APPROVAL SHEET

MULTILAYER CERAMIC CAPACITORS

Soft Termination Series

(SG_6.3V to 3000V)

X7R Dielectric

0603 to 1206 Sizes

Halogen Free & RoHS Compliance

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

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1. INTRODUCTION

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

2. FEATURES

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

3. APPLICATIONS

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

4. HOW TO ORDER

SG	31	B	104	K	500	C	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
SG=Soft termination	**18**=0603 (1608) **21**=0805 (2012) **31**=1206 (3216)	**B**=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg. 104=10x10^4 =100nF	**J**=±5% **K**=±10% **M**=±20%	Two significant digits followed by no. of zeros. And R is in place of decimal point. **6R3**=6.3 VDC **100**=10 VDC **160**=16 VDC **250**=25 VDC **500**=50 VDC **101**=100 VDC **201**=200 VDC **251**=250 VDC **401**=400 VDC **451**=450 VDC **501**=500 VDC **631**=630 VDC **102**=1000 VDC **152**=1500 VDC **202**=2000 VDC	**C**=Cu Polymer /Ni/Sn	**T**=7" reeled **G**=13" reeled

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5. EXTERNAL DIMENSIONS & CONSTRUCTIONS

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

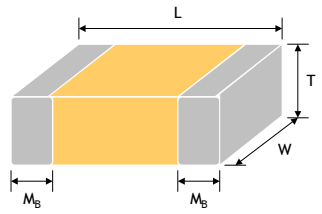

Fig. 1 The outline of MLCC

Reflow soldering only is recommended.

* For 1206_≧1000V products.

6. GENERAL ELECTRICAL DATA

Dielectric	X7R
Size	0603, 0805, 1206
Capacitance range*	100pF to 1μF
Capacitance tolerance**	J (±5%), K (±10%), M (±20%)
Rated voltage (WVDC)	6.3V to 2000V
Operating temperature	-55 to +125℃
Capacitance characteristic	±15%
Termination	Ni/Sn (lead-free termination)

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

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

X7R, X5R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25℃ am bient temperature.

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

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7. CAPACITANCE RANGE

X7R Dielectric 0402, 0603 Sizes

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

1. The letter in cell is expressed the symbol of product thickness.

2. For more information about products with special capacitance or other data, please contact WTC local representative.

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X7R Dielectric 0805 Size

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

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X7R Dielectric 1206 Size

DIELECTRIC		X7R												
SIZE		1206												
RATED VOLTAGE		10	16	25	50	100	200	250	400	450	500	630	1000	1500	2000
Capacitance	100pF (101)						D	D			D	D	D	D	D
	120pF (121)						D	D			D	D	D	D	D
	150pF (151)	D	D	D	D	D	D	D			D	D	D	D	D
	180pF (181)	D	D	D	D	D	D	D			D	D	D	D	D
	220pF (221)	D	D	D	D	D	D	D			D	D	D	D	D
	270pF (271)	D	D	D	D	D	D	D			D	D	D	D	D
	330pF (331)	D	D	D	D	D	D	D			D	D	D	D	D
	390pF (391)	D	D	D	D	D	D	D			D	D	D	D	D
	470pF (471)	D	D	D	D	D	D	D			D	D	D	D	D
	560pF (561)	D	D	D	D	D	D	D			D	D	D	D	D
	680pF (681)	D	D	D	D	D	D	D			D	D	D	D	D
	820pF (821)	D	D	D	D	D	D	D			D	D	D	G	G
	1,000pF (102)	D	D	D	D	D	D	D			D	D	D	G	G
	1,200pF (122)	D	D	D	D	D	D	D			D	D	D	G	G
	1,500pF (152)	D	D	D	D	D	D	D			D	D	D	G	G
	1,800pF (182)	D	D	D	D	D	D	D			D	D	D	G	G
	2,200pF (222)	D	D	D	D	D	D	D			D	D	D	G	G
	2,700pF (272)	D	D	D	D	D	D	D			D	D	D	G	G
	3,300pF (332)	D	D	D	D	D	D	D			D	D	D	G	G
	3,900pF (392)	D	D	D	D	D	D	D			D	D	D	G	
	4,700pF (472)	D	D	D	D	D	D	D			D	D	D	G	
	5,600pF (562)	D	D	D	D	D	D	D			D	D	D	G	
	6,800pF (682)	D	D	D	D	D	D	D			D	D	D	G	
	8,200pF (822)	D	D	D	D	D	D	D			D	D	D	G	
	0.010μF (103)	D	D	D	D	D	D	D			D	D	D	G	
	0.012μF (123)	D	D	D	D	D	D	D			D	D	G		
	0.015μF (153)	D	D	D	D	D	D	D			D	D	G		
	0.018μF (183)	D	D	D	D	D	D	D			D	D			
	0.022μF (223)	D	D	D	D	D	D	D			G	G			
	0.027μF (273)	D	D	D	D	D	D	D			G	G			
	0.033μF (333)	D	D	D	D	D	G	G			G	G			
	0.039μF (393)	D	D	D	D	D	G	G			G	G			
	0.047μF (473)	D	D	D	D	D	G	G			G	G			
	0.056μF (563)	D	D	D	D	D	G	G			G	G			
	0.068μF (683)	D	D	D	D	D	G	G	G	G					
	0.082μF (823)	D	D	D	D	D	G	G	G	G					
	0.10μF (104)	D	D	D	D	D	G	G	G	G					
	0.12μF (124)	D	D	D	D	D									
	0.15μF (154)	C	C	C	C	G									
	0.18μF (184)	C	C	C	C	G									
	0.22μF (224)	C	C	C	C	G									
	0.27μF (274)	C	C	C	D	G									
	0.33μF (334)	C	C	C	D	G									
	0.39μF (394)	C	C	J	P	G									
	0.47μF (474)	J	J	J	P	G									
	0.56μF (564)	J	J	J	P	P									
	0.68μF (684)	J	J	J	P	P									
	0.82μF (824)	J	J	J	P	P									
	1.0μF (105)	J	J	J	P										
	1.5μF (155)														
	2.2μF (225)														
	3.3μF (335)														
	4.7μF (475)														
	10μF (106)														
	22μF (226)														
	47μF (476)														

