

APPROVAL SHEET

MULTILAYER CERAMIC CAPACITORS

Soft Termination Series

(SG_6.3V to 3000V)

X7R Dielectric

0603 to 1206 Sizes

Halogen Free & RoHS Compliance

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

1. INTRODUCTION

WTC soft termination series MLCC is designed and with a polymer layer within end terminations of product, which can absorb mechanical stress caused by PCB handling in SMT line and reduce the mechanical impact for product. It will offer more robust and reliable performance in applications.

2. FEATURES

- a. MLCC's termination are with a soft & flexible polymer layer to withstand high bending stress in SMT line.
- b. Available for any item in standard series range.

3. APPLICATIONS

- a. Automotive industry.
- b. Power supply and related industries.
- c. Lighting industry.
- d. The other mechanical stress concerned products.

4. HOW TO ORDER

<u>SG</u>	<u>31</u>	<u>B</u>	<u>104</u>	<u>K</u>	<u>500</u>	<u>C</u>	<u>I</u>
<u>Series</u>	<u>Size</u>	<u>Dielectric</u>	<u>Capacitance</u>	<u>Tolerance</u>	<u>Rated voltage</u>	<u>Termination</u>	<u>Packaging</u>
SG=Soft termination	18=0603 (1608) 21=0805 (2012) 31=1206 (3216)	B=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg: 104=10x10 ⁴ =100nF	K=±10% M=±20%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 6R3=6.3 VDC 100=10 VDC 160=16 VDC 250=25 VDC 500=50 VDC 101=100 VDC 201=200 VDC 251=250 VDC 401=400 VDC 451=450 VDC 501=500 VDC 631=630 VDC 102=1000 VDC 152=1500 VDC 202=2000 VDC	C=Cu Polymer /Ni/Sn	T=7" reeled G=13" reeled

Multilayer Ceramic Capacitors

5. EXTERNAL DIMENSIONS & CONSTRUCTIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Remark	M _B (mm)	
0603 (1608)	1.60±0.20	0.80±0.10	0.80±0.07	S	0.40±0.15	
	1.60±0.30	0.80±0.30	0.80±0.30	X		
0805 (2012)	2.00±0.20	1.25±0.10	0.60±0.10	A	0.50±0.20	
			0.80±0.10	B		
	1.25±0.10	D	#			
	1.25±0.30	I	#			
1206 (3216)	3.20+0.4/-0.1	1.60±0.15	0.80±0.10	B	0.60±0.20 (0.5±0.25)*	
			0.95±0.10	C		#
			1.15±0.15	J		#
			1.25±0.10	D		#
	3.20+0.4/-0.1	1.60±0.20	1.60±0.20	G		#
	3.20±0.50	1.60±0.50	1.60±0.50	P		#

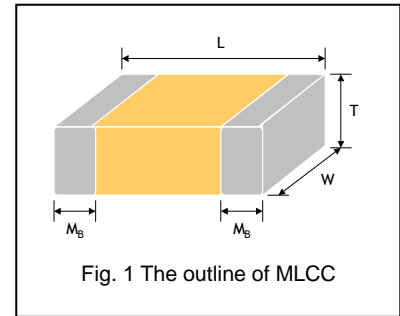
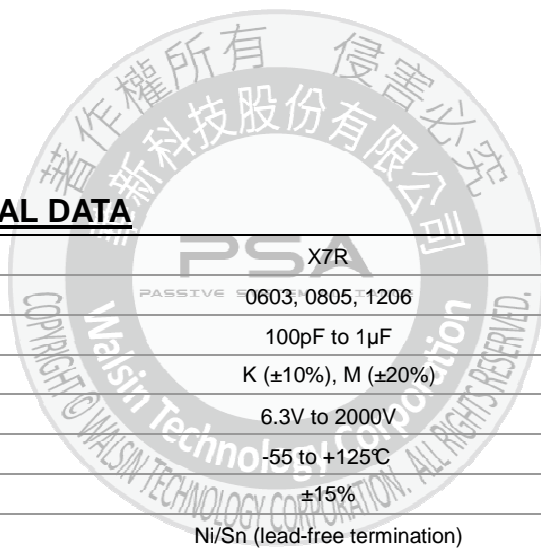


Fig. 1 The outline of MLCC

Reflow soldering only is recommended.

* For 1206_≥1000V products.



6. GENERAL ELECTRICAL DATA

Dielectric	X7R
Size	0603, 0805, 1206
Capacitance range*	100pF to 1μF
Capacitance tolerance**	K (±10%), M (±20%)
Rated voltage (WVDC)	6.3V to 2000V
Operating temperature	-55 to +125°C
Capacitance characteristic	±15%
Termination	Ni/Sn (lead-free termination)

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

NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature
X7R, X5R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature.

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

Multilayer Ceramic Capacitors

7. CAPACITANCE RANGE

X7R Dielectric 0402, 0603 Sizes

	DIELECTRIC SIZE RATED VOLTAGE	X7R 0603						
		10	16	25	50	100	200	250
		Capacitance	100pF (101)	S	S	S	S	S
120pF (121)	S		S	S	S	S	X	X
150pF (151)	S		S	S	S	S	X	X
180pF (181)	S		S	S	S	S	X	X
220pF (221)	S		S	S	S	S	X	X
270pF (271)	S		S	S	S	S	X	X
330pF (331)	S		S	S	S	S	X	X
390pF (391)	S		S	S	S	S	X	X
470pF (471)	S		S	S	S	S	X	X
560pF (561)	S		S	S	S	S	X	X
680pF (681)	S		S	S	S	S	X	X
820pF (821)	S		S	S	S	S	X	X
1,000pF (102)	S		S	S	S	S	X	X
1,200pF (122)	S		S	S	S	S	X	X
1,500pF (152)	S		S	S	S	S	X	X
1,800pF (182)	S		S	S	S	S	X	X
2,200pF (222)	S		S	S	S	S	X	X
2,700pF (272)	S		S	S	S	S	X	X
3,300pF (332)	S		S	S	S	S	X	X
3,900pF (392)	S		S	S	S	S	X	X
4,700pF (472)	S		S	S	S	S	X	X
5,600pF (562)	S		S	S	S	S	X	X
6,800pF (682)	S		S	S	S	S	X	X
8,200pF (822)	S		S	S	S	S	X	X
0.010μF (103)	S		S	S	S	S	X	X
0.012μF (123)	S		S	S	S	X		
0.015μF (153)	S		S	S	S	X		
0.018μF (183)	S		S	S	S	X		
0.022μF (223)	S		S	S	S	X		
0.027μF (273)	S		S	S	S	X		
0.033μF (333)	S		S	S	X	X		
0.039μF (393)	S		S	S	X	X		
0.047μF (473)	S		S	S	X	X		
0.056μF (563)	S		S	S	X	X		
0.068μF (683)	S		S	S	X	X		
0.082μF (823)	S		S	S	X	X		
0.10μF (104)	S		S	S	X	X		
0.12μF (124)	S		S	X				
0.15μF (154)	S		S	X				
0.18μF (184)	S		S	X				
0.22μF (224)	S	S	X					
0.27μF (274)								
0.33μF (334)								
0.39μF (394)								
0.47μF (474)								
0.56μF (564)								
0.68μF (684)								
0.82μF (824)								
1.0μF (105)								
1.5μF (155)								
2.2μF (225)								
4.7μF (475)								

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.

