

APPROVAL SHEET

MULTILAYER CERAMIC CAPACITORS

General Purpose Series (4V to 100V)

0201 to 1812 Sizes

NP0, X7R, X6S, X7S & X5R Dielectrics

Halogen Free & RoHS Compliance



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

Multilayer Ceramic Capacitors

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 MLCC is made by NP0, X7R, X6S and X5R dielectric material and which provides product with high electrical precision, stability and reliability.

2. FEATURES

- a. A wide selection of sizes is available (0201 to 1812).
- b. High capacitance in given case size.
- c. Capacitor with lead-free termination (pure Tin).

3. APPLICATIONS

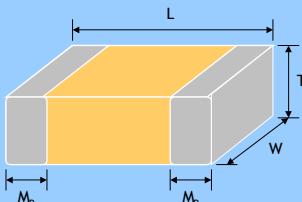
- a. For general digital circuit.
- b. For power supply bypass capacitors.
- c. For consumer electronics.
- d. For telecommunication.

4. HOW TO ORDER

1206	B	104	K	500	C	I
Size Inch (mm)	Dielectric N=NP0 (C0G)	Capacitance 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	Tolerance A=±0.05pF B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20% Z=-20/+80%	Rated voltage Two significant digits followed by no. of zeros. And R is in place of decimal point. 4R0=4 VDC 6R3=6.3 VDC 100=10 VDC 160=16 VDC 250=25 VDC 500L=50 VDC 101=100 VDC	Termination C=Cu/Ni/Sn	Packaging style T=7" reeled G=13" reeled
0201 (0603)						
0402 (1005)						
0603 (1608)						
0805 (2012)						
1206 (3216)						
1210 (3225)						
1812 (4532)						

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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	0.10±0.03
	0201 (0603)	0.6±0.03	0.3±0.03	0.3±0.03	L	0.15±0.05
		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}		0.15+0.1/-0.05
	0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05/-0.10
				0.50+0.02/-0.05	Q	
		1.00±0.20	0.50±0.20	0.5±0.20	E	
	0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S	0.40±0.15
		1.60+0.15/-0.10	0.80+0.15/-0.10	0.50±0.10	H	
				0.80+0.15/-0.10	X	
		1.60±0.20 ^{#1}	0.80±0.20 ^{#1}	0.8±0.20 ^{#1}		
	0805 (2012)	2.00±0.15	1.25±0.10	0.50±0.10	H	0.50±0.20
				0.60±0.10	A	
				0.80±0.10	B	
				1.25±0.10	D	
		2.00±0.20	1.25±0.20	0.85±0.10	T	
				1.25±0.20	I	
	1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B	0.60±0.20 (0.5±0.25)***
				0.95±0.10	C	
				1.25±0.10	D	
				1.15±0.15	J	
		3.20±0.20	1.60±0.20	1.60±0.20	G	
				0.85±0.10	T	
				1.60+0.30/-0.10	P	
				3.20+0.30/-0.1 ^{#5}		
				3.30+0.30/-0.1 ^{#5}		
	1210 (3225)	3.20±0.30	2.50±0.20	0.95±0.10	C	0.75±0.25
				0.85±0.10	T	
				1.25±0.10	D	
		3.20±0.40	2.50±0.30	1.60±0.20	G	
				2.00±0.20	K	
				2.50±0.30	M	
	1808 (4520)	4.50±0.40 (4.5+0.5/-0.3)**	2.03±0.25	2.50±0.50 ^{#4}	2.50±0.50 ^{#4}	0.75±0.25 (0.5±0.25)***
				1.25±0.10	D	
				1.40±0.15	F	
				1.60±0.20	G	
				2.00±0.20	K	
	1812 (4532)	4.50±0.40 (4.5+0.5/-0.3)**	3.20±0.30	1.25±0.10	D	0.75±0.25 (0.5±0.25)***
				1.60±0.20	G	
				2.00±0.20	K	
		3.20±0.40	3.20±0.30	2.50±0.30	M	
				2.80±0.30	U	
				2.80±0.30	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/ 0.1uF < Cap < 0.68uF products, Excluding 0201X334~474(≤6.3V) & 0201X224(≤10V).

#3: For 0201/Cap≥0.68μF products.

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

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

Multilayer Ceramic Capacitors

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X5R	X6S	X7S
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812				
Capacitance range*	0.1pF to 0.1μF	100pF to 47μF	100pF to 220μF	0.1μF to 100μF	0.1μF to 100μF
Capacitance tolerance**	Cap≤5pF ^{#1} : A ($\pm 0.05\text{pF}$), B ($\pm 0.1\text{pF}$), C ($\pm 0.25\text{pF}$) 5pF<Cap<10pF: C ($\pm 0.25\text{pF}$), D ($\pm 0.5\text{pF}$) Cap≥10pF: F ($\pm 1\%$), G ($\pm 2\%$), J ($\pm 5\%$), K ($\pm 10\%$)	J ($\pm 5\%$), K ($\pm 10\%$), M ($\pm 20\%$)	K ($\pm 10\%$), M ($\pm 20\%$)	K ($\pm 10\%$), M ($\pm 20\%$)	K ($\pm 10\%$), M ($\pm 20\%$)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	6.3V, 10V, 16V, 25V, 50V, 100V			
Operating temperature	-55 to +125°C		-55 to +85°C	-55 to +105°C	-55 to +125°C
Capacitance characteristic	±30ppm	±15%	±15%	±22%	±22%
Termination	Ni/Sn (lead-free termination)				

#1: NP0, 0.1pF product only provide B tolerance; 0603N0R3/0R4 provide B&C tolerance.

* 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

X7R/X6S/X5R/X7S: Please refer to page 13 "Reliability test conditions and requirements" for detail.

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



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7. CAPACITANCE RANGE

7-1. NPO Dielectric 0201, 0402, 0603, 0805 Sizes

Capacitance	DIELECTRIC	NPO															0805				
	SIZE	0201					0402					0603					0805				
	RATED VOLTAGE (VDC)	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
0.1pF (0R1)	L	L	L	L	L	N	N	N	N												
0.2pF (0R2)	L	L	L	L	L	N	N	N	N												
0.3pF (0R3)	L	L	L	L	L	N	N	N	N		S	S	S	S	S						
0.4pF (0R4)	L	L	L	L	L	N	N	N	N		S	S	S	S	S						
0.5pF (0R5)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
0.6pF (0R6)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
0.7pF (0R7)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
0.8pF (0R8)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
0.9pF (0R9)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
1.0pF (1R0)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
1.2pF (1R2)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
1.5pF (1R5)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
1.8pF (1R8)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
2.0pF (2R0)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
2.2pF (2R2)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
2.7pF (2R7)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
3.0pF (3R0)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
3.3pF (3R3)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
3.9pF (3R9)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
4.0pF (4R0)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
4.7pF (4R7)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
5.0pF (5R0)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
5.6pF (5R6)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
6.0pF (6R0)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
6.8pF (6R8)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
7.0pF (7R0)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
8.0pF (8R0)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
8.2pF (8R2)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
9.0pF (9R0)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
10pF (100)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
12pF (120)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
15pF (150)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
18pF (180)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
22pF (220)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
27pF (270)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
33pF (330)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
39pF (390)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
47pF (470)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
56pF (560)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
68pF (680)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
82pF (820)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
100pF (101)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
120pF (121)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
150pF (151)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
180pF (181)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
220pF (221)	L	L	L	L	L	N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
270pF (271)	L					N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
330pF (331)	L					N	N	N	N		S	S	S	S	S	S	A	A	A	A	A
390pF (391)	L					N	N	N	N		S	S	S	S	S	S	B	B	B	B	B
470pF (471)	L					N	N	N	N		S	S	S	S	S	S	B	B	B	B	B
560pF (561)	L					N	N	N	N		S	S	S	S	S	S	B	B	B	B	B
680pF (681)						N	N	N	N		S	S	S	S	S	S	B	B	B	B	B
820pF (821)						N	N	N	N		S	S	S	S	S	S	B	B	B	B	B
1,000pF (102)						N	N	N	N		S	S	S	S	S	S	B	B	B	B	B
1,200pF (122)											X	X	X	X	X		B	B	B	B	B
1,500pF (152)											X	X	X	X	X		B	B	B	B	B
1,800pF (182)											X	X	X	X	X		B	B	B	B	B
2,200pF (222)											X	X	X	X	X		B	B	B	B	B
2,700pF (272)											X	X	X	X	X		D	D	D	D	D
3,300pF (332)											X	X	X	X	X		D	D	D	D	D
3,900pF (392)											X	X	X	X	X		D	D	D	D	D
4,700pF (472)											X	X	X	X	X		D	D	D	D	D
5,600pF (562)											X	X	X	X	X		D	D	D	D	D
6,800pF (682)											X	X	X	X	X		D	D	D	D	D
8,200pF (822)											X	X	X	X	X		D	D	D	D	D
0.010uF (103)											X	X	X	X	X		D	D	D	D	D
0.012uF (123)																	D	D	D	D	D
0.015uF (153)																	D	D	D	D	D
0.018uF (183)																	D	D	D	D	D
0.022uF (223)																	D	D	D	D	D

