

# Viking Tech Corporation

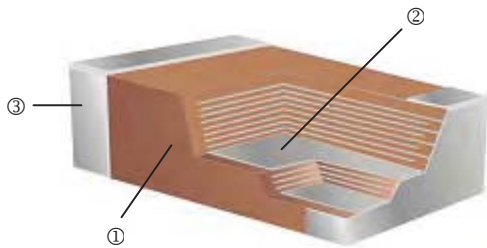
## Multilayer Ceramic Chip Capacitor



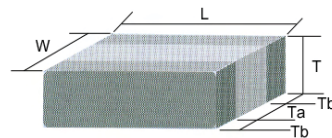
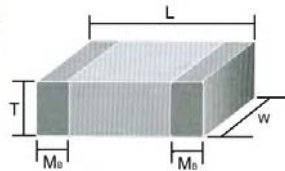
### Features

- Wide capacitance range, extremely compact size
- Low inductance of capacitor for high frequency application
- Excellent solderability and resistance to soldering heat, suitable for flow and reflow soldering
- Adaptable to high-speed surface mount assembly
- Conform to EIAJ-RC3402, and also compatible with EIA-RS198 and IEC PUB. 384-10

### Construction



①	Ceramic Material	③	Termination:
②	Inner Electrodes		NPO: Ag/Ni/Sn dielectric X7R, Y5V, X5R: Cu/Ni/Sn dielectric



Unit: mm

### Dimensions

MC / MCHL / MCRF Type

Type	Size (Inch)	L	W	T / Symbol		M <sub>B</sub>	Packaging (7" Reel)	
							Paper tape	Plastic tape
01	0201	0.6±0.03	0.3±0.03	0.3±0.03	L	0.15±0.05	15K	-
02	0402	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05 / -0.10	10K	-
03	0603	1.60±0.10	0.80±0.10	0.80±0.10	S	0.40±0.15	4K	-
		1.60 +0.15 / -0.10	0.80 +0.15 / -0.10	0.80 +0.15 / -0.10	X		4K	
05	0805	2.00±0.15	1.25±0.20	0.60±0.15	A	0.50±0.20	4K	-
				0.80±0.10	B		4K	-
				1.25±0.10	D		-	3K
				0.85±0.10	T		4K	-
				1.25±0.20	I		-	3K
06	1206	3.20±0.15	1.60±0.15	0.80±0.10	B	0.60±0.20 (0.50±0.20)***	4K	-
				0.95±0.10	C		-	3K
				1.25±0.10	D		-	3K
				1.15±0.15	J		-	3K
				1.60±0.20	G		-	2K
				1.60±0.3 / -0.1	P		-	2K
10	1210	3.20±0.30	2.50±0.20	0.95±0.10	C	0.75±0.25	-	3K
				1.25±0.10	D		-	3K
				1.60±0.20	G		-	2K
				2.00±0.20	K		-	1K
				2.50±0.30	M		-	1K
08	1808	4.50±0.40 (4.5+0.5/-0.3)**	2.03±0.25	1.25±0.10	D	0.75±0.25 (0.50±0.20)***	-	2K
				2.00±0.20	K		-	1K
				1.25±0.10	D		-	1K
12	1812	4.50±0.40 (4.5+0.5/-0.3)**	3.20±0.30	2.00±0.20	K	0.75±0.25 (0.50±0.20)***	-	1K
				2.50±0.30	M		-	1K
				3.20±0.40			-	0.5K

\*\* For 1808/1812: 200~3KV, \*\*\*For 1206:1KV~3KV; 1808/1812: 200~3KV

Low Inductance Capacitors for MCLI Type

Unit: mm

Type	Size (Inch)	L	W	T / Symbol		T <sub>a</sub> min.	T <sub>b</sub> min.	Packaging (7" Reel)	
								Paper tape	Plastic tape
MCLI43	0612	3.20±0.15	1.60±0.15	0.80±0.10	B	0.5	0.13	4K	-

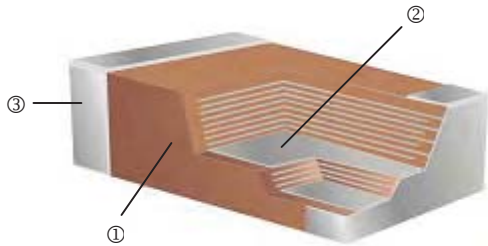
# Multilayer Ceramic Chip Capacitor



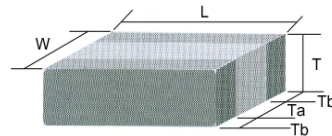
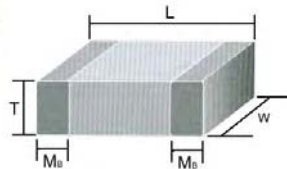
## Features

- Wide capacitance range, extremely compact size
- Low inductance of capacitor for high frequency application
- Excellent solderability and resistance to soldering heat, suitable for flow and reflow soldering
- Adaptable to high-speed surface mount assembly
- Conform to EIAJ-RC3402, and also compatible with EIA-RS198 and IEC PUB. 384-10

## Construction



①	Ceramic Material	③	Termination:
②	Inner Electrodes		NPO: Ag/Ni/Sn dielectric X7R, Y5V, X5R: Cu/Ni/Sn dielectric



Unit: mm

## Dimensions

MC / MCHL / MCRF Type

Type	Size (Inch)	L	W	T / Symbol		M <sub>B</sub>	Packaging (7" Reel)	
							Paper tape	Plastic tape
01	0201	0.6±0.03	0.3±0.03	0.3±0.03	L	0.15±0.05	15K	-
02	0402	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05 / -0.10	10K	-
03	0603	1.60±0.10	0.80±0.10	0.80±0.10	S	0.40±0.15	4K	-
		1.60 +0.15 / -0.10	0.80 +0.15 / -0.10	0.80 +0.15 / -0.10	X		4K	
05	0805	2.00±0.15	1.25±0.20	0.60±0.15	A	0.50±0.20	4K	-
				0.80±0.10	B		4K	-
		1.25±0.10		D	-		3K	
		0.85±0.10		T	4K		-	
06	1206	3.20±0.15	1.60±0.15	1.25±0.20	I	0.60±0.20 (0.50±0.20)***	-	3K
				0.80±0.10	B		4K	-
		0.95±0.10		C	-		3K	
		1.25±0.10		D	-		3K	
06	1206	3.20±0.20	1.60±0.20	1.15±0.15	J	0.60±0.20 (0.50±0.20)***	-	3K
		1.60±0.20		G	-		2K	
		3.20+0.3 / -0.1		1.60+0.3 / -0.1	1.60+0.3 / -0.1		P	-
10	1210	3.20±0.30	2.50±0.20	0.95±0.10	C	0.75±0.25	-	3K
				1.25±0.10	D		-	3K
		3.20±0.40	2.50±0.30	1.60±0.20	G		-	2K
				2.00±0.20	K		-	1K
				2.50±0.30	M		-	1K
08	1808	4.50±0.40 (4.5+0.5/-0.3)**	2.03±0.25	1.25±0.10	D	0.75±0.25 (0.50±0.20)***	-	2K
				2.00±0.20	K		-	1K
12	1812	4.50±0.40 (4.5+0.5/-0.3)**	3.20±0.30	1.25±0.10	D	0.75±0.25 (0.50±0.20)***	-	1K
				2.00±0.20	K		-	1K
				2.50±0.30	M		-	0.5K

\*\* For 1808/1812: 200~3KV, \*\*\*For 1206:1KV~3KV; 1808/1812: 200~3KV

Low Inductance Capacitors for MCLI Type

Unit: mm

Type	Size (Inch)	L	W	T / Symbol		T <sub>a</sub> min.	T <sub>b</sub> min.	Packaging (7" Reel)	
								Paper tape	Plastic tape
MCLI43	0612	3.20±0.15	1.60±0.15	0.80±0.10	B	0.5	0.13	4K	-

## Part Numbering

MC	03	J	T	N	250	3R9
Product Type	Dimensions (L×W)	Capacitance Tolerance	Packaging	Dielectric	Voltage (VDCW)	Capacitance
MC : General; Ultra-small Middle and High Voltage MCHL: High Q and Low ESR MCRF: Ultra High Q and Low ESR (RF) MCLI: Low Inductance	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 08: 1808 12: 1812 43: 0612	B: $\pm 0.1\text{pF}$ ( $\text{Cap} \leq 5\text{pF}$ ) C: $\pm 0.25\text{pF}$ ( $\text{Cap} \leq 5\text{pF}$ ) D: $\pm 0.5\text{pF}$ ( $5\text{pF} < \text{Cap} < 10\text{pF}$ ) F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$ K: $\pm 10\%$ M: $\pm 20\%$ Z: $+80/-20\%$	T: Taping Reel	N: NPO (COG) B: X7R F: Y5V X: X5R	6V3: 6.3V 250: 25V 500: 50V 101: 100V 102: 1000V 202: 2000V 302: 3000V	3R9: 3.9pF 150: 15pF 181: 180pF 225: 2.2 $\mu\text{F}$ 476: 47 $\mu\text{F}$ 107: 100 $\mu\text{F}$

# Ultra High Q & Low ESR Capacitors for MCRF Series

## Capacitance & Voltage

Dielectric		NPO										
EIA	Size	0201			0402		0603			0805		
Code	VDCW	6.3V	10V	25V	50V	100V	50V	100V	250V	50V	100V	250V
0R1	0.1pF	L	L	L	N	N						
0R2	0.2	L	L	L	N	N						
0R3	0.3	L	L	L	N	N	S	S	S	T	T	T
0R4	0.4	L	L	L	N	N	S	S	S	T	T	T
0R5	0.5	L	L	L	N	N	S	S	S	T	T	T
0R6	0.6	L	L	L	N	N	S	S	S	T	T	T
0R7	0.7	L	L	L	N	N	S	S	S	T	T	T
0R8	0.8	L	L	L	N	N	S	S	S	T	T	T
0R9	0.9	L	L	L	N	N	S	S	S	T	T	T
1R0	1.0	L	L	L	N	N	S	S	S	T	T	T
1R2	1.2	L	L	L	N	N	S	S	S	T	T	T
1R5	1.5	L	L	L	N	N	S	S	S	T	T	T
1R8	1.8	L	L	L	N	N	S	S	S	T	T	T
2R2	2.2	L	L	L	N	N	S	S	S	T	T	T
2R7	2.7	L	L	L	N	N	S	S	S	T	T	T
3R3	3.3	L	L	L	N	N	S	S	S	T	T	T
3R9	3.9	L	L	L	N	N	S	S	S	T	T	T
4R7	4.7	L	L	L	N	N	S	S	S	T	T	T
5R6	5.6	L	L	L	N	N	S	S	S	T	T	T
6R8	6.8	L	L	L	N	N	S	S	S	T	T	T
8R2	8.2	L	L	L	N	N	S	S	S	T	T	T
100	10	L	L	L	N	N	S	S	S	T	T	T
120	12	L	L	L	N		S	S	S	T	T	T
150	15	L	L	L	N		S	S	S	T	T	T
180	18	L	L	L	N		S	S	S	T	T	T
220	22	L	L	L	N		S	S	S	T	T	T
330	33	L	L	L			S	S	S	T	T	T
390	39						S	S	S	T	T	T
470	47						S	S	S	T	T	T
560	56									T	T	T
680	68									T	T	T
820	82									T	T	T
101	100									T	T	T

■ The letter in cell is expressed the symbol of product thickness

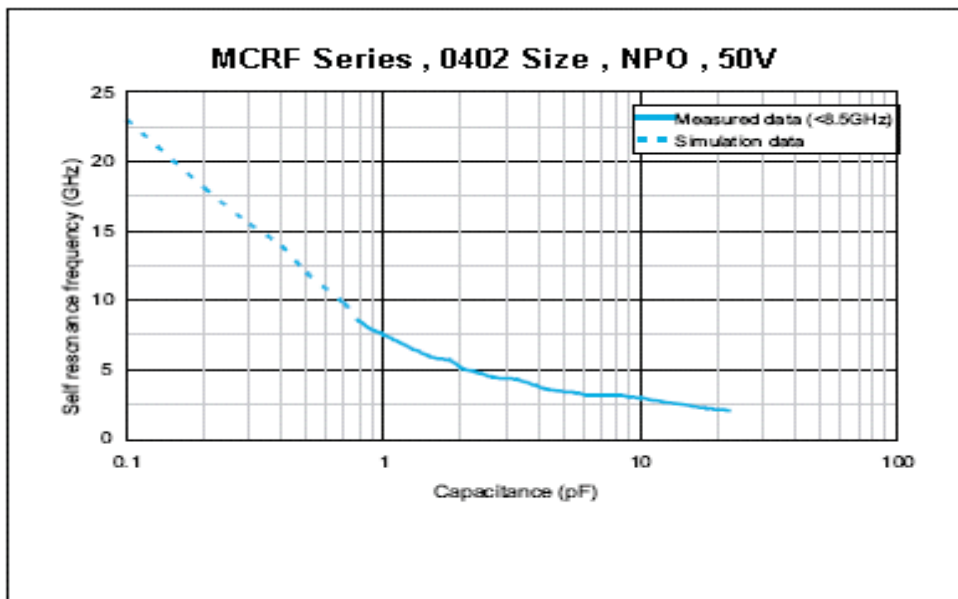
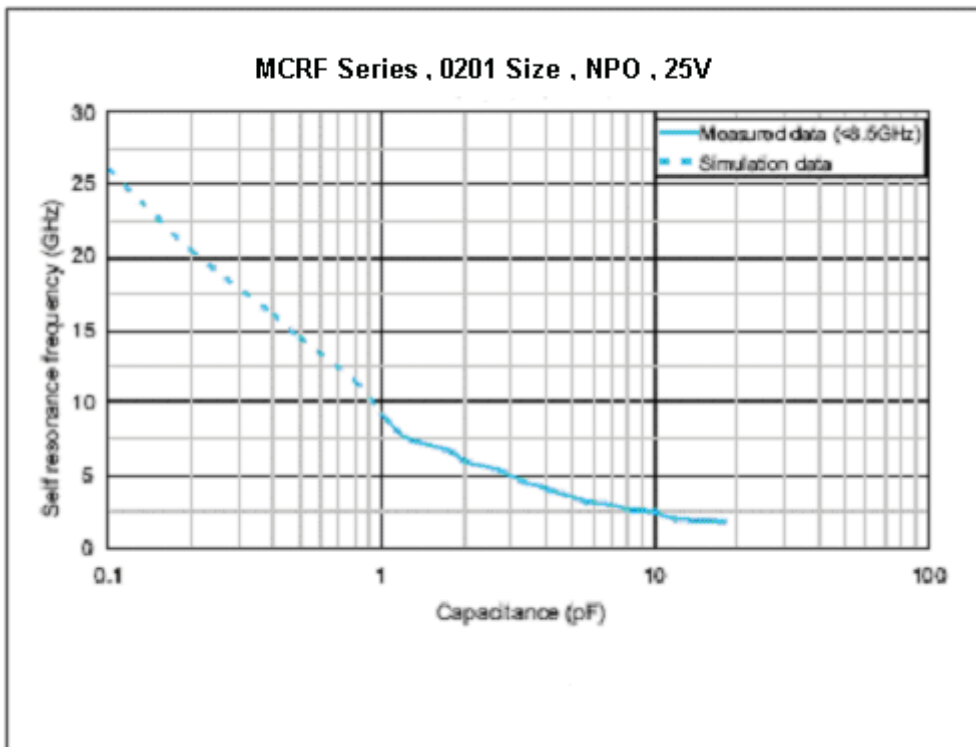
## Electrical Data

Dielectric Size	NPO
	0201, 0402, 0603, 0805
Capacitance*	0201: 0.1pF ~ 33pF, 0402: 0.1pF ~ 22pF 0603: 0.3pF ~ 47pF, 0805: 0.3pF ~ 100pF
Capacitance tolerance**	Cap ≤ 5pF: A(±0.05pF), B(±0.1pF), C(±0.25pF) 5pF < Cap < 10pF: B(±0.1pF), C(±0.25pF), D(±0.5pF) Cap ≥ 10pF: F(±1%), G(±2%), J(±5%)
Rated voltage (VDCW)	6.3V, 10V, 25V, 50V, 100V, 250V
Q *	Cap ≥ 30pF: Q ≥ 1000, Cap < 30pF: Q ≥ 400+20C;
Insulation resistance at Ur	≥ 10GΩ
Operating temperature	-55 to +125°C
Capacitance	±30 ppm
Termination	Ni/Sn (lead-free termination)

■ \*\*Measured at the conditions of 25°C ambient temperature and 30~70% related humidity

■ Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap ≤ 1000pF; 1.0KHz±10% for Cap > 1000pF

Electrical characteristics



## Environmental Characteristics

Item	Requirement	Test Method			
External Appearance	No defects which may affect performance	Visual inspection & Dimension measurement			
Capacitance(Cap.)	Within the specified tolerance that refers on page2	NPO: (Class I) Cap <sub>≤</sub> 1000pF 1.0±0.2Vrms, 1MHz±10% Cap>1000pF 1.0±0.2Vrms, 1KHz±10%			
Dissipation Factor (D.F.) or Quality factor (Q=1/D.F.)	NPO: Cap <sub>≥</sub> 30pF, Q <sub>≥</sub> 1000; Cap<30pF, Q <sub>≥</sub> 400+20C X7R, X5R:	X7R, X5R, Y5V: (Class II) Cap <sub>≤</sub> 10uF 1.0±0.2Vrms, 1KHz±10% Cap>10uF 0.5±0.2Vrms, 120Hz±10%			
	Rated vol.		D.F.≤	Exception of D.F. ≤	
	≥ 50V		2.5%	3%	0201(50V); 0603 <sub>≥</sub> 0.047μF 0805 <sub>≥</sub> 0.18μF; 1206 <sub>≥</sub> 0.47μF
				5%	1210 <sub>≥</sub> 4.7μF
				7%	0603 <sub>≥</sub> 1μF; 0805 <sub>≥</sub> 1μF 1206 <sub>≥</sub> 2.2μF; 1210 <sub>≥</sub> 10μF
	25V		3.5%	5%	0201 <sub>≥</sub> 0.01μF; 0805 <sub>≥</sub> 1μF 1210 <sub>≥</sub> 10μF
				7%	0603 <sub>≥</sub> 0.33μF; 1206 <sub>≥</sub> 4.7μF
				10%	0402 <sub>≥</sub> 0.10μF; 0603 <sub>≥</sub> 0.47μF 0805 <sub>≥</sub> 2.2μF; 1206 <sub>≥</sub> 6.8μF 1210 <sub>≥</sub> 22μF
	16V		3.5%	5%	0201 <sub>≥</sub> 0.01μF; 0402 <sub>≥</sub> 0.033μF 0603 <sub>≥</sub> 0.15μF; 0805 <sub>≥</sub> 0.68μF 1206 <sub>≥</sub> 2.2μF; 1210 <sub>≥</sub> 4.7μF
				10%	0402 <sub>≥</sub> 0.22μF; 0603 <sub>≥</sub> 0.68μF 0805 <sub>≥</sub> 2.2μF; 1206 <sub>≥</sub> 4.7μF 1210 <sub>≥</sub> 22μF
	10V		5%	10%	0201 <sub>≥</sub> 0.012μF; 0402 <sub>≥</sub> 0.33μF 0603 <sub>≥</sub> 0.33μF; 0805 <sub>≥</sub> 2.2μF 1206 <sub>≥</sub> 2.2μF; 1210 <sub>≥</sub> 22μF
				15%	0201 <sub>≥</sub> 0.1μF; 0402 <sub>≥</sub> 1μF
	6.3V		10%	15%	0201 <sub>≥</sub> 0.01μF; 0402 <sub>≥</sub> 1μF 0603 <sub>≥</sub> 10μF; 0805 <sub>≥</sub> 4.7μF 1206 <sub>≥</sub> 47μF; 1210 <sub>≥</sub> 100μF
				20%	0402 <sub>≥</sub> 2.2μF
Y5V:	Rated vol.	D.F.≤	Exception of D.F. ≤		
≥ 50V	5%	7%	0603 <sub>≥</sub> 0.1μF; 0805 <sub>≥</sub> 0.47μF 1206 <sub>≥</sub> 4.7uF		
35V	7%	—	—		
25V	5%	7%	0402 <sub>≥</sub> 0.047μF; 0603 <sub>≥</sub> 0.1μF 0805 <sub>≥</sub> 0.33μF; 1206 <sub>≥</sub> 1μF 1210 <sub>≥</sub> 4.7μF		
		9%	0402 <sub>≥</sub> 0.068μF; 0603 <sub>≥</sub> 0.47μF 1206 <sub>≥</sub> 4.7μF; 1210 <sub>≥</sub> 22μF		
16V (C < 1.0μF)	7%	9%	0402 <sub>≥</sub> 0.068μF; 0603 <sub>≥</sub> 0.68μF		
		12.5%	0402 <sub>≥</sub> 0.22μF		
16V (C ≥ 1.0μF)	9%	12.5%	0603 <sub>≥</sub> 2.2μF; 0805 <sub>≥</sub> 3.3μF 1206 <sub>≥</sub> 10μF; 1210 <sub>≥</sub> 22μF 1812 <sub>≥</sub> 47μF		
10V	12.5%	20%	0402 <sub>≥</sub> 0.47μF		
6.3V	20%	-	-		
Dielectric Strength	No evidence of damage or flash over during test	To apply voltage(≤ 100V) 250% Duration: 1 to 5sec Charge and discharge current less than 50mA  To apply voltage: 200V~300V            ≥ 2 time VDC 500V~999V           ≥ 1.5 time VDC 1000V~3000V        ≥ 1.2 time VDC Cut-off, set at 10mA TEST=15 sec.        RAMP=0			

Item	Requirement	Test Method																				
Insulation Resistance	10GΩ or RxC ≥ 500Ω-F Whichever is smaller X7R, X5R, Y5V:	To apply rated voltage for max. 120sec																				
	<table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="5">RxC ≥ 100Ω-F</td> </tr> <tr> <td>50V: 0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF</td> </tr> <tr> <td>25V: 0402 ≥ 1uF; 0603 ≥ 2.2uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 10uF</td> </tr> <tr> <td>16V: 0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF</td> </tr> <tr> <td>6.3V</td> <td></td> </tr> </tbody> </table>		Rated Voltage	Insulation Resistance	100V: X7R	RxC ≥ 100Ω-F	50V: 0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF	25V: 0402 ≥ 1uF; 0603 ≥ 2.2uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 10uF	16V: 0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF	10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF	6.3V											
	Rated Voltage		Insulation Resistance																			
100V: X7R	RxC ≥ 100Ω-F																					
50V: 0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF																						
25V: 0402 ≥ 1uF; 0603 ≥ 2.2uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 10uF																						
16V: 0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF																						
10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF																						
6.3V																						
≥ 10GΩ or 100Ω-F whichever is smaller Rated voltage: 200V~630V	To apply rated voltage(500V max.) for 60sec.																					
≥ 10GΩ Rated voltage: >630V	To apply 500V for 60sec.																					
Temperature Characteristic of Capacitance	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>NPO</td> <td>±30 (ppm/°C)</td> </tr> <tr> <td>X7R</td> <td>±15%</td> </tr> <tr> <td>X5R</td> <td>±15%</td> </tr> <tr> <td>Y5V</td> <td>+30% ~ -80%</td> </tr> </tbody> </table>	T.C.	Capacitance Change	NPO	±30 (ppm/°C)	X7R	±15%	X5R	±15%	Y5V	+30% ~ -80%	<p>With no electrical load.</p> <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> </thead> <tbody> <tr> <td>NPO</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X7R</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X5R</td> <td>-55 ~ 85°C at 25°C</td> </tr> <tr> <td>Y5V</td> <td>-25 ~ 85°C at 20°C</td> </tr> </tbody> </table>	T.C.	Operating Temp	NPO	-55 ~ 125°C at 25°C	X7R	-55 ~ 125°C at 25°C	X5R	-55 ~ 85°C at 25°C	Y5V	-25 ~ 85°C at 20°C
	T.C.	Capacitance Change																				
NPO	±30 (ppm/°C)																					
X7R	±15%																					
X5R	±15%																					
Y5V	+30% ~ -80%																					
T.C.	Operating Temp																					
NPO	-55 ~ 125°C at 25°C																					
X7R	-55 ~ 125°C at 25°C																					
X5R	-55 ~ 85°C at 25°C																					
Y5V	-25 ~ 85°C at 20°C																					
Adhesive Strength of Termination	No remarkable damage or removal of the terminations	Pressurizing force: 0201:2N 0402&0603:5N>0603:10N Test time: 10±1 sec																				
Vibration Resistance	No remarkable damage Cap change and Q/D.F.: To meet initial spec	Vibration frequency: 10~55Hz/min Total amplitude: 1.5mm Test time: 6hrs.(two hrs each in three mutually Perpendicular directions.)																				
Solderability	95% min. coverage of all metalized area.	Solder temperature: 235±5°C Dipping time: 2±0.5 sec.																				
Bending Test	No remarkable damage Cap change: NPO: within±5% or 0.5pF whichever is larger X7R, X5R: within±12.5% Y5V: within±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5±1sec. Measurement to be made after keeping at room temp. for 24±2hrs(Class I) or 48±4hrs(Class II) (Thickness>1.0mm, Thickness≤1.0mm)																				
Resistance to Soldering Heat	No remarkable damage Cap change: NPO: within±2.5% or 0.25pF whichever is larger X7R, X5R: Within±7.5% Y5V: within±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25%max. leaching on each edge.	Solder temperature: 260±5°C Dipping time: 10±1sec Preheating: 120 to 150°C for 1minute before immerse the capacitor in a eutectic solder. Before initial measurement(Class II only): Perform 150+0/-10°C for 1hr and then set for 24±4hrs at room temp. Measurement to be made after keep at room temp. for 24±2 hrs.																				
Temperature Cycle	No remarkable damage. Cap change: NPO: within±2.5% or 0.25pF whichever is larger X7R, X5R: within±7.5% Y5V: within±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements.	Conduct the five cycles according to the temperature and time. <table border="1"> <thead> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp.+0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp</td> <td>2-3</td> </tr> <tr> <td>3</td> <td>Max. operating temp.+3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2-3</td> </tr> </tbody> </table> <p>Before initial measurement(Class II only): Perform 150+0/-10°C for 1hr and then set for 48±4 hrs at room temp. Measurement to be made after keeping at room temp. for 24±2 hrs.(Class I) or 48±4 hrs.(Class II).</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					
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																				

Item	Requirement	Test Method																																																																																
Humidity (steady state)	<p>No remarkable damage. Cap change: NPO: within±5% or 0.5pF whichever is large X7R, X5R: ≥ 10V, within±12.5%; 6.3V, within±25% Y5V: ≥ 10V, within±30%; 6.3V, within±30/-40% Q/D.F. value: NPO: More than 30pF Q ≥ 350, 10pF ≤ C ≤ 30pF, Q ≥ 275+2.5C Less than 10pF Q ≥ 200+10C X7R, X5R:</p> <table border="1" data-bbox="293 443 927 1169"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF;1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="293 1205 927 1684"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <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>15%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C&lt;1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ .0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥ 10V 1GΩ or 50Ω-F whichever is smaller. Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="293 1760 927 2056"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="5">Rx C ≥ 10Ω-F</td> </tr> <tr> <td>50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF</td> </tr> <tr> <td>25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF	15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF	20%	0201 ≥ 0.1μF;0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF	16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ .0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	Rx C ≥ 10Ω-F	50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF	25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF	16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF	10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF	<p>Test temp: 40±2℃ Humidity: 90~95% RH Test time: 500+24/-0hrs Measurement to be made after keeping at room temp. for 24±2hrs.</p>
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																
≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF																																																																															
		10%	1210 ≥ 4.7μF																																																																															
		20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF																																																																															
25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF																																																																															
		14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF																																																																															
		15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF																																																																															
16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF																																																																															
		15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																															
10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF																																																																															
		20%	0201 ≥ 0.1μF;0402 ≥ 1μF																																																																															
6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF																																																																															
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF																																																																															
35V	10%	—	—																																																																															
25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF																																																																															
		15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																															
16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF																																																																															
		20%	0402 ≥ 0.22μF																																																																															
16V (C ≥ .0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF																																																																															
10V	20%	30%	0402 ≥ 0.47μF																																																																															
6.3V	30%	-	-																																																																															
Rated voltage	Insulation Resistance																																																																																	
100V:X7R	Rx C ≥ 10Ω-F																																																																																	
50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF																																																																																		
25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF																																																																																		
16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF																																																																																		
10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF																																																																																		



Item	Requirement	Test Method																																																																																	
Humidity load	<p>No remarkable damage.            Cap change:            NPO:±7.5% or 0.75pF whichever is larger            X7R, X5R: ≥ 10V, within±12.5%; 6.3V, 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:            NPO: C ≥ 30pF,Q ≥ 200; C &lt; 30pF,Q ≥ 100+10/3C            X7R, X5R:</p> <table border="1" data-bbox="293 405 943 1167"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF;1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.10μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <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>15%</td> <td>0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="293 1196 943 1686"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥ 10V 500MΩ or 25Ω-F (Whichever is smaller)            Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="293 1738 943 2065"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="6">RxC ≥ 5Ω-F</td> </tr> <tr> <td>50V:0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF</td> </tr> <tr> <td>25V:0402≥1uF;0603≥2.2uF 0805≥2.2uF; 1206≥10uF;1210≥10uF</td> </tr> <tr> <td>16V:0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF</td> </tr> <tr> <td>10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF	15%	0402 ≥ 0.10μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF;0805 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF	20%	0201 ≥ 0.1μF;0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	RxC ≥ 5Ω-F	50V:0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF	25V:0402≥1uF;0603≥2.2uF 0805≥2.2uF; 1206≥10uF;1210≥10uF	16V:0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF	10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF	6.3V	<p>Test temp: 40±2°C            Humidity: 90~95%RH            Test time: 500+24/-0 hrs            To apply voltage: Rated voltage(Max. 500V)            Measurement to be made after keeping at room temp for 24±2hrs.(Class I) or 48±4hrs.(Class II)</p>
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																	
≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																																
		10%	1210 ≥ 4.7μF																																																																																
		20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF																																																																																
25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF																																																																																
		14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF																																																																																
		15%	0402 ≥ 0.10μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF																																																																																
16V	5%	10%	0603 ≥ 0.15μF;0805 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF																																																																																
		15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																																
10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF																																																																																
		20%	0201 ≥ 0.1μF;0402 ≥ 1μF																																																																																
6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF																																																																																
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																	
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF																																																																																
35V	10%	—	—																																																																																
25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF																																																																																
		15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																
16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																																
		20%	0402 ≥ 0.22μF																																																																																
16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF																																																																																
10V	20%	30%	0402 ≥ 0.47μF																																																																																
6.3V	30%	-	-																																																																																
Rated voltage	Insulation Resistance																																																																																		
100V:X7R	RxC ≥ 5Ω-F																																																																																		
50V:0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF																																																																																			
25V:0402≥1uF;0603≥2.2uF 0805≥2.2uF; 1206≥10uF;1210≥10uF																																																																																			
16V:0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF																																																																																			
10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF																																																																																			
6.3V																																																																																			

Item	Requirement	Test Method																																																																																																																																						
High Temperature Load (Endurance)	<p>No remarkable damage.            Cap change:            NPO: <math>\pm 3\%</math> or <math>\pm 0.3F</math> whichever is larger            X7R, X5R: <math>\geq 10V</math>, within <math>\pm 12.5\%</math>; 6.3V, within <math>+30/-40\%</math>            10V: 0603 <math>\geq 4.7\mu F</math>; 0402 <math>\geq 1\mu F</math>; 0201 <math>\geq 0.1\mu F</math>, within <math>\pm 25\%</math>            Q/D.F. value:            NPO: More than 30pF, <math>Q \geq 350</math>            10pF <math>\leq C &lt; 30pF</math>, <math>Q \geq 275+2.5C</math>            Less than 10pF, <math>Q \geq 200+10C</math>            X7R, X5R:</p> <table border="1" data-bbox="306 443 933 1160"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq 50V</math></td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V); 0603 <math>\geq 0.047\mu F</math> 0805 <math>\geq 0.18\mu F</math>; 1206 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>10%</td> <td>1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>20%</td> <td>0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0805 <math>\geq 1\mu F</math> 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>14%</td> <td>0603 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.10\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 6.8\mu F</math> 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 <math>\geq 0.15\mu F</math>; 0805 <math>\geq 0.68\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0402 <math>\geq 0.033\mu F</math> 0603 <math>\geq 0.68\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 <math>\geq 0.012\mu F</math>; 0402 <math>\geq 0.33\mu F</math> 0603 <math>\geq 0.33\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td>20%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math> 0603 <math>\geq 10\mu F</math>; 0805 <math>\geq 4.7\mu F</math> 1210 <math>\geq 100\mu F</math></td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="306 1191 933 1697"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq 50V</math></td> <td>7.5%</td> <td>10%</td> <td>0603 <math>\geq 0.1\mu F</math>; 0805 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>35V</td> <td>10%</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 <math>\geq 0.047\mu F</math>; 0603 <math>\geq 0.1\mu F</math> 0805 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 1\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0<math>\mu F</math>)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.68\mu F</math></td> </tr> <tr> <td>20%</td> <td>0402 <math>\geq 0.22\mu F</math></td> </tr> <tr> <td rowspan="2">16V (C <math>\geq 1.0\mu F</math>)</td> <td rowspan="2">12.5%</td> <td>20%</td> <td>0603 <math>\geq 2.2\mu F</math>; 0805 <math>\geq 3.3\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 22\mu F</math> 1812 <math>\geq 47\mu F</math></td> </tr> <tr> <td>30%</td> <td>0402 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>10V</td> <td>20%</td> <td>-</td> <td>-</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: <math>\geq 10V</math> 1G<math>\Omega</math> or 50<math>\Omega</math>-F whichever is smaller            Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="306 1758 933 2056"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="5">RxC <math>\geq</math> 10Q-F</td> </tr> <tr> <td>50V: 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math>; 1206 <math>\geq 2.2\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>25V: 0402 <math>\geq 1\mu F</math>; 0603 <math>\geq 2.2\mu F</math>; 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>16V: 0402 <math>\geq 0.22\mu F</math>; 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> <tr> <td>10V: 0201 <math>\geq 47nF</math>; 0402 <math>\geq 0.47\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$	10%	1210 $\geq 4.7\mu F$	20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$	25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$	14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$	15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$	16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$	15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$	20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$	6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$	35V	10%	-	-	25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$	15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	16V (C < 1.0 $\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$	20%	0402 $\geq 0.22\mu F$	16V (C $\geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$	30%	0402 $\geq 0.47\mu F$	10V	20%	-	-	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V: X7R	RxC $\geq$ 10Q-F	50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$	25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$	16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$	10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$	<p>Test temp:            NPO, X7R: 125<math>\pm</math>3<math>^{\circ}C</math>            X5R, Y5V: 85<math>\pm</math>3<math>^{\circ}C</math>            Test Time: 1000+25/-0 hrs            To apply voltage:            (1.1) 100% of rated voltage for below range.</p> <table border="1" data-bbox="965 353 1471 616"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td>C <math>\geq 0.1\mu F</math></td> </tr> <tr> <td>0402</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td>C <math>\geq 1.0\mu F</math></td> </tr> <tr> <td>0603</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td>C <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>0805</td> <td>X5R, X7R</td> <td>6.3V</td> <td>C <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R, X7R</td> <td>6.3V</td> <td>C <math>\geq 47\mu F</math></td> </tr> <tr> <td>NPO</td> <td>3000V</td> <td>C <math>\geq 1.5pF</math></td> </tr> </tbody> </table> <p>(1.2) 6.3V or C <math>\geq 10\mu F</math>: 150% of rated voltage            (2) 10V <math>\leq U_r &lt; 500V</math>: 200% of rated voltage.            150% of rated voltage for below range.</p> <table border="1" data-bbox="965 712 1471 996"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0402</td> <td>X5R, X7R</td> <td>10V, 16V, 25V</td> <td>C <math>\geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C <math>\geq 0.47\mu F</math></td> </tr> <tr> <td rowspan="2">0603</td> <td>X5R, X7R</td> <td>10V, 16V</td> <td>C <math>\geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C <math>\geq 2.2\mu F</math></td> </tr> <tr> <td rowspan="2">0805</td> <td>X5R, X7R</td> <td>10V</td> <td>C <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C <math>\geq 4.7\mu F</math></td> </tr> </tbody> </table> <p>(3) 500V: 150% of rated voltage            (4) <math>U_r \geq 630V</math>: 120% of rated voltage</p> <p>Test time: 1000+24/-0hrs            Measurement to be made after keeping at room temp. for 24<math>\pm</math>2hrs.</p>	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R, X7R	6.3V, 10V	C $\geq 0.1\mu F$	0402	X5R, X7R	6.3V, 10V	C $\geq 1.0\mu F$	0603	X5R, X7R	6.3V, 10V	C $\geq 4.7\mu F$	0805	X5R, X7R	6.3V	C $\geq 22\mu F$	1206	X5R, X7R	6.3V	C $\geq 47\mu F$	NPO	3000V	C $\geq 1.5pF$	Size	Dielectric	Rated voltage	Capacitance range	0402	X5R, X7R	10V, 16V, 25V	C $\geq 1.0\mu F$	Y5V	16V	C $\geq 0.47\mu F$	0603	X5R, X7R	10V, 16V	C $\geq 1.0\mu F$	Y5V	16V	C $\geq 2.2\mu F$	0805	X5R, X7R	10V	C $\geq 4.7\mu F$	Y5V	16V	C $\geq 4.7\mu F$
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																																																																																						
$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$																																																																																																																																					
		10%	1210 $\geq 4.7\mu F$																																																																																																																																					
		20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$																																																																																																																																					
25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$																																																																																																																																					
		14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$																																																																																																																																					
		15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$																																																																																																																																					
16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$																																																																																																																																					
		15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																					
10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																					
		20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$																																																																																																																																					
6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$																																																																																																																																					
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																																																																																						
$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$																																																																																																																																					
35V	10%	-	-																																																																																																																																					
25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$																																																																																																																																					
		15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																					
16V (C < 1.0 $\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$																																																																																																																																					
		20%	0402 $\geq 0.22\mu F$																																																																																																																																					
16V (C $\geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$																																																																																																																																					
		30%	0402 $\geq 0.47\mu F$																																																																																																																																					
10V	20%	-	-																																																																																																																																					
6.3V	30%	-	-																																																																																																																																					
Rated voltage	Insulation Resistance																																																																																																																																							
100V: X7R	RxC $\geq$ 10Q-F																																																																																																																																							
50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$																																																																																																																																								
25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$																																																																																																																																								
16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$																																																																																																																																								
10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$																																																																																																																																								
Size	Dielectric	Rated voltage	Capacitance range																																																																																																																																					
0201	X5R, X7R	6.3V, 10V	C $\geq 0.1\mu F$																																																																																																																																					
0402	X5R, X7R	6.3V, 10V	C $\geq 1.0\mu F$																																																																																																																																					
0603	X5R, X7R	6.3V, 10V	C $\geq 4.7\mu F$																																																																																																																																					
0805	X5R, X7R	6.3V	C $\geq 22\mu F$																																																																																																																																					
1206	X5R, X7R	6.3V	C $\geq 47\mu F$																																																																																																																																					
	NPO	3000V	C $\geq 1.5pF$																																																																																																																																					
Size	Dielectric	Rated voltage	Capacitance range																																																																																																																																					
0402	X5R, X7R	10V, 16V, 25V	C $\geq 1.0\mu F$																																																																																																																																					
	Y5V	16V	C $\geq 0.47\mu F$																																																																																																																																					
0603	X5R, X7R	10V, 16V	C $\geq 1.0\mu F$																																																																																																																																					
	Y5V	16V	C $\geq 2.2\mu F$																																																																																																																																					
0805	X5R, X7R	10V	C $\geq 4.7\mu F$																																																																																																																																					
	Y5V	16V	C $\geq 4.7\mu F$																																																																																																																																					

