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Messrs. : _____

Date : _____

APPROVAL SHEET

Product Name : General Purpose Multilayer Ceramic Chip Capacitors

Part No. : FN Series

Description : Size 0201~2225, C0G/X5R/X7R/Y5V, UR ≤ 50V

PREPARED BY	APPROVED BY

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SPECIFICATION

FOR

Product Name : General Purpose Multilayer Ceramic Chip Capacitors

Part No. : FN Series

Description : Size 0201~2225, C0G/X5R/X7R/Y5V, UR ≤ 50V

SPEC. No.	: <u>FN-000-001-03</u>
DATE	:

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



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.

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. A wide selection of sizes is available (0201 to 2225).
- b. High capacitance in given case size.
- c. Capacitor with lead-free termination (pure Tin).
- d. 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

<u>FN</u>	<u>21</u>	<u>X</u>	<u>471</u>	<u>K</u>	<u>500</u>	<u>P</u>	<u>X</u>	<u>G</u>
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
FN	General Purpose product \leq 50Vdc

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	$102=10 \times 10^2=1000\text{pF}$	
0R5	0.5pF	104	$104=10 \times 10^4=100\text{nF}$	
100	$100=10 \times 10^0=10\text{pF}$	106	$106=10 \times 10^6=10\mu\text{F}$	

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

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

Table 9	Special Control Code
Code	Description
G	RoHS Compliant

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	Code / T (mm)	M _B (mm)
0201 (0603)	0.60±0.03	0.30±0.03	See No.4 Reference Table 8	0.15±0.05
0402 (1005)	1.00±0.10	0.50±0.10		0.25 +0.05/-0.10
0603 (1608)	1.60±0.15	0.80±0.15		0.40±0.15
0805 (2012)	2.00±0.20	1.25±0.20		0.50±0.20
1206 (3216)	3.20±0.20	1.60±0.20		0.60±0.20
1210 (3225)	3.20±0.30	2.50±0.30		0.75±0.35
1808 (4520)	4.50±0.40	2.00±0.25		0.75±0.35
1812 (4532)	4.50±0.40	3.20±0.30		0.75±0.35
1825 (4563)	4.50±0.40	6.30±0.40		0.75±0.35
2220 (5750)	5.70±0.40	5.00±0.40		0.85±0.35
2225 (5763)	5.70±0.40	6.30±0.40		0.85±0.35

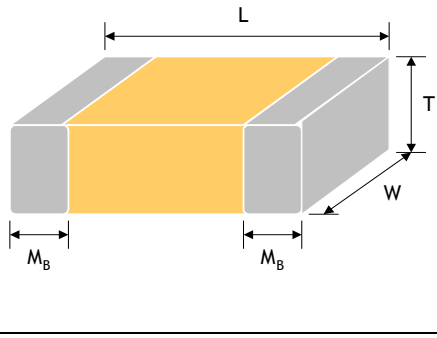


Fig.5-1 The outline of MLCC

6. GENERAL ELECTRICAL DATA

Dielectric	C0G	X7R	X5R	Y5V
Size	0201, 0402, 0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225	0201, 0402, 0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225	0201, 0402, 0603,	0201, 0402, 0603, 0805, 1206, 1210, 1812,
Rated voltage (WVDC)	10V, 16V, 25V, 50V	6.3V, 10V, 16V, 25V, 50V,	4V, 6.3V, 10V, 16V, 25V, 50V	6.3V, 10V, 16V, 25V, 50V
Capacitance range*	0R1 to 390nF	100pF to 820nF	100pF to 820nF	10nF to 820nF
Capacitance tolerance	J(±5%), K (±10%)	J(±5%), K (±10%), M(±20%)		Z (-20/+80%)
Tan δ	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1		
Operating temperature	-55 to +125°C		-55 to +85°C	-25 to +85°C
Capacitance characteristic	±30ppm	±15%		+30/-80%
Termination	Cu (or Ag) / Ni / Sn (lead-free termination)			

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

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

X7R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature.

Y5V: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 20°C ambient temperature.

Note 1

X7R/X5R

Rated vol.	D.F. ≤	Exception of D.F. ≤	
		≤ 3%	≤ 5%
50V	≤ 2.5%	≤ 3%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
		≤ 5%	0201 ≥ 0.01μF; 1210 ≥ 4.7μF
		≤ 10%	0402 ≥ 0.1μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
35V	≤ 3.5%	≤ 10%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
		≤ 5%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF
		≤ 7%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF
25V	≤ 3.5%	≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF
		≤ 12.5%	0402 ≥ 0.47μF
		≤ 5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF
16V	≤ 3.5%	≤ 10%	0201 ≥ 0.1μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
		≤ 10%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF
10V	≤ 5%	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF
		≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF
6.3V	≤ 10%	≤ 20%	0402 ≥ 2.2μF
		---	---
4V	≤ 15%	---	---

Y5V

Rated vol.	D.F. ≤	Exception of D.F. ≤	
		≤ 7%	≤ 12.5%
≥ 50V	≤ 5%	≤ 7%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF
		≤ 12.5%	1210 ≥ 6.8μF
35V	≤ 7%	---	---
25V	≤ 5%	≤ 7%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF
		≤ 9%	0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
16V (C<1.0μF)	≤ 7%	≤ 9%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF
16V (C ≥ 1.0μF)	≤ 9%	≤ 12.5%	0402 ≥ 0.22μF
		≤ 12.5%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF
10V	≤ 12.5%	≤ 20%	0402 ≥ 0.47μF
6.3V	≤ 20%	---	---

7.CAPACITANCE RANGE(Con.)

