

# APPROVAL SHEET

## MULTILAYER CERAMIC CAPACITORS

Soft Termination Series

(SH Series) X7R Dielectric

0603 to 1812 Sizes, 10V to 250V

RoHS Compliance

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

## 1. INTRODUCTION

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

## 2. FEATURES

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

## 3. APPLICATIONS

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

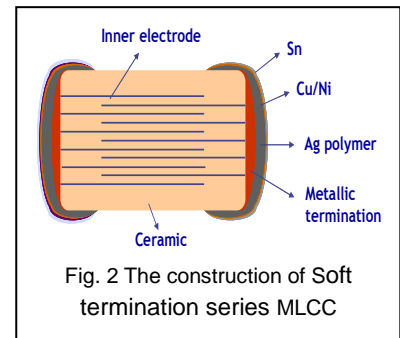
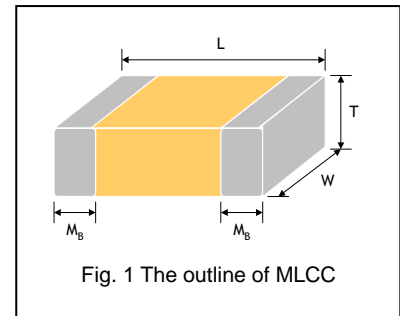
## 4. HOW TO ORDER

<u>SH</u>	<u>31</u>	<u>B</u>	<u>104</u>	<u>K</u>	<u>500</u>	<u>C</u>	<u>I</u>
<u>Series</u>	<u>Size</u>	<u>Dielectric</u>	<u>Capacitance</u>	<u>Tolerance</u>	<u>Rated voltage</u>	<u>Termination</u>	<u>Packaging</u>
SH=Soft termination	18=0603 (1608) 21=0805 (2012) 31=1206 (3216) 32=1210 (3225) 43=1812 (4532)	B=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg. 104=10x10 <sup>4</sup> =100nF	J=±5% K=±10% M=±20%	Two significant digits followed by no. of zeros. And R is in place of decimal point.  100=10 VDC 160=16 VDC 250=25 VDC 500=50 VDC 101=100VDC 201=200 VDC 251=250 VDC	C=Cu/Polymer /Ni/Sn	T=7" reeled G=13" reeled

Note 1: Please see below product range to find right termination code.

## 5. EXTERNAL DIMENSIONS & CONSTRUCTIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Remark	M <sub>B</sub> (mm)
0603 (1608)	1.60±0.20	0.80±0.10	0.80±0.07	S	0.40±0.15
	1.60 +0.20/-0.10	0.80 +0.15/-0.10	0.80 +0.15/-0.10	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+0.25/-0.2	1.25±0.20	1.25±0.20	I #	
1206 (3216)	3.20+0.4/-0.1	1.60±0.15	0.80±0.10	B	0.60±0.20
			0.95±0.10	C	
			1.15±0.15	J #	
			1.25±0.10	D #	
			1.60±0.20	G #	
	3.20+0.4/-0.1	1.60±0.20	1.60±0.20	P #	
1210 (3225)	3.20±0.40	2.50±0.20	0.95±0.10	C #	0.75±0.25
			1.25±0.10	D #	
			1.60±0.20	G #	
	3.20±0.50	2.50±0.30	2.00±0.20	K #	
			2.50±0.30	M #	
1812 (4532)	4.50+0.6/-0.4	3.20±0.30	1.25±0.10	D #	0.75±0.25
			2.00±0.20	K #	
			3.20±0.40	M #	



# Reflow soldering only is recommended.

## 6. GENERAL ELECTRICAL DATA

<b>Dielectric</b>	X7R
<b>Size</b>	0603, 0805, 1206, 1210, 1812
<b>Capacitance*</b>	100pF to 4.7μF
<b>Capacitance tolerance**</b>	J (±5%), K (±10%), M (±20%)
<b>Rated voltage (WVDC)</b>	10V to 250V
<b>Tan δ*</b>	Note 1
<b>Insulation resistance at U<sub>r</sub></b>	≥10GΩ or RxC≥100Ω·F whichever is smaller
<b>Dielectric strength</b>	≤100V : ≥2.5 x WVDC ; 200~300V ≥ 2 times VDC
<b>Operating temperature</b>	-55 to +125°C
<b>Capacitance characteristic</b>	±15%