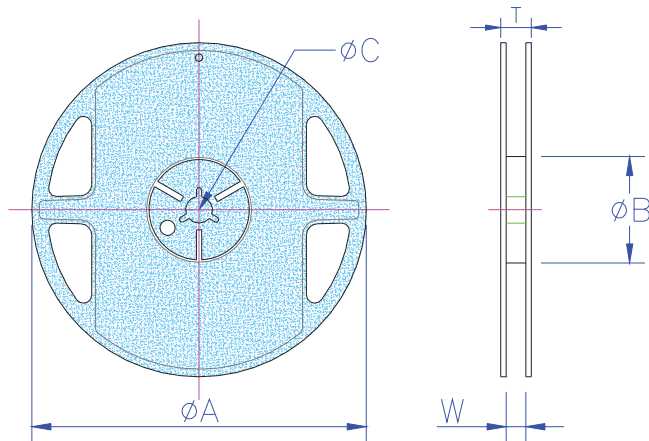
# ■ Packaging

Packaging Quantity

Unit: mm

Type	Thickness / Symbol		Packaging (7" Reel)	
			Paper tape	Plastic tape
0201	0.30±0.03	L	15K	-
0402	0.50±0.05	N	10K	-
0603	0.80±0.10	S	4K	-
	0.80 +0.15 / -0.10	X	4K	-
0805	0.60±0.10	A	4K	-
	0.80±0.10	B	4K	-
	0.85±0.10	T	4K	-
	1.25±0.10	D	-	3K
	1.25±0.20	I	-	3K
1206	0.80±0.10	B	4K	-
	0.95±0.10	C	-	3K
	1.15±0.15	J	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	1.60 +0.30 / -0.10	P	-	2K
1210	0.95±0.10	C	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	1K
1808	1.25±0.10	D	-	2K
	2.00±0.20	K	-	1K
1812	1.25±0.10	D	-	1K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	0.5K
0612	0.80±0.10	B	4K	-

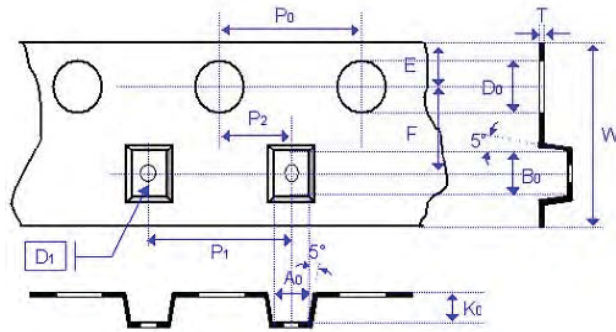
Tape and Reel



Unit: mm

Type	Chip Size							
	0201	0402	0603	0805	1206/0612	1210	1808	1812
$\phi C$	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0
$W$	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	13.5±1.0	13.5±1.0
$\phi A$	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")
$\phi B$	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	80.0±1.0(7")	80.0±1.0(7")

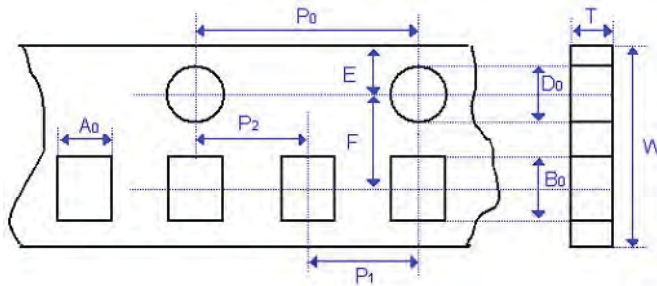
Plastic Tape Size Specification



Unit: mm

Type	0805		1206			1210					1808		1812				
	D	I	C	J	D	G	P	C	D	G	K	M	D	K	D	K	M
A <sub>0</sub>	<1.57		<1.85			<1.95			<2.97			<2.97		<3.81			
B <sub>0</sub>	<2.40		<3.46			<3.67			<3.73			<3.73		<4.98		<5.30	
T	0.23±0.05		0.23±0.05			0.23±0.05			0.23±0.05			0.23±0.05		0.25±0.05			
K <sub>0</sub>	<2.50		<2.50			<2.50			<2.50			<3.00		<2.50		<3.00	
W	8.00±0.10		8.00±0.10			8.00±0.10			8.00±0.10			8.00±0.10		12.0±0.20			
P <sub>0</sub>	4.00±0.10		4.00±0.10			4.00±0.10			4.00±0.10			4.00±0.10		4.00±0.10			
P <sub>1</sub>	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 <sub>2</sub>	2.00±0.05		2.00±0.05			2.00±0.05			2.00±0.05			2.00±0.05		2.00±0.05			
D <sub>0</sub>	1.50±0.05		1.50±0.05			1.50±0.05			1.50±0.05			1.50±0.05		1.50±0.05			
D <sub>1</sub>	1.00±0.10		1.00±0.10			1.00±0.10			1.00±0.10			1.00±0.10		1.00±0.10			
E	1.75±0.10		1.75±0.10			1.75±0.10			1.75±0.10			1.75±0.10		1.75±0.10			
F	3.50±0.05		3.50±0.05			3.50±0.05			3.50±0.05			3.50±0.05		5.50±0.05			

Paper Tape Size Specification



Unit: mm

Type	0201	0402	0603		0805		1206/0612
	L	N	S	X	A	B	B
A <sub>0</sub>	0.45±0.05	0.62±0.05	1.02±0.05		1.50±0.10	1.50±0.10	2.00±0.10
B <sub>0</sub>	0.75±0.05	1.12±0.05	1.82±0.05		2.30±0.10	2.30±0.10	3.50±0.10
T	0.60±0.05	0.60±0.05	0.95±0.05		0.75±0.05	0.95±0.05	0.95±0.05
W	8.00±0.10	8.00±0.10	8.00±0.10		8.00±0.10	8.00±0.10	8.00±0.10
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>1</sub>	2.00±0.05	2.00±0.05	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05		2.00±0.05	2.00±0.05	2.00±0.05
D <sub>0</sub>	1.55±0.05	1.55±0.05	1.55±0.05		1.55±0.05	1.55±0.05	1.50±0.05
E	1.75±0.05	1.75±0.05	1.75±0.05		1.75±0.05	1.75±0.05	1.75±0.10
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

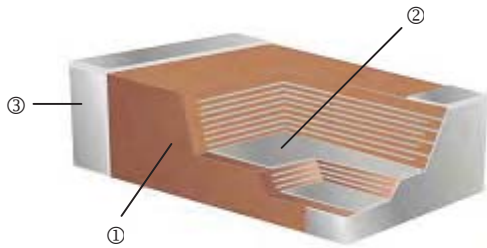
# Multilayer Ceramic Chip Capacitor



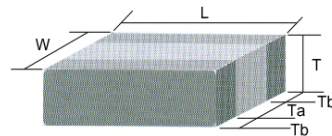
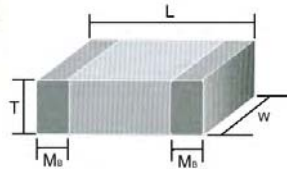
## Features

- Wide capacitance range, extremely compact size
- Low inductance of capacitor for high frequency application
- Excellent solderability and resistance to soldering heat, suitable for flow and reflow soldering
- Adaptable to high-speed surface mount assembly
- Conform to EIAJ-RC3402, and also compatible with EIA-RS198 and IEC PUB. 384-10

## Construction



①	Ceramic Material	③	Termination:
②	Inner Electrodes		NPO: Ag/Ni/Sn dielectric X7R, Y5V, X5R: Cu/Ni/Sn dielectric



Unit: mm

## Dimensions

MC / MCHL / MCRF Type

Type	Size (Inch)	L	W	T / Symbol		Mb	Packaging (7" Reel)	
							Paper tape	Plastic tape
01	0201	0.6±0.03	0.3±0.03	0.3±0.03	L	0.15±0.05	15K	-
02	0402	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05 / -0.10	10K	-
03	0603	1.60±0.10	0.80±0.10	0.80±0.10	S	0.40±0.15	4K	-
		1.60 +0.15 / -0.10	0.80 +0.15 / -0.10	0.80 +0.15 / -0.10	X		4K	
05	0805	2.00±0.15	1.25±0.20	0.60±0.15	A	0.50±0.20	4K	-
				0.80±0.10	B		4K	-
		1.25±0.10		D	-		3K	
		0.85±0.10		T	4K		-	
06	1206	3.20±0.15	1.60±0.15	1.25±0.20	I	0.60±0.20 (0.50±0.20)***	-	3K
				0.80±0.10	B		4K	-
		0.95±0.10		C	-		3K	
		1.25±0.10		D	-		3K	
06	1206	3.20±0.20	1.60±0.20	1.15±0.15	J	0.60±0.20 (0.50±0.20)***	-	3K
		3.20+0.3 / -0.1		1.60±0.20	G		-	2K
				1.60+0.3 / -0.1	1.60+0.3 / -0.1		P	-
10	1210	3.20±0.30	2.50±0.20	0.95±0.10	C	0.75±0.25	-	3K
				1.25±0.10	D		-	3K
		3.20±0.40	2.50±0.30	1.60±0.20	G		-	2K
				2.00±0.20	K		-	1K
				2.50±0.30	M		-	1K
08	1808	4.50±0.40 (4.5+0.5/-0.3)**	2.03±0.25	1.25±0.10	D	0.75±0.25 (0.50±0.20)***	-	2K
				2.00±0.20	K		-	1K
12	1812	4.50±0.40 (4.5+0.5/-0.3)**	3.20±0.30	1.25±0.10	D	0.75±0.25 (0.50±0.20)***	-	1K
				2.00±0.20	K		-	1K
				2.50±0.30	M		-	0.5K

\*\* For 1808/1812: 200~3KV, \*\*\*For 1206:1KV~3KV; 1808/1812: 200~3KV

Low Inductance Capacitors for MCLI Type

Unit: mm

Type	Size (Inch)	L	W	T / Symbol		Ta min.	Tb min.	Packaging (7" Reel)	
								Paper tape	Plastic tape
MCLI43	0612	3.20±0.15	1.60±0.15	0.80±0.10	B	0.5	0.13	4K	-

## Part Numbering

MC	03	J	T	N	250	3R9
Product Type	Dimensions (L×W)	Capacitance Tolerance	Packaging	Dielectric	Voltage (VDCW)	Capacitance
MC : General; Ultra-small Middle and High Voltage MCHL: High Q and Low ESR MCRF: Ultra High Q and Low ESR (RF) MCLI: Low Inductance	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 08: 1808 12: 1812 43: 0612	B: $\pm 0.1\text{pF}$ ( $\text{Cap} \leq 5\text{pF}$ ) C: $\pm 0.25\text{pF}$ ( $\text{Cap} \leq 5\text{pF}$ ) D: $\pm 0.5\text{pF}$ ( $5\text{pF} < \text{Cap} < 10\text{pF}$ ) F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$ K: $\pm 10\%$ M: $\pm 20\%$ Z: $+80/-20\%$	T: Taping Reel	N: NPO (COG) B: X7R F: Y5V X: X5R	6V3: 6.3V 250: 25V 500: 50V 101: 100V 102: 1000V 202: 2000V 302: 3000V	3R9: 3.9pF 150: 15pF 181: 180pF 225: 2.2 $\mu\text{F}$ 476: 47 $\mu\text{F}$ 107: 100 $\mu\text{F}$

## Low Inductance Capacitors for MCLI Series

### Capacitance & Voltage

Dielectric		X7R
EIA	Size	0612
Code	VDCW	50V
103	10nF	B
123	12	B
153	15	B
183	18	B
223	22	B
273	27	B
333	33	B
393	39	B
473	47	B
563	56	B
683	68	B
823	82	B
104	100	B
124	120	B
154	150	B

■ The letter in cell is expressed the symbol of product thickness

### General Electrical data

Size	0612
Dielectric	X7R
Capacitance*	10nF~150nF
Capacitance tolerance	K (±10%) M (±20%)
Rated voltage (WVDC)	50V
Tan δ *	≤2.5%
Insulation resistance at Ur	≥ 10GΩ or R×C≥ 500Ω×F Whichever is less
Operating temperature	-55 to +125°C
Capacitance change	±15%
Termination	Ni/Sn (lead-free termination)
ESL	500pH

■ \*\*Measured at 1.0±0.2Vrms, 1.0KHz±10%, 30~70% related humidity, 25°C ambient temperature

## Environmental Characteristics

Item	Requirement	Test Method																																																																										
External Appearance	No defects which may affect performance	Visual inspection & Dimension measurement																																																																										
Capacitance(Cap.)	Within the specified tolerance that refers on page2	NPO: (Class I) Cap $\leq$ 1000pF 1.0 $\pm$ 0.2Vrms, 1MHz $\pm$ 10% Cap>1000pF 1.0 $\pm$ 0.2Vrms, 1KHz $\pm$ 10%																																																																										
Dissipation Factor (D.F.) or Quality factor (Q=1/D.F.)	<p>NPO: Cap<math>\geq</math> 30pF, Q<math>\geq</math> 1000; Cap&lt;30pF, Q<math>\geq</math> 400+20C X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.<math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq</math> 50V</td> <td rowspan="3">2.5%</td> <td>3%</td> <td>0201(50V); 0603<math>\geq</math>0.047<math>\mu</math>F 0805<math>\geq</math>0.18<math>\mu</math>F; 1206<math>\geq</math>0.47<math>\mu</math>F</td> </tr> <tr> <td>5%</td> <td>1210<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>7%</td> <td>0603<math>\geq</math>1<math>\mu</math>F; 0805<math>\geq</math>1<math>\mu</math>F 1206<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">3.5%</td> <td>5%</td> <td>0201<math>\geq</math>0.01<math>\mu</math>F; 0805<math>\geq</math>1<math>\mu</math>F 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td>7%</td> <td>0603<math>\geq</math>0.33<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>10%</td> <td>0402<math>\geq</math>0.10<math>\mu</math>F; 0603<math>\geq</math>0.47<math>\mu</math>F 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>6.8<math>\mu</math>F 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">3.5%</td> <td>5%</td> <td>0201<math>\geq</math>0.01<math>\mu</math>F; 0402<math>\geq</math>0.033<math>\mu</math>F 0603<math>\geq</math>0.15<math>\mu</math>F; 0805<math>\geq</math>0.68<math>\mu</math>F 1206<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>10%</td> <td>0402<math>\geq</math>0.22<math>\mu</math>F; 0603<math>\geq</math>0.68<math>\mu</math>F 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0201<math>\geq</math>0.012<math>\mu</math>F; 0402<math>\geq</math>0.33<math>\mu</math>F 0603<math>\geq</math>0.33<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F 1206<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td>15%</td> <td>0201<math>\geq</math>0.1<math>\mu</math>F; 0402<math>\geq</math>1<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">10%</td> <td>15%</td> <td>0201<math>\geq</math>0.01<math>\mu</math>F; 0402<math>\geq</math>1<math>\mu</math>F 0603<math>\geq</math>10<math>\mu</math>F; 0805<math>\geq</math>4.7<math>\mu</math>F 1206<math>\geq</math>47<math>\mu</math>F; 1210<math>\geq</math>100<math>\mu</math>F</td> </tr> <tr> <td>20%</td> <td>0402<math>\geq</math>2.2<math>\mu</math>F</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.<math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq</math> 50V</td> <td>5%</td> <td>7%</td> <td>0603<math>\geq</math>0.1<math>\mu</math>F; 0805<math>\geq</math>0.47<math>\mu</math>F 1206<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>35V</td> <td>7%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">5%</td> <td>7%</td> <td>0402<math>\geq</math>0.047<math>\mu</math>F; 0603<math>\geq</math>0.1<math>\mu</math>F 0805<math>\geq</math>0.33<math>\mu</math>F; 1206<math>\geq</math>1<math>\mu</math>F 1210<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>9%</td> <td>0402<math>\geq</math>0.068<math>\mu</math>F; 0603<math>\geq</math>0.47<math>\mu</math>F 1206<math>\geq</math>4.7<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0<math>\mu</math>F)</td> <td rowspan="2">7%</td> <td>9%</td> <td>0402<math>\geq</math>0.068<math>\mu</math>F; 0603<math>\geq</math>0.68<math>\mu</math>F</td> </tr> <tr> <td>12.5%</td> <td>0402<math>\geq</math>0.22<math>\mu</math>F</td> </tr> <tr> <td>16V (C <math>\geq</math> 1.0<math>\mu</math>F)</td> <td>9%</td> <td>12.5%</td> <td>0603<math>\geq</math>2.2<math>\mu</math>F; 0805<math>\geq</math>3.3<math>\mu</math>F 1206<math>\geq</math>10<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F 1812<math>\geq</math>47<math>\mu</math>F</td> </tr> <tr> <td>10V</td> <td>12.5%</td> <td>20%</td> <td>0402<math>\geq</math>0.47<math>\mu</math>F</td> </tr> <tr> <td>6.3V</td> <td>20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq$ 50V	2.5%	3%	0201(50V); 0603 $\geq$ 0.047 $\mu$ F 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F	5%	1210 $\geq$ 4.7 $\mu$ F	7%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F	25V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1210 $\geq$ 10 $\mu$ F	7%	0603 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F	10%	0402 $\geq$ 0.10 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 6.8 $\mu$ F 1210 $\geq$ 22 $\mu$ F	16V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 0.033 $\mu$ F 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F	10%	0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F 1210 $\geq$ 22 $\mu$ F	10V	5%	10%	0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.33 $\mu$ F 0603 $\geq$ 0.33 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	15%	0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F	6.3V	10%	15%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 1 $\mu$ F 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 4.7 $\mu$ F 1206 $\geq$ 47 $\mu$ F; 1210 $\geq$ 100 $\mu$ F	20%	0402 $\geq$ 2.2 $\mu$ F	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq$ 50V	5%	7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F	35V	7%	—	—	25V	5%	7%	0402 $\geq$ 0.047 $\mu$ F; 0603 $\geq$ 0.1 $\mu$ F 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F 1210 $\geq$ 4.7 $\mu$ F	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	16V (C < 1.0 $\mu$ F)	7%	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F	12.5%	0402 $\geq$ 0.22 $\mu$ F	16V (C $\geq$ 1.0 $\mu$ F)	9%	12.5%	0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 3.3 $\mu$ F 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F 1812 $\geq$ 47 $\mu$ F	10V	12.5%	20%	0402 $\geq$ 0.47 $\mu$ F	6.3V	20%	-	-	<p>X7R, X5R, Y5V: (Class II) Cap<math>\leq</math> 10uF 1.0<math>\pm</math>0.2Vrms, 1KHz<math>\pm</math>10% Cap&gt;10uF 0.5<math>\pm</math>0.2Vrms, 120Hz<math>\pm</math>10%</p>
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																										
$\geq$ 50V	2.5%	3%	0201(50V); 0603 $\geq$ 0.047 $\mu$ F 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F																																																																									
		5%	1210 $\geq$ 4.7 $\mu$ F																																																																									
		7%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F																																																																									
25V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1210 $\geq$ 10 $\mu$ F																																																																									
		7%	0603 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F																																																																									
		10%	0402 $\geq$ 0.10 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 6.8 $\mu$ F 1210 $\geq$ 22 $\mu$ F																																																																									
16V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 0.033 $\mu$ F 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F																																																																									
		10%	0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F 1210 $\geq$ 22 $\mu$ F																																																																									
10V	5%	10%	0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.33 $\mu$ F 0603 $\geq$ 0.33 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F																																																																									
		15%	0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F																																																																									
6.3V	10%	15%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 1 $\mu$ F 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 4.7 $\mu$ F 1206 $\geq$ 47 $\mu$ F; 1210 $\geq$ 100 $\mu$ F																																																																									
		20%	0402 $\geq$ 2.2 $\mu$ F																																																																									
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																										
$\geq$ 50V	5%	7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F																																																																									
35V	7%	—	—																																																																									
25V	5%	7%	0402 $\geq$ 0.047 $\mu$ F; 0603 $\geq$ 0.1 $\mu$ F 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F 1210 $\geq$ 4.7 $\mu$ F																																																																									
		9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F																																																																									
16V (C < 1.0 $\mu$ F)	7%	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F																																																																									
		12.5%	0402 $\geq$ 0.22 $\mu$ F																																																																									
16V (C $\geq$ 1.0 $\mu$ F)	9%	12.5%	0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 3.3 $\mu$ F 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F 1812 $\geq$ 47 $\mu$ F																																																																									
10V	12.5%	20%	0402 $\geq$ 0.47 $\mu$ F																																																																									
6.3V	20%	-	-																																																																									
Dielectric Strength	No evidence of damage or flash over during test	<p>To apply voltage(<math>\leq</math> 100V) 250% Duration: 1 to 5sec Charge and discharge current less than 50mA</p> <p>To apply voltage: 200V~300V <math>\geq</math> 2 time VDC 500V~999V <math>\geq</math> 1.5 time VDC 1000V~3000V <math>\geq</math> 1.2 time VDC Cut-off, set at 10mA TEST=15 sec. RAMP=0</p>																																																																										



Item	Requirement	Test Method																				
Insulation Resistance	10GΩ or R×C≥ 500Ω-F Whichever is smaller X7R, X5R, Y5V:	To apply rated voltage for max. 120sec																				
	<table border="1"> <tr> <td>Rated Voltage</td> <td>Insulation Resistance</td> </tr> <tr> <td>100V: X7R</td> <td rowspan="5">RxC ≥ 100Ω-F</td> </tr> <tr> <td>50V: 0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF</td> </tr> <tr> <td>25V: 0402≥1uF;0603≥2.2uF;0805≥2.2uF 1206≥10uF;1210≥10uF</td> </tr> <tr> <td>16V: 0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF</td> </tr> <tr> <td>10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF</td> </tr> <tr> <td>6.3V</td> <td></td> </tr> </table>		Rated Voltage	Insulation Resistance	100V: X7R	RxC ≥ 100Ω-F	50V: 0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF	25V: 0402≥1uF;0603≥2.2uF;0805≥2.2uF 1206≥10uF;1210≥10uF	16V: 0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF	10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF	6.3V											
	Rated Voltage		Insulation Resistance																			
100V: X7R	RxC ≥ 100Ω-F																					
50V: 0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF																						
25V: 0402≥1uF;0603≥2.2uF;0805≥2.2uF 1206≥10uF;1210≥10uF																						
16V: 0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF																						
10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF																						
6.3V																						
≥ 10GΩ or 100Ω -F whichever is smaller Rated voltage: 200V~630V	To apply rated voltage(500V max.) for 60sec.																					
≥ 10GΩ Rated voltage: >630V	To apply 500V for 60sec.																					
Temperature Characteristic of Capacitance	<table border="1"> <tr> <td>T.C.</td> <td>Capacitance Change</td> </tr> <tr> <td>NPO</td> <td>±30 (ppm/°C)</td> </tr> <tr> <td>X7R</td> <td>±15%</td> </tr> <tr> <td>X5R</td> <td>±15%</td> </tr> <tr> <td>Y5V</td> <td>+30% ~ -80%</td> </tr> </table>	T.C.	Capacitance Change	NPO	±30 (ppm/°C)	X7R	±15%	X5R	±15%	Y5V	+30% ~ -80%	<p>With no electrical load.</p> <table border="1"> <tr> <td>T.C.</td> <td>Operating Temp</td> </tr> <tr> <td>NPO</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X7R</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X5R</td> <td>-55 ~ 85°C at 25°C</td> </tr> <tr> <td>Y5V</td> <td>-25 ~ 85°C at 20°C</td> </tr> </table>	T.C.	Operating Temp	NPO	-55 ~ 125°C at 25°C	X7R	-55 ~ 125°C at 25°C	X5R	-55 ~ 85°C at 25°C	Y5V	-25 ~ 85°C at 20°C
	T.C.	Capacitance Change																				
NPO	±30 (ppm/°C)																					
X7R	±15%																					
X5R	±15%																					
Y5V	+30% ~ -80%																					
T.C.	Operating Temp																					
NPO	-55 ~ 125°C at 25°C																					
X7R	-55 ~ 125°C at 25°C																					
X5R	-55 ~ 85°C at 25°C																					
Y5V	-25 ~ 85°C at 20°C																					
Adhesive Strength of Termination	No remarkable damage or removal of the terminations	Pressurizing force: 0201:2N 0402&0603:5N>0603:10N Test time: 10±1 sec																				
Vibration Resistance	No remarkable damage Cap change and Q/D.F.: To meet initial spec	Vibration frequency: 10~55Hz/min Total amplitude: 1.5mm Test time: 6hrs.(two hrs each in three mutually Perpendicular directions.)																				
Solderability	95% min. coverage of all metalized area.	Solder temperature: 235±5°C Dipping time: 2±0.5 sec.																				
Bending Test	No remarkable damage Cap change: NPO: within±5% or 0.5pF whichever is larger X7R, X5R: within±12.5% Y5V: within±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5±1sec. Measurement to be made after keeping at room temp. for 24±2hrs(Class I) or 48±4hrs(Class II) (Thickness>1.0mm, Thickness≤1.0mm)																				
Resistance to Soldering Heat	No remarkable damage Cap change: NPO: within±2.5% or 0.25pF whichever is larger X7R, X5R: Within±7.5% Y5V: within±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25%max. leaching on each edge.	Solder temperature: 260±5°C Dipping time: 10±1sec Preheating: 120 to 150°C for 1minute before immerse the capacitor in a eutectic solder. Before initial measurement(Class II only): Perform 150+0/-10°C for 1hr and then set for 24±4hrs at room temp. Measurement to be made after keep at room temp. for 24±2 hrs.																				
Temperature Cycle	No remarkable damage. Cap change: NPO: within±2.5% or 0.25pF whichever is larger X7R, X5R: within±7.5% Y5V: within±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements.	Conduct the five cycles according to the temperature and time. <table border="1"> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min)</th> </tr> <tr> <td>1</td> <td>Min. operating temp.+0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp</td> <td>2-3</td> </tr> <tr> <td>3</td> <td>Max. operating temp.+3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2-3</td> </tr> </table> <p>Before initial measurement(Cass II only): Perform 150+0/-10°C for 1hr and then set for 48±4 hrs at room temp. Measurement to be made after keeping at room temp. for 24±2 hrs.(Class I) or 48±4 hrs.(Class II).</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					
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																				

Item	Requirement	Test Method																																																																																
Humidity (steady state)	<p>No remarkable damage. Cap change: NPO: within±5% or 0.5pF whichever is large X7R, X5R: ≥ 10V, within±12.5%; 6.3V, within±25% Y5V: ≥ 10V, within±30%; 6.3V, within±30/-40% Q/D.F. value: NPO: More than 30pF Q ≥ 350, 10pF ≤ C ≤ 30pF, Q ≥ 275+2.5C Less than 10pF Q ≥ 200+10C X7R, X5R:</p> <table border="1" data-bbox="293 443 927 1167"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF;1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="293 1205 927 1686"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <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>15%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ .0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥ 10V 1GΩ or 50Ω-F whichever is smaller. Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="293 1760 927 2056"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="5">Rx C ≥ 10Ω-F</td> </tr> <tr> <td>50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF</td> </tr> <tr> <td>25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF	15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF	20%	0201 ≥ 0.1μF;0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF	16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ .0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	Rx C ≥ 10Ω-F	50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF	25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF	16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF	10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF	<p>Test temp: 40±2°C Humidity: 90~95% RH Test time: 500+24/-0hrs Measurement to be made after keeping at room temp. for 24±2hrs.</p>
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																
≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF																																																																															
		10%	1210 ≥ 4.7μF																																																																															
		20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF																																																																															
25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF																																																																															
		14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF																																																																															
		15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF																																																																															
16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF																																																																															
		15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																															
10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF																																																																															
		20%	0201 ≥ 0.1μF;0402 ≥ 1μF																																																																															
6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF																																																																															
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF																																																																															
35V	10%	—	—																																																																															
25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF																																																																															
		15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																															
16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF																																																																															
		20%	0402 ≥ 0.22μF																																																																															
16V (C ≥ .0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF																																																																															
10V	20%	30%	0402 ≥ 0.47μF																																																																															
6.3V	30%	-	-																																																																															
Rated voltage	Insulation Resistance																																																																																	
100V:X7R	Rx C ≥ 10Ω-F																																																																																	
50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF																																																																																		
25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF																																																																																		
16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF																																																																																		
10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF																																																																																		

Item	Requirement			Test Method																																																																																	
Humidity load	No remarkable damage. Cap change: NPO:±7.5% or 0.75pF whichever is larger X7R, X5R: ≥ 10V, within±12.5%; 6.3V, 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: NPO: C ≥ 30pF,Q ≥ 200; C < 30pF,Q ≥ 100+10/3C X7R, X5R: <table border="1" data-bbox="293 405 943 1167"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF;1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.10μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <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>15%</td> <td>0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table> Y5V: <table border="1" data-bbox="293 1193 943 1686"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> I.R.: ≥ 10V 500MΩ or 25Ω-F (Whichever is smaller) Class II (X7R, X5R, Y5V) <table border="1" data-bbox="293 1738 943 2065"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="6">RxC ≥ 5Ω-F</td> </tr> <tr> <td>50V:0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF</td> </tr> <tr> <td>25V:0402≥1uF;0603≥2.2uF 0805≥2.2uF; 1206≥10uF;1210≥10uF</td> </tr> <tr> <td>16V:0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF</td> </tr> <tr> <td>10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table>			Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF	15%	0402 ≥ 0.10μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF;0805 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF	20%	0201 ≥ 0.1μF;0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	RxC ≥ 5Ω-F	50V:0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF	25V:0402≥1uF;0603≥2.2uF 0805≥2.2uF; 1206≥10uF;1210≥10uF	16V:0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF	10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF	6.3V	Test temp: 40±2°C Humidity: 90~95%RH Test time: 500+24/-0 hrs To apply voltage: Rated voltage(Max. 500V) Measurement to be made after keeping at room temp for 24±2hrs.(Class I) or 48±4hrs.(Class II)
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																			
≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																																		
		10%	1210 ≥ 4.7μF																																																																																		
		20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF																																																																																		
25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF																																																																																		
		14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF																																																																																		
		15%	0402 ≥ 0.10μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF																																																																																		
16V	5%	10%	0603 ≥ 0.15μF;0805 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF																																																																																		
		15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																																		
10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF																																																																																		
		20%	0201 ≥ 0.1μF;0402 ≥ 1μF																																																																																		
6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF																																																																																		
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																			
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF																																																																																		
35V	10%	—	—																																																																																		
25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF																																																																																		
		15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																		
16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																																		
		20%	0402 ≥ 0.22μF																																																																																		
16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF																																																																																		
10V	20%	30%	0402 ≥ 0.47μF																																																																																		
6.3V	30%	-	-																																																																																		
Rated voltage	Insulation Resistance																																																																																				
100V:X7R	RxC ≥ 5Ω-F																																																																																				
50V:0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF																																																																																					
25V:0402≥1uF;0603≥2.2uF 0805≥2.2uF; 1206≥10uF;1210≥10uF																																																																																					
16V:0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF																																																																																					
10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF																																																																																					
6.3V																																																																																					

