

ALTERNATION HISTORY RECORDS 变更记录

Date 日期	Version 版本	Mark 标记	Page 页码	Description 描述	Drafter 制定者	Approver 审批者
2023-05-01	B	/		Reversion release	Doris Chang	
2023-05-20	B-1	△1	P2	Added A thickness comparison column between version A and B	Doris Chang	Emily Peng
2023-05-20	B-1	△1	P10	To correct the error, refer to point 5 of this document to correct the thickness deviation	Doris Chang	Emily Peng
2024-04-11	B-2	△2	P16	Perfect the reel dimensions is demonstrated	Doris Chang	Emily Peng
2024-05-30	B-3	△3	P3	Add "X7S"Spec	Doris Chang	Emily Peng
2025-03-27	B-4	△4	P1	Add a special capacity part number code	Doris Chang	Emily Peng
2025-05-23	B-5	△5	P17	Add Manual soldering (solder iron)	Doris Chang	Emily Peng

1. DESCRIPTION

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

MLCC is made by NP0, X7R, X6S, X5R X7S dielectric material and which provides product with high electrical precision, stability and reliability.

2. FEATURES

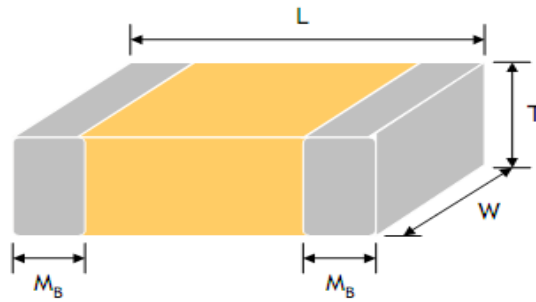
- A wide selection of sizes is available (0402 to 1812).
- High capacitance in given case size.
- Capacitor with lead-free termination (pure Tin).

3. APPLICATIONS

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

4. HOW TO ORDER

<u>1206</u>	<u>N</u>	<u>104</u>	<u>Z</u>	<u>500</u>	<u>C</u>	<u>D</u> 	<u>-G</u>
<u>Size</u>	<u>Dielectric</u>	<u>Capacitance</u>	<u>Tolerance</u>	<u>Rated voltage</u>	<u>Thickness</u>	<u>Packaging Q'TY</u>	<u>Suffix</u>
Inch (mm)	N=NP0 (C0G)	Two significant digits followed by	A=±0.05pF	Two significant digits	A=0.6 ±0.10mm	K=0.5kpcs/ reel	
0201 (0603)		no. of zeros. And R	B=±0.1pF	followed by no. of zeros.	S=0.8 ±0.10mm	A=1kpcs/ reel	
0402 (1005)	B=X7R	is in place of	C=±0.25pF	And R is in place of	Reference to item	B=2kpcs/ reel	
0603 (1608)	W=X5R	decimal point.	D=±0.5pF	decimal point.	5 this page	C=3kpcs/ reel	
0805 (2012)	S=X6S	eg.:	F=±1%	100=10 VDC		D=4kpcs/ reel	
1206 (3216)	A=X7S		G=±2%	160=16 VDC		J=6kpcs/ reel	
1210 (3225)		0R5=0.5pF	J=±5%	250=25 VDC		L=8kpcs/ reel	
1812 (4532)		R55=0.55pF 	K=±10%	500=50 VDC		H=9kpcs/ reel	
		1R0=1.0pF	M=±20%	101=100 VDC		I=10kpcs/ reel	
		104=10x10 ⁴	Z=-20/+80%			E=15kpcs/ reel	
		=100nF				F=50kpcs/ reel	
						G=70kpcs/ reel	

5. EXTERNAL DIMENSIONS


Size Inch(mm)	L (mm)	W (mm)	T(mm)/Symbol	Thick Code		M _B (mm)
				Before April 2023	April 2023 and beyond	
0201 (0603)	0.6±0.09	0.30±0.09	0.30±0.09	L	L	0.15+0.1/-0.05
0402 (1005)	1.00±0.20	0.50±0.20	0.50±0.20	N	H	0.25+0.05/-0.10
			0.50±0.05	/	N	
0603 (1608)	1.60±0.20	0.80±0.20	0.50±0.20	N	H	0.40±0.15
			0.80±0.10	S	S	
			0.85±0.15	B	B	
			0.80±0.20	X	X	
0805 (2012)	2.00±0.20	1.25±0.20	0.50±0.20	N	H	0.50±0.20
			0.60±0.10	A	A	
			0.80±0.20	X	X	
			0.85±0.15	B	B	
			1.25±0.20	I	C	
1206 (3216)	3.20±0.30	1.60±0.30	0.85±0.15	B	B	0.60±0.20
			0.95±0.10	C	I	
			1.25±0.20	I	C	
			1.15±0.20	J	J	
			1.60±0.20	G	D	
			1.60+0.30/-0.10	P	P	
1210 (3225)	3.20±0.40	2.50±0.30	0.85±0.15	B	B	0.75±0.25
			0.95±0.10	C	I	
			1.25±0.20	I	C	
			1.60±0.20	G	D	
			2.00±0.20	K	K	
			2.50±0.30	M	M	
1808 (4520)	4.50±0.40	2.03±0.25	1.25±0.20	I	C	0.75±0.25
			1.60±0.20	G	D	
			2.00±0.20	K	K	
1812 (4532)	4.50±0.40	3.20±0.40	1.25±0.20	I	C	0.75±0.25
			1.60±0.20	G	D	
			2.00±0.20	K	K	
			2.50±0.30	M	M	
			2.80±0.30	U	U	
1825 (4563)	4.50±0.40	6.30±0.40	1.60±0.20	G	D	0.75±0.35
			2.00±0.20	K	K	0.85±0.35
			2.50±0.30	M	M	0.85±0.35
			2.80±0.30	U	U	0.85±0.35
2211(5728)	5.70±0.40	2.80±0.30	1.60±0.20	G	D	0.75±0.35
			2.00±0.20	K	K	0.85±0.35
			2.50±0.30	M	M	0.85±0.35
			2.80±0.30	U	U	0.85±0.35
2220(5750)	5.70±0.40	5.00±0.40	1.60±0.20	G	D	0.75±0.35
			2.00±0.20	K	K	0.85±0.35
			2.50±0.30	M	M	0.85±0.35
			2.80±0.30	U	U	0.85±0.35
2225(5763)	5.70±0.40	6.30±0.40	1.60±0.20	G	D	0.75±0.35
			2.00±0.20	K	K	0.85±0.35
			2.50±0.30	M	M	0.85±0.35
			2.80±0.30	U	U	0.85±0.35

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X5R	X6S	X7S $\triangle$
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812				
Capacitance range*	0.1pF to 0.1μF	100pF to 47μF	100pF to 220μF	0.1μF to 100μF	0.1μF to 100μF
Capacitance tolerance**	Cap≤5pF ^{#1} : A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	K (±10%), M (±20%)	K (±10%), M (±20%)	K (±10%), M (±20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	4V, 6.3V, 10V, 16V, 25V, 35V, 50V, 100V			
Operating temperature	-55 to +125°C		-55 to +85°C	-55 to +105°C	-55 to +125°C
Capacitance characteristic	±30ppm	±15%	±15%	±22%	±22%
Termination	Ni/Sn (lead-free termination)				

#1: NP0, 0.1pF product only provide B tolerance; 0603N0R3/0R4 provide B&C tolerance.

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

NP0: 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/X6S/X5R/X7S: Please refer to page 13 "Reliability test conditions and requirements" for detail.

** Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour and then leave in ambient condition for 24±2 hours before measurement.