7-1. C0G

DIELECTRIC & Series		C0G																			
Cap(pF)	EIA Size	0201				0402				0603				0805				1206			
		10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V
0.1	0R1	L	L	L	L	N	N	N	N												
0.2	0R2	L	L	L	L	N	N	N	N												
0.3	0R3	L	L	L	L	N	N	N	N	S	S	S	S								
0.4	0R4	L	L	L	L	N	N	N	N	S	S	S	S								
0.5	0R5	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A				
1.0	1R0	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A				X
1.2	1R2	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
1.5	1R5	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
1.8	1R8	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
2.2	2R2	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
2.7	2R7	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
3.3	3R3	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
3.9	3R9	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
4.7	4R7	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
5.6	5R6	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
6.8	6R8	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
8.2	8R2	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
10	100	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
12	120	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
15	150	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
18	180	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
22	220	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
27	270	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
33	330	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
39	390	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
47	470	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
56	560	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
68	680	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
82	820	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
100	101	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
120	121	L	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
150	151			L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
180	181					N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
220	221					N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
270	271			L		N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
330	331			L		N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
390	391			L		N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
470	471			L		N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
560	561			L		N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
680	681					N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
820	821					N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
1000	102					N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
1200	122									B	B	B	B	X	X	X	X	X	X	X	X
1500	152									B	B	B	B	X	X	X	X	X	X	X	X
1800	182									B	B	B	B	X	X	X	X	X	X	X	X
2200	222									B	B	B	B	X	X	X	X	X	X	X	X
2700	272									B	B	B	B	C	C	C	C	X	X	X	X
3300	332									B	B	B	B	C	C	C	C	X	X	X	X
3900	392									B	B	B	B	C	C	C	C	X	X	X	X
4700	472									B	B	B	B	C	C	C	C	X	X	X	X
5600	562									B	B	B	B	C	C	C	C	X	X	X	X
6800	682									B	B	B	B	C	C	C	C	M	M	M	M
8200	822									B	B	B	B	C	C	C	C	C	C	C	C
10000	103									B	B	B	B	C	C	C	C	C	C	C	C
12000	123													T	T	T	T	P	P	P	P
15000	153													T	T	T	T	P	P	P	P
18000	183													C	C	C	C	P	P	P	P
22000	223													C	C	C	C	P	P	P	P
27000	273																	P	P	P	P
33000	333																	P	P	P	P
39000	393																	P	P	P	P
47000	473																	J	J	J	J
56000	563																	J	J	J	J
68000	683																	E	E	E	E
82000	823																	E	E	E	E
100000	104																	E	E	E	E

7.CAPACITANCE RANGE(Con.)

7-1. C0G

DIELECTRIC & Series		C0G															
Cap(pF)	EIA Size	1210				1808		1812				1825		2220		2225	
	Rated Voltage	10V	16V	25V	50V	25V	50V	10V	16V	25V	50V	25V	50V	25V	50V	25V	50V
2.2	2R2					C	C										
2.7	2R7					C	C										
3.3	3R3					C	C										
3.9	3R9					C	C										
4.7	4R7					C	C										
5.6	5R6					C	C										
6.8	6R8					C	C										
8.2	8R2					C	C										
10	100	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
12	120	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
15	150	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
18	180	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
22	220	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
27	270	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
33	330	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
39	390	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
47	470	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
56	560	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
68	680	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
82	820	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
100	101	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
120	121	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
150	151	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
180	181	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
220	221	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
270	271	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
330	331	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
390	391	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
470	471	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
560	561	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
680	681	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
820	821	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
1000	102	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
1200	122	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
1500	152	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
1800	182	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
2200	222	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
2700	272	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
3300	332	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
3900	392	M	M	M	M	C	C	C	C	C	C	E	E	E	E	E	E
4700	472	M	M	M	C	C	C	C	C	C	C	E	E	E	E	E	E
5600	562	M	M	M	C	C	C	C	C	C	C	E	E	E	E	E	E
6800	682	M	M	M	E	C	C	C	C	C	C	E	E	E	E	E	E
8200	822	M	M	M	E	C	C	C	C	C	C	E	E	E	E	E	E
10000	103	M	M	M	E	C	C	C	C	C	C	E	E	E	E	E	E
12000	123	C	C	C	E	E	E	C	C	C	C	E	E	E	E	E	E
15000	153	C	C	C	E	E	E	C	C	C	C	E	E	E	E	E	E
18000	183	F	F	F	F	F	F	C	C	C	C	E	E	E	E	E	E
22000	223	F	F	F	F	F	F	C	C	C	C	E	E	E	E	E	E
27000	273	F	F	F	G	F	F	C	C	C	C	E	E	E	E	E	E
33000	333	F	F	F	G	F	F	C	C	C	C	E	E	E	E	E	E
39000	393			G	G	F	F			F	F	E	E	E	E	E	E
47000	473			G	G					F	F	E	E	E	E	E	E
56000	563			G	G					G	G	E	E	E	E	E	E
68000	683			G	G					G	G	E	E	F	F	E	E
82000	823									G	G	F	F	G	G	F	F
100000	104									G	G	G	G	G	G	F	F
120000	124									G	G	G	G	G	G	G	G
150000	154									G	G	G	G	G	G	G	G
180000	184											G	G	G	G	G	G
220000	224											G	G	G	G	G	G
270000	274											G	G	G	G	G	G
330000	334													G	G	G	G
390000	394															G	G

7.CAPACITANCE RANGE(Con.)

7-2. X7R

DIELECTRIC & Series		X7R																			
Cap(pF)	EIA Size Rated Voltage	0201					0402					0603					0805				
		6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
100	101			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
120	121			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
150	151			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
180	181			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
220	221			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
270	271			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
330	331			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
390	391			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
470	471			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
560	561			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
680	681			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
820	821			L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
1000	102	L	L	L	L	L		N	N	N	N		S	S	S	S		X	X	X	X
1200	122	L	L	L	L			N	N	N	N		S	S	S	S		X	X	X	X
1500	152	L	L	L	L			N	N	N	N		S	S	S	S		X	X	X	X
1800	182	L	L	L	L			N	N	N	N		S	S	S	S		X	X	X	X
2200	222	L	L	L	L			N	N	N	N		S	S	S	S		X	X	X	X
2700	272	L	L	L	L			N	N	N	N		S	S	S	S		X	X	X	X
3300	332	L	L	L	L			N	N	N	N		S	S	S	S		X	X	X	X
3900	392	L	L	L	L			N	N	N	N		S	S	S	S		X	X	X	X
4700	472	L	L	L	L			N	N	N	N		S	S	S	S		X	X	X	X
5600	562	L	L					N	N	N	N		S	S	S	S		X	X	X	X
6800	682	L	L					N	N	N	N		S	S	S	S		X	X	X	X
8200	822	L	L					N	N	N	N		S	S	S	S		X	X	X	X
10000	103	L	L	L	L			N	N	N	N		S	S	S	S		X	X	X	X
12000	123							N	N	N	N		S	S	S	S		X	X	X	X
15000	153							N	N	N	N		S	S	S	S		X	X	X	X
18000	183							N	N	N	N		S	S	S	S		X	X	X	X
22000	223		L	L				N	N	N	N		S	S	S	S		X	X	X	X
27000	273							N	N	N	N		S	S	S	S		X	X	X	X
33000	333							N	N	N	N		S	S	S	B		X	X	X	X
39000	393							N	N	N	N		S	S	S	B		X	X	X	X
47000	473							N	N	N	N		S	S	S	B		X	X	X	X
56000	563							N	N	N	N		S	S	S	B		X	X	X	X
68000	683							N	N	N	N		S	S	S	B		X	X	X	X
82000	823							N	N	N	N		S	S	S	B		X	X	X	X
100000	104						N	N	N	N			S	S	S	B		X	X	X	X
120000	124												S	S	B			X	X	X	C
150000	154												S	S	B			C	C	C	C
180000	184												S	S	B			C	C	C	C
220000	224						N	N	N	N			S	S	B	B		C	C	C	C
270000	274											B	B	B	B		C	C	C	C	I
330000	334												B	B	B	B		C	C	C	I
390000	394												B	B	B			C	C	C	I
470000	474						N	N				B	B	B	B	B		C	C	C	I
560000	564												B	B	B			C	C	C	
680000	684											B	B	B				C	C	C	
820000	824												B	B				C	C	C	

7.CAPACITANCE RANGE(Con.)