\* Measured at 1.0±0.2Vrms, 1.0kHz±10% for C≤10μF, 30~70% related humidity, 25°C ambient temperature for X7R

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

Note 1: X7R

Rated vol.	D.F. ≤	Exception of D.F. ≤
≥50V	≤2.5%	≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
		≤5% 1210 ≥ 4.7μF
		≤10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF
35V	≤3.5%	≤10% 0805 ≥ 2.2μF; 1210 ≥ 10μF
		≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF
25V	≤3.5%	≤7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF
		≤10% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF
		≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF
16V	≤3.5%	≤10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
		≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF
		≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF
10V	≤5%	≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF
		≤20% 0402 ≥ 2.2μF
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6.3V	≤10%	---
4V	≤15%	---

### 7. CAPACITANCE RANGE (X7R Dielectric)

DIELECTRIC		X7R											
SIZE		0603					0805						
RATED VOLTAGE (VDC)		10	16	25	50	100	10	16	25	50	100	200	250
Capacitance	100pF (101)	S	S	S	S	S	D	D	D	D	D	D	D
	120pF (121)	S	S	S	S	S	D	D	D	D	D	D	D
	150pF (151)	S	S	S	S	S	D	D	D	D	D	D	D
	180pF (181)	S	S	S	S	S	D	D	D	D	D	D	D
	220pF (221)	S	S	S	S	S	D	D	D	D	D	D	D
	270pF (271)	S	S	S	S	S	D	D	D	D	D	D	D
	330pF (331)	S	S	S	S	S	D	D	D	D	D	D	D
	390pF (391)	S	S	S	S	S	D	D	D	D	D	D	D
	470pF (471)	S	S	S	S	S	D	D	D	D	D	D	D
	560pF (561)	S	S	S	S	S	D	D	D	D	D	D	D
	680pF (681)	S	S	S	S	S	D	D	D	D	D	D	D
	820pF (821)	S	S	S	S	S	D	D	D	D	D	D	D
	1,000pF (102)	S	S	S	S	S	D	D	D	D	D	D	D
	1,200pF (122)	S	S	S	S	S	D	D	D	D	D	D	D
	1,500pF (152)	S	S	S	S	S	D	D	D	D	D	D	D
	1,800pF (182)	S	S	S	S	S	D	D	D	D	D	D	D
	2,200pF (222)	S	S	S	S	S	D	D	D	D	D	D	D
	2,700pF (272)	S	S	S	S	S	D	D	D	D	D	D	D
	3,300pF (332)	S	S	S	S	S	D	D	D	D	D	D	D
	3,900pF (392)	S	S	S	S	S	D	D	D	D	D	D	D
	4,700pF (472)	S	S	S	S	S	D	D	D	D	D	D	D
	5,600pF (562)	S	S	S	S	S	D	D	D	D	D	D	D
	6,800pF (682)	S	S	S	S	S	D	D	D	D	D	D	D
	8,200pF (822)	S	S	S	S	S	D	D	D	D	D	D	D
	0.010μF (103)	S	S	S	S	S	D	D	D	D	D	D	D
	0.012μF (123)	S	S	S	S		D	D	D	D	D	D	D
	0.015μF (153)	S	S	S	S		D	D	D	D	D	D	D
	0.018μF (183)	S	S	S	S		D	D	D	D	D	D	D
	0.022μF (223)	S	S	S	S		D	D	D	D	D	D	D
	0.027μF (273)	S	S	S	S		D	D	D	D	D		
	0.033μF (333)	S	S	S	X		D	D	D	D	D		
	0.039μF (393)	S	S	S	X		D	D	D	D	D		
	0.047μF (473)	S	S	S	X		D	D	D	D	D		
	0.056μF (563)	S	S	S	X		D	D	D	D	D		
	0.068μF (683)	S	S	S	X		D	D	D	D	D		
0.082μF (823)	S	S	S	X		D	D	D	D	D			
0.10μF (104)	S	S	S	X		D	D	D	D	D			
0.12μF (124)	S	S	X			D	D	D	D				
0.15μF (154)	S	S	X			D	D	D	D				
0.18μF (184)	S	S	X			D	D	D	D				
0.22μF (224)	S	S	X			D	D	D	D				
0.27μF (274)	X	X	X			I	I	I					
0.33μF (334)	X	X	X			I	I	I					
0.39μF (394)	X	X	X			I	I	I					
0.47μF (474)	X	X	X			I	I	I					
0.56μF (564)	X	X				I	I	I					
0.68μF (684)	X	X				I	I	I					
0.82μF (824)						I	I	I					
1.0μF (105)						I	I	I					

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.

