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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 dielectric material and which provides product with high electrical precision, stability and reliability.

2. FEATURES

- A wide selection of sizes is available (0201 to 1812).
- High capacitance in given case size.
- Capacitor with lead-free termination (pure Tin).

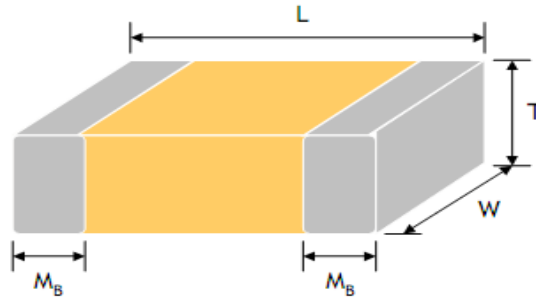
3. APPLICATIONS

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

4. HOW TO ORDER

1206	B	104	K	500	A	D
Size Inch (mm) 0201 (0603) 0402 (1005) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 1812 (4532)	Dielectric N=NP0 (C0G) B=X7R W=X5R S=X6S	Capacitance Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 0R5=0.5pF R25=0.25pF 1R0=1.0pF 104=10x104=100nF	Tolerance A=±0.05pF B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20% Z=-20/+80%	Rated Voltage Two significant digits followed by no. of zeros. And R is in place of decimal point. 4R0 =4 VDC 6R3 =6.3 VDC 100 =10 VDC 160 =16 VDC 250 =25 VDC 500 =50 VDC 101 =100 VDC	Thickness Item 5 & Item 7 for details	Packaging Quantity K: 0.5 KPS/Reel A: 1KPS/Reel B: 2KPS/Reel C: 3KPS/Reel D: 4KPS/Reel E: 15KPS/Reel I: 10KPS/Reel J: 2.5KPS/Reel F: others

5. EXTERNAL DIMENSIONS



Size Inch(mm)	L (mm)	W (mm)	T(mm)/Symbol		Soldering Method	M _B (mm)
0201 (0603)	0.6±0.09	0.30±0.09	0.30±0.09	L	R	0.15±0.1/-0.05
0402 (1005)	1.00±0.20	0.50±0.20	0.50±0.05 /0.50±0.10	N/E	R	0.25±0.05/-0.10
			0.50±0.20	H	R	
0603 (1608)	1.60±0.20	0.80±0.20	0.50±0.20	H	R/W	0.40±0.15
			0.80±0.10	S	R/W	
			0.85±0.15	B	R/W	
			0.80±0.20	X	R/W	
0805 (2012)	2.00±0.20	1.25±0.20	0.50±0.20	H	R	0.50±0.20
			0.60±0.10	A	R/W	
			0.80±0.20	X	R/W	
			0.85±0.15	B	R/W	
			1.25±0.20	C	R	
1206 (3216)	3.20±0.30	1.60±0.30	0.85±0.15	B	R/W	0.60±0.20 0.50±0.25
			0.95±0.10	I	R	
			1.25±0.20	C	R	
			1.15±0.20	J	R	
			1.60±0.20/1.60±0.30	D/Y	R	
			1.60+0.30/-0.10	P	R	
1210 (3225)	3.20±0.40	2.50±0.30 $\triangle$	0.85±0.15	B	R	0.75±0.25
			0.95±0.10	I	R	
			1.25±0.20	C	R	
			1.60±0.20	D	R	
			2.00±0.20	K	R	
			2.50±0.30	M	R	
1808 (4520)	4.50±0.40	2.03±0.25	1.25±0.20	C	R	0.75±0.25 0.50±0.25*
			1.40±0.20	F	R	
			1.60±0.20	D	R	
			2.00±0.20	K	R	
1812 (4532)	4.50±0.40	3.20±0.40	1.25±0.20	C	R	0.75±0.25 0.50±0.25*
			1.60±0.20	D	R	
			2.00±0.20	K	R	
			2.50±0.30	M	R	
			2.80±0.30	U	R	
1825 (4563)	4.50±0.40	6.30±0.40	1.60±0.20	D	R	0.75±0.35
			2.00±0.20	K	R	0.85±0.35
			2.50±0.30	M	R	0.85±0.35
			2.80±0.30	U	R	0.85±0.35
2211(5728)	5.70±0.40	2.80±0.30	1.60±0.20	D	R	0.75±0.35
			2.00±0.20	K	R	0.85±0.35
			2.50±0.30	M	R	0.85±0.35
			2.80±0.30	U	R	0.85±0.35
2220(5750)	5.70±0.40	5.00±0.40	1.60±0.20	D	R	0.75±0.35
			2.00±0.20	K	R	0.85±0.35
			2.50±0.30	M	R	0.85±0.35
			2.80±0.30	U	R	0.85±0.35
2225(5763)	5.70±0.40	6.30±0.40	1.60±0.20	D	R	0.75±0.35
			2.00±0.20	K	R	0.85±0.35
			2.50±0.30	M	R	0.85±0.35
			2.80±0.30	U	R	0.85±0.35

