

APPROVAL SHEET

MULTILAYER CERAMIC CAPACITORS

MG Series Capacitors (MG)

0201 to 1812 Sizes

NP0, X7R, X5R, Dielectrics,

6.3V to 3000V

Halogen Free & RoHS Compliance

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

1. DESCRIPTION

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used.

WTC's MG series MLCC is made by NP0, X7R & X5R dielectrics and which provides product with high electrical precision, stability and reliability. Besides, MG series MLCC is tighten controlling in quality in line to assure quality performance in non-safety automotive device and industrial equipment applications.

2. FEATURES

- A wide selection of sizes is available (0402 to 1812).
- High capacitance in given case size.
- Capacitor with lead-free termination (pure Tin).

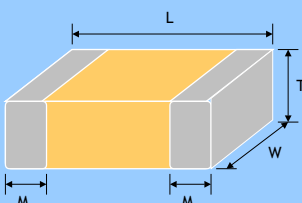
3. APPLICATIONS

- For Navigation & Information equipment's.
- For entertainment equipment's
- For comfortable equipment's.
- For industrial equipment's

4. HOW TO ORDER

<u>MG</u>	<u>31</u>	<u>B</u>	<u>104</u>	<u>K</u>	<u>500</u>	<u>C</u>	<u>I</u>
Series	Size	Dielectric	Capacitance	Tolerance	Rated voltage	Termination	Packaging style
MG= Industry & Automotive (without AEC-Q200 certification)	03=0201 (0603) 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	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 0R5=0.5pF 1R0=1.0pF 104=10x10 ⁴ =100nF	B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 6R3=6.3 VDC 100=10 VDC 160=16 VDC 250=25 VDC 500=50 VDC 101=100 VDC 201=200 VDC 251=250 VDC 501=500 VDC 631=630 VDC 102=1000 VDC 302=1000 VDC	C=Cu/Ni/Sn	T=7" reeled G=13" reeled

5. EXTERNAL DIMENSIONS

Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Soldering Method *	M _B (mm)	
 Fig. 1 The outline of MLCC	01R5 (0402)	0.4±0.02	0.2±0.02	0.2±0.02	V	R	0.07~0.13	
	0201 (0603)	0.6±0.03	0.3±0.03	0.3±0.03	L	R	0.10~0.25	
		0.6±0.05 ^{#2}	0.3±0.05 ^{#2}	0.3±0.05 ^{#2}				
		0.6±0.09 ^{#3}	0.3±0.09 ^{#3}	0.3±0.09 ^{#3}				
	0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	R	0.15~0.35	
		1.00±0.20	0.50±0.20	0.50+0.02/-0.05	Q	R		
				0.5±0.20	E	R		
	0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S	R / W	0.25~0.60	
		1.60+0.15/-0.10	0.80+0.15/-0.10	0.50±0.10	H	R / W		
				0.80±0.10	B	R / W		
				0.80+0.15/-0.10	X			
	0805 (2012)	2.00±0.15	1.25±0.10	0.50±0.10	H	R / W	0.30~0.70	
				0.60±0.10	A	R / W		
				0.80±0.10	B	R / W		
				1.25±0.10	D	R		
		2.00±0.20	1.25±0.20	0.85±0.10	T	R / W		
				1.25±0.20	I	R		
	1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B	R / W	0.25~1.00 (0.50±0.25) ^{***}	
				0.95±0.10	C	R		
				1.25±0.10	D	R		
				1.15±0.15	J	R		
		3.20±0.20	1.60±0.20	1.60±0.20	G	R		
				0.85±0.10	T	R / W		
	1210 (3225)	3.20+0.30/-0.1 3.30+0.30/-0.1 ^{#5}		1.60+0.30/-0.10	1.60+0.30/-0.10	P	R	0.50~1.00
		3.20±0.30	2.50±0.20	0.95±0.10	C	R		
				0.85±0.10	T	R		
				1.25±0.10	D	R		
				1.60±0.20	G	R		
		3.20±0.40	2.50±0.30	2.00±0.20	K	R		
				2.50±0.30	M	R		
	1808 (4520)	4.50±0.40 (4.5+0.5/-0.3) ^{**}	2.03±0.25	1.25±0.10	D	R	0.25~1.10 (0.50±0.25) ^{***}	
				1.40±0.15	F	R		
				1.60±0.20	G	R		
				2.00±0.20	K	R		
	1812 (4532)	4.50±0.40 (4.5+0.5/-0.3) ^{**}	3.20±0.30	1.25±0.10	D	R	0.25~1.10 (0.50±0.25) ^{***}	
				1.60±0.20	G	R		
				2.00±0.20	K	R		
			3.20±0.40	2.50±0.30	M	R		
				2.80±0.30	U	R		

* R = Reflow soldering process ; W = Wave soldering process.

** For 1808/1812/1825_200V~4000V and safety certificated products.

*** For 1206_≥1000V, 1808/1812_200V~4000V and safety certificated products.

#1: For 0603/Cap ≥ 10μF or 0603(≤6.3V)/Cap ≥ 4.7μF or 0603(>10V)/Cap > 1μF products,

Excluding 0603X225(16V&25V), 0603S225(6.3V&16V), 0603X475(6.3V&16V), 0603S475(4V&6.3V).

#2: For 0201/ 0.1μF < Cap < 0.68μF products, Excluding 0201X334~474(≤6.3V) & 0201X224(≤10V).

#3: For 0201X334(16V&25V), 0201/Cap ≥ 0.68μF products, Excluding 0201X105*6R3=>(L:0.6±0.05,W:0.3±0.05,T:0.3±0.05).

#4: For 1210B(200V&250V)/Cap > 0.47μF products.

#5: For 1206B(100V)/Cap ≥ 1.2μF products.

#6: For 0402X475M6R3CT products.

Multilayer Ceramic Capacitors

Approval Sheet

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X5R
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812		
Capacitance range*	0.1pF to 0.047μF	100pF to 47μF	0.068μF to 10μF
Capacitance tolerance**	Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF ^{#1} : A (±0.05pF),B (±0.1pF) , C (±0.25pF) D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)	J (±5%), K (±10%), M (±20%)	
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V, 1000V		6.3V, 10V, 16V, 25V
Operating temperature	-55 to +125°C		-55 to +85°C
Capacitance characteristic	±30ppm/°C	±15%	
Termination	Ni/Sn (lead-free termination)		

#1: 5pF<Cap<10pF products need to check with sales if it can supply A (±0.05pF).

* 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°C at ambient temperature
Measured at 1.0±0.2Vrms, 1.0kHz±10% for C≤10μF; 0.5±0.2Vrms, 120Hz±20% for C>10μF, 30~70% related humidity, 25°C ambient temperature for X7R, X5R.

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



Multilayer Ceramic Capacitors

7. CAPACITANCE RANGE (NP0 Dielectric)

NP0 Dielectric 0201, 0402, 0603 Sizes

DIELECTRIC		NP0																
SIZE		0201					0402					0603						
RATED VOLTAGE		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100	200	250
Capacitance	0.1pF (0R1)	L	L	L	L	L	N	N	N	N	N							
	0.2pF (0R2)	L	L	L	L	L	N	N	N	N	N							
	0.3pF (0R3)	L	L	L	L	L	N	N	N	N	N							
	0.4pF (0R4)	L	L	L	L	L	N	N	N	N	N							
	0.5pF (0R5)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.6pF (0R6)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.7pF (0R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.8pF (0R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.9pF (0R9)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.0pF (1R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.2pF (1R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.5pF (1R5)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.8pF (1R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.0pF (2R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.2pF (2R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.7pF (2R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.0pF (3R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.3pF (3R3)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.9pF (3R9)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	4.0pF (4R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	4.7pF (4R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	5.0pF (5R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	5.6pF (5R6)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	6.0pF (6R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	6.8pF (6R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	7.0pF (7R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	8.0pF (8R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	8.2pF (8R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	9.0pF (9R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	10pF (100)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	12pF (120)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	15pF (150)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	18pF (180)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	22pF (220)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	27pF (270)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	33pF (330)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	39pF (390)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	47pF (470)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	56pF (560)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	68pF (680)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	82pF (820)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	100pF (101)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	120pF (121)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	150pF (151)						N	N	N	N	N	S	S	S	S	S	S	S
	180pF (181)						N	N	N	N	N	S	S	S	S	S	S	S
	220pF (221)						N	N	N	N	N	S	S	S	S	S	S	S
	270pF (271)						N	N	N	N	N	S	S	S	S	S	X	X
	330pF (331)						N	N	N	N	N	S	S	S	S	S	X	X
	390pF (391)						N	N	N	N	N	S	S	S	S	S	X	X
	470pF (471)						N	N	N	N	N	S	S	S	S	S	X	X
560pF (561)						N	N	N	N	N	S	S	S	S	S	X	X	
680pF (681)						N	N	N	N	N	S	S	S	S	S	X	X	
820pF (821)						N	N	N	N	N	S	S	S	S	S	X	X	
1,000pF (102)						N	N	N	N	N	S	S	S	S	S			
1,200pF (122)											X	X	X	X	X			
1,500pF (152)											X	X	X	X	X			
1,800pF (182)											X	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)																		
0.01uF (103)																		

