITANCE RANGE(Con.)

## 7-1. C0G

Dimension		1210											1808												
Cap (pF)	Code Voltage	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV
2.2	2R2													C	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	C
3.3	3R3													C	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	C
4.7	4R7													C	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	C
5.6	5R6													C	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	C
8.2	8R2													C	C	C	C	C	C	C	C	C	C	C	C
10	100	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
12	120	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
15	150	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
18	180	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
22	220	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
27	270	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
33	330	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
39	390	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
47	470	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
56	560	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
68	680	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
82	820	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
100	101	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
120	121	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
150	151	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
180	181	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
220	221	M	M	M	M	M	M	M	M	M	M	M	F	C	C	C	C	C	C	C	C	C	C	C	C
270	271	M	M	M	M	M	M	M	M	M	M	M	G	C	C	C	C	C	C	C	C	C	C	C	C
330	331	M	M	M	M	M	M	M	M	M	M	M		C	C	C	C	C	C	C	C	C	C	C	E
390	391	M	M	M	M	M	M	M	M	M	M	M		C	C	C	C	C	C	C	C	C	C	C	E
470	471	M	M	M	M	M	M	M	M	M	C	C		C	C	C	C	C	C	C	C	C	C	F	
560	561	M	M	M	M	M	M	M	M	C	C	C		C	C	C	C	C	C	C	C	C	C	F	
680	681	M	M	M	M	M	M	M	M	C	E	E	E	C	C	C	C	C	C	C	C	C	C	C	
820	821	M	M	M	M	M	M	M	M	E	E	E	E	C	C	C	C	C	C	C	C	C	C	C	
1000	102	M	M	M	M	M	M	M	M	E	F	F		C	C	C	C	C	C	C	C	E	E		
1200	122	M	M	M	M	M	M	M	M	E	F	F		C	C	C	C	C	C	C	E	E	E		
1500	152	M	M	M	M	M	M	M	M	F	G	G		C	C	C	C	C	C	C	E	F	F		
1800	182	M	M	M	M	M	M	M	M	G	G	G		C	C	C	C	C	C	C	F	F	F		
2200	222	M	M	M	M	M	M	M	M	G				C	C	C	C	C	C	C	F				
2700	272	M	M	M	M	M	M	M	M	G				C	C	C	C	C	C	C	F				
3300	332	M	M	M	M	M	M	M	M	G				C	C	C	C	C	C	C	F				
3900	392	M	M	M	C	C	C	C	C	G				C	C	C	C	C	C	C					
4700	472	M	M	M	C	C	C	C	C					C	C	C	C	C	C	C					
5600	562	M	M	C	C	C	C	C	C					C	C	C	E	E	E	E					
6800	682	C	C	C	E	E	E	E	E					C	C	C	E	E	E	E					
8200	822	C	C	C	E	E	E	E	E					C	C	E	F	F	F	F					
10000	103	C	C	E	F	F	F	F	F					C	C	E	F	F	F	F					
12000	123	E	E	E	F	F	F	F	F					E	E	F	F	F	F	F					
15000	153	E	E	F	G	G	G	G	G					E	E	F	F	F	F						
18000	183	F	F	G	G	G	G	G						F	F	F	F	F							
22000	223	F	F	G	G	G								F	F	F									
27000	273	G	G	G	G	G								F	F	F									
33000	333	G	G	G	G	G								F	F										
39000	393	G	G	G										F	F										
47000	473	G	G	G																					
56000	563	G	G																						
68000	683	G	G																						

# 7.CAPACITANCE RANGE(Con.)

## 7-1. C0G

Dimension		1812											1825												
Cap (pF)	Code Voltage	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV
10	100	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
12	120	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
15	150	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
18	180	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
22	220	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
27	270	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
33	330	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
39	390	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
47	470	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
56	560	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
68	680	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
82	820	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
100	101	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
120	121	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
150	151	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
180	181	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
220	221	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
270	271	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
330	331	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
390	391	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	
470	471	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	E	
560	561	C	C	C	C	C	C	C	C	C	C	C	E	E	E	E	E	E	E	E	E	E	E	E	
680	681	C	C	C	C	C	C	C	C	C	C	C	F	E	E	E	E	E	E	E	E	E	E	E	
820	821	C	C	C	C	C	C	C	C	C	C	C	G	E	E	E	E	E	E	E	E	E	E	E	
1000	102	C	C	C	C	C	C	C	C	C	C	C	G	E	E	E	E	E	E	E	E	E	E	E	
1200	122	C	C	C	C	C	C	C	C	C	E	E		E	E	E	E	E	E	E	E	E	E	E	
1500	152	C	C	C	C	C	C	C	C	C	E	E		E	E	E	E	E	E	E	E	E	E	F	
1800	182	C	C	C	C	C	C	C	C	E	F	F		E	E	E	E	E	E	E	E	E	E	F	
2200	222	C	C	C	C	C	C	C	C	E	F	F		E	E	E	E	E	E	E	E	E	E	G	
2700	272	C	C	C	C	C	C	C	C	F	G	G		E	E	E	E	E	E	E	E	E	E	G	
3300	332	C	C	C	C	C	C	C	C	F	G	G		E	E	E	E	E	E	E	E	E	E		
3900	392	C	C	C	C	C	C	C	C	G				E	E	E	E	E	E	E	E	E	E		
4700	472	C	C	C	C	C	C	C	C	G				E	E	E	E	E	E	E	E	F	F		
5600	562	C	C	C	C	C	C	C	C	G				E	E	E	E	E	E	E	E	F	F	F	
6800	682	C	C	C	C	C	C	C	C					E	E	E	E	E	E	E	E	F	G	G	
8200	822	C	C	C	C	C	C	C	C					E	E	E	E	E	E	E	E	G	G	G	
10000	103	C	C	C	C	C	C	C	C					E	E	E	E	E	E	E	E	G			
12000	123	C	C	C	E	E	E	E	E					E	E	E	E	E	E	E	E	G			
15000	153	C	C	C	E	E	E	E	E					E	E	E	E	E	E	E	E				
18000	183	C	C	E	F	F	F	F	F					E	E	E	E	E	E	E	E				
22000	223	C	C	E	F	F	F	F	F					E	E	E	E	E	E	E	E				
27000	273	E	E	F	G	G	G	G	G					E	E	E	E	E	E	E	E				
33000	333	E	E	F	G	G	G	G	G					E	E	E	E	E	E	E	E				
39000	393	F	F	G	G	G	G							E	E	E	F	F	F	F	F				
47000	473	F	F	G	G	G								E	E	E	F	F	F	F	F				
56000	563	G	G	G	G	G								E	E	F	G	G	G	G	G				
68000	683	G	G	G										E	E	F	G	G	G	G	G				
82000	823	G	G	G										F	F	G	G	G							
100000	104	G	G	G										G	G	G	G	G							
120000	124	G	G											G	G	G									
150000	154	G	G											G	G										

