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

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

3. APPLICATIONS

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

4. HOW TO ORDER

SH	31	B	104	K	500	C	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
SH=Soft termination	**15**=0402 (1005) **18**=0603 (1608) **21**=0805 (2012) **31**=1206 (3216) **32**=1210 (3225) **43**=1812 (4532)	**N**=NP0 (C0G) **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.

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	#	
	2.00±0.30	1.25±0.30	1.25±0.30	I	#	
1206 (3216)	3.20+0.4/-0.1	1.60±0.15	0.80±0.10	B		0.60±0.20
			0.95±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.

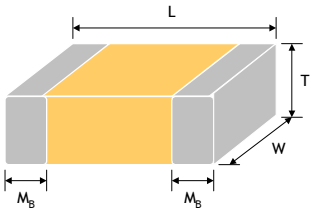


Fig. 1 The outline of MLCC

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℃ am bient 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 mbient 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		S	S	S	S	S	A	A	A	A	A
	330pF (331)	E	E	E	E		S	S	S	S	S	A	A	A	A	A
	390pF (391)	E	E	E	E		S	S	S	S	S	B	B	B	B	B
	470pF (471)	E	E	E	E		S	S	S	S	S	B	B	B	B	B
	560pF (561)	E	E	E	E		S	S	S	S	S	B	B	B	B	B
	680pF (681)	E	E	E	E		S	S	S	S	S	B	B	B	B	B
	820pF (821)	E	E	E	E		S	S	S	S	S	B	B	B	B	B
	1,000pF (102)	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	
	0.010uF (103)											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.

1206, 1210, 1812 Sizes

DIELECTRIC		NP0														
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		S	S	S	S	S	D	D	D	D	D
	6,800pF (682)	E	E	E	E		S	S	S	S	S	D	D	D	D	D
	8,200pF (822)	E	E	E	E		S	S	S	S	S	D	D	D	D	D
	0.010μF (103)	E	E	E	E		S	S	S	S	S	D	D	D	D	D
	0.012μF (123)	E	E	E			S	S	S	S	X	D	D	D	D	D
	0.015μF (153)	E	E	E			S	S	S	S	X	D	D	D	D	D
	0.018μF (183)	E	E	E			S	S	S	S	X	D	D	D	D	D
	0.022μF (223)	E	E	E			S	S	S	S	X	D	D	D	D	D
	0.027μF (273)	E	E	E			S	S	S	S	X	D	D	D	D	D
	0.033μF (333)	E	E	E			S	S	S	X	X	D	D	D	D	D
	0.039μF (393)	E	E	E			S	S	S	X	X	D	D	D	D	D
	0.047μF (473)	E	E	E			S	S	S	X	X	D	D	D	D	D
	0.056μF (563)	E	E				S	S	S	X	X	D	D	D	D	D
	0.068μF (683)	E	E				S	S	S	X	X	D	D	D	D	D
	0.082μF (823)	E	E				S	S	S	X	X	D	D	D	D	D
	0.10μF (104)	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	D	D	D	D	D	D
	0.18μF (184)	C	C	C	C	G		C	C	C	C	D	D	D	D	D	D
	0.22μF (224)	C	C	C	C	G		C	C	C	C	D	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.

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																
	0.33μF (334)	E	E			X	X	X	X																
	0.39μF (394)						X	X	X																
	0.47μF (474)	E	E				X	X	X																
	0.68μF (684)	E	E			X	X	X	X																
	0.82uF (824)					X	X	X																	
	1.0μF (105)					X	X	X	X			D	D	D											
	1.5μF (155)					X					I	I	I	I			J	J				K	K		
	2.2μF (225)					X	X	X			I	I	I	I			J	J	P			K	K		
	3.3μF (335)					X					I	I	I	I			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	50
Capacitance	0.010μF (103)		E	E	E	E	S	S	S	S
	0.015μF (153)		E	E	E	E	S	S	S	S
	0.022μF (223)		E	E	E	E	S	S	S	S
	0.033μF (333)		E	E	E	E	S	S	S	S
	0.047μF (473)		E	E	E		S	S	S	S
	0.068μF (683)		E	E	E		S	S	S	S
	0.10μF (104)		E	E	E		S	S	S	S
	0.15μF (154)		E	E			S	S	S	S
	0.22μF (224)	E	E	E			S	S	S	S
	0.33μF (334)	E	E	E			S	S	S	
	0.47μF (474)						S	S	X	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