Item	Requirement	Test Method																																																																
High Temperature Load (Endurance)	No remarkable damage. Cap change: NPO: $\pm 3\%$ or $\pm 0.3F$ whichever is larger X7R, X5R: $\geq 10V$ , within $\pm 12.5\%$ ; 6.3V, within $+30/-40\%$ 10V: 0603 $\geq 4.7\mu F$ ; 0402 $\geq 1\mu F$ ; 0201 $\geq 0.1\mu F$ , within $\pm 25\%$ Q/D.F. value: NPO: More than 30pF, $Q \geq 350$ $10pF \leq C < 30pF$ , $Q \geq 275+2.5C$ Less than 10pF, $Q \geq 200+10C$ X7R, X5R:	Test temp: NPO, X7R: $125 \pm 3^\circ C$ X5R, Y5V: $85 \pm 3^\circ C$ Test Time: 1000+25/-0 hrs To apply voltage: (1.1) 100% of rated voltage for below range.																																																																
	<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq 50V</math></td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V); 0603 <math>\geq 0.047\mu F</math> 0805 <math>\geq 0.18\mu F</math>; 1206 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>10%</td> <td>1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>20%</td> <td>0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0805 <math>\geq 1\mu F</math> 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>14%</td> <td>0603 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.10\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 6.8\mu F</math> 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 <math>\geq 0.15\mu F</math>; 0805 <math>\geq 0.68\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0402 <math>\geq 0.033\mu F</math> 0603 <math>\geq 0.68\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 <math>\geq 0.012\mu F</math>; 0402 <math>\geq 0.33\mu F</math> 0603 <math>\geq 0.33\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td>20%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math> 0603 <math>\geq 10\mu F</math>; 0805 <math>\geq 4.7\mu F</math> 1210 <math>\geq 100\mu F</math></td> </tr> </tbody> </table>		Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$	10%	1210 $\geq 4.7\mu F$	20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$	25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$	14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$	15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$	16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$	15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$	20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$	6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$	<table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R,X7R</td> <td>6.3V,10V</td> <td><math>C \geq 0.1\mu F</math></td> </tr> <tr> <td>0402</td> <td>X5R,X7R</td> <td>6.3V,10V</td> <td><math>C \geq 1.0\mu F</math></td> </tr> <tr> <td>0603</td> <td>X5R,X7R</td> <td>6.3V,10V</td> <td><math>C \geq 4.7\mu F</math></td> </tr> <tr> <td>0805</td> <td>X5R,X7R</td> <td>6.3V</td> <td><math>C \geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R,X7R</td> <td>6.3V</td> <td><math>C \geq 47\mu F</math></td> </tr> <tr> <td>NPO</td> <td>3000V</td> <td><math>C \geq 1.5pF</math></td> </tr> </tbody> </table>	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R,X7R	6.3V,10V	$C \geq 0.1\mu F$	0402	X5R,X7R	6.3V,10V	$C \geq 1.0\mu F$	0603	X5R,X7R	6.3V,10V	$C \geq 4.7\mu F$	0805	X5R,X7R	6.3V	$C \geq 22\mu F$	1206	X5R,X7R	6.3V	$C \geq 47\mu F$	NPO	3000V	$C \geq 1.5pF$
	Rated vol.		D.F. $\leq$	Exception of D.F. $\leq$																																																														
	$\geq 50V$		3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$																																																													
				10%	1210 $\geq 4.7\mu F$																																																													
				20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$																																																													
	25V		5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$																																																													
				14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$																																																													
				15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$																																																													
	16V		5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$																																																													
15%		0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																
10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$																																																															
		20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$																																																															
6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$																																																															
Size	Dielectric	Rated voltage	Capacitance range																																																															
0201	X5R,X7R	6.3V,10V	$C \geq 0.1\mu F$																																																															
0402	X5R,X7R	6.3V,10V	$C \geq 1.0\mu F$																																																															
0603	X5R,X7R	6.3V,10V	$C \geq 4.7\mu F$																																																															
0805	X5R,X7R	6.3V	$C \geq 22\mu F$																																																															
1206	X5R,X7R	6.3V	$C \geq 47\mu F$																																																															
	NPO	3000V	$C \geq 1.5pF$																																																															
		(1.2) 6.3V or $C \geq 10\mu F$ : 150% of rated voltage (2) $10V \leq U_r < 500V$ : 200% of rated voltage. 150% of rated voltage for below range.																																																																
		<table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0402</td> <td>X5R,X7R</td> <td>10V,16V,25V</td> <td><math>C \geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td><math>C \geq 0.47\mu F</math></td> </tr> <tr> <td rowspan="2">0603</td> <td>X5R,X7R</td> <td>10V,16V</td> <td><math>C \geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td><math>C \geq 2.2\mu F</math></td> </tr> <tr> <td rowspan="2">0805</td> <td>X5R,X7R</td> <td>10V</td> <td><math>C \geq 4.7\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td><math>C \geq 4.7\mu F</math></td> </tr> </tbody> </table>	Size	Dielectric	Rated voltage	Capacitance range	0402	X5R,X7R	10V,16V,25V	$C \geq 1.0\mu F$	Y5V	16V	$C \geq 0.47\mu F$	0603	X5R,X7R	10V,16V	$C \geq 1.0\mu F$	Y5V	16V	$C \geq 2.2\mu F$	0805	X5R,X7R	10V	$C \geq 4.7\mu F$	Y5V	16V	$C \geq 4.7\mu F$																																							
Size	Dielectric	Rated voltage	Capacitance range																																																															
0402	X5R,X7R	10V,16V,25V	$C \geq 1.0\mu F$																																																															
	Y5V	16V	$C \geq 0.47\mu F$																																																															
0603	X5R,X7R	10V,16V	$C \geq 1.0\mu F$																																																															
	Y5V	16V	$C \geq 2.2\mu F$																																																															
0805	X5R,X7R	10V	$C \geq 4.7\mu F$																																																															
	Y5V	16V	$C \geq 4.7\mu F$																																																															
		(3) 500V: 150% of rated voltage (4) $U_r \geq 630V$ : 120% of rated voltage																																																																
		Test time: 1000+24/-0hrs Measurement to be made after keeping at room temp. for 24 $\pm$ 2hrs.																																																																
	Y5V:																																																																	
	<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq 50V</math></td> <td>7.5%</td> <td>10%</td> <td>0603 <math>\geq 0.1\mu F</math>; 0805 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>35V</td> <td>10%</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 <math>\geq 0.047\mu F</math>; 0603 <math>\geq 0.1\mu F</math> 0805 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 1\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V (<math>C &lt; 1.0\mu F</math>)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.68\mu F</math></td> </tr> <tr> <td>20%</td> <td>0402 <math>\geq 0.22\mu F</math></td> </tr> <tr> <td rowspan="2">16V (<math>C \geq 1.0\mu F</math>)</td> <td rowspan="2">12.5%</td> <td>20%</td> <td>0603 <math>\geq 2.2\mu F</math>; 0805 <math>\geq 3.3\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 22\mu F</math> 1812 <math>\geq 47\mu F</math></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$	35V	10%	-	-	25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$	15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	16V ( $C < 1.0\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$	20%	0402 $\geq 0.22\mu F$	16V ( $C \geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$			10V	20%	30%	0402 $\geq 0.47\mu F$	6.3V	30%	-	-																											
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																
$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$																																																															
35V	10%	-	-																																																															
25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$																																																															
		15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																															
16V ( $C < 1.0\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$																																																															
		20%	0402 $\geq 0.22\mu F$																																																															
16V ( $C \geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$																																																															
10V	20%	30%	0402 $\geq 0.47\mu F$																																																															
6.3V	30%	-	-																																																															
	I.R.: $\geq 10V$ 1G $\Omega$ or 50 $\Omega$ -F whichever is smaller Class II (X7R, X5R, Y5V)																																																																	
	<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="5">RxC <math>\geq</math> 10<math>\Omega</math>-F</td> </tr> <tr> <td>50V: 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math>; 1206 <math>\geq 2.2\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>25V: 0402 <math>\geq 1\mu F</math>; 0603 <math>\geq 2.2\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>16V: 0402 <math>\geq 0.22\mu F</math>; 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> <tr> <td>10V: 0201 <math>\geq 47nF</math>; 0402 <math>\geq 0.47\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: X7R	RxC $\geq$ 10 $\Omega$ -F	50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$	25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$	16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$	10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$																																																									
Rated voltage	Insulation Resistance																																																																	
100V: X7R	RxC $\geq$ 10 $\Omega$ -F																																																																	
50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$																																																																		
25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$																																																																		
16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$																																																																		
10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$																																																																		

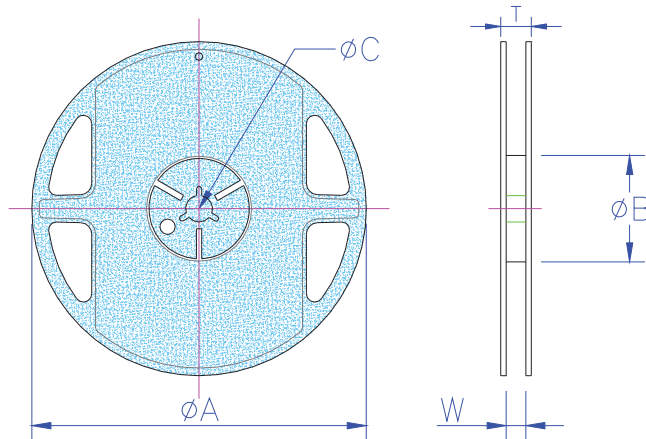
# ■ Packaging

## Packaging Quantity

Unit: mm

Type	Thickness / Symbol		Packaging (7" Reel)	
			Paper tape	Plastic tape
0201	0.30±0.03	L	15K	-
0402	0.50±0.05	N	10K	-
0603	0.80±0.10	S	4K	-
	0.80 +0.15 / -0.10	X	4K	-
0805	0.60±0.10	A	4K	-
	0.80±0.10	B	4K	-
	0.85±0.10	T	4K	-
	1.25±0.10	D	-	3K
	1.25±0.20	I	-	3K
1206	0.80±0.10	B	4K	-
	0.95±0.10	C	-	3K
	1.15±0.15	J	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	1.60 +0.30 / -0.10	P	-	2K
1210	0.95±0.10	C	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	1K
1808	1.25±0.10	D	-	2K
	2.00±0.20	K	-	1K
1812	1.25±0.10	D	-	1K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	0.5K
0612	0.80±0.10	B	4K	-

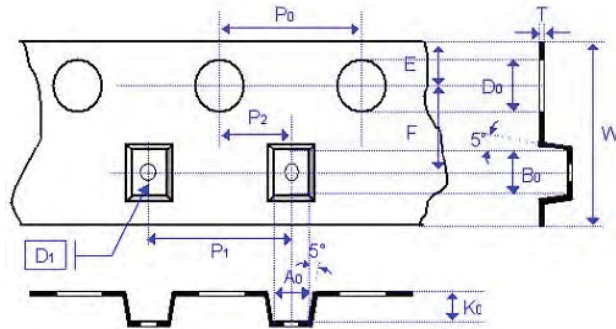
## Tape and Reel



Unit: mm

Type	Chip Size							
	0201	0402	0603	0805	1206/0612	1210	1808	1812
$\phi C$	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0
W	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	13.5±1.0	13.5±1.0
$\phi A$	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")
$\phi B$	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	80.0±1.0(7")	80.0±1.0(7")

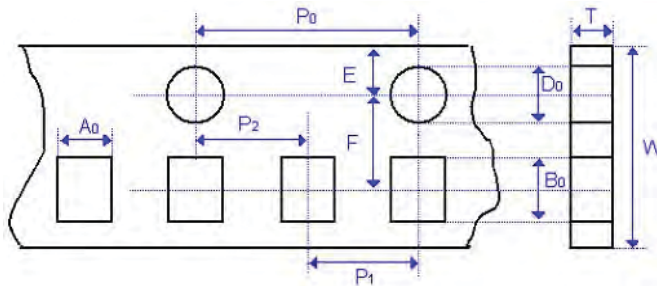
Plastic Tape Size Specification



Unit: mm

Type	0805		1206			1210					1808		1812				
	D	I	C	J	D	G	P	C	D	G	K	M	D	K	D	K	M
A <sub>0</sub>	<1.57		<1.85			<1.95					<2.97		<3.81				
B <sub>0</sub>	<2.40		<3.46			<3.67					<3.73		<4.98   <5.00		<5.30		
T	0.23±0.05		0.23±0.05			0.23±0.05					0.23±0.05		0.25±0.05		0.25±0.05		
K <sub>0</sub>	<2.50		<2.50			<2.50					<2.50		<3.00				
W	8.00±0.10		8.00±0.10			8.00±0.10					8.00±0.10		8.00±0.10		12.0±0.20		
P <sub>0</sub>	4.00±0.10		4.00±0.10			4.00±0.10					4.00±0.10		4.00±0.10		4.00±0.10		
P <sub>1</sub>	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 <sub>2</sub>	2.00±0.05		2.00±0.05			2.00±0.05					2.00±0.05		2.00±0.05		2.00±0.05		
D <sub>0</sub>	1.50±0.05		1.50±0.05			1.50±0.05					1.50±0.05		1.50±0.05		1.50±0.05		
D <sub>1</sub>	1.00±0.10		1.00±0.10			1.00±0.10					1.00±0.10		1.00±0.10		1.00±0.10		
E	1.75±0.10		1.75±0.10			1.75±0.10					1.75±0.10		1.75±0.10		1.75±0.10		
F	3.50±0.05		3.50±0.05			3.50±0.05					3.50±0.05		3.50±0.05		5.50±0.05		

Paper Tape Size Specification



Unit: mm

Type	0201	0402	0603		0805		1206/0612
	L	N	S	X	A	B	B
A <sub>0</sub>	0.45±0.05	0.62±0.05	1.02±0.05		1.50±0.10	1.50±0.10	2.00±0.10
B <sub>0</sub>	0.75±0.05	1.12±0.05	1.82±0.05		2.30±0.10	2.30±0.10	3.50±0.10
T	0.60±0.05	0.60±0.05	0.95±0.05		0.75±0.05	0.95±0.05	0.95±0.05
W	8.00±0.10	8.00±0.10	8.00±0.10		8.00±0.10	8.00±0.10	8.00±0.10
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>1</sub>	2.00±0.05	2.00±0.05	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05		2.00±0.05	2.00±0.05	2.00±0.05
D <sub>0</sub>	1.55±0.05	1.55±0.05	1.55±0.05		1.55±0.05	1.55±0.05	1.50±0.05
E	1.75±0.05	1.75±0.05	1.75±0.05		1.75±0.05	1.75±0.05	1.75±0.10
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

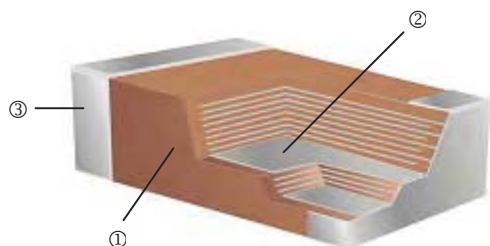
# Multilayer Ceramic Chip Capacitor



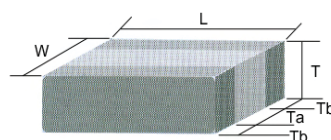
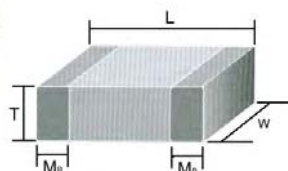
## Features

- Wide capacitance range, extremely compact size
- Low inductance of capacitor for high frequency application
- Excellent solderability and resistance to soldering heat, suitable for flow and reflow soldering
- Adaptable to high-speed surface mount assembly
- Conform to EIAJ-RC3402, and also compatible with EIA-RS198 and IEC PUB. 384-10

## Construction



①	Ceramic Material	③	Termination:
②	Inner Electrodes		NPO: Ag/Ni/Sn dielectric X7R, Y5V, X5R: Cu/Ni/Sn dielectric



Unit: mm

## Dimensions

MC / MCHL / MCRF Type

Type	Size (Inch)	L	W	T / Symbol		M <sub>B</sub>	Packaging (7" Reel)	
							Paper tape	Plastic tape
01	0201	0.6±0.03	0.3±0.03	0.3±0.03	L	0.15±0.05	15K	-
02	0402	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05 / -0.10	10K	-
03	0603	1.60±0.10	0.80±0.10	0.80±0.10	S	0.40±0.15	4K	-
		1.60 +0.15 / -0.10	0.80 +0.15 / -0.10	0.80 +0.15 / -0.10	X		4K	
05	0805	2.00±0.15	1.25±0.20	0.60±0.15	A	0.50±0.20	4K	-
				0.80±0.10	B		4K	-
		1.25±0.10		D	-		3K	
		0.85±0.10		T	4K		-	
06	1206	2.00±0.20	1.60±0.15	1.25±0.20	I	0.60±0.20 (0.50±0.20)***	-	3K
				0.80±0.10	B		4K	-
		0.95±0.10		C	-		3K	
		1.25±0.10		D	-		3K	
06	1206	3.20±0.20	1.60±0.20	1.15±0.15	J	0.60±0.20 (0.50±0.20)***	-	3K
				1.60±0.20	G		-	2K
		3.20+0.3 / -0.1		1.60+0.3 / -0.1	1.60+0.3 / -0.1		P	-
10	1210	3.20±0.30	2.50±0.20	0.95±0.10	C	0.75±0.25	-	3K
				1.25±0.10	D		-	3K
		3.20±0.40	2.50±0.30	1.60±0.20	G		-	2K
				2.00±0.20	K		-	1K
08	1808	4.50±0.40 (4.5+0.5/-0.3)**	2.03±0.25	2.50±0.30	M	0.75±0.25 (0.50±0.20)***	-	1K
				1.25±0.10	D		-	2K
				2.00±0.20	K		-	1K
12	1812	4.50±0.40 (4.5+0.5/-0.3)**	3.20±0.30	1.25±0.10	D	0.75±0.25 (0.50±0.20)***	-	1K
				2.00±0.20	K		-	1K
				3.20±0.40	2.50±0.30		M	-

\*\* For 1808/1812: 200~3KV, \*\*\*For 1206:1KV~3KV; 1808/1812: 200~3KV

Low Inductance Capacitors for MCLI Type

Unit: mm

Type	Size (Inch)	L	W	T / Symbol		T <sub>a</sub> min.	T <sub>b</sub> min.	Packaging (7" Reel)	
								Paper tape	Plastic tape
MCLI43	0612	3.20±0.15	1.60±0.15	0.80±0.10	B	0.5	0.13	4K	-

## Part Numbering

MC	03	J	T	N	250	3R9
Product Type	Dimensions (L×W)	Capacitance Tolerance	Packaging	Dielectric	Voltage (VDCW)	Capacitance
MC : General; Ultra-small Middle and High Voltage MCHL: High Q and Low ESR MCRF: Ultra High Q and Low ESR (RF) MCLI: Low Inductance	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 08: 1808 12: 1812 43: 0612	B: $\pm 0.1\text{pF}$ ( $\text{Cap} \leq 5\text{pF}$ ) C: $\pm 0.25\text{pF}$ ( $\text{Cap} \leq 5\text{pF}$ ) D: $\pm 0.5\text{pF}$ ( $5\text{pF} < \text{Cap} < 10\text{pF}$ ) F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$ K: $\pm 10\%$ M: $\pm 20\%$ Z: $+80/-20\%$	T: Taping Reel	N: NPO (COG) B: X7R F: Y5V X: X5R	6V3: 6.3V 250: 25V 500: 50V 101: 100V 102: 1000V 202: 2000V 302: 3000V	3R9: 3.9pF 150: 15pF 181: 180pF 225: 2.2 $\mu\text{F}$ 476: 47 $\mu\text{F}$ 107: 100 $\mu\text{F}$



## High Q and Low ESR Capacitors for MCHL Series

### Capacitance & Voltage

Dielectric		NPO								
EIA	Size	0402			0603				0805	
Code	VDCW	16V	25V	50V	16V	25V	50V	100V	50V	100V
0R5	0.5pF	N^	N^	N^	S^	S^	S^	S^	B	B
0R6	0.6pF	N^	N^	N^	S^	S^	S^	S^	B	B
0R7	0.7	N^	N^	N^	S^	S^	S^	S^	B	B
0R8	0.8	N^	N^	N^	S^	S^	S^	S^	B	B
0R9	0.9	N^	N^	N^	S^	S^	S^	S^	B	B
1R0	1.0	N^	N^	N^	S^	S^	S^	S^	B	B
1R2	1.2	N^	N^	N^	S^	S^	S^	S^	B	B
1R5	1.5	N^	N^	N^	S^	S^	S^	S^	B	B
1R8	1.8	N^	N^	N^	S^	S^	S^	S^	B	B
2R2	2.2	N^	N^	N^	S^	S^	S^	S^	B	B
2R7	2.7	N^	N^	N^	S^	S^	S^	S^	B	B
3R3	3.3	N^	N^	N^	S^	S^	S^	S^	B	B
3R9	3.9	N^	N^	N^	S^	S^	S^	S^	B	B
4R7	4.7	N^	N^	N^	S^	S^	S^	S^	B	B
5R6	5.6	N^	N^	N^	S^	S^	S^	S^	B	B
6R8	6.8	N^	N^	N^	S^	S^	S^	S^	B	B
8R2	8.2	N^	N^	N^	S^	S^	S^	S^	B	B
100	10	N	N	N	S	S	S	S	B	B
120	12	N	N	N	S	S	S	S	B	B
150	15	N	N	N	S	S	S	S	B	B
180	18	N	N	N	S	S	S	S	B	B
220	22	N	N	N	S	S	S	S	B	B
270	27	N	N	N	S	S	S	S	B	B
330	33	N	N	N	S	S	S	S	B	B
390	39	N	N	N	S	S	S	S	B	B
470	47	N	N	N	S	S	S	S	B	B
560	56	N	N	N	S	S	S	S	B	B
680	68	N	N	N	S	S	S	S	B	B
820	82	N	N	N	S	S	S	S	B	B
101	100	N	N	N	S	S	S	S	B	B
121	120	N	N	N	S	S	S	S	D	D
151	150	N	N	N	S	S	S	S	D	D
181	180	N	N	N	S	S	S	S		
221	220	N	N	N	S	S	S	S		
271	270	N	N	N	S	S	S	S		
331	330	N	N	N	S	S	S	S		
391	390	N	N	N	S	S	S	S		
471	470	N	N	N	S	S	S	S		
561	560				S	S	S			
681	680				S	S	S			
821	820				S	S	S			
102	1000				S	S	S			
122	1200				X	X	X			
152	1500				X	X	X			
182	1800				X	X	X			
222	2200				X	X	X			
272	2700				X	X	X			
332	3300				X	X	X			

■ The letter in cell is expressed the symbol of product thickness

■ The “^” mark is expressed product with Ag/Ni/Sn terminations

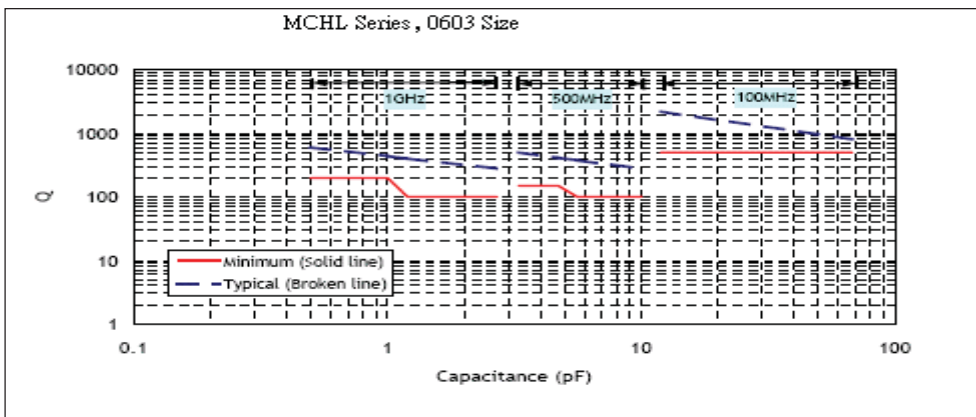
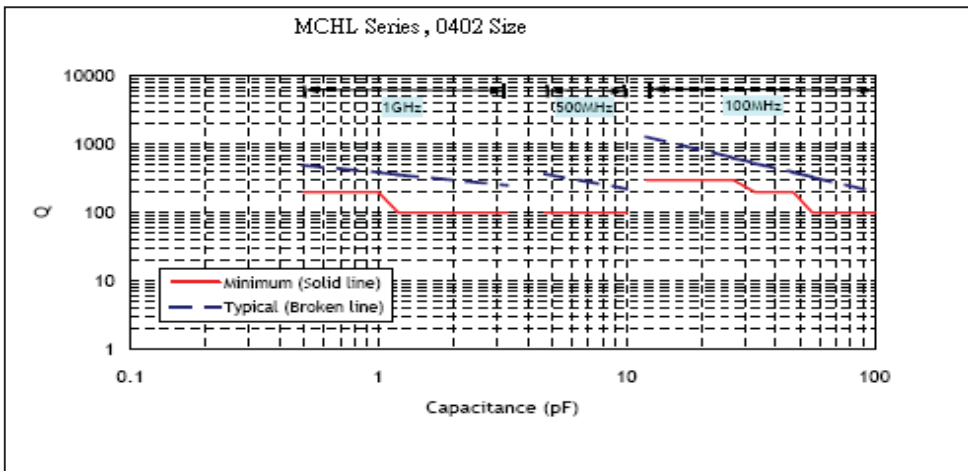
■ 0402, Capacitance<0.5pF:On request

Electrical Data

Dielectric	NPO
Size	0402, 0603,0805
Capacitance*	0402: 0.5pF ~ 470pF(<0.5pF: on requested) 0603: 0.5pF ~ 3300pF 0805: 0.5pF ~ 150pF
Capacitance tolerance	Cap ≤ 5pF: B(±0.1pF), C(±0.25pF) 5pF < Cap < 10pF: C(±0.25pF), D(±0.50pF) Cap ≥ 10pF: J(±5%)
Rated voltage (VDCW)	16V, 25V, 50V, 100V
Q *	Cap < 30pF: Q ≥ 400 + 20C Cap ≥ 30pF: Q ≥ 1000
Insulation resistance at Ur	≥ 10GΩ
Operating temperature	-55 to +125°C
Capacitance change	±30 ppm
ESR	Cap < 2.2pF: ≤ 1000mΩ @ 900±100MHz 2.2pF ≤ Cap ≤ 470pF: ≤ 500mΩ @ 900±100MHz Cap > 470pF: ≤ 500mΩ @ 60±10MHz
Termination	Ni/Sn (lead-free termination)

- \*\*Measured at the conditions of 25°C ambient temperature and 30~70% related humidity
- Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap ≤ 1000pF; 1.0KHz±10% for Cap > 1000pF

Electrical characteristics



## Environmental Characteristics

Item	Requirement	Test Method																																																																										
External Appearance	No defects which may affect performance	Visual inspection & Dimension measurement																																																																										
Capacitance(Cap.)	Within the specified tolerance that refers on page2	NPO: (Class I) Cap $\leq$ 1000pF 1.0 $\pm$ 0.2Vrms, 1MHz $\pm$ 10% Cap $>$ 1000pF 1.0 $\pm$ 0.2Vrms, 1KHz $\pm$ 10%																																																																										
Dissipation Factor (D.F.) or Quality factor (Q=1/D.F.)	NPO: Cap $\geq$ 30pF, Q $\geq$ 1000; Cap $<$ 30pF, Q $\geq$ 400+20C X7R, X5R: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.<math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq</math> 50V</td> <td rowspan="3">2.5%</td> <td>3%</td> <td>0201(50V); 0603 <math>\geq</math> 0.047<math>\mu</math>F 0805 <math>\geq</math> 0.18<math>\mu</math>F; 1206 <math>\geq</math> 0.47<math>\mu</math>F</td> </tr> <tr> <td>5%</td> <td>1210 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td>7%</td> <td>0603 <math>\geq</math> 1<math>\mu</math>F; 0805 <math>\geq</math> 1<math>\mu</math>F 1206 <math>\geq</math> 2.2<math>\mu</math>F; 1210 <math>\geq</math> 10<math>\mu</math>F</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">3.5%</td> <td>5%</td> <td>0201 <math>\geq</math> 0.01<math>\mu</math>F; 0805 <math>\geq</math> 1<math>\mu</math>F 1210 <math>\geq</math> 10<math>\mu</math>F</td> </tr> <tr> <td>7%</td> <td>0603 <math>\geq</math> 0.33<math>\mu</math>F; 1206 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td>10%</td> <td>0402 <math>\geq</math> 0.10<math>\mu</math>F; 0603 <math>\geq</math> 0.47<math>\mu</math>F 0805 <math>\geq</math> 2.2<math>\mu</math>F; 1206 <math>\geq</math> 6.8<math>\mu</math>F 1210 <math>\geq</math> 22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">3.5%</td> <td>5%</td> <td>0201 <math>\geq</math> 0.01<math>\mu</math>F; 0402 <math>\geq</math> 0.033<math>\mu</math>F 0603 <math>\geq</math> 0.15<math>\mu</math>F; 0805 <math>\geq</math> 0.68<math>\mu</math>F 1206 <math>\geq</math> 2.2<math>\mu</math>F; 1210 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td>10%</td> <td>0402 <math>\geq</math> 0.22<math>\mu</math>F; 0603 <math>\geq</math> 0.68<math>\mu</math>F 0805 <math>\geq</math> 2.2<math>\mu</math>F; 1206 <math>\geq</math> 4.7<math>\mu</math>F 1210 <math>\geq</math> 22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0201 <math>\geq</math> 0.012<math>\mu</math>F; 0402 <math>\geq</math> 0.33<math>\mu</math>F 0603 <math>\geq</math> 0.33<math>\mu</math>F; 0805 <math>\geq</math> 2.2<math>\mu</math>F 1206 <math>\geq</math> 2.2<math>\mu</math>F; 1210 <math>\geq</math> 22<math>\mu</math>F</td> </tr> <tr> <td>15%</td> <td>0201 <math>\geq</math> 0.1<math>\mu</math>F; 0402 <math>\geq</math> 1<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">10%</td> <td>15%</td> <td>0201 <math>\geq</math> 0.01<math>\mu</math>F; 0402 <math>\geq</math> 1<math>\mu</math>F 0603 <math>\geq</math> 10<math>\mu</math>F; 0805 <math>\geq</math> 4.7<math>\mu</math>F 1206 <math>\geq</math> 47<math>\mu</math>F; 1210 <math>\geq</math> 100<math>\mu</math>F</td> </tr> <tr> <td>20%</td> <td>0402 <math>\geq</math> 2.2<math>\mu</math>F</td> </tr> </tbody> </table> Y5V: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.<math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq</math> 50V</td> <td>5%</td> <td>7%</td> <td>0603 <math>\geq</math> 0.1<math>\mu</math>F; 0805 <math>\geq</math> 0.47<math>\mu</math>F 1206 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td>35V</td> <td>7%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">5%</td> <td>7%</td> <td>0402 <math>\geq</math> 0.047<math>\mu</math>F; 0603 <math>\geq</math> 0.1<math>\mu</math>F 0805 <math>\geq</math> 0.33<math>\mu</math>F; 1206 <math>\geq</math> 1<math>\mu</math>F 1210 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td>9%</td> <td>0402 <math>\geq</math> 0.068<math>\mu</math>F; 0603 <math>\geq</math> 0.47<math>\mu</math>F 1206 <math>\geq</math> 4.7<math>\mu</math>F; 1210 <math>\geq</math> 22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0<math>\mu</math>F)</td> <td rowspan="2">7%</td> <td>9%</td> <td>0402 <math>\geq</math> 0.068<math>\mu</math>F; 0603 <math>\geq</math> 0.68<math>\mu</math>F</td> </tr> <tr> <td>12.5%</td> <td>0402 <math>\geq</math> 0.22<math>\mu</math>F</td> </tr> <tr> <td>16V (C <math>\geq</math> 1.0<math>\mu</math>F)</td> <td>9%</td> <td>12.5%</td> <td>0603 <math>\geq</math> 2.2<math>\mu</math>F; 0805 <math>\geq</math> 3.3<math>\mu</math>F 1206 <math>\geq</math> 10<math>\mu</math>F; 1210 <math>\geq</math> 22<math>\mu</math>F 1812 <math>\geq</math> 47<math>\mu</math>F</td> </tr> <tr> <td>10V</td> <td>12.5%</td> <td>20%</td> <td>0402 <math>\geq</math> 0.47<math>\mu</math>F</td> </tr> <tr> <td>6.3V</td> <td>20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq$ 50V	2.5%	3%	0201(50V); 0603 $\geq$ 0.047 $\mu$ F 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F	5%	1210 $\geq$ 4.7 $\mu$ F	7%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F	25V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1210 $\geq$ 10 $\mu$ F	7%	0603 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F	10%	0402 $\geq$ 0.10 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 6.8 $\mu$ F 1210 $\geq$ 22 $\mu$ F	16V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 0.033 $\mu$ F 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F	10%	0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F 1210 $\geq$ 22 $\mu$ F	10V	5%	10%	0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.33 $\mu$ F 0603 $\geq$ 0.33 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	15%	0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F	6.3V	10%	15%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 1 $\mu$ F 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 4.7 $\mu$ F 1206 $\geq$ 47 $\mu$ F; 1210 $\geq$ 100 $\mu$ F	20%	0402 $\geq$ 2.2 $\mu$ F	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq$ 50V	5%	7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F	35V	7%	—	—	25V	5%	7%	0402 $\geq$ 0.047 $\mu$ F; 0603 $\geq$ 0.1 $\mu$ F 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F 1210 $\geq$ 4.7 $\mu$ F	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	16V (C < 1.0 $\mu$ F)	7%	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F	12.5%	0402 $\geq$ 0.22 $\mu$ F	16V (C $\geq$ 1.0 $\mu$ F)	9%	12.5%	0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 3.3 $\mu$ F 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F 1812 $\geq$ 47 $\mu$ F	10V	12.5%	20%	0402 $\geq$ 0.47 $\mu$ F	6.3V	20%	-	-	X7R, X5R, Y5V: (Class II) Cap $\leq$ 10uF 1.0 $\pm$ 0.2Vrms, 1KHz $\pm$ 10% Cap $>$ 10uF 0.5 $\pm$ 0.2Vrms, 120Hz $\pm$ 10%
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																										
$\geq$ 50V	2.5%	3%	0201(50V); 0603 $\geq$ 0.047 $\mu$ F 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F																																																																									
		5%	1210 $\geq$ 4.7 $\mu$ F																																																																									
		7%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F																																																																									
25V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1210 $\geq$ 10 $\mu$ F																																																																									
		7%	0603 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F																																																																									
		10%	0402 $\geq$ 0.10 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 6.8 $\mu$ F 1210 $\geq$ 22 $\mu$ F																																																																									
16V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 0.033 $\mu$ F 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F																																																																									
		10%	0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F 1210 $\geq$ 22 $\mu$ F																																																																									
10V	5%	10%	0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.33 $\mu$ F 0603 $\geq$ 0.33 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F																																																																									
		15%	0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F																																																																									
6.3V	10%	15%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 1 $\mu$ F 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 4.7 $\mu$ F 1206 $\geq$ 47 $\mu$ F; 1210 $\geq$ 100 $\mu$ F																																																																									
		20%	0402 $\geq$ 2.2 $\mu$ F																																																																									
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																										
$\geq$ 50V	5%	7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F																																																																									
35V	7%	—	—																																																																									
25V	5%	7%	0402 $\geq$ 0.047 $\mu$ F; 0603 $\geq$ 0.1 $\mu$ F 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F 1210 $\geq$ 4.7 $\mu$ F																																																																									
		9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F																																																																									
16V (C < 1.0 $\mu$ F)	7%	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F																																																																									
		12.5%	0402 $\geq$ 0.22 $\mu$ F																																																																									
16V (C $\geq$ 1.0 $\mu$ F)	9%	12.5%	0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 3.3 $\mu$ F 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F 1812 $\geq$ 47 $\mu$ F																																																																									
10V	12.5%	20%	0402 $\geq$ 0.47 $\mu$ F																																																																									
6.3V	20%	-	-																																																																									
Dielectric Strength	No evidence of damage or flash over during test	To apply voltage( $\leq$ 100V) 250% Duration: 1 to 5sec Charge and discharge current less than 50mA  To apply voltage: 200V~300V $\geq$ 2 time VDC 500V~999V $\geq$ 1.5 time VDC 1000V~3000V $\geq$ 1.2 time VDC Cut-off, set at 10mA TEST=15 sec. RAMP=0																																																																										