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X5R	X6S
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
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%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	6.3V, 10V, 16V, 25V, 50V, 100V		
Operating temperature	-55 to +125°C		-55 to +85°C	-55 to +105°C
Capacitance characteristic	±30ppm	±15%	±15%	±22%
Termination	Ni/Sn (lead-free termination)			

#1: NP0, 0.1pF product only provide B tolerance; 0603N0R4 provide B&C tolerance; 0603N0R3 only provide 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.

X7R:

Note 1:

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
50V	≤ 2.5%	≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
	≤ 5%	0201 ≥ 0.01μF; 1210 ≥ 4.7μF
	≤ 10%	0402 ≥ 0.012μF; 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/X7R ≥ 10μF
		≤ 7% 0603 ≥ 0.33μF
		≤ 10% 0201 ≥ 0.1μF; 0402/X7R ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 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/X7R ≥ 0.022μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF;
		≤ 15% 0201 ≥ 0.01μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5/X5R
10V	≤ 5%	0201 ≥ 0.1μF; 0402 ≥ 1μF
		0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF;
6.3V	≤ 10%	0402 ≥ 2.2μF
		0402 ≥ 2.2μF
4V	≤ 15%	---

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
50V	≤ 2.5%	≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
	≤ 5%	0201 ≥ 0.01μF; 1210 ≥ 4.7μF
	≤ 10%	0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 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/X7R ≥ 10μF
		≤ 7% 0603 ≥ 0.33μF
		≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210/X5R ≥ 10μF;
		≤ 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; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF;
		≤ 15% 0201 ≥ 0.01μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5/X5R
10V	≤ 5%	0201 ≥ 0.1μF; 0402 ≥ 1μF
		0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF;
6.3V	≤ 10%	0402 ≥ 2.2μF
		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
50V	≤ 2.5%	≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
	≤ 5%	0201 ≥ 0.01μF; 1210 ≥ 4.7μF
	≤ 10%	0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 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/X7R ≥ 10μF
		≤ 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 ≥ 0.47μF
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; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF;
		≤ 15% 0201 ≥ 0.01μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5/X5R
10V	≤ 5%	0201 ≥ 0.1μF; 0402 ≥ 1μF
		0201 ≥ 0.1μF; 0402/X6S ≥ 0.47μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF;
6.3V	≤ 10%	0402 ≥ 2.2μF
		0402 ≥ 2.2μF
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/B	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/B	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/B	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/B	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/B	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/B	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/B	S	A	A	A	A	A
	18pF (180)	L	L	L	H	H	H	H	H	S	S	S	S/B	S	A	A	A	A	A
	22pF (220)	L	L	L	H	H	H	H/N	H	S	S	S	S/B	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											
	33pF (330)	L	L	L	H	H	H	H	H	S	S	S/B	S/B	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/B	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/N	H	S	S	S	S/B	S	A	A	A	A	A
	120pF (121)	L	L	L	H	H	H	H	H	S	S	S	S/B	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/B	S	A	A	A	A	A
	330pF (331)	L			H	H	H	H		S	S	S	S/B	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/B	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	S/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/B	S/B	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	B	
	220pF (221)	L	L	L	L	L	H	H	H	H	H	H	S	S	S	S	S/B	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	S	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/B	S/B	S/B	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/B	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/B	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/B	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/B	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/B	S/B	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/B	S/B	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/B	X	B	B	B	B	B	B	
	0.027μF (273)						H	H	H	H	H		S	S	S	S	S/B	X	B	B	B	B	B	C	
	0.033μF (333)						H	H	H	H	H		S	S	S	S	X/B	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/B	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/B	S/B	X	X	B	B	B	B	B/C	C	
	0.12μF (124)												S	S	S	X			B	B	B	B	C	C	
	0.15μF (154)						H	H	H				S	S	S/B	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/B	X/B	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/B	X/B	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	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/B	X				C	C	C	C	C			
