

APPROVAL SHEET

MULTILAYER CERAMIC CAPACITORS

General Purpose Series (4V to 100V)

0201 to 1812 Sizes

NP0, X7R, Y5V, X6S & X5R Dielectrics

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 MLCC is made by NP0, X7R, X6S, X5R and Y5V dielectric material and which provides product with high electrical precision, stability and reliability.

2. FEATURES

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

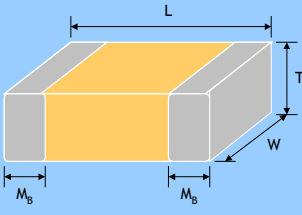
3. APPLICATIONS

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

4. HOW TO ORDER

<u>1206</u>	<u>B</u>	<u>104</u>	<u>K</u>	<u>500</u>	<u>C</u>	<u>I</u>
<u>Size</u>	<u>Dielectric</u>	<u>Capacitance</u>	<u>Tolerance</u>	<u>Rated voltage</u>	<u>Termination</u>	<u>Packaging style</u>
Inch (mm) 0201 (0603) 0402 (1005) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 1812 (4532)	N =NP0 (C0G) B =X7R F =Y5V X =X5R S =X6S	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	A =±0.05pF B =±0.1pF C =±0.25pF D =±0.5pF F =±1% G =±2% J =±5% K =±10% M =±20% Z =-20/+80%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 4R0 =4 VDC 6R3 =6.3 VDC 100 =10 VDC 160 =16 VDC 250 =25 VDC 500 =50 VDC 101 =100 VDC	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)
 <p>Fig. 1 The outline of MLCC</p>	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
				0.50+0.02/-0.05	Q	R	
		1.00±0.20	0.50±0.20	0.5±0.20	E	R	+0.05/-0.10
	0603 (1608)	1.60+0.15/-0.10	0.80+0.15/-0.10	0.80±0.07	S	R / W	0.40±0.15
				0.50±0.10	H	R / W	
		1.60±0.20 ^{#1}	0.80±0.20 ^{#1}	0.8±0.20 ^{#1}	X	R / W	
	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 ^{#4}	T ^{#4}	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	
		3.20±0.20	1.60±0.20	1.15±0.15	J	R	
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		
	3.20±0.40	2.50±0.30	1.60±0.20	G	R		
			2.00±0.20	K	R		
			2.50±0.30	M	R		
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		
			2.00±0.20	K	R		
	3.20±0.40	2.50±0.30	M	R			
		2.80±0.30	U	R			

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

** For 1808_200V ~3kV, 1812_200V~3kV and safety certificated products.

*** For 1206_1000V ~3kV,1808_200V ~3kV, 1812_200V~3kV and safety certificated products.

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

#2 : For 0201/Cap ≥ 0.68μF products.

#3 : For 0201/Cap ≥ 1μF products.

#4 : For 0805/0.22μF/100V/ T thickness:0.85+0.15/-0.1(mm)

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	Y5V	X5R	X6S
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812				
Capacitance range*	0.1pF to 0.1μF	100pF to 47μF	0.01μF to 100μF	100pF to 220μF	0.1μF to 100μF
Capacitance tolerance**	Cap≤5pF ^{#1} : A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	M (±20%), Z (-20/+80%)	K (±10%), M (±20%)	K (±10%), M (±20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	6.3V, 10V, 16V, 25V, 50V, 100V		4V, 6.3V, 10V, 16V, 25V, 50V	
DF(Tan δ)*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1			
Operating temperature	-55 to +125°C		-25 to +85°C	-55 to +85°C	-55 to +105°C
Capacitance characteristic	±30ppm	±15%	+30/-80%	±15%	±22%
Termination	Ni/Sn (lead-free termination)				

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

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

NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature

X7R/X6S/X5R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature.

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

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

Note 1:

X7R/X5R/X6S

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
50V	≤2.5%	≤3%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
		≤5%	1210 ≥ 4.7μF
		≤10%	0402 ≥ 0.1μF; 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; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF; TT series
		≤12.5%	0402 ≥ 0.47μF
16V	≤3.5%	≤5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF
		≤10%	0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series
		≤15%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); TT series
10V	≤5%	≤15%	0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5
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%	---	---

Y5V

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

7. CAPACITANCE RANGE

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

DIELECTRIC		NP0																	
SIZE		0201			0402				0603					0805					
RATED VOLTAGE (VDC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	0.1pF (0R1)	L	L	L	N	N	N	N											
	0.2pF (0R2)	L	L	L	N	N	N	N											
	0.3pF (0R3)	L	L	L	N	N	N	N		S	S	S	S						
	0.4pF (0R4)	L	L	L	N	N	N	N		S	S	S	S						
	0.5pF (0R5)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.6pF (0R6)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.7pF (0R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.8pF (0R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.9pF (0R9)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.0pF (1R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.2pF (1R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.5pF (1R5)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.8pF (1R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.0pF (2R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.2pF (2R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.7pF (2R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.0pF (3R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.3pF (3R3)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.9pF (3R9)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.0pF (4R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.7pF (4R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.0pF (5R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.6pF (5R6)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.0pF (6R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.8pF (6R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	7.0pF (7R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.0pF (8R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.2pF (8R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	9.0pF (9R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	10pF (100)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	12pF (120)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	15pF (150)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	18pF (180)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	22pF (220)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	27pF (270)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	33pF (330)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	39pF (390)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	47pF (470)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	56pF (560)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	68pF (680)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	82pF (820)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	100pF (101)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	120pF (121)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	150pF (151)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	180pF (181)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
220pF (221)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
270pF (271)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
330pF (331)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
390pF (391)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
470pF (471)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
560pF (561)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
680pF (681)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
820pF (821)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
1,000pF (102)				N	N	N	N		S	S	S	S	S	B	B	B	B	B	
1,200pF (122)									X	X	X	X	X*	B	B	B	B	B	
1,500pF (152)									X	X	X	X	X*	B	B	B	B	B	
1,800pF (182)									X	X	X	X		B	B	B	B	B	
2,200pF (222)									X	X	X	X		B	B	B	B	B	
2,700pF (272)									X	X	X	X		D	D	D	D	D	
3,300pF (332)									X	X	X	X		D	D	D	D	D	
3,900pF (392)									X*	X*	X*	X*		D	D	D	D	D	
4,700pF (472)									X*	X*	X*	X*		D	D	D	D	D	
5,600pF (562)									X*	X*	X*	X*		D	D	D	D	D	
6,800pF (682)									X*	X*	X*	X*		D	D	D	D	D	
8,200pF (822)									X*	X*	X*	X*		D	D	D	D	D	
0.010uF (103)									X*	X*	X*	X*		D	D	D	D	D	
0.012uF (123)														T*	T*	T*	T*		
0.015uF (153)														T*	T*	T*	T*		
0.018uF (183)														D*	D*	D*	D*		
0.022uF (223)														D*	D*	D*	D*		

1. The letter in cell is expressed the symbol of product thickness.
 2. The letter in cell with "*" mark is expressed capacitance tolerance "J" (±5%) only.
 3. For more information about products with special capacitance or other data, please contact WTC local representative.