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2. For more information about products with special capacitance or other data, please contact WTC local representative.

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8. PACKAGING STYLE AND QUANTITY

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

Unit: pieces

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9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Visual and Mechanical</td><td>---</td><td>* No remarkable defect.
* Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>2.</td><td>Capacitance</td><td>Class I: (NP0)
C≦1000pF, 1.0±0.2Vrms，1MHz±10%
C＞1000pF, 1.0±0.2Vrms，1KHz±10%
Class II: (X7R, X7E, X6S, X5R,X7S,Y5V)
C≦10μF, 1.0±0.2Vrms，1KHz±10% **
C＞10μF, 0.5±0.2Vrms，120Hz±20%</td><td>* Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3.</td><td>Q/ D.F. (Dissipation Factor)</td><td>** Test condition: 0.5±0.2Vrms，1KHz±10%
X7R:
0805=106(6.3V), 0603/475(6.3V)
X5R:
0201≧224 (6.3V,10V,16V)#1,
0402≧475 (6.3V,16V), 0402≧225(10V),
0603=106 (6.3V,10V),
TT18X≧475(10V) , TT15X series
X6S:
0201/474(4V),0201≧104 (6.3V,10V#1),
0402≧225 (6.3V),
0402/475 (10V), 0603/106 (6.3V),
X7S:
0402/225(6.3V)

#1 Excluding
X5R/0201/105(6.3V);225(10V),
X6S/0201/104(10V)
(1.0±0.2Vrms，1KHz±10%)

*Before initial measurement (Class II only):
To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.</td><td>NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C
X7R,X5R,X6S,X7S:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧100V</td><td rowspan="3">≦2.5%</td><td>≦3%</td><td>1206≧0.47μF</td></tr>
<tr><td>≦5%</td><td>0805＞0.1μF;0603≧0.068μF;1206>1μF;1210≧2.2μF;TT series</td></tr>
<tr><td>≦10%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
<tr><td rowspan="3">50V</td><td rowspan="3">≦2.5%</td><td>≦3%</td><td>0201(50V);0603≧0.047μF;0805≧0.18μF;1206≧0.47μF</td></tr>
<tr><td>≦5%</td><td>0201≧0.01uF;1210≧4.7μF</td></tr>
<tr><td>≦10%</td><td>0402≧0.012μF; 0603>0.1μF; 0805≧1μF(0805/X7R>0.47μF);
1206≧2.2μF; 1210≧10μF; TT series</td></tr>
<tr><td>35V</td><td>≦3.5%</td><td>≦10%</td><td>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%</td><td>0201≧0.01μF;0805≧1μF;1210≧10μF</td></tr>
<tr><td>≦7%</td><td>0603≧0.33μF</td></tr>
<tr><td>≦10%</td><td>0201≧0.1μF;0402≧0.10μF&(0402/X7R≧0.056μF);TT series;
0603≧0.47μF;0805≧2.2μF;1206≧4.7μF;1210≧22μF</td></tr>
<tr><td>≦12.5%</td><td>0402≧0.47μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦3.5%</td><td>≦5%</td><td>0201≧0.01μF;0402≧0.033μF;0603≧0.15μF;
0805≧0.68μF;1206≧2.2μF;1210≧4.7μF</td></tr>
<tr><td>≦10%</td><td>0201≧0.1uF(0201/X7R≧0.022μF);0402≧0.22uF;TT series
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%</td><td>0201≧0.012μF;0402≧0.33μF(0402/X7R≧0.22μF);TT series
0603≧0.33μF;0805≧2.2μF;1206≧2.2μF;1210≧22μF;01R5</td></tr>
<tr><td>≦15%</td><td>0201≧0.1μF; 0402≧1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≦10%</td><td>≦15%</td><td>0201≧0.1μF;0402≧1μF(0402/X6S≧0.47μF);0603≧10μF;
0805≧4.7μF;1206≧47μF;1210≧100μF;TT series</td></tr>
<tr><td>≦20%</td><td>0402≧2.2μF</td></tr>
<tr><td>4V</td><td>≦15%</td><td>---</td><td>---</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F. ≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td rowspan="2">≧50V</td><td rowspan="2">≦5%</td><td>≦7%</td><td>0603≧0.1μF; 0805≧0.47μF; 1206≧4.7μF; TT series</td></tr>
<tr><td>≦12.5%</td><td>1210≧6.8μF</td></tr>
<tr><td>35V</td><td>≦7%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≦5%</td><td>≦7%</td><td>0402≧0.047μF;0603≧0.1μF; 0805≧0.33μF;
1206≧1μF; 1210≧4.7μF</td></tr>
<tr><td>≦9%</td><td>0402≧0.068μF;0603≧0.47μF; 1206≧4.7μF;
1210≧22μF; TT series</td></tr>
<tr><td rowspan="2">16V
(C<1.0μF)</td><td rowspan="2">≦7%</td><td>≦9%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr>
<tr><td>≦12.5%</td><td>0402≧0.22μF</td></tr>
<tr><td>16V
(C≧1.0μF)</td><td>≦9%</td><td>≦12.5%</td><td>0603≧2.2μF; 0805≧3.3μF;1206≧10μF;
1210≧22μF; 1812≧47μF; TT series</td></tr>
<tr><td>10V</td><td>≦12.5%</td><td>≦20%</td><td>0402≧0.47μF</td></tr>
<tr><td>6.3V</td><td>≦20%</td><td>---</td><td>---</td></tr>
</table></td></tr>
<tr><td>4.</td><td>Dielectric Strength</td><td>*To apply voltage:
≦100V: 250% of rated voltage.
200V ~ 300V: 200% of rated voltage.
400V ~ 450V: 120% of rated voltage.
500V ~ 999V: 150% of rated voltage.
1000V ~ 3000V: 120% of rated voltage.
4000V: 110% of rated voltage.
*Duration: 1 to 5 sec.
Charge & discharge current less than 50mA.</td><td> No evidence of damage or flash over during test.</td></tr>
</table>