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

Multilayer Ceramic Capacitors

Approval Sheet

NP0 Dielectric 0805 Size (Continued)

DIELECTRIC		NP0								
SIZE		0805								
RATED VOLTAGE		10	16	25	50	100	200	250	500	630
Capacitance	0.5pF (0R5)	A	A	A	A	A	A	A	A	A
	0.6pF (0R6)	A	A	A	A	A	A	A	A	A
	0.7pF (0R7)	A	A	A	A	A	A	A	A	A
	0.8pF (0R8)	A	A	A	A	A	A	A	A	A
	0.9pF (0R9)	A	A	A	A	A	A	A	A	A
	1.0pF (1R0)	A	A	A	A	A	A	A	A	A
	1.2pF (1R2)	A	A	A	A	A	A	A	A	A
	1.5pF (1R5)	A	A	A	A	A	A	A	A	A
	1.8pF (1R8)	A	A	A	A	A	A	A	A	A
	2.2pF (2R2)	A	A	A	A	A	A	A	A	A
	2.7pF (2R7)	A	A	A	A	A	A	A	A	A
	3.3pF (3R3)	A	A	A	A	A	A	A	A	A
	3.9pF (3R9)	A	A	A	A	A	A	A	A	A
	4.7pF (4R7)	A	A	A	A	A	A	A	A	A
	5.6pF (5R6)	A	A	A	A	A	A	A	A	A
	6.8pF (6R8)	A	A	A	A	A	A	A	A	A
	8.2pF (8R2)	A	A	A	A	A	A	A	A	A
	10pF (100)	A	A	A	A	A	A	A	A	A
	12pF (120)	A	A	A	A	A	A	A	A	A
	15pF (150)	A	A	A	A	A	A	A	A	A
	18pF (180)	A	A	A	A	A	A	A	A	A
	22pF (220)	A	A	A	A	A	A	A	A	A
	27pF (270)	A	A	A	A	A	A	A	A	A
	33pF (330)	A	A	A	A	A	A	A	A	A
	39pF (390)	A	A	A	A	A	A	A	A	A
	47pF (470)	A	A	A	A	A	A	A	A	A
	56pF (560)	A	A	A	A	A	A	A	A	A
	68pF (680)	A	A	A	A	A	A	A	A	A
	82pF (820)	A	A	A	A	A	A	A	B	B
	100pF (101)	A	A	A	A	A	B	B	B	B
	120pF (121)	A	A	A	A	A	B	B	D	D
	150pF (151)	A	A	A	A	A	D	D	D	D
	180pF (181)	A	A	A	A	A	D	D	D	D
	220pF (221)	A	A	A	A	A	D	D	D	D
	270pF (271)	A	A	A	A	A	D	D	D	D
	330pF (331)	A	A	A	A	A	D	D	D	D
	390pF (391)	B	B	B	B	B	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	I	I
	1,500pF (152)	B	B	B	B	B	D	D	I	I
	1,800pF (182)	B	B	B	B	B	D	D	I	I
	2,200pF (222)	B	B	B	B	B	D	D	I	I
	2,700pF (272)	D	D	D	D	D	I	I		
	3,300pF (332)	D	D	D	D	D	I	I		
	3,900pF (392)	D	D	D	D	D	I	I		
	4,700pF (472)	D	D	D	D	D	I	I		
	5,600pF (562)	D	D	D	D	D				
	6,800pF (682)	D	D	D	D	D				
	8,200pF (822)	D	D	D	D	D				
	0.01μF (103)	D	D	D	D	D				
	0.012μF (123)	D	D	D	D	D				
	0.015μF (153)	D	D	D	D	D				
	0.018μF (183)	D	D	D	D	D				
	0.022μF (223)	D	D	D	D	D				

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

Multilayer Ceramic Capacitors

Approval Sheet

NP0 Dielectric 1206 Size (Continued)

DIELECTRIC		NP0									
SIZE		1206									
RATED VOLTAGE		10	16	25	50	100	200	250	500	630	1000
Capacitance	1.0pF (1R0)										
	1.2pF (1R2)	B	B	B	B	B	B	B	B	B	
	1.5pF (1R5)	B	B	B	B	B	B	B	B	B	B
	1.8pF (1R8)	B	B	B	B	B	B	B	B	B	B
	2.2pF (2R2)	B	B	B	B	B	B	B	B	B	B
	2.7pF (2R7)	B	B	B	B	B	B	B	B	B	B
	3.3pF (3R3)	B	B	B	B	B	B	B	B	B	B
	3.9pF (3R9)	B	B	B	B	B	B	B	B	B	B
	4.7pF (4R7)	B	B	B	B	B	B	B	B	B	B
	5.6pF (5R6)	B	B	B	B	B	B	B	B	B	B
	6.8pF (6R8)	B	B	B	B	B	B	B	B	B	B
	8.2pF (8R2)	B	B	B	B	B	B	B	B	B	B
	10pF (100)	B	B	B	B	B	B	B	B	B	B
	12pF (120)	B	B	B	B	B	B	B	B	B	B
	15pF (150)	B	B	B	B	B	B	B	B	B	B
	18pF (180)	B	B	B	B	B	B	B	B	B	B
	22pF (220)	B	B	B	B	B	B	B	B	B	D
	27pF (270)	B	B	B	B	B	B	B	B	B	D
	33pF (330)	B	B	B	B	B	B	B	B	B	D
	39pF (390)	B	B	B	B	B	B	B	B	B	D
	47pF (470)	B	B	B	B	B	B	B	B	B	D
	56pF (560)	B	B	B	B	B	B	B	B	B	D
	68pF (680)	B	B	B	B	B	B	B	B	B	D
	82pF (820)	B	B	B	B	B	B	B	B	B	D
	100pF (101)	B	B	B	B	B	B	B	B	B	D
	120pF (121)	B	B	B	B	B	B	B	B	B	D
	150pF (151)	B	B	B	B	B	B	B	B	B	D
	180pF (181)	B	B	B	B	B	B	B	B	B	G
	220pF (221)	B	B	B	B	B	B	B	B	B	G
	270pF (271)	B	B	B	B	B	B	C	C	C	G
	330pF (331)	B	B	B	B	B	B	C	C	C	G
	390pF (391)	B	B	B	B	B	B	C	C	C	G
	470pF (471)	B	B	B	B	B	B	C	C	C	G
	560pF (561)	B	B	B	B	B	B	D	D	D	G
	680pF (681)	B	B	B	B	B	B	D	D	D	G
	820pF (821)	B	B	B	B	B	B	G	G	G	G
	1,000pF (102)	B	B	B	B	B	B	G	G	G	G
	1,200pF (122)	B	B	B	B	B	B	G	G	G	
	1,500pF (152)	B	B	B	B	B	B	D	G	G	
	1,800pF (182)	B	B	B	B	B	B	D	G	G	
	2,200pF (222)	B	B	B	B	B	B	D	G	G	
	2,700pF (272)	B	B	B	B	B	B	D	G	G	
	3,300pF (332)	B	B	B	B	B	B	D	G	G	
	3,900pF (392)	B	B	B	B	B	B	D	G	G	
	4,700pF (472)	B	B	B	B	B	B	D	G	G	
	5,600pF (562)	B	B	B	B	B	B	G	G		
	6,800pF (682)	C	C	C	C	C	C	G	G		
	8,200pF (822)	D	D	D	D	D	D	G	G		
	0.01μF (103)	D	D	D	D	D	D	G	G		

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

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

Multilayer Ceramic Capacitors

Approval Sheet

NP0 Dielectric 1210 Size (Continued)

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

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

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

Multilayer Ceramic Capacitors

NP0 Dielectric 1812 Size (Continued)