**CAPACITANCE RANGE (X7R Dielectric)**

DIELECTRIC		X7R																				
SIZE		1206							1210							1812						
RATED VOLTAGE		10	16	25	50	100	200	250	10	16	25	50	100	200	250	10	16	25	50	100	200	250
Capacitance	100pF (101)																					
	120pF (121)																					
	150pF (151)	D	D	D	D	D	D	D														
	180pF (181)	D	D	D	D	D	D	D														
	220pF (221)	D	D	D	D	D	D	D														
	270pF (271)	D	D	D	D	D	D	D														
	330pF (331)	D	D	D	D	D	D	D														
	390pF (391)	D	D	D	D	D	D	D														
	470pF (471)	D	D	D	D	D	D	D														
	560pF (561)	D	D	D	D	D	D	D														
	680pF (681)	D	D	D	D	D	D	D														
	820pF (821)	D	D	D	D	D	D	D														
	1,000pF (102)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	1,200pF (122)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	1,500pF (152)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	1,800pF (182)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	2,200pF (222)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	2,700pF (272)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	3,300pF (332)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	3,900pF (392)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	4,700pF (472)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	5,600pF (562)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	6,800pF (682)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	8,200pF (822)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	0.01μF (103)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	0.012μF (123)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	0.015μF (153)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	0.018μF (183)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	0.022μF (223)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	0.027μF (273)	D	D	D	D	D	D	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	0.033μF (333)	D	D	D	D	D	G	G	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	0.039μF (393)	D	D	D	D	D	G	G	C	C	C	C	C	C	C	D	D	D	D	D	D	D
	0.047μF (473)	D	D	D	D	D	G	G	C	C	C	C	C	D	D	D	D	D	D	D	D	D
	0.056μF (563)	D	D	D	D	D	G	G	C	C	C	C	C	D	D	D	D	D	D	D	D	D
	0.068μF (683)	D	D	D	D	D	G	G	C	C	C	C	C	G	G	D	D	D	D	D	D	D
	0.082μF (823)	D	D	D	D	D	G	G	C	C	C	C	C	G	G	D	D	D	D	D	D	D
	0.10μF (104)	D	D	D	D	D	G	G	C	C	C	C	C	G	G	D	D	D	D	D	D	D
	0.12μF (124)	D	D	D	D	D			C	C	C	C	C	G	G	D	D	D	D	D	D	D
	0.15μF (154)	C	C	C	C	G			C	C	C	C	D	M	M	D	D	D	D	D	K	K
	0.18μF (184)	C	C	C	C	G			C	C	C	C	D	M	M	D	D	D	D	D	K	K
0.22μF (224)	C	C	C	C	G			C	C	C	C	D	M	M	D	D	D	D	D	K	K	
0.27μF (274)	C	C	C	D				C	C	C	C	G	M	M	D	D	D	D	D	K	K	
0.33μF (334)	C	C	C	D				C	C	C	D	G	M	M	D	D	D	D	D	K	K	
0.39μF (394)	C	C	J	P				C	C	C	D	M	M	M	D	D	D	D	D	K	K	
0.47μF (474)	J	J	J	P				C	C	C	D	M	M	M	D	D	D	D	D	K	K	
0.56μF (564)	J	J	J	P				D	D	D	D	M			D	D	D	D	D	K	K	
0.68μF (684)	J	J	J	P				D	D	D	D	K			D	D	D	K	K			
0.82μF (824)	J	J	J	P				D	D	D	D	K			D	D	D	K	K			
1.0μF (105)	J	J	J	P				D	D	D	D	K			D	D	D	K	K			
1.5μF (155)	J	J	P																	K		
2.2μF (225)	J	J	P																	M		
3.3μF (335)	P	P	P																			
4.7μF (475)	P	P	P																			