X7R Dielectric 0805 Size

Multilayer Ceramic Capacitors

Approval Sheet

DIELECTRIC		X7R									
SIZE		0805									
RATED VOLTAGE		10	16	25	50	100	200	250	500	630	1000
Capacitance	100pF (101)	D	D	D	D	D	D	D	B	B	B
	120pF (121)	D	D	D	D	D	D	D	B	B	B
	150pF (151)	D	D	D	D	D	D	D	B	B	B
	180pF (181)	D	D	D	D	D	D	D	B	B	B
	220pF (221)	D	D	D	D	D	D	D	B	B	B
	270pF (271)	D	D	D	D	D	D	D	B	B	B
	330pF (331)	D	D	D	D	D	D	D	B	B	B
	390pF (391)	D	D	D	D	D	D	D	B	B	B
	470pF (471)	D	D	D	D	D	D	D	B	B	B
	560pF (561)	D	D	D	D	D	D	D	B	B	B
	680pF (681)	D	D	D	D	D	D	D	B	B	B
	820pF (821)	D	D	D	D	D	D	D	B	B	B
	1,000pF (102)	D	D	D	D	D	D	D	B	B	B
	1,200pF (122)	D	D	D	D	D	D	D	B	B	B
	1,500pF (152)	D	D	D	D	D	D	D	B	B	D
	1,800pF (182)	D	D	D	D	D	D	D	B	B	D
	2,200pF (222)	D	D	D	D	D	D	D	B	B	D
	2,700pF (272)	D	D	D	D	D	D	D	B	B	
	3,300pF (332)	D	D	D	D	D	D	D	B	B	
	3,900pF (392)	D	D	D	D	D	D	D	B	B	
	4,700pF (472)	D	D	D	D	D	D	D	D	D	
	5,600pF (562)	D	D	D	D	D	D	D	D	D	
	6,800pF (682)	D	D	D	D	D	D	D	D	D	
	8,200pF (822)	D	D	D	D	D	D	D	D	D	
	0.010μF (103)	D	D	D	D	D	D	D	D	D	
	0.012μF (123)	D	D	D	D	D	D	D	D	D	
	0.015μF (153)	D	D	D	D	D	D	D	D	D	
	0.018μF (183)	D	D	D	D	D	D	D	D	D	
	0.022μF (223)	D	D	D	D	D	D	D	D	D	
	0.027μF (273)	D	D	D	D	D	D	D	D	D	
	0.033μF (333)	D	D	D	D	D	D	D	D	D	
	0.039μF (393)	D	D	D	D	D	D	D	D	D	
	0.047μF (473)	D	D	D	D	D	D	D	D	D	
	0.056μF (563)	D	D	D	D	D	D	D	D	D	
	0.068μF (683)	D	D	D	D	D	D	D	D	D	
	0.082μF (823)	D	D	D	D	D	D	D	D	D	
	0.10μF (104)	D	D	D	D	D	D	D	D	D	
	0.12μF (124)	D	D	D	D	D	D	D	D	D	
	0.15μF (154)	D	D	D	D	D	D	D	D	D	
	0.18μF (184)	D	D	D	D	D	I				
	0.22μF (224)	D	D	D	D	D	I				
	0.27μF (274)	I	I	I	I	I					
	0.33μF (334)	I	I	I	I	I					
	0.39μF (394)	I	I	I	I	I					
	0.47μF (474)	I	I	I	I	I					
	0.56μF (564)	I	I	I	I	I					
	0.68μF (684)	I	I	I	I	I					
0.82μF (824)	I	I	I	I	I						
1.0μF (105)											
1.5μF (155)											
2.2μF (225)											
3.3μF (335)											
4.7μF (475)											
10μF (106)											
22μF (226)											
47μF (476)											

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

Multilayer Ceramic Capacitors

Approval Sheet

X7R Dielectric 1206 Size

DIELECTRIC	X7R													
	SIZE													
RATED VOLTAGE	10	16	25	50	100	200	250	400	450	500	630	1000	1500	2000
100pF (101)						D	D			D	D	D	D	D
120pF (121)						D	D			D	D	D	D	D
150pF (151)	D	D	D	D	D	D	D			D	D	D	D	D
180pF (181)	D	D	D	D	D	D	D			D	D	D	D	D
220pF (221)	D	D	D	D	D	D	D			D	D	D	D	D
270pF (271)	D	D	D	D	D	D	D			D	D	D	D	D
330pF (331)	D	D	D	D	D	D	D			D	D	D	D	D
390pF (391)	D	D	D	D	D	D	D			D	D	D	D	D
470pF (471)	D	D	D	D	D	D	D			D	D	D	D	D
560pF (561)	D	D	D	D	D	D	D			D	D	D	D	D
680pF (681)	D	D	D	D	D	D	D			D	D	D	D	D
820pF (821)	D	D	D	D	D	D	D			D	D	D	G	G
1,000pF (102)	D	D	D	D	D	D	D			D	D	D	G	G
1,200pF (122)	D	D	D	D	D	D	D			D	D	D	G	G
1,500pF (152)	D	D	D	D	D	D	D			D	D	D	G	G
1,800pF (182)	D	D	D	D	D	D	D			D	D	D	G	G
2,200pF (222)	D	D	D	D	D	D	D			D	D	D	G	G
2,700pF (272)	D	D	D	D	D	D	D			D	D	D	G	G
3,300pF (332)	D	D	D	D	D	D	D			D	D	D	G	G
3,900pF (392)	D	D	D	D	D	D	D			D	D	D	G	
4,700pF (472)	D	D	D	D	D	D	D			D	D	D	G	
5,600pF (562)	D	D	D	D	D	D	D			D	D	D	G	
6,800pF (682)	D	D	D	D	D	D	D			D	D	D	G	
8,200pF (822)	D	D	D	D	D	D	D			D	D	D	G	
0.010μF (103)	D	D	D	D	D	D	D			D	D	D	G	
0.012μF (123)	D	D	D	D	D	D	D			D	D	G		
0.015μF (153)	D	D	D	D	D	D	D			D	D	G		
0.018μF (183)	D	D	D	D	D	D	D			D	D			
0.022μF (223)	D	D	D	D	D	D	D			G	G			
0.027μF (273)	D	D	D	D	D	D	D			G	G			
0.033μF (333)	D	D	D	D	D	G	G			G	G			
0.039μF (393)	D	D	D	D	D	G	G			G	G			
0.047μF (473)	D	D	D	D	D	G	G			G	G			
0.056μF (563)	D	D	D	D	D	G	G			G	G			
0.068μF (683)	D	D	D	D	D	G	G	G	G					
0.082μF (823)	D	D	D	D	D	G	G	G	G					
0.10μF (104)	D	D	D	D	D	G	G	G	G					
0.12μF (124)	D	D	D	D	D									
0.15μF (154)	C	C	C	C	C	G								
0.18μF (184)	C	C	C	C	C	G								
0.22μF (224)	C	C	C	C	G									
0.27μF (274)	C	C	C	D	G									
0.33μF (334)	C	C	C	D	G									
0.39μF (394)	C	C	J	P	G									
0.47μF (474)	J	J	J	P	G									
0.56μF (564)	J	J	J	P	P									
0.68μF (684)	J	J	J	P	P									
0.82μF (824)	J	J	J	P	P									
1.0μF (105)	J	J	J	P										
1.5μF (155)														
2.2μF (225)														
3.3μF (335)														
4.7μF (475)														
10μF (106)														
22μF (226)														
47μF (476)														

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.

8. PACKAGING STYLE AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0603 (1608)	0.80±0.07	S	4k	15k	-	-
	0.80±0.30	X	4k	15k	-	-
0805 (2012)	0.60±0.10	A	4k	15k	-	-
	0.80±0.10	B	4k	15k	-	-
	1.25±0.10	D	-	-	3k	10k
	1.25±0.30	I	-	-	3k	10k
1206 (3216)	0.80±0.10	B	4k	15k	-	-
	0.95±0.10	C	-	-	3k	10k
	1.15±0.15	J	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	10k
	1.60±0.50	P	-	-	2k	9k