DIELECTRIC		NP0				
SIZE		1812				
RATED VOLTAGE (VDC)		10	16	25	50	100
Capacitance	10pF (100)					D
	12pF (120)					D
	15pF (150)					D
	18pF (180)					D
	22pF (220)					D
	27pF (270)					D
	33pF (330)					D
	39pF (390)					D
	47pF (470)					D
	56pF (560)					D
	68pF (680)					D
	82pF (820)					D
	100pF (101)					D
	120pF (121)					D
	150pF (151)					D
	180pF (181)					D
	220pF (221)					D
	270pF (271)					D
	330pF (331)					D
	390pF (391)					D
	470pF (471)					D
	560pF (561)					D
	680pF (681)					D
	820pF (821)					D
	1,000pF (102)	D	D	D	D	D
	1,200pF (122)	D	D	D	D	D
	1,500pF (152)	D	D	D	D	D
	1,800pF (182)	D	D	D	D	D
	2,200pF (222)	D	D	D	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	D
	0.010μF (103)	D	D	D	D	D
	0.012μF (123)	D	D	D	D	D
	0.015μF (153)	D	D	D	D	D
	0.018μF (183)	D	D	D	D	D
	0.022μF (223)	D	D	D	D	D
	0.027μF (273)	D	D	D	D	D
	0.033μF (333)	D	D	D	D	D
	0.039μF (393)					

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8. CAPACITANCE RANGE (X7R Dielectric)

X7R Dielectric 0201, 0402, 0603 Sizes

Capacitance	DIELECTRIC	X7R													
	SIZE	0201				0402					0603				
	RATED VOLTAGE	10	16	25	50	10	16	25	50	100	10	16	25	50	100
	100pF (101)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	120pF (121)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	150pF (151)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	180pF (181)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	220pF (221)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	270pF (271)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	330pF (331)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	390pF (391)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	470pF (471)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	560pF (561)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	680pF (681)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	820pF (821)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	1,000pF (102)	L	L	L	L	N	N	N	N	N	S	S	S	S	S
	1,200pF (122)	L	L	L		N	N	N	N		S	S	S	S	S
	1,500pF (152)	L	L	L		N	N	N	N		S	S	S	S	S
	1,800pF (182)	L	L	L		N	N	N	N		S	S	S	S	S
	2,200pF (222)	L	L	L		N	N	N	N		S	S	S	S	S
	2,700pF (272)	L	L	L		N	N	N	N		S	S	S	S	S
	3,300pF (332)	L	L	L		N	N	N	N		S	S	S	S	S
	3,900pF (392)	L	L	L		N	N	N	N		S	S	S	S	S
	4,700pF (472)	L	L	L		N	N	N	N		S	S	S	S	S
	5,600pF (562)	L	L	L		N	N	N	N		S	S	S	S	S
	6,800pF (682)	L				N	N	N	N		S	S	S	S	S
	8,200pF (822)	L				N	N	N	N		S	S	S	S	S
	0.010μF (103)	L				N	N	N	N		S	S	S	S	S
	0.012μF (123)					N	N	N			S	S	S	S	X
	0.015μF (153)					N	N	N			S	S	S	S	X
	0.018μF (183)					N	N	N	N		S	S	S	S	X
	0.022μF (223)					N	N	N	N		S	S	S	S	X
	0.027μF (273)					N	N	N	N		S	S	S	S	X
	0.033μF (333)					N	N	N	N		S	S	S	X	X
	0.039μF (393)					N	N	N	N		S	S	S	X	X
	0.047μF (473)					N	N	N	N		S	S	S	X	X
	0.056μF (563)					N	N	N	N		S	S	S	X	
	0.068μF (683)					N	N	N	N		S	S	S	X	
	0.082μF (823)					N	N	N	N		S	S	S	X	
	0.10μF (104)					N	N	N	N		S	S	S	X	
	0.12μF (124)										S	S	X		
	0.15μF (154)										S	S	X	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	X	
	0.39μF (394)										X	X	X		
	0.47μF (474)										X	X	X		
	1μF (105)												X		
	2.2μF (225)										X				

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X7R Dielectric 0805, 1206 Size

DIELECTRIC		X7R																			
SIZE		0805									1206										
RATED VOLTAGE (VDC)		10	16	25	50	100	200	250	500	630	1000	10	16	25	50	100	200	250	500	630	
Capacitance	100pF (101)	B	B	B	B	B	B	B	B	B	B						D	D	D	D	
	120pF (121)	B	B	B	B	B	B	B	B	B	B						D	D	D	D	
	150pF (151)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	180pF (181)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	220pF (221)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	270pF (271)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	330pF (331)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	390pF (391)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	470pF (471)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	560pF (561)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	680pF (681)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	820pF (821)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	1,000pF (102)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	1,200pF (122)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	D	D	D	D	
	1,500pF (152)	B	B	B	B	B	B	B	B	B	B	D	B	B	B	B	B	D	D	D	D
	1,800pF (182)	B	B	B	B	B	B	B	B	B	B	D	B	B	B	B	B	D	D	D	D
	2,200pF (222)	B	B	B	B	B	B	B	B	B	B	D	B	B	B	B	B	D	D	D	D
	2,700pF (272)	B	B	B	B	B	B	B	B	B	B	D	B	B	B	B	B	D	D	D	D
	3,300pF (332)	B	B	B	B	B	B	B	B	B	B	D	B	B	B	B	B	D	D	D	D
	3,900pF (392)	B	B	B	B	B	B	B	B	B	B	D	B	B	B	B	B	D	D	D	D
	4,700pF (472)	B	B	B	B	B	B	B	B	D	D	D	B	B	B	B	B	D	D	D	D
	5,600pF (562)	B	B	B	B	B	B	B	B	D	D	D	B	B	B	B	B	D	D	D	D
	6,800pF (682)	B	B	B	B	B	B	B	B	D	D	D	B	B	B	B	B	D	D	D	D
	8,200pF (822)	B	B	B	B	B	B	B	B	D	D	D	B	B	B	B	B	D	D	D	D
	0.010μF (103)	B	B	B	B	B	D	D	D	D	D	D	B	B	B	B	B	D	D	D	D
	0.012μF (123)	B	B	B	B	B	D	D					B	B	B	B	B	D	D		
	0.015μF (153)	B	B	B	B	B	D	D					B	B	B	B	B	D	D		
	0.018μF (183)	B	B	B	B	B	D	D					B	B	B	B	B	D	D		
	0.022μF (223)	B	B	B	B	B	D	D					B	B	B	B	B	D	D		
	0.027μF (273)	B	B	B	B	D							B	B	B	B	B	D	D		
	0.033μF (333)	B	B	B	B	D							B	B	B	B	B	G	G		
	0.039μF (393)	B	B	B	B	D							B	B	B	B	B	G	G		
	0.047μF (473)	B	B	B	B	D							B	B	B	B	B	G	G		
	0.056μF (563)	B	B	B	B	D							B	B	B	B	B	G	G		
	0.068μF (683)	B	B	B	B	D							B	B	B	B	B	G	G		
	0.082μF (823)	B	B	B	B	D							B	B	B	B	D	G	G		
	0.10μF (104)	B	B	B	B	D							B	B	B	B	D	G	G		
	0.12μF (124)	B	B	B	D								B	B	B	B	D				
	0.15μF (154)	D	D	D	D								C	C	C	C	G				
	0.18μF (184)	D	D	D	D								C	C	C	C	G				
	0.22μF (224)	D	D	D	D								C	C	C	C	G				
	0.27μF (274)	D	D	D	I								C	C	C	D					
	0.33μF (334)	D	D	D	I								C	C	C	D					
	0.39μF (394)	D	D	D	I								C	C	J	P					
	0.47μF (474)	D	D	D	I								J	J	J	P					
	0.56μF (564)	D	D	D									J	J	J	P					
	0.68μF (684)	D	D	D	I								J	J	J	P					
0.82μF (824)	D	D	D									J	J	J	P						
1.0μF (105)	D	D	D	I								J	J	J	P						
1.5μF (155)												J	J	P							
2.2μF (225)												J	J	P	P						
4.7μF (475)	I	I	I												P						
10μF (106)													P	P							
22μF (226)												P									
47μF (476)												P									

