

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.

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

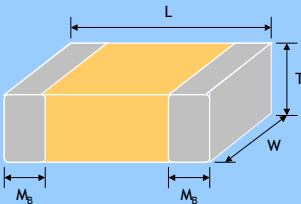
3. APPLICATIONS

- For Navigation & Information equipments.
- For entertainment equipments
- 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>
Series	Size	Dielectric	Capacitance	Tolerance	Rated voltage	Termination	Packaging style
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=10×10 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

5. EXTERNAL DIMENSIONS

Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Soldering Method *	M _B (mm)		
 Fig. 1 The outline of MLCC	01R5 (0402)	0.4±0.02	0.2±0.02	0.2±0.02	V	R	0.10±0.03		
	0201 (0603)	0.6±0.03	0.3±0.03	0.3±0.03	L	R	0.15±0.05		
		0.6±0.05 ^{#2}	0.3±0.05 ^{#2}	0.3±0.05 ^{#2}			0.15±0.1/-0.05		
		0.6±0.09 ^{#3}	0.3±0.09 ^{#3}	0.3±0.09 ^{#3}					
	0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	R	0.25 +0.05/-0.10		
				0.50±0.02/-0.05	Q	R			
		1.00±0.20	0.50±0.20	0.5±0.20	E	R			
	0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S	R / W	0.40±0.15		
		1.60+0.15/-0.10	0.80+0.15/-0.10	0.50±0.10	H	R / W			
				0.80+0.15/-0.10	X	R / W			
		1.60±0.20 ^{#1}	0.80±0.20 ^{#1}	0.8±0.20 ^{#1}					
	0805 (2012)	2.00±0.15	1.25±0.10	0.50±0.10	H	R / W	0.50±0.20		
				0.60±0.10	A	R / W			
				0.80±0.10	B	R / W			
				1.25±0.10	D	R			
		2.00±0.20	1.25±0.20	0.85±0.10	T	R / W			
				1.25±0.20	I	R			
	1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B	R / W	0.60±0.20 (0.5±0.25) ^{***}		
				0.95±0.10	C	R			
				1.25±0.10	D	R			
				1.15±0.15	J	R			
		3.20±0.20	1.60±0.20	1.60±0.20	G	R			
		0.85±0.10	T	R / W					
	3.20+0.30/-0.10	1.60+0.30/-0.10	1.60+0.30/-0.10	P	R				
	1210 (3225)	3.20±0.30	2.50±0.20	0.95±0.10	C	R	0.75±0.25		
				0.85±0.10	T	R			
				1.25±0.10	D	R			
				1.60±0.20	G	R			
				3.20±0.40	2.50±0.30	2.00±0.20		K	R
				3.20±0.60 ^{#4}	2.50±0.50 ^{#4}	2.50±0.30		M	R
		2.50±0.50 ^{#4}							
	1808 (4520)	4.50±0.40 (4.5+0.5/-0.3) ^{**}	2.03±0.25	1.25±0.10	D	R	0.75±0.25 (0.5±0.25) ^{***}		
				1.40±0.15	F	R			
				1.60±0.20	G	R			
				2.00±0.20	K	R			
	1812 (4532)	4.50±0.40 (4.5+0.5/-0.3) ^{**}	3.20±0.30	1.25±0.10	D	R	0.75±0.25 (0.5±0.25) ^{***}		
				1.60±0.20	G	R			
			3.20±0.40	2.00±0.20	K	R			
2.50±0.30				M	R				
2.80±0.30		U		R					

* R = Reflow soldering process ; W = Wave soldering process.

** For 1808/1812/1825_200V~4000V and safety certificated products.

*** For 1206_≥1000V, 1808/1812_200V~4000V and safety certificated products.

#1: For 0603/Cap ≥10μF or 0603(≤6.3V)/Cap ≥4.7μF or 0603(>10V)/Cap >1μF products.

#2: For 0201/ 0.1μF < Cap < 0.68μF products, Excluding 0201X334~474(≤6.3V) & 0201X224(≤10V).

#3: For 0201/Cap ≥0.68μF products.

#4: For 1210(100V)/Cap >1μF or 1210(250V)/Cap >0.47μF or 1210(400V~630V)/Cap >0.22μF.

Multilayer Ceramic Capacitors

Approval Sheet

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X5R
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812		
Capacitance range*	0.1pF to 0.047μF	100pF to 2.2μF	0.068μF 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℃		-55 to +85℃
Capacitance characteristic	±30ppm/℃	±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℃ 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℃ ambient temperature for X7R, X5R.

** Preconditioning for Class II MLCC: Perform a heat treatment at 150±10℃ 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% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF
		≤ 10% 0805 > 0.22μF; 1210 ≥ 3.3μF
50V	≤ 2.5%	≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
		≤ 5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF
		≤ 10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF(0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF
		≤ 12.5% 1206 ≥ 10μF
35V	≤ 3.5%	≤ 10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
25V	≤ 3.5%	≤ 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF*
		≤ 7% 0603 ≥ 0.33μF
		≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF(0402/X7R ≥ 0.056μF); 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF(1210/X5R ≥ 10μF)*
		≤ 12.5% 0402 ≥ 0.47μF; 0805/X5R=10μF
16V	≤ 3.5%	≤ 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF
		≤ 10% 0201 ≥ 0.1μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
		≤ 12.5% 0805/X5R=10μF
10V	≤ 5%	≤ 10% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5/X5R
		≤ 12.5% 0805/X5R=10μF
		≤ 15% 0201 ≥ 0.1μF(0201/X5R > 0.1μF); 0402 ≥ 1μF; 0603/X5R ≥ 10μF
6.3V	≤ 10%	≤ 15% 0201 ≥ 0.1μF(0201/X5R > 0.1μF); 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF
		≤ 20% 0402 ≥ 2.2μF
4V	≤ 15%	---

Multilayer Ceramic Capacitors

Approval Sheet

7. CAPACITANCE RANGE (NP0 Dielectric)

NP0 Dielectric 0201, 0402, 0603 Sizes

DIELECTRIC		NP0																
SIZE		0201					0402					0603						
RATED VOLTAGE		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100	200	250
Capacitance	0.1pF (0R1)	L	L	L	L	L	N	N	N	N	N							
	0.2pF (0R2)	L	L	L	L	L	N	N	N	N	N							
	0.3pF (0R3)	L	L	L	L	L	N	N	N	N	N							
	0.4pF (0R4)	L	L	L	L	L	N	N	N	N	N							
	0.5pF (0R5)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.6pF (0R6)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.7pF (0R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.8pF (0R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.9pF (0R9)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.0pF (1R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.2pF (1R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.5pF (1R5)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.8pF (1R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.0pF (2R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.2pF (2R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.7pF (2R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.0pF (3R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.3pF (3R3)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.9pF (3R9)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	4.0pF (4R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	4.7pF (4R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	5.0pF (5R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	5.6pF (5R6)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	6.0pF (6R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	6.8pF (6R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	7.0pF (7R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	8.0pF (8R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	8.2pF (8R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	9.0pF (9R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	10pF (100)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	12pF (120)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	15pF (150)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	18pF (180)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	22pF (220)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	27pF (270)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	33pF (330)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	39pF (390)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	47pF (470)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	56pF (560)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	68pF (680)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	82pF (820)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	100pF (101)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	120pF (121)	L	L	L	L	L	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

Approval Sheet

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	I	I
	560pF (561)	B	B	B	B	B	D	D	I	I
	680pF (681)	B	B	B	B	B	D	D	I	I
	820pF (821)	B	B	B	B	B	D	D	I	I
	1,000pF (102)	B	B	B	B	B	D	D	I	I
	1,200pF (122)	B	B	B	B	B	D	D		
	1,500pF (152)	B	B	B	B	B	D	D		
	1,800pF (182)	B	B	B	B	B	D	D		
	2,200pF (222)	B	B	B	B	B	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					
	0.01μF (103)	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	G	
	3,300pF (332)	B	B	B	B	B	B	D	G	G	
	3,900pF (392)	B	B	B	B	B	B	D	G	G	
	4,700pF (472)	B	B	B	B	B	B	D	G	G	
	5,600pF (562)	B	B	B	B	B	B				
	6,800pF (682)	C	C	C	C	C					
	8,200pF (822)	D	D	D	D	D					
	0.01μF (103)	D	D	D	D	D					

