APPROVAL SHEET

MULTILAYER CERAMIC CAPACITORS

Soft Termination Series

(SH_6.3V to 3000V)

NP0, X7R, X5R & Y5V Dielectrics

0402 to 2225 Sizes

Halogen Free & RoHS Compliance

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1. INTRODUCTION

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

2. FEATURES

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

3. APPLICATIONS

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

4. HOW TO ORDER

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) **42**=1808 (4520) **43**=1812 (4532) **46**=1825 (4563) **55**=2220 (5750) **56**=2225 (5763)	**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 **201**=200 VDC **251**=250 VDC **401**=400 VDC **451**=450 VDC **501**=500 VDC **631**=630 VDC **102**=1000 VDC **152**=1500 VDC **202**=2000 VDC **252=** 2500 VDC **302**=3000 VDC	**C**=Ag Polymer /Ni/Sn	**T**=7" reeled **G**=13" reeled

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5. EXTERNAL DIMENSIONS & CONSTRUCTIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	M_B (mm)
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 (0.50±0.25)*
			0.95±0.10	C	#	
			1.15±0.15	J	#	
			1.25±0.10	D	#	
	3.20+0.4/-0.1	1.60±0.20	1.60±0.20	G	#	
	3.20±0.50	1.60±0.50	1.60±0.50	P	#	
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	#	
1808 (4520)	4.50+0.6/-0.4	2.03±0.25	1.25±0.10	D	#	0.50±0.25
			2.00±0.20	K	#	
1812 (4532)	4.50+0.6/-0.4	3.20±0.30	1.25±0.10	D	#	0.75±0.25 (0.50±0.25)*
			1.60±0.20	G	#	
			2.00±0.20	K	#	
		3.20±0.40	2.50±0.50	M	#	
1825 (4563)	4.50+0.6/-0.4	6.30±0.40	2.00±0.20 (K) 2.50±0.30 (M) 2.80±0.30 (U)		#	0.75±0.35
2220 (5750)	5.70±0.50	5.00±0.40			#	0.85±0.35
2225 (5763)	5.70±0.50	6.30±0.40			#	0.85±0.35

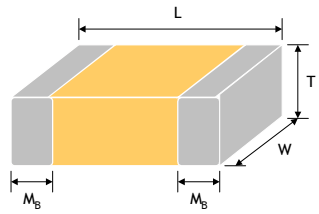


Fig. 1 The outline of MLCC

Reflow soldering only is recommended.
* For 1206≧1000V, 1812_200V~4000V products.

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X5R	Y5V
Size	0402, 0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225			
Capacitance range*	0.1pF to 0.1μF	100pF to 47μF	0.033μF to 10μF	0.01μF to 2.2μF
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 to 3000V			
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.

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7. CAPACITANCE RANGE (NP0 Dielectric)

NP0 Dielectric 0402, 0603 Sizes

DIELECTRIC		NP0												
SIZE		0402					0603							
RATED VOLTAGE (VDC)		10	16	25	50	100	10	16	25	50	100	200	250
Capacitance	0.1pF (0R1)	E	E	E	E								
	0.2pF (0R2)	E	E	E	E								
	0.3pF (0R3)	E	E	E	E		S	S	S	S			
	0.4pF (0R4)	E	E	E	E		S	S	S	S			
	0.5pF (0R5)	E	E	E	E	E	S	S	S	S	S	S	S
	0.6pF (0R6)	E	E	E	E	E	S	S	S	S	S	S	S
	0.7pF (0R7)	E	E	E	E	E	S	S	S	S	S	S	S
	0.8pF (0R8)	E	E	E	E	E	S	S	S	S	S	S	S
	0.9pF (0R9)	E	E	E	E	E	S	S	S	S	S	S	S
	1.0pF (1R0)	E	E	E	E	E	S	S	S	S	S	S	S
	1.2pF (1R2)	E	E	E	E	E	S	S	S	S	S	S	S
	1.5pF (1R5)	E	E	E	E	E	S	S	S	S	S	S	S
	1.8pF (1R8)	E	E	E	E	E	S	S	S	S	S	S	S
	2.2pF (2R2)	E	E	E	E	E	S	S	S	S	S	S	S
	2.7pF (2R7)	E	E	E	E	E	S	S	S	S	S	S	S
	3.3pF (3R3)	E	E	E	E	E	S	S	S	S	S	S	S
	3.9pF (3R9)	E	E	E	E	E	S	S	S	S	S	S	S
	4.7pF (4R7)	E	E	E	E	E	S	S	S	S	S	S	S
	5.6pF (5R6)	E	E	E	E	E	S	S	S	S	S	S	S
	6.8pF (6R8)	E	E	E	E	E	S	S	S	S	S	S	S
	8.2pF (8R2)	E	E	E	E	E	S	S	S	S	S	S	S
	10pF (100)	E	E	E	E	E	S	S	S	S	S	S	S
	12pF (120)	E	E	E	E	E	S	S	S	S	S	S	S
	15pF (150)	E	E	E	E	E	S	S	S	S	S	S	S
	18pF (180)	E	E	E	E	E	S	S	S	S	S	S	S
	22pF (220)	E	E	E	E	E	S	S	S	S	S	S	S
	27pF (270)	E	E	E	E	E	S	S	S	S	S	S	S
	33pF (330)	E	E	E	E	E	S	S	S	S	S	S	S
	39pF (390)	E	E	E	E	E	S	S	S	S	S	S	S
	47pF (470)	E	E	E	E	E	S	S	S	S	S	S	S
	56pF (560)	E	E	E	E	E	S	S	S	S	S	S	S
	68pF (680)	E	E	E	E	E	S	S	S	S	S	S	S
	82pF (820)	E	E	E	E	E	S	S	S	S	S	S	S
	100pF (101)	E	E	E	E	E	S	S	S	S	S	S	S
	120pF (121)	E	E	E	E	E	S	S	S	S	S	S	S
	150pF (151)	E	E	E	E	E	S	S	S	S	S	S	S
	180pF (181)	E	E	E	E	E	S	S	S	S	S	S	S
	220pF (221)	E	E	E	E	E	S	S	S	S	S	S	S
	270pF (271)	E	E	E	E		S	S	S	S	S	X	X
	330pF (331)	E	E	E	E		S	S	S	S	S	X	X
	390pF (391)	E	E	E	E		S	S	S	S	S	X	X
	470pF (471)	E	E	E	E		S	S	S	S	S	X	X
	560pF (561)	E	E	E	E		S	S	S	S	S		
	680pF (681)	E	E	E	E		S	S	S	S	S		
	820pF (821)	E	E	E	E		S	S	S	S	S		
	1,000pF (102)	E	E	E	E		S	S	S	S	S		
	1,200pF (122)						X	X	X	X			
	1,500pF (152)						X	X	X	X			
	1,800pF (182)						X	X	X	X			
	2,200pF (222)						X	X	X	X			
	2,700pF (272)						X	X	X	X			
	3,300pF (332)						X	X	X	X			
	3,900pF (392)												
	4,700pF (472)												
	5,600pF (562)												
	6,800pF (682)												
	8,200pF (822)												
	0.010uF (103)												
	0.012uF (123)												

1. The letter in cell is expressed the symbol of product thickness.
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NP0 Dielectric 0805 Size

DIELECTRIC		NP0									
SIZE		0805									
RATED VOLTAGE (VDC)		10	16	25	50	100	200	250	500	630	1000
Capacitance	0.5pF (0R5)	A	A	A	A	A	A	A	A	A	D
	0.6pF (0R6)	A	A	A	A	A	A	A	A	A	D
	0.7pF (0R7)	A	A	A	A	A	A	A	A	A	D
	0.8pF (0R8)	A	A	A	A	A	A	A	A	A	D
	0.9pF (0R9)	A	A	A	A	A	A	A	A	A	D
	1.0pF (1R0)	A	A	A	A	A	A	A	A	A	D
	1.2pF (1R2)	A	A	A	A	A	A	A	A	A	D
	1.5pF (1R5)	A	A	A	A	A	A	A	A	A	D
	1.8pF (1R8)	A	A	A	A	A	A	A	A	A	D
	2.2pF (2R2)	A	A	A	A	A	A	A	A	A	D
	2.7pF (2R7)	A	A	A	A	A	A	A	A	A	D
	3.3pF (3R3)	A	A	A	A	A	A	A	A	A	D
	3.9pF (3R9)	A	A	A	A	A	A	A	A	A	D
	4.7pF (4R7)	A	A	A	A	A	A	A	A	A	D
	5.6pF (5R6)	A	A	A	A	A	A	A	A	A	D
	6.8pF (6R8)	A	A	A	A	A	A	A	A	A	D
	8.2pF (8R2)	A	A	A	A	A	A	A	A	A	D
	10pF (100)	A	A	A	A	A	A	A	A	A	D
	12pF (120)	A	A	A	A	A	A	A	A	A	D
	15pF (150)	A	A	A	A	A	A	A	A	A	D
	18pF (180)	A	A	A	A	A	A	A	A	A	D
	22pF (220)	A	A	A	A	A	A	A	A	A	D
	27pF (270)	A	A	A	A	A	A	A	A	A	D
	33pF (330)	A	A	A	A	A	A	A	A	A	D
	39pF (390)	A	A	A	A	A	A	A	A	A	D
	47pF (470)	A	A	A	A	A	A	A	A	A	D
	56pF (560)	A	A	A	A	A	A	A	A	A	D
	68pF (680)	A	A	A	A	A	A	A	A	A	D
	82pF (820)	A	A	A	A	A	A	A	B	B	D
	100pF (101)	A	A	A	A	A	A	B	B	B	D
	120pF (121)	A	A	A	A	A	A	B	D	D	D
	150pF (151)	A	A	A	A	A	B	D	D	D	D
	180pF (181)	A	A	A	A	A	B	D	D	D	D
	220pF (221)	A	A	A	A	A	D	D	D	D	D
	270pF (271)	A	A	A	A	A	D	D	D	D	D
	330pF (331)	A	A	A	A	A	D	D	D	D	D
	390pF (391)	B	B	B	B	B	D	D	D	D	D
	470pF (471)	B	B	B	B	B	D	D	I	I	
	560pF (561)	B	B	B	B	B	D	D	I	I	
	680pF (681)	B	B	B	B	B	D	D	I	I	
	820pF (821)	B	B	B	B	B	D	D	I	I	
	1,000pF (102)	B	B	B	B	B	D	D	I	I	
	1,200pF (122)	B	B	B	B	B	D	D			
	1,500pF (152)	B	B	B	B	B	D	D			
	1,800pF (182)	B	B	B	B	B	D	D			
	2,200pF (222)	B	B	B	B	B	D	D			
	2,700pF (272)	D	D	D	D	D					
	3,300pF (332)	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						
	0.010μF (103)	D	D	D	D						