7-2. X7R

DIELECTRIC & Series		X7R																					
Cap(pF)	EIA Size Rated Voltage	1206					1210					1808		1812				1825		2220		2225	
		6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	25V	50V	10V	16V	25V	50V	25V	50V	25V	50V	25V	50V
100	101					X																	
120	121					X																	
150	151		X	X	X	X						C	C										
180	181		X	X	X	X						C	C										
220	221		X	X	X	X					M	C	C										
270	271		X	X	X	X					M	C	C					C					
330	331		X	X	X	X					M	C	C					C					
390	391		X	X	X	X					M	C	C					C					
470	471		X	X	X	X					M	C	C					C					
560	561		X	X	X	X					M	C	C					C					
680	681		X	X	X	X					M	C	C					C					
820	821		X	X	X	X					M	C	C					C					
1000	102		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
1200	122		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
1500	152		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
1800	182		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
2200	222		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
2700	272		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
3300	332		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
3900	392		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
4700	472		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
5600	562		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
6800	682		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
8200	822		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
10000	103		X	X	X	X		M	M	M	M	C	C	C	C	C	C	F	F	F	F	F	F
12000	123		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
15000	153		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
18000	183		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
22000	223		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
27000	273		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
33000	333		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
39000	393		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
47000	473		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
56000	563		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
68000	683		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
82000	823		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
100000	104		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
120000	124		X	X	X	X		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
150000	154		M	M	M	M		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
180000	184		M	M	M	M		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
220000	224		M	M	M	M		M	M	M	M	E	E	C	C	C	C	F	F	F	F	F	F
270000	274		M	M	M	C		M	M	M	M	F	F	C	C	C	C	F	F	F	F	F	F
330000	334		M	M	M	C		M	M	M	C	F	F	C	C	C	C	F	F	F	F	F	F
390000	394		M	M	J	P		M	M	M	C	F	F	C	C	C	C	F	F	F	F	F	F
470000	474		J	J	J	P		M	M	M	C	F	F	C	C	C	C	F	F	F	F	F	F
560000	564		J	J	J	P		C	C	C	C	F	F	C	C	C	C	F	F	F	F	F	F
680000	684		J	J	J	P		C	C	C	C	F	F	C	C	C	C	F	F	F	F	F	F
820000	824		J	J	J	P		C	C	C	C			C	C	C	C	F	F	F	F	F	F

7.CAPACITANCE RANGE(Con.)

7-3.X5R

DIELECTRIC & Series		X5R																		
Cap(pF)	EIA Size Rated Voltage	0201					0402					0603								
		4V	6.3V	10V	16V	25V	50V	4V	6.3V	10V	16V	25V	50V	4V	6.3V	10V	16V	25V	50V	
100	101				L	L	L													
120	121				L	L	L													
150	151				L	L	L													
180	181				L	L	L													
220	221				L	L	L													
270	271				L	L	L													
330	331				L	L	L													
390	391				L	L	L													
470	471				L	L	L													
560	561				L	L	L													
680	681				L	L	L													
820	821				L	L	L													
1000	102			L	L	L	L													
1500	152			L	L	L														
2200	222			L	L	L														
2700	272			L	L	L														
3300	332			L	L	L														
4700	472			L	L	L														
6800	682			L	L	L														
10000	103		L	L	L	L	L													
15000	153		L	L																
22000	223		L	L																
27000	273		L	L							N									
33000	333		L	L							N									
39000	393		L	L							N									
47000	473		L	L						N	N	N								
56000	563		L	L						N	N	N								
68000	683		L	L						N	N	N								
82000	823		L	L						N	N	N								
100000	104		L	L	L	L				N	N	N	N						S	
150000	154									N	N	N	N							
220000	224		L	L	L					N	N	N	N	N		B	B	B	B	B
270000	274									N							B	B	B	B
330000	334		L							N	N					B	B	B	B	
390000	394									N							B	B	B	
470000	474	L	L							N	N	K	K	K		B	B	B	B	B
680000	684									N	N					B	B	B	B	
820000	824															B	B	B	B	

7.CAPACITANCE RANGE(Con.)

7-4.Y5V

DIELECTRIC & Series		Y5V														
Cap(pF)	EIA Size Rated Voltage	0201		0402				0603					0805			
		6.3V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	10V	16V	25V	50V
10000	103			N	N	N	N		S	S	S	S	A	A	A	A
15000	153			N	N	N	N		S	S	S	S	A	A	A	A
22000	223			N	N	N	N		S	S	S	S	A	A	A	A
33000	333			N	N	N	N		S	S	S	S	A	A	A	A
47000	473			N	N	N			S	S	S	S	A	A	A	A
68000	683			N	N	N			S	S	S	S	A	A	A	A
100000	104	L		N	N	N			S	S	S	S	A	A	A	A
150000	154			N	N				S	S	S	S	A	A	A	A
220000	224		N	N	N			S	S	S	S	S	A	A	A	A
330000	334		N	N	N				S	S	S	B	X	X	X	X
470000	474		N	N	N				S	S	B	B	X	X	X	X/C
680000	684		N						S	B	B		X	X	C	C

DIELECTRIC & Series		Y5V											
Cap(pF)	EIA Size Rated Voltage	1206				1210				1812			
		10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V
10000	103	X	X	X	X								
15000	153	X	X	X	X								
22000	223	X	X	X	X								
33000	333	X	X	X	X								
47000	473	X	X	X	X								
68000	683	X	X	X	X								
100000	104	X	X	X	X	M	M	M	M	C	C	C	C
150000	154	X	X	X	X	M	M	M	M	C	C	C	C
220000	224	X	X	X	X	M	M	M	M	C	C	C	C
330000	334	X	X	X	X	M	M	M	M	C	C	C	C
470000	474	X	X	X	X	M	M	M	M	C	C	C	C
680000	684	X	X	X	X	M	M	M	M	C	C	C	C