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

Multilayer Ceramic Capacitors

Approval Sheet

X7R Dielectric 1210, 1812 Size

DIELECTRIC		X7R																	
SIZE		1210									1812								
RATED VOLTAGE (VDC)		10	16	25	50	100	200	250	500	1000	10	16	25	50	100	200	250	3000	
Capacitance	100pF (101)							D	D	D									
	120pF (121)							D	D	D									
	150pF (151)							D	D	D									
	180pF (181)							D	D	D									
	220pF (221)							D	D	D									
	270pF (271)							D	D	D								K	
	330pF (331)							D	D	D								K	
	390pF (391)							D	D	D								K	
	470pF (471)							D	D	D								K	
	560pF (561)							D	D	D								K	
	680pF (681)							C	D	D								K	
	820pF (821)							C	D	D								K	
	1,000pF (102)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	K
	1,200pF (122)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	K
	1,500pF (152)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	K
	1,800pF (182)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	M
	2,200pF (222)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	M
	2,700pF (272)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	M
	3,300pF (332)	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	M
	3,900pF (392)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D	D	M
	4,700pF (472)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D	D	M
	5,600pF (562)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D	D	
	6,800pF (682)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D	D	
	8,200pF (822)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D	D	
	0.010μF (103)	C	C	C	C	C	C	C	D	G	D	D	D	D	D	D	D	D	
	0.012μF (123)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D	D	
	0.015μF (153)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D	D	
	0.018μF (183)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D	D	
	0.022μF (223)	C	C	C	C	C	C	C	D		D	D	D	D	D	D	D	D	
	0.027μF (273)	C	C	C	C	C	C	C			D	D	D	D	D	D	D	D	
	0.033μF (333)	C	C	C	C	C	C	C			D	D	D	D	D	D	D	D	
	0.039μF (393)	C	C	C	C	C	C	C			D	D	D	D	D	D	D	D	
	0.047μF (473)	C	C	C	C	C	D	D			D	D	D	D	D	D	D	D	
	0.056μF (563)	C	C	C	C	C	D	D			D	D	D	D	D	D	D	D	
	0.068μF (683)	C	C	C	C	C	G	G			D	D	D	D	D	D	D	D	
	0.082μF (823)	C	C	C	C	C	G	G			D	D	D	D	D	D	D	D	
	0.10μF (104)	C	C	C	C	C	G	G			D	D	D	D	D	D	D	D	
	0.12μF (124)	C	C	C	C	C	G	G			D	D	D	D	D	D	D	D	
	0.15μF (154)	C	C	C	C	D	M	M			D	D	D	D	D	K	K	K	
	0.18μF (184)	C	C	C	C	D	M	M			D	D	D	D	D	K	K	K	
	0.22μF (224)	C	C	C	C	D	M	M			D	D	D	D	D	K	K	K	
	0.27μF (274)	C	C	C	C	G	M	M			D	D	D	D	D	K	K	K	
	0.33μF (334)	C	C	C	D	G	M	M			D	D	D	D	D	K	K	K	
	0.39μF (394)	C	C	C	D	M	M	M			D	D	D	D	D	K	K	K	
	0.47μF (474)	C	C	C	D	M	M	M			D	D	D	D	K	K	K	K	
0.56μF (564)	D	D	D	D	M					D	D	D	D	K					
0.68μF (684)	D	D	D	D	K					D	D	D	K	K					
0.82μF (824)	D	D	D	D	K					D	D	D	K	K					
1.0μF (105)	D	D	D	D	K					D	D	D	K	K					
1.5μF (155)	K	K	G												K				
2.2μF (225)	K	K	G												M				
4.7μF (475)				M															
10μF (106)				M															
22μF (226)	M	M	M																
47μF (476)	M																		

* X7R/1210 can provide optional "D" thickness for Cap.154~474=10V~25V & Cap.154~274=50V.

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.

9. CAPACITANCE RANGE (X5R Dielectric)

DIELECTRIC		X5R															
SIZE		0402				0603				0805				1206			
RATED VOLTAGE(VDC)		6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	6.3	10	16	25
Capacitance	0.022μF (223)																
	0.033μF (333)																
	0.047μF (473)																
	0.068μF (683)		N														
	0.10μF (104)		N	N													
	0.15μF (154)		N	N													
	0.22μF (224)	N	N	N					X								
	0.33μF (334)	N	N				X	X	X								
	0.47μF (474)	N					X	X	X								
	0.68μF (684)	N					X	X	X								
	1.0μF (105)					X	X	X	X								
	1.5μF (155)									I	I				J	J	P
	2.2μF (225)									I	I	I	I		J	J	P
	3.3μF (335)											I	I	P	P	P	P
	4.7μF (475)											I	I	P	P	P	P
	6.8μF (685)													P			
	10μF (106)													P			
	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.



Multilayer Ceramic Capacitors

10. PACKAGING STYLE AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0201 (0603)	0.30±0.03	L	15k	70k	-	-
0402 (1005)	0.50±0.05	N	10k	50k	-	-
0603 (1608)	0.80±0.07	S	4k	15k	-	-
	0.80+0.15/-0.10	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±0.20	I	-	-	3k	10k
1206 (3216)	0.80±0.10	B	4k	15k	-	-
	0.95±0.10	C	-	-	3k	10k
	1.15±0.15	J	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	10k
	1.60+0.30/-0.10	P	-	-	2k	9k
1210 (3225)	0.95±0.10	C	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	8k
	2.00±0.20	K	-	-	1k	6k
	2.50±0.30	M	-	-	1k	6k
1812 (4532)	1.25±0.10	D	-	-	1k	5k
	2.00±0.20	K	-	-	1k	3k
	2.50±0.30	M	-	-	0.5k	3k

Unit: pieces



Multilayer Ceramic Capacitors

Approval Sheet

11. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																																																																																																				
1.	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.																																																																																																																				
2.	Capacitance	*Test temp.: Room Temperature. *Class I: (NP0) ≤1000pF, 1.0±0.2Vrms · 1MHz±10% >1000pF, 1.0±0.2Vrms · 1KHz±10% Class II: (X7R, X5R, Y5V) C≤10μF, 1.0±0.2Vrms · 1KHz±10% ** C>10μF, 0.5±0.2Vrms · 120Hz±20%	* Shall not exceed the limits given in the detailed spec. NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R:																																																																																																																				
3.	Q/ D.F. (Dissipation Factor)	** Test condition: 0.5±0.2Vrms · 1KHz±10% X7R: 0603/475(6.3V) X5R ^{#1} : 0201 ≥ 224 (6.3V, 10V, 16V), 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); 224(16V), 0402X475M6R3, 0402X106M100 (1.0±0.2Vrms · 1KHz±10%) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	Rated vol. D.F. ≤ Exception of D.F. ≤ <table> <tr> <td rowspan="4">≥ 100V</td> <td rowspan="4">≤ 2.5%</td> <td>≤ 3%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 3.5%</td> <td>1812 ≥ 4.7μF; 1825 ≥ 4.7μF; 2220 ≥ 4.7μF; 2225 ≥ 4.7μF</td> </tr> <tr> <td>≤ 5%</td> <td>0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF;</td> </tr> <tr> <td>≤ 10%</td> <td>0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="4">50V</td> <td rowspan="4">≤ 2.5%</td> <td>≤ 3%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 3.5%</td> <td>1812 ≥ 4.7μF; 1825 ≥ 4.7μF; 2220 ≥ 4.7μF; 2225 ≥ 4.7μF</td> </tr> <tr> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 0402 ≥ 0.012μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤ 10%</td> <td>0402 > 0.047μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 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 rowspan="4">25V</td> <td rowspan="4">≤ 3.5%</td> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 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0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 3.5%	1812 ≥ 4.7μF; 1825 ≥ 4.7μF; 2220 ≥ 4.7μF; 2225 ≥ 4.7μF	≤ 5%	0201 ≥ 0.01μF; 0402 ≥ 0.012μF; 1210 ≥ 3.3μF	≤ 10%	0402 > 0.047μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	35V	≤ 3.5%	≤ 10%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 3.5%	≤ 5%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤ 7%	0603 ≥ 0.33μF	≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 12.5%	0402 ≥ 0.33μF	16V	≤ 3.5%	≤ 5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	10V	≤ 5%	≤ 10%	0201/X7R ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 10%	0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF	≤ 20%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	6.3V	≤ 10%	≤ 15%	0402 ≥ 2.2μF	4V	≤ 15%	---	---	≥ 100V	≤ 2.5%	≤ 3%	1206 ≥ 0.47μF	≤ 5%	0603 ≥ 0.068μF; 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		≤ 7%	0603 ≥ 0.33μF																																																																																																																				
		≤ 10%	0201 > 0.01μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																																																																																																				
		≤ 12.5%	0402 ≥ 0.33μF; 0805=10μF																																																																																																																				
16V	≤ 3.5%	≤ 5%	0201=0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																																																																				
10V	≤ 5%	≤ 10%	0201 > 0.01μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																																																																				
		≤ 10%	0402 ≥ 1μF; 0805=10μF																																																																																																																				
		≤ 12.5%	0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; 01R5/X5R																																																																																																																				
		≤ 15%	0805=10μF																																																																																																																				
6.3V	≤ 10%	≤ 15%	0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF																																																																																																																				
4V	≤ 15%	≤ 20%	0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																																																																																																				
4V	≤ 15%	---	---																																																																																																																				
4.	Dielectric Strength	* To apply voltage (≤100V) 250%. 200V~300V ≥2 times VDC 400V~450V ≥1.2 times VDC 500V~999V ≥1.5 times VDC 1000V~3000V ≥1.2 times VDC * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.																																																																																																																				

