

APPROVAL SHEET

MULTILAYER CERAMIC CAPACITORS

Automotive Capacitors Series (MG)

0201 to 1812 Sizes

NP0, X7R, X5R, Dielectrics,

6.3V to 1000V

Halogen Free & RoHS Compliance



*Contents in this sheet are subject to change without prior notice.

Multilayer Ceramic Capacitors

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.

WTC's MG series MLCC is made by NP0, X7R & X5R dielectrics and which provides product with high electrical precision, stability and reliability. Besides, MG series MLCC is tighten controlling in quality in line to assure quality performance in automotive applications.

2. FEATURES

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

3. APPLICATIONS

- a. For Navigation & Information equipments.
- b. For entertainment equipments
- c. For comfortable equipments.

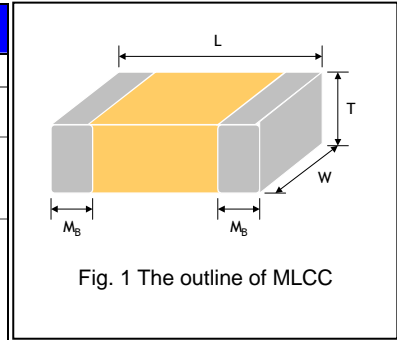
4. HOW TO ORDER

<u>MG</u>	<u>31</u>	<u>B</u>	<u>104</u>	<u>K</u>	<u>500</u>	<u>C</u>	<u>I</u>
<u>Series</u>	<u>Size</u>	<u>Dielectric</u>	<u>Capacitance</u>	<u>Tolerance</u>	<u>Rated voltage</u>	<u>Termination</u>	<u>Packaging style</u>
MG= Automotive (without AEC-Q200 certification)	03= 0201 (0603) 15= 0402 (1005) 18= 0603 (1608) 21= 0805 (2012) 31= 1206 (3216) 32= 1210 (3225) 43= 1812 (4532)	N= NP0 (C0G) B= X7R X= X5R	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 0R5=0.5pF 1R0=1.0pF 104=10x10 ⁴ =100nF	B= ±0.1pF C= ±0.25pF D= ±0.5pF F= ±1% G= ±2% J= ±5% K= ±10% M= ±20%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 6R3= 6.3 VDC 100= 10 VDC 160= 16 VDC 250= 25 VDC 500= 50 VDC 101= 100 VDC 201= 200 VDC 251= 250 VDC 501= 500 VDC 631= 630 VDC 102= 1000 VDC	C= Cu/Ni/Sn	T= 7" reeled G= 13" reeled

Multilayer Ceramic Capacitors

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Remark	M _B (mm)
0201 (0603)	0.60±0.03	0.30±0.03	0.30±0.03	L #	0.15±0.05
0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N #	0.25 +0.05/-0.10
0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S	0.40±0.15
	1.60 +0.15/-0.10	0.80 +0.15/-0.10	0.80 +0.15/-0.10	X	
0805 (2012)	2.00±0.15	1.25±0.10	0.60±0.10	A	0.50±0.20
			0.80±0.10	B	
			1.25±0.10	D #	
	2.00±0.20	1.25±0.20	1.25±0.20	I #	
1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B	0.60±0.20 (0.5±0.25)*
			0.95±0.10	C	
			1.25±0.10	D #	
	3.20±0.20	1.60±0.20	1.60±0.20	G #	
	3.20±0.3/-0.1	1.60±0.3/0.1	1.60±0.30/-0.10	P #	
1210 (3225)	3.20±0.30	2.50±0.20	0.95±0.10	C #	0.75±0.25
			1.25±0.10	D #	
	3.20±0.40	2.50±0.30	1.60±0.20	G #	
			2.00±0.20	K #	
			2.50±0.30	M #	
3.20±0.60**	2.50±0.50**	2.50±0.50**	M #		
1812 (4532)	4.50±0.40 (4.50±0.5/-0.3)*	3.20±0.30	1.25±0.10	D #	0.75±0.25 (0.50±0.25)*
			2.00±0.20	K #	
	3.20±0.40	2.50±0.30	2.50±0.30	M #	



Reflow soldering only is recommended.

* For 1206_1000V ~3000V; 1812_200V~3000V products.

** For 1210_100V: Cap > 1μF, 250V: Cap >0.47μF, 400V~630V: Cap >0.22μF.



Multilayer Ceramic Capacitors

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X5R
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812		
Capacitance range*	0.1pF to 0.033μF	100pF to 2.2μF	0.056μF to 10μF
Capacitance tolerance**	Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)		J (±5%), K (±10%), M (±20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V, 1000V		6.3V, 10V, 16V, 25V
Tan δ*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1	
Operating temperature	-55 to +125°C		-55 to +85°C
Capacitance characteristic	±30ppm/°C		±15%
Termination	Ni/Sn (lead-free termination)		

* 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
Measured at 1.0±0.2Vrms, 1.0kHz±10% for C≤10μF; 0.5±0.2Vrms, 120Hz±20% for C>10μF, 30~70% related humidity, 25°C ambient temperature for X7R, X5R.

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

Note 1: X7R/X5R

Rated vol.	D.F. ≤	Exception of D.F. ≤	
≥ 100V	≤ 2.5%	≤ 3%	1206 ≥ 0.47μF
		≤ 5%	0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series
		≤ 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; TT series
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; 1206 ≥ 4.7μF
		≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF
		≤ 12.5%	0402 ≥ 0.47μF
16V	≤ 3.5%	≤ 5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF
		≤ 10%	0201 ≥ 0.1μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series
		≤ 15%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); TT series 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5
10V	≤ 5%	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF
		≤ 20%	0402 ≥ 2.2μF
6.3V	≤ 10%	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series
		≤ 20%	0402 ≥ 2.2μF
4V	≤ 15%	---	---

Multilayer Ceramic Capacitors

7. CAPACITANCE RANGE (NP0 Dielectric)

NP0 Dielectric 0201, 0402, 0603 Sizes

DIELECTRIC	NP0																
	SIZE	0201				0402					0603						
	RATED VOLTAGE	10	16	25	50	10	16	25	50	100	10	16	25	50	100	200	250
Capacitance	0.1pF (0R1)	L	L	L	L	N	N	N	N	N							
	0.2pF (0R2)	L	L	L	L	N	N	N	N	N							
	0.3pF (0R3)	L	L	L	L	N	N	N	N	N							
	0.4pF (0R4)	L	L	L	L	N	N	N	N	N							
	0.5pF (0R5)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.6pF (0R6)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.7pF (0R7)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.8pF (0R8)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.9pF (0R9)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.0pF (1R0)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.2pF (1R2)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.5pF (1R5)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.8pF (1R8)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.0pF (2R0)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.2pF (2R2)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.7pF (2R7)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.0pF (3R0)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.3pF (3R3)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.9pF (3R9)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	4.0pF (4R0)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	4.7pF (4R7)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	5.0pF (5R0)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	5.6pF (5R6)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	6.0pF (6R0)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	6.8pF (6R8)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	7.0pF (7R0)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	8.0pF (8R0)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	8.2pF (8R2)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	9.0pF (9R0)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	10pF (100)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	12pF (120)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	15pF (150)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	18pF (180)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	22pF (220)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	27pF (270)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	33pF (330)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	39pF (390)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	47pF (470)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	56pF (560)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	68pF (680)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	82pF (820)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	100pF (101)	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
120pF (121)					N	N	N	N	N	S	S	S	S	S	S	S	
150pF (151)					N	N	N	N	N	S	S	S	S	S	S	S	
180pF (181)					N	N	N	N	N	S	S	S	S	S	S	S	
220pF (221)					N	N	N	N	N	S	S	S	S	S	S	S	
270pF (271)					N	N	N	N	N	S	S	S	S	S	X	X	
330pF (331)					N	N	N	N	N	S	S	S	S	S	X	X	
390pF (391)					N	N	N	N	N	S	S	S	S	S	X	X	
470pF (471)					N	N	N	N	N	S	S	S	S	S	X	X	
560pF (561)					N	N	N	N	N	S	S	S	S	S			
680pF (681)					N	N	N	N	N	S	S	S	S	S			
820pF (821)					N	N	N	N	N	S	S	S	S	S			
1,000pF (102)					N	N	N	N	N	S	S	S	S	S			
1,200pF (122)										X	X	X	X				
1,500pF (152)										X	X	X	X				
1,800pF (182)										X	X	X	X				
2,200pF (222)										X	X	X	X				
2,700pF (272)										X	X	X	X				
3,300pF (332)										X	X	X	X				
3,900pF (392)																	
4,700pF (472)																	
5,600pF (562)																	
6,800pF (682)																	
8,200pF (822)																	
0.01μF (103)																	

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 WTC local representative.

Multilayer Ceramic Capacitors
NP0 Dielectric 0805 Size (Continued)