Unit: pieces



Multilayer Ceramic Capacitors

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) C ≤ 1000pF, 1.0±0.2Vrms · 1MHz±10% C > 1000pF, 1.0±0.2Vrms · 1KHz±10% Class II: (X7R, X7E, X6S, X5R, X7S, Y5V) C ≤ 10μF, 1.0±0.2Vrms · 1KHz±10% ** C > 10μF, 0.5±0.2Vrms · 120Hz±20%	* Shall not exceed the limits given in the detailed spec. NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R, X5R, X6S, X7S:																																																			
3.	Q/ D.F. (Dissipation Factor)	** Test condition: 0.5±0.2Vrms · 1KHz±10% X7R: 0805=106(6.3V), 0603/475(6.3V) X5R: 0201 ≥ 224 (6.3V, 10V, 16V) #1, 0402 ≥ 475 (6.3V, 16V), 0402 ≥ 225(10V), 0603=106 (6.3V, 10V), TT18X ≥ 475(10V) , TT15X series X6S: 0201/474(4V), 0201 ≥ 104 (6.3V, 10V #1), 0402 ≥ 225 (6.3V), 0402/475 (10V), 0603/106 (6.3V), X7S: 0402/225(6.3V) #1 Excluding X5R/0201/105(6.3V); 225(10V), X6S/0201/104(10V) (1.0±0.2Vrms · 1KHz±10%) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 100V</td> <td>≤ 2.5%</td> <td>≤ 3% 1206 ≥ 0.47μF ≤ 5% 0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series ≤ 10% 0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>50V</td> <td>≤ 2.5%</td> <td>≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF ≤ 5% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>≤ 3.5%</td> <td>≤ 10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF(0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series ≤ 3% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V</td> <td>≤ 3.5%</td> <td>≤ 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF ≤ 7% 0603 ≥ 0.33μF ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF ≤ 12.5% 0402 ≥ 0.47μF</td> </tr> <tr> <td>16V</td> <td>≤ 3.5%</td> <td>≤ 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF ≤ 10% 0201 ≥ 0.1μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; TT series 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>10V</td> <td>≤ 5%</td> <td>≤ 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</td> </tr> <tr> <td>6.3V</td> <td>≤ 10%</td> <td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF(0402/X6S ≥ 0.47μF); 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series ≤ 20% 0402 ≥ 2.2μF</td> </tr> <tr> <td>4V</td> <td>≤ 15%</td> <td>---</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50V</td> <td>≤ 5%</td> <td>≤ 7% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF; TT series ≤ 12.5% 1210 ≥ 6.8μF</td> </tr> <tr> <td>35V</td> <td>≤ 7%</td> <td>---</td> </tr> <tr> <td>25V</td> <td>≤ 5%</td> <td>≤ 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</td> </tr> <tr> <td>16V (C < 1.0μF)</td> <td>≤ 7%</td> <td>≤ 9% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF ≤ 12.5% 0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>≤ 9%</td> <td>≤ 12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; TT series</td> </tr> <tr> <td>10V</td> <td>≤ 12.5%</td> <td>≤ 20% 0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 20%</td> <td>---</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 100V	≤ 2.5%	≤ 3% 1206 ≥ 0.47μF ≤ 5% 0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series ≤ 10% 0805 > 0.22μF; 1210 ≥ 3.3μF	50V	≤ 2.5%	≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF ≤ 5% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF	35V	≤ 3.5%	≤ 10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF(0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series ≤ 3% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 3.5%	≤ 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF ≤ 7% 0603 ≥ 0.33μF ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF ≤ 12.5% 0402 ≥ 0.47μF	16V	≤ 3.5%	≤ 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF ≤ 10% 0201 ≥ 0.1μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; TT series 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	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(0402/X6S ≥ 0.47μF); 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. ≤	≥ 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	10V	≤ 12.5%	≤ 20% 0402 ≥ 0.47μF	6.3V	≤ 20%	---
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																				
≥ 100V	≤ 2.5%	≤ 3% 1206 ≥ 0.47μF ≤ 5% 0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series ≤ 10% 0805 > 0.22μF; 1210 ≥ 3.3μF																																																				
50V	≤ 2.5%	≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF ≤ 5% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF																																																				
35V	≤ 3.5%	≤ 10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF(0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series ≤ 3% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																				
25V	≤ 3.5%	≤ 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF ≤ 7% 0603 ≥ 0.33μF ≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF ≤ 12.5% 0402 ≥ 0.47μF																																																				
16V	≤ 3.5%	≤ 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF ≤ 10% 0201 ≥ 0.1μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; TT series 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																				
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(0402/X6S ≥ 0.47μF); 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. ≤																																																				
≥ 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																																																				
10V	≤ 12.5%	≤ 20% 0402 ≥ 0.47μF																																																				
6.3V	≤ 20%	---																																																				
4.	Dielectric Strength	*To apply voltage: ≤ 100V: 250% of rated voltage. 200V ~ 300V: 200% of rated voltage. 400V ~ 450V: 120% of rated voltage. 500V ~ 999V: 150% of rated voltage. 1000V ~ 3000V: 120% of rated voltage. 4000V: 110% of rated voltage. *Duration: 1 to 5 sec. *Charge & discharge current less than 50mA.	* No evidence of damage or flash over during test.																																																			

No.	Item	Test Condition	Requirements																						
5.	Insulation Resistance	To apply rated voltage for MAX. 120sec.	10GΩ or $RxC \geq 500\Omega\cdot F$ whichever is smaller. Class II (X7R, X7E, X5R,X6S,X7S,Y5V:)																						
			<table border="1"> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> <tr> <td>100V: All X7R</td> <td rowspan="7">10GΩ or $RxC \geq 100 \Omega\cdot F$ whichever is smaller.</td> </tr> <tr> <td>50V: 0402>0.01μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF</td> </tr> <tr> <td>35V: 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF</td> </tr> <tr> <td>16V: 0201≥0.1μF; 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF</td> </tr> <tr> <td>10V: 0201≥47nF; 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF</td> </tr> <tr> <td>6.3V ; 4V ; TT series; Size≥1812</td> </tr> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> <tr> <td>All X6S items, All X7S items</td> <td rowspan="8">RxC ≥ 50 Ω·F.</td> </tr> <tr> <td>100V: 1210≥3.3μF</td> </tr> <tr> <td>50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF; 1206≥10μF</td> </tr> <tr> <td>35V: 0603≥1μF;</td> </tr> <tr> <td>25V: 0201≥0.1μF; 0402≥2.2μF; 0603≥10μF; 0805≥10μF; 1206≥22μF</td> </tr> <tr> <td>16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF</td> </tr> <tr> <td>10V: 0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF; TT21>4.7μF</td> </tr> <tr> <td>6.3V: 0201≥0.1μF; 0603>4.7μF; 0805≥47μF; 1206≥10μF; TT15>1.0μF</td> </tr> <tr> <td>4V: 0603≥22μF; 0805≥47μF; 1206≥100μF</td> </tr> </table>	Rated voltage	Insulation Resistance	100V: All X7R	10GΩ or $RxC \geq 100 \Omega\cdot F$ whichever is smaller.	50V: 0402>0.01μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF	35V: 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF	25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF	16V: 0201≥0.1μF; 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF	10V: 0201≥47nF; 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF	6.3V ; 4V ; TT series; Size≥1812	Rated voltage	Insulation Resistance	All X6S items, All X7S items	RxC ≥ 50 Ω·F.	100V: 1210≥3.3μF	50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF; 1206≥10μF	35V: 0603≥1μF;	25V: 0201≥0.1μF; 0402≥2.2μF; 0603≥10μF; 0805≥10μF; 1206≥22μF	16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF	10V: 0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF; TT21>4.7μF	6.3V: 0201≥0.1μF; 0603>4.7μF; 0805≥47μF; 1206≥10μF; TT15>1.0μF	4V: 0603≥22μF; 0805≥47μF; 1206≥100μF
			Rated voltage	Insulation Resistance																					
			100V: All X7R	10GΩ or $RxC \geq 100 \Omega\cdot F$ whichever is smaller.																					
50V: 0402>0.01μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF																									
35V: 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF																									
25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF																									
16V: 0201≥0.1μF; 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF																									
10V: 0201≥47nF; 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF																									
6.3V ; 4V ; TT series; Size≥1812																									
Rated voltage	Insulation Resistance																								
All X6S items, All X7S items	RxC ≥ 50 Ω·F.																								
100V: 1210≥3.3μF																									
50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF; 1206≥10μF																									
35V: 0603≥1μF;																									
25V: 0201≥0.1μF; 0402≥2.2μF; 0603≥10μF; 0805≥10μF; 1206≥22μF																									
16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF																									
10V: 0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF; TT21>4.7μF																									
6.3V: 0201≥0.1μF; 0603>4.7μF; 0805≥47μF; 1206≥10μF; TT15>1.0μF																									
4V: 0603≥22μF; 0805≥47μF; 1206≥100μF																									
Rated voltage: 200~630V	To apply rated voltage (500V max.) for 60 sec.	≥10GΩ or $RxC \geq 100\Omega\cdot F$ whichever is smaller																							
Rated voltage: >630V	To apply 500V for 60 sec.																								