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<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>5.</td><td>Insulation Resistance</td><td>To apply rated voltage for MAX. 120sec.</td><td>10GΩ or RxC≧500Ω-F whichever is smaller.
Class II (X7R, X7E, X5R,X6S,X7S,Y5V:)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R</td><td rowspan="6">10GΩ or RxC≧100 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1206≧2.2μF;1210≧10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: 0201≥0.1μF,0402≥0.22μF;0603≥1μF;
0805≥2.2μF;1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ; TT series; Size≥1812</td><td rowspan="10">RxC≧50 Ω-F.</td></tr>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>All X6S items, All X7S items</td></tr>
<tr><td>100V: 1210≥3.3μF</td></tr>
<tr><td>50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF</td></tr>
<tr><td>35V: 0603≥1μF;</td></tr>
<tr><td>25V: 0201≥0.1μF; 0402≥2.2μF;0603≥10μF; 0805≥10μF;1206≥22μF</td></tr>
<tr><td>16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF</td></tr>
<tr><td>10V: 0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF; TT21>4.7μF</td></tr>
<tr><td>6.3V: 0201≥0.1μF; 0603>4.7μF; 0805≥47μF;1206≥10μF; TT15>1.0μF</td></tr>
<tr><td>4V:0603≥22μF; 0805≥47μF; 1206≥100μF</td></tr>
</table></td></tr>
<tr><td></td><td></td><td>Rated voltage: 200~630V</td><td>To apply rated voltage (500V max.) for 60 sec.</td><td>≥10GΩ or RxC≥100Ω-F whichever is smaller</td></tr>
<tr><td></td><td></td><td>Rated voltage: >630V</td><td>To apply 500V for 60 sec.</td><td></td></tr>
<tr><td>6.</td><td>Temperature Coefficient</td><td>With no electrical load.
<table>
<tr><th>T.C.</th><th>Operating Temp</th></tr>
<tr><td>NPO</td><td>-55~125℃ at 25℃</td></tr>
<tr><td>X7R</td><td>-55~125℃ at 25℃</td></tr>
<tr><td>X7S</td><td>-55 ~ 125℃ at 25℃</td></tr>
<tr><td>X5R</td><td>-55~ 85℃ at 25℃</td></tr>
<tr><td>X6S</td><td>-55~105℃ at 25℃</td></tr>
<tr><td>Y5V</td><td>-25~ 85℃ at 20℃</td></tr>
</table>
*Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.
* Measurement voltage for Class II:
<table>
<tr><th>T.C.</th><th>Capacitance Change</th></tr>
<tr><td>NPO</td><td>Within ±30ppm/℃</td></tr>
<tr><td>X7R</td><td>Within ±15%</td></tr>
<tr><td>X7S</td><td>Within ±22%</td></tr>
<tr><td>X5R</td><td>Within ±15%</td></tr>
<tr><td>X6S</td><td>Within ±22%</td></tr>
<tr><td>Y5V</td><td>Within +30%/-80%</td></tr>
</table>
<table>
<tr><th>01005</th><th>0201</th></tr>
<tr><td>Cap≤0.01μF: 0.5V</td><td>Cap<0.1μF:1V</td></tr>
<tr><td>Cap>0.01μF: 0.2V</td><td>0.1μF*≤Cap<1μF: 0.2V</td></tr>
<tr><td></td><td>Cap≥1μF: 0.1V</td></tr>
<tr><td></td><td>* 0201X104/16V: 0.5V
0201X224/10V: 0.5V</td></tr>
<tr><th>0402</th><th>0603</th></tr>
<tr><td>Cap<1μF: 1V</td><td>Cap<1μF: 1V</td></tr>
<tr><td>Cap=1μF: 0.5V**
0402B224-16V: 0.5V
0402B474-10V: 0.5V
0402X475M6R3: 0.5V</td><td>1μF≤Cap≤4.7μF: 0.5V</td></tr>
<tr><td>1μF<Cap<10μF: 0.2V
**0402B105M6R3V: 0.2V</td><td>Cap>4.7μF: 0.2V</td></tr>
<tr><td>Cap≥10μF: 0.1V</td><td></td></tr>
<tr><th>0805</th><th>1206/1210</th></tr>
<tr><td>Cap<10μF: 1V</td><td>Cap≤10μF: 1V</td></tr>
<tr><td>Cap=10μF: 0.5V</td><td>10μF<Cap≤100μF: 0.5V</td></tr>
<tr><td>Cap>10μF: 0.2V</td><td>Cap>100μF: 0.2V</td></tr>
</table></td><td></td></tr>
</table>