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

DIELECTRIC		NP0														
SIZE		1206					1210					1812				
RATED VOLTAGE (VDC)		10	16	25	50	100	10	16	25	50	100	16	25	50	100	
Capacitance	1.0pF (1R0)															
	1.2pF (1R2)	B	B	B	B	B										
	1.5pF (1R5)	B	B	B	B	B										
	1.8pF (1R8)	B	B	B	B	B										
	2.2pF (2R2)	B	B	B	B	B										
	2.7pF (2R7)	B	B	B	B	B										
	3.3pF (3R3)	B	B	B	B	B										
	3.9pF (3R9)	B	B	B	B	B										
	4.7pF (4R7)	B	B	B	B	B										
	5.6pF (5R6)	B	B	B	B	B										
	6.8pF (6R8)	B	B	B	B	B										
	8.2pF (8R2)	B	B	B	B	B										
	10pF (100)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	12pF (120)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	15pF (150)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	18pF (180)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	22pF (220)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	27pF (270)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	33pF (330)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	39pF (390)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	47pF (470)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	56pF (560)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	68pF (680)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	82pF (820)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	100pF (101)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	120pF (121)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	150pF (151)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	180pF (181)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	220pF (221)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	270pF (271)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	330pF (331)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	390pF (391)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	470pF (471)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	560pF (561)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	680pF (681)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	820pF (821)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	1,000pF (102)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	1,200pF (122)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	1,500pF (152)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	1,800pF (182)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	2,200pF (222)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	2,700pF (272)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	3,300pF (332)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	3,900pF (392)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
	4,700pF (472)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
5,600pF (562)	B	B	B	B	B	C	C	C	C	C	D	D	D	D		
6,800pF (682)	C	C	C	C	C	C	C	C	C	C	D	D	D	D		
8,200pF (822)	D	D	D	D	D	C	C	C	C	C	D	D	D	D		
0.010μF (103)	D	D	D	D	D	C	C	C	C	C	D	D	D	D		
0.012μF (123)	P	P	P	P	P	D	D	D	D	D	D	D	D	D		
0.015μF (153)	P	P	P	P	P	D	D	D	D	D	D	D	D	D		
0.018μF (183)	P	P	P	P	P	K	K	K	K	K	D	D	D	D		
0.022μF (223)	P	P	P	P	P	K	K	K	K	K	D	D	D	D		
0.027μF (273)	P	P	P	P	P	K	K	K	K	K	D	D	D	D		
0.033μF (333)	P	P	P	P	P	K	K	K	K	K	D	D	D	D		
0.039μF (393)	P	P	P	P	P						M	M	M	M		
0.047μF (473)	J*	J*	J*	J*	J*						M	M	M	M		
0.056μF (563)	J*	J*	J*	J*	J*						M	M	M	M		
0.068μF (683)	G*	G*	G*	G*	G*						M	M	M	M		
0.082μF (823)	G*	G*	G*	G*	G*						M	M	M	M		
0.1μF (104)	G*	G*	G*	G*	G*						M	M	M	M		

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "*" mark is expressed capacitance tolerance "J" (±5%) only.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

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

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

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with " * " mark is expressed product not in 10% (code "K") tolerance.

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

DIELECTRIC	X7R																			
	1206							1210					1812							
	SIZE	6.3	10	16	25	35	50	100	6.3	10	16	25	50	100	10	16	25	50	100	
Capacitance	100pF (101)																			
	120pF (121)																			
	150pF (151)		B	B	B		B	B												
	180pF (181)		B	B	B		B	B												
	220pF (221)		B	B	B		B	B												
	270pF (271)		B	B	B		B	B												
	330pF (331)		B	B	B		B	B												
	390pF (391)		B	B	B		B	B												
	470pF (471)		B	B	B		B	B												
	560pF (561)		B	B	B		B	B												
	680pF (681)		B	B	B		B	B												
	820pF (821)		B	B	B		B	B												
	1,000pF (102)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	1,200pF (122)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	1,500pF (152)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	1,800pF (182)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	2,200pF (222)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	2,700pF (272)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	3,300pF (332)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	3,900pF (392)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	4,700pF (472)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	5,600pF (562)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	6,800pF (682)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	8,200pF (822)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.010μF (103)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.012μF (123)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.015μF (153)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.018μF (183)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.022μF (223)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.027μF (273)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.033μF (333)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.039μF (393)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.047μF (473)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.056μF (563)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.068μF (683)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D	D
	0.082μF (823)		B	B	B		B	D		C	C	C	C	C	D	D	D	D	D	D
	0.10μF (104)		B	B	B		B	D		C	C	C	C	C	D	D	D	D	D	D
	0.12μF (124)		B	B	B		B	D		C	C	C	C	C	D	D	D	D	D	D
	0.15μF (154)		C	C	C		C	G		C	C	C	C	D	D	D	D	D	D	D
	0.18μF (184)		C	C	C		C	G		C	C	C	C	D	D	D	D	D	D	D
	0.22μF (224)		C	C	C		C	G		C	C	C	C	D	D	D	D	D	D	D
	0.27μF (274)		C	C	C		D	G		C	C	C	C	G	D	D	D	D	D	D
	0.33μF (334)		C	C	C		D	G		C	C	C	D	G	D	D	D	D	D	D
	0.39μF (394)		C	C	J		P	G		C	C	C	D	M	D	D	D	D	D	D
	0.47μF (474)		J	J	J		P	G		C	C	C	D	M	D	D	D	D	D	K
0.56μF (564)		J	J	J		P	P		D	D	D	D	M	D	D	D	D	D	K	
0.68μF (684)		J	J	J		P	P		D	D	D	D	K	D	D	D	D	K	K	
0.82μF (824)		J	J	J		P	P		D	D	D	D	K	D	D	D	D	K	K	
1.0μF (105)		J	J	J		P	P		D	D	D	D	K	D	D	D	D	K	K	
1.5μF (155)		J	J	J	P					K	G	M	M						K	
2.2μF (225)		J	J	J	P		P			K	G	M	M				M	M		
3.3μF (335)			P	P	P					K	G									
4.7μF (475)		P	P	P	P		P			K	K	K	M							
6.8μF (685)																				
10μF (106)		P	P	P	P	P				K	K	K	M							
22μF (226)		P	P	P*						M	M	M								
47μF (476)									M	M										
100μF (107)																				

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "*" mark is expressed product not in 10% (code "K") tolerance.

7-3. Y5V Dielectric 0402, 0603, 0805 Sizes

DIELECTRIC		Y5V															
SIZE		0402					0603					0805					
RATED VOLTAGE (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	100
Capacitance	0.010μF (103)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.015μF (153)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.022μF (223)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.033μF (333)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.047μF (473)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.068μF (683)		N	N	N			S	S	S	S		A	A	A	A	B
	0.10μF (104)		N	N	N			S	S	S	S		A	A	A	A	B
	0.15μF (154)			N	N			S	S	S	S		A	A	A	A	
	0.22μF (224)	N	N	N				S	S	S	S		A	A	A	A	
	0.33μF (334)	N	N	N				S	S	S	X		B	B	B	B	
	0.47μF (474)	N	N	N				S	S	X	X		B	B	B	B	
	0.68μF (684)	N						S	X	X			B	B	D	D	
	1.0μF (105)	N	N					S	X	X			B	B	D	D	
	1.5μF (155)							S					D	D			
	2.2μF (225)						S	S	X				D	D	I		
	3.3μF (335)												D	D			
	4.7μF (475)						X	X					D	D	I		
	6.8μF (685)												I				
10μF (106)											I	I	I				
22μF (226)											I	I					

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.