No.	Item	Test Condition	Requirements																																																								
6.	Temperature Coefficient	<p>With no electrical load.</p> <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> </thead> <tbody> <tr> <td>NPO</td> <td>-55~125°C at 25°C</td> </tr> <tr> <td>X7R</td> <td>-55~125°C at 25°C</td> </tr> <tr> <td>X7S</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X5R</td> <td>-55~ 85°C at 25°C</td> </tr> <tr> <td>X6S</td> <td>-55~105°C at 25°C</td> </tr> <tr> <td>Y5V</td> <td>-25~ 85°C at 20°C</td> </tr> </tbody> </table> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24± 2 hrs at room temp.</p> <p>* Measurement voltage for Class II:</p> <table border="1"> <thead> <tr> <th>01005</th> <th>0201</th> </tr> </thead> <tbody> <tr> <td>Cap≤0.01μF: 0.5V</td> <td>Cap<0.1μF:1V</td> </tr> <tr> <td>Cap>0.01μF: 0.2V</td> <td>0.1μF*≤Cap<1μF: 0.2V</td> </tr> <tr> <td></td> <td>Cap≥1μF: 0.1V</td> </tr> <tr> <td></td> <td>*0201X104/16V: 0.5V</td> </tr> <tr> <th>0402</th> <th>0603</th> </tr> <tr> <td>Cap<1μF: 1V</td> <td>Cap≤1μF: 1V</td> </tr> <tr> <td>Cap=1μF: 0.5V</td> <td>1μF<Cap≤4.7μF: 0.5V</td> </tr> <tr> <td>1μF<Cap<10μF: 0.2V</td> <td>Cap>4.7μF: 0.2V</td> </tr> <tr> <td>Cap≥10μF: 0.1V</td> <td></td> </tr> <tr> <th>0805</th> <th>1206/1210</th> </tr> <tr> <td>Cap<10μF: 1V</td> <td>Cap≤10μF: 1V</td> </tr> <tr> <td>Cap=10μF: 0.5V</td> <td>10μF<Cap≤100μF: 0.5V</td> </tr> <tr> <td>Cap>10μF: 0.2V</td> <td>Cap>100μF: 0.2V</td> </tr> </tbody> </table>	T.C.	Operating Temp	NPO	-55~125°C at 25°C	X7R	-55~125°C at 25°C	X7S	-55 ~ 125°C at 25°C	X5R	-55~ 85°C at 25°C	X6S	-55~105°C at 25°C	Y5V	-25~ 85°C at 20°C	01005	0201	Cap≤0.01μF: 0.5V	Cap<0.1μF:1V	Cap>0.01μF: 0.2V	0.1μF*≤Cap<1μF: 0.2V		Cap≥1μF: 0.1V		*0201X104/16V: 0.5V	0402	0603	Cap<1μF: 1V	Cap≤1μF: 1V	Cap=1μF: 0.5V	1μF<Cap≤4.7μF: 0.5V	1μF<Cap<10μF: 0.2V	Cap>4.7μF: 0.2V	Cap≥10μF: 0.1V		0805	1206/1210	Cap<10μF: 1V	Cap≤10μF: 1V	Cap=10μF: 0.5V	10μF<Cap≤100μF: 0.5V	Cap>10μF: 0.2V	Cap>100μF: 0.2V	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>NPO</td> <td>Within ±30ppm/°C</td> </tr> <tr> <td>X7R</td> <td>Within ±15%</td> </tr> <tr> <td>X7S</td> <td>Within ±22%</td> </tr> <tr> <td>X5R</td> <td>Within ±15%</td> </tr> <tr> <td>X6S</td> <td>Within ±22%</td> </tr> <tr> <td>Y5V</td> <td>Within +30%/-80%</td> </tr> </tbody> </table>	T.C.	Capacitance Change	NPO	Within ±30ppm/°C	X7R	Within ±15%	X7S	Within ±22%	X5R	Within ±15%	X6S	Within ±22%	Y5V	Within +30%/-80%
T.C.	Operating Temp																																																										
NPO	-55~125°C at 25°C																																																										
X7R	-55~125°C at 25°C																																																										
X7S	-55 ~ 125°C at 25°C																																																										
X5R	-55~ 85°C at 25°C																																																										
X6S	-55~105°C at 25°C																																																										
Y5V	-25~ 85°C at 20°C																																																										
01005	0201																																																										
Cap≤0.01μF: 0.5V	Cap<0.1μF:1V																																																										
Cap>0.01μF: 0.2V	0.1μF*≤Cap<1μF: 0.2V																																																										
	Cap≥1μF: 0.1V																																																										
	*0201X104/16V: 0.5V																																																										
0402	0603																																																										
Cap<1μF: 1V	Cap≤1μF: 1V																																																										
Cap=1μF: 0.5V	1μF<Cap≤4.7μF: 0.5V																																																										
1μF<Cap<10μF: 0.2V	Cap>4.7μF: 0.2V																																																										
Cap≥10μF: 0.1V																																																											
0805	1206/1210																																																										
Cap<10μF: 1V	Cap≤10μF: 1V																																																										
Cap=10μF: 0.5V	10μF<Cap≤100μF: 0.5V																																																										
Cap>10μF: 0.2V	Cap>100μF: 0.2V																																																										
T.C.	Capacitance Change																																																										
NPO	Within ±30ppm/°C																																																										
X7R	Within ±15%																																																										
X7S	Within ±22%																																																										
X5R	Within ±15%																																																										
X6S	Within ±22%																																																										
Y5V	Within +30%/-80%																																																										
7.	Adhesive Strength of Termination	<p>Pressurizing force : 2N (0201) and 5N (≤0603) and 10N (>0603)</p> <p>* Test time: 10±1 sec.</p>	<p>* No remarkable damage or removal of the terminations.</p>																																																								
8.	Vibration Resistance	<p>* Vibration frequency: 10~55 Hz/min.</p> <p>* Total amplitude: 1.5mm</p> <p>* Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)</p> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24± 2 hrs at room temp.</p> <p>*Cap./DF(Q) Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	<p>* No remarkable damage.</p> <p>* Cap change and Q/D.F.: To meet initial spec.</p>																																																								
9.	Solderability	<p>* Solder temperature: 235±5°C</p> <p>* Dipping time: 2±0.5 sec.</p>	<p>* 75% min. coverage of all metalized area.</p>																																																								
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 5 mm and then the pressure shall be maintained for 5±1 sec.</p> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24± 2 hrs at room temp.</p> <p>* Measurement to be made after keeping at room temp. for 24±2 hrs.</p>	<p>* No remarkable damage.</p> <p>* Cap change : NPO: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S, X7S: within ±12.5% Y5V: within ±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>																																																								
11.	Resistance to Soldering Heat	<p>* Solder temperature: 260±5°C</p> <p>* Dipping time: 10±1 sec</p> <p>* Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder.</p> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p> <p>*Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	<p>* No remarkable damage.</p> <p>* Cap change: NPO: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S, X7S: within ±7.5% Y5V: within ±20%</p> <p>* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</p> <p>* 25% max. leaching on each edge.</p>																																																								
12.	Temperature Cycle	<p>* Conduct the five cycles according to the temperatures and time.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p> <p>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	Step	Temp. (°C)	Time (min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	<p>* No remarkable damage.</p> <p>* Cap change : NPO: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S, X7S: within ±7.5% Y5V: within ±20%</p> <p>* 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): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. * Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; TT series & C≥ 1uF, within ±25% **10V: 0603 ≥ 4.7μF; 0402 ≥ 1μF; 0201 ≥ 0.1μF, within ±25%; Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40% * Q/D.F. value: NP0: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C X7R, X5R, X6S, X7S: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td rowspan="3">≤3%</td> <td>≤6% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5% 0805 > 0.1μF, 0603 ≥ 0.068μF, 1206 > 1μF; 1210 ≥ 2.2μF; TT series</td> </tr> <tr> <td>≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤3%</td> <td>≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF (0805/X7R > 0.47μF); 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="3">25V</td> <td rowspan="3">≤5%</td> <td>≤10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤14% 0603 ≥ 0.33μF</td> </tr> <tr> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤5%</td> <td>≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td>≤20% 0402 ≥ 0.47μF</td> </tr> <tr> <td>10V</td> <td>≤7.5%</td> <td>≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤15%</td> <td>≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5</td> </tr> <tr> <td>≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF (0402/X6S ≥ 0.47μF); 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>---</td> </tr> </tbody> </table> 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="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>≤12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>16V (C < 1.0μF)</td> <td>≤10%</td> <td>≤20% 0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>≤12.5%</td> <td>≤20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;</td> </tr> <tr> <td>10V</td> <td>≤20%</td> <td>≤30% 0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>≤30%</td> <td>---</td> </tr> </tbody> </table> *I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, X7S, Y5V) <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210 ≥ 3.3μF</td> <td rowspan="7">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥ 1812</td> </tr> </tbody> </table>	Rated 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	≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF	50V	≤3%	≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF	≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF (0805/X7R > 0.47μF); 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	≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V	≤5%	≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	≤20% 0402 ≥ 0.47μF	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	6.3V	≤15%	≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5	≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF (0402/X6S ≥ 0.47μF); 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 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	≤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	≤12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF	16V (C < 1.0μF)	≤10%	≤20% 0402 ≥ 0.22μF	16V (C ≥ 1.0μF)	≤12.5%	≤20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;	10V	≤20%	≤30% 0402 ≥ 0.47μF	6.3V	≤30%	---	Rated voltage	Insulation Resistance	100V: All X7R; 1210 ≥ 3.3μF	1GΩ or RxC ≥ 10 Ω-F whichever is smaller.	50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF	35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥ 1812
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																																																																										
		≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF																																																																										
50V	≤3%	≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																										
		≤10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF																																																																										
		≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF (0805/X7R > 0.47μF); 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																																																																										
		≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																										
16V	≤5%	≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																										
		≤15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series																																																																										
		≤20% 0402 ≥ 0.47μF																																																																										
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																																																																										
6.3V	≤15%	≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5																																																																										
		≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF (0402/X6S ≥ 0.47μF); 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 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																																																																										
		≤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																																																																										
		≤12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																										
16V (C < 1.0μF)	≤10%	≤20% 0402 ≥ 0.22μF																																																																										
16V (C ≥ 1.0μF)	≤12.5%	≤20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;																																																																										
10V	≤20%	≤30% 0402 ≥ 0.47μF																																																																										
6.3V	≤30%	---																																																																										
Rated voltage	Insulation Resistance																																																																											
100V: All X7R; 1210 ≥ 3.3μF	1GΩ or RxC ≥ 10 Ω-F whichever is smaller.																																																																											
50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF																																																																												
35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																												
25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF																																																																												
16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF																																																																												
10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																																																												
6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥ 1812																																																																												

