

Prosperity Dielectrics Co., Ltd.

No.566-1, Kaoshi Rd., Yangmei, Taoyuan 32668, Taiwan (R.O.C.)

Tel : 886-3-4753355

Fax : 886-3-4854959

Messrs. : 一般共用

Date : 2023/12/15

APPROVAL SHEET

Product Name : Open-mode Design Capacitors

Part No. : OP Series

Description : Size 0805~1812, X7R, 25Vdc~630Vdc

PREPARED BY	APPROVED BY

信昌電子陶瓷股份有限公司

PROSPERITY DIELECTRICS CO., LTD.

桃園市楊梅區高獅路 566-1 號 <http://www.pdc.com.tw>

Tel : 03-4753355 ext :

Fax : 03-4854959

Contactor : _____ **Mobile :** _____

SPECIFICATION

FOR

Product Name : Open-mode Design Capacitors

Part No. : OP Series

Description : Size 0805~1812, X7R, 25Vdc~630Vdc

SPEC. No. : OP-000-001-04

DATE : 2023/12/15

DRAWN BY	CHECEKED BY	APPROVED BY
<i>Jane Hsiao</i>	<i>Yvens Chou</i>	<i>Jason Lin</i>

1. INTRODUCTION

POSPERITY open-mode series MLCC is designed by a special internal electrode pattern, which can reduce voltage concentrations by distributing voltage gradients throughout the entire capacitor. This special design also affords open-mode pattern to prevent circuit leakage when focused to failure in a board flex situation.

2. FEATURES

- Medium voltage in a given case size.
- Circuit open during product cracking.
- High stability and reliability.
- RoHS compliant.

3. APPLICATIONS

- High current applications.
- Power supply and related industries.
- The other mechanical stress concerned products.

4. HOW TO ORDER

<u>OP</u>	<u>31</u>	<u>X</u>	<u>333</u>	<u>K</u>	<u>631</u>	<u>E</u>	<u>E</u>	<u>G</u>
PDC Family	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	PDC Family
Code	Description
OP	Open-mode design series

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

Table 3		Dielectric Material Characteristics	
Code	Description	Code	Description
X	X7R		

Table 4		Capacitance Rule Code	
Code	Description	Code	Description
R47	0.47pF	102	102=10x10 ² =1000pF
0R5	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	J	±5 %	X	+10%~+20%
B	±0.10 pF	K	±10 %		
C	±0.25 pF	L	0% ~ +10%		
D	±0.50 pF	M	±20 %		
F	±1 %	N	-5% ~ +10%		
G	±2 %	P	±0.02 pF		
H	±3 %	Q	±0.03 pF		
I	-10% ~ 0%	Z	-20% ~ +80%		

Table 6		Rated Voltage			
Code	Description	Code	Description	Code	Description
250	25Vdc	201	200Vdc	501	500Vdc
500	50Vdc	251	250Vdc	631	630Vdc
101	100Vdc	401	400Vdc		

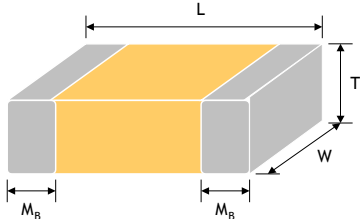
Table 7		Packaging Type	
Code	Description	Code	Description
B	Bulk	T	Tray package
E	Tape and 7" Reel, Embossed Tape	P	Tape and 7" Reel, Paper Tape
K	Tape and 10" Reel, Embossed Tape	D	Tape and 10" Reel, Paper Tape
L	Tape and 13" Reel, Embossed Tape	G	Tape and 13" Reel, Paper Tape

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
E	Soft termination

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	Code / T (mm)	M _B (mm)
0805(2012)	2.10±0.20	1.25±0.20	See No.4 Reference Table 8	0.50±0.20
1206(3216)	3.30±0.30	1.60±0.20 1.60 +0.3/-0.1#		0.60±0.20
1210(3225)	3.30±0.40	2.50±0.30		0.75±0.35
1812(4532)	4.60±0.50	3.20±0.30		0.75±0.35



The diagram illustrates the physical dimensions of a Multilayer Ceramic Capacitor (MLCC). It shows a 3D perspective of a rectangular component. The length is labeled 'L', the width is 'W', and the thickness is 'T'. The end faces are shaded gray, and the central body is yellow. The distance from the end face to the start of the central body is labeled 'M_B' on both sides.