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

## 8. PACKAGING DIMENSION 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+0.15/-0.10	X	4k	15k	-	-
0805 (2012)	0.80±0.10	B	4k	15k	-	-
	1.25±0.10	D	-	-	3k	10k
	1.25±0.20	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+0.30/-0.10	P	-	-	2k	9k
1210 (3225)	0.95±0.10	C	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	-
	2.00±0.20	K	-	-	1k	6k
	2.50±0.30	M	-	-	1k	6k
1812 (4532)	1.25±0.10	D	-	-	1k	5k
	2.00±0.20	K	-	-	1k	-
	2.50±0.30	M	-	-	0.5k	3k

Unit: pieces

### 9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																
1.	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.																																
2.	Capacitance	Class I: NPO Cap≤1000pF 1.0±0.2Vrms, 1MHz±10% Cap>1000pF 1.0±0.2Vrms, 1KHz±10%	* Shall not exceed the limits given in the detailed spec. NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R, X5R:																																
3.	Q/ D.F. (Dissipation Factor)	Class II: X7R, X7E, X5R, Y5V Cap≤10μF, 1.0±0.2Vrms, 1kHz±10% ** Cap>10μF, 0.5±0.2Vrms, 120Hz±20%  ** Test condition: 0.5±0.2Vrms · 1KHz±10% X7R: 0603≥225(10V), 0805=106(6.3V&10V) X5R: 01R5≥103, 0201≥224 (6.3V), 0402≥475 (6.3V), 0402≥225(10V), 0603=106 (6.3V), TT18X≥475(10V) , TT15X series	<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">≥ 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% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 10% 0805≥2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF ; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td>≤ 5% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 5%</td> <td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF ; 1210 ≥ 100μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 10%</td> <td>≤ 20% 0402 ≥ 2.2μF</td> </tr> <tr> <td>---</td> </tr> <tr> <td>4V</td> <td>≤ 15%</td> <td>---</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 2.5%	≤ 3% 0201(50V); 0603≥0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 5% 1210 ≥ 4.7μF	≤ 10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 3.5%	≤ 10% 0805≥2.2μF; 1210 ≥ 10μF	≤ 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	25V	≤ 3.5%	≤ 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤ 10% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF ; 1210 ≥ 22μF	≤ 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	16V	≤ 3.5%	≤ 10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	≤ 5% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; TT series	10V	≤ 5%	≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF	≤ 10% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF ; 1210 ≥ 100μF	6.3V	≤ 10%	≤ 20% 0402 ≥ 2.2μF	---	4V	≤ 15%	---
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4b.	Dielectric Strength (for X1/Y2 & X2/Y3)	* To apply 1500 VAC voltage. * Duration: 60 sec.	* No evidence of damage or flash over during test.																																
5.	Insulation Resistance	To apply rated voltage for max. 120 sec.	10GΩ or RxC ≥ 500Ω-F whichever is smaller. Class II (X7R, X7E, X5R, Y5V) <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="6">10GΩ or RxC ≥ 100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td> </tr> <tr> <td>35V:0805≥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: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</td> <td></td> </tr> </tbody> </table> <table border="1"> <tr> <td>Rated Voltage: 200V ~ 630V</td> <td>To apply rated voltage (500V max.) for 60 sec.</td> <td>&gt;10GΩ or 100Ω-F whichever is smaller.</td> </tr> <tr> <td>Rated Voltage: &gt;630V</td> <td>To apply 500V for 60sec.</td> <td>&gt;10GΩ</td> </tr> </table>	Rated voltage	Insulation Resistance	100V: X7R	10GΩ or RxC ≥ 100 Ω-F whichever is smaller.	50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF	35V:0805≥2.2μF;1210 ≥ 10μF	25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF	16V: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		Rated Voltage: 200V ~ 630V	To apply rated voltage (500V max.) for 60 sec.	>10GΩ or 100Ω-F whichever is smaller.	Rated Voltage: >630V	To apply 500V for 60sec.	>10GΩ															
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7.	Adhesive Strength of Termination	*Pressurizing force : 0201: 2N 0402 & 0603: 5N >0603: 10N *Test time : 10 ±1 sec	* No remarkable damage or removal of the terminations.																																