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	Class I: C0G Cap≤1000pF 1.0±0.2Vrms, 1MHz±10% Cap>1000pF 1.0±0.2Vrms, 1KHz±10%	* Shall not exceed the limits given in the detailed spec. C0G: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C																																																																																						
3.	Q/ D.F. (Dissipation Factor)	Class II: X7R, X7E, X5R, Y5V Cap≤10μF, 1.0±0.2Vrms, 1kHz±10% ** Cap>10μF, 0.5±0.2Vrms, 120Hz±20% ** Test condition: 0.5±0.2Vrms · 1KHz±10% X7R: 0603≥ 225(10V), 0805=106(6.3V&10V) X5R: 01R5≥ 103, 0201≥ 224 (6.3V), 0402≥ 475 (6.3V), 0402≥ 225(10V), 0603=106 (6.3V), 0603≥ 475(10V)	X7R, X5R: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3%</td> <td>0201(50V); 0603≥ 0.047μF; 0805≥ 0.18μF; 1206≥ 0.47μF</td> </tr> <tr> <td>≤ 5%</td> <td>0201≥ 0.01μF; 1210≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0402≥ 0.1μF; 0603>0.1μF; 0805≥ 1μF; 1206≥ 2.2μF; 1210≥ 10μF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 10%</td> <td>0603≥ 1μF; 0805≥ 2.2μF; 1206≥ 2.2μF; 1210≥ 10μF</td> </tr> <tr> <td>≤ 5%</td> <td>0201≥ 0.01μF; 0805≥ 1μF; 1210≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 7%</td> <td>0603≥ 0.33μF; 1206≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0201≥ 0.1μF; 0402≥ 0.10μF; 0603≥ 0.47μF; 0805≥ 2.2μF; 1206≥ 6.8μF; 1210≥ 22μF</td> </tr> <tr> <td>≤ 12.5%</td> <td>0402≥ 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 5%</td> <td>0201≥ 0.01μF; 0402≥ 0.033μF; 0603≥ 0.15μF; 0805≥ 0.68μF; 1206≥ 2.2μF; 1210≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0201≥ 0.1μF(0201/X7R≥ 0.022μF); 0402≥ 0.22μF; 0603≥ 0.68μF; 0805≥ 2.2μF;</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10%</td> <td>0201≥ 0.012μF; 0402≥ 0.33μF(0402/X7R≥ 0.22μF); 0603≥ 0.33μF; 0805≥ 2.2μF; 1206≥ 2.2μF; 1210≥ 22μF</td> </tr> <tr> <td>≤ 15%</td> <td>0201≥ 0.1μF; 0402≥ 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 10%</td> <td>≤ 15%</td> <td>0201≥ 0.1μF; 0402≥ 1μF; 0603≥ 10μF; 0805≥ 4.7μF; 1206≥ 47μF; 1210≥ 100μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402≥ 2.2μF</td> </tr> <tr> <td>4V</td> <td>≤ 15%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> Y5V: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50V</td> <td>5%</td> <td>7%</td> <td>0603≥ 0.1μF; 0805≥ 0.47μF; 1206≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>7%</td> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">5%</td> <td>7%</td> <td>0402≥ 0.047μF; 0603≥ 0.1μF; 0805≥ 0.33μF; 1206≥ 1μF; 1210≥ 4.7μF</td> </tr> <tr> <td>9%</td> <td>0402≥ 0.068μF; 0603≥ 0.47μF; 1206≥ 4.7μF; 1210≥ 22μF</td> </tr> <tr> <td>16V (C<1.0μF)</td> <td>7%</td> <td>9%</td> <td>0402≥ 0.068μF; 0603≥ 0.68μF</td> </tr> <tr> <td></td> <td></td> <td>12.5%</td> <td>0402≥ 0.22μF</td> </tr> <tr> <td>16V (C≥ 1.0μF)</td> <td>9%</td> <td>12.5%</td> <td>0603≥ 2.2μF; 0805≥ 3.3μF; 1206≥ 10μF; 1210≥ 22μF; 1812≥ 47μF</td> </tr> <tr> <td>10V</td> <td>12.5%</td> <td>20%</td> <td>0402≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table>	Rated vol.	D.F.≤	Exception of D.F. ≤		50V	≤ 2.5%	≤ 3%	0201(50V); 0603≥ 0.047μF; 0805≥ 0.18μF; 1206≥ 0.47μF	≤ 5%	0201≥ 0.01μF; 1210≥ 4.7μF	≤ 10%	0402≥ 0.1μF; 0603>0.1μF; 0805≥ 1μF; 1206≥ 2.2μF; 1210≥ 10μF	35V	≤ 3.5%	≤ 10%	0603≥ 1μF; 0805≥ 2.2μF; 1206≥ 2.2μF; 1210≥ 10μF	≤ 5%	0201≥ 0.01μF; 0805≥ 1μF; 1210≥ 10μF	25V	≤ 3.5%	≤ 7%	0603≥ 0.33μF; 1206≥ 4.7μF	≤ 10%	0201≥ 0.1μF; 0402≥ 0.10μF; 0603≥ 0.47μF; 0805≥ 2.2μF; 1206≥ 6.8μF; 1210≥ 22μF	≤ 12.5%	0402≥ 0.47μF	16V	≤ 3.5%	≤ 5%	0201≥ 0.01μF; 0402≥ 0.033μF; 0603≥ 0.15μF; 0805≥ 0.68μF; 1206≥ 2.2μF; 1210≥ 4.7μF	≤ 10%	0201≥ 0.1μF(0201/X7R≥ 0.022μF); 0402≥ 0.22μF; 0603≥ 0.68μF; 0805≥ 2.2μF;	10V	≤ 5%	≤ 10%	0201≥ 0.012μF; 0402≥ 0.33μF(0402/X7R≥ 0.22μF); 0603≥ 0.33μF; 0805≥ 2.2μF; 1206≥ 2.2μF; 1210≥ 22μF	≤ 15%	0201≥ 0.1μF; 0402≥ 1μF	6.3V	≤ 10%	≤ 15%	0201≥ 0.1μF; 0402≥ 1μF; 0603≥ 10μF; 0805≥ 4.7μF; 1206≥ 47μF; 1210≥ 100μF	≤ 20%	0402≥ 2.2μF	4V	≤ 15%	---	---	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	5%	7%	0603≥ 0.1μF; 0805≥ 0.47μF; 1206≥ 4.7μF	35V	7%	---	---	25V	5%	7%	0402≥ 0.047μF; 0603≥ 0.1μF; 0805≥ 0.33μF; 1206≥ 1μF; 1210≥ 4.7μF	9%	0402≥ 0.068μF; 0603≥ 0.47μF; 1206≥ 4.7μF; 1210≥ 22μF	16V (C<1.0μF)	7%	9%	0402≥ 0.068μF; 0603≥ 0.68μF			12.5%	0402≥ 0.22μF	16V (C≥ 1.0μF)	9%	12.5%	0603≥ 2.2μF; 0805≥ 3.3μF; 1206≥ 10μF; 1210≥ 22μF; 1812≥ 47μF	10V	12.5%	20%	0402≥ 0.47μF	6.3V	20%	---	---
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8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements															
6.	Dielectric Strength	<ul style="list-style-type: none"> * To apply voltage ($\leq 50V$) 200%. * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA. 	<ul style="list-style-type: none"> * No evidence of damage or flash over during test. 															