7-3. Y5V Dielectric 1206, 1210, 1812 Sizes

DIELECTRIC		Y5V																	
SIZE		1206					1210						1812						
RATED VOLTAGE (VDC)		6.3	10	16	25	50	100	6.3	10	16	25	35	50	100	10	16	25	50	100
Capacitance	0.010μF (103)		B	B	B	B	B							C					D
	0.015μF (153)		B	B	B	B	B							C					D
	0.022μF (223)		B	B	B	B	B							C					D
	0.033μF (333)		B	B	B	B	B							C					D
	0.047μF (473)		B	B	B	B	B							C					D
	0.068μF (683)		B	B	B	B	B							C					D
	0.10μF (104)		B	B	B	B	B		C	C	C		C	C	D	D	D	D	D
	0.15μF (154)		B	B	B	B	C		C	C	C		C	C	D	D	D	D	D
	0.22μF (224)		B	B	B	B	C		C	C	C		C	C	D	D	D	D	D
	0.33μF (334)		B	B	B	B			C	C	C		C	C	D	D	D	D	D
	0.47μF (474)		B	B	B	B			C	C	C		C		D	D	D	D	D
	0.68μF (684)		B	B	B	B			C	C	C		C		D	D	D	D	D
	1.0μF (105)		C	C	C	C			C	C	C		C		D	D	D	D	D
	1.5μF (155)		C	C	C				C	C	C				D	D	D	D	
	2.2μF (225)		C	C	C	J			C	C	C		G		D	D	D	D	
	3.3μF (335)		J	J	J				C	C	C				D	D	D	D	
	4.7μF (475)		J	J	J	P			C	C	D		G		D	D	D	D	
	6.8μF (685)		J	J					C	C	D		K		D	D	D	D	
10μF (106)		J	J	P				D	D	G	K	K		D	D	D	K		
22μF (226)			P	P					K	K									
47μF (476)	P							K	K						M				
100μF (107)								M											

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

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

Dielectric		X5R															
Size		0201					0402					0603					
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	
Capacitance	100pF (101)			L	L	L											
	120pF (121)			L	L	L											
	150pF (151)			L	L	L											
	180pF (181)			L	L	L											
	220pF (221)			L	L	L											
	270pF (271)			L	L	L											
	330pF (331)			L	L	L											
	390pF (391)			L	L	L											
	470pF (471)			L	L	L											
	560pF (561)			L	L	L											
	680pF (681)			L	L	L											
	820pF (821)			L	L	L											
	1,000pF (102)			L	L	L	L										
	1,500pF (152)			L	L												
	2,200pF (222)			L	L												
	2,700pF (272)			L	L												
	3,300pF (332)			L	L												
	4,700pF (472)			L	L												
	6,800pF (682)			L													
	0.010μF (103)		L	L	L	L											
	0.015μF (153)		L	L													
	0.022μF (223)		L	L													
	0.027μF (273)		L	L						N							
	0.033μF (333)		L	L						N							
	0.039μF (393)		L	L						N							
	0.047μF (473)		L	L						N							
	0.056μF (563)		L	L						N	N						
	0.068μF (683)		L	L						N	N						
	0.082μF (823)		L	L				N	N	N							
	0.10μF (104)		L	L	L	L		N	N	N	N	N					
	0.15μF (154)							N	N	N	N						
	0.22μF (224)		L	L				N	N	N	N	N			X	X	
	0.27μF (274)													X	X	X	
	0.33μF (334)							N	N				X	X	X	X	
	0.39μF (394)												X	X	X		
	0.47μF (474)		L					N	N	E	E	E	X	X	X	X	X
	0.68μF (684)							N	N				X	X	X	X	
	0.82μF (824)												X	X	X		
	1.0μF (105)		L	L*				N	N	N	N		X	X	X	X	X
	1.5μF (155)												X				
	2.2μF (225)		L*					N	N	E	E		X	X	X	X	X
	3.3μF (335)												X	X			
	4.7μF (475)							E*	E*	E*			X	X	X	X	
	6.8μF (685)																
	10μF (106)							E*	E*				X	X	X	X*	
	22μF (226)												X*	X*			
	47μF (476)												X*				

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

- The letter in cell is expressed the symbol of product thickness.
- The letter in cell with "*" mark is expressed product not in 10% (code "K") tolerance.

9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																																						
1.	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.																																																						
2.	Capacitance	Class I: (NP0) Class II: (X7R, X7E, X6S, X5R, Y5V)	* Shall not exceed the limits given in the detailed spec. NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R, X5R, X6S:																																																						
3.	Q/ D.F. (Dissipation Factor)	≤ 1000pF, 1.0±0.2Vrms · 1MHz±10% > 1000pF, 1.0±0.2Vrms · 1KHz±10% Class II: (X7R, X7E, X6S, X5R, 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&10V) X5R: 01R5 ≥ 103, 0201 ≥ 224 (6.3V, 10V) #1, 0402 ≥ 475 (6.3V, 16V), 0402 ≥ 225(10V), 0603=106 (6.3V, 10V), TT18X ≥ 475(10V) , TT15X series X6S: 0201 ≥ 104 (6.3V), 0402 ≥ 225 (6.3V), 0603 ≥ 106 (6.3V), #1 Excluding 0201X105K6R3(1.0±0.2Vrms · 1KHz±10%)	<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="2">≥ 100V</td> <td rowspan="2">≤ 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 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>1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0402 ≥ 0.1μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 10%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 7%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td>≤ 12.5%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); TT series 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="2">6.3V</td> <td rowspan="2">≤ 10%</td> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 2.2μF</td> </tr> <tr> <td>4V</td> <td>≤ 15%</td> <td>---</td> <td>---</td> </tr> </tbody> </table>	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	50V	≤ 2.5%	≤ 3%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 5%	1210 ≥ 4.7μF	≤ 10%	0402 ≥ 0.1μF; 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	25V	≤ 3.5%	≤ 7%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF; TT series	≤ 12.5%	0402 ≥ 0.47μF	16V	≤ 3.5%	≤ 5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	10V	≤ 5%	≤ 10%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); TT series 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																																																			
			50V	≤ 2.5%	≤ 3%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																			
					≤ 5%	1210 ≥ 4.7μF																																																			
					≤ 10%	0402 ≥ 0.1μF; 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																																																			
			25V	≤ 3.5%	≤ 7%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																			
					≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF; TT series																																																			
					≤ 12.5%	0402 ≥ 0.47μF																																																			
			16V	≤ 3.5%	≤ 5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																			
					≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series																																																			
			10V	≤ 5%	≤ 10%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); TT series 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%	---	---																																																						
Y5V:			<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥ 50V</td> <td rowspan="2">≤ 5%</td> <td>≤ 7%</td> <td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF; TT series</td> </tr> <tr> <td>≤ 12.5%</td> <td>1210 ≥ 6.8μF</td> </tr> <tr> <td>35V</td> <td>≤ 7%</td> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">≤ 5%</td> <td>≤ 7%</td> <td>0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 9%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td rowspan="2">16V (C<1.0μF)</td> <td rowspan="2">≤ 7%</td> <td>≤ 9%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>≤ 12.5%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td rowspan="2">16V (C≥1.0μF)</td> <td rowspan="2">≤ 9%</td> <td>≤ 12.5%</td> <td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; TT series</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>10V</td> <td>≤ 12.5%</td> <td>≤ 20%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	≤ 5%	≤ 7%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF; TT series	≤ 12.5%	1210 ≥ 6.8μF	35V	≤ 7%	---	---	25V	≤ 5%	≤ 7%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF	≤ 9%	0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	16V (C<1.0μF)	≤ 7%	≤ 9%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	≤ 12.5%	0402 ≥ 0.22μF	16V (C≥1.0μF)	≤ 9%	≤ 12.5%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; TT series	≤ 20%	0402 ≥ 0.47μF	10V	≤ 12.5%	≤ 20%	0402 ≥ 0.47μF	6.3V	≤ 20%	---	---														
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																							
≥ 50V	≤ 5%	≤ 7%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF; TT series																																																						
		≤ 12.5%	1210 ≥ 6.8μF																																																						
35V	≤ 7%	---	---																																																						
25V	≤ 5%	≤ 7%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF																																																						
		≤ 9%	0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series																																																						
16V (C<1.0μF)	≤ 7%	≤ 9%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																						
		≤ 12.5%	0402 ≥ 0.22μF																																																						
16V (C≥1.0μF)	≤ 9%	≤ 12.5%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; TT series																																																						
		≤ 20%	0402 ≥ 0.47μF																																																						
10V	≤ 12.5%	≤ 20%	0402 ≥ 0.47μF																																																						
6.3V	≤ 20%	---	---																																																						
4.	Dielectric Strength	To apply voltage (≤100V) 250%. Duration: 1 to 5 sec. Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.																																																						
5.	Insulation Resistance	To apply rated voltage for max. 120 sec.	10GΩ or RxC ≥ 500Ω·F whichever is smaller. Class II (X7R, X5R, X6S, Y5V)																																																						
			<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="6">10GΩ or RxC ≥ 100 Ω·F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF;</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</td> <td></td> </tr> <tr> <td> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>All X6S items</td> <td rowspan="7">RxC ≥ 50 Ω·F.</td> </tr> <tr> <td>50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF;</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF</td> </tr> <tr> <td>16V: 0603 ≥ 10μF</td> </tr> <tr> <td>10V: 0201 > 0.1μF; 0603 ≥ 10μF; 0805 ≥ 47μF; TT21 > 4.7μF</td> </tr> <tr> <td>6.3V: 0201 ≥ 0.1μF; 0603 > 4.7μF; 1206 ≥ 10μF</td> </tr> <tr> <td>4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF</td> </tr> </tbody> </table> </td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: 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;	10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V ; TT series		<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>All X6S items</td> <td rowspan="7">RxC ≥ 50 Ω·F.</td> </tr> <tr> <td>50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF;</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF</td> </tr> <tr> <td>16V: 0603 ≥ 10μF</td> </tr> <tr> <td>10V: 0201 > 0.1μF; 0603 ≥ 10μF; 0805 ≥ 47μF; TT21 > 4.7μF</td> </tr> <tr> <td>6.3V: 0201 ≥ 0.1μF; 0603 > 4.7μF; 1206 ≥ 10μF</td> </tr> <tr> <td>4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	All X6S items	RxC ≥ 50 Ω·F.	50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF	35V: 0603 ≥ 1μF;	25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF	16V: 0603 ≥ 10μF	10V: 0201 > 0.1μF; 0603 ≥ 10μF; 0805 ≥ 47μF; TT21 > 4.7μF	6.3V: 0201 ≥ 0.1μF; 0603 > 4.7μF; 1206 ≥ 10μF	4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF																															
			Rated voltage	Insulation Resistance																																																					
			100V: 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;																																																						
			10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																																						
			6.3V ; 4V ; TT series																																																						
			<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>All X6S items</td> <td rowspan="7">RxC ≥ 50 Ω·F.</td> </tr> <tr> <td>50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF;</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF</td> </tr> <tr> <td>16V: 0603 ≥ 10μF</td> </tr> <tr> <td>10V: 0201 > 0.1μF; 0603 ≥ 10μF; 0805 ≥ 47μF; TT21 > 4.7μF</td> </tr> <tr> <td>6.3V: 0201 ≥ 0.1μF; 0603 > 4.7μF; 1206 ≥ 10μF</td> </tr> <tr> <td>4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	All X6S items	RxC ≥ 50 Ω·F.	50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF	35V: 0603 ≥ 1μF;	25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF	16V: 0603 ≥ 10μF	10V: 0201 > 0.1μF; 0603 ≥ 10μF; 0805 ≥ 47μF; TT21 > 4.7μF	6.3V: 0201 ≥ 0.1μF; 0603 > 4.7μF; 1206 ≥ 10μF	4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF																																											
			Rated voltage	Insulation Resistance																																																					
			All X6S items	RxC ≥ 50 Ω·F.																																																					
			50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF																																																						
			35V: 0603 ≥ 1μF;																																																						
25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF																																																									
16V: 0603 ≥ 10μF																																																									
10V: 0201 > 0.1μF; 0603 ≥ 10μF; 0805 ≥ 47μF; TT21 > 4.7μF																																																									
6.3V: 0201 ≥ 0.1μF; 0603 > 4.7μF; 1206 ≥ 10μF																																																									
4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF																																																									

