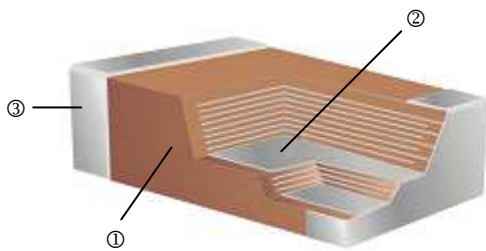


Multilayer Ceramic Chip Capacitor

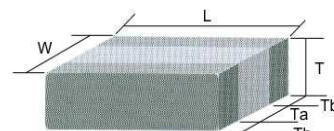
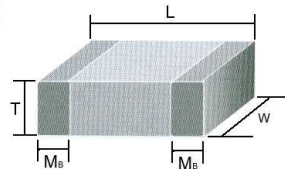
Features

- 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 _B	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	-
		0.6±0.05 ^{#2}	0.3±0.05 ^{#2}	0.3±0.05 ^{#2}				
		0.6±0.09 ^{#3}	0.3±0.09 ^{#3}	0.3±0.09 ^{#3}				
02	0402	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05 / -0.10	10K	-
				0.50+0.02/-0.05	Q			
		1.00±0.20	0.50±0.20	0.50±0.20	E			
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	0.50±0.10	H			
		1.60±0.20 ^{#1}	0.80±0.20 ^{#1}	0.80+0.15 / -0.10	X			
05	0805	2.00±0.15	1.25±0.10	0.50±0.10	H	0.50±0.20	4K	-
				0.60±0.15	A			-
				0.80±0.10	B			-
				1.25±0.10	D			3K
		2.00±0.20	1.25±0.20	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±0.25) ^{***}	4K	-
				0.95±0.10	C		-	3K
				1.25±0.10	D		-	3K
				1.15±0.15	J		-	3K
		3.20±0.20	1.60±0.20	1.60±0.20	G		-	2K
				0.85±0.10	T		4K	-
10	1210	3.20±0.30	2.50±0.20	1.60+0.3 / -0.1	P	0.75±0.25	-	2K
				0.95±0.10	C		-	3K
				0.85±0.10	T		-	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±0.25) ^{***}	-	1K
				1.25±0.10	D		-	2K
				1.40±0.15	F		-	2K
				1.60±0.20	G		-	2K

Type	Size (Inch)	L	W	T / Symbol		M _B	Packaging (7" Reel)	
							Paper tape	Plastic tape
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±0.25)***	-	1K
				1.60±0.20	G		-	1K
				2.00±0.20	K		-	1K
			3.20±0.40	2.50±0.30	M		-	0.5K
				2.80±0.30	U		-	0.5K

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

#1: For 0603 Cap ≥ 10uF or 0603 Cap ≥ 4.7uF (≤ 6.3V) or 0603 Cap > 1uF (> 10V) products ;

#2: For 0201/Cap ≥ 0.68uF products ;