No.	Item	Test Condition	Requirements																																								
8.	<b>Vibration Resistance</b>	* Vibration frequency: 10~55 Hz/min. * Total amplitude: 1.5mm * Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.) * Measurement to be made after keeping at room temp. for 24±2 hrs.	* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.																																								
9.	<b>Solderability</b>	* Solder temperature: 235±5°C * Dipping time: 2±0.5 sec.	95% min. coverage of all metalized area.																																								
10.	<b>Bending Test</b>	*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 / SH series: 5 mm** & 3 mm*** and then the pressure shall be maintained for 5±1 sec. *Measurement to be made after keeping at room temp. for 24±2 hrs. (** Thickness >1.0mm; *** Thickness ≤1.0mm)	* No remarkable damage. * Cap change : NP0: within ±5% or 0.5pF whichever is larger X7R, X7E, X5R: within ±12.5% , Y5V: within ±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)																																								
11.	<b>Resistance to Soldering Heat</b>	* Solder temperature: 260±5°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): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp. * Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and 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 ±2.5% or 0.25pF whichever is larger X7R, X7E, X5R: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge.																																								
12.	<b>Temperature Cycle</b>	* Conduct the five cycles according to the temperatures and time. <table border="1" style="margin: 10px 0;"> <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> * Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs.	Step	Temp. (°C)	Time (min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	No remarkable damage. * Cap change : NP0: within ±2.5% or 0.25pF whichever is larger X7R, X7E, X5R: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements.																									
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13.	<b>Humidity (Damp Heat) Steady State</b>	* Test temp.: 40±2°C * Humidity: 90~95% RH * Test time: 500+24/-0hrs. *Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and 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, X7E, X5R: ≥10V, within ±12.5%; 6.3V, within ±25% TT series & C≥ 1uF, 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: <table border="1" style="margin: 10px 0;"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0201(50V);0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 5%</td> <td>≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0201 ≥ 0.1μF ; 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> </tr> </tbody> </table> *I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller. Class II (X7R, X7E, X5R, Y5V) <table border="1" style="margin: 10px 0;"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0805 ≥ 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: 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</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 3%	≤ 6% 0201(50V);0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10% 1210 ≥ 4.7μF	≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤ 15% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20% 0201 ≥ 0.1μF ; 0402 ≥ 1μF	6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	4V	≤ 20%	---	Rated voltage	Insulation Resistance	100V: X7R	1GΩ or RxC ≥ 10 Ω-F whichever is smaller.	50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF	35V: 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	16V: 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
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		≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																									
35V	≤ 5%	≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF																																									
25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																									
		≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																									
		≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF																																									
16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																									
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10V	≤ 7.5%	≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																									
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6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																									
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No	Item	Test Condition	Requirements		
14	Humidity (Damp Heat) Load	* Test temp.: 40±2°C * Humidity: 90~95%RH * Test time: 500+24/-0 hrs. * To apply voltage : Rated voltage.(Max.500V) * Before initial measurement (Class II only): To apply test voltage for 1hr at 40°C and 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: ±7.5% or 0.75pF whichever is larger. X7R, X7E, X5R: ≥10V, within ±12.5%; 6.3V, within ±25%, TT series & Cap ≥ 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:		
			Rated vol.	D.F. ≤	Exception of D.F. ≤
			≥ 50V	≤ 3%	≤ 6% 0201(50V);0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF ≤ 10% 1210 ≥ 4.7μF ≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF;1206 ≥ 4.7μF; 1210 ≥ 10μF
			35V	≤ 5%	≤ 20% 0805 ≥ 2.2μF;1210 ≥ 10μF
			25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF;0805 ≥ 1μF; 1210 ≥ 10μF
					≤ 14% 0603 ≥ 0.33μF;1206 ≥ 4.7μF ≤ 15% 0402 ≥ 0.10μF;0603 ≥ 0.47μF;0805 ≥ 2.2μF;1206 ≥ 6.8μF; 1210 ≥ 22μF
			16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF;0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF
					≤ 15% 0201 ≥ 0.01μF;0402 ≥ 0.033μF;0603 ≥ 0.68μF;0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
			10V	≤ 7.5%	≤ 15% 0201 ≥ 0.012μF;0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF
					≤ 20% 0201 ≥ 0.1μF ;0402 ≥ 1μF
			6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603 ≥ 10μF; 0805 ≥ 4.7μF;1206 ≥ 47μF;1210 ≥ 100μF
			4V	≤ 20%	---
			*I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. Class II (X7R, X7E, X5R, Y5V)		
			Rated voltage		Insulation Resistance
100V: X7R		500MΩ or RxC ≥ 5 Ω-F whichever is smaller.			
50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF					
35V:0805≥2.2μF;1210 ≥ 10μF					
25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF					
16V: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					