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>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>*To apply voltage :</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	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>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%	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																																																				
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%																																																				
X5R	Within ±15%																																																				
X6S	Within ±22%																																																				
Y5V	Within +30%/-80%																																																				
7.	Adhesive Strength of Termination	<p>Pressurizing force : 1N (0201) and 5N (≤0603) and 10N (>0603)</p> <p>* 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.) * Measurement to be made after keeping at room temp. for 24±2 hrs.</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. * 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: 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): Perform 150+0/-10°C for 1 hr and 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 ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: 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): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs.</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: 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																																																			

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): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs.	* No remarkable damage. * Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S: ≥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:																																				
				<table border="1"> <thead> <tr> <th>Rated</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥100V</td> <td rowspan="2">≤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 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% 1210 ≥4.7μF</td> </tr> <tr> <td>≤20% 0402 ≥0.1μF; 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="3">25V</td> <td rowspan="3">≤5%</td> <td>≤14% 0603 ≥0.33μF; 1206 ≥4.7μF</td> </tr> <tr> <td>≤15% 0201 ≥0.1μF; 0402 ≥0.10μF; 0603 ≥0.47μF; 0805 ≥2.2μF; 1206 ≥6.8μF; 1210 ≥22μF; TT series</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; 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); 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>6.3V</td> <td>≤15%</td> <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	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	≥50V	≤3%	≤6% 0201(50V); 0603 ≥0.047μF; 0805 ≥0.18μF; 1206 ≥0.47μF	≤10% 1210 ≥4.7μF	≤20% 0402 ≥0.1μF; 0603 >0.1μF; 0805 ≥1μF; 1206 ≥2.2μF; 1210 ≥10μF; 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; 0603 ≥0.47μF; 0805 ≥2.2μF; 1206 ≥6.8μF; 1210 ≥22μF; TT series	≤20% 0402 ≥0.47μF	16V	≤5%	≤10% 0603 ≥0.15μF; 0805 ≥0.68μF; 1206 ≥2.2μF; 1210 ≥4.7μF	≤15% 0201 ≥0.01μF; 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); 0603 ≥0.33μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥22μF	≤20% 0201 ≥0.1μF; 0402 ≥1μF; TT series; 01R5	6.3V	≤15%	≤30% 0201 ≥0.1μF; 0402 ≥1μF; 0603 ≥10μF; 0805 ≥4.7μF; 1206 ≥47μF; 1210 ≥100μF; TT series	4V	≤20%	---
				Rated	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																																	
				≥50V	≤3%	≤6% 0201(50V); 0603 ≥0.047μF; 0805 ≥0.18μF; 1206 ≥0.47μF																																	
						≤10% 1210 ≥4.7μF																																	
						≤20% 0402 ≥0.1μF; 0603 >0.1μF; 0805 ≥1μF; 1206 ≥2.2μF; 1210 ≥10μF; 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; 0603 ≥0.47μF; 0805 ≥2.2μF; 1206 ≥6.8μF; 1210 ≥22μF; TT series																																	
						≤20% 0402 ≥0.47μF																																	
				16V	≤5%	≤10% 0603 ≥0.15μF; 0805 ≥0.68μF; 1206 ≥2.2μF; 1210 ≥4.7μF																																	
						≤15% 0201 ≥0.01μF; 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); 0603 ≥0.33μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥22μF																																					
		≤20% 0201 ≥0.1μF; 0402 ≥1μF; TT series; 01R5																																					
6.3V	≤15%	≤30% 0201 ≥0.1μF; 0402 ≥1μF; 0603 ≥10μF; 0805 ≥4.7μF; 1206 ≥47μF; 1210 ≥100μF; TT series																																					
4V	≤20%	---																																					
Y5V:																																							
<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥50V</td> <td rowspan="2">≤7.5%</td> <td>≤10% 0603 ≥0.1μF; 0805 ≥0.47μF; 1206 ≥4.7μF</td> </tr> <tr> <td>≤20% 1210 ≥6.8μF</td> </tr> <tr> <td>35V</td> <td>≤10%</td> <td>---</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">≤7.5%</td> <td>≤10% 0402 ≥0.047μF; 0603 ≥0.1μF; 0805 ≥0.33μF; 1206 ≥1μF; 1210 ≥4.7μF</td> </tr> <tr> <td>≤15% 0402 ≥0.068μF; 0603 ≥0.47μF; 1206 ≥4.7μF; 1210 ≥22μF</td> </tr> <tr> <td>16V (C<1.0μF)</td> <td>≤10%</td> <td>≤12.5% 0402 ≥0.068μF; 0603 ≥0.68μF</td> </tr> <tr> <td>16V (C≥1.0μF)</td> <td>≤12.5%</td> <td>≤20% 0402 ≥0.22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤20%</td> <td>≤30% 0603 ≥2.2μF; 0805 ≥3.3μF; 1206 ≥10μF; 1210 ≥22μF; 1812 ≥47μF;</td> </tr> <tr> <td>0402 ≥0.47μF</td> </tr> <tr> <td>6.3V</td> <td>≤30%</td> <td>---</td> </tr> </tbody> </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	10V	≤20%	≤30% 0603 ≥2.2μF; 0805 ≥3.3μF; 1206 ≥10μF; 1210 ≥22μF; 1812 ≥47μF;	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																																					
10V	≤20%	≤30% 0603 ≥2.2μF; 0805 ≥3.3μF; 1206 ≥10μF; 1210 ≥22μF; 1812 ≥47μF;																																					
		0402 ≥0.47μF																																					
6.3V	≤30%	---																																					
*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.																																							
Class II (X7R, X5R, X6S, Y5V)																																							
<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">1GΩ or RxC ≥10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 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 items</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: X7R	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 items																													
Rated voltage	Insulation Resistance																																						
100V: X7R	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 items																																							