7.	Solderability	<ul style="list-style-type: none"> * Solder temperature: $235 \pm 5^\circ C$ for (0201~1210) * Solder temperature: $245 \pm 5^\circ C$ for (1808~2225) * Dipping time: 2 ± 0.5 sec. 	75% min. coverage of all metalized area.															
8.	Resistance to Soldering Heat	<ul style="list-style-type: none"> * 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. * Before initial measurement (Class II only): Perform $150 \pm 0/-10^\circ C$ for 1 hr and then set for 48 ± 4 hrs (Class II only) at room temp. * Measurement to be made after keeping at room temp. for 24 ± 2 hrs (Class I) or 48 ± 4 hrs (Class II). 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: C0G: within $\pm 2.5\%$ or $\pm 0.25pF$ whichever is larger. X7R, X5R: within $\pm 7.5\%$ Y5V: within $\pm 20\%$ * 25% max. leaching on each edge. 															
9.	Temperature Cycle	<ul style="list-style-type: none"> * Conduct the five cycles according to the temperatures and time. <table border="1" style="margin-left: 20px;"> <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 ± 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> <ul style="list-style-type: none"> * Before initial measurement (Class II only): Perform $150 \pm 0/-10^\circ C$ 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). 	Step	Temp. ($^\circ C$)	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	<ul style="list-style-type: none"> * No remarkable damage. * Cap change : C0G: within $\pm 2.5\%$ or $\pm 0.25pF$ whichever is larger. X7R, X5R: within $\pm 7.5\%$ Y5V: within $\pm 20\%$ * Q/D.F. \leq initial requirement * I.R. $\geq 0.25 \times$ initial requirements.
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No.	Item	Test Condition	Requirements																																																																							
10.	Humidity (Damp Heat) Steady State	<p>*Test temp.: 40±2°C</p> <p>*Humidity: 90~95%RH</p> <p>*Test time: 500+24/-0hrs.</p> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p> <p>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	<p>* No remarkable damage.</p> <p>* Cap change: C0G: within ±5% or 0.5pF whichever is larger X7R, X5R,: ≥10V**, within ±12.5%; ≤ 6.3V within ±25%; **10V: 0603 ≥ 4.7μF; 0402 ≥ 1μF; 0201 ≥ 0.1μF, within ±25%; Y5V: ≥10V, within ±30%; ≤ 6.3V, within +30/-40%</p> <p>* Q/D.F. value: C0G: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C</p> <p>X7R, X5R,</p> <table border="1"> <thead> <tr> <th>Rated</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td>≤ 6%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10%</td> <td>0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 0.1μF; 0603 ≥ 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 5%</td> <td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td>≤ 5%</td> <td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0201 ≥ 0.1μF ; 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥ 50V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 1210 ≥ 6.8μF</td> </tr> <tr> <td>35V</td> <td>≤ 10%</td> <td>---</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 10% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>16V (C<1.0μF)</td> <td>≤ 10%</td> <td>≤ 12.5 0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td rowspan="2">16V (C≥1.0μF)</td> <td rowspan="2">≤ 12.5</td> <td>≤ 20% 0402 ≥ 0.22μF</td> </tr> <tr> <td>≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;</td> </tr> <tr> <td>10V</td> <td>≤ 20%</td> <td>≤ 30% 0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 30%</td> <td>---</td> </tr> </tbody> </table> <p>*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.</p> <p>Class II (X7R, X5R, Y5V)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>50V: 0402>0.01μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF</td> <td rowspan="6">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>35V: 0603≥1μF; 0805≥2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402≥0.22μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 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	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 6%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10%	0201 ≥ 0.01μF; 1210 ≥ 4.7μF	≤ 20%	0402 ≥ 0.1μF; 0603 ≥ 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	≤ 20% 0402 ≥ 0.47μF	16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤ 15%	0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20% 0201 ≥ 0.1μF ; 0402 ≥ 1μF	6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	4V	≤ 20%	---	Rated vol.	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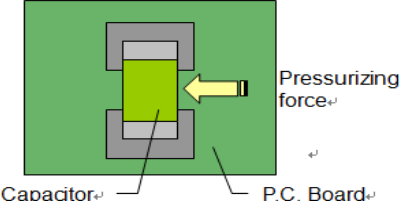
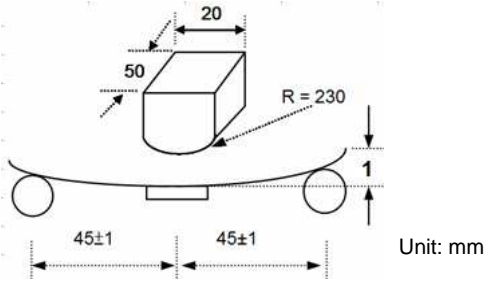
8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