<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Visual and Mechanical</td><td>---</td><td>* No remarkable defect.
* Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>2.</td><td>Capacitance</td><td>Class I: (NP0)
≦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%</td><td>* Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3.</td><td>Q/ D.F. (Dissipation Factor)</td><td>** Test condition: 0.5±0.2Vrms，1KHz±10%
X7R:
0805=106(6.3V), 0603/475(6.3V)
X5R:
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%)

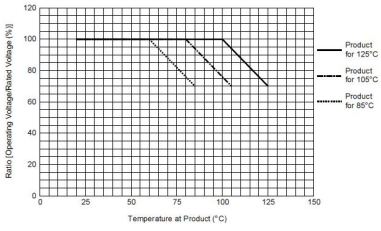
*Before initial measurement (Class II only):
To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.</td><td>NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C
X7R,X5R,X6S,X7S:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th>Exception of D.F. ≦</th><th></th></tr>
<tr><td rowspan="3">≧100V</td>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

*Before initial measurement (Class II only):
To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.</td><td>10GΩ or RxC≧500Ω-F whichever is smaller.
Class II (X7R, X7E, X5R,X6S,X7S,Y5V:)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R</td><td rowspan="8">10GΩ or RxC≧100 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1206≧2.2μF;1210≧10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: 0201≥0.1μF,0402≥0.22μF;0603≥1μF;
0805≥2.2μF;1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ; TT series; Size≥1812</td></tr>
<tr><td></td></tr>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>All X6S items, All X7S items</td><td rowspan="10">RxC≧50 Ω-F.</td></tr>
<tr><td>100V: 1210≥3.3μF</td></tr>
<tr><td>50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF</td></tr>
<tr><td>35V: 0603≥1μF;</td></tr>
<tr><td>25V: 0201≥0.1μF; 0402≥2.2μF;0603≥10μF; 0805≥10μF;1206≥22μF</td></tr>
<tr><td>16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF</td></tr>
<tr><td>10V: 0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF; TT21>4.7μF</td></tr>
<tr><td>6.3V: 0201≥0.1μF; 0603>4.7μF; 0805≥47μF;1206≥10μF; TT15>1.0μF</td></tr>
<tr><td>4V:0603≥22μF; 0805≥47μF; 1206≥100μF</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>6.</td><td>Temperature Coefficient</td><td>With no electrical load.
<table>
<tr><td>T.C.</td><td>Operating Temp</td></tr>
<tr><td>NPO</td><td>-55~125℃ at 25℃</td></tr>
<tr><td>X7R</td><td>-55~125℃ at 25℃</td></tr>
<tr><td>X7S</td><td>-55 ~ 125℃ at 25℃</td></tr>
<tr><td>X5R</td><td>-55~ 85℃ at 25℃</td></tr>
<tr><td>X6S</td><td>-55~105℃ at 25℃</td></tr>
<tr><td>Y5V</td><td>-25~ 85℃ at 20℃</td></tr>
</table>
*Before initial measurement (Class II only):
To apply de-aging at 150℃ for 1hr then set for 24± 2 hrs at room temp.
<table>
<tr><td>01005</td><td>0201</td></tr>
<tr><td>Cap≤0.01μF: 0.5V</td><td>Cap<0.1μF:1V</td></tr>
<tr><td>Cap>0.01μF: 0.2V</td><td>0.1μF≤Cap<1μF: 0.2V</td></tr>
<tr><td></td><td>Cap≥1μF: 0.1V</td></tr>
<tr><td>0402</td><td>0603</td></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><td>0805</td><td>1206/1210</td></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>
* Measurement voltage for Class II:</td><td><table>
<tr><td>T.C.</td><td>Capacitance Change</td></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></td></tr>
<tr><td>7.</td><td>Adhesive Strength of Termination</td><td>* Pressurizing force：
1N (0201) and 5N (≤0603) and 10N (>0603)
* Test time: 10±1 sec.</td><td>* No remarkable damage or removal of the terminations.</td></tr>
<tr><td>8.</td><td>Vibration Resistance</td><td>* 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.</td><td> No remarkable damage.
* Cap change and Q/D.F.: To meet initial spec.</td></tr>
<tr><td>9.</td><td>Solderability</td><td>* Solder temperature: 235±5℃
* Dipping time: 2±0.5 sec.</td><td>95% min. coverage of all metalized area.</td></tr>
<tr><td>10.</td><td>Bending Test</td><td>*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.</td><td>* No remarkable damage.
* Cap change：
NP0: within ±5% or 0.5pF whichever is larger
X7R, X5R, X6S, X7S: within ±12.5%
Y5V: within ±30%
(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</td></tr>
<tr><td>11.</td><td>Resistance to Soldering Heat</td><td>* Solder temperature: 260±5℃
* Dipping time: 10±1 sec
* Preheating: 120 to 150℃ for 1 minute before imme rse the capacitor in a eutectic solder.
*Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.
Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.</td><td> No remarkable damage.
* Cap change:
NP0: within ±2.5% or 0.25pF whichever is larger
X7R, X5R, X6S, X7S: within ±7.5%
Y5V: within ±20%
* Q/D.F., I.R. and dielectric strength: To meet initial requirements.
* 25% max. leaching on each edge.</td></tr>
<tr><td>12.</td><td>Temperature Cycle</td><td>* Conduct the five cycles according to the temperatures and time.
<table>
<tr><td>Step</td><td>Temp. (℃)</td><td>Time (min.)</td></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.</td><td>* No remarkable damage.
* Cap change：
NP0: within ±2.5% or 0.25pF whichever is larger
X7R, X5R, X6S, X7S: within ±7.5%
Y5V: within ±20%
* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</td></tr>
</table>