No	Item	Test Condition	Requirements																																																																																											
15.	High Temperature Load (Endurance)	*Test temp. : NP0, X7R/X7E: 125±3°C X5R, Y5V: 85±3°C *Test time: 1000+24/-0 hrs. *To apply voltage: (1) 6.3V or C ≥ 10µF or TT series: 150% of rated voltage. (2) 10V ≤ Ur < 500V: 200% of rated voltage. (3) 500V: 150% of rated voltage. (4) Ur ≥ 630V: 120% of rated voltage. (5) 100% of rated voltage for below range.  <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R/X7R</td> <td>6.3V, 10V</td> <td>C ≥ 0.1µF</td> </tr> <tr> <td>0402</td> <td>X5R/X7R</td> <td>6.3V, 10V</td> <td>C ≥ 1.0µF</td> </tr> <tr> <td>0603</td> <td>X5R/X7R</td> <td>6.3V, 10V</td> <td>C ≥ 4.7µF</td> </tr> <tr> <td>0805</td> <td>X5R/X7R</td> <td>6.3V</td> <td>C ≥ 22µF</td> </tr> <tr> <td>1206</td> <td>X5R/X7R</td> <td>6.3V</td> <td>C ≥ 47µF</td> </tr> <tr> <td></td> <td>NP0</td> <td>3000V</td> <td>C ≥ 1.5pF</td> </tr> </tbody> </table> (6) 150% of rated voltage for below range.  <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0402</td> <td>X5R/X7R</td> <td>10V, 16V, 25V</td> <td>C ≥ 0.22µF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C ≥ 0.47µF</td> </tr> <tr> <td rowspan="2">0603</td> <td>X5R/X7R</td> <td>10V, 16V</td> <td>C ≥ 1.0µF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C ≥ 2.2µF</td> </tr> <tr> <td rowspan="2">0805</td> <td>X5R/X7R</td> <td>10V</td> <td>C ≥ 4.7µF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C ≥ 4.7µF</td> </tr> </tbody> </table>	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R/X7R	6.3V, 10V	C ≥ 0.1µF	0402	X5R/X7R	6.3V, 10V	C ≥ 1.0µF	0603	X5R/X7R	6.3V, 10V	C ≥ 4.7µF	0805	X5R/X7R	6.3V	C ≥ 22µF	1206	X5R/X7R	6.3V	C ≥ 47µF		NP0	3000V	C ≥ 1.5pF	Size	Dielectric	Rated voltage	Capacitance range	0402	X5R/X7R	10V, 16V, 25V	C ≥ 0.22µF	Y5V	16V	C ≥ 0.47µF	0603	X5R/X7R	10V, 16V	C ≥ 1.0µF	Y5V	16V	C ≥ 2.2µF	0805	X5R/X7R	10V	C ≥ 4.7µF	Y5V	16V	C ≥ 4.7µF	* No remarkable damage. Cap change: NP0: ±3.0% or ±0.3pF whichever is larger X7R, X7E, X5R: ≥10V, within ±12.5%; 6.3V, within ±25%, TT series & Cap ≥ 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: <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">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0201(50V); 0603 ≥ 0.047µF; 0805 ≥ 0.18µF; 1206 ≥ 0.47µF</td> </tr> <tr> <td>≤ 10% 1210 ≥ 4.7µF</td> </tr> <tr> <td>≤ 20% 0603 ≥ 1µF; 0805 ≥ 1µF; 1206 ≥ 4.7µF; 1210 ≥ 10µF</td> </tr> <tr> <td>35V</td> <td>≤ 5%</td> <td>≤ 20% 0805 ≥ 2.2µF; 1210 ≥ 10µF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10% 0201 ≥ 0.01µF; 0805 ≥ 1µF; 1210 ≥ 10µF</td> </tr> <tr> <td>≤ 14% 0603 ≥ 0.33µF; 1206 ≥ 4.7µF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.10µF; 0603 ≥ 0.47µF; 0805 ≥ 2.2µF; 1206 ≥ 6.8µF; 1210 ≥ 22µF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10% 0603 ≥ 0.15µF; 0805 ≥ 0.68µF; 1206 ≥ 2.2µF; 1210 ≥ 4.7µF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.01µF; 0402 ≥ 0.033µF; 0603 ≥ 0.68µF; 0805 ≥ 2.2µF; 1206 ≥ 4.7µF; 1210 ≥ 22µF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤ 7.5%</td> <td>≤ 15% 0201 ≥ 0.012µF; 0402 ≥ 0.33µF; 0603 ≥ 0.33µF; 0805 ≥ 2.2µF; 1206 ≥ 2.2µF; 1210 ≥ 22µF</td> </tr> <tr> <td>≤ 20% 0201 ≥ 0.1µF ; 0402 ≥ 1µF</td> </tr> <tr> <td>6.3V ≤ 15% ≤ 30% 0201 ≥ 0.1µF; 0402 ≥ 1µF; 0603 ≥ 10µF; 0805 ≥ 4.7µF; 1206 ≥ 47µF; 1210 ≥ 100µF</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> </tr> </tbody> </table> *I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller. 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**APPENDIXES**