# 7.CAPACITANCE RANGE(Con.)

## 7-1. C0G

Dimension		2220												2225													
Cap (pF)	Code Voltage	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV	4KV	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV	4KV
10	100	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
12	120	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
15	150	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
18	180	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
22	220	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
27	270	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
33	330	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
39	390	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
47	470	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
56	560	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
68	680	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
82	820	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
100	101	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
120	121	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
150	151	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
180	181	E	E	E	E	E	E	E	E	E	E	E	E	F	E	E	E	E	E	E	E	E	E	E	E	F	
220	221	E	E	E	E	E	E	E	E	E	E	E	E	F	E	E	E	E	E	E	E	E	E	E	E	F	
270	271	E	E	E	E	E	E	E	E	E	E	E	E	G	E	E	E	E	E	E	E	E	E	E	E	G	
330	331	E	E	E	E	E	E	E	E	E	E	E	E	G	E	E	E	E	E	E	E	E	E	E	E	E	
390	391	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
470	471	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
560	561	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
680	681	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
820	821	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
1000	102	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
1200	122	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
1500	152	E	E	E	E	E	E	E	E	E	E	E	F	E	E	E	E	E	E	E	E	E	E	E	E	E	
1800	182	E	E	E	E	E	E	E	E	E	E	E	G	E	E	E	E	E	E	E	E	E	E	E	F	E	
2200	222	E	E	E	E	E	E	E	E	E	E	E	G	E	E	E	E	E	E	E	E	E	E	E	F	E	
2700	272	E	E	E	E	E	E	E	E	E	E	E	G	E	E	E	E	E	E	E	E	E	E	E	G	E	
3300	332	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	G	E	
3900	392	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
4700	472	E	E	E	E	E	E	E	E	E	F	F	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
5600	562	E	E	E	E	E	E	E	E	F	F	F	E	E	E	E	E	E	E	E	E	F	F	E	E	E	
6800	682	E	E	E	E	E	E	E	E	F	G	G	E	E	E	E	E	E	E	E	E	F	F	E	E	E	
8200	822	E	E	E	E	E	E	E	E	G	G	G	E	E	E	E	E	E	E	E	F	G	G	E	E	E	
10000	103	E	E	E	E	E	E	E	E	G	E	E	E	E	E	E	E	E	E	E	G	G	E	E	E	E	
12000	123	E	E	E	E	E	E	E	E	G	E	E	E	E	E	E	E	E	E	E	G	E	E	E	E	E	
15000	153	E	E	E	E	E	E	E	E	E	E	E	E	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	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	E	E	E	E	E	E	E	E	E	E	E	E	
27000	273	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
33000	333	E	E	E	F	F	F	F	F	F	F	F	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
39000	393	E	E	E	F	F	F	F	F	F	F	F	E	E	E	F	F	F	F	F	F	F	E	E	E	E	
47000	473	E	E	E	G	G	G	G	G	G	G	G	E	E	E	F	F	F	F	F	F	F	E	E	E	E	
56000	563	E	E	F	G	G	G	G	G	E	E	E	E	E	E	G	G	G	G	G	G	E	E	E	E	E	
68000	683	E	E	F	G	G	G	G	E	E	E	F	G	G	G	G	G	G	G	E	E	E	E	E	E	E	
82000	823	F	F	G	G	G	E	E	E	E	E	F	F	F	G	G	G	G	G	E	E	E	E	E	E	E	
100000	104	G	G	G	G	G	E	E	E	E	E	E	E	E	E	G	G	G	E	E	E	E	E	E	E	E	
120000	124	G	G	G	E	E	E	E	E	E	E	E	E	E	E	G	G	G	E	E	E	E	E	E	E	E	
150000	154	G	G	G	E	E	E	E	E	E	E	E	E	E	E	G	G	G	E	E	E	E	E	E	E	E	
180000	184	G	G	G	E	E	E	E	E	E	E	E	E	E	E	G	G	G	E	E	E	E	E	E	E	E	
220000	224	G	G	E	E	E	E	E	E	E	E	E	E	E	E	G	G	G	E	E	E	E	E	E	E	E	
270000	274	G	G	E	E	E	E	E	E	E	E	E	E	E	E	G	G	E	E	E	E	E	E	E	E	E	
330000	334	G	G	E	E	E	E	E	E	E	E	E	E	E	E	G	G	E	E	E	E	E	E	E	E	E	



# 7.CAPACITANCE RANGE(Con.)

## 7-2. X7R

Dimension		0603					0805										1206									
Cap (pF)	Code Voltage	25V	50V	100V	200V	250V	25V	50V	100V	200V	250V	400V	500V	630V	1KV	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV
100	101	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
120	121	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
150	151	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
180	181	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
220	221	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
270	271	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
330	331	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
390	391	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
470	471	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
560	561	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
680	681	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	M	M
820	821	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	M	M
1000	102	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C
1200	122	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	E	E
1500	152	S	S	S	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	E	E
1800	182	S	S	S	B	B	X	X	X	X	X	X	X	C	X	X	X	X	X	X	X	X	X	X	E	E
2200	222	S	S	S	B	B	X	X	X	X	X	X	X	C	X	X	X	X	X	X	X	X	X	X	E	E
2700	272	S	S	S	B	B	X	X	X	X	X	X	X	C	X	X	X	X	X	X	X	X	X	X	E	E
3300	332	S	S	S	B	B	X	X	X	X	X	X	X	C	X	X	X	X	X	X	X	X	X	X	E	E
3900	392	S	S	S	B	B	X	X	X	X	X	X	X	C	X	X	X	X	X	X	X	X	X	X	E	E
4700	472	S	S	S	B	B	X	X	X	X	X	X	X	C	X	X	X	X	X	X	X	X	X	X	E	
5600	562	S	S	S	B	B	X	X	X	X	M	M	M	C	X	X	X	X	X	X	X	X	X	X		
6800	682	S	S	S	B	B	X	X	X	X	C	C	C	C	X	X	X	X	X	X	X	X	X	M		
8200	822	S	S	S	B	B	X	X	X	X	C	C	C	C	X	X	X	X	X	X	X	X	M			
10000	103	S	S	S	B	B	X	X	X	X	C	C	C		X	X	X	X	X	M	M	M	M			
12000	123	S	S	B	B	B	X	X	X	X	C	C	C		X	X	X	X	X	C	C	C	C			
15000	153	S	S	B	B	B	X	X	X	X	C	C	C		X	X	X	X	X	C	C	C	E			
18000	183	S	S	B			X	X	X	X	C	C	C		X	X	X	X	X	C	C	C	E			
22000	223	S	S	B			X	X	X	X	C	C	C		X	X	X	X	X	E	E	E	E			
27000	273	S	S	B			X	X	M	M	M				X	X	X	X	X	E	E	E				
33000	333	B	B	B			X	X	M	C	C				X	X	X	X	X	E	E	E				
39000	393	B	B	B			X	X	M	C					X	X	X	X	X	E	E	E				
47000	473	B	B	B			X	X	M	C					X	X	X	X	X	E	E	E				
56000	563	B	B	B			X	X	M	C					X	X	X	M	M							
68000	683	B	B	B			X	X	M	C					X	X	X	C	C							
82000	823	B	B				X	X	M						X	X	X	C	C							
100000	104	B	B				X	X	C						X	X	X	E	E							
120000	124						X	X	C						X	X	X									
150000	154						X	X	C						X	X	X									
180000	184						X	X	C						X	X	M									
220000	224						X	X	C						X	X	M									
270000	274						C	C	C						X	X	C									
330000	334						C	C	C						X	X	E									
390000	394						C	C	C						C	C	E									
470000	474						C	C	C						C	C	E									
560000	564						C	C							C	C	P									
680000	684						C	C							C	C	P									
820000	824						C	C							E	E	P									
1000000	105						C	C							P	P	P									
1200000	125														P	P	P									
1500000	155														P	P										
1800000	185														P	P										
2200000	225														P	P										