Note 1:

X7R:

Rated vol.	D.F.≤	Exception of D.F. ≤
≥100V	≤2.5%	≤3% 1206 ≥ 0.47μF
		≤3.5% 1812 ≥ 4.7μF; 1825 ≥ 4.7μF; 2220 ≥ 4.7μF; 2225 ≥ 4.7μF
		≤5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF;
		≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF
50V	≤2.5%	≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
		≤3.5% 1812 ≥ 4.7μF; 1825 ≥ 4.7μF; 2220 ≥ 4.7μF; 2225 ≥ 4.7μF
		≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.012μF; 1210 ≥ 3.3μF
		≤10% 0402 > 0.047μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
35V	≤3.5%	≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
25V	≤3.5%	≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF
		≤7% 0603 ≥ 0.33μF
		≤10% 0201 > 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
		≤12.5% 0402 ≥ 0.33μF
16V	≤3.5%	≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF
10V	≤5%	≤10% 0201/X7R ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
		≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF
		≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF
		≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF
6.3V	≤10%	≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF
4V	≤15%	≤20% 0402 ≥ 2.2μF

X5R:

Rated vol.	D.F.≤	Exception of D.F. ≤
≥100V	≤2.5%	≤3% 1206 ≥ 0.47μF
		≤5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF
		≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF
		≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
50V	≤2.5%	≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.012μF; 1210 ≥ 3.3μF
		≤10% 0402 ≥ 0.047μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
		≤12.5% 1206 = 10μF
		≤3.5% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
35V	≤3.5%	≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
25V	≤3.5%	≤5% 0201 = 0.01μF; 0805 ≥ 1μF
		≤7% 0603 ≥ 0.33μF
		≤10% 0201 > 0.01μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF
		≤12.5% 0402 ≥ 0.33μF; 0805 = 10μF
16V	≤3.5%	≤5% 0201 = 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF
		≤10% 0201 > 0.01μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
		≤12.5% 0402 ≥ 1μF; 0805 = 10μF
		≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5/X5R
10V	≤5%	≤10% 0805 = 10μF
6.3V	≤10%	≤15% 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF
		≤20% 0402 ≥ 2.2μF
		≤15% 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF
		≤20% 0402 ≥ 2.2μF
4V	≤15%	---

X6S:

Rated vol.	D.F.≤	Exception of D.F. ≤
≥100V	≤2.5%	≤3% 1206 ≥ 0.47μF
		≤5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF
		≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF
		≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
50V	≤2.5%	≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF
		≤10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
		≤3.5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF
		≤7% 0603 ≥ 0.33μF
25V	≤3.5%	≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
		≤12.5% 0402 ≥ 0.33μF; 0805 = 10μF
		≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF
		≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
16V	≤3.5%	≤12.5% 0402 = 10μF; 0805 = 10μF
		≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF
		≤15% 0805 = 10μF
		≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF
10V	≤5%	≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF
		≤20% 0402 ≥ 2.2μF
		≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF
		≤20% 0402 ≥ 2.2μF
6.3V	≤10%	≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF
4V	≤15%	---

X7S: $\triangle$

Rated vol.	D.F.≤	Exception of D.F. ≤
≥100V	≤2.5%	≤3% 1206 ≥ 0.47μF
		≤5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF
		≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF
		≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
50V	≤2.5%	≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF
		≤10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
		≤3.5% 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
		≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
		≤12.5% 0402 ≥ 0.33μF
		≤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; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
		≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF
		≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF
		≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF
10V	≤5%	≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF
		≤20% 0402 ≥ 2.2μF
		≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF
		≤20% 0402 ≥ 2.2μF
6.3V	≤10%	≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF
4V	≤15%	---

7. CAPACITANCE RANGE

7-1. NP0 Dielectric 0201, 0402, 0603, 0805 Sizes

DIELECTRIC		NP0																	
SIZE		0201			0402					0603					0805				
RATED VOLTAGE (VDC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	0.1pF (R10)	L	L	L	H	H	H	H											
	0.2pF (R20)	L	L	L	H	H	H	H											
	0.3pF (R30)	L	L	L	H	H	H	H											
	0.4pF (R40)	L	L	L	H	H	H	H											
	0.5pF (R50)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	0.6pF (R60)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	0.7pF (R70)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	0.8pF (R80)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	0.9pF (R90)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	1.0pF (1R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	1.2pF (1R2)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	1.5pF (1R5)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	1.6pF (1R6)							H											
	1.8pF (1R8)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	2.0pF (2R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	2.2pF (2R2)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	2.7pF (2R7)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	3.0pF (3R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	3.3pF (3R3)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	3.9pF (3R9)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	4.0pF (4R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	4.7pF (4R7)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	5.0pF (5R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	5.6pF (5R6)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	6.0pF (6R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	6.8pF (6R8)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	7.0pF (7R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	8.0pF (8R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	8.2pF (8R2)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	9.0pF (9R0)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	10pF (100)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	12pF (120)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	15pF (150)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	18pF (180)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	22pF (220)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	27pF (270)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	30pF (300)							H		S	S	S	S	S	A	A	A	A	A
	33pF (330)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	39pF (390)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	47pF (470)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	56pF (560)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	68pF (680)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	82pF (820)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	100pF (101)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	120pF (121)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	150pF (151)	L	L	L	H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	180pF (181)				H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	220pF (221)				H	H	H	H	H	S	S	S	S	S	A	A	A	A	A
	270pF (271)	L			H	H	H	H		S	S	S	S	S	A	A	A	A	A
	330pF (331)	L			H	H	H	H		S	S	S	S	S	A	A	A	A	A
	390pF (391)	L			H	H	H	H		S	S	S	S	S	B	B	B	B	B
	470pF (471)	L			H	H	H	H		S	S	S	S	S	B	B	B	B	B
	560pF (561)	L			H	H	H	H		S	S	S	S	S	B	B	B	B	B
	680pF (681)				H	H	H	H		S	S	S	S	S	B	B	B	B	B
	820pF (821)		L		H	H	H	H		S	S	S	S	S	B	B	B	B	B
	1,000pF (102)				H	H	H	H		S	S	S	S	S	B	B	B	B	B
	1,200pF (122)									X	X	X	X	X	B	B	B	B	B
	1,500pF (152)									X	X	X	X	X	B	B	B	B	B
	1,800pF (182)									X	X	X	X		B	B	B	B	B
	2,200pF (222)									X	X	X	X/B		B	B	B	B	B
	2,700pF (272)									X	X	X	X/B		C	C	C	C	C
	3,300pF (332)									X	X	X	X		C	C	C	C	C
	3,900pF (392)									X	X	X	X		C	C	C	C	C
	4,700pF (472)									X	X	X	X		C	C	C	C	C
	5,600pF (562)									X	X	X	X		C	C	C	C	C
	6,800pF (682)									X	X	X	X		C	C	C	C	C
	8,200pF (822)									X	X	X	X		C	C	C	C	
	0.010μF (103)									X	X	X	X		C	C	C	C	
	0.012μF (123)														B	B	B	B	
	0.018μF (183)														C	C	C	C	
	0.022μF (223)														C	C	C	C	

1、The letter in cell is expressed the symbol of product thickness.

2、For more information about products with special capacitance or other data, please contact our sales local representative.