■ **Tape & reel dimensions**

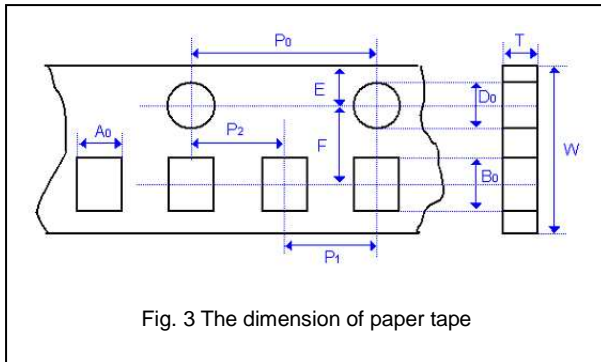


Fig. 3 The dimension of paper tape

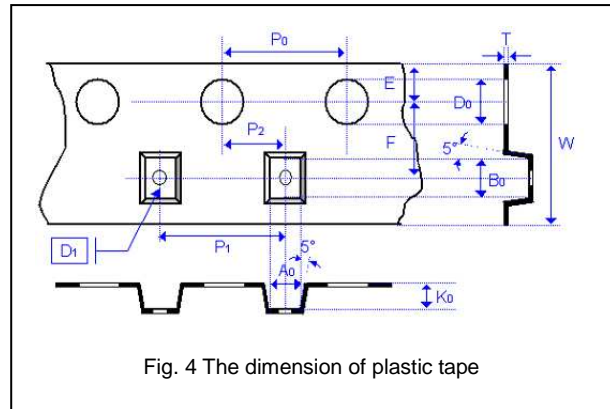


Fig. 4 The dimension of plastic tape

Size	0603	0805			1206			1210		1812
Thickness	S, X	A	B	C, D, I	B	C, J, D	G	C, D, G	M	D, K
A <sub>0</sub>	1.02±0.05	1.50±0.10	1.50±0.10	<1.57	2.00±0.10	<1.85	<1.95	<2.97	<2.97	<3.81
B <sub>0</sub>	1.80±0.05	2.30±0.10	2.30±0.10	<2.40	3.50±0.10	<3.46	<3.67	<3.73	<3.73	<5.30
T	0.95±0.05	0.75±0.05	0.95±0.05	0.23±0.05	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.25±0.05
K <sub>0</sub>	-	-	-	<2.50	-	<2.50	<2.50	<2.50	<3.00	<2.50
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	8.00±0.10	8.00±0.10	8.00±0.10	12.0±0.20
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.100	4.00±0.10	4.00±0.10
10xP <sub>0</sub>	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10
P <sub>1</sub>	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	8.00±0.10
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D <sub>0</sub>	1.55±0.05	1.55±0.05	1.55±0.05	1.50±0.05	1.50±0.05	1.50±0.05	1.50±0.05	1.50±0.05	1.50±0.05	1.50±0.05
D <sub>1</sub>	-	-	-	1.00±0.10	-	1.00±0.10	1.00±0.10	1.00±0.10	1.00±0.10	1.50±0.10
E	1.75±0.05	1.75±0.05	1.75±0.05	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	5.50±0.05