DIELECTRIC		NP0								
SIZE		0805								
RATED VOLTAGE		10	16	25	50	100	200	250	500	630
Capacitance	0.5pF (0R5)	A	A	A	A	A	A	A	A	A
	0.6pF (0R6)	A	A	A	A	A	A	A	A	A
	0.7pF (0R7)	A	A	A	A	A	A	A	A	A
	0.8pF (0R8)	A	A	A	A	A	A	A	A	A
	0.9pF (0R9)	A	A	A	A	A	A	A	A	A
	1.0pF (1R0)	A	A	A	A	A	A	A	A	A
	1.2pF (1R2)	A	A	A	A	A	A	A	A	A
	1.5pF (1R5)	A	A	A	A	A	A	A	A	A
	1.8pF (1R8)	A	A	A	A	A	A	A	A	A
	2.2pF (2R2)	A	A	A	A	A	A	A	A	A
	2.7pF (2R7)	A	A	A	A	A	A	A	A	A
	3.3pF (3R3)	A	A	A	A	A	A	A	A	A
	3.9pF (3R9)	A	A	A	A	A	A	A	A	A
	4.7pF (4R7)	A	A	A	A	A	A	A	A	A
	5.6pF (5R6)	A	A	A	A	A	A	A	A	A
	6.8pF (6R8)	A	A	A	A	A	A	A	A	A
	8.2pF (8R2)	A	A	A	A	A	A	A	A	A
	10pF (100)	A	A	A	A	A	A	A	A	A
	12pF (120)	A	A	A	A	A	A	A	A	A
	15pF (150)	A	A	A	A	A	A	A	A	A
	18pF (180)	A	A	A	A	A	A	A	A	A
	22pF (220)	A	A	A	A	A	A	A	A	A
	27pF (270)	A	A	A	A	A	A	A	A	A
	33pF (330)	A	A	A	A	A	A	A	A	A
	39pF (390)	A	A	A	A	A	A	A	A	A
	47pF (470)	A	A	A	A	A	A	A	A	A
	56pF (560)	A	A	A	A	A	A	A	A	A
	68pF (680)	A	A	A	A	A	A	A	A	A
	82pF (820)	A	A	A	A	A	A	A	B	B
	100pF (101)	A	A	A	A	A	B	B	B	B
	120pF (121)	A	A	A	A	A	B	B	D	D
	150pF (151)	A	A	A	A	A	D	D	D	D
	180pF (181)	A	A	A	A	A	D	D	D	D
	220pF (221)	A	A	A	A	A	D	D	D	D
	270pF (271)	A	A	A	A	A	D	D	D	D
	330pF (331)	A	A	A	A	A	D	D	D	D
	390pF (391)	B	B	B	B	B	D	D	D	D
	470pF (471)	B	B	B	B	B	D	D	D	D
	560pF (561)	B	B	B	B	B	D	D	D	D
	680pF (681)	B	B	B	B	B	D	D	D	D
820pF (821)	B	B	B	B	B	D	D	D	D	
1,000pF (102)	B	B	B	B	B	D	D	D	D	
1,200pF (122)	B	B	B	B	B	D	D	D	D	
1,500pF (152)	B	B	B	B	B	D	D	D	D	
1,800pF (182)	B	B	B	B	B	D	D	D	D	
2,200pF (222)	B	B	B	B	B	D	D	D	D	
2,700pF (272)	D	D	D	D	D	D	D	D	D	
3,300pF (332)	D	D	D	D	D	D	D	D	D	
3,900pF (392)	D	D	D	D	D	D	D	D	D	
4,700pF (472)	D	D	D	D	D	D	D	D	D	
5,600pF (562)	D	D	D	D	D	D	D	D	D	
6,800pF (682)	D	D	D	D	D	D	D	D	D	
8,200pF (822)	D	D	D	D	D	D	D	D	D	
0.01μF (103)	D	D	D	D	D	D	D	D	D	

Multilayer Ceramic Capacitors

Approval Sheet

NP0 Dielectric 1206 Size (Continued)

DIELECTRIC		NP0									
SIZE		1206									
RATED VOLTAGE		10	16	25	50	100	200	250	500	630	1000
Capacitance	1.0pF (1R0)										
	1.2pF (1R2)	B	B	B	B	B	B	B	B	B	
	1.5pF (1R5)	B	B	B	B	B	B	B	B	B	B
	1.8pF (1R8)	B	B	B	B	B	B	B	B	B	B
	2.2pF (2R2)	B	B	B	B	B	B	B	B	B	B
	2.7pF (2R7)	B	B	B	B	B	B	B	B	B	B
	3.3pF (3R3)	B	B	B	B	B	B	B	B	B	B
	3.9pF (3R9)	B	B	B	B	B	B	B	B	B	B
	4.7pF (4R7)	B	B	B	B	B	B	B	B	B	B
	5.6pF (5R6)	B	B	B	B	B	B	B	B	B	B
	6.8pF (6R8)	B	B	B	B	B	B	B	B	B	B
	8.2pF (8R2)	B	B	B	B	B	B	B	B	B	B
	10pF (100)	B	B	B	B	B	B	B	B	B	B
	12pF (120)	B	B	B	B	B	B	B	B	B	B
	15pF (150)	B	B	B	B	B	B	B	B	B	B
	18pF (180)	B	B	B	B	B	B	B	B	B	B
	22pF (220)	B	B	B	B	B	B	B	B	B	D
	27pF (270)	B	B	B	B	B	B	B	B	B	D
	33pF (330)	B	B	B	B	B	B	B	B	B	D
	39pF (390)	B	B	B	B	B	B	B	B	B	D
	47pF (470)	B	B	B	B	B	B	B	B	B	D
	56pF (560)	B	B	B	B	B	B	B	B	B	D
	68pF (680)	B	B	B	B	B	B	B	B	B	D
	82pF (820)	B	B	B	B	B	B	B	B	B	D
	100pF (101)	B	B	B	B	B	B	B	B	B	D
	120pF (121)	B	B	B	B	B	B	B	B	B	D
	150pF (151)	B	B	B	B	B	B	B	B	B	D
	180pF (181)	B	B	B	B	B	B	B	B	B	G
	220pF (221)	B	B	B	B	B	B	B	B	B	G
	270pF (271)	B	B	B	B	B	B	C	C	C	G
	330pF (331)	B	B	B	B	B	B	C	C	C	G
	390pF (391)	B	B	B	B	B	B	C	C	C	G
	470pF (471)	B	B	B	B	B	B	C	C	C	G
	560pF (561)	B	B	B	B	B	B	C	D	D	G
680pF (681)	B	B	B	B	B	B	C	D	D	G	
820pF (821)	B	B	B	B	B	B	C	G	G	G	
1,000pF (102)	B	B	B	B	B	B	C	G	G	G	
1,200pF (122)	B	B	B	B	B	B	C	G	G		
1,500pF (152)	B	B	B	B	B	B	D	G	G		
1,800pF (182)	B	B	B	B	B	B	D	G	G		
2,200pF (222)	B	B	B	B	B	B	D	G	G		
2,700pF (272)	B	B	B	B	B	B	D	G			
3,300pF (332)	B	B	B	B	B	B	D	G			
3,900pF (392)	B	B	B	B	B	B	D	G			
4,700pF (472)	B	B	B	B	B	B	D	G			
5,600pF (562)	B	B	B	B	B	B					
6,800pF (682)	C	C	C	C	C	C					
8,200pF (822)	D	D	D	D	D	D					
0.01μF (103)	D	D	D	D	D	D					

Multilayer Ceramic Capacitors
NP0 Dielectric 1210 Size (Continued)

DIELECTRIC	NP0											
	SIZE	1210										
		RATED VOLTAGE	10	16	25	50	100	200	250	500	630	1000
Capacitance	10pF (100)	C	C	C	C	C	C	C	C	C	C	C
	12pF (120)	C	C	C	C	C	C	C	C	C	C	C
	15pF (150)	C	C	C	C	C	C	C	C	C	C	C
	18pF (180)	C	C	C	C	C	C	C	C	C	C	C
	22pF (220)	C	C	C	C	C	C	C	C	C	C	C
	27pF (270)	C	C	C	C	C	C	C	C	C	C	C
	33pF (330)	C	C	C	C	C	C	C	C	C	C	C
	39pF (390)	C	C	C	C	C	C	C	C	C	C	C
	47pF (470)	C	C	C	C	C	C	C	C	C	C	C
	56pF (560)	C	C	C	C	C	C	C	C	C	C	C
	68pF (680)	C	C	C	C	C	C	C	C	C	C	C
	82pF (820)	C	C	C	C	C	C	C	C	C	C	C
	100pF (101)	C	C	C	C	C	C	C	C	C	C	D
	120pF (121)	C	C	C	C	C	C	C	C	C	C	D
	150pF (151)	C	C	C	C	C	C	C	C	C	C	D
	180pF (181)	C	C	C	C	C	C	C	C	C	C	D
	220pF (221)	C	C	C	C	C	C	C	C	C	C	G
	270pF (271)	C	C	C	C	C	C	C	C	C	C	G
	330pF (331)	C	C	C	C	C	C	C	C	C	C	G
	390pF (391)	C	C	C	C	C	C	C	C	C	C	G
	470pF (471)	C	C	C	C	C	C	C	C	C	C	G
	560pF (561)	C	C	C	C	C	C	C	C	C	C	G
	680pF (681)	C	C	C	C	C	C	C	C	C	C	G
	820pF (821)	C	C	C	C	C	C	C	C	C	C	G
	1,000pF (102)	C	C	C	C	C	D	D	D	D	D	G
	1,200pF (122)	C	C	C	C	C	D	D	D	D	D	
	1,500pF (152)	C	C	C	C	C	D	D	D	D	D	
	1,800pF (182)	C	C	C	C	C	D	D	D	D	D	
	2,200pF (222)	C	C	C	C	C	D	D	D	D	D	
	2,700pF (272)	C	C	C	C	C	D	D	D	D	D	
	3,300pF (332)	C	C	C	C	C	D	D	D	D	D	
	3,900pF (392)	C	C	C	C	C	D	D	D	D	D	
	4,700pF (472)	C	C	C	C	C	G	G				
	5,600pF (562)	C	C	C	C	C	G	G				
	6,800pF (682)	C	C	C	C	C	G	G				
	8,200pF (822)	C	C	C	C	C	G	G				
	0.010μF (103)	C	C	C	C	C	G	G				
	0.012μF (123)	C	D	D	D	D						
	0.015μF (153)	C	D	D	D	D						
	0.018μF (183)	K	K	K	K	K						
0.022μF (223)	K	K	K	K	K							
0.027μF (273)	K	K	K	K	K							
0.033μF (333)	K	K	K	K	K							
0.039μF (393)	K	K	K	K	K							
0.047μF (473)	K	K	K	K	K							

Multilayer Ceramic Capacitors
NP0 Dielectric 1812 Size (Continued)

DIELECTRIC	NP0				
	1812				
SIZE	10	16	25	50	100
RATED VOLTAGE (VDC)	10	16	25	50	100
10pF (100)					D
12pF (120)					D
15pF (150)					D
18pF (180)					D
22pF (220)					D
27pF (270)					D
33pF (330)					D
39pF (390)					D
47pF (470)					D
56pF (560)					D
68pF (680)					D
82pF (820)					D
100pF (101)					D
120pF (121)					D
150pF (151)					D
180pF (181)					D
220pF (221)					D
270pF (271)					D
330pF (331)					D
390pF (391)					D
470pF (471)					D
560pF (561)					D
680pF (681)					D
820pF (821)					D
1,000pF (102)	D	D	D	D	D
1,200pF (122)	D	D	D	D	D
1,500pF (152)	D	D	D	D	D
1,800pF (182)	D	D	D	D	D
2,200pF (222)	D	D	D	D	D
2,700pF (272)	D	D	D	D	D
3,300pF (332)	D	D	D	D	D
3,900pF (392)	D	D	D	D	D
4,700pF (472)	D	D	D	D	D
5,600pF (562)	D	D	D	D	D
6,800pF (682)	D	D	D	D	D
8,200pF (822)	D	D	D	D	D
0.010μF (103)	D	D	D	D	D
0.012μF (123)	D	D	D	D	D
0.015μF (153)	D	D	D	D	D
0.018μF (183)	D	D	D	D	D
0.022μF (223)	D	D	D	D	D
0.027μF (273)	D	D	D	D	D
0.033μF (333)	D	D	D	D	D
0.039μF (393)					

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 WTC local representative.

