



CCAB

1. INTRODUCTION

Jinpei 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.

CCAB 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.

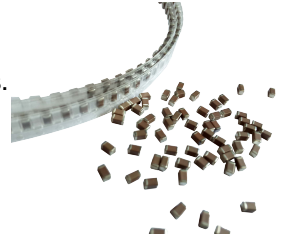
The nickel-barrier terminations are consisted of a nickel barrier layer over the silver metallization and then finished by electroplated solder layer to ensure the terminations have good solderability. The nickel barrier layer in terminations prevents the dissolution of termination when extended immersion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

2. FEATURES

- High performance to withstanding 3~5mm of substrate bending test guarantee.
- A wide selection of sizes is available.
- High capacitance in given case size.
- Capacitor with lead-free termination (pure Tin).
- Reduction in PCB bend failure.
- High reliability and stability.
- RoHS & Jinpei compliant.

3. APPLICATIONS

- For general digital circuit.
- For power supply bypass capacitors.
- For consumer electronics.
- For telecommunication.
- DC to DC converter.



4. PART NUMBER EXAMPLE

CCAB	1210	X	225	K	2A	E	G	G
JINPEI Series No.	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Packaging	Thickness	Control Code
Table 1	Table 2	Table 3	Table 4	Table 5	Table 6	Table 7	Table 8	Table 9

Table 1		Series No.			
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	NPO	B	X7R		
X	X5R	Y	Y5V		

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 %	X	+10% ~ +20%
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
OJ	6.3Vdc	2D	200Vdc	3R	1500Vdc
1A	10Vdc	2E	250Vdc	3D	2000Vdc
1C	16Vdc	2G	400Vdc	3U	3000Vdc
1E	25Vdc	2H	500Vdc	3G	4000Vdc
1H	50Vdc	2J	630Vdc	3H	5000Vdc
2A	100Vdc	3A	1000Vdc	3I	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	Code	Description		
G	RoHS Compliant	H	High reliability		
O	Gold plating (Size≥0603)	Q	Surface Coating (Size 1206~2225)		



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5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	Code / T (mm)	M _B (mm)	
0402(1005)	1.00±0.20	0.50±0.20	See No.4 Reference Table 8	0.25	
				+0.05/-0.10	
0603(1608)	1.60±0.20	0.80±0.20		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±0.20		0.60±0.20	
		1.60+0.30/-0.10 [#]			
1210(3225)	3.30±0.40	2.50±0.30		0.75±0.35	
1808(4520)	4.60±0.50	2.00±0.25		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

[#] For 1206 size P thickness products.

6. GENERAL ELECTRICAL DATA

Dielectric	COG	X7R						
Size	0402, 0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225	0402, 0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225						
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V, 1KV, 1.5KV, 2KV, 3KV, 4KV	6.3V, 10V, 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V, 1KV, 1.5KV, 2KV, 3KV, 4KV						
Capacitance range	0.1pF ~ 330nF	100pF ~ 22μF						
Capacitance tolerance	Reference to Table 5	Reference to Table 5						
Tan δ	<table border="1"> <thead> <tr> <th>Cap. Range</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. Range	Q Spec.	Cap.<30pF	Q≥400+20C	Cap.≥30pF	Q≥1000	Reference to 8. RELIABILITY TECCAB CONDITIONS AND REQUIREMENTS
	Cap. Range	Q Spec.						
	Cap.<30pF	Q≥400+20C						
Cap.≥30pF	Q≥1000							
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						
	<table border="1"> <thead> <tr> <th>Cap. Range</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. Range	Test Condition	Cap.≤1000pF	1.0±0.2Vrms, 1.0MHz±10%	Cap.>1000pF	1.0±0.2Vrms, 1.0KHz±10%
	Cap. Range		Test Condition					
Cap.≤1000pF	1.0±0.2Vrms, 1.0MHz±10%							
Cap.>1000pF	1.0±0.2Vrms, 1.0KHz±10%							
Insulation resistance	≥10GΩ or RxC≥500Ω·F, whichever is smaller	≥10GΩ or RxC≥100Ω·F, whichever is smaller						
Operating temperature	-55°C to +125°C	-55°C to +125°C						
Temperature coefficient	±30ppm/°C	±15%						
Termination	Cu/Ag polymer/Ni/Sn(lead-free termination)	Cu/Ag polymer/Ni/Sn(lead-free termination)						



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7. CAPACITANCE RANGE

7-1. NPO

Dimension	Code	0402				0603				0805														
		10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	200V	250V	10V	16V	25V	50V	100V	200V	250V	500V	630V	1000V	
0.1	0R1	K	K	K	K																			
0.2	0R2	K	K	K	K																			
0.3	0R3	K	K	K	K		S	S	S	S														
0.4	0R4	K	K	K	K		S	S	S	S														
0.5	0R5	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
0.6	0R6	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
0.7	0R7	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
0.8	0R8	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
0.9	0R9	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
1.0	1R0	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
1.2	1R2	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
1.5	1R5	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
1.8	1R8	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
2.2	2R2	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
2.7	2R7	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
3.3	3R3	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
3.9	3R9	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
4.7	4R7	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
5.0	5R0	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
5.6	5R6	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
6.8	6R8	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
8.2	8R2	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
10	100	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
12	120	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
15	150	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
18	180	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
22	220	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
27	270	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
33	330	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
39	390	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
47	470	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
56	560	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
68	680	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A	A	C
82	820	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	X	X	C
100	101	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	X	X	X	C
120	121	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	A	X	C	C	C
150	151	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	X	X	C	C	C
180	181	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	X	C	C	C	C
220	221	K	K	K	K	K	S	S	S	S	S	S	S	A	A	A	A	A	A	C	C	C	C	C
270	271	K	K	K	K		S	S	S	S	S	B	B	A	A	A	A	A	A	C	C	C	C	C
330	331	K	K	K	K		S	S	S	S	S	B	B	A	A	A	A	A	A	C	C	C	C	C
390	391	K	K	K	K		S	S	S	S	S	B	B	X	X	X	X	X	X	C	C	C	C	C
470	471	K	K	K	K		S	S	S	S	S	B	B	X	X	X	X	X	X	C	C	I	I	
560	561	K	K	K	K		S	S	S	S	S			X	X	X	X	X	X	C	C	I	I	
680	681	K	K	K	K		S	S	S	S	S			X	X	X	X	X	X	C	C	I	I	
820	821	K	K	K	K		S	S	S	S	S			X	X	X	X	X	X	C	C	I	I	
1000	102	K	K	K	K		S	S	S	S	S			X	X	X	X	X	X	C	C	I	I	
1200	122						B	B	B	B				X	X	X	X	X	C	C				
1500	152						B	B	B	B				X	X	X	X	X	C	C				
1800	182						B	B	B	B				X	X	X	X	X	C	C				
2200	222						B	B	B	B				X	X	X	X	X	C	C				
2700	272						B	B	B	B				C	C	C	C	C	C	C				
3300	332						B	B	B	B				C	C	C	C	C	C					
3900	392													C	C	C	C	C	C					
4700	472													C	C	C	C	C	C					
5600	562													C	C	C	C	C	C					
6800	682													C	C	C	C	C	C					
8200	822													C	C	C	C	C	C					
10000	103													C	C	C	C	C	C					