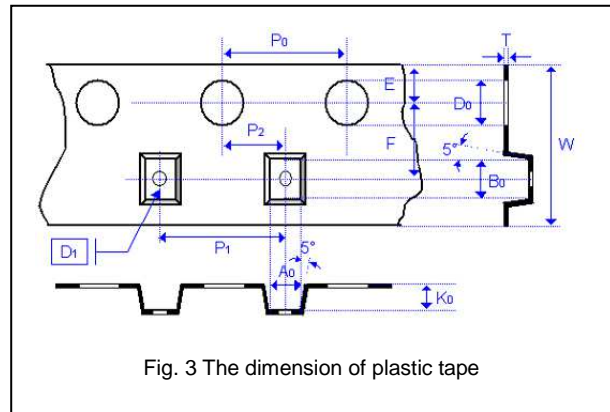
No	Item	Test Condition	Requirements																																																																							
14	Humidity (Damp Heat) Load	* Test temp.: 40±2°C * Humidity: 90~95%RH * Test time: 500+24/-0 hrs. * To apply voltage : rated voltage. * Before initial measurement (Class II only): To apply test voltage for 1hr at 40°C and 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: ±7.5% or 0.75pF whichever is larger. X7R, X5R, X6S: ≥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, X6S: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Rated vol</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥ 100V</td> <td rowspan="2">≤ 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 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% 1210 ≥ 4.7µF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.1µF; 0603 > 0.1µF; 0805 ≥ 1µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF; TT series</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; 1206 ≥ 4.7µF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.1µF; 0402 ≥ 0.10µF; 0603 ≥ 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 6.8µF; 1210 ≥ 22µF; TT series</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="3">10V</td> <td rowspan="3">≤ 7.5%</td> <td>≤ 15% 0201 ≥ 0.012µF; 0402 ≥ 0.33µF(0402/X7R ≥ 0.22µF); 0603 ≥ 0.33µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 22µF</td> </tr> <tr> <td>≤ 20% 0201 ≥ 0.1µF; 0402 ≥ 1µF; TT series; 01R5</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30% 0201 ≥ 0.1µF; 0402 ≥ 1µF; 0603 ≥ 10µF; 0805 ≥ 4.7µF; 1206 ≥ 47µF; 1210 ≥ 100µF; TT series</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> </tr> </tbody> </table> Y5V: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50V</td> <td>≤ 7.5%</td> <td>≤ 10% 0603 ≥ 0.1µF; 0805 ≥ 0.47µF; 1206 ≥ 4.7µF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤ 10%</td> <td>≤ 20% 1210 ≥ 6.8µF</td> </tr> <tr> <td>---</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 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>≤ 20% 0402 ≥ 0.22µF</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>16V (C≥1.0µF)</td> <td>≤ 12.5%</td> <td>≤ 20% 0603 ≥ 2.2µF; 0805 ≥ 3.3µF; 1206 ≥ 10µF; 1210 ≥ 22µF; 1812 ≥ 47µF;</td> </tr> <tr> <td>10V</td> <td>≤ 20%</td> <td>≤ 30% 0402 ≥ 0.47µF</td> </tr> <tr> <td>6.3V</td> <td>≤ 30%</td> <td>---</td> </tr> </tbody> </table> *I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, Y5V) <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</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 ≥ 0.1µF; 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 items</td> </tr> </tbody> </table>	Rated vol	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	≥ 50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047µF; 0805 ≥ 0.18µF; 1206 ≥ 0.47µF	≤ 10% 1210 ≥ 4.7µF	≤ 20% 0402 ≥ 0.1µF; 0603 > 0.1µF; 0805 ≥ 1µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF; TT series	35V	≤ 5%	≤ 20% 0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF	25V	≤ 5%	≤ 10% 0201 ≥ 0.01µF; 0805 ≥ 1µF; 1210 ≥ 10µF	≤ 14% 0603 ≥ 0.33µF; 1206 ≥ 4.7µF	≤ 15% 0201 ≥ 0.1µF; 0402 ≥ 0.10µF; 0603 ≥ 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 6.8µF; 1210 ≥ 22µF; TT series	≤ 20% 0402 ≥ 0.47µF	16V	≤ 5%	≤ 10% 0603 ≥ 0.15µF; 0805 ≥ 0.68µF; 1206 ≥ 2.2µF; 1210 ≥ 4.7µF	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.012µF; 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	6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1µF; 0402 ≥ 1µF; 0603 ≥ 10µF; 0805 ≥ 4.7µF; 1206 ≥ 47µF; 1210 ≥ 100µF; TT series	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	≤ 20% 0402 ≥ 0.22µF	16V (C<1.0µF)	≤ 10%	≤ 12.5% 0402 ≥ 0.068µF; 0603 ≥ 0.68µF	16V (C≥1.0µF)	≤ 12.5%	≤ 20% 0603 ≥ 2.2µF; 0805 ≥ 3.3µF; 1206 ≥ 10µF; 1210 ≥ 22µF; 1812 ≥ 47µF;	10V	≤ 20%	≤ 30% 0402 ≥ 0.47µF	6.3V	≤ 30%	---	Rated voltage	Insulation Resistance	100V: X7R	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 ≥ 0.1µF; 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 items
Rated vol	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																																																																								
≥ 50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047µF; 0805 ≥ 0.18µF; 1206 ≥ 0.47µF																																																																								
		≤ 10% 1210 ≥ 4.7µF																																																																								
		≤ 20% 0402 ≥ 0.1µF; 0603 > 0.1µF; 0805 ≥ 1µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF; TT series																																																																								
35V	≤ 5%	≤ 20% 0603 ≥ 1µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF																																																																								
25V	≤ 5%	≤ 10% 0201 ≥ 0.01µF; 0805 ≥ 1µF; 1210 ≥ 10µF																																																																								
		≤ 14% 0603 ≥ 0.33µF; 1206 ≥ 4.7µF																																																																								
		≤ 15% 0201 ≥ 0.1µF; 0402 ≥ 0.10µF; 0603 ≥ 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 6.8µF; 1210 ≥ 22µF; TT series																																																																								
		≤ 20% 0402 ≥ 0.47µF																																																																								
16V	≤ 5%	≤ 10% 0603 ≥ 0.15µF; 0805 ≥ 0.68µF; 1206 ≥ 2.2µF; 1210 ≥ 4.7µF																																																																								
10V	≤ 7.5%	≤ 15% 0201 ≥ 0.012µF; 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																																																																								
		6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1µF; 0402 ≥ 1µF; 0603 ≥ 10µF; 0805 ≥ 4.7µF; 1206 ≥ 47µF; 1210 ≥ 100µF; TT series																																																																						
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																																																																								
		≤ 20% 0402 ≥ 0.22µF																																																																								
16V (C<1.0µF)	≤ 10%	≤ 12.5% 0402 ≥ 0.068µF; 0603 ≥ 0.68µF																																																																								
16V (C≥1.0µF)	≤ 12.5%	≤ 20% 0603 ≥ 2.2µF; 0805 ≥ 3.3µF; 1206 ≥ 10µF; 1210 ≥ 22µF; 1812 ≥ 47µF;																																																																								
10V	≤ 20%	≤ 30% 0402 ≥ 0.47µF																																																																								
6.3V	≤ 30%	---																																																																								
Rated voltage	Insulation Resistance																																																																									
100V: X7R	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 ≥ 0.1µF; 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 items																																																																										