Item	Requirement	Test Method																				
Insulation Resistance	10GΩ or $R \times C \geq 500\Omega\text{-F}$ Whichever is smaller X7R, X5R, Y5V:	To apply rated voltage for max. 120sec																				
	<table border="1"> <tr> <th>Rated Voltage</th> <th>Insulation Resistance</th> </tr> <tr> <td>100V: X7R</td> <td rowspan="5">Rx C <math>\geq 100\Omega\text{-F}</math></td> </tr> <tr> <td>50V: 0603<math>\geq 1\mu\text{F}</math>;0805<math>\geq 1\mu\text{F}</math>;1206<math>\geq 2.2\mu\text{F}</math> 1210<math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td>25V: 0402<math>\geq 1\mu\text{F}</math>;0603<math>\geq 2.2\mu\text{F}</math>;0805<math>\geq 2.2\mu\text{F}</math> 1206<math>\geq 10\mu\text{F}</math>;1210<math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>16V: 0402<math>\geq 0.22\mu\text{F}</math>;0603<math>\geq 1\mu\text{F}</math>;0805<math>\geq 2.2\mu\text{F}</math> 1206<math>\geq 10\mu\text{F}</math>;1210<math>\geq 47\mu\text{F}</math></td> </tr> <tr> <td>10V: 0201<math>\geq 47\text{nF}</math>;0402<math>\geq 0.47\mu\text{F}</math>;0603<math>\geq 0.47\mu\text{F}</math> 0805<math>\geq 2.2\mu\text{F}</math>;1206<math>\geq 4.7\mu\text{F}</math>;1210<math>\geq 47\mu\text{F}</math></td> </tr> <tr> <td>6.3V</td> <td></td> </tr> </table>		Rated Voltage	Insulation Resistance	100V: X7R	Rx C $\geq 100\Omega\text{-F}$	50V: 0603 $\geq 1\mu\text{F}$ ;0805 $\geq 1\mu\text{F}$ ;1206 $\geq 2.2\mu\text{F}$ 1210 $\geq 4.7\mu\text{F}$	25V: 0402 $\geq 1\mu\text{F}$ ;0603 $\geq 2.2\mu\text{F}$ ;0805 $\geq 2.2\mu\text{F}$ 1206 $\geq 10\mu\text{F}$ ;1210 $\geq 10\mu\text{F}$	16V: 0402 $\geq 0.22\mu\text{F}$ ;0603 $\geq 1\mu\text{F}$ ;0805 $\geq 2.2\mu\text{F}$ 1206 $\geq 10\mu\text{F}$ ;1210 $\geq 47\mu\text{F}$	10V: 0201 $\geq 47\text{nF}$ ;0402 $\geq 0.47\mu\text{F}$ ;0603 $\geq 0.47\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$ ;1206 $\geq 4.7\mu\text{F}$ ;1210 $\geq 47\mu\text{F}$	6.3V											
	Rated Voltage		Insulation Resistance																			
100V: X7R	Rx C $\geq 100\Omega\text{-F}$																					
50V: 0603 $\geq 1\mu\text{F}$ ;0805 $\geq 1\mu\text{F}$ ;1206 $\geq 2.2\mu\text{F}$ 1210 $\geq 4.7\mu\text{F}$																						
25V: 0402 $\geq 1\mu\text{F}$ ;0603 $\geq 2.2\mu\text{F}$ ;0805 $\geq 2.2\mu\text{F}$ 1206 $\geq 10\mu\text{F}$ ;1210 $\geq 10\mu\text{F}$																						
16V: 0402 $\geq 0.22\mu\text{F}$ ;0603 $\geq 1\mu\text{F}$ ;0805 $\geq 2.2\mu\text{F}$ 1206 $\geq 10\mu\text{F}$ ;1210 $\geq 47\mu\text{F}$																						
10V: 0201 $\geq 47\text{nF}$ ;0402 $\geq 0.47\mu\text{F}$ ;0603 $\geq 0.47\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$ ;1206 $\geq 4.7\mu\text{F}$ ;1210 $\geq 47\mu\text{F}$																						
6.3V																						
$\geq 10G\Omega$ or $100\Omega\text{-F}$ whichever is smaller Rated voltage: 200V~630V	To apply rated voltage(500V max.) for 60sec.																					
$\geq 10G\Omega$ Rated voltage: >630V	To apply 500V for 60sec.																					
Temperature Characteristic of Capacitance	<table border="1"> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> <tr> <td>NPO</td> <td><math>\pm 30</math> (ppm/<math>^{\circ}\text{C}</math>)</td> </tr> <tr> <td>X7R</td> <td><math>\pm 15\%</math></td> </tr> <tr> <td>X5R</td> <td><math>\pm 15\%</math></td> </tr> <tr> <td>Y5V</td> <td>+30%~-80%</td> </tr> </table>	T.C.	Capacitance Change	NPO	$\pm 30$ (ppm/ $^{\circ}\text{C}$ )	X7R	$\pm 15\%$	X5R	$\pm 15\%$	Y5V	+30%~-80%	<p>With no electrical load.</p> <table border="1"> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> <tr> <td>NPO</td> <td>-55 ~ 125<math>^{\circ}\text{C}</math> at 25<math>^{\circ}\text{C}</math></td> </tr> <tr> <td>X7R</td> <td>-55 ~ 125<math>^{\circ}\text{C}</math> at 25<math>^{\circ}\text{C}</math></td> </tr> <tr> <td>X5R</td> <td>-55 ~ 85<math>^{\circ}\text{C}</math> at 25<math>^{\circ}\text{C}</math></td> </tr> <tr> <td>Y5V</td> <td>-25 ~ 85<math>^{\circ}\text{C}</math> at 20<math>^{\circ}\text{C}</math></td> </tr> </table>	T.C.	Operating Temp	NPO	-55 ~ 125 $^{\circ}\text{C}$ at 25 $^{\circ}\text{C}$	X7R	-55 ~ 125 $^{\circ}\text{C}$ at 25 $^{\circ}\text{C}$	X5R	-55 ~ 85 $^{\circ}\text{C}$ at 25 $^{\circ}\text{C}$	Y5V	-25 ~ 85 $^{\circ}\text{C}$ at 20 $^{\circ}\text{C}$
T.C.	Capacitance Change																					
NPO	$\pm 30$ (ppm/ $^{\circ}\text{C}$ )																					
X7R	$\pm 15\%$																					
X5R	$\pm 15\%$																					
Y5V	+30%~-80%																					
T.C.	Operating Temp																					
NPO	-55 ~ 125 $^{\circ}\text{C}$ at 25 $^{\circ}\text{C}$																					
X7R	-55 ~ 125 $^{\circ}\text{C}$ at 25 $^{\circ}\text{C}$																					
X5R	-55 ~ 85 $^{\circ}\text{C}$ at 25 $^{\circ}\text{C}$																					
Y5V	-25 ~ 85 $^{\circ}\text{C}$ at 20 $^{\circ}\text{C}$																					
Adhesive Strength of Termination	No remarkable damage or removal of the terminations	Pressurizing force: 0201:2N 0402&0603:5N>0603:10N Test time: 10 $\pm$ 1 sec																				
Vibration Resistance	No remarkable damage Cap change and Q/D.F.: To meet initial spec	Vibration frequency: 10~55Hz/min Total amplitude: 1.5mm Test time: 6hrs.(two hrs each in three mutually Perpendicular directions.)																				
Solderability	95% min. coverage of all metalized area.	Solder temperature: 235 $\pm$ 5 $^{\circ}\text{C}$ Dipping time: 2 $\pm$ 0.5 sec.																				
Bending Test	No remarkable damage Cap change: NPO: within $\pm 5\%$ or 0.5pF whichever is larger X7R, X5R: within $\pm 12.5\%$ Y5V: within $\pm 30\%$ (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5 $\pm$ 1sec. Measurement to be made after keeping at room temp. for 24 $\pm$ 2hrs(Class I) or 48 $\pm$ 4hrs(Class II) (Thickness>1.0mm, Thickness $\leq$ 1.0mm)																				
Resistance to Soldering Heat	No remarkable damage Cap change: NPO: within $\pm 2.5\%$ or 0.25pF whichever is larger X7R, X5R: Within $\pm 7.5\%$ Y5V: within $\pm 20\%$ Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25%max. leaching on each edge.	Solder temperature: 260 $\pm$ 5 $^{\circ}\text{C}$ Dipping time: 10 $\pm$ 1sec Preheating: 120 to 150 $^{\circ}\text{C}$ for 1minute before immerse the capacitor in a eutectic solder. Before initial measurement(Class II only): Perform 150+0/-10 $^{\circ}\text{C}$ for 1hr and then set for 24 $\pm$ 4hrs at room temp. Measurement to be made after keep at room temp. for 24 $\pm$ 2 hrs.																				
Temperature Cycle	No remarkable damage. Cap change: NPO: within $\pm 2.5\%$ or 0.25pF whichever is larger X7R, X5R: within $\pm 7.5\%$ Y5V: within $\pm 20\%$ Q/D.F., I.R. and dielectric strength: To meet initial requirements.	Conduct the five cycles according to the temperature and time. <table border="1"> <thead> <tr> <th>Step</th> <th>Temp.(<math>^{\circ}\text{C}</math>)</th> <th>Time(min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp.+0/-3</td> <td>30<math>\pm</math>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<math>\pm</math>3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2-3</td> </tr> </tbody> </table> <p>Before initial measurement(Cass II only): Perform 150+0/-10<math>^{\circ}\text{C}</math> for 1hr and then set for 48<math>\pm</math>4 hrs at room temp. Measurement to be made after keeping at room temp. for 24<math>\pm</math>2 hrs.(Class I) or 48<math>\pm</math>4 hrs.(Class II).</p>	Step	Temp.( $^{\circ}\text{C}$ )	Time(min)	1	Min. operating temp.+0/-3	30 $\pm$ 3	2	Room temp	2-3	3	Max. operating temp.+3/-0	30 $\pm$ 3	4	Room temp.	2-3					
Step	Temp.( $^{\circ}\text{C}$ )	Time(min)																				
1	Min. operating temp.+0/-3	30 $\pm$ 3																				
2	Room temp	2-3																				
3	Max. operating temp.+3/-0	30 $\pm$ 3																				
4	Room temp.	2-3																				

Item	Requirement	Test Method																																				
Humidity (steady state)	No remarkable damage. Cap change: NPO: within±5% or 0.5pF whichever is large X7R, X5R: ≥ 10V, within±12.5%; 6.3V, within±25% Y5V: ≥ 10V, within±30%; 6.3V, within+30/-40% Q/D.F. value: NPO: More than 30pF Q ≥ 350, 10pF ≤ C ≤ 30pF, Q ≥ 275+2.5C Less than 10pF Q ≥ 200+10C X7R, X5R:	Test temp: 40±2°C Humidity: 90~95% RH Test time: 500+24/-0hrs Measurement to be made after keeping at room temp. for 24±2hrs.																																				
	<table border="1" data-bbox="293 443 927 1167"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF;1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF	15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF	20%	0201 ≥ 0.1μF;0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF	
Rated vol.	D.F. ≤	Exception of D.F. ≤																																				
≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF																																			
		10%	1210 ≥ 4.7μF																																			
		20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF																																			
25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF																																			
		14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF																																			
		15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF																																			
16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF																																			
		15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																			
10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF																																			
		20%	0201 ≥ 0.1μF;0402 ≥ 1μF																																			
6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF																																			
	Y5V: <table border="1" data-bbox="293 1200 927 1686"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <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>15%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C&lt;1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ .0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF	16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ .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 vol.	D.F. ≤	Exception of D.F. ≤																																				
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF																																			
35V	10%	—	—																																			
25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF																																			
		15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																			
16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF																																			
		20%	0402 ≥ 0.22μF																																			
16V (C ≥ .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%	-	-																																			
	I.R.: ≥ 10V 1GΩ or 50Ω-F whichever is smaller. Class II (X7R, X5R, Y5V)																																					
	<table border="1" data-bbox="293 1753 927 2051"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="5">RxC ≥ 10Ω-F</td> </tr> <tr> <td>50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF</td> </tr> <tr> <td>25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V:X7R	RxC ≥ 10Ω-F	50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF	25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF	16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF	10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF																													
Rated voltage	Insulation Resistance																																					
100V:X7R	RxC ≥ 10Ω-F																																					
50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF																																						
25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF																																						
16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF																																						
10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF																																						

Item	Requirement	Test Method																																																																																	
Humidity load	<p>No remarkable damage.            Cap change:            NPO:±7.5% or 0.75pF whichever is larger            X7R, X5R: ≥ 10V, within±12.5%; 6.3V, 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:            NPO: C ≥ 30pF, Q ≥ 200; C &lt; 30pF, Q ≥ 100+10/3C            X7R, X5R:</p> <table border="1" data-bbox="292 398 943 1167"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF; 0805 ≥ 1μF 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <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>15%</td> <td>0201 ≥ 0.01μF; 0402 ≥ 0.033μF 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.33μF 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="292 1189 943 1682"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥ 10V 500MΩ or 25Ω-F (Whichever is smaller)            Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="292 1731 943 2056"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="6">RxC ≥ 5Ω-F</td> </tr> <tr> <td>50V:0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF</td> </tr> <tr> <td>25V:0402 ≥ 1uF; 0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF; 1210 ≥ 10uF</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF; 0805 ≥ 1μF 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF	20%	0201 ≥ 0.1μF; 0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	RxC ≥ 5Ω-F	50V:0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF	25V:0402 ≥ 1uF; 0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF; 1210 ≥ 10uF	16V:0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF	10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF	6.3V	<p>Test temp: 40±2°C            Humidity: 90~95%RH            Test time: 500+24/-0 hrs            To apply voltage: Rated voltage(Max. 500V)            Measurement to be made after keeping at room temp for 24±2hrs.(Class I) or 48±4hrs.(Class II)</p>
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																	
≥ 50V	3.0%	6%	0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																																
		10%	1210 ≥ 4.7μF																																																																																
		20%	0603 ≥ 1μF; 0805 ≥ 1μF 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																																
25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF																																																																																
		14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																																																
		15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF 1210 ≥ 22μF																																																																																
16V	5%	10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																																
		15%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																
10V	7.5%	15%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																																																
		20%	0201 ≥ 0.1μF; 0402 ≥ 1μF																																																																																
6.3V	15%	30%	0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF																																																																																
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																	
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF																																																																																
35V	10%	—	—																																																																																
25V	7.5%	10%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF																																																																																
		15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																
16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																																
		20%	0402 ≥ 0.22μF																																																																																
16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF																																																																																
10V	20%	30%	0402 ≥ 0.47μF																																																																																
6.3V	30%	-	-																																																																																
Rated voltage	Insulation Resistance																																																																																		
100V:X7R	RxC ≥ 5Ω-F																																																																																		
50V:0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF																																																																																			
25V:0402 ≥ 1uF; 0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF; 1210 ≥ 10uF																																																																																			
16V:0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF																																																																																			
10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF																																																																																			
6.3V																																																																																			

Item	Requirement	Test Method																																																																																																																																				
High Temperature Load (Endurance)	<p>No remarkable damage. Cap change: NPO: <math>\pm 3\%</math> or <math>\pm 0.3F</math> whichever is larger X7R, X5R: <math>\geq 10V</math>, within <math>\pm 12.5\%</math>; 6.3V, within <math>+30/-40\%</math> 10V: 0603 <math>\geq 4.7\mu F</math>; 0402 <math>\geq 1\mu F</math>; 0201 <math>\geq 0.1\mu F</math>, within <math>\pm 25\%</math> Q/D.F. value: NPO: More than 30pF, <math>Q \geq 350</math> <math>10pF \leq C &lt; 30pF</math>, <math>Q \geq 275 + 2.5C</math> Less than 10pF, <math>Q \geq 200 + 10C</math> X7R, X5R:</p> <table border="1" data-bbox="308 443 935 1160"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq 50V</math></td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V); 0603 <math>\geq 0.047\mu F</math> 0805 <math>\geq 0.18\mu F</math>; 1206 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>10%</td> <td>1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>20%</td> <td>0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0805 <math>\geq 1\mu F</math> 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>14%</td> <td>0603 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.10\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 6.8\mu F</math> 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 <math>\geq 0.15\mu F</math>; 0805 <math>\geq 0.68\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0402 <math>\geq 0.033\mu F</math> 0603 <math>\geq 0.68\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 <math>\geq 0.012\mu F</math>; 0402 <math>\geq 0.33\mu F</math> 0603 <math>\geq 0.33\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td>20%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math> 0603 <math>\geq 10\mu F</math>; 0805 <math>\geq 4.7\mu F</math> 1210 <math>\geq 100\mu F</math></td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="308 1189 935 1697"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq 50V</math></td> <td>7.5%</td> <td>10%</td> <td>0603 <math>\geq 0.1\mu F</math>; 0805 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>35V</td> <td>10%</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 <math>\geq 0.047\mu F</math>; 0603 <math>\geq 0.1\mu F</math> 0805 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 1\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0<math>\mu F</math>)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.68\mu F</math></td> </tr> <tr> <td>20%</td> <td>0402 <math>\geq 0.22\mu F</math></td> </tr> <tr> <td>16V (C <math>\geq 1.0\mu F</math>)</td> <td>12.5%</td> <td>20%</td> <td>0603 <math>\geq 2.2\mu F</math>; 0805 <math>\geq 3.3\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 22\mu F</math> 1812 <math>\geq 47\mu F</math></td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: <math>\geq 10V</math> 1G<math>\Omega</math> or 50<math>\Omega</math>-F whichever is smaller Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="308 1760 935 2056"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="5">RxC <math>\geq</math> 10<math>\Omega</math>-F</td> </tr> <tr> <td>50V: 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math>; 1206 <math>\geq 2.2\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>25V: 0402 <math>\geq 1\mu F</math>; 0603 <math>\geq 2.2\mu F</math>; 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>16V: 0402 <math>\geq 0.22\mu F</math>; 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> <tr> <td>10V: 0201 <math>\geq 47nF</math>; 0402 <math>\geq 0.47\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$	10%	1210 $\geq 4.7\mu F$	20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$	25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$	14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$	15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$	16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$	15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$	20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$	6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$	35V	10%	-	-	25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$	15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	16V (C < 1.0 $\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$	20%	0402 $\geq 0.22\mu F$	16V (C $\geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$	10V	20%	30%	0402 $\geq 0.47\mu F$	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V: X7R	RxC $\geq$ 10 $\Omega$ -F	50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$	25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$	16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$	10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$	<p>Test temp: NPO, X7R: 125<math>\pm 3^\circ C</math> X5R, Y5V: 85<math>\pm 3^\circ C</math> Test Time: 1000+25/-0 hrs To apply voltage: (1.1) 100% of rated voltage for below range.</p> <table border="1" data-bbox="967 353 1469 618"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td>C <math>\geq 0.1\mu F</math></td> </tr> <tr> <td>0402</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td>C <math>\geq 1.0\mu F</math></td> </tr> <tr> <td>0603</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td>C <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>0805</td> <td>X5R, X7R</td> <td>6.3V</td> <td>C <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R, X7R</td> <td>6.3V</td> <td>C <math>\geq 47\mu F</math></td> </tr> <tr> <td>NPO</td> <td>3000V</td> <td>C <math>\geq 1.5pF</math></td> </tr> </tbody> </table> <p>(1.2) 6.3V or C <math>\geq 10\mu F</math>: 150% of rated voltage (2) 10V <math>\leq U_r &lt; 500V</math>: 200% of rated voltage. 150% of rated voltage for below range.</p> <table border="1" data-bbox="967 712 1469 999"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0402</td> <td>X5R, X7R</td> <td>10V, 16V, 25V</td> <td>C <math>\geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C <math>\geq 0.47\mu F</math></td> </tr> <tr> <td rowspan="2">0603</td> <td>X5R, X7R</td> <td>10V, 16V</td> <td>C <math>\geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C <math>\geq 2.2\mu F</math></td> </tr> <tr> <td rowspan="2">0805</td> <td>X5R, X7R</td> <td>10V</td> <td>C <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C <math>\geq 4.7\mu F</math></td> </tr> </tbody> </table> <p>(3) 500V: 150% of rated voltage (4) <math>U_r \geq 630V</math>: 120% of rated voltage</p> <p>Test time: 1000+24/-0hrs Measurement to be made after keeping at room temp. for 24<math>\pm 2</math>hrs.</p>	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R, X7R	6.3V, 10V	C $\geq 0.1\mu F$	0402	X5R, X7R	6.3V, 10V	C $\geq 1.0\mu F$	0603	X5R, X7R	6.3V, 10V	C $\geq 4.7\mu F$	0805	X5R, X7R	6.3V	C $\geq 22\mu F$	1206	X5R, X7R	6.3V	C $\geq 47\mu F$	NPO	3000V	C $\geq 1.5pF$	Size	Dielectric	Rated voltage	Capacitance range	0402	X5R, X7R	10V, 16V, 25V	C $\geq 1.0\mu F$	Y5V	16V	C $\geq 0.47\mu F$	0603	X5R, X7R	10V, 16V	C $\geq 1.0\mu F$	Y5V	16V	C $\geq 2.2\mu F$	0805	X5R, X7R	10V	C $\geq 4.7\mu F$	Y5V	16V	C $\geq 4.7\mu F$
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																																																																																				
$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$																																																																																																																																			
		10%	1210 $\geq 4.7\mu F$																																																																																																																																			
		20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$																																																																																																																																			
25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$																																																																																																																																			
		14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$																																																																																																																																			
		15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$																																																																																																																																			
16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$																																																																																																																																			
		15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																			
10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																			
		20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$																																																																																																																																			
6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$																																																																																																																																			
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																																																																																				
$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$																																																																																																																																			
35V	10%	-	-																																																																																																																																			
25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$																																																																																																																																			
		15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																			
16V (C < 1.0 $\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$																																																																																																																																			
		20%	0402 $\geq 0.22\mu F$																																																																																																																																			
16V (C $\geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$																																																																																																																																			
10V	20%	30%	0402 $\geq 0.47\mu F$																																																																																																																																			
6.3V	30%	-	-																																																																																																																																			
Rated voltage	Insulation Resistance																																																																																																																																					
100V: X7R	RxC $\geq$ 10 $\Omega$ -F																																																																																																																																					
50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$																																																																																																																																						
25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$																																																																																																																																						
16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$																																																																																																																																						
10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$																																																																																																																																						
Size	Dielectric	Rated voltage	Capacitance range																																																																																																																																			
0201	X5R, X7R	6.3V, 10V	C $\geq 0.1\mu F$																																																																																																																																			
0402	X5R, X7R	6.3V, 10V	C $\geq 1.0\mu F$																																																																																																																																			
0603	X5R, X7R	6.3V, 10V	C $\geq 4.7\mu F$																																																																																																																																			
0805	X5R, X7R	6.3V	C $\geq 22\mu F$																																																																																																																																			
1206	X5R, X7R	6.3V	C $\geq 47\mu F$																																																																																																																																			
	NPO	3000V	C $\geq 1.5pF$																																																																																																																																			
Size	Dielectric	Rated voltage	Capacitance range																																																																																																																																			
0402	X5R, X7R	10V, 16V, 25V	C $\geq 1.0\mu F$																																																																																																																																			
	Y5V	16V	C $\geq 0.47\mu F$																																																																																																																																			
0603	X5R, X7R	10V, 16V	C $\geq 1.0\mu F$																																																																																																																																			
	Y5V	16V	C $\geq 2.2\mu F$																																																																																																																																			
0805	X5R, X7R	10V	C $\geq 4.7\mu F$																																																																																																																																			
	Y5V	16V	C $\geq 4.7\mu F$																																																																																																																																			

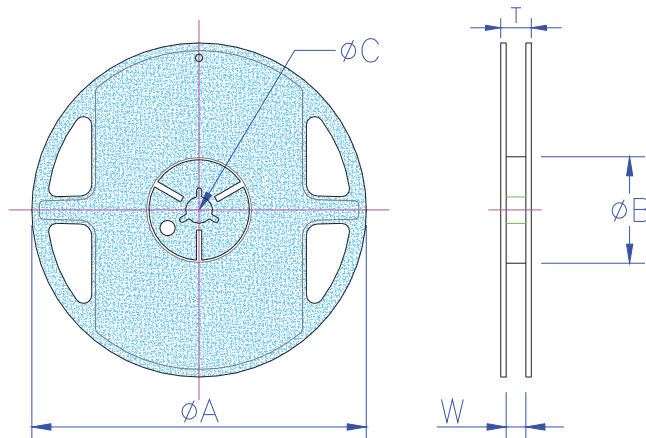
## ■ Packaging

### Packaging Quantity

Unit: mm

Type	Thickness / Symbol		Packaging (7" Reel)	
			Paper tape	Plastic tape
0201	0.30±0.03	L	15K	-
0402	0.50±0.05	N	10K	-
0603	0.80±0.10	S	4K	-
	0.80 +0.15 / -0.10	X	4K	-
0805	0.60±0.10	A	4K	-
	0.80±0.10	B	4K	-
	0.85±0.10	T	4K	-
	1.25±0.10	D	-	3K
	1.25±0.20	I	-	3K
1206	0.80±0.10	B	4K	-
	0.95±0.10	C	-	3K
	1.15±0.15	J	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	1.60 +0.30 / -0.10	P	-	2K
1210	0.95±0.10	C	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	1K
1808	1.25±0.10	D	-	2K
	2.00±0.20	K	-	1K
1812	1.25±0.10	D	-	1K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	0.5K
0612	0.80±0.10	B	4K	-

### Tape and Reel

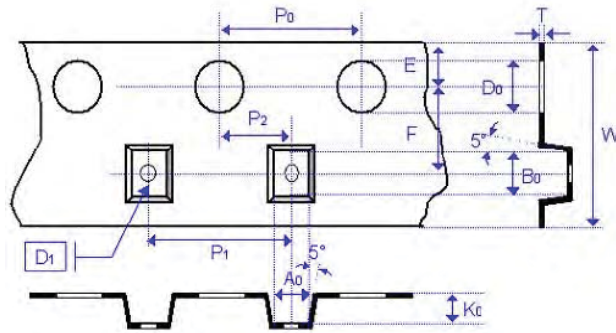


Unit: mm

Type	Chip Size							
	0201	0402	0603	0805	1206/0612	1210	1808	1812
$\Phi C$	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0
$W$	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	13.5±1.0	13.5±1.0
$\Phi A$	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")
$\Phi B$	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	80.0±1.0(7")	80.0±1.0(7")



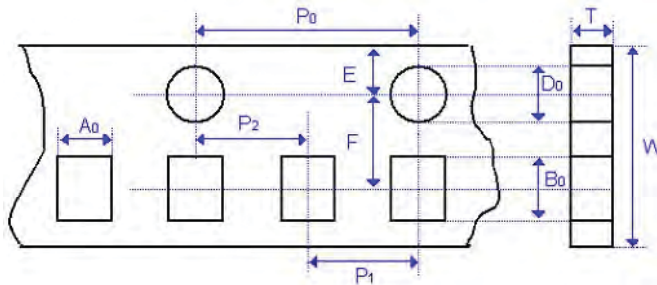
Plastic Tape Size Specification



Unit: mm

Type	0805		1206			1210					1808		1812					
Thickness	D	I	C	J	D	G	P	C	D	G	K	M	D	K	D	K	M	
A <sub>0</sub>	<1.57		<1.85			<1.95		<2.97					<2.97		<3.81			
B <sub>0</sub>	<2.40		<3.46			<3.67		<3.73					<3.73		<4.98		<5.30	
T	0.23±0.05		0.23±0.05			0.23±0.05		0.23±0.05					0.23±0.05		0.25±0.05			
K <sub>0</sub>	<2.50		<2.50			<2.50		<2.50					<3.00		<2.50		<3.00	
W	8.00±0.10		8.00±0.10			8.00±0.10		8.00±0.10					8.00±0.10		12.0±0.20			
P <sub>0</sub>	4.00±0.10		4.00±0.10			4.00±0.10		4.00±0.10					4.00±0.10		4.00±0.10			
P <sub>1</sub>	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 <sub>2</sub>	2.00±0.05		2.00±0.05			2.00±0.05		2.00±0.05					2.00±0.05		2.00±0.05			
D <sub>0</sub>	1.50±0.05		1.50±0.05			1.50±0.05		1.50±0.05					1.50±0.05		1.50±0.05			
D <sub>1</sub>	1.00±0.10		1.00±0.10			1.00±0.10		1.00±0.10					1.00±0.10		1.00±0.10			
E	1.75±0.10		1.75±0.10			1.75±0.10		1.75±0.10					1.75±0.10		1.75±0.10			
F	3.50±0.05		3.50±0.05			3.50±0.05		3.50±0.05					3.50±0.05		5.50±0.05			

Paper Tape Size Specification



Unit: mm

Type	0201	0402	0603		0805		1206/0612
Thickness	L	N	S	X	A	B	B
A <sub>0</sub>	0.45±0.05	0.62±0.05	1.02±0.05		1.50±0.10	1.50±0.10	2.00±0.10
B <sub>0</sub>	0.75±0.05	1.12±0.05	1.82±0.05		2.30±0.10	2.30±0.10	3.50±0.10
T	0.60±0.05	0.60±0.05	0.95±0.05		0.75±0.05	0.95±0.05	0.95±0.05
W	8.00±0.10	8.00±0.10	8.00±0.10		8.00±0.10	8.00±0.10	8.00±0.10
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>1</sub>	2.00±0.05	2.00±0.05	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05		2.00±0.05	2.00±0.05	2.00±0.05
D <sub>0</sub>	1.55±0.05	1.55±0.05	1.55±0.05		1.55±0.05	1.55±0.05	1.50±0.05
E	1.75±0.05	1.75±0.05	1.75±0.05		1.75±0.05	1.75±0.05	1.75±0.10
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

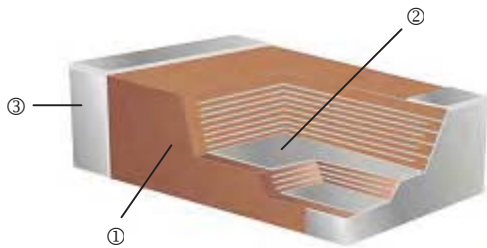
# Multilayer Ceramic Chip Capacitor



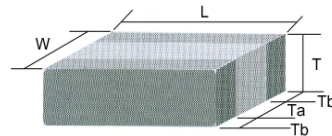
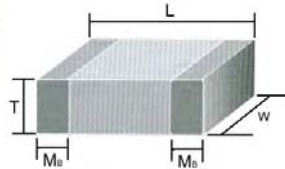
## Features

- Wide capacitance range, extremely compact size
- Low inductance of capacitor for high frequency application
- Excellent solderability and resistance to soldering heat, suitable for flow and reflow soldering
- Adaptable to high-speed surface mount assembly
- Conform to EIAJ-RC3402, and also compatible with EIA-RS198 and IEC PUB. 384-10

## Construction



① Ceramic Material	③ Termination:
② Inner Electrodes	NPO: Ag/Ni/Sn dielectric X7R, Y5V, X5R: Cu/Ni/Sn dielectric



Unit: mm

## Dimensions

MC / MCHL / MCRF Type

Type	Size (Inch)	L	W	T / Symbol		Mb	Packaging (7" Reel)	
							Paper tape	Plastic tape
01	0201	0.6±0.03	0.3±0.03	0.3±0.03	L	0.15±0.05	15K	-
02	0402	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05 / -0.10	10K	-
03	0603	1.60±0.10	0.80±0.10	0.80±0.10	S	0.40±0.15	4K	-
		1.60 +0.15 / -0.10	0.80 +0.15 / -0.10	0.80 +0.15 / -0.10	X		4K	
05	0805	2.00±0.15	1.25±0.20	0.60±0.15	A	0.50±0.20	4K	-
				0.80±0.10	B		4K	-
				1.25±0.10	D		-	3K
				0.85±0.10	T		4K	-
				1.25±0.20	I		-	3K
06	1206	3.20±0.15	1.60±0.15	0.80±0.10	B	0.60±0.20 (0.50±0.20)***	4K	-
				0.95±0.10	C		-	3K
				1.25±0.10	D		-	3K
				1.15±0.15	J		-	3K
				1.60±0.20	G		-	2K
3.20+0.3 / -0.1	1.60+0.3 / -0.1	1.60+0.3 / -0.1	P	-	2K			
10	1210	3.20±0.30	2.50±0.20	0.95±0.10	C	0.75±0.25	-	3K
				1.25±0.10	D		-	3K
				1.60±0.20	G		-	2K
				2.00±0.20	K		-	1K
				2.50±0.30	M		-	1K
08	1808	4.50±0.40 (4.5+0.5/-0.3)**	2.03±0.25	1.25±0.10	D	0.75±0.25 (0.50±0.20)***	-	2K
				2.00±0.20	K		-	1K
				1.25±0.10	D		-	1K
12	1812	4.50±0.40 (4.5+0.5/-0.3)**	3.20±0.30	2.00±0.20	K	0.75±0.25 (0.50±0.20)***	-	1K
				2.50±0.30	M		-	1K
				3.20±0.40	M		-	0.5K

\*\* For 1808/1812: 200~3KV, \*\*\*For 1206:1KV~3KV; 1808/1812: 200~3KV

Low Inductance Capacitors for MCLI Type

Unit: mm

Type	Size (Inch)	L	W	T / Symbol		Ta min.	Tb min.	Packaging (7" Reel)	
								Paper tape	Plastic tape
MCLI43	0612	3.20±0.15	1.60±0.15	0.80±0.10	B	0.5	0.13	4K	-

## Part Numbering

MC	03	J	T	N	250	3R9
Product Type	Dimensions (L×W)	Capacitance Tolerance	Packaging	Dielectric	Voltage (VDCW)	Capacitance
MC : General; Ultra-small Middle and High Voltage MCHL: High Q and Low ESR MCRF: Ultra High Q and Low ESR (RF) MCLI: Low Inductance	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 08: 1808 12: 1812 43: 0612	B: ±0.1pF (Cap≤5pF) C: ±0.25pF (Cap≤5pF) D: ±0.5pF (5pF<Cap<10pF) F: ±1% G: ±2% J: ±5% K: ±10% M: ±20% Z: +80/-20%	T: Taping Reel	N: NPO (COG) B: X7R F: Y5V X: X5R	6V3: 6.3V 250: 25V 500: 50V 101: 100V 102: 1000V 202: 2000V 302: 3000V	3R9: 3.9pF 150: 15pF 181: 180pF 225: 2.2μF 476: 47μF 107: 100μF

## Ultra-small 0201 Capacitors

### Capacitance & Voltage

EIA	Size	0201		
		Dielectric		
Dielectric		NPO		
Code	VDCW	16V	25V	50V
0R3	0.3pF		L^	L^
0R4	0.4		L^	L^
0R5	0.5		L^	L^
1R0	1.0		L^	L^
1R2	1.2		L^	L^
1R5	1.5		L^	L^
1R8	1.8		L^	L^
2R2	2.2		L^	L^
2R7	2.7		L^	L^
3R3	3.3		L^	L^
3R9	3.9		L^	L^
4R0	4.0		L^	L^
4R7	4.7		L^	L^
5R6	5.6		L^	L^
6R8	6.8		L^	L^
8R2	8.2		L^	L^
100	10		L^	L^
120	12		L^	L^
150	15		L^	L^
180	18		L^	L^
220	22		L^	L^
270	27		L^	L^
330	33		L^	L^
390	39		L^	L^
470	47		L^	L^
560	56	L^	L^	
680	68	L^	L^	
820	82	L^	L^	
101	100	L^	L^	

EIA	Size	0201												
		Dielectric					X7R					X5R		
Dielectric		X7R					X5R							
Code	VDCW	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V			
101	100pF			L	L	L			L	L	L			
121	120			L	L	L			L	L	L			
151	150			L	L	L			L	L	L			
181	180			L	L	L			L	L	L			
221	220			L	L	L			L	L	L			
271	270			L	L	L			L	L	L			
331	330			L	L	L			L	L	L			
391	390			L	L	L			L	L	L			
471	470			L	L	L			L	L	L			
561	560			L	L	L			L	L	L			
681	680			L	L	L			L	L	L			
821	820			L	L	L			L	L	L			
102	1000	L	L	L	L	L			L	L	L			
152	1500	L	L	L				L	L					
222	2200	L	L	L				L	L					
272	2700	L	L	L				L	L					
332	3300	L	L	L				L	L					
472	4700	L	L	L				L	L					
682	6800	L	L					L						
103	0.010μF	L	L	L				L	L					
153	0.015							L	L					
223	0.022							L	L					
333	0.033							L	L					
473	0.047							L	L					
683	0.068							L	L					
104	0.100							L	L					
224	0.220							L						
474	0.470							L						