# 7.CAPACITANCE RANGE(Con.)

## 7-2. X7R

Dimension		1210										1808													
Cap (pF)	Code Voltage	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV	4KV
150	151												C	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	C	F
220	221	M	M	M	M	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	C	C	F
270	271	M	M	M	M	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	C	C	F
330	331	M	M	M	M	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	C	C	F
390	391	M	M	M	M	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	C	C	F
470	471	M	M	M	M	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	C	C	F
560	561	M	M	M	M	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	C	C	F
680	681	M	M	M	M	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	C	C	F
820	821	M	M	M	M	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	C	C	F
1000	102	M	M	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	C	C	C	F	F
1200	122	M	M	M	M	M	M	M	M	M	E	E	C	C	C	C	C	C	C	C	C	C	C	C	F
1500	152	M	M	M	M	M	M	M	M	M	E	E	C	C	C	C	C	C	C	C	C	C	C	C	F
1800	182	M	M	M	M	M	M	M	M	M	E	E	C	C	C	C	C	C	C	C	C	C	C	C	F
2200	222	M	M	M	M	M	M	M	M	M	F	F	C	C	C	C	C	C	C	C	C	E	E	F	
2700	272	M	M	M	M	M	M	M	M	M	F	G	C	C	C	C	C	C	C	C	C	F	F		
3300	332	M	M	M	M	M	M	M	M	M	F	G	C	C	C	C	C	C	C	C	C	F	F		
3900	392	M	M	M	M	M	M	M	M	M	G	G	C	C	C	C	C	C	C	C	C	F	F		
4700	472	M	M	M	M	M	M	M	M	M	G	G	C	C	C	C	C	C	C	C	C	F	F		
5600	562	M	M	M	M	M	M	M	M	M	G	G	C	C	C	C	C	C	C	C	C	F	F		
6800	682	M	M	M	M	M	M	M	M	M	G	G	C	C	C	C	C	C	C	C	C	F	F		
8200	822	M	M	M	M	M	M	M	M	M	G	G	C	C	C	C	C	C	C	C	C				
10000	103	M	M	M	M	M	M	M	M	C			C	C	C	C	C	C	C	C					
12000	123	M	M	M	M	M	M	M	M	C			E	E	E	E	E	E	E	E					
15000	153	M	M	M	M	M	M	M	M	E			E	E	E	E	E	E	E	E					
18000	183	M	M	M	M	M	M	C	C	E			E	E	E	E	E	F	F	F	F				
22000	223	M	M	M	M	M	M	C	C	E			E	E	E	E	E	F	F	F	F				
27000	273	M	M	M	M	M	M	C	C	E			E	E	E	E	E	F	F	F	F				
33000	333	M	M	M	M	M	M	E	E	E			E	E	E	E	E	F	F	F	F				
39000	393	M	M	M	M	M	M	E	E	F			E	E	E	E	E	F	F	F	F				
47000	473	M	M	M	M	M	M	E	E	G			E	E	E	E	E	F	F	F	F				
56000	563	M	M	M	M	M	M	E	E	G			E	E	E	E	E	F	F	F	F				
68000	683	M	M	M	M	M	M	F	F	G			E	E	E	E	E	F	F	F					
82000	823	M	M	M	M	M	M	F	F				E	E	E	E	E	F	F	F					
100000	104	M	M	M	M	M	M	F	F				E	E	E	E	E								
120000	124	M	M	M	E	E	E	G	G				E	E	E	E	E								
150000	154	M	M	M	E	E	E	G	G				E	E	E	E	E								
180000	184	M	M	M	E	E	E						E	E	E	F	F								
220000	224	M	M	M	E	E	E						E	E	E										
270000	274	M	M	M	F	F	F						F	F	F										
330000	334	M	M	M	F	F	F						F	F	F										
390000	394	M	M	C	G	G	G						F	F	F										
470000	474	M	M	C	G	G	G						F	F											
560000	564	M	M	E	G	G							F	F											
680000	684	M	M	E	G	G							F	F											
820000	824	C	C	P																					
1000000	105	C	C	P																					
1200000	125	P	P	F																					
1500000	155	F	F	F																					
1800000	185	G	G	G																					
2200000	225	G	G	G																					
2700000	275	G	G	G																					
3300000	335	G	G	G																					
3900000	395	G	G																						
4700000	475	G	G																						

# 7.CAPACITANCE RANGE(Con.)

## 7-2. X7R

Dimension		1812												1825													
Cap (pF)	Code Voltage	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV	4KV	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV	4KV
270	271	C	C	C	C	C	C	C	C	C	C	C	C	F												F	
330	331	C	C	C	C	C	C	C	C	C	C	C	C	F												F	
390	391	C	C	C	C	C	C	C	C	C	C	C	C	F												F	
470	471	C	C	C	C	C	C	C	C	C	C	C	C	F												F	
560	561	C	C	C	C	C	C	C	C	C	C	C	C	F												F	
680	681	C	C	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	C	F												F	
1000	102	C	C	C	C	C	C	C	C	C	C	C	E	F	F	F	F	F	F	F	F	F	F	F	F	F	
1200	122	C	C	C	C	C	C	C	C	C	C	C	F	G	F	F	F	F	F	F	F	F	F	F	F	G	
1500	152	C	C	C	C	C	C	C	C	C	C	C	F	G	F	F	F	F	F	F	F	F	F	F	F	G	
1800	182	C	C	C	C	C	C	C	C	C	C	C	G	G	F	F	F	F	F	F	F	F	F	F	F	G	
2200	222	C	C	C	C	C	C	C	C	C	C	C	G		F	F	F	F	F	F	F	F	F	F	F		
2700	272	C	C	C	C	C	C	C	C	C	C	C	G		F	F	F	F	F	F	F	F	F	F	F		
3300	332	C	C	C	C	C	C	C	C	C	C	E	E	G	F	F	F	F	F	F	F	F	F	F	F		
3900	392	C	C	C	C	C	C	C	C	C	F	F			F	F	F	F	F	F	F	F	F	F	F		
4700	472	C	C	C	C	C	C	C	C	C	F	F			F	F	F	F	F	F	F	F	F	F	F		
5600	562	C	C	C	C	C	C	C	C	C	G	G			F	F	F	F	F	F	F	F	F	F	F	G	
6800	682	C	C	C	C	C	C	C	C	C	G	G			F	F	F	F	F	F	F	F	F	F	F	G	
8200	822	C	C	C	C	C	C	C	C	C	G	G			F	F	F	F	F	F	F	F	F	F	F	G	
10000	103	C	C	C	C	C	C	C	C	C	G	G			F	F	F	F	F	F	F	F	F	F	F	G	
12000	123	C	C	C	C	C	C	C	C	C					F	F	F	F	F	F	F	F	F	F	G	H	
15000	153	C	C	C	C	C	C	C	C	C					F	F	F	F	F	F	F	F	F	G	G	H	
18000	183	C	C	C	C	C	C	C	C	E					F	F	F	F	F	F	F	F	F	G	G	H	
22000	223	C	C	C	C	C	C	C	C	E					F	F	F	F	F	F	F	F	F	G	G		
27000	273	C	C	C	C	C	C	C	C	F					F	F	F	F	F	F	F	F	F	H	H		
33000	333	C	C	C	C	C	C	C	C	F					F	F	F	F	F	F	F	F	F	H	H		
39000	393	C	C	C	C	C	C	C	C	G					F	F	F	F	F	F	F	F	F	H	H		
47000	473	C	C	C	C	C	C	C	C	G					F	F	F	F	F	F	F	F	F	H	H		
56000	563	C	C	C	C	C	C	E	E	G					F	F	F	F	F	F	F	F	F	H	H		
68000	683	C	C	C	C	C	C	E	E	G					F	F	F	F	F	F	F	F	F				
82000	823	C	C	C	C	C	C	E	E	G					F	F	F	F	F	F	F	F	F				
100000	104	C	C	C	C	C	C	E	E	G					F	F	F	F	F	F	F	F	F	G			
120000	124	C	C	C	C	C	C	F	F						F	F	F	F	F	F	F	F	H				
150000	154	C	C	C	C	C	C	F	F						F	F	F	F	F	F	F	F	H				
180000	184	C	C	C	C	C	C	G	G						F	F	F	F	F	F	F	F	H				
220000	224	C	C	C	C	C	C	G	G						F	F	F	F	F	F	F	F	H				
270000	274	C	C	C	E	E	E	G							F	F	F	F	F	F	F	F	H				
330000	334	C	C	C	E	E	E	G							F	F	F	F	F	F	F	F	H				
390000	394	C	C	C	F	F	F	G							F	F	F	F	F	F	F	F					
470000	474	C	C	C	F	F	F	G							F	F	F	F	F	F	F	F					
560000	564	C	C	C	G	G	G								F	F	F	F	F	G	G	G					
680000	684	C	C	C	G	G	G								F	F	F	F	F	G	G	G					
820000	824	C	C	C	G	G									F	F	F	F	F	H	H	H					
1000000	105	C	C	C	G	G									F	F	F	F	F								
1200000	125	C	C	C											F	F	F	G	G								
1500000	155	C	C	C											F	F	F	G	G								
1800000	185	E	E	E											F	F	F	G	G								
2200000	225	E	E	E											F	F	F	G	G								
2700000	275	F	F	F											F	F	F	H	H								
3300000	335	F	F	F											F	F	F										
3900000	395	F	F	F											F	F	F										
4700000	475	G	G	G											F	F	F										
5600000	565	G	G	G											F	F	F										
6800000	685	G	G												F	F	F										
8200000	825	G	G												G	G	G										
10000000	106	G	G												G	G	G										