3.3μF (335)																									
4.7μF (475)												X	X	X				C	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/B	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/E					
	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	
	0.33μF (334)	L*	L*				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	
	6.8uF(685)															
	10μF (106)						H*	H*	H*			X/B	X	X	X*	
	22μF (226)						H*					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	35	50
Capacitance	1.0μF (105)			C	C	C	C												
	1.5μF (155)		C	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	C		P	P	P								
	4.7μF (475)		C	C	C	C	C	P	P	P	P	P			K	K	K		
	6.8uF (685)							P	P										
	10μF (106)		C	C	C	C	C	P	P	P	P/D	P		K	K	K	K	M	M
	22μF (226)		C	C*	C*	C*		P	P	P	P			M	M	M	M	M	
	47μF (476)		C*	C*				P	P	P*	P/Y			M	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	
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	-	-	-
0402 (1005)	0.50±0.05	N	10000	50000		-
	0.50±0.10	E	10,000	50,000	-	-
	0.50±0.20	H	10000	-	-	-
0603 (1608)	0.50±0.20	H	4000	-	-	-
	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±0.15	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±0.15	J	-	-	3,000	10,000
	1.25±0.20	C	-	-	3,000	10,000
	1.60±0.15	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±0.20	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. NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C X7R,X5R,X6S:See <Note 1>																																																
3	Q/D.F.(Dissipation Factor)																																																		
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) 10GΩ or RxC≥500Ω·F whichever is smaller. <table><tr><th>Rated voltage</th><th>IR.</th></tr><tr><td>100V: All X7R</td><td rowspan="6">10GΩ or RxC≥100Ω·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 rowspan="10">RxC≥50Ω·F.</td></tr><tr><td>All X6S items</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≥0.22μF;0603≥10μF;0805≥10μF;1206≥22μF</td></tr><tr><td>16V: 0201≥0.22μF;0402≥1μF 0603≥10μF</td></tr><tr><td>10V: 0201>0.1μF;0402≥1μF; 0603≥10μF; 0805≥47μF</td></tr><tr><td>6.3V: 0201≥0.1μF; 0603≥4.7μF; 0805≥47μF;1206≥10μF</td></tr><tr><td>4V:0603≥22μF; 0805≥47μF; 1206≥100μF</td></tr></table>	Rated voltage	IR.	100V: All X7R	10GΩ or RxC≥100Ω·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	RxC≥50Ω·F.	All X6S items	100V: 1210≥3.3μF	50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF	35V: 0603≥1μF;	25V: 0201≥0.1μF;0402≥0.22μF;0603≥10μF;0805≥10μF;1206≥22μF	16V: 0201≥0.22μF;0402≥1μF 0603≥10μF	10V: 0201>0.1μF;0402≥1μF; 0603≥10μF; 0805≥47μF	6.3V: 0201≥0.1μF; 0603≥4.7μF; 0805≥47μF;1206≥10μF	4V:0603≥22μF; 0805≥47μF; 1206≥100μF																												
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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>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><th>01005</th><th>0201</th></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></td><td>*0201X104/16V: 0.5V</td></tr><tr><th>0402</th><th>0603</th></tr><tr><td>Cap<1μF: 1V</td><td>Cap<1μF: 1V</td></tr><tr><td>Cap=1μF: 0.5V</td><td>1μF≤Cap≤4.7μF: 0.5V</td></tr><tr><td>1μF<Cap<10μF: 0.2V</td><td>Cap>4.7μF: 0.2V</td></tr><tr><td>Cap≥10μF: 0.1V</td><td></td></tr><tr><th>0805</th><th>1206/1210</th></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>Cap>10μF: 0.2V</td><td>Cap>100μF: 0.2V</td></tr></table>	T.C.	Operating Temp	NPO	-55~125°C at 25°C	X7R	-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		*0201X104/16V: 0.5V	0402	0603	Cap<1μF: 1V	Cap<1μF: 1V	Cap=1μF: 0.5V	1μF≤Cap≤4.7μF: 0.5V	1μF<Cap<10μF: 0.2V	Cap>4.7μF: 0.2V	Cap≥10μF: 0.1V		0805	1206/1210	Cap<10μF: 1V	Cap≤10μF: 1V	Cap=10μF: 0.5V	10μF<Cap≤100μF: 0.5V	Cap>10μF: 0.2V	Cap>100μF: 0.2V	<table><tr><th>T.C.</th><th>Operating Temp</th></tr><tr><td>NPO</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>X5R</td><td>Within ±15%</td></tr><tr><td>X6S</td><td>Within ±22%</td></tr></table>	T.C.	Operating Temp	NPO	Within ±30ppm/°C	X7R	Within ±15%	X5R	Within ±15%	X6S	Within ±22%
T.C.	Operating Temp																																																		
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0402	0603																																																		
Cap<1μF: 1V	Cap<1μF: 1V																																																		
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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: 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: within ±7.5%  * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge.
12	Temperature Cycle	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 * Conduct the five cycles according to the temperatures and time. * Before initial measurement (Class II only): Perform 150+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.	* No remarkable damage. * Cap change : NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5%  * Q/D.F., I.R. and dielectric strength: To meet initial requirements.