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No.	Item	Test Condition	Requirements
7.	**Adhesive Strength of Termination**	* Pressurizing force： 2N (0201) and 5N (≤0603) and 10N (>0603) * Test time: 10±1 sec.	* No remarkable damage or removal of the terminations.
8.	**Vibration Resistance**	* Vibration frequency: 10~55 Hz/min. * Total amplitude: 1.5mm * Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.) *Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24± 2 hrs at room temp. *Cap./DF(Q) Measurement to be made after de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.
9.	**Solderability**	* Solder temperature: 235±5℃ * Dipping time: 2±0.5 sec.	* 75% min. coverage of all metalized area.
10.	**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 5 mm and then the pressure shall be maintained for 5±1 sec. *Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24± 2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs.	* No remarkable damage. * Cap change： NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S, X7S: within ±12.5% Y5V: within ±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)
11.	**Resistance to Soldering Heat**	* Solder temperature: 260±5℃ * Dipping time: 10±1 sec * Preheating: 120 to 150℃ for 1 minute before imme rse the capacitor in a eutectic solder. *Before initial measurement (Class II only): To apply de-aging at 150℃ 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℃ for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. * Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S, X7S: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge.
12.	**Temperature Cycle**	* Conduct the five cycles according to the temperatures and time. Step / Temp. (℃) / 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 *Before initial measurement (Class II only): To apply de-aging at 150℃ 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℃ for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. * Cap change： NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S, X7S: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements.