# 7.CAPACITANCE RANGE(Con.)

## 7-2. X7R

Dimension		2220												2225													
Cap (pF)	Code Voltage	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV	4KV	25V	50V	100V	200V	250V	400V	500V	630V	1KV	1.5KV	2KV	3KV	4KV
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	F	
1200	122	F	F	F	F	F	F	F	F	F	F	F	F	M	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	F	M	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	F	M	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	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	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	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	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	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	F		
6800	682	F	F	F	F	F	F	F	F	F	F	F	G		F	F	F	F	F	F	F	F	F	F	G		
8200	822	F	F	F	F	F	F	F	F	F	G	G	G		F	F	F	F	F	F	F	F	F	F	G		
10000	103	F	F	F	F	F	F	F	F	F	G	G	G		F	F	F	F	F	F	F	F	F	F	G		
12000	123	F	F	F	F	F	F	F	F	F	G	G	H		F	F	F	F	F	F	F	F	F	G	G		
15000	153	F	F	F	F	F	F	F	F	F	G	G	H		F	F	F	F	F	F	F	F	F	G	G		
18000	183	F	F	F	F	F	F	F	F	F	H	H	H		F	F	F	F	F	F	F	F	F	G	G	H	
22000	223	F	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	F	G	G		
27000	273	F	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	F	G	G		
33000	333	F	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	F	G	G		
39000	393	F	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	F	G	H		
47000	473	F	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	F	G	H		
56000	563	F	F	F	F	F	F	F	F	F	H	H			F	F	F	F	F	F	F	F	F	G	H		
68000	683	F	F	F	F	F	F	F	F	F					F	F	F	F	F	F	F	F	F	G			
82000	823	F	F	F	F	F	F	F	F	F					F	F	F	F	F	F	F	F	F	G			
100000	104	F	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	F	G					F	F	F	F	F	F	F	F	H				
150000	154	F	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	F	H					F	F	F	F	F	F	F	F	H				
220000	224	F	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	F	H					F	F	F	F	F	F	F	F	H				
330000	334	F	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	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	F					
560000	564	F	F	F	F	F	G	G	G						F	F	F	F	F	F	F	F					
680000	684	F	F	F	F	F	G	G	G						F	F	F	F	F	F	F	F					
820000	824	F	F	F	F	F	H	H	H						F	F	F	F	F	G	G	G					
1000000	105	F	F	F	F	F	H	H	H						F	F	F	F	F	G	G	G					
1200000	125	F	F	F	G	G									F	F	F	G	G	H	H	H					
1500000	155	F	F	F	G	G									F	F	F	G	G	H	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	F										
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 Mechanical	---	*No remarkable defect. *Dimensions to conform to individual specification sheet.																			
2.	Capacitance	Class I: Cap≤1000pF, 1.0±0.2Vrms, 1MHz±10% Cap>1000pF, 1.0±0.2Vrms, 1KHz±10%  Class II: Cap≤10μF, 1.0±0.2Vrms, 1KHz±10%	*Shall not exceed the limits given in the detailed spec.																			
3.	Q/D.F. (Dissipation Factor)	Class I: Cap≤1000pF, 1.0±0.2Vrms, 1MHz±10% Cap>1000pF, 1.0±0.2Vrms, 1KHz±10%  Class II: Cap≤10μF, 1.0±0.2Vrms, 1KHz±10%	<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≥1000</td> <td>Cap≥30pF</td> </tr> <tr> <td>Q≥400+20C</td> <td>Cap&lt;30pF</td> </tr> <tr> <td rowspan="3">Class II</td> <td rowspan="2">25V</td> <td>D.F. &lt; 3.5%</td> <td></td> </tr> <tr> <td>D.F. &lt; 2.5%</td> <td></td> </tr> <tr> <td>≥50</td> <td>D.F. &lt; 3.0%</td> <td>0603≥0.047μF; 0805≥0.18μF, 1206≥0.47μF</td> </tr> </tbody> </table>	Dielectric	Rated vol.(V)	Q/D.F.	Remark	Class I	All	Q≥1000	Cap≥30pF	Q≥400+20C	Cap<30pF	Class II	25V	D.F. < 3.5%		D.F. < 2.5%		≥50	D.F. < 3.0%	0603≥0.047μF; 0805≥0.18μF, 1206≥0.47μF
Dielectric	Rated vol.(V)	Q/D.F.	Remark																			
Class I	All	Q≥1000	Cap≥30pF																			
		Q≥400+20C	Cap<30pF																			
Class II	25V	D.F. < 3.5%																				
		D.F. < 2.5%																				
	≥50	D.F. < 3.0%	0603≥0.047μF; 0805≥0.18μF, 1206≥0.47μF																			
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>X7R</td> <td>-55~125°C at 25°C</td> </tr> <tr> <td>C0G</td> <td>-55~125°C at 25°C</td> </tr> </tbody> </table>	T.C.	Operating Temp	X7R	-55~125°C at 25°C	C0G	-55~125°C at 25°C	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>X7R</td> <td>Within ±15%</td> </tr> <tr> <td>C0G</td> <td>Within ±30ppm/°C</td> </tr> </tbody> </table>	T.C.	Capacitance Change	X7R	Within ±15%	C0G	Within ±30ppm/°C							
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5.	Dielectric Strength	<table border="1"> <thead> <tr> <th>Rated vol.(V)</th> <th>Condition</th> </tr> </thead> <tbody> <tr> <td>≤ 250</td> <td>2.0 times of U<sub>R</sub></td> </tr> <tr> <td>250&lt;V≤500</td> <td>1.5 times of U<sub>R</sub></td> </tr> <tr> <td>630≤V≤3000V</td> <td>1.2 times of U<sub>R</sub></td> </tr> <tr> <td>3000&lt;V≤5000V</td> <td>1.1 times of U<sub>R</sub></td> </tr> <tr> <td>&gt;5000V</td> <td>1.0 times of U<sub>R</sub></td> </tr> </tbody> </table> <p>*Voltage ramp up rate 500v/sec *Duration: 1 to 5 sec. *Charge and discharge current less than 50mA.</p>	Rated vol.(V)	Condition	≤ 250	2.0 times of U <sub>R</sub>	250<V≤500	1.5 times of U <sub>R</sub>	630≤V≤3000V	1.2 times of U <sub>R</sub>	3000<V≤5000V	1.1 times of U <sub>R</sub>	>5000V	1.0 times of U <sub>R</sub>	*No evidence of damage or flash over during test.							