Multilayer Ceramic Capacitors

8. CAPACITANCE RANGE (X7R Dielectric)

X7R Dielectric 0201, 0402, 0603 Sizes

DIELECTRIC	X7R													
	SIZE	0201				0402				0603				
	RATED VOLTAGE	10	16	25	50	10	16	25	50	10	16	25	50	100
Capacitance	100pF (101)	L	L	L	L	N	N	N	N	S	S	S	S	S
	120pF (121)	L	L	L	L	N	N	N	N	S	S	S	S	S
	150pF (151)	L	L	L	L	N	N	N	N	S	S	S	S	S
	180pF (181)	L	L	L	L	N	N	N	N	S	S	S	S	S
	220pF (221)	L	L	L	L	N	N	N	N	S	S	S	S	S
	270pF (271)	L	L	L	L	N	N	N	N	S	S	S	S	S
	330pF (331)	L	L	L	L	N	N	N	N	S	S	S	S	S
	390pF (391)	L	L	L	L	N	N	N	N	S	S	S	S	S
	470pF (471)	L	L	L	L	N	N	N	N	S	S	S	S	S
	560pF (561)	L	L	L	L	N	N	N	N	S	S	S	S	S
	680pF (681)	L	L	L	L	N	N	N	N	S	S	S	S	S
	820pF (821)	L	L	L	L	N	N	N	N	S	S	S	S	S
	1,000pF (102)	L	L	L	L	N	N	N	N	S	S	S	S	S
	1,200pF (122)	L	L	L		N	N	N	N	S	S	S	S	S
	1,500pF (152)	L	L	L		N	N	N	N	S	S	S	S	S
	1,800pF (182)	L	L	L		N	N	N	N	S	S	S	S	S
	2,200pF (222)	L	L	L		N	N	N	N	S	S	S	S	S
	2,700pF (272)	L	L	L		N	N	N	N	S	S	S	S	S
	3,300pF (332)	L	L	L		N	N	N	N	S	S	S	S	S
	3,900pF (392)	L	L	L		N	N	N	N	S	S	S	S	S
	4,700pF (472)	L	L	L		N	N	N	N	S	S	S	S	S
	5,600pF (562)	L	L	L		N	N	N	N	S	S	S	S	S
	6,800pF (682)	L				N	N	N	N	S	S	S	S	S
	8,200pF (822)	L				N	N	N	N	S	S	S	S	S
	0.010μF (103)	L				N	N	N	N	S	S	S	S	S
	0.012μF (123)					N	N	N		S	S	S	S	X
	0.015μF (153)					N	N	N		S	S	S	S	X
	0.018μF (183)					N	N	N		S	S	S	S	X
	0.022μF (223)					N	N	N		S	S	S	S	X
	0.027μF (273)					N	N	N		S	S	S	S	
	0.033μF (333)					N	N	N		S	S	S	X	
	0.039μF (393)					N	N	N		S	S	S	X	
	0.047μF (473)					N	N	N		S	S	S	X	
	0.056μF (563)					N	N			S	S	S	X	
	0.068μF (683)					N	N			S	S	S	X	
	0.082μF (823)					N	N			S	S	S	X	
0.10μF (104)					N	N			S	S	S	X		
0.12μF (124)									S	S	X			
0.15μF (154)									S	S	X			
0.18μF (184)									S	S	X			
0.22μF (224)									S	S	X			
0.27μF (274)									X	X	X			
0.33μF (334)									X	X	X			
0.39μF (394)									X	X	X			
0.47μF (474)									X	X	X			

X7R Dielectric 0805, 1206 Size

Multilayer Ceramic Capacitors

Approval Sheet

DIELECTRIC	X7R																	
	SIZE	0805								1206								
		10	16	25	50	100	200	250	500	630	10	16	25	50	100	200	250	500
RATED VOLTAGE (VDC)																		
Capacitance	100pF (101)	B	B	B	B	B	B	B	B						D	D	D	D
	120pF (121)	B	B	B	B	B	B	B	B						D	D	D	D
	150pF (151)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	180pF (181)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	220pF (221)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	270pF (271)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	330pF (331)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	390pF (391)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	470pF (471)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	560pF (561)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	680pF (681)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	820pF (821)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	1,000pF (102)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	1,200pF (122)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	1,500pF (152)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	1,800pF (182)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	2,200pF (222)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	2,700pF (272)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	3,300pF (332)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	3,900pF (392)	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D
	4,700pF (472)	B	B	B	B	B	B	B	D	D	B	B	B	B	B	D	D	D
	5,600pF (562)	B	B	B	B	B	B	B	D	D	B	B	B	B	B	D	D	D
	6,800pF (682)	B	B	B	B	B	B	B	D	D	B	B	B	B	B	D	D	D
	8,200pF (822)	B	B	B	B	B	B	B	D	D	B	B	B	B	B	D	D	D
	0.010μF (103)	B	B	B	B	B	D	D	D	D	B	B	B	B	B	D	D	D
	0.012μF (123)	B	B	B	B	B	D	D			B	B	B	B	B	D	D	
	0.015μF (153)	B	B	B	B	B	D	D			B	B	B	B	B	D	D	
	0.018μF (183)	B	B	B	B	B	D	D			B	B	B	B	B	D	D	
	0.022μF (223)	B	B	B	B	B	D	D			B	B	B	B	B	D	D	
	0.027μF (273)	B	B	B	B	D					B	B	B	B	B	D	D	
	0.033μF (333)	B	B	B	B	D					B	B	B	B	B	G	G	
	0.039μF (393)	B	B	B	B	D					B	B	B	B	B	G	G	
	0.047μF (473)	B	B	B	B	D					B	B	B	B	B	G	G	
	0.056μF (563)	B	B	B	B	D					B	B	B	B	B	G	G	
	0.068μF (683)	B	B	B	B	D					B	B	B	B	B	G	G	
	0.082μF (823)	B	B	B	B	D					B	B	B	B	D	G	G	
0.10μF (104)	B	B	B	B	D					B	B	B	B	D	G	G		
0.12μF (124)	B	B	B	D						B	B	B	B	D				
0.15μF (154)	D	D	D	D						C	C	C	C	G				
0.18μF (184)	D	D	D	D						C	C	C	C	G				
0.22μF (224)	D	D	D	D						C	C	C	C	G				
0.27μF (274)	D	D	D							C	C	C	D					
0.33μF (334)	D	D	D							C	C	C	D					
0.39μF (394)	D	D	D							C	C	J	P					
0.47μF (474)	D	D	D							J	J	J	P					
0.56μF (564)	D	D	D							J	J	J	P					
0.68μF (684)	D	D	D							J	J	J	P					
0.82μF (824)	D	D	D							J	J	J	P					
1.0μF (105)	D	D	D							J	J	J	P					
1.5μF (155)										J	J	P						
2.2μF (225)										J	J	P						
4.7μF (475)																		
10μF (106)																		

- The letter in cell is expressed the symbol of product thickness.
- For more information about products with special capacitance or other data, please contact WTC local representative.

Multilayer Ceramic Capacitors
X7R Dielectric 1210, 1812 Size

DIELECTRIC		X7R															
SIZE		1210								1812							
RATED VOLTAGE (VDC)		10	16	25	50	100	200	250	500	1000	10	16	25	50	100	200	250
Capacitance	100pF (101)							D	D	D							
	120pF (121)							D	D	D							
	150pF (151)							D	D	D							
	180pF (181)							D	D	D							
	220pF (221)							D	D	D							
	270pF (271)							D	D	D							
	330pF (331)							D	D	D							
	390pF (391)							D	D	D							
	470pF (471)							D	D	D							
	560pF (561)							D	D	D							
	680pF (681)							C	D	D							
	820pF (821)							C	D	D							
	1,000pF (102)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D
	1,200pF (122)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D
	1,500pF (152)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D
	1,800pF (182)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D
	2,200pF (222)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D
	2,700pF (272)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D
	3,300pF (332)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D
	3,900pF (392)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D
	4,700pF (472)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D
	5,600pF (562)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D
	6,800pF (682)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D
	8,200pF (822)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D
	0.010μF (103)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D
	0.012μF (123)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D
	0.015μF (153)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D
	0.018μF (183)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D
	0.022μF (223)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D
	0.027μF (273)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D
	0.033μF (333)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D
	0.039μF (393)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D
0.047μF (473)	C	C	C	C	C	D	D			D	D	D	D	D	D	D	
0.056μF (563)	C	C	C	C	C	D	D			D	D	D	D	D	D	D	
0.068μF (683)	C	C	C	C	C	G	G			D	D	D	D	D	D	D	
0.082μF (823)	C	C	C	C	C	G	G			D	D	D	D	D	D	D	
0.10μF (104)	C	C	C	C	C	G	G			D	D	D	D	D	D	D	
0.12μF (124)	C	C	C	C	C	G	G			D	D	D	D	D	D	D	
0.15μF (154)	D	D	D	D	D	M	M			D	D	D	D	D	K	K	
0.18μF (184)	D	D	D	D	D	M	M			D	D	D	D	D	K	K	
0.22μF (224)	D	D	D	D	D	M	M			D	D	D	D	D	K	K	
0.27μF (274)	D	D	D	D	G	M	M			D	D	D	D	D	K	K	
0.33μF (334)	D	D	D	D	G	M	M			D	D	D	D	D	K	K	
0.39μF (394)	D	D	D	D	M	M	M			D	D	D	D	D	K	K	
0.47μF (474)	D	D	D	D	M	M	M			D	D	D	D	K	K	K	
0.56μF (564)	D	D	D	D	M					D	D	D	D	K			
0.68μF (684)	D	D	D	D	K					D	D	D	K	K			
0.82μF (824)	D	D	D	D	K					D	D	D	K	K			
1.00μF (105)	D	D	D	D	K					D	D	D	K	K			
1.50μF (155)	K	K	G												K		
2.20μF (225)	K	K	G												M		