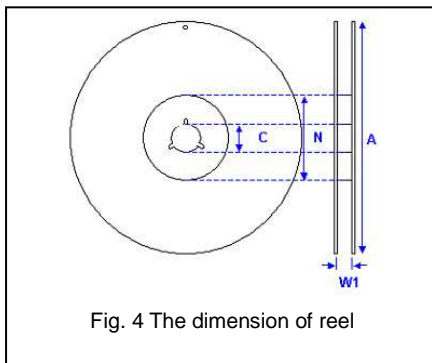
No	Item	Test Condition	Requirements																																																																																																																																																											
15.	High Temperature Load (Endurance)	Test temp. : NP0, X7R/X7E: 125±3°C X6S: 105±3°C X5R, Y5V: 85±3°C Test time: 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: ≥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:																																																																																																																																																											
		<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>0201</td> <td>X5R/X7R/X6S</td> <td>≤ 10V</td> <td>C ≥ 0.1µF</td> <td rowspan="2">≥ 100V</td> <td rowspan="2">≤ 3%</td> <td>≤ 6% 1206 ≥ 0.47µF</td> </tr> <tr> <td>0402</td> <td>X5R/X7R/X6S Y5V</td> <td>6.3V, 10V 16V, 25V</td> <td>C ≥ 1.0µF</td> <td>≤ 7.5% 0805 > 0.1µF, 0603 ≥ 0.068µF, 1206 > 1µF; 1210 ≥ 2.2µF; TT series</td> </tr> <tr> <td rowspan="2">0603</td> <td rowspan="2">X5R/X7R/X6S</td> <td>4V</td> <td>C ≥ 22µF</td> <td rowspan="2">≥ 50V</td> <td rowspan="2">≤ 3%</td> <td>≤ 6% 0201(50V); 0603 ≥ 0.047µF; 0805 ≥ 0.18µF; 1206 ≥ 0.47µF</td> </tr> <tr> <td>6.3V, 10V</td> <td>C ≥ 4.7µF</td> <td>≤ 10% 1210 ≥ 4.7µF</td> </tr> <tr> <td rowspan="2">0805</td> <td rowspan="2">X5R/X7R/X6S</td> <td>25V, 35V</td> <td>C ≥ 1.0µF</td> <td rowspan="2">35V</td> <td rowspan="2">≤ 5%</td> <td>≤ 20% 0402 ≥ 0.1µF; 0603 > 0.1µF; 0805 ≥ 1µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF</td> </tr> <tr> <td>4V</td> <td>C ≥ 47µF</td> <td>≤ 10% 0201 ≥ 0.01µF; 0805 ≥ 1µF; 1210 ≥ 10µF</td> </tr> <tr> <td rowspan="2">1206</td> <td rowspan="2">X5R/X7R/X6S</td> <td>6.3V</td> <td>C ≥ 22µF</td> <td rowspan="2">25V</td> <td rowspan="2">≤ 5%</td> <td>≤ 14% 0603 ≥ 0.33µF; 1206 ≥ 4.7µF</td> </tr> <tr> <td>10V~50V</td> <td>C ≥ 10µF</td> <td>≤ 15% 0201 ≥ 0.1µF; 0402 ≥ 0.10µF; 0603 ≥ 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 6.8µF; 1210 ≥ 22µF; TT series</td> </tr> <tr> <td>1210</td> <td>X5R/X7R/X6S</td> <td>≤ 6.3V</td> <td>C ≥ 47µF</td> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 20% 0402 ≥ 0.47µF</td> </tr> <tr> <td>NP0</td> <td>3000V</td> <td>C ≥ 1.5pF</td> <td>≤ 10% 0603 ≥ 0.15µF; 0805 ≥ 0.68µF; 1206 ≥ 2.2µF; 1210 ≥ 4.7µF</td> </tr> <tr> <td>TT18</td> <td>Y5V</td> <td>16V</td> <td>C ≥ 47µF</td> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15% 0201 ≥ 0.01µF; 0402 ≥ 0.033µF; 0603 ≥ 0.68µF; 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF; TT series</td> </tr> <tr> <td>TT21</td> <td>Y5V</td> <td>6.3V</td> <td>C ≥ 2.2µF</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>TT31</td> <td>Y5V</td> <td>6.3V</td> <td>C ≥ 22µF</td> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 15%</td> <td>≤ 20% 0201 ≥ 0.1µF; 0402 ≥ 1µF; TT series: 01R5</td> </tr> <tr> <td colspan="3">**1WV items must follow de-rating conditions</td> <td>≤ 30% 0201 ≥ 0.1µF; 0402 ≥ 1µF; 0603 ≥ 10µF; 0805 ≥ 4.7µF; 1206 ≥ 47µF; 1210 ≥ 100µF; TT series</td> </tr> <tr> <td colspan="3">(6) 150% of rated voltage for below range.</td> <td>≤ 20% ---</td> <td colspan="3"></td> </tr> <tr> <td>0201</td> <td>X5R/X7R/X6S</td> <td>16V/25V</td> <td>C ≥ 0.1µF</td> <td rowspan="2">4V</td> <td rowspan="2">≤ 20%</td> <td>---</td> </tr> <tr> <td rowspan="2">0402</td> <td rowspan="2">X5R/X7R/X6S</td> <td>50V</td> <td>C ≥ 0.1µF</td> <td>Y5V:</td> </tr> <tr> <td>10~25V</td> <td>C ≥ 0.22µF</td> <td>Rated vol.</td> <td>D.F. ≤</td> <td>Exception of D.F. ≤</td> </tr> <tr> <td rowspan="2">0603</td> <td rowspan="2">X5R/X7R/X6S</td> <td>Y5V</td> <td>16V</td> <td>≥ 50V</td> <td>≤ 7.5%</td> <td>≤ 10% 0603 ≥ 0.1µF; 0805 ≥ 0.47µF; 1206 ≥ 4.7µF</td> </tr> <tr> <td>X7R</td> <td>50V</td> <td>35V</td> <td>≤ 10%</td> <td>≤ 20% 1210 ≥ 6.8µF</td> </tr> <tr> <td rowspan="2">0805</td> <td rowspan="2">X5R/X7R/X6S</td> <td>10V, 16V, 50V</td> <td>C ≥ 1.0µF</td> <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>Y5V</td> <td>16V</td> <td>≤ 15% 0402 ≥ 0.068µF; 0603 ≥ 0.47µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF</td> </tr> <tr> <td rowspan="2">1206</td> <td rowspan="2">X5R/X7R/X6S</td> <td>10~50V</td> <td>C ≥ 4.7µF</td> <td rowspan="2">16V (C < 1.0µF)</td> <td rowspan="2">≤ 10%</td> <td>≤ 12.5% 0402 ≥ 0.068µF; 0603 ≥ 0.68µF</td> </tr> <tr> <td>X5R/X7R</td> <td>50V</td> <td>≤ 20% 0402 ≥ 0.22µF</td> </tr> <tr> <td rowspan="2">1210</td> <td rowspan="2">X5R/X7R/X6S</td> <td>100V</td> <td>C ≥ 0.47µF</td> <td rowspan="2">16V (C ≥ 1.0µF)</td> <td rowspan="2">≤ 12.5%</td> <td>≤ 20% 0603 ≥ 2.2µF; 0805 ≥ 3.3µF; 1206 ≥ 10µF; 1210 ≥ 22µF; 1812 ≥ 47µF;</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>≤ 30% 0402 ≥ 0.47µF</td> </tr> <tr> <td>1825 2220 2225</td> <td>X7R</td> <td>100V~250V</td> <td>C ≥ 1.0µF</td> <td>6.3V</td> <td>≤ 30%</td> <td>---</td> </tr> </tbody> </table>	Size	Dielectric	Rated voltage	Capacitance range	Rated vol.	D.F. ≤	Exception of D.F. ≤	0201	X5R/X7R/X6S	≤ 10V	C ≥ 0.1µF	≥ 100V	≤ 3%	≤ 6% 1206 ≥ 0.47µF	0402	X5R/X7R/X6S Y5V	6.3V, 10V 16V, 25V	C ≥ 1.0µF	≤ 7.5% 0805 > 0.1µF, 0603 ≥ 0.068µF, 1206 > 1µF; 1210 ≥ 2.2µF; TT series	0603	X5R/X7R/X6S	4V	C ≥ 22µF	≥ 50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047µF; 0805 ≥ 0.18µF; 1206 ≥ 0.47µF	6.3V, 10V	C ≥ 4.7µF	≤ 10% 1210 ≥ 4.7µF	0805	X5R/X7R/X6S	25V, 35V	C ≥ 1.0µF	35V	≤ 5%	≤ 20% 0402 ≥ 0.1µF; 0603 > 0.1µF; 0805 ≥ 1µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF	4V	C ≥ 47µF	≤ 10% 0201 ≥ 0.01µF; 0805 ≥ 1µF; 1210 ≥ 10µF	1206	X5R/X7R/X6S	6.3V	C ≥ 22µF	25V	≤ 5%	≤ 14% 0603 ≥ 0.33µF; 1206 ≥ 4.7µF	10V~50V	C ≥ 10µF	≤ 15% 0201 ≥ 0.1µF; 0402 ≥ 0.10µF; 0603 ≥ 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 6.8µF; 1210 ≥ 22µF; TT series	1210	X5R/X7R/X6S	≤ 6.3V	C ≥ 47µF	16V	≤ 5%	≤ 20% 0402 ≥ 0.47µF	NP0	3000V	C ≥ 1.5pF	≤ 10% 0603 ≥ 0.15µF; 0805 ≥ 0.68µF; 1206 ≥ 2.2µF; 1210 ≥ 4.7µF	TT18	Y5V	16V	C ≥ 47µF	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.01µF; 0402 ≥ 0.033µF; 0603 ≥ 0.68µF; 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF; TT series	TT21	Y5V	6.3V	C ≥ 2.2µF	≤ 15% 0201 ≥ 0.012µF; 0402 ≥ 0.33µF(0402/X7R ≥ 0.22µF); 0603 ≥ 0.33µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 22µF	TT31	Y5V	6.3V	C ≥ 22µF	6.3V	≤ 15%	≤ 20% 0201 ≥ 0.1µF; 0402 ≥ 1µF; TT series: 01R5	**1WV items must follow de-rating conditions			≤ 30% 0201 ≥ 0.1µF; 0402 ≥ 1µF; 0603 ≥ 10µF; 0805 ≥ 4.7µF; 1206 ≥ 47µF; 1210 ≥ 100µF; TT series	(6) 150% of rated voltage for below range.			≤ 20% ---				0201	X5R/X7R/X6S	16V/25V	C ≥ 0.1µF	4V	≤ 20%	---	0402	X5R/X7R/X6S	50V	C ≥ 0.1µF	Y5V:	10~25V	C ≥ 0.22µF	Rated vol.	D.F. ≤	Exception of D.F. ≤	0603	X5R/X7R/X6S	Y5V	16V	≥ 50V	≤ 7.5%	≤ 10% 0603 ≥ 0.1µF; 0805 ≥ 0.47µF; 1206 ≥ 4.7µF	X7R	50V	35V	≤ 10%	≤ 20% 1210 ≥ 6.8µF	0805	X5R/X7R/X6S	10V, 16V, 50V	C ≥ 1.0µF	25V	≤ 7.5%	≤ 10% 0402 ≥ 0.047µF; 0603 ≥ 0.1µF; 0805 ≥ 0.33µF; 1206 ≥ 1µF; 1210 ≥ 4.7µF	Y5V	16V	≤ 15% 0402 ≥ 0.068µF; 0603 ≥ 0.47µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF	1206	X5R/X7R/X6S	10~50V	C ≥ 4.7µF	16V (C < 1.0µF)	≤ 10%	≤ 12.5% 0402 ≥ 0.068µF; 0603 ≥ 0.68µF	X5R/X7R	50V	≤ 20% 0402 ≥ 0.22µF	1210	X5R/X7R/X6S	100V	C ≥ 0.47µF	16V (C ≥ 1.0µF)	≤ 12.5%	≤ 20% 0603 ≥ 2.2µF; 0805 ≥ 3.3µF; 1206 ≥ 10µF; 1210 ≥ 22µF; 1812 ≥ 47µF;	Y5V	16V	≤ 30% 0402 ≥ 0.47µF	1825 2220 2225	X7R	100V~250V	C ≥ 1.0µF	6.3V	≤ 30%	---
		Size	Dielectric	Rated voltage	Capacitance range	Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																																																																																						
