

General Purpose Multilayer Ceramic Capacitors 4 to 100V (NP0, X5R, X7R & Y5V Dielectrics)

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**RoHS
Compliant**



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. The MLCC is made by NP0, X7R, X6S, X5R and Y5V dielectric material and which provides product with high electrical precision, stability and reliability.

Features:

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

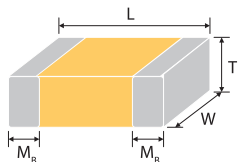
Applications:

- For general digital circuit.
- For power supply bypass capacitors.
- For consumer electronics.
- For telecommunication.

How To Order:

MC	1206	B	104	K	500	C	T
	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Termination	Packaging style
multicomp Pro	Inch (mm) 0201 (0603) 0402 (1005) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 1812 (4532)	N=NP0 (C0G) B=X7R F=Y5V X=X5R S=X6S	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg.: 0R5=0.5pF 1R0=1.0pF 104 = 10×10^4 = 100nF	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%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 4R0=4V DC 6R3=6.3V DC 100=10V DC 160=16V DC 250=25V DC 500=50V DC 101=100V DC	C=Cu/Ni/Sn	T=7" reeled G=13" reeled

External Dimensions:



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Soldering Method *	M _B (mm)
01R5 (0402)	0.4 ±0.02	0.2 ±0.02	0.2 ±0.02 V	R	0.1 ±0.03
0201 (0603)	0.6±0.03	0.3 ±0.03	0.3 ±0.03	L	0.15 ±0.05 0.15 +0.1/-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}		
0402 (1005)	1 ±0.05	0.5 ±0.05	0.5 ±0.05 N	R	0.25 +0.05/-0.1
	1 ±0.2	0.5 ±0.2	0.5 +0.02/-0.05 Q		
	1 ±0.15 ^{#6}	0.5 ±0.15 ^{#6}	0.5 ±0.15 ^{#6} E		

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**General Purpose Multilayer Ceramic Capacitors
4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)**

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Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Soldering Method *	M _B (mm)
0603 (1608)	1.6 ±0.1	0.8 ±0.1	0.8 ±0.07	S	R / W	0.4 ±0.15
	1.6 +0.15/-0.1	0.8 +0.15/-0.1	0.5 ±0.1	H	R / W	
			0.8 +0.15/-0.1	X	R / W	
			1.6 ±0.2 ^{#1}			
0805 (2012)	2 ±0.15	1.25 ±0.1	0.5 ±0.1	H	R / W	0.5 ±0.2
			0.6 ±0.1	A	R / W	
			0.8 ±0.1	B	R / W	
			1.25 ±0.1	D	R	
	2 ±0.2	1.25 ±0.2	0.85 ±0.1	T	R / W	
			1.25 ±0.2	I	R	
1206 (3216)	3.2 ±0.15	1.6 ±0.15	0.8 ±0.1	B	R / W	0.6 ±0.2 (0.5±0.25) ^{***}
			0.95 ±0.1	C	R	
			1.25 ±0.1	D	R	
	3.2 ±0.2		1.6 ±0.2	1.15 ±0.15	J	
		1.6 ±0.2		G	R	
		0.85 ±0.1		T	R / W	
	3.2 +0.3/-0.1 3.3 +0.3/-0.1 ^{#5}		1.6 +0.3/-0.1	1.6 +0.3/-0.1	P	
1210 (3225)	3.2 ±0.3	2.5±0.2	0.95 ±0.1	C	R	0.75 ±0.25
			0.85 ±0.1	T	R	
			1.25 ±0.1	D	R	
	3.2±0.4	2.5±0.3	1.6 ±0.2	G	R	
			2 ±0.2	K	R	
			2.5 ±0.3	M	R	
	3.20 ±0.6 ^{#4}		2.5 ±0.5 ^{#4}		2.5 ±0.5 ^{#4}	
1808 (4520)	4.5 ±0.4 (4.5+0.5/-0.3) ^{**}	2.03 ±0.25	1.25 ±0.1	D	R	0.75 ±0.25 (0.5±0.25) ^{***}
			1.4 ±0.15	F	R	
			1.6 ±0.2	G	R	
			2 ±0.2	K	R	
1812 (4532)	4.5 ±0.4 4.5+0.5/-0.3) ^{**}	3.2 ±0.3	1.25 ±0.1	D	R	0.75 ±0.25 0.5±0.25) ^{***}
			1.6 ±0.2	G	R	
			2 ±0.2	K	R	
		3.2 ±0.4	2.5 ±0.3	M	R	
			2.8 ±0.3	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.