No	Item	Test Condition	Requirements																																																																										
14	Humidity (Damp Heat) Load	*Test temp. : 40±2°C *Humidity : 90~95%RH *Test time : 500+24/-0 hrs. *To apply voltage : Rated voltage (MAX. 500V) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. Cap change: NP0: ±7.5% or 0.75pF whichever is larger. X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; 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, X7S:																																																																										
			<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="3">≥ 100V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 7.5% 0805 > 0.1μF, 0603 ≥ 0.068μF, 1206 > 1μF; 1210 ≥ 2.2μF; TT series</td> </tr> <tr> <td>≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 0201 ≥ 0.01uF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF (0805/X7R > 0.47μF); 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="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14% 0603 ≥ 0.33μF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤ 5%</td> <td>≤ 20% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 10% 0402 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤ 7.5%</td> <td>≤ 15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td>≤ 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 (0402/X6S ≥ 0.47μF); 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> <p>Y5V:</p> <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="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>≤ 12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>16V (C < 1.0μF)</td> <td>≤ 10%</td> <td>≤ 20% 0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>≤ 12.5%</td> <td>≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;</td> </tr> <tr> <td>10V</td> <td>≤ 20%</td> <td>≤ 30% 0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 30%</td> <td>---</td> </tr> </tbody> </table> <p>*I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, X7S, Y5V)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210 ≥ 3.3μF</td> <td rowspan="7">500MΩ or RxC ≥ 5 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥ 1812</td> </tr> </tbody> </table>	Rated 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	≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF	50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10% 0201 ≥ 0.01uF; 1210 ≥ 4.7μF	≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF (0805/X7R > 0.47μF); 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	≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series	16V	≤ 5%	≤ 20% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 10% 0402 ≥ 0.47μF	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series: 01R5	6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF (0402/X6S ≥ 0.47μF); 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	≤ 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	≤ 12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF	16V (C < 1.0μF)	≤ 10%	≤ 20% 0402 ≥ 0.22μF	16V (C ≥ 1.0μF)	≤ 12.5%	≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;	10V	≤ 20%	≤ 30% 0402 ≥ 0.47μF	6.3V	≤ 30%	---	Rated voltage	Insulation Resistance	100V: All X7R; 1210 ≥ 3.3μF	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/X7S items; Size ≥ 1812
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																																																																											
		≤ 20% 0805 > 0.22μF; 1210 ≥ 3.3μF																																																																											
50V	≤ 3%	≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																											
		≤ 10% 0201 ≥ 0.01uF; 1210 ≥ 4.7μF																																																																											
		≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF (0805/X7R > 0.47μF); 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																																																																											
		≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series																																																																											
16V	≤ 5%	≤ 20% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																											
		≤ 10% 0402 ≥ 0.47μF																																																																											
		≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																											
10V	≤ 7.5%	≤ 15% 0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series																																																																											
		≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																																											
		≤ 20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series: 01R5																																																																											
6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF (0402/X6S ≥ 0.47μF); 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																																																																											
		≤ 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																																																																											
		≤ 12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																											
16V (C < 1.0μF)	≤ 10%	≤ 20% 0402 ≥ 0.22μF																																																																											
16V (C ≥ 1.0μF)	≤ 12.5%	≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;																																																																											
10V	≤ 20%	≤ 30% 0402 ≥ 0.47μF																																																																											
6.3V	≤ 30%	---																																																																											
Rated voltage	Insulation Resistance																																																																												
100V: All X7R; 1210 ≥ 3.3μF	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/X7S items; Size ≥ 1812																																																																													