#3: For 0201/Cap ≥ 1uF products

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

Multilayer Ceramic Chip Capacitor

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

Multilayer Ceramic Chip Capacitor

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≤ 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.)	<p>NPO: Cap≥ 30pF, Q≥ 1000; Cap<30pF, Q≥ 400+20C X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr> </thead> <tbody> <tr> <td rowspan="3">≥ 100V</td><td rowspan="3">2.5%</td><td>3% 1206 ≥ 0.047μF</td></tr> <tr> <td>5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF 1206 > 1μF; 1210 ≥ 2.2μF</td></tr> <tr> <td>10% 0805 > 0.22μF; 1210 ≥ 3.3μF</td></tr> <tr> <td rowspan="3">50V</td><td rowspan="3">2.5%</td><td>3% 0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td></tr> <tr> <td>5% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td></tr> <tr> <td>10% 0402 ≥ 0.1μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td></tr> <tr> <td>35V</td><td>3.5%</td><td>10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td></tr> <tr> <td rowspan="4">25V</td><td rowspan="4">3.5%</td><td>5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td></tr> <tr> <td>7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td></tr> <tr> <td>10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td></tr> <tr> <td>12.5% 0402 ≥ 0.47μF</td></tr> <tr> <td rowspan="2">16V</td><td rowspan="2">3.5%</td><td>5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td></tr> <tr> <td>10% 0201 ≥ 0.1μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td></tr> <tr> <td rowspan="2">10V</td><td rowspan="2">5%</td><td>10% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF) 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF</td></tr> <tr> <td>15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td></tr> <tr> <td rowspan="2">6.3V</td><td rowspan="2">10%</td><td>15% 0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1206 ≥ 47μF; 1210 ≥ 100μF</td></tr> <tr> <td>20% 0402 ≥ 2.2μF</td></tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr> </thead> <tbody> <tr> <td rowspan="2">≥ 50V</td><td rowspan="2">5%</td><td>7% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF</td></tr> <tr> <td>12.5% 1210 ≥ 6.8μF</td></tr> <tr> <td>35V</td><td>7%</td><td>—</td></tr> <tr> <td rowspan="2">25V</td><td rowspan="2">5%</td><td>7% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.33μF; 1206 ≥ 1μF 1210 ≥ 4.7μF</td></tr> <tr> <td>9% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td></tr> <tr> <td rowspan="2">16V (C < 1.0μF)</td><td rowspan="2">7%</td><td>9% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td></tr> <tr> <td>12.5% 0402 ≥ 0.22μF</td></tr> <tr> <td>16V (C ≥ 1.0μF)</td><td>9%</td><td>12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF</td></tr> <tr> <td>10V</td><td>12.5%</td><td>20% 0402 ≥ 0.47μF</td></tr> <tr> <td>6.3V</td><td>20%</td><td>-</td></tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 100V	2.5%	3% 1206 ≥ 0.047μF	5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF 1206 > 1μF; 1210 ≥ 2.2μF	10% 0805 > 0.22μF; 1210 ≥ 3.3μF	50V	2.5%	3% 0201(50V); 0603 ≥ 0.047μF 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	5% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF	10% 0402 ≥ 0.1μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	35V	3.5%	10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V	3.5%	5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	12.5% 0402 ≥ 0.47μF	16V	3.5%	5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	10% 0201 ≥ 0.1μF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	5%	10% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF) 0603 ≥ 0.33μF; 0805 ≥ 2.2μF 1206 ≥ 2.2μF; 1210 ≥ 22μF	15% 0201 ≥ 0.1μF; 0402 ≥ 1μF	6.3V	10%	15% 0201 ≥ 0.1μF; 0402 ≥ 1μF 0603 ≥ 10μF; 0805 ≥ 4.7μF 1206 ≥ 47μF; 1210 ≥ 100μF	20% 0402 ≥ 2.2μF	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	5%	7% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF	12.5% 1210 ≥ 6.8μF	35V	7%	—	25V	5%	7% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.33μF; 1206 ≥ 1μF 1210 ≥ 4.7μF	9% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C < 1.0μF)	7%	9% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF	12.5% 0402 ≥ 0.22μF	16V (C ≥ 1.0μF)	9%	12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF	10V	12.5%	20% 0402 ≥ 0.47μF	6.3V	20%	-	<p>X7R, X5R, Y5V: (Class II) Cap≤10uF 1.0±0.2Vrms, 1KHz±10%** Cap>10uF 0.5±0.2Vrms, 120Hz±10%</p> <p>** Test condition: 0.5±0.2Vrms , 1KHz±10%</p> <p>X7R: 0805=106(6.3V,10V), 0603/475(6.3V) X5R: 0201 ≥ 224 (6.3V,10V,16V)#1 0402 ≥ 475 (6.3V,16V), 0402 ≥ 225(10V) 0603=106 (6.3V,10V), #1 Excluding X5R/0201/105(6.3V);225(10V), (1.0±0.2Vrms , 1KHz±10%)</p> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>
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Dielectric Strength	No evidence of damage or flash over during test	<p>To apply voltage(≤ 100V) 250% Duration: 1 to 5sec Charge and discharge current less than 50mA</p> <p>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</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 *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.																																														
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≥ 10GΩ or 100Ω ·F whichever is smaller Rated voltage: 200V~630V	To apply rated voltage(500V max.) for 60sec.																																															
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Temperature Characteristic of Capacitance	<table><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%	With no electrical load. <table><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> *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement voltage for Class II: <table><tr><td>0201</td><td>0402</td></tr><tr><td>Cap<0.1μF:1V</td><td>Cap<1μF: 1V</td></tr><tr><td>0.1μF≤Cap<1μF: 0.2V</td><td>Cap=1μF: 0.5V</td></tr><tr><td>Cap≥1μF: 0.1V</td><td>1μF<Cap<10μF: 0.2V</td></tr><tr><td></td><td>Cap≥10μF: 0.1V</td></tr><tr><td>0603</td><td>0805</td></tr><tr><td>Cap≤1μF: 1V</td><td>Cap<10μF: 1V</td></tr><tr><td>1μF<Cap≤4.7μF: 0.5V</td><td>Cap=10μF: 0.5V</td></tr><tr><td>Cap>4.7μF: 0.2V</td><td>Cap>10μF: 0.2V</td></tr><tr><td>1206</td><td>1210</td></tr><tr><td>Cap≤10μF: 1V</td><td>Cap≤10μF: 1V</td></tr><tr><td>10μF<Cap≤100μF: 0.5V</td><td>10μF<Cap≤100μF: 0.5V</td></tr><tr><td>Cap>100μF: 0.2V</td><td>Cap>100μF: 0.2V</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	0201	0402	Cap<0.1μF:1V	Cap<1μF: 1V	0.1μF≤Cap<1μF: 0.2V	Cap=1μF: 0.5V	Cap≥1μF: 0.1V	1μF<Cap<10μF: 0.2V		Cap≥10μF: 0.1V	0603	0805	Cap≤1μF: 1V	Cap<10μF: 1V	1μF<Cap≤4.7μF: 0.5V	Cap=10μF: 0.5V	Cap>4.7μF: 0.2V	Cap>10μF: 0.2V	1206	1210	Cap≤10μF: 1V	Cap≤10μF: 1V	10μF<Cap≤100μF: 0.5V	10μF<Cap≤100μF: 0.5V	Cap>100μF: 0.2V	Cap>100μF: 0.2V
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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.) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *Cap./DF(Q) Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.																																														
Solderability	95% min. coverage of all metalized area.	Solder temperature: 235±5°C Dipping time: 2±0.5 sec.																																														