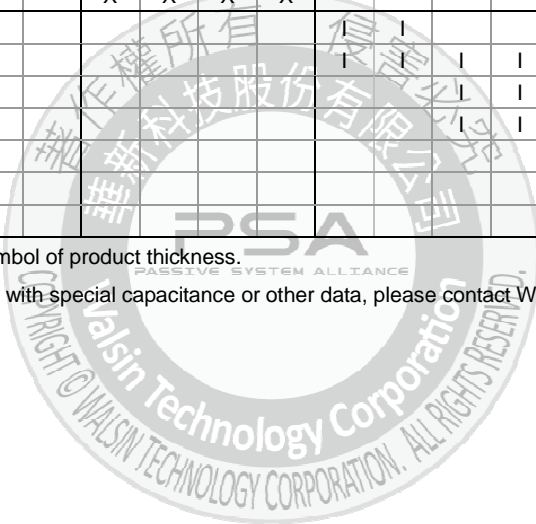
1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

Multilayer Ceramic Capacitors

9. CAPACITANCE RANGE (X5R Dielectric)

DIELECTRIC		X5R																		
SIZE		0402				0603				0805				1206				1210		
RATED VOLTAGE(VDC)		6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	10	16	
Capacitance	0.027µF (273)																			
	0.033µF (333)																			
	0.039µF (393)																			
	0.047µF (473)																			
	0.056µF (563)		N																	
	0.068µF (683)		N																	
	0.082µF (823)		N																	
	0.10µF (104)		N	N																
	0.15µF (154)		N	N																
	0.22µF (224)	N	N	N																
	0.27µF (274)	N	N					X	X	X										
	0.33µF (334)	N	N					X	X	X										
	0.39µF (394)	N						X	X	X										
	0.47µF (474)	N						X	X	X										
	0.68µF (684)	N						X	X	X										
	0.82µF (824)	N					X	X	X	X										
	1.0µF (105)					X	X	X	X											
	1.5µF (155)										I	I				J	J	P	K	K
	2.2µF (225)										I	I	I	I		J	J	P	K	K
	3.3µF (335)												I	I	P	P	P	P	K	K
	4.7µF (475)												I	I	P	P	P	P	K	K
	6.8µF (685)														P	P				
10µF (106)														P						
22µF (226)																				

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 WTC local representative.



Multilayer Ceramic Capacitors
10. PACKAGING STYLE AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0201 (0603)	0.30±0.03	L	15k	70k	-	-
0402 (1005)	0.50±0.05	N	10k	50k	-	-
0603 (1608)	0.80±0.07	S	4k	15k	-	-
	0.80+0.15/-0.10	X	4k	15k	-	-
0805 (2012)	0.60±0.10	A	4k	15k	-	-
	0.80±0.10	B	4k	15k	-	-
	1.25±0.10	D	-	-	3k	10k
	1.25±0.20	I	-	-	3k	10k
1206 (3216)	0.80±0.10	B	4k	15k	-	-
	0.95±0.10	C	-	-	3k	10k
	1.15±0.15	J	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	10k
	1.60+0.30/-0.10	P	-	-	2k	9k
1210 (3225)	0.95±0.10	C	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	-
	2.00±0.20	K	-	-	1k	6k
	2.50±0.30	M	-	-	1k	6k
1812 (4532)	1.25±0.10	D	-	-	1k	5k
	2.00±0.20	K	-	-	1k	-
	2.50±0.30	M	-	-	0.5k	3k

Unit: pieces



Multilayer Ceramic Capacitors

11. 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%	* Shall not exceed the limits given in the detailed spec. NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R, X5R, X6S, X7S:																																																																
3.	Q/ D.F. (Dissipation Factor)	Class II: (X7R, X7E, X6S, X5R, X7S, Y5V) 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 ≥ 104 (6.3V, 10V) ^{#1} , 0402 ≥ 225 (6.3V), 0402/475 (10V), 0603/106 (6.3V), X7S: 0402/225(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 then set for 24±2 hrs at room temp.	<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 100V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5%</td> <td>0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series</td> </tr> <tr> <td>≤ 10%</td> <td>0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 10%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 7%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 10%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series</td> </tr> <tr> <td>≤ 10%</td> <td>0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 12.5%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0201 ≥ 0.1μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); TT series</td> </tr> <tr> <td>≤ 10%</td> <td>0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="3">6.3V</td> <td rowspan="3">≤ 10%</td> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 2.2μF</td> </tr> <tr> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="3">4V</td> <td rowspan="3">≤ 15%</td> <td>---</td> <td>---</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 100V	≤ 2.5%	≤ 3%	1206 ≥ 0.47μF	≤ 5%	0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series	≤ 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; TT series	35V	≤ 3.5%	≤ 10%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	≤ 5%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤ 7%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	25V	≤ 3.5%	≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series	≤ 10%	0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	≤ 12.5%	0402 ≥ 0.47μF	16V	≤ 3.5%	≤ 5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤ 10%	0201 ≥ 0.1μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF	10V	≤ 5%	≤ 10%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); TT series	≤ 10%	0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF	6.3V	≤ 10%	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series	≤ 20%	0402 ≥ 2.2μF	---	---	4V	≤ 15%	---	---
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																	
≥ 100V	≤ 2.5%	≤ 3%	1206 ≥ 0.47μF																																																																
		≤ 5%	0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series																																																																
		≤ 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; TT series																																																																
35V	≤ 3.5%	≤ 10%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																
		≤ 5%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																																																
		≤ 7%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																																
25V	≤ 3.5%	≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series																																																																
		≤ 10%	0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF																																																																
		≤ 12.5%	0402 ≥ 0.47μF																																																																
16V	≤ 3.5%	≤ 5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																
		≤ 10%	0201 ≥ 0.1μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series																																																																
		≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF																																																																
10V	≤ 5%	≤ 10%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); TT series																																																																
		≤ 10%	0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5																																																																
		≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF																																																																
6.3V	≤ 10%	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series																																																																
		≤ 20%	0402 ≥ 2.2μF																																																																
		---	---																																																																
4V	≤ 15%	---	---																																																																
		4.	Dielectric Strength	To apply voltage (≤100V) 250%. 200V~300V ≥ 2 times VDC 400V~450V ≥ 1.2 times VDC 500V~999V ≥ 1.5 times VDC 1000V~3000V ≥ 1.2 times VDC Duration: 1 to 5 sec. Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.																																																														
		5.	Insulation Resistance	Rated voltage: ≤100V To apply rated voltage for MAX. 120sec. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R</td> <td rowspan="7">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; TT series; Size ≥ 1812</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; TT21 > 4.7μF</td> </tr> <tr> <td>6.3V: 0201 ≥ 0.1μF; 0603 > 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF; TT15 > 1.0μF</td> </tr> <tr> <td>4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF</td> </tr> </tbody> </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; TT series; 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; TT21 > 4.7μF	6.3V: 0201 ≥ 0.1μF; 0603 > 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF; TT15 > 1.0μF	4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF																																								
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; TT series; 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; TT21 > 4.7μF																																																																			
6.3V: 0201 ≥ 0.1μF; 0603 > 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF; TT15 > 1.0μF																																																																			
4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF																																																																			
	Rated voltage: 200~630V	To apply rated voltage (500V max.) for 60 sec.	≥ 10GΩ or RxC ≥ 100Ω-F whichever is smaller																																																																
	Rated voltage: ≥ 630V	To apply 500V for 60 sec.																																																																	

Multilayer Ceramic Capacitors

No.	Item	Test Condition	Requirements																																																						
6.	Temperature Coefficient	<p>With no electrical load.</p> <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> </thead> <tbody> <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> <tr> <td>Y5V</td> <td>-25~ 85°C at 20°C</td> </tr> </tbody> </table> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement voltage for Class II:</p> <table border="1"> <thead> <tr> <th>01005</th> <th>0201</th> </tr> </thead> <tbody> <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> <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> </tbody> </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	Y5V	-25~ 85°C at 20°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	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 border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <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> <tr> <td>Y5V</td> <td>Within +30%/-80%</td> </tr> </tbody> </table>	T.C.	Capacitance Change	NPO	Within ±30ppm/°C	X7R	Within ±15%	X7S	Within ±22%	X5R	Within ±15%	X6S	Within ±22%	Y5V	Within +30%/-80%
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																																																								
Y5V	-25~ 85°C at 20°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																																																								
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																																																								
T.C.	Capacitance Change																																																								
NPO	Within ±30ppm/°C																																																								
X7R	Within ±15%																																																								
X7S	Within ±22%																																																								
X5R	Within ±15%																																																								
X6S	Within ±22%																																																								
Y5V	Within +30%/-80%																																																								
7.	Adhesive Strength of Termination	<p>* Pressurizing force : 2N (0201) and 5N (≤0603) and 10N (>0603) * Test time: 10±1 sec.</p>	* No remarkable damage or removal of the terminations.																																																						
8.	Vibration Resistance	<p>* 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 at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	<p>* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.</p>																																																						
9.	Solderability	<p>* Solder temperature: 235±5°C * Dipping time: 2±0.5 sec.</p>	95% min. coverage of all metalized area.																																																						
10.	Bending Test	<p>* 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.</p>	<p>* No remarkable damage. * Cap change : NPO: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S, X7S: within ±12.5% Y5V: within ±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>																																																						
11.	Resistance to Soldering Heat	<p>* 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 temp.</p>	<p>* No remarkable damage. * Cap change: NPO: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S, X7S: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge.</p>																																																						
12.	Temperature Cycle	<p>* Conduct the five cycles according to the temperatures and time.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	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	<p>No remarkable damage. * Cap change : NPO: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S, X7S: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements.</p>																																							
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																																																							