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

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>14</td><td>Humidity (Damp Heat) Load</td><td>*Test temp.：40±2℃
*Humidity：90~95%RH
*Test time：500+24/-0 hrs.
*To apply voltage：
Rated voltage (MAX. 500V)
*Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.
* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.</td><td>
* No remarkable damage.
Cap change:
NP0: ±7.5% or 0.75pF whichever is larger.
X7R, X5R, X6S, X7S: ≥10V**,within ±12.5%; ≦6.3V within ±25%;
TT series & C≥ 1uF,within ±25%
**10V: 0603≧4.7μF;0402≧1μF;0201≧0.1μF, within ±25%;
Y5V: ≥10V, within ±30%; ≦6.3V, within +30/-40%
Q/D.F. value:
NP0: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C
X7R, X5R, X6S, X7S:
<table>
<tr><th>Rated V</th><th>D.F.≦</th><th>Exception of D.F.≦</th><th></th></tr>
<tr><td rowspan="3">≧100V</td><td rowspan="3">≦3%</td><td>≦6%</td><td>1206≧0.47μF</td></tr>
<tr><td>≦7.5%</td><td>0805＞0.1μF, 0603≧0.068μF, 1206>1μF;1210≧2.2μF;TT se</td></tr>
<tr><td>≦20%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
<tr><td rowspan="3">≧50V</td><td rowspan="3">≦3%</td><td>≦6%</td><td>0201(50V);0603≧0.047μF; 0805≧0.18μF; 1206≧0.47μF</td></tr>
<tr><td>≦10%</td><td>0201≧0.01uF;1210≧4.7μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.012μF; 0603>0.1μF; 0805≧1μF; 1206≧2.2μF;
1210≧10μF; TT series</td></tr>
<tr><td>35V</td><td>≦5%</td><td>≦20%</td><td>0603≧1μF;0805≥2.2μF;1206≧2.2μF;1210≧10μF</td></tr>
<tr><td rowspan="4">25V</td><td rowspan="4">≦5%</td><td>≦10%</td><td>0201≧0.01μF;0805≧1μF; 1210≧10μF</td></tr>
<tr><td>≦14%</td><td>0603≧0.33μF;1206≧4.7μF</td></tr>
<tr><td>≦15%</td><td>0201≧0.1μF;0402≧0.10μF&(0402/X7R≧0.056μF); TT series
0603≧0.47μF;0805≧2.2μF;1206≧6.8μF;1210≧22μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.47μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦5%</td><td>≦10%</td><td>0603≧0.15μF;0805≧0.68μF;1206≧2.2μF;1210≧4.7μF</td></tr>
<tr><td>≦15%</td><td>0201≧0.01μF(0201/X7R≧0.022μF);0402≧0.033μF;
0603≧0.68μF;0805≧2.2μF;1206≧4.7μF; 1210≧22μF; TT s</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦7.5%</td><td>≦15%</td><td>0201≧0.012μF; 0402≧0.33μF(0402/X7R≧0.22μF);
0603≧0.33μF;0805≧2.2μF;1206≧2.2μF; 1210≧22μF</td></tr>
<tr><td>≦20%</td><td>0201≧0.1μF ;0402≧1μF; TT series; 01R5</td></tr>
<tr><td>6.3V</td><td>≦15%</td><td>≦30%</td><td>0201≧0.1μF;0402≧1μF;0603≧10μF;
0805≧4.7μF;1206≧47μF;1210≧100μF;TT series</td></tr>
<tr><td>4V</td><td>≦20%</td><td>---</td><td>---</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50V</td><td>≦7.5%</td><td>≦10%</td><td>0603≧0.1μF; 0805≧0.47μF;1206≧4.7μF</td></tr>
<tr><td></td><td></td><td>≦20%</td><td>1210≧6.8μF</td></tr>