		0201	X5R/X7R/X6S	≤ 10V	C ≥ 0.1µF	≥ 100V	≤ 3%	≤ 6% 1206 ≥ 0.47µF																																																																																																																																																						
		0402	X5R/X7R/X6S Y5V	6.3V, 10V 16V, 25V	C ≥ 1.0µF			≤ 7.5% 0805 > 0.1µF, 0603 ≥ 0.068µF, 1206 > 1µF; 1210 ≥ 2.2µF; TT series																																																																																																																																																						
		0603	X5R/X7R/X6S	4V	C ≥ 22µF	≥ 50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047µF; 0805 ≥ 0.18µF; 1206 ≥ 0.47µF																																																																																																																																																						
				6.3V, 10V	C ≥ 4.7µF			≤ 10% 1210 ≥ 4.7µF																																																																																																																																																						
		0805	X5R/X7R/X6S	25V, 35V	C ≥ 1.0µF	35V	≤ 5%	≤ 20% 0402 ≥ 0.1µF; 0603 > 0.1µF; 0805 ≥ 1µF; 1206 ≥ 2.2µF; 1210 ≥ 10µF																																																																																																																																																						
				4V	C ≥ 47µF			≤ 10% 0201 ≥ 0.01µF; 0805 ≥ 1µF; 1210 ≥ 10µF																																																																																																																																																						
		1206	X5R/X7R/X6S	6.3V	C ≥ 22µF	25V	≤ 5%	≤ 14% 0603 ≥ 0.33µF; 1206 ≥ 4.7µF																																																																																																																																																						
				10V~50V	C ≥ 10µF			≤ 15% 0201 ≥ 0.1µF; 0402 ≥ 0.10µF; 0603 ≥ 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 6.8µF; 1210 ≥ 22µF; TT series																																																																																																																																																						
		1210	X5R/X7R/X6S	≤ 6.3V	C ≥ 47µF	16V	≤ 5%	≤ 20% 0402 ≥ 0.47µF																																																																																																																																																						
		NP0	3000V	C ≥ 1.5pF	≤ 10% 0603 ≥ 0.15µF; 0805 ≥ 0.68µF; 1206 ≥ 2.2µF; 1210 ≥ 4.7µF																																																																																																																																																									
		TT18	Y5V	16V	C ≥ 47µF	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.01µF; 0402 ≥ 0.033µF; 0603 ≥ 0.68µF; 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF; TT series																																																																																																																																																						
		TT21	Y5V	6.3V	C ≥ 2.2µF			≤ 15% 0201 ≥ 0.012µF; 0402 ≥ 0.33µF(0402/X7R ≥ 0.22µF); 0603 ≥ 0.33µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 22µF																																																																																																																																																						
TT31	Y5V	6.3V	C ≥ 22µF	6.3V	≤ 15%	≤ 20% 0201 ≥ 0.1µF; 0402 ≥ 1µF; TT series: 01R5																																																																																																																																																								
**1WV items must follow de-rating conditions			≤ 30% 0201 ≥ 0.1µF; 0402 ≥ 1µF; 0603 ≥ 10µF; 0805 ≥ 4.7µF; 1206 ≥ 47µF; 1210 ≥ 100µF; TT series																																																																																																																																																											
(6) 150% of rated voltage for below range.			≤ 20% ---																																																																																																																																																											
0201	X5R/X7R/X6S	16V/25V	C ≥ 0.1µF	4V	≤ 20%	---																																																																																																																																																								
0402	X5R/X7R/X6S	50V	C ≥ 0.1µF			Y5V:																																																																																																																																																								
		10~25V	C ≥ 0.22µF	Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																																																																																								
0603	X5R/X7R/X6S	Y5V	16V	≥ 50V	≤ 7.5%	≤ 10% 0603 ≥ 0.1µF; 0805 ≥ 0.47µF; 1206 ≥ 4.7µF																																																																																																																																																								
		X7R	50V	35V	≤ 10%	≤ 20% 1210 ≥ 6.8µF																																																																																																																																																								
0805	X5R/X7R/X6S	10V, 16V, 50V	C ≥ 1.0µF	25V	≤ 7.5%	≤ 10% 0402 ≥ 0.047µF; 0603 ≥ 0.1µF; 0805 ≥ 0.33µF; 1206 ≥ 1µF; 1210 ≥ 4.7µF																																																																																																																																																								
		Y5V	16V			≤ 15% 0402 ≥ 0.068µF; 0603 ≥ 0.47µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF																																																																																																																																																								
1206	X5R/X7R/X6S	10~50V	C ≥ 4.7µF	16V (C < 1.0µF)	≤ 10%	≤ 12.5% 0402 ≥ 0.068µF; 0603 ≥ 0.68µF																																																																																																																																																								
		X5R/X7R	50V			≤ 20% 0402 ≥ 0.22µF																																																																																																																																																								
1210	X5R/X7R/X6S	100V	C ≥ 0.47µF	16V (C ≥ 1.0µF)	≤ 12.5%	≤ 20% 0603 ≥ 2.2µF; 0805 ≥ 3.3µF; 1206 ≥ 10µF; 1210 ≥ 22µF; 1812 ≥ 47µF;																																																																																																																																																								
		Y5V	16V			≤ 30% 0402 ≥ 0.47µF																																																																																																																																																								
1825 2220 2225	X7R	100V~250V	C ≥ 1.0µF	6.3V	≤ 30%	---																																																																																																																																																								
* Before initial measurement (Class II only): To apply test voltage for 1hr at test temp. and then set for 24±2 hrs at room temp.			Class II (X7R, X5R, X6S, Y5V)																																																																																																																																																											
* Measurement to be made after keeping at room temp. for 24±2 hrs																																																																																																																																																														
** De-rating conditions:			Rated voltage	Insulation Resistance																																																																																																																																																										
			100V: X7R	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 items																																																																																																																																																											