Multilayer Ceramic Capacitors

Approval Sheet

No	Item	Test Condition	Requirements																																																																																																																																																																																																																																																													
15.	High Temperature Load (Endurance)	Test temp. : NP0, X7R/X7E/X7S: 125±3°C X6S: 105±3°C X5R, Y5V: 85±3°C Test time: 1000+24/-0 hrs. To apply voltage: (1) ≤ 6.3V or C ≥ 10μF or TT series: 150% of rated voltage. (2) 10V~250V: 200% of rated voltage. (3) 400V~450V: 120% of rated voltage. (4) 500V: 150% of rated voltage. (5) 630V~3000V: 120% of rated voltage. (6) 4000V: 110% of rated voltage (7) 100% of rated voltage for below range.	* No remarkable damage. Cap change: NP0: ±3.0% or ±0.3pF whichever is larger X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤ 6.3V within ±25%; TT series & C ≥ 1μF, within ±25% **10V: 0603 ≥ 4.7μF; 0402 ≥ 1μF; 0201 ≥ 0.1μF, within ±25%; Y5V: ≥10V, within ±30%; ≤ 6.3V, within +30/-40% Q/D.F. value: NP0: More than 30pF, Q≥350 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C X7R, X5R, X6S, X7S:																																																																																																																																																																																																																																																													
		<table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated</th> <th>Capacitance</th> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td rowspan="2">X5R/X7R/X6S</td> <td>≤ 10V</td> <td>C ≥ 0.1μF</td> <td rowspan="2">≥ 100V</td> <td rowspan="2">≤ 3%</td> <td>≤ 6%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≥ 16V</td> <td>C > 0.1μF</td> <td>≤ 7.5%</td> <td>0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series</td> </tr> <tr> <td rowspan="4">0402</td> <td rowspan="2">X5R</td> <td>≤ 16V</td> <td>C > 1.0μF</td> <td rowspan="4">50V</td> <td rowspan="4">≤ 3%</td> <td>≤ 20%</td> <td>0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>25V, 50V</td> <td>C ≥ 1.0μF</td> <td>≤ 6%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>6.3V, 10V</td> <td>C > 1.0μF</td> <td>≤ 10%</td> <td>0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>16V, 25V</td> <td>C ≥ 1.0μF</td> <td>≤ 20%</td> <td>0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF(0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series</td> </tr> <tr> <td rowspan="2">X7R/X7S/Y5V</td> <td>6.3V, 10V</td> <td>C ≥ 1.0μF</td> <td rowspan="2">35V</td> <td rowspan="2">≤ 5%</td> <td>≤ 20%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>4V</td> <td>C ≥ 22μF</td> <td>≤ 10%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">0603</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>6.3V, 10V</td> <td>C ≥ 4.7μF</td> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 14%</td> <td>0603 ≥ 0.33μF</td> </tr> <tr> <td>25V</td> <td>C ≥ 1.0μF</td> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series</td> </tr> <tr> <td>35V</td> <td>C ≥ 1.0μF</td> <td>≤ 20%</td> <td>0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>X7R</td> <td>4V</td> <td>C ≥ 47μF</td> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10%</td> <td>0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>6.3V</td> <td>C ≥ 22μF</td> <td>≤ 15%</td> <td>0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td rowspan="2">X7R/X6S/X7S</td> <td>16V, 25V</td> <td>C ≥ 10μF</td> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15%</td> <td>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>C ≥ 22μF</td> <td>≤ 20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5</td> </tr> <tr> <td rowspan="2">1206</td> <td rowspan="2">X5R/X7R/X6S</td> <td>≤ 6.3V</td> <td>C ≥ 47μF</td> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 15%</td> <td>≤ 30%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF(0402/X6S ≥ 0.47μF); 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>3000V</td> <td>C ≥ 1.5pF</td> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="2">1210</td> <td rowspan="2">X5R/X7R/X6S</td> <td>16V</td> <td>C ≥ 47μF</td> <td rowspan="2">4V</td> <td rowspan="2">≤ 20%</td> <td>---</td> <td>---</td> </tr> <tr> <td>100V</td> <td>C ≥ 3.3μF</td> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="2">TT15</td> <td rowspan="2">X5R</td> <td>6.3V</td> <td>C > 1.0μF</td> <td rowspan="2">Y5V:</td> <td rowspan="2">---</td> <td>---</td> <td>---</td> </tr> <tr> <td>6.3V</td> <td>C ≥ 10μF</td> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="2">TT18</td> <td rowspan="2">Y5V</td> <td>6.3V, 10V</td> <td>C ≥ 2.2μF</td> <td rowspan="2">Rated vol.</td> <td rowspan="2">D.F. ≤</td> <td rowspan="2">Exception of D.F. ≤</td> </tr> <tr> <td>6.3V</td> <td>C ≥ 10μF</td> </tr> <tr> <td rowspan="2">TT21</td> <td rowspan="2">X5R/X7R/X6S</td> <td>≤ 10V</td> <td>C ≥ 10μF</td> <td>≥ 50V</td> <td>≤ 7.5%</td> <td>≤ 10%</td> <td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>6.3V</td> <td>C ≥ 22μF</td> <td>35V</td> <td>≤ 10%</td> <td>---</td> <td>1210 ≥ 6.8μF</td> </tr> <tr> <td rowspan="2">TT31</td> <td rowspan="2">Y5V</td> <td>6.3V</td> <td>C ≥ 22μF</td> <td rowspan="2">25V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 10%</td> <td>0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>---</td> <td>---</td> <td>≤ 15%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">0201</td> <td rowspan="2">X5R/X6S</td> <td>16V, 25V</td> <td>C = 0.1μF</td> <td rowspan="2">16V (C < 1.0μF)</td> <td rowspan="2">≤ 10%</td> <td>≤ 12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>50V</td> <td>C > 0.01μF</td> <td>≤ 20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td rowspan="2">0402</td> <td rowspan="2">X7R/X5R/X6S</td> <td>10~25V</td> <td>C ≥ 0.22μF</td> <td rowspan="2">16V (C < 1.0μF)</td> <td rowspan="2">≤ 10%</td> <td>≤ 20%</td> <td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;</td> </tr> <tr> <td>50V~100V</td> <td>C > 0.22μF</td> <td>≤ 30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="4">0603</td> <td rowspan="2">X7R</td> <td>50V</td> <td>C > 0.1μF</td> <td rowspan="4">6.3V</td> <td rowspan="4">≤ 30%</td> <td>---</td> <td>---</td> </tr> <tr> <td>25V</td> <td>C = 1.0μF</td> <td>---</td> <td>---</td> </tr> <tr> <td>50V</td> <td>C ≥ 1.0μF</td> <td>---</td> <td>---</td> </tr> <tr> <td>50V</td> <td>C ≥ 1.0μF</td> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>10V, 16V,</td> <td>C ≥ 1.0μF</td> <td rowspan="2">100V, 16V,</td> <td rowspan="2">C ≥ 0.47μF</td> <td rowspan="2">C ≥ 1.0μF</td> <td rowspan="2">C ≥ 4.7μF</td> </tr> <tr> <td>16V</td> <td>C ≥ 2.2μF</td> </tr> <tr> <td rowspan="4">0805</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>100V</td> <td>C ≥ 0.47μF</td> <td rowspan="4">100V: All X7R; 1210 ≥ 3.3μF</td> <td rowspan="4">50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> <td rowspan="4">35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>50V</td> <td>C ≥ 1.0μF</td> <td rowspan="2">25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>C ≥ 2.2μF</td> <td rowspan="2">16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10~25V</td> <td>C ≥ 4.7μF</td> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td rowspan="2">Y5V</td> <td>16V</td> <td>C ≥ 4.7μF</td> <td rowspan="2">100V~250V</td> <td rowspan="2">C ≥ 1.0μF</td> <td rowspan="2">C ≥ 1.0μF</td> <td rowspan="2">Insulation Resistance</td> </tr> <tr> <td>100V</td> <td>C ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">1206</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>100V</td> <td>C > 1.0μF</td> <td rowspan="2">100V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> <td rowspan="2">C ≥ 1.0μF</td> <td rowspan="2">C ≥ 1.0μF</td> </tr> <tr> <td>50V</td> <td>C = 4.7μF</td> </tr> <tr> <td rowspan="2">1210</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>50V~100V</td> <td>C ≥ 2.2μF</td> <td rowspan="2">6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥ 1812</td> <td rowspan="2">C ≥ 2.2μF</td> <td rowspan="2">C ≥ 2.2μF</td> </tr> <tr> <td>100V~250V</td> <td>C ≥ 1.0μF</td> </tr> </tbody> </table>	Size	Dielectric	Rated	Capacitance	Rated vol.	D.F. ≤	Exception of D.F. ≤	0201	X5R/X7R/X6S	≤ 10V	C ≥ 0.1μF	≥ 100V	≤ 3%	≤ 6%	1206 ≥ 0.47μF	≥ 16V	C > 0.1μF	≤ 7.5%	0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series	0402	X5R	≤ 16V	C > 1.0μF	50V	≤ 3%	≤ 20%	0805 > 0.22μF; 1210 ≥ 3.3μF	25V, 50V	C ≥ 1.0μF	≤ 6%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	6.3V, 10V	C > 1.0μF	≤ 10%	0201 ≥ 0.01μF; 1210 ≥ 4.7μF	16V, 25V	C ≥ 1.0μF	≤ 20%	0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF(0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series	X7R/X7S/Y5V	6.3V, 10V	C ≥ 1.0μF	35V	≤ 5%	≤ 20%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	4V	C ≥ 22μF	≤ 10%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	0603	X5R/X7R/X6S/X7S	6.3V, 10V	C ≥ 4.7μF	25V	≤ 5%	≤ 14%	0603 ≥ 0.33μF	25V	C ≥ 1.0μF	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series	35V	C ≥ 1.0μF	≤ 20%	0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	X7R	4V	C ≥ 47μF	16V	≤ 5%	≤ 10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	6.3V	C ≥ 22μF	≤ 15%	0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	X7R/X6S/X7S	16V, 25V	C ≥ 10μF	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	C ≥ 22μF	≤ 20%	0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5	1206	X5R/X7R/X6S	≤ 6.3V	C ≥ 47μF	6.3V	≤ 15%	≤ 30%	0201 ≥ 0.1μF; 0402 ≥ 1μF(0402/X6S ≥ 0.47μF); 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series	3000V	C ≥ 1.5pF	---	---	1210	X5R/X7R/X6S	16V	C ≥ 47μF	4V	≤ 20%	---	---	100V	C ≥ 3.3μF	---	---	TT15	X5R	6.3V	C > 1.0μF	Y5V:	---	---	---	6.3V	C ≥ 10μF	---	---	TT18	Y5V	6.3V, 10V	C ≥ 2.2μF	Rated vol.	D.F. ≤	Exception of D.F. ≤	6.3V	C ≥ 10μF	TT21	X5R/X7R/X6S	≤ 10V	C ≥ 10μF	≥ 50V	≤ 7.5%	≤ 10%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF	6.3V	C ≥ 22μF	35V	≤ 10%	---	1210 ≥ 6.8μF	TT31	Y5V	6.3V	C ≥ 22μF	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	0201	X5R/X6S	16V, 25V	C = 0.1μF	16V (C < 1.0μF)	≤ 10%	≤ 12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	50V	C > 0.01μF	≤ 20%	0402 ≥ 0.22μF	0402	X7R/X5R/X6S	10~25V	C ≥ 0.22μF	16V (C < 1.0μF)	≤ 10%	≤ 20%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;	50V~100V	C > 0.22μF	≤ 30%	0402 ≥ 0.47μF	0603	X7R	50V	C > 0.1μF	6.3V	≤ 30%	---	---	25V	C = 1.0μF	---	---	50V	C ≥ 1.0μF	---	---	50V	C ≥ 1.0μF	---	---	X5R/X7R/X6S/X7S	10V, 16V,	C ≥ 1.0μF	100V, 16V,	C ≥ 0.47μF	C ≥ 1.0μF	C ≥ 4.7μF	16V	C ≥ 2.2μF	0805	X5R/X7R/X6S/X7S	100V	C ≥ 0.47μF	100V: All X7R; 1210 ≥ 3.3μF	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	50V	C ≥ 1.0μF	25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	35V	C ≥ 2.2μF	16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10~25V	C ≥ 4.7μF	10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	Y5V	16V	C ≥ 4.7μF	100V~250V	C ≥ 1.0μF	C ≥ 1.0μF	Insulation Resistance	100V	C ≥ 0.47μF	1206	X5R/X7R/X6S/X7S	100V	C > 1.0μF	100V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	C ≥ 1.0μF	C ≥ 1.0μF	50V	C = 4.7μF	1210	X5R/X7R/X6S/X7S	50V~100V	C ≥ 2.2μF	6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥ 1812	C ≥ 2.2μF	C ≥ 2.2μF	100V~250V	C ≥ 1.0μF
		Size	Dielectric	Rated	Capacitance	Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																																																																																																																																																																																								
		0201	X5R/X7R/X6S	≤ 10V	C ≥ 0.1μF	≥ 100V	≤ 3%	≤ 6%	1206 ≥ 0.47μF																																																																																																																																																																																																																																																							
				≥ 16V	C > 0.1μF			≤ 7.5%	0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series																																																																																																																																																																																																																																																							
		0402	X5R	≤ 16V	C > 1.0μF	50V	≤ 3%	≤ 20%	0805 > 0.22μF; 1210 ≥ 3.3μF																																																																																																																																																																																																																																																							
				25V, 50V	C ≥ 1.0μF			≤ 6%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																																																																																																																																																																																																							
			6.3V, 10V	C > 1.0μF	≤ 10%			0201 ≥ 0.01μF; 1210 ≥ 4.7μF																																																																																																																																																																																																																																																								
			16V, 25V	C ≥ 1.0μF	≤ 20%			0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF(0805/X7R > 0.47μF); 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series																																																																																																																																																																																																																																																								
		X7R/X7S/Y5V	6.3V, 10V	C ≥ 1.0μF	35V	≤ 5%	≤ 20%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																																																																																																																																																																																																								
			4V	C ≥ 22μF			≤ 10%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																																																																																																																																																																																																																																								
		0603	X5R/X7R/X6S/X7S	6.3V, 10V	C ≥ 4.7μF	25V	≤ 5%	≤ 14%	0603 ≥ 0.33μF																																																																																																																																																																																																																																																							
				25V	C ≥ 1.0μF			≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series																																																																																																																																																																																																																																																							
			35V	C ≥ 1.0μF	≤ 20%			0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																																																																																																																																																																																								
		X7R	4V	C ≥ 47μF	16V	≤ 5%	≤ 10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																																																																																																																																																																																																								
		6.3V	C ≥ 22μF	≤ 15%			0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series																																																																																																																																																																																																																																																									
		X7R/X6S/X7S	16V, 25V	C ≥ 10μF	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																																																																																																																																																																																																																																																								
			C ≥ 22μF	≤ 20%			0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5																																																																																																																																																																																																																																																									
		1206	X5R/X7R/X6S	≤ 6.3V	C ≥ 47μF	6.3V	≤ 15%	≤ 30%	0201 ≥ 0.1μF; 0402 ≥ 1μF(0402/X6S ≥ 0.47μF); 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series																																																																																																																																																																																																																																																							
				3000V	C ≥ 1.5pF			---	---																																																																																																																																																																																																																																																							