Fig. 5.1 The outline of MLCC

For 1206 size P thickness products.

6. GENERAL ELECTRICAL DATA

Dielectric	X7R
Size	0805, 1206, 1210, 1812
Rated voltage (WVDC)	25V, 50V, 100V, 200V, 250V, 500V, 630V
Capacitance range	100pF ~ 1μF
Capacitance tolerance	Reference to Table 5
Tan δ	≤2.5%~≤10.0%
Capacitance & Tan δ Test condition	Measured at the condition of 30~70% related humidity
	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
	1.0±0.2Vrms, 1.0KHz±10%, at 25°C ambient temperature
Insulation resistance at Ur	≥10GΩ or RxC≥100Ω-F, whichever is smaller
Operating temperature	-55 to +125°C
Capacitance characteristic	±15%
Termination	Cu/Ni/Sn (lead-free termination)

7. CAPACITANCE RANGE

7-1. X7R

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

7. CAPACITANCE RANGE

7-1. X7R

Dimension		1210						1812					
Cap(pF)	code	50V	100V	200V	250V	500V	630V	50V	100V	200V	250V	500V	630V
100	101												
120	121												
150	151												
180	181												
220	221												
270	271												
330	331												
390	391												
470	471												
560	561												
680	681												
820	821												
1000	102	M	M	M	M	M	M	C	C	C	C	C	C
1200	122	M	M	M	M	M	M	C	C	C	C	C	C
1500	152	M	M	M	M	M	M	C	C	C	C	C	C
1800	182	M	M	M	M	M	M	C	C	C	C	C	C
2200	222	M	M	M	M	M	M	C	C	C	C	C	C
2700	272	M	M	M	M	M	M	C	C	C	C	C	C
3300	332	M	M	M	M	M	M	C	C	C	C	C	C
3900	392	M	M	M	M	M	M	C	C	C	C	C	C
4700	472	M	M	M	M	M	M	C	C	C	C	C	C
5600	562	M	M	M	M	M	M	C	C	C	C	C	C
6800	682	M	M	M	M	M	M	C	C	C	C	C	C
8200	822	M	M	M	M	M	M	C	C	C	C	C	C
10000	103	M	M	M	M	M	M	C	C	C	C	C	C
12000	123	M	M	M	M	M	M	C	C	C	C	C	C
15000	153	M	M	M	M	M	M	C	C	C	C	C	C
18000	183	M	M	M	M	C	C	C	C	C	C	C	C
22000	223	M	M	M	M	C	C	C	C	C	C	C	C
27000	273	M	M	M	M	C	C	C	C	C	C	C	C
33000	333	M	M	M	M	E	E	C	C	C	C	C	C
39000	393	M	M	M	M	E	E	C	C	C	C	C	C
47000	473	M	M	M	M	E	E	C	C	C	C	C	C
56000	563	M	M	M	M	F	F	C	C	C	C	E	E
68000	683	M	M	M	M	G	G	C	C	C	C	E	E
82000	823	M	M	M	M			C	C	C	C	F	F
100000	104	M	M	M	M			C	C	C	C	F	F
120000	124	M	M	E	E			C	C	C	C	G	G
150000	154	M	M	E	E			C	C	C	C	G	G
180000	184	M	M	E	E			C	C	C	C		
220000	224	M	M	E	E			C	C	C	C		
270000	274	M	M	F	F			C	C	E	E		
330000	334	M	M	F	F			C	C	E	E		
390000	394	M	C	G	G			C	C	F	F		
470000	474	M	C					C	C	F	F		
560000	564	C	E					C	C	G	G		
680000	684	C	E					C	C	G	G		
820000	824	C	F					C	E				
1000000	105	P	G					C	E				
1200000	125	F						E	F				
1500000	155	G						E	F				
1800000	185							F	G				
2200000	225							F					
2700000	275							G					

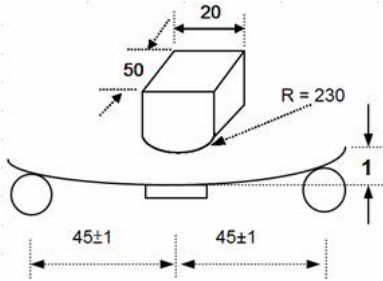
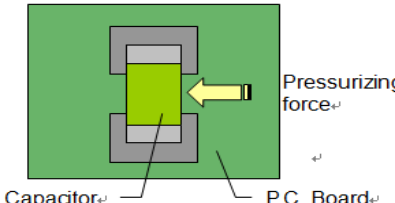
8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