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7. CAPACITANCE RANGE

7-1. NPO

Dimension		1206										1210										
Cap.(pF)	Code	10V 16V 25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	10V 16V 25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	
1.0	1R0		X																			
1.2	1R2	X	X	X			X															
1.5	1R5	X	X	X	X	X	X	X	X	X	X											
1.8	1R8	X	X	X	X	X	X	X	X	X	X											
2.2	2R2	X	X	X	X	X	X	X	X	X	X											
2.7	2R7	X	X	X	X	X	X	X	X	X	X											
3.3	3R3	X	X	X	X	X	X	X	X	X	X											
3.9	3R9	X	X	X	X	X	X	X	X	X	X											
4.7	4R7	X	X	X	X	X	X	X	X	X	X											
5.0	5R0	X	X	X	X	X	X	X	X	X	X											
5.6	5R6	X	X	X	X	X	X	X	X	X	X											
6.8	6R8	X	X	X	X	X	X	X	X	X	X											
8.2	8R2	X	X	X	X	X	X	X	X	X	X											
10	100	X	X	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M	M	M
12	120	X	X	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M	M	M
15	150	X	X	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M	M	M
18	180	X	X	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M	M	M
22	220	X	X	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M	M	M
27	270	X	X	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M	M	M
33	330	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M	M	M	M	M
39	390	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M	M	M	M	M
47	470	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M	M	M	M	M	M
56	560	X	X	X	X	X	X	X	M	C	C	M	M	M	M	M	M	M	M	M	C	C
68	680	X	X	X	X	X	X	X	M	C	C	M	M	M	M	M	M	M	M	M	C	C
82	820	X	X	X	X	X	X	X	C	C	C	M	M	M	M	M	M	M	M	M	C	C
100	101	X	X	X	X	X	X	X	C	C	C	M	M	M	M	M	M	M	M	M	C	C
120	121	X	X	X	X	X	X	X	C	E	E	M	M	M	M	M	M	M	M	C	C	C
150	151	X	X	X	X	X	X	X	C	E	E	M	M	M	M	M	M	M	M	C	E	E
180	181	X	X	X	X	X	X	X	E	E	E	M	M	M	M	M	M	M	M	C	E	E
220	221	X	X	X	X	X	X	X	E	E	E	M	M	M	M	M	M	M	M	E	E	E
270	271	X	X	X	X	M	M	M	E	P	P	M	M	M	M	M	M	M	M	E	F	F
330	331	X	X	X	X	M	M	M	E	P	P	M	M	M	M	M	M	M	M	E	F	F
390	391	X	X	X	X	M	M	M	E	P	P	M	M	M	M	M	M	M	M	E	G	G
470	471	X	X	X	M	M	M	M	E			M	M	M	M	M	M	M	M	E	G	G
560	561	X	X	X	M	C	C	C	E			M	M	M	M	M	M	M	M	E		
680	681	X	X	X	M	C	C	C	E			M	M	M	M	M	M	M	M	E		
820	821	X	X	X	M	E	E	E	E			M	M	M	M	M	M	M	M	E		
1000	102	X	X	X	M	E	E	E	E			M	M	M	C	C	C	C	C	E		
1200	122	X	X	X	M	E	E	E				M	M	M	C	C	C	C	C	E		
1500	152	X	X	X	C	E	E	E				M	M	M	C	C	C	C	C	F		
1800	182	X	X	X	C	E	E	E				M	M	M	C	C	C	C	C	G		
2200	222	X	X	X	C	E	E	E				M	M	M	C	C	C	C	C	G		
2700	272	X	X	X	C	E	E	E				M	M	M	C	C	C	C	C			
3300	332	X	X	X	C	E	E	E				M	M	M	C	C	C	C	C			
3900	392	X	X	X	E	E	E	E				M	M	M	C	C	C	C	C			
4700	472	X	X	X	E	E	E	E				M	M	M	E	E	E	E	E			
5600	562	X	X	X	E	E	E					M	M	C	E	E	E	E	E			
6800	682	M	M	M	E	E	E					M	M	C	E	E	E	E	E			
8200	822	C	C	C	E	E						M	M	C	E	E	E	E	E			
10000	103	C	C	C	E	E						M	M	E	F	F	F	F	F			
12000	123	P	P	P								C	C	E								
15000	153	P	P	P								C	C	F								
18000	183	P	P	P								F	F	G								
22000	223	P	P	P								F	F	G								
27000	273	P	P									G	G									
33000	333	P	P									G	G									
39000	393	P	P									G	G									
47000	473																					
56000	563																					
68000	683																					



CCAB

7. CAPACITANCE RANGE

7-1. NPO

Dimension		1808										1812												
Cap.(pF)	Code	25V 50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	10V 16V	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	
1.0	1R0																							
1.2	1R2																							
1.5	1R5																							
1.8	1R8																							
2.2	2R2	C	C	C	C	C	C	C	C	C	C													
2.7	2R7	C	C	C	C	C	C	C	C	C	C													
3.3	3R3	C	C	C	C	C	C	C	C	C	C													
3.9	3R9	C	C	C	C	C	C	C	C	C	C													
4.7	4R7	C	C	C	C	C	C	C	C	C	C													
5.0	5R0	C	C	C	C	C	C	C	C	C	C													
5.6	5R6	C	C	C	C	C	C	C	C	C	C													
6.8	6R8	C	C	C	C	C	C	C	C	C	C													
8.2	8R2	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	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	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	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	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	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	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	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	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	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	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	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	C
100	101	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
120	121	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
150	151	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
180	181	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
220	221	C	C	C	C	C	C	C	C	C	E	C	C	C	C	C	C	C	C	C	C	C	C	C
270	271	C	C	C	C	C	C	C	C	C	E	C	C	C	C	C	C	C	C	C	C	C	C	C
330	331	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	C	C	C
390	391	C	C	C	C	C	C	C	C	C	F	C	C	C	C	C	C	C	C	C	C	C	C	C
470	471	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	E
560	561	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C
680	681	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C
820	821	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C
1000	102	C	C	C	C	C	C	C	E	E		C	C	C	C	C	C	C	C	C	C	C	C	C
1200	122	C	C	C	C	C	C	E				C	C	C	C	C	C	C	C	C	E	E	E	E
1500	152	C	C	C	C	C	C	E				C	C	C	C	C	C	C	C	C	E	E	E	E
1800	182	C	C	C	C	C	C	F				C	C	C	C	C	C	C	C	E				
2200	222	C	C	C	C	C	C	F				C	C	C	C	C	C	C	E					
2700	272	C	C	C	C	C	C					C	C	C	C	C	C	C	C	F				
3300	332	C	C	C	C	C	C					C	C	C	C	C	C	C	C	F				
3900	392	C	C	C	C							C	C	C	C	C	C	C	C	G				
4700	472	C	C	C	C							C	C	C	C	C	C	C						
5600	562	C	C	E	E							C	C	C	C	C	C	C						
6800	682	C	C	E	E							C	C	C	C	C	C	C						
8200	822	C	E	F	F							C	C	C	C	C	C	C						
10000	103	C	E	F	F							C	C	C	C	C	C	C						
12000	123	E										C	C	C	E	E	E	E						
15000	153	E										C	C	C	E	E	E	E						
18000	183	F										C	C	C	E	F	F	F						
22000	223	F										C	C	C	E	F	F	F						
27000	273											C	E	E	F	G	G							
33000	333											C	E	E	F									
39000	393												F	F	G									
47000	473												F	F	G									
56000	563												G	G										
68000	683												G	G										
82000	823												G	G										
100000	104												G	G										
120000	124																							
150000	154																							



CCAB

7. CAPACITANCE RANGE

7-1. NPO

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	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F			F	F	
12	120	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F		F	F	
15	150	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
18	180	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
22	220	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
27	270	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
33	330	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
39	390	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
47	470	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
56	560	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
68	680	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
82	820	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
100	101	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
120	121	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
150	151	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
180	181	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
220	221	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
270	271	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
330	331	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
390	391	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
470	471	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
560	561	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
680	681	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
820	821	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	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
1200	122	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
1500	152	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
1800	182	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
2200	222	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	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
3300	332	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
4700	472	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
6800	682	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
8200	822	F	F	F	F	F	F	G				F	F	F	F	F	F	G				
10000	103	F	F	F	F	F	F	G				F	F	F	F	F	F	G				
12000	123	F	F	F	F	F	F					F	F	F	F	F	F					
15000	153	F	F	F	F	F	F					F	F	F	F	F	F					
18000	183	F	F	F	F	F	F					F	F	F	F	F	F					
22000	223	F	F	F	F	F	F					F	F	F	F	F	F					
27000	273	F	F	F	F	F						F	F	F	F	F						
33000	333	F	F	F	F	F						F	F	F	F	F						
39000	393	F	E	F	F	G						F	F	F	F	F						
47000	473	F	E	F	F	G						F	F	G	G	G						
56000	563	F	F	G	G							F	F	G	G							
68000	683	F	F	G	G							F	F	G	G							
82000	823	F	G									F	G									
100000	104	G	G									G	G									
120000	124																					
150000	154																					
180000	184																					
220000	224																					
270000	274																					
330000	334																					

