

APPROVAL SHEET

MULTILAYER CERAMIC CAPACITORS

Soft Termination Series

(SH_6.3V to 100V)

NP0, X7R, X5R & Y5V Dielectrics

0402 to 1812 Sizes, 6.3V to 100V

Halogen Free & 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

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

3. APPLICATIONS

- Automotive industry.
- Power supply and related industries.
- Lighting industry.
- 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	15=0402 (1005) 18=0603 (1608) 21=0805 (2012) 31=1206 (3216) 32=1210 (3225) 43=1812 (4532)	N=NP0 (COG) B=X7R X=X5R F=Y5V	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg: 104=10x10 ⁴ =100nF	B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20% Z=-20/+80%	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	C=Ag Polymer /Ni/Sn	T=7" reeled G=13" reeled

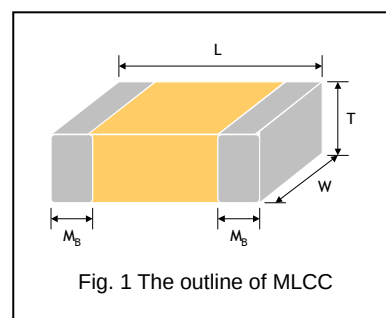
Note 1: Please see below product range to find right termination code.

Multilayer Ceramic Capacitors

5. EXTERNAL DIMENSIONS & CONSTRUCTIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Remark	M _B (mm)
0402 (1005)	1.00±0.20	0.50±0.20	0.50±0.20	E #	0.25 +0.05/-0.10
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 #	
			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
			0.95±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 #	
1210 (3225)	3.20±0.40	2.50±0.20	0.95±0.10	C #	0.75±0.25
			1.25±0.10	D #	
	3.20±0.60	2.50±0.50	1.60±0.20	G #	
			2.00±0.20	K #	
			2.50±0.50	M #	
1812 (4532)	4.50+0.6/-0.4	3.20±0.30	1.25±0.10	D #	0.75±0.25
			1.60±0.20	G #	
			2.00±0.20	K #	
		3.20±0.40	2.50±0.50	M #	

Reflow soldering only is recommended.



6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X5R	Y5V
Size	0402, 0603, 0805, 1206, 1210, 1812			
Capacitance range*	0.1pF to 0.039μF	100pF to 47μF	0.027μF to 10μF	0.01μF to 4.7μF
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%)			K (±10%), M (±20%) Z (-20/+80%)
Rated voltage (WVDC)	6.3V, 10V, 16V, 25V, 50V, 100V			
Operating temperature	-55 to +125℃	-55 to +125℃	-55 to +85℃	-25 to +85℃
Capacitance characteristic	±30ppm	±15%	±15%	+30/-80%
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℃ ambient temperature.

Y5V: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 20℃ ambient temperature.

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

7. CAPACITANCE RANGE (NP0 Dielectric)

0402, 0603, 0805 Sizes

DIELECTRIC		NP0														
SIZE		0402					0603					0805				
RATED VOLTAGE		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	0.1pF (0R1)	E	E	E	E											
	0.2pF (0R2)	E	E	E	E											
	0.3pF (0R3)	E	E	E	E											
	0.4pF (0R4)	E	E	E	E											
	0.5pF (0R5)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	0.6pF (0R6)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	0.7pF (0R7)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	0.8pF (0R8)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	0.9pF (0R9)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	1.0pF (1R0)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	1.2pF (1R2)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	1.5pF (1R5)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	1.8pF (1R8)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	2.2pF (2R2)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	2.7pF (2R7)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	3.3pF (3R3)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	3.9pF (3R9)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	4.7pF (4R7)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	5.6pF (5R6)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	6.8pF (6R8)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	8.2pF (8R2)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	10pF (100)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	12pF (120)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	15pF (150)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	18pF (180)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	22pF (220)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	27pF (270)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	33pF (330)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	39pF (390)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	47pF (470)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	56pF (560)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	68pF (680)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	82pF (820)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	100pF (101)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	120pF (121)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	150pF (151)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	180pF (181)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	220pF (221)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	270pF (271)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	330pF (331)	E	E	E	E	E	S	S	S	S	S	A	A	A	A	A
	390pF (391)	E	E	E	E	E	S	S	S	S	S	B	B	B	B	B
	470pF (471)	E	E	E	E	E	S	S	S	S	S	B	B	B	B	B
	560pF (561)	E	E	E	E	E	S	S	S	S	S	B	B	B	B	B
	680pF (681)	E	E	E	E	E	S	S	S	S	S	B	B	B	B	B
	820pF (821)	E	E	E	E	E	S	S	S	S	S	B	B	B	B	B
	1,000pF (102)	E	E	E	E	E	S	S	S	S	S	B	B	B	B	B
	1,200pF (122)						X	X	X	X		B	B	B	B	B
	1,500pF (152)						X	X	X	X		B	B	B	B	B
	1,800pF (182)						X	X	X	X		B	B	B	B	B
	2,200pF (222)						X	X	X	X		B	B	B	B	B
	2,700pF (272)						X	X	X	X		D	D	D	D	D
	3,300pF (332)						X	X	X	X		D	D	D	D	D
	3,900pF (392)											D	D	D	D	D
	4,700pF (472)											D	D	D	D	D
	5,600pF (562)											D	D	D	D	D
	6,800pF (682)											D	D	D	D	D
	8,200pF (822)											D	D	D	D	D
	0.010uF (103)											D	D	D	D	D
	0.012uF (123)															

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.