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NP0 Dielectric 1206 Size

DIELECTRIC		NP0											
SIZE		1206											
RATED VOLTAGE (VDC)		10	16	25	50	100	200	250	500	630	1000	1500	2000
Capacitance	1.0pF (1R0)												
	1.2pF (1R2)	B	B	B	B	B							
	1.5pF (1R5)	B	B	B	B	B	B	B	B	B	B	B	B
	1.8pF (1R8)	B	B	B	B	B	B	B	B	B	B	B	B
	2.2pF (2R2)	B	B	B	B	B	B	B	B	B	B	B	B
	2.7pF (2R7)	B	B	B	B	B	B	B	B	B	B	B	B
	3.3pF (3R3)	B	B	B	B	B	B	B	B	B	B	B	B
	3.9pF (3R9)	B	B	B	B	B	B	B	B	B	B	B	B
	4.7pF (4R7)	B	B	B	B	B	B	B	B	B	B	B	B
	5.6pF (5R6)	B	B	B	B	B	B	B	B	B	B	B	B
	6.8pF (6R8)	B	B	B	B	B	B	B	B	B	B	B	B
	8.2pF (8R2)	B	B	B	B	B	B	B	B	B	B	B	B
	10pF (100)	B	B	B	B	B	B	B	B	B	B	B	B
	12pF (120)	B	B	B	B	B	B	B	B	B	B	B	B
	15pF (150)	B	B	B	B	B	B	B	B	B	B	B	B
	18pF (180)	B	B	B	B	B	B	B	B	B	B	B	B
	22pF (220)	B	B	B	B	B	B	B	B	B	B	B	B
	27pF (270)	B	B	B	B	B	B	B	B	B	B	B	B
	33pF (330)	B	B	B	B	B	B	B	B	B	B	C	C
	39pF (390)	B	B	B	B	B	B	B	B	B	B	C	C
	47pF (470)	B	B	B	B	B	B	B	B	B	C	C	C
	56pF (560)	B	B	B	B	B	B	B	B	B	C	D	D
	68pF (680)	B	B	B	B	B	B	B	B	B	C	D	D
	82pF (820)	B	B	B	B	B	B	B	B	B	D	D	D
	100pF (101)	B	B	B	B	B	B	B	B	B	D	D	D
	120pF (121)	B	B	B	B	B	B	B	B	B	D	G	G
	150pF (151)	B	B	B	B	B	B	B	B	B	D	G	G
	180pF (181)	B	B	B	B	B	B	B	B	B	G	G	G
	220pF (221)	B	B	B	B	B	B	B	B	B	G	G	G
	270pF (271)	B	B	B	B	B	B	C	C	C	G	P	P
	330pF (331)	B	B	B	B	B	B	C	C	C	G	P	P
	390pF (391)	B	B	B	B	B	B	C	C	C	G	P	P
	470pF (471)	B	B	B	B	B	C	C	C	C	G		
	560pF (561)	B	B	B	B	B	C	D	D	D	G		
	680pF (681)	B	B	B	B	B	C	D	D	D	G		
	820pF (821)	B	B	B	B	B	C	G	G	G	G		
	1,000pF (102)	B	B	B	B	B	C	G	G	G	G		
	1,200pF (122)	B	B	B	B	B	C	G	G	G			
	1,500pF (152)	B	B	B	B	B	D	G	G	G			
	1,800pF (182)	B	B	B	B	B	D	G	G	G			
	2,200pF (222)	B	B	B	B	B	D	G	G	G			
	2,700pF (272)	B	B	B	B	B	D	G	G	G			
	3,300pF (332)	B	B	B	B	B	D	G	G	G			
	3,900pF (392)	B	B	B	B	B	D	G	G	G			
	4,700pF (472)	B	B	B	B	B	D	G	G	G			
	5,600pF (562)	B	B	B	B	B							
	6,800pF (682)	C	C	C	C	C							
	8,200pF (822)	D	D	D	D	D							
	0.010μF (103)	D	D	D	D	D							
	0.012μF (123)	P	P	P	P	P							
	0.015μF (153)	P	P	P	P	P							
	0.018μF (183)	P	P	P	P	P							
	0.022μF (223)	P	P	P	P	P							
	0.027μF (273)	P	P	P	P								
	0.033μF (333)	P	P	P	P								
	0.039μF (393)	P	P	P	P								

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NP0 Dielectric 1210 Size

DIELECTRIC		NP0											
SIZE		1210											
RATED VOLTAGE (VDC)		10	16	25	50	100	200	250	500	630	1000	1500	2000
Capacitance	10pF (100)	C	C	C	C	C	C	C	C	C	C	C	C
	12pF (120)	C	C	C	C	C	C	C	C	C	C	C	C
	15pF (150)	C	C	C	C	C	C	C	C	C	C	C	C
	18pF (180)	C	C	C	C	C	C	C	C	C	C	C	C
	22pF (220)	C	C	C	C	C	C	C	C	C	C	C	C
	27pF (270)	C	C	C	C	C	C	C	C	C	C	C	C
	33pF (330)	C	C	C	C	C	C	C	C	C	C	C	C
	39pF (390)	C	C	C	C	C	C	C	C	C	C	C	C
	47pF (470)	C	C	C	C	C	C	C	C	C	C	C	C
	56pF (560)	C	C	C	C	C	C	C	C	C	C	D	D
	68pF (680)	C	C	C	C	C	C	C	C	C	C	D	D
	82pF (820)	C	C	C	C	C	C	C	C	C	C	D	D
	100pF (101)	C	C	C	C	C	C	C	C	C	D	D	D
	120pF (121)	C	C	C	C	C	C	C	C	C	D	D	D
	150pF (151)	C	C	C	C	C	C	C	C	C	D	G	G
	180pF (181)	C	C	C	C	C	C	C	C	C	D	G	G
	220pF (221)	C	C	C	C	C	C	C	C	C	G	G	G
	270pF (271)	C	C	C	C	C	C	C	C	C	G	K	K
	330pF (331)	C	C	C	C	C	C	C	C	C	G	K	K
	390pF (391)	C	C	C	C	C	C	C	C	C	G	M	M
	470pF (471)	C	C	C	C	C	C	C	C	C	G	M	M
	560pF (561)	C	C	C	C	C	C	C	C	C	G		
	680pF (681)	C	C	C	C	C	C	C	C	C	G		
	820pF (821)	C	C	C	C	C	C	C	C	C	G		
	1,000pF (102)	C	C	C	C	C	D	D	D	D	G		
	1,200pF (122)	C	C	C	C	C	D	D	D	D	G		
	1,500pF (152)	C	C	C	C	C	D	D	D	D	K		
	1,800pF (182)	C	C	C	C	C	D	D	D	D	M		
	2,200pF (222)	C	C	C	C	C	D	D	D	D	M		
	2,700pF (272)	C	C	C	C	C	D	D	D	D	M		
	3,300pF (332)	C	C	C	C	C	D	D	D	D	M		
	3,900pF (392)	C	C	C	C	C	D	D	D	D	M		
	4,700pF (472)	C	C	C	C	C	G	G					
	5,600pF (562)	C	C	C	C	C	G	G					
	6,800pF (682)	C	C	C	C	C	G	G					
	8,200pF (822)	C	C	C	C	C	G	G					
	0.010μF (103)	C	C	C	C	C	G	G					
	0.012μF (123)	D	D	D	D	D							
	0.015μF (153)	D	D	D	D	D							
	0.018μF (183)												
	0.022μF (223)												
	0.027μF (273)												
	0.033μF (333)												
	0.039μF (393)												
	0.047μF (473)												