7-1. NP0 Dielectric 1206, 1210, 1812 Sizes

DIELECTRIC		NPO												
SIZE		1206					1210					1812		
RATED VOLTAGE(VDC)		10	16	25	50	100	10	16	25	50	100	16	50	100
Capacitance	1.0pF (1R0)				B									
	1.2pF (1R2)	B	B	B	B	B								
	1.5pF (1R5)	B	B	B	B	B								
	1.8pF (1R8)	B	B	B	B	B								
	2.2pF (2R2)	B	B	B	B	B								
	2.7pF (2R7)	B	B	B	B	B								
	3.3pF (3R3)	B	B	B	B	B								
	3.9pF (3R9)	B	B	B	B	B								
	4.7pF (4R7)	B	B	B	B	B								
	5.6pF (5R6)	B	B	B	B	B								
	6.8pF (6R8)	B	B	B	B	B								
	7.0pF (7R0)	B	B	B	B	B								
	8.2pF (8R2)	B	B	B	B	B								
	10pF (100)	B	B	B	B	B	I	I	I	I	I	C	C	C
	15pF (150)	B	B	B	B	B	I	I	I	I	I	C	C	C
	18pF (180)	B	B	B	B	B	I	I	I	I	I	C	C	C
	22pF (220)	B	B	B	B	B	I	I	I	I	I	C	C	C
	27pF (270)	B	B	B	B	B	I	I	I	I	I	C	C	C
	33pF (330)	B	B	B	B	B	I	I	I	I	I	C	C	C
	39pF (390)	B	B	B	B	B	I	I	I	I	I	C	C	C
	47pF (470)	B	B	B	B	B	I	I	I	I	I	C	C	C
	56pF (560)	B	B	B	B	B	I	I	I	I	I	C	C	C
	68pF (680)	B	B	B	B	B	I	I	I	I	I	C	C	C
	82pF (820)	B	B	B	B	B	I	I	I	I	I	C	C	C
	100pF (101)	B	B	B	B	B	I	I	I	I	I	C	C	C
	120pF (121)	B	B	B	B	B	I	I	I	I	I	C	C	C
	150pF (151)	B	B	B	B	B	I	I	I	I	I	C	C	C
	180pF (181)	B	B	B	B	B	I	I	I	I	I	C	C	C
	220pF (221)	B	B	B	B	B	I	I	I	I	I	C	C	C
	270pF (271)	B	B	B	B	B	I	I	I	I	I	C	C	C
	330pF (331)	B	B	B	B	B	I	I	I	I	I	C	C	C
	390pF (391)	B	B	B	B	B	I	I	I	I	I	C	C	C
	560pF (561)	B	B	B	B	B	I	I	I	I	I	C	C	C
	680pF (681)	B	B	B	B	B	I	I	I	I	I	C	C	C
	820pF (821)	B	B	B	B	B	I	I	I	I	I	C	C	C
	1,000pF (102)	B	B	B	B	B	I	I	I	I	I	C	C	C
	1,200pF (122)	B	B	B	B	B	I	I	I	I	I	C	C	C
	1,500pF (152)	B	B	B	B	B	I	I	I	I	I	C	C	C
	1,800pF (182)	B	B	B	B	B	I	I	I	I	I	C	C	C
	2,200pF (222)	B	B	B	B	B	I	I	I	I	I	C	C	C
	2,700pF (272)	B	B	B	B	B	I	I	I	I	I	C	C	C
	3,300pF (332)	B	B	B	B	B	I	I	I	I	I	C	C	C
	3,900pF (392)	B	B	B	B	B	I	I	I	I	I	C	C	C
	4,700pF (472)	B	B	B	B	B	I	I	I	I	I	C	C	C
	5,600pF (562)	B	B	B	B	B	I	I	I	I	I	C	C	C
	6,800pF (682)	I	I	I	I	I	I	I	I	I	I	C	C	C
	8,200pF (822)	C	C	C	C	C	I	I	I	I	I	C	C	C
	0.010μF (103)	C	C	C	C	C	I	I	I	I	I	C	C	C
	0.012μF (123)	P	P	P	P	P	C	C	C	C	C	C	C	C
	0.015μF (153)	P	P	P	P	P	C	C	C	C	C	C	C	C
0.018μF (183)	P	P	P	P	P		K	K	K	K	C	C	C	
0.022μF (223)	P	P	P	P	P		K	K	K	K	C	C	C	
0.027μF (273)	P	P	P	P			K	K	K	K	C	C	C	
0.033μF (333)	P	P	P	P			K	K	K	K	C	C	C	
0.039μF (393)	P	P	P	P			K	K	K	K	M	M	M	
0.047μF (473)	J	J	J	J			K	K	K	K	M	M	M	
0.056μF (563)	J	J	J	J							M	M	M	
0.068μF (683)	D	D	D	D							M	M	M	
0.082μF (823)	D	D	D	D							M	M	M	
0.1uF (104)	D	D	D	D							M	M	M	

1、The letter in cell is expressed the symbol of product thickness.

2、For more information about products with special capacitance or other data, please contact our sales local representative.

7-2. X7R Dielectric 0201, 0402, 0603, 0805 Sizes

DIELECTRIC		X7R																							
SIZE		0201					0402						0603						0805						
RATED VOLTAGE(VDC)		6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	6.3	10	16	25	50	100	
Capacitance	100pF (101)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	120pF (121)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	150pF (151)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	180pF (181)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	220pF (221)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	270pF (271)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	330pF (331)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	390pF (391)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	470pF (471)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	560pF (561)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	680pF (681)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	820pF (821)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	1,000pF (102)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	1,200pF (122)	L	L	L	L		H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	1,500pF (152)	L	L	L	L		H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	1,800pF (182)	L	L	L	L		H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	2,200pF (222)	L	L	L	L		H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	2,700pF (272)	L	L	L	L		H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	3,300pF (332)	L	L	L	L		H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	3,900pF (392)	L	L	L	L		H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	4,700pF (472)	L	L	L	L		H	H	H	H	H	H	S	S	S	S	S	S	B	B	B	B	B	B	
	5,600pF (562)	L	L	L	L		H	H	H	H	H		S	S	S	S	S	S	B	B	B	B	B	B	
	6,800pF (682)	L	L	L			H	H	H	H	H		S	S	S	S	S	S	B	B	B	B	B	B	
	8,200pF (822)	L	L	L			H	H	H	H	H		S	S	S	S	S	S	B	B	B	B	B	B	
	0.010μF (103)	L	L	L			H	H	H	H	H		S	S	S	S	S	S	B	B	B	B	B	B	
	0.012μF (123)						H	H	H	H	H		S	S	S	S	S	X	B	B	B	B	B	B	
	0.015μF (153)						H	H	H	H	H		S	S	S	S	S	X	B	B	B	B	B	B	
	0.018μF (183)						H	H	H	H	H		S	S	S	S	S	X	B	B	B	B	B	B	
	0.022μF (223)						H	H	H	H	H		S	S	S	S	S	X	B	B	B	B	B	B	
	0.027μF (273)						H	H	H	H	H		S	S	S	S	S	X	B	B	B	B	B	C	
	0.033μF (333)						H	H	H	H	H		S	S	S	S	X	X	B	B	B	B	B	C	
	0.039μF (393)						H	H	H	H	H		S	S	S	S	X	X	B	B	B	B	B	C	
	0.047μF (473)						H	H	H	H	H		S	S	S	S	X	X	B	B	B	B	B	C	
	0.056μF (563)						H	H	H	H	H		S	S	S	S	X	X	B	B	B	B	B	C	
	0.068μF (683)						H	H	H	H	H		S	S	S	S	X	X	B	B	B	B	B	C	
	0.082μF (823)						H	H	H	H	H		S	S	S	S	X	X	B	B	B	B	B	C	
	0.10μF (104)						H	H	H	H	H		S	S	S	S	X	X	B	B	B	B	B	C	
	0.12μF (124)												S	S	S	X			B	B	B	B	C	C	
	0.15μF (154)												S	S	S	X			C	C	C	C	C	C	
	0.18μF (184)												S	S	S	X			C	C	C	C	C	C	
0.22μF (224)						H	H	H	H			S	S	S	X	X		C	C	C	C	C	C		
0.27μF (274)												X	X	X	X			C	C	C	C	C			
0.33μF (334)												X	X	X	X			C	C	C	C	C			
0.39μF (394)												X	X	X	X			C	C	C	C	C			
0.47μF (474)						H	H					X	X	X	X	X		C	C	C	C	C	C		
0.56μF (564)												X	X	X				C	C	C	C				
0.68μF (684)												X	X	X				C	C	C	C				
0.82μF (824)												X	X	X				C	C	C	C				
1.0μF (105)						H	H					X	X	X	X	X		C	C	C	C	C			
1.5μF (155)																		C	C	C	C				
2.2μF (225)												X	X	X				C	C	C	C	C			
3.3μF (335)																									
4.7μF (475)												X	X	X				C	C	C	C				
6.8μF (685)																									
10μF (106)																		C*	C*	C*					
22μF (226)																									

- 1、The letter in cell is expressed the symbol of product thickness.
- 2、The letter in cell with “*” mark is expressed: “M tolerance” (20%) only