Multilayer Ceramic Capacitors

Approval Sheet

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
	12pF (120)	C	C	C	C	C	C	C	C	C	C
	15pF (150)	C	C	C	C	C	C	C	C	C	C
	18pF (180)	C	C	C	C	C	C	C	C	C	C
	22pF (220)	C	C	C	C	C	C	C	C	C	C
	27pF (270)	C	C	C	C	C	C	C	C	C	C
	33pF (330)	C	C	C	C	C	C	C	C	C	C
	39pF (390)	C	C	C	C	C	C	C	C	C	C
	47pF (470)	C	C	C	C	C	C	C	C	C	C
	56pF (560)	C	C	C	C	C	C	C	C	C	C
	68pF (680)	C	C	C	C	C	C	C	C	C	C
	82pF (820)	C	C	C	C	C	C	C	C	C	C
	100pF (101)	C	C	C	C	C	C	C	C	C	D
	120pF (121)	C	C	C	C	C	C	C	C	C	D
	150pF (151)	C	C	C	C	C	C	C	C	C	D
	180pF (181)	C	C	C	C	C	C	C	C	C	D
	220pF (221)	C	C	C	C	C	C	C	C	C	G
	270pF (271)	C	C	C	C	C	C	C	C	C	G
	330pF (331)	C	C	C	C	C	C	C	C	C	G
	390pF (391)	C	C	C	C	C	C	C	C	C	G
	470pF (471)	C	C	C	C	C	C	C	C	C	G
	560pF (561)	C	C	C	C	C	C	C	C	C	G
	680pF (681)	C	C	C	C	C	C	C	C	C	G
	820pF (821)	C	C	C	C	C	C	C	C	C	G
	1,000pF (102)	C	C	C	C	C	D	D	D	D	G
	1,200pF (122)	C	C	C	C	C	D	D	D	D	
	1,500pF (152)	C	C	C	C	C	D	D	D	D	
	1,800pF (182)	C	C	C	C	C	D	D	D	D	
	2,200pF (222)	C	C	C	C	C	D	D	D	D	
	2,700pF (272)	C	C	C	C	C	D	D	D	D	
	3,300pF (332)	C	C	C	C	C	D	D	D	D	
	3,900pF (392)	C	C	C	C	C	D	D	D	D	
	4,700pF (472)	C	C	C	C	C	G	G	G	G	
	5,600pF (562)	C	C	C	C	C	G	G	G	G	
	6,800pF (682)	C	C	C	C	C	G	G	G	G	
	8,200pF (822)	C	C	C	C	C	G	G	G	G	
	0.010μF (103)	C	C	C	C	C	G	G	K	K	
	0.012μF (123)	D	D	D	D	D	M	M	M	M	
	0.015μF (153)	D	D	D	D	D	M	M	M	M	
	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				
SIZE		1812				
RATED VOLTAGE (VDC)		10	16	25	50	100
Capacitance	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	X
	0.033μF (333)					N	N	N		S	S	S	X	X
	0.039μF (393)					N	N	N		S	S	S	X	X
	0.047μF (473)					N	N	N		S	S	S	X	X
	0.056μF (563)					N	N	N		S	S	S	X	
	0.068μF (683)					N	N	N		S	S	S	X	
	0.082μF (823)					N	N	N		S	S	S	X	
	0.10μF (104)					N	N	N		S	S	S	X	
	0.12μF (124)									S	S	X		
	0.15μF (154)									S	S	X	X	
	0.18μF (184)									S	S	X		
	0.22μF (224)									S	S	X	X	
	0.27μF (274)									X	X	X		
	0.33μF (334)									X	X	X	X	
	0.39μF (394)									X	X	X		
	0.47μF (474)									X	X	X		

Multilayer Ceramic Capacitors

Approval Sheet

X7R Dielectric 0805, 1206 Size

DIELECTRIC		X7R																	
SIZE		0805									1206								
RATED VOLTAGE (VDC)		10	16	25	50	100	200	250	500	630	10	16	25	50	100	200	250	500	630
Capacitance	100pF (101)	B	B	B	B	B	B	B	B	B						D	D	D	D
	120pF (121)	B	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	B	D	D	D	D
	180pF (181)	B	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	B	D	D	D	D
	270pF (271)	B	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	B	D	D	D	D
	390pF (391)	B	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	B	D	D	D	D
	560pF (561)	B	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	B	D	D	D	D
	820pF (821)	B	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	B	D	D	D	D
	1,200pF (122)	B	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	B	D	D	D	D
	1,800pF (182)	B	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	B	D	D	D	D
	2,700pF (272)	B	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	B	D	D	D	D
	3,900pF (392)	B	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	D
	5,600pF (562)	B	B	B	B	B	B	B	D	D	B	B	B	B	B	D	D	D	D
	6,800pF (682)	B	B	B	B	B	B	B	D	D	B	B	B	B	B	D	D	D	D
	8,200pF (822)	B	B	B	B	B	B	B	D	D	B	B	B	B	B	D	D	D	D
	0.010μF (103)	B	B	B	B	B	D	D	D	D	B	B	B	B	B	D	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	I						C	C	C	D					
	0.33μF (334)	D	D	D	I						C	C	C	D					
	0.39μF (394)	D	D	D	I						C	C	J	P					
	0.47μF (474)	D	D	D	I						J	J	J	P					
	0.56μF (564)	D	D	D							J	J	J	P					
	0.68μF (684)	D	D	D	I						J	J	J	P					
	0.82μF (824)	D	D	D							J	J	J	P					
	1.0μF (105)	D	D	D	I						J	J	J	P					
	1.5μF (155)										J	J	P						
	2.2μF (225)										J	J	P						
	4.7μF (475)																		
	10μF (106)																		

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

Approval Sheet

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
	0.033μF (333)	C	C	C	C	C	C	C			D	D	D	D	D	D	D
	0.039μF (393)	C	C	C	C	C	C	C			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		
	1.0μF (105)	D	D	D	D	K					D	D	D	K	K		
	1.5μF (155)	K	K	G												K	
	2.2μF (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

Approval Sheet

9. CAPACITANCE RANGE (X5R Dielectric)

DIELECTRIC		X5R															
SIZE		0402				0603				0805				1206			
RATED VOLTAGE(VDC)		6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	6.3	10	16	25
Capacitance	0.022μF (223)																
	0.033μF (333)																
	0.047μF (473)																
	0.068μF (683)		N														
	0.10μF (104)		N	N													
	0.15μF (154)		N	N													
	0.22μF (224)	N	N	N					X								
	0.33μF (334)	N	N				X	X	X								
	0.47μF (474)	N					X	X	X								
	0.68μF (684)	N					X	X	X								
	1.0μF (105)					X	X	X	X								
	1.5μF (155)									I	I				J	J	P
	2.2μF (225)									I	I	I	I		J	J	P
	3.3μF (335)											I	I	P	P	P	P
	4.7μF (475)											I	I	P	P	P	P
	6.8μF (685)													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.