■ The letter in cell is expressed the symbol of product thickness

■ The "A" mark is expressed product with Ag/Ni/Sn terminations

Electrical Data

Size	0201		
Dielectric	NPO	X7R	X5R
Capacitance*	0.3pF~100pF	100pF~10nF	100pF~0.47μF
Capacitance tolerance	Cap ≤ 5pF: C (±0.25pF) 5pF < Cap < 10pF: D (±0.50pF) Cap ≥ 10pF: J (±5%)	J (±5%) K (±10%)	K (±10%) M (±20%)
Rated voltage (VDCW)	16V, 25V, 50V	6.3V, 10V, 16V, 25V, 50V	6.3V, 10V, 16V, 25V, 50V
Tan δ/Q*	Cap < 30pF: Q ≥ 400 +20C Cap ≥ 30pF: Q ≥ 1000	Ur=50V: ≤ 3.0% Ur=16V, 25V: ≤ 3.5% Ur=10V: ≤ 5.0% Ur=6.3V: ≤ 10%	Ur=50V: ≤ 3.0% Ur=16V, 25V: ≤ 3.5% Ur=10V: ≤ 5.0% Ur=6.3V: ≤ 10%
Insulation resistance at Ur	≥ 10GΩ	≥ 10GΩ or R×C ≥ 500Ω×F Whichever is less	
Operating temperature	-55 to +125°C		-55 to +85°C
Capacitance change	±30 ppm	±15%	
Termination	Ni/Sn (lead-free termination)		

■ \*\*Measured at 30~70% related humidity

■ NPO: Apply 1.0±0.2Vrms, 1.0MHz±10% at the condition of 25°C ambient temperature

■ X7R, X5R: Apply 1.0±0.2Vrms, 1.0KHz±10% at the condition of 25°C ambient temperature

## Environmental Characteristics

Item	Requirement	Test Method																																				
External Appearance	No defects which may affect performance	Visual inspection & Dimension measurement																																				
Capacitance(Cap.)	Within the specified tolerance that refers on page2	NPO: (Class I) Cap $\leq$ 1000pF 1.0 $\pm$ 0.2Vrms, 1MHz $\pm$ 10% Cap $>$ 1000pF 1.0 $\pm$ 0.2Vrms, 1KHz $\pm$ 10%																																				
Dissipation Factor (D.F.) or Quality factor (Q=1/D.F.)	NPO: Cap $\geq$ 30pF, Q $\geq$ 1000; Cap $<$ 30pF, Q $\geq$ 400+20C X7R, X5R:	X7R, X5R, Y5V: (Class II) Cap $\leq$ 10uF 1.0 $\pm$ 0.2Vrms, 1KHz $\pm$ 10% Cap $>$ 10uF 0.5 $\pm$ 0.2Vrms, 120Hz $\pm$ 10%																																				
	<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.<math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq</math> 50V</td> <td rowspan="3">2.5%</td> <td>3%</td> <td>0201(50V); 0603 <math>\geq</math>0.047<math>\mu</math>F 0805 <math>\geq</math>0.18<math>\mu</math>F; 1206 <math>\geq</math>0.47<math>\mu</math>F</td> </tr> <tr> <td>5%</td> <td>1210 <math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>7%</td> <td>0603 <math>\geq</math>1<math>\mu</math>F; 0805 <math>\geq</math>1<math>\mu</math>F 1206 <math>\geq</math>2.2<math>\mu</math>F; 1210 <math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">3.5%</td> <td>5%</td> <td>0201 <math>\geq</math>0.01<math>\mu</math>F; 0805 <math>\geq</math>1<math>\mu</math>F 1210 <math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td>7%</td> <td>0603 <math>\geq</math>0.33<math>\mu</math>F; 1206 <math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>10%</td> <td>0402 <math>\geq</math>0.10<math>\mu</math>F; 0603 <math>\geq</math>0.47<math>\mu</math>F 0805 <math>\geq</math>2.2<math>\mu</math>F; 1206 <math>\geq</math>6.8<math>\mu</math>F 1210 <math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">3.5%</td> <td>5%</td> <td>0201 <math>\geq</math>0.01<math>\mu</math>F; 0402 <math>\geq</math>0.033<math>\mu</math>F 0603 <math>\geq</math>0.15<math>\mu</math>F; 0805 <math>\geq</math>0.68<math>\mu</math>F 1206 <math>\geq</math>2.2<math>\mu</math>F; 1210 <math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>10%</td> <td>0402 <math>\geq</math>0.22<math>\mu</math>F; 0603 <math>\geq</math>0.68<math>\mu</math>F 0805 <math>\geq</math>2.2<math>\mu</math>F; 1206 <math>\geq</math>4.7<math>\mu</math>F 1210 <math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0201 <math>\geq</math>0.012<math>\mu</math>F; 0402 <math>\geq</math>0.33<math>\mu</math>F 0603 <math>\geq</math>0.33<math>\mu</math>F; 0805 <math>\geq</math>2.2<math>\mu</math>F 1206 <math>\geq</math>2.2<math>\mu</math>F; 1210 <math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td>15%</td> <td>0201 <math>\geq</math>0.1<math>\mu</math>F; 0402 <math>\geq</math>1<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">10%</td> <td>15%</td> <td>0201 <math>\geq</math>0.01<math>\mu</math>F; 0402 <math>\geq</math>1<math>\mu</math>F 0603 <math>\geq</math>10<math>\mu</math>F; 0805 <math>\geq</math>4.7<math>\mu</math>F 1206 <math>\geq</math>47<math>\mu</math>F; 1210 <math>\geq</math>100<math>\mu</math>F</td> </tr> <tr> <td>20%</td> <td>0402 <math>\geq</math>2.2<math>\mu</math>F</td> </tr> </tbody> </table>		Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq$ 50V	2.5%	3%	0201(50V); 0603 $\geq$ 0.047 $\mu$ F 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F	5%	1210 $\geq$ 4.7 $\mu$ F	7%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F	25V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1210 $\geq$ 10 $\mu$ F	7%	0603 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F	10%	0402 $\geq$ 0.10 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 6.8 $\mu$ F 1210 $\geq$ 22 $\mu$ F	16V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 0.033 $\mu$ F 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F	10%	0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F 1210 $\geq$ 22 $\mu$ F	10V	5%	10%	0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.33 $\mu$ F 0603 $\geq$ 0.33 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	15%	0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F	6.3V	10%	15%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 1 $\mu$ F 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 4.7 $\mu$ F 1206 $\geq$ 47 $\mu$ F; 1210 $\geq$ 100 $\mu$ F
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																				
$\geq$ 50V	2.5%	3%	0201(50V); 0603 $\geq$ 0.047 $\mu$ F 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F																																			
		5%	1210 $\geq$ 4.7 $\mu$ F																																			
		7%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F																																			
25V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1210 $\geq$ 10 $\mu$ F																																			
		7%	0603 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F																																			
		10%	0402 $\geq$ 0.10 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 6.8 $\mu$ F 1210 $\geq$ 22 $\mu$ F																																			
16V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 0.033 $\mu$ F 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F																																			
		10%	0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F 1210 $\geq$ 22 $\mu$ F																																			
10V	5%	10%	0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.33 $\mu$ F 0603 $\geq$ 0.33 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F																																			
		15%	0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F																																			
6.3V	10%	15%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 1 $\mu$ F 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 4.7 $\mu$ F 1206 $\geq$ 47 $\mu$ F; 1210 $\geq$ 100 $\mu$ F																																			
		20%	0402 $\geq$ 2.2 $\mu$ F																																			
	Y5V:																																					
	<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.<math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq</math> 50V</td> <td>5%</td> <td>7%</td> <td>0603 <math>\geq</math>0.1<math>\mu</math>F; 0805 <math>\geq</math>0.47<math>\mu</math>F 1206 <math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>35V</td> <td>7%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">5%</td> <td>7%</td> <td>0402 <math>\geq</math>0.047<math>\mu</math>F; 0603 <math>\geq</math>0.1<math>\mu</math>F 0805 <math>\geq</math>0.33<math>\mu</math>F; 1206 <math>\geq</math>1<math>\mu</math>F 1210 <math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>9%</td> <td>0402 <math>\geq</math>0.068<math>\mu</math>F; 0603 <math>\geq</math>0.47<math>\mu</math>F 1206 <math>\geq</math>4.7<math>\mu</math>F; 1210 <math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0<math>\mu</math>F)</td> <td rowspan="2">7%</td> <td>9%</td> <td>0402 <math>\geq</math>0.068<math>\mu</math>F; 0603 <math>\geq</math>0.68<math>\mu</math>F</td> </tr> <tr> <td>12.5%</td> <td>0402 <math>\geq</math>0.22<math>\mu</math>F</td> </tr> <tr> <td>16V (C <math>\geq</math> 1.0<math>\mu</math>F)</td> <td>9%</td> <td>12.5%</td> <td>0603 <math>\geq</math>2.2<math>\mu</math>F; 0805 <math>\geq</math>3.3<math>\mu</math>F 1206 <math>\geq</math>10<math>\mu</math>F; 1210 <math>\geq</math>22<math>\mu</math>F 1812 <math>\geq</math>47<math>\mu</math>F</td> </tr> <tr> <td>10V</td> <td>12.5%</td> <td>20%</td> <td>0402 <math>\geq</math>0.47<math>\mu</math>F</td> </tr> <tr> <td>6.3V</td> <td>20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq$ 50V	5%	7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F	35V	7%	—	—	25V	5%	7%	0402 $\geq$ 0.047 $\mu$ F; 0603 $\geq$ 0.1 $\mu$ F 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F 1210 $\geq$ 4.7 $\mu$ F	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	16V (C < 1.0 $\mu$ F)	7%	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F	12.5%	0402 $\geq$ 0.22 $\mu$ F	16V (C $\geq$ 1.0 $\mu$ F)	9%	12.5%	0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 3.3 $\mu$ F 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F 1812 $\geq$ 47 $\mu$ F	10V	12.5%	20%	0402 $\geq$ 0.47 $\mu$ F	6.3V	20%	-	-	
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																				
$\geq$ 50V	5%	7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F																																			
35V	7%	—	—																																			
25V	5%	7%	0402 $\geq$ 0.047 $\mu$ F; 0603 $\geq$ 0.1 $\mu$ F 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F 1210 $\geq$ 4.7 $\mu$ F																																			
		9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F																																			
16V (C < 1.0 $\mu$ F)	7%	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F																																			
		12.5%	0402 $\geq$ 0.22 $\mu$ F																																			
16V (C $\geq$ 1.0 $\mu$ F)	9%	12.5%	0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 3.3 $\mu$ F 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F 1812 $\geq$ 47 $\mu$ F																																			
10V	12.5%	20%	0402 $\geq$ 0.47 $\mu$ F																																			
6.3V	20%	-	-																																			
Dielectric Strength	No evidence of damage or flash over during test	To apply voltage( $\leq$ 100V) 250% Duration: 1 to 5sec Charge and discharge current less than 50mA  To apply voltage: 200V~300V $\geq$ 2 time VDC 500V~999V $\geq$ 1.5 time VDC 1000V~3000V $\geq$ 1.2 time VDC Cut-off, set at 10mA TEST=15 sec. RAMP=0																																				

Item	Requirement	Test Method																				
Insulation Resistance	10GΩ or R×C≥ 500Ω-F Whichever is smaller X7R, X5R, Y5V:	To apply rated voltage for max. 120sec																				
	<table border="1"> <tr> <th>Rated Voltage</th> <th>Insulation Resistance</th> </tr> <tr> <td>100V: X7R</td> <td rowspan="5">RxC ≥ 100Ω-F</td> </tr> <tr> <td>50V: 0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF</td> </tr> <tr> <td>25V: 0402≥1uF;0603≥2.2uF;0805≥2.2uF 1206≥10uF;1210≥10uF</td> </tr> <tr> <td>16V: 0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF</td> </tr> <tr> <td>10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF</td> </tr> <tr> <td>6.3V</td> <td></td> </tr> </table>		Rated Voltage	Insulation Resistance	100V: X7R	RxC ≥ 100Ω-F	50V: 0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF	25V: 0402≥1uF;0603≥2.2uF;0805≥2.2uF 1206≥10uF;1210≥10uF	16V: 0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF	10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF	6.3V											
	Rated Voltage		Insulation Resistance																			
100V: X7R	RxC ≥ 100Ω-F																					
50V: 0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF																						
25V: 0402≥1uF;0603≥2.2uF;0805≥2.2uF 1206≥10uF;1210≥10uF																						
16V: 0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF																						
10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF																						
6.3V																						
≥ 10GΩ or 100Ω -F whichever is smaller Rated voltage: 200V~630V	To apply rated voltage(500V max.) for 60sec.																					
≥ 10GΩ Rated voltage: >630V	To apply 500V for 60sec.																					
Temperature Characteristic of Capacitance	<table border="1"> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> <tr> <td>NPO</td> <td>±30 (ppm/°C)</td> </tr> <tr> <td>X7R</td> <td>±15%</td> </tr> <tr> <td>X5R</td> <td>±15%</td> </tr> <tr> <td>Y5V</td> <td>+30% ~ -80%</td> </tr> </table>	T.C.	Capacitance Change	NPO	±30 (ppm/°C)	X7R	±15%	X5R	±15%	Y5V	+30% ~ -80%	<p>With no electrical load.</p> <table border="1"> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> <tr> <td>NPO</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X7R</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X5R</td> <td>-55 ~ 85°C at 25°C</td> </tr> <tr> <td>Y5V</td> <td>-25 ~ 85°C at 20°C</td> </tr> </table>	T.C.	Operating Temp	NPO	-55 ~ 125°C at 25°C	X7R	-55 ~ 125°C at 25°C	X5R	-55 ~ 85°C at 25°C	Y5V	-25 ~ 85°C at 20°C
	T.C.	Capacitance Change																				
NPO	±30 (ppm/°C)																					
X7R	±15%																					
X5R	±15%																					
Y5V	+30% ~ -80%																					
T.C.	Operating Temp																					
NPO	-55 ~ 125°C at 25°C																					
X7R	-55 ~ 125°C at 25°C																					
X5R	-55 ~ 85°C at 25°C																					
Y5V	-25 ~ 85°C at 20°C																					
Adhesive Strength of Termination	No remarkable damage or removal of the terminations	Pressurizing force: 0201:2N 0402&0603:5N>0603:10N Test time: 10±1 sec																				
Vibration Resistance	No remarkable damage Cap change and Q/D.F.: To meet initial spec	Vibration frequency: 10~55Hz/min Total amplitude: 1.5mm Test time: 6hrs.(two hrs each in three mutually Perpendicular directions.)																				
Solderability	95% min. coverage of all metalized area.	Solder temperature: 235±5°C Dipping time: 2±0.5 sec.																				
Bending Test	No remarkable damage Cap change: NPO: within±5% or 0.5pF whichever is larger X7R, X5R: within±12.5% Y5V: within±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5±1sec. Measurement to be made after keeping at room temp. for 24±2hrs(Class I) or 48±4hrs(Class II) (Thickness>1.0mm, Thickness≤1.0mm)																				
Resistance to Soldering Heat	No remarkable damage Cap change: NPO: within±2.5% or 0.25pF whichever is larger X7R, X5R: Within±7.5% Y5V: within±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25%max. leaching on each edge.	Solder temperature: 260±5°C Dipping time: 10±1sec Preheating: 120 to 150°C for 1minute before immerse the capacitor in a eutectic solder. Before initial measurement(Class II only): Perform 150+0/-10°C for 1hr and then set for 24±4hrs at room temp. Measurement to be made after keep at room temp. for 24±2 hrs.																				
Temperature Cycle	No remarkable damage. Cap change: NPO: within±2.5% or 0.25pF whichever is larger X7R, X5R: within±7.5% Y5V: within±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements.	Conduct the five cycles according to the temperature and time. <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(Cass II only): Perform 150+0/-10°C for 1hr and then set for 48±4 hrs at room temp. Measurement to be made after keeping at room temp. for 24±2 hrs.(Class I) or 48±4 hrs.(Class II).</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					
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																				

Item	Requirement	Test Method																																																																																
Humidity (steady state)	<p>No remarkable damage. Cap change: NPO: within±5% or 0.5pF whichever is large X7R, X5R: ≥ 10V, within±12.5%; 6.3V, within±25% Y5V: ≥ 10V, within±30%; 6.3V, within±30/-40% Q/D.F. value: NPO: More than 30pF Q ≥ 350, 10pF ≤ C ≤ 30pF, Q ≥ 275+2.5C Less than 10pF Q ≥ 200+10C X7R, X5R:</p> <table border="1" data-bbox="293 443 927 1167"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF;1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="293 1205 927 1686"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <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>15%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C&lt;1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ .0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥ 10V 1GΩ or 50Ω-F whichever is smaller. Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="293 1756 927 2054"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="5">Rx C ≥ 10Ω-F</td> </tr> <tr> <td>50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF</td> </tr> <tr> <td>25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF	15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF	20%	0201 ≥ 0.1μF;0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF	16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ .0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	Rx C ≥ 10Ω-F	50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF	25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF	16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF	10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF	<p>Test temp: 40±2℃ Humidity: 90~95% RH Test time: 500+24/-0hrs Measurement to be made after keeping at room temp. for 24±2hrs.</p>
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																
≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF																																																																															
		10%	1210 ≥ 4.7μF																																																																															
		20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF																																																																															
25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF																																																																															
		14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF																																																																															
		15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF																																																																															
16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF																																																																															
		15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																															
10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF																																																																															
		20%	0201 ≥ 0.1μF;0402 ≥ 1μF																																																																															
6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF																																																																															
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF																																																																															
35V	10%	—	—																																																																															
25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF																																																																															
		15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																															
16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF																																																																															
		20%	0402 ≥ 0.22μF																																																																															
16V (C ≥ .0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF																																																																															
10V	20%	30%	0402 ≥ 0.47μF																																																																															
6.3V	30%	-	-																																																																															
Rated voltage	Insulation Resistance																																																																																	
100V:X7R	Rx C ≥ 10Ω-F																																																																																	
50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF																																																																																		
25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF																																																																																		
16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF																																																																																		
10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF																																																																																		

Item	Requirement	Test Method																																																																																	
Humidity load	<p>No remarkable damage.            Cap change:            NPO:±7.5% or 0.75pF whichever is larger            X7R, X5R: ≥ 10V, within±12.5%; 6.3V, 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:            NPO: C ≥ 30pF, Q ≥ 200; C &lt; 30pF, Q ≥ 100+10/3C            X7R, X5R:</p> <table border="1" data-bbox="293 400 943 1167"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF; 0805 ≥ 1μF 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <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>15%</td> <td>0201 ≥ 0.01μF; 0402 ≥ 0.033μF 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.33μF 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="293 1189 943 1682"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥ 10V 500MΩ or 25Ω-F (Whichever is smaller)            Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="293 1733 943 2063"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="6">RxC ≥ 5Ω-F</td> </tr> <tr> <td>50V:0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF</td> </tr> <tr> <td>25V:0402 ≥ 1uF; 0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF; 1210 ≥ 10uF</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF; 0805 ≥ 1μF 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF	20%	0201 ≥ 0.1μF; 0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	RxC ≥ 5Ω-F	50V:0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF	25V:0402 ≥ 1uF; 0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF; 1210 ≥ 10uF	16V:0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF	10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF	6.3V	<p>Test temp: 40±2°C            Humidity: 90~95%RH            Test time: 500+24/-0 hrs            To apply voltage: Rated voltage(Max. 500V)            Measurement to be made after keeping at room temp for 24±2hrs.(Class I) or 48±4hrs.(Class II)</p>
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																	
≥ 50V	3.0%	6%	0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																																
		10%	1210 ≥ 4.7μF																																																																																
		20%	0603 ≥ 1μF; 0805 ≥ 1μF 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																																
25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF																																																																																
		14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																																																
		15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF 1210 ≥ 22μF																																																																																
16V	5%	10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																																
		15%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																
10V	7.5%	15%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																																																
		20%	0201 ≥ 0.1μF; 0402 ≥ 1μF																																																																																
6.3V	15%	30%	0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF																																																																																
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																	
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF																																																																																
35V	10%	—	—																																																																																
25V	7.5%	10%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF																																																																																
		15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																
16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																																
		20%	0402 ≥ 0.22μF																																																																																
16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF																																																																																
10V	20%	30%	0402 ≥ 0.47μF																																																																																
6.3V	30%	-	-																																																																																
Rated voltage	Insulation Resistance																																																																																		
100V:X7R	RxC ≥ 5Ω-F																																																																																		
50V:0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF																																																																																			
25V:0402 ≥ 1uF; 0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF; 1210 ≥ 10uF																																																																																			
16V:0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF																																																																																			
10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF																																																																																			
6.3V																																																																																			



Item	Requirement	Test Method																																																																																																																																						
High Temperature Load (Endurance)	<p>No remarkable damage. Cap change: NPO: <math>\pm 3\%</math> or <math>\pm 0.3F</math> whichever is larger X7R, X5R: <math>\geq 10V</math>, within <math>\pm 12.5\%</math>; 6.3V, within <math>+30/-40\%</math> 10V: 0603 <math>\geq 4.7\mu F</math>; 0402 <math>\geq 1\mu F</math>; 0201 <math>\geq 0.1\mu F</math>, within <math>\pm 25\%</math> Q/D.F. value: NPO: More than 30pF, <math>Q \geq 350</math> 10pF <math>\leq C &lt; 30pF</math>, <math>Q \geq 275+2.5C</math> Less than 10pF, <math>Q \geq 200+10C</math> X7R, X5R:</p> <table border="1" data-bbox="308 443 935 1160"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq 50V</math></td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V); 0603 <math>\geq 0.047\mu F</math> 0805 <math>\geq 0.18\mu F</math>; 1206 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>10%</td> <td>1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>20%</td> <td>0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0805 <math>\geq 1\mu F</math> 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>14%</td> <td>0603 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.10\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 6.8\mu F</math> 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 <math>\geq 0.15\mu F</math>; 0805 <math>\geq 0.68\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0402 <math>\geq 0.033\mu F</math> 0603 <math>\geq 0.68\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 <math>\geq 0.012\mu F</math>; 0402 <math>\geq 0.33\mu F</math> 0603 <math>\geq 0.33\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td>20%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math> 0603 <math>\geq 10\mu F</math>; 0805 <math>\geq 4.7\mu F</math> 1210 <math>\geq 100\mu F</math></td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="308 1189 935 1697"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq 50V</math></td> <td>7.5%</td> <td>10%</td> <td>0603 <math>\geq 0.1\mu F</math>; 0805 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>35V</td> <td>10%</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 <math>\geq 0.047\mu F</math>; 0603 <math>\geq 0.1\mu F</math> 0805 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 1\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0<math>\mu F</math>)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.68\mu F</math></td> </tr> <tr> <td>20%</td> <td>0402 <math>\geq 0.22\mu F</math></td> </tr> <tr> <td rowspan="2">16V (C <math>\geq 1.0\mu F</math>)</td> <td rowspan="2">12.5%</td> <td>20%</td> <td>0603 <math>\geq 2.2\mu F</math>; 0805 <math>\geq 3.3\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 22\mu F</math> 1812 <math>\geq 47\mu F</math></td> </tr> <tr> <td>-</td> <td>-</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: <math>\geq 10V</math> 1G<math>\Omega</math> or 50<math>\Omega</math>-F whichever is smaller Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="308 1760 935 2058"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="5">RxC <math>\geq</math> 10<math>\Omega</math>-F</td> </tr> <tr> <td>50V: 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math>; 1206 <math>\geq 2.2\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>25V: 0402 <math>\geq 1\mu F</math>; 0603 <math>\geq 2.2\mu F</math>; 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>16V: 0402 <math>\geq 0.22\mu F</math>; 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> <tr> <td>10V: 0201 <math>\geq 47nF</math>; 0402 <math>\geq 0.47\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$	10%	1210 $\geq 4.7\mu F$	20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$	25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$	14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$	15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$	16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$	15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$	20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$	6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$	35V	10%	-	-	25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$	15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	16V (C < 1.0 $\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$	20%	0402 $\geq 0.22\mu F$	16V (C $\geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$	-	-	10V	20%	30%	0402 $\geq 0.47\mu F$	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V: X7R	RxC $\geq$ 10 $\Omega$ -F	50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$	25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$	16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$	10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$	<p>Test temp: NPO, X7R: 125<math>\pm 3^\circ C</math> X5R, Y5V: 85<math>\pm 3^\circ C</math> Test Time: 1000+25/-0 hrs To apply voltage: (1.1) 100% of rated voltage for below range.</p> <table border="1" data-bbox="967 353 1469 618"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td><math>C \geq 0.1\mu F</math></td> </tr> <tr> <td>0402</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td><math>C \geq 1.0\mu F</math></td> </tr> <tr> <td>0603</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td><math>C \geq 4.7\mu F</math></td> </tr> <tr> <td>0805</td> <td>X5R, X7R</td> <td>6.3V</td> <td><math>C \geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R, X7R</td> <td>6.3V</td> <td><math>C \geq 47\mu F</math></td> </tr> <tr> <td>NPO</td> <td>3000V</td> <td><math>C \geq 1.5pF</math></td> </tr> </tbody> </table> <p>(1.2) 6.3V or <math>C \geq 10\mu F</math>: 150% of rated voltage (2) <math>10V \leq U_r &lt; 500V</math>: 200% of rated voltage. 150% of rated voltage for below range.</p> <table border="1" data-bbox="967 712 1469 999"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0402</td> <td>X5R, X7R</td> <td>10V, 16V, 25V</td> <td><math>C \geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td><math>C \geq 0.47\mu F</math></td> </tr> <tr> <td rowspan="2">0603</td> <td>X5R, X7R</td> <td>10V, 16V</td> <td><math>C \geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td><math>C \geq 2.2\mu F</math></td> </tr> <tr> <td rowspan="2">0805</td> <td>X5R, X7R</td> <td>10V</td> <td><math>C \geq 4.7\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td><math>C \geq 4.7\mu F</math></td> </tr> </tbody> </table> <p>(3) 500V: 150% of rated voltage (4) <math>U_r \geq 630V</math>: 120% of rated voltage</p> <p>Test time: 1000+24/-0hrs Measurement to be made after keeping at room temp. for 24<math>\pm</math>2hrs.</p>	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R, X7R	6.3V, 10V	$C \geq 0.1\mu F$	0402	X5R, X7R	6.3V, 10V	$C \geq 1.0\mu F$	0603	X5R, X7R	6.3V, 10V	$C \geq 4.7\mu F$	0805	X5R, X7R	6.3V	$C \geq 22\mu F$	1206	X5R, X7R	6.3V	$C \geq 47\mu F$	NPO	3000V	$C \geq 1.5pF$	Size	Dielectric	Rated voltage	Capacitance range	0402	X5R, X7R	10V, 16V, 25V	$C \geq 1.0\mu F$	Y5V	16V	$C \geq 0.47\mu F$	0603	X5R, X7R	10V, 16V	$C \geq 1.0\mu F$	Y5V	16V	$C \geq 2.2\mu F$	0805	X5R, X7R	10V	$C \geq 4.7\mu F$	Y5V	16V	$C \geq 4.7\mu F$
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																																																																																						
$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$																																																																																																																																					
		10%	1210 $\geq 4.7\mu F$																																																																																																																																					
		20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$																																																																																																																																					
25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$																																																																																																																																					
		14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$																																																																																																																																					
		15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$																																																																																																																																					
16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$																																																																																																																																					
		15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																					
10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																					
		20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$																																																																																																																																					
6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$																																																																																																																																					
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																																																																																						
$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$																																																																																																																																					
35V	10%	-	-																																																																																																																																					
25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$																																																																																																																																					
		15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																					
16V (C < 1.0 $\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$																																																																																																																																					
		20%	0402 $\geq 0.22\mu F$																																																																																																																																					
16V (C $\geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$																																																																																																																																					
		-	-																																																																																																																																					
10V	20%	30%	0402 $\geq 0.47\mu F$																																																																																																																																					
6.3V	30%	-	-																																																																																																																																					
Rated voltage	Insulation Resistance																																																																																																																																							
100V: X7R	RxC $\geq$ 10 $\Omega$ -F																																																																																																																																							
50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$																																																																																																																																								
25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$																																																																																																																																								
16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$																																																																																																																																								
10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$																																																																																																																																								
Size	Dielectric	Rated voltage	Capacitance range																																																																																																																																					
0201	X5R, X7R	6.3V, 10V	$C \geq 0.1\mu F$																																																																																																																																					
0402	X5R, X7R	6.3V, 10V	$C \geq 1.0\mu F$																																																																																																																																					
0603	X5R, X7R	6.3V, 10V	$C \geq 4.7\mu F$																																																																																																																																					
0805	X5R, X7R	6.3V	$C \geq 22\mu F$																																																																																																																																					
1206	X5R, X7R	6.3V	$C \geq 47\mu F$																																																																																																																																					
	NPO	3000V	$C \geq 1.5pF$																																																																																																																																					
Size	Dielectric	Rated voltage	Capacitance range																																																																																																																																					
0402	X5R, X7R	10V, 16V, 25V	$C \geq 1.0\mu F$																																																																																																																																					
	Y5V	16V	$C \geq 0.47\mu F$																																																																																																																																					
0603	X5R, X7R	10V, 16V	$C \geq 1.0\mu F$																																																																																																																																					
	Y5V	16V	$C \geq 2.2\mu F$																																																																																																																																					
0805	X5R, X7R	10V	$C \geq 4.7\mu F$																																																																																																																																					
	Y5V	16V	$C \geq 4.7\mu F$																																																																																																																																					

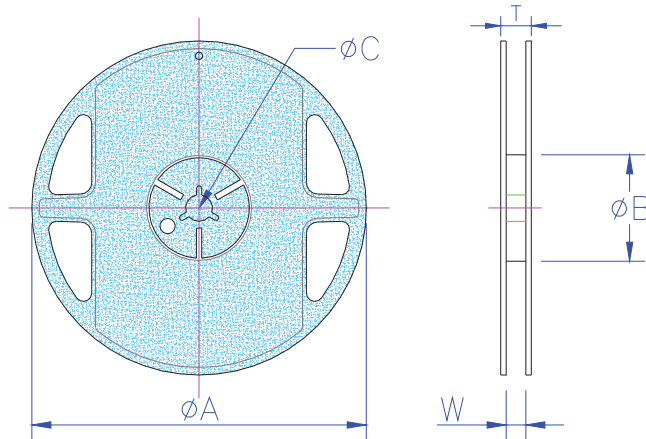
# ■ Packaging

## Packaging Quantity

Unit: mm

Type	Thickness / Symbol		Packaging (7" Reel)	
			Paper tape	Plastic tape
0201	0.30±0.03	L	15K	-
0402	0.50±0.05	N	10K	-
0603	0.80±0.10	S	4K	-
	0.80 +0.15 / -0.10	X	4K	-
0805	0.60±0.10	A	4K	-
	0.80±0.10	B	4K	-
	0.85±0.10	T	4K	-
	1.25±0.10	D	-	3K
	1.25±0.20	I	-	3K
1206	0.80±0.10	B	4K	-
	0.95±0.10	C	-	3K
	1.15±0.15	J	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	1.60 +0.30 / -0.10	P	-	2K
1210	0.95±0.10	C	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	1K
1808	1.25±0.10	D	-	2K
	2.00±0.20	K	-	1K
1812	1.25±0.10	D	-	1K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	0.5K
0612	0.80±0.10	B	4K	-

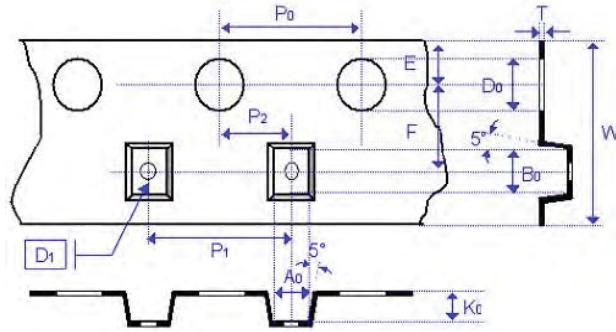
## Tape and Reel



Unit: mm

Type	Chip Size							
	0201	0402	0603	0805	1206/0612	1210	1808	1812
$\phi C$	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0
W	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	13.5±1.0	13.5±1.0
$\phi A$	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")
$\phi B$	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	80.0±1.0(7")	80.0±1.0(7")

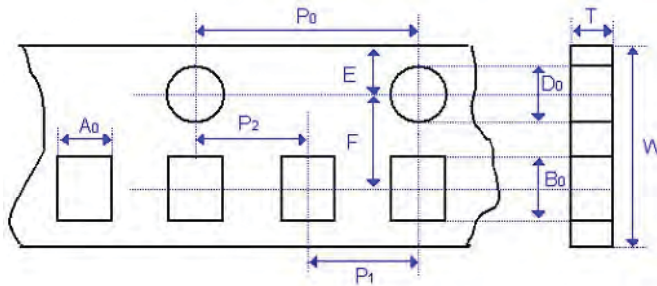
Plastic Tape Size Specification



Unit: mm

Type	0805		1206			1210					1808		1812				
Thickness	D	I	C	J	D	G	P	C	D	G	K	M	D	K	D	K	M
A <sub>0</sub>	<1.57		<1.85			<1.95			<2.97		<2.97		<2.35		<3.81		
B <sub>0</sub>	<2.40		<3.46			<3.67			<3.73		<3.73		<4.98	<5.00	<5.30		
T	0.23±0.05		0.23±0.05			0.23±0.05			0.23±0.05		0.23±0.05		0.25±0.05		0.25±0.05		
K <sub>0</sub>	<2.50		<2.50			<2.50			<2.50		<3.00		<2.50		<2.50	<3.00	
W	8.00±0.10		8.00±0.10			8.00±0.10			8.00±0.10		8.00±0.10		12.0±0.20		12.0±0.20		
P <sub>0</sub>	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		
P <sub>1</sub>	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 <sub>2</sub>	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		
D <sub>0</sub>	1.50±0.05		1.50±0.05			1.50±0.05			1.50±0.05		1.50±0.05		1.50±0.05		1.50±0.05		
D <sub>1</sub>	1.00±0.10		1.00±0.10			1.00±0.10			1.00±0.10		1.00±0.10		1.00±0.10		1.00±0.10		
E	1.75±0.10		1.75±0.10			1.75±0.10			1.75±0.10		1.75±0.10		1.75±0.10		1.75±0.10		
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		5.50±0.05		

Paper Tape Size Specification



Unit: mm

Type	0201	0402	0603		0805		1206/0612
Thickness	L	N	S	X	A	B	B
A <sub>0</sub>	0.45±0.05	0.62±0.05	1.02±0.05		1.50±0.10	1.50±0.10	2.00±0.10
B <sub>0</sub>	0.75±0.05	1.12±0.05	1.82±0.05		2.30±0.10	2.30±0.10	3.50±0.10
T	0.60±0.05	0.60±0.05	0.95±0.05		0.75±0.05	0.95±0.05	0.95±0.05
W	8.00±0.10	8.00±0.10	8.00±0.10		8.00±0.10	8.00±0.10	8.00±0.10
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>1</sub>	2.00±0.05	2.00±0.05	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05		2.00±0.05	2.00±0.05	2.00±0.05
D <sub>0</sub>	1.55±0.05	1.55±0.05	1.55±0.05		1.55±0.05	1.55±0.05	1.50±0.05
E	1.75±0.05	1.75±0.05	1.75±0.05		1.75±0.05	1.75±0.05	1.75±0.10
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