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NP0 Dielectric 1808 Size

DIELECTRIC		NP0					
SIZE		1808					
RATED VOLTAGE (VDC)		500	630	1000	1500	2000	3000
Capacitance	2.0pF (2R0)						
	2.2pF (2R2)	D	D	D	D	D	D
	2.7pF (2R7)	D	D	D	D	D	D
	3.3pF (3R3)	D	D	D	D	D	D
	3.9pF (3R9)	D	D	D	D	D	D
	4.7pF (4R7)	D	D	D	D	D	D
	5.6pF (5R6)	D	D	D	D	D	D
	6.8pF (6R8)	D	D	D	D	D	D
	8.2pF (8R2)	D	D	D	D	D	D
	10pF (100)	D	D	D	D	D	D
	12pF (120)	D	D	D	D	D	D
	15pF (150)	D	D	D	D	D	D
	18pF (180)	D	D	D	D	D	D
	22pF (220)	D	D	D	D	D	D
	27pF (270)	D	D	D	D	D	D
	33pF (330)	D	D	D	D	D	D
	39pF (390)	D	D	D	D	D	D
	47pF (470)	D	D	D	D	D	D
	56pF (560)	D	D	D	D	D	D
	68pF (680)	D	D	D	D	D	D
	82pF (820)	D	D	D	D	D	D
	100pF (101)	D	D	D	D	D	K
	120pF (121)	D	D	D	D	D	K
	150pF (151)	D	D	D	K	K	K
	180pF (181)	D	D	D	K	K	K
	220pF (221)	D	D	D	K	K	K
	270pF (271)	K	K	K	K	K	K
	330pF (331)	K	K	K	K	K	K
	390pF (391)	K	K	K	K	K	K
	470pF (471)	K	K	K	K	K	
	560pF (561)	K	K	K	K	K	
	680pF (681)	K	K	K	K	K	
	820pF (821)	K	K	K	D	D	
	1,000pF (102)	K	K	K	G	G	
	1,200pF (122)	K	K	G			
	1,500pF (152)	K	K	G			
	1,800pF (182)	K	K	K			
	2,200pF (222)	K	K	K			
	2,700pF (272)	K	K				
	3,300pF (332)	K	K				
	3,900pF (392)						

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NP0 Dielectric 1812 Size

DIELECTRIC		NP0												
SIZE		1812												
RATED VOLTAGE (VDC)		10	16	25	50	100	200	250	500	630	1000	1500	2000	3000
Capacitance	10pF (100)	D	D	D	D	D	D	D	D	D	D	D	D	D
	12pF (120)	D	D	D	D	D	D	D	D	D	D	D	D	D
	15pF (150)	D	D	D	D	D	D	D	D	D	D	D	D	D
	18pF (180)	D	D	D	D	D	D	D	D	D	D	D	D	D
	22pF (220)	D	D	D	D	D	D	D	D	D	D	D	D	D
	27pF (270)	D	D	D	D	D	D	D	D	D	D	D	D	D
	33pF (330)	D	D	D	D	D	D	D	D	D	D	D	D	D
	39pF (390)	D	D	D	D	D	D	D	D	D	D	D	D	D
	47pF (470)	D	D	D	D	D	D	D	D	D	D	D	D	D
	56pF (560)	D	D	D	D	D	D	D	D	D	D	D	D	D
	68pF (680)	D	D	D	D	D	D	D	D	D	D	D	D	D
	82pF (820)	D	D	D	D	D	D	D	D	D	D	D	D	D
	100pF (101)	D	D	D	D	D	D	D	D	D	D	D	D	D
	120pF (121)	D	D	D	D	D	D	D	D	D	D	D	D	D
	150pF (151)	D	D	D	D	D	D	D	D	D	D	D	D	D
	180pF (181)	D	D	D	D	D	D	D	D	D	D	D	D	K
	220pF (221)	D	D	D	D	D	D	D	D	D	D	D	D	K
	270pF (271)	D	D	D	D	D	D	D	D	D	D	K	K	K
	330pF (331)	D	D	D	D	D	D	D	D	D	D	K	K	K
	390pF (391)	D	D	D	D	D	D	D	D	D	D	K	K	K
	470pF (471)	D	D	D	D	D	D	D	D	D	K	K	K	K
	560pF (561)	D	D	D	D	D	D	D	D	D	K	K	K	
	680pF (681)	D	D	D	D	D	D	D	D	D	K	K	K	
	820pF (821)	D	D	D	D	D	D	D	D	D	K	K	K	
	1,000pF (102)	D	D	D	D	D	D	D	D	D	K	K	K	
	1,200pF (122)	D	D	D	D	D	D	D	D	D	K			
	1,500pF (152)	D	D	D	D	D	D	D	D	D	K			
	1,800pF (182)	D	D	D	D	D	D	D	D	D	K			
	2,200pF (222)	D	D	D	D	D	D	D	D	D	K			
	2,700pF (272)	D	D	D	D	D	D	D	D	D	K			
	3,300pF (332)	D	D	D	D	D	D	D	D	D	K			
	3,900pF (392)	D	D	D	D	D	D	D	D	D	M			
	4,700pF (472)	D	D	D	D	D	D	D	D	D				
	5,600pF (562)	D	D	D	D	D	D	D	D	D				
	6,800pF (682)	D	D	D	D	D	D	D	D	D				
	8,200pF (822)	D	D	D	D	D			D	D				
	0.010μF (103)	D	D	D	D	D			D	D				
	0.012μF (123)	D	D	D	D	D			G	G				
	0.015μF (153)	D	D	D	D	D			G	G				
	0.018μF (183)	D	D	D	D	D			K	K				
	0.022μF (223)	D	D	D	D	D			K	K				
	0.027μF (273)	D	D	D	D	D								
	0.033μF (333)	D	D	D	D	D								
	0.039μF (393)													
	0.047μF (473)													

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NP0 Dielectric 1825 to 2225 Sizes

DIELECTRIC		NP0																		
SIZE		1825						2220							2225							
RATED VOLTAGE (VDC)		100	200 250	500 630	1000	2000	3000	100	200 250	500	630	1000	2000	3000	100	200 250	500	630	1000	2000	3000
Capacitance	10pF (100)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	12pF (120)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	15pF (150)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	18pF (180)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	22pF (220)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	27pF (270)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	33pF (330)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	39pF (390)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	47pF (470)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	56pF (560)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	68pF (680)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	82pF (820)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	100pF (101)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	120pF (121)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	150pF (151)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	180pF (181)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	220pF (221)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	270pF (271)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	330pF (331)	K	K	K	K	K	K	K	K	K	K	K	K	M	K	K	K	K	K	K	K
	390pF (391)	K	K	K	K	K	K	K	K	K	K	K	K	M	K	K	K	K	K	K	K
	470pF (471)	K	K	K	K	K	K	K	K	K	K	K	K	M	K	K	K	K	K	K	K
	560pF (561)	K	K	K	K	K	K	K	K	K	K	K	K	M	K	K	K	K	K	K	K
	680pF (681)	K	K	K	K	K	M	K	K	K	K	K	K	M	K	K	K	K	K	K	K
	820pF (821)	K	K	K	K	K	M	K	K	K	K	K	K	M	K	K	K	K	K	M	M
	1,000pF (102)	K	K	K	K	K	M	K	K	K	K	K	K	M	K	K	K	K	K	M	M
	1,200pF (122)	K	K	K	K	K		K	K	K	K	M	M	M	K	K	K	K	K	M	
	1,500pF (152)	K	K	K	K	M		K	K	K	K	M	M	M	K	K	K	K	K	M	
	1,800pF (182)	K	K	K	K	M		K	K	K	K	M	M		K	K	K	K	K	M	
	2,200pF (222)	K	K	K	K	M		K	K	K	K	M	M		K	K	K	K	K	M	
	2,700pF (272)	K	K	K	K	M		K	K	K	K	M	M		K	K	K	K	K	M	
	3,300pF (332)	K	K	K	K	M		K	K	K	K	M	M		K	K	K	K	K	M	
	3,900pF (392)	K	K	K	M	M		K	K	K	K	M	M		K	K	K	K	K	M	
	4,700pF (472)	K	K	K	M	M		K	K	K	K	M	M		K	K	K	K	K	M	
	5,600pF (562)	K	K	K	M			K	K	K	K	M			K	K	K	K	M	M	
	6,800pF (682)	K	K	K	M			K	K	K	K	M			K	K	K	K	M	M	
	8,200pF (822)	K	K	K	M			K	K	K	K	M			K	K	K	K	M	M	
	0.010uF (103)	K	K	K	M			K	K	K	K	M			K	K	K	K	M	M	
	0.012μF (123)	K	K	K				K	K	K	K				K	K	K	K			
	0.015μF (153)	K	K	K				K	K	K	K				K	K	K	K			
	0.018μF (183)	K	K	K				K	K	K	K				K	K	K	K			
	0.022μF (223)	K	K	K				K	K	K	K				K	K	K	K			
	0.027μF (273)	K	K	K				K	K	K					K	K	K	K			
	0.033μF (333)	K	K	K				K	K	K					K	K	K	K			
	0.039μF (393)	K	K	M				K	K	M					K	K	K	K			
	0.047μF (473)	K	K					K	M	M					K	K	K	K			
	0.056μF (563)	K	M					K	M						K	M	M	M			
	0.068μF (683)	K	M					K	M						K	M	M	M			
	0.082μF (823)	M						M							K	M	M				
	0.1μF (104)	M						M							M	M					
	0.12μF (124)																				
	0.15μF (154)																				
	0.18μF (184)																				
	0.22μF (224)																				
	0.27μF (274)																				

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7-1. CAPACITANCE RANGE (X7R Dielectric)