Multilayer Ceramic Chip Capacitor

Item	Requirement	Test Method															
Bending Test	No remarkable damage. Cap change : NP0: within $\pm 5\%$ or 0.5pF whichever is larger X7R, X5R, X6S, X7S: 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 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5 ± 1 sec. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24 ± 2 hrs at room temp. Measurement to be made after keeping at room temp. for 24 ± 2 hrs.															
Resistance to Soldering Heat	No remarkable damage. Cap change: NP0: within $\pm 2.5\%$ or 0.25pF whichever is larger X7R, X5R, X6S, X7S: 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 ± 1 sec Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24 ± 2 hrs at room temp. Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24 ± 2 hrs at room temp															
Temperature Cycle	No remarkable damage. * Cap change : NP0: within $\pm 2.5\%$ or 0.25pF whichever is larger X7R, X5R, X6S, X7S: 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.($^{\circ}\text{C}$)</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> Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24 ± 2 hrs at room temp. Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24 ± 2 hrs at room temp.	Step	Temp.($^{\circ}\text{C}$)	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.($^{\circ}\text{C}$)	Time(min)															
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Item	Requirement	Test Method																																																																																																		
Humidity (steady state)	<p>No remarkable damage.</p> <p>Cap change:</p> <p>NP0: within $\pm 5\%$ or $0.5\mu\text{F}$ whichever is larger</p> <p>X7R, X5R: $\geq 10\text{V}^{**}$, within $\pm 12.5\%$; $\leq 6.3\text{V}$ within $\pm 25\%$; $C \geq 1\mu\text{F}$, within $\pm 25\%$</p> <p>$**10\text{V}$: $0603 \geq 4.7\mu\text{F}$; $0402 \geq 1\mu\text{F}$; $0201 \geq 0.1\mu\text{F}$, within $\pm 25\%$;</p> <p>Y5V: $\geq 10\text{V}$, within $\pm 30\%$; $\leq 6.3\text{V}$, within $+30\%$ / -40%</p> <p>Q/D.F. value:</p> <p>NP0: More than 30pF $Q \geq 350$, $10\text{pF} \leq C \leq 30\text{pF}$, $Q \geq 275 + 2.5C$ Less than 10pF $Q \geq 200 + 10C$</p> <p>X7R, X5R:</p> <table><tr><th>Rated vol.</th><th>D.F. \leq</th><th colspan="2">Exception of D.F. \leq</th></tr><tr><td rowspan="3">$\geq 100\text{V}$</td><td rowspan="3">3%</td><td>6%</td><td>$1206 \geq 0.47\mu\text{F}$</td></tr><tr><td>7.5%</td><td>$0603 \geq 0.068\mu\text{F}$; $0805 > 0.1\mu\text{F}$; $1206 > 1\mu\text{F}$; $1210 \geq 2.2\mu\text{F}$</td></tr><tr><td>20%</td><td>$0805 > 0.22\mu\text{F}$; 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D.F. \leq	Exception of D.F. \leq		$\geq 50\text{V}$	7.5%	10%	$0603 \geq 0.1\mu\text{F}$; $0805 \geq 0.47\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$	20%	$1210 \geq 6.8\mu\text{F}$	35V	10%	—	—	25V	7.5%	10%	$0402 \geq 0.047\mu\text{F}$; $0603 \geq 0.1\mu\text{F}$; $0805 \geq 0.33\mu\text{F}$; $1206 \geq 1\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$	15%	$0402 \geq 0.068\mu\text{F}$; $0603 \geq 0.47\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 22\mu\text{F}$	16V ($C < 1.0\mu\text{F}$)	10%	12.5%	$0402 \geq 0.068\mu\text{F}$; $0603 \geq 0.68\mu\text{F}$	20%	$0402 \geq 0.22\mu\text{F}$	16V ($C \geq 1.0\mu\text{F}$)	12.5%	20%	$0603 \geq 2.2\mu\text{F}$; $0805 \geq 3.3\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 22\mu\text{F}$; $1812 \geq 47\mu\text{F}$	10V	20%	30%	$0402 \geq 0.47\mu\text{F}$	6.3V	30%	-	-	Rated Voltage	Insulation Resistance	100V: X7R	10G Ω or RxC $\geq 10\Omega\text{-F}$ Whichever is smaller	50V: $0402 > 0.01\mu\text{F}$; $0603 \geq 1\mu\text{F}$; $0805 \geq 1\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$	35V: $0603 \geq 1\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 10\mu\text{F}$	25V: $0201 \geq 0.1\mu\text{F}$; $0402 \geq 0.22\mu\text{F}$; $0603 \geq 2.2\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 10\mu\text{F}$	16V: $0201 \geq 0.1\mu\text{F}$; $0402 \geq 0.22\mu\text{F}$; $0603 \geq 1\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 47\mu\text{F}$	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	<p>Test temp.: $40 \pm 2^\circ\text{C}$</p> <p>Humidity: $90 \sim 95\% \text{RH}$</p> <p>Test time: $500 + 24 \times 0 \text{hrs}$.</p> <p>Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24 ± 2 hrs at room temp.</p> <p>Cap. / DF(Q) / I.R. 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		10%	$0201 \geq 0.01\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$																																																																																																	