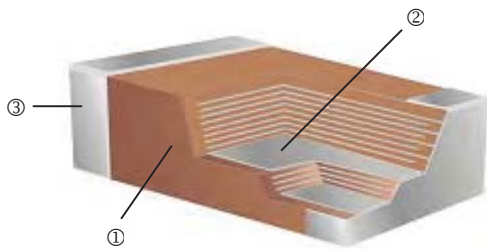
# Multilayer Ceramic Chip Capacitor



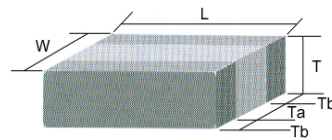
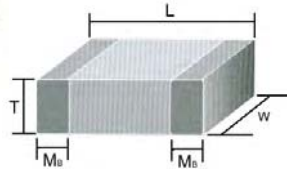
## Features

- Wide capacitance range, extremely compact size
- Low inductance of capacitor for high frequency application
- Excellent solderability and resistance to soldering heat, suitable for flow and reflow soldering
- Adaptable to high-speed surface mount assembly
- Conform to EIAJ-RC3402, and also compatible with EIA-RS198 and IEC PUB. 384-10

## Construction



①	Ceramic Material	③	Termination:
②	Inner Electrodes		NPO: Ag/Ni/Sn dielectric X7R, Y5V, X5R: Cu/Ni/Sn dielectric



Unit: mm

## Dimensions

MC / MCHL / MCRF Type

Type	Size (Inch)	L	W	T / Symbol		M <sub>B</sub>	Packaging (7" Reel)		
							Paper tape	Plastic tape	
01	0201	0.6±0.03	0.3±0.03	0.3±0.03	L	0.15±0.05	15K	-	
02	0402	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05 / -0.10	10K	-	
03	0603	1.60±0.10	0.80±0.10	0.80±0.10	S	0.40±0.15	4K	-	
		1.60 +0.15 / -0.10	0.80 +0.15 / -0.10	0.80 +0.15 / -0.10	X		4K		
05	0805	2.00±0.15	1.25±0.20	0.60±0.15	A	0.50±0.20	4K	-	
				0.80±0.10	B		4K	-	
				1.25±0.10	D		-	3K	
		0.85±0.10		T	4K		-		
		2.00±0.20		1.25±0.20	I		-	3K	
06	1206	3.20±0.15	1.60±0.15	0.80±0.10	B	0.60±0.20 (0.50±0.20)***	4K	-	
				0.95±0.10	C		-	3K	
				1.25±0.10	D		-	3K	
		3.20±0.20		1.60±0.20	1.60±0.20		G	-	3K
		3.20±0.3 / -0.1		1.60±0.3 / -0.1	1.60±0.3 / -0.1		P	-	2K
10	1210	3.20±0.30	2.50±0.20	0.95±0.10	C	0.75±0.25	-	3K	
				1.25±0.10	D		-	3K	
		3.20±0.40		2.50±0.30	1.60±0.20		G	-	2K
					2.00±0.20		K	-	1K
					2.50±0.30		M	-	1K
08	1808	4.50±0.40 (4.5+0.5/-0.3)**	2.03±0.25	1.25±0.10	D	0.75±0.25 (0.50±0.20)***	-	2K	
					2.00±0.20		K	-	1K
12	1812	4.50±0.40 (4.5+0.5/-0.3)**	3.20±0.30	1.25±0.10	D	0.75±0.25 (0.50±0.20)***	-	1K	
				2.00±0.20	K		-	1K	
		3.20±0.40		2.50±0.30	M		-	0.5K	

\*\* For 1808/1812: 200~3KV, \*\*\*For 1206:1KV~3KV; 1808/1812: 200~3KV

## Low Inductance Capacitors for MCLI Type

Unit: mm

Type	Size (Inch)	L	W	T / Symbol		T <sub>a</sub> min.	T <sub>b</sub> min.	Packaging (7" Reel)	
								Paper tape	Plastic tape
MCLI43	0612	3.20±0.15	1.60±0.15	0.80±0.10	B	0.5	0.13	4K	-

# Part Numbering

MC	03	J	T	N	250	3R9
Product Type	Dimensions (L×W)	Capacitance Tolerance	Packaging	Dielectric	Voltage (VDCW)	Capacitance
MC : General; Ultra-small Middle and High Voltage MCHL: High Q and Low ESR MCRF: Ultra High Q and Low ESR (RF) MCLI: Low Inductance	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 08: 1808 12: 1812 43: 0612	B: ±0.1pF (Cap≤5pF) C: ±0.25pF (Cap≤5pF) D: ±0.5pF (5pF<Cap<10pF) F: ±1% G: ±2% J: ±5% K: ±10% M: ±20% Z: +80/-20%	T: Taping Reel	N: NPO (COG) B: X7R F: Y5V X: X5R	6V3: 6.3V 250: 25V 500: 50V 101: 100V 102: 1000V 202: 2000V 302: 3000V	3R9: 3.9pF 150: 15pF 181: 180pF 225: 2.2μF 476: 47μF 107: 100μF

# Middle and High Voltage

Capacitance & Voltage (NPO 200V~3KV)

Dielectric		NPO																												
EIA	Size	0603				0805				1206				1210				1808			1812									
Code	VDCW	200	250	200	250	500	630	200	250	500	630	1000	2000	200	250	500	630	1000	2000	1000	2000	3000	200	250	500	630	1000	2000	3000	
0R5	0.5pF	S	S	A	A	A	A																							
1R0	1	S	S	A	A	A	A																							
1R2	1.2	S	S	A	A	A	A																							
1R5	1.5	S	S	A	A	A	A	B	B	B	B	B	B																	
1R8	1.8	S	S	A	A	A	A	B	B	B	B	B	B																	
2R2	2.2	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D								
2R7	2.7	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D								
3R3	3.3	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D								
3R9	3.9	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D								
4R7	4.7	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D								
5R6	5.6	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D								
6R8	6.8	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D								
8R2	8.2	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D								
100	10pF	S	S	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
120	12	S	S	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
150	15	S	S	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
180	18	S	S	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
220	22	S	S	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
270	27	S	S	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
330	33	S	S	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
390	39	S	S	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
470	47	S	S	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
560	56	S	S	A	A	A	A	B	B	B	B	B	B	C	D	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
680	68	S	S	A	A	A	A	B	B	B	B	B	B	C	D	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
820	82	S	S	A	A	B	B	B	B	B	B	B	D	D	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D
101	100pF	S	S	A	B	B	B	B	B	B	B	D	D	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D
121	120	S	S	A	B	D	D	B	B	B	B	D	D	G	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D
151	150	S	S	B	D	D	D	B	B	B	B	D	G	C	C	C	C	C	D	G	D	K	K	D	D	D	D	D	D	D
181	180	S	S	B	D	D	D	B	B	B	B	G	G	C	C	C	C	C	D	G	D	K	K	D	D	D	D	D	D	K
221	220	S	S	D	D	D	D	B	B	B	B	G	G	C	C	C	C	G	G	D	K	K	D	D	D	D	D	D	D	K
271	270			D	D	D	D	B	C	C	C	G		C	C	C	C	G		K	K	K	D	D	D	D	D	D	K	K
331	330			D	D	D	D	B	C	C	C	G		C	C	C	C	G		K	K	K	D	D	D	D	D	D	K	K
391	390			D	D	D	D	B	C	C	C	G		C	C	C	C	G		K	K		D	D	D	D	D	D	K	K
471	470			D				C	C	C	C	G		C	C	C	C	G		K	K		D	D	D	D	D	D	K	K
561	560			D				C	D	D	D			C	C	C	C			K	K		D	D	D	D	D	D	K	K
681	680			D				C	D	D	D			C	C	C	C			K	K		D	D	D	D	D	D	K	K
821	820			D				C	G	G	G			C	C	C	C			K			D	D	D	D	D	D	K	K
102	1000pF			D				C	G	G	G			D	D	D	D			K			D	D	D	D	D	D	K	K
122	1200							C	G	G	G			D	D	D	D						D	D	D	D	D	D	K	
152	1500							D	G	G	G			D	D	D	D						D	D	D	D	D	D	K	
182	1800							D	G	G	G			D	D	D	D						D	D	D	D	D	D		
222	2200							D	G	G	G			D	D								D	D	D	D	D	D		
272	2700													D	D								D	D	D	D	D	D		
332	3300													D									D	D	D	D	D	D		
392	3900													D									D							
472	4700																						D							
562	5600																						D							
682	6800																						D							

The letter in cell is expressed the symbol of product thickness

Capacitance & Voltage (X7R 200V~3KV)

Dielectric		X7R																									
EIA	Size	0805				1206						1210					1808			1812							
Code	VDCW	200V	250V	500V	630V	200V	250V	500V	630V	1000V	2000V	200V	250V	500V	630V	1000V	1000V	2000V	3000V	200V	250V	500V	630V	1000V	2000V	3000V	
101	100pF	B	B	B	B																						
121	120	B	B	B	B																						
151	150	B	B	B	B	D	D	D	D	D	D							D	D	D							
181	180	B	B	B	B	D	D	D	D	D	D							D	D	D							
221	220	B	B	B	B	D	D	D	D	D	D							D	D	D							
271	270	B	B	B	B	D	D	D	D	D	D							D	D	D				D	D		
331	330	B	B	B	B	D	D	D	D	D	D							D	D	K				D	D		
391	390	B	B	B	B	D	D	D	D	D	D							D	D	K				D	D		
471	470	B	B	B	B	D	D	D	D	D	D							D	D	K				D	D		
561	560	B	B	B	B	D	D	D	D	D	D							D	D	K				D	D		
681	680	B	B	B	B	D	D	D	D	D	D							D	D	K				D	D	K	
821	820	B	B	B	B	D	D	D	D	D	G							D	D	K				D	D	K	
102	1000pF	B	B	B	B	D	D	D	D	D	D/G	C	C	D	D	D	D	D	K	D	D	D	D	D	D	K	
122	1200	B	B	B	B	D	D	D	D	D	G	C	C	D	D	D	D	K		D	D	D	D	D	D		
152	1500	B	B	B	B	D	D	D	D	D	G	C	C	D	D	D	D	K		D	D	D	D	D	D		
182	1800	B	B	B	B	D	D	D	D	D	G	C	C	D	D	D	D	K		D	D	D	D	D	D		
222	2200	B	B	B	B	D	D	D	D	D		C	C	D	D	D	D	K		D	D	D	D	D	D		
272	2700	B	B	B	B	D	D	D	D	D		C	C	D	D	D	D			D	D	D	D	D	D		
332	3300	B	B	B	B	D	D	D	D	D		C	C	D	D	D	D			D	D	D	D	D	D	K	
392	3900	B	B	B	B	D	D	D	D	D		C	C	D	D	G	D			D	D	D	D	D	D	K	
472	4700	B	D			D	D	D	D	D		C	C	D	D	G	D			D	D	D	D	D	D	K	
562	5600	D	D			D	D	D	D	D		C	C	D	D	G	K			D	D	D	D	D	D		
682	6800	D	D			D	D	D	D	D		C	C	D	D	G	K			D	D	D	D	D	D		
822	8200	D	D			D	D	D	D	D		C	C	D	D	G	K			D	D	D	D	D	D		
103	0.010μF	D	D			D	D	D	D	D		C	C	D	D	G	K			D	D	D	D	D	D		
123	0.012	D				D	D	D	D	D		C	C	D	D					D	D	D	D	D	K		
153	0.015	D				D	D	D	D	D		C	C	D	D					D	D	D	D	D	K		
183	0.018	D				D	D	D	D	D		C	C	D	D					D	D	D	D	D			
223	0.022	D				D	D	G	G			C	C	D	D					D	D	D	D				
273	0.027					D	D	G	G			C	C	G	G					D	D	D	D				
333	0.033					G	G	G	G			C	C	G	G					D	D	D	D				
393	0.039					G	G					C	C	G	G					D	D	D	D				
473	0.047					G	G					D	D	G	G					D	D	D	D				
563	0.056					G	G					D	D	G	G					D	D	K	K				
683	0.068					G	G					G	G							D	D	K	K				
823	0.082					G	G					G	G							D	D	K	K				
104	0.10μF					G	G					G	G							D	D	K	K				
124	0.12											G	G							D	D						
154	0.15											M	M							K	K						
184	0.18											M	M							K	K						
224	0.22											M	M							K	K						
274	0.27											M	M							K	K						
334	0.33											M	M							K	K						
394	0.39											M	M							K	K						
474	0.47											M	M							K	K						

■ The letter in cell is expressed the symbol of product thickness

Capacitance & Voltage (Y5V 200V~250V)

Dielectric		Y5V							
EIA	Size	0805		1206		1210		1812	
Code	VDCW	200	250	200	250	200	250	200	250
103	0.010 $\mu$ F	B	B	B	B	C	C	D	D
153	0.015	B	B	B	B	C	C	D	D
223	0.022	B	B	B	B	C	C	D	D
333	0.033	B	B	B	B	C	C	D	D
473	0.047	B	B	B	B	C	C	D	D
683	0.068	B	B	B	B	C	C	D	D
104	0.10 $\mu$ F			B	B	C	C	D	D
154	0.15			C	C	C	C	D	D
224	0.22							D	D
334	0.33							D	D
474	0.47							D	D
684	0.68							D	D

■ The letter in cell is expressed the symbol of product thickness

Electrical data

Dielectric	NP0	X7R	Y5V
Size	0603,0805,1206,1210,1808,1812	0805,1206,1210,1808,1812	0805,1206,1210,1812
Capacitance*	0.5pF~6800pF	100pF~0.47 $\mu$ F	0.01 $\mu$ F~0.68 $\mu$ F
Capacitance tolerance	Cap $\leq$ 5pF: C ( $\pm$ 0.25pF) 5pF<Cap<10pF: D ( $\pm$ 0.50pF) Cap $\geq$ 10pF: J ( $\pm$ 5%), K ( $\pm$ 10%)	K ( $\pm$ 10%) M ( $\pm$ 20%)	Z (-20 / +80%)
Rated voltage (VDCW)	200V to 3KV		200V, 250V
Q*	Cap<30pF: Q $\geq$ 400 +20C Cap $\geq$ 30pF: Q $\geq$ 1000	$\leq$ 2.5%	$\leq$ 5%
Insulation resistance at Ur**	Ur=200~630V: $\geq$ 10G $\Omega$ or R $\times$ C $\geq$ 100 $\Omega$ -F Whichever is smaller Ur=1000~3000V: $\geq$ 10G $\Omega$		
Dielectric Strength	200~300V: $\geq$ 2 $\times$ VDCW 500~999V: $\geq$ 1.5 $\times$ VDCW 1000~3000V: $\geq$ 1.2 $\times$ VDCW		
Operating temperature	-55 to +125 $^{\circ}$ C		-25 to +85 $^{\circ}$ C
Capacitance change	$\pm$ 30 ppm	$\pm$ 15%	+30/-80%
Termination	Ni/Sn (lead-free termination)		

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

■ NP0: Apply 1.0 $\pm$ 0.2Vrms, 1.0MHz $\pm$ 10% for Cap $\leq$ 1000pF and 1.0 $\pm$ 0.2Vrms, 1.0KHz $\pm$ 10% for Cap>1000pF, 25 $^{\circ}$ C ambient temperature

■ X7R, X5R: Apply 1.0 $\pm$ 0.2Vrms, 1.0KHz $\pm$ 10% at the condition of 20 $^{\circ}$ C ambient temperature

■ \*\*\*Measured at 500V<sub>DC</sub> for 60 sec. for Ur > 500V<sub>DC</sub>

## Environmental Characteristics

Item	Requirement	Test Method																																																																										
External Appearance	No defects which may affect performance	Visual inspection & Dimension measurement																																																																										
Capacitance(Cap.)	Within the specified tolerance that refers on page2	NPO: (Class I) Cap $\leq$ 1000pF 1.0 $\pm$ 0.2Vrms, 1MHz $\pm$ 10% Cap $>$ 1000pF 1.0 $\pm$ 0.2Vrms, 1KHz $\pm$ 10%																																																																										
Dissipation Factor (D.F.) or Quality factor (Q=1/D.F.)	NPO: Cap $\geq$ 30pF, Q $\geq$ 1000; Cap $<$ 30pF, Q $\geq$ 400+20C X7R, X5R: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.<math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq</math> 50V</td> <td rowspan="3">2.5%</td> <td>3%</td> <td>0201(50V); 0603 <math>\geq</math> 0.047<math>\mu</math>F 0805 <math>\geq</math> 0.18<math>\mu</math>F; 1206 <math>\geq</math> 0.47<math>\mu</math>F</td> </tr> <tr> <td>5%</td> <td>1210 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td>7%</td> <td>0603 <math>\geq</math> 1<math>\mu</math>F; 0805 <math>\geq</math> 1<math>\mu</math>F 1206 <math>\geq</math> 2.2<math>\mu</math>F; 1210 <math>\geq</math> 10<math>\mu</math>F</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">3.5%</td> <td>5%</td> <td>0201 <math>\geq</math> 0.01<math>\mu</math>F; 0805 <math>\geq</math> 1<math>\mu</math>F 1210 <math>\geq</math> 10<math>\mu</math>F</td> </tr> <tr> <td>7%</td> <td>0603 <math>\geq</math> 0.33<math>\mu</math>F; 1206 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td>10%</td> <td>0402 <math>\geq</math> 0.10<math>\mu</math>F; 0603 <math>\geq</math> 0.47<math>\mu</math>F 0805 <math>\geq</math> 2.2<math>\mu</math>F; 1206 <math>\geq</math> 6.8<math>\mu</math>F 1210 <math>\geq</math> 22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">3.5%</td> <td>5%</td> <td>0201 <math>\geq</math> 0.01<math>\mu</math>F; 0402 <math>\geq</math> 0.033<math>\mu</math>F 0603 <math>\geq</math> 0.15<math>\mu</math>F; 0805 <math>\geq</math> 0.68<math>\mu</math>F 1206 <math>\geq</math> 2.2<math>\mu</math>F; 1210 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td>10%</td> <td>0402 <math>\geq</math> 0.22<math>\mu</math>F; 0603 <math>\geq</math> 0.68<math>\mu</math>F 0805 <math>\geq</math> 2.2<math>\mu</math>F; 1206 <math>\geq</math> 4.7<math>\mu</math>F 1210 <math>\geq</math> 22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0201 <math>\geq</math> 0.012<math>\mu</math>F; 0402 <math>\geq</math> 0.33<math>\mu</math>F 0603 <math>\geq</math> 0.33<math>\mu</math>F; 0805 <math>\geq</math> 2.2<math>\mu</math>F 1206 <math>\geq</math> 2.2<math>\mu</math>F; 1210 <math>\geq</math> 22<math>\mu</math>F</td> </tr> <tr> <td>15%</td> <td>0201 <math>\geq</math> 0.1<math>\mu</math>F; 0402 <math>\geq</math> 1<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">10%</td> <td>15%</td> <td>0201 <math>\geq</math> 0.01<math>\mu</math>F; 0402 <math>\geq</math> 1<math>\mu</math>F 0603 <math>\geq</math> 10<math>\mu</math>F; 0805 <math>\geq</math> 4.7<math>\mu</math>F 1206 <math>\geq</math> 47<math>\mu</math>F; 1210 <math>\geq</math> 100<math>\mu</math>F</td> </tr> <tr> <td>20%</td> <td>0402 <math>\geq</math> 2.2<math>\mu</math>F</td> </tr> </tbody> </table> Y5V: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.<math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq</math> 50V</td> <td>5%</td> <td>7%</td> <td>0603 <math>\geq</math> 0.1<math>\mu</math>F; 0805 <math>\geq</math> 0.47<math>\mu</math>F 1206 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td>35V</td> <td>7%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">5%</td> <td>7%</td> <td>0402 <math>\geq</math> 0.047<math>\mu</math>F; 0603 <math>\geq</math> 0.1<math>\mu</math>F 0805 <math>\geq</math> 0.33<math>\mu</math>F; 1206 <math>\geq</math> 1<math>\mu</math>F 1210 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td>9%</td> <td>0402 <math>\geq</math> 0.068<math>\mu</math>F; 0603 <math>\geq</math> 0.47<math>\mu</math>F 1206 <math>\geq</math> 4.7<math>\mu</math>F; 1210 <math>\geq</math> 22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0<math>\mu</math>F)</td> <td rowspan="2">7%</td> <td>9%</td> <td>0402 <math>\geq</math> 0.068<math>\mu</math>F; 0603 <math>\geq</math> 0.68<math>\mu</math>F</td> </tr> <tr> <td>12.5%</td> <td>0402 <math>\geq</math> 0.22<math>\mu</math>F</td> </tr> <tr> <td>16V (C <math>\geq</math> 1.0<math>\mu</math>F)</td> <td>9%</td> <td>12.5%</td> <td>0603 <math>\geq</math> 2.2<math>\mu</math>F; 0805 <math>\geq</math> 3.3<math>\mu</math>F 1206 <math>\geq</math> 10<math>\mu</math>F; 1210 <math>\geq</math> 22<math>\mu</math>F 1812 <math>\geq</math> 47<math>\mu</math>F</td> </tr> <tr> <td>10V</td> <td>12.5%</td> <td>20%</td> <td>0402 <math>\geq</math> 0.47<math>\mu</math>F</td> </tr> <tr> <td>6.3V</td> <td>20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq$ 50V	2.5%	3%	0201(50V); 0603 $\geq$ 0.047 $\mu$ F 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F	5%	1210 $\geq$ 4.7 $\mu$ F	7%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F	25V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1210 $\geq$ 10 $\mu$ F	7%	0603 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F	10%	0402 $\geq$ 0.10 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 6.8 $\mu$ F 1210 $\geq$ 22 $\mu$ F	16V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 0.033 $\mu$ F 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F	10%	0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F 1210 $\geq$ 22 $\mu$ F	10V	5%	10%	0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.33 $\mu$ F 0603 $\geq$ 0.33 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	15%	0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F	6.3V	10%	15%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 1 $\mu$ F 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 4.7 $\mu$ F 1206 $\geq$ 47 $\mu$ F; 1210 $\geq$ 100 $\mu$ F	20%	0402 $\geq$ 2.2 $\mu$ F	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq$ 50V	5%	7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F	35V	7%	—	—	25V	5%	7%	0402 $\geq$ 0.047 $\mu$ F; 0603 $\geq$ 0.1 $\mu$ F 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F 1210 $\geq$ 4.7 $\mu$ F	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	16V (C < 1.0 $\mu$ F)	7%	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F	12.5%	0402 $\geq$ 0.22 $\mu$ F	16V (C $\geq$ 1.0 $\mu$ F)	9%	12.5%	0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 3.3 $\mu$ F 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F 1812 $\geq$ 47 $\mu$ F	10V	12.5%	20%	0402 $\geq$ 0.47 $\mu$ F	6.3V	20%	-	-	X7R, X5R, Y5V: (Class II) Cap $\leq$ 10uF 1.0 $\pm$ 0.2Vrms, 1KHz $\pm$ 10% Cap $>$ 10uF 0.5 $\pm$ 0.2Vrms, 120Hz $\pm$ 10%
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																										
$\geq$ 50V	2.5%	3%	0201(50V); 0603 $\geq$ 0.047 $\mu$ F 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F																																																																									
		5%	1210 $\geq$ 4.7 $\mu$ F																																																																									
		7%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F																																																																									
25V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1210 $\geq$ 10 $\mu$ F																																																																									
		7%	0603 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F																																																																									
		10%	0402 $\geq$ 0.10 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 6.8 $\mu$ F 1210 $\geq$ 22 $\mu$ F																																																																									
16V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 0.033 $\mu$ F 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F																																																																									
		10%	0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F 1210 $\geq$ 22 $\mu$ F																																																																									
10V	5%	10%	0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.33 $\mu$ F 0603 $\geq$ 0.33 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F																																																																									
		15%	0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F																																																																									
6.3V	10%	15%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 1 $\mu$ F 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 4.7 $\mu$ F 1206 $\geq$ 47 $\mu$ F; 1210 $\geq$ 100 $\mu$ F																																																																									
		20%	0402 $\geq$ 2.2 $\mu$ F																																																																									
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																										
$\geq$ 50V	5%	7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F																																																																									
35V	7%	—	—																																																																									
25V	5%	7%	0402 $\geq$ 0.047 $\mu$ F; 0603 $\geq$ 0.1 $\mu$ F 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F 1210 $\geq$ 4.7 $\mu$ F																																																																									
		9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F																																																																									
16V (C < 1.0 $\mu$ F)	7%	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F																																																																									
		12.5%	0402 $\geq$ 0.22 $\mu$ F																																																																									
16V (C $\geq$ 1.0 $\mu$ F)	9%	12.5%	0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 3.3 $\mu$ F 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F 1812 $\geq$ 47 $\mu$ F																																																																									
10V	12.5%	20%	0402 $\geq$ 0.47 $\mu$ F																																																																									
6.3V	20%	-	-																																																																									
Dielectric Strength	No evidence of damage or flash over during test	To apply voltage( $\leq$ 100V) 250% Duration: 1 to 5sec Charge and discharge current less than 50mA  To apply voltage: 200V~300V $\geq$ 2 time VDC 500V~999V $\geq$ 1.5 time VDC 1000V~3000V $\geq$ 1.2 time VDC Cut-off, set at 10mA TEST=15 sec. RAMP=0																																																																										



Item	Requirement	Test Method																				
Insulation Resistance	10GΩ or $R \times C \geq 500\Omega\text{-F}$ Whichever is smaller X7R, X5R, Y5V:	To apply rated voltage for max. 120sec																				
	<table border="1"> <tr> <th>Rated Voltage</th> <th>Insulation Resistance</th> </tr> <tr> <td>100V: X7R</td> <td rowspan="5">RxC <math>\geq 100\Omega\text{-F}</math></td> </tr> <tr> <td>50V: 0603<math>\geq 1\mu\text{F}</math>;0805<math>\geq 1\mu\text{F}</math>;1206<math>\geq 2.2\mu\text{F}</math> 1210<math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td>25V: 0402<math>\geq 1\mu\text{F}</math>;0603<math>\geq 2.2\mu\text{F}</math>;0805<math>\geq 2.2\mu\text{F}</math> 1206<math>\geq 10\mu\text{F}</math>;1210<math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>16V: 0402<math>\geq 0.22\mu\text{F}</math>;0603<math>\geq 1\mu\text{F}</math>;0805<math>\geq 2.2\mu\text{F}</math> 1206<math>\geq 10\mu\text{F}</math>;1210<math>\geq 47\mu\text{F}</math></td> </tr> <tr> <td>10V: 0201<math>\geq 47\text{nF}</math>;0402<math>\geq 0.47\mu\text{F}</math>;0603<math>\geq 0.47\mu\text{F}</math> 0805<math>\geq 2.2\mu\text{F}</math>;1206<math>\geq 4.7\mu\text{F}</math>;1210<math>\geq 47\mu\text{F}</math></td> </tr> <tr> <td>6.3V</td> <td></td> </tr> </table>		Rated Voltage	Insulation Resistance	100V: X7R	RxC $\geq 100\Omega\text{-F}$	50V: 0603 $\geq 1\mu\text{F}$ ;0805 $\geq 1\mu\text{F}$ ;1206 $\geq 2.2\mu\text{F}$ 1210 $\geq 4.7\mu\text{F}$	25V: 0402 $\geq 1\mu\text{F}$ ;0603 $\geq 2.2\mu\text{F}$ ;0805 $\geq 2.2\mu\text{F}$ 1206 $\geq 10\mu\text{F}$ ;1210 $\geq 10\mu\text{F}$	16V: 0402 $\geq 0.22\mu\text{F}$ ;0603 $\geq 1\mu\text{F}$ ;0805 $\geq 2.2\mu\text{F}$ 1206 $\geq 10\mu\text{F}$ ;1210 $\geq 47\mu\text{F}$	10V: 0201 $\geq 47\text{nF}$ ;0402 $\geq 0.47\mu\text{F}$ ;0603 $\geq 0.47\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$ ;1206 $\geq 4.7\mu\text{F}$ ;1210 $\geq 47\mu\text{F}$	6.3V											
	Rated Voltage		Insulation Resistance																			
100V: X7R	RxC $\geq 100\Omega\text{-F}$																					
50V: 0603 $\geq 1\mu\text{F}$ ;0805 $\geq 1\mu\text{F}$ ;1206 $\geq 2.2\mu\text{F}$ 1210 $\geq 4.7\mu\text{F}$																						
25V: 0402 $\geq 1\mu\text{F}$ ;0603 $\geq 2.2\mu\text{F}$ ;0805 $\geq 2.2\mu\text{F}$ 1206 $\geq 10\mu\text{F}$ ;1210 $\geq 10\mu\text{F}$																						
16V: 0402 $\geq 0.22\mu\text{F}$ ;0603 $\geq 1\mu\text{F}$ ;0805 $\geq 2.2\mu\text{F}$ 1206 $\geq 10\mu\text{F}$ ;1210 $\geq 47\mu\text{F}$																						
10V: 0201 $\geq 47\text{nF}$ ;0402 $\geq 0.47\mu\text{F}$ ;0603 $\geq 0.47\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$ ;1206 $\geq 4.7\mu\text{F}$ ;1210 $\geq 47\mu\text{F}$																						
6.3V																						
$\geq 10G\Omega$ or $100\Omega\text{-F}$ whichever is smaller Rated voltage: 200V~630V	To apply rated voltage(500V max.) for 60sec.																					
$\geq 10G\Omega$ Rated voltage: >630V	To apply 500V for 60sec.																					
Temperature Characteristic of Capacitance	<table border="1"> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> <tr> <td>NPO</td> <td><math>\pm 30</math> (ppm/°C)</td> </tr> <tr> <td>X7R</td> <td><math>\pm 15\%</math></td> </tr> <tr> <td>X5R</td> <td><math>\pm 15\%</math></td> </tr> <tr> <td>Y5V</td> <td>+30%~-80%</td> </tr> </table>	T.C.	Capacitance Change	NPO	$\pm 30$ (ppm/°C)	X7R	$\pm 15\%$	X5R	$\pm 15\%$	Y5V	+30%~-80%	<p>With no electrical load.</p> <table border="1"> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> <tr> <td>NPO</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X7R</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X5R</td> <td>-55 ~ 85°C at 25°C</td> </tr> <tr> <td>Y5V</td> <td>-25 ~ 85°C at 20°C</td> </tr> </table>	T.C.	Operating Temp	NPO	-55 ~ 125°C at 25°C	X7R	-55 ~ 125°C at 25°C	X5R	-55 ~ 85°C at 25°C	Y5V	-25 ~ 85°C at 20°C
T.C.	Capacitance Change																					
NPO	$\pm 30$ (ppm/°C)																					
X7R	$\pm 15\%$																					
X5R	$\pm 15\%$																					
Y5V	+30%~-80%																					
T.C.	Operating Temp																					
NPO	-55 ~ 125°C at 25°C																					
X7R	-55 ~ 125°C at 25°C																					
X5R	-55 ~ 85°C at 25°C																					
Y5V	-25 ~ 85°C at 20°C																					
Adhesive Strength of Termination	No remarkable damage or removal of the terminations	Pressurizing force: 0201:2N 0402&0603:5N>0603:10N Test time: 10 $\pm$ 1 sec																				
Vibration Resistance	No remarkable damage Cap change and Q/D.F.: To meet initial spec	Vibration frequency: 10~55Hz/min Total amplitude: 1.5mm Test time: 6hrs.(two hrs each in three mutually Perpendicular directions.)																				
Solderability	95% min. coverage of all metalized area.	Solder temperature: 235 $\pm$ 5°C Dipping time: 2 $\pm$ 0.5 sec.																				
Bending Test	No remarkable damage Cap change: NPO: within $\pm 5\%$ or 0.5pF whichever is larger X7R, X5R: within $\pm 12.5\%$ Y5V: within $\pm 30\%$ (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5 $\pm$ 1sec. Measurement to be made after keeping at room temp. for 24 $\pm$ 2hrs(Class I) or 48 $\pm$ 4hrs(Class II) (Thickness>1.0mm, Thickness $\leq$ 1.0mm)																				
Resistance to Soldering Heat	No remarkable damage Cap change: NPO: within $\pm 2.5\%$ or 0.25pF whichever is larger X7R, X5R: Within $\pm 7.5\%$ Y5V: within $\pm 20\%$ Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25%max. leaching on each edge.	Solder temperature: 260 $\pm$ 5°C Dipping time: 10 $\pm$ 1sec Preheating: 120 to 150°C for 1minute before immerse the capacitor in a eutectic solder. Before initial measurement(Class II only): Perform 150+0/-10°C for 1hr and then set for 24 $\pm$ 4hrs at room temp. Measurement to be made after keep at room temp. for 24 $\pm$ 2 hrs.																				
Temperature Cycle	No remarkable damage. Cap change: NPO: within $\pm 2.5\%$ or 0.25pF whichever is larger X7R, X5R: within $\pm 7.5\%$ Y5V: within $\pm 20\%$ Q/D.F., I.R. and dielectric strength: To meet initial requirements.	Conduct the five cycles according to the temperature and time. <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<math>\pm</math>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<math>\pm</math>3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2-3</td> </tr> </tbody> </table> <p>Before initial measurement(Cass II only): Perform 150+0/-10°C for 1hr and then set for 48<math>\pm</math>4 hrs at room temp. Measurement to be made after keeping at room temp. for 24<math>\pm</math>2 hrs.(Class I) or 48<math>\pm</math>4 hrs.(Class II).</p>	Step	Temp.(°C)	Time(min)	1	Min. operating temp.+0/-3	30 $\pm$ 3	2	Room temp	2-3	3	Max. operating temp.+3/-0	30 $\pm$ 3	4	Room temp.	2-3					
Step	Temp.(°C)	Time(min)																				
1	Min. operating temp.+0/-3	30 $\pm$ 3																				
2	Room temp	2-3																				
3	Max. operating temp.+3/-0	30 $\pm$ 3																				
4	Room temp.	2-3																				

Item	Requirement	Test Method																																				
Humidity (steady state)	No remarkable damage. Cap change: NPO: within±5% or 0.5pF whichever is large X7R, X5R: ≥ 10V, within±12.5%; 6.3V, within±25% Y5V: ≥ 10V, within±30%; 6.3V, within+30/-40% Q/D.F. value: NPO: More than 30pF Q ≥ 350, 10pF ≤ C ≤ 30pF, Q ≥ 275+2.5C Less than 10pF Q ≥ 200+10C X7R, X5R:	Test temp: 40±2°C Humidity: 90~95% RH Test time: 500+24/-0hrs Measurement to be made after keeping at room temp. for 24±2hrs.																																				
	<table border="1" data-bbox="293 443 927 1167"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF;1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF	15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF	20%	0201 ≥ 0.1μF;0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF	
Rated vol.	D.F. ≤	Exception of D.F. ≤																																				
≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF																																			
		10%	1210 ≥ 4.7μF																																			
		20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF																																			
25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF																																			
		14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF																																			
		15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF																																			
16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF																																			
		15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																			
10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF																																			
		20%	0201 ≥ 0.1μF;0402 ≥ 1μF																																			
6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF																																			
	Y5V: <table border="1" data-bbox="293 1205 927 1686"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <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>15%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C&lt;1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ .0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF	16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ .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 vol.	D.F. ≤	Exception of D.F. ≤																																				
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF																																			
35V	10%	—	—																																			
25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF																																			
		15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																			
16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF																																			
		20%	0402 ≥ 0.22μF																																			
16V (C ≥ .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%	-	-																																			
	I.R.: ≥ 10V 1GΩ or 50Ω-F whichever is smaller. Class II (X7R, X5R, Y5V)																																					
	<table border="1" data-bbox="293 1760 927 2051"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="5">RxC ≥ 10Ω-F</td> </tr> <tr> <td>50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF</td> </tr> <tr> <td>25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V:X7R	RxC ≥ 10Ω-F	50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF	25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF	16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF	10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF																													
Rated voltage	Insulation Resistance																																					
100V:X7R	RxC ≥ 10Ω-F																																					
50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF																																						
25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF																																						
16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF																																						
10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF																																						