Rated vol.(V)	Condition																					
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6.	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<sub>R</sub></td> <td>Max. 120 sec</td> </tr> <tr> <td>100 &lt;V ≤ 500</td> <td>1 times of U<sub>R</sub></td> <td>60 sec</td> </tr> <tr> <td>&gt; 500</td> <td>500VDC</td> <td>60 sec</td> </tr> </tbody> </table>	Rated vol.(V)	Apply Voltage	Charge Time	≤ 100	1 times of U <sub>R</sub>	Max. 120 sec	100 <V ≤ 500	1 times of U <sub>R</sub>	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>≥100GΩ or Rx≥ 500Ω-F whichever is smaller.</td> </tr> <tr> <td>Class II</td> <td>≥10GΩ or Rx≥ 100Ω-F whichever is smaller.</td> </tr> </tbody> </table>	Dielectric	Requirements	Class I	≥100GΩ or Rx≥ 500Ω-F whichever is smaller.	Class II	≥10GΩ or Rx≥ 100Ω-F whichever is smaller.	
Rated vol.(V)	Apply Voltage	Charge Time																				
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> 500	500VDC	60 sec																				
Dielectric	Requirements																					
Class I	≥100GΩ or Rx≥ 500Ω-F whichever is smaller.																					
Class II	≥10GΩ or Rx≥ 100Ω-F whichever is smaller.																					
7.	Solderability	* Solder temperature: 235±5°C for (0603~1210) * Solder temperature: 245±5°C for (1808~2225) * Dipping time: 2±0.5 sec.	75% min. coverage of all metalized area.																			
8.	Resistance to Soldering Heat	*Solder temperature: 260±5°C *Dipping time: 10±1 sec *Preheating: 120 to 150°C for 1 minute before immer se 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 r oom temp. *Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	<table border="1"> <thead> <tr> <th>Dielectric</th> <th>Class I</th> <th>Class II</th> </tr> </thead> <tbody> <tr> <td>External Appearance</td> <td>No remarkable damage</td> <td>No remarkable damage</td> </tr> <tr> <td>Cap Change</td> <td>Within ±2.5% or ±0.25pF whichever is larger.</td> <td>X7R within ±7.5%</td> </tr> <tr> <td>D.F</td> <td>To meet Initial requirement</td> <td>To meet Initial requirement</td> </tr> <tr> <td>I.R</td> <td>To meet Initial requirement</td> <td>To meet Initial requirement</td> </tr> <tr> <td>Dielectric Strength</td> <td>To meet initial requirement</td> <td>To meet initial requirement</td> </tr> </tbody> </table>	Dielectric	Class I	Class II	External Appearance	No remarkable damage	No remarkable damage	Cap Change	Within ±2.5% or ±0.25pF whichever is larger.	X7R within ±7.5%	D.F	To meet Initial requirement	To meet Initial requirement	I.R	To meet Initial requirement	To meet Initial requirement	Dielectric Strength	To meet initial requirement	To meet initial requirement	
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## 8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																	
9.	Temperature Cycle	<p>*Conduct the five cycles according to the temperatures and time.</p> <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±3</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±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> <p>*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)</p>	Step	Temp. (°C)	Time(min.)	1	Min. operating temp.+0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp.+3/-0	30±3	4	Room temp.	2~3	Dielectric	Class II	Class II
			Step	Temp. (°C)	Time(min.)															
			1	Min. operating temp.+0/-3	30±3															
			2	Room temp.	2~3															
			3	Max. operating temp.+3/-0	30±3															
			4	Room temp.	2~3															
			External Appearance	No remarkable damage	No remarkable damage															
			Cap Change	Within ±2.5% or ±0.25pF whichever is larger.	within ±7.5%															
D.F	≤ 1.0(Q) × Initial requirement	≤ 1.5(D.F.) × Initial requirement																		
I.R	To meet Initial requirement	To meet Initial requirement																		
Dielectric Strength	To meet initial requirement	To meet initial requirement																		
10.	Humidity (Damp Heat) Steady State	<p>*Test temp.: 40±2°C *Humidity: 90~95% RH *Test time: 500+24/-0hrs. *Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</p>	Dielectric	Class I	Class II															
			External Appearance	No remarkable damage	No remarkable damage															
			Cap Change	within ±5.0% or ±0.5pF whichever is larger	X7R within ±12.5%															
			D.F	C ≥30pF	Q≥350;	D.F. ≤ 200% × Initial requirement														
				10pF ≤ C < 30pF	Q≥275 +2.5C															
				C < 10pF	Q≥200 +10C															
			I.R	≥1GΩ or R•C≥50Ω-F whichever is smaller	≥1GΩ or R•C≥50Ω-F whichever is smaller															
			11.	Humidity (Damp Heat) Load	<p>*Test temp.: 40±2°C *Humidity: 90~95% RH *Test time: 500+24/-0hrs. *To apply voltage :rated voltage *Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</p>	Dielectric	Class I	Class II												
External Appearance	No remarkable damage	No remarkable damage																		
Cap Change	within ±7.5% or ±0.75pF whichever is larger	X7R within ±12.5%																		
D.F	C ≥30pF	Q≥350;				D.F. ≤ 200% × Initial requirement														
	10pF ≤ C < 30pF	Q≥275 +2.5C																		
	C < 10pF	Q≥200 +10C																		
I.R	≥1GΩ or R•C≥50Ω-F whichever is smaller	≥1GΩ or R•C≥50Ω-F whichever is smaller																		

