

# 1. INTRODUCTION

POSPERITY Multilayer Ceramic Chip Capacitors supplied in bulk or tape & reel package are ideally suitable for thick-film hybrid circuits and automatic surface mounting on any printed circuit boards.

The nickel-barrier terminations are consisted of a nickel barrier layer over the silver metallization and then finished by electroplated solder layer to ensure the terminations have good solderability. The nickel barrier layer in terminations prevents the dissolution of termination when extended immersion in molten solder at elevated solder temperature.

## 2. FEATURES

- a. A wide selection of sizes is available (0402 to 2225).
- b. High capacitance in given case size.
- c. Capacitor with lead-free termination (pure Tin).

## 3. APPLICATIONS

- a. For general digital circuit.
- b. For power supply bypass capacitors.
- c. For consumer electronics.
- d. For telecommunication.
- e. DC to DC converter

## 4. HOW TO ORDER

<u>MA</u>	<u>1206</u>	<u>XR</u>	-	<u>104</u>	<u>K</u>	-	<u>500</u>	<u>PR</u>	<u>G</u>
<u>PDC Family</u>	<u>Size</u>	<u>Dielectric</u>		<u>Capacitance</u>	<u>Tolerance</u>		<u>Rated voltage</u>	<u>Packaging</u>	<u>Control Code</u>
	Inch (mm) <b>0402</b> (1005) <b>0603</b> (1608) <b>0805</b> (2012) <b>1206</b> (3216) <b>1210</b> (3225) <b>1808</b> (4520) <b>1812</b> (4532) <b>2220</b> (5750) <b>2225</b> (5763)	CG: C0G XR: X7R or X5R YV: Y5V		Two significant digits followed by no. of zeros. And R is in place of decimal point.  eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 100=10x10 <sup>0</sup> =10pF	<b>B</b> =±0.1pF <b>C</b> =±0.25pF <b>D</b> =±0.5pF <b>F</b> =±1% <b>G</b> =±2% <b>J</b> =±5% <b>K</b> =±10% <b>M</b> =±20% <b>Z</b> =-20/+80%		Two significant digits followed by no. of zeros. And R is in place of decimal point.  <b>100</b> =10 VDC <b>160</b> =16 VDC <b>250</b> =25 VDC <b>500</b> =50 VDC	ER: Tape and Reel, Embossed Tape PR: Tape and Reel, Paper Tape No Code: Bulk	G: RoHS compliant

## 5. EXTERNAL DIMENSIONS

Size	L (mm)	W (mm)	Tmax (mm)	M <sub>B</sub> min (mm)
0402 (1005)	1.00±0.05	0.50±0.05	0.55	0.15
0603 (1608)	1.60±0.15	0.80±0.15	0.95	0.20
0805 (2012)	2.00±0.20	1.25±0.20	1.45	0.30
1206 (3216)	3.20±0.20	1.60±0.20	1.80	0.30
	3.20+0.3/-0.1	1.60+0.3/0.1	1.90	
1210 (3225)	3.20±0.40	2.50±0.30	2.80	0.30
1812 (4532)	4.50±0.40	3.20±0.30	2.80	0.26
1825 (4563)	4.50±0.40	6.30±0.40	3.00	0.30
2220 (5750)	5.70±0.40	5.00±0.40	3.00	0.30
2225 (5763)	5.70±0.40	6.30±0.40	3.00	0.30

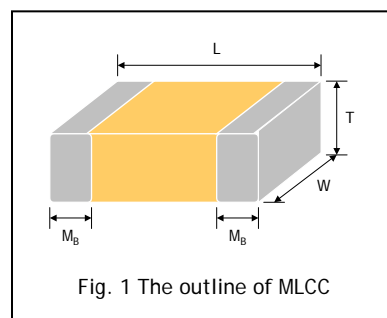


Fig. 1 The outline of MLCC

## 6. GENERAL ELECTRICAL DATA

Dielectric	NPO	X7R	Y5V
Size	0402, 0603, 0805, 1206, 1210, 1812	0402, 0603, 0805, 1206, 1210, 1812, 2220, 2225	0402, 0603, 0805, 1206, 1210, 1812
Capacitance range*	0.5pF to 39nF	100pF to 2.2μF	10nF to 1.0μF
Capacitance tolerance	Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	M (±20%), Z (-20/+80%)
Rated voltage (WVDC)	16V, 25V, 50V	10V, 16V, 25V, 50V	
Tan δ*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1	
Insulation resistance at U <sub>r</sub>	≥10GΩ	≥10GΩ or R <sub>x</sub> C≥100ΩxF whichever is less	
Operating temperature	-55 to +125°C		-25 to +85°C
Capacitance characteristic	±30ppm	±15%	+30/-80%
Termination	Cu (or Ag)/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, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature

X7R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature. Y5V

Rated vol.	D.F.	Exception of D.F.		Rated vol.	D.F.	Exception of D.F.	
Note 1: ≥50V	≤2.5%	≤3%	0603≥0.047μF; 0805≥0.18μF, 1206≥0.47μF	≥50V	≤5.0%	7.0%	0603≥0.1μF; 0805≥0.47μF
25V	≤3.5%	≤5%	0805≥1μF; 1210≥10μF	25V	≤5.0%	≤7%	0402≥0.047μF; 0603≥0.1μF; 0805≥0.33μF; 1206≥1μF
		≤7%	0603≥0.33μF			≤9%	0402≥0.068μF; 0603≥0.47μF
16V	≤3.5%	≤5%	0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF	16V (C<1.0μF)	≤7.0%	≤9%	0402≥0.068μF; 0603≥0.68μF
		≤10%	1210≥22μF; 0603≥0.68μF	16V (C≥1.0μF)	≤9.0%	≤12.5%	0805≥4.7μF; 1206≥10μF; 1210≥22μF; 1812≥47μF
10V	≤5.0%	≤10%	0603≥1μF; 0805≥2.2μF	10V	≤12.5%	---	---

# 7. CAPACITANCE RANGE (NP0 Dielectric)

7-1. 0402, 0603, 0805 Sizes.

DIELECTRIC SIZE		NP0											
		0402				0603				0805			
RATED VOLTAGE (VDC)		10	16	25	50	10	16	25	50	10	16	25	50
Capacitance	0.5pF (0R5)												
	0.6pF (0R6)												
	0.7pF (0R7)												
	0.8pF (0R8)												
	0.9pF (0R9)												
	1.0pF (1R0)												
	1.2pF (1R2)												
	1.5pF (1R5)												
	1.8pF (1R8)												
	2.2pF (2R2)												
	2.7pF (2R7)												
	3.3pF (3R3)												
	3.9pF (3R9)												
	4.7pF (4R7)												
	5.6pF (5R6)												
	6.8pF (6R8)												
	8.2pF (8R2)												
	10pF (100)												
	12pF (120)												
	15pF (150)												
	18pF (180)												
	22pF (220)												
	27pF (270)												
	33pF (330)												
	39pF (390)												
	47pF (470)												
	56pF (560)												
	68pF (680)												
	82pF (820)												
	100pF (101)												
	120pF (121)												
	150pF (151)												
	180pF (181)												
	220pF (221)												
	270pF (271)												
	330pF (331)												
	390pF (391)												
	470pF (471)												
	560pF (561)												
	680pF (681)												
820pF (821)													
1,000pF (102)													
1,200pF (122)													
1,500pF (152)													
1,800pF (182)													
2,200pF (222)													
2,700pF (272)													
3,300pF (332)													
3,900pF (392)													
4,700pF (472)													
5,600pF (562)													
6,800pF (682)													
8,200pF (822)													
0.010μF (103)													
0.012μF (123)													

7-1. 1206, 1210, 1812 Sizes

DIELECTRIC		NP0												
SIZE		1206				1210				1812				
RATED VOLTAGE (VDC)		10	16	25	50	10	16	25	50	10	16	25	50	
Capacitance	1.0pF (1R0)													
	1.2pF (1R2)													
	1.5pF (1R5)													
	1.8pF (1R8)													
	2.2pF (2R2)													
	2.7pF (2R7)													
	3.3pF (3R3)													
	3.9pF (3R9)													
	4.7pF (4R7)													
	5.6pF (5R6)													
	6.8pF (6R8)													
	8.2pF (8R2)													
	10pF (100)													
	12pF (120)													
	15pF (150)													
	18pF (180)													
	22pF (220)													
	27pF (270)													
	33pF (330)													
	39pF (390)													
	47pF (470)													
	56pF (560)													
	68pF (680)													
	82pF (820)													
	100pF (101)													
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	270pF (271)													
	330pF (331)													
	390pF (391)													
	470pF (471)													
	560pF (561)													
	680pF (681)													
	820pF (821)													
	1,000pF (102)													
	1,200pF (122)													
	1,500pF (152)													
	1,800pF (182)													
2,200pF (222)														
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8,200pF (822)														
0.010μF (103)														
0.012μF (123)														
0.015μF (153)														
0.018μF (183)														
0.022μF (223)														
0.027μF (273)														
0.033μF (333)														
0.039μF (393)														