Multilayer Ceramic Capacitors

Approval Sheet

1206, 1210, 1812 Sizes

DIELECTRIC		1206					NP0					1812				
SIZE		1206					1210					1812				
RATED VOLTAGE		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	1.0pF (1R0)															
	1.2pF (1R2)	B	B	B	B	B										
	1.5pF (1R5)	B	B	B	B	B										
	1.8pF (1R8)	B	B	B	B	B										
	2.2pF (2R2)	B	B	B	B	B										
	2.7pF (2R7)	B	B	B	B	B										
	3.3pF (3R3)	B	B	B	B	B										
	3.9pF (3R9)	B	B	B	B	B										
	4.7pF (4R7)	B	B	B	B	B										
	5.6pF (5R6)	B	B	B	B	B										
	6.8pF (6R8)	B	B	B	B	B										
	8.2pF (8R2)	B	B	B	B	B										
	10pF (100)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	12pF (120)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	15pF (150)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	18pF (180)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	22pF (220)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	27pF (270)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	33pF (330)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	39pF (390)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	47pF (470)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	56pF (560)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	68pF (680)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	82pF (820)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	100pF (101)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	120pF (121)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	150pF (151)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	180pF (181)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	220pF (221)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	270pF (271)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	330pF (331)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	390pF (391)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	470pF (471)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	560pF (561)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	680pF (681)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	820pF (821)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	1,000pF (102)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	1,200pF (122)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	1,500pF (152)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	1,800pF (182)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	2,200pF (222)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	2,700pF (272)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	3,300pF (332)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	3,900pF (392)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	4,700pF (472)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	5,600pF (562)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	6,800pF (682)	C	C	C	C	C	C	C	C	C	C	D	D	D	D	D
	8,200pF (822)	D	D	D	D	D	C	C	C	C	C	D	D	D	D	D
	0.010μF (103)	D	D	D	D	D	C	C	C	C	C	D	D	D	D	D
	0.012μF (123)	P	P	P	P	P	D	D	D	D	D	D	D	D	D	D
	0.015μF (153)	P	P	P	P	P	D	D	D	D	D	D	D	D	D	D
	0.018μF (183)	P	P	P	P	P						D	D	D	D	D
	0.022μF (223)	P	P	P	P	P						D	D	D	D	D
	0.027μF (273)	P	P	P	P							D	D	D	D	D
	0.033μF (333)	P	P	P	P							D	D	D	D	D
	0.039μF (393)	P	P	P	P											

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.

7-1. CAPACITANCE RANGE (X7R Dielectric)

0402, 0603, 0805 Sizes

DIELECTRIC		X7R														
SIZE		0402					0603					0805				
RATED VOLTAGE		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	100pF (101)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	120pF (121)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	150pF (151)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	180pF (181)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	220pF (221)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	270pF (271)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	330pF (331)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	390pF (391)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	470pF (471)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	560pF (561)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	680pF (681)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	820pF (821)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	1,000pF (102)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	1,200pF (122)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	1,500pF (152)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	1,800pF (182)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	2,200pF (222)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	2,700pF (272)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	3,300pF (332)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	3,900pF (392)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	4,700pF (472)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	5,600pF (562)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	6,800pF (682)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	8,200pF (822)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	0.010μF (103)	E	E	E	E	E	S	S	S	S	S	D	D	D	D	D
	0.012μF (123)	E	E	E	E	E	S	S	S	S	X	D	D	D	D	D
	0.015μF (153)	E	E	E	E	E	S	S	S	S	X	D	D	D	D	D
	0.018μF (183)	E	E	E	E	E	S	S	S	S	X	D	D	D	D	D
	0.022μF (223)	E	E	E	E	E	S	S	S	S	X	D	D	D	D	D
	0.027μF (273)	E	E	E	E	E	S	S	S	S	X	D	D	D	D	D
	0.033μF (333)	E	E	E	E	E	S	S	S	X	X	D	D	D	D	D
	0.039μF (393)	E	E	E	E	E	S	S	S	X	X	D	D	D	D	D
	0.047μF (473)	E	E	E	E	E	S	S	S	X	X	D	D	D	D	D
	0.056μF (563)	E	E	E	E	E	S	S	S	X	X	D	D	D	D	D
	0.068μF (683)	E	E	E	E	E	S	S	S	X	X	D	D	D	D	D
	0.082μF (823)	E	E	E	E	E	S	S	S	X	X	D	D	D	D	D
	0.10μF (104)	E	E	E	E	E	S	S	S	X	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	X		D	D	D	D	I
	0.27μF (274)						X	X	X			I	I	I	I	
	0.33μF (334)						X	X	X			I	I	I	I	
	0.39μF (394)						X	X	X			I	I	I	I	
	0.47μF (474)						X	X	X			I	I	I	I	
	0.56μF (564)						X	X				I	I	I		
	0.68μF (684)						X	X				I	I	I		
	0.82μF (824)						X	X				I	I	I		
	1.0μF (105)						X	X				I	I	I	I	
	1.5μF (155)											I	I	I		
	2.2μF (225)											I	I	I		
	4.7μF (475)												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.

1206, 1210, 1812 Sizes

DIELECTRIC		X7R															
SIZE		1206					1210					1812					
RATED VOLTAGE		10	16	25	50	100	6.3	10	16	25	50	100	10	16	25	50	100
Capacitance	100pF (101)																
	120pF (121)																
	150pF (151)	D	D	D	D	D											
	180pF (181)	D	D	D	D	D											
	220pF (221)	D	D	D	D	D											
	270pF (271)	D	D	D	D	D											
	330pF (331)	D	D	D	D	D											
	390pF (391)	D	D	D	D	D											
	470pF (471)	D	D	D	D	D											
	560pF (561)	D	D	D	D	D											
	680pF (681)	D	D	D	D	D											
	820pF (821)	D	D	D	D	D											
	1,000pF (102)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	1,200pF (122)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	1,500pF (152)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	1,800pF (182)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	2,200pF (222)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	2,700pF (272)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	3,300pF (332)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	3,900pF (392)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	4,700pF (472)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	5,600pF (562)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	6,800pF (682)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	8,200pF (822)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.010μF (103)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.012μF (123)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.015μF (153)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.018μF (183)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.022μF (223)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.027μF (273)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.033μF (333)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.039μF (393)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.047μF (473)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.056μF (563)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.068μF (683)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.082μF (823)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.10μF (104)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.12μF (124)	D	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.15μF (154)	C	C	C	C	G		C	C	C	C	C	D	D	D	D	D
	0.18μF (184)	C	C	C	C	G		C	C	C	C	C	D	D	D	D	D
	0.22μF (224)	C	C	C	C	G		C	C	C	C	C	D	D	D	D	D
	0.27μF (274)	C	C	C	D	G		C	C	C	C	G	D	D	D	D	D
	0.33μF (334)	C	C	C	D	G		C	C	C	D	G	D	D	D	D	D
	0.39μF (394)	C	C	J	P	G		C	C	C	D	M	D	D	D	D	D
	0.47μF (474)	J	J	J	P	G		C	C	C	D	M	D	D	D	D	K
	0.56μF (564)	J	J	J	P	P		D	D	D	D	M	D	D	D	D	K
0.68μF (684)	J	J	J	P	P		D	D	D	D	K	D	D	D	K	K	
0.82μF (824)	J	J	J	P	P		D	D	D	D	K	D	D	D	K	K	
1.0μF (105)	J	J	J	P	P		D	D	D	D	K	D	D	D	K	K	
1.5μF (155)	J	J	P					K	G	M	M					K	
2.2μF (225)	J	J	P	P				K	G	M	M				M	M	
3.3μF (335)	P	P	P					K	G	M							
4.7μF (475)	P	P	P				K	K	K	M							
10μF (106)	P	P	P				K	K	M	M							
22μF (226)	P							M									
47μF (476)						M											

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.