## 8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																			
12.	High Temperature Load (Endurance)	*Reflow solder the capacitors on a P.C. Board before testing *Test temp.: 125±3°C																																				
		<table border="1"> <thead> <tr> <th>Rated vol.(V)</th> <th>Apply Voltage</th> </tr> </thead> <tbody> <tr> <td>≤ 250</td> <td>2.0 times of U<sub>R</sub></td> </tr> <tr> <td>250 &lt; V ≤ 500</td> <td>1.5 times of U<sub>R</sub></td> </tr> <tr> <td>630 ≤ V ≤ 1000</td> <td>1.2 times of U<sub>R</sub></td> </tr> <tr> <td>1000 &lt; V ≤ 5000V</td> <td>1.1 times of U<sub>R</sub></td> </tr> <tr> <td>&gt; 5000</td> <td>1.0 times of U<sub>R</sub></td> </tr> </tbody> </table> <p>Exception item (X7R only):</p> <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="5">100</td> <td>0805</td> <td>≥ 124</td> <td rowspan="10">1.5 times of U<sub>R</sub></td> </tr> <tr> <td>1206</td> <td rowspan="5">≥ 105</td> </tr> <tr> <td>1210</td> </tr> <tr> <td>1825</td> </tr> <tr> <td>2220</td> </tr> <tr> <td>2225</td> </tr> <tr> <td rowspan="5">200 &amp; 250</td> <td>1210</td> <td>&gt; 224</td> </tr> <tr> <td>1812</td> <td>&gt; 474</td> </tr> <tr> <td>1825</td> <td rowspan="3">≥ 105</td> </tr> <tr> <td>2220</td> </tr> <tr> <td>2225</td> </tr> </tbody> </table>	Rated vol.(V)	Apply Voltage	≤ 250	2.0 times of U <sub>R</sub>	250 < V ≤ 500	1.5 times of U <sub>R</sub>	630 ≤ V ≤ 1000	1.2 times of U <sub>R</sub>	1000 < V ≤ 5000V	1.1 times of U <sub>R</sub>	> 5000	1.0 times of U <sub>R</sub>	Rated vol.(V)	Size	Cap. Range	Apply Voltage	100	0805	≥ 124	1.5 times of U <sub>R</sub>	1206	≥ 105	1210	1825	2220	2225	200 & 250	1210	> 224	1812	> 474	1825	≥ 105	2220	2225	Dielectric
Rated vol.(V)	Apply Voltage																																					
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External Appearance	No remarkable damage	No remarkable damage																																				
Cap Change	within ±3.0% or ±0.3pF whichever is larger	X7R within ±12.5%																																				
D.F	D.F. ≤ 200% × Initial requirement	D.F. ≤ 200% × Initial requirement																																				
I.R	≥1GΩ or R•C≥50Ω-F whichever is smaller	≥1GΩ or R•C≥50Ω-F whichever is smaller																																				
13.	Resistance to Flexure of Substrate	*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 5mm.																																				
			Dielectric	Class I	Class II																																	
		Unit:mm	External Appearance	No remarkable damage	No remarkable damage																																	
Cap Change	within ±3.0% or ±0.3pF whichever is larger	X7R within ±12.5%																																				
(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)																																						
14.	Adhesive Strength of Termination	* 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.																																				
			*No remarkable damage or removal of the terminations.																																			
15.	Vibration	*Reflow solder the capacitors on P.C.Board before test. *Vibration frequency: 10~55 Hz/min. *Total amplitude: 1.5mm *Repeat the conditions for 2 hours each in 3perpendicular directions.	Dielectric	Class I	Class II																																	
		External Appearance	No remarkable damage	No remarkable damage																																		
		Cap Change	Within ±2.5% or ±0.25pF whichever is larger.	X7R within ±7.5%																																		
		D.F	To meet Initial requirement	To meet Initial requirement																																		
		I.R	To meet Initial requirement	To meet Initial requirement																																		

## 9. PACKAGE DIMENSION AND QUANTITY

Size	Thickness (mm)	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
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

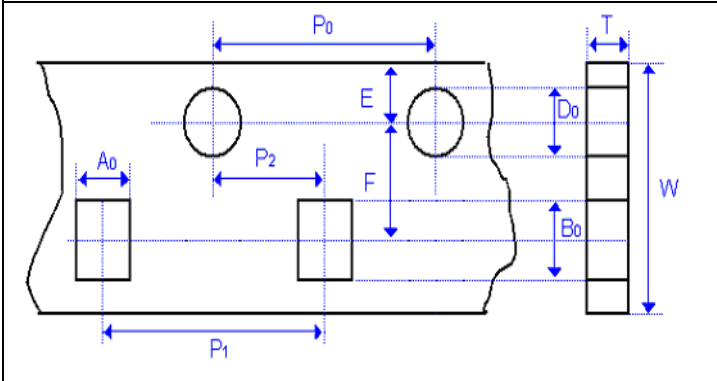


Fig. 9.1 The dimension of paper tape

### 9.2. EMBOSSED TAPE DIMENSIONS

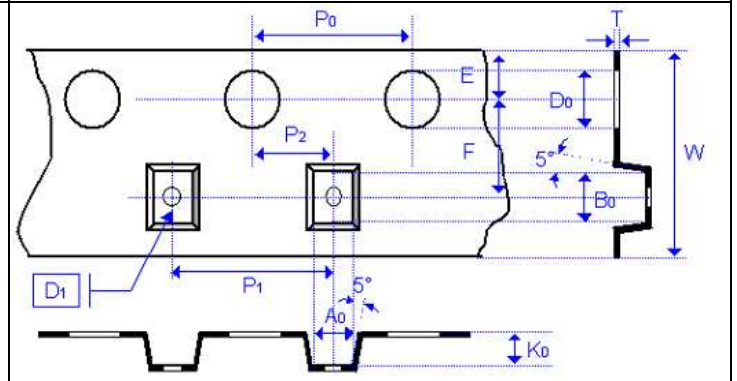


Fig. 9.2 The dimension of plastic tape

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 <sub>0</sub>	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 <sub>0</sub>	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 <sub>0</sub>	-	-	-	<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 <sub>0</sub>	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
10xP <sub>0</sub>	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 <sub>1</sub>	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 <sub>2</sub>	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 <sub>0</sub>	1.55±0.05	1.55±0.05	1.55±0.05	1.50±0.10/-0	1.55±0.05	1.50±0.10/-0	1.50±0.10/-0
D <sub>1</sub>	-	-	-	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 <sub>0</sub>	<3.05	<3.10	<2.50	<2.50	<3.90	<3.90
B <sub>0</sub>	<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 <sub>0</sub>	<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 <sub>0</sub>	4.00±0.100	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP <sub>0</sub>	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 <sub>1</sub>	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 <sub>2</sub>	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 <sub>0</sub>	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 <sub>1</sub>	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+/-0.1
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

Prosperity Dielectrics Co., Ltd.

No.220-1, Sec. 2, Nanshan Rd., Lujhu, Taoyuan 33860, Taiwan, R.O.C.

<http://www.pdc.com.tw>

SPEC. No. : **FP-000-001-02**



## 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 <sub>0</sub>	<6.80	<6.80	<5.80	<5.80	<6.80	<6.80
B <sub>0</sub>	<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 <sub>0</sub>	<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 <sub>0</sub>	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 <sub>0</sub>	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 <sub>1</sub>	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 <sub>2</sub>	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 <sub>0</sub>	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 <sub>1</sub>	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	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 <sub>1</sub>	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

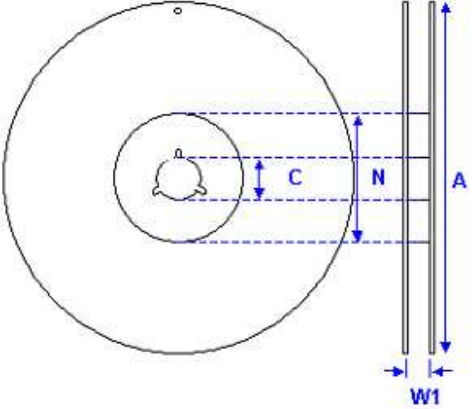


Fig. 4 The dimension of reel

## 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 middy 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:

FP series or Soft termination series do not recommend using hand soldering, due to the direct contact of soldering iron might carry a huge temperature deviation to the device and damage the device.