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

2. The letter in cell with “*” mark is expressed capacitance tolerance “J” ($\pm 5\%$) only.

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

Multilayer Ceramic Capacitors

7-1. NP0 Dielectric 1206, 1210, 1812 Sizes

DIELECTRIC		NP0													
SIZE		1206					1210					1812			
RATED VOLTAGE (VDC)	10	16	25	50	100	10	16	25	50	100	16	25	50	100	
1.0pF (1R0)															
1.2pF (1R2)	B	B	B	B	B										
1.5pF (1R5)	B	B	B	B	B										
1.8pF (1R8)	B	B	B	B	B										
2.2pF (2R2)	B	B	B	B	B										
2.7pF (2R7)	B	B	B	B	B										
3.3pF (3R3)	B	B	B	B	B										
3.9pF (3R9)	B	B	B	B	B										
4.7pF (4R7)	B	B	B	B	B										
5.6pF (5R6)	B	B	B	B	B										
6.8pF (6R8)	B	B	B	B	B										
8.2pF (8R2)	B	B	B	B	B										
10pF (100)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
12pF (120)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
15pF (150)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
18pF (180)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
22pF (220)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
27pF (270)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
33pF (330)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
39pF (390)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
47pF (470)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
56pF (560)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
68pF (680)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
82pF (820)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
100pF (101)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
120pF (121)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
150pF (151)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
180pF (181)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
220pF (221)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
270pF (271)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
330pF (331)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
390pF (391)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
470pF (471)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
560pF (561)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
680pF (681)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
820pF (821)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
1.000pF (102)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
1,200pF (122)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
1,500pF (152)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
1,800pF (182)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
2,200pF (222)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
2,700pF (272)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
3,300pF (332)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
3,900pF (392)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
4,700pF (472)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
5,600pF (562)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	
6,800pF (682)	C	C	C	C	C	C	C	C	C	C	D	D	D	D	
8,200pF (822)	D	D	D	D	D	C	C	C	C	C	D	D	D	D	
0.010μF (103)	D	D	D	D	D	C	C	C	C	C	D	D	D	D	
0.012μF (123)	P	P	P	P	P	D	D	D	D	D	D	D	D	D	
0.015μF (153)	P	P	P	P	P	D	D	D	D	D	D	D	D	D	
0.018μF (183)	P	P	P	P	P	K	K	K	K	K	D	D	D	D	
0.022μF (223)	P	P	P	P	P	K	K	K	K	K	D	D	D	D	
0.027μF (273)	P	P	P	P		K	K	K	K	K	D	D	D	D	
0.033μF (333)	P	P	P	P	T	K	K	K	K	K	D	D	D	D	
0.039μF (393)	P	P	P	P		K	K	K	K	K	M	M	M	M	
0.047μF (473)	P	P	P	P		K	K	K	K	K	M	M	M	M	
0.056μF (563)	P	P	P	P							M	M	M	M	
0.068μF (683)	P	P	P	P							M	M	M	M	
0.082μF (823)	P	P	P	P							M	M	M	M	
0.1μF (104)	P	P	P	P	P						M	M	M	M	

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

2. The letter in cell with “*” mark is expressed capacitance tolerance “J” ($\pm 5\%$) only.

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

Multilayer Ceramic Capacitors

7-2. X7R Dielectric 0201, 0402, 0603, 0805 Sizes

DIELECTRIC		X7R																							
SIZE		0201					0402					0603					0805								
RATED VOLTAGE (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	6.3	10	16	25	50	100	
Capacitance	100pF (101)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	120pF (121)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	150pF (151)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	180pF (181)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	220pF (221)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	270pF (271)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	330pF (331)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	390pF (391)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	470pF (471)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	560pF (561)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	680pF (681)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	820pF (821)		L	L	L		N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	1,000pF (102)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	1,200pF (122)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	1,500pF (152)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	1,800pF (182)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	2,200pF (222)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	2,700pF (272)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	3,300pF (332)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	3,900pF (392)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	4,700pF (472)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	5,600pF (562)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	6,800pF (682)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	8,200pF (822)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	0.010μF (103)	L	L	L	L	L	N	N	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	
	0.012μF (123)						N	N	N	N	N	N	S	S	S	S	S	X	B	B	B	B	B	B	
	0.015μF (153)						N	N	N	N	N	N	S	S	S	S	S	X	B	B	B	B	B	B	
	0.018μF (183)						N	N	N	N	N	N	S	S	S	S	S	X	B	B	B	B	B	B	
	0.022μF (223)	L	L				N	N	N	N	N	N	S	S	S	S	S	X	B	B	B	B	B	B	
	0.027μF (273)						N	N	N	N	N	N	S	S	S	S	S	X	B	B	B	B	D		
	0.033μF (333)						N	N	N	N	N	N	S	S	S	S	S	X	B	B	B	B	D		
	0.039μF (393)						N	N	N	N	N	N	S	S	S	S	S	X	B	B	B	B	D		
	0.047μF (473)						N	N	N	N	N	N	S	S	S	S	X	X	B	B	B	B	D		
	0.056μF (563)						N	N	N	E			S	S	S	S	X	X	B	B	B	B	D		
	0.068μF (683)						N	N	N	E			S	S	S	S	X	X	B	B	B	B	D		
	0.082μF (823)						N	N	N	E			S	S	S	S	X	X	B	B	B	B	D		
	0.10μF (104)						N	N	N	E			S	S	S	S	X	X	B	B	B	B	D		
	0.12μF (124)												S	S	X				B	B	B	B	I		
	0.15μF (154)												N	S	S	X	X		D	D	D	D	I		
	0.18μF (184)													S	S	X			D	D	D	D	I		
	0.22μF (224)												N	N	N	N	S	X		D	D	D	D	I	
	0.27μF (274)													X	X	X	X			D	D	D	I	I	
	0.33μF (334)													X	X	X	X	X		D	D	D	I	I	
	0.39μF (394)													X	X	X	X	X		D	D	D	I	I	
	0.47μF (474)												N	X	X	X	X	X		D	D	D	I	I	
	0.56μF (564)													X	X	X				D	D	D	D		
	0.68μF (684)													X	X	X				D	D	D	I		
	0.82μF (824)													X	X	X				D	D	D	D		
	1.0μF (105)												N		X	X	X	X	X	D	D	D	I		
	1.5μF (155)																			I	I	I			
	2.2μF (225)																		X	I	I	I	I	I	
	3.3μF (335)																		X	I	I	I	I	I	
	4.7μF (475)																			I	I	I	I	I	
	6.8μF (685)																								
	10μF (106)																			I	I	I	I*		
	22μF (226)																								