# 8. CAPACITANCE RANGE (X7R Dielectric)

## 8.1 0402, 0603, 0805, 1206 Sizes

DIELECTRIC SIZE		X7R																
		0402				0603				0805				1206				
RATED VOLTAGE (VDC)		6.3	10	16	25	50	10	16	25	50	10	16	25	50	10	16	25	50
Capacitance	100pF (101)																	
	120pF (121)																	
	150pF (151)																	
	180pF (181)																	
	220pF (221)																	
	270pF (271)																	
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	820pF (821)																	
	1,000pF (102)																	
	1,200pF (122)																	
	1,500pF (152)																	
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	2,200pF (222)																	
	2,700pF (272)																	
	3,300pF (332)																	
	3,900pF (392)																	
	4,700pF (472)																	
	5,600pF (562)																	
	6,800pF (682)																	
	8,200pF (822)																	
	0.010μF (103)																	
	0.012μF (123)																	
	0.015μF (153)																	
	0.018μF (183)																	
	0.022μF (223)																	
	0.027μF (273)																	
	0.033μF (333)																	
	0.039μF (393)																	
	0.047μF (473)																	
	0.056μF (563)																	
	0.068μF (683)																	
	0.082μF (823)																	
	0.10μF (104)																	
	0.12μF (124)																	
	0.15μF (154)																	
	0.18μF (184)																	
0.22μF (224)																		
0.27μF (274)																		
0.33μF (334)																		
0.39μF (394)																		
0.47μF (474)																		
0.56μF (564)																		
0.68μF (684)																		
0.82μF (824)																		
1.0μF (105)																		

8-2. 1210, 1812, 2220, 2225 Sizes

DIELECTRIC		X7R										
SIZE		1210				1812				1825	2220	2225
RATED VOLTAGE (VDC)		10	16	25	50	10	16	25	50	50	50	50
Capacitance	100pF (101)											
	120pF (121)											
	150pF (151)											
	180pF (181)											
	220pF (221)											
	270pF (271)											
	330pF (331)											
	390pF (391)											
	470pF (471)											
	560pF (561)											
	680pF (681)											
	820pF (821)											
	1,000pF (102)											
	1,200pF (122)											
	1,500pF (152)											
	1,800pF (182)											
	2,200pF (222)											
	2,700pF (272)											
	3,300pF (332)											
	3,900pF (392)											
	4,700pF (472)											
	5,600pF (562)											
	6,800pF (682)											
	8,200pF (822)											
	0.010μF (103)											
	0.012μF (123)											
	0.015μF (153)											
	0.018μF (183)											
	0.022μF (223)											
	0.027μF (273)											
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0.22μF (224)												
0.27μF (274)												
0.33μF (334)												
0.39μF (394)												
0.47μF (474)												
0.56μF (564)												
0.68μF (684)												
0.82μF (824)												
1.0μF (105)												

# 9. CAPACITANCE RANGE (Y5V Dielectric)

## 9-1. 0402, 0603, 0805 Sizes

DIELECTRIC SIZE		Y5V													
RATED VOLTAGE (VDC)		0402				0603					0805				
		6.3	10	16	25	50	6.3	10	16	25	50	10	16	25	50
Capacitance	0.010µF (103)														
	0.015µF (153)														
	0.022µF (223)														
	0.033µF (333)														
	0.047µF (473)														
	0.068µF (683)														
	0.10µF (104)														
	0.15µF (154)														
	0.22µF (224)														
	0.33µF (334)														
	0.47µF (474)														
	0.68µF (684)														
1.0µF (105)															