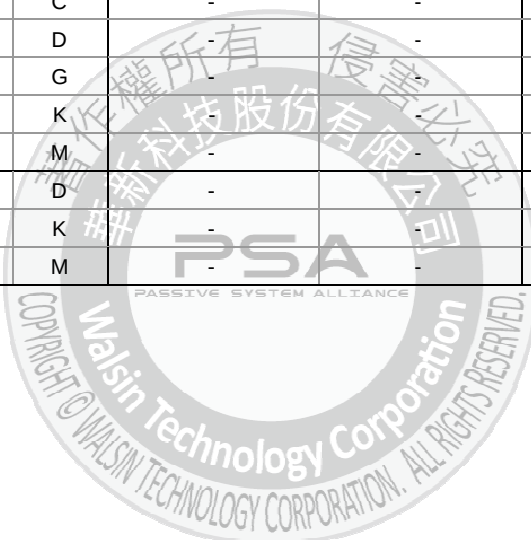


Multilayer Ceramic Capacitors

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% Class II: (X7R, X5R,Y5V) C ≤10μF, 1.0±0.2Vrms · 1KHz±10% ** C >10μF, 0.5±0.2Vrms · 120Hz±20%	* Shall not exceed the limits given in the detailed spec. NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C X7R,X5R:			
3.	Q/ D.F. (Dissipation Factor)	** 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) #1 Excluding X5R/0201/105(6.3V);225(10V) , 0402X475M6R3 *Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.	Rated vol.	D.F. ≤	Exception of D.F. ≤	
			≥ 100V	≤ 2.5%	≤ 3%	1206 ≥ 0.47μF
					≤ 5%	0603 ≥ 0.068μF;0805 > 0.1μF;1206 ≥ 1μF;1210 ≥ 2.2μF
					≤ 10%	0805 > 0.22μF;1210 ≥ 3.3μF
			50V	≤ 2.5%	≤ 3%	0201(50V);0603 ≥ 0.047μF;0805 ≥ 0.18μF;1206 ≥ 0.47μF
					≤ 5%	0201 ≥ 0.01uF;1210 ≥ 3.3μF
					≤ 10%	0402 ≥ 0.012μF;0603>0.1μF;0805 ≥ 1μF(0805/X7R>0.47μF); 1206 ≥ 2.2μF;1210 ≥ 10μF
					≤ 12.5%	1206 ≥ 10μF
			35V	≤ 3.5%	≤ 10%	0603 ≥ 1μF;0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF
			25V	≤ 3.5%	≤ 5%	0201 ≥ 0.01μF;0805 ≥ 1μF;1210 ≥ 10μF*
					≤ 7%	0603 ≥ 0.33μF
					≤ 10%	0201 ≥ 0.1μF;0402 ≥ 0.10μF(0402/X7R ≥ 0.056μF);0603 ≥ 0.47μF; 0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF(1210/X5R ≥ 10μF)*
			16V	≤ 3.5%	≤ 12.5%	0402 ≥ 0.47μF;0805/X5R=10μF
					≤ 5%	0201 ≥ 0.01μF;0402 ≥ 0.033μF;0603 ≥ 0.15μF; 0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF
					≤ 10%	0201 ≥ 0.1uF(0201/X7R ≥ 0.022μF);0402 ≥ 0.22uF; 0603>0.47μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF
			10V	≤ 5%	≤ 10%	0201 ≥ 0.012μF;0402 ≥ 0.22μF;0603 ≥ 0.33μF; 0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 22μF;01R5/X5R
≤ 12.5%	0805/X5R=10μF					
≤ 15%	0201 ≥ 0.1μF(0201/X5R>0.1μF);0402 ≥ 1μF;0603/X5R ≥ 10μF					
6.3V	≤ 10%	≤ 15%	0201 ≥ 0.1μF(0201/X5R>0.1μF);0402 ≥ 1μF;0603 ≥ 10μF; 0805 ≥ 4.7μF;1206 ≥ 47μF;1210 ≥ 100μF			
		≤ 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.	10GΩ or RxC ≥ 500Ω·F whichever is smaller. Class II (X7R, X5R,Y5V)			
			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			
			6.3V: 0201≥0.1μF; 0402≥1μF; 0603>4.7μF; 0805≥47μF;1206≥10μF			
			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

Approval Sheet

No.	Item	Test Condition	Requirements																																			
6.	Temperature Coefficient	With no electrical load.																																				
		<table><tr><th>T.C.</th><th>Operating Temp</th></tr><tr><td>NP0</td><td>-55~125℃ at 25℃</td></tr><tr><td>X7R</td><td>-55~125℃ at 25℃</td></tr><tr><td>X5R</td><td>-55~ 85℃ at 25℃</td></tr><tr><td>Y5V</td><td>-25~ 85℃ at 20℃</td></tr></table>	T.C.	Operating Temp	NP0	-55~125℃ at 25℃	X7R	-55~125℃ at 25℃	X5R	-55~ 85℃ at 25℃	Y5V	-25~ 85℃ at 20℃	<table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>NP0</td><td>Within ±30ppm/℃</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>X5R</td><td>Within ±15%</td></tr><tr><td>Y5V</td><td>Within +30%/-80%</td></tr></table>	T.C.	Capacitance Change	NP0	Within ±30ppm/℃	X7R	Within ±15%	X5R	Within ±15%	Y5V	Within +30%/-80%															
		T.C.	Operating Temp																																			
		NP0	-55~125℃ at 25℃																																			
		X7R	-55~125℃ at 25℃																																			
		X5R	-55~ 85℃ at 25℃																																			
		Y5V	-25~ 85℃ at 20℃																																			
		T.C.	Capacitance Change																																			
		NP0	Within ±30ppm/℃																																			
		X7R	Within ±15%																																			
X5R	Within ±15%																																					
Y5V	Within +30%/-80%																																					
*Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24± 2 hrs at room temp.																																						
* Measurement voltage for Class II:																																						
<table><tr><th>01005</th><th>0201</th></tr><tr><td>Cap≤0.01μF: 0.5V</td><td>Cap<0.1μF:1V</td></tr><tr><td>Cap>0.01μF: 0.2V</td><td>0.1μF*≤Cap<1μF: 0.2V</td></tr><tr><td></td><td>Cap≥1μF: 0.1V</td></tr><tr><td></td><td>* 0201X104/16V: 0.5V 0201X224/10V: 0.5V</td></tr><tr><th>0402</th><th>0603</th></tr><tr><td>Cap<1μF: 1V</td><td>Cap<1μF: 1V</td></tr><tr><td>Cap=1μF: 0.5V**</td><td></td></tr><tr><td>0402B224-16V: 0.5V</td><td>1μF≤Cap≤4.7μF: 0.5V</td></tr><tr><td>0402B474-10V: 0.5V</td><td></td></tr><tr><td>0402X475M6R3: 0.5V</td><td></td></tr><tr><td>1μF<Cap<10μF: 0.2V</td><td>Cap>4.7μF: 0.2V</td></tr><tr><td>**0402B105M6R3V: 0.2V</td><td></td></tr><tr><td>Cap≥10μF: 0.1V</td><td></td></tr><tr><th>0805</th><th>1206/1210</th></tr><tr><td>Cap<10μF: 1V</td><td>Cap≤10μF: 1V</td></tr><tr><td>Cap=10μF: 0.5V</td><td>10μF<Cap≤100μF: 0.5V</td></tr><tr><td>Cap>10μF: 0.2V</td><td>Cap>100μF: 0.2V</td></tr></table>		01005	0201	Cap≤0.01μF: 0.5V	Cap<0.1μF:1V	Cap>0.01μF: 0.2V	0.1μF*≤Cap<1μF: 0.2V		Cap≥1μF: 0.1V		* 0201X104/16V: 0.5V 0201X224/10V: 0.5V	0402	0603	Cap<1μF: 1V	Cap<1μF: 1V	Cap=1μF: 0.5V**		0402B224-16V: 0.5V	1μF≤Cap≤4.7μF: 0.5V	0402B474-10V: 0.5V		0402X475M6R3: 0.5V		1μF<Cap<10μF: 0.2V	Cap>4.7μF: 0.2V	**0402B105M6R3V: 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	
01005	0201																																					
Cap≤0.01μF: 0.5V	Cap<0.1μF:1V																																					
Cap>0.01μF: 0.2V	0.1μF*≤Cap<1μF: 0.2V																																					
	Cap≥1μF: 0.1V																																					
	* 0201X104/16V: 0.5V 0201X224/10V: 0.5V																																					
0402	0603																																					
Cap<1μF: 1V	Cap<1μF: 1V																																					
Cap=1μF: 0.5V**																																						
0402B224-16V: 0.5V	1μF≤Cap≤4.7μF: 0.5V																																					
0402B474-10V: 0.5V																																						
0402X475M6R3: 0.5V																																						
1μF<Cap<10μF: 0.2V	Cap>4.7μF: 0.2V																																					
**0402B105M6R3V: 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																																					
7.	Adhesive Strength of Termination	* Pressurizing force : 2N (0201) and 5N (≤0603) and 10N (>0603) * Test time: 10±1 sec.	* No remarkable damage or removal of the terminations.																																			
8.	Vibration Resistance	* Vibration frequency: 10~55 Hz/min. * Total amplitude: 1.5mm * Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.) *Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24± 2 hrs at room temp. *Cap./DF(Q) Measurement to be made after de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.																																			
9.	Solderability	* Solder temperature: 235±5℃ * Dipping time: 2±0.5 sec.	95% mint. coverage of all metalized area.																																			
10.	Bending Test	* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec. *Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24± 2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs.	* No remarkable damage. * Cap change : NP0: within ±5% or 0.5pF whichever is larger X7R, X5R: 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.)																																			
11.	Resistance to Soldering Heat	* Solder temperature: 260±5℃ * Dipping time: 10±1 sec * Preheating: 120 to 150℃ for 1 minute before immerse the capacitor in a eutectic solder. *Before initial measurement (Class II only): To apply de-aging at 150℃ 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℃ for 1hr then set for 24±2 hrs at room temp .	* No remarkable damage. * Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements * 25% max. leaching on each edge.																																			