0402, 0603 Sizes

DIELECTRIC		X7R											
SIZE		0402					0603						
RATED VOLTAGE (VDC)		10	16	25	50	100	10	16	25	50	100	200	250
Capacitance	100pF (101)	E	E	E	E	E	S	S	S	S	S	X	X
	120pF (121)	E	E	E	E	E	S	S	S	S	S	X	X
	150pF (151)	E	E	E	E	E	S	S	S	S	S	X	X
	180pF (181)	E	E	E	E	E	S	S	S	S	S	X	X
	220pF (221)	E	E	E	E	E	S	S	S	S	S	X	X
	270pF (271)	E	E	E	E	E	S	S	S	S	S	X	X
	330pF (331)	E	E	E	E	E	S	S	S	S	S	X	X
	390pF (391)	E	E	E	E	E	S	S	S	S	S	X	X
	470pF (471)	E	E	E	E	E	S	S	S	S	S	X	X
	560pF (561)	E	E	E	E	E	S	S	S	S	S	X	X
	680pF (681)	E	E	E	E	E	S	S	S	S	S	X	X
	820pF (821)	E	E	E	E	E	S	S	S	S	S	X	X
	1,000pF (102)	E	E	E	E	E	S	S	S	S	S	X	X
	1,200pF (122)	E	E	E	E	E	S	S	S	S	S	X	X
	1,500pF (152)	E	E	E	E	E	S	S	S	S	S	X	X
	1,800pF (182)	E	E	E	E	E	S	S	S	S	S	X	X
	2,200pF (222)	E	E	E	E	E	S	S	S	S	S	X	X
	2,700pF (272)	E	E	E	E	E	S	S	S	S	S	X	X
	3,300pF (332)	E	E	E	E	E	S	S	S	S	S	X	X
	3,900pF (392)	E	E	E	E	E	S	S	S	S	S	X	X
	4,700pF (472)	E	E	E	E	E	S	S	S	S	S	X	X
	5,600pF (562)	E	E	E	E		S	S	S	S	S	X	X
	6,800pF (682)	E	E	E	E		S	S	S	S	S	X	X
	8,200pF (822)	E	E	E	E		S	S	S	S	S	X	X
	0.010μF (103)	E	E	E	E		S	S	S	S	S	X	X
	0.012μF (123)	E	E	E			S	S	S	S	X		
	0.015μF (153)	E	E	E			S	S	S	S	X		
	0.018μF (183)	E	E	E			S	S	S	S	X		
	0.022μF (223)	E	E	E			S	S	S	S	X		
	0.027μF (273)	E	E	E			S	S	S	S	X		
	0.033μF (333)	E	E	E			S	S	S	X	X		
	0.039μF (393)	E	E	E			S	S	S	X	X		
	0.047μF (473)	E	E	E			S	S	S	X	X		
	0.056μF (563)	E	E				S	S	S	X	X		
	0.068μF (683)	E	E				S	S	S	X	X		
	0.082μF (823)	E	E				S	S	S	X	X		
	0.10μF (104)	E	E				S	S	S	X	X		
	0.12μF (124)						S	S	X				
	0.15μF (154)						S	S	X				
	0.18μF (184)						S	S	X				
	0.22μF (224)						S	S	X	X			
	0.27μF (274)						X	X	X				
	0.33μF (334)						X	X	X				
	0.39μF (394)						X	X	X				
	0.47μF (474)						X	X	X				
	0.56μF (564)						X	X					
	0.68μF (684)						X	X					
	0.82μF (824)						X	X					
	1.0μF (105)						X	X	X				
	1.5μF (155)												
	2.2μF (225)												
	4.7μF (475)												

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X7R Dielectric 0805 Size

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

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X7R Dielectric 1206 Size

DIELECTRIC		X7R														
SIZE		1206														
RATED VOLTAGE (VDC)		10	16	25	35	50	100	200	250	400	450	500	630	1000	1500	2000
Capacitance	100pF (101)							D	D			D	D	D	D	D
	120pF (121)							D	D			D	D	D	D	D
	150pF (151)	D	D	D		D	D	D	D			D	D	D	D	D
	180pF (181)	D	D	D		D	D	D	D			D	D	D	D	D
	220pF (221)	D	D	D		D	D	D	D			D	D	D	D	D
	270pF (271)	D	D	D		D	D	D	D			D	D	D	D	D
	330pF (331)	D	D	D		D	D	D	D			D	D	D	D	D
	390pF (391)	D	D	D		D	D	D	D			D	D	D	D	D
	470pF (471)	D	D	D		D	D	D	D			D	D	D	D	D
	560pF (561)	D	D	D		D	D	D	D			D	D	D	D	D
	680pF (681)	D	D	D		D	D	D	D			D	D	D	D	D
	820pF (821)	D	D	D		D	D	D	D			D	D	D	G	G
	1,000pF (102)	D	D	D		D	D	D	D			D	D	D	G	G
	1,200pF (122)	D	D	D		D	D	D	D			D	D	D	G	G
	1,500pF (152)	D	D	D		D	D	D	D			D	D	D	G	G
	1,800pF (182)	D	D	D		D	D	D	D			D	D	D	G	G
	2,200pF (222)	D	D	D		D	D	D	D			D	D	D	G	G
	2,700pF (272)	D	D	D		D	D	D	D			D	D	D	G	G
	3,300pF (332)	D	D	D		D	D	D	D			D	D	D	G	G
	3,900pF (392)	D	D	D		D	D	D	D			D	D	D	G	
	4,700pF (472)	D	D	D		D	D	D	D			D	D	D	G	
	5,600pF (562)	D	D	D		D	D	D	D			D	D	D	G	
	6,800pF (682)	D	D	D		D	D	D	D			D	D	D	G	
	8,200pF (822)	D	D	D		D	D	D	D			D	D	D	G	
	0.010μF (103)	D	D	D		D	D	D	D			D	D	D	G	
	0.012μF (123)	D	D	D		D	D	D	D			D	D	G		
	0.015μF (153)	D	D	D		D	D	D	D			D	D	G		
	0.018μF (183)	D	D	D		D	D	D	D			D	D			
	0.022μF (223)	D	D	D		D	D	D	D			G	G			
	0.027μF (273)	D	D	D		D	D	D	D			G	G			
	0.033μF (333)	D	D	D		D	D	G	G			G	G			
	0.039μF (393)	D	D	D		D	D	G	G			G	G			
	0.047μF (473)	D	D	D		D	D	G	G			G	G			
	0.056μF (563)	D	D	D		D	D	G	G			G	G			
	0.068μF (683)	D	D	D		D	D	G	G	G	G					
	0.082μF (823)	D	D	D		D	D	G	G	G	G					
	0.10μF (104)	D	D	D		D	D	G	G	G	G					
	0.12μF (124)	D	D	D		D	D									
	0.15μF (154)	C	C	C		C	G									
	0.18μF (184)	C	C	C		C	G									
	0.22μF (224)	C	C	C		C	G									
	0.27μF (274)	C	C	C		D	G									
	0.33μF (334)	C	C	C		D	G									
	0.39μF (394)	C	C	J		P	G									
	0.47μF (474)	J	J	J		P	G									
	0.56μF (564)	J	J	J		P	P									
	0.68μF (684)	J	J	J		P	P									
	0.82μF (824)	J	J	J		P	P									
	1.0μF (105)	J	J	J		P	P									
	1.5μF (155)	J	J	P		P	P									
	2.2μF (225)	J	J	P		P	P									
	3.3μF (335)	P	P	P												
	4.7μF (475)	P	P	P		P										
	10μF (106)	P	P	P	P											
	22μF (226)	P														
	47μF (476)															

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X7R Dielectric 1210 Size

DIELECTRIC		X7R														
SIZE		1210														
RATED VOLTAGE (VDC)		6.3	10	16	25	50	100	200	250	400	450	500	630	1000	1500	2000
Capacitance	100pF (101)											D	D	D	D	D
	120pF (121)											D	D	D	D	D
	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)		C	C	C	C	C	C	C			D	D	D	D	D
	1,200pF (122)		C	C	C	C	C	C	C			D	D	D	M	M
	1,500pF (152)		C	C	C	C	C	C	C			D	D	D	M	M
	1,800pF (182)		C	C	C	C	C	C	C			D	D	D	M	M
	2,200pF (222)		C	C	C	C	C	C	C			D	D	D	M	M
	2,700pF (272)		C	C	C	C	C	C	C			D	D	D	M	M
	3,300pF (332)		C	C	C	C	C	C	C			D	D	D	M	M
	3,900pF (392)		C	C	C	C	C	C	C			D	D	G	M	M
	4,700pF (472)		C	C	C	C	C	C	C			D	D	G	M	M
	5,600pF (562)		C	C	C	C	C	C	C			D	D	G	M	M
	6,800pF (682)		C	C	C	C	C	C	C			D	D	G	M	M
	8,200pF (822)		C	C	C	C	C	C	C			D	D	G	M	M
	0.010μF (103)		C	C	C	C	C	C	C			D	D	G		
	0.012μF (123)		C	C	C	C	C	C	C			D	D	G		
	0.015μF (153)		C	C	C	C	C	C	C			D	D	G		
	0.018μF (183)		C	C	C	C	C	C	C			D	D	G		
	0.022μF (223)		C	C	C	C	C	C	C			D	D	G		
	0.027μF (273)		C	C	C	C	C	C	C			G	G	G		
	0.033μF (333)		C	C	C	C	C	C	C			G	G	G		
	0.039μF (393)		C	C	C	C	C	C	C			G	G	K		
	0.047μF (473)		C	C	C	C	C	D	D			G	G	M		
	0.056μF (563)		C	C	C	C	C	D	D			G	G			
	0.068μF (683)		C	C	C	C	C	G	G			K	K			
	0.082μF (823)		C	C	C	C	C	G	G			K	K			
	0.10μF (104)		C	C	C	C	C	G	G			K	K			
	0.12μF (124)		C	C	C	C	C	G	G	M	M					
	0.15μF (154)		C	C	C	C	D	M	M	M	M					
	0.18μF (184)		C	C	C	C	D	M	M	M	M					
	0.22μF (224)		C	C	C	C	D	M	M	M	M					
	0.27μF (274)		C	C	C	C	G	M	M	M	M					
	0.33μF (334)		C	C	C	D	G	M	M	M	M					
	0.39μF (394)		C	C	C	D	M	M	M							
	0.47μF (474)		C	C	C	D	M	M	M							
	0.56μF (564)		D	D	D	D	M	M	M							
	0.68μF (684)		D	D	D	D	K	M	M							
	0.82μF (824)		D	D	D	D	K									
	1.0μF (105)		D	D	D	D	K									
	1.5μF (155)			K	G	M	M									
	2.2μF (225)			K	G	M	M									
	3.3μF (335)			K	G	M										
	4.7μF (475)		K	K	K	M	M									
	10μF (106)		K	K	M	M										
	22μF (226)			M												
	47μF (476)	M														