Multilayer Ceramic Capacitors

No.	Item	Test Condition	Requirements																																										
13.	Humidity (Damp Heat) Steady State	*Test temp.: 40±2°C *Humidity: 90-95%RH *Test time: 500+24/-0hrs. *Before initial measurement (Class II only): To apply de-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: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; TT series & C≥ 1uF, 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: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C X7R, X5R, X6S, X7S:																																										
			<table border="1"> <thead> <tr> <th>Rated V</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 100V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 7.5% 0805 > 0.1μF, 0603 ≥ 0.068μF, 1206 > 1μF; 1210 ≥ 2.2μF; TT series</td> </tr> <tr> <td>≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤ 5%</td> <td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">≤ 5%</td> <td>≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series</td> </tr> <tr> <td>≤ 15% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤ 5%</td> <td>≤ 15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series: 01R5</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤ 7.5%</td> <td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>---</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 15%</td> <td>≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>---</td> </tr> <tr> <td rowspan="2">4V</td> <td rowspan="2">≤ 20%</td> <td>---</td> </tr> <tr> <td>---</td> </tr> </tbody> </table>	Rated V	D.F. ≤	Exception of D.F. ≤	≥ 100V	≤ 3%	≤ 6% 1206 ≥ 0.47μF	≤ 7.5% 0805 > 0.1μF, 0603 ≥ 0.068μF, 1206 > 1μF; 1210 ≥ 2.2μF; TT series	≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF	50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF	≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series	35V	≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	25V	≤ 5%	≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series	≤ 15% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	≤ 20% 0402 ≥ 0.47μF	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	16V	≤ 5%	≤ 15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series: 01R5	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series	---	6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series	---	4V	≤ 20%	---	---
Rated V	D.F. ≤	Exception of D.F. ≤																																											
≥ 100V	≤ 3%	≤ 6% 1206 ≥ 0.47μF																																											
		≤ 7.5% 0805 > 0.1μF, 0603 ≥ 0.068μF, 1206 > 1μF; 1210 ≥ 2.2μF; TT series																																											
		≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF																																											
50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																											
		≤ 10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF																																											
		≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series																																											
35V	≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																											
		≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																											
		≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																											
25V	≤ 5%	≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series																																											
		≤ 15% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF																																											
		≤ 20% 0402 ≥ 0.47μF																																											
		≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																											
16V	≤ 5%	≤ 15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series																																											
		≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																											
		≤ 20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series: 01R5																																											
10V	≤ 7.5%	≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series																																											
		≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series																																											

6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series																																											

4V	≤ 20%	---																																											

			*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, X7S, Y5V)																																										
			<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210 ≥ 3.3μF</td> <td rowspan="7">1GΩ or RxC ≥ 10 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 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V; 4V; TT series; All X6S/X7S items; Size ≥ 1812</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: All X7R; 1210 ≥ 3.3μF	1GΩ or RxC ≥ 10 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 ≥ 0.1μF; 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; TT series; All X6S/X7S items; Size ≥ 1812																																
Rated voltage	Insulation Resistance																																												
100V: All X7R; 1210 ≥ 3.3μF	1GΩ or RxC ≥ 10 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 ≥ 0.1μF; 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; TT series; All X6S/X7S items; Size ≥ 1812																																													

Multilayer Ceramic Capacitors

No	Item	Test Condition	Requirements																																						
14	Humidity (Damp Heat) Load	*Test temp. : 40±2°C	* 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%; TT series & C _z ≥ 1uF, 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 border="1"> <thead> <tr> <th>Rated V</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 100V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 7.5% 0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series</td> </tr> <tr> <td>≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 0201 ≥ 0.01uF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤ 5%</td> <td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">≤ 5%</td> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series</td> </tr> <tr> <td>≤ 20% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF);</td> </tr> <tr> <td>≤ 20% 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 15%</td> <td>≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5</td> </tr> <tr> <td>≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> </tr> </tbody> </table>	Rated V	D.F. ≤	Exception of D.F. ≤	≥ 100V	≤ 3%	≤ 6% 1206 ≥ 0.47μF	≤ 7.5% 0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series	≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF	50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10% 0201 ≥ 0.01uF; 1210 ≥ 4.7μF	≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series	35V	≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series	≤ 20% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	≤ 20% 0402 ≥ 0.47μF	16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤ 15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF);	≤ 20% 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series	4V	≤ 20%	---
		Rated V		D.F. ≤	Exception of D.F. ≤																																				
		≥ 100V		≤ 3%	≤ 6% 1206 ≥ 0.47μF																																				
					≤ 7.5% 0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series																																				
					≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF																																				
		50V		≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																				
					≤ 10% 0201 ≥ 0.01uF; 1210 ≥ 4.7μF																																				
					≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series																																				
		35V		≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																				
					≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																				
		25V		≤ 5%	≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																				
					≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series																																				
					≤ 20% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF																																				
					≤ 20% 0402 ≥ 0.47μF																																				
16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																							
		≤ 15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series																																							
10V	≤ 7.5%	≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF);																																							
		≤ 20% 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																							
6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5																																							
		≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series																																							
4V	≤ 20%	---																																							
*I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, X7S, Y5V)																																									
<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <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 ; TT series ; All X6S/X7S items; Size ≥ 1812</td> </tr> </tbody> </table>			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 ; TT series ; All X6S/X7S items; Size ≥ 1812																													
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 ; TT series ; All X6S/X7S items; Size ≥ 1812																																									