If hand soldering is an unavoidable process, please follow recommend as below:

\*Soldering iron tip diameter  $\leq 1.0$  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.

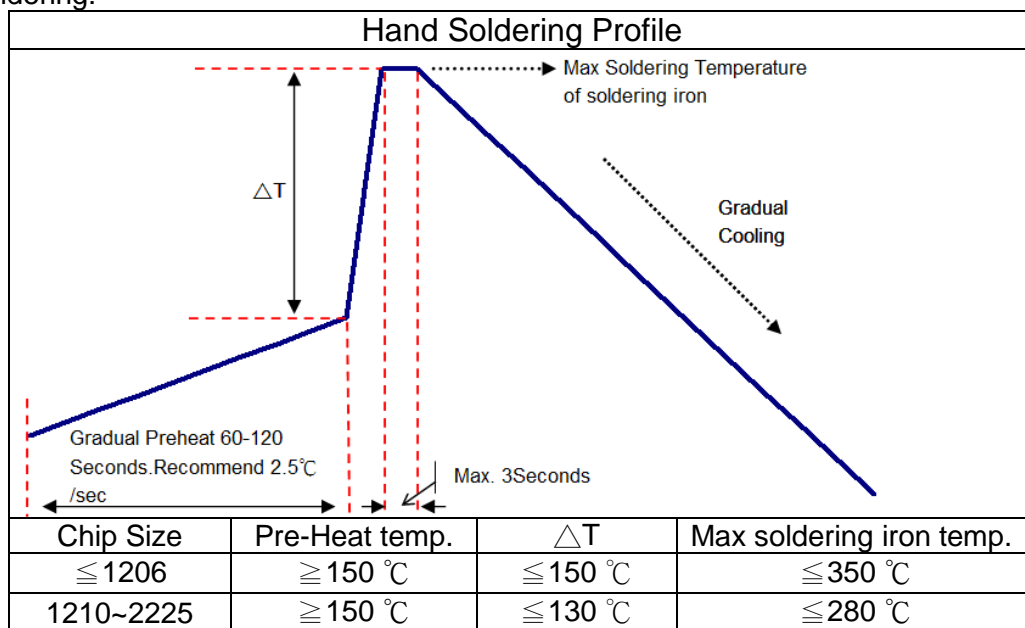
\*The required amount of solder shall be melted on the soldering tip.

\*The tip of iron should not contact the termination of chip capacitor directly.

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

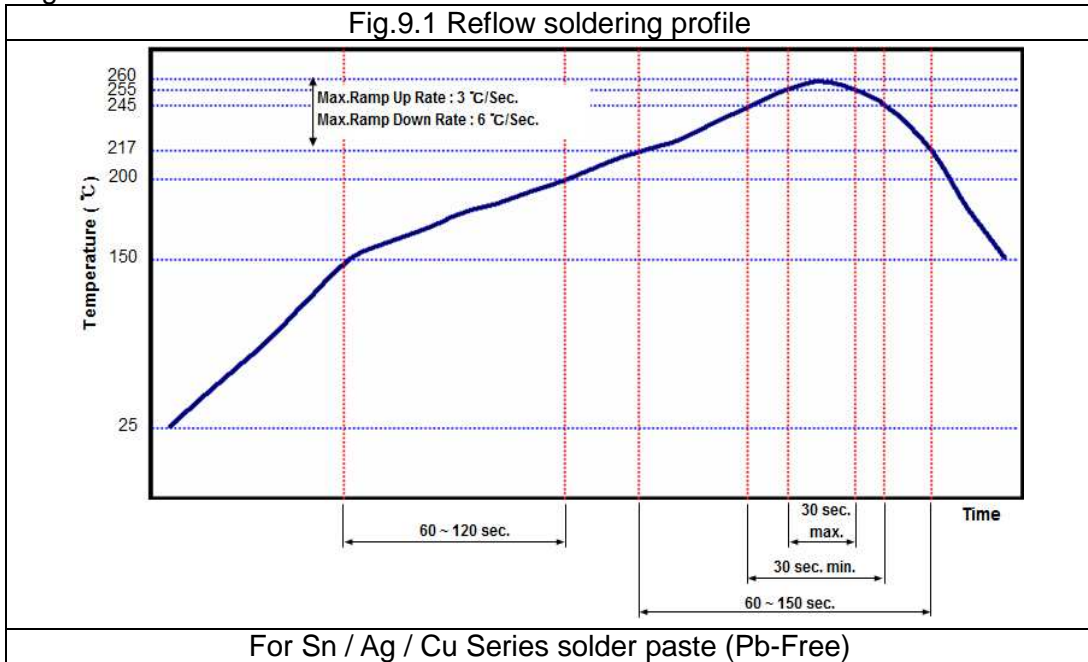
\*Forced air cooling is not allowed.

a.) Hand soldering:

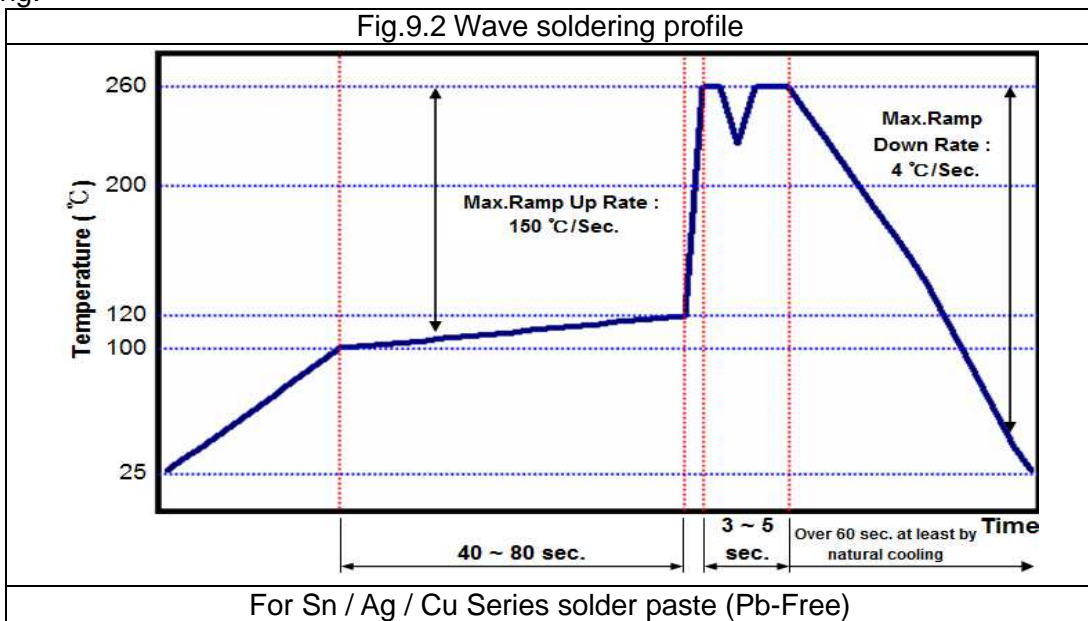


# 10. APPLICATION NOTES

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	Recommended not to use	○
0805 (2012)	Class I - C0G	All	Recommended not to use	○
1206 (3216)	Class I - C0G	All	Recommended not to use	○
≥ 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 $\mu$ F	Recommended not to use	○
		Cap. $\geq$ 2.2 $\mu$ F	X	○
0805 (2012)	Class II - X7R	Cap. < 4.7 $\mu$ F	Recommended not to use	○
		Cap. $\geq$ 4.7 $\mu$ F	X	○
1206 (3216)	Class II - X7R	Cap. < 4.7 $\mu$ F	Recommended not to use	○
		Cap. $\geq$ 4.7 $\mu$ F	X	○
$\geq$ 1210 (3225)	Class II - X7R	All	X	○