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X7R Dielectric 1808, 1812 Sizes

DIELECTRIC		X7R																		
SIZE		1808						1812												
RATED VOLTAGE (VDC)		500	630	1000	1500	2000	3000	10	16	25	50	100	200	250	500	630	1000	1500	2000	3000
Capacitance	100pF (101)																			
	120pF (121)																			
	150pF (151)	D	D	D	D	D	D													
	180pF (181)	D	D	D	D	D	D													
	220pF (221)	D	D	D	D	D	D													
	270pF (271)	D	D	D	D	D	D						D	D	D	D	D	D	D	K
	330pF (331)	D	D	D	D	D	K						D	D	D	D	D	D	D	K
	390pF (391)	D	D	D	D	D	K						D	D	D	D	D	D	D	K
	470pF (471)	D	D	D	D	D	K						D	D	D	D	D	D	D	K
	560pF (561)	D	D	D	D	D	K						D	D	D	D	D	D	D	K
	680pF (681)	D	D	D	D	D	K						D	D	D	D	D	D	D	K
	820pF (821)	D	D	D	D	D	K						D	D	D	D	D	D	D	K
	1,000pF (102)	D	D	D	K	K	K	D	D	D	D	D	D	D	D	D	D	D	D	K
	1,200pF (122)	D	D	D	K	K	K	D	D	D	D	D	D	D	D	D	D	D	D	K
	1,500pF (152)	D	D	D	K	K	K	D	D	D	D	D	D	D	D	D	D	D	D	K
	1,800pF (182)	D	D	D	K	K	K	D	D	D	D	D	D	D	D	D	D	G	G	M
	2,200pF (222)	D	D	D	K	K		D	D	D	D	D	D	D	D	D	D	G	G	M
	2,700pF (272)	D	D	D	K	K		D	D	D	D	D	D	D	D	D	D	G	G	M
	3,300pF (332)	D	D	D	K	K		D	D	D	D	D	D	D	D	D	D	K	K	M
	3,900pF (392)	D	D	D	K	K		D	D	D	D	D	D	D	D	D	D	K	K	M
	4,700pF (472)	D	D	D	K	K		D	D	D	D	D	D	D	D	D	D	K	K	M
	5,600pF (562)	K	K	K	K	K		D	D	D	D	D	D	D	D	D	D	M	M	M
	6,800pF (682)	K	K	K	K	K		D	D	D	D	D	D	D	D	D	D	M	M	M
	8,200pF (822)	K	K	K				D	D	D	D	D	D	D	D	D	D	M	M	
	0.010μF (103)	K	K	K				D	D	D	D	D	D	D	D	D	D	M	M	
	0.012μF (123)	K	K	K				D	D	D	D	D	D	D	D	D	K			
	0.015μF (153)	K	K	K				D	D	D	D	D	D	D	D	D	K			
	0.018μF (183)	K	K	K				D	D	D	D	D	D	D	D	D	M			
	0.022μF (223)	K	K	K				D	D	D	D	D	D	D	D	D	M			
	0.027μF (273)	K	K	K				D	D	D	D	D	D	D	D	D	M			
	0.033μF (333)	K	K	K				D	D	D	D	D	D	D	D	D	M			
	0.039μF (393)	K	K	K				D	D	D	D	D	D	D	D	D	M			
	0.047μF (473)	K	K	K				D	D	D	D	D	D	D	D	D	M			
	0.056μF (563)	K	K	K				D	D	D	D	D	D	D	K	K	M			
	0.068μF (683)	K	K					D	D	D	D	D	D	D	K	K	M			
	0.082μF (823)	K	K					D	D	D	D	D	D	D	K	K	M			
	0.10μF (104)							D	D	D	D	D	D	D	K	K	M			
	0.12μF (124)							D	D	D	D	D	D	D	M	M				
	0.15μF (154)							D	D	D	D	D	K	K	M	M				
	0.18μF (184)							D	D	D	D	D	K	K	M	M				
	0.22μF (224)							D	D	D	D	D	K	K	M	M				
	0.27μF (274)							D	D	D	D	D	K	K	M					
	0.33μF (334)							D	D	D	D	D	K	K	M					
	0.39μF (394)							D	D	D	D	D	K	K	M					
	0.47μF (474)							D	D	D	D	K	K	K	M					
	0.56μF (564)							D	D	D	D	K	M	M						
	0.68μF (684)							D	D	D	K	K	M	M						
	0.82μF (824)							D	D	D	K	K	M	M						
	1.0μF (105)							D	D	D	K	K	M	M						
	1.5μF (155)											K								
	2.2μF (225)										M	M								
	3.3μF (335)																			
	4.7μF (475)																			

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X7R Dielectric 1825 to 2225 Sizes

DIELECTRIC		X7R																					
SIZE		1825						2220										2225					
RATED VOLTAGE (VDC)		250	500	630	1000	2000	3000	25	50	100	250	500	630	1000	1500	2000	3000	500	630	1000	1500	2000	3000
Capacitance	1,000pF (102)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	1,200pF (122)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	1,500pF (152)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	1,800pF (182)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	2,200pF (222)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	2,700pF (272)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	3,300pF (332)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	3,900pF (392)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	4,700pF (472)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	5,600pF (562)	K	K	K	K	K	M	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
	6,800pF (682)	K	K	K	K	K	M	K	K	K	K	K	K	K	K	K	M	K	K	K	K	K	M
	8,200pF (822)	K	K	K	K	K	M	K	K	K	K	K	K	K	M	M	M	K	K	K	K	K	M
	0.010μF (103)	K	K	K	K	K	M	K	K	K	K	K	K	K	M	M	M	K	K	K	K	K	M
	0.012μF (123)	K	K	K	K	M	U	K	K	K	K	K	K	K	M	M	U	K	K	K	M	M	M
	0.015μF (153)	K	K	K	K	M	U	K	K	K	K	K	K	K	M	M	U	K	K	K	M	M	M
	0.018μF (183)	K	K	K	K	M	U	K	K	K	K	K	K	K	U	U	U	K	K	K	M	M	U
	0.022μF (223)	K	K	K	K	M		K	K	K	K	K	K	K	U	U		K	K	K	M	M	
	0.027μF (273)	K	K	K	K	U		K	K	K	K	K	K	K	U	U		K	K	K	M	M	
	0.033μF (333)	K	K	K	K	U		K	K	K	K	K	K	K	U	U		K	K	K	M	M	
	0.039μF (393)	K	K	K	K	U		K	K	K	K	K	K	K	U	U		K	K	K	M	U	
	0.047μF (473)	K	K	K	K	U		K	K	K	K	K	K	K	U	U		K	K	K	M	U	
	0.056μF (563)	K	K	K	K			K	K	K	K	K	K	K	U	U		K	K	K	M	U	
	0.068μF (683)	K	K	K	K			K	K	K	K	K	K	K				K	K	K	M		
	0.082μF (823)	K	K	K	M			K	K	K	K	K	K	K				K	K	K	M		
	0.10μF (104)	K	K	K	M			K	K	K	K	K	K	K				K	K	K	M		
	0.12μF (124)	K	K	K				K	K	K	K	K	K	M				K	K	U			
	0.15μF (154)	K	K	K				K	K	K	K	K	K	U				K	K	U			
	0.18μF (184)	K	K	K				K	K	K	K	K	K	U				K	K	U			
	0.22μF (224)	K	K	K				K	K	K	K	K	K	U				K	K	U			
	0.27μF (274)	K	K	K				K	K	K	K	K	K					K	K				
	0.33μF (334)	K	K	K				K	K	K	K	K	K					K	K				
	0.39μF (394)	K	K	K				K	K	K	K	K	K					K	K				
	0.47μF (474)	K	K	K				K	K	K	K	K	K					K	K				
	0.56μF (564)	K	M	M				K	K	K	K	M	M					K	K				
	0.68μF (684)	K						K	K	K	K	M	M										
	0.82μF (824)	K						K	K	K	K	U	U										
	1.0μF (105)	K						K	K	K	K	U	U										
	1.5μF (155)							K	K	K	M												
	2.2μF (225)							K	K	K	M												
	3.3μF (335)								K	K													
	4.7μF (475)								K	M													
	6.8μF (685)								M	U													
	10μF (106)								U	U													