Multilayer Ceramic Capacitors

No	Item	Test Condition	Requirements																																																																																																																
15.	High Temperature Load (Endurance)	Test temp. : NP0, X7R/X7E/X7S: 125±3°C X6S: 105±3°C X5R, Y5V: 85±3°C Test time: 1000+24/-0 hrs. To apply voltage: (1) ≤6.3V or C ≥10µF or TT series: 150% of rated voltage. (2) 10V ≤Ur<500V: 200% of rated voltage. (3) 500V: 150% of rated voltage. (4) Ur ≥630V: 120% of rated voltage. (5) 100% of rated voltage for below range.	* 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%; TT series & C ≥1µF, 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: More than 30pF, Q≥350 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C X7R, X5R, X6S, X7S:																																																																																																																
		<table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> <th>Rated V.D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td rowspan="2">X5R/X7R/X6S</td> <td>≤10V</td> <td>C ≥0.1µF</td> <td rowspan="2">≥100V</td> <td>≤3%</td> <td>≤6% 1206 ≥0.47µF</td> </tr> <tr> <td>≥16V</td> <td>C >0.1µF</td> <td>≤7.5% 0805 >0.1µF; 0603 ≥0.068µF; 1206 >1µF; 1210 ≥2.2µF; TT series</td> </tr> <tr> <td rowspan="4">0402</td> <td rowspan="2">X5R</td> <td>≤16V</td> <td>C >1.0µF</td> <td rowspan="4">50V</td> <td>≤3%</td> <td>≤20% 0805 >0.22µF; 1210 ≥3.3µF</td> </tr> <tr> <td>25V, 50V</td> <td>C ≥1.0µF</td> <td>≤6% 0201(50V); 0603 ≥0.047µF; 0805 ≥0.18µF; 1206 ≥0.47µF</td> </tr> <tr> <td>6.3V</td> <td>C >1.0µF</td> <td>≤10% 0201 ≥0.01µF; 1210 ≥4.7µF</td> </tr> <tr> <td>10V~25V</td> <td>C ≥1.0µF</td> <td>≤20% 0402 ≥0.012µF; 0603 >0.1µF; 0805 ≥1µF; 1206 ≥2.2µF; 1210 >10µF; TT series</td> </tr> <tr> <td rowspan="2">0603</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>6.3V, 10V</td> <td>C ≥1.0µF</td> <td rowspan="2">35V</td> <td>≤5%</td> <td>≤20% 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF</td> </tr> <tr> <td>4V</td> <td>C ≥22µF</td> <td>≤10% 0201 ≥0.01µF; 0805 ≥1µF; 1210 ≥10µF</td> </tr> <tr> <td rowspan="3">0805</td> <td rowspan="3">X5R/X7R/X6S/X7S</td> <td>25V, 35V</td> <td>C ≥1.0µF</td> <td rowspan="3">25V</td> <td>≤5%</td> <td>≤14% 0603 ≥0.33µF; 1206 ≥4.7µF</td> </tr> <tr> <td>4V</td> <td>C ≥47µF</td> <td>≤15% 0201 ≥0.1µF; 0402 ≥0.10µF & (0402/X7R ≥0.056µF); TT series</td> </tr> <tr> <td>6.3V</td> <td>C ≥22µF</td> <td>≤20% 0603 ≥0.47µF; 0805 ≥2.2µF; 1206 ≥6.8µF; 1210 ≥22µF</td> </tr> <tr> <td rowspan="2">1206</td> <td rowspan="2">X5R/X7R/X6S</td> <td>10V~50V</td> <td>C ≥10µF</td> <td rowspan="2">16V</td> <td>≤5%</td> <td>≤10% 0402 ≥0.47µF</td> </tr> <tr> <td>3000V</td> <td>C ≥1.5pF</td> <td>≤15% 0603 ≥0.15µF; 0805 ≥0.68µF; 1206 ≥2.2µF; 1210 ≥4.7µF</td> </tr> <tr> <td rowspan="2">1210</td> <td rowspan="2">X5R/X7R/X6S</td> <td>16V</td> <td>C ≥47µF</td> <td rowspan="2">10V</td> <td>≤7.5%</td> <td>≤15% 0201 ≥0.01µF (0201/X7R ≥0.022µF); 0402 ≥0.033µF; 0603 ≥0.68µF; 0805 ≥2.2µF; 1206 ≥4.7µF; 1210 ≥22µF; TT series</td> </tr> <tr> <td>100V</td> <td>C ≥3.3µF</td> <td>≤15% 0201 ≥0.012µF; 0402 ≥0.33µF (0402/X7R ≥0.22µF); 0603 ≥0.33µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥22µF</td> </tr> <tr> <td>TT15</td> <td>X5R</td> <td>6.3V</td> <td>C >1.0µF</td> <td>10V</td> <td>≤7.5%</td> <td>≤15% 0201 ≥0.012µF; 0402 ≥0.33µF (0402/X7R ≥0.22µF); 0603 ≥0.33µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥22µF</td> </tr> <tr> <td>TT18</td> <td>Y5V</td> <td>6.3V, 10V</td> <td>C ≥2.2µF</td> <td>6.3V</td> <td>≤15%</td> <td>≤30% 0201 ≥0.1µF; 0402 ≥1µF; TT series: 01R5</td> </tr> <tr> <td>TT21</td> <td>Y5V</td> <td>6.3V</td> <td>C ≥10µF</td> <td>4V</td> <td>≤20%</td> <td>---</td> </tr> <tr> <td>TT31</td> <td>Y5V</td> <td>6.3V</td> <td>C ≥22µF</td> <td>---</td> <td>---</td> <td>---</td> </tr> </tbody> </table>	Size	Dielectric	Rated voltage	Capacitance range	Rated V.D.F. ≤	Exception of D.F. ≤	0201	X5R/X7R/X6S	≤10V	C ≥0.1µF	≥100V	≤3%	≤6% 1206 ≥0.47µF	≥16V	C >0.1µF	≤7.5% 0805 >0.1µF; 0603 ≥0.068µF; 1206 >1µF; 1210 ≥2.2µF; TT series	0402	X5R	≤16V	C >1.0µF	50V	≤3%	≤20% 0805 >0.22µF; 1210 ≥3.3µF	25V, 50V	C ≥1.0µF	≤6% 0201(50V); 0603 ≥0.047µF; 0805 ≥0.18µF; 1206 ≥0.47µF	6.3V	C >1.0µF	≤10% 0201 ≥0.01µF; 1210 ≥4.7µF	10V~25V	C ≥1.0µF	≤20% 0402 ≥0.012µF; 0603 >0.1µF; 0805 ≥1µF; 1206 ≥2.2µF; 1210 >10µF; TT series	0603	X5R/X7R/X6S/X7S	6.3V, 10V	C ≥1.0µF	35V	≤5%	≤20% 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF	4V	C ≥22µF	≤10% 0201 ≥0.01µF; 0805 ≥1µF; 1210 ≥10µF	0805	X5R/X7R/X6S/X7S	25V, 35V	C ≥1.0µF	25V	≤5%	≤14% 0603 ≥0.33µF; 1206 ≥4.7µF	4V	C ≥47µF	≤15% 0201 ≥0.1µF; 0402 ≥0.10µF & (0402/X7R ≥0.056µF); TT series	6.3V	C ≥22µF	≤20% 0603 ≥0.47µF; 0805 ≥2.2µF; 1206 ≥6.8µF; 1210 ≥22µF	1206	X5R/X7R/X6S	10V~50V	C ≥10µF	16V	≤5%	≤10% 0402 ≥0.47µF	3000V	C ≥1.5pF	≤15% 0603 ≥0.15µF; 0805 ≥0.68µF; 1206 ≥2.2µF; 1210 ≥4.7µF	1210	X5R/X7R/X6S	16V	C ≥47µF	10V	≤7.5%	≤15% 0201 ≥0.01µF (0201/X7R ≥0.022µF); 0402 ≥0.033µF; 0603 ≥0.68µF; 0805 ≥2.2µF; 1206 ≥4.7µF; 1210 ≥22µF; TT series	100V	C ≥3.3µF	≤15% 0201 ≥0.012µF; 0402 ≥0.33µF (0402/X7R ≥0.22µF); 0603 ≥0.33µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥22µF	TT15	X5R	6.3V	C >1.0µF	10V	≤7.5%	≤15% 0201 ≥0.012µF; 0402 ≥0.33µF (0402/X7R ≥0.22µF); 0603 ≥0.33µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥22µF	TT18	Y5V	6.3V, 10V	C ≥2.2µF	6.3V	≤15%	≤30% 0201 ≥0.1µF; 0402 ≥1µF; TT series: 01R5	TT21	Y5V	6.3V	C ≥10µF	4V	≤20%	---	TT31	Y5V	6.3V	C ≥22µF	---	---	---										
		Size	Dielectric	Rated voltage	Capacitance range	Rated V.D.F. ≤	Exception of D.F. ≤																																																																																																												
		0201	X5R/X7R/X6S	≤10V	C ≥0.1µF	≥100V	≤3%	≤6% 1206 ≥0.47µF																																																																																																											
				≥16V	C >0.1µF		≤7.5% 0805 >0.1µF; 0603 ≥0.068µF; 1206 >1µF; 1210 ≥2.2µF; TT series																																																																																																												
		0402	X5R	≤16V	C >1.0µF	50V	≤3%	≤20% 0805 >0.22µF; 1210 ≥3.3µF																																																																																																											
				25V, 50V	C ≥1.0µF		≤6% 0201(50V); 0603 ≥0.047µF; 0805 ≥0.18µF; 1206 ≥0.47µF																																																																																																												
			6.3V	C >1.0µF	≤10% 0201 ≥0.01µF; 1210 ≥4.7µF																																																																																																														
			10V~25V	C ≥1.0µF	≤20% 0402 ≥0.012µF; 0603 >0.1µF; 0805 ≥1µF; 1206 ≥2.2µF; 1210 >10µF; TT series																																																																																																														
		0603	X5R/X7R/X6S/X7S	6.3V, 10V	C ≥1.0µF	35V	≤5%	≤20% 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF																																																																																																											
				4V	C ≥22µF		≤10% 0201 ≥0.01µF; 0805 ≥1µF; 1210 ≥10µF																																																																																																												
		0805	X5R/X7R/X6S/X7S	25V, 35V	C ≥1.0µF	25V	≤5%	≤14% 0603 ≥0.33µF; 1206 ≥4.7µF																																																																																																											
				4V	C ≥47µF		≤15% 0201 ≥0.1µF; 0402 ≥0.10µF & (0402/X7R ≥0.056µF); TT series																																																																																																												
				6.3V	C ≥22µF		≤20% 0603 ≥0.47µF; 0805 ≥2.2µF; 1206 ≥6.8µF; 1210 ≥22µF																																																																																																												
		1206	X5R/X7R/X6S	10V~50V	C ≥10µF	16V	≤5%	≤10% 0402 ≥0.47µF																																																																																																											
				3000V	C ≥1.5pF		≤15% 0603 ≥0.15µF; 0805 ≥0.68µF; 1206 ≥2.2µF; 1210 ≥4.7µF																																																																																																												
		1210	X5R/X7R/X6S	16V	C ≥47µF	10V	≤7.5%	≤15% 0201 ≥0.01µF (0201/X7R ≥0.022µF); 0402 ≥0.033µF; 0603 ≥0.68µF; 0805 ≥2.2µF; 1206 ≥4.7µF; 1210 ≥22µF; TT series																																																																																																											
				100V	C ≥3.3µF		≤15% 0201 ≥0.012µF; 0402 ≥0.33µF (0402/X7R ≥0.22µF); 0603 ≥0.33µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥22µF																																																																																																												
		TT15	X5R	6.3V	C >1.0µF	10V	≤7.5%	≤15% 0201 ≥0.012µF; 0402 ≥0.33µF (0402/X7R ≥0.22µF); 0603 ≥0.33µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥22µF																																																																																																											
		TT18	Y5V	6.3V, 10V	C ≥2.2µF	6.3V	≤15%	≤30% 0201 ≥0.1µF; 0402 ≥1µF; TT series: 01R5																																																																																																											
		TT21	Y5V	6.3V	C ≥10µF	4V	≤20%	---																																																																																																											
		TT31	Y5V	6.3V	C ≥22µF	---	---	---																																																																																																											
				**1WV items must follow de-rating conditions.																																																																																																															
				(6) 150% of rated voltage for below range.																																																																																																															
				<table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td rowspan="2">X5R/X6S</td> <td>≤16V, 25V</td> <td>C=0.1µF</td> <td>≥50V</td> <td>≤7.5%</td> <td>≤10% 0603 ≥0.1µF; 0805 ≥0.47µF; 1206 ≥4.7µF</td> </tr> <tr> <td>16V</td> <td>C ≥0.022µF</td> <td>35V</td> <td>≤10%</td> <td>≤20% 1210 ≥6.8µF</td> </tr> <tr> <td rowspan="3">0402</td> <td rowspan="2">X7R/X5R/X6S</td> <td>50V</td> <td>C ≥0.1µF</td> <td rowspan="3">25V</td> <td>≤7.5%</td> <td>≤10% 0402 ≥0.047µF; 0603 ≥0.1µF; 0805 ≥0.33µF; 1206 ≥1µF; 1210 ≥4.7µF</td> </tr> <tr> <td>10~25V</td> <td>C ≥0.22µF</td> <td>≤15% 0402 ≥0.068µF; 0603 ≥0.47µF; 1206 ≥4.7µF; 1210 ≥22µF</td> </tr> <tr> <td>16V</td> <td>C ≥0.47µF</td> <td>≤20% 0402 ≥0.068µF; 0603 ≥0.68µF</td> </tr> <tr> <td rowspan="4">0603</td> <td rowspan="2">X7S</td> <td>50V~100V</td> <td>C >0.22µF</td> <td rowspan="4">16V (C<1.0µF)</td> <td>≤10%</td> <td>≤12.5% 0402 ≥0.068µF; 0603 ≥0.68µF</td> </tr> <tr> <td>50V</td> <td>C >0.1µF</td> <td>≤20% 0402 ≥0.22µF</td> </tr> <tr> <td>50V</td> <td>C ≥1.0µF</td> <td>≤12.5% 0603 ≥2.2µF; 0805 ≥3.3µF; 1206 ≥10µF; 1210 ≥22µF; 1812 ≥47µF;</td> </tr> <tr> <td>10V, 16V</td> <td>C ≥1.0µF</td> <td>≤20% 0402 ≥0.47µF</td> </tr> <tr> <td rowspan="3">0805</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>100V</td> <td>C ≥0.47µF</td> <td rowspan="3">6.3V</td> <td>≤30%</td> <td>---</td> </tr> <tr> <td>50V</td> <td>C ≥1.0µF</td> <td>---</td> </tr> <tr> <td>35V</td> <td>C ≥2.2µF</td> <td>---</td> </tr> <tr> <td rowspan="2">1206</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>100V</td> <td>C >1.0µF</td> <td rowspan="2">10V</td> <td>≤20%</td> <td>≤30% 0402 ≥0.47µF</td> </tr> <tr> <td>50V</td> <td>C =4.7µF</td> <td>---</td> </tr> <tr> <td>1210</td> <td>X5R/X7R/X6S/X7S</td> <td>50V~100V</td> <td>C ≥2.2µF</td> <td>10V</td> <td>≤20%</td> <td>≤30% 0402 ≥0.47µF</td> </tr> <tr> <td>1825</td> <td rowspan="3">X7R</td> <td rowspan="3">100V~250V</td> <td rowspan="3">C ≥1.0µF</td> <td>50V</td> <td>≤10%</td> <td>≤20% 0402 >0.01µF; 0603 ≥1µF; 0805 ≥1µF; 1206 ≥4.7µF; 1210 ≥4.7µF</td> </tr> <tr> <td>35V</td> <td>≤10%</td> <td>≤20% 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF</td> </tr> <tr> <td>25V</td> <td>≤10%</td> <td>≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥2.2µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF</td> </tr> <tr> <td>2220</td> <td rowspan="2">X7R</td> <td rowspan="2">100V~250V</td> <td rowspan="2">C ≥1.0µF</td> <td>16V</td> <td>≤10%</td> <td>≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF</td> </tr> <tr> <td>10V</td> <td>≤10%</td> <td>≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥0.47µF; 0805 ≥2.2µF; 1206 ≥4.7µF; 1210 ≥47µF</td> </tr> <tr> <td>2225</td> <td rowspan="2">X7R</td> <td rowspan="2">100V~250V</td> <td rowspan="2">C ≥1.0µF</td> <td>6.3V</td> <td>≤10%</td> <td>≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF</td> </tr> <tr> <td>4V</td> <td>≤10%</td> <td>≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF</td> </tr> </tbody> </table>	Size	Dielectric	Rated voltage	Capacitance range	Rated vol.	