		20%	$0402 \geq 0.1\mu\text{F}$; $0603 > 0.1\mu\text{F}$; $0805 \geq 1\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 10\mu\text{F}$																																																																																																	
35V	5%	20%	$0603 \geq 1\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 10\mu\text{F}$																																																																																																	
25V	5%	10%	$0201 \geq 0.01\mu\text{F}$; $0805 \geq 1\mu\text{F}$; $1210 \geq 10\mu\text{F}$																																																																																																	
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		20%	$0402 \geq 0.47\mu\text{F}$																																																																																																	
16V	5%	10%	$0603 \geq 0.15\mu\text{F}$; $0805 \geq 0.68\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$																																																																																																	
		15%	$0201 \geq 0.01\mu\text{F}$ ($0201/\text{X7R} \geq 0.022\mu\text{F}$); $0402 \geq 0.33\mu\text{F}$; $0603 \geq 0.68\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 22\mu\text{F}$																																																																																																	
10V	7.5%	15%	$0201 \geq 0.012\mu\text{F}$; $0402 \geq 0.33\mu\text{F}$ ($0402/\text{X7R} \geq 0.22\mu\text{F}$); $0603 \geq 0.33\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 22\mu\text{F}$																																																																																																	
		20%	$0201 \geq 0.1\mu\text{F}$; $0402 \geq 1\mu\text{F}$																																																																																																	
6.3V	15%	30%	$0201 \geq 0.1\mu\text{F}$; $0402 \geq 1\mu\text{F}$; $0603 \geq 10\mu\text{F}$; $0805 \geq 4.7\mu\text{F}$; $1206 \geq 47\mu\text{F}$; $1210 \geq 100\mu\text{F}$																																																																																																	
Rated vol.	D.F. \leq	Exception of D.F. \leq																																																																																																		
$\geq 50\text{V}$	7.5%	10%	$0603 \geq 0.1\mu\text{F}$; $0805 \geq 0.47\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$																																																																																																	
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35V	10%	—	—																																																																																																	
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		15%	$0402 \geq 0.068\mu\text{F}$; $0603 \geq 0.47\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 22\mu\text{F}$																																																																																																	
16V ($C < 1.0\mu\text{F}$)	10%	12.5%	$0402 \geq 0.068\mu\text{F}$; $0603 \geq 0.68\mu\text{F}$																																																																																																	
		20%	$0402 \geq 0.22\mu\text{F}$																																																																																																	
16V ($C \geq 1.0\mu\text{F}$)	12.5%	20%	$0603 \geq 2.2\mu\text{F}$; $0805 \geq 3.3\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 22\mu\text{F}$; $1812 \geq 47\mu\text{F}$																																																																																																	
10V	20%	30%	$0402 \geq 0.47\mu\text{F}$																																																																																																	
6.3V	30%	-	-																																																																																																	
Rated Voltage	Insulation Resistance																																																																																																			
100V: X7R	10G Ω or RxC $\geq 10\Omega\text{-F}$ Whichever is smaller																																																																																																			
50V: $0402 > 0.01\mu\text{F}$; $0603 \geq 1\mu\text{F}$; $0805 \geq 1\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$																																																																																																				
35V: $0603 \geq 1\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 10\mu\text{F}$																																																																																																				
25V: $0201 \geq 0.1\mu\text{F}$; $0402 \geq 0.22\mu\text{F}$; $0603 \geq 2.2\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 10\mu\text{F}$																																																																																																				
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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																																																																																																				