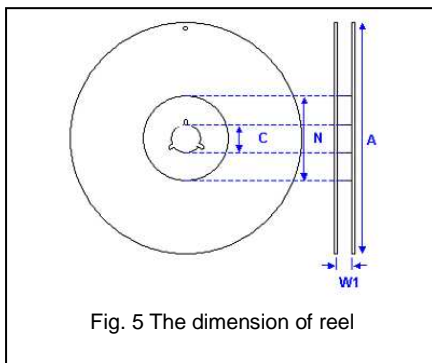
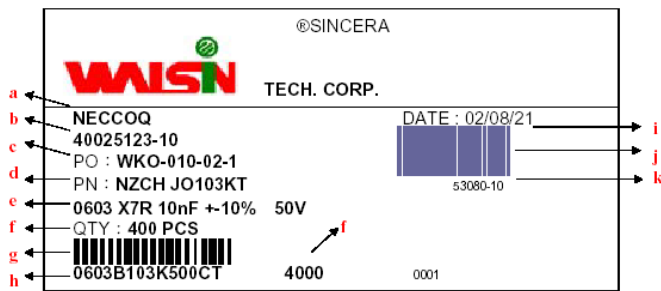


Fig. 5 The dimension of reel

Size	0402, 0603, 0805, 1206, 1210			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 <sub>1</sub>	8.4+1.5/-0	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0±0.10	250.0±1.0	330.0±1.0	178.0±0.10
N	60.0+1.0/-0	100.0±1.0	100±1.0	60.0+1.0/-0

▣ Description of customer label



- 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

▣ Storage and handling conditions

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

Cautions:

- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.
- c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

☑ Recommended soldering conditions

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N<sub>2</sub> within oven are recommended.

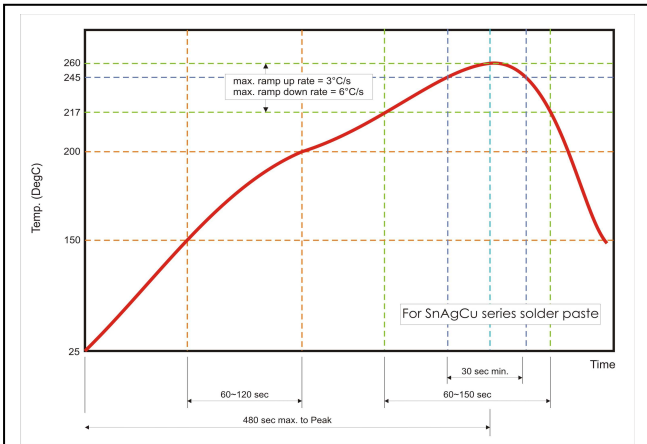


Fig. 6 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

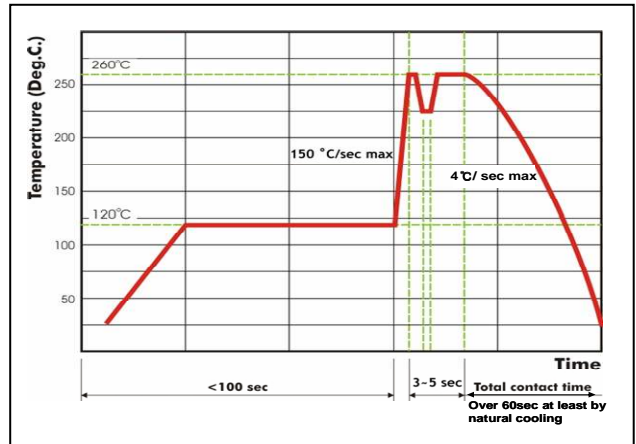


Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.