D.F. ≤	Exception of D.F. ≤	0201	X5R/X6S	≤16V, 25V	C=0.1µF	≥50V	≤7.5%	≤10% 0603 ≥0.1µF; 0805 ≥0.47µF; 1206 ≥4.7µF	16V	C ≥0.022µF	35V	≤10%	≤20% 1210 ≥6.8µF	0402	X7R/X5R/X6S	50V	C ≥0.1µF	25V	≤7.5%	≤10% 0402 ≥0.047µF; 0603 ≥0.1µF; 0805 ≥0.33µF; 1206 ≥1µF; 1210 ≥4.7µF	10~25V	C ≥0.22µF	≤15% 0402 ≥0.068µF; 0603 ≥0.47µF; 1206 ≥4.7µF; 1210 ≥22µF	16V	C ≥0.47µF	≤20% 0402 ≥0.068µF; 0603 ≥0.68µF	0603	X7S	50V~100V	C >0.22µF	16V (C<1.0µF)	≤10%	≤12.5% 0402 ≥0.068µF; 0603 ≥0.68µF	50V	C >0.1µF	≤20% 0402 ≥0.22µF	50V	C ≥1.0µF	≤12.5% 0603 ≥2.2µF; 0805 ≥3.3µF; 1206 ≥10µF; 1210 ≥22µF; 1812 ≥47µF;	10V, 16V	C ≥1.0µF	≤20% 0402 ≥0.47µF	0805	X5R/X7R/X6S/X7S	100V	C ≥0.47µF	6.3V	≤30%	---	50V	C ≥1.0µF	---	35V	C ≥2.2µF	---	1206	X5R/X7R/X6S/X7S	100V	C >1.0µF	10V	≤20%	≤30% 0402 ≥0.47µF	50V	C =4.7µF	---	1210	X5R/X7R/X6S/X7S	50V~100V	C ≥2.2µF	10V	≤20%	≤30% 0402 ≥0.47µF	1825	X7R	100V~250V	C ≥1.0µF	50V	≤10%	≤20% 0402 >0.01µF; 0603 ≥1µF; 0805 ≥1µF; 1206 ≥4.7µF; 1210 ≥4.7µF	35V	≤10%	≤20% 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF	25V	≤10%	≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥2.2µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF	2220	X7R	100V~250V	C ≥1.0µF	16V	≤10%	≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF	10V	≤10%	≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥0.47µF; 0805 ≥2.2µF; 1206 ≥4.7µF; 1210 ≥47µF	2225	X7R	100V~250V	C ≥1.0µF	6.3V	≤10%	≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF	4V	≤10%	≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF
		Size	Dielectric	Rated voltage	Capacitance range	Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																																											
		0201	X5R/X6S	≤16V, 25V	C=0.1µF	≥50V	≤7.5%	≤10% 0603 ≥0.1µF; 0805 ≥0.47µF; 1206 ≥4.7µF																																																																																																											
				16V	C ≥0.022µF	35V	≤10%	≤20% 1210 ≥6.8µF																																																																																																											
0402	X7R/X5R/X6S	50V	C ≥0.1µF	25V	≤7.5%	≤10% 0402 ≥0.047µF; 0603 ≥0.1µF; 0805 ≥0.33µF; 1206 ≥1µF; 1210 ≥4.7µF																																																																																																													
		10~25V	C ≥0.22µF		≤15% 0402 ≥0.068µF; 0603 ≥0.47µF; 1206 ≥4.7µF; 1210 ≥22µF																																																																																																														
	16V	C ≥0.47µF	≤20% 0402 ≥0.068µF; 0603 ≥0.68µF																																																																																																																
0603	X7S	50V~100V	C >0.22µF	16V (C<1.0µF)	≤10%	≤12.5% 0402 ≥0.068µF; 0603 ≥0.68µF																																																																																																													
		50V	C >0.1µF		≤20% 0402 ≥0.22µF																																																																																																														
	50V	C ≥1.0µF	≤12.5% 0603 ≥2.2µF; 0805 ≥3.3µF; 1206 ≥10µF; 1210 ≥22µF; 1812 ≥47µF;																																																																																																																
	10V, 16V	C ≥1.0µF	≤20% 0402 ≥0.47µF																																																																																																																
0805	X5R/X7R/X6S/X7S	100V	C ≥0.47µF	6.3V	≤30%	---																																																																																																													
		50V	C ≥1.0µF		---																																																																																																														
	35V	C ≥2.2µF	---																																																																																																																
1206	X5R/X7R/X6S/X7S	100V	C >1.0µF	10V	≤20%	≤30% 0402 ≥0.47µF																																																																																																													
		50V	C =4.7µF		---																																																																																																														
1210	X5R/X7R/X6S/X7S	50V~100V	C ≥2.2µF	10V	≤20%	≤30% 0402 ≥0.47µF																																																																																																													
1825	X7R	100V~250V	C ≥1.0µF	50V	≤10%	≤20% 0402 >0.01µF; 0603 ≥1µF; 0805 ≥1µF; 1206 ≥4.7µF; 1210 ≥4.7µF																																																																																																													
35V				≤10%	≤20% 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF																																																																																																														
25V				≤10%	≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥2.2µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF																																																																																																														
2220	X7R	100V~250V	C ≥1.0µF	16V	≤10%	≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF																																																																																																													
10V				≤10%	≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥0.47µF; 0805 ≥2.2µF; 1206 ≥4.7µF; 1210 ≥47µF																																																																																																														
2225	X7R	100V~250V	C ≥1.0µF	6.3V	≤10%	≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF																																																																																																													
4V				≤10%	≤20% 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF																																																																																																														
		I.R.: ≥10V, 1GΩ or 50 Ω·F whichever is smaller.																																																																																																																	
		Class II (X7R, X5R, X6S, X7S, Y5V)																																																																																																																	
		<table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">1206</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>100V</td> <td>C >1.0µF</td> <td>100V: All X7R; 1210 ≥3.3µF</td> <td rowspan="2">1GΩ or RxC ≥10 Ω·F whichever is smaller.</td> </tr> <tr> <td>50V</td> <td>C =4.7µF</td> <td>50V: 0402 >0.01µF; 0603 ≥1µF; 0805 ≥1µF; 1206 ≥4.7µF; 1210 ≥4.7µF</td> </tr> <tr> <td rowspan="2">1825</td> <td rowspan="2">X7R</td> <td rowspan="2">100V~250V</td> <td rowspan="2">C ≥1.0µF</td> <td>35V: 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF</td> <td rowspan="2"></td> </tr> <tr> <td>25V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥2.2µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF</td> </tr> <tr> <td>2220</td> <td rowspan="2">X7R</td> <td rowspan="2">100V~250V</td> <td rowspan="2">C ≥1.0µF</td> <td>16V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF</td> <td rowspan="2"></td> </tr> <tr> <td>10V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥0.47µF; 0805 ≥2.2µF; 1206 ≥4.7µF; 1210 ≥47µF</td> </tr> <tr> <td>2225</td> <td rowspan="2">X7R</td> <td rowspan="2">100V~250V</td> <td rowspan="2">C ≥1.0µF</td> <td>6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥1812</td> <td rowspan="2"></td> </tr> <tr> <td>4V</td> </tr> </tbody> </table>	Size	Dielectric	Rated voltage	Capacitance range	Rated voltage	Insulation Resistance	1206	X5R/X7R/X6S/X7S	100V	C >1.0µF	100V: All X7R; 1210 ≥3.3µF	1GΩ or RxC ≥10 Ω·F whichever is smaller.	50V	C =4.7µF	50V: 0402 >0.01µF; 0603 ≥1µF; 0805 ≥1µF; 1206 ≥4.7µF; 1210 ≥4.7µF	1825	X7R	100V~250V	C ≥1.0µF	35V: 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF		25V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥2.2µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF	2220	X7R	100V~250V	C ≥1.0µF	16V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF		10V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥0.47µF; 0805 ≥2.2µF; 1206 ≥4.7µF; 1210 ≥47µF	2225	X7R	100V~250V	C ≥1.0µF	6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥1812		4V																																																																													
Size	Dielectric	Rated voltage	Capacitance range	Rated voltage	Insulation Resistance																																																																																																														
1206	X5R/X7R/X6S/X7S	100V	C >1.0µF	100V: All X7R; 1210 ≥3.3µF	1GΩ or RxC ≥10 Ω·F whichever is smaller.																																																																																																														
		50V	C =4.7µF	50V: 0402 >0.01µF; 0603 ≥1µF; 0805 ≥1µF; 1206 ≥4.7µF; 1210 ≥4.7µF																																																																																																															
1825	X7R	100V~250V	C ≥1.0µF	35V: 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥2.2µF; 1210 ≥10µF																																																																																																															
				25V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥2.2µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF																																																																																																															
2220	X7R	100V~250V	C ≥1.0µF	16V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥1µF; 0805 ≥2.2µF; 1206 ≥10µF; 1210 ≥47µF																																																																																																															
10V: 0201 ≥0.1µF; 0402 ≥0.22µF; 0603 ≥0.47µF; 0805 ≥2.2µF; 1206 ≥4.7µF; 1210 ≥47µF																																																																																																																			
2225	X7R	100V~250V	C ≥1.0µF	6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥1812																																																																																																															
4V																																																																																																																			
		* Before initial measurement (Class II only): To apply de-rating at 150% for 24±2 hrs at room temp. per de-rating table for 1µF or 10µF then set for 24±2 hrs at room temp.																																																																																																																	
		** De-rating conditions:																																																																																																																	