## 9-2. 1206, 1210, 1812 Sizes

DIELECTRIC SIZE		Y5V											
RATED VOLTAGE (VDC)		1206				1210				1812			
		10	16	25	50	10	16	25	50	10	16	25	50
Capacitance	0.010µF (103)												
	0.015µF (153)												
	0.022µF (223)												
	0.033µF (333)												
	0.047µF (473)												
	0.068µF (683)												
	0.10µF (104)												
	0.15µF (154)												
	0.22µF (224)												
	0.33µF (334)												
	0.47µF (474)												
	0.68µF (684)												
1.0µF (105)													

# 10.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																																																				
1.	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.																																																																				
2.	Capacitance	Class I: NP0	* Shall not exceed the limits given in the detailed spec.																																																																				
3.	Q/ D.F. (Dissipation Factor)	Cap $\leq$ 1000pF, 1.0 $\pm$ 0.2Vrms, 1MHz $\pm$ 10% Cap $>$ 1000pF, 1.0 $\pm$ 0.2Vrms, 1KHz $\pm$ 10%  Cap $\leq$ 10 $\mu$ F, 1.0 $\pm$ 0.2Vrms, 1KHz $\pm$ 10% Cap $>$ 10 $\mu$ F, 0.5 $\pm$ 0.2Vrms, 120Hz $\pm$ 20%	NP0: 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.</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td><math>\geq</math>50V</td> <td><math>\leq</math>2.5%</td> <td><math>\leq</math>3%</td> <td>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>25V</td> <td><math>\leq</math>3.5%</td> <td><math>\leq</math>5%</td> <td>0805<math>\geq</math>1<math>\mu</math>F;</td> </tr> <tr> <td></td> <td></td> <td><math>\leq</math>7%</td> <td>0603<math>\geq</math>0.33<math>\mu</math>F</td> </tr> <tr> <td>16V</td> <td><math>\leq</math>3.5%</td> <td><math>\leq</math>5%</td> <td>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</td> </tr> <tr> <td></td> <td></td> <td><math>\leq</math>10%</td> <td>0603<math>\geq</math>0.68<math>\mu</math>F</td> </tr> <tr> <td>10V</td> <td><math>\leq</math>5.0%</td> <td><math>\leq</math>10%</td> <td>0603<math>\geq</math>1<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td>6.3V</td> <td><math>\leq</math>10%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> Y5V: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td><math>\geq</math>50V</td> <td><math>\leq</math>5.0%</td> <td><math>\leq</math>7%</td> <td>0603<math>\geq</math>0.1<math>\mu</math>F; 0805<math>\geq</math>0.47<math>\mu</math>F;</td> </tr> <tr> <td>35V</td> <td><math>\leq</math>7%</td> <td>---</td> <td>---</td> </tr> <tr> <td>25V</td> <td><math>\leq</math>5.0%</td> <td><math>\leq</math>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</td> </tr> <tr> <td></td> <td></td> <td><math>\leq</math>9%</td> <td>0402<math>\geq</math>0.068<math>\mu</math>F; 0603<math>\geq</math>0.47<math>\mu</math>F</td> </tr> <tr> <td>16V (C<math>&lt;</math>1.0<math>\mu</math>F)</td> <td><math>\leq</math>7.0%</td> <td><math>\leq</math>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>16V (C<math>\geq</math>1.0<math>\mu</math>F)</td> <td><math>\leq</math>9.0%</td> <td><math>\leq</math>12.5%</td> <td>0805<math>\geq</math>4.7<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><math>\leq</math>12.5%</td> <td>---</td> <td>---</td> </tr> <tr> <td>6.3V</td> <td><math>\leq</math>20%</td> <td>---</td> <td>--</td> </tr> </tbody> </table>	Rated vol.	D.F.	Exception of D.F.		$\geq$ 50V	$\leq$ 2.5%	$\leq$ 3%	0603 $\geq$ 0.047 $\mu$ F; 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F	25V	$\leq$ 3.5%	$\leq$ 5%	0805 $\geq$ 1 $\mu$ F;			$\leq$ 7%	0603 $\geq$ 0.33 $\mu$ F	16V	$\leq$ 3.5%	$\leq$ 5%	0402 $\geq$ 0.033 $\mu$ F; 0603 $\geq$ 0.15 $\mu$ F; 0805 $\geq$ 0.68 $\mu$ F			$\leq$ 10%	0603 $\geq$ 0.68 $\mu$ F	10V	$\leq$ 5.0%	$\leq$ 10%	0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 22 $\mu$ F	6.3V	$\leq$ 10%	---	---	Rated vol.	D.F.	Exception of D.F.		