Soldering hight:

<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

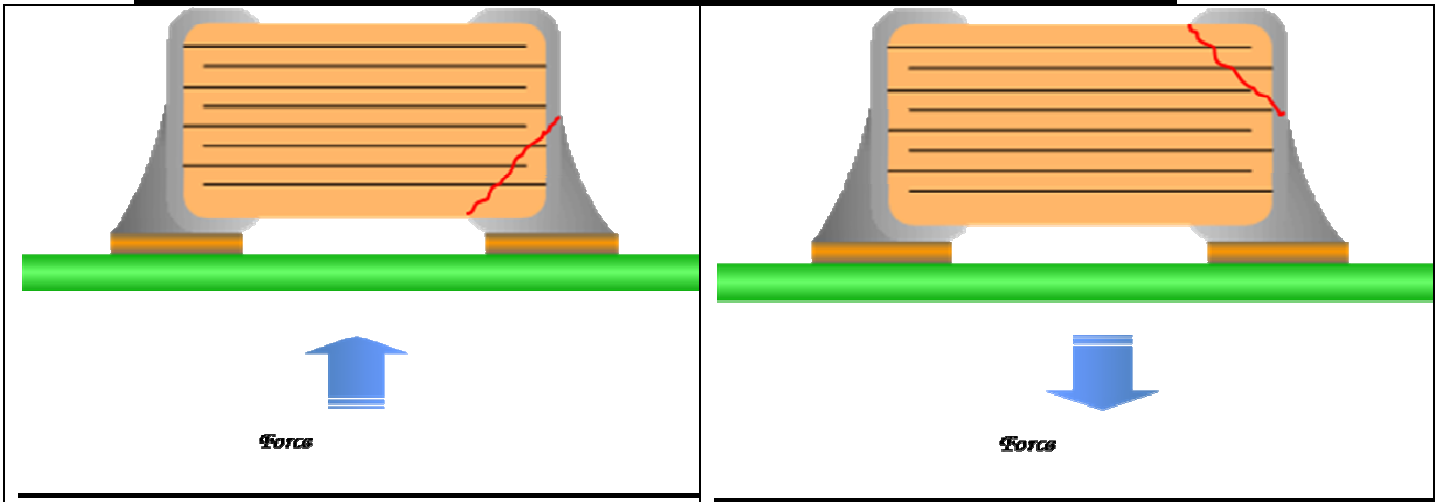
After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint.

### 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.

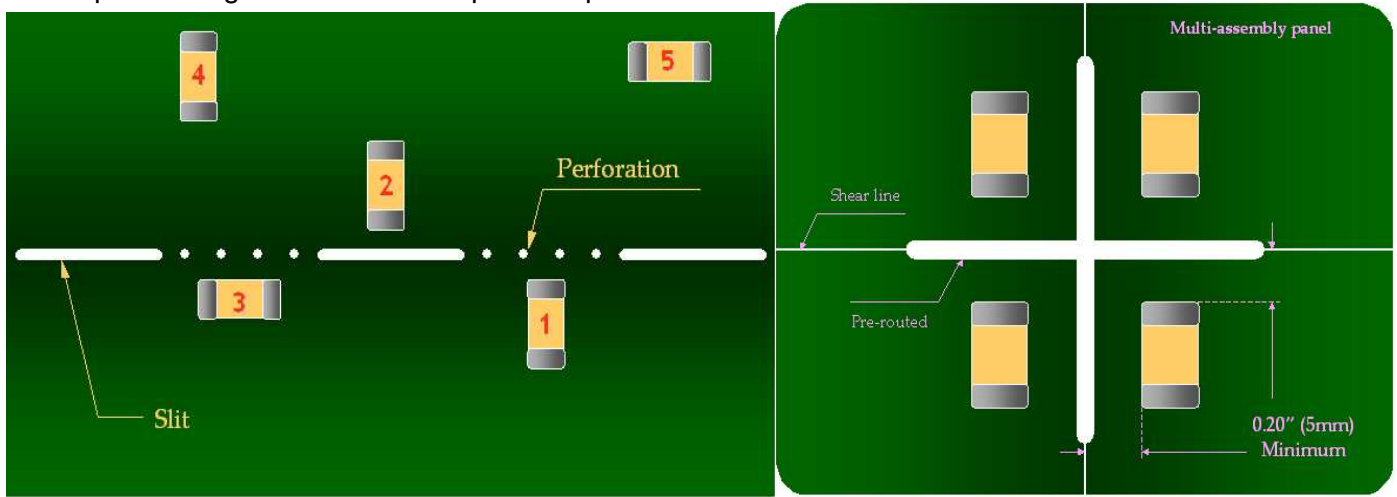
## 11. Typical Bending Cracks of MLCC

MLCC ceramic body is consisted of rigidity material. It will be suffered compressive and tensional stress when the carried board is bended. If the suffered stress is over ceramic body strength, the bending crack is occurred. **Therefore, the bending crack will be only occurred after soldering process.**



## 12. The stress v.s. position on PCB during bending

Chip mounting close to board separation point

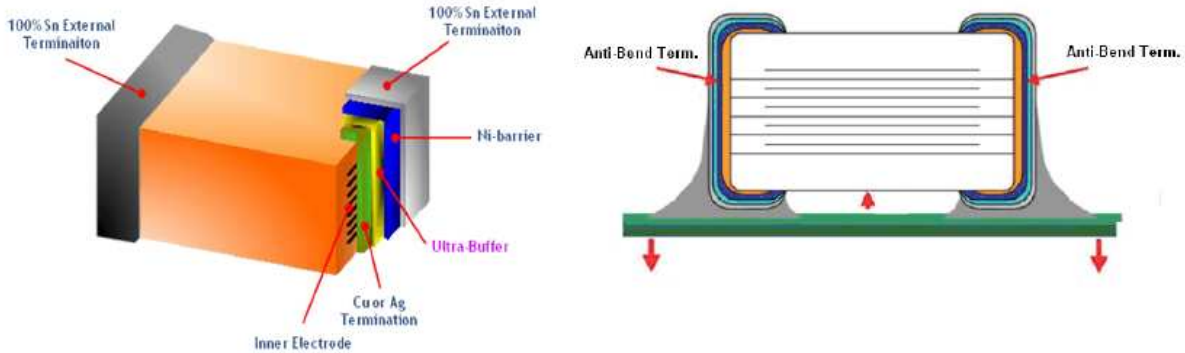


**Magnitude of stress  $1 > 2 \approx 3 > 4 > 5$**



## 13. Structure

PDC FP series is added a special termination material (Ultra-Buffer or Anti-Bend) between ceramic body and Ni-barrier that can absorb mechanical stress to prevent bending crack occurred.



## 14. Illustration of Bending Test