		1210	X5R/X7R/X6S	16V	C ≥ 47μF	4V	≤ 20%	---	---																																																																																																																																																																																																																																																							
				100V	C ≥ 3.3μF			---	---																																																																																																																																																																																																																																																							
		TT15	X5R	6.3V	C > 1.0μF	Y5V:	---	---	---																																																																																																																																																																																																																																																							
				6.3V	C ≥ 10μF			---	---																																																																																																																																																																																																																																																							
		TT18	Y5V	6.3V, 10V	C ≥ 2.2μF	Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																																																																																																																																																																																								
6.3V	C ≥ 10μF																																																																																																																																																																																																																																																															
TT21	X5R/X7R/X6S	≤ 10V	C ≥ 10μF	≥ 50V	≤ 7.5%	≤ 10%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF																																																																																																																																																																																																																																																									
		6.3V	C ≥ 22μF	35V	≤ 10%	---	1210 ≥ 6.8μF																																																																																																																																																																																																																																																									
TT31	Y5V	6.3V	C ≥ 22μF	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																																																																																																																																																																																																																																																									
0201	X5R/X6S	16V, 25V	C = 0.1μF	16V (C < 1.0μF)	≤ 10%	≤ 12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																																																																																																																																																																																																									
		50V	C > 0.01μF			≤ 20%	0402 ≥ 0.22μF																																																																																																																																																																																																																																																									
0402	X7R/X5R/X6S	10~25V	C ≥ 0.22μF	16V (C < 1.0μF)	≤ 10%	≤ 20%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF;																																																																																																																																																																																																																																																									
		50V~100V	C > 0.22μF			≤ 30%	0402 ≥ 0.47μF																																																																																																																																																																																																																																																									
0603	X7R	50V	C > 0.1μF	6.3V	≤ 30%	---	---																																																																																																																																																																																																																																																									
		25V	C = 1.0μF			---	---																																																																																																																																																																																																																																																									
	50V	C ≥ 1.0μF	---			---																																																																																																																																																																																																																																																										
	50V	C ≥ 1.0μF	---			---																																																																																																																																																																																																																																																										
X5R/X7R/X6S/X7S	10V, 16V,	C ≥ 1.0μF	100V, 16V,	C ≥ 0.47μF	C ≥ 1.0μF	C ≥ 4.7μF																																																																																																																																																																																																																																																										
	16V	C ≥ 2.2μF																																																																																																																																																																																																																																																														
0805	X5R/X7R/X6S/X7S	100V	C ≥ 0.47μF	100V: All X7R; 1210 ≥ 3.3μF	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																																																																																																																																																																																																																																																										
		50V	C ≥ 1.0μF				25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF																																																																																																																																																																																																																																																									
	35V	C ≥ 2.2μF	16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF																																																																																																																																																																																																																																																													
	10~25V	C ≥ 4.7μF					10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																																																																																																																																																																																																																																									
Y5V	16V	C ≥ 4.7μF	100V~250V	C ≥ 1.0μF	C ≥ 1.0μF	Insulation Resistance																																																																																																																																																																																																																																																										
	100V	C ≥ 0.47μF																																																																																																																																																																																																																																																														
1206	X5R/X7R/X6S/X7S	100V	C > 1.0μF	100V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	C ≥ 1.0μF	C ≥ 1.0μF																																																																																																																																																																																																																																																										
		50V	C = 4.7μF																																																																																																																																																																																																																																																													
1210	X5R/X7R/X6S/X7S	50V~100V	C ≥ 2.2μF	6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥ 1812	C ≥ 2.2μF	C ≥ 2.2μF																																																																																																																																																																																																																																																										
		100V~250V	C ≥ 1.0μF																																																																																																																																																																																																																																																													
<p>**1WV items must follow de-rating conditions.</p> <p>8) 150% of rated voltage for below range.</p>																																																																																																																																																																																																																																																																
<table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td rowspan="2">X5R/X6S</td> <td>16V, 25V</td> <td>C = 0.1μF</td> </tr> <tr> <td>16V</td> <td>C ≥ 0.022μF</td> </tr> <tr> <td rowspan="2">0402</td> <td rowspan="2">X7R/X5R/X6S</td> <td>50V</td> <td>C > 0.01μF</td> </tr> <tr> <td>10~25V</td> <td>C ≥ 0.22μF</td> </tr> <tr> <td rowspan="4">0603</td> <td rowspan="2">X7S</td> <td>50V~100V</td> <td>C > 0.22μF</td> </tr> <tr> <td>50V</td> <td>C > 0.1μF</td> </tr> <tr> <td rowspan="2">X7R</td> <td>25V</td> <td>C = 1.0μF</td> </tr> <tr> <td>50V</td> <td>C ≥ 1.0μF</td> </tr> <tr> <td rowspan="2">X5R</td> <td>50V</td> <td>C ≥ 1.0μF</td> </tr> <tr> <td>X5R/X7R/X6S/X7S</td> <td>10V, 16V,</td> <td>C ≥ 1.0μF</td> </tr> <tr> <td rowspan="2">0805</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>100V</td> <td>C ≥ 0.47μF</td> </tr> <tr> <td>50V</td> <td>C ≥ 1.0μF</td> </tr> <tr> <td rowspan="2">Y5V</td> <td rowspan="2">Y5V</td> <td>16V</td> <td>C ≥ 4.7μF</td> </tr> <tr> <td>10~25V</td> <td>C ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">1206</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>100V</td> <td>C > 1.0μF</td> </tr> <tr> <td>50V</td> <td>C = 4.7μF</td> </tr> <tr> <td rowspan="2">1210</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>50V~100V</td> <td>C ≥ 2.2μF</td> </tr> <tr> <td>1825 2220 2225</td> <td>X7R</td> <td>100V~250V</td> <td>C ≥ 1.0μF</td> </tr> </tbody> </table>		Size	Dielectric	Rated	Capacitance	0201	X5R/X6S	16V, 25V	C = 0.1μF	16V	C ≥ 0.022μF	0402	X7R/X5R/X6S	50V	C > 0.01μF	10~25V	C ≥ 0.22μF	0603	X7S	50V~100V	C > 0.22μF	50V	C > 0.1μF	X7R	25V	C = 1.0μF	50V	C ≥ 1.0μF	X5R	50V	C ≥ 1.0μF	X5R/X7R/X6S/X7S	10V, 16V,	C ≥ 1.0μF	0805	X5R/X7R/X6S/X7S	100V	C ≥ 0.47μF	50V	C ≥ 1.0μF	Y5V	Y5V	16V	C ≥ 4.7μF	10~25V	C ≥ 4.7μF	1206	X5R/X7R/X6S/X7S	100V	C > 1.0μF	50V	C = 4.7μF	1210	X5R/X7R/X6S/X7S	50V~100V	C ≥ 2.2μF	1825 2220 2225	X7R	100V~250V	C ≥ 1.0μF																																																																																																																																																																																																				
Size	Dielectric	Rated	Capacitance																																																																																																																																																																																																																																																													
0201	X5R/X6S	16V, 25V	C = 0.1μF																																																																																																																																																																																																																																																													
		16V	C ≥ 0.022μF																																																																																																																																																																																																																																																													
0402	X7R/X5R/X6S	50V	C > 0.01μF																																																																																																																																																																																																																																																													
		10~25V	C ≥ 0.22μF																																																																																																																																																																																																																																																													
0603	X7S	50V~100V	C > 0.22μF																																																																																																																																																																																																																																																													
		50V	C > 0.1μF																																																																																																																																																																																																																																																													
	X7R	25V	C = 1.0μF																																																																																																																																																																																																																																																													
		50V	C ≥ 1.0μF																																																																																																																																																																																																																																																													
X5R	50V	C ≥ 1.0μF																																																																																																																																																																																																																																																														
	X5R/X7R/X6S/X7S	10V, 16V,	C ≥ 1.0μF																																																																																																																																																																																																																																																													
0805	X5R/X7R/X6S/X7S	100V	C ≥ 0.47μF																																																																																																																																																																																																																																																													
		50V	C ≥ 1.0μF																																																																																																																																																																																																																																																													
Y5V	Y5V	16V	C ≥ 4.7μF																																																																																																																																																																																																																																																													
		10~25V	C ≥ 4.7μF																																																																																																																																																																																																																																																													
1206	X5R/X7R/X6S/X7S	100V	C > 1.0μF																																																																																																																																																																																																																																																													
		50V	C = 4.7μF																																																																																																																																																																																																																																																													
1210	X5R/X7R/X6S/X7S	50V~100V	C ≥ 2.2μF																																																																																																																																																																																																																																																													
		1825 2220 2225	X7R	100V~250V	C ≥ 1.0μF																																																																																																																																																																																																																																																											
<p>* Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * De-rating conditions:</p>																																																																																																																																																																																																																																																																