7-2. X7R Dielectric 1206, 1210, 1812 Sizes

DIELECTRIC		X7R																
SIZE		1206					1210					1812						
RATED VOLTAGE(VDC)		6.3	10	16	25	50	100	6.3	10	16	25	50	100	10	16	25	50	100
Capacitance	100pF (101)																	
	120pF (121)																	
	150pF (151)	B	B	B	B	B	B											
	180pF (181)	B	B	B	B	B	B											
	220pF (221)	B	B	B	B	B	B											
	270pF (271)	B	B	B	B	B	B											
	330pF (331)	B	B	B	B	B	B											
	390pF (391)	B	B	B	B	B	B											
	470pF (471)	B	B	B	B	B	B											
	560pF (561)	B	B	B	B	B	B											
	680pF (681)	B	B	B	B	B	B											
	820pF (821)	B	B	B	B	B	B											
	1,000pF (102)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	1,200pF (122)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	1,500pF (152)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	1,800pF (182)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	2,200pF (222)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	2,700pF (272)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	3,300pF (332)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	3,900pF (392)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	4,700pF (472)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	5,600pF (562)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	6,800pF (682)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	8,200pF (822)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.010μF (103)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.012μF (123)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.015μF (153)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.018μF (183)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.022μF (223)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.027μF (273)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.033μF (333)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.039μF (393)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.047μF (473)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.056μF (563)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.068μF (683)	B	B	B	B	B	B		I	I	I	I	I	C	C	C	C	C
	0.082μF (823)	B	B	B	B	B	C		I	I	I	I	I	C	C	C	C	C
	0.10μF (104)	B	B	B	B	B	C		I	I	I	I	I	C	C	C	C	C
	0.12μF (124)	B	B	B	B	B	C		I	I	I	I	I	C	C	C	C	C
	0.15μF (154)	I	I	I	I	I	D		I	I	I	I	C	C	C	C	C	C
	0.18μF (184)	I	I	I	I	I	D		I	I	I	I	C	C	C	C	C	C
0.22μF (224)	I	I	I	I	I	D		I	I	I	I	C	C	C	C	C	C	
0.27μF (274)	I	I	I	I	C	D		I	I	I	I	D	C	C	C	C	C	
0.33μF (334)	I	I	I	I	C	D		I	I	I	C	D	C	C	C	C	C	
0.39μF (394)	I	I	I	J	P	D		I	I	I	C	M	C	C	C	C	C	
0.47μF (474)	J	J	J	J	P	D		I	I	I	C	M	C	C	C	C	K	
0.56μF (564)	J	J	J	J	P	P		C	C	C	C	M	C	C	C	C	K	
0.68μF (684)	J	J	J	J	P	P		C	C	C	C	K	C	C	C	K	K	
0.82μF (824)	J	J	J	J	P	P		C	C	C	C	K	C	C	C	K	K	
1.0μF (105)	J	J	J	J	P	P		C	C	C	C	K	C	C	C	K	K	
1.5μF (155)	J	J	J	P					D	D	M	M				K	K	
2.2μF (225)	J	J	J	P	P	P			D	D	M	M				M	M	
3.3μF (335)	P	P	P	P					D	D	M							
4.7μF (475)	P	P	P	P	P			K	K	K	M	M						
6.8μF (685)																		
10μF (106)	P	P	P	P				K	K	K	M							
22μF (226)	P*	P*	P*					M	M	M								
47μF (476)								M										
100μF (107)	P*	P*																

- 1、The letter in cell is expressed the symbol of product thickness.
- 2、The letter in cell with “*” mark is expressed:“M tolerance” (20%) only

7-4. X5R Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X5R														
Size		0201					0402					0603				
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	100pF (101)			L	L	L										
	120pF (121)			L	L	L										
	150pF (151)			L	L	L										
	180pF (181)			L	L	L										
	220pF (221)			L	L	L										
	270pF (271)			L	L	L										
	330pF (331)			L	L	L										
	390pF (391)			L	L	L										
	470pF (471)			L	L	L										
	560pF (561)			L	L	L										
	680pF (681)			L	L	L										
	820pF (821)			L	L	L										
	1,000pF (102)		L	L	L	L										
	1,500pF (152)		L	L	L											
	2,200pF (222)		L	L	L											
	2,700pF (272)		L	L	L											
	3,300pF (332)		L	L	L											
	4,700pF (472)		L	L	L											
	6,800pF (682)		L	L	L											
	0.010μF (103)	L	L	L	L	L										
	0.015μF (153)	L	L								H					
	0.022μF (223)	L	L								H					
	0.027μF (273)	L	L						H		H					
	0.033μF (333)	L	L						H		H					
	0.039μF (393)	L	L						H		H					
	0.047μF (473)	L	L				H	H	H		H					
	0.056μF (563)	L	L				H	H	H		H					
	0.068μF (683)	L	L				H	H	H		H					
	0.082μF (823)	L	L				H	H	H		H					
	0.10μF (104)	L	L	L			H	H	H	H	H					
	0.15μF (154)						H	H	H	H						
	0.22μF (224)	L	L	L*	L		H	H	H	H	H	X	X	X	X	
	0.27μF (274)												X	X	X	X
0.33μF (334)	L*	L*				H	H	H			X	X	X	X		
0.39μF (394)												X	X	X		
0.47μF (474)	L					H	H	H	H	H	X	X/B	X	X	X	
0.68μF (684)						H	H				X	X	X	X		
0.82μF (824)											X	X	X	X		
1.0μF (105)	L*	L*	L*			H	H	H	H	H	X	X	X	X/B	X/B	
1.5μF (155)											X					
2.2μF (225)	L*	L*				H	H	H	H		X/B	X	X	X	X	
3.3μF (335)											X	X				
4.7μF (475)						H	H	H*			X	X	X	X		
6.8μF (685)																
10μF (106)						H*	H*	H*			X/B	X	X	X*		
22μF (226)						H*					X*	X*	X*			

Dielectric		X5R																
Size		0805					1206					1210						
Rated Voltage (VDC)		4	6.3	10	16	25	50	6.3	10	16	25	50	4	6.3	10	16	25	50
Capacitance	1.0μF (105)			C	C	C	C											
	1.5μF (155)		C	C	C	C		J	J						K	K		
	2.2μF (225)		C	C	C	C	C		J	J	P	P			K	K		
	3.3μF (335)		C	C	C	C		P	P	P	P							
	4.7μF (475)		C	C	C	C	C	P	P	P	P	P			K	K	K	
	6.8μF (685)							P	P									
	10μF (106)		C	C	C	C	C	P	P	P	P/D	P		K	K	K	K	M
	22μF (226)		C	C*	C*	C*		P	P	P	P			M	M	M		
	47μF (476)		C*	C*				P	P	P*	P/Y			M	M	M*		
	100μF (107)		C*					P*						M*	M*			
220μF (227)												M*	M*					

1、The letter in cell is expressed the symbol of product thickness.

2、For more information about products with special capacitance or other data, please contact our sales local representative.

3、The letter in cell with “*” mark is expressed :“M tolerance” (20%) only

7-5. X6S Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X6S																											
Size		0201		0402			0603					0805						1206					1210						
Rated Voltage (VDC)		4	6.3	6.3	10	16	25	4	6.3	10	16	25	4	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	
Capacitance	0.10μF (104)	L	L																										
	0.15μF (154)																												
	0.22μF (224)		L																										
	0.33μF (334)																												
	0.47μF (474)			H																									
	0.68μF (684)																												
	1.0μF (105)	L*		H	H	H	H																						
	1.5μF (155)																												
	2.2μF (225)			H	H	H																							
	3.3μF (335)																												
	4.7μF (475)								X		X	X						C	C										
	6.8uF(685)																												
	10μF (106)								X*	X*	X*			C	C	C	C	C					D						
	22μF (226)								X*	X*					C*	C*	C*				P	P*						M	
	47μF (476)														C*						P					M	M	M	
100nF (107)																									M*				

7-6. X7S Dielectric 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X7S																							
Size	0201	0402				0603				0805					1206					1210					
Rated Voltage (VDC)	10V	6.3	10	16	6.3	10	16	25	10	16	25	50	100	6.3	10	16	25	50	6.3	10	16	25	50		
Capacitance	0.1μF (104)	L											I												
	1.0μF (105)			H				X																	
	1.5μF (155)																								
	2.2μF (225)		H	H					X																
	3.3μF (335)																								
	4.7μF (475)						X	X					I												
	6.8uF (685)																								
	10μF (106)										I	I													
	22μF (226)																P*								
	47μF (476)														P*										
100μF (107)																			M*						