<tr><td>35V</td><td>≦10%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≦7.5%</td><td>≦10%</td><td>0402≧0.047μF;0603≧0.1μF;
0805≧0.33μF;1206≧1μF; 1210≧4.7μF</td></tr>
<tr><td>≦15%</td><td>0402≧0.068μF;0603≧0.47μF;
1206≧4.7μF; 1210≧22μF</td></tr>
<tr><td rowspan="2">16V
(C<1.0μF)</td><td rowspan="2">≦10%</td><td>≦12.5%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.22μF</td></tr>
<tr><td>16V
(C≧1.0μF)</td><td>≦12.5%</td><td>≦20%</td><td>0603≧2.2μF; 0805≧3.3μF;
1206≧10μF;1210≧22μF; 1812≧47μF;</td></tr>
<tr><td>10V</td><td>≦20%</td><td>≦30%</td><td>0402≧0.47μF</td></tr>
<tr><td>6.3V</td><td>≦30%</td><td>---</td><td>---</td></tr>
</table>
*I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller.
Class II (X7R, X5R, X6S, X7S, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="6">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><td></td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>15.</td><td>High Temperature Load (Endurance)</td><td>
*Test temp. :
NP0, X7R/X7E/X7S: 125±3℃
X6S: 105±3℃
X5R, Y5V: 85±3℃
*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 rowspan="2">0201</td><td rowspan="2">X5R/X7R/X6S</td><td>≦10V</td><td>C≧0.1μF</td></tr>
<tr><td>≧16V</td><td>C>0.1μF</td></tr>
<tr><td>0402</td><td>X5R/X7R/ X6S/X7S/Y5V</td><td>6.3V,10V 16V,25V</td><td>C≧1.0μF</td></tr>
<tr><td rowspan="3">0603</td><td rowspan="3">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>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 rowspan="2">1206</td><td>X5R/X7R/X6S</td><td>≦6.3V</td><td>C≧47μF</td></tr>
<tr><td>NP0</td><td>3000V</td><td>C≧1.5pF</td></tr>
<tr><td rowspan="2">1210</td><td>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>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</th></tr>
<tr><td>0201</td><td>X5R/X7R/X6</td><td>16V/25V</td><td>C≧0.1μF</td></tr>
<tr><td rowspan="4">0402</td><td>X7R</td><td>16V</td><td>C≧0.022μF</td></tr>
<tr><td rowspan="3">X5R/X7R/X6S</td><td>50V</td><td>C≧0.1μF</td></tr>
<tr><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="3">0603</td><td>X7R</td><td>50V</td><td>C>0.1μF</td></tr>
<tr><td>X5R/X7R/ X6S/X7S</td><td>10V,16V, 50V</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>X5R/X7R/ X6S/X7S</td><td>10~50V</td><td>C≧4.7μF</td></tr>
<tr><td rowspan="3">X5R/X7R/X7S</td><td>50V</td><td>C≧2.2μF</td></tr>
<tr><td>100V</td><td>C≧0.47μF</td></tr>
<tr><td>Y5V</td><td>16V</td><td>C≧4.7μF</td></tr>
<tr><td>1206</td><td>X5R/X7R/X6</td><td>100V</td><td>C>1.0μF</td></tr>
<tr><td>1210</td><td>X5R/X7R/X6</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>
*Test time: 1000+24/-0 hrs.
*Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.
* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.
** De-rating conditions:


</td><td>
* 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</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td rowspan="3">≧100V</td><td rowspan="3">≦3%</td><td>≦6%</td><td>1206≧0.47μF</td></tr>
<tr><td>≦7.5%</td><td>0805＞0.1μF, 0603≧0.068μF, 1206>1μF;1210≧2.2μF;TT se</td></tr>
<tr><td>≦20%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
<tr><td rowspan="3">≧50V</td><td rowspan="3">≦3%</td><td>≦6%</td><td>0201(50V);0603≧0.047μF; 0805≧0.18μF; 1206≧0.47μF</td></tr>
<tr><td>≦10%</td><td>0201≧0.01uF;1210≧4.7μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.012μF; 0603>0.1μF; 0805≧1μF; 1206≧2.2μF; 1210≧10μF; TT series</td></tr>
<tr><td>35V</td><td>≦5%</td><td>≦20%</td><td>0603≧1μF;0805≥2.2μF;1206≧2.2μF;1210≧10μF</td></tr>
<tr><td rowspan="4">25V</td><td rowspan="4">≦5%</td><td>≦10%</td><td>0201≧0.01μF;0805≧1μF; 1210≧10μF</td></tr>
<tr><td>≦14%</td><td>0603≧0.33μF;1206≧4.7μF</td></tr>
<tr><td>≦15%</td><td>0201≧0.1μF;0402≧0.10μF&(0402/X7R≧0.056μF); TT serie :0603≧0.47μF;0805≧2.2μF;1206≧6.8μF;1210≧22μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.47μF</td></tr>
<tr><td rowspan="3">16V</td><td rowspan="3">≦5%</td><td>≦10%</td><td>0603≧0.15μF;0805≧0.68μF;1206≧2.2μF;1210≧4.7μF</td></tr>
<tr><td>≦15%</td><td>0201≧0.01μF(0201/X7R≧0.022μF);0402≧0.033μF; 0603≧0.68μF;0805≧2.2μF;1206≧4.7μF; 1210≧22μF; TT s</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦7.5%</td><td>≦15%</td><td>0201≧0.012μF; 0402≧0.33μF(0402/X7R≧0.22μF); 0603≧0.33μF;0805≧2.2μF;1206≧2.2μF; 1210≧22μF</td></tr>
<tr><td>≦20%</td><td>0201≧0.1μF ;0402≧1μF; TT series; 01R5</td></tr>
<tr><td>6.3V</td><td>≦15%</td><td>≦30%</td><td>0201≧0.1μF;0402≧1μF;0603≧10μF; 0805≧4.7μF;1206≧47μF;1210≧100μF;TT series</td></tr>
<tr><td>4V</td><td>≦20%</td><td>---</td><td>---</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50V</td><td>≦7.5%</td><td>≦10%</td><td>0603≧0.1μF; 0805≧0.47μF;1206≧4.7μF</td></tr>
<tr><td></td><td></td><td>≦20%</td><td>1210≧6.8μF</td></tr>
<tr><td>35V</td><td>≦10%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≦7.5%</td><td>≦10%</td><td>0402≧0.047μF;0603≧0.1μF; 0805≧0.33μF;1206≧1μF; 1210≧4.7μF</td></tr>
<tr><td>≦15%</td><td>0402≧0.068μF;0603≧0.47μF; 1206≧4.7μF; 1210≧22μF</td></tr>
<tr><td rowspan="2">16V (C<1.0μF)</td><td rowspan="2">≦10%</td><td>≦12.5%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.22μF</td></tr>
<tr><td>16V (C≧1.0μF)</td><td>≦12.5%</td><td>≦20%</td><td>0603≧2.2μF; 0805≧3.3μF; 1206≧10μF;1210≧22μF; 1812≧47μF;</td></tr>
<tr><td>10V</td><td>≦20%</td><td>≦30%</td><td>0402≧0.47μF</td></tr>
<tr><td>6.3V</td><td>≦30%</td><td>---</td><td>---</td></tr>
</table>
*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.
Class II (X7R, X5R, X6S, X7S, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="7">1GΩ or RxC ≧10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0603≥1μF;0805≥2.2μF; 1206≧2.2μF;1210≧10μF</td></tr>
<tr><td>25V:0201≧0.1μF; 0402≥0.22μF; 0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: 0201≧0.1μF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ; TT series ; All X6S/X7S items; Size≥1812</td></tr>
</table>
</td></tr>
</table>