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.																
3.	Q/ D.F. (Dissipation Factor)	* 1.0±0.2Vrms, 1kHz±10% * Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp																	
			<table><tr><th>Dielectric</th><th>Q/D.F.</th><th>Remark</th></tr><tr><td rowspan="4">Class II</td><td>D.F.≤2.5%</td><td>X7R items</td></tr><tr><td>D.F.≤3.5%</td><td>X7R 0805≥0.082μF, 1206≥0.47μF, ALL 25V/50V</td></tr><tr><td>D.F.≤5.0%</td><td>X7R 0805≥0.12μF</td></tr><tr><td>D.F.≤10.0%</td><td>X7R 0805≥0.27μF</td></tr></table>	Dielectric	Q/D.F.	Remark	Class II	D.F.≤2.5%	X7R items	D.F.≤3.5%	X7R 0805≥0.082μF, 1206≥0.47μF, ALL 25V/50V	D.F.≤5.0%	X7R 0805≥0.12μF	D.F.≤10.0%	X7R 0805≥0.27μF				
			Dielectric	Q/D.F.	Remark														
			Class II	D.F.≤2.5%	X7R items														
D.F.≤3.5%	X7R 0805≥0.082μF, 1206≥0.47μF, ALL 25V/50V																		
D.F.≤5.0%	X7R 0805≥0.12μF																		
D.F.≤10.0%	X7R 0805≥0.27μF																		
4.	Temperature Coefficient	* With no electrical load.																	
		<table><tr><th>T.C.</th><th>Operating Temp.</th></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr></table>	T.C.	Operating Temp.	X7R	-55~125°C at 25°C	<table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±15%</td></tr></table>	T.C.	Capacitance Change	X7R	Within ±15%								
T.C.	Operating Temp.																		
X7R	-55~125°C at 25°C																		
T.C.	Capacitance Change																		
X7R	Within ±15%																		
5.	Insulation Resistance	<table><tr><th>Rated Vol.(V)</th><th>Apply Voltage</th><th>Test Condition</th></tr><tr><td>≤100</td><td>1 times of UR</td><td>Max. 120 sec.</td></tr><tr><td>100<V≤500</td><td>1 times of UR</td><td>60 sec.</td></tr><tr><td>>500</td><td>500Vdc</td><td>60 sec.</td></tr></table>	Rated Vol.(V)	Apply Voltage	Test Condition	≤100	1 times of UR	Max. 120 sec.	100<V≤500	1 times of UR	60 sec.	>500	500Vdc	60 sec.	<table><tr><th>Dielectric</th><th>Requirements</th></tr><tr><td>Class II</td><td>≥10GΩ or Rx C≥100Ω-F, whichever is smaller</td></tr></table>	Dielectric	Requirements	Class II	≥10GΩ or Rx C≥100Ω-F, whichever is smaller
		Rated Vol.(V)	Apply Voltage	Test Condition															
		≤100	1 times of UR	Max. 120 sec.															
100<V≤500	1 times of UR	60 sec.																	
>500	500Vdc	60 sec.																	
Dielectric	Requirements																		
Class II	≥10GΩ or Rx C≥100Ω-F, whichever is smaller																		
6.	Solderability	* Solder temperature : 235±5°C for (0805~1210). * Solder temperature : 245±5°C for (1812). * Dipping time : 2±0.5 sec.	* 75% min. coverage of all metalized area.																
7.	Dielectric Strength	<table><tr><th>Rated Vol.(V)</th><th>Condition</th></tr><tr><td>≤100</td><td>2.5 times of UR</td></tr><tr><td>100<V≤250</td><td>2.0 times of UR</td></tr><tr><td>250<V≤500</td><td>1.5 times of UR</td></tr><tr><td>≥630</td><td>1.2 times of UR</td></tr></table>	Rated Vol.(V)	Condition	≤100	2.5 times of UR	100<V≤250	2.0 times of UR	250<V≤500	1.5 times of UR	≥630	1.2 times of UR	* No evidence of damage or flashover during test.						
		Rated Vol.(V)	Condition																
		≤100	2.5 times of UR																
		100<V≤250	2.0 times of UR																
250<V≤500	1.5 times of UR																		
≥630	1.2 times of UR																		
8.	Resistance to Soldering Heat	* Duration : 1 to 5 sec.	* No remarkable damage. * Cap. Change : X7R : Within ±7.5%. * Q/D.F. & I.R. : To meet the initial requirement. * 25% max. leaching on each edge.																
		* Charge and discharge current less than 50mA.																	
		* Solder temperature : 260±5°C.																	
		* Dipping time : 10±1 sec.																	
9.	Temperature Cycle	* Preheating : 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder.	* No remarkable damage. * Cap. change : X7R : Within ±7.5%. * Q/D.F. : X7R : D.F.≤150% of initial requirement. * I.R. : To meet the initial requirement.																
		* 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 48±4 hrs (Class II).																	
		* Conduct the five cycles according to the temperatures and time.																	
		<table><tr><th>Step</th><th>Temp.(°C)</th><th>Time(min.)</th></tr><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></table>	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		
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																	
		* 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).																	