Item	Requirement	Test Method																																																																																	
Humidity load	<p>No remarkable damage.            Cap change:            NPO:±7.5% or 0.75pF whichever is larger            X7R, X5R: ≥ 10V, within±12.5%; 6.3V, 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:            NPO: C ≥ 30pF, Q ≥ 200; C &lt; 30pF, Q ≥ 100+10/3C            X7R, X5R:</p> <table border="1" data-bbox="295 398 941 1164"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF; 0805 ≥ 1μF 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <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>15%</td> <td>0201 ≥ 0.01μF; 0402 ≥ 0.033μF 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.33μF 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="295 1187 941 1680"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥ 10V 500MΩ or 25Ω-F (Whichever is smaller)            Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="295 1724 941 2056"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="6">RxC ≥ 5Ω-F</td> </tr> <tr> <td>50V:0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF</td> </tr> <tr> <td>25V:0402 ≥ 1uF; 0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF; 1210 ≥ 10uF</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF; 0805 ≥ 1μF 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF	20%	0201 ≥ 0.1μF; 0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	RxC ≥ 5Ω-F	50V:0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF	25V:0402 ≥ 1uF; 0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF; 1210 ≥ 10uF	16V:0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF	10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF	6.3V	<p>Test temp: 40±2°C            Humidity: 90~95%RH            Test time: 500+24/-0 hrs            To apply voltage: Rated voltage(Max. 500V)            Measurement to be made after keeping at room temp for 24±2hrs.(Class I) or 48±4hrs.(Class II)</p>
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																	
≥ 50V	3.0%	6%	0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																																
		10%	1210 ≥ 4.7μF																																																																																
		20%	0603 ≥ 1μF; 0805 ≥ 1μF 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																																
25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF																																																																																
		14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																																																
		15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF 1210 ≥ 22μF																																																																																
16V	5%	10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																																
		15%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF 0603 ≥ 0.68μF; 0805 ≥ 2.2μF 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																
10V	7.5%	15%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																																																
		20%	0201 ≥ 0.1μF; 0402 ≥ 1μF																																																																																
6.3V	15%	30%	0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1210 ≥ 100μF																																																																																
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																	
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF																																																																																
35V	10%	—	—																																																																																
25V	7.5%	10%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF																																																																																
		15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																
16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																																
		20%	0402 ≥ 0.22μF																																																																																
16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF																																																																																
10V	20%	30%	0402 ≥ 0.47μF																																																																																
6.3V	30%	-	-																																																																																
Rated voltage	Insulation Resistance																																																																																		
100V:X7R	RxC ≥ 5Ω-F																																																																																		
50V:0603 ≥ 1uF; 0805 ≥ 1uF; 1206 ≥ 2.2uF 1210 ≥ 4.7uF																																																																																			
25V:0402 ≥ 1uF; 0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF; 1210 ≥ 10uF																																																																																			
16V:0402 ≥ 0.22uF; 0603 ≥ 1uF; 0805 ≥ 2.2uF 1206 ≥ 10uF; 1210 ≥ 47uF																																																																																			
10V: 0201 ≥ 47nF; 0402 ≥ 0.47uF; 0603 ≥ 0.47uF 0805 ≥ 2.2uF; 1206 ≥ 4.7uF; 1210 ≥ 47uF																																																																																			
6.3V																																																																																			

Item	Requirement	Test Method																																																																																																																																				
High Temperature Load (Endurance)	<p>No remarkable damage. Cap change: NPO: <math>\pm 3\%</math> or <math>\pm 0.3F</math> whichever is larger X7R, X5R: <math>\geq 10V</math>, within <math>\pm 12.5\%</math>; 6.3V, within <math>+30/-40\%</math> 10V: 0603 <math>\geq 4.7\mu F</math>; 0402 <math>\geq 1\mu F</math>; 0201 <math>\geq 0.1\mu F</math>, within <math>\pm 25\%</math> Q/D.F. value: NPO: More than 30pF, <math>Q \geq 350</math> <math>10pF \leq C &lt; 30pF</math>, <math>Q \geq 275 + 2.5C</math> Less than 10pF, <math>Q \geq 200 + 10C</math> X7R, X5R:</p> <table border="1" data-bbox="308 443 935 1160"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq 50V</math></td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V); 0603 <math>\geq 0.047\mu F</math> 0805 <math>\geq 0.18\mu F</math>; 1206 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>10%</td> <td>1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>20%</td> <td>0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0805 <math>\geq 1\mu F</math> 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>14%</td> <td>0603 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.10\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 6.8\mu F</math> 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 <math>\geq 0.15\mu F</math>; 0805 <math>\geq 0.68\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0402 <math>\geq 0.033\mu F</math> 0603 <math>\geq 0.68\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 <math>\geq 0.012\mu F</math>; 0402 <math>\geq 0.33\mu F</math> 0603 <math>\geq 0.33\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td>20%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math> 0603 <math>\geq 10\mu F</math>; 0805 <math>\geq 4.7\mu F</math> 1210 <math>\geq 100\mu F</math></td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="308 1189 935 1697"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq 50V</math></td> <td>7.5%</td> <td>10%</td> <td>0603 <math>\geq 0.1\mu F</math>; 0805 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 <math>\geq 0.047\mu F</math>; 0603 <math>\geq 0.1\mu F</math> 0805 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 1\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V (<math>C &lt; 1.0\mu F</math>)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.68\mu F</math></td> </tr> <tr> <td>20%</td> <td>0402 <math>\geq 0.22\mu F</math></td> </tr> <tr> <td>16V (<math>C \geq 1.0\mu F</math>)</td> <td>12.5%</td> <td>20%</td> <td>0603 <math>\geq 2.2\mu F</math>; 0805 <math>\geq 3.3\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 22\mu F</math> 1812 <math>\geq 47\mu F</math></td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: <math>\geq 10V</math> 1G<math>\Omega</math> or 50<math>\Omega</math>-F whichever is smaller Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="308 1760 935 2056"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="5">RxC <math>\geq</math> 10<math>\Omega</math>-F</td> </tr> <tr> <td>50V: 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math>; 1206 <math>\geq 2.2\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>25V: 0402 <math>\geq 1\mu F</math>; 0603 <math>\geq 2.2\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>16V: 0402 <math>\geq 0.22\mu F</math>; 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> <tr> <td>10V: 0201 <math>\geq 47nF</math>; 0402 <math>\geq 0.47\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$	10%	1210 $\geq 4.7\mu F$	20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$	25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$	14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$	15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$	16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$	15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$	20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$	6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$	35V	10%	—	—	25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$	15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	16V ( $C < 1.0\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$	20%	0402 $\geq 0.22\mu F$	16V ( $C \geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$	10V	20%	30%	0402 $\geq 0.47\mu F$	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V: X7R	RxC $\geq$ 10 $\Omega$ -F	50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$	25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$	16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$	10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$	<p>Test temp: NPO, X7R: 125<math>\pm 3^\circ C</math> X5R, Y5V: 85<math>\pm 3^\circ C</math> Test Time: 1000+25/-0 hrs To apply voltage: (1.1) 100% of rated voltage for below range.</p> <table border="1" data-bbox="965 353 1469 613"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td><math>C \geq 0.1\mu F</math></td> </tr> <tr> <td>0402</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td><math>C \geq 1.0\mu F</math></td> </tr> <tr> <td>0603</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td><math>C \geq 4.7\mu F</math></td> </tr> <tr> <td>0805</td> <td>X5R, X7R</td> <td>6.3V</td> <td><math>C \geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R, X7R</td> <td>6.3V</td> <td><math>C \geq 47\mu F</math></td> </tr> <tr> <td>NPO</td> <td>3000V</td> <td><math>C \geq 1.5pF</math></td> </tr> </tbody> </table> <p>(1.2) 6.3V or <math>C \geq 10\mu F</math>: 150% of rated voltage (2) <math>10V \leq U_r &lt; 500V</math>: 200% of rated voltage. 150% of rated voltage for below range.</p> <table border="1" data-bbox="965 712 1469 994"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0402</td> <td>X5R, X7R</td> <td>10V, 16V, 25V</td> <td><math>C \geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td><math>C \geq 0.47\mu F</math></td> </tr> <tr> <td rowspan="2">0603</td> <td>X5R, X7R</td> <td>10V, 16V</td> <td><math>C \geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td><math>C \geq 2.2\mu F</math></td> </tr> <tr> <td rowspan="2">0805</td> <td>X5R, X7R</td> <td>10V</td> <td><math>C \geq 4.7\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td><math>C \geq 4.7\mu F</math></td> </tr> </tbody> </table> <p>(3) 500V: 150% of rated voltage (4) <math>U_r \geq 630V</math>: 120% of rated voltage</p> <p>Test time: 1000+24/-0hrs Measurement to be made after keeping at room temp. for 24<math>\pm 2</math>hrs.</p>	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R, X7R	6.3V, 10V	$C \geq 0.1\mu F$	0402	X5R, X7R	6.3V, 10V	$C \geq 1.0\mu F$	0603	X5R, X7R	6.3V, 10V	$C \geq 4.7\mu F$	0805	X5R, X7R	6.3V	$C \geq 22\mu F$	1206	X5R, X7R	6.3V	$C \geq 47\mu F$	NPO	3000V	$C \geq 1.5pF$	Size	Dielectric	Rated voltage	Capacitance range	0402	X5R, X7R	10V, 16V, 25V	$C \geq 1.0\mu F$	Y5V	16V	$C \geq 0.47\mu F$	0603	X5R, X7R	10V, 16V	$C \geq 1.0\mu F$	Y5V	16V	$C \geq 2.2\mu F$	0805	X5R, X7R	10V	$C \geq 4.7\mu F$	Y5V	16V	$C \geq 4.7\mu F$
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																																																																																				
$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$																																																																																																																																			
		10%	1210 $\geq 4.7\mu F$																																																																																																																																			
		20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$																																																																																																																																			
25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$																																																																																																																																			
		14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$																																																																																																																																			
		15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$																																																																																																																																			
16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$																																																																																																																																			
		15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																			
10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																			
		20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$																																																																																																																																			
6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$																																																																																																																																			
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																																																																																				
$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$																																																																																																																																			
35V	10%	—	—																																																																																																																																			
25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$																																																																																																																																			
		15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																			
16V ( $C < 1.0\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$																																																																																																																																			
		20%	0402 $\geq 0.22\mu F$																																																																																																																																			
16V ( $C \geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$																																																																																																																																			
10V	20%	30%	0402 $\geq 0.47\mu F$																																																																																																																																			
6.3V	30%	-	-																																																																																																																																			
Rated voltage	Insulation Resistance																																																																																																																																					
100V: X7R	RxC $\geq$ 10 $\Omega$ -F																																																																																																																																					
50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$																																																																																																																																						
25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$																																																																																																																																						
16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$																																																																																																																																						
10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$																																																																																																																																						
Size	Dielectric	Rated voltage	Capacitance range																																																																																																																																			
0201	X5R, X7R	6.3V, 10V	$C \geq 0.1\mu F$																																																																																																																																			
0402	X5R, X7R	6.3V, 10V	$C \geq 1.0\mu F$																																																																																																																																			
0603	X5R, X7R	6.3V, 10V	$C \geq 4.7\mu F$																																																																																																																																			
0805	X5R, X7R	6.3V	$C \geq 22\mu F$																																																																																																																																			
1206	X5R, X7R	6.3V	$C \geq 47\mu F$																																																																																																																																			
	NPO	3000V	$C \geq 1.5pF$																																																																																																																																			
Size	Dielectric	Rated voltage	Capacitance range																																																																																																																																			
0402	X5R, X7R	10V, 16V, 25V	$C \geq 1.0\mu F$																																																																																																																																			
	Y5V	16V	$C \geq 0.47\mu F$																																																																																																																																			
0603	X5R, X7R	10V, 16V	$C \geq 1.0\mu F$																																																																																																																																			
	Y5V	16V	$C \geq 2.2\mu F$																																																																																																																																			
0805	X5R, X7R	10V	$C \geq 4.7\mu F$																																																																																																																																			
	Y5V	16V	$C \geq 4.7\mu F$																																																																																																																																			

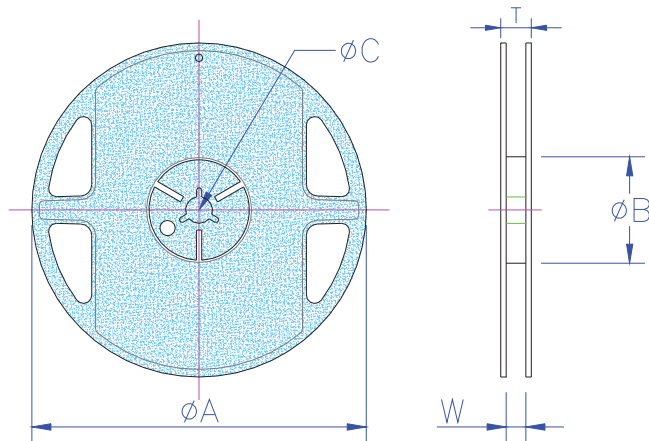
# ■ Packaging

Packaging Quantity

Unit: mm

Type	Thickness / Symbol		Packaging (7" Reel)	
			Paper tape	Plastic tape
0201	0.30±0.03	L	15K	-
0402	0.50±0.05	N	10K	-
0603	0.80±0.10	S	4K	-
	0.80 +0.15 / -0.10	X	4K	-
0805	0.60±0.10	A	4K	-
	0.80±0.10	B	4K	-
	0.85±0.10	T	4K	-
	1.25±0.10	D	-	3K
	1.25±0.20	I	-	3K
1206	0.80±0.10	B	4K	-
	0.95±0.10	C	-	3K
	1.15±0.15	J	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	1.60 +0.30 / -0.10	P	-	2K
1210	0.95±0.10	C	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	1K
1808	1.25±0.10	D	-	2K
	2.00±0.20	K	-	1K
1812	1.25±0.10	D	-	1K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	0.5K
0612	0.80±0.10	B	4K	-

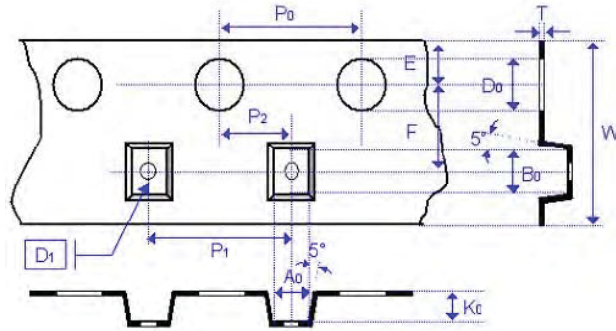
Tape and Reel



Unit: mm

Type	Chip Size							
	0201	0402	0603	0805	1206/0612	1210	1808	1812
$\phi C$	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0
W	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	13.5±1.0	13.5±1.0
$\phi A$	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")
$\phi B$	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	80.0±1.0(7")	80.0±1.0(7")

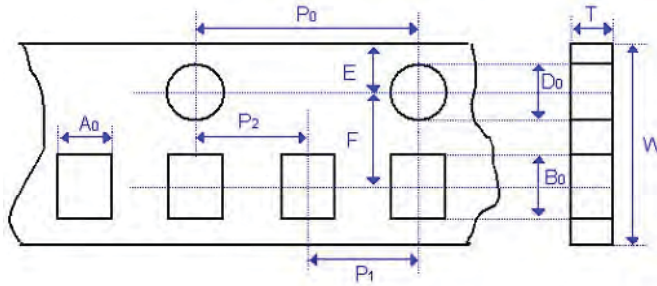
Plastic Tape Size Specification



Unit: mm

Type	0805		1206			1210					1808		1812				
Thickness	D	I	C	J	D	G	P	C	D	G	K	M	D	K	D	K	M
A <sub>0</sub>	<1.57		<1.85			<1.95		<2.97			<2.97		<2.35		<3.81		
B <sub>0</sub>	<2.40		<3.46			<3.67		<3.73			<3.73		<4.98	<5.00	<5.30		
T	0.23±0.05		0.23±0.05			0.23±0.05		0.23±0.05			0.23±0.05		0.25±0.05		0.25±0.05		
K <sub>0</sub>	<2.50		<2.50			<2.50		<2.50			<3.00		<2.50		<2.50	<3.00	
W	8.00±0.10		8.00±0.10			8.00±0.10		8.00±0.10			8.00±0.10		12.0±0.20		12.0±0.20		
P <sub>0</sub>	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		
P <sub>1</sub>	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 <sub>2</sub>	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		
D <sub>0</sub>	1.50±0.05		1.50±0.05			1.50±0.05		1.50±0.05			1.50±0.05		1.50±0.05		1.50±0.05		
D <sub>1</sub>	1.00±0.10		1.00±0.10			1.00±0.10		1.00±0.10			1.00±0.10		1.00±0.10		1.00±0.10		
E	1.75±0.10		1.75±0.10			1.75±0.10		1.75±0.10			1.75±0.10		1.75±0.10		1.75±0.10		
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		5.50±0.05		

Paper Tape Size Specification



Unit: mm

Type	0201	0402	0603		0805		1206/0612
Thickness	L	N	S	X	A	B	B
A <sub>0</sub>	0.45±0.05	0.62±0.05	1.02±0.05		1.50±0.10	1.50±0.10	2.00±0.10
B <sub>0</sub>	0.75±0.05	1.12±0.05	1.82±0.05		2.30±0.10	2.30±0.10	3.50±0.10
T	0.60±0.05	0.60±0.05	0.95±0.05		0.75±0.05	0.95±0.05	0.95±0.05
W	8.00±0.10	8.00±0.10	8.00±0.10		8.00±0.10	8.00±0.10	8.00±0.10
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>1</sub>	2.00±0.05	2.00±0.05	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05		2.00±0.05	2.00±0.05	2.00±0.05
D <sub>0</sub>	1.55±0.05	1.55±0.05	1.55±0.05		1.55±0.05	1.55±0.05	1.50±0.05
E	1.75±0.05	1.75±0.05	1.75±0.05		1.75±0.05	1.75±0.05	1.75±0.10
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

# Part Numbering

MC	03	J	T	N	250	3R9
Product Type	Dimensions (L×W)	Capacitance Tolerance	Packaging	Dielectric	Voltage (VDCW)	Capacitance
MC : General; Ultra-small Middle and High Voltage MCHL: High Q and Low ESR MCRF: Ultra High Q and Low ESR (RF) MCLI: Low Inductance	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 08: 1808 12: 1812 43: 0612	B: ±0.1pF (Cap≤5pF) C: ±0.25pF (Cap≤5pF) D: ±0.5pF (5pF<Cap<10pF) F: ±1% G: ±2% J: ±5% K: ±10% M: ±20% Z: +80/-20%	T: Taping Reel	N: NPO (COG) B: X7R F: Y5V X: X5R	6V3: 6.3V 250: 25V 500: 50V 101: 100V 102: 1000V 202: 2000V 302: 3000V	3R9: 3.9pF 150: 15pF 181: 180pF 225: 2.2μF 476: 47μF 107: 100μF

# General Capacitance & Voltage

## Capacitance & Voltage (NPO)

Dielectric		NPO														
EIA	Size	0402					0603					0805				
Code	VDCW	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V
0R5	0.5pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
0R6	0.6	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
0R7	0.7	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
0R8	0.8	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
0R9	0.9	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
1R0	1.0	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
1R2	1.2	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
1R5	1.5	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
1R8	1.8	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
2R2	2.2	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
2R7	2.7	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
3R3	3.3	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
3R9	3.9	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
4R7	4.7	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
5R6	5.6	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
6R8	6.8	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
8R2	8.2	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
100	10pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
120	12	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
150	15	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
180	18	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
220	22	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
270	27	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
330	33	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
390	39	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
470	47	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
560	56	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
680	68	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
820	82	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
101	100pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
121	120	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
151	150	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
181	180	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
221	220	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
271	270	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
331	330	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
391	390	N	N	N	N	N	S	S	S	S	S	B	B	B	A/B	B/T
471	470	N	N	N	N	N	S	S	S	S	S	B	B	B	A/B	B/T
561	560	N	N	N	N	N	S	S	S	S	S	B	B	B	A/B	B/T
681	680	N	N	N	N	N	S	S	S	S	S	B	B	B	A/B	B/T
821	820	N	N	N	N	N	S	S	S	S	S	B	B	B	A/B	B/T
102	1000pF	N	N	N	N		S	S	S	S	S	B	B	B	A/B	B/T
122	1200						X	X	X	X		B	B	B	B/T	B/T
152	1500						X	X	X	X		B	B	B	B/T	B/T
182	1800						X	X	X	X		B	B	B	B/T	B/T
222	2200						X	X	X	X		B	B	B	B/T	B/T
272	2700						X	X	X	X		D	D	D	I	I
332	3300						X	X	X	X		D	D	D	I	I
392	3900											D	D	D	I	D
472	4700											D	D	D	I	D
562	5600											D	D	D	I	
682	6800											D	D	D	I	
822	8200											D	D	D	I	
103	0.01uF											D	D	D	B/I	

■ The letter in cell is expressed the symbol of product thickness

Capacitance & Voltage (NPO)

Dielectric		NPO												
EIA	Size	1206					1210					1812		
Code	VDCW	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	16V	50V	100V
1R2	1.8	B	B	B	B	B								
1R5	1.5	B	B	B	B	B								
1R8	1.8	B	B	B	B	B								
2R2	2.2	B	B	B	B	B								
2R7	2.7	B	B	B	B	B								
3R3	3.3	B	B	B	B	B					C			
3R9	3.9	B	B	B	B	B					C			
4R7	4.7	B	B	B	B	B					C			
5R6	5.6	B	B	B	B	B					C			
6R8	6.8	B	B	B	B	B					C			
8R2	8.2	B	B	B	B	B					C			
100	10pF	B	B	B	B	B					C	D	D	D
120	12	B	B	B	B	B					C	D	D	D
150	15	B	B	B	B	B					C	D	D	D
180	18	B	B	B	B	B					C	D	D	D
220	22	B	B	B	B	B	C	C	C	C	C	D	D	D
270	27	B	B	B	B	B	C	C	C	C	C	D	D	D
330	33	B	B	B	B	B	C	C	C	C	C	D	D	D
390	39	B	B	B	B	B	C	C	C	C	C	D	D	D
470	47	B	B	B	B	B	C	C	C	C	C	D	D	D
560	56	B	B	B	B	B	C	C	C	C	C	D	D	D
680	68	B	B	B	B	B	C	C	C	C	C	D	D	D
820	82	B	B	B	B	B	C	C	C	C	C	D	D	D
101	100pF	B	B	B	B	B	C	C	C	C	C	D	D	D
121	120	B	B	B	B	B	C	C	C	C	C	D	D	D
151	150	B	B	B	B	B	C	C	C	C	C	D	D	D
181	180	B	B	B	B	B	C	C	C	C	C	D	D	D
221	220	B	B	B	B	B	C	C	C	C	C	D	D	D
271	270	B	B	B	B	B	C	C	C	C	C	D	D	D
331	330	B	B	B	B	B	C	C	C	C	C	D	D	D
391	390	B	B	B	B	B	C	C	C	C	C	D	D	D
471	470	B	B	B	B	B	C	C	C	C	C	D	D	D
561	560	B	B	B	B	B	C	C	C	C	C	D	D	D
681	680	B	B	B	B	B	C	C	C	C	C	D	D	D
821	820	B	B	B	B	B	C	C	C	C	C	D	D	D
102	1000pF	B	B	B	B	B	C	C	C	C	C	D	D	D
122	1200	B	B	B	B	B	C	C	C	C	C	D	D	D
152	1500	B	B	B	B	B	C	C	C	C	C	D	D	D
182	1800	B	B	B	B	B	C	C	C	C	C	D	D	D
222	2200	B	B	B	B	B	C	C	C	C	C	D	D	D
272	2700	B	B	B	B	B	C	C	C	C	C	D	D	D
332	3300	B	B	B	B	B	C	C	C	C	C	D	D	D
392	3900	B	B	B	B	B	C	C	C	C	C	D	D	D
472	4700	B	B	B	B	B	C	C	C	C	C	D	D	D
562	5600	B	B	B	B	B	C	C	C	C	C	D	D	D
682	6800	C	C	C	C	C	C	C	C	C	C	D	D	D
822	8200	D	D	D	D	D	C	C	C	C	C	D	D	D
103	0.01uF	D	D	D	D	D	C	C	C	C	C	D	D	D
123	0.012	D^	D^				C	C	D	D	D	D	D	D
153	0.015	D^	D^				C	C	D	D	D	D	D	D
183	0.018	D^	D^									D	D	D
223	0.022	D^	D^									D	D	D
273	0.027	D^	D^									D	D	D
333	0.033	D^	D^									D	D	D
393	0.039	G^	G^											

- The letter in cell is expressed the symbol of product thickness
- The “^” mark is expressed product with Ag/Ni/Sn



Capacitance & Voltage (X7R)

Dielectric		X7R															
EIA	Size	0402				0603					0805						
Code	VDCW	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V
101	100pF	N	N	N	N		S	S	S	S	S		B	B	B	B	B
121	120	N	N	N	N		S	S	S	S	S		B	B	B	B	B
151	150	N	N	N	N		S	S	S	S	S		B	B	B	A/B/T	B/T
181	180	N	N	N	N		S	S	S	S	S		B	B	B	A/B/T	B/T
221	220	N	N	N	N		S	S	S	S	S		B	B	B	A/B/T	B/T
271	270	N	N	N	N		S	S	S	S	S		B	B	B	A/B/T	B/T
331	330	N	N	N	N		S	S	S	S	S		B	B	B	A/B/T	B/T
391	390	N	N	N	N		S	S	S	S	S		B	B	B	A/B/T	B/T
471	470	N	N	N	N		S	S	S	S	S		B	B	B	A/B/T	B/T
561	560	N	N	N	N		S	S	S	S	S		B	B	B	A/B/T	B/T
681	680	N	N	N	N		S	S	S	S	S		B	B	B	A/B/T	B/T
821	820	N	N	N	N		S	S	S	S	S		B	B	B	A/B/T	B/T
102	1000pF	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
122	1200	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
152	1500	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
182	1800	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
222	2200	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
272	2700	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
332	3300	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
392	3900	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
472	4700	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
562	5600	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
682	6800	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
822	8200	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
103	0.01μF	N	N	N	N		S	S	S	S	S		B	B	A/B/T	A/B/T	B/T
123	0.012	N	N	N			S	S	S	S			B	B	A/B/T	A/B/T	B/T
153	0.015	N	N	N			S	S	S	S			B	B	A/B/T	A/B/T	B/T
183	0.018	N	N	N			S	S	S	S			B	B	A/B/T	A/B/T	B/T
223	0.022	N	N	N			S	S	S	S			B	B	A/B/T	A/B/T	B/T
273	0.027	N	N	N			S	S	S	S			B	B	A/B/T	A/B/T	D
333	0.033	N	N	N			S	S	S	X			B	B	A/B/T	A/B/T	D
393	0.039	N	N	N			S	S	S	X			B	B	A/B/T	A/B/T	D
473	0.047	N	N	N			S	S	S	X			B	B	B/T	B/T	D
563	0.056	N	N				S	S	S	X			B	B	B/T	B/T	D
683	0.068	N	N				S	S	S	X			B	B	B/T	B/T	D
823	0.082	N	N				S	S	S	X			B	B	B/T	B/T	D
104	0.10μF	N	N	N	N		S	S	S	X			B	B	B/T	B/T	D
124	0.12						S	X	X				D	D	D/T	D/T	
154	0.15						S	X	X				D	D	D/T	D/T	
184	0.18						S	X	X				D	D	D/T	D/T	
224	0.22	N	N			X	S	X	X				D	D	D/T	D/T	
274	0.27					X	X	X	X				D	D	D/T	D/T	
334	0.33					X	X	X	X				D	I	I	I	
394	0.39					X	X	X	X				D	D	D	I	
474	0.47					X	X	X	X				D	I	I	I	
564	0.56					X	X	X					D	D	D		
684	0.68					X	X	X					D	D	D		
824	0.82					X	X	X					D	D	D		
105	1.0μF					X	X	X	X				D	D	D		
155	1.5												I	I	I	I	
225	2.2						X					I	I	I	I		
335	3.3																
475	4.7											I	I	I	I		
106	10											I	I				

■ The letter in cell is expressed the symbol of product thickness

Capacitance & Voltage (X7R)

Dielectric		X7R															
EIA	Size	1206					1210					1812					
Code	VDCW	6.3V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V
101	100pF																
121	120																
151	150		B	B	B	B	B										
181	180		B	B	B	B	B										
221	220		B	B	B	B	B										
271	270		B	B	B	B	B										
331	330		B	B	B	B	B										
391	390		B	B	B	B	B										
471	470		B	B	B	B	B										
561	560		B	B	B	B	B										
681	680		B	B	B	B	B										
821	820		B	B	B	B	B										
102	1000pF		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
122	1200		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
152	1500		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
182	1800		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
222	2200		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
272	2700		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
332	3300		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
392	3900		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
472	4700		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
562	5600		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
682	6800		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
822	8200		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
103	0.01μF		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
123	0.012		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
153	0.015		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
183	0.018		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
223	0.022		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
273	0.027		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
333	0.033		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
393	0.039		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
473	0.047		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
563	0.056		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
683	0.068		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
823	0.082		B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
104	0.10μF		B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
124	0.12		B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
154	0.15		C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
184	0.18		C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
224	0.22		C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
274	0.27		C	C	C	D	G	C	C	C	C	G	D	D	D	D	D
334	0.33		C	C	C	D	G	C	C	C	D	G	D	D	D	D	D
394	0.39		C	C	J	P	G	C	C	C	D	M	D	D	D	D	D
474	0.47		J	J	J	P	G	C	C	C	D	M	D	D	D	D	K
564	0.56		J	J	J	P	P	D	D	D	D	M	D	D	D	D	K
684	0.68		J	J	J	P	P	D	D	D	D	K	D	D	D	K	K
824	0.82		J	J	J	P	P	D	D	D	D	K	D	D	D	K	K
105	1.0μF		J	J	J	P	P	D	D	D	D	K	D	D	D	K	K
155	1.5	J	J	J	P							M					K
225	2.2	J	J	J	P	P			K	G		M				M	M
335	3.3	P	P	P	P						G						
475	4.7	P	P	P	P	P		K	K	K	M						
106	10	P	P	P	P			K	K	K	M						
226	22		P						M	M							

■ The letter in cell is expressed the symbol of product thickness



## Environmental Characteristics

Size	0402, 0603, 0805, 1206, 1210, 1812			
Dielectric	NPO	X7R	X5R	Y5V
Capacitance*	0.5pF~0.039μF	100pF~22μF	27nF~100μF	10nF~100μF
Capacitance tolerance	Cap ≤ 5pF: B (±0.1pF), C (±0.25pF) 5pF < Cap < 10pF: C (±0.25pF), D (±0.50pF) Cap ≥ 10pF: J (±5%)	J (± 5%) K (±10%)		M (±20%) Z (-20 / +80%)
Rated voltage (VDCW)	10V, 16V, 25V, 50V, 100V	6.3V, 10V, 16V, 25V, 35V, 50V, 100V		
Q*	Cap < 30pF: Q ≥ 400 +20C Cap ≥ 30pF: Q ≥ 1000	Note 1		
Insulation resistance at Ur**	≥ 10GΩ or R×C ≥ 500Ω×F Whichever is less			
Operating temperature	-55 to +125°C		-55 to 85°C	-25 to +85°C
Capacitance change	±30 ppm	±15%		+30/-80%
Termination	Ni/Sn (lead-free termination)			

- \*\*Measured at the condition of 30~70% related humidity
- NPO: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap ≤ 1000pF and 1.0±0.2Vrms, 1.0 KHz±10% for Cap > 1000pF, 25°C ambient temperature
- X7R: Apply 1.0±0.2Vrms, 1.0KHz±10% at the condition of 25°C ambient temperature
- Y5V: Apply 1.0±0.2Vrms, 1.0 KHz±10% at the condition of 20°C ambient temperature

### Note 1:

#### X7R / X5R

Rated vol.	D.F.	Exception of D.F.	
≥ 50V	≤ 2.5%	≤ 3%	0603 ≥ 0.047μF 0805 ≥ 0.18μF 1206 ≥ 0.47μF
25V	≤ 3.5%	≤ 5%	0805 ≥ 1μF 1210 ≥ 10μF
		≤ 7%	0603 ≥ 0.33μF 1206 ≥ 4.7μF
		≤ 10%	0402 ≥ 0.10μF 0603 ≥ 0.47μF 0805 ≥ 2.2μF 1206 ≥ 6.8μF
16V	≤ 3.5%	≤ 5%	0402 ≥ 0.033μF 0603 ≥ 0.15μF 0805 ≥ 0.68μF 1206 ≥ 2.2μF 1210 ≥ 4.7μF
		≤ 10%	0603 ≥ 0.68μF 0805 ≥ 0.68μF 1206 ≥ 4.7μF 1210 ≥ 22μF
10V	≤ 5.0%	≤ 10%	0402 ≥ 0.33μF 0603 ≥ 0.33μF 0805 ≥ 2.2μF 1206 ≥ 2.2μF 1210 ≥ 22μF
		≤ 15%	0402 ≥ 1μF
6.3V	≤ 10%	≤ 15%	0603 ≥ 10μF 0805 ≥ 4.7μF 1210 ≥ 100μF
		≤ 20%	0402 ≥ 2.2μF

#### Y5V

Rated vol.	D.F.	Exception of D.F.	
≥ 50V	≤ 5.0%	≤ 7%	0603 ≥ 0.1μF 0805 ≥ 0.47μF 1206 ≥ 4.7μF
35V	7%	—	—
25V	≤ 5.0%	≤ 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
16V (C < 1.0μF)	≤ 7.0%	≤ 9%	0402 ≥ 0.068μF 0603 ≥ 0.68μF
		≤ 12.5%	0402 ≥ 0.22μF
16V (C ≥ 1.0μF)	≤ 9.0%	≤ 12.5%	0603 ≥ 2.2μF 0805 ≥ 3.3μF 1206 ≥ 10μF 1210 ≥ 22μF 1812 ≥ 47μF
10V	≤ 12.5%	≤ 20%	0402 ≥ 0.47μF
6.3V	≤ 20%	—	—