$\geq$ 50V	$\leq$ 5.0%	$\leq$ 7%	0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.47 $\mu$ F;	35V	$\leq$ 7%	---	---	25V	$\leq$ 5.0%	$\leq$ 7%	0402 $\geq$ 0.047 $\mu$ F ;0603 $\geq$ 0.1 $\mu$ F; 0805 $\geq$ 0.33 $\mu$ F; 1206 $\geq$ 1 $\mu$ F			$\leq$ 9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F	16V (C $<$ 1.0 $\mu$ F)	$\leq$ 7.0%	$\leq$ 9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F	16V (C $\geq$ 1.0 $\mu$ F)	$\leq$ 9.0%	$\leq$ 12.5%	0805 $\geq$ 4.7 $\mu$ F; 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F; 1812 $\geq$ 47 $\mu$ F	10V	$\leq$ 12.5%	---	---	6.3V	$\leq$ 20%	---	--
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16V (C $<$ 1.0 $\mu$ F)	$\leq$ 7.0%	$\leq$ 9%	0402 $\geq$ 0.068 $\mu$ F; 0603 $\geq$ 0.68 $\mu$ F																																																																				
16V (C $\geq$ 1.0 $\mu$ F)	$\leq$ 9.0%	$\leq$ 12.5%	0805 $\geq$ 4.7 $\mu$ F; 1206 $\geq$ 10 $\mu$ F; 1210 $\geq$ 22 $\mu$ F; 1812 $\geq$ 47 $\mu$ F																																																																				
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4.	Temperature Coefficient	With no electrical load. <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> </thead> <tbody> <tr> <td>NP0(C0G)</td> <td>-55~125°C at 25°C</td> </tr> <tr> <td>NP0(C0J)</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	NP0(C0G)	-55~125°C at 25°C	NP0(C0J)	-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	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>NP0(C0G)</td> <td>Within <math>\pm</math>30ppm/</td> </tr> <tr> <td>NP0(C0J)</td> <td>Within <math>\pm</math>120ppm/</td> </tr> <tr> <td>X7R</td> <td>Within <math>\pm</math>15%</td> </tr> <tr> <td>X5R</td> <td>Within <math>\pm</math>15%</td> </tr> <tr> <td>Y5V</td> <td>Within +30%/-80%</td> </tr> </tbody> </table>	T.C.	Capacitance Change	NP0(C0G)	Within $\pm$ 30ppm/	NP0(C0J)	Within $\pm$ 120ppm/	X7R	Within $\pm$ 15%	X5R	Within $\pm$ 15%	Y5V	Within +30%/-80%																																												
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5.	Dielectric Strength	* To apply voltage ( $\leq$ 50V) 250%. * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.																																																																				
6.	Insulation Resistance	To apply rated voltage for max. 120 sec.	NP0 : $\geq$ 100G $\Omega$ or Rx $C\geq$ 1000 $\Omega$ -F whichever is smaller. X7R, X5R, Y5V : $\geq$ 10G $\Omega$ or Rx $C\geq$ 100 $\Omega$ -F whichever is smaller.																																																																				
7.	Adhesive Strength of Termination	* Pressurizing force : 0201 : 2N 0402 & 0603 : 5N >0603 : 10N * Test time: 10 $\pm$ 1 sec.	* No remarkable damage or removal of the terminations.																																																																				
8.	Solderability	* Solder temperature: 235 $\pm$ 5°C * Dipping time: 5 $\pm$ 0.5 sec.	75% min. coverage of all metalized area.																																																																				
9.	Bending Test	* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5 $\pm$ 1 sec.	* No remarkable damage. * Cap change : NP0: within $\pm$ 10% 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.)																																																																				
10.	Resistance to Soldering Heat	* Solder temperature: 260 $\pm$ 5°C * Dipping time: 10 $\pm$ 1 sec * Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. * Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48 $\pm$ 4 hrs (Class II only) at room temp. * Measurement to be made after keeping at room temp. for 24 $\pm$ 2hrs (Class I) or 48 $\pm$ 4 hrs (Class II).	* No remarkable damage. * Cap change: NP0: within $\pm$ 2.5% or $\pm$ 0.25pF whichever is larger. X7R, X5R: within $\pm$ 7.5% Y5V: within $\pm$ 20% * 25% max. leaching on each edge.																																																																				