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																											
10.	Humidity (Damp Heat) Steady State	* Test temp. : 40±2°C. * Humidity : 90~95%RH. * Test time : 500 +24/-0 hrs. * Measurement to be made after keeping at room temp. for 24±2 hrs 48±4 hrs (Class II).	* No remarkable damage. * Cap. change : X7R : Within ±12.5%. * Q/D.F. : X7R : D.F.≤200% of initial requirement. * I.R. : ≥1GΩ or RxC≥50Ω-F, whichever is smaller. X7R 100V : ≥1GΩ or RxC≥10Ω-F, whichever is smaller.																											
11.	Humidity (Damp Heat) Load	* Test temp. : 40±2°C. * Humidity : 90~95% RH. * Test time : 500 +24/-0hrs. * To apply voltage : Rated voltage (Max. 500Vdc). * Measurement to be made after keeping at room temp. for 48±4 hrs (Class II).	* No remarkable damage. * Cap. change : X7R : Within ±12.5%. * Q/D.F. : X7R : D.F.≤200% of initial requirement. * I.R. : ≥500MΩ or RxC≥25Ω-F, whichever is smaller. X7R 100V : ≥500MΩ or RxC≥5Ω-F, whichever is smaller.																											
12.	High Temperature Load (Endurance)	* Test temp. : C0G, X7R : 125±3°C. <table><tr><th>Dielectric</th><th>Rated Vol.(V)</th><th>Apply Voltage</th></tr><tr><td rowspan="3">X7R</td><td>≤100</td><td>2.0 times of UR</td></tr><tr><td>200≤V≤500</td><td>1.5 times of UR</td></tr><tr><td>=630</td><td>1.2 times of UR</td></tr></table> * Exception items : <table><tr><th>Rated Vol.(V)</th><th>Size</th><th>Cap. Range</th><th>Apply Voltage</th></tr><tr><td rowspan="2">100</td><td>0603</td><td>≥0.082μF</td><td rowspan="6">1.5 times of UR</td></tr><tr><td>0805</td><td>≥0.12μF</td></tr><tr><td rowspan="3">200 & 250</td><td>0603</td><td>≥0.082μF</td></tr><tr><td>1210</td><td>≥0.22μF</td></tr><tr><td>1812</td><td>≥0.47μF</td></tr></table> * Test time : 1000 +24/-0 hrs. * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).	Dielectric	Rated Vol.(V)	Apply Voltage	X7R	≤100	2.0 times of UR	200≤V≤500	1.5 times of UR	=630	1.2 times of UR	Rated Vol.(V)	Size	Cap. Range	Apply Voltage	100	0603	≥0.082μF	1.5 times of UR	0805	≥0.12μF	200 & 250	0603	≥0.082μF	1210	≥0.22μF	1812	≥0.47μF	* No remarkable damage. * Cap. change : X7R : Within ±12.5%. * Q/D.F. : X7R : D.F.≤200% of initial requirement. * I.R. : ≥1GΩ or RxC≥50Ω-F, whichever is smaller. X7R 100V : ≥1GΩ or RxC≥10Ω-F, whichever is smaller.
Dielectric	Rated Vol.(V)	Apply Voltage																												
X7R	≤100	2.0 times of UR																												
	200≤V≤500	1.5 times of UR																												
	=630	1.2 times of UR																												
Rated Vol.(V)	Size	Cap. Range	Apply Voltage																											
100	0603	≥0.082μF	1.5 times of UR																											
	0805	≥0.12μF																												
200 & 250	0603	≥0.082μF																												
	1210	≥0.22μF																												
	1812	≥0.47μF																												