CCAB



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


CCAB
7. CAPACITANCE RANGE(Con.)
7-2. X7R

Dimension		0402						0603								0805											
Cap.(pF)	Code	6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V	200V	250V	6.3V	10V	16V	25V	50V	100V	200V	250V	500V	630V	1000V	
100	101		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
120	121		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
150	151		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
180	181		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
220	221		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
270	271		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
330	331		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
390	391		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
470	471		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
560	561		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
680	681		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
820	821		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
1000	102		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
1200	122		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	X
1500	152		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	C
1800	182		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	C
2200	222		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	C
2700	272		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	C
3300	332		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	
3900	392		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	
4700	472		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	
5600	562		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	
6800	682		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	
8200	822		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	
10000	103		K	K	K	K	K		S	S	S	S	S	S	B	B		C	C	C	C	C	C	C	X	X	
12000	123		K	K	K				S	S	S	S	S	B				C	C	C	C	C	C	C	X	X	
15000	153		K	K	K				S	S	S	S	S	B				C	C	C	C	C	C	C	X	X	
18000	183		K	K	K				S	S	S	S	S	B				C	C	C	C	C	C	C	X	X	
22000	223		K	K	K				S	S	S	S	S	B				C	C	C	C	C	C	C	X	X	
27000	273		K	K	K				S	S	S	S	S	B				C	C	C	C	C	C	C	X	X	
33000	333		K	K	K				S	S	S	S	S	B	B			C	C	C	C	C	C	C	X	X	
39000	393		K	K	K				S	S	S	S	S	B	B			C	C	C	C	C	C	C	X	X	
47000	473		K	K	K				S	S	S	S	S	B	B			C	C	C	C	C	C	C	X	X	
56000	563		K	K					S	S	S	S	S	B	B			C	C	C	C	C	C	C	X	X	
68000	683		K	K					S	S	S	S	S	B	B			C	C	C	C	C	C	C	X	X	
82000	823		K	K					S	S	S	S	S	B	B			C	C	C	C	C	C	C	X	X	
100000	104	K	K	K					S	S	S	S	S	B	B			C	C	C	C	C	C				
120000	124								S	S	S	S	S	B				C	C	C	C	C	I				
150000	154								S	S	S	S	S	B				C	C	C	C	I					
180000	184								S	S	S	S	S	B				C	C	C	C	I					
220000	224								S	S	S	S	S	B	B			C	C	C	C	I					
270000	274							B	B	B	B							I	I	I	I						
330000	334								B	B	B							I	I	I	I						
390000	394								B	B	B							I	I	I	I						
470000	474							B	B	B	B							I	I	I	I	I					
560000	564								B	B								I	I	I							
680000	684								B	B	B							I	I	I							
820000	824								B	B	B							I	I	I							
1000000	105							B	B	B								I	I	I	I						
1200000	125																										
1500000	155																	I	I	I							
2200000	225																I	I	I	I							
4700000	475																	I									



CCAB

7. CAPACITANCE RANGE(Con.)

7-2. X7R

Dimension		1206													1210												
Cap.(pF)	Code	6.3V	10V	16V	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	10V	16V	25V	50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	
100	101						C	C	C	C	C	C	C	C													
120	121						C	C	C	C	C	C	C	C													
150	151		C	C	C	C	C	C	C	C	C	C	C	C													
180	181		C	C	C	C	C	C	C	C	C	C	C	C													
220	221		C	C	C	C	C	C	C	C	C	C	C	C			M	M	M	M	M	M	M	M	M	M	
270	271		C	C	C	C	C	C	C	C	C	C	C	C			M	M	M	M	M	M	M	M	M	M	
330	331		C	C	C	C	C	C	C	C	C	C	C	C			M	M	M	M	M	M	M	M	M	M	
390	391		C	C	C	C	C	C	C	C	C	C	C	C			M	M	M	M	M	M	M	M	M	M	
470	471		C	C	C	C	C	C	C	C	C	C	C	C			M	M	M	M	M	M	M	M	M	M	
560	561		C	C	C	C	C	C	C	C	C	C	C	C			M	M	M	M	M	M	M	M	M	M	
680	681		C	C	C	C	C	C	C	C	C	C	C	C			M	M	M	M	M	M	M	M	M	M	
820	821		C	C	C	C	C	C	C	C	C	C	C	C			M	M	M	M	M	M	M	M	M	M	
1000	102		C	C	C	C	C	C	C	C	C	C	C	C	M	M	M	M	M	M	M	M	M	M	M	C	
1200	122		C	C	C	C	C	C	C	C	C	C	E	E	M	M	M	M	M	M	M	M	M	M	E	E	
1500	152		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	E	E	
1800	182		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	E	E	
2200	222		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	F	F	
2700	272		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	F	G	
3300	332		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	F	G	
3900	392		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	G	G	
4700	472		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	G	G	
5600	562		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	G	G*	
6800	682		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	G	G*	
8200	822		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	G	G*	
10000	103		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	C		
12000	123		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	C		
15000	153		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	M	E		
18000	183		C	C	C	C	C	C	C	C	C	E	E	E	M	M	M	M	M	M	M	M	M	C	C	E	
22000	223		C	C	C	C	C	C	C	E	E	E	E	E	M	M	M	M	M	M	C	C	C	E			
27000	273		C	C	C	C	C	C	C	E	E	E	E	E	M	M	M	M	M	M	C	C	C	E			
33000	333		C	C	C	C	E	E	E	E	E	E	E	E	M	M	M	M	M	M	E	E	E	E			
39000	393		C	C	C	C	E	E	E	E	E	E	E	E	M	M	M	M	M	M	E	E	E	F			
47000	473		C	C	C	C	E	E	E	E	E	E	E	E	M	M	M	M	M	C	C	E	E	G			
56000	563		C	C	C	C	E	E	E	E	E	E	E	E	M	M	M	M	M	C	C	E	E				
68000	683		C	C	C	C	E	E	E	E	E	E	E	E	M	M	M	M	M	E	E	F	F				
82000	823		C	C	C	C	E	E	E	E	E	E	E	E	M	M	M	M	M	E	E	F	F				
100000	104		C	C	C	C	E	E	E	E	E	E	E	E	M	M	M	M	M	E	E	F	F				
120000	124		C	C	C	C									M	M	M	M	M	E	E						
150000	154		M	M	M	M	E								M	M	M	M	C	E	E						
180000	184		M	M	M	M	E								M	M	M	M	C	E	E						
220000	224		M	M	M	M	E								M	M	M	M	C	E	E						
270000	274		M	M	M	C	E								M	M	M	M	E	F	F						
330000	334		M	M	M	C	E								M	M	M	C	E	F	F						
390000	394		M	M	J	P	E								M	M	M	C	G	G	G						
470000	474		J	J	J	P	E								M	M	M	C	G	G	G						
560000	564		J	J	J	P	P								C	C	C	C	G	G	G						
680000	684		J	J	J	P	P								C	C	C	C	F	G	G						
820000	824		J	J	J	P	P								C	C	C	C	F								
1000000	105		J	J	J	P	P								C	C	C	C	F								
1200000	125																										
1500000	155	J	J	J	P	P										F	E	G	G								
1800000	185																										
2200000	225	J	J	J	P	P										F	E	G	G								
2700000	275																										
3300000	335		P	P	P											F	E	G	G								
3900000	395																										
4700000	475	P	P	P	P											F	F	F	G								
10000000	106	P	P	P	P											F	F	G	G								
22000000	226		P														G										

* Surface coating only.