Multilayer Ceramic Chip Capacitor

Item	Requirement	Test Method																																																		
Humidity load	No remarkable damage. Cap change: NP0: $\pm 7.5\%$ or $0.75\mu\text{F}$ whichever is larger. X7R, X5R, X6S, X7S: $\geq 10\text{V}^{**}$, within $\pm 12.5\%$; $\leq 6.3\text{V}$ within $\pm 25\%$; TT series & C $\geq 1\mu\text{F}$, within $\pm 25\%$ $^{**}10\text{V}$: 0603 $4.7\mu\text{F}$; 0402 $1\mu\text{F}$; 0201 $\geq \geq \geq 0.1\mu\text{F}$, within $\pm 25\%$; Y5V: $\geq 10\text{V}$, within $\pm 30\%$; $\leq 6.3\text{V}$, within $+30/-40\%$ Q/D.F. value: NP0: C $\geq 30\mu\text{F}$, Q ≥ 200 ; C $< 30\mu\text{F}$, Q $\geq 100+10/3\text{C}$ X7R, X5R:	Test temp. : $40\pm 2^\circ\text{C}$ Humidity : 90~95%RH Test time : 500+24/-0 hrs. To apply voltage : Rated voltage (MAX. 500V) Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24 ± 2 hrs at room temp. Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24 ± 2 hrs at room temp.																																																		
	<table><tr><td>Rated vol.</td><td>D.F. \leq</td><td colspan="2">Exception of D.F. \leq</td></tr><tr><td rowspan="3">$\geq 100\text{V}$</td><td rowspan="3">3%</td><td>6%</td><td>$1206 \geq 0.47\mu\text{F}$</td></tr><tr><td>7.5%</td><td>$0603 \geq 0.068\mu\text{F}$; $0805 > 0.1\mu\text{F}$; $1206 > 1\mu\text{F}$; $1210 \geq 2.2\mu\text{F}$</td></tr><tr><td>20%</td><td>$0805 > 0.22\mu\text{F}$; $1210 \geq 3.3\mu\text{F}$</td></tr><tr><td rowspan="3">$\geq 50\text{V}$</td><td rowspan="3">3%</td><td>6%</td><td>$0201(50\text{V})$; $0603 \geq 0.047\mu\text{F}$; $0805 \geq 0.18\mu\text{F}$; $1206 \geq 0.47\mu\text{F}$</td></tr><tr><td>10%</td><td>$0201 \geq 0.01\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$</td></tr><tr><td>20%</td><td>$0402 \geq 0.1\mu\text{F}$; $0603 > 0.1\mu\text{F}$; $0805 \geq 1\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 10\mu\text{F}$</td></tr><tr><td>35V</td><td>5%</td><td>20%</td><td>$0603 \geq 1\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 10\mu\text{F}$</td></tr><tr><td rowspan="4">25V</td><td rowspan="4">5%</td><td>10%</td><td>$0201 \geq 0.01\mu\text{F}$; $0805 \geq 1\mu\text{F}$; $1210 \geq 10\mu\text{F}$</td></tr><tr><td>14%</td><td>$0603 \geq 0.33\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$</td></tr><tr><td>15%</td><td>$0201 \geq 0.1\mu\text{F}$; $0402 \geq 0.10\mu\text{F}$; $0603 \geq 0.47\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 6.8\mu\text{F}$; $1210 \geq 22\mu\text{F}$</td></tr><tr><td>20%</td><td>$0402 \geq 0.47\mu\text{F}$</td></tr><tr><td rowspan="2">16V</td><td rowspan="2">5%</td><td>10%</td><td>$0603 \geq 0.15\mu\text{F}$; $0805 \geq 0.68\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$</td></tr><tr><td>15%</td><td>$0201 \geq 0.01\mu\text{F}$ ($0201/\text{X7R} \geq 0.022\mu\text{F}$); $0402 \geq 0.33\mu\text{F}$; $0603 \geq 0.68\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 22\mu\text{F}$</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">7.5%</td><td>15%</td><td>$0201 \geq 0.012\mu\text{F}$; $0402 \geq 0.33\mu\text{F}$ ($0402/\text{X7R} \geq 0.22\mu\text{F}$); $0603 \geq 0.33\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 22\mu\text{F}$</td></tr><tr><td>20%</td><td>$0201 \geq 0.1\mu\text{F}$; $0402 \geq 1\mu\text{F}$</td></tr><tr><td>6.3V</td><td>15%</td><td>30%</td><td>$0201 \geq 0.1\mu\text{F}$; $0402 \geq 1\mu\text{F}$; $0603 \geq 10\mu\text{F}$; $0805 \geq 4.7\mu\text{F}$; $1206 \geq 47\mu\text{F}$; $1210 \geq 100\mu\text{F}$</td></tr></table>	Rated vol.	D.F. \leq	Exception of D.F. \leq		$\geq 100\text{V}$	3%	6%	$1206 \geq 0.47\mu\text{F}$	7.5%	$0603 \geq 0.068\mu\text{F}$; $0805 > 0.1\mu\text{F}$; $1206 > 1\mu\text{F}$; $1210 \geq 2.2\mu\text{F}$	20%	$0805 > 0.22\mu\text{F}$; $1210 \geq 3.3\mu\text{F}$	$\geq 50\text{V}$	3%	6%	$0201(50\text{V})$; $0603 \geq 0.047\mu\text{F}$; $0805 \geq 0.18\mu\text{F}$; $1206 \geq 0.47\mu\text{F}$	10%	$0201 \geq 0.01\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$	20%	$0402 \geq 0.1\mu\text{F}$; $0603 > 0.1\mu\text{F}$; $0805 \geq 1\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 10\mu\text{F}$	35V	5%	20%	$0603 \geq 1\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 10\mu\text{F}$	25V	5%	10%	$0201 \geq 0.01\mu\text{F}$; $0805 \geq 1\mu\text{F}$; $1210 \geq 10\mu\text{F}$	14%	$0603 \geq 0.33\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$	15%	$0201 \geq 0.1\mu\text{F}$; $0402 \geq 0.10\mu\text{F}$; $0603 \geq 0.47\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 6.8\mu\text{F}$; $1210 \geq 22\mu\text{F}$	20%	$0402 \geq 0.47\mu\text{F}$	16V	5%	10%	$0603 \geq 0.15\mu\text{F}$; $0805 \geq 0.68\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$	15%	$0201 \geq 0.01\mu\text{F}$ ($0201/\text{X7R} \geq 0.022\mu\text{F}$); $0402 \geq 0.33\mu\text{F}$; $0603 \geq 0.68\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 22\mu\text{F}$	10V	7.5%	15%	$0201 \geq 0.012\mu\text{F}$; $0402 \geq 0.33\mu\text{F}$ ($0402/\text{X7R} \geq 0.22\mu\text{F}$); $0603 \geq 0.33\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 22\mu\text{F}$	20%	$0201 \geq 0.1\mu\text{F}$; $0402 \geq 1\mu\text{F}$	6.3V	15%	30%	$0201 \geq 0.1\mu\text{F}$; $0402 \geq 1\mu\text{F}$; $0603 \geq 10\mu\text{F}$; $0805 \geq 4.7\mu\text{F}$; $1206 \geq 47\mu\text{F}$; $1210 \geq 100\mu\text{F}$	