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

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7-2. CAPACITANCE RANGE (X5R Dielectric)

Dielectric		X5R																				
Size		0402				0603					0805					1206					1210				
	Rated Voltage	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	0.033μF (333)			E																					
	0.047μF (473)			E																					
	0.068μF (683)		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																
	0.33μF (334)	E	E			X	X	X	X																
	0.47μF (474)	E	E				X	X	X																
	0.68μF (684)	E	E			X	X	X	X																
	1.0μF (105)					X	X	X	X																
	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)					X										P	P	P	P			K	K	K	
	6.8uF (685)															P	P								
	10μF (106)															P	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				S	S	S	S
	0.22μF (224)	E	E				S	S	S	S
	0.33μF (334)	E	E				S	S	S	
	0.47μF (474)						S	S		
	0.68μF (684)						S	X		
	1.0μF (105)						S	X		
	2.2μF (225)						S			
	4.7μF (475)									

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

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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
1808 (4520)	1.25±0.10	D	-	-	2k	10k
	1.60±0.20	G			2k	8k
	2.00±0.20	K	-	-	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
1825 (4563)	2.00±0.20	K	-	-	1k	-
2220 (5750)	2.50±0.30	M	-	-	0.5k	-
2225 (5763)	2.80±0.30	U	-	-	0.5k	-

Unit: pieces

PSA PASSIVE SYSTEM ALLIANCE
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9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Visual and Mechanical</td><td>---</td><td>* No remarkable defect.
* Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>2.</td><td>Capacitance</td><td>*Test temp.: Room Temperature.
*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%

** Test condition: 0.5±0.2Vrms，1KHz±10%
X7R:
0603/475(6.3V)
X5R:
0201≧224 (6.3V,10V,16V)#1,
0402≧475 (6.3V,16V), 0402≧225(10V),
0603=106 (6.3V)
TT18X≧475(10V) , TT15X series
X6S:
0201/474(4V),0201>104 (6.3V,10V),
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) ,
0402X475M6R3
(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>* Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3.</td><td>Q/ D.F. (Dissipation Factor)</td><td></td><td>NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C
X7R,X5R,X6S,X7S:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td>≧100V</td><td>≦2.5%</td><td>≦3%</td><td>1206≧0.47μF</td></tr>
<tr><td></td><td></td><td>≦5%</td><td>0603≧0.068μF;0805＞0.1μF;1206≧1μF;1210≧2.2μF;TT series</td></tr>
<tr><td></td><td></td><td>≦10%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
<tr><td>50V</td><td>≦2.5%</td><td>≦3%</td><td>0201(50V);0603≧0.047μF;0805≧0.18μF;1206≧0.47μF</td></tr>
<tr><td></td><td></td><td>≦5%</td><td>0201≧0.01uF;1210≧3.3μF</td></tr>
<tr><td></td><td></td><td>≦10%</td><td>0402≧0.012μF;0603>0.1μF;0805≧1μF(0805/X7R>0.47μF);
1206≧2.2μF;1210≧10μF;TT series</td></tr>
<tr><td></td><td></td><td>≦12.5%</td><td>1206/X5R=10μF</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>25V</td><td>≦3.5%</td><td>≦5%</td><td>0201≧0.01μF(0201/X5R=0.01μF);0805≧1μF;1210≧10μF*</td></tr>
<tr><td></td><td></td><td>≦7%</td><td>0603≧0.33μF</td></tr>
<tr><td></td><td></td><td>≦10%</td><td>0201≧0.1μF(0201/X5R>0.01μF);0603≧0.47μF;TT series;
0402≧0.10μF(0402/X7R≧0.056μF);0805≧2.2μF;
1206≧4.7μF;1210≧22μF(1210/X5R≧10μF)*</td></tr>
<tr><td></td><td></td><td>≦12.5%</td><td>0402≧0.47μF;0805/X5R/X6S=10μF</td></tr>
<tr><td>16V</td><td>≦3.5%</td><td>≦5%</td><td>0201≧0.01μF(0201/X5R=0.01μF);0402≧0.033μF;
0603≧0.15μF;0805≧0.68μF;1206≧2.2μF;1210≧4.7μF</td></tr>
<tr><td></td><td></td><td>≦10%</td><td>0201≧0.1μ(0201/X5R>0.01μF;0201/X7R≧0.022μF);0402≧0.22uF;
0603>0.47μF;0805≧2.2μF;1206≧4.7μF;1210≧22μF;TT series</td></tr>
<tr><td></td><td></td><td>≦12.5%</td><td>0402/X5R≧1μF;0402/X6S=1μF;0805/X5R/X6S=10μF</td></tr>
<tr><td>10V</td><td>≦5%</td><td>≦10%</td><td>0201≧0.012μF;0402≧0.22μF;0603≧0.33μF;TT series;
0805≧2.2μF;1206≧2.2μF;1210≧22μF:01R5/X5R</td></tr>
<tr><td></td><td></td><td>≦12.5%</td><td>0805/X5R/X6S=10μF</td></tr>
<tr><td></td><td></td><td>≦15%</td><td>0201≧0.1μF(0201/X5R>0.1μF);0402≧1μF;0603/X5R≧10μF</td></tr>
<tr><td>6.3V</td><td>≦10%</td><td>≦15%</td><td>0201≧0.1μF(0201/X5R>0.1μF);0402≧1μF(0402/X6S≧0.47μF);
0603≧10μF;0805≧4.7μF;1206≧47μF;1210≧100μF;TT series</td></tr>
<tr><td></td><td></td><td>≦20%</td><td>0402≧2.2μF</td></tr>
<tr><td>4V</td><td>≦15%</td><td>---</td><td>---</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F. ≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧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>25V</td><td>≦5%</td><td>≦7%</td><td>0402≧0.047μF;0603≧0.1μF; 0805≧0.33μF;
1206≧1μF; 1210≧4.7μF</td></tr>
<tr><td></td><td></td><td>≦9%</td><td>0402≧0.068μF;0603≧0.47μF; 1206≧4.7μF;
1210≧22μF; TT series</td></tr>
<tr><td>16V (C<1.0μF)</td><td>≦7%</td><td>≦9%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr>
<tr><td></td><td></td><td>≦12.5%</td><td>0402≧0.22μF</td></tr>
<tr><td>16V (C≧1.0μF)</td><td>≦9%</td><td>≦12.5%</td><td>0603≧2.2μF; 0805≧3.3μF;1206≧10μF;
1210≧22μF; 1812≧47μF; TT series</td></tr>
<tr><td>10V</td><td>≦12.5%</td><td>≦20%</td><td>0402≧0.47μF</td></tr>
<tr><td>6.3V</td><td>≦20%</td><td>---</td><td>---</td></tr>
</table></td></tr>
<tr><td>4.</td><td>Dielectric Strength</td><td>*To apply voltage:
≦100V: 250% of rated voltage.
200V ~ 300V: 200% of rated voltage.
400V ~ 450V: 120% of rated voltage.
500V ~ 999V: 150% of rated voltage.
1000V ~ 3000V: 120% of rated voltage.
4000V: 110% of rated voltage.
*Duration: 1 to 5 sec.
Charge & discharge current less than 50mA.</td><td> No evidence of damage or flash over during test.</td></tr>
</table>

* "Room condition" Temperature: 15 to 35℃, Relativ e humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

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<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>5.</td><td>Insulation Resistance</td><td>*Test temp.: Room Temperature.
*To apply rated voltage for MAX. 120sec.</td><td>10GΩ or RxC≧500Ω-F whichever is smaller.
Class II (X7R, X7E, X5R,X6S,X7S,Y5V:)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R</td><td rowspan="7">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><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>All X6S items, All X7S items</td><td rowspan="9">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; 0402≥1μF;0603>4.7μF;0805≥47μF;1206≥10μF;</td></tr>
<tr><td>4V:0603≥22μF; 0805≥47μF; 1206≥100μF</td></tr>
</table>
<table>
<tr><td>Rated voltage: 200~630V</td><td>To apply rated voltage (500V max.) for 60 sec.</td><td>≥10GΩ or RxC≥100Ω-F whichever is smaller</td></tr>
<tr><td>Rated voltage: >630V</td><td>To apply 500V for 60 sec.</td><td></td></tr>
</table></td></tr>
<tr><td>6.</td><td>Temperature Coefficient</td><td>With no electrical load.
<table>
<tr><th>T.C.</th><th>Operating Temp</th></tr>
<tr><td>NPO</td><td>-55~125℃ at 25℃</td></tr>
<tr><td>X7R</td><td>-55~125℃ at 25℃</td></tr>
<tr><td>X7S</td><td>-55 ~ 125℃ at 25℃</td></tr>
<tr><td>X5R</td><td>-55~ 85℃ at 25℃</td></tr>
<tr><td>X6S</td><td>-55~105℃ at 25℃</td></tr>
<tr><td>Y5V</td><td>-25~ 85℃ at 20℃</td></tr>
</table>
*Before initial measurement (Class II only):
To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.
* Measurement voltage for Class II:
<table>
<tr><th>01005</th><th>0201</th></tr>
<tr><td>Cap≤0.01μF: 0.5V</td><td>Cap<0.1μF:1V</td></tr>
<tr><td>Cap>0.01μF: 0.2V</td><td>0.1μF≤Cap<1μF: 0.2V*</td></tr>
<tr><td></td><td>Cap≥1μF: 0.1V*</td></tr>
<tr><td>*0201X104/6.3V~25V: 0.5V
0201X224/10V: 0.5V</td><td>*0201S104/6.3V~16V: 0.3V
0201S224/6.3V: 0.3V
0201X105/6.3V&10V: 0.3V</td></tr>
<tr><th>0402</th><th>0603</th></tr>
<tr><td>Cap<1μF: 1V</td><td>Cap<1μF: 1V</td></tr>
<tr><td>Cap=1μF: 0.5V**
0402B224-16V: 0.5V
0402B474-10V: 0.5V
0402X475M6R3: 0.5V</td><td>1μF≤Cap≤4.7μF: 0.5V</td></tr>
<tr><td>1μF<Cap<10μF: 0.2V
**0402B105M6R3V: 0.2V</td><td>Cap>4.7μF: 0.2V</td></tr>
<tr><td>Cap≥10μF: 0.1V</td><td></td></tr>
<tr><th>0805</th><th>1206/1210</th></tr>
<tr><td>Cap<10μF: 1V</td><td>Cap≤10μF: 1V</td></tr>
<tr><td>Cap=10μF: 0.5V
0805B475/6.3V~25V: 0.5V</td><td>10μF<Cap≤100μF: 0.5V</td></tr>
<tr><td>Cap>10μF: 0.2V</td><td>Cap>100μF: 0.2V</td></tr>
</table></td><td>
<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></td></tr>
</table>