APPENDIXES

◙ Tape & reel dimensions

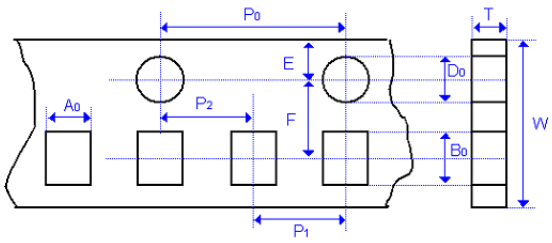


Fig. 2 The dimension of paper tape

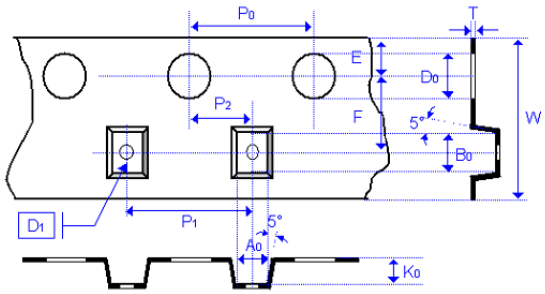


Fig. 3 The dimension of plastic tape

Size	0402	0603	0805			1206			1210		1808	1812	
Thickness	E	S, X	A	B	C, D, I	B	C, J, D	G, P	C,D,G,K	M	D, G, K	D, G, K	M, U
A_0	0.70 +/-0.2	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	<2.30	< 3.05	< 3.20	< 2.50	< 3.90	< 3.90
B_0	1.20 +/-0.2	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	< 2.70	3.50 +/-0.50	< 3.70	< 4.00	< 3.80	<3.95	< 5.30	< 5.30	< 5.30
T	≦0.80	≦1.20	≦1.15	≦1.30	0.23 +/-0.1	≦1.30	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1
K_0	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 2.50	< 3.00	< 2.50	< 2.50	< 3.50
W	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.20	8.00 +/-0.10	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	12.00 +/-0.20	12.00 +/-0.20	12.00 +/-0.20
P_0	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	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	8.00 +/-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 +/-0.10	2.00 +/-0.10	2.00 +/-0.10
D_0	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.50 +0.10/-0	1.55 +/-0.05	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0
D_1	-	-	-	-	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	1.50 +/-0.10
E	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.10	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	3.50 +/-0.05	5.50 +/-0.10	5.50 +/-0.10	5.50 +/-0.10