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements				
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 1mm.  Unit : mm	* No remarkable damage. <table border="1"><thead><tr><th>Dielectric</th><th>Cap. Change</th></tr></thead><tbody><tr><td>Class II (X7R)</td><td>Within ±12.5%</td></tr></tbody></table> (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test)	Dielectric	Cap. Change	Class II (X7R)	Within ±12.5%
Dielectric	Cap. Change						
Class II (X7R)	Within ±12.5%						
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.  Pressurizing force Capacitor P.C. Board	* No remarkable damage or removal of the terminations.				
15.	Vibration Resistance	* Vibration frequency : 10~55 Hz/min. * Total amplitude : 1.5mm. * Test time : 6 hrs. (Two hrs each in three mutually perpendicular directions) * Measurement to be made after keeping at room temp. for 48±4 hrs (Class II).	* No remarkable damage. * Cap. change and Q/D.F. : To meet the initial spec.				

9. PACKAGE DIMENSION AND QUANTITY

Size	Thickness (mm)	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
0201(0603)	0.30±0.03	15k	70k	-	-
	0.30±0.05	15k	-	-	-
	0.30±0.09	15k	-	-	-
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
1206(3216)	1.25±0.20	-	-	3k	10k
	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
1210(3225)	1.60±0.20	-	-	2k	10k
	1.60 +0.30/-0.10	-	-	2k	9k
	0.85±0.10	-	-	3k	10k
	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
1808(4520)	2.00±0.20	-	-	1k	6k
	2.50±0.30	-	-	1k	6k
	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

9. PACKAGE DIMENSION AND QUANTITY

9.1. EMBOSSED TAPE DIMENSIONS

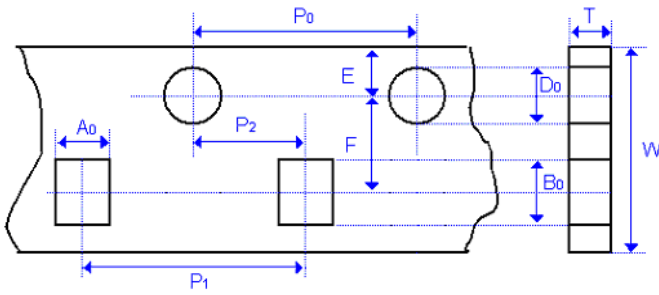


Fig. 9.1 The dimension of paper tape

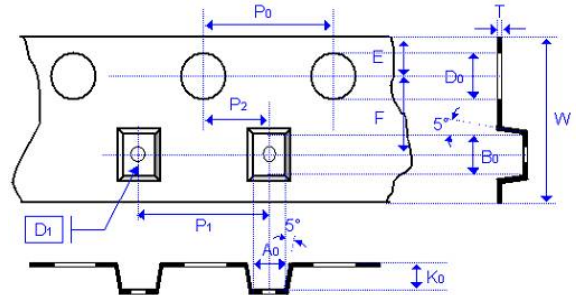


Fig. 9.2 The dimension of plastic tape

Size	0201	0402	0603		0805	
Chip Thickness	0.30±0.03	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	0.39±0.07	0.70±0.20	1.00 +0.05/-0.10	1.02 +0.05/-0.10	1.50±0.10	<1.65
B ₀	0.69±0.07	1.20±0.20	1.80±0.10	1.80±0.10	2.30±0.10	<2.40
T	≤0.50	≤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	40.0±0.10	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

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	0201, 0402, 0603, 0805, 1206, 1210		1808, 1812, 1825, 2220, 2225
Reel size	7"	13"	7"
C	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	8.4 +1.5/-0	8.4 +1.5/-0
W	14.4max	14.4max	shall accommodate tape width without interference
A	178.0 ±0.10	330.0 ±1.0	178.0 ±0.10
N	60.0 +1.0/-0	100 ±1.0	60.0 +1.0/-0