Multilayer Ceramic Capacitors

7-2. CAPACITANCE RANGE (X5R Dielectric)

Dielectric		X5R																							
Size		0402				0603					0805					1206					1210				
Rated Voltage (VDC)		6.3	10	16	25	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	0.027μF (273)			E																					
	0.033μF (333)			E																					
	0.039μF (393)			E																					
	0.047μF (473)			E																					
	0.056μF (563)		E	E																					
	0.068μF (683)		E	E																					
	0.082μF (823)	E	E	E																					
	0.10μF (104)	E	E	E	E																				
	0.15μF (154)	E	E	E	E																				
	0.22μF (224)	E	E	E	E				X	X															
	0.27uF (274)						X	X	X	X															
	0.33μF (334)	E	E			X	X	X	X	X															
	0.39μF (394)						X	X	X	X															
	0.47μF (474)	E	E				X	X	X	X															
	0.68μF (684)	E	E			X	X	X	X	X															
	0.82uF (824)					X	X	X	X	X															
	1.0μF (105)					X	X	X	X	X		D	D	D	D										
	1.5μF (155)					X					I	I	I	I	I		J	J				K	K		
	2.2μF (225)					X	X	X	X	X	I	I	I	I	I		J	J	P			K	K		
	3.3μF (335)					X					I	I	I	I	I		P	P	P	P					
	4.7μF (475)															P	P	P	P			K	K	K	
	6.8uF (685)															P	P								
	10μF (106)															P	P	P			K	K	K		
	22μF (226)																								

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.

7-3. CAPACITANCE RANGE (Y5V Dielectric)

DIELECTRIC		Y5V							
SIZE		0402				0603			
RATED VOLTAGE		6.3	10	16	25	50	10	16	25
Capacitance	0.010μF (103)		E	E	E	E	S	S	S
	0.015μF (153)		E	E	E	E	S	S	S
	0.022μF (223)		E	E	E	E	S	S	S
	0.033μF (333)		E	E	E	E	S	S	S
	0.047μF (473)		E	E	E		S	S	S
	0.068μF (683)		E	E	E		S	S	S
	0.10μF (104)		E	E	E		S	S	S
	0.15μF (154)		E	E			S	S	S
	0.22μF (224)		E	E			S	S	S
	0.33μF (334)	E	E	E			S	S	S
	0.47μF (474)						S	S	X
	0.68μF (684)						S	X	
	1.0μF (105)						S	X	X
	2.2μF (225)						S	X	
	4.7μF (475)						X		

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.

8. PACKAGING STYLE AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0402 (1005)	0.50±0.20	E	10k	-	-	-
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
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±0.50	M	-	-	1k	6k
1812 (4532)	1.25±0.10	D	-	-	1k	5k
	1.60±0.20	G	-	-	1k	-
	2.00±0.20	K	-	-	1k	-
	2.50±0.50	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: (NP0) ≤1000pF, 1.0±0.2Vrms · 1MHz±10% >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%	* Shall not exceed the limits given in the detailed spec. NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C X7R,X5R,X6S,X7S:	
3.	Q/ D.F. (Dissipation Factor)	** Test condition: 0.5±0.2Vrms · 1KHz±10% X7R: 0805=106(6.3V), 0603/475(6.3V) X5R: 01R5 ≥ 103, 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 ≥ 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°C for 1hr then set for 24±2 hrs at room temp.	Rated vol. D.F. ≤ Exception of D.F. ≤	
			≥ 100V ≤ 2.5% ≤ 3% 1206 ≥ 0.47μF	
			≤ 5% 0805 > 0.1μF;0603 ≥ 0.068μF;1206>1μF;1210 ≥ 2.2μF;TT series	
			≤ 10% 0805 > 0.22μF;1210 ≥ 3.3μF	
			50V ≤ 2.5% ≤ 3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF;1206 ≥ 0.47μF	
			≤ 5% 0201 ≥ 0.01uF; 1210 ≥ 4.7μF	
			≤ 10% 0402 ≥ 0.012μF;0603>0.1μF; 0805 ≥ 1μF;1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series	
			35V ≤ 3.5% ≤ 10% 0603 ≥ 1μF;0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF	
			≤ 5% 0201 ≥ 0.01μF;0805 ≥ 1μF; 1210 ≥ 10μF	
			≤ 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	
			25V ≤ 3.5% ≤ 10% 0201 ≥ 0.1μF;0402 ≥ 0.10μF&(0402/X7R ≥ 0.056μF); TT series	
			≤ 10% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF;1206 ≥ 6.8μF; 1210 ≥ 22μF	
			≤ 12.5% 0402 ≥ 0.47μF	
			16V ≤ 3.5% ≤ 5% 0201 ≥ 0.01μF;0402 ≥ 0.033μF;0603 ≥ 0.15μF; 0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF	
			≤ 10% 0201 ≥ 0.1uF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.22uF; 0603 ≥ 0.68μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	
			10V ≤ 5% ≤ 10% 0201 ≥ 0.012μF;0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF); TT series	
			≤ 15% 0603 ≥ 0.33μF; 0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 22μF;01R5	
			0201 ≥ 0.1μF; 0402 ≥ 1μF	
			6.3V ≤ 10% ≤ 15% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF :1210 ≥ 100μF; TT series	
			≤ 20% 0402 ≥ 2.2μF	
			4V ≤ 15% --- ---	
			Y5V:	
			Rated vol. D.F. ≤ Exception of D.F. ≤	
			≥ 50V ≤ 5% ≤ 7% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF; TT series	
			≤ 12.5% 1210 ≥ 6.8μF	
			35V ≤ 7% --- ---	
≤ 7% 0402 ≥ 0.047μF;0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF				
25V ≤ 5% ≤ 9% 0402 ≥ 0.068μF;0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series				
≤ 9% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF				
16V (C<1.0μF) ≤ 7% ≤ 12.5% 0402 ≥ 0.22μF				
16V (C>1.0μF) ≤ 9% ≤ 12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF;1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; TT series				
10V ≤ 12.5% ≤ 20% 0402 ≥ 0.47μF				
6.3V ≤ 20% --- ---				
4.	Dielectric Strength	* To apply voltage (≤100V) 250%. * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.	
5.	Insulation Resistance	To apply rated voltage for MAX. 120sec. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	10GΩ or RxC ≥ 500Ω·F whichever is smaller. Class II (X7R, X7E, X5R,X6S,X7S,Y5V:)	
			Rated voltage	Insulation Resistance
			100V: All X7R	10GΩ or RxC ≥ 100 Ω·F whichever is smaller.
			50V:0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF	
			35V:0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF	
			25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF	
			16V: 0201≥0.1μF;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; Size≥1812	
			Rated voltage	
			All X6S items, All X7S items	RxC ≥ 50 Ω·F.
			100V: 1210≥3.3μF	
			50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF	
			35V: 0603≥1μF;	
			25V: 0201≥0.1μF; 0402≥2.2μF;0603≥10μF; 0805≥10μF;1206≥22μF	
			16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF	
			10V: 0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF; TT21>4.7μF	
6.3V: 0201≥0.1μF; 0603>4.7μF; 0805≥47μF;1206≥10μF; TT15>1.0μF				
4V:0603≥22μF; 0805≥47uF; 1206≥100uF				