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<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>13.</td><td>Humidity (Damp Heat) Steady State</td><td>*Test temp.: 40±2℃
*Humidity: 90~95%RH
*Test time: 500+24/-0hrs.
*Before initial measurement (Class II only): To apply de-aging at 150℃ 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℃ for 1hr then set for 24±2 hrs at room temp.</td><td>
* No remarkable damage.
* Cap change:
NP0: within ±5% or 0.5pF whichever is larger
X7R, X5R, X6S, X7S: ≥10V**,within ±12.5%; ≦6.3V within ±25%;
TT series & C≥ 1uF,within ±25%
**10V: 0603≧4.7μF;0402≧1μF;0201≧0.1μF, within ±25%;
Y5V: ≥10V, within ±30%; ≦6.3V, within +30/-40%
* Q/D.F. value:
NP0: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C
Less than 10pF Q≥200+10C
X7R, X5R, X6S, X7S:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td rowspan="3">≧100V</td><td rowspan="3">≦3%</td><td>≦6%</td><td>1206≧0.47μF</td></tr>
<tr><td>≦7.5%</td><td>0805＞0.1μF, 0603≧0.068μF, 1206>1μF;1210≧2.2μF;TT series</td></tr>
<tr><td>≦20%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
<tr><td rowspan="3">50V</td><td rowspan="3">≦3%</td><td>≦6%</td><td>0201(50V);0603≧0.047μF; 0805≧0.18μF; 1206≧0.47μF</td></tr>
<tr><td>≦10%</td><td>0201≧0.01uF;1210≧4.7μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.012μF; 0603>0.1μF; 0805≧1μF(0805/X7R>0.47μF);
1206≧2.2μF; 1210≧10μF; TT series</td></tr>
<tr><td>35V</td><td>≦5%</td><td>≦20%</td><td>0603≧1μF;0805≥2.2μF;1206≧2.2μF;1210≧10μF</td></tr>
<tr><td rowspan="4">25V</td><td rowspan="4">≦5%</td><td>≦10%</td><td>0201≧0.01μF;0805≧1μF; 1210≧10μF</td></tr>
<tr><td>≦14%</td><td>0603≧0.33μF</td></tr>
<tr><td>≦15%</td><td>0201≧0.1μF;0402≧0.10μF&(0402/X7R≧0.056μF); TT series
;0603≧0.47μF;0805≧2.2μF;1206≧4.7μF;1210≧22μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.47μF</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(0201/X7R≧0.022μF);0402≧0.033μF;
0603≧0.68μF;0805≧2.2μF;1206≧4.7μF; 1210≧22μF; TT series</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦7.5%</td><td>≦15%</td><td>0201≧0.012μF; 0402≧0.33μF(0402/X7R≧0.22μF);
0603≧0.33μF;0805≧2.2μF;1206≧2.2μF; 1210≧22μF</td></tr>
<tr><td>≦20%</td><td>0201≧0.1μF ;0402≧1μF; TT series; 01R5</td></tr>
<tr><td>6.3V</td><td>≦15%</td><td>≦30%</td><td>0201≧0.1μF;0402≧1μF(0402/X6S≧0.47μF);0603≧10μF;
0805≧4.7μF;1206≧47μF;1210≧100μF;TT series</td></tr>
<tr><td>4V</td><td>≦20%</td><td>---</td><td>---</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td rowspan="2">≧50V</td><td rowspan="2">≦7.5%</td><td>≦10%</td><td>0603≧0.1μF; 0805≧0.47μF;
1206≧4.7μF</td></tr>
<tr><td>≦20%</td><td>1210≧6.8μF</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>16V
(C<1.0μF)</td><td>≦10%</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>0402≧0.22μF
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>
</table>
*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.
Class II (X7R, X5R, X6S, X7S, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="7">1GΩ or RxC≧10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0603≥1μF;0805≥2.2μF; 1206≧2.2μF;1210≧10μF</td></tr>
<tr><td>25V:0201≧0.1uF; 0402≥0.22μF; 0603≥2.2μF;0805≥2.2μF;
1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: 0201≧0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF;
1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ; TT series ; All X6S/X7S items; Size≥1812</td></tr>
</table>
</td></tr>
</table>

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<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>14</td><td>Humidity (Damp Heat) Load</td><td>*Test temp.：40±2℃
*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℃ 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℃ for 1hr then set for 24±2 hrs at room temp.</td><td>
* No remarkable damage.
Cap change:
NP0: ±7.5% or 0.75pF whichever is larger.
X7R, X5R, X6S, X7S: ≥10V**,within ±12.5%; ≦6.3V within ±25%;
TT series & C≥ 1uF,within ±25%
**10V: 0603≧4.7μF;0402≧1μF;0201≧0.1μF, within ±25%;
Y5V: ≥10V, within ±30%; ≦6.3V, within +30/-40%
Q/D.F. value:
NP0: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C
X7R, X5R, X6S, X7S:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td rowspan="3">≧100V</td><td rowspan="3">≦3%</td><td>≦6%</td><td>1206≧0.47μF</td></tr>
<tr><td>≦7.5%</td><td>0805＞0.1μF, 0603≧0.068μF, 1206>1μF;1210≧2.2μF;TT series</td></tr>
<tr><td>≦20%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
<tr><td rowspan="3">50V</td><td rowspan="3">≦3%</td><td>≦6%</td><td>0201(50V);0603≧0.047μF; 0805≧0.18μF; 1206≧0.47μF</td></tr>
<tr><td>≦10%</td><td>0201≧0.01uF;1210≧4.7μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.012μF; 0603>0.1μF; 0805≧1μF(0805/X7R>0.47μF);
1206≧2.2μF; 1210≧10μF; TT series</td></tr>
<tr><td>35V</td><td>≦5%</td><td>≦20%</td><td>0603≧1μF;0805≥2.2μF;1206≧2.2μF;1210≧10μF</td></tr>
<tr><td rowspan="4">25V</td><td rowspan="4">≦5%</td><td>≦10%</td><td>0201≧0.01μF;0805≧1μF; 1210≧10μF</td></tr>
<tr><td>≦14%</td><td>0603≧0.33μF</td></tr>
<tr><td>≦15%</td><td>0201≧0.1μF;0402≧0.10μF&(0402/X7R≧0.056μF); TT series
;0603≧0.47μF;0805≧2.2μF;1206≧4.7μF;1210≧22μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.47μF</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(0201/X7R≧0.022μF);0402≧0.033μF;
0603≧0.68μF;0805≧2.2μF;1206≧4.7μF; 1210≧22μF; TT series</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦7.5%</td><td>≦15%</td><td>0201≧0.012μF; 0402≧0.33μF(0402/X7R≧0.22μF);
0603≧0.33μF;0805≧2.2μF;1206≧2.2μF; 1210≧22μF</td></tr>
<tr><td>≦20%</td><td>0201≧0.1μF ;0402≧1μF; TT series; 01R5</td></tr>
<tr><td>6.3V</td><td>≦15%</td><td>≦30%</td><td>0201≧0.1μF;0402≧1μF(0402/X6S≧0.47μF);0603≧10μF;
0805≧4.7μF;1206≧47μF;1210≧100μF;TT series</td></tr>
<tr><td>4V</td><td>≦20%</td><td>---</td><td>---</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td rowspan="2">≧50V</td><td rowspan="2">≦7.5%</td><td>≦10%</td><td>0603≧0.1μF; 0805≧0.47μF;1206≧4.7μF</td></tr>
<tr><td>≦20%</td><td>1210≧6.8μF</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>16V
(C<1.0μF)</td><td>≦10%</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>0402≧0.22μF
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>
</table>
*I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller.
Class II (X7R, X5R, X6S, X7S, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="7">500MΩ or RxC≧5 Ω-F whichever is smaller.</td></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0603≥1μF;0805≥2.2μF; 1206≧2.2μF;1210≧10μF</td></tr>
<tr><td>25V:0201≧0.1uF; 0402≥0.22μF; 0603≥2.2μF;0805≥2.2μF;
1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: 0201≧0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF;
1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ; TT series ; All X6S/X7S items; Size≥1812</td></tr>
</table>
</td></tr>
</table>