Multilayer Ceramic Capacitors

APPENDIXES

■ Tape & reel dimensions

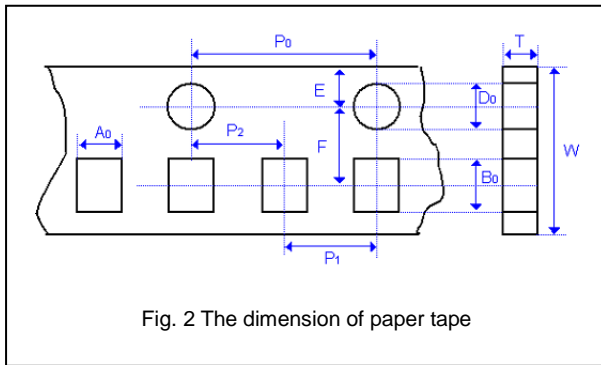


Fig. 2 The dimension of paper tape

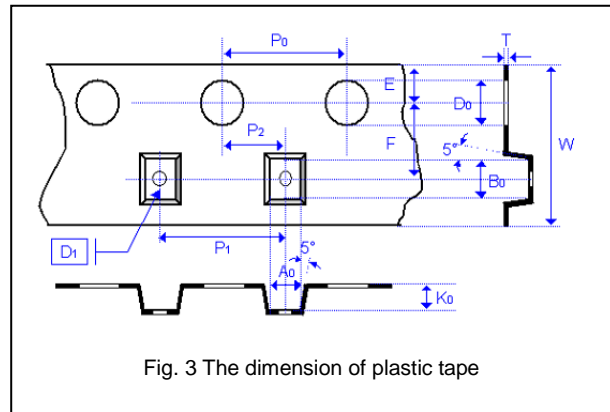


Fig. 3 The dimension of plastic tape

Size	0402	0603	0805			1206			1210		1808	1812	
Thickness	E	S, X	A	B	C, D, I	B	C, J, D	G, P	C,D,G,K	M	D, G, K	D, G, K	M, U
A ₀	0.70 +/-0.20	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	< 2.30	< 3.05	< 3.05	< 3.20	< 2.50	< 3.90
B ₀	1.20 +/-0.20	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	< 2.70	3.50 +/-0.50	< 3.70	< 4.00	< 3.80	< 3.80	< 4.00	< 5.30	< 5.30
T	≤ 0.80	≤ 1.20	≤ 1.15	≤ 1.20	0.23 +/-0.1	≤ 1.20	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.25 +/-0.1	0.25 +/-0.1
K ₀	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 1.50	< 2.50	< 3.20	< 2.50	< 2.50
W	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30
P ₀	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
10xP ₀	40.00 +/-0.10	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20
P ₁	2.00 +/-0.05	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
P ₂	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.10	2.00 +/-0.10
D ₀	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0
D ₁	-	-	-	-	1.00 +/-0.10	-	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.50 +/-0.10	1.50 +/-0.10
E	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10
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	5.50 +/-0.10	5.50 +/-0.10

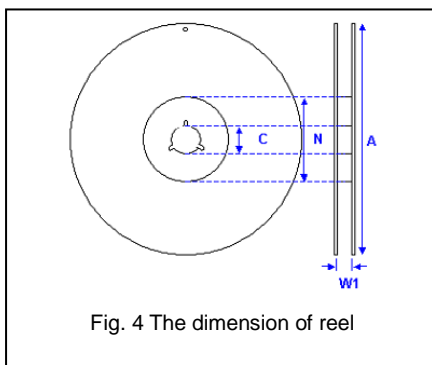
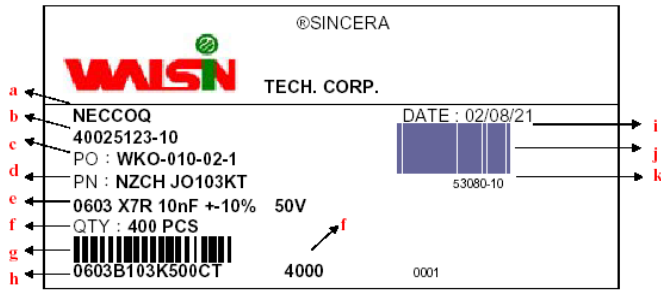


Fig. 4 The dimension of reel

Size	0402, 0603, 0805, 1206, 1210			1808, 1812
Reel size	7"	10"	13"	7"
C	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2
W ₁	8.4+1.5/-0	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0±1.0	250.0±1.0	330.0±1.0	178.0±1.00
N	60.0+1.0/-0	100.0±1.0	100±1.0	60.0+1.0/-0

Multilayer Ceramic Capacitors

Example of customer label

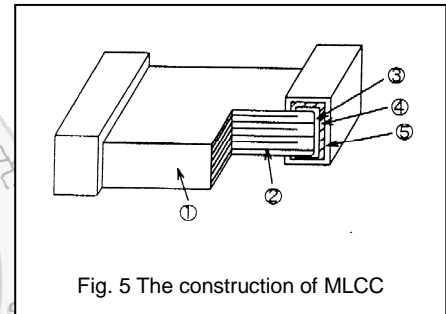


*Customized label is available upon request

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

Constructions

No.	Name	X7R
①	Ceramic material	BaTiO ₃ based
②	Inner electrode	Ni
③	Termination	Inner layer Cu + Cu Polymer
④		Middle layer Ni
⑤		Outer layer Sn



Storage and handling conditions

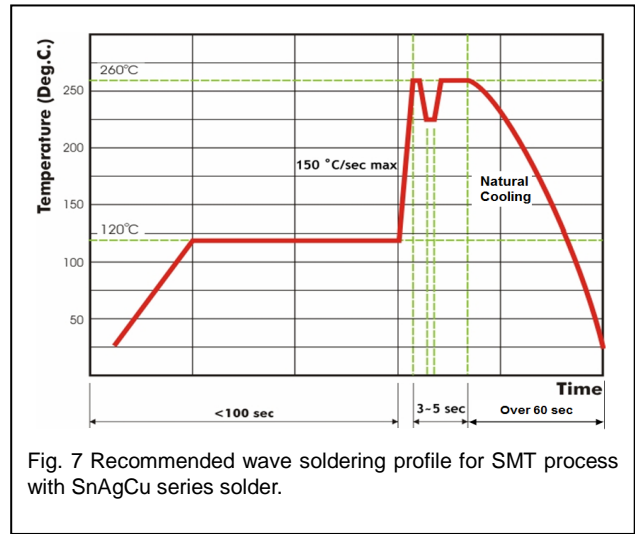
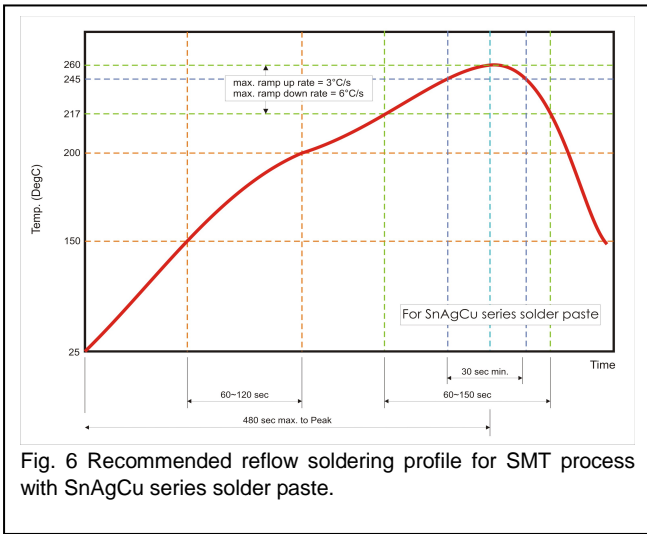
- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

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.



单击下面可查看定价，库存，交付和生命周期等信息

[>>Walsin Technology\(华新科技\(华科\)\)](#)

[>>点击查看相关商品](#)