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General Purpose Multilayer Ceramic Capacitors 4 to 100V (NP0, X5R, X7R & Y5V Dielectrics)

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- #1: For 0603/Cap $\geq$ 10 μ F or 0603($\leq$ 6.3V)/Cap $\geq$ 4.7 μ F or 0603(>10V)/Cap>1 μ F products, Excluding 0603X225(16V&25V),0603S225(6.3V&16V),0603X475(6.3V&16V),0603S475(4V&6.3V).
 #2: For 0201/ 0.1 μ F < Cap < 0.68 μ F products, Excluding 0201X334~474($\leq$ 6.3V) & 0201X224($\leq$ 10V).
 #3: For 0201X334(16V&25V), 0201/Cap $\geq$ 0.68 μ F products, Excluding 0201X105*6R3=>(L:0.6 $\pm$ 0.05,W:0.3 $\pm$ 0.05,T:0.3 $\pm$ 0.05).
 #4: For 1210(200V&250V)/Cap>0.47 μ F products.
 #5: For 1206(100V)/Cap $\geq$ 1.2 μ F products.
 #6: For 0402X475M6R3CT products.

General Electrical Data:

Dielectric	NP0	X7R	X5R	X6S	X7S
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812				
Capacitance range*	0.1pF to 0.1 μ F	100pF to 47 μ F	100pF to 220 μ F	0.1 μ F to 100 μ F	0.1 μ F to 100 μ F
Capacitance tolerance**	Cap $\leq$ 5pF#1: A ($\pm$ 0.05pF), B ($\pm$ 0.1pF), C ($\pm$ 0.25pF) 5pF<Cap<10pF: C ($\pm$ 0.25pF), D ($\pm$ 0.5pF) Cap $\geq$ 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	4V,6.3V, 10V, 16V, 25V, 35V,50V, 100V			
DF(Tan δ)*	Cap<30pF: Q $\geq$ 400+20C Cap $\geq$ 30pF: Q $\geq$ 1000	Note 1			
Operating temperature	-55 to +125°C		-55°C to +85°C	-55°C to +105°C	-55°C to +125°C
Capacitance characteristic	$\pm$ 30ppm	$\pm$ 15%	$\pm$ 15%	$\pm$ 22%	$\pm$ 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 $\pm$ 0.2Vrms, 1.0MHz $\pm$ 10% for Cap $\leq$ 1000pF and 1.0 $\pm$ 0.2Vrms, 1.0kHz $\pm$ 10% for Cap>1000pF, 25°C at ambient temperature

X7R/X6S/X5R: Apply 1.0 $\pm$ 0.2Vrms, 1.0kHz $\pm$ 10%, at 25°C ambient temperature.

Y5V: Apply 1.0 $\pm$ 0.2Vrms, 1.0kHz $\pm$ 10%, at 20°C ambient temperature.