13

Humidity
(Damp
Heat)Steady
State

</

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.

* 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: ≥10V**, within ±12.5%; ≤ 6.3V within ±25%;

**10V: 0603 4.7≥ μF; 0402 ≥1 μF; 0201≥ 0.1 μF, within ±25%;

Q/D.F. value:

NP0: C≥30pF, Q≥200; C<30pF, Q≥100+10/3C

X7R, X5R, X6S: Δ

Rated vol.	D.F.≤	Exception	of D.F. ≤
≥100V	≤3%	≤ 6% ≤7.5%	1206≥0.47μF 0603 ≥ 0.068μF, 0805 > 0.1μF, 1206 ≥ 1μF; 1210 ≥ 2.2μF
50V	≤3%	≤ 6% ≤ 10% ≤ 20%	0201(50V):0603≥0.047μF;0805≥0.18μF; 1206≥0.47μF 1210≥ 4.7μF 0402≥0.1μF;0603>0.1μF;0805≥1μF; 1206≥2.2μF;1210≥10μF
35V	≤5%	≤20% ≤10%	0603≥1 μF;0805≥2.2μF; 1210≥10 μF 0201≥0.01μF;0805≥1 μF; 1210≥10μF
25V	≤5%	≤14% ≤15% ≤20%	0603≥0.33μF; 1206≥4.7μF 0402≥0.10μF;0603≥0.47μF; 0805≥2.2μF;1206≥6.8μF ; 1210≥22μF 0402≥1μF
16V	≤5%	≤10% ≤15%	0201≥0.01μF;0402≥0.033μF;0603≥0.15μF;0805 ≥0.68μF;1206≥2.2μF;1210≥4.7μF 0201≥0.1μF;0402≥0.22μF;0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF
10V	≤7.5%	≤15% ≤20%	0201≥0.012μF;0402≥0.33μF(0402/X7R≥0.22μF) ;0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF 0201≥0.1μF; 0402≥1 μF
6.3V	≤ 15%	≤30%	0201≥0.1μF;0402≥1μF;0603≥10μF;0805≥4.7μF; 1206≥47μF ;1210≥ 100μF;
4V	≤20%	---	---

*I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller.

Class II (X7R, X5R, X6S) Δ

Rated voltage	I.R.
100V: X7R;1210≥3.3μF	1GΩ or RxC≥10Ω-F whichever is smaller
50V:0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF	
35V:0603≥1μF ;0805≥2.2μF;1210≥10μF;	
25V:0201≥0.1μF;0402≥0.22μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V:0201≥0.1μF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF	
10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF	
6.3V; 4V; All X6S items Size ≥1812	

*Test temp.:
NP0, X7R: 125±3°C X6S:
105±3°C
X5R: 85±3°C

*Test time: 1000+24/-0 hrs.

*To apply voltage:

(1) ≤ 6.3V or C 10≥ μF :

150% of rated voltage.

(2) 10V≤ Ur<500V: 200% of rated voltage.

(3) 500V: 150% of rated voltage.

(4) Ur≥ 630V: 120% of rated voltage.