12.	Temperature Cycle	* Conduct the five cycles according to the temperatures and time. <table><tr><th>Step</th><th>Temp. (℃)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table> *Before initial measurement (Class II only): To apply de-aging at 150℃ 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℃ for 1hr then set for 24±2 hrs at room temp .	Step	Temp. (℃)	Time (min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	* No remarkable damage. Cap change : NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements																				
Step	Temp. (℃)	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℃	* No remarkable damage.																																			
		*Humidity: 90~95%RH	* Cap change:																																			
		*Test time: 500+24/-0hrs.	NP0: within ±5% or 0.5pF whichever is larger																																			
		*Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.	X7R, X5R: ≥10V**, within ±12.5%; ≤ 6.3V within ±25%;																																			
		*Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.	**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:																																			
			<table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td rowspan="3">≥100V</td><td rowspan="3">≤ 3%</td><td>≤ 6% 1206 ≥ 0.47μF</td></tr><tr><td>≤ 7.5% 0603 ≥ 0.068μF, 0805 > 0.1μF, 1206 ≥ 1μF; 1210 ≥ 2.2μF</td></tr><tr><td>≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF</td></tr><tr><td rowspan="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 ≥ 3.3μF</td></tr><tr><td>≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF(0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF</td></tr><tr><td>35V</td><td>≤ 5%</td><td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td></tr><tr><td rowspan="4">25V</td><td rowspan="4">≤ 5%</td><td>≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td></tr><tr><td>≤ 14% 0603 ≥ 0.33μF</td></tr><tr><td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF(1210/X5R ≥ 10μF)</td></tr><tr><td>≤ 20% 0402 ≥ 0.47μF</td></tr><tr><td>16V</td><td>≤ 5%</td><td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">≤ 7.5%</td><td>≤ 15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td></tr><tr><td>≤ 20% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td></tr><tr><td>6.3V</td><td>≤ 15%</td><td>≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF</td></tr><tr><td>4V</td><td>≤ 20%</td><td>---</td></tr></table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥100V	≤ 3%	≤ 6% 1206 ≥ 0.47μF	≤ 7.5% 0603 ≥ 0.068μF, 0805 > 0.1μF, 1206 ≥ 1μF; 1210 ≥ 2.2μF	≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF	50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF	≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF(0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤ 14% 0603 ≥ 0.33μF	≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF(1210/X5R ≥ 10μF)	≤ 20% 0402 ≥ 0.47μF	16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 20% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF	4V	≤ 20%	---
		Rated vol.	D.F. ≤	Exception of D.F. ≤																																		
		≥100V	≤ 3%	≤ 6% 1206 ≥ 0.47μF																																		
≤ 7.5% 0603 ≥ 0.068μF, 0805 > 0.1μF, 1206 ≥ 1μF; 1210 ≥ 2.2μF																																						
≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF																																						
50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																				
		≤ 10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF																																				
		≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF(0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF																																				
35V	≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																				
25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																				
		≤ 14% 0603 ≥ 0.33μF																																				
		≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF(1210/X5R ≥ 10μF)																																				
		≤ 20% 0402 ≥ 0.47μF																																				
16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																				
10V	≤ 7.5%	≤ 15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																				
		≤ 20% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																				
6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF																																				
4V	≤ 20%	---																																				
		Y5V:																																				
		<table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td rowspan="2">≥50V</td><td rowspan="2">≤ 7.5%</td><td>≤ 10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF</td></tr><tr><td>≤ 20% 1210 ≥ 6.8μF</td></tr><tr><td>35V</td><td>≤ 10%</td><td>---</td></tr><tr><td rowspan="2">25V</td><td rowspan="2">≤ 7.5%</td><td>≤ 10% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF</td></tr><tr><td>≤ 15% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td></tr><tr><td>16V (C<1.0μF)</td><td>≤ 10%</td><td>≤ 12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td></tr><tr><td rowspan="2">16V (C≥1.0μF)</td><td rowspan="2">≤ 12.5%</td><td>≤ 20% 0402 ≥ 0.22μF</td></tr><tr><td>≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF</td></tr><tr><td>10V</td><td>≤ 20%</td><td>≤ 30% 0402 ≥ 0.47μF</td></tr><tr><td>6.3V</td><td>≤ 30%</td><td>---</td></tr></table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥50V	≤ 7.5%	≤ 10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF	≤ 20% 1210 ≥ 6.8μF	35V	≤ 10%	---	25V	≤ 7.5%	≤ 10% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF	≤ 15% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C<1.0μF)	≤ 10%	≤ 12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF	16V (C≥1.0μF)	≤ 12.5%	≤ 20% 0402 ≥ 0.22μF	≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF	10V	≤ 20%	≤ 30% 0402 ≥ 0.47μF	6.3V	≤ 30%	---									
Rated vol.	D.F. ≤	Exception of D.F. ≤																																				
≥50V	≤ 7.5%	≤ 10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF																																				
		≤ 20% 1210 ≥ 6.8μF																																				
35V	≤ 10%	---																																				
25V	≤ 7.5%	≤ 10% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF																																				
		≤ 15% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																				
16V (C<1.0μF)	≤ 10%	≤ 12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																				
16V (C≥1.0μF)	≤ 12.5%	≤ 20% 0402 ≥ 0.22μF																																				
		≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF																																				
10V	≤ 20%	≤ 30% 0402 ≥ 0.47μF																																				
6.3V	≤ 30%	---																																				
		*I.R.: ≥10V, 1GΩ or 50 Ω·F whichever is smaller.																																				
		Class II (X7R, X5R, Y5V)																																				
		<table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: All X7R; 1210 ≥ 3.3μF</td><td rowspan="8">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 ; All X6S/X7S items; Size ≥ 1812</td></tr></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 ; 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 ; All X6S/X7S items; Size ≥ 1812																																						