CCAB

7. CAPACITANCE RANGE(Con.)

7-2. X7R

Dimension		1808							1812													
Cap.(pF)	Code	500V	630V	1000V	1500V	2000V	3000V	4000V	10V 16V	25V 50V	100V	200V	250V	400V	500V	630V	1000V	1500V	2000V	3000V	4000V	
100	101																					
120	121																					
150	151	C	C	C	C	C	C	F*														
180	181	C	C	C	C	C	C	F*														
220	221	C	C	C	C	C	C	F*														
270	271	C	C	C	C	C	C	F*		C	C	C	C	C	C	C	C	C	C	C	C	F*
330	331	C	C	C	C	C	C	F*		C	C	C	C	C	C	C	C	C	C	C	C	F*
390	391	C	C	C	C	C	C	F*		C	C	C	C	C	C	C	C	C	C	C	C	F*
470	471	C	C	C	C	C	C	F*		C	C	C	C	C	C	C	C	C	C	C	C	F*
560	561	C	C	C	C	C	E	F*		C	C	C	C	C	C	C	C	C	C	C	C	F*
680	681	C	C	C	C	C	E	F*		C	C	C	C	C	C	C	C	C	C	C	C	F*
820	821	C	C	C	C	C	E	F*		C	C	C	C	C	C	C	C	C	C	C	C	F*
1000	102	C	C	C	C	C	F	F*		C	C	C	C	C	C	C	C	C	C	C	E	F*
1200	122	C	C	C	C	C	F			C	C	C	C	C	C	C	C	C	C	C	F	G*
1500	152	C	C	C	C	C	F			C	C	C	C	C	C	C	C	C	C	C	F	G*
1800	182	C	C	C	C	C	F			C	C	C	C	C	C	C	C	C	C	C	G	G*
2200	222	C	C	C	E	E	F			C	C	C	C	C	C	C	C	C	C	C	G*	
2700	272	C	C	C	F	F				C	C	C	C	C	C	C	C	C	C	C	G*	
3300	332	C	C	C	F	F				C	C	C	C	C	C	C	C	C	E	E	G*	
3900	392	C	C	C	F	F				C	C	C	C	C	C	C	C	C	F	F		
4700	472	C	C	C	F	F				C	C	C	C	C	C	C	C	C	F	F		
5600	562	C	C	C	F	F				C	C	C	C	C	C	C	C	C	G	G		
6800	682	C	C	C	F	F				C	C	C	C	C	C	C	C	C	G	G		
8200	822	C	C	C						C	C	C	C	C	C	C	C	C	G	G		
10000	103	C	C	C						C	C	C	C	C	C	C	C	C	G	G		
12000	123	E	E	E						C	C	C	C	C	C	C	C					
15000	153	E	E	E						C	C	C	C	C	C	C	C					
18000	183	F	F	F						C	C	C	C	C	C	C	C	E				
22000	223	F	F	F						C	C	C	C	C	C	C	C	E				
27000	273	F	F	F						C	C	C	C	C	C	C	C	F				
33000	333	F	F	F						C	C	C	C	C	C	C	C	F				
39000	393	F	F	F						C	C	C	C	C	C	C	C	G				
47000	473	F	F	F						C	C	C	C	C	C	C	C	G				
56000	563	F	F	F						C	C	C	C	C	C	E	E	G				
68000	683	F	F							C	C	C	C	C	C	E	E	G				
82000	823	F	F							C	C	C	C	C	C	E	E	G				
100000	104									C	C	C	C	C	C	E	E	G				
120000	124									C	C	C	C	C	C	F	F					
150000	154									C	C	C	C	C	C	F	F					
180000	184									C	C	C	C	C	C	G	G					
220000	224									C	C	C	C	C	C	G	G					
270000	274									C	C	C	E	E	E	G						
330000	334									C	C	C	E	E	E	G						
390000	394									C	C	C	F	F	F	G						
470000	474									C	C	C	F	F	F	G						
560000	564									C	C	C	G	G								
680000	684									C	C	C	G	G								
820000	824									C	C	C	G	G								
1000000	105									C	C	C	G	G								
1200000	125									C	C	C										
1500000	155									C	C											
1800000	185									E	E											
2200000	225									E	E											
2700000	275									F	F											
3300000	335									F	F											
3900000	395									F	F											
4700000	475									G	G											
5600000	565									G												
6800000	685									G												
8200000	825									G												
10000000	106									G												

* Surface coating only.



7. CAPACITANCE RANGE(Con.)

7-2. X7R

Dimension		1825											2220											
Cap.(pF)	Code	25V 50V	100V	200V	250V	500V	630V	1000V	1500V	2000V	3000V	4000V	25V 50V	100V	200V	250V	400V	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*
1200	122	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	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	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	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	G*	F	F	F	F	F	F	F	F	F	F	F	F*
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	F	G*	F	F	F	F	F	F	F	G	G	G	G	G*
10000	103	F	F	F	F	F	F	F	F	F	F	G*	F	F	F	F	F	F	F	F	G	G	G	G*
12000	123	F	F	F	F	F	F	F	G	G	H*	F	F	F	F	F	F	F	F	G	G	G	H*	H*
15000	153	F	F	F	F	F	F	F	G	G	H*	F	F	F	F	F	F	F	F	G	G	G	H*	H*
18000	183	F	F	F	F	F	F	F	G	G	H*	F	F	F	F	F	F	F	F	H	H	H	H	H*
22000	223	F	F	F	F	F	F	F	G	G		F	F	F	F	F	F	F	F	H	H	H		
27000	273	F	F	F	F	F	F	F	H	H		F	F	F	F	F	F	F	F	H	H	H		
33000	333	F	F	F	F	F	F	F	H	H		F	F	F	F	F	F	F	F	H	H	H		
39000	393	F	F	F	F	F	F	F	H	H		F	F	F	F	F	F	F	F	H	H	H		
47000	473	F	F	F	F	F	F	F	H	H		F	F	F	F	F	F	F	F	H	H	H		
56000	563	F	F	F	F	F	F	F				F	F	F	F	F	F	F	F	H	H	H		
68000	683	F	F	F	F	F	F	F				F	F	F	F	F	F	F	F					
82000	823	F	F	F	F	F	F	F				F	F	F	F	F	F	F	F					
100000	104	F	F	F	F	F	F	G				F	F	F	F	F	F	F	F	G				
120000	124	F	F	F	F	F	F					F	F	F	F	F	F	F	F	G				
150000	154	F	F	F	F	F	F					F	F	F	F	F	F	F	F	H				
180000	184	F	F	F	F	F	F					F	F	F	F	F	F	F	F	H				
220000	224	F	F	F	F	F	F					F	F	F	F	F	F	F	F	H				
270000	274	F	F	F	F	F	F					F	F	F	F	F	F	F						
330000	334	F	F	F	F	F	F					F	F	F	F	F	F	F						
390000	394	F	F	F	F	F	F					F	F	F	F	F	F	F						
470000	474	F	F	F	F	F	F					F	F	F	F	F	F	F						
560000	564	F	F	F	F	G	G					F	F	F	F									
680000	684	F	F	F	F							F	F	F	F									
820000	824	F	F	F	F							F	F	F	F									
1000000	105	F	F	F	F							F	F	F	F									
1200000	125	F	F									F	F	G	G									
1500000	155	F	F									F	F	G	G									
1800000	185	F	F									F	F	G	G									
2200000	225	F	F									F	F	G	G									
2700000	275	F	F									F	F											
3300000	335	F	F									F	F											
3900000	395	F	F									F	F											
4700000	475	F	F									F	F											
5600000	565	F	F									F	F											
6800000	685	F	F									F	F											
8200000	825	G	G									G	G											
10000000	106	G	G									G	G											
12000000	126											H												
15000000	156											H												
18000000	186											H												
22000000	226											H												

* Surface coating only.



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7. CAPACITANCE RANGE(Con.)