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

2. The letter in cell with “*” mark is expressed product not in 10% (code “K”) tolerance.

Multilayer Ceramic Capacitors

7-2. X7R Dielectric 1206, 1210, 1812 Sizes

Capacitance	DIELECTRIC	X7R																		
	SIZE	1206					1210					1812								
	RATED VOLTAGE (VDC)	6.3	10	16	25	35	50	100	6.3	10	16	25	35	50	100	10	16	25	50	100
	100pF (101)																			
	120pF (121)																			
	150pF (151)	B	B	B		B	B													
	180pF (181)	B	B	B		B	B													
	220pF (221)	B	B	B		B	B													
	270pF (271)	B	B	B		B	B													
	330pF (331)	B	B	B		B	B													
	390pF (391)	B	B	B		B	B													
	470pF (471)	B	B	B		B	B													
	560pF (561)	B	B	B		B	B													
	680pF (681)	B	B	B		B	B													
	820pF (821)	B	B	B		B	B													
	1,000pF (102)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	1,200pF (122)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	1,500pF (152)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	1,800pF (182)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	2,200pF (222)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	2,700pF (272)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	3,300pF (332)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	3,900pF (392)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	4,700pF (472)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	5,600pF (562)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	6,800pF (682)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	8,200pF (822)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.010μF (103)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.012μF (123)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.015μF (153)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.018μF (183)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.022μF (223)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.027μF (273)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.033μF (333)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.039μF (393)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.047μF (473)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.056μF (563)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.068μF (683)	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D	
	0.082μF (823)	B	B	B		B	D		C	C	C		C	C	D	D	D	D	D	
	0.10μF (104)	B	B	B		B	C		C	C	C		C	C	D	D	D	D	D	
	0.12μF (124)	B	B	B		B	D		C	C	C		C	C	D	D	D	D	D	
	0.15μF (154)	C	C	C		C	G		C	C	C		C	D	D	D	D	D	D	
	0.18μF (184)	C	C	C		C	G		C	C	C		C	D	D	D	D	D	D	
	0.22μF (224)	C	C	C		C	G		C	C	C		C	D	D	D	D	D	D	
	0.27μF (274)	C	C	C		D	G		C	C	C		C	G	D	D	D	D	D	
	0.33μF (334)	C	C	C		D	G		C	C	C		D	G	D	D	D	D	D	
	0.39μF (394)	C	C	J		P	G		C	C	C		D	M	D	D	D	D	D	
	0.47μF (474)	J	J	J		P	G		C	C	C		D	M	D	D	D	D	K	
	0.56μF (564)	J	J	J		P	P		D	D	D		D	M	D	D	D	D	K	
	0.68μF (684)	J	J	J		P	P		D	D	D		D	K	D	D	D	K	K	
	0.82μF (824)	J	J	J		P	P		D	D	D		D	K	D	D	D	K	K	
	1.0μF (105)	J	J	J		P	P		D	D	D		D	K	D	D	D	K	K	
	1.5μF (155)	J	J	J	P	P			G	G		M	M						K	
	2.2μF (225)	J	J	J	P	P	P		G	G		M	M				M	M		
	3.3μF (335)	P	P	P	P	P			G	G		M	M							
	4.7μF (475)	P	P	P	P	P			K	K	K	M	M							
	6.8μF (685)																			
	10μF (106)	P	P	P	P	P			K	K	K	M	M							
	22μF (226)	P	P	P*					M	M	M									
	47μF (476)								M	M										
	100μF (107)																			

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

2. The letter in cell with “*” mark is expressed product not in 10% (code “K”) tolerance.

Multilayer Ceramic Capacitors

7-3. X5R Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X5R															
Size		0201					0402					0603					
Rated Voltage (VDC)	6.3	10	16	25	50	4	6.3	10	16	25	50	4	6.3	10	16	25	50
Capacitance	100pF (101)		L	L	L												
	150pF (151)		L	L	L												
	220pF (221)		L	L	L												
	330pF (331)		L	L	L												
	470pF (471)		L	L	L												
	680pF (681)		L	L	L												
	820pF (821)		L	L	L												
	1,000pF (102)	L	L	L	L												
	1,500pF (152)	L	L	L													
	2,200pF (222)	L	L	L													
	2,700pF (272)	L	L	L													
	3,300pF (332)	L	L	L													
	4,700pF (472)	L	L	L													
	6,800pF (682)	L	L	L													
	0.010μF (103)	L	L	L	L	L											
	0.015μF (153)	L	L									N					
	0.022μF (223)	L	L	L	L							N					
	0.033μF (333)	L	L									N	N				
	0.047μF (473)	L	L	L	L			N	N	N	N	N					
	0.068μF (683)	L	L					N	N	N	N	E					
	0.082μF (823)	L	L					N	N	N	N	E					
	0.10μF (104)	L	L	L	L			N	N	N	N	N	E				
	0.15μF (154)							N	N	N	N	N	N				
	0.22μF (224)	L	L	L*				N	N	N	N	N	N	X	X	X	X
	0.33μF (334)	L						N	N	N	N	N	N	X	X	X	X
	0.47μF (474)	L	L					N	N	N	N	N	E	X	X	X	X
	0.68μF (684)							N	N	N	N	N	N	X	X	X	X
	0.82μF (824)							N	N	N	N	N	N	X	X	X	X
	1.0μF (105)	L	L*	L*				N	N	N	N	N	E	X	X	X	X
	1.5μF (155)													X	X		
	2.2μF (225)	L*	L*					N	N	E	E			X	X	X	X
	3.3μF (335)							N	E	E*				X	X		
	4.7μF (475)							P	P	P	P	P		X	X	X	X
	6.8μF (685)							P	P								
	10μF (106)							E*	E*	E*				X	X	X	X
	22μF (226)							E*	E*					X*	X*	X*	
	47μF (476)							P*						X*	X*		

Dielectric		X5R																	
Size		0805					1206					1210							
Rated Voltage (VDC)	4	6.3	10	16	25	50	4	6.3	10	16	25	50	4	6.3	10	16	25	35	50
Capacitance	1.0μF (105)		D	D	D	I							P						
	1.5μF (155)	I	I	I	I	I					J	J			K	K			
	2.2μF (225)	I	I	I	I	I				J	J	P	P		K	K			
	3.3μF (335)	I	I	I	I	I			P	P	P	P							
	4.7μF (475)	I	I	I	I	I	P	P	P	P	P	P		K	K	K			
	6.8μF (685)						P	P											
	10μF (106)	I	I	I	I	I	P	P	P	P	P	P	K	K	K	K	M	M	
	22μF (226)	I	I*	I*	I*	I*	P	P	P	P	P	P	M	M	M	M	M	M	
	47μF (476)	I*	I*	I*			P	P	P	P*			M	M	M	M	M*		
	100μF (107)	I*	I*				P						M*	M*	M*				
	220μF (227)						P*						M*	M*					

- The letter in cell is expressed the symbol of product thickness.
- The letter in cell with “*” mark is expressed product not in 10% (code “K”) tolerance.

Multilayer Ceramic Capacitors

7-4. X6S Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X6S																													
Size		0201					0402					0603					0805					1206					1210				
Rated Voltage (VDC)		4	6.3	10	16	25	6.3	10	16	25	4	6.3	10	16	25	4	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	0.10μF (104)	L	L	L	L	L	N																								
	0.15μF (154)																														
	0.22μF (224)	L	L*				N																								
	0.33μF (334)																														
	0.47μF (474)	L					N																								
	0.68μF (684)																														
	1.0μF (105)	L*	L*				N	N	N	E																					
	1.5μF (155)																														
	2.2μF (225)						E	E	E		X	X	X	X					I												
	3.3μF (335)																														
	4.7μF (475)						E	E			X	X	X	X	X				I	I	I	I	I								
	6.8μF (685)																														
	10μF (106)						E*				X*	X*	X*	X*		I	I	I	I	I			P								
	22μF (226)										X*	X*				I*	I*	I*	I*	I*		P	P*	P					M		
	47μF (476)															I*	I*					P					M	M	M		
	100μF (107)																										M*	M*			

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

2. The letter in cell with “*” mark is expressed product not in 10% (code “K”) tolerance.

7-5. X7S Dielectric 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X7S																													
Size		0201					0402					0603					0805					1206					1210				
Rated Voltage (VDC)		10V	6.3	10	16	25	6.3	10	16	25	10	16	25	50	100	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	
Capacitance	0.1μF (104)	L														I															
	1.0μF (105)		E																												
	1.5μF (155)																														
	2.2μF (225)	E	E								X																				
	3.3μF (335)										X	X				I															
	4.7μF (475)															I															
	6.8μF (685)																														
	10μF (106)																														
	22μF (226)																														
	47μF (476)																														
	100μF (107)																														

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

2. The letter in cell with “*” mark is expressed product not in 10% (code “K”) tolerance.

Multilayer Ceramic Capacitors

8. 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	15,000	70,000	-	-
	0.30±0.05 L	15,000	-	-	-
	0.30±0.09 L	15,000	-	-	-
0402 (1005)	0.50±0.05 N	10,000	50,000	-	-
	0.50+0.02/-0.05 Q	10,000	50,000	-	-
	0.50±0.20 E	10,000	-	-	-
0603 (1608)	0.50±0.10 H	4,000	-	-	-
	0.80±0.07 S	4,000	15,000	-	-
	0.80+0.15/-0.10 X	4,000	15,000	-	-
0805 (2012)	0.50±0.10 H	4,000	15,000	-	-
	0.60±0.10 A	4,000	15,000	-	-
	0.80±0.10 B	4,000	15,000	-	-
	0.85±0.10 T	4,000	15,000	-	-
	1.25±0.10 D	-	-	3,000	10,000
	1.25±0.20 I	-	-	3,000	10,000
1206 (3216)	0.80±0.10 B	4,000	15,000	-	-
	0.85±0.10 T	4,000	15,000	-	-
	0.95±0.10 C	-	-	3,000	10,000
	1.15±0.15 J	-	-	3,000	10,000
	1.25±0.10 D	-	-	3,000	10,000
	1.60±0.20 G	-	-	2,000	10,000
1210 (3225)	1.60+0.30/-0.10 P	-	-	2,000	9,000
	0.85±0.10 T	-	-	3,000	10,000
	0.95±0.10 C	-	-	3,000	10,000
	1.25±0.10 D	-	-	3,000	10,000
	1.60±0.20 G	-	-	2,000	-
	2.00±0.20 K	-	-	1,000	6,000
1808 (4520)	2.50±0.30 M	-	-	1,000	6,000
	1.25±0.10 D	-	-	2,000	10,000
	1.40±0.15 F	-	-	2,000	10,000
	1.60±0.20 G	-	-	2,000	8,000
1812 (4532)	2.00±0.20 K	-	-	1,000	6,000
	1.25±0.10 D	-	-	1,000	5,000
	1.60±0.20 G	-	-	1,000	-
	2.00±0.20 K	-	-	1,000	-
	2.50±0.30 M	-	-	500	3,000
	2.80±0.30 U	-	-	500	-