Multilayer Ceramic Capacitors

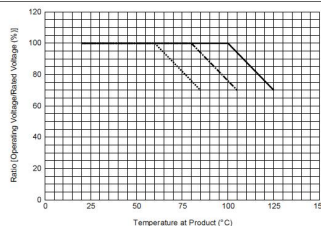
Approval Sheet

No	Item	Test Condition	Requirements																																																																								
14	Humidity (Damp Heat) Load	*Test temp. : 40±2℃ *Humidity : 90~95%RH *Test time : 500+24/-0 hrs. *To apply voltage : Rated voltage (MAX. 500V) *Before initial measurement (Class II only): To apply de-aging at 150℃ 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℃ for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. Cap change: NP0: ±7.5% or 0.75pF whichever is larger. X7R, X5R: ≥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: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C X7R, X5R: <table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td rowspan="3">≥ 100V</td><td rowspan="3">≤ 3%</td><td>≤ 6% 1206 ≥ 0.47μF</td></tr><tr><td>≤ 7.5% 0603 ≥ 0.068μF, 0805 > 0.1μF, 1206 ≥ 1μF;1210 ≥ 2.2μF</td></tr><tr><td>≤ 20% 0805 > 0.22μF;1210 ≥ 3.3μF</td></tr><tr><td rowspan="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 ≥ 3.3μF</td></tr><tr><td>≤ 20% 0402 ≥ 0.012μF;0603>0.1μF; 0805 ≥ 1μF(0805/X7R>0.47μF); 1206 ≥ 2.2μF;1210 ≥ 10μF</td></tr><tr><td>35V</td><td>≤ 5%</td><td>≤ 20% 0603 ≥ 1μF;0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF</td></tr><tr><td rowspan="4">25V</td><td rowspan="4">≤ 5%</td><td>≤ 10% 0201 ≥ 0.01μF;0805 ≥ 1μF;1210 ≥ 10μF</td></tr><tr><td>≤ 14% 0603 ≥ 0.33μF</td></tr><tr><td>≤ 15% 0201 ≥ 0.1μF;0402 ≥ 0.10μF&(0402/X7R ≥ 0.056μF);0603 ≥ 0.47μF; 0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF(1210/X5R ≥ 10μF)</td></tr><tr><td>≤ 20% 0402 ≥ 0.47μF</td></tr><tr><td>16V</td><td>≤ 5%</td><td>≤ 10% 0603 ≥ 0.15μF;0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">≤ 7.5%</td><td>≤ 15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF);0402 ≥ 0.033μF; 0603>0.47μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF</td></tr><tr><td>≤ 20% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 22μF</td></tr><tr><td>6.3V</td><td>≤ 15%</td><td>≤ 30% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603/X5R ≥ 10μF</td></tr><tr><td>4V</td><td>≤ 20%</td><td>---</td></tr></table> Y5V: <table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td>≥ 50V</td><td>≤ 7.5%</td><td>≤ 10% 0603 ≥ 0.1μF;0805 ≥ 0.47μF;1206 ≥ 4.7μF</td></tr><tr><td rowspan="2">35V</td><td rowspan="2">≤ 10%</td><td>≤ 20% 1210 ≥ 6.8μF</td></tr><tr><td>---</td></tr><tr><td rowspan="2">25V</td><td rowspan="2">≤ 7.5%</td><td>≤ 10% 0402 ≥ 0.047μF;0603 ≥ 0.1μF; 0805 ≥ 0.33μF;1206 ≥ 1μF; 1210 ≥ 4.7μF</td></tr><tr><td>≤ 15% 0402 ≥ 0.068μF;0603 ≥ 0.47μF; 1206 ≥ 4.7μF;1210 ≥ 22μF</td></tr><tr><td>16V (C<1.0μF)</td><td>≤ 10%</td><td>≤ 12.5% 0402 ≥ 0.068μF;0603 ≥ 0.68μF</td></tr><tr><td rowspan="2">16V (C ≥ 1.0μF)</td><td rowspan="2">≤ 12.5%</td><td>≤ 20% 0402 ≥ 0.22μF</td></tr><tr><td>≤ 20% 0603 ≥ 2.2μF;0805 ≥ 3.3μF; 1206 ≥ 10μF;1210 ≥ 22μF;1812 ≥ 47μF;</td></tr><tr><td>10V</td><td>≤ 20%</td><td>≤ 30% 0402 ≥ 0.47μF</td></tr><tr><td>6.3V</td><td>≤ 30%</td><td>---</td></tr></table> *I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. Class II (X7R, X5R, Y5V) <table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="7">500MΩ or RxC ≥ 5 Ω-F whichever is smaller.</td></tr><tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr><tr><td>35V:0603≥1μF;0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF</td></tr><tr><td>25V:0201 ≥ 0.1uF; 0402≥0.22μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF</td></tr><tr><td>16V: 0201 ≥ 0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF</td></tr><tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF</td></tr><tr><td>6.3V ; 4V ; TT series ; All X6S/X7S items; Size≥1812</td></tr></table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 100V	≤ 3%	≤ 6% 1206 ≥ 0.47μF	≤ 7.5% 0603 ≥ 0.068μF, 0805 > 0.1μF, 1206 ≥ 1μF;1210 ≥ 2.2μF	≤ 20% 0805 > 0.22μF;1210 ≥ 3.3μF	50V	≤ 3%	≤ 6% 0201(50V);0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10% 0201 ≥ 0.01uF;1210 ≥ 3.3μF	≤ 20% 0402 ≥ 0.012μF;0603>0.1μF; 0805 ≥ 1μF(0805/X7R>0.47μF); 1206 ≥ 2.2μF;1210 ≥ 10μF	35V	≤ 5%	≤ 20% 0603 ≥ 1μF;0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF	25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF;0805 ≥ 1μF;1210 ≥ 10μF	≤ 14% 0603 ≥ 0.33μF	≤ 15% 0201 ≥ 0.1μF;0402 ≥ 0.10μF&(0402/X7R ≥ 0.056μF);0603 ≥ 0.47μF; 0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF(1210/X5R ≥ 10μF)	≤ 20% 0402 ≥ 0.47μF	16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF;0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF);0402 ≥ 0.033μF; 0603>0.47μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF	≤ 20% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 22μF	6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603/X5R ≥ 10μF	4V	≤ 20%	---	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 7.5%	≤ 10% 0603 ≥ 0.1μF;0805 ≥ 0.47μF;1206 ≥ 4.7μF	35V	≤ 10%	≤ 20% 1210 ≥ 6.8μF	---	25V	≤ 7.5%	≤ 10% 0402 ≥ 0.047μF;0603 ≥ 0.1μF; 0805 ≥ 0.33μF;1206 ≥ 1μF; 1210 ≥ 4.7μF	≤ 15% 0402 ≥ 0.068μF;0603 ≥ 0.47μF; 1206 ≥ 4.7μF;1210 ≥ 22μF	16V (C<1.0μF)	≤ 10%	≤ 12.5% 0402 ≥ 0.068μF;0603 ≥ 0.68μF	16V (C ≥ 1.0μF)	≤ 12.5%	≤ 20% 0402 ≥ 0.22μF	≤ 20% 0603 ≥ 2.2μF;0805 ≥ 3.3μF; 1206 ≥ 10μF;1210 ≥ 22μF;1812 ≥ 47μF;	10V	≤ 20%	≤ 30% 0402 ≥ 0.47μF	6.3V	≤ 30%	---	Rated voltage	Insulation Resistance	100V: 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 vol.	D.F. ≤	Exception of D.F. ≤																																																																									
≥ 100V	≤ 3%	≤ 6% 1206 ≥ 0.47μF																																																																									
		≤ 7.5% 0603 ≥ 0.068μF, 0805 > 0.1μF, 1206 ≥ 1μF;1210 ≥ 2.2μF																																																																									
		≤ 20% 0805 > 0.22μF;1210 ≥ 3.3μF																																																																									
50V	≤ 3%	≤ 6% 0201(50V);0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																									
		≤ 10% 0201 ≥ 0.01uF;1210 ≥ 3.3μF																																																																									
		≤ 20% 0402 ≥ 0.012μF;0603>0.1μF; 0805 ≥ 1μF(0805/X7R>0.47μF); 1206 ≥ 2.2μF;1210 ≥ 10μF																																																																									
35V	≤ 5%	≤ 20% 0603 ≥ 1μF;0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF																																																																									
25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF;0805 ≥ 1μF;1210 ≥ 10μF																																																																									
		≤ 14% 0603 ≥ 0.33μF																																																																									
		≤ 15% 0201 ≥ 0.1μF;0402 ≥ 0.10μF&(0402/X7R ≥ 0.056μF);0603 ≥ 0.47μF; 0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF(1210/X5R ≥ 10μF)																																																																									
		≤ 20% 0402 ≥ 0.47μF																																																																									
16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF;0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF																																																																									
10V	≤ 7.5%	≤ 15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF);0402 ≥ 0.033μF; 0603>0.47μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF																																																																									
		≤ 20% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 22μF																																																																									
6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603/X5R ≥ 10μF																																																																									
4V	≤ 20%	---																																																																									
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																									
≥ 50V	≤ 7.5%	≤ 10% 0603 ≥ 0.1μF;0805 ≥ 0.47μF;1206 ≥ 4.7μF																																																																									
35V	≤ 10%	≤ 20% 1210 ≥ 6.8μF																																																																									