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11.	Humidity (Damp Heat) Load	<ul style="list-style-type: none"> * Test temp.: 40±2°C * Humidity: 90~95%RH * Test time: 500+24/-0 hrs. * 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>* No remarkable damage.</p> <p>Cap change: COG: ±7.5% or 0.75pF whichever is larger. X7R, X7E, X5R: ≥10V**, within ±12.5%; 6.3V within ±25%; **10V:0603≥ 4.7μF;0402≥ 1μF;0201≥ 0.1μF, within ±25%; Y5V: ≥10V, within ±30%; 6.3V, within +30/-40%</p> <p>Q/D.F. value: COG: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td>≤ 6%</td> <td>0201(50V);0603≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10%</td> <td>0201 ≥ 0.01μF;1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 0.1μF; 0603 ≥ 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 5%</td> <td>≤ 20% 0603 ≥ 1μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">≤ 5%</td> <td>≤ 10%</td> <td>0201 ≥ 0.01μF;0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14%</td> <td>0603 ≥ 0.33μF;1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.1μF;0402 ≥ 0.10μF;0603 ≥ 0.47μF;0805 ≥ 2.2μF; 1206 ≥ 6.8μF;1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10%</td> <td>0603 ≥ 0.15μF;0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF);0402 ≥ 0.033μF; 0603 ≥ 0.68μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20%</td> <td>0201 ≥ 0.1μF ;0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF;0603 ≥ 10μF; 0805 ≥ 4.7μF;1206 ≥ 47μF;1210 ≥ 100μF</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50V</td> <td>7.5%</td> <td>10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>---</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 ≥ 0.047μF;0603 ≥ 0.1μF; 0805 ≥ 0.33μF;1206 ≥ 1μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>16V (C<1.0μF)</td> <td>10%</td> <td>12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF 20% 0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>12.5%</td> <td>20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF;1210 ≥ 22μF; 1812 ≥ 47μF;</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30% 0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>---</td> </tr> </tbody> </table> <p>*I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. 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8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																																																																																																							
12.	High Temperature Load (Endurance)	<p>*Test temp. : COG, X7R: 125±3°C X5R, Y5V: 85±3°C</p> <p>*Test time: 1000+24/-0 hrs.</p> <p>*To apply voltage: (1) 6.3V or C≥ 10μF or TT series: 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.</p> <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R</td> <td>6.3V,10V</td> <td>C≥ 0.1μF</td> </tr> <tr> <td>0402</td> <td>X5R</td> <td>6.3V,10V</td> <td>C≥ 1.0μF</td> </tr> <tr> <td>0603</td> <td>X5R</td> <td>6.3V,10V</td> <td>C≥ 4.7μF</td> </tr> <tr> <td>0805</td> <td>X5R</td> <td>6.3V</td> <td>C≥ 22μF</td> </tr> <tr> <td>1206</td> <td>X5R</td> <td>6.3V</td> <td>C≥ 47μF</td> </tr> </tbody> </table> <p>(6)150% of rated voltage for below range.</p> <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0402</td> <td>X5R</td> <td>10V,16V,25V</td> <td>C≥ 0.22μF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C≥ 0.47μF</td> </tr> <tr> <td rowspan="2">0603</td> <td>X5R</td> <td>10V,16V</td> <td>C≥ 1.0μF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C≥ 2.2μF</td> </tr> <tr> <td rowspan="2">0805</td> <td>X5R</td> <td>10V</td> <td>C≥ 4.7μF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C≥ 4.7μF</td> </tr> </tbody> </table> <p>* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</p>	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R	6.3V,10V	C≥ 0.1μF	0402	X5R	6.3V,10V	C≥ 1.0μF	0603	X5R	6.3V,10V	C≥ 4.7μF	0805	X5R	6.3V	C≥ 22μF	1206	X5R	6.3V	C≥ 47μF	Size	Dielectric	Rated voltage	Capacitance range	0402	X5R	10V,16V,25V	C≥ 0.22μF	Y5V	16V	C≥ 0.47μF	0603	X5R	10V,16V	C≥ 1.0μF	Y5V	16V	C≥ 2.2μF	0805	X5R	10V	C≥ 4.7μF	Y5V	16V	C≥ 4.7μF	<p>* No remarkable damage.</p> <p>Cap change: COG: ±3.0% or ±0.3pF whichever is larger X7R, X5R: ≥10V**, within ±12.5%; 6.3V within ±25%; **10V:0603≥ 4.7μF;0402≥ 1μF;0201≥ 0.1μF, within ±25%; Y5V: ≥10V, within ±30%; 6.3V, within +30/-40%</p> <p>Q/D.F. value: COG: More than 30pF, Q≥350 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C</p> <p>X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.≤</th> <th>Exception of D.F.≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 100V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 7.5% 0805 > 0.1μF, 0603 ≥ 0.068μF, 1206 > 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.1μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 5%</td> <td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0201 ≥ 0.1μF ; 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.≤</th> <th>Exception of D.F.≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50V</td> <td>7.5%</td> <td>10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>---</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>15% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C<1.0μF)</td> <td rowspan="2">10%</td> <td>12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>20% 0402 ≥ 0.22μF</td> </tr> <tr> <td rowspan="2">16V (C≥ 1.0μF)</td> <td rowspan="2">12.5%</td> <td>20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;</td> </tr> <tr> <td>10V 20% 30% 0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>---</td> </tr> </tbody> </table> <p>*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.</p> <p>Class II (X7R, X5R, Y5V)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 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</td> </tr> </tbody> </table>	Rated vol.	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35V	≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																																																																								
25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																																																																																																								
		≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																																																																																								
		≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF																																																																																																																								
≤ 20% 0402 ≥ 0.47μF																																																																																																																										
16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																																																																								
		≤ 15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																																																								
10V	≤ 7.5%	≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																																																																																								
		≤ 20% 0201 ≥ 0.1μF ; 0402 ≥ 1μF																																																																																																																								
6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																																																																																																								
4V	≤ 20%	---																																																																																																																								
Rated vol.	D.F.≤	Exception of D.F.≤																																																																																																																								
≥ 50V	7.5%	10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF																																																																																																																								
35V	10%	---																																																																																																																								
25V	7.5%	10% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF																																																																																																																								
		15% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																																																								
16V (C<1.0μF)	10%	12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																																																																								
		20% 0402 ≥ 0.22μF																																																																																																																								
16V (C≥ 1.0μF)	12.5%	20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;																																																																																																																								
		10V 20% 30% 0402 ≥ 0.47μF																																																																																																																								
6.3V	30%	---																																																																																																																								
Rated voltage	Insulation Resistance																																																																																																																									
100V: X7R	1GΩ or RxC ≥ 10 Ω-F whichever is smaller.																																																																																																																									
50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF																																																																																																																										
35V: 0805 ≥ 2.2μF; 1210 ≥ 10μF																																																																																																																										
25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF																																																																																																																										
16V: 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																																																																																																																										