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Y5V:	<table><tr><td>Rated vol.</td><td>D.F. \leq</td><td colspan="2">Exception of D.F. \leq</td></tr><tr><td rowspan="2">$\geq 50\text{V}$</td><td rowspan="2">7.5%</td><td>10%</td><td>$0603 \geq 0.1\mu\text{F}$; $0805 \geq 0.47\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$</td></tr><tr><td>20%</td><td>$1210 \geq 6.8\mu\text{F}$</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>$0402 \geq 0.047\mu\text{F}$; $0603 \geq 0.1\mu\text{F}$; $0805 \geq 0.33\mu\text{F}$; $1206 \geq 1\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$</td></tr><tr><td>15%</td><td>$0402 \geq 0.068\mu\text{F}$; $0603 \geq 0.47\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 22\mu\text{F}$</td></tr><tr><td>16V (C $< 1.0\mu\text{F}$)</td><td>10%</td><td>12.5%</td><td>$0402 \geq 0.068\mu\text{F}$; $0603 \geq 0.68\mu\text{F}$</td></tr><tr><td rowspan="2">16V (C $\geq 1.0\mu\text{F}$)</td><td rowspan="2">12.5%</td><td>20%</td><td>$0603 \geq 2.2\mu\text{F}$; $0805 \geq 3.3\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 22\mu\text{F}$; $1812 \geq 47\mu\text{F}$</td></tr><tr><td>30%</td><td>$0402 \geq 0.47\mu\text{F}$</td></tr><tr><td>10V</td><td>20%</td><td>30%</td><td>$0402 \geq 0.47\mu\text{F}$</td></tr><tr><td>6.3V</td><td>30%</td><td>-</td><td>-</td></tr></table>	Rated vol.	D.F. \leq	Exception of D.F. \leq		$\geq 50\text{V}$	7.5%	10%	$0603 \geq 0.1\mu\text{F}$; $0805 \geq 0.47\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$	20%	$1210 \geq 6.8\mu\text{F}$	35V	10%	—	—	25V	7.5%	10%	$0402 \geq 0.047\mu\text{F}$; $0603 \geq 0.1\mu\text{F}$; $0805 \geq 0.33\mu\text{F}$; $1206 \geq 1\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$	15%	$0402 \geq 0.068\mu\text{F}$; $0603 \geq 0.47\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 22\mu\text{F}$	16V (C $< 1.0\mu\text{F}$)	10%	12.5%	$0402 \geq 0.068\mu\text{F}$; $0603 \geq 0.68\mu\text{F}$	16V (C $\geq 1.0\mu\text{F}$)	12.5%	20%	$0603 \geq 2.2\mu\text{F}$; $0805 \geq 3.3\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 22\mu\text{F}$; $1812 \geq 47\mu\text{F}$	30%	$0402 \geq 0.47\mu\text{F}$	10V	20%	30%	$0402 \geq 0.47\mu\text{F}$	6.3V	30%	-	-													
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I.R.: $\geq 10\text{V}$, 500M Ω or 25 $\Omega\cdot\text{F}$ whichever is smaller. Class II (X7R, X5R, Y5V)	<table><tr><td>Rated Voltage</td><td>Insulation Resistance</td></tr><tr><td>100V: X7R</td><td rowspan="7">500MΩ or RxC $\geq 5\Omega\cdot\text{F}$ Whichever is smaller</td></tr><tr><td>50V: $0402 > 0.01\mu\text{F}$; $0603 \geq 1\mu\text{F}$; $0805 \geq 1\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$</td></tr><tr><td>35V: $0603 \geq 1\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 10\mu\text{F}$</td></tr><tr><td>25V: $0201 \geq 0.1\mu\text{F}$; $0402 \geq 0.22\mu\text{F}$; $0603 \geq 2.2\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 10\mu\text{F}$</td></tr><tr><td>16V: $0201 \geq 0.1\mu\text{F}$; $0402 \geq 0.22\mu\text{F}$; $0603 \geq 1\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 47\mu\text{F}$</td></tr><tr><td>10V: $0201 \geq 47\text{nF}$; $0402 \geq 0.47\mu\text{F}$; $0603 \geq 0.47\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 47\mu\text{F}$</td></tr><tr><td>6.3V</td></tr></table>	Rated Voltage	Insulation Resistance	100V: X7R	500M Ω or RxC $\geq 5\Omega\cdot\text{F}$ Whichever is smaller	50V: $0402 > 0.01\mu\text{F}$; $0603 \geq 1\mu\text{F}$; $0805 \geq 1\mu\text{F}$; $1206 \geq 4.7\mu\text{F}$; $1210 \geq 4.7\mu\text{F}$	35V: $0603 \geq 1\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 2.2\mu\text{F}$; $1210 \geq 10\mu\text{F}$	25V: $0201 \geq 0.1\mu\text{F}$; $0402 \geq 0.22\mu\text{F}$; $0603 \geq 2.2\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 10\mu\text{F}$	16V: $0201 \geq 0.1\mu\text{F}$; $0402 \geq 0.22\mu\text{F}$; $0603 \geq 1\mu\text{F}$; $0805 \geq 2.2\mu\text{F}$; $1206 \geq 10\mu\text{F}$; $1210 \geq 47\mu\text{F}$	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																																									
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6.3V																																																				