- 1、The letter in cell is expressed the symbol of product thickness.
- 2、For more information about products with special capacitance or other data, please contact our sales local representative.
- 3、The letter in cell with “*” mark is expressed : “M tolerance” (20%) only

8. PACKAGING STYLE AND QUANTIT

Unit: pieces

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0201 (0603)	0.30±0.09	L	15,000	70,000	-	-
0402 (1005)	0.50±0.20	H	10000	50000	-	-
0603 (1608)	0.50±0.20	H	4,000	-	-	-
	0.80±0.10	S	4,000	15,000	-	-
	0.80±0.20	X	4,000	15,000	-	-
0805 (2012)	0.50±0.20	H	4,000	15,000	-	-
	0.60±0.10	A	4,000	15,000	-	-
	0.85±0.15	B	4,000	15,000	-	-
	1.25±0.20	C	-	-	3,000	10,000
1206 (3216)	0.85±0.15	B	4,000	15,000	-	-
	0.95±0.10	I	-	-	3,000	10,000
	1.15±0.20	J	-	-	3,000	10,000
	1.25±0.20	C	-	-	3,000	10,000
	1.60±0.20	D	-	-	2,000	10,000
	1.60+0.30/-0.10	P	-	-	2,000	9,000
1210 (3225)	0.85±0.15	B	-	-	3,000	10,000
	0.95±0.10	I	-	-	3,000	10,000
	1.25±0.20	C	-	-	3,000	10,000
	1.60±0.20	D	-	-	2,000	-
	2.00±0.20	K	-	-	1,000	6,000
	2.50±0.30	M	-	-	1,000	6,000
1808 (4520)	1.25±0.15	C	-	-	2,000	10,000
	1.60±0.20	D	-	-	2,000	8,000
	2.00±0.20	K	-	-	1,000	6,000
1812 (4532)	1.25±0.20	C	-	-	1,000	5,000
	1.60±0.20	D	-	-	1,000	-
	2.00±0.20	K	-	-	1,000	-
	2.50±0.30	M	-	-	500	3,000
	2.80±0.30	U	-	-	500	-

9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																																																												
1	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.																																																																												
2	Capacitance	Class I: (NP0) ≤ 1000pF, 1.0±0.2Vrms , 1MHz±10% > 1000pF, 1.0±0.2Vrms , 1KHz±10% Class II: (X7R, X6S, X5R) C ≤ 10μF, 1.0±0.2Vrms , 1KHz±10% ** C > 10μF, 0.5±0.2Vrms , 120Hz±20% ** Test condition: 0.5±0.2Vrms , 1KHz±10% X7R: 0805=106(6.3V), 0603/475(6.3V) X5R: 0201 ≥ 224 (6.3V,10V,16V) ^{#1} , 0402 ≥ 475 (6.3V,16V), 0402 ≥ 225(10V), 0603=106 (6.3V,10V), TT18X ≥ 475(10V) , TT15X series X6S: 0201/474(4V),0201 ≥ 104 (6.3V,10V) ^{#1} , 0402 ≥ 225 (6.3V), 0402/475 (10V), 0603/106 (6.3V), #1 Excluding X5R/0201/105(6.3V);225(10V), X6S/0201/104(10V) (1.0±0.2Vrms , 1KHz±10%) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr for 24±2 hrs at room temp.	* Shall not exceed the limits given in the detailed spec.																																																																												
3	Q/D.F.(Dissipation Factor)		NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C X7R,X5R,X6S:See <Note 1>																																																																												
4	Dielectric Strength	* To apply voltage (≤100V) 250%. * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.																																																																												
5	Insulation Resistance	* 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. To apply rated voltage for max. 120 sec.	Class I: (NP0) 10GΩ or RxC≥500Ω-F whichever is smaller. Class II (X7R, X5R, X6S,X7S) <table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: All X7R</td><td rowspan="6">10GΩ or RxC ≥ 100 Ω-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:0805≥2.2μF;1206 ≥ 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: 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><td></td></tr><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>All X6S items, All X7S items</td><td rowspan="8">RxC ≥ 50 Ω-F.</td></tr><tr><td>100V: 1210≥3.3μF</td></tr><tr><td>50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF</td></tr><tr><td>35V: 0603≥1μF;</td></tr><tr><td>25V: 0201≥0.1μF; 0402≥2.2μF;0603≥10μF; 0805≥10μF;1206≥22μF</td></tr><tr><td>16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF</td></tr><tr><td>10V: 0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF</td></tr><tr><td>6.3V:0201≥0.1μF; 0402≥1μF; 0603≥4.7μF; 0805≥47μF; 1206≥10μF</td></tr><tr><td>4V: 0603≥22μF; 0805≥47μF; 1206≥100μF</td><td></td></tr></table>	Rated voltage	Insulation Resistance	100V: All X7R	10GΩ or RxC ≥ 100 Ω-F whichever is smaller.	50V:0402≥0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF	35V:0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF	25V:0402≥1μF;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≥47μF	10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF	6.3V ; 4V ; Size≥1812		Rated voltage	Insulation Resistance	All X6S items, All X7S items	RxC ≥ 50 Ω-F.	100V: 1210≥3.3μF	50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF	35V: 0603≥1μF;	25V: 0201≥0.1μF; 0402≥2.2μF;0603≥10μF; 0805≥10μF;1206≥22μF	16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF	10V: 0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF	6.3V:0201≥0.1μF; 0402≥1μF; 0603≥4.7μF; 0805≥47μF; 1206≥10μF	4V: 0603≥22μF; 0805≥47μF; 1206≥100μF																																																					
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4V: 0603≥22μF; 0805≥47μF; 1206≥100μF																																																																															
6	Temperature Coefficient	With no electrical load. <table><tr><th>T.C.</th><th>Operating Temp</th></tr><tr><td>NPO</td><td>-55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr><tr><td>X7S</td><td>-55 ~ 125°C at 25°C</td></tr><tr><td>X5R</td><td>-55~ 85°C at 25°C</td></tr><tr><td>X6S</td><td>-55~105°C at 25°C</td></tr></table> *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 voltage for Class II: <table><tr><td>01005</td><td>0201</td></tr><tr><td>Cap≤0.01μF: 0.5V</td><td>Cap<0.1μF:1V</td></tr><tr><td>Cap<0.01μF: 0.2V</td><td>0.1μF<Cap≤1μF: 0.2V*</td></tr><tr><td></td><td>Cap≤1μF: 0.1V*</td></tr><tr><td>* 0201X104/6.3V~25V: 0.5V</td><td>*0201B104/6.3V~10V: 0.3V</td></tr><tr><td>0201X224/10V~25V: 0.5V</td><td>0201S104/6.3V~16V: 0.3V</td></tr><tr><td></td><td>0201S224/6.3V: 0.3V</td></tr><tr><td></td><td>0201X334/474/105-6.3V/8.10V: 0.3V</td></tr><tr><td>0402</td><td>0603</td></tr><tr><td>Cap≤1μF: 1V</td><td>Cap<1μF: 1V</td></tr><tr><td>Cap≤1μF: 0.5V**</td><td></td></tr><tr><td>0402B224-16V: 0.5V</td><td>1μF<Cap≤4.7μF: 0.5V</td></tr><tr><td>0402B334/474-6.3V/10V: 0.5V</td><td>0603X106-10V: 0.5V</td></tr><tr><td>0402S334/474-6.3V: 0.5V</td><td></td></tr><tr><td>0402C225/475-6.3V: 0.5V</td><td></td></tr><tr><td>1μF<Cap≤10μF: 0.2V</td><td>Cap≥4.7μF: 0.2V</td></tr><tr><td>**0402B105M/6.3V: 0.2V</td><td></td></tr><tr><td>Cap≤10μF: 0.1V</td><td></td></tr><tr><td>0805</td><td>1206/1210</td></tr><tr><td>Cap≤10μF: 1V</td><td>Cap≤10μF: 1V</td></tr><tr><td>Cap≤10μF: 0.5V</td><td>10μF<Cap≤100μF: 0.5V</td></tr><tr><td>0805B475/6.3V~25V: 0.5V</td><td></td></tr><tr><td>Cap>10μF: 0.2V</td><td>Cap>100μF: 0.2V</td></tr><tr><td></td><td>1206X107-6.3V: 0.2V</td></tr><tr><td></td><td>1206A476-6.3V: 0.1V</td></tr><tr><td></td><td>1210S107-6.3V: 0.2V</td></tr></table>	T.C.	Operating Temp	NPO	-55~125°C at 25°C	X7R	-55~125°C at 25°C	X7S	-55 ~ 125°C at 25°C	X5R	-55~ 85°C at 25°C	X6S	-55~105°C at 25°C	01005	0201	Cap≤0.01μF: 0.5V	Cap<0.1μF:1V	Cap<0.01μF: 0.2V	0.1μF<Cap≤1μF: 0.2V*		Cap≤1μF: 0.1V*	* 0201X104/6.3V~25V: 0.5V	*0201B104/6.3V~10V: 0.3V	0201X224/10V~25V: 0.5V	0201S104/6.3V~16V: 0.3V		0201S224/6.3V: 0.3V		0201X334/474/105-6.3V/8.10V: 0.3V	0402	0603	Cap≤1μF: 1V	Cap<1μF: 1V	Cap≤1μF: 0.5V**		0402B224-16V: 0.5V	1μF<Cap≤4.7μF: 0.5V	0402B334/474-6.3V/10V: 0.5V	0603X106-10V: 0.5V	0402S334/474-6.3V: 0.5V		0402C225/475-6.3V: 0.5V		1μF<Cap≤10μF: 0.2V	Cap≥4.7μF: 0.2V	**0402B105M/6.3V: 0.2V		Cap≤10μF: 0.1V		0805	1206/1210	Cap≤10μF: 1V	Cap≤10μF: 1V	Cap≤10μF: 0.5V	10μF<Cap≤100μF: 0.5V	0805B475/6.3V~25V: 0.5V		Cap>10μF: 0.2V	Cap>100μF: 0.2V		1206X107-6.3V: 0.2V		1206A476-6.3V: 0.1V		1210S107-6.3V: 0.2V	<table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>NPO</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>X7S</td><td>Within ±22%</td></tr><tr><td>X5R</td><td>Within ±15%</td></tr><tr><td>X6S</td><td>Within ±22%</td></tr></table>	T.C.	Capacitance Change	NPO	Within ±30ppm/°C	X7R	Within ±15%	X7S	Within ±22%	X5R	Within ±15%	X6S	Within ±22%
T.C.	Operating Temp																																																																														
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01005	0201																																																																														
Cap≤0.01μF: 0.5V	Cap<0.1μF:1V																																																																														
Cap<0.01μF: 0.2V	0.1μF<Cap≤1μF: 0.2V*																																																																														
	Cap≤1μF: 0.1V*																																																																														
* 0201X104/6.3V~25V: 0.5V	*0201B104/6.3V~10V: 0.3V																																																																														
0201X224/10V~25V: 0.5V	0201S104/6.3V~16V: 0.3V																																																																														
	0201S224/6.3V: 0.3V																																																																														
	0201X334/474/105-6.3V/8.10V: 0.3V																																																																														
0402	0603																																																																														
Cap≤1μF: 1V	Cap<1μF: 1V																																																																														
Cap≤1μF: 0.5V**																																																																															
0402B224-16V: 0.5V	1μF<Cap≤4.7μF: 0.5V																																																																														
0402B334/474-6.3V/10V: 0.5V	0603X106-10V: 0.5V																																																																														
0402S334/474-6.3V: 0.5V																																																																															
0402C225/475-6.3V: 0.5V																																																																															
1μF<Cap≤10μF: 0.2V	Cap≥4.7μF: 0.2V																																																																														
**0402B105M/6.3V: 0.2V																																																																															
Cap≤10μF: 0.1V																																																																															
0805	1206/1210																																																																														
Cap≤10μF: 1V	Cap≤10μF: 1V																																																																														
Cap≤10μF: 0.5V	10μF<Cap≤100μF: 0.5V																																																																														
0805B475/6.3V~25V: 0.5V																																																																															
Cap>10μF: 0.2V	Cap>100μF: 0.2V																																																																														
	1206X107-6.3V: 0.2V																																																																														
	1206A476-6.3V: 0.1V																																																																														
	1210S107-6.3V: 0.2V																																																																														
T.C.	Capacitance Change																																																																														
NPO	Within ±30ppm/°C																																																																														
X7R	Within ±15%																																																																														
X7S	Within ±22%																																																																														
X5R	Within ±15%																																																																														
X6S	Within ±22%																																																																														

* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

No.	Item	Test Condition	Requirements															
7	Adhesive Strength of Termination	* Pressurizing force :2N (0201) and 5N (≤0603) and 10N (>0603) * Test time: 10±1 sec.	* No remarkable damage or removal of the terminations.															
8	Vibration Resistance	* Vibration frequency: 10~55 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±2 hrs at room temp. *Cap./DF(Q) Measurement to be made after de-aging a 150°C for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage or removal of the terminations. * No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.															
9	Solder ability	* Solder temperature: 235±5°C * Dipping time: 2±0.5 sec.	95% min. coverage of all metalized area.															
10	Bending Test	* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the Pressure shall be maintained for 5±1 sec. *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 24±2 hrs.	* No remarkable damage. * Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S, X7S: within ±12.5% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)															
11	Resistance to Soldering Heat	* Solder temperature: 260±5°C * Dipping time: 10±1 sec * Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *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	* No remarkable damage. * Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S, X7S: within ±7.5% * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge.															
12	Temperature Cycle	* 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> * Before initial measurement (Class II only): Perform150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp. * 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.	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	* No remarkable damage. * Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S, X7S: within ±7.5% * Q/D.F., I.R. and dielectric strength: To meet initial requirements.
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																

* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

No.	Item	Test Condition	Requirements
13.	Humidity (Damp Heat) Steady State	*Test temp.: 40±2°C	* No remarkable damage.
		*Humidity: 90~95%RH	* Cap change:
		*Test time: 500+24/-0hrs.	NP0: within ±5% or 0.5pF whichever is larger
		*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤6.3V within ±25%;
		* 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.	**10V: 0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%;
			* Q/D.F. value:
			NP0: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C
			Less than 10pF Q≥200+10C
			X7R, X5R, X6S, X7S:

* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

No	Item	Test Condition	Requirements																																																		
14	Humidity (Damp Heat) Load	*Test temp. : 40±2°C *Humidity : 90~95%RH *Test time : 500+24/-0 hrs. *To apply voltage : Rated voltage (MAX. 500V) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * 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.	* No remarkable damage. Cap change: NP0: ±7.5% or 0.75pF whichever is larger. X7R, X5R, X6S, X7S: ≥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% Q/D.F. value: NP0: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C X7R, X5R, X6S, X7S: <table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td rowspan="4">≥ 100V</td><td rowspan="4">≤ 3%</td><td>≤ 6% 1206 ≥ 0.47μF</td></tr><tr><td>≤ 7% 1812 ≥ 4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF</td></tr><tr><td>≤ 7.5% 0603 ≥ 0.068μF;0805 > 0.1μF;1206 ≥ 1μF;1210 ≥ 2.2μF</td></tr><tr><td>≤ 20% 0805 > 0.22μF;1210 ≥ 3.3μF</td></tr><tr><td rowspan="4">50V</td><td rowspan="4">≤ 3%</td><td>≤ 6% 0201(50V);0603 ≥ 0.047μF;0805 ≥ 0.18μF;1206 ≥ 0.47μF</td></tr><tr><td>≤ 7% 1812 ≥ 4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF</td></tr><tr><td>≤ 10% 0201 ≥ 0.01uF; 0402 ≥ 0.012μF;1210 ≥ 3.3μF</td></tr><tr><td>≤ 20% 0402 ≥ 0.047μF;0603>0.1μF;0805 ≥ 1μF(0805/X7R>0.47μF); 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% 0201 ≥ 0.01μF(0201/X5R=0.01μF;0805 ≥ 1μF;1210 ≥ 10μF*</td></tr><tr><td>≤ 14% 0603 ≥ 0.33μF</td></tr><tr><td>≤ 15% 0201 ≥ 0.1μF(0201/X5R>0.01μF);0603 ≥ 0.47μF;TT series</td></tr><tr><td>0402 ≥ 0.10μF(0402/X7R ≥ 0.056μF);0805 ≥ 2.2μF; 1206 ≥ 4.7μF;1210 ≥ 22μF(1210/X5R ≥ 10μF)*</td></tr><tr><td rowspan="4">16V</td><td rowspan="4">≤ 5%</td><td>≤ 20% 0402 ≥ 0.33μF</td></tr><tr><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>0.47μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF</td></tr><tr><td>≤ 15% 0201 ≥ 0.012μF;0402 ≥ 0.22μF (0402/X7R ≥ 0.15μF); 0603 ≥ 0.33μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 22μF</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">≤ 7.5%</td><td>≤ 20% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603/X5R ≥ 10μF;01R5/X5R</td></tr><tr><td>0201 ≥ 0.1μF;0402 ≥ 1μF(0402/X6S ≥ 0.47μF); 0603 ≥ 10μF;0805 ≥ 4.7μF;1206 ≥ 47μF;1210 ≥ 100μF</td></tr><tr><td>6.3V</td><td>≤ 15%</td><td>≤ 30%</td></tr><tr><td>4V</td><td>≤ 20%</td><td>---</td></tr></table> *I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, X7S) <table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="7">500MΩ or RxC≥5 Ω-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 ; All X6S/X7S items; Size≥1812</td></tr></table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 100V	≤ 3%	≤ 6% 1206 ≥ 0.47μF	≤ 7% 1812 ≥ 4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF	≤ 7.5% 0603 ≥ 0.068μF;0805 > 0.1μF;1206 ≥ 1μF;1210 ≥ 2.2μF	≤ 20% 0805 > 0.22μF;1210 ≥ 3.3μF	50V	≤ 3%	≤ 6% 0201(50V);0603 ≥ 0.047μF;0805 ≥ 0.18μF;1206 ≥ 0.47μF	≤ 7% 1812 ≥ 4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF	≤ 10% 0201 ≥ 0.01uF; 0402 ≥ 0.012μF;1210 ≥ 3.3μF	≤ 20% 0402 ≥ 0.047μF;0603>0.1μF;0805 ≥ 1μF(0805/X7R>0.47μF); 1206 ≥ 2.2μF;1210 ≥ 10μF;	35V	≤ 5%	≤ 20% 0603 ≥ 1μF;0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF	25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF(0201/X5R=0.01μF;0805 ≥ 1μF;1210 ≥ 10μF*	≤ 14% 0603 ≥ 0.33μF	≤ 15% 0201 ≥ 0.1μF(0201/X5R>0.01μF);0603 ≥ 0.47μF;TT series	0402 ≥ 0.10μF(0402/X7R ≥ 0.056μF);0805 ≥ 2.2μF; 1206 ≥ 4.7μF;1210 ≥ 22μF(1210/X5R ≥ 10μF)*	16V	≤ 5%	≤ 20% 0402 ≥ 0.33μF	≤ 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>0.47μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF	≤ 15% 0201 ≥ 0.012μF;0402 ≥ 0.22μF (0402/X7R ≥ 0.15μF); 0603 ≥ 0.33μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 22μF	10V	≤ 7.5%	≤ 20% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603/X5R ≥ 10μF;01R5/X5R	0201 ≥ 0.1μF;0402 ≥ 1μF(0402/X6S ≥ 0.47μF); 0603 ≥ 10μF;0805 ≥ 4.7μF;1206 ≥ 47μF;1210 ≥ 100μF	6.3V	≤ 15%	≤ 30%	4V	≤ 20%	---	Rated voltage	Insulation Resistance	100V: All X7R;1210≥3.3μF	500MΩ or RxC≥5 Ω-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 ; All X6S/X7S items; Size≥1812
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																			
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10V	≤ 7.5%	≤ 20% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603/X5R ≥ 10μF;01R5/X5R																																																			
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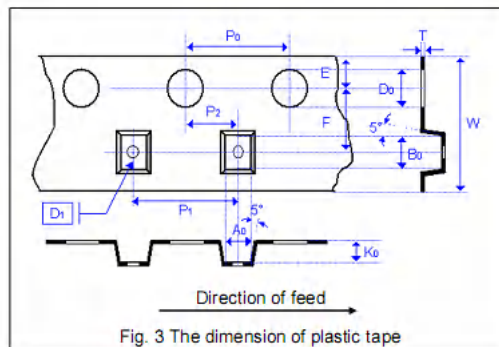
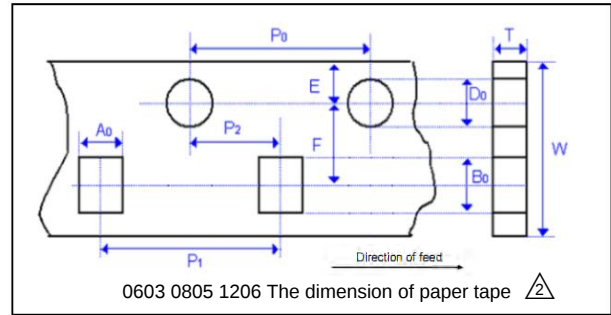
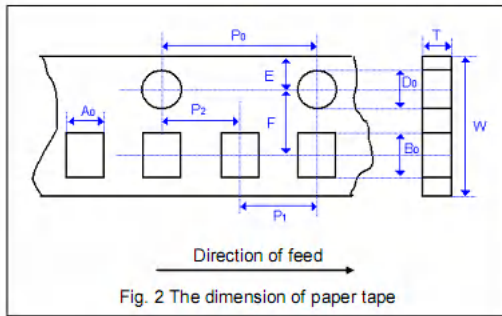
* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