Multilayer Ceramic Capacitors

Approval Sheet

No.	Item	Test Condition	Requirements																												
6.	Temperature Coefficient	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>	T.C.	Operating Temp	NPO	-55~125℃ at 25℃	X7R	-55~125℃ at 25℃	X7S	-55 ~ 125℃ at 25℃	X5R	-55~ 85℃ at 25℃	X6S	-55~105℃ at 25℃	Y5V	-25~ 85℃ at 20℃	<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>	T.C.	Capacitance Change	NPO	Within ±30ppm/℃	X7R	Within ±15%	X7S	Within ±22%	X5R	Within ±15%	X6S	Within ±22%	Y5V	Within +30%/-80%
		T.C.	Operating Temp																												
		NPO	-55~125℃ at 25℃																												
		X7R	-55~125℃ at 25℃																												
		X7S	-55 ~ 125℃ at 25℃																												
		X5R	-55~ 85℃ at 25℃																												
		X6S	-55~105℃ at 25℃																												
		Y5V	-25~ 85℃ at 20℃																												
		T.C.	Capacitance Change																												
NPO	Within ±30ppm/℃																														
X7R	Within ±15%																														
X7S	Within ±22%																														
X5R	Within ±15%																														
X6S	Within ±22%																														
Y5V	Within +30%/-80%																														
*Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24± 2 hrs at room temp.																															
<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><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</td><td>1μF<Cap≤4.7μF: 0.5V</td></tr><tr><td>1μF<Cap<10μF: 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>		01005	0201	Cap≤0.01μF: 0.5V	Cap<0.1μF:1V	Cap>0.01μF: 0.2V	0.1μF≤Cap<1μF: 0.2V		Cap≥1μF: 0.1V	0402	0603	Cap<1μF: 1V	Cap≤1μF: 1V	Cap=1μF: 0.5V	1μF<Cap≤4.7μF: 0.5V	1μF<Cap<10μF: 0.2V	Cap>4.7μF: 0.2V	Cap≥10μF: 0.1V		0805	1206/1210	Cap<10μF: 1V	Cap≤10μF: 1V	Cap=10μF: 0.5V	10μF<Cap≤100μF: 0.5V	Cap>10μF: 0.2V	Cap>100μF: 0.2V				
01005	0201																														
Cap≤0.01μF: 0.5V	Cap<0.1μF:1V																														
Cap>0.01μF: 0.2V	0.1μF≤Cap<1μF: 0.2V																														
	Cap≥1μF: 0.1V																														
0402	0603																														
Cap<1μF: 1V	Cap≤1μF: 1V																														
Cap=1μF: 0.5V	1μF<Cap≤4.7μF: 0.5V																														
1μF<Cap<10μF: 0.2V	Cap>4.7μF: 0.2V																														
Cap≥10μF: 0.1V																															
0805	1206/1210																														
Cap<10μF: 1V	Cap≤10μF: 1V																														
Cap=10μF: 0.5V	10μF<Cap≤100μF: 0.5V																														
Cap>10μF: 0.2V	Cap>100μF: 0.2V																														
* Measurement voltage for Class II:																															
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.	95% 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 : NPO: 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 immerse 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: NPO: 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. <table><tr><th>Step</th><th>Temp. (℃)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table> *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.	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	* No remarkable damage. * Cap change : NPO: 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.													
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																													