Unit: pieces

Multilayer Ceramic Capacitors

9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																																																																	
1.	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.																																																																																	
2.	Capacitance	*Test temp.: Room Temperature. *Class I: (NP0)	* Shall not exceed the limits given in the detailed spec.																																																																																	
3.	Q/D.F. (Dissipation Factor)	<p>≤1000pF, 1.0±0.2Vrms, 1MHz±10% >1000pF, 1.0±0.2Vrms, 1KHz±10%</p> <p>Class II: (X7R, X7E, X6S, X5R, X7S) $C \leq 10\mu F$, 1.0±0.2Vrms, 1KHz±10% ** $C > 10\mu F$, 0.5±0.2Vrms, 120Hz±20%</p> <p>** 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)</p> <p>#1 Excluding X5R/0201/105(6.3V); 225(10V), 0402X475M6R3 (1.0±0.2Vrms, 1KHz±10%)</p>	<p>NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3% 1206≥0.47μF</td> </tr> <tr> <td>≤ 5% 0603≥0.068μF; 0805>0.1μF; 1206≥1μF; 1210≥2.2μF;</td> </tr> <tr> <td>≤ 10% 0805>0.22μF; 1210≥3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3% 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤ 5% 0201≥0.01μF; 1210≥3.3μF</td> </tr> <tr> <td>≤ 10% 0402≥0.012μF; 0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="5">35V</td> <td rowspan="5">≤ 3.5%</td> <td>≤ 10% 0603≥1μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>≤ 5% 0201≥0.01μF; 0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>≤ 7% 0603≥0.33μF</td> </tr> <tr> <td>≤ 10% 0201≥0.1μF; 0402≥0.056μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td>≤ 12.5% 0402≥0.47μF</td> </tr> <tr> <td rowspan="5">25V</td> <td rowspan="5">≤ 3.5%</td> <td>≤ 5% 0201≥0.01μF; 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>≤ 10% 0201/X7R≥0.022μF; 0402≥0.15μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td>≤ 12.5% 0201≥0.012μF; 0402≥0.15μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>≤ 15% 0201≥0.1μF; 0402≥1μF</td> </tr> <tr> <td>≤ 20% 0201≥0.1μF; 0402≥1μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10% 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>≤ 15% 0201≥0.1μF; 0402≥1μF</td> </tr> <tr> <td rowspan="3">6.3V</td> <td rowspan="3">≤ 10%</td> <td>≤ 15% 0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>≤ 20% 0402≥2.2μF</td> </tr> <tr> <td>≤ 25% ---</td> </tr> <tr> <td>4V</td> <td>≤ 15%</td> <td>---</td> </tr> </tbody> </table> <p>X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3% 1206≥0.47μF</td> </tr> <tr> <td>≤ 5% 0603≥0.068μF; 0805>0.1μF; 1206≥1μF; 1210≥2.2μF</td> </tr> <tr> <td>≤ 10% 0805>0.22μF; 1210≥3.3μF</td> </tr> <tr> <td rowspan="5">50V</td> <td rowspan="5">≤ 2.5%</td> <td>≤ 3% 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤ 5% 0201≥0.01μF; 1210≥3.3μF</td> </tr> <tr> <td>≤ 10% 0402≥0.012μF; 0603>0.1μF; 0805≥1μF; 1206≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>≤ 12.5% 1206≥10μF</td> </tr> <tr> <td>≤ 15% 0201≥0.012μF; 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td rowspan="5">35V</td> <td rowspan="5">≤ 3.5%</td> <td>≤ 10% 0603≥1μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>≤ 5% 0201≥0.01μF; 0805≥1μF</td> </tr> <tr> <td>≤ 7% 0603≥0.33μF</td> </tr> <tr> <td>≤ 10% 0201≥0.01μF; 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td>≤ 12.5% 0402≥0.47μF; 0805≥10μF</td> </tr> <tr> <td rowspan="5">25V</td> <td rowspan="5">≤ 3.5%</td> <td>≤ 5% 0201≥0.01μF; 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>≤ 10% 0201≥0.01μF; 0402≥0.22μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td>≤ 12.5% 0402≥1μF; 0805≥10μF</td> </tr> <tr> <td>≤ 15% 0201≥0.012μF; 0402≥0.22μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF; 01R5/X5R</td> </tr> <tr> <td>≤ 20% 0201≥0.1μF; 0402≥1μF; 0603≥10μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10% 0201≥0.012μF; 0402≥0.22μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF; 01R5/X5R</td> </tr> <tr> <td>≤ 12.5% 0805≥10μF</td> </tr> <tr> <td>≤ 15% 0201≥0.1μF; 0402≥1μF; 0603≥10μF</td> </tr> <tr> <td rowspan="3">6.3V</td> <td rowspan="3">≤ 10%</td> <td>≤ 15% 0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>≤ 20% 0402≥2.2μF</td> </tr> <tr> <td>≤ 25% ---</td> </tr> <tr> <td>4V</td> <td>≤ 15%</td> <td>---</td> </tr> </tbody> </table>	Rated vol.	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* "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		
	Q/D.F. (Dissipation Factor)	X6S:			
		Rated vol.	D.F. \leq	Exception of D.F. \leq	
		100V	2.5%	$\leq 3\%$	1206 $\geq 0.47\mu F$
				$\leq 5\%$	0603 $\geq 0.068\mu F$; 0805 $> 0.1\mu F$; 1206 $\geq 1\mu F$; 1210 $\geq 2.2\mu F$
				$\leq 10\%$	0805 $> 0.22\mu F$; 1210 $\geq 3.3\mu F$
		50V	2.5%	$\leq 3\%$	0201(50V); 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$
				$\leq 5\%$	0201 $\geq 0.01\mu F$; 1210 $\geq 3.3\mu F$
				$\leq 10\%$	0402 $\geq 0.012\mu F$; 0603 $> 0.1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 2.2\mu F$
		35V	3.5%	$\leq 10\%$	0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$
				$\leq 5\%$	0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$
		25V	3.5%	$\leq 7\%$	0603 $\geq 0.33\mu F$
				$\leq 10\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$
				$\leq 12.5\%$	0402 $\geq 0.47\mu F$; 0805 $= 10\mu F$
		16V	3.5%	$\leq 5\%$	0201 $\geq 0.01\mu F$; 0402 $\geq 0.033\mu F$; 0603 $\geq 0.15\mu F$; 0805 $\geq 0.68\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 4.7\mu F$
				$\leq 10\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 0.22\mu F$; 0603 $> 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$
				$\leq 12.5\%$	0402 $\geq 0.47\mu F$; 0805 $\geq 10\mu F$
		10V	5%	$\leq 10\%$	0201 $\geq 0.012\mu F$; 0402 $\geq 0.22\mu F$; 0603 $\geq 0.33\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 22\mu F$
				$\leq 12.5\%$	0805 $\geq 10\mu F$
				$\leq 15\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 1\mu F$
		6.3V	10%	$\leq 15\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 0.47\mu F$; 0603 $\geq 10\mu F$; 0805 $\geq 4.7\mu F$; 1206 $\geq 47\mu F$; 1210 $\geq 100\mu F$
				$\leq 20\%$	0402 $\geq 2.2\mu F$
		4V	15%	---	---
		X7S:			
		Rated vol.	D.F. \leq	Exception of D.F. \leq	
		100V	2.5%	$\leq 3\%$	1206 $\geq 0.47\mu F$
				$\leq 5\%$	0603 $\geq 0.068\mu F$; 0805 $> 0.1\mu F$; 1206 $\geq 1\mu F$; 1210 $\geq 2.2\mu F$
				$\leq 10\%$	0805 $> 0.22\mu F$; 1210 $\geq 3.3\mu F$
		50V	2.5%	$\leq 3\%$	0201(50V); 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$
				$\leq 5\%$	0201 $\geq 0.01\mu F$; 1210 $\geq 3.3\mu F$
				$\leq 10\%$	0402 $\geq 0.012\mu F$; 0603 $> 0.1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$
		35V	3.5%	$\leq 10\%$	0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$
				$\leq 5\%$	0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$
		25V	3.5%	$\leq 7\%$	0603 $\geq 0.33\mu F$
				$\leq 10\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$
				$\leq 12.5\%$	0402 $\geq 0.47\mu F$
		16V	3.5%	$\leq 5\%$	0201 $\geq 0.01\mu F$; 0402 $\geq 0.033\mu F$; 0603 $\geq 0.15\mu F$; 0805 $\geq 0.68\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 4.7\mu F$
				$\leq 10\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 0.22\mu F$; 0603 $> 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$
				$\leq 15\%$	0201 $\geq 0.012\mu F$; 0402 $\geq 0.22\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 22\mu F$
		10V	5%	$\leq 10\%$	0201 $\geq 0.012\mu F$; 0402 $\geq 0.22\mu F$; 0603 $\geq 0.33\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 22\mu F$
				$\leq 15\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 1\mu F$
		6.3V	10%	$\leq 15\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 1\mu F$; 0603 $\geq 10\mu F$; 0805 $\geq 4.7\mu F$; 1206 $\geq 47\mu F$; 1210 $\geq 100\mu F$
				$\leq 20\%$	0402 $\geq 2.2\mu F$
		4V	15%	---	---
4.	Dielectric Strength	* To apply voltage ($\leq 100V$) 250%. * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.		