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

General Purpose Multilayer Ceramic Capacitors 4 to 100V (NP0, X5R, X7R & Y5V Dielectrics)

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Capacitance Range

NP0 Dielectric 0201, 0402, 0603, 0805 Sizes

Dielectric		NP0																			
Size		0201					0402					0603					0805				
Rated Voltage (V DC)		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	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						
	0.4pF (0R4)	L	L	L	L	L	N	N	N	N		S	S	S	S						
	0.5pF (0R5)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.6pF (0R6)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.7pF (0R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.8pF (0R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.9pF (0R9)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.0pF (1R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.2pF (1R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.5pF (1R5)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.8pF (1R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.0pF (2R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.2pF (2R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.7pF (2R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.0pF (3R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.3pF (3R3)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.9pF (3R9)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.0pF (4R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.7pF (4R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.0pF (5R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.6pF (5R6)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.0pF (6R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.8pF (6R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	7.0pF (7R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.0pF (8R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.2pF (8R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	9.0pF (9R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	10pF (100)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	12pF (120)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	15pF (150)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	18pF (180)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	22pF (220)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	27pF (270)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	33pF (330)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	39pF (390)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	47pF (470)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	56pF (560)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	68pF (680)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A

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General Purpose Multilayer Ceramic Capacitors 4 to 100V (NP0, X5R, X7R & Y5V Dielectrics)

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Dielectric		NP0																			
Size		0201					0402					0603					0805				
Rated Voltage (V DC)		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	82pF (820)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	100pF (101)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	120pF (121)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	150pF (151)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	180pF (181)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	220pF (221)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	270pF (271)	L	L	L			N	N	N	N		S	S	S	S	S	A	A	A	A	A
	330pF (331)	L	L	L			N	N	N	N		S	S	S	S	S	A	A	A	A	A
	390pF (391)	L	L	L			N	N	N	N		S	S	S	S	S	B	B	B	B	B
	470pF (471)	L	L	L			N	N	N	N		S	S	S	S	S	B	B	B	B	B
	560pF (561)	L	L	L			N	N	N	N		S	S	S	S	S	B	B	B	B	B
	680pF (681)	L	L	L			N	N	N	N		S	S	S	S	S	B	B	B	B	B
	820pF (821)						N	N	N	N		S	S	S	S	S	B	B	B	B	B
	1,000pF (102)						N	N	N	N		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” (±5%) only.

NP0 Dielectric 1206, 1210, 1812 Sizes

Dielectric		NP0													
Size		1206					1210					1812			
Rated Voltage (V DC)		10	16	25	50	100	10	16	25	50	100	16	25	50	100
Capacitance	1.0pF (1R0)														
	1.2pF (1R2)	B	B	B	B	B									
	1.5pF (1R5)	B	B	B	B	B									
	1.8pF (1R8)	B	B	B	B	B									

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General Purpose Multilayer Ceramic Capacitors 4 to 100V (NP0, X5R, X7R & Y5V Dielectrics)

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Dielectric		NP0													
Size		1206					1210					1812			
Rated Voltage (V DC)		10	16	25	50	100	10	16	25	50	100	16	25	50	100
Capacitance	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

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General Purpose Multilayer Ceramic Capacitors 4 to 100V (NP0, X5R, X7R & Y5V Dielectrics)

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Dielectric		NP0													
Size		1206					1210					1812			
Rated Voltage (V DC)		10	16	25	50	100	10	16	25	50	100	16	25	50	100
Capacitance	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		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							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" (±5%) only.

X7R Dielectric 0201, 0402, 0603, 0805 Sizes

Dielectric		X7R																							
Size		0201					0402						0603						0805						
Rated Voltage (V DC)		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	35	50	100
Capacitance	100pF (101)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	120pF (121)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	150pF (151)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	180pF (181)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	220pF (221)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	270pF (271)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	330pF (331)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	390pF (391)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	470pF (471)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	560pF (561)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	680pF (681)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	820pF (821)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	1,000pF (102)	L	L	L	L	L	N	N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	1,200pF (122)	L	L	L	L			N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	1,500pF (152)	L	L	L	L			N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	1,800pF (182)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	2,200pF (222)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B		B	B

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General Purpose Multilayer Ceramic Capacitors 4 to 100V (NP0, X5R, X7R & Y5V Dielectrics)