No	Item	Test Condition	Requirements																																																																														
15.	High Temperature Load (Endurance)	Test temp. : NP0, X7R/X7E/X7S: 125±3°C X6S: 105±3°C X5R, 85±3°C *Test time: 1000+24/-0 hrs. *To apply voltage: (1) 100% of rated voltage for below range.	* No remarkable damage. Cap change: NP0: ±3.0% or ±0.3pF whichever is larger X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; **10V: 0603≥4.7μF; 0402≥1μF; 0201≥0.1μF, within ±25% Q/D.F. value: NP0: More than 30pF, Q≥350 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C X7R, X5R, X6S, X7S:																																																																														
		<table><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance</th></tr><tr><td>01R5</td><td>X5R</td><td>=10V</td><td>C=0.1μF</td></tr><tr><td>0201</td><td>X5R/X7R/ X6S/X7S</td><td>≤10V ≥16V</td><td>C≥0.1μF C>0.1μF</td></tr><tr><td rowspan="4">0402</td><td rowspan="2">X5R</td><td>≤16V</td><td>C>1.0μF</td></tr><tr><td>25V, 50V</td><td>C≥1.0μF</td></tr><tr><td rowspan="2">X6S</td><td>6.3V, 10V</td><td>C>1.0μF</td></tr><tr><td>16V, 25V</td><td>C≥1.0μF</td></tr><tr><td></td><td>X7R/X7S</td><td>6.3V, 10V</td><td>C≥1.0μF</td></tr><tr><td rowspan="4">0603</td><td rowspan="2">X5R/X7R/ X6S/X7S</td><td>4V</td><td>C≥22μF</td></tr><tr><td>6.3V, 10V</td><td>C≥4.7μF#1</td></tr><tr><td rowspan="2">X5R/X6S/X7S</td><td>25V</td><td>C≥1.0μF</td></tr><tr><td>X7R</td><td>35V</td><td>C≥1.0μF</td></tr><tr><td rowspan="6">0805</td><td rowspan="3">X5R/X7R/ X6S/X7S</td><td>4V</td><td>C≥47μF</td></tr><tr><td>6.3V</td><td>C≥22μF</td></tr><tr><td>10V, 50V</td><td>C≥10μF</td></tr><tr><td rowspan="2">X6S</td><td>16V</td><td>C>10μF</td></tr><tr><td>25V</td><td>C≥10μF</td></tr><tr><td>X7R/X7S</td><td>16V, 25V</td><td>C≥10μF</td></tr><tr><td></td><td>X5R</td><td></td><td>C≥22μF</td></tr><tr><td>1206</td><td>X5R/X7R/X6S</td><td>≤6.3V</td><td>C≥47μF</td></tr><tr><td>1210</td><td>X5R/X7R/X6S</td><td>16V</td><td>C≥47μF</td></tr><tr><td></td><td>X7R</td><td>100V</td><td>C≥3.3μF</td></tr><tr><td>TT15</td><td>X5R</td><td>6.3V</td><td>C>1.0μF</td></tr><tr><td>TT21</td><td>X5R/X7R/X6S</td><td>≤10V</td><td>C≥10μF</td></tr></table> **1WV items must follow de-rating conditions. #1. 0603X106/475(10V)&0603S106(4V&6.3V): 150% of rated voltage (2) 150% of rated voltage for below range.	Size	Dielectric	Rated voltage	Capacitance	01R5	X5R	=10V	C=0.1μF	0201	X5R/X7R/ X6S/X7S	≤10V ≥16V	C≥0.1μF C>0.1μF	0402	X5R	≤16V	C>1.0μF	25V, 50V	C≥1.0μF	X6S	6.3V, 10V	C>1.0μF	16V, 25V	C≥1.0μF		X7R/X7S	6.3V, 10V	C≥1.0μF	0603	X5R/X7R/ X6S/X7S	4V	C≥22μF	6.3V, 10V	C≥4.7μF#1	X5R/X6S/X7S	25V	C≥1.0μF	X7R	35V	C≥1.0μF	0805	X5R/X7R/ X6S/X7S	4V	C≥47μF	6.3V	C≥22μF	10V, 50V	C≥10μF	X6S	16V	C>10μF	25V	C≥10μF	X7R/X7S	16V, 25V	C≥10μF		X5R		C≥22μF	1206	X5R/X7R/X6S	≤6.3V	C≥47μF	1210	X5R/X7R/X6S	16V	C≥47μF		X7R	100V	C≥3.3μF	TT15	X5R	6.3V	C>1.0μF	TT21	X5R/X7R/X6S	≤10V	C≥10μF
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(3) ≤6.3V or C≥10μF or TT series: 150% of rated voltage. (4) 10V~250V: 200% of rated voltage. Excluding 1812/NP0(250V)/104: 100% of rated voltage. 0201/X6S(10V)/393~823: 150% of rated voltage. (5) 400V~450V: 120% of rated voltage. (6) 500V: 150% of rated voltage. (7) 630V~3000V: 120% of rated voltage. Excluding 1210/X7R(2kV)/103: 110% of rated voltage. 1210/NP0(1kV)/333: 100% of rated voltage. 1812/NP0(1kV)/472~562: 100% of rated voltage. (8) Ur=3.5kV & 4kV: 110% of rated voltage.																																																																																	
* Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * 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.																																																																																	

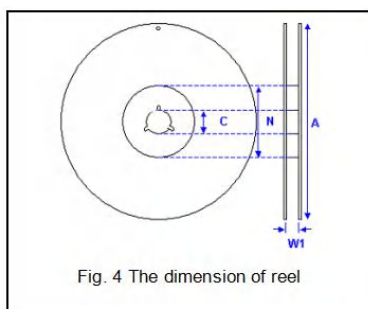
* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

APPENDIXES

■ Tape & reel dimensions



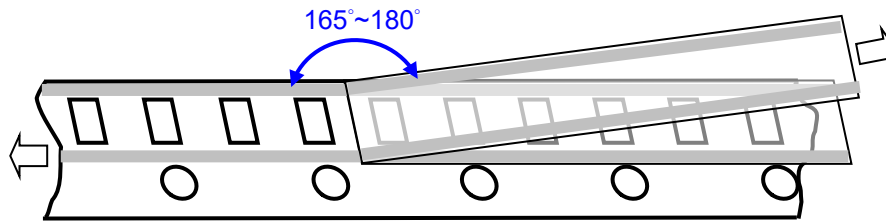
Size	0201	0402	0603	0805			1206			1210			1812	
Thickness	L	H N	H,S,B,X	A,H	B,X	C	B	I,C,J	D,P	B	I,C,D,K	M	C,D,K	M,U
A ₀	0.40 +/-0.10	0.70 +/-0.20	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	< 2.30	< 3.05	< 3.05	< 3.20	< 3.90	< 3.90
B ₀	0.70 +/-0.10	1.20 +/-0.20	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	< 2.70	3.50 +/-0.50	< 3.70	< 4.00	< 3.80	< 3.80	< 4.00	< 5.30	< 5.30
T	≤ 0.55	≤ 0.80	≤ 1.20	≤ 1.15	≤ 1.20	0.23 +/-0.1	≤ 1.20	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.25 +/-0.1	0.25 +/-0.1
K ₀	-	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 1.50	< 2.50	< 3.20	< 2.50	< 3.50
W	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30
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	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 +/-0.10	40.00 +/-0.10	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	40.00 +/-0.20	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	4.00 +/-0.10	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	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.10	2.00 +/-0.10
D ₀	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0
D ₁	-	-	-	-	-	1.00 +/-0.10	-	1.00 +/-0.10	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	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	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	5.50 +/-0.10	5.50 +/-0.10



Size	0201, 0402, 0603, 0805, 1206, 1210			1812
Reel size	7"	10"	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	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0±0.10	250.0±1.0	330.0±1.0	178.0±0.10
N	60.0+1.0/-0	100.0±1.0	100±1.0	60.0+1.0/-0

Peeling force (EIA-481)

Peel-off force should be in the range of 10 grams to 100 grams at a peel-off speed of 300 ± 10 mm/min.



Storage and handling conditions

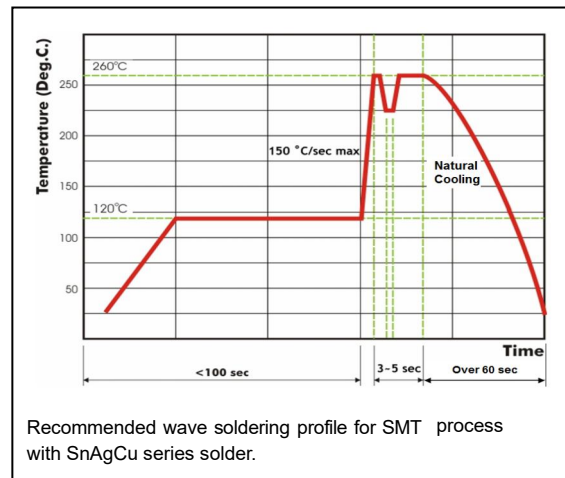
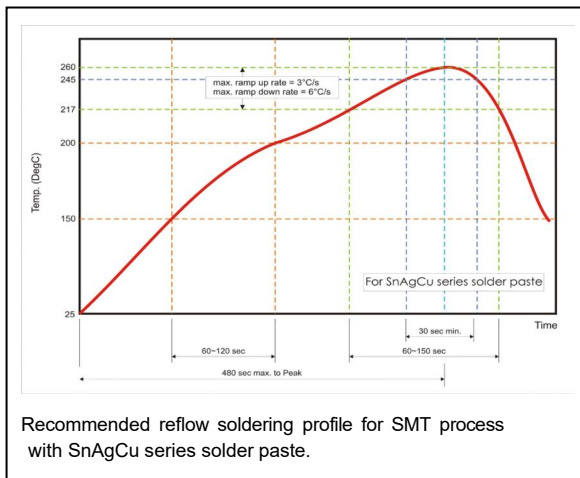
- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions; MSL Level 1.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.
- c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

Recommended soldering conditions

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N_2 within oven are recommended.



Manual soldering (solder iron) ⚠