7-2. X7R

Dimension		2225													
Cap.(pF)	Code	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*
330	331														F*
390	391														F*
470	471														F*
560	561														F*
680	681														F*
820	821														F*
1000	102	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*	G*	
1500	152	F	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*	G*	
2200	222	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*		
3300	332	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*		
4700	472	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*	G*	
6800	682	F	F	F	F	F	F	F	F	F	F	F	F*	G*	
8200	822	F	F	F	F	F	F	F	F	F	F	F	F*	G*	
10000	103	F	F	F	F	F	F	F	F	F	F	F	F*	G*	
12000	123	F	F	F	F	F	F	F	F	G	G	G	G*		
15000	153	F	F	F	F	F	F	F	F	G	G	G	G*		
18000	183	F	F	F	F	F	F	F	F	G	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	G	G				
33000	333	F	F	F	F	F	F	F	F	G	G				
39000	393	F	F	F	F	F	F	F	F	G	H				
47000	473	F	F	F	F	F	F	F	F	G	H				
56000	563	F	F	F	F	F	F	F	F	G	H				
68000	683	F	F	F	F	F	F	F	F	G					
82000	823	F	F	F	F	F	F	F	F	G					
100000	104	F	F	F	F	F	F	F	G	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							
330000	334	F	F	F	F	F	F	F							
390000	394	F	F	F	F	F	F	F							
470000	474	F	F	F	F	F	F	F							
560000	564	F	F	F	F	F	F	F							
680000	684	F	F	F	F	F									
820000	824	F	F	F	F	F									
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	G	G									
3300000	335	F	F	F											
3900000	395	F	F	F											
4700000	475	F	F	F											
5600000	565	F	F	F											
6800000	685	F	F	F											
8200000	825	G	G	G											
10000000	106	G	G	G											
12000000	126														
15000000	156														
18000000	186														
22000000	226														

* Surface coating only.



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8. RELIABILITY TECCAB CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																																								
1.	Visual and Dimensions	---	* No remarkable defect. * Dimensions to confirm to individual specification sheet.																																																								
2.	Capacitance		* Shall not exceed the limits given in the detailed spec.																																																								
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CCAB

8. RELIABILITY TECCAB CONDITIONS AND REQUIREMENTS

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		<table border="1"> <thead> <tr> <th>Rated Vol.(V)</th> <th>Apply Voltage</th> <th>Charge Time</th> </tr> </thead> <tbody> <tr> <td>≤ 100</td> <td>1 times of U_R</td> <td>Max. 120 sec.</td> </tr> <tr> <td>$100 < V \leq 500$</td> <td>1 times of U_R</td> <td>60 sec.</td> </tr> <tr> <td>> 500</td> <td>500Vdc</td> <td>60 sec.</td> </tr> </tbody> </table>	Rated Vol.(V)	Apply Voltage	Charge Time	≤ 100	1 times of U_R	Max. 120 sec.	$100 < V \leq 500$	1 times of U_R	60 sec.	> 500	500Vdc	60 sec.																
Rated Vol.(V)	Apply Voltage	Charge Time																												
≤ 100	1 times of U_R	Max. 120 sec.																												
$100 < V \leq 500$	1 times of U_R	60 sec.																												
> 500	500Vdc	60 sec.																												
6.	Dielectric Strength	<table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Condition</th> </tr> </thead> <tbody> <tr> <td>≤ 100</td> <td>2.5 times of U_R</td> </tr> <tr> <td>$100 < V \leq 250$</td> <td>2.0 times of U_R</td> </tr> <tr> <td>$250 < V \leq 500$</td> <td>1.5 times of U_R</td> </tr> <tr> <td>$630 < V \leq 3000V$</td> <td>1.2 times of U_R</td> </tr> <tr> <td>$3000 < V \leq 5000V$</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> <p>* Duration : 1 to 5 sec. * Charge and discharge current less than 50mA. * Test in insulating fluid for rated voltage $\geq 1KV$ products.</p>	Rated Voltage	Condition	≤ 100	2.5 times of U_R	$100 < V \leq 250$	2.0 times of U_R	$250 < V \leq 500$	1.5 times of U_R	$630 < V \leq 3000V$	1.2 times of U_R	$3000 < V \leq 5000V$	1.1 times of U_R	$> 5000V$	1.0 times of U_R	* No evidence of damage or flash over during test.													
		Rated Voltage	Condition																											
≤ 100	2.5 times of U_R																													
$100 < V \leq 250$	2.0 times of U_R																													
$250 < V \leq 500$	1.5 times of U_R																													
$630 < V \leq 3000V$	1.2 times of U_R																													
$3000 < V \leq 5000V$	1.1 times of U_R																													
$> 5000V$	1.0 times of U_R																													
7.	Solderability	<p>* Solder temperature : $235 \pm 5^\circ C$ for (0402~1210). * Solder temperature : $245 \pm 5^\circ C$ for (1808~2225). * Dipping time : 2 ± 0.5 sec.</p>	* 75% min. coverage of all metalized area.																											
8.	Resistance to Soldering Heat	<p>* Solder temperature : $260 \pm 5^\circ C$. * Dipping time : 10 ± 1 sec. * Preheating : 120 to $150^\circ C$ for 1 minute before immerse the capacitor in a eutectic solder.</p> <p>Before initial measurement (Class II only) : To apply de-aging at $150^\circ C$ for 1hr then set for 24 ± 2 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>	<p>* No remarkable damage. * Cap. change : COG : Within $\pm 2.5\%$ or $\pm 0.25pF$, whichever is larger. X7R : Within $\pm 7.5\%$. * D.F./Q, I.R. and dielectric strength : To meet initial requirements. * 25% max. leaching on each edge.</p>																											
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.($^\circ C$)</th> <th>Time(min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30\pm3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30\pm3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> <p>Before initial measurement (Class II only) : To apply de-aging at $150^\circ C$ for 1hr then set for 24 ± 2 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.($^\circ C$)	Time(min.)	1	Min. operating temp. +0/-3	30 \pm 3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30 \pm 3	4	Room temp.	2~3	<p>* No remarkable damage. * Cap. change : COG : Within $\pm 2.5\%$ or $\pm 0.25pF$, whichever is larger. X7R : Within $\pm 7.5\%$. * D.F./Q : COG : $Q \geq 100\%$ of initial requirements. X7R : D.F.$\leq 150\%$ of initial requirement. * I.R. : $\geq 100\%$ of initial requirement.</p>												
		Step	Temp.($^\circ C$)	Time(min.)																										
1	Min. operating temp. +0/-3	30 \pm 3																												
2	Room temp.	2~3																												
3	Max. operating temp. +3/-0	30 \pm 3																												
4	Room temp.	2~3																												


CCAB

8. RELIABILITY TECCAB 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/-0hrs. * Before initial measurement (Class II only) : To apply de-gaging at 150°C for 1hr then set for 24±2 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).	* No remarkable damage. * Cap. change : COG : Within ±5.0% or ±0.5pF, whichever is larger. X7R : Within ±12.5% for ≥10V**, within ±25% for 6.3V. **10V : Within ±25% for 0603≥4.7μF, 0402≥1μF. * D.F./Q : COG : Q≥350 for Cap.>30pF, Q≥275+2.5C for 10pF≤Cap.≤30pF, Q≥200+10C for Cap.<10pF. X7R : D.F.≤200% of initial requirement. * I.R. : ≥10V, ≥1GΩ or RxC≥50Ω-F, whichever is smaller. Except :											
			<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>I.R.</th> </tr> </thead> <tbody> <tr> <td>100V : All X7R; 1210≥3.3μF</td> <td rowspan="10">≥1GΩ or RxC≥10Ω-F, whichever is smaller</td> </tr> <tr> <td>50V : 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF</td> </tr> <tr> <td>35V : 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF</td> </tr> <tr> <td>25V : 0201≥0.1uF, 0402≥0.22μF, 0603≥2.2μF, 0805≥2.2μF, 1206≥10μF, 1210≥10μF</td> </tr> <tr> <td>16V : 0201≥0.1uF, 0402≥0.22μF, 0603≥1μF, 0805≥2.2μF, 1206≥10μF, 1210≥47μF</td> </tr> <tr> <td>10V : 0201≥47nF, 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥47μF</td> </tr> <tr> <td>6.3V; 4V; Size≥1812</td> </tr> </tbody> </table>	Rated voltage	I.R.	100V : All X7R; 1210≥3.3μF	≥1GΩ or RxC≥10Ω-F, whichever is smaller	50V : 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF	35V : 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF	25V : 0201≥0.1uF, 0402≥0.22μF, 0603≥2.2μF, 0805≥2.2μF, 1206≥10μF, 1210≥10μF	16V : 0201≥0.1uF, 0402≥0.22μF, 0603≥1μF, 0805≥2.2μF, 1206≥10μF, 1210≥47μF	10V : 0201≥47nF, 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥47μF	6.3V; 4V; Size≥1812	
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11.		Humidity (Damp Heat) Load	* Reflow solder the capacitors on a P.C. Board before test. * Test temp. : 40±2°C(85±3°C for control code H). * Humidity : 90~95% RH (85±5% for control code H). * Test time : 500 +24/-0hrs. * To apply voltage : Rated voltage (500Vdc max. for general purpose and 100Vdc max. for control code H) * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	* No remarkable damage. * Cap. change : COG : Within ±7.5% or ±0.75pF, whichever is larger. X7R : Within ±12.5% for ≥10V**, within ±25% for 6.3V. **10V : Within ±25% for 0603≥4.7μF, 0402≥1μF. * D.F./Q : COG : Q≥350 for Cap.>30pF, Q≥275+2.5C for 10pF≤Cap.≤30pF, Q≥200+10C for Cap.<10pF. X7R : ≤200% of initial requirement. * I.R. : ≥10V, ≥500MΩ or RxC≥25Ω-F, whichever is smaller. Except :										
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6.3V; 4V; Size≥1812														