Multilayer Ceramic Capacitors

APPENDIXES

■ **Tape & reel dimensions**

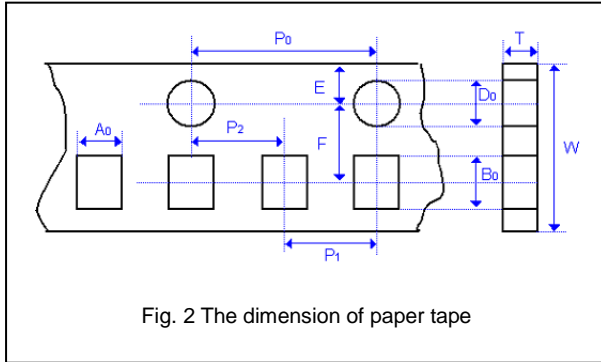


Fig. 2 The dimension of paper tape

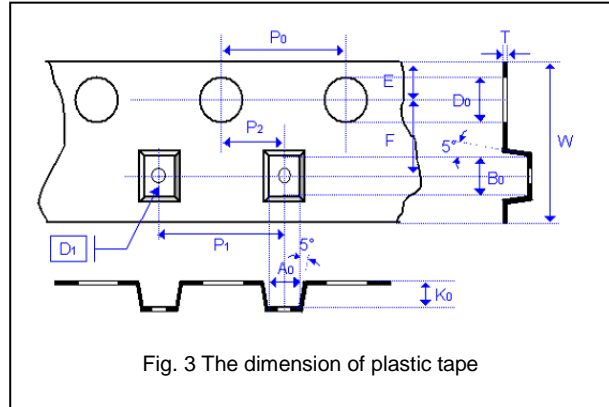


Fig. 3 The dimension of plastic tape

Size	0201	0402	0603	0805			1206			1210			1808	1812	
Thickness	L	N,E	S,H,X	A,H	B,T	D,I	B,T	C,J,D	G,P	T	C,D,G,K	M	D,F,G,K	D,F,G,K	M,U
A₀	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	< 2.50	< 3.90	< 3.90
B₀	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	< 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	0.25 +/-0.1
K₀	-	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 1.50	< 2.50	< 3.20	< 2.50	< 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	12.00 +/-0.30
P₀	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	4.00 +/-0.10
10xP₀	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	40.00 +/-0.20
P₁	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	4.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10
P₂	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	2.00 +/-0.10
D₀	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	1.50 +0.1/-0
D₁	-	-	-	-	-	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	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	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	5.50 +/-0.10

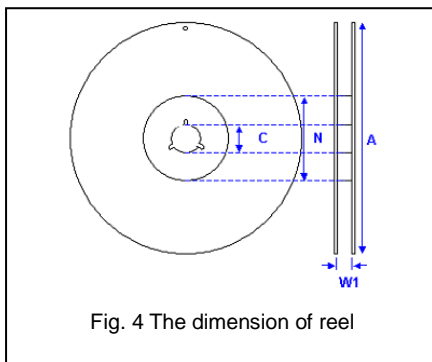
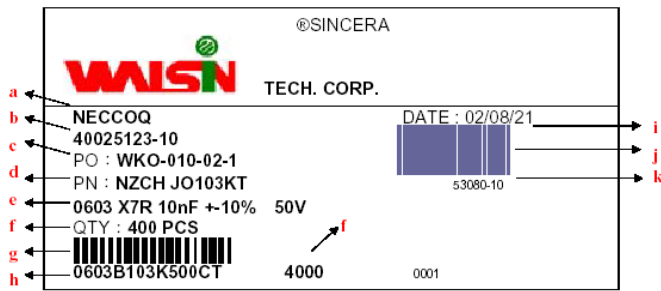


Fig. 4 The dimension of reel

Size	0201, 0402, 0603, 0805, 1206, 1210			1808, 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
W₁	8.4+1.5/-0	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0±1.0	250.0±1.0	330.0±1.0	178.0±1.0
N	60.0+1.0/-0	100.0±1.0	100±1.0	60.0+1.0/-0

Multilayer Ceramic Capacitors

Description of customer label



- a. Customer name
- b. WTC order series and item number
- c. Customer P/O
- d. Customer P/N
- e. Description of product
- f. Quantity
- g. Bar code including quantity & WTC P/N or customer
- h. WTC P/N
- i. Shipping date
- j. Order bar code including series and item numbers
- k. Serial number of label

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 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 N₂ within oven are recommended.

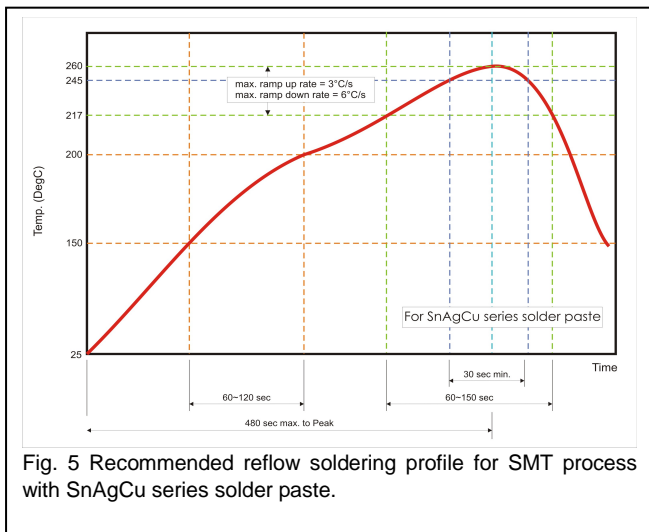


Fig. 5 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

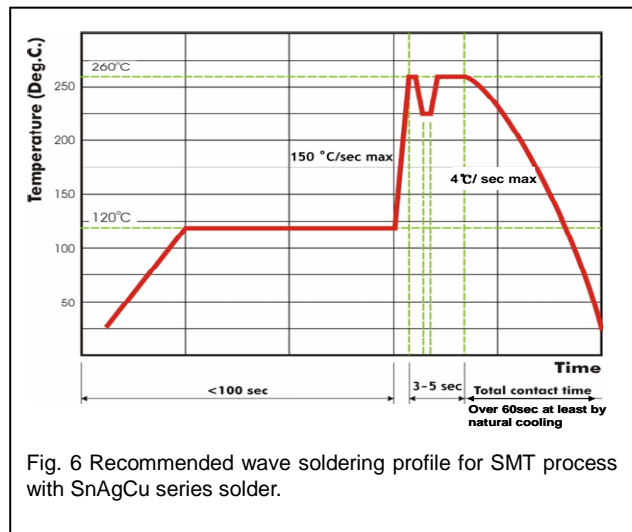


Fig. 6 Recommended wave soldering profile for SMT process with SnAgCu series solder.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for [Multilayer Ceramic Capacitors MLCC - SMD/SMT](#) category:

Click to view products by [Walsin](#) manufacturer:

Other Similar products are found below :

[M39014/02-1225V](#) [M39014/22-0631](#) [D55342E07B523DR-T/R](#) [NCA1206X7R103K50TRPF](#) [NCA1206X7R104K16TRPF](#) [NIN-FB391JTRF](#)
[NIN-FC2R7JTRF](#) [NMC0201X5R474K4TRPF](#) [NMC0402NPO220J50TRPF](#) [NMC0402X5R105K6.3TRPF](#) [NMC0402X5R224K6.3TRPF](#)
[NMC0402X7R103J25TRPF](#) [NMC0402X7R153K16TRPF](#) [NMC0603NPO1R8C50TRPF](#) [NMC0603NPO201J50TRPF](#)
[NMC0603NPO330G50TRPF](#) [NMC0603X5R475M6.3TRPF](#) [NMC0805NPO270J50TRPF](#) [NMC0805NPO820J50TRPF](#)
[NMC0805X7R224K25TRPF](#) [NMC1206X7R102K50TRPF](#) [NMC-H0805X7R472K250TRPF](#) [NMC-L0402NPO7R0C50TRPF](#) [NMC-](#)
[L0603NPO2R2B50TRPF](#) [NMC-P0805NPO221J500TRPLPF](#) [NMC-Q0402NPO8R2D200TRPF](#) [C1206C101J1GAC](#) [C1608C0G2A221J](#)
[C1608X7R1E334K](#) [C2012C0G2A472J](#) [2220J2K00562KXT](#) [1812J2K00332KXT](#) [CDR31BX103AKWR](#) [CDR33BX104AKUR](#)
[CDR33BX683AKUS](#) [CGA2B2C0G1H010C](#) [CGA2B2C0G1H040C](#) [CGA2B2C0G1H050C](#) [CGA2B2C0G1H060D](#) [CGA2B2C0G1H070D](#)
[CGA2B2C0G1H120J](#) [CGA2B2C0G1H151J](#) [CGA2B2C0G1H181JT0Y0F](#) [CGA2B2C0G1H1R5C](#) [CGA2B2C0G1H2R2C](#)
[CGA2B2C0G1H390J](#) [CGA2B2C0G1H391J](#) [CGA2B2C0G1H3R3C](#) [CGA2B2C0G1H680J](#) [CGA2B2C0G1H6R8D](#)