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Dielectric		X7R																							
Size		0201					0402						0603						0805						
Rated Voltage (V DC)		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	35	50	100
Capacitance	2,700pF (272)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	3,300pF (332)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	3,900pF (392)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	4,700pF (472)	L	L	L			N	N	N	N	N	N		S	S	S	S	S		B	B	B		B	B
	5,600pF (562)	L	L					N	N	N	N			S	S	S	S	S		B	B	B		B	B
	6,800pF (682)	L	L					N	N	N	N			S	S	S	S	S		B	B	B		B	B
	8,200pF (822)	L	L					N	N	N	N			S	S	S	S	S		B	B	B		B	B
	0.010μF (103)	L	L	L			N	N	N	N	N			S	S	S	S	S		B	B	B		B	B
	0.012μF (123)							N	N	N	N			S	S	S	S	X		B	B	B		B	B
	0.015μF (153)							N	N	N	N			S	S	S	S	X		B	B	B		B	B
	0.018μF (183)							N	N	N	N			S	S	S	S	X		B	B	B		B	B
	0.022μF (223)						N	N	N	N	N			S	S	S	S	X		B	B	B		B	B
	0.027μF (273)							N	N	N	N			S	S	S	S	X		B	B	B		B	D
	0.033μF (333)							N	N	N	N			S	S	S	X	X		B	B	B		B	D
	0.039μF (393)							N	N	N	N			S	S	S	X	X		B	B	B		B	D
	0.047μF (473)							N	N	N	N			S	S	S	X	X		B	B	B		B	D
	0.056μF (563)							N	N		E			S	S	S	X	X		B	B	B		B	D
	0.068μF (683)							N	N		E			S	S	S	X	X		B	B	B		B	D
	0.082μF (823)							N	N		E			S	S	S	X	X		B	B	B		B	D
	0.10μF (104)						N	N	N	N	E			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	S	X	X			D	D	D		D	I
	0.27μF (274)													X	X	X	X			D	D	D		I	I
	0.33μF (334)						N	N						X	X	X	X	X		D	D	D		I	I
	0.39μF (394)													X	X	X	X			D	D	D		I	I
	0.47μF (474)						N	N						X	X	X	X	X		D	D	D		I	I
	0.56μF (564)													X	X	X				D	D	D			
	0.68μF (684)													X	X	X				D	D	D		I	
	0.82μF (824)													X	X	X				D	D	D			
	1.0μF (105)						N							X	X	X	X	X		D	D	D	I	I	
	1.5μF (155)																			I	I	I			
	2.2μF (225)													X	X	X				I	I	I	I	I	
	3.3μF (335)																								
	4.7μF (475)													X	X					I	I	I	I		
	6.8μF (685)																								
	10μF (106)																			I	I	I*			
	22μF (226)																								

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General Purpose Multilayer Ceramic Capacitors 4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)

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X7R Dielectric 1206, 1210, 1812 Sizes

Dielectric		X7R																		
Size		1206						1210						1812						
Rated Voltage (V DC)		6.3	10	16	25	35	50	100	6.3	10	16	25	35	50	100	10	16	25	50	100
Capacitance	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	

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General Purpose Multilayer Ceramic Capacitors 4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)