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8. RELIABILITY TECCAB CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements
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12. **High Temperature Load (Endurance)** * Test temp. : 125±3°C.
 * To apply voltage :
 (1) ≤6.3V or Cap.≥10μF : 150% of rated voltage.
 (2) 10V≤Ur<500V : 200% of rated voltage.
 (3) 500V : 150% of rated voltage.
 (4) Ur≥630V : 120% of rated voltage.
 (5) 100% of rated voltage for below range :

Size	Dielectric	Rated	Capacitance
0201	X7R	≤10V	C≥0.1μF
		≥16V	C>0.1μF
0402	X7R	6.3V, 10V, 16V, 25V	C≥1.0μF
		4V	C≥2.2μF
0603	X7R	6.3V, 10V	C≥4.7μF
		25V, 35V	C≥1.0μF
0805	X7R	4V	C≥4.7μF
		6.3V	C≥2.2μF
1206	X7R	10V~50V	C≥1.0μF
		≤6.3V	C≥4.7μF
1210	X7R	16V	C≥4.7μF
		≥100V	C≥3.3μF

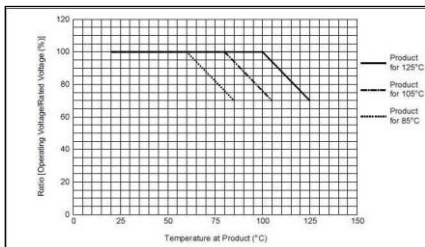
(6) 150% of rated voltage for below range :

Size	Dielectric	Rated Voltage	Capacitance
0201	X7R	16V	C≥0.022μF
0402	X7R	50V	C≥0.1μF
		10~25V	C≥0.22μF
0603	X7R	≥50V	C≥0.082μF
		10V, 16V, 50V	C≥1.0μF
0805	X7R	10~50V	C≥4.7μF
		50V	C≥0.47μF
1206	X7R	≥100V	C≥0.12μF
		≥50V	C≥1.0μF
1210	X7R	≤100V	C≥1.0μF
		>100V	C≥0.22μF
1812	X7R	≤50V	C≥4.7μF
		100V	C≥1.0μF
		200V~250V	C≥0.47μF
1825	X7R	≥100V	C≥1.0μF
2220			
2225			

(7) 120% of rated voltage for below range :

Size	Dielectric	Rated Voltage	Capacitance
2220	X7R	≥100V	C≥15μF

* Test time : 1000 +24/-0 hrs.
 * Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.
 * Measurement to be made after keeping at room temp. for 48±4 hrs (Class II).
 ** De-rating conditions :



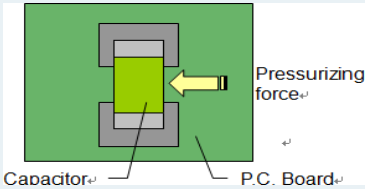
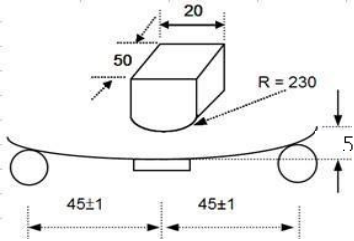
* No remarkable damage.
 * Cap. change :
 COG : Within ±5.0% or ±0.5pF, whichever is larger.
 X7R : Within ±12.5% for ≥10V**, within ±25% for 6.3V.
 **10V : Within ±25% for 0603≥4.7μF, 0402≥1μF.
 * D.F./Q :
 COG : Q≥350 for Cap.>30pF, Q≥275+2.5C for 10pF≤Cap.≤30pF, Q≥200+10C for Cap.<10pF.
 X7R : D.F.≤200% of initial requirement.
 * I.R. : ≥10V, ≥1GΩ or R×C≥50Ω·F, whichever is smaller.
 Except :

Rated voltage	I.R.
100V : All X7R; 1210≥3.3μF	≥1GΩ or RxC≥10Ω·F, whichever is smaller
50V : 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF	
35V : 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF	
25V : 0201≥0.1μF, 0402≥0.22μF, 0603≥2.2μF, 0805≥2.2μF, 1206≥10μF, 1210≥10μF	
16V : 0201≥0.1μF, 0402≥0.22μF, 0603≥1μF, 0805≥2.2μF, 1206≥10μF, 1210≥4.7μF	
10V : 0201≥47nF, 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥4.7μF	
6.3V; 4V; Size≥1812	



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8. RELIABILITY TECCAB CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements						
13.	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\pm1second.</p> 	<p>* No remarkable damage or removal of the terminations.</p>						
		<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 5mm for product size < 1808, 3mm for product size ≥ 1808.</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 (COG)</td> <td>Within $\pm 5.0\%$ or $\pm 0.5\text{pF}$, 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 (COG)	Within $\pm 5.0\%$ or $\pm 0.5\text{pF}$, whichever is larger	Class II (X7R)	Within $\pm 12.5\%$
Dielectric	Cap. Change								
Class I (COG)	Within $\pm 5.0\%$ or $\pm 0.5\text{pF}$, whichever is larger								
Class II (X7R)	Within $\pm 12.5\%$								
14.	Bending Test								
		Unit : mm							
15.	Vibration Resistance	<p>* Vibration frequency : 10\sim55 Hz/min. * Total amplitude : 1.5mm. * Test time : 6 hrs. (Two hrs each in three mutually perpendicular directions) * Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24\pm2 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).</p>	<p>* No remarkable damage. * Cap. change and D.F./Q : 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	-	-
	0.50 +0.02/-0.05	10k	50k	-	-
	0.50±0.20	10k	-	-	-
0603(1608)	0.50±0.10	4k	-	-	-
	0.80±0.07	4k	15k	-	-
	0.80 +0.15/-0.10	4k	15k	-	-
0805(2012)	0.50±0.10	4k	15k	-	-
	0.60±0.10	4k	15k	-	-
	0.80±0.10	4k	15k	-	-
	0.85±0.10	4k	15k	-	-
	1.25±0.10	-	-	3k	10k
	1.25±0.20	-	-	3k	10k
1206(3216)	0.80±0.10	4k	15k	-	-
	0.85±0.10	4k	15k	-	-
	0.95±0.10	-	-	3k	10k
	1.15±0.15	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	10k
	1.60 +0.30/-0.10	-	-	2k	9k
1210(3225)	0.85±0.10	-	-	3k	10k
	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
	2.00±0.20	-	-	1k	6k
	2.50±0.30	-	-	1k	6k
1808(4520)	1.25±0.10	-	-	2k	10k
	1.60±0.20	-	-	2k	8k
	2.00±0.20	-	-	1k	6k
1812(4532)	1.25±0.10	-	-	1k	5k
	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	3k
	2.80±0.30	-	-	0.5k	-
1825(4563)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-
	2.80±0.30	-	-	0.5k	-
2220(5750)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-
	2.80±0.30	-	-	0.5k	-
2225(5763)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-
	2.80±0.30	-	-	0.5k	-