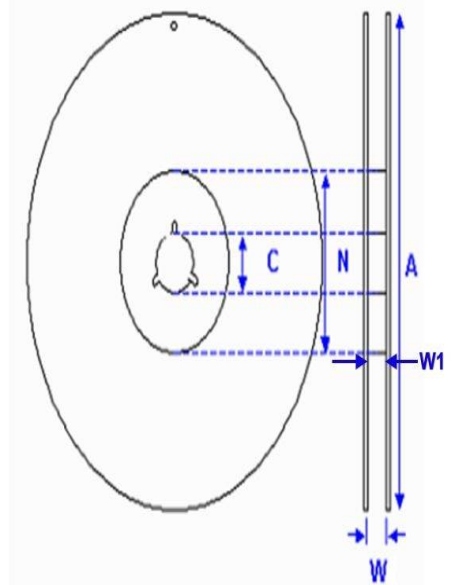


Fig. 9.3 The dimension of reel

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.

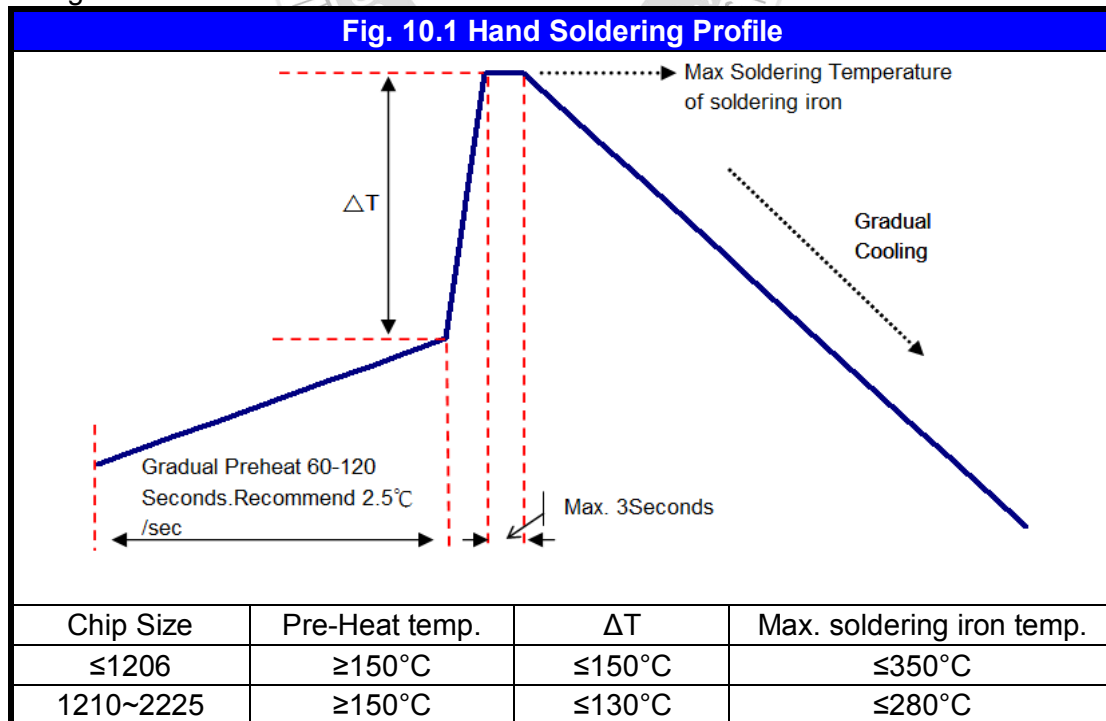
PREHEAT

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 :



* 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.