Multilayer Ceramic Capacitors

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No	Item	Test Condition		Requirements	
5.	Insulation Resistance	*Test temp.: Room Temperature. Rated voltage: ≤100V To apply rated voltage for MAX. 120sec.		10GΩ or RxC≥500Ω·F whichever is smaller.	
				Class II (X7R, X5R)	
				Rated voltage	
				100V: All X7R	
				50V: 0402≥0.01μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF	
				35V: 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF	
				25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF	
				16V: 0201≥0.1μF; 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF	
				10V: 0201≥47nF; 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF	
				6.3V ; 4V ; Size≥1812	
				Rated voltage	
				All X6S items, All X7S items	
				100V: 1210≥3.3μF	
				50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF; 1206≥10μF	
				35V: 0603≥1μF;	
				25V: 0201≥0.1μF; 0402≥2.2μF; 0603≥10μF; 0805≥10μF; 1206≥22μF	
				16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF	
				10V: 0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF	
				6.3V: 0201≥0.1μF; 0402≥1μF; 0603≥4.7μF; 0805≥47μF; 1206≥10μF	
4V: 0603≥22μF; 0805≥47μF; 1206≥100μF					
Insulation Resistance					
10GΩ or RxC ≥ 100 Ω·F whichever is smaller.					
Insulation Resistance					
RxC ≥ 50 Ω·F.					
		Rated voltage: 200~630V	To apply rated voltage (500V max.) for 60 sec.	≥10GΩ or RxC≥100Ω·F whichever is smaller	
		Rated voltage: ≥630V	To apply 500V for 60 sec.		
6.	Temperature Coefficient	With no electrical load.			
		T.C.	Operating Temp	T.C.	Capacitance Change
		NPO	-55~125°C at 25°C	NPO	Within ±30ppm/°C
		X7R	-55~125°C at 25°C	X7R	Within ±15%
		X7S	-55 ~ 125°C at 25°C	X7S	Within ±22%
		X5R	-55~ 85°C at 25°C	X5R	Within ±15%
		X6S	-55~105°C at 25°C	X6S	Within ±22%
		*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement voltage for Class II:			
		01005		0201	
		Cap≤0.01μF: 0.5V		Cap<0.1μF: 1V*	
		Cap>0.01μF: 0.2V		0.1μF≤Cap<1μF: 0.2V**	
				Cap≥1μF: 0.1V**	
		*0201X273~823/6.3V~16V & 0201X473/25V & 0201S273~823/6.3V~10V: 0.5V **0201X104/6.3V~25V & 0201X224 ~ 334/16V~25V: 0.5V 0201X224/10V & 0201X334 ~ 474/6.3V~10V & 0201B104/6.3V~10V & 0201S104/6.3V~16V & 0201S224/6.3V: 0.3V **0201X105/6.3V~10V: 0.3V			
		0402		0603	
		Cap<1μF: 1V**		Cap<1μF: 1V	
		Cap=1μF: 0.5V**		1μF≤Cap≤4.7μF: 0.5V**	
		1μF<Cap<10μF: 0.2V**		Cap>4.7μF: 0.2V**	
		Cap≥10μF: 0.1V			
		**0402B224-16V: 0.5V 0402B334/474-6.3V&10V: 0.5V 0402S334/474-6.3V: 0.5V **0402B105/6R3V: 0.2V **0402X225/475-6.3V: 0.5V		**0603B105/35V: 1V **0603X106/10V: 0.5V **0603S226/6.3V: 0.1V	
		0805		1206/1210	
		Cap<10μF: 1V**		Cap≤10μF: 1V	
		Cap=10μF: 0.5V		10μF<Cap≤100μF: 0.5V**	
		Cap>10μF: 0.2V		Cap>100μF: 0.2V	
		**0805B475/6.3V~25V: 0.5V		**1206X107-6.3V: 0.2V 1206A476-6.3V: 0.1V 1210S107-6.3V: 0.2V	

* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

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No.	Item	Test Condition	Requirements															
7.	Adhesive Strength of Termination	* Pressurizing force : 2N (0201) and 5N (≤0603) and 10N (>0603) * Test time: 10±1 sec.	* No remarkable damage or removal of the terminations.															
8.	Vibration Resistance	* Vibration frequency: 10~55 Hz/min. * Total amplitude: 1.5mm * Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *Cap./DF(Q) Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.															
9.	Solderability	* Solder temperature: 235±5°C(0201~1210). * Solder temperature: 245±5°C(1808~2225). * Dipping time: 2±0.5 sec.	95% min. coverage of all metalized area.															
10.	Bending Test	* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs.	* No remarkable damage. * Cap change : NP0: within ±5% or 0.5pF whichever is larger X7R, X5R: within ±12.5% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)															
11.	Resistance to Soldering Heat	* Solder temperature: 260±5°C * Dipping time: 10±1 sec * Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. * Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge.															
12.	Temperature Cycle	* Conduct the five cycles according to the temperatures and time. <table><tr><th>Step</th><th>Temp. (°C)</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°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	Step	Temp. (°C)	Time (min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	* No remarkable damage. * Cap change : NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements.
Step	Temp. (°C)	Time (min.)																
1	Min. operating temp. +0/-3	30±3																
2	Room temp.	2~3																
3	Max. operating temp. +3/-0	30±3																
4	Room temp.	2~3																

* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

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No.	Item	Test Condition	Requirements									
13.	Humidity (Damp Heat) Steady State	*Test temp.: 40±2°C	* No remarkable damage.									
		*Humidity: 90~95%RH	* Cap change:									
		*Test time: 500+24/-0hrs.	NP0: within ±5% or 0.5pF whichever is larger									
		*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	X7R, X5R: ≥10V**, within ±12.5%; ≤6.3V within ±25%;									
		* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	**10V: 0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%;									
		* 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:										
		Rated vol.	D.F. ≤	Exception of D.F. ≤								
		≥100V	≤3%	≤6% 1206≥0.47μF								
				≤7% 1812≥4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF								
				≤7.5% 0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF								
≤20% 0805>0.22μF;1210≥3.3μF												
50V	≤3%	≤6% 0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF										
		≤7% 1812≥4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF										
		≤10% 0201≥0.01uF; 0402≥0.012μF;1210≥3.3μF										
		≤20% 0402≥0.047μF;0603>0.1μF;0805≥1μF(0805/X7R>0.47μF); 1206≥2.2μF;1210≥10μF;										
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;TT series 0402≥0.10μF(0402/X7R≥0.056μF);0805≥2.2μF; 1206≥4.7μF;1210≥22μF(1210/X5R≥10μF)										
		≤20% 0402≥0.33μF										
16V	≤5%	≤10% 0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF										
10V	≤7.5%	≤15% 0201≥0.01μF(0201/X7R≥0.022μF);0402≥0.033μF; 0603>0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF										
		≤15% 0201≥0.012μF;0402≥0.22μF (0402/X7R≥0.15μF); 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF										
		≤20% 0201≥0.1μF;0402≥1μF;0603/X5R≥10μF;01R5/X5R										
6.3V	≤15%	≤30% 0201≥0.1μF;0402≥1μF(0402/X6S≥0.47μF); 0603≥10μF;0805≥4.7μF;1206≥47μF;1210≥100μF										
4V	≤20%	---										
		*I.R.: ≥10V, 1GΩ or 50 Ω·F whichever is smaller.										
		Class II (X7R, X5R)										
		<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 ; All X6S/X7S items; Size≥1812</td></tr></table>	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 ; All X6S/X7S items; Size≥1812
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 ; All X6S/X7S items; Size≥1812												

* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

Multilayer Ceramic Capacitors

No	Item	Test Condition	Requirements																																														
14	Humidity (Damp Heat) Load	*Test temp. : 40±2°C *Humidity : 90~95%RH *Test time : 500+24/-0 hrs. *To apply voltage : Rated voltage (MAX. 500V) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. Cap change: NP0: ±7.5% or 0.75pF whichever is larger. X7R, X5R: ≥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%; Q/D.F. value: NP0: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C X7R, X5R: <table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td rowspan="4">≥ 100V</td><td rowspan="4">≤ 3%</td><td>≤ 6% 1206 ≥ 0.47μF</td></tr><tr><td>≤ 7% 1812 ≥ 4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF</td></tr><tr><td>≤ 7.5% 0603 ≥ 0.068μF;0805 > 0.1μF;1206 ≥ 1μF;1210 ≥ 2.2μF</td></tr><tr><td>≤ 20% 0805 > 0.22μF;1210 ≥ 3.3μF</td></tr><tr><td rowspan="4">50V</td><td rowspan="4">≤ 3%</td><td>≤ 6% 0201(50V);0603 ≥ 0.047μF;0805 ≥ 0.18μF;1206 ≥ 0.47μF</td></tr><tr><td>≤ 7% 1812 ≥ 4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF</td></tr><tr><td>≤ 10% 0201 ≥ 0.01uF; 0402 ≥ 0.012μF;1210 ≥ 3.3μF</td></tr><tr><td>≤ 20% 0402 ≥ 0.047μF;0603>0.1μF;0805 ≥ 1μF(0805/X7R>0.47μF); 1206 ≥ 2.2μF;1210 ≥ 10μF;</td></tr><tr><td>35V</td><td>≤ 5%</td><td>≤ 20% 0603 ≥ 1μF;0805≥2.2μF;1206 ≥ 2.2μF;1210 ≥ 10μF</td></tr><tr><td rowspan="4">25V</td><td rowspan="4">≤ 5%</td><td>≤ 10% 0201 ≥ 0.01μF(0201/X5R=0.01μF;0805 ≥ 1μF;1210 ≥ 10μF*</td></tr><tr><td>≤ 14% 0603 ≥ 0.33μF</td></tr><tr><td>≤ 15% 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>≤ 20% 0402 ≥ 0.33μF</td></tr><tr><td>16V</td><td>≤ 5%</td><td>≤ 10% 0603 ≥ 0.15μF;0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF</td></tr><tr><td rowspan="4">10V</td><td rowspan="4">≤ 7.5%</td><td>≤ 15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF);0402 ≥ 0.033μF; 0603>0.47μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF</td></tr><tr><td>≤ 15% 0201 ≥ 0.012μF;0402 ≥ 0.22μF (0402/X7R ≥ 0.15μF); 0603 ≥ 0.33μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 22μF</td></tr><tr><td>≤ 20% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603/X5R ≥ 10μF;01R5/X5R</td></tr><tr><td>≤ 30% 0201 ≥ 0.1μF;0402 ≥ 1μF(0402/X6S ≥ 0.47μF); 0603 ≥ 10μF;0805 ≥ 4.7μF;1206 ≥ 47μF;1210 ≥ 100μF</td></tr><tr><td>4V</td><td>≤ 20%</td><td>---</td></tr></table> *I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. Class II (X7R, X5R) <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 ; All X6S/X7S items; Size≥1812</td></tr></table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 100V	≤ 3%	≤ 6% 1206 ≥ 0.47μF	≤ 7% 1812 ≥ 4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF	≤ 7.5% 0603 ≥ 0.068μF;0805 > 0.1μF;1206 ≥ 1μF;1210 ≥ 2.2μF	≤ 20% 0805 > 0.22μF;1210 ≥ 3.3μF	50V	≤ 3%	≤ 6% 0201(50V);0603 ≥ 0.047μF;0805 ≥ 0.18μF;1206 ≥ 0.47μF	≤ 7% 1812 ≥ 4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF	≤ 10% 0201 ≥ 0.01uF; 0402 ≥ 0.012μF;1210 ≥ 3.3μF	≤ 20% 0402 ≥ 0.047μF;0603>0.1μF;0805 ≥ 1μF(0805/X7R>0.47μF); 1206 ≥ 2.2μF;1210 ≥ 10μF;	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;TT series 0402 ≥ 0.10μF(0402/X7R ≥ 0.056μF);0805 ≥ 2.2μF; 1206 ≥ 4.7μF;1210 ≥ 22μF(1210/X5R ≥ 10μF)*	≤ 20% 0402 ≥ 0.33μF	16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF;0805 ≥ 0.68μF;1206 ≥ 2.2μF;1210 ≥ 4.7μF	10V	≤ 7.5%	≤ 15% 0201 ≥ 0.01μF(0201/X7R ≥ 0.022μF);0402 ≥ 0.033μF; 0603>0.47μF;0805 ≥ 2.2μF;1206 ≥ 4.7μF;1210 ≥ 22μF	≤ 15% 0201 ≥ 0.012μF;0402 ≥ 0.22μF (0402/X7R ≥ 0.15μF); 0603 ≥ 0.33μF;0805 ≥ 2.2μF;1206 ≥ 2.2μF;1210 ≥ 22μF	≤ 20% 0201 ≥ 0.1μF;0402 ≥ 1μF;0603/X5R ≥ 10μF;01R5/X5R	≤ 30% 0201 ≥ 0.1μF;0402 ≥ 1μF(0402/X6S ≥ 0.47μF); 0603 ≥ 10μF;0805 ≥ 4.7μF;1206 ≥ 47μF;1210 ≥ 100μF	4V	≤ 20%	---	Rated voltage	Insulation Resistance	100V: All X7R;1210≥3.3μF	500MΩ or RxC ≥ 5 Ω-F whichever is smaller.	50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF	35V:0603≥1μF;0805≥2.2μF; 1206 ≥ 2.2μF;1210 ≥ 10μF	25V:0201 ≥ 0.1uF; 0402≥0.22μF; 0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	16V: 0201 ≥ 0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF	10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF	6.3V ; 4V ; All X6S/X7S items; Size≥1812
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* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