Unit : pcs

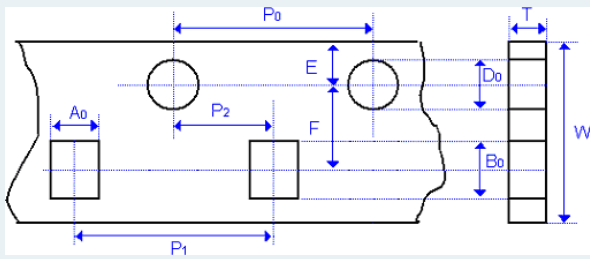

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9. PACKAGE DIMENSION AND QUANTITY
9.1. EMBOSSED TAPE DIMENSIONS


Fig. 9.1 The dimension of paper tape

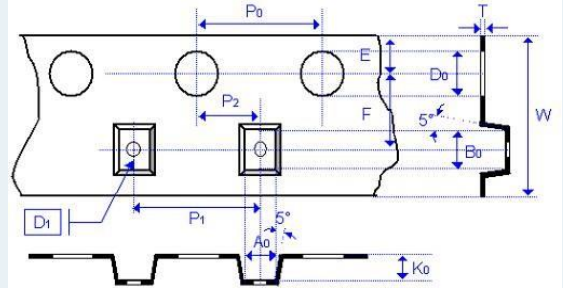


Fig. 9.2 The dimension of plastic tape

Size	0402		0603		0805	
Chip Thickness	0.50±0.05	0.50±0.10	0.80±0.07	0.80 +0.15/-0.1	0.80±0.10	1.25±0.10 1.25±0.20
A ₀	0.70±0.20	0.70±0.20	1.00 +0.05/-0.1	1.02 +0.05/-0.1	1.50±0.10	<1.65
B ₀	1.20±0.20	1.20±0.20	1.80±0.10	1.80±0.10	2.30±0.10	<2.40
T	≤0.80	≤0.80	0.95±0.05	0.97±0.05	0.95±0.05	0.23±0.05
K ₀	-	-	-	-	-	<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
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±0.10	40.00±0.10	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P ₁	2.00±0.05	2.00±0.05	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
D ₀	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.50 +0.10/-0
D ₁	-	-	-	-	-	1.00±0.10
E	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.10
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05
Unit :	mm	mm	mm	mm	mm	mm

Size	1206			1210		1812	
Chip Thickness	0.80±0.10	0.95±0.10 1.25±0.10	1.60±0.20 1.60+0.3/-0/1	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	2.50±0.30
A ₀	2.00±0.10	<2.00	<2.00	<3.05	<3.10	<3.90	<3.90
B ₀	3.50±0.10	<3.60	<3.70	<3.80	<4.00	<5.30	<5.30
T	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.25±0.05	0.25±0.05
K ₀	-	<2.50	<2.50	<2.50	<3.50	<2.50	<3.00
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	12.00±0.20	12.00±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	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	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	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	2.00±0.05
D ₀	1.55±0.05	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	-	1.00±0.10	1.00±0.10	1.00±0.10	1.00±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	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	5.50±0.05	5.50±0.05
Unit :	mm	mm	mm	mm	mm	mm	mm


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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	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20	12.00±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±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10
F	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05
Unit :	mm	mm	mm	mm	mm	mm

9.2. 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

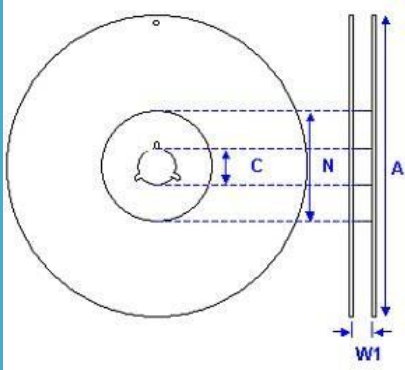


Fig. 9.3 The dimension of reel



10. APPLICATION NOTES

CCABORAGE

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.

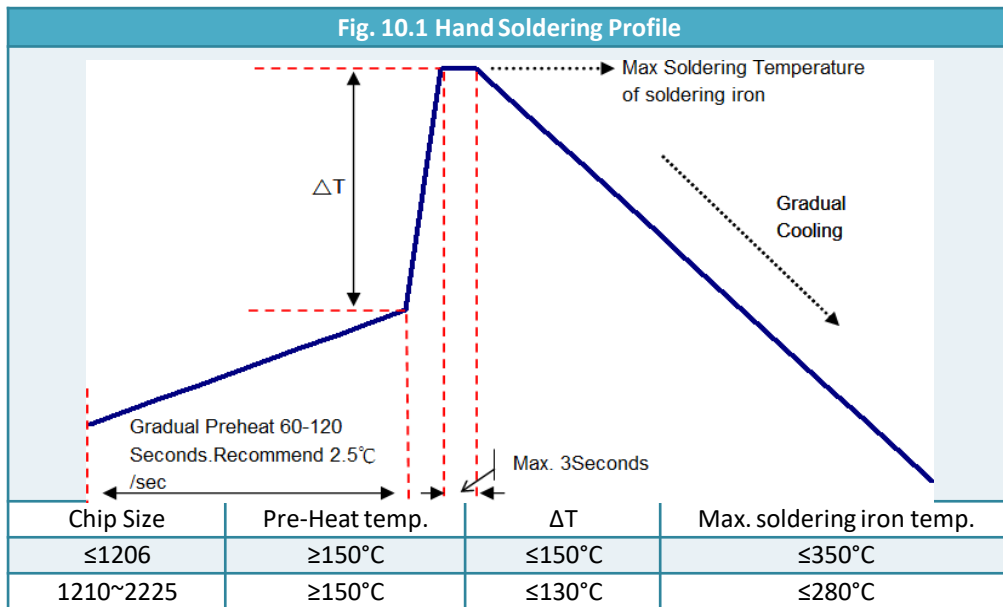
PREHEAT

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 :



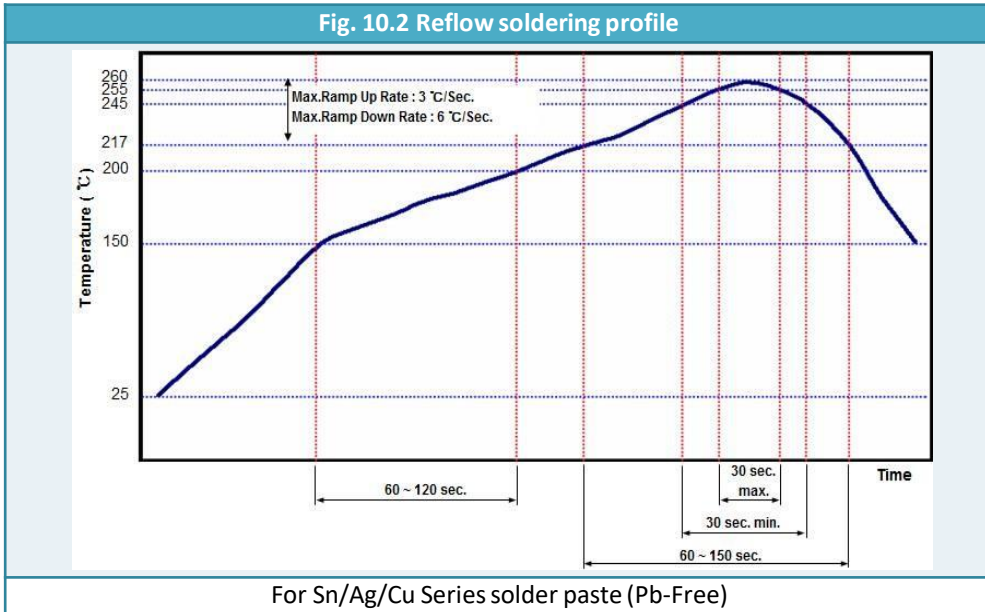
- * Soldering iron tip diameter ≤ 1.0 mm and wattage max. 20W.
- * The Capacitors shall be pre-heated and that the temperature gradient between the devices and the tip of the soldering iron.
- * The required amount of solder shall be melted on the soldering tip.
- * The tip of iron should not contact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