Item	Requirement			Test Method		
High Temperature Load (Endurance)	No remarkable damage. Cap change: NP0: $\pm 3.0\%$ or $\pm 0.3\text{pF}$ whichever is larger X7R, X5R, X6S, X7S: $\geq 10\text{V}^{**}$, within $\pm 12.5\%$; $\leq 6.3\text{V}$ within $\pm 25\%$; TT series & C $\geq 1\mu\text{F}$, within $\pm 25\%$ $^{**}10\text{V}$: 0603 $\geq 4.7\mu\text{F}$; 0402 $\geq 1\mu\text{F}$; 0201 $\geq 0.1\mu\text{F}$, within $\pm 25\%$; Y5V: $\geq 10\text{V}$, within $\pm 30\%$; $\leq 6.3\text{V}$, within $+30/-40\%$ Q/D.F. value: NP0: More than 30pF, Q ≥ 350 10pF \leq C $<$ 30pF, Q $\geq 275+2.5\text{C}$ Less than 10pF, Q $\geq 200+10\text{C}$ X7R, X5R:					
	Rated vol.	D.F. \leq	Exception of D.F. \leq			
	$\geq 100\text{V}$	3%	6%	1206 $\geq 0.47\mu\text{F}$		
			7.5%	0603 $\geq 0.068\mu\text{F}$; 0805 $> 0.1\mu\text{F}$; 1206 $> 1\mu\text{F}$; 1210 $\geq 2.2\mu\text{F}$		
			20%	0805 $> 0.22\mu\text{F}$; 1210 $\geq 3.3\mu\text{F}$		
	$\geq 50\text{V}$	3%	6%	0201(50V); 0603 $\geq 0.047\mu\text{F}$; 0805 $\geq 0.18\mu\text{F}$; 1206 $\geq 0.47\mu\text{F}$		
			10%	0201 $\geq 0.01\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$		
			20%	0402 $\geq 0.1\mu\text{F}$; 0603 $> 0.1\mu\text{F}$; 0805 $\geq 1\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$		
	35V	5%	20%	0603 $\geq 1\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$		
	25V	5%	10%	0201 $\geq 0.01\mu\text{F}$; 0805 $\geq 1\mu\text{F}$; 1210 $\geq 10\mu\text{F}$		
			14%	0603 $\geq 0.33\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$		
			15%	0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 0.10\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 6.8\mu\text{F}$; 1210 $\geq 22\mu\text{F}$		
			20%	0402 $\geq 0.47\mu\text{F}$		
	16V	5%	10%	0603 $\geq 0.15\mu\text{F}$; 0805 $\geq 0.68\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$		
			15%	0201 $\geq 0.01\mu\text{F}$ (0201/X7R $\geq 0.022\mu\text{F}$); 0402 $\geq 0.33\mu\text{F}$; 0603 $\geq 0.68\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 22\mu\text{F}$		
	10V	7.5%	15%	0201 $\geq 0.012\mu\text{F}$; 0402 $\geq 0.33\mu\text{F}$ (0402/X7R $\geq 0.22\mu\text{F}$); 0603 $\geq 0.33\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 22\mu\text{F}$		
			20%	0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 1\mu\text{F}$		
	6.3V	15%	30%	0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 1\mu\text{F}$; 0603 $\geq 10\mu\text{F}$; 0805 $\geq 4.7\mu\text{F}$ 1206 $\geq 47\mu\text{F}$; 1210 $\geq 100\mu\text{F}$		
Y5V:						
Rated vol.	D.F. \leq	Exception of D.F. \leq				
$\geq 50\text{V}$	7.5%	10%	0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 0.47\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$			
		20%	1210 $\geq 6.8\mu\text{F}$			
35V	10%	—	—			
25V	7.5%	10%	0402 $\geq 0.047\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 0.33\mu\text{F}$; 1206 $\geq 1\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$			
		15%	0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 22\mu\text{F}$			
16V (C $< 1.0\mu\text{F}$)	10%	12.5%	0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.68\mu\text{F}$			
16V (C $\geq 1.0\mu\text{F}$)	12.5%	20%	0402 $\geq 0.22\mu\text{F}$			
		20%	0603 $\geq 2.2\mu\text{F}$; 0805 $\geq 3.3\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 22\mu\text{F}$; 1812 $\geq 47\mu\text{F}$			
10V	20%	30%	0402 $\geq 0.47\mu\text{F}$			
6.3V	30%	-	-			
I.R.: $\geq 10\text{V}$, 1G Ω or 50 Ω -F whichever is smaller.						
Class II (X7R, X5R, Y5V)						
Rated Voltage			Insulation Resistance			
100V: X7R			500M Ω or Rx C $\geq 5\Omega$ -F Whichever is smaller			
50V: 0402 $> 0.01\mu\text{F}$; 0603 $\geq 1\mu\text{F}$; 0805 $\geq 1\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$						
35V: 0603 $\geq 1\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$						
25V: 0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 0.22\mu\text{F}$; 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: 0201 $\geq 0.1\mu\text{F}$; 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						
Test temp. : NP0, X7R: 125 \pm 3 $^{\circ}\text{C}$ X5R, Y5V: 85 \pm 3 $^{\circ}\text{C}$ To apply voltage: (1) $\leq 6.3\text{V}$ or C $\geq 10\mu\text{F}$: 150% of rated voltage. (2) 10V \leq Ur $<$ 500V: 200% of rated voltage. (3) 500V: 150% of rated voltage. (4) Ur \geq 630V: 120% of rated voltage. (5) 100% of rated voltage for below range.						
Size	Dielectric	Rated voltage	Capacitance range			
0201	X5R, X7R	$\leq 10\text{V}$	C $\geq 0.1\mu\text{F}$			
		$\geq 16\text{V}$	C $> 0.1\mu\text{F}$			
0402	X5R, X7R, Y5V	6.3V, 10V, 16V, 25V	C $\geq 1.0\mu\text{F}$			
0603	X5R, X7R	6.3V, 10V, 25V, 35V	C $\geq 4.7\mu\text{F}$			
			C $\geq 1.0\mu\text{F}$			
0805	X5R, X7R	6.3V	C $\geq 22\mu\text{F}$			
		10V~50V	C $\geq 10\mu\text{F}$			
1206	X5R, X7R	6.3V	C $\geq 47\mu\text{F}$			
		NPO	C $\geq 1.5\mu\text{F}$			
1210	X5R, X7R	16V	C $\geq 47\mu\text{F}$			
		X7R	C $\geq 3.3\mu\text{F}$			
(6) 150% of rated voltage for below range						
Size	Dielectric	Rated voltage	Capacitance range			
0201	X5R, X7R	16V, 25V	C $\geq 0.1\mu\text{F}$			
		X7R	C $> 0.022\mu\text{F}$			
0402	X5R, X7R,	50V	C $\geq 1.0\mu\text{F}$			
		Y5V	10~25V	C $\geq 0.022\mu\text{F}$		
0603	X7R	16V	C $\geq 0.47\mu\text{F}$			
		X5R, X7R,	50V	C $\geq 0.1\mu\text{F}$		
		Y5V	10V, 16V, 50V	C $\geq 1.0\mu\text{F}$		
0805	X5R, X7R	16V	C $\geq 2.2\mu\text{F}$			
		X5R, X7R,	10V~50V	C $\geq 4.7\mu\text{F}$		
		Y5V	50V	C $\geq 2.2\mu\text{F}$		
		Y5V	100V	C $\geq 0.47\mu\text{F}$		
1206	X5R, X7R	100V	C $\geq 1.0\mu\text{F}$			
1210	X5R, X7R	50V~100V	C $\geq 2.2\mu\text{F}$			