* "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																																											
5.	Insulation Resistance	*Test temp.: Room Temperature. *To apply rated voltage for MAX. 120sec.	10GΩ or $R_{xC} \geq 500\Omega \cdot F$ whichever is smaller. Class II (X7R, X7E, X5R, X6S, X7S) 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																																											
6.	Temperature Coefficient	With no electrical load. T.C. Operating Temp NPO -55~125°C at 25°C X7R -55~125°C at 25°C X7S -55 ~ 125°C at 25°C X5R -55~ 85°C at 25°C X6S -55~105°C at 25°C *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: <table border="1"> <tr><td>01005</td><td>0201</td></tr> <tr><td>Cap≤0.01μF: 0.5V</td><td>Cap<0.1μF: 1V</td></tr> <tr><td>Cap>0.01μF: 0.2V</td><td>0.1μF≤Cap<1μF: 0.2V*</td></tr> <tr><td></td><td>Cap≥1μF: 0.1V*</td></tr> <tr><td>*0201X104/6.3V~25V: 0.5V</td><td>*0201S104/6.3V~16V: 0.3V</td></tr> <tr><td>0201X224&474/10V: 0.5V</td><td>0201S224/6.3V: 0.3V</td></tr> <tr><td></td><td>0201X105/6.3V&10V: 0.3V</td></tr> <tr><td>0402</td><td>0603</td></tr> <tr><td>Cap<1μF: 1V</td><td>Cap<1μF: 1V</td></tr> <tr><td>Cap=1μF: 0.5V**</td><td>1μF≤Cap≤4.7μF: 0.5V</td></tr> <tr><td>0402B224-16V: 0.5V</td><td>0603X106-10V: 0.5V</td></tr> <tr><td>0402B474-10V: 0.5V</td><td></td></tr> <tr><td>0402X475M6R3: 0.5V</td><td></td></tr> <tr><td>1μF<Cap<10μF: 0.2V</td><td>Cap>4.7μF: 0.2V</td></tr> <tr><td>**0402B105M6R3V: 0.2V</td><td></td></tr> <tr><td>Cap≥10μF: 0.1V</td><td></td></tr> <tr><td>0805</td><td>1206/1210</td></tr> <tr><td>Cap<10μF: 1V</td><td>Cap≤10μF: 1V</td></tr> <tr><td>Cap=10μF: 0.5V</td><td>10μF<Cap≤100μF: 0.5V</td></tr> <tr><td>0805B475/6.3V~25V: 0.5V</td><td></td></tr> <tr><td>Cap>10μF: 0.2V</td><td>Cap>100μF: 0.2V</td></tr> <tr><td></td><td>1206X107-6.3V: 0.2V</td></tr> </table>	01005	0201	Cap≤0.01μF: 0.5V	Cap<0.1μF: 1V	Cap>0.01μF: 0.2V	0.1μF≤Cap<1μF: 0.2V*		Cap≥1μF: 0.1V*	*0201X104/6.3V~25V: 0.5V	*0201S104/6.3V~16V: 0.3V	0201X224&474/10V: 0.5V	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	0402B224-16V: 0.5V	0603X106-10V: 0.5V	0402B474-10V: 0.5V		0402X475M6R3: 0.5V		1μF<Cap<10μF: 0.2V	Cap>4.7μF: 0.2V	**0402B105M6R3V: 0.2V		Cap≥10μF: 0.1V		0805	1206/1210	Cap<10μF: 1V	Cap≤10μF: 1V	Cap=10μF: 0.5V	10μF<Cap≤100μF: 0.5V	0805B475/6.3V~25V: 0.5V		Cap>10μF: 0.2V	Cap>100μF: 0.2V		1206X107-6.3V: 0.2V
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* "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															
7.	Adhesive Strength of Termination	* Pressurizing force : 2N (0201) and 5N (\leq 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 * Dipping time: 2±0.5 sec.	95% min. coverage of all metallized 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, X6S, X7S: 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, X6S, X7S: within ±7.5% * 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 border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2-3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2-3</td> </tr> </tbody> </table> * Before initial measurement (Class II only): 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, X6S, X7S: within ±7.5% * Q/D.F., I.R. and dielectric strength: To meet initial requirements.
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1	Min. operating temp. +0/-3	30±3																
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4	Room temp.	2-3																

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

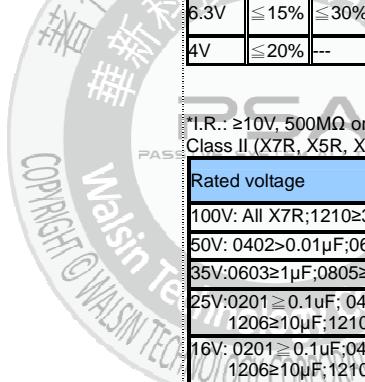
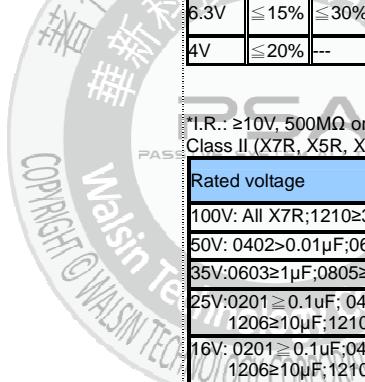
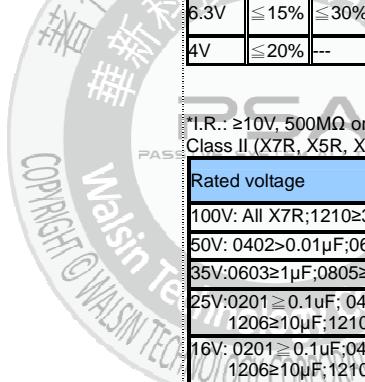
Multilayer Ceramic Capacitors