25V	≤ 7.5%	≤ 10% 0402 ≥ 0.047μF;0603 ≥ 0.1μF; 0805 ≥ 0.33μF;1206 ≥ 1μF; 1210 ≥ 4.7μF																																																																									
		≤ 15% 0402 ≥ 0.068μF;0603 ≥ 0.47μF; 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																									
16V (C<1.0μF)	≤ 10%	≤ 12.5% 0402 ≥ 0.068μF;0603 ≥ 0.68μF																																																																									
16V (C ≥ 1.0μF)	≤ 12.5%	≤ 20% 0402 ≥ 0.22μF																																																																									
		≤ 20% 0603 ≥ 2.2μF;0805 ≥ 3.3μF; 1206 ≥ 10μF;1210 ≥ 22μF;1812 ≥ 47μF;																																																																									
10V	≤ 20%	≤ 30% 0402 ≥ 0.47μF																																																																									
6.3V	≤ 30%	---																																																																									
Rated voltage	Insulation Resistance																																																																										
100V: 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: 125±3°C X5R, Y5V: 85±3°C Test time: 1000+24/-0 hrs. To apply voltage: (1) ≤ 6.3V or C ≥10μF: 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. <table><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance</th></tr><tr><td>0201</td><td>X5R/X7R/X6S</td><td>≤10V ≥16V</td><td>C ≥0.1μF C >0.1μF</td></tr><tr><td></td><td></td><td>≤16V</td><td>C >1.0μF</td></tr><tr><td></td><td>X5R</td><td>25V, 50V</td><td>C ≥1.0μF</td></tr><tr><td>0402</td><td>X6S</td><td>6.3V, 10V 16V, 25V</td><td>C ≥1.0μF C ≥1.0μF</td></tr><tr><td></td><td>X7R/X7S/Y5V</td><td>6.3V, 10V</td><td>C ≥1.0μF</td></tr><tr><td></td><td>X5R/X7R/X6S/X7S</td><td>4V 6.3V, 10V</td><td>C ≥22μF C ≥4.7μF</td></tr><tr><td>0603</td><td>X5R/X6S/X7S</td><td>25V</td><td>C ≥1.0μF</td></tr><tr><td></td><td>X7R</td><td>35V</td><td>C ≥1.0μF</td></tr><tr><td></td><td></td><td>4V</td><td>C ≥47μF</td></tr><tr><td></td><td>X5R/X7R/X6S/X7S</td><td>6.3V 10V, 50V</td><td>C ≥22μF C ≥10μF</td></tr><tr><td></td><td>X7R/X6S/X7S</td><td>16V, 25V</td><td>C ≥10μF</td></tr><tr><td></td><td>X5R</td><td></td><td>C ≥22μF</td></tr><tr><td>1206</td><td>X5R/X7R/X6S</td><td>≤6.3V</td><td>C ≥47μF</td></tr><tr><td></td><td>X5R/X7R/X6S</td><td>16V</td><td>C ≥47μF</td></tr><tr><td>1210</td><td>X7R</td><td>100V</td><td>C ≥3.3μF</td></tr></table> **1WV items must follow de-rating conditions. (6) 150% of rated voltage for below range. <table><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance</th></tr><tr><td>0201</td><td>X5R/X6S</td><td>16V, 25V</td><td>C=0.1μF</td></tr><tr><td></td><td>X7R</td><td>16V</td><td>C ≥0.022μF</td></tr><tr><td></td><td>X7R/X5R/X6S</td><td>50V</td><td>C >0.01μF</td></tr><tr><td>0402</td><td>X6S</td><td>10~25V</td><td>C ≥0.22μF</td></tr><tr><td></td><td>Y5V</td><td>16V</td><td>C ≥0.47μF</td></tr><tr><td></td><td>X7S</td><td>50V~100V</td><td>C >0.22μF</td></tr><tr><td></td><td></td><td>50V</td><td>C >0.1μF</td></tr><tr><td></td><td>X7R</td><td>25V</td><td>C=1.0μF</td></tr><tr><td></td><td>X5R</td><td>50V</td><td>C ≥1.0μF</td></tr><tr><td></td><td>X5R/X7R/X6S/X7S</td><td>10V, 16V</td><td>C ≥1.0μF</td></tr><tr><td></td><td>Y5V</td><td>16V</td><td>C ≥2.2μF</td></tr><tr><td></td><td></td><td>100V</td><td>C ≥0.47μF</td></tr><tr><td></td><td>X5R/X7R/X6S/X7S</td><td>50V</td><td>C ≥0.68μF</td></tr><tr><td></td><td></td><td>35V</td><td>C ≥2.2μF</td></tr><tr><td></td><td>Y5V</td><td>10~25V</td><td>C ≥4.7μF</td></tr><tr><td></td><td></td><td>16V</td><td>C ≥4.7μF</td></tr><tr><td></td><td>X7R</td><td>100V</td><td>C ≥1.0μF</td></tr><tr><td></td><td></td><td>50V</td><td>C=4.7μF</td></tr><tr><td></td><td>X5R/X6S/X7S</td><td>100V</td><td>C >1.0μF</td></tr><tr><td></td><td></td><td>50V</td><td>C=4.7μF</td></tr><tr><td>1210</td><td>X5R/X7R/X6S/X7S</td><td>50V~100V</td><td>C ≥2.2μF</td></tr><tr><td>1825 2220 2225</td><td>X7R</td><td>100V~250V</td><td>C ≥1.0μF</td></tr></table> * Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * De-rating conditions: Ratio (Operating Voltage/Rated Voltage) [%] Temperature at Product (°C) — Product for 125°C — Product for 100°C — Product for 85°C * No remarkable damage. Cap change: NP0: ±3.0% or ±0.3pF whichever is larger X7R, X5R: ≥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: <table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td>≥100V</td><td>≤3%</td><td>≤6% 1206 ≥0.47μF ≤7.5% 0603 ≥0.068μF, 0805 >0.1μF, 1206 ≥1μF; 1210 ≥2.2μF ≤20% 0805 >0.22μF; 1210 ≥3.3μF</td></tr><tr><td>50V</td><td>≤3%</td><td>≤6% 0201(50V); 0603 ≥0.047μF; 0805 ≥0.18μF; 1206 ≥0.47μF ≤10% 0201 ≥0.01μF; 1210 ≥3.3μF ≤20% 0402 ≥0.012μF; 0603 >0.1μF; 0805 ≥1μF (0805/X7R >0.47μF); 1206 ≥2.2μF; 1210 ≥10μF</td></tr><tr><td>35V</td><td>≤5%</td><td>≤20% 0603 ≥1μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥10μF ≤10% 0201 ≥0.01μF; 0805 ≥1μF; 1210 ≥10μF ≤14% 0603 ≥0.33μF</td></tr><tr><td>25V</td><td>≤5%</td><td>≤15% 0201 ≥0.1μF; 0402 ≥0.10μF & (0402/X7R ≥0.056μF); 0603 ≥0.47μF 0805 ≥2.2μF; 1206 ≥4.7μF; 1210 ≥22μF (1210/X5R ≥10μF) ≤20% 0402 ≥0.47μF</td></tr><tr><td>16V</td><td>≤5%</td><td>≤10% 0603 ≥0.15μF; 0805 ≥0.68μF; 1206 ≥2.2μF; 1210 ≥4.7μF ≤15% 0201 ≥0.01μF (0201/X7R ≥0.022μF); 0402 ≥0.033μF; 0603 >0.47μF; 0805 ≥2.2μF; 1206 ≥4.7μF; 1210 ≥22μF</td></tr><tr><td>10V</td><td>≤7.5%</td><td>≤15% 0201 ≥0.012μF; 0402 ≥0.22μF; 0603 ≥0.33μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥22μF ≤20% 0201 ≥0.1μF (0201/X5R >0.1μF); 0402 ≥1μF; (0603/X5R ≥10μF); 01R5/X5R</td></tr><tr><td>6.3V</td><td>≤15%</td><td>≤30% 0201 ≥0.1μF (0201/X5R >0.1μF); 0402 ≥1μF (0402/X6S ≥0.47μF); 0603 ≥10μF; 0805 ≥4.7μF; 1206 ≥47μF; 1210 ≥100μF</td></tr><tr><td>4V</td><td>≤20%</td><td>---</td></tr></table> Y5V: ALLIANCE <table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td>≥50V</td><td>≤7.5%</td><td>≤10% 0603 ≥0.1μF; 0805 ≥0.47μF; 1206 ≥4.7μF ≤20% 1210 ≥6.8μF</td></tr><tr><td>35V</td><td>≤10%</td><td>---</td></tr><tr><td>25V</td><td>≤7.5%</td><td>≤10% 0402 ≥0.047μF; 0603 ≥0.1μF; 0805 ≥0.33μF; 1206 ≥1μF; 1210 ≥4.7μF ≤15% 0402 ≥0.068μF; 0603 ≥0.47μF; 1206 ≥4.7μF; 1210 ≥22μF</td></tr><tr><td>16V (C < 1.0μF)</td><td>≤10%</td><td>≤12.5% 0402 ≥0.068μF; 0603 ≥0.68μF ≤20% 0402 ≥0.22μF</td></tr><tr><td>16V (C ≥ 1.0μF)</td><td>≤12.5%</td><td>≤20% 0603 ≥2.2μF; 0805 ≥3.3μF; 1206 ≥10μF; 1210 ≥22μF; 1812 ≥47μF;</td></tr><tr><td>10V</td><td>≤20%</td><td>≤30% 0402 ≥0.47μF</td></tr><tr><td>6.3V</td><td>≤30%</td><td>---</td></tr></table> *I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller. Class II (X7R, X5R, Y5V) <table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: All X7R; 1210 ≥3.3μF</td><td rowspan="6">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><td></td></tr></table>	Size	Dielectric	Rated voltage	Capacitance	0201	X5R/X7R/X6S	≤10V ≥16V	C ≥0.1μF C >0.1μF			≤16V	C >1.0μF		X5R	25V, 50V	C ≥1.0μF	0402	X6S	6.3V, 10V 16V, 25V	C ≥1.0μF C ≥1.0μF		X7R/X7S/Y5V	6.3V, 10V	C ≥1.0μF		X5R/X7R/X6S/X7S	4V 6.3V, 10V	C ≥22μF C ≥4.7μF	0603	X5R/X6S/X7S	25V	C ≥1.0μF		X7R	35V	C ≥1.0μF			4V	C ≥47μF		X5R/X7R/X6S/X7S	6.3V 10V, 50V	C ≥22μF C ≥10μF		X7R/X6S/X7S	16V, 25V	C ≥10μF		X5R		C ≥22μF	1206	X5R/X7R/X6S	≤6.3V	C ≥47μF		X5R/X7R/X6S	16V	C ≥47μF	1210	X7R	100V	C ≥3.3μF	Size	Dielectric	Rated voltage	Capacitance	0201	X5R/X6S	16V, 25V	C=0.1μF		X7R	16V	C ≥0.022μF		X7R/X5R/X6S	50V	C >0.01μF	0402	X6S	10~25V	C ≥0.22μF		Y5V	16V	C ≥0.47μF		X7S	50V~100V	C >0.22μF			50V	C >0.1μF		X7R	25V	C=1.0μF		X5R	50V	C ≥1.0μF		X5R/X7R/X6S/X7S	10V, 16V	C ≥1.0μF		Y5V	16V	C ≥2.2μF			100V	C ≥0.47μF		X5R/X7R/X6S/X7S	50V	C ≥0.68μF			35V	C ≥2.2μF		Y5V	10~25V	C ≥4.7μF			16V	C ≥4.7μF		X7R	100V	C ≥1.0μF			50V	C=4.7μF		X5R/X6S/X7S	100V	C >1.0μF			50V	C=4.7μF	1210	X5R/X7R/X6S/X7S	50V~100V	C ≥2.2μF	1825 2220 2225	X7R	100V~250V	C ≥1.0μF	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥100V	≤3%	≤6% 1206 ≥0.47μF ≤7.5% 0603 ≥0.068μF, 0805 >0.1μF, 1206 ≥1μF; 1210 ≥2.2μF ≤20% 0805 >0.22μF; 1210 ≥3.3μF	50V	≤3%	≤6% 0201(50V); 0603 ≥0.047μF; 0805 ≥0.18μF; 1206 ≥0.47μF ≤10% 0201 ≥0.01μF; 1210 ≥3.3μF ≤20% 0402 ≥0.012μF; 0603 >0.1μF; 0805 ≥1μF (0805/X7R >0.47μF); 1206 ≥2.2μF; 1210 ≥10μF	35V	≤5%	≤20% 0603 ≥1μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥10μF ≤10% 0201 ≥0.01μF; 0805 ≥1μF; 1210 ≥10μF ≤14% 0603 ≥0.33μF	25V	≤5%	≤15% 0201 ≥0.1μF; 0402 ≥0.10μF & (0402/X7R ≥0.056μF); 0603 ≥0.47μF 0805 ≥2.2μF; 1206 ≥4.7μF; 1210 ≥22μF (1210/X5R ≥10μF) ≤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 >0.47μF; 0805 ≥2.2μF; 1206 ≥4.7μF; 1210 ≥22μF	10V	≤7.5%	≤15% 0201 ≥0.012μF; 0402 ≥0.22μF; 0603 ≥0.33μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥22μF ≤20% 0201 ≥0.1μF (0201/X5R >0.1μF); 0402 ≥1μF; (0603/X5R ≥10μF); 01R5/X5R	6.3V	≤15%	≤30% 0201 ≥0.1μF (0201/X5R >0.1μF); 0402 ≥1μF (0402/X6S ≥0.47μF); 0603 ≥10μF; 0805 ≥4.7μF; 1206 ≥47μF; 1210 ≥100μF	4V	≤20%	---	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥50V	≤7.5%	≤10% 0603 ≥0.1μF; 0805 ≥0.47μF; 1206 ≥4.7μF ≤20% 1210 ≥6.8μF	35V	≤10%	---	25V	≤7.5%	≤10% 0402 ≥0.047μF; 0603 ≥0.1μF; 0805 ≥0.33μF; 1206 ≥1μF; 1210 ≥4.7μF ≤15% 0402 ≥0.068μF; 0603 ≥0.47μF; 1206 ≥4.7μF; 1210 ≥22μF	16V (C < 1.0μF)	≤10%	≤12.5% 0402 ≥0.068μF; 0603 ≥0.68μF ≤20% 0402 ≥0.22μF	16V (C ≥ 1.0μF)	≤12.5%	≤20% 0603 ≥2.2μF; 0805 ≥3.3μF; 1206 ≥10μF; 1210 ≥22μF; 1812 ≥47μF;	10V	≤20%	≤30% 0402 ≥0.47μF	6.3V	≤30%	---	Rated voltage	Insulation Resistance	100V: 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	
Size	Dielectric	Rated voltage	Capacitance																																																																																																																																																																																																																									
0201	X5R/X7R/X6S	≤10V ≥16V	C ≥0.1μF C >0.1μF																																																																																																																																																																																																																									
		≤16V	C >1.0μF																																																																																																																																																																																																																									
	X5R	25V, 50V	C ≥1.0μF																																																																																																																																																																																																																									
0402	X6S	6.3V, 10V 16V, 25V	C ≥1.0μF C ≥1.0μF																																																																																																																																																																																																																									
	X7R/X7S/Y5V	6.3V, 10V	C ≥1.0μF																																																																																																																																																																																																																									
	X5R/X7R/X6S/X7S	4V 6.3V, 10V	C ≥22μF C ≥4.7μF																																																																																																																																																																																																																									
0603	X5R/X6S/X7S	25V	C ≥1.0μF																																																																																																																																																																																																																									
	X7R	35V	C ≥1.0μF																																																																																																																																																																																																																									
		4V	C ≥47μF																																																																																																																																																																																																																									
	X5R/X7R/X6S/X7S	6.3V 10V, 50V	C ≥22μF C ≥10μF																																																																																																																																																																																																																									