No.	Item	Test Condition	Requirements																																																																																								
13.	Humidity (Damp Heat) Steady State	*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.	* 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>Exception of D.F.≤</th></tr><tr><td rowspan="3">≥100V</td><td rowspan="3">≤3%</td><td>≤6% 1206 ≥ 0.47μF</td></tr><tr><td>≤7.5% 0805 > 0.1μF, 0603 ≥ 0.068μF, 1206 > 1μF; 1210 ≥ 2.2μF; TT series</td></tr><tr><td>≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF</td></tr><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% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td></tr><tr><td>≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series</td></tr><tr><td>35V</td><td>≤5%</td><td>≤20% 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% 0201 ≥ 0.01μF;0805 ≥ 1μF; 1210 ≥ 10μF</td></tr><tr><td>≤14% 0603 ≥ 0.33μF;1206 ≥ 4.7μF</td></tr><tr><td>≤15% 0201 ≥ 0.1μF;0402 ≥ 0.10μF&(0402/X7R ≥ 0.056μF); TT series</td></tr><tr><td>≤20% 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% 0402 ≥ 0.47μF</td></tr><tr><td>≤10% 0603 ≥ 0.15μF;0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF);0402 ≥ 0.033μF;</td></tr><tr><td>≤20% 0603 ≥ 0.68μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td></tr><tr><td>6.3V</td><td>≤15%</td><td>≤30% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF);</td></tr><tr><td>4V</td><td>≤20%</td><td>≤20% 0603 ≥ 0.33μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF; 1210 ≥ 22μF</td></tr><tr><td></td><td></td><td>≤20% 0201 ≥ 0.1μF ;0402 ≥ 1μF; TT series; 01R5</td></tr><tr><td></td><td></td><td>≤30% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603 ≥ 10μF;</td></tr><tr><td></td><td></td><td>≤30% 0805 ≥ 4.7μF;1206 ≥ 47μF;1210 ≥ 100μF;TT series</td></tr></table> Y5V: <table><tr><th>Rated vol.</th><th>D.F.≤</th><th>Exception of D.F.≤</th></tr><tr><td rowspan="2">≥50V</td><td rowspan="2">≤7.5%</td><td>≤10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF;</td></tr><tr><td>1206 ≥ 4.7μF</td></tr><tr><td>35V</td><td>≤10%</td><td>≤20% 1210 ≥ 6.8μF</td></tr><tr><td rowspan="3">25V</td><td rowspan="3">≤7.5%</td><td>≤10% 0402 ≥ 0.047μF;0603 ≥ 0.1μF;</td></tr><tr><td>0805 ≥ 0.33μF;1206 ≥ 1μF; 1210 ≥ 4.7μF</td></tr><tr><td>≤15% 0402 ≥ 0.068μF;0603 ≥ 0.47μF;</td></tr><tr><td>16V</td><td>≤10%</td><td>≤12.5% 1206 ≥ 4.7μF; 1210 ≥ 22μF</td></tr><tr><td>16V (C<1.0μF)</td><td>≤10%</td><td>≤20% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td></tr><tr><td>16V (C≥1.0μF)</td><td>≤12.5%</td><td>≤20% 0402 ≥ 0.22μF</td></tr><tr><td>10V</td><td>≤20%</td><td>≤30% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF;</td></tr><tr><td>6.3V</td><td>≤30%</td><td>≤20% 1206 ≥ 10μF;1210 ≥ 22μF; 1812 ≥ 47μF;</td></tr><tr><td></td><td></td><td>≤30% 0402 ≥ 0.47μF</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>	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 ≥ 0.01μF; 1210 ≥ 4.7μF	≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 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;1206 ≥ 4.7μF	≤15% 0201 ≥ 0.1μF;0402 ≥ 0.10μF&(0402/X7R ≥ 0.056μF); TT series	≤20% 0603 ≥ 0.47μF;0805 ≥ 2.2μF;1206 ≥ 6.8μF;1210 ≥ 22μF	16V	≤5%	≤10% 0402 ≥ 0.47μF	≤10% 0603 ≥ 0.15μF;0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF	10V	≤7.5%	≤15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF);0402 ≥ 0.033μF;	≤20% 0603 ≥ 0.68μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	6.3V	≤15%	≤30% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF);	4V	≤20%	≤20% 0603 ≥ 0.33μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF; 1210 ≥ 22μF			≤20% 0201 ≥ 0.1μF ;0402 ≥ 1μF; TT series; 01R5			≤30% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603 ≥ 10μF;			≤30% 0805 ≥ 4.7μF;1206 ≥ 47μF;1210 ≥ 100μF;TT series	Rated vol.	D.F.≤	Exception of D.F.≤	≥50V	≤7.5%	≤10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF;	1206 ≥ 4.7μF	35V	≤10%	≤20% 1210 ≥ 6.8μF	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;	16V	≤10%	≤12.5% 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V (C<1.0μF)	≤10%	≤20% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF	16V (C≥1.0μF)	≤12.5%	≤20% 0402 ≥ 0.22μF	10V	≤20%	≤30% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF;	6.3V	≤30%	≤20% 1206 ≥ 10μF;1210 ≥ 22μF; 1812 ≥ 47μF;			≤30% 0402 ≥ 0.47μF	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
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No	Item	Test Condition	Requirements																																																																											
14	Humidity (Damp Heat) Load	*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.	* 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 V</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td rowspan="3">≥100V</td><td rowspan="3">≤3%</td><td>≤6% 1206 ≥0.47μF</td></tr><tr><td>≤7.5% 0805 >0.1μF, 0603 ≥0.068μF, 1206 >1μF; 1210 ≥2.2μF; TT series</td></tr><tr><td>≤20% 0805 >0.22μF; 1210 ≥3.3μF</td></tr><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% 0201 ≥0.01μF; 1210 ≥4.7μF</td></tr><tr><td>≤20% 0402 ≥0.012μF; 0603 >0.1μF; 0805 ≥1μF; 1206 ≥2.2μF; 1210 ≥10μF; TT series</td></tr><tr><td rowspan="3">35V</td><td rowspan="3">≤5%</td><td>≤20% 0603 ≥1μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥10μF</td></tr><tr><td>≤10% 0201 ≥0.01μF; 0805 ≥1μF; 1210 ≥10μF</td></tr><tr><td>≤14% 0603 ≥0.33μF; 1206 ≥4.7μF</td></tr><tr><td rowspan="3">25V</td><td rowspan="3">≤5%</td><td>≤15% 0201 ≥0.1μF; 0402 ≥0.10μF & (0402/X7R ≥0.056μF); TT series</td></tr><tr><td>≤20% 0603 ≥0.47μF; 0805 ≥2.2μF; 1206 ≥6.8μF; 1210 ≥22μF</td></tr><tr><td>0402 ≥0.47μF</td></tr><tr><td rowspan="3">16V</td><td rowspan="3">≤5%</td><td>≤10% 0603 ≥0.15μF; 0805 ≥0.68μF; 1206 ≥2.2μF; 1210 ≥4.7μF</td></tr><tr><td>≤15% 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>≤20% 0402 ≥0.012μF; 0402 ≥0.33μF (0402/X7R ≥0.22μF); 0603 ≥0.33μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥22μF</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15% 0201 ≥0.1μF; 0402 ≥1μF; TT series; 01R5</td></tr><tr><td>≤20% 0201 ≥0.1μF; 0402 ≥1μF; 0603 ≥10μF; 0805 ≥4.7μF; 1206 ≥47μF; 1210 ≥100μF; TT series</td></tr><tr><td>6.3V</td><td>≤15%</td><td>≤30%</td></tr><tr><td>4V</td><td>≤20%</td><td>---</td></tr></table> Y5V: <table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td rowspan="2">≥50V</td><td rowspan="2">≤7.5%</td><td>≤10% 0603 ≥0.1μF; 0805 ≥0.47μF; 1206 ≥4.7μF</td></tr><tr><td>≤20% 1210 ≥6.8μF</td></tr><tr><td>35V</td><td>≤10%</td><td>---</td></tr><tr><td rowspan="3">25V</td><td rowspan="3">≤7.5%</td><td>≤10% 0402 ≥0.047μF; 0603 ≥0.1μF; 0805 ≥0.33μF; 1206 ≥1μF; 1210 ≥4.7μF</td></tr><tr><td>≤15% 0402 ≥0.068μF; 0603 ≥0.47μF; 1206 ≥4.7μF; 1210 ≥22μF</td></tr><tr><td>≤20% 0402 ≥0.068μF; 0603 ≥0.68μF</td></tr><tr><td>16V (C<1.0μF)</td><td>≤10%</td><td>≤12.5% 0402 ≥0.22μF</td></tr><tr><td>16V (C≥1.0μF)</td><td>≤12.5%</td><td>≤20% 0603 ≥2.2μF; 0805 ≥3.3μF; 1206 ≥10μF; 1210 ≥22μF; 1812 ≥47μF;</td></tr><tr><td>10V</td><td>≤20%</td><td>≤30% 0402 ≥0.47μF</td></tr><tr><td>6.3V</td><td>≤30%</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>	Rated V	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 ≥0.01μF; 1210 ≥4.7μF	≤20% 0402 ≥0.012μF; 0603 >0.1μF; 0805 ≥1μF; 1206 ≥2.2μF; 1210 ≥10μF; TT series	35V	≤5%	≤20% 0603 ≥1μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥10μF	≤10% 0201 ≥0.01μF; 0805 ≥1μF; 1210 ≥10μF	≤14% 0603 ≥0.33μF; 1206 ≥4.7μF	25V	≤5%	≤15% 0201 ≥0.1μF; 0402 ≥0.10μF & (0402/X7R ≥0.056μF); TT series	≤20% 0603 ≥0.47μF; 0805 ≥2.2μF; 1206 ≥6.8μF; 1210 ≥22μF	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 series	≤20% 0402 ≥0.012μF; 0402 ≥0.33μF (0402/X7R ≥0.22μF); 0603 ≥0.33μF; 0805 ≥2.2μF; 1206 ≥2.2μF; 1210 ≥22μF	10V	≤7.5%	≤15% 0201 ≥0.1μF; 0402 ≥1μF; TT series; 01R5	≤20% 0201 ≥0.1μF; 0402 ≥1μF; 0603 ≥10μF; 0805 ≥4.7μF; 1206 ≥47μF; 1210 ≥100μF; TT series	6.3V	≤15%	≤30%	4V	≤20%	---	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	≤20% 0402 ≥0.068μF; 0603 ≥0.68μF	16V (C<1.0μF)	≤10%	≤12.5% 0402 ≥0.22μF	16V (C≥1.0μF)	≤12.5%	≤20% 0603 ≥2.2μF; 0805 ≥3.3μF; 1206 ≥10μF; 1210 ≥22μF; 1812 ≥47μF;	10V	≤20%	≤30% 0402 ≥0.47μF	6.3V	≤30%	---	Rated voltage	Insulation Resistance	100V: All X7R; 1210 ≥3.3μF	500MΩ or RxC ≥5 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
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Multilayer Ceramic Capacitors