(5) 100% of rated voltage for below range

Size	Dielectric	Rated voltage	Capacitance
0201	X5R/X7R/X6S	≤10V	C≥0.1μF
		≥16V	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	6.3V,10V	C≥1.0μF
0603	X5R/ X7R/ X6S	4V	C≥22μF
		6.3V,10V	C≥4.7μF
	X5R/ X6S	25V	C≥1.0μF
	X7R	35V	C≥1.0μF
0805	X5R/X7R/ X6S	4V	C≥47μF
		6.3V	C≥22μF
		10V,50V	C≥10μF
	X6S//X7R		C≥10μF
	X5R	16V,25V	C≥22μF
1206	X5R/X7R/ X6S	≤6.3V	C≥47μF
1210	X5R/X7R/ X6S	16V	C≥47μF
	X7R	100V	C≥3.3μF

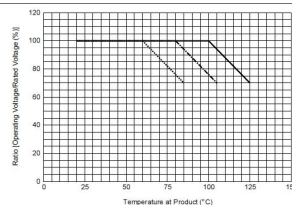
(6) 150% of rated voltage for below range.

Size	Dielectric	Rated voltage	Capacitance
0201	X5R/X6S	16V,25V	C=0.1μF
	X7R	16V	C≥0.022μF
0402	X5R/X7R/X6S	50V	C>0.01μF
		10-25V	C≥0.22μF
0603	X7R	50V	C>0.1μF
	X5R	25V	C=1.0μF
		50V	C≥1.0μF
	X5R/X7R/X6S	10V,16V	C≥1.0μF
0805	X5R/X7R/X6S	100V	C≥0.47μF
		50V	C≥1.0μF
		35V	C≥2.2μF
		10-25V	C≥4.7μF
1206	X7R	100V	C>1.0μF
		50V	C=4.7μF
	X5R/X6S	100V	C>1.0μF
		50V	C=4.7μF
1210	X5R/X7R/X6S	50V-100V	C≥2.2μF
1825 2220 2225	X7R	100V-250V	C≥1.0μF

* 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.

** De-rating conditions:



* No remarkable damage. Cap change:
NP0: ±3.0% or ±0.3pF whichever is larger
X7R, X5R, X6S: ≥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,
X7R, X5R,X6S: Δ

Rated vol.	D.F.≤	Exception of D.F. ≤	
≥100V	≤3%	≤ 6%	1206≥0.47μF
		≤7.5%	0805>0.1μF, 0603≥0.068 μF, 1206>1 μF
50V	≤3%	≤ 6%	0201(50V);0603≥0.047μF;0805≥0.18μF; 1206≥0.47μF
		≤ 10%	1210≥ 4.7μF
		≤ 20%	0402≥0.1μF;0603>0.1μF;0805≥1μF; 1206≥2.2μF;1210≥10μF
35V	≤5%	≤20%	0603≥1 μF;0805≥2.2μF; 1210≥10 μF
		≤10%	0201≥0.01μF;0805≥1 μF; 1210≥10μF
		≤14%	0603≥0.33μF; 1206≥4.7μF
25V	≤5%	≤15%	0402≥0.10μF;0603≥0.47μF; 0805≥2.2μF;1206≥6.8μF ; 1210≥22μF
		≤20%	0402≥1μF
16V	≤5%	≤10%	0201≥0.01μF;0402≥0.033μF;0603≥0.15μF;0805 ≥0.68μF;1206≥2.2μF;1210≥4.7μF
		≤15%	0201≥0.1μF;0402≥0.22μF;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≥22 μF
		≤20%	0201≥0.1μF; 0402≥1 μF
6.3V	≤ 15%	≤30%	0201≥0.1μF;0402≥1μF;0603≥10μF;0805≥4.7μF; 1206≥47μF ;1210≥ 100μF;
4V	≤20%	---	---