No.	Item	Test Condition	Requirements																																								
13.	Humidity (Damp Heat) Steady State	<p>* Test temp.: 40±2°C * Humidity: 90~95%RH * Test time: 500+24~0hrs. * 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.</p>	<p>* No remarkable damage. * Cap change: NPO: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S, X7S: ≥10V*: within ±12.5%; ≤6.3V within ±25%; **10V: 0603≥4.7μF; 0402≥1μF; 0201≥0.1μF, within ±25%; * Q/D.F. value: NPO: More than 30pF Q≥350, 10pF≤C<30pF, Q≥275+2.5C Less than 10pF Q≥200+10C X7R, X5R, X6S, X7S:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 100V</td> <td>≤ 3%</td> <td>≤ 6% 1206≥0.47μF ≤ 7.5% 0603≥0.068μF; 0805≥0.1μF; 1206≥1μF; 1210≥2.2μF ≤ 20% 0805≥0.22μF; 1210≥3.3μF</td> </tr> <tr> <td>50V</td> <td>≤ 3%</td> <td>≤ 6% 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF ≤ 10% 0201≥0.01μF; 1210≥3.3μF ≤ 20% 0402≥0.012μF; 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>25V</td> <td>≤ 5%</td> <td>≤ 10% 0201≥0.01μF; 0805≥1μF; 1210≥10μF* ≤ 14% 0603≥0.33μF ≤ 15% 0201>0.01μF; 0402≥0.10μF(0402/X7R≥0.056μF); 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF(1210/X5R≥10μF)* ≤ 20% 0402≥0.47μF</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>10V</td> <td>≤ 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>6.3V</td> <td>≤ 15%</td> <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>4V</td> <td>≤ 20%</td> <td>≤ 20% 0201≥0.1μF; 0402≥1μF(0402/X6S≥0.47μF); 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td></td> <td></td> <td>---</td> </tr> </tbody> </table> <p>I.R.: ≥10V, 1GΩ or 50 Ω·F whichever is smaller. Class II (X7R, X5R, X6S, X7S)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210≥3.3μF</td> <td rowspan="7">1GΩ or $R \times C \geq 10$ 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> </tr> </tbody> </table>	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 ≤ 20% 0805≥0.22μF; 1210≥3.3μF	50V	≤ 3%	≤ 6% 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF ≤ 10% 0201≥0.01μF; 1210≥3.3μF ≤ 20% 0402≥0.012μF; 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; 0805≥1μF; 1210≥10μF* ≤ 14% 0603≥0.33μF ≤ 15% 0201>0.01μF; 0402≥0.10μF(0402/X7R≥0.056μF); 0603≥0.47μF; 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	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	6.3V	≤ 15%	≤ 15% 0201≥0.012μF; 0402≥0.22μF(0402/X7R≥0.15μF); 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	4V	≤ 20%	≤ 20% 0201≥0.1μF; 0402≥1μF(0402/X6S≥0.47μF); 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF			---	Rated voltage	Insulation Resistance	100V: All X7R; 1210≥3.3μF	1GΩ or $R \times C \geq 10$ 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
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 ≤ 20% 0805≥0.22μF; 1210≥3.3μF																																									
50V	≤ 3%	≤ 6% 0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF ≤ 10% 0201≥0.01μF; 1210≥3.3μF ≤ 20% 0402≥0.012μF; 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; 0805≥1μF; 1210≥10μF* ≤ 14% 0603≥0.33μF ≤ 15% 0201>0.01μF; 0402≥0.10μF(0402/X7R≥0.056μF); 0603≥0.47μF; 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																																									
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																																									
6.3V	≤ 15%	≤ 15% 0201≥0.012μF; 0402≥0.22μF(0402/X7R≥0.15μF); 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF																																									
4V	≤ 20%	≤ 20% 0201≥0.1μF; 0402≥1μF(0402/X6S≥0.47μF); 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF																																									

Rated voltage	Insulation Resistance																																										
100V: All X7R; 1210≥3.3μF	1GΩ or $R \times C \geq 10$ 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																																											
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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																																											

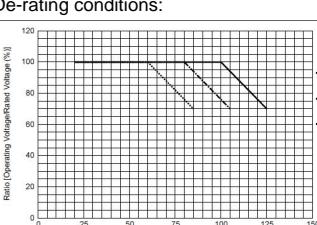
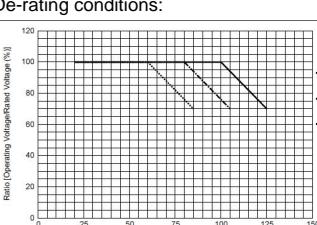
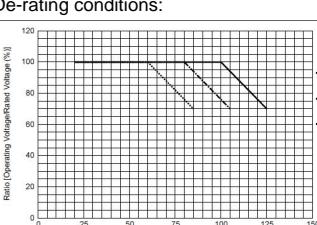
* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