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11.	<b>Temperature Cycle</b>	<p>* Conduct the five cycles according to the temperatures and time.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> <p>* Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp.</p> <p>* 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	<p>* No remarkable damage.</p> <p>* Cap change :  NP0: within ±2.5% or ±0.25pF whichever is larger.  X7R, X5R: within ±15%  Y5V: within ±20%</p> <p>* Q/D.F.≤1.5×initial requirement</p> <p>* I.R.≥ 0.25×initial requirements.</p>																																															
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12.	<b>Humidity (Damp Heat) Steady State</b>	<p>* Test temp.: 40±2°C</p> <p>* Humidity: 90~95% RH</p> <p>* Test time: 500+24/-0hrs.</p> <p>* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</p>	<p>* No remarkable damage.</p> <p>* Cap change:  NP0: within 5% or ±0.5pF whichever is larger.  X7R, X5R: ≥10V, within ±15%;  6.3V, within ±25%  Y5V: ≥10V, within ±30%;  6.3V, within +30/-40%</p> <p>* Q/D.F. value:  NP0: Cap≥30pF, Q≥ 350; 10pF≤Cap&lt;30pF, Q≥275+2.5C  Cap&lt;10pF, Q≥200+10C  X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤3.0%</td> <td>≤6.0%</td> <td>0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">≤5.0%</td> <td>≤10.0%</td> <td>0805≥1μF; 1210≥10μF;</td> </tr> <tr> <td>≤14.0%</td> <td>0603≥0.33μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5.0%</td> <td rowspan="2">≤10.0%</td> <td>0402≥0.033μF; 0603≥0.15μF;</td> </tr> <tr> <td>0805≥0.68μF; 1206≥2.2μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td rowspan="2">≤15.0%</td> <td>0402≥0.056μF; 0603≥0.33μF;</td> </tr> <tr> <td>0805≥2.2μF; 1206≥2.2μF;</td> </tr> <tr> <td>6.3V</td> <td>≤15.0%</td> <td>≤30.0%</td> <td>0805≥10μF; 1210≥100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤7.5%</td> <td>---</td> <td>---</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>≤10.0%</td> <td>0402≥0.047μF; 0603≥0.1μF; 0805≥0.33μF; 1206≥1μF; 1210≥4.7μF</td> </tr> <tr> <td>≤12.5%</td> <td>0402≥0.068μF; 0603≥0.47μF</td> </tr> <tr> <td>16V (C&lt;1.0μF)</td> <td>≤10.0%</td> <td>≤12.5%</td> <td>0402≥0.068μF; 0603≥0.68μF</td> </tr> <tr> <td>16V (C≥1.0μF)</td> <td>≤12.5%</td> <td>≤20%</td> <td>0805≥4.7μF; 1206≥10μF; 1210≥22μF; 1812≥47μF</td> </tr> <tr> <td>10V</td> <td>≤15.0%</td> <td>---</td> <td>---</td> </tr> <tr> <td>6.3V</td> <td>≤30%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>* I.R.: ≥10V, ≥1GΩ or RxC≥50Ω-F whichever is smaller. ;6.3V, RxC≥10Ω-F</p>	Rated vol.	D.F.	Exception of D.F.		≥50V	≤3.0%	≤6.0%	0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	25V	≤5.0%	≤10.0%	0805≥1μF; 1210≥10μF;	≤14.0%	0603≥0.33μF	16V	≤5.0%	≤10.0%	0402≥0.033μF; 0603≥0.15μF;	0805≥0.68μF; 1206≥2.2μF	10V	≤7.5%	≤15.0%	0402≥0.056μF; 0603≥0.33μF;	0805≥2.2μF; 1206≥2.2μF;	6.3V	≤15.0%	≤30.0%	0805≥10μF; 1210≥100μF	Rated vol.	D.F.	Exception of D.F.		≥50V	≤7.5%	---	---	35V	≤10%	---	---	25V	≤7.5%	≤10.0%	0402≥0.047μF; 0603≥0.1μF; 0805≥0.33μF; 1206≥1μF; 1210≥4.7μF	≤12.5%	0402≥0.068μF; 0603≥0.47μF	16V (C<1.0μF)	≤10.0%	≤12.5%	0402≥0.068μF; 0603≥0.68μF	16V (C≥1.0μF)	≤12.5%	≤20%	0805≥4.7μF; 1206≥10μF; 1210≥22μF; 1812≥47μF	10V	≤15.0%	---	---	6.3V	≤30%	---	---