## Environmental Characteristics

Item	Requirement	Test Method																																																																										
External Appearance	No defects which may affect performance	Visual inspection & Dimension measurement																																																																										
Capacitance(Cap.)	Within the specified tolerance that refers on page2	NPO: (Class I) Cap $\leq$ 1000pF 1.0 $\pm$ 0.2Vrms, 1MHz $\pm$ 10% Cap>1000pF 1.0 $\pm$ 0.2Vrms, 1KHz $\pm$ 10%																																																																										
Dissipation Factor (D.F.) or Quality factor (Q=1/D.F.)	<p>NPO: Cap<math>\geq</math> 30pF, Q<math>\geq</math> 1000; Cap&lt;30pF, Q<math>\geq</math> 400+20C X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.<math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq</math> 50V</td> <td rowspan="3">2.5%</td> <td>3%</td> <td>0201(50V); 0603<math>\geq</math>0.047<math>\mu</math>F 0805<math>\geq</math>0.18<math>\mu</math>F; 1206<math>\geq</math>0.47<math>\mu</math>F</td> </tr> <tr> <td>5%</td> <td>1210<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>7%</td> <td>0603<math>\geq</math>1<math>\mu</math>F; 0805<math>\geq</math>1<math>\mu</math>F 1206<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">3.5%</td> <td>5%</td> <td>0201<math>\geq</math>0.01<math>\mu</math>F; 0805<math>\geq</math>1<math>\mu</math>F 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td>7%</td> <td>0603<math>\geq</math>0.33<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>10%</td> <td>0402<math>\geq</math>0.10<math>\mu</math>F; 0603<math>\geq</math>0.47<math>\mu</math>F 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>6.8<math>\mu</math>F 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">3.5%</td> <td>5%</td> <td>0201<math>\geq</math>0.01<math>\mu</math>F; 0402<math>\geq</math>0.033<math>\mu</math>F 0603<math>\geq</math>0.15<math>\mu</math>F; 0805<math>\geq</math>0.68<math>\mu</math>F 1206<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>10%</td> <td>0402<math>\geq</math>0.22<math>\mu</math>F; 0603<math>\geq</math>0.68<math>\mu</math>F 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0201<math>\geq</math>0.012<math>\mu</math>F; 0402<math>\geq</math>0.33<math>\mu</math>F 0603<math>\geq</math>0.33<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F 1206<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td>15%</td> <td>0201<math>\geq</math>0.1<math>\mu</math>F; 0402<math>\geq</math>1<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">10%</td> <td>15%</td> <td>0201<math>\geq</math>0.01<math>\mu</math>F; 0402<math>\geq</math>1<math>\mu</math>F 0603<math>\geq</math>10<math>\mu</math>F; 0805<math>\geq</math>4.7<math>\mu</math>F 1206<math>\geq</math>47<math>\mu</math>F; 1210<math>\geq</math>100<math>\mu</math>F</td> </tr> <tr> <td>20%</td> <td>0402<math>\geq</math>2.2<math>\mu</math>F</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.<math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq</math> 50V</td> <td>5%</td> <td>7%</td> <td>0603<math>\geq</math>0.1<math>\mu</math>F; 0805<math>\geq</math>0.47<math>\mu</math>F 1206<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>35V</td> <td>7%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">5%</td> <td>7%</td> <td>0402<math>\geq</math>0.047<math>\mu</math>F; 0603<math>\geq</math>0.1<math>\mu</math>F 0805<math>\geq</math>0.33<math>\mu</math>F; 1206<math>\geq</math>1<math>\mu</math>F 1210<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>9%</td> <td>0402<math>\geq</math>0.068<math>\mu</math>F; 0603<math>\geq</math>0.47<math>\mu</math>F 1206<math>\geq</math>4.7<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0<math>\mu</math>F)</td> <td rowspan="2">7%</td> <td>9%</td> <td>0402<math>\geq</math>0.068<math>\mu</math>F; 0603<math>\geq</math>0.68<math>\mu</math>F</td> </tr> <tr> <td>12.5%</td> <td>0402<math>\geq</math>0.22<math>\mu</math>F</td> </tr> <tr> <td>16V (C <math>\geq</math> 1.0<math>\mu</math>F)</td> <td>9%</td> <td>12.5%</td> <td>0603<math>\geq</math>2.2<math>\mu</math>F; 0805<math>\geq</math>3.3<math>\mu</math>F 1206<math>\geq</math>10<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F 1812<math>\geq</math>47<math>\mu</math>F</td> </tr> <tr> <td>10V</td> <td>12.5%</td> <td>20%</td> <td>0402<math>\geq</math>0.47<math>\mu</math>F</td> </tr> <tr> <td>6.3V</td> <td>20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq$ 50V	2.5%	3%	0201(50V); 0603 $\geq$ 0.047 $\mu$ F 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F	5%	1210 $\geq$ 4.7 $\mu$ F	7%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F	25V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1210 $\geq$ 10 $\mu$ F	7%	0603 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F	10%	0402 $\geq$ 0.10 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 6.8 $\mu$ F 1210 $\geq$ 22 $\mu$ F	16V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 0.033 $\mu$ F 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F	10%	0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F 1210 $\geq$ 22 $\mu$ F	10V	5%	10%	0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.33 $\mu$ F 0603 $\geq$ 0.33 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	15%	0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F	6.3V	10%	15%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 1 $\mu$ F 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 4.7 $\mu$ F 1206 $\geq$ 47 $\mu$ F; 1210 $\geq$ 100 $\mu$ F	20%	0402 $\geq$ 2.2 $\mu$ F	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq$ 50V	5%	7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F	35V	7%	—	—	25V	5%	7%	0402 $\geq$ 0.047 $\mu$ F; 0603 $\geq$ 0.1 $\mu$ F 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F 1210 $\geq$ 4.7 $\mu$ F	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	16V (C < 1.0 $\mu$ F)	7%	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F	12.5%	0402 $\geq$ 0.22 $\mu$ F	16V (C $\geq$ 1.0 $\mu$ F)	9%	12.5%	0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 3.3 $\mu$ F 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F 1812 $\geq$ 47 $\mu$ F	10V	12.5%	20%	0402 $\geq$ 0.47 $\mu$ F	6.3V	20%	-	-	<p>X7R, X5R, Y5V: (Class II) Cap<math>\leq</math> 10<math>\mu</math>F 1.0<math>\pm</math>0.2Vrms, 1KHz<math>\pm</math>10% Cap&gt;10<math>\mu</math>F 0.5<math>\pm</math>0.2Vrms, 120Hz<math>\pm</math>10%</p>
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																										
$\geq$ 50V	2.5%	3%	0201(50V); 0603 $\geq$ 0.047 $\mu$ F 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F																																																																									
		5%	1210 $\geq$ 4.7 $\mu$ F																																																																									
		7%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F																																																																									
25V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F 1210 $\geq$ 10 $\mu$ F																																																																									
		7%	0603 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F																																																																									
		10%	0402 $\geq$ 0.10 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 6.8 $\mu$ F 1210 $\geq$ 22 $\mu$ F																																																																									
16V	3.5%	5%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 0.033 $\mu$ F 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 4.7 $\mu$ F																																																																									
		10%	0402 $\geq$ 0.22 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F 1210 $\geq$ 22 $\mu$ F																																																																									
10V	5%	10%	0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.33 $\mu$ F 0603 $\geq$ 0.33 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F																																																																									
		15%	0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F																																																																									
6.3V	10%	15%	0201 $\geq$ 0.01 $\mu$ F; 0402 $\geq$ 1 $\mu$ F 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 4.7 $\mu$ F 1206 $\geq$ 47 $\mu$ F; 1210 $\geq$ 100 $\mu$ F																																																																									
		20%	0402 $\geq$ 2.2 $\mu$ F																																																																									
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																										
$\geq$ 50V	5%	7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F																																																																									
35V	7%	—	—																																																																									
25V	5%	7%	0402 $\geq$ 0.047 $\mu$ F; 0603 $\geq$ 0.1 $\mu$ F 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F 1210 $\geq$ 4.7 $\mu$ F																																																																									
		9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F																																																																									
16V (C < 1.0 $\mu$ F)	7%	9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F																																																																									
		12.5%	0402 $\geq$ 0.22 $\mu$ F																																																																									
16V (C $\geq$ 1.0 $\mu$ F)	9%	12.5%	0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 3.3 $\mu$ F 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F 1812 $\geq$ 47 $\mu$ F																																																																									
10V	12.5%	20%	0402 $\geq$ 0.47 $\mu$ F																																																																									
6.3V	20%	-	-																																																																									
Dielectric Strength	No evidence of damage or flash over during test	<p>To apply voltage(<math>\leq</math> 100V) 250% Duration: 1 to 5sec Charge and discharge current less than 50mA</p> <p>To apply voltage: 200V~300V <math>\geq</math> 2 time VDC 500V~999V <math>\geq</math> 1.5 time VDC 1000V~3000V <math>\geq</math> 1.2 time VDC Cut-off, set at 10mA TEST=15 sec. RAMP=0</p>																																																																										

Item	Requirement	Test Method																				
Insulation Resistance	10GΩ or R×C≥ 500Ω-F Whichever is smaller X7R, X5R, Y5V:	To apply rated voltage for max. 120sec																				
	<table border="1"> <tr> <td>Rated Voltage</td> <td>Insulation Resistance</td> </tr> <tr> <td>100V: X7R</td> <td rowspan="5">RxC ≥ 100Ω-F</td> </tr> <tr> <td>50V: 0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF</td> </tr> <tr> <td>25V: 0402≥1uF;0603≥2.2uF;0805≥2.2uF 1206≥10uF;1210≥10uF</td> </tr> <tr> <td>16V: 0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF</td> </tr> <tr> <td>10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF</td> </tr> <tr> <td>6.3V</td> <td></td> </tr> </table>		Rated Voltage	Insulation Resistance	100V: X7R	RxC ≥ 100Ω-F	50V: 0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF	25V: 0402≥1uF;0603≥2.2uF;0805≥2.2uF 1206≥10uF;1210≥10uF	16V: 0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF	10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF	6.3V											
	Rated Voltage		Insulation Resistance																			
100V: X7R	RxC ≥ 100Ω-F																					
50V: 0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF																						
25V: 0402≥1uF;0603≥2.2uF;0805≥2.2uF 1206≥10uF;1210≥10uF																						
16V: 0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF																						
10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF																						
6.3V																						
≥ 10GΩ or 100Ω -F whichever is smaller Rated voltage: 200V~630V	To apply rated voltage(500V max.) for 60sec.																					
≥ 10GΩ Rated voltage: >630V	To apply 500V for 60sec.																					
Temperature Characteristic of Capacitance	<table border="1"> <tr> <td>T.C.</td> <td>Capacitance Change</td> </tr> <tr> <td>NPO</td> <td>±30 (ppm/°C)</td> </tr> <tr> <td>X7R</td> <td>±15%</td> </tr> <tr> <td>X5R</td> <td>±15%</td> </tr> <tr> <td>Y5V</td> <td>+30% ~ -80%</td> </tr> </table>	T.C.	Capacitance Change	NPO	±30 (ppm/°C)	X7R	±15%	X5R	±15%	Y5V	+30% ~ -80%	<p>With no electrical load.</p> <table border="1"> <tr> <td>T.C.</td> <td>Operating Temp</td> </tr> <tr> <td>NPO</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X7R</td> <td>-55 ~ 125°C at 25°C</td> </tr> <tr> <td>X5R</td> <td>-55 ~ 85°C at 25°C</td> </tr> <tr> <td>Y5V</td> <td>-25 ~ 85°C at 20°C</td> </tr> </table>	T.C.	Operating Temp	NPO	-55 ~ 125°C at 25°C	X7R	-55 ~ 125°C at 25°C	X5R	-55 ~ 85°C at 25°C	Y5V	-25 ~ 85°C at 20°C
	T.C.	Capacitance Change																				
NPO	±30 (ppm/°C)																					
X7R	±15%																					
X5R	±15%																					
Y5V	+30% ~ -80%																					
T.C.	Operating Temp																					
NPO	-55 ~ 125°C at 25°C																					
X7R	-55 ~ 125°C at 25°C																					
X5R	-55 ~ 85°C at 25°C																					
Y5V	-25 ~ 85°C at 20°C																					
Adhesive Strength of Termination	No remarkable damage or removal of the terminations	Pressurizing force: 0201:2N 0402&0603:5N>0603:10N Test time: 10±1 sec																				
Vibration Resistance	No remarkable damage Cap change and Q/D.F.: To meet initial spec	Vibration frequency: 10~55Hz/min Total amplitude: 1.5mm Test time: 6hrs.(two hrs each in three mutually Perpendicular directions.)																				
Solderability	95% min. coverage of all metalized area.	Solder temperature: 235±5°C Dipping time: 2±0.5 sec.																				
Bending Test	No remarkable damage Cap change: NPO: within±5% or 0.5pF whichever is larger X7R, X5R: within±12.5% Y5V: within±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5±1sec. Measurement to be made after keeping at room temp. for 24±2hrs(Class I) or 48±4hrs(Class II) (Thickness>1.0mm, Thickness≤1.0mm)																				
Resistance to Soldering Heat	No remarkable damage Cap change: NPO: within±2.5% or 0.25pF whichever is larger X7R, X5R: Within±7.5% Y5V: within±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25%max. leaching on each edge.	Solder temperature: 260±5°C Dipping time: 10±1sec Preheating: 120 to 150°C for 1minute before immerse the capacitor in a eutectic solder. Before initial measurement(Class II only): Perform 150+0/-10°C for 1hr and then set for 24±4hrs at room temp. Measurement to be made after keep at room temp. for 24±2 hrs.																				
Temperature Cycle	No remarkable damage. Cap change: NPO: within±2.5% or 0.25pF whichever is larger X7R, X5R: within±7.5% Y5V: within±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements.	Conduct the five cycles according to the temperature and time. <table border="1"> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min)</th> </tr> <tr> <td>1</td> <td>Min. operating temp.+0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp</td> <td>2-3</td> </tr> <tr> <td>3</td> <td>Max. operating temp.+3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2-3</td> </tr> </table> <p>Before initial measurement(Cass II only): Perform 150+0/-10°C for 1hr and then set for 48±4 hrs at room temp. Measurement to be made after keeping at room temp. for 24±2 hrs.(Class I) or 48±4 hrs.(Class II).</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					
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																				

Item	Requirement	Test Method																																																																																
Humidity (steady state)	<p>No remarkable damage.</p> <p>Cap change: NPO: within±5% or 0.5pF whichever is large X7R, X5R: ≥ 10V, within±12.5%; 6.3V, within±25% Y5V: ≥ 10V, within±30%; 6.3V, within±30/-40% Q/D.F. value: NPO: More than 30pF Q ≥ 350, 10pF ≤ C ≤ 30pF, Q ≥ 275+2.5C Less than 10pF Q ≥ 200+10C X7R, X5R:</p> <table border="1" data-bbox="293 443 927 1167"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF;1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="293 1205 927 1686"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <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>15%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C&lt;1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF;0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ .0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥ 10V 1GΩ or 50Ω-F whichever is smaller.</p> <p>Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="293 1756 927 2054"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="5">Rx C ≥ 10Ω-F</td> </tr> <tr> <td>50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF</td> </tr> <tr> <td>25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF	15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF	20%	0201 ≥ 0.1μF;0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF	16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ .0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	Rx C ≥ 10Ω-F	50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF	25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF	16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF	10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF	<p>Test temp: 40±2℃ Humidity: 90~95% RH Test time: 500+24/-0hrs Measurement to be made after keeping at room temp. for 24±2hrs.</p>
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																
≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF;1206 ≥ 0.47μF																																																																															
		10%	1210 ≥ 4.7μF																																																																															
		20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF																																																																															
25V	5.0%	10%	0201 ≥ 0.01μF;0805 ≥ 1μF 1210 ≥ 10μF																																																																															
		14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF																																																																															
		15%	0402 ≥ 0.1μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF																																																																															
16V	5%	10%	0603 ≥ 0.15μF;0603 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF																																																																															
		15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																															
10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF																																																																															
		20%	0201 ≥ 0.1μF;0402 ≥ 1μF																																																																															
6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF																																																																															
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF																																																																															
35V	10%	—	—																																																																															
25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.33μF;1206 ≥ 1μF 1210 ≥ 4.7μF																																																																															
		15%	0402 ≥ 0.068μF;0603 ≥ 0.47μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																															
16V (C<1.0μF)	10%	12.5%	0402 ≥ 0.068μF;0603 ≥ 0.68μF																																																																															
		20%	0402 ≥ 0.22μF																																																																															
16V (C ≥ .0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF;1210 ≥ 22μF 1812 ≥ 47μF																																																																															
10V	20%	30%	0402 ≥ 0.47μF																																																																															
6.3V	30%	-	-																																																																															
Rated voltage	Insulation Resistance																																																																																	
100V:X7R	Rx C ≥ 10Ω-F																																																																																	
50V:0603 ≥ 1uF;0805 ≥ 1uF;1206 ≥ 2.2uF 1210 ≥ 4.7uF																																																																																		
25V:0402 ≥ 1uF;0603 ≥ 2.2uF 0805 ≥ 2.2uF; 1206 ≥ 10uF;1210 ≥ 10uF																																																																																		
16V:0402 ≥ 0.22uF;0603 ≥ 1uF;0805 ≥ 2.2uF 1206 ≥ 10uF;1210 ≥ 47uF																																																																																		
10V: 0201 ≥ 47nF;0402 ≥ 0.47uF;0603 ≥ 0.47uF 0805 ≥ 2.2uF;1206 ≥ 4.7uF;1210 ≥ 47uF																																																																																		

Item	Requirement	Test Method																																																																																	
Humidity load	<p>No remarkable damage.            Cap change:            NPO:±7.5% or 0.75pF whichever is larger            X7R, X5R: ≥ 10V, within±12.5%; 6.3V, 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:            NPO: C ≥ 30pF,Q ≥ 200; C &lt; 30pF,Q ≥ 100+10/3C            X7R, X5R:</p> <table border="1" data-bbox="293 405 943 1167"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>20%</td> <td>0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF;1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.10μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF</td> </tr> <tr> <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>15%</td> <td>0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="293 1193 943 1682"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥ 10V 500MΩ or 25Ω-F (Whichever is smaller)            Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="293 1738 943 2065"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="6">RxC ≥ 5Ω-F</td> </tr> <tr> <td>50V:0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF</td> </tr> <tr> <td>25V:0402≥1uF;0603≥2.2uF 0805≥2.2uF; 1206≥10uF;1210≥10uF</td> </tr> <tr> <td>16V:0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF</td> </tr> <tr> <td>10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF	25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF	14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF	15%	0402 ≥ 0.10μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF	16V	5%	10%	0603 ≥ 0.15μF;0805 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF	15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF	10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF	20%	0201 ≥ 0.1μF;0402 ≥ 1μF	6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF	35V	10%	—	—	25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF	10V	20%	30%	0402 ≥ 0.47μF	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V:X7R	RxC ≥ 5Ω-F	50V:0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF	25V:0402≥1uF;0603≥2.2uF 0805≥2.2uF; 1206≥10uF;1210≥10uF	16V:0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF	10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF	6.3V	<p>Test temp: 40±2°C            Humidity: 90~95%RH            Test time: 500+24/-0 hrs            To apply voltage: Rated voltage(Max. 500V)            Measurement to be made after keeping at room temp for 24±2hrs.(Class I) or 48±4hrs.(Class II)</p>
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																	
≥ 50V	3.0%	6%	0201(50V);0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																																																
		10%	1210 ≥ 4.7μF																																																																																
		20%	0603 ≥ 1μF;0805 ≥ 1μF 1206 ≥ 2.2μF;1210 ≥ 10μF																																																																																
25V	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF 1210 ≥ 10μF																																																																																
		14%	0603 ≥ 0.33μF;1206 ≥ 4.7μF																																																																																
		15%	0402 ≥ 0.10μF;0603 ≥ 0.47μF 0805 ≥ 2.2μF;1206 ≥ 6.8μF 1210 ≥ 22μF																																																																																
16V	5%	10%	0603 ≥ 0.15μF;0805 ≥ 0.68μF 1206 ≥ 2.2μF;1210 ≥ 4.7μF																																																																																
		15%	0201 ≥ 0.01μF;0402 ≥ 0.033μF 0603 ≥ 0.68μF;0805 ≥ 2.2μF 1206 ≥ 4.7μF;1210 ≥ 22μF																																																																																
10V	7.5%	15%	0201 ≥ 0.012μF;0402 ≥ 0.33μF 0603 ≥ 0.33μF;0805 ≥ 2.2μF 1206 ≥ 2.2μF;1210 ≥ 22μF																																																																																
		20%	0201 ≥ 0.1μF;0402 ≥ 1μF																																																																																
6.3V	15%	30%	0201 ≥ 0.1μF;0402 ≥ 1μF 0603 ≥ 10μF;0805 ≥ 4.7μF 1210 ≥ 100μF																																																																																
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																	
≥ 50 V	7.5%	10%	0603 ≥ 0.1μF;0805 ≥ 0.47μF 1206 ≥ 4.7μF																																																																																
35V	10%	—	—																																																																																
25V	7.5%	10%	0402 ≥ 0.047μF;0603 ≥ 0.1μF 0805 ≥ 0.033μF; 1206 ≥ 1μF 1210 ≥ 4.7μF																																																																																
		15%	0402 ≥ 0.068μF; 0603 ≥ 0.1μF 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																
16V (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																																
		20%	0402 ≥ 0.22μF																																																																																
16V (C ≥ 1.0μF)	12.5%	20%	0603 ≥ 2.2μF;0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF																																																																																
10V	20%	30%	0402 ≥ 0.47μF																																																																																
6.3V	30%	-	-																																																																																
Rated voltage	Insulation Resistance																																																																																		
100V:X7R	RxC ≥ 5Ω-F																																																																																		
50V:0603≥1uF;0805≥1uF;1206≥2.2uF 1210≥4.7uF																																																																																			
25V:0402≥1uF;0603≥2.2uF 0805≥2.2uF; 1206≥10uF;1210≥10uF																																																																																			
16V:0402≥ 0.22uF;0603≥1uF;0805≥2.2uF 1206≥10uF;1210≥47uF																																																																																			
10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF																																																																																			
6.3V																																																																																			



Item	Requirement	Test Method																																																																																																																																				
High Temperature Load (Endurance)	<p>No remarkable damage. Cap change: NPO: <math>\pm 3\%</math> or <math>\pm 0.3F</math> whichever is larger X7R, X5R: <math>\geq 10V</math>, within <math>\pm 12.5\%</math>; 6.3V, within <math>+30/-40\%</math> 10V: 0603 <math>\geq 4.7\mu F</math>; 0402 <math>\geq 1\mu F</math>; 0201 <math>\geq 0.1\mu F</math>, within <math>\pm 25\%</math> Q/D.F. value: NPO: More than 30pF, <math>Q \geq 350</math> 10pF <math>\leq C &lt; 30pF</math>, <math>Q \geq 275 + 2.5C</math> Less than 10pF, <math>Q \geq 200 + 10C</math> X7R, X5R:</p> <table border="1" data-bbox="308 443 935 1160"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq 50V</math></td> <td rowspan="3">3.0%</td> <td>6%</td> <td>0201(50V); 0603 <math>\geq 0.047\mu F</math> 0805 <math>\geq 0.18\mu F</math>; 1206 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>10%</td> <td>1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>20%</td> <td>0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0805 <math>\geq 1\mu F</math> 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>14%</td> <td>0603 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.10\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 6.8\mu F</math> 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 <math>\geq 0.15\mu F</math>; 0805 <math>\geq 0.68\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0201 <math>\geq 0.01\mu F</math>; 0402 <math>\geq 0.033\mu F</math> 0603 <math>\geq 0.68\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0201 <math>\geq 0.012\mu F</math>; 0402 <math>\geq 0.33\mu F</math> 0603 <math>\geq 0.33\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td>20%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 1\mu F</math> 0603 <math>\geq 10\mu F</math>; 0805 <math>\geq 4.7\mu F</math> 1210 <math>\geq 100\mu F</math></td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="308 1189 935 1697"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td><math>\geq 50V</math></td> <td>7.5%</td> <td>10%</td> <td>0603 <math>\geq 0.1\mu F</math>; 0805 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>35V</td> <td>10%</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 <math>\geq 0.047\mu F</math>; 0603 <math>\geq 0.1\mu F</math> 0805 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 1\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>15%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">16V (C &lt; 1.0<math>\mu F</math>)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 <math>\geq 0.068\mu F</math>; 0603 <math>\geq 0.68\mu F</math></td> </tr> <tr> <td>20%</td> <td>0402 <math>\geq 0.22\mu F</math></td> </tr> <tr> <td>16V (C <math>\geq 1.0\mu F</math>)</td> <td>12.5%</td> <td>20%</td> <td>0603 <math>\geq 2.2\mu F</math>; 0805 <math>\geq 3.3\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 22\mu F</math> 1812 <math>\geq 47\mu F</math></td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 <math>\geq 0.47\mu F</math></td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: <math>\geq 10V</math> 1G<math>\Omega</math> or 50<math>\Omega</math>-F whichever is smaller Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="308 1760 935 2058"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="5">RxC <math>\geq</math> 10<math>\Omega</math>-F</td> </tr> <tr> <td>50V: 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 1\mu F</math>; 1206 <math>\geq 2.2\mu F</math> 1210 <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>25V: 0402 <math>\geq 1\mu F</math>; 0603 <math>\geq 2.2\mu F</math>; 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 10\mu F</math></td> </tr> <tr> <td>16V: 0402 <math>\geq 0.22\mu F</math>; 0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 2.2\mu F</math> 1206 <math>\geq 10\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> <tr> <td>10V: 0201 <math>\geq 47nF</math>; 0402 <math>\geq 0.47\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 47\mu F</math></td> </tr> </tbody> </table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$	10%	1210 $\geq 4.7\mu F$	20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$	25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$	14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$	15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$	16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$	15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$	20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$	6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$	35V	10%	-	-	25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$	15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	16V (C < 1.0 $\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$	20%	0402 $\geq 0.22\mu F$	16V (C $\geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$	10V	20%	30%	0402 $\geq 0.47\mu F$	6.3V	30%	-	-	Rated voltage	Insulation Resistance	100V: X7R	RxC $\geq$ 10 $\Omega$ -F	50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$	25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$	16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$	10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$	<p>Test temp: NPO, X7R: 125<math>\pm 3^\circ C</math> X5R, Y5V: 85<math>\pm 3^\circ C</math> Test Time: 1000+25/-0 hrs To apply voltage: (1.1) 100% of rated voltage for below range.</p> <table border="1" data-bbox="967 353 1469 618"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td>C <math>\geq 0.1\mu F</math></td> </tr> <tr> <td>0402</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td>C <math>\geq 1.0\mu F</math></td> </tr> <tr> <td>0603</td> <td>X5R, X7R</td> <td>6.3V, 10V</td> <td>C <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>0805</td> <td>X5R, X7R</td> <td>6.3V</td> <td>C <math>\geq 22\mu F</math></td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R, X7R</td> <td>6.3V</td> <td>C <math>\geq 47\mu F</math></td> </tr> <tr> <td>NPO</td> <td>3000V</td> <td>C <math>\geq 1.5pF</math></td> </tr> </tbody> </table> <p>(1.2) 6.3V or C <math>\geq 10\mu F</math>: 150% of rated voltage (2) 10V <math>\leq U_r &lt; 500V</math>: 200% of rated voltage. 150% of rated voltage for below range.</p> <table border="1" data-bbox="967 712 1469 999"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0402</td> <td>X5R, X7R</td> <td>10V, 16V, 25V</td> <td>C <math>\geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C <math>\geq 0.47\mu F</math></td> </tr> <tr> <td rowspan="2">0603</td> <td>X5R, X7R</td> <td>10V, 16V</td> <td>C <math>\geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C <math>\geq 2.2\mu F</math></td> </tr> <tr> <td rowspan="2">0805</td> <td>X5R, X7R</td> <td>10V</td> <td>C <math>\geq 4.7\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C <math>\geq 4.7\mu F</math></td> </tr> </tbody> </table> <p>(3) 500V: 150% of rated voltage (4) <math>U_r \geq 630V</math>: 120% of rated voltage</p> <p>Test time: 1000+24/-0hrs Measurement to be made after keeping at room temp. for 24<math>\pm 2</math>hrs.</p>	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R, X7R	6.3V, 10V	C $\geq 0.1\mu F$	0402	X5R, X7R	6.3V, 10V	C $\geq 1.0\mu F$	0603	X5R, X7R	6.3V, 10V	C $\geq 4.7\mu F$	0805	X5R, X7R	6.3V	C $\geq 22\mu F$	1206	X5R, X7R	6.3V	C $\geq 47\mu F$	NPO	3000V	C $\geq 1.5pF$	Size	Dielectric	Rated voltage	Capacitance range	0402	X5R, X7R	10V, 16V, 25V	C $\geq 1.0\mu F$	Y5V	16V	C $\geq 0.47\mu F$	0603	X5R, X7R	10V, 16V	C $\geq 1.0\mu F$	Y5V	16V	C $\geq 2.2\mu F$	0805	X5R, X7R	10V	C $\geq 4.7\mu F$	Y5V	16V	C $\geq 4.7\mu F$
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																																																																																				
$\geq 50V$	3.0%	6%	0201(50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$																																																																																																																																			
		10%	1210 $\geq 4.7\mu F$																																																																																																																																			
		20%	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$																																																																																																																																			
25V	5.0%	10%	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ 1210 $\geq 10\mu F$																																																																																																																																			
		14%	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$																																																																																																																																			
		15%	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ 1210 $\geq 22\mu F$																																																																																																																																			
16V	5%	10%	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$																																																																																																																																			
		15%	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																			
10V	7.5%	15%	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																			
		20%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$																																																																																																																																			
6.3V	15%	30%	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1210 $\geq 100\mu F$																																																																																																																																			
Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$																																																																																																																																				
$\geq 50V$	7.5%	10%	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$																																																																																																																																			
35V	10%	-	-																																																																																																																																			
25V	7.5%	10%	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$																																																																																																																																			
		15%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$																																																																																																																																			
16V (C < 1.0 $\mu F$ )	10%	12.5%	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$																																																																																																																																			
		20%	0402 $\geq 0.22\mu F$																																																																																																																																			
16V (C $\geq 1.0\mu F$ )	12.5%	20%	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$																																																																																																																																			
10V	20%	30%	0402 $\geq 0.47\mu F$																																																																																																																																			
6.3V	30%	-	-																																																																																																																																			
Rated voltage	Insulation Resistance																																																																																																																																					
100V: X7R	RxC $\geq$ 10 $\Omega$ -F																																																																																																																																					
50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ 1210 $\geq 4.7\mu F$																																																																																																																																						
25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$																																																																																																																																						
16V: 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$																																																																																																																																						
10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$																																																																																																																																						
Size	Dielectric	Rated voltage	Capacitance range																																																																																																																																			
0201	X5R, X7R	6.3V, 10V	C $\geq 0.1\mu F$																																																																																																																																			
0402	X5R, X7R	6.3V, 10V	C $\geq 1.0\mu F$																																																																																																																																			
0603	X5R, X7R	6.3V, 10V	C $\geq 4.7\mu F$																																																																																																																																			
0805	X5R, X7R	6.3V	C $\geq 22\mu F$																																																																																																																																			
1206	X5R, X7R	6.3V	C $\geq 47\mu F$																																																																																																																																			
	NPO	3000V	C $\geq 1.5pF$																																																																																																																																			
Size	Dielectric	Rated voltage	Capacitance range																																																																																																																																			
0402	X5R, X7R	10V, 16V, 25V	C $\geq 1.0\mu F$																																																																																																																																			
	Y5V	16V	C $\geq 0.47\mu F$																																																																																																																																			
0603	X5R, X7R	10V, 16V	C $\geq 1.0\mu F$																																																																																																																																			
	Y5V	16V	C $\geq 2.2\mu F$																																																																																																																																			
0805	X5R, X7R	10V	C $\geq 4.7\mu F$																																																																																																																																			
	Y5V	16V	C $\geq 4.7\mu F$																																																																																																																																			

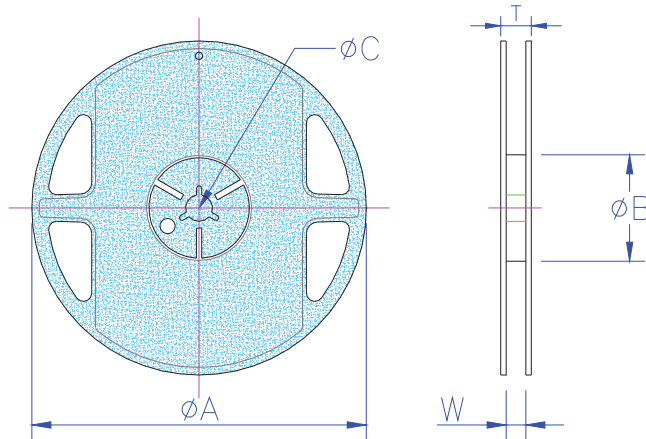
# ■ Packaging

## Packaging Quantity

Unit: mm

Type	Thickness / Symbol		Packaging (7" Reel)	
			Paper tape	Plastic tape
0201	0.30±0.03	L	15K	-
0402	0.50±0.05	N	10K	-
0603	0.80±0.10	S	4K	-
	0.80 +0.15 / -0.10	X	4K	-
0805	0.60±0.10	A	4K	-
	0.80±0.10	B	4K	-
	0.85±0.10	T	4K	-
	1.25±0.10	D	-	3K
	1.25±0.20	I	-	3K
1206	0.80±0.10	B	4K	-
	0.95±0.10	C	-	3K
	1.15±0.15	J	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	1.60 +0.30 / -0.10	P	-	2K
1210	0.95±0.10	C	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	1K
1808	1.25±0.10	D	-	2K
	2.00±0.20	K	-	1K
1812	1.25±0.10	D	-	1K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	0.5K
0612	0.80±0.10	B	4K	-

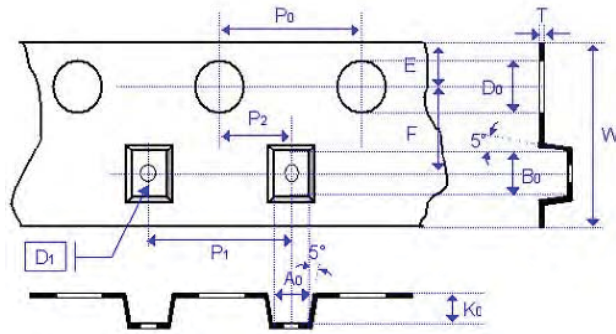
## Tape and Reel



Unit: mm

Type	Chip Size							
	0201	0402	0603	0805	1206/0612	1210	1808	1812
ΦC	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0
W	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	13.5±1.0	13.5±1.0
ΦA	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")
ΦB	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	80.0±1.0(7")	80.0±1.0(7")

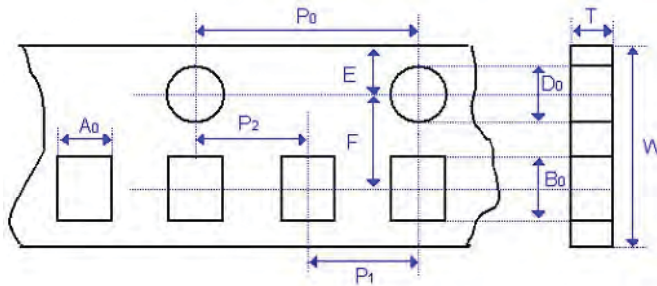
Plastic Tape Size Specification



Unit: mm

Type	0805		1206			1210					1808		1812				
Thickness	D	I	C	J	D	G	P	C	D	G	K	M	D	K	D	K	M
A <sub>0</sub>	<1.57		<1.85			<1.95			<2.97		<2.97		<2.35		<3.81		
B <sub>0</sub>	<2.40		<3.46			<3.67			<3.73		<3.73		<4.98	<5.00	<5.30		
T	0.23±0.05		0.23±0.05			0.23±0.05			0.23±0.05		0.23±0.05		0.25±0.05		0.25±0.05		
K <sub>0</sub>	<2.50		<2.50			<2.50			<2.50		<3.00		<2.50		<2.50	<3.00	
W	8.00±0.10		8.00±0.10			8.00±0.10			8.00±0.10		8.00±0.10		12.0±0.20		12.0±0.20		
P <sub>0</sub>	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		
P <sub>1</sub>	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 <sub>2</sub>	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		
D <sub>0</sub>	1.50±0.05		1.50±0.05			1.50±0.05			1.50±0.05		1.50±0.05		1.50±0.05		1.50±0.05		
D <sub>1</sub>	1.00±0.10		1.00±0.10			1.00±0.10			1.00±0.10		1.00±0.10		1.00±0.10		1.00±0.10		
E	1.75±0.10		1.75±0.10			1.75±0.10			1.75±0.10		1.75±0.10		1.75±0.10		1.75±0.10		
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		5.50±0.05		

Paper Tape Size Specification



Unit: mm

Type	0201	0402	0603		0805		1206/0612
Thickness	L	N	S	X	A	B	B
A <sub>0</sub>	0.45±0.05	0.62±0.05	1.02±0.05		1.50±0.10	1.50±0.10	2.00±0.10
B <sub>0</sub>	0.75±0.05	1.12±0.05	1.82±0.05		2.30±0.10	2.30±0.10	3.50±0.10
T	0.60±0.05	0.60±0.05	0.95±0.05		0.75±0.05	0.95±0.05	0.95±0.05
W	8.00±0.10	8.00±0.10	8.00±0.10		8.00±0.10	8.00±0.10	8.00±0.10
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>1</sub>	2.00±0.05	2.00±0.05	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05		2.00±0.05	2.00±0.05	2.00±0.05
D <sub>0</sub>	1.55±0.05	1.55±0.05	1.55±0.05		1.55±0.05	1.55±0.05	1.50±0.05
E	1.75±0.05	1.75±0.05	1.75±0.05		1.75±0.05	1.75±0.05	1.75±0.10
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