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No	Item	Test Condition	Requirements
15.	**High Temperature Load (Endurance)**	*Test temp.： NP0, X7R/X7E/X7S: 125±3℃ X6S: 105±3℃ X5R, Y5V: 85±3℃ *Test time: 1000+24/-0 hrs. *To apply voltage: (1) ≦6.3V or C≧10μF or TT series: 150% of rated voltage. (2) 10V~250V: 200% of rated voltage. (3) 400V~450V: 120% of rated voltage. (4) 500V: 150% of rated voltage. (5) 630V~3000V: 120% of rated voltage. (6) 4000V: 110% of rated voltage (7) 100% of rated voltage for below range.	* No remarkable damage. Cap change: NP0: ±3.0% or ±0.3pF whichever is larger X7R, X5R, X6S, X7S: ≥10V**,within ±12.5%; ≦6.3V within ±25%; TT series & C≥ 1uF,within ±25% **10V: 0603≧4.7μF;0402≧1μF;0201≧0.1μF, within ±25%; Y5V: ≥10V, within ±30%; ≦6.3V, within +30/-40% Q/D.F. value: NP0: More than 30pF, Q≥350 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C

Size	Dielectric	Rated v.	Capacitance
0201	X5R/X7R/X6S	≦10V	C≧0.1μF
		≧16V	C >0.1μF
0402	X5R	≦16V	C >1.0μF
		25V,50V	C≧1.0μF
	X6S	6.3V,10V	C >1.0μF
		16V,25V	C≧1.0μF
	X7R/X7S/Y5V	6.3V,10V	C≧1.0μF
0603	X5R/X7R/ X6S/X7S	4V	C≧22μF
		6.3V,10V	C≧4.7μF
	X5R/X6S/X7S	25V	C≧1.0μF
	X7R	35V	C≧1.0μF
0805	X5R/X7R/ X6S/X7S	4V	C≧47μF
		6.3V	C≧22μF
		10V,50V	C≧10μF
	X7R/X6S/X7S	16V,25V	C≧10μF
	X5R		C≧22μF
1206	X5R/X7R/X6S	≦6.3V	C≧47μF
	NP0	3000V	C≧1.5pF
1210	X5R/X7R/X6S	16V	C≧47μF
	X7R	100V	C≧3.3μF
TT15	X5R	6.3V	C >1.0μF
TT18	Y5V	6.3V,10V	C≧2.2μF
TT21	Y5V	6.3V	C≧10μF
	X5R/X7R/X6S	≦10V	C≧10μF
TT31	Y5V	6.3V	C≧22μF

Rated vol.	D.F.≦	Exception of D.F.≦	
≧100V	≦3%	≦6%	1206≧0.47μF
		≦7.5%	0805＞0.1μF,0603≧0.068μF,1206>1μF;1210≧2.2μF;TT series
		≦20%	0805＞0.22μF;1210≧3.3μF
50V	≦3%	≦6%	0201(50V);0603≧0.047μF; 0805≧0.18μF; 1206≧0.47μF
		≦10%	0201≧0.01uF;1210≧4.7μF
		≦20%	0402≧0.012μF; 0603>0.1μF; 0805≧1μF(0805/X7R>0.47μF); 1206≧2.2μF; 1210≧10μF; TT series
35V	≦5%	≦20%	0603≧1μF;0805≧2.2μF;1206≧2.2μF;1210≧10μF
25V	≦5%	≦10%	0201≧0.01μF;0805≧1μF; 1210≧10μF
		≦14%	0603≧0.33μF
		≦15%	0201≧0.1μF;0402≧0.10μF&(0402/X7R≧0.056μF); TT series ;0603≧0.47μF;0805≧2.2μF;1206≧4.7μF;1210≧22μF
		≦20%	0402≧0.47μF
16V	≦5%	≦10%	0603≧0.15μF;0805≧0.68μF;1206≧2.2μF;1210≧4.7μF
		≦15%	0201≧0.01μF(0201/X7R≧0.022μF);0402≧0.033μF; 0603≧0.68μF;0805≧2.2μF;1206≧4.7μF; 1210≧22μF; TT ser
10V	≦7.5%	≦15%	0201≧0.012μF; 0402≧0.33μF(0402/X7R≧0.22μF); 0603≧0.33μF;0805≧2.2μF;1206≧2.2μF; 1210≧22μF
		≦20%	0201≧0.1μF ;0402≧1μF; TT series; 01R5
6.3V	≦15%	≦30%	0201≧0.1μF;0402≧1μF(0402/X6S≧0.47μF);0603≧10μF; 0805≧4.7μF;1206≧47μF;1210≧100μF;TT series
4V	≦20%	---	---