Multilayer Ceramic Chip Capacitor

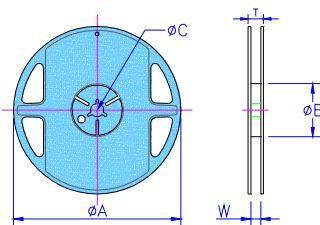
■Packaging

Packaging Quantity

Unit: mm

Type	Thickness / Symbol		Packaging (7" Reel)	
			Paper tape	Plastic tape
0201	0.30±0.03	L	15K	-
	0.30±0.05	L	15K	-
	0.30±0.09	L	15K	-
0402	0.50±0.05	N	10K	-
	0.5+0.02/-0.05	Q	10K	-
	0.50±0.20	E	10K	-
0603	0.50±0.10	H	4K	-
	0.80±0.10	S	4K	-
	0.80 +0.15 / -0.10	X	4K	-
0805	0.50±0.10	H	4K	-
	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	-
	0.85±0.10	T	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	0.85±0.10	T	-	3K
	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
	1.10±0.15	F	-	2K
	1.60±0.20	G	-	2K
	2.00±0.20	K	-	1K
1812	1.25±0.10	D	-	1K
	1.60±0.20	G	-	1K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	0.5K
	2.80±0.30	U	-	0.5K
0612	0.80±0.10	B	4K	-

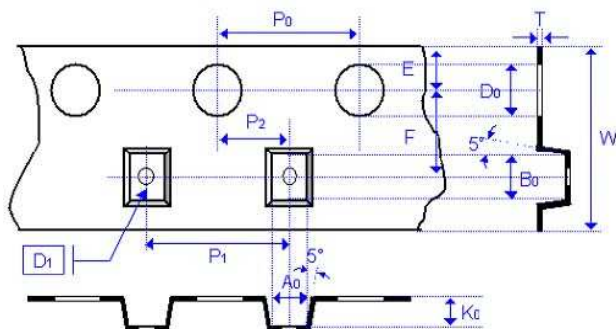
Tape and Reel



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")

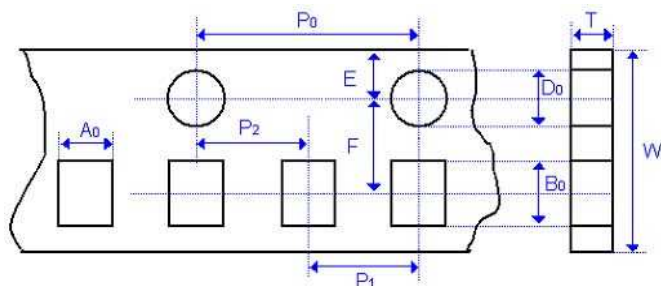
Plastic Tape Size Specification



Unit: mm

Type	0805		1206					1210						1808				1812					
Thickness	D	I	C	J	D	G	P	T	C	D	G	K	M	D	F	G	K	D	F	G	K	M	U
A ₀	<1.80		<200			<2.30		<3.05			<3.05		<3.20		<2.50			<3.90					
B ₀	<2.70		<3.70			<4.00		<3.80			<3.80		<3.95		<5.30			<5.30					
T	0.23±0.10		0.23±0.10			0.23±0.10		0.23±0.10			0.23±0.10		0.23±0.10		0.25±0.10			0.25±0.10					
K ₀	<2.50		<2.50			<2.50		<1.50			<2.50		<3.00		<2.50			<2.50			<3.50		
W	8.00±0.20		8.00±0.20			8.00±0.20		8.00±0.20			8.00±0.20		8.00±0.20		12.0±0.20			12.0±0.20					
P ₀	4.00±0.10		4.00±0.10			4.00±0.10		4.00±0.10			4.00±0.10		4.00±0.10		4.00±0.10			4.00±0.10					
P ₁	4.00±0.10		4.00±0.10			4.00±0.10		4.00±0.10			4.00±0.10		4.00±0.10		4.00±0.10			8.00±0.10					
P ₂	2.00±0.05		2.00±0.05			2.00±0.05		2.00±0.05			2.00±0.05		2.00±0.05		2.00±0.10			2.00±0.05					
D ₀	1.50+0.1/-0		1.50±0.05			1.50+0.1/-0		1.50+0.1/-0			1.50+0.1/-0		1.50+0.1/-0		1.50+0.1/-0			1.50+0.1/-0					
D ₁	1.00±0.10		1.00±0.10			1.00±0.10		1.00±0.10			1.00±0.10		1.00±0.10		1.50±0.10			1.50±0.10					
E	1.75±0.10		1.75±0.10			1.75±0.10		1.75±0.10			1.75±0.10		1.75±0.10		1.75±0.10			1.75±0.10					
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±0.10			5.50±0.10					

Paper Tape Size Specification



Unit: mm

Type	0201	0402		0603			0805				1206/0612	
Thickness	L	N	E	S	H	X	A	H	B	T	B	T
A ₀	0.39±0.07	0.70±0.20		1.05±0.30			1.50±0.20		1.50±0.20		1.90±0.50	
B ₀	0.69±0.07	1.20±0.20		1.80±0.30			2.30±0.20		2.30±0.20		3.50±0.50	
T	≤ 0.50	≤ 0.80		≤ 1.20			≤ 1.15		≤ 1.30		≤ 1.30	
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 ₀	4.00±0.10	4.00±0.10		4.00±0.10			4.00±0.10		4.00±0.10		4.00±0.10	
P ₁	2.00±0.05	2.00±0.05		4.00±0.10			4.00±0.10		4.00±0.10		4.00±0.10	
P ₂	2.00±0.05	2.00±0.05		2.00±0.05			2.00±0.05		2.00±0.05		2.00±0.05	
D ₀	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	