Multilayer Ceramic Capacitors

No	Item	Test Condition	Requirements																																																																		
14	Humidity (Damp Heat) Load	<ul style="list-style-type: none"> * Test temp. : $40 \pm 2^\circ\text{C}$ * Humidity : 90~95%RH * Test time : 500+24/-0 hrs. * To apply voltage : <ul style="list-style-type: none"> 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. 	<p>* No remarkable damage. Cap change: NPO: $\pm 7.5\%$ or $0.75\mu\text{F}$ whichever is larger. X7R, X5R, X6S, X7S: $\geq 10\text{V}^{**}$, within $\pm 12.5\%$; $\leq 6.3\text{V}$ within $\pm 25\%$; $^{**} 10\text{V}: 0603 \geq 4.7\mu\text{F}; 0402 \geq 1\mu\text{F}; 0201 \geq 0.1\mu\text{F}$, within $\pm 25\%$;</p> <p>Q/D.F. value: NP0: $C \geq 30\text{pF}, Q \geq 200; C < 30\text{pF}, Q \geq 100 + 10/3C$ X7R, X5R, X6S, X7S:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #ADD8E6;">Rated vol.</th> <th style="background-color: #ADD8E6;">D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="3">$\geq 100\text{V}$</td> <td rowspan="3">$\leq 3\%$</td> <td>$\leq 6\%$</td> <td>$1206 \geq 0.47\mu\text{F}$</td> </tr> <tr> <td>$\leq 7.5\%$</td> <td>$0603 \geq 0.068\mu\text{F}; 0805 \geq 0.1\mu\text{F}; 1206 \geq 1\mu\text{F}; 1210 \geq 2.2\mu\text{F}$</td> </tr> <tr> <td>$\leq 20\%$</td> <td>$0805 \geq 0.22\mu\text{F}; 1210 \geq 3.3\mu\text{F}$</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">$\leq 3\%$</td> <td>$\leq 6\%$</td> <td>$0201(50\text{V}); 0603 \geq 0.047\mu\text{F}; 0805 \geq 0.18\mu\text{F}; 1206 \geq 0.47\mu\text{F}$</td> </tr> <tr> <td>$\leq 10\%$</td> <td>$0201 \geq 0.01\mu\text{F}; 1210 \geq 3.3\mu\text{F}$</td> </tr> <tr> <td>$\leq 20\%$</td> <td>$0402 \geq 0.012\mu\text{F}; 0603 > 0.1\mu\text{F}; 0805 \geq 1\mu\text{F}(0805/X7R > 0.47\mu\text{F}); 1206 \geq 2.2\mu\text{F}; 1210 \geq 10\mu\text{F}$</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">$\leq 5\%$</td> <td>$\leq 20\%$</td> <td>$0603 \geq 1\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 2.2\mu\text{F}; 1210 \geq 10\mu\text{F}$</td> </tr> <tr> <td>$\leq 10\%$</td> <td>$0201 \geq 0.01\mu\text{F}(0201/X5R = 0.01\mu\text{F}); 0805 \geq 1\mu\text{F}; 1210 \geq 10\mu\text{F}^*$</td> </tr> <tr> <td>$\leq 14\%$</td> <td>$0603 \geq 0.33\mu\text{F}$</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">$\leq 5\%$</td> <td>$\leq 15\%$</td> <td>$0201 \geq 0.1\mu\text{F}(0201/X5R > 0.01\mu\text{F}); 0603 \geq 0.47\mu\text{F}; \text{TT series}$</td> </tr> <tr> <td>$\leq 20\%$</td> <td>$0402 \geq 0.10\mu\text{F}(0402/X7R \geq 0.056\mu\text{F}); 0805 \geq 2.2\mu\text{F}; 1206 \geq 4.7\mu\text{F}; 1210 \geq 22\mu\text{F}(1210/X5R \geq 10\mu\text{F})^*$</td> </tr> <tr> <td>$\leq 25\%$</td> <td>$0402 \geq 0.47\mu\text{F}$</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">$\leq 5\%$</td> <td>$\leq 10\%$</td> <td>$0603 \geq 0.15\mu\text{F}; 0805 \geq 0.68\mu\text{F}; 1206 \geq 2.2\mu\text{F}; 1210 \geq 4.7\mu\text{F}$</td> </tr> <tr> <td>$\leq 15\%$</td> <td>$0201 \geq 0.01\mu\text{F}(0201/X7R \geq 0.022\mu\text{F}); 0402 \geq 0.033\mu\text{F}; 0603 > 0.47\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 4.7\mu\text{F}; 1210 \geq 22\mu\text{F}$</td> </tr> <tr> <td>$\leq 20\%$</td> <td>$0201 \geq 0.1\mu\text{F}; 0402 \geq 1\mu\text{F}; 0603/X5R \geq 10\mu\text{F}; 01R5/X5R$</td> </tr> <tr> <td>$10\text{V}$</td> <td>$\leq 7.5\%$</td> <td>$\leq 15\%$</td> <td>$0201 \geq 0.012\mu\text{F}; 0402 \geq 0.22\mu\text{F}(0402/X7R \geq 0.15\mu\text{F}); 0603 \geq 0.33\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 2.2\mu\text{F}; 1210 \geq 22\mu\text{F}$</td> </tr> <tr> <td>$6.3\text{V}$</td> <td>$\leq 15\%$</td> <td>$\leq 30\%$</td> <td>$0201 \geq 0.1\mu\text{F}; 0402 \geq 1\mu\text{F}(0402/X6S \geq 0.47\mu\text{F}); 0603 \geq 10\mu\text{F}; 0805 \geq 4.7\mu\text{F}; 1206 \geq 47\mu\text{F}; 1210 \geq 100\mu\text{F}$</td> </tr> <tr> <td></td> <td></td> <td>$\geq 20\%$</td> <td>---</td> </tr> </tbody> </table> <p>I.R.: $\geq 10\text{V}, 500\text{M}\Omega$ or $25 \Omega\text{-F}$ whichever is smaller. Class II (X7R, X5R, X6S, X7S)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #ADD8E6;">Rated voltage</th> <th style="background-color: #ADD8E6;">Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210 $\geq 3.3\mu\text{F}$</td> <td rowspan="7" style="vertical-align: middle; text-align: center;">  500MΩ or $RxC \geq 5 \Omega\text{-F}$ whichever is smaller. </td> </tr> <tr> <td>50V: 0402 $> 0.01\mu\text{F}; 0603 \geq 1\mu\text{F}; 0805 \geq 1\mu\text{F}; 1206 \geq 4.7\mu\text{F}; 1210 \geq 4.7\mu\text{F}$</td> </tr> <tr> <td>35V: 0603 $\geq 1\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 2.2\mu\text{F}; 1210 \geq 10\mu\text{F}$</td> </tr> <tr> <td>25V: 0201 $\geq 0.1\mu\text{F}; 0402 \geq 0.22\mu\text{F}; 0603 \geq 2.2\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 10\mu\text{F}; 1210 \geq 10\mu\text{F}$</td> </tr> <tr> <td>16V: 0201 $\geq 0.1\mu\text{F}; 0402 \geq 0.22\mu\text{F}; 0603 \geq 1\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 10\mu\text{F}; 1210 \geq 47\mu\text{F}$</td> </tr> <tr> <td>10V: 0201 $\geq 47\text{nF}; 0402 \geq 0.47\mu\text{F}; 0603 \geq 0.47\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 4.7\mu\text{F}; 1210 \geq 47\mu\text{F}$</td> </tr> <tr> <td>6.3V ; 4V ; All X6S/X7S items; Size ≥ 1812</td> </tr> </tbody> </table>	Rated vol.	D.F. \leq	Exception of D.F. \leq		$\geq 100\text{V}$	$\leq 3\%$	$\leq 6\%$	$1206 \geq 0.47\mu\text{F}$	$\leq 7.5\%$	$0603 \geq 0.068\mu\text{F}; 0805 \geq 0.1\mu\text{F}; 1206 \geq 1\mu\text{F}; 1210 \geq 2.2\mu\text{F}$	$\leq 20\%$	$0805 \geq 0.22\mu\text{F}; 1210 \geq 3.3\mu\text{F}$	50V	$\leq 3\%$	$\leq 6\%$	$0201(50\text{V}); 0603 \geq 0.047\mu\text{F}; 0805 \geq 0.18\mu\text{F}; 1206 \geq 0.47\mu\text{F}$	$\leq 10\%$	$0201 \geq 0.01\mu\text{F}; 1210 \geq 3.3\mu\text{F}$	$\leq 20\%$	$0402 \geq 0.012\mu\text{F}; 0603 > 0.1\mu\text{F}; 0805 \geq 1\mu\text{F}(0805/X7R > 0.47\mu\text{F}); 1206 \geq 2.2\mu\text{F}; 1210 \geq 10\mu\text{F}$	35V	$\leq 5\%$	$\leq 20\%$	$0603 \geq 1\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 2.2\mu\text{F}; 1210 \geq 10\mu\text{F}$	$\leq 10\%$	$0201 \geq 0.01\mu\text{F}(0201/X5R = 0.01\mu\text{F}); 0805 \geq 1\mu\text{F}; 1210 \geq 10\mu\text{F}^*$	$\leq 14\%$	$0603 \geq 0.33\mu\text{F}$	25V	$\leq 5\%$	$\leq 15\%$	$0201 \geq 0.1\mu\text{F}(0201/X5R > 0.01\mu\text{F}); 0603 \geq 0.47\mu\text{F}; \text{TT series}$	$\leq 20\%$	$0402 \geq 0.10\mu\text{F}(0402/X7R \geq 0.056\mu\text{F}); 0805 \geq 2.2\mu\text{F}; 1206 \geq 4.7\mu\text{F}; 1210 \geq 22\mu\text{F}(1210/X5R \geq 10\mu\text{F})^*$	$\leq 25\%$	$0402 \geq 0.47\mu\text{F}$	16V	$\leq 5\%$	$\leq 10\%$	$0603 \geq 0.15\mu\text{F}; 0805 \geq 0.68\mu\text{F}; 1206 \geq 2.2\mu\text{F}; 1210 \geq 4.7\mu\text{F}$	$\leq 15\%$	$0201 \geq 0.01\mu\text{F}(0201/X7R \geq 0.022\mu\text{F}); 0402 \geq 0.033\mu\text{F}; 0603 > 0.47\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 4.7\mu\text{F}; 1210 \geq 22\mu\text{F}$	$\leq 20\%$	$0201 \geq 0.1\mu\text{F}; 0402 \geq 1\mu\text{F}; 0603/X5R \geq 10\mu\text{F}; 01R5/X5R$	10V	$\leq 7.5\%$	$\leq 15\%$	$0201 \geq 0.012\mu\text{F}; 0402 \geq 0.22\mu\text{F}(0402/X7R \geq 0.15\mu\text{F}); 0603 \geq 0.33\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 2.2\mu\text{F}; 1210 \geq 22\mu\text{F}$	6.3V	$\leq 15\%$	$\leq 30\%$	$0201 \geq 0.1\mu\text{F}; 0402 \geq 1\mu\text{F}(0402/X6S \geq 0.47\mu\text{F}); 0603 \geq 10\mu\text{F}; 0805 \geq 4.7\mu\text{F}; 1206 \geq 47\mu\text{F}; 1210 \geq 100\mu\text{F}$			$\geq 20\%$	---	Rated voltage	Insulation Resistance	100V: All X7R; 1210 $\geq 3.3\mu\text{F}$	 500MΩ or $RxC \geq 5 \Omega\text{-F}$ whichever is smaller.	50V: 0402 $> 0.01\mu\text{F}; 0603 \geq 1\mu\text{F}; 0805 \geq 1\mu\text{F}; 1206 \geq 4.7\mu\text{F}; 1210 \geq 4.7\mu\text{F}$	35V: 0603 $\geq 1\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 2.2\mu\text{F}; 1210 \geq 10\mu\text{F}$	25V: 0201 $\geq 0.1\mu\text{F}; 0402 \geq 0.22\mu\text{F}; 0603 \geq 2.2\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 10\mu\text{F}; 1210 \geq 10\mu\text{F}$	16V: 0201 $\geq 0.1\mu\text{F}; 0402 \geq 0.22\mu\text{F}; 0603 \geq 1\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 10\mu\text{F}; 1210 \geq 47\mu\text{F}$	10V: 0201 $\geq 47\text{nF}; 0402 \geq 0.47\mu\text{F}; 0603 \geq 0.47\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 4.7\mu\text{F}; 1210 \geq 47\mu\text{F}$	6.3V ; 4V ; All X6S/X7S items; Size ≥ 1812
Rated vol.	D.F. \leq	Exception of D.F. \leq																																																																			
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25V	$\leq 5\%$	$\leq 15\%$	$0201 \geq 0.1\mu\text{F}(0201/X5R > 0.01\mu\text{F}); 0603 \geq 0.47\mu\text{F}; \text{TT series}$																																																																		
		$\leq 20\%$	$0402 \geq 0.10\mu\text{F}(0402/X7R \geq 0.056\mu\text{F}); 0805 \geq 2.2\mu\text{F}; 1206 \geq 4.7\mu\text{F}; 1210 \geq 22\mu\text{F}(1210/X5R \geq 10\mu\text{F})^*$																																																																		
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10V	$\leq 7.5\%$	$\leq 15\%$	$0201 \geq 0.012\mu\text{F}; 0402 \geq 0.22\mu\text{F}(0402/X7R \geq 0.15\mu\text{F}); 0603 \geq 0.33\mu\text{F}; 0805 \geq 2.2\mu\text{F}; 1206 \geq 2.2\mu\text{F}; 1210 \geq 22\mu\text{F}$																																																																		
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Multilayer Ceramic Capacitors