Y5V:

Rated vol.	D.F.≦	Exception of D.F.≦	
≧50V	≦7.5%	≦10%	0603≧0.1μF; 0805≧0.47μF;1206≧4.7μF
		≦20%	1210≧6.8μF
35V	≦10%	---	---
25V	≦7.5%	≦10%	0402≧0.047μF;0603≧0.1μF; 0805≧0.33μF;1206≧1μF; 1210≧4.7μF
		≦15%	0402≧0.068μF;0603≧0.47μF; 1206≧4.7μF; 1210≧22μF
16V (C<1.0μF)	≦10%	≦12.5%	0402≧0.068μF; 0603≧0.68μF
		≦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%	---	---

*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.

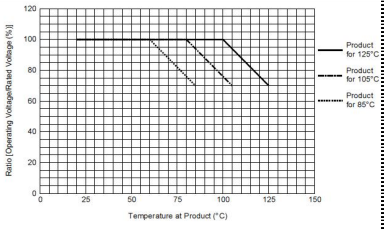
Class II (X7R, X5R, X6S, X7S, Y5V)

Rated voltage	Insulation Resistance
100V: All X7R;1210≥3.3μF	1GΩ or RxC≧ 10 Ω-F whichever is smaller.
50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF	
35V:0603≥1μF;0805≥2.2μF; 1206≧2.2μF;1210≧10μF	
25V:0201≧0.1uF; 0402≥0.22μF; 0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V: 0201≧0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF	
10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF	
6.3V ; 4V ; TT series ; All X6S/X7S items; Size≥1812	

Size	Dielectric	Rated v.	Capacitance
0201	X5R/X6S	16V,25V	C=0.1μF
	X7R	16V	C≧0.022μF
0402	X7R/X5R/ X6S	50V	C>0.01μF
		10~25V	C≧0.22μF
	Y5V	16V	C≧0.47μF
0603	X7S	50V~100V	C>0.22μF
	X7R	50V	C>0.1μF
		25V	C=1.0μF
	X5R	50V	C≧1.0μF
	X5R/X7R/ X6S/X7S	10V,16V,	C≧1.0μF
	Y5V	16V	C≧2.2μF
0805	X5R/X7R/ X6S/X7S	100V	C≧0.47μF
		50V	C≧1.0μF
		35V	C≧2.2μF
		10~25V	C≧4.7μF
	Y5V	16V	C≧4.7μF
1206	X5R/X7R/ X6S/X7S	100V	C>1.0μF
		50V	C=4.7μF
1210	X5R/X7R/ X6S/X7S	50V~100V	C≧2.2μF
1825 2220 2225	X7R	100V~250V	C≧1.0μF

**1WV items must follow de-rating conditions.
(8) 150% of rated voltage for below range.

* Before initial measurement (Class II only): To apply de-aging at 150℃ 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℃ for 1hr then set for 24±2 hrs at room temp.
** De-rating conditions:



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APPENDIXES

◙ Tape & reel dimensions

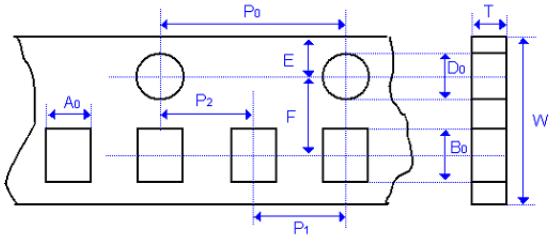

Fig. 2 The dimension of paper tape

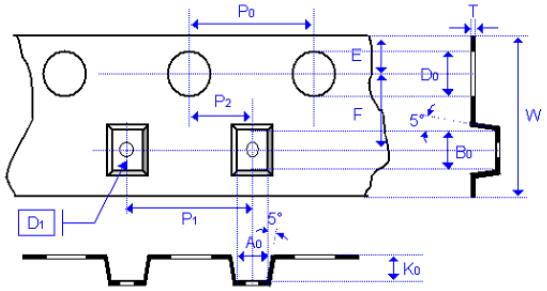

Fig. 3 The dimension of plastic tape

Size	0402	0603	0805			1206			1210		1808	1812	
Thickness	E	S, X	A	B	C, D, I	B	C, J, D	G, P	C,D,G,K	M	D, G, K	D, G, K	M, U
A_0	0.70 +/-0.20	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	<2.30	< 3.05	< 3.05	< 3.20	< 2.50	< 3.90
B_0	1.20 +/-0.20	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	< 2.70	3.50 +/-0.50	< 3.70	< 4.00	< 3.80	< 3.80	<4.00	< 5.30	< 5.30
T	≦0.80	≦1.20	≦1.15	≦1.20	0.23 +/-0.1	≦1.20	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.25 +/-0.1	0.25 +/-0.1
K_0	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 1.50	< 2.50	< 3.20	< 2.50	< 2.50
W	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30
P_0	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
$10xP_0$	40.00 +/-0.10	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20
P_1	2.00 +/-0.05	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	8.00 +/-0.10
P_2	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.10	2.00 +/-0.10
D_0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0
D_1	-	-	-		1.00 +/-0.10	-	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.50 +/-0.10	1.50 +/-0.10
E	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10
F	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	5.50 +/-0.10	5.50 +/-0.10

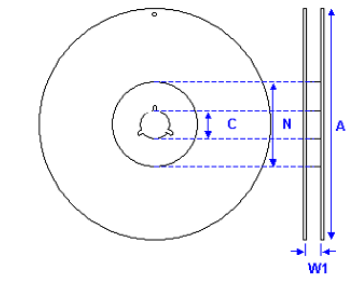

Fig. 4 The dimension of reel

Size	0402, 0603, 0805, 1206, 1210			1808, 1812
Reel size	7”	10”	13”	7”
C	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2
W_1	8.4+1.5/-0	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0±1.0	250.0±1.0	330.0±1.0	178.0±1.00
N	60.0+1.0/-0	100.0±1.0	100±1.0	60.0+1.0/-0

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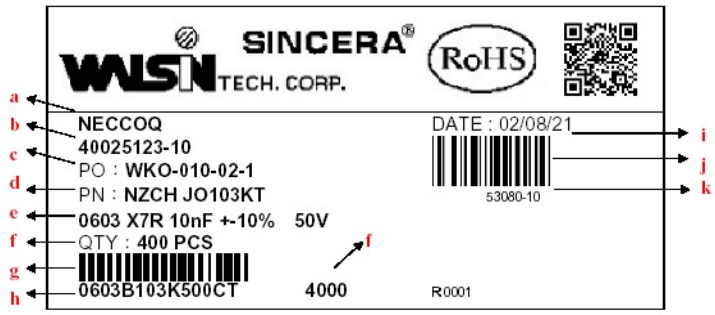
Example of customer label



*Customized label is available upon request

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

Constructions

No.	Name		X7R
①	Ceramic material		$BaTiO_3$ based
②	Inner electrode		Ni
③	Termination	Inner layer	Cu + Cu Polymer
④		Middle layer	Ni
⑤		Outer layer	Sn

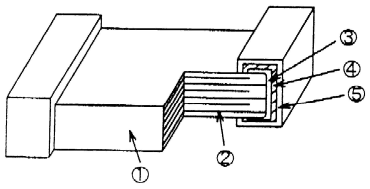


Fig. 5 The construction of MLCC

Storage and handling conditions

(1) To store products at 5 to 40°C ambient temperature and 20 to 70%. related humidity conditions; MSL Level 1.

(2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)

b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.

c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight,the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

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◙ Recommended soldering conditions

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N_2 within oven are recommended.

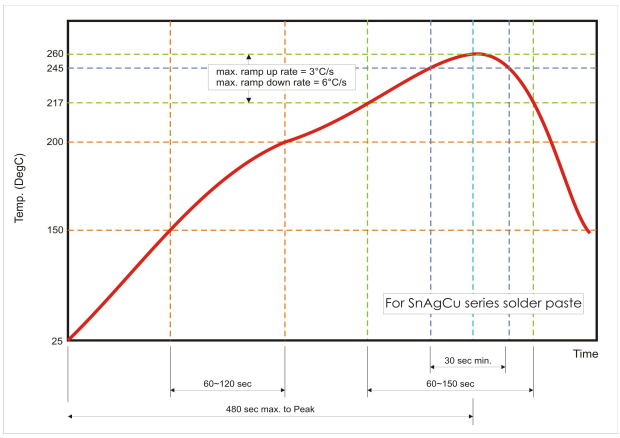

Fig. 6 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

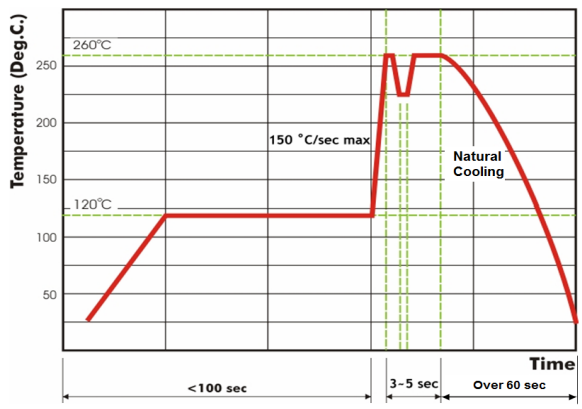

Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.

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