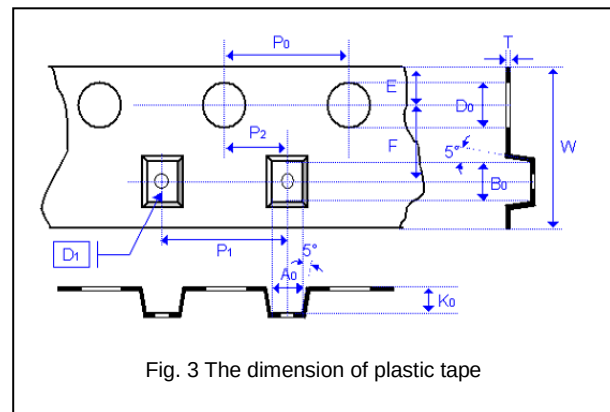
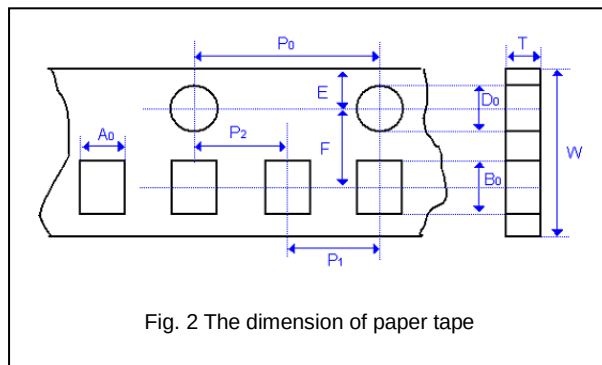
Approval Sheet