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13.	High Temperature Load (Endurance)	* Test temp.: NP0, X7R: 125±3°C X5R, Y5V: 85±3°C * To apply voltage: 200% of rated voltage. * Test time: 1000+24/-0 hrs. * Measurement to be made after keeping at room temp. for 48±4 hrs.	* No remarkable damage. * Cap change: NP0: ±3% or ±3pF whichever is larger X7R, X5R: ≥10V, within ±20%; 6.3V, within ±25% Y5V: ≥10V, within ±30%; 6.3V, within +30/-40% * Q/D.F. value: NP0: Cap≥30pF, Q≥ 350; 10pF≤Cap<30pF, Q≥275+2.5C Cap<10pF, Q≥200+10C X7R, X5R: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤3.0%</td> <td>≤6.0%</td> <td>0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">≤5.0%</td> <td>≤10.0%</td> <td>0805≥1μF; 1210≥10μF;</td> </tr> <tr> <td>≤14.0%</td> <td>0603≥0.33μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5.0%</td> <td rowspan="2">≤10.0%</td> <td>0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF</td> </tr> <tr> <td>1206≥2.2μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td rowspan="2">≤15.0%</td> <td>0402≥0.056μF; 0603≥0.33μF; 0805≥2.2μF</td> </tr> <tr> <td>1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>6.3V</td> <td>≤15.0%</td> <td>≤30.0%</td> <td>0805≥10μF; 1210≥100μF</td> </tr> </tbody> </table> Y5V: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤7.5%</td> <td>---</td> <td>---</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>≤10.0%</td> <td>0603≥0.1μF; 0805≥0.33μF; 1206≥1μF; 1210≥4.7μF</td> </tr> <tr> <td>≤12.5%</td> <td>0402≥0.068μF</td> </tr> <tr> <td>16V (C&lt;1.0μF)</td> <td>≤10.0%</td> <td>≤12.5%</td> <td>0402≥0.068μF; 0603≥0.68μF</td> </tr> <tr> <td>16V (C≥1.0μF)</td> <td>≤12.5%</td> <td>≤20%</td> <td>0805≥4.7μF; 1206≥10μF; 1210≥22μF; 1812≥47μF</td> </tr> <tr> <td>10V</td> <td>≤15.0%</td> <td>---</td> <td>---</td> </tr> <tr> <td>6.3V</td> <td>≤30%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> * I.R.: ≥10V, ≥1GΩ or RxC≥50Ω-F whichever is smaller.; 6.3V, RxC≥10Ω-F	Rated vol.	D.F.	Exception of D.F.		≥50V	≤3.0%	≤6.0%	0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	25V	≤5.0%	≤10.0%	0805≥1μF; 1210≥10μF;	≤14.0%	0603≥0.33μF	16V	≤5.0%	≤10.0%	0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF	1206≥2.2μF	10V	≤7.5%	≤15.0%	0402≥0.056μF; 0603≥0.33μF; 0805≥2.2μF	1206≥2.2μF; 1210≥22μF	6.3V	≤15.0%	≤30.0%	0805≥10μF; 1210≥100μF	Rated vol.	D.F.	Exception of D.F.		≥50V	≤7.5%	---	---	35V	≤10%	---	---	25V	≤7.5%	≤10.0%	0603≥0.1μF; 0805≥0.33μF; 1206≥1μF; 1210≥4.7μF	≤12.5%	0402≥0.068μF	16V (C<1.0μF)	≤10.0%	≤12.5%	0402≥0.068μF; 0603≥0.68μF	16V (C≥1.0μF)	≤12.5%	≤20%	0805≥4.7μF; 1206≥10μF; 1210≥22μF; 1812≥47μF	10V	≤15.0%	---	---	6.3V	≤30%	---	---
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