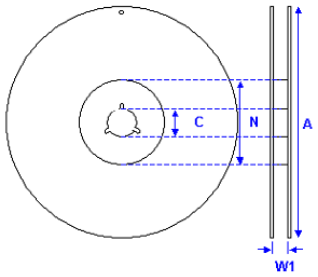
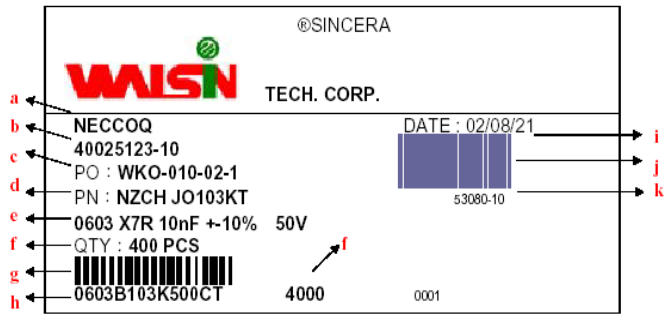


Fig. 4 The dimension of reel

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

◙ 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	Cu + Ag Polymer
④		Middle layer	Ni
⑤		Outer layer	Sn

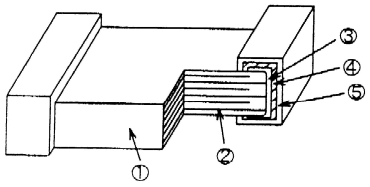


Fig. 5 The construction of MLCC

◙ Storage and handling conditions

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

(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.

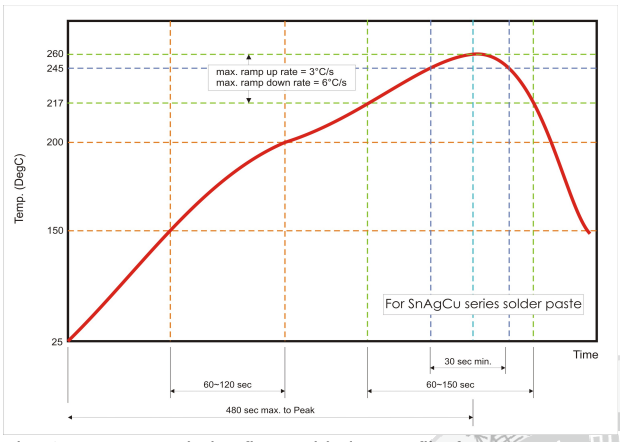


Fig. 6 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

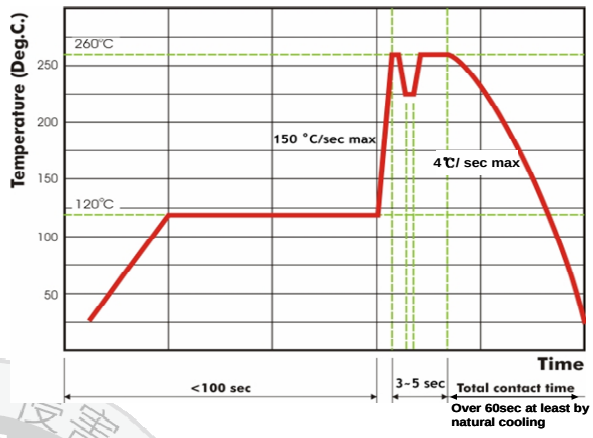


Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.