No	Item	Test Condition	Requirements																																																																																																																																																																																																										
15.	High Temperature Load (Endurance)	Test temp. : NP0, X7R/X7E/X7S: 125±3°C X6S: 105±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><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr><tr><td>0201</td><td>X5R/X7R/X6S</td><td>≤ 10V ≥ 16V</td><td>C ≥ 0.1μF C > 0.1μF</td></tr><tr><td rowspan="3">0402</td><td rowspan="2">X5R</td><td>≤ 16V</td><td>C > 1.0μF</td></tr><tr><td>25V, 50V</td><td>C ≥ 1.0μF</td></tr><tr><td>X6S</td><td>6.3V</td><td>C > 1.0μF</td></tr><tr><td></td><td></td><td>10V~25V</td><td>C ≥ 1.0μF</td></tr><tr><td></td><td>X7R/X7S/Y5V</td><td>6.3V, 10V</td><td>C ≥ 1.0μF</td></tr><tr><td rowspan="2">0603</td><td rowspan="2">X5R/X7R/X6S/X7S</td><td>4V</td><td>C ≥ 22μF</td></tr><tr><td>6.3V, 10V</td><td>C ≥ 4.7μF</td></tr><tr><td></td><td></td><td>25V, 35V</td><td>C ≥ 1.0μF</td></tr><tr><td rowspan="3">0805</td><td rowspan="3">X5R/X7R/X6S/X7S</td><td>4V</td><td>C ≥ 47μF</td></tr><tr><td>6.3V</td><td>C ≥ 22μF</td></tr><tr><td>10V~50V</td><td>C ≥ 10μF</td></tr><tr><td>1206</td><td>X5R/X7R/X6S</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><tr><td rowspan="2">1210</td><td rowspan="2">X5R/X7R/X6S</td><td>16V</td><td>C ≥ 47μF</td></tr><tr><td>X7R</td><td>100V</td><td>C ≥ 3.3μF</td></tr><tr><td>TT15</td><td>X5R</td><td>6.3V</td><td>C > 1.0μF</td></tr><tr><td>TT18</td><td>Y5V</td><td>6.3V, 10V</td><td>C ≥ 2.2μF</td></tr><tr><td rowspan="2">TT21</td><td rowspan="2">Y5V</td><td>6.3V</td><td>C ≥ 10μF</td></tr><tr><td>X5R/X7R/X6S</td><td>≤ 10V</td><td>C ≥ 10μF</td></tr><tr><td>TT31</td><td>Y5V</td><td>6.3V</td><td>C ≥ 22μF</td></tr></table> **1WV items must follow de-rating conditions. (6) 150% of rated voltage for below range. <table><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr><tr><td rowspan="2">0201</td><td>X5R/X6S</td><td>16V, 25V</td><td>C ≥ 0.1μF</td></tr><tr><td>X7R</td><td>16V</td><td>C ≥ 0.022μF</td></tr><tr><td rowspan="3">0402</td><td>X7R/X5R/X6S</td><td>50V</td><td>C ≥ 0.1μF</td></tr><tr><td></td><td>10~25V</td><td>C ≥ 0.22μF</td></tr><tr><td>Y5V</td><td>16V</td><td>C ≥ 0.47μF</td></tr><tr><td rowspan="5">0603</td><td>X7S</td><td>50V~100V</td><td>C > 0.22μF</td></tr><tr><td>X7R</td><td>50V</td><td>C > 0.1μF</td></tr><tr><td>X5R</td><td>50V</td><td>C ≥ 1.0μF</td></tr><tr><td>X5R/X7R/X6S/X7S</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="4">0805</td><td rowspan="4">X5R/X7R/X6S/X7S</td><td>100V</td><td>C ≥ 0.47μF</td></tr><tr><td>50V</td><td>C ≥ 1.0μF</td></tr><tr><td>35V</td><td>C ≥ 2.2μF</td></tr><tr><td>10~25V</td><td>C ≥ 4.7μF</td></tr><tr><td></td><td>Y5V</td><td>16V</td><td>C ≥ 4.7μF</td></tr><tr><td>1206</td><td>X5R/X7R/X6S/X7S</td><td>100V</td><td>C > 1.0μF</td></tr><tr><td></td><td></td><td>50V</td><td>C = 4.7μF</td></tr><tr><td>1210</td><td>X5R/X7R/X6S/X7S</td><td>50V~100V</td><td>C ≥ 2.2μF</td></tr><tr><td>1825 2220 2225</td><td>X7R</td><td>100V~250V</td><td>C ≥ 1.0μF</td></tr></table> * Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * De-rating conditions:	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R/X7R/X6S	≤ 10V ≥ 16V	C ≥ 0.1μF C > 0.1μF	0402	X5R	≤ 16V	C > 1.0μF	25V, 50V	C ≥ 1.0μF	X6S	6.3V	C > 1.0μF			10V~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			25V, 35V	C ≥ 1.0μF	0805	X5R/X7R/X6S/X7S	4V	C ≥ 47μF	6.3V	C ≥ 22μF	10V~50V	C ≥ 10μF	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	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R/X6S	16V, 25V	C ≥ 0.1μF	X7R	16V	C ≥ 0.022μF	0402	X7R/X5R/X6S	50V	C ≥ 0.1μF		10~25V	C ≥ 0.22μF	Y5V	16V	C ≥ 0.47μF	0603	X7S	50V~100V	C > 0.22μF	X7R	50V	C > 0.1μF	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	* 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 X7R, X5R, X6S, X7S: <table><tr><th>Rated V.D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td>≥ 100V ≤ 3%</td><td>≤ 6% 1206 ≥ 0.47μF ≤ 7.5% 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>≤ 6%</td><td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td></tr><tr><td>≥ 50V ≤ 3%</td><td>≤ 10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF ≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series</td></tr><tr><td>35V ≤ 5%</td><td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF ≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF ≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td></tr><tr><td>25V ≤ 5%</td><td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series ≤ 20% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF 0402 ≥ 0.47μF</td></tr><tr><td>16V ≤ 5%</td><td>≤ 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 series</td></tr><tr><td>10V ≤ 7.5%</td><td>≤ 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</td></tr><tr><td>6.3V ≤ 15%</td><td>≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td></tr><tr><td>4V ≤ 20%</td><td>---</td></tr></table> Y5V: <table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td>≥ 50V</td><td>≤ 7.5%</td><td>≤ 10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF ≤ 20% 1210 ≥ 6.8μF</td></tr><tr><td>35V</td><td>≤ 10%</td><td>---</td></tr><tr><td rowspan="2">25V</td><td rowspan="2">≤ 7.5%</td><td>≤ 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</td></tr><tr><td>≤ 12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF ≤ 20% 0402 ≥ 0.22μF</td></tr><tr><td>16V (C < 1.0μF)</td><td>≤ 10%</td><td>≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; 0402 ≥ 0.47μF</td></tr><tr><td>16V (C ≥ 1.0μF)</td><td>≤ 12.5%</td><td>≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; 0402 ≥ 0.47μF</td></tr><tr><td>10V</td><td>≤ 20%</td><td>≤ 30% 0402 ≥ 0.47μF</td></tr><tr><td>6.3V</td><td>≤ 30%</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="6">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><td></td></tr></table>	Rated V.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	≤ 6%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≥ 50V ≤ 3%	≤ 10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF ≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series	35V ≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF ≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF ≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	25V ≤ 5%	≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series ≤ 20% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF 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 series	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; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series	4V ≤ 20%	---	Rated vol.	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≤ 20%	0805 > 0.22μF; 1210 ≥ 3.3μF																																																																																																																																																																																																												
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≥ 50V ≤ 3%	≤ 10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF ≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series																																																																																																																																																																																																												
35V ≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF ≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF ≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																																																																																																																																																																												
25V ≤ 5%	≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series ≤ 20% 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF 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 series																																																																																																																																																																																																												
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; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series																																																																																																																																																																																																												
4V ≤ 20%	---																																																																																																																																																																																																												
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																																																																																																																																																																																																											
		≤ 12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF ≤ 20% 0402 ≥ 0.22μF																																																																																																																																																																																																											
16V (C < 1.0μF)	≤ 10%	≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; 0402 ≥ 0.47μF																																																																																																																																																																																																											
16V (C ≥ 1.0μF)	≤ 12.5%	≤ 20% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; 0402 ≥ 0.47μF																																																																																																																																																																																																											
10V	≤ 20%	≤ 30% 0402 ≥ 0.47μF																																																																																																																																																																																																											
6.3V	≤ 30%	---																																																																																																																																																																																																											
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																																																																																																																																																																																																													