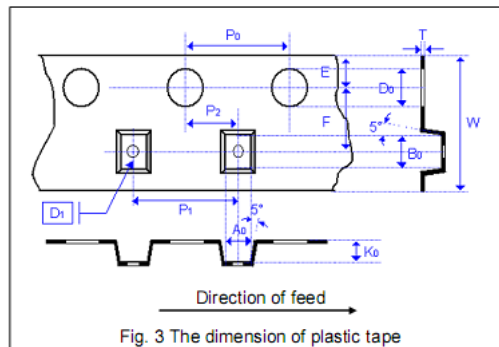
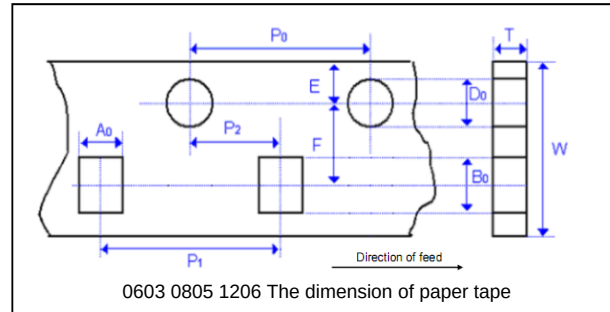
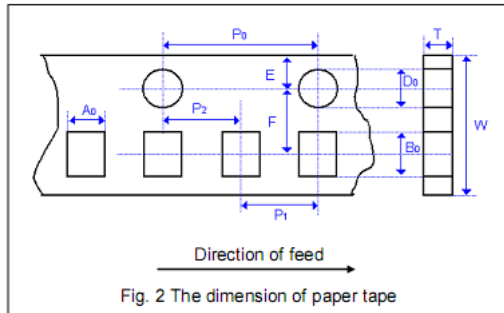
*I.R.: ≥10V, 1GΩ or 50Ω-F whichever is smaller.

Class II (X7R, X5R, X6S) Δ

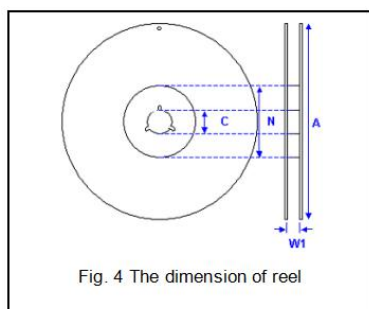
Rated voltage	I.R.
100V: X7R;1210≥3.3μF	1GΩ or Rx C≥10Ω-F whichever is smaller
50V:0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF	
35V:0603≥1μF ;0805≥2.2μF;1210≥10μF;	
25V:0201≥0.1μF;0402≥0.22μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V:0201≥0.1μF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF	
10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF	
6.3V; 4V; All X6S items Size ≥ 1812	

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 +/-0.05	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

Storage and handling conditions

- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solder ability in case of shelf life extension is needed.
- (3) Don't open the tape until the parts are to be used, use the chips within 3 months after the tape is opened.
- (4) For product of high dielectric constant (Class2&3, characteristics B/W & Y), the Electro static capacity changes with the passage of time due to the inherent characteristics of ceramic dielectric materials. The changed capacity reverts to nominal at the temperature it reaches during the soldering process.

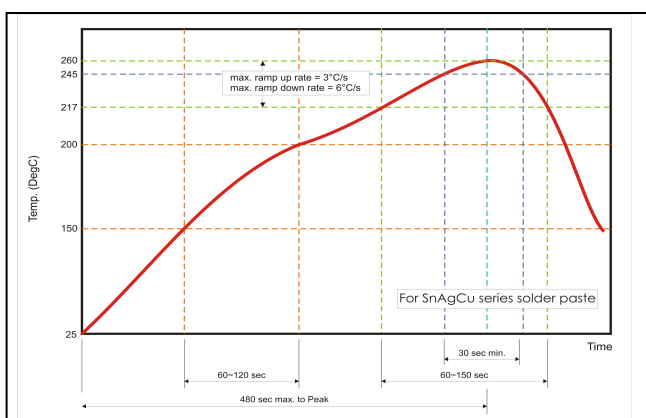
Cautions:

- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solder ability. 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, solder ability 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 sun light, the solder ability 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.

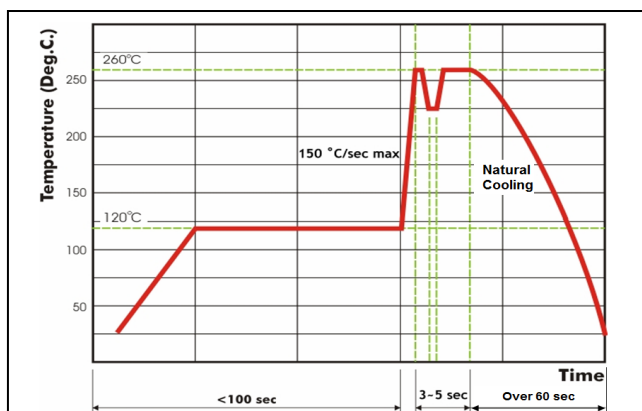
Recommended soldering conditions

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 N₂ within oven are recommended.



Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.



Recommended wave soldering profile for SMT process with SnAgCu series solder.

Manual soldering (solder iron) ⚠