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements
13.	Adhesive Strength of Termination	<ul style="list-style-type: none"> Capacitors mounted on a substrate. A force of 5N(≤ 0603) or 10N(> 0603) applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10 ± 1 second. 	<ul style="list-style-type: none"> No remarkable damage or removal of the terminations.
14.	Bending Test	<ul style="list-style-type: none"> The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm. 	<ul style="list-style-type: none"> No remarkable damage. Cap change: <ul style="list-style-type: none"> C0G: within $\pm 5.0\%$ or $\pm 0.5\text{pF}$ whichever is larger. X7R/X5R: within $\pm 12.5\%$ Y5V: within $\pm 30\%$ <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>
15.	Vibration Resistance	<ul style="list-style-type: none"> Vibration frequency: 10~55 Hz/min. Total amplitude: 1.5mm Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.) 	<ul style="list-style-type: none"> No remarkable damage. Cap change and Q/D.F.: To meet 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	-	-
0402 (1005)	0.50±0.05	10k	50K	-	-
	0.50+0.02/-0.05	10k	50K		
	0.50±0.20	10k			
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

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. : FN-000-001-03



PDC

9. PACKAGE DIMENSION AND QUANTITY

9.1. EMBOSSED TAPE DIMENSIONS

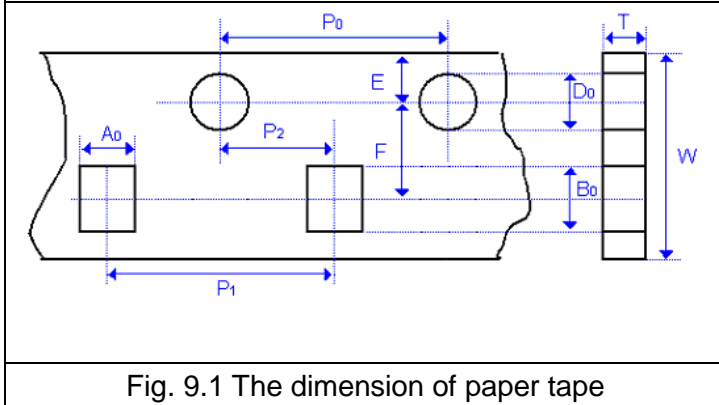


Fig. 9.1 The dimension of paper tape

9.2. EMBOSSED TAPE DIMENSIONS

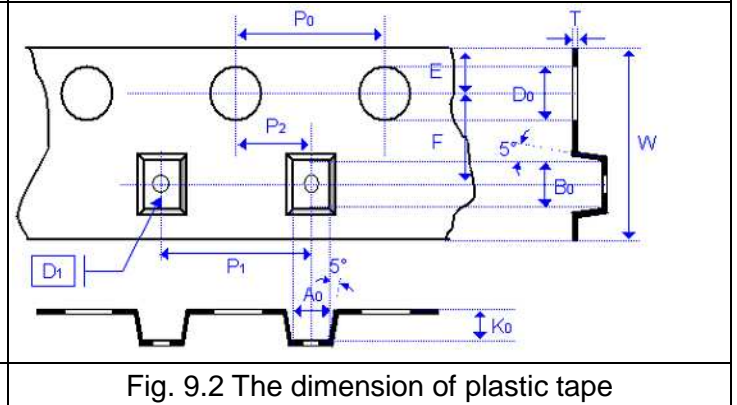


Fig. 9.2 The dimension of plastic tape

Size	0201	0402	0603		0805	
Chip Thickness	0.30±0.03	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 +/-0.2	1.00+0.05/-0.1	1.02+0.05/-0.1	1.50±0.10	<1.65
B ₀	0.69 +/-0.07	1.20 +/-0.2	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+/-0.10	8+/-0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P ₀	4+/-0.10	4+/-0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP ₀	40+/-0.10	40+/-0.10	40.00±0.2	40.00±0.2	40.00±0.2	40.00±0.20
P ₁	2+/-0.05	2+/-0.05	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
P ₂	2+/-0.05	2+/-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	3.5+/-0.05	3.5+/-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	12.0±0.20	12.0±0.20
P ₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.100	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+/-0.1
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	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20
P ₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP ₀	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P ₁	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P ₂	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D ₀	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0
D ₁	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10
E	1.75±0.1	1.75±0.10	1.75±0.1	1.75±0.10	1.75±0.10	1.75±0.10
F	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05
Unit:	mm	mm	mm	mm	mm	mm

9.3. REEL DIMENSIONS

Size	0201, 0402, 0603, 0805, 1206, 1210			1808, 1812, 1825, 2220, 2225
	7"	7"	13"	7"
Reel size	7"	7"	13"	7"
C	13.0 +0.5/-0.2	13.0 +0.5/-0.2	13.0 +0.5/-0.2	13.0 +0.5/-0.2
W ₁	8.4 +1.5/-0	12.4 +2.0/-0	8.4 +1.5/-0	8.4 +1.5/-0
A	178.0 ±0.10	178.0 ±0.10	330.0 ±1.0	178.0 ±0.10
N	60.0 +1.0/-0	80.0 ±1.0	100 ±1.0	60.0 +1.0/-0

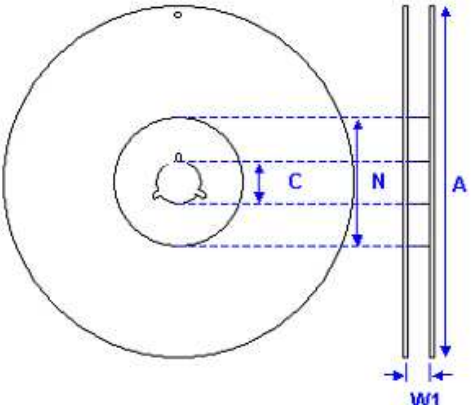


Fig. 4 The dimension of reel

10. APPLICATION NOTES

STORAGE

To prevent the damage of solderability of terminations, the following storage conditions are recommended: Indoors under 5 ~ 40°C and 20% ~ 70% RH.

No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine.

Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as is practicable. Taped product should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The product is recommended to be used within 12 months after shipment and checked the solderability before use.

HANDLING

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

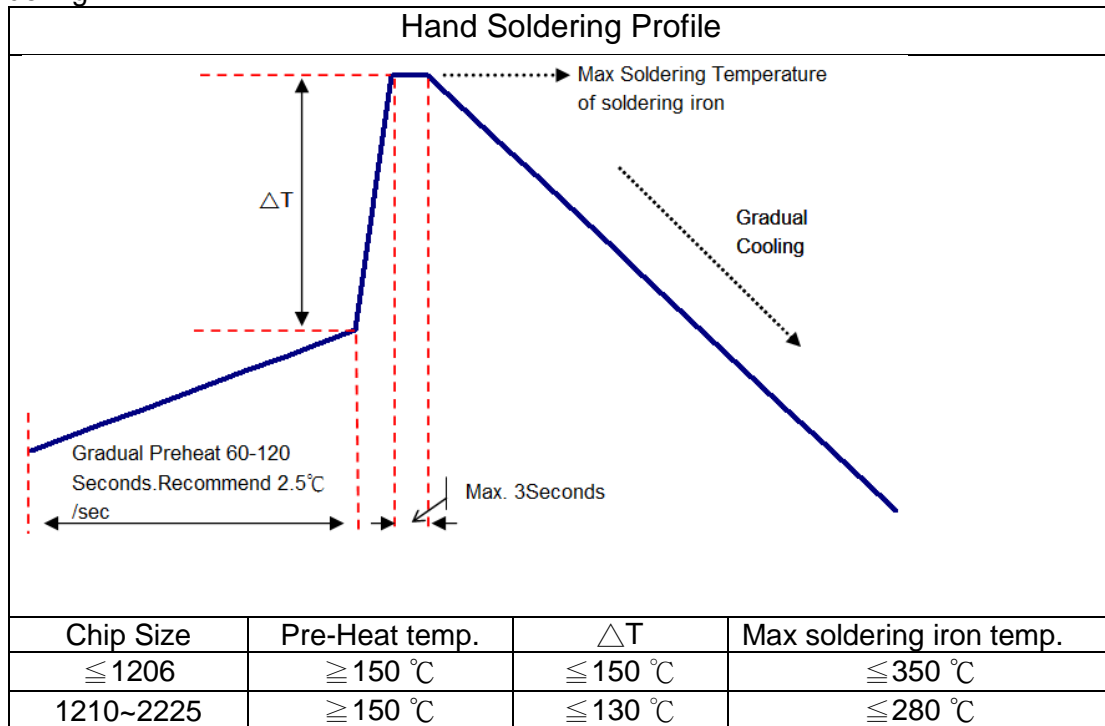
PREHEAT

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

SOLDERING

Use 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 $\leq 1.0\text{ mm}$ and wattage max. 20W.