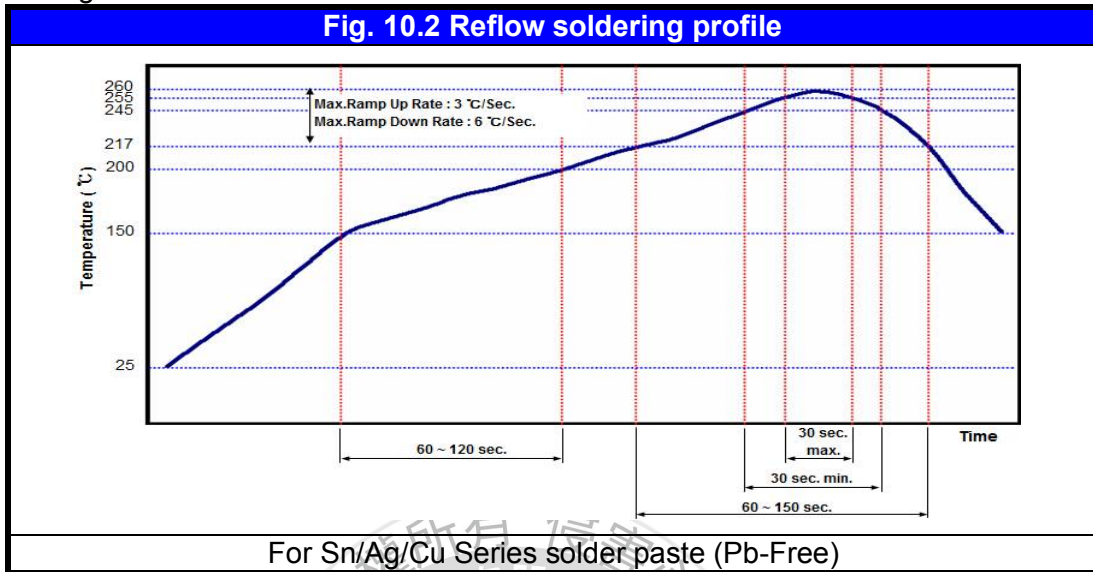
* The tip of iron should not contact the ceramic body directly.

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

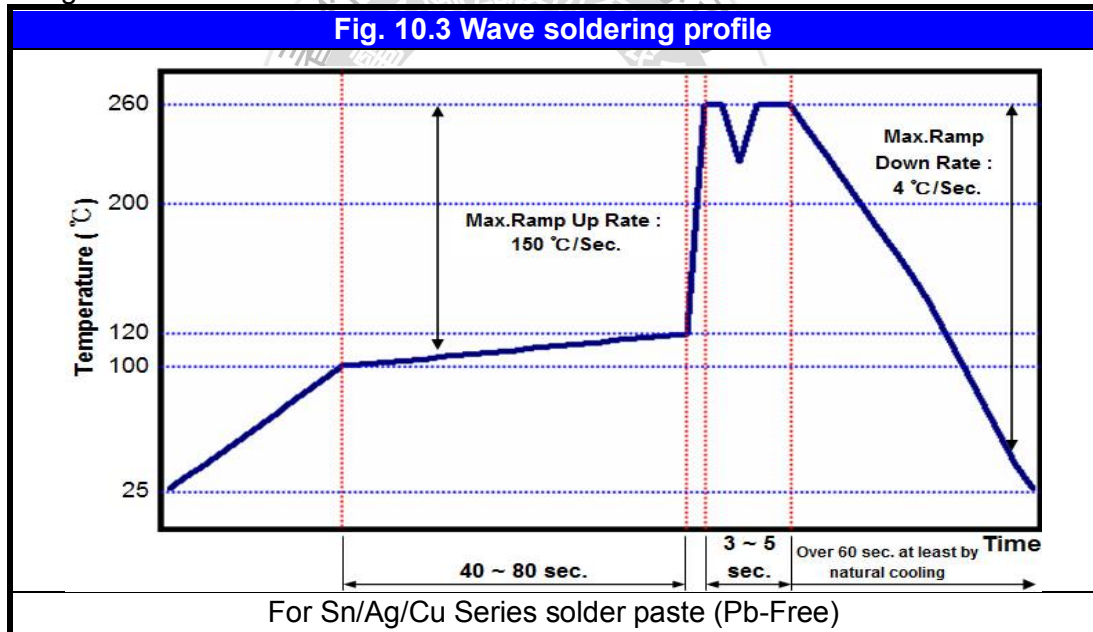
* Forced air cooling is not allowed.

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	All	X	O
0603 (1608)	Class I	All	O	O
0805 (2012)	Class I	All	O	O
1206 (3216)	Class I	All	O	O
		Thickness >0.95mm	X	O
≥1210 (3225)	Class I	All	X	O
Coating Products	All	All	X	O

10. APPLICATION NOTES

Soldering conditions :

Class II :

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

Soldering height :

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

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.

INNER CONSTRUCTION OF OPEN-MODE DESIGN

Fig. 10-4 Normal design ($CP < MB$) – circuit leakage during cracking.

Fig. 10-5 Open-mode design ($CP > MB$) – circuit open during cracking.

Fig. 10-6 Floating design (one kind of open-mode design) – circuit open during cracking.