* "Room condition" Temperature: 15 to 35℃, Relativ e humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

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<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>7.</td><td>Adhesive Strength of Termination</td><td>* Pressurizing force：
2N (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>* 75% 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><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.</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>

* "Room condition" Temperature: 15 to 35℃, Relativ e humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

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

* "Room condition" Temperature: 15 to 35℃, Relativ e humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

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<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>14</td><td>Humidity (Damp Heat) Load</td><td>*Test temp.：40±2℃
*Humidity：90~95%RH
*Test time：500+24/-0 hrs.
*To apply voltage：
Rated voltage (MAX. 500V)
*Before initial measurement (Class II only): To apply de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.
* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150℃ for 1hr then set for 24±2 hrs at room temp.</td><td>* No remarkable damage.
Cap change:
NP0: ±7.5% or 0.75pF whichever is larger.
X7R, X5R, X6S, X7S: ≥10V**,within ±12.5%; ≦6.3V within ±25%;
TT series & C≥ 1uF,within ±25%
**10V: 0603≧4.7μF;0402≧1μF;0201≧0.1μF, within ±25%;
Y5V: ≥10V, within ±30%; ≦6.3V, within +30/-40%
Q/D.F. value:
NP0: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C
X7R, X5R, X6S, X7S:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td rowspan="3">≧ 100V</td><td rowspan="3">≦3%</td><td>≦6%</td><td>1206≧0.47μF</td></tr>
<tr><td>≦7.5%</td><td>0603≧0.068μF;0805＞0.1μF;1206≧1μF;1210≧2.2μF;TT series</td></tr>
<tr><td>≦20%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
<tr><td rowspan="3">50V</td><td rowspan="3">≦3%</td><td>≦6%</td><td>0201(50V);0603≧0.047μF;0805≧0.18μF;1206≧0.47μF</td></tr>
<tr><td>≦10%</td><td>0201≧0.01uF;1210≧3.3μF</td></tr>
<tr><td>≦20%</td><td>0402≧0.012μF;0603>0.1μF;0805≧1μF(0805/X7R>0.47μF);
1206≧2.2μF;1210≧10μF; TT series</td></tr>
<tr><td>35V</td><td>≦5%</td><td>≦20%</td><td>0603≧1μF;0805≥2.2μF;1206≧2.2μF;1210≧10μF</td></tr>
<tr><td rowspan="4">25V</td><td rowspan="4">≦5%</td><td>≦10%</td><td>0201≧0.01μF(0201/X5R=0.01μF);0805≧1μF;1210≧10μF*</td></tr>
<tr><td>≦14%</td><td>0603≧0.33μF</td></tr>
<tr><td>≦15%</td><td>0201≧0.1μF(0201/X5R>0.01μF); 0603≧0.47μF;TTseries
0402≧0.10μF(0402/X7R≧0.056μF);0805≧2.2μF;
1206≧4.7μF;1210≧22μF(1210/X5R≧10μF)*;</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>0.47μF;0805≧2.2μF;1206≧4.7μF;1210≧22μF;TT series</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦7.5%</td><td>≦15%</td><td>0201≧0.012μF;0402≧0.22μF;
0603≧0.33μF;0805≧2.2μF;1206≧2.2μF;1210≧22μF</td></tr>
<tr><td>≦20%</td><td>0201≧0.1μF;0402≧1μF;0603/X5R≧10μF;TT series;01R5/X5R</td></tr>
<tr><td>6.3V</td><td>≦15%</td><td>≦30%</td><td>0201≧0.1μF;0402≧1μF(0402/X6S≧0.47μF);
0603≧10μF;0805≧4.7μF;1206≧47μF;1210≧100μF;TT series</td></tr>
<tr><td>4V</td><td>≦20%</td><td>---</td><td>---</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧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>16V (C<1.0μF)</td><td>≦10%</td><td>≦12.5%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr>
<tr><td></td><td></td><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="7">500MΩ or RxC≧5 Ω-F whichever is smaller.</td></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0603≥1μF;0805≥2.2μF; 1206≧2.2μF;1210≧10μF</td></tr>
<tr><td>25V:0201≧0.1uF; 0402≥0.22μF; 0603≥2.2μF;0805≥2.2μF;
1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: 0201≧0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF;
1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ; TT series ; All X6S/X7S items; Size≥1812</td></tr>
</table></td></tr>
</table>

* "Room condition" Temperature: 15 to 35℃, Relativ e humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

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

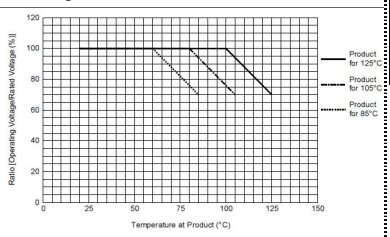
Size	Dielectric	Rated voltage	Capacitance
0201	X5R/X7R/ X6S/X7S	≦10V	C≧0.1μF
		≧16V	C >0.1μF
0402	X5R	≦16V	C >1.0μF
		25V,50V	C≧1.0μF
	X6S	6.3V,10V	C >1.0μF
		16V,25V	C≧1.0μF
	X7R/X7S/Y5V	6.3V,10V	C≧1.0μF
0603	X5R/X7R/ X6S/X7S	4V	C≧22μF
		6.3V,10V	C≧4.7μF
	X5R/X6S/X7S	25V	C≧1.0μF
	X7R	35V	C≧1.0μF
0805	X5R/X7R/ X6S/X7S	4V	C≧47μF
		6.3V	C≧22μF
		10V,50V	C≧10μF
	X6S	16V	C >10μF
		25V	C≧10μF
	X7R/X7S	16V,25V	C≧10μF
	X5R		C≧22μF
1206	X5R/X7R/X6S	≦6.3V	C≧47μF
1210	X5R/X7R/X6S	16V	C≧47μF
	X7R	100V	C≧3.3μF

**1WV items must follow de-rating conditions.

(2) 150% of rated voltage for below range.

Size	Dielectric	Rated voltage	Capacitance
0201	X5R/X6S	16V,25V	C=0.1μF
	X7R	16V	C≧0.022μF
0402	X7R/X5R/ X6S	50V	C>0.01μF
		10~25V	C≧0.22μF
	Y5V	16V	C≧0.47μF
0603	X7S	50V~100V	C>0.22μF
	X7R	50V	C>0.1μF
		25V	C=1.0μF
	X5R	50V	C≧1.0μF
	X5R/X7R/ X6S/X7S	10V,16V	C≧1.0μF
	Y5V	16V	C≧2.2μF
0805	X5R/X7R/ X6S/X7S	100V	C≧0.47μF
		50V	C≧0.68μF
		35V	C≧2.2μF
		10~25V	C≧4.7μF
	Y5V	16V	C≧4.7μF
1206	X7R	100V	C≧1.0μF
		50V	C≧2.2μF
	X5R/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

(3)≦6.3V or C≧10μF: 150% of rated voltage.
(4) 10V~250V: 200% of rated voltage.
(5) 400V~450V: 120% of rated voltage.
(6) 500V: 150% of rated voltage.
(7) 630V~3000V: 120% of rated voltage.
(8) 4000V: 110% of rated voltage
* 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:



Rated vol.	D.F.≦	Exception of D.F.≦	
≧100V	≦3%	≦6%	1206≧0.47μF
		≦7.5%	0603≧0.068μF;0805＞0.1μF;1206≧1μF;1210≧2.2μF;TT series
		≦20%	0805＞0.22μF;1210≧3.3μF
50V	≦3%	≦6%	0201(50V);0603≧0.047μF;0805≧0.18μF;1206≧0.47μF
		≦10%	0201≧0.01uF;1210≧3.3μF
		≦20%	0402≧0.012μF;0603>0.1μF;0805≧1μF(0805/X7R>0.47μF); 1206≧2.2μF;1210≧10μF; TT series
35V	≦5%	≦20%	0603≧1μF;0805≥2.2μF;1206≧2.2μF;1210≧10μF
25V	≦5%	≦10%	0201≧0.01μF(0201/X5R=0.01μF);0805≧1μF;1210≧10μF*
		≦14%	0603≧0.33μF
		≦15%	0201≧0.1μF(0201/X5R>0.01μF); 0603≧0.47μF;TTseries 0402≧0.10μF(0402/X7R≧0.056μF);0805≧2.2μF; 1206≧4.7μF;1210≧22μF(1210/X5R≧10μF)*;
		≦20%	0402≧0.47μF
16V	≦5%	≦10%	0603≧0.15μF;0805≧0.68μF;1206≧2.2μF;1210≧4.7μF
		≦15%	0201≧0.01μF(0201/X7R≧0.022μF);0402≧0.033μF; 0603>0.47μF;0805≧2.2μF;1206≧4.7μF;1210≧22μF;TT series
10V	≦7.5%	≦15%	0201≧0.012μF;0402≧0.22μF; 0603≧0.33μF;0805≧2.2μF;1206≧2.2μF;1210≧22μF
		≦20%	0201≧0.1μF;0402≧1μF;0603/X5R≧10μF;TT series;01R5/X5R
6.3V	≦15%	≦30%	0201≧0.1μF;0402≧1μF(0402/X6S≧0.47μF); 0603≧10μF;0805≧4.7μF;1206≧47μF;1210≧100μF;TT series
4V	≦20%	---	---

Y5V:

Rated vol.	D.F.≦	Exception of D.F.≦	
≧50V	≦7.5%	≦10%	0603≧0.1μF; 0805≧0.47μF;1206≧4.7μF
		≦20%	1210≧6.8μF
35V	≦10%	---	---
25V	≦7.5%	≦10%	0402≧0.047μF;0603≧0.1μF; 0805≧0.33μF;1206≧1μF; 1210≧4.7μF
		≦15%	0402≧0.068μF;0603≧0.47μF; 1206≧4.7μF; 1210≧22μF
16V (C<1.0μF)	≦10%	≦12.5%	0402≧0.068μF; 0603≧0.68μF
		≦20%	0402≧0.22μF
16V (C≧1.0μF)	≦12.5%	≦20%	0603≧2.2μF; 0805≧3.3μF; 1206≧10μF;1210≧22μF; 1812≧47μF;
10V	≦20%	≦30%	0402≧0.47μF
6.3V	≦30%	---	---

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

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

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

* "Room condition" Temperature: 15 to 35℃, Relativ e humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

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APPENDIXES

◙ Tape & reel dimensions

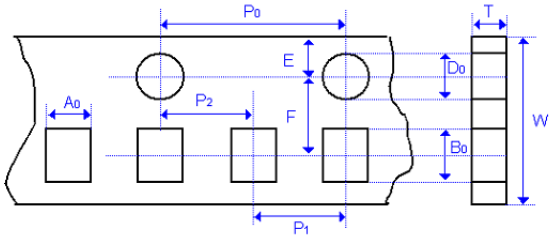


Fig. 2 The dimension of paper tape

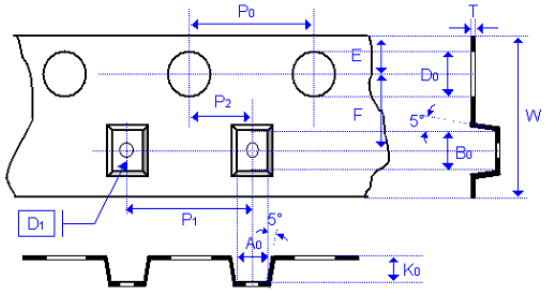


Fig. 3 The dimension of plastic tape

Size	0402	0603	0805			1206			1210		1808	1812		1825		2220		2225	
Thickness	N,E	S,X	A,H	B,T	D,I	B,T	C,J, D	G,P	C,D, G,K	M	D,F, G,K	D,F, G,K	M,U	K	M,U	K	M,U	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	< 3.20	< 2.50	< 3.90	< 3.90	< 6.80	< 6.80	< 5.80	< 5.80	< 6.80	< 6.80
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	<4.00	< 5.30	< 5.30	< 5.30	< 5.30	< 5.30	< 6.50	< 6.50	< 6.50	< 6.50
T	≦0.80	≦1.20	≦1.15	≦1.20	0.23 +/-0.1	≦1.20	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.30 +/-0.1	0.30 +/-0.1	0.30 +/-0.1	0.30 +/-0.1	0.30 +/-0.1	0.30 +/-0.1
K_0	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 2.50	< 3.20	< 2.50	< 2.50	< 3.50	< 2.50	< 3.50	< 2.50	< 3.50	< 2.50	< 3.50
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	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-0.30	12.00 +/-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	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	40.00 +/-0.20	40.00 +/-0.20	40.0 +/-0.20	40.0 +/-0.20	40.0 +/-0.20	40.0 +/-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	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-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	2.00 +/-0.10	2.00 +/-0.10	2.00 +/-0.10	2.00 +/-0.10	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	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	1.50 +/-0.10	1.50 +/-0.10	1.50 +/-0.10	1.50 +/-0.10	1.50 +/-0.10	1.50 +/-0.10	1.50 +/-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	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	5.50 +/-0.05	5.50 +/-0.05	5.50 +/-0.05	5.50 +/-0.05	5.50 +/-0.05	5.50 +/-0.05

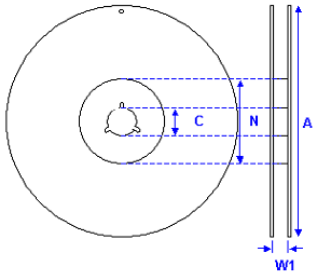
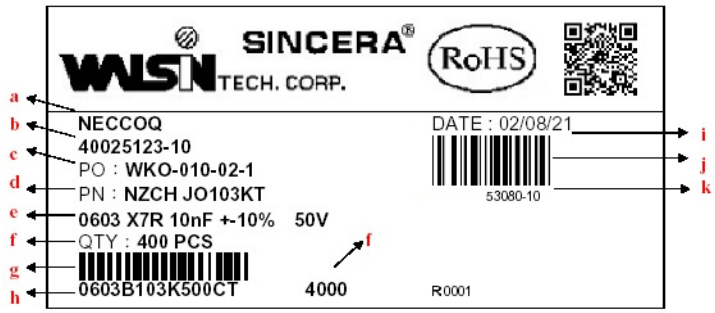


Fig. 4 The dimension of reel

Size	0402, 0603, 0805, 1206, 1210			1808 to 2225
Reel size	7”	10”	13”	7”
C	13.0±0.5	13.0±0.5	13.0±0.5	13.0±0.5
W_1	10.0±1.5	10.0±1.5	10.0±1.5	12.4+2.0/-0
A	178.0±2.0	250.0±2.0	330.0±2.0	178.0±2.0
N	60.0+1.0/-0	50 min	50 min	60.0+1.0/-0

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Example of customer label



*Customized label is available upon request

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

Constructions

No.	Name		NPO	X7R, X5R, Y5V
①	Ceramic material		$CaZrO_3$ based	$BaTiO_3$ based
②	Inner electrode		Ni	
③	Termination	Inner layer	Cu + Ag Polymer	
④		Middle layer	Ni	
⑤		Outer layer	Sn	

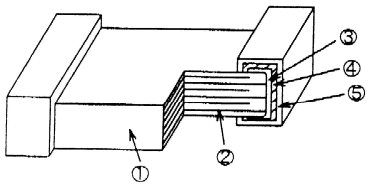


Fig. 5 The construction of MLCC

Storage and handling conditions

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

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

Cautions:

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

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

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

Caution for SOFT TERMINATION Products

Since the middle layer of the terminal electrode contains Ag (silver), when chip capacitors on printed circuit board (PCB), it should be protected by moisture proof-sealing to prevent electromigration of Ag under high temperature, high humidity and failure due to corrosive gas.

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◙ Recommended soldering conditions

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

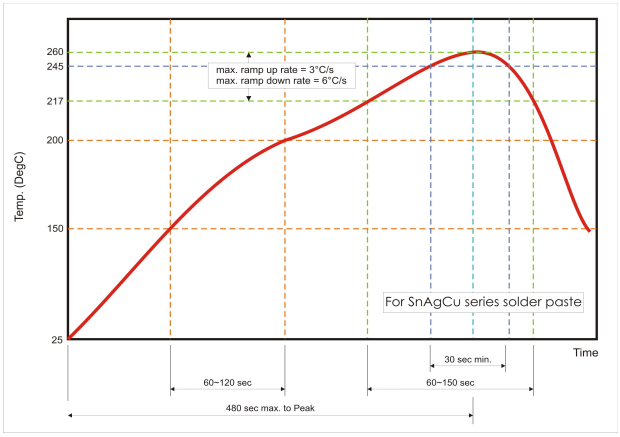


Fig. 6 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

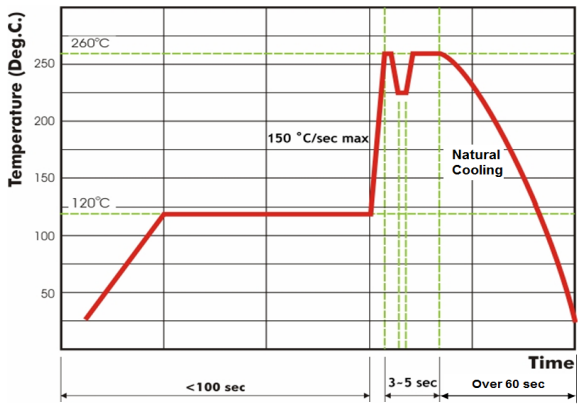


Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.

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