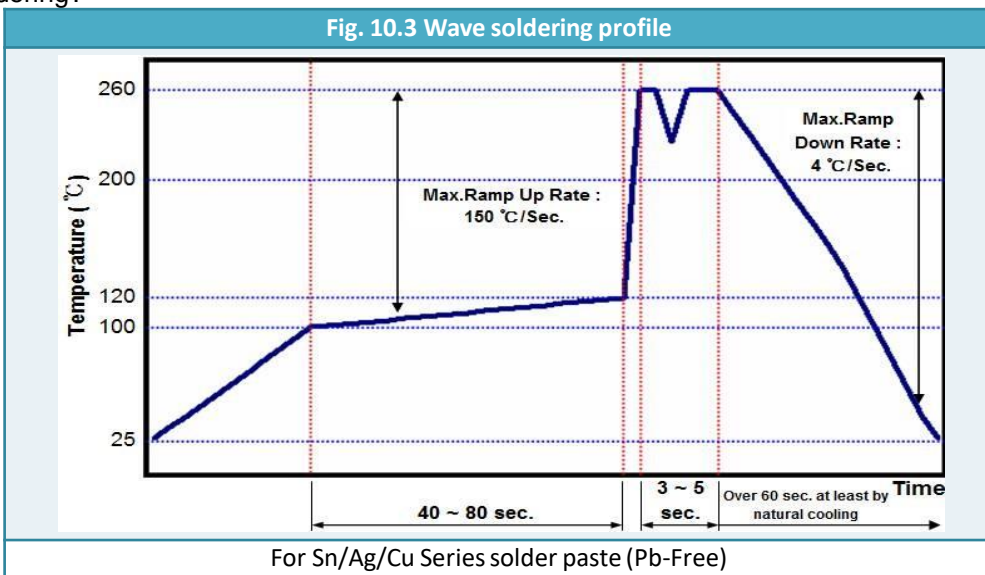
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10. APPLICATION NOTES

b.) Reflow soldering :



c.) Wave soldering :



Soldering conditions :

Class I :

Size Inch (mm)	Temper. Cher.	Capacitance	Wave Condition		Reflow
			Wave	Condition	
≤0402 (1005)	All Class I	All	X		O
0603 (1608)	All Class I	All	Not recommended		O
0805 (2012)	All Class I	All	Not recommended		O
1206 (3216)	All Class I	All	Not recommended		O
≥1210 (3225)	All Class I	All	X		O



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10. APPLICATION NOTES

Soldering conditions :

Class II :

Size Inch (mm)	Temper. Cher.	Capacitance	Wave	Condition	Reflow
≤0402 (1005)	All Class II	All	X		O
0603 (1608)	All Class II	Cap. <2.2μF	Not recommended		O
		Cap. ≥2.2μF	X		O
0805 (2012)	All Class II	Cap. <4.7μF	Not recommended		O
		Cap. ≥4.7μF	X		O
1206 (3216)	All Class II	Cap. <4.7μF	Not recommended		O
		Cap. ≥4.7μF	X		O
≥1210 (3225)	All Class II	All	X		O

Soldering height :

<p>The solder climbing minimum height is suggesting to 25% of chip thickness or 500um whichever is less. (Reference from IPC-610E)</p>	<p>The diagram illustrates a 3D view of a chip on a substrate. A vertical double-headed arrow on the left indicates the 'Chip Thickness'. A horizontal double-headed arrow on the right indicates the 'Soldering Height', which is the height of the solder joint on the chip's side.</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

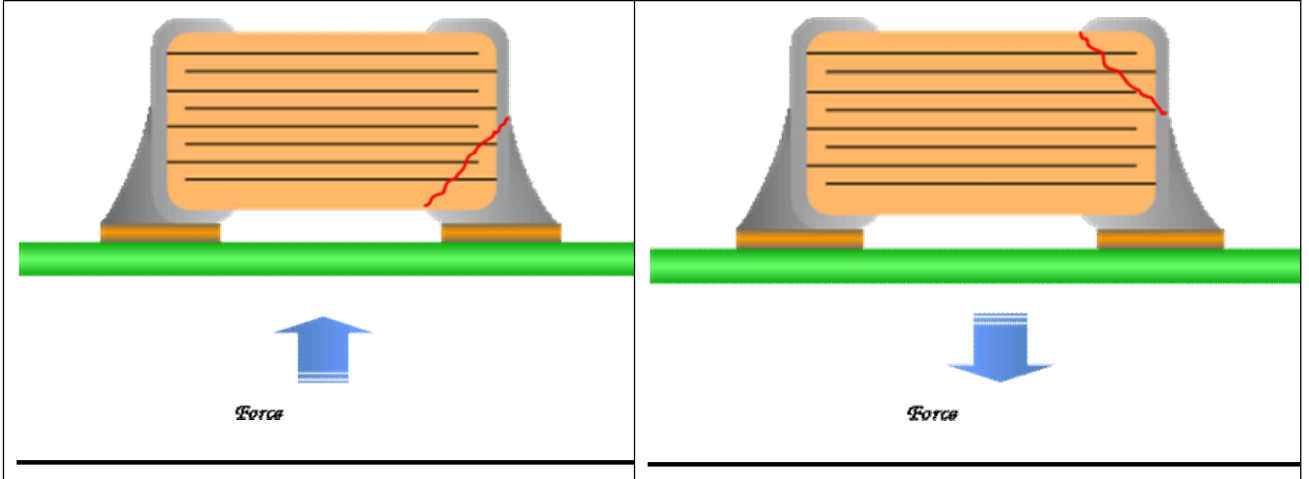
All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors 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.



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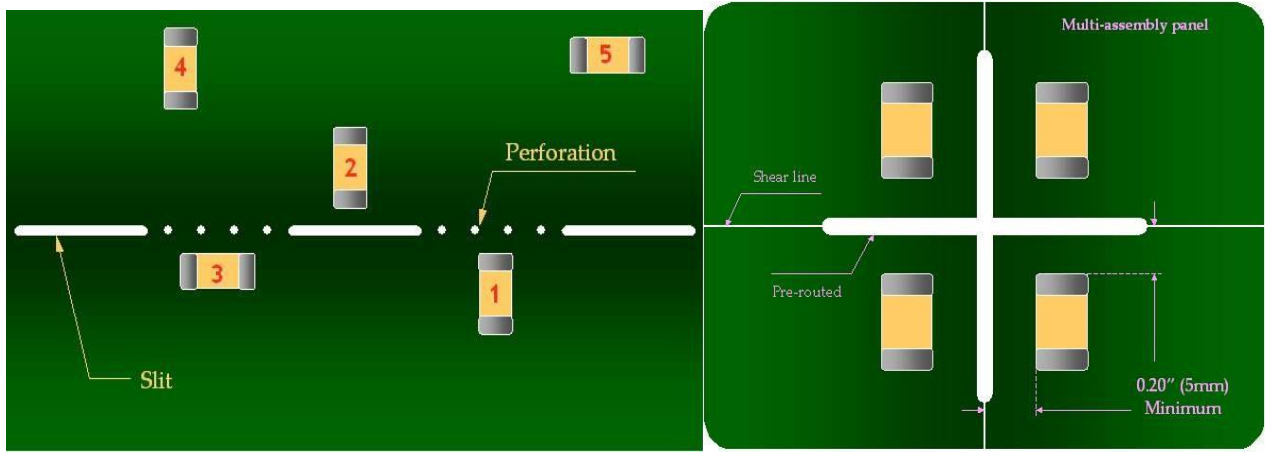
11. Typical Bending Cracks of MLCC

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



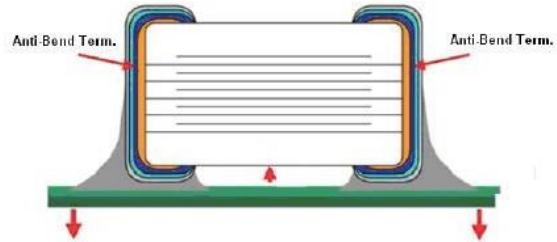
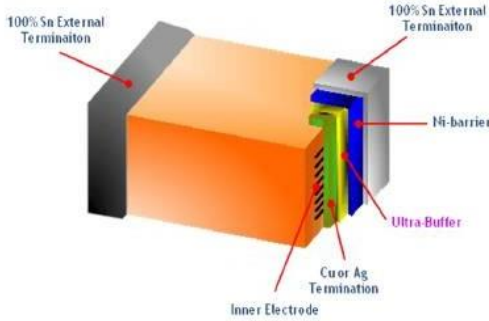
Magnitude of stress 1 > 2 3 > 4 > 5



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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