APPENDIXES

■ Tape & reel dimensions

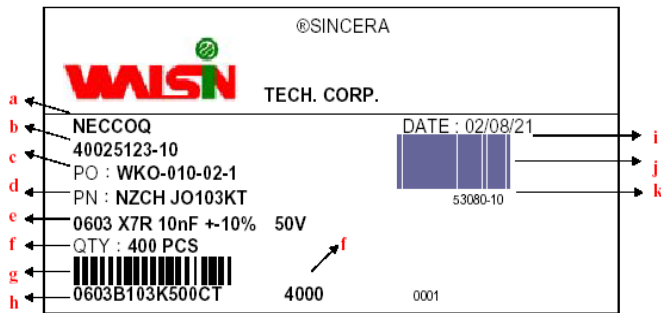


Size	0201	0402	0603	0805			1206			1210			1808	1812	
Thickness	L	N,E	S,H,X	A,H	B,T	D,I	B,T	C,J,D	G,P	T	C,D,G,K	M	D,F,G,K	D,F,G,K	M,U
A₀	0.39 +/-0.07	0.70 +/-0.2	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	<2.30	< 3.05	< 3.05	< 3.20	< 2.50	< 3.90	< 3.90
B₀	0.69 +/-0.07	1.20 +/-0.2	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	<3.95	< 5.30	< 5.30	< 5.30
T	≤ 0.50	≤ 0.80	≤ 1.20	≤ 1.15	≤ 1.30	0.23 +/-0.1	≤ 1.30	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	< 3.00	< 2.50	< 2.50	< 3.50
W	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.20	8.00 +/-0.10	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	12.00 +/-0.20	12.00 +/-0.20	12.00 +/-0.20
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	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.50 +0.1/-0	1.55 +/-0.05	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 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.10	1.75 +/-0.05	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



Size	0201, 0402, 0603, 0805, 1206, 1210			1812
Reel size	7"	10"	13"	7"
C	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2
W₁	8.4+1.5/-0	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0±0.10	250.0±1.0	330.0±1.0	178.0±0.10
N	60.0+1.0/-0	100.0±1.0	100±1.0	60.0+1.0/-0

▣ 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

▣ Constructions

No.	Name	NPO, X7R, X5R, X6S, Y5V
①	Ceramic material	BaTiO ₃ based
②	Inner electrode	Ni
③	Termination	Inner layer
④		Middle layer
⑤		Outer layer

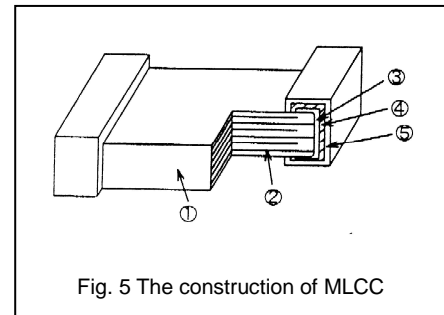


Fig. 5 The construction of MLCC

▣ 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.

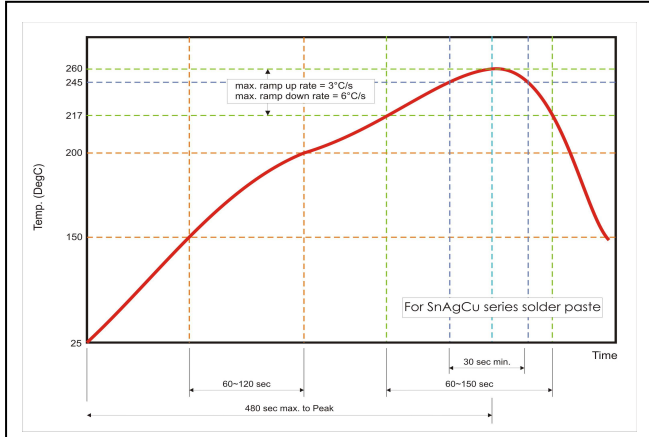


Fig. 6 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.



Fig. 7 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](#)