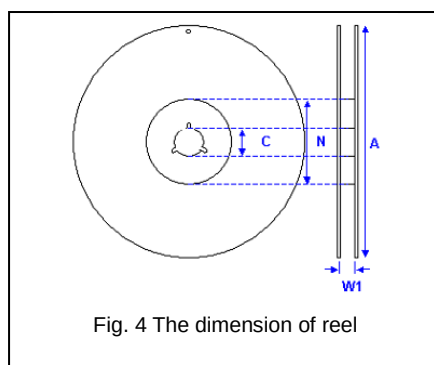
Multilayer Ceramic Capacitors

APPENDIXES

■ Tape & reel dimensions



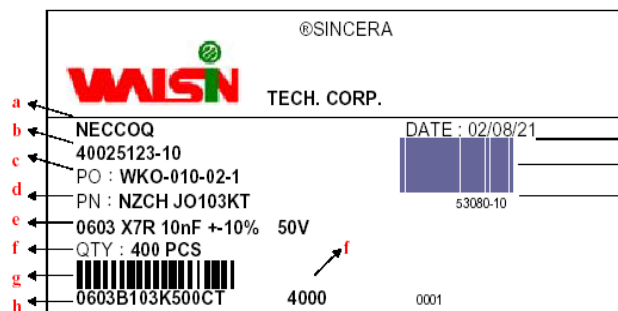
Size	0402	0603	0805			1206			1210		1808	1812	
Thickness	E	S, X	A	B	C, D, I	B	C, J, D	G, P	C, D, G, K	M	D, G, K	D, G, K	M, U
A ₀	0.70 +/-0.20	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	< 2.30	< 3.05	< 3.05	< 3.20	< 2.50	< 3.90
B ₀	1.20 +/-0.20	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	< 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 +/-0.1	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



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

Multilayer Ceramic Capacitors

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

Constructions

No.	Name	NPO, X7R, X5R, Y5V
①	Ceramic material	BaTiO ₃ based
②	Inner electrode	Ni
③	Termination	Inner layer
④		Middle layer
⑤		Outer layer

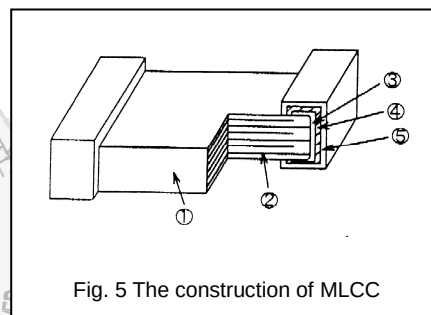


Fig. 5 The construction of MLCC

Storage and handling conditions

- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (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_2 within oven are recommended.

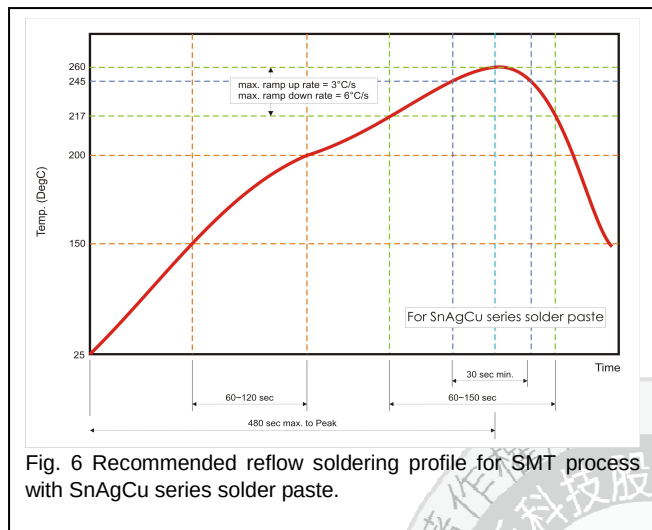


Fig. 6 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

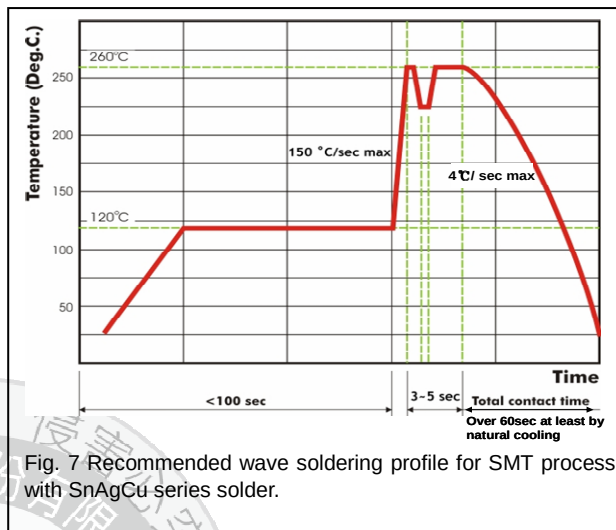


Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.