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15.	High Temperature Load (Endurance)	Test temp. : NP0, X7R: 125±3°C X5R, 85±3°C 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: ≥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%; Q/D.F. value: NP0: More than 30pF, Q≥350 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C X7R, X5R:																																																																																																																																																																																												
		<table><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr><tr><td>01R5</td><td>X5R</td><td>≤10V</td><td>C≥0.1μF</td></tr><tr><td rowspan="2">0201</td><td rowspan="2">X5R/X7R/ X6S/X7S</td><td>≤10V</td><td>C≥0.1μF</td></tr><tr><td>≥16V</td><td>C>0.1μF</td></tr><tr><td rowspan="4">0402</td><td rowspan="2">X5R</td><td>≤16V</td><td>C>1.0μF</td></tr><tr><td>25V,50V</td><td>C≥1.0μF</td></tr><tr><td rowspan="2">X6S</td><td>6.3V,10V</td><td>C>1.0μF</td></tr><tr><td>16V,25V</td><td>C≥1.0μF</td></tr><tr><td rowspan="4">0603</td><td rowspan="2">X7R/X7S</td><td>6.3V,10V</td><td>C≥1.0μF</td></tr><tr><td>4V</td><td>C≥22μF</td></tr><tr><td rowspan="2">X5R/X7R/ X6S/X7S</td><td>6.3V,10V</td><td>C≥4.7μF^{*1}</td></tr><tr><td>25V</td><td>C≥1.0μF</td></tr><tr><td rowspan="6">0805</td><td rowspan="4">X5R/X7R/ X6S/X7S</td><td>35V</td><td>C≥1.0μF</td></tr><tr><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">X6S</td><td>16V</td><td>C>10μF</td></tr><tr><td>25V</td><td>C≥10μF</td></tr><tr><td>1206</td><td>X5R/X7R/X6S</td><td>16V,25V</td><td>C≥10μF</td></tr><tr><td rowspan="2">1210</td><td>X5R/X7R/X6S</td><td>16V</td><td>C≥22μF</td></tr><tr><td>X7R</td><td>100V</td><td>C≥47μF</td></tr><tr><td>TT15</td><td>X5R</td><td>100V</td><td>C≥3.3μF</td></tr><tr><td>TT21</td><td>X5R</td><td>6.3V</td><td>C>1.0μF</td></tr><tr><td>TT21</td><td>X5R/X7R/X6S</td><td>≤10V</td><td>C≥10μF</td></tr></table> **1WV items must follow de-rating conditions. #1. 0603X106/475(10V)&0603S106(4V&6.3V): 150% of rated voltage (2) 150% of rated voltage for below range. <table><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr><tr><td rowspan="2">0201</td><td>X5R/X6S</td><td>16V,25V</td><td>C=0.1μF</td></tr><tr><td>X7R</td><td>16V</td><td>C≥0.022μF</td></tr><tr><td rowspan="2">0402</td><td>X7R/X5R/ X6S</td><td>50V</td><td>C>0.01μF</td></tr><tr><td>X6S</td><td>10~25V</td><td>C≥0.22μF</td></tr><tr><td rowspan="6">0603</td><td rowspan="2">X7S</td><td>50V~100V</td><td>C>0.22μF</td></tr><tr><td>50V</td><td>C>0.1μF</td></tr><tr><td rowspan="2">X7R</td><td>25V</td><td>C=1.0μF</td></tr><tr><td>50V</td><td>C≥1.0μF</td></tr><tr><td rowspan="2">X5R</td><td>50V</td><td>C≥1.0μF</td></tr><tr><td>X7R/X5R/ X6S/X7S</td><td>10V,16V</td><td>C≥1.0μF</td></tr><tr><td rowspan="4">0805</td><td rowspan="2">X5R/X7R/ X6S/X7S</td><td>100V</td><td>C≥0.47μF</td></tr><tr><td>50V</td><td>C≥0.68μF</td></tr><tr><td rowspan="2">X7R</td><td>35V</td><td>C≥2.2μF</td></tr><tr><td>10~25V</td><td>C≥4.7μF</td></tr><tr><td rowspan="3">1206</td><td rowspan="2">X7R</td><td>100V</td><td>C≥1.0μF</td></tr><tr><td>50V</td><td>C≥2.2μF</td></tr><tr><td>X5R/X6S/ X7S</td><td>100V</td><td>C>1.0μF</td></tr><tr><td rowspan="2">1210</td><td>X5R/X7R/ X6S/X7S</td><td>50V</td><td>C=4.7μF</td></tr><tr><td>X5R/X7R/ X6S/X7S</td><td>50V~100V</td><td>C≥2.2μF</td></tr><tr><td>1812</td><td>X7R</td><td>≤50V</td><td>C≥4.7μF</td></tr><tr><td>1825 2220 2225</td><td>X7R</td><td>100V</td><td>C≥1.0μF</td></tr></table> (3) ≤6.3V or C≥10μF : 150% of rated voltage. (4) 10V~250V: 200% of rated voltage. Excluding:1812N104/(250V):100% of rated voltage. (5) 400V~450V: 120% of rated voltage. (6) 500V: 150% of rated voltage. (7) 630V~3000V: 120% of rated voltage. Excluding 1808B102(T:1.25mm)/(3kV) & 1210B103(2KV) :110% of rated voltage. 1210N333(1KV) & 1812N472~562(1KV) :100% of rated voltage. (8) Ur=3.5KV & 4KV: 110% of rated voltage. * Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	Size	Dielectric	Rated voltage	Capacitance range	01R5	X5R	≤10V	C≥0.1μF	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	0603	X7R/X7S	6.3V,10V	C≥1.0μF	4V	C≥22μF	X5R/X7R/ X6S/X7S	6.3V,10V	C≥4.7μF ^{*1}	25V	C≥1.0μF	0805	X5R/X7R/ X6S/X7S	35V	C≥1.0μF	4V	C≥47μF	6.3V	C≥22μF	10V,50V	C≥10μF	X6S	16V	C>10μF	25V	C≥10μF	1206	X5R/X7R/X6S	16V,25V	C≥10μF	1210	X5R/X7R/X6S	16V	C≥22μF	X7R	100V	C≥47μF	TT15	X5R	100V	C≥3.3μF	TT21	X5R	6.3V	C>1.0μF	TT21	X5R/X7R/X6S	≤10V	C≥10μF	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R/X6S	16V,25V	C=0.1μF	X7R	16V	C≥0.022μF	0402	X7R/X5R/ X6S	50V	C>0.01μF	X6S	10~25V	C≥0.22μF	0603	X7S	50V~100V	C>0.22μF	50V	C>0.1μF	X7R	25V	C=1.0μF	50V	C≥1.0μF	X5R	50V	C≥1.0μF	X7R/X5R/ X6S/X7S	10V,16V	C≥1.0μF	0805	X5R/X7R/ X6S/X7S	100V	C≥0.47μF	50V	C≥0.68μF	X7R	35V	C≥2.2μF	10~25V	C≥4.7μF	1206	X7R	100V	C≥1.0μF	50V	C≥2.2μF	X5R/X6S/ X7S	100V	C>1.0μF	1210	X5R/X7R/ X6S/X7S	50V	C=4.7μF	X5R/X7R/ X6S/X7S	50V~100V	C≥2.2μF	1812	X7R	≤50V	C≥4.7μF	1825 2220 2225	X7R	100V	C≥1.0μF	<table><tr><th>Rated vol.</th><th>D.F. ≤</th><th>Exception of D.F. ≤</th></tr><tr><td rowspan="5">≥100V</td><td rowspan="5">≤3%</td><td>≤6% 1206≥0.47μF</td></tr><tr><td>≤7% 1812≥4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF</td></tr><tr><td>≤7.5% 0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF</td></tr><tr><td>≤20% 0805>0.22μF;1210≥3.3μF</td></tr><tr><td>≤6% 0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF</td></tr><tr><td rowspan="5">50V</td><td rowspan="5">≤3%</td><td>≤7% 1812≥4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF</td></tr><tr><td>≤10% 0201≥0.01μF; 0402≥0.012μF;1210≥3.3μF</td></tr><tr><td>≤20% 0402≥0.047μF;0603>0.1μF;0805≥1μF(0805/X7R>0.47μF); 1206≥2.2μF;1210≥10μF;</td></tr><tr><td>≤35V</td><td>≤5%</td><td>≤20% 0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF ≤10% 0201≥0.01μF(0201/X5R=0.01μF;0805≥1μF;1210≥10μF*) ≤14% 0603≥0.33μF</td></tr><tr><td rowspan="3">25V</td><td rowspan="3">≤5%</td><td>≤15% 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)* ≤20% 0402≥0.33μF</td></tr><tr><td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10% 0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF ≤15% 0201≥0.01μF(0201/X7R≥0.022μF);0402≥0.033μF; 0603>0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15% 0201≥0.012μF;0402≥0.22μF (0402/X7R≥0.15μF); 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF ≤20% 0201≥0.1μF;0402≥1μF;0603/X5R≥10μF;01R5/X5R</td></tr><tr><td rowspan="2">6.3V</td><td rowspan="2">≤15%</td><td>≤30% 0201≥0.1μF;0402≥1μF(0402/X6S≥0.47μF); 0603≥10μF;0805≥4.7μF;1206≥47μF;1210≥100μF</td></tr><tr><td>4V</td><td>≤20%</td><td>--</td></tr></table> *I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller. Class II (X7R, X5R) <table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="6">1GΩ or RxC≥10 Ω-F whichever is smaller.</td></tr><tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr><tr><td>35V:0603≥1μF;0805≥2.2μF; 1206≥2.2μF;1210≥10μF</td></tr><tr><td>25V:0201≥0.1μF; 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 ; All X6S/X7S items; Size≥1812</td><td></td></tr></table> ** De-rating conditions: The general MLCC products are designed for use in devices with a typical lifetime around 10 years. The general MLCC products are designed so that the useful lifetime can be extended longer than 10 years under the following conditions: 「80% of the rated voltage or less, Maximum operating temperature -20 degree C or less」 Extended useful lifetime, under specific operating conditions, can be estimated from the chart. ※The useful lifetime is the time when cumulative failure rate becomes 1%. ※Please note that the useful lifetime data is for reference only and not guaranteed.	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥100V	≤3%	≤6% 1206≥0.47μF	≤7% 1812≥4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF	≤7.5% 0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF	≤20% 0805>0.22μF;1210≥3.3μF	≤6% 0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF	50V	≤3%	≤7% 1812≥4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF	≤10% 0201≥0.01μF; 0402≥0.012μF;1210≥3.3μF	≤20% 0402≥0.047μF;0603>0.1μF;0805≥1μF(0805/X7R>0.47μF); 1206≥2.2μF;1210≥10μF;	≤35V	≤5%	≤20% 0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF ≤10% 0201≥0.01μF(0201/X5R=0.01μF;0805≥1μF;1210≥10μF*) ≤14% 0603≥0.33μF	25V	≤5%	≤15% 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)* ≤20% 0402≥0.33μF	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	10V	≤7.5%	≤15% 0201≥0.012μF;0402≥0.22μF (0402/X7R≥0.15μF); 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF ≤20% 0201≥0.1μF;0402≥1μF;0603/X5R≥10μF;01R5/X5R	6.3V	≤15%	≤30% 0201≥0.1μF;0402≥1μF(0402/X6S≥0.47μF); 0603≥10μF;0805≥4.7μF;1206≥47μF;1210≥100μF	4V	≤20%	--	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≥0.1μF; 0402≥0.22μF; 0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	16V: 0201≥0.1μF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF	10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF	6.3V : 4V ; All X6S/X7S items; Size≥1812	
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50V	≤3%	≤7% 1812≥4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF																																																																																																																																																																																													
		≤10% 0201≥0.01μF; 0402≥0.012μF;1210≥3.3μF																																																																																																																																																																																													
		≤20% 0402≥0.047μF;0603>0.1μF;0805≥1μF(0805/X7R>0.47μF); 1206≥2.2μF;1210≥10μF;																																																																																																																																																																																													
		≤35V	≤5%	≤20% 0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF ≤10% 0201≥0.01μF(0201/X5R=0.01μF;0805≥1μF;1210≥10μF*) ≤14% 0603≥0.33μF																																																																																																																																																																																											
		25V	≤5%	≤15% 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)* ≤20% 0402≥0.33μF																																																																																																																																																																																											
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																																																																																																																																																																																											
				10V	≤7.5%	≤15% 0201≥0.012μF;0402≥0.22μF (0402/X7R≥0.15μF); 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF ≤20% 0201≥0.1μF;0402≥1μF;0603/X5R≥10μF;01R5/X5R																																																																																																																																																																																									
6.3V	≤15%	≤30% 0201≥0.1μF;0402≥1μF(0402/X6S≥0.47μF); 0603≥10μF;0805≥4.7μF;1206≥47μF;1210≥100μF																																																																																																																																																																																													
		4V	≤20%	--																																																																																																																																																																																											
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≥0.1μF; 0402≥0.22μF; 0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF																																																																																																																																																																																															
16V: 0201≥0.1μF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF																																																																																																																																																																																															
10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF																																																																																																																																																																																															
6.3V : 4V ; All X6S/X7S items; Size≥1812																																																																																																																																																																																															

* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

Multilayer Ceramic Capacitors

APPENDIXES

■ Tape & reel dimensions

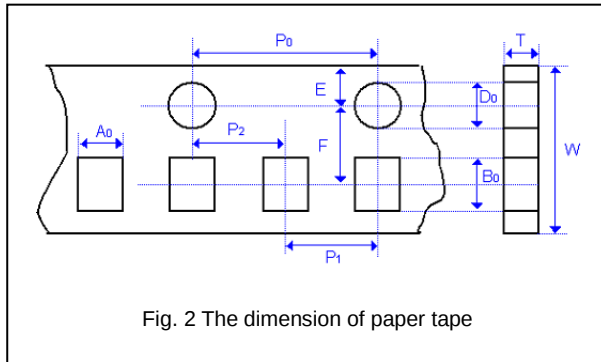


Fig. 2 The dimension of paper tape

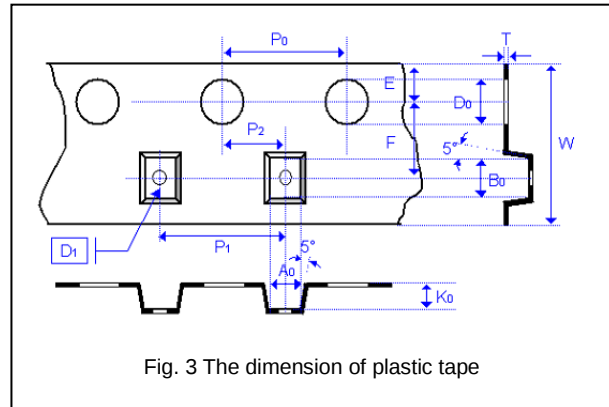


Fig. 3 The dimension of plastic tape

Size	0201	0402	0603	0805			1206			1210				1808		1812		
Thickness	L	N,E	S,H,X	A,H	B,T	D,I	B,T	C,J,D	G,P	T	C,D	G,K	M	D,F	G,K	D,F	G,K	M,U
A ₀	0.40 +/-0.10	0.70 +/-0.20	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	<1.80	1.90 +/-0.50	<2.00	<2.30	<3.05	<3.05	<3.05	<3.20	<2.50	<2.50	<3.90	<3.90	<3.90
B ₀	0.70 +/-0.10	1.20 +/-0.20	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	<2.70	3.50 +/-0.50	<3.70	<4.00	<3.80	<3.80	<3.80	<4.00	<5.30	<5.30	<5.30	<5.30	<5.30
T	≤0.55	≤0.80	≤1.20	≤1.15	≤1.20	0.23 +/-0.1	≤1.20	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1
K ₀	-	-	-	-	-	<2.00	-	<2.00	<2.50	<1.50	<2.00	<2.50	<3.20	<2.00	<2.50	<2.00	<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	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
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
10xP ₀	40.00 +/-0.10	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	40.00 +/-0.20	40.00 +/-0.20
P ₁	2.00 +/-0.05	2.00 +/-0.05	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	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 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05
D 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	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-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
F	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	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

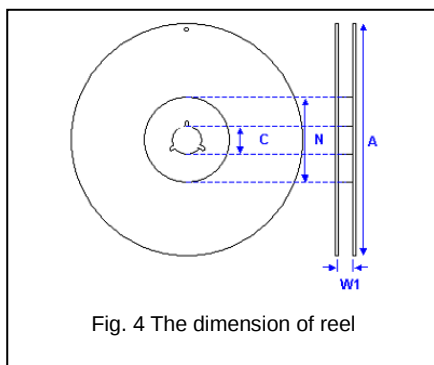
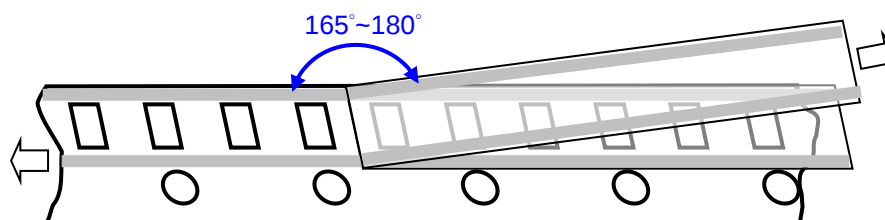


Fig. 4 The dimension of reel

Size	0201, 0402, 0603, 0805, 1206, 1210	1812
Reel size	7"	7"
C	13.0±0.5	13.0±0.5
W ₁	10.0±1.5	10.0±1.5
A	178.0±2.0	178.0±2.0
N	60.0+1.0/-0	60.0+1.0/-0

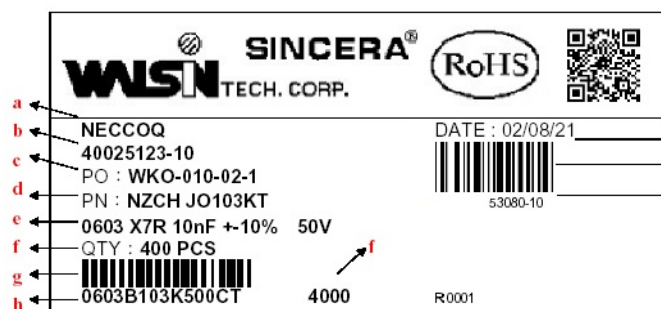
■ Peeling force (EIA-481)

Peel-off force should be in the range of 10 grams to 100 grams at a peel-off speed of 300±10 mm/min.



Multilayer Ceramic Capacitors

Example 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

*Customized label is available upon request

Constructions

No.	Name	NP0,	X7R, X5R
①	Ceramic material	CaZrO ₃ based	BaTiO ₃ based
②	Inner electrode	Ni	
③	Termination	Inner layer	Cu
④		Middle layer	Ni
⑤		Outer layer	Sn (Matt)

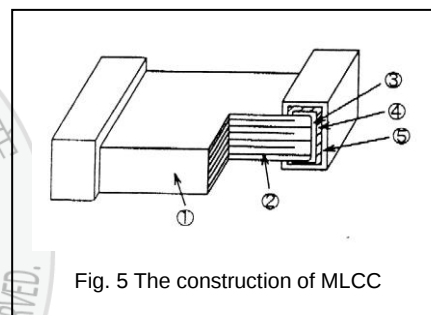


Fig. 5 The construction of MLCC

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.

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 N₂ within oven are recommended.

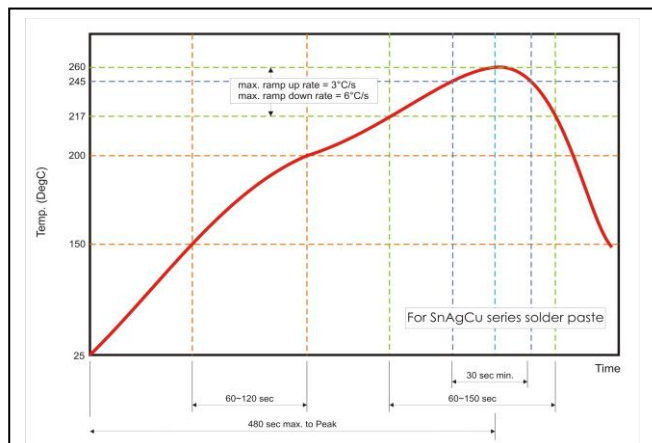


Fig. 5 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

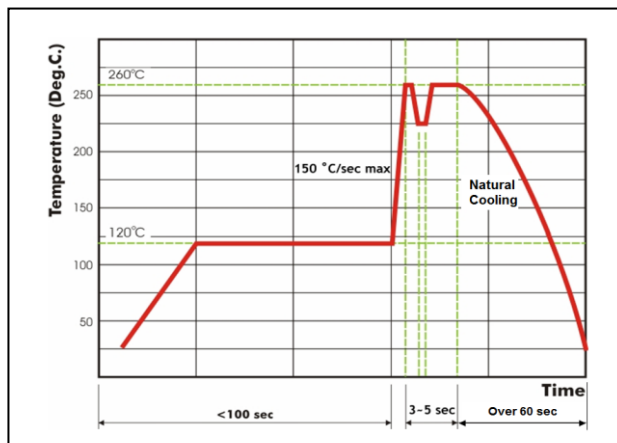


Fig. 6 Recommended wave soldering profile for SMT process with SnAgCu series solder.