	X7R/X6S/X7S	16V, 25V	C ≥10μF																																																																																																																																																																																																																									
	X5R		C ≥22μF																																																																																																																																																																																																																									
1206	X5R/X7R/X6S	≤6.3V	C ≥47μF																																																																																																																																																																																																																									
	X5R/X7R/X6S	16V	C ≥47μF																																																																																																																																																																																																																									
1210	X7R	100V	C ≥3.3μF																																																																																																																																																																																																																									
Size	Dielectric	Rated voltage	Capacitance																																																																																																																																																																																																																									
0201	X5R/X6S	16V, 25V	C=0.1μF																																																																																																																																																																																																																									
	X7R	16V	C ≥0.022μF																																																																																																																																																																																																																									
	X7R/X5R/X6S	50V	C >0.01μF																																																																																																																																																																																																																									
0402	X6S	10~25V	C ≥0.22μF																																																																																																																																																																																																																									
	Y5V	16V	C ≥0.47μF																																																																																																																																																																																																																									
	X7S	50V~100V	C >0.22μF																																																																																																																																																																																																																									
		50V	C >0.1μF																																																																																																																																																																																																																									
	X7R	25V	C=1.0μF																																																																																																																																																																																																																									
	X5R	50V	C ≥1.0μF																																																																																																																																																																																																																									
	X5R/X7R/X6S/X7S	10V, 16V	C ≥1.0μF																																																																																																																																																																																																																									
	Y5V	16V	C ≥2.2μF																																																																																																																																																																																																																									
		100V	C ≥0.47μF																																																																																																																																																																																																																									
	X5R/X7R/X6S/X7S	50V	C ≥0.68μF																																																																																																																																																																																																																									
		35V	C ≥2.2μF																																																																																																																																																																																																																									
	Y5V	10~25V	C ≥4.7μF																																																																																																																																																																																																																									
		16V	C ≥4.7μF																																																																																																																																																																																																																									
	X7R	100V	C ≥1.0μF																																																																																																																																																																																																																									
		50V	C=4.7μF																																																																																																																																																																																																																									
	X5R/X6S/X7S	100V	C >1.0μF																																																																																																																																																																																																																									
		50V	C=4.7μF																																																																																																																																																																																																																									
1210	X5R/X7R/X6S/X7S	50V~100V	C ≥2.2μF																																																																																																																																																																																																																									
1825 2220 2225	X7R	100V~250V	C ≥1.0μF																																																																																																																																																																																																																									
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																																																																																																																																																										
≥100V	≤3%	≤6% 1206 ≥0.47μF ≤7.5% 0603 ≥0.068μF, 0805 >0.1μF, 1206 ≥1μF; 1210 ≥2.2μF ≤20% 0805 >0.22μF; 1210 ≥3.3μF																																																																																																																																																																																																																										
50V	≤3%	≤6% 0201(50V); 0603 ≥0.047μF; 0805 ≥0.18μF; 1206 ≥0.47μF ≤10% 0201 ≥0.01μF; 1210 ≥3.3μF ≤20% 0402 ≥0.012μF; 0603 >0.1μF; 0805 ≥1μF (0805/X7R >0.47μF); 1206 ≥2.2μF; 1210 ≥10μF																																																																																																																																																																																																																										
35V	≤5%	≤20% 0603 ≥1μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥10μF ≤10% 0201 ≥0.01μF; 0805 ≥1μF; 1210 ≥10μF ≤14% 0603 ≥0.33μF																																																																																																																																																																																																																										
25V	≤5%	≤15% 0201 ≥0.1μF; 0402 ≥0.10μF & (0402/X7R ≥0.056μF); 0603 ≥0.47μF 0805 ≥2.2μF; 1206 ≥4.7μF; 1210 ≥22μF (1210/X5R ≥10μF) ≤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 >0.47μF; 0805 ≥2.2μF; 1206 ≥4.7μF; 1210 ≥22μF																																																																																																																																																																																																																										
10V	≤7.5%	≤15% 0201 ≥0.012μF; 0402 ≥0.22μF; 0603 ≥0.33μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥22μF ≤20% 0201 ≥0.1μF (0201/X5R >0.1μF); 0402 ≥1μF; (0603/X5R ≥10μF); 01R5/X5R																																																																																																																																																																																																																										
6.3V	≤15%	≤30% 0201 ≥0.1μF (0201/X5R >0.1μF); 0402 ≥1μF (0402/X6S ≥0.47μF); 0603 ≥10μF; 0805 ≥4.7μF; 1206 ≥47μF; 1210 ≥100μF																																																																																																																																																																																																																										
4V	≤20%	---																																																																																																																																																																																																																										
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																																																																																																																																																										
≥50V	≤7.5%	≤10% 0603 ≥0.1μF; 0805 ≥0.47μF; 1206 ≥4.7μF ≤20% 1210 ≥6.8μF																																																																																																																																																																																																																										
35V	≤10%	---																																																																																																																																																																																																																										
25V	≤7.5%	≤10% 0402 ≥0.047μF; 0603 ≥0.1μF; 0805 ≥0.33μF; 1206 ≥1μF; 1210 ≥4.7μF ≤15% 0402 ≥0.068μF; 0603 ≥0.47μF; 1206 ≥4.7μF; 1210 ≥22μF																																																																																																																																																																																																																										
16V (C < 1.0μF)	≤10%	≤12.5% 0402 ≥0.068μF; 0603 ≥0.68μF ≤20% 0402 ≥0.22μF																																																																																																																																																																																																																										
16V (C ≥ 1.0μF)	≤12.5%	≤20% 0603 ≥2.2μF; 0805 ≥3.3μF; 1206 ≥10μF; 1210 ≥22μF; 1812 ≥47μF;																																																																																																																																																																																																																										
10V	≤20%	≤30% 0402 ≥0.47μF																																																																																																																																																																																																																										
6.3V	≤30%	---																																																																																																																																																																																																																										
Rated voltage	Insulation Resistance																																																																																																																																																																																																																											
100V: 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																																																																																																																																																																																																																												