*The Capacitors shall be pre-heated and that the temperature gradient between the devices and the tip of the soldering iron.

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

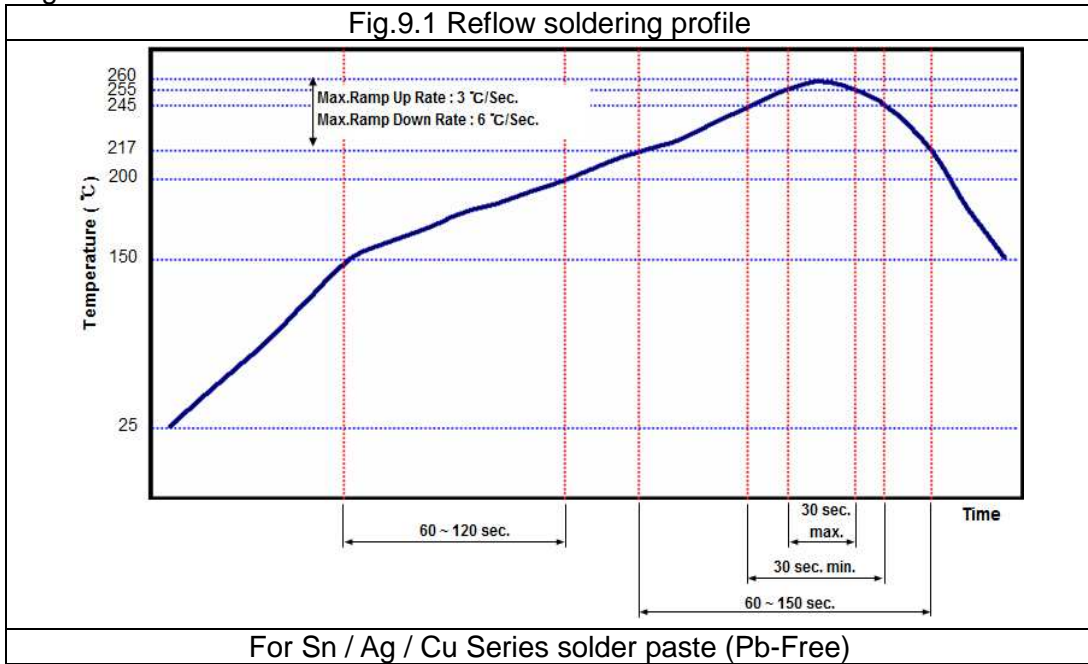
*The tip of iron should not contact the ceramic body directly.

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

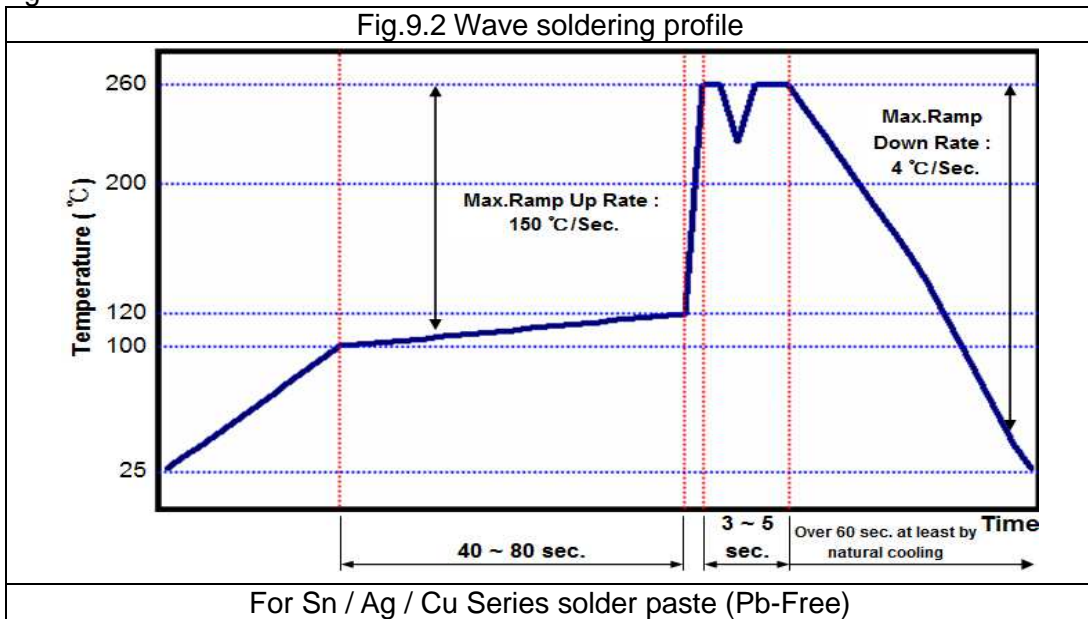
*Forced air cooling is not allowed.

10. APPLICATION NOTES

b.) Reflow soldering:



c.) Wave soldering:



Soldering conditions:

Class I:

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

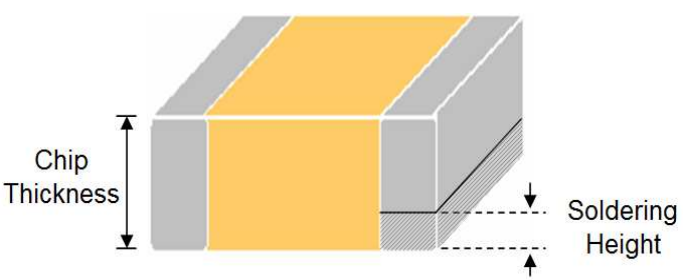
10. APPLICATION NOTES

Soldering conditions:

Class II:

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

Soldering height:

<p>The solder climbing minimum height is suggesting to 25% of chip thickness or 500μm whichever is less. (Reference from IPC-610E)</p>	 <p>The diagram illustrates a cross-section of a chip (yellow) on a substrate (grey). A vertical double-headed arrow on the left indicates the 'Chip Thickness'. A horizontal dashed line with a vertical arrow pointing down from the top surface of the chip indicates the 'Soldering Height'.</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.