No	Item	Test Condition				Requirements																																																																																																																																																																																															
15.	High Temperature Load (Endurance)	Test temp. : NP0, X7R/X7E/X7S: $125 \pm 3^\circ\text{C}$ X6S: $105 \pm 3^\circ\text{C}$ X5R: $85 \pm 3^\circ\text{C}$ Test time: $1000 + 24 + 0$ hrs. 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1206	X7R	100V	$C \geq 1.0\mu\text{F}$																																																																																																																																																																																																		
		50V	$C \geq 2.2\mu\text{F}$																																																																																																																																																																																																		
	X5R/X6S/ X7S	100V	$C > 1.0\mu\text{F}$																																																																																																																																																																																																		
		50V	$C = 4.7\mu\text{F}$																																																																																																																																																																																																		
1210	X5R/X7R/ X6S/X7S	50V~100V	$C \geq 2.2\mu\text{F}$																																																																																																																																																																																																		
1825 2220 2225	X7R	100V~250V	$C \geq 1.0\mu\text{F}$																																																																																																																																																																																																		
(3) $\leq 6.3V$ or $C \geq 10\mu\text{F}$: 150% of rated voltage. (4) $10V \leq U_r < 250V$: 200% of rated voltage. (5) 500V: 150% of rated voltage. (6) $U \geq 630V$: 120% 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. ** De-rating conditions: 																																																																																																																																																																																																					

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

Multilayer Ceramic Capacitors

APPENDIXES

□ Tape & reel dimensions

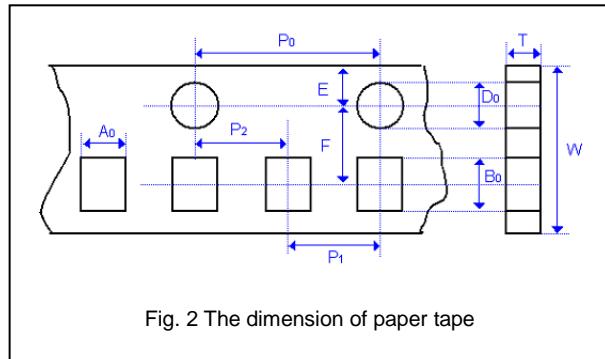


Fig. 2 The dimension of paper tape

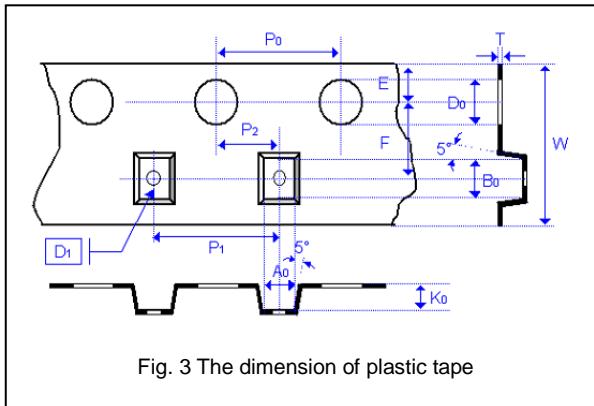
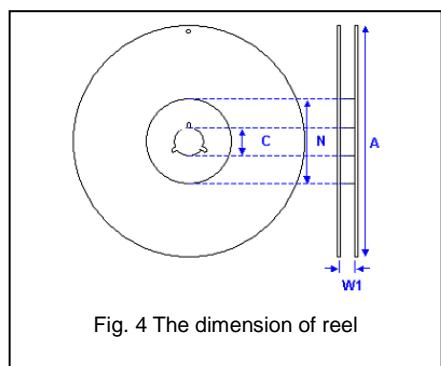


Fig. 3 The dimension of plastic tape

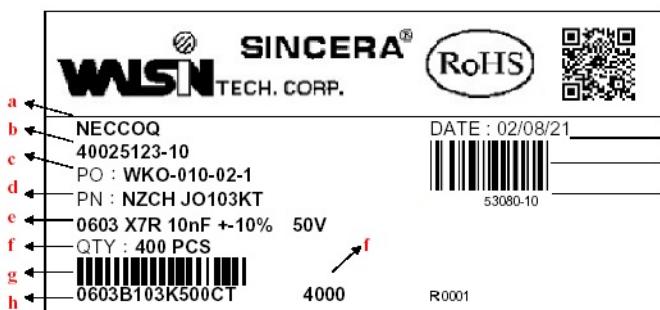
Size	0201	0402	0603	0805			1206			1210			1808			1812		
Thickness	L	N,E	S,H,X	A,H	B,T	D,I	B,T	C,J,D	G,P	T	C,D	G,K	M	D,F	G,K	D,F	G,K	M,U
A₀	0.40 +/-0.10	0.70 +/-0.20	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	<1.80	1.90 +/-0.50	<2.00	<2.30	<3.05	<3.05	<3.05	<3.20	<2.50	<2.50	<3.90	<3.90	<3.90
B₀	0.70 +/-0.10	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	0.23	0.23	0.23	0.23	0.25	0.25	0.25	0.25	0.25	0.25
K₀	-	-	-	-	-	<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	12.00	12.00	12.00	12.00	12.00	12.00
P₀	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	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
10xP₀	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	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00
P₁	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	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
P₂	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	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
D₀	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	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
D₁	-	-	-	-	-	1.00 +/-0.10	-	1.00 +/-0.10	1.00 +/-0.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
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	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50



Size	0201, 0402, 0603, 0805, 1206, 1210			1812
Reel size	7"	10"	13"	7"
C	13.0±0.5	13.0±0.5	13.0±0.5	13.0±0.5
W₁	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

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	NPO	X7R, X5R, X6S, X7S
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

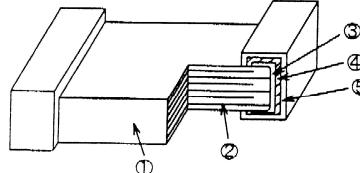


Fig. 5 The construction of MLCC

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.

Multilayer Ceramic Capacitors

■ 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.

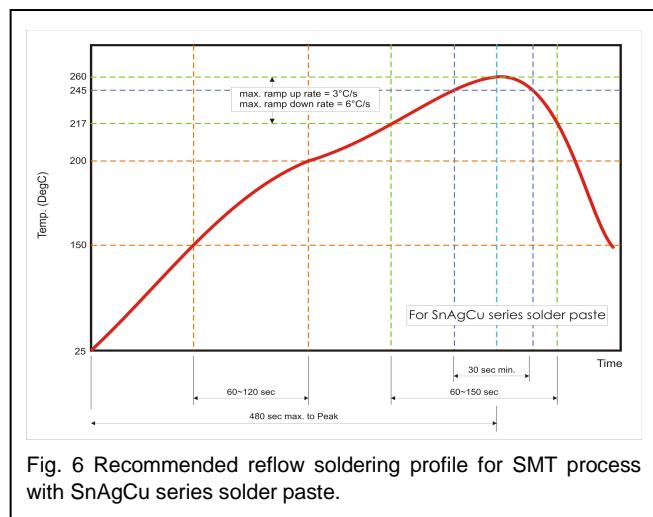


Fig. 6 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

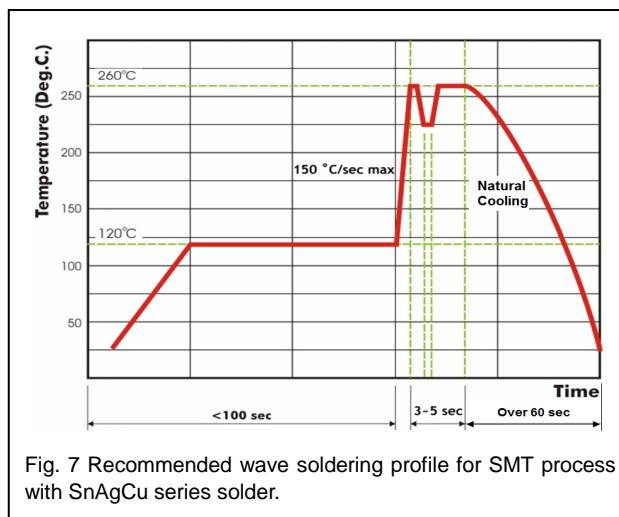


Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.