APPENDIXES

■ Tape & reel dimensions

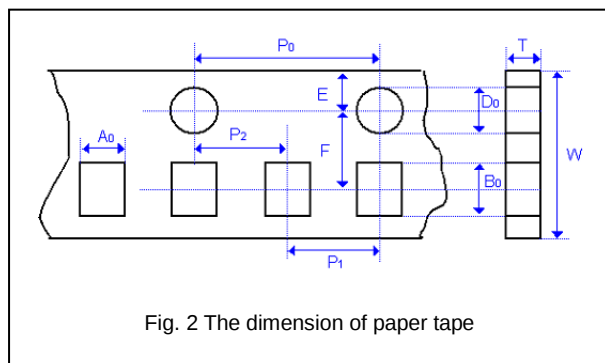


Fig. 2 The dimension of paper tape

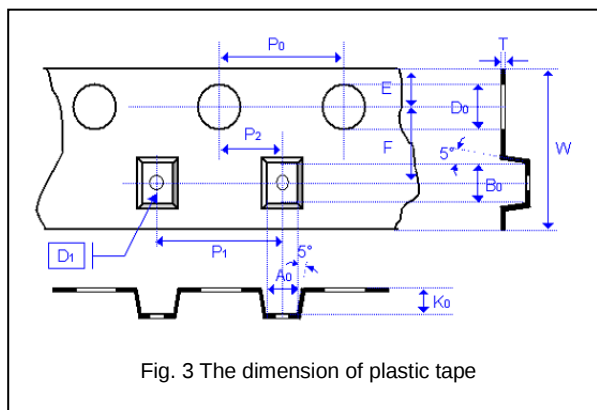


Fig. 3 The dimension of plastic tape

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
A ₀	0.40 +/-0.10	0.70 +/-0.20	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	< 2.30	< 3.05	< 3.05	< 3.05	< 3.20	< 2.50	< 2.50	< 3.90	< 3.90	< 3.90
B ₀	0.70 +/-0.10	1.20 +/-0.20	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	< 2.70	3.50 +/-0.50	< 3.70	< 4.00	< 3.80	< 3.80	< 3.80	< 4.00	< 5.30	< 5.30	< 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	0.23 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1
K ₀	-	-	-	-	-	< 2.00	-	< 2.00	< 2.50	< 1.50	< 2.00	< 2.50	< 3.20	< 2.00	< 2.50	< 2.00	< 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	8.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30
P ₀	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
10xP ₀	40.00 +/-0.10	40.00 +/-0.10	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20
P ₁	2.00 +/-0.05	2.00 +/-0.05	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10
P ₂	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	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	2.00 +/-0.10	2.00 +/-0.10
D ₀	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0
D ₁	-	-	-	-	-	1.00 +/-0.10	-	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-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	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	3.50 +/-0.05	5.50 +/-0.10	5.50 +/-0.10	5.50 +/-0.10	5.50 +/-0.10	5.50 +/-0.10

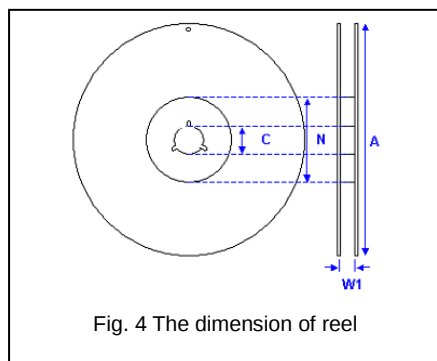
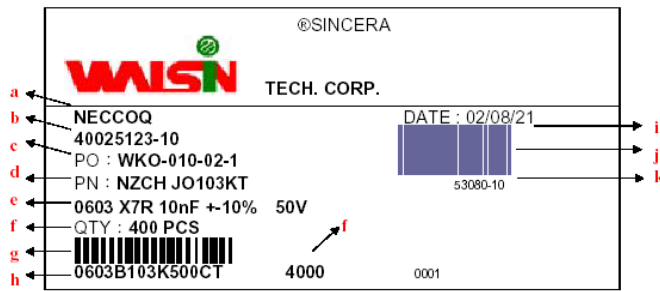


Fig. 4 The dimension of reel

Size	0201, 0402, 0603, 0805, 1206, 1210			1812
Reel size	7"	10"	13"	7"
C	13.0±0.5	13.0±0.5	13.0±0.5	13.0±0.5
W ₁	10.0±1.5	10.0±1.5	10.0±1.5	12.4±2.0/-0
A	178.0±2.0	250.0±2.0	330.0±2.0	178.0±2.0
N	60.0±1.0/-0	50 min	50 min	60.0±1.0/-0

Multilayer Ceramic Capacitors

Example of customer label

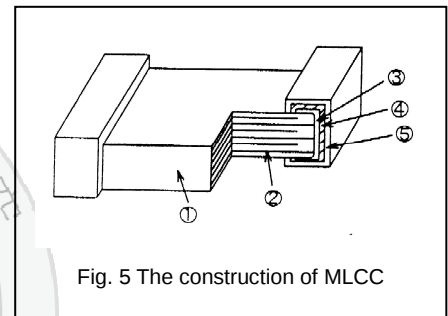


*Customized label is available upon request

- 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

Constructions

No.	Name	NP0,	X7R, X5R
①	Ceramic material	CaZrO ₃ based	BaTiO ₃ based
②	Inner electrode	Ni	
③	Termination	Inner layer	Cu
④		Middle layer	Ni
⑤		Outer layer	Sn (Matt)



Storage and handling conditions

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

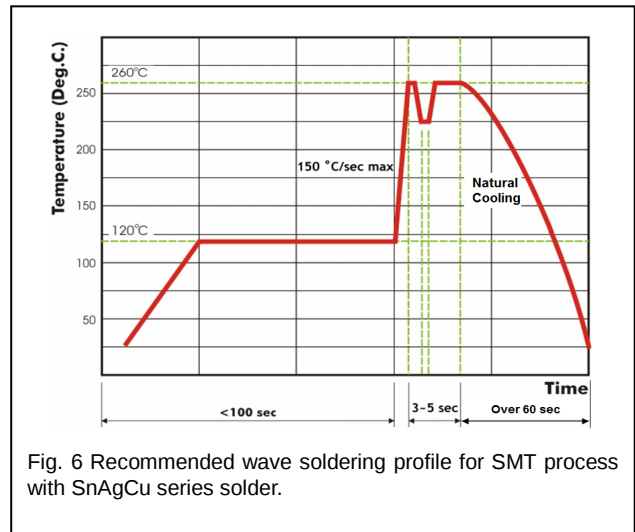
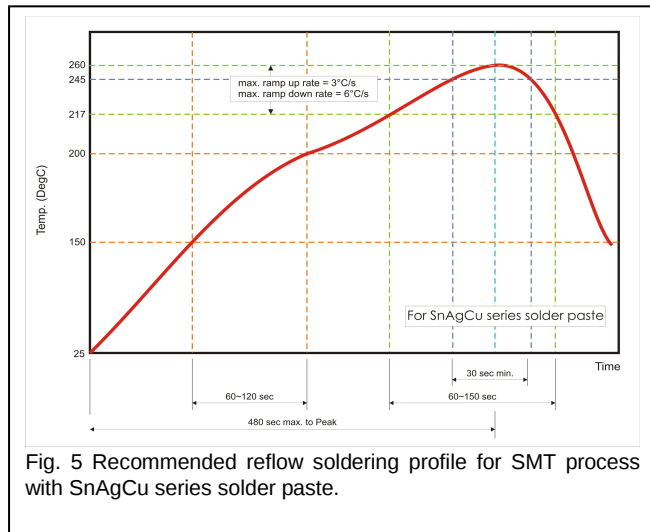
Cautions:

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

Multilayer Ceramic Capacitors

Recommended soldering conditions

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



Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Walsin:

[MG21B105K250CT](#) [MG32B224K500CT](#) [MG32B473K500CT](#) [MG18N101J500CT](#) [MG15B104K160CT](#)
[MG18B224K160CT](#) [MG21X475K250](#) [MG21X475K250CT](#) [MG15N821J250CT](#) [MG15X154K100CT](#)