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Dielectric		X7R																		
Size		1206						1210						1812						
Rated Voltage (V DC)		6.3	10	16	25	35	50	100	6.3	10	16	25	35	50	100	10	16	25	50	100
Capacitance	0.22μF (224)		C	C	C		C	G		C	C	C		C	D	D	D	D	D	D
	0.27μF (274)		C	C	C		D	G		C	C	C		C	G	D	D	D	D	D
	0.33μF (334)		C	C	C		D	G		C	C	C		D	G	D	D	D	D	D
	0.39μF (394)		C	C	J		P	G		C	C	C		D	M	D	D	D	D	D
	0.47μF (474)		J	J	J		P	G		C	C	C		D	M	D	D	D	D	K
	0.56μF (564)		J	J	J		P	P		D	D	D		D	M	D	D	D	D	K
	0.68μF (684)		J	J	J		P	P		D	D	D		D	K	D	D	D	K	K
	0.82μF (824)		J	J	J		P	P		D	D	D		D	K	D	D	D	K	K
	1.0μF (105)		J	J	J		P	P		D	D	D		D	K	D	D	D	K	K
	1.5μF (155)		J	J	P		P				G	G		M	M	D	D	D	K	K
	2.2μF (225)		J	J	P		P	p			G	G		M	M	G	G	G	M	M
	3.3μF (335)		P	P	P		P				G	G		M		K	K	K	K	
	4.7μF (475)		P	P	P		P			K	K	K		M	M	M	M	M	M	
	6.8μF (685)															M	M	M	M	
	10μF (106)	P	P	P	P	P				K	K	K	K	M	M		M	M	M	M
22μF (226)	P	P	P*							M	M	M				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.

X5R Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X5R																		
Size		0201					0402							0603						
Rated Voltage (V DC)		6.3	10	16	25	50	4	6.3	10	16	25	50	63	4	6.3	10	16	25	35	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															

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General Purpose Multilayer Ceramic Capacitors 4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)

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Dielectric		X5R																		
Size		0201					0402							0603						
Rated Voltage (V DC)		6.3	10	16	25	50	4	6.3	10	16	25	50	63	4	6.3	10	16	25	35	50
Capacitance	0.010μF (103)	L	L	L	L	L														
	0.015μF (153)	L	L									N								
	0.022μF (223)	L	L	L	L						N	N								
	0.033μF (333)	L	L							N		N								
	0.047μF (473)	L	L	L	L			N	N	N		N								
	0.068μF (683)	L	L					N	N	N		E								
	0.082μF (823)	L	L					N	N	N		E								
	0.10μF (104)	L	L	L	L			N	N	N	N	E								
	0.15μF (154)							N	N	N	N									
	0.22μF (224)	L	L	L	L			N	N	N	N	N	N		X	X	X	X		
	0.33μF (334)	L	L	L	L			N	N	N	N				X	X	X	X		
	0.47μF (474)	L	L					N	N	N	N				X	X	X	X		X
	0.68μF (684)							N	N						X	X	X	X		
	0.82uF (824)														X	X	X	X		
	1.0μF (105)	L	L*	L*				N	N	N	N	E			X	X	X	X	X	X
	1.5μF (155)														X	X				
	2.2μF (225)	L*	L*					N	N	E	E				X	X	X	X		X
	3.3μF (335)														X	X				
	4.7μF (475)							E	E	E*					X	X	X	X		
	6.8uF (685)																			
	10μF (106)						E*	E*	E*						X	X	X	X	X	
	22μF (226)						E*	E*							X*	X*	X*			
	47μF (476)														X*	X*				

Dielectric		X5R																			
Size		0805					1206							1210							
Rated Voltage (V DC)		4	6.3	10	16	25	50	4	6.3	10	16	25	50	63	4	6.3	10	16	25	35	50
Capacitance	1.0μF (105)			D	D	D	I						P								
	1.5μF (155)		I	I	I	I				J	J	P	P				K	K			
	2.2μF (225)		I	I	I	I	I			J	J	P	P				K	K			
	3.3μF (335)		I	I	I	I				P	P	P	P								
	4.7μF (475)		I	I	I	I	I		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			K	K	K	K	M	M
	22μF (226)		I	I*	I*	I*			P	P	P	P				M	M	M	M	M	
	47μF (476)	I*	I*	I*					P*	P*	P*					M	M	M	M*		
	100μF (107)	I*	I*						P							M*	M*	M*			
	220μF (227)							P*	P*						M*	M*					

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

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General Purpose Multilayer Ceramic Capacitors 4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)

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X6S Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X6S													
Size		0201					0402				0603				
Rated Voltage (VDC)		4	6.3	10	16	25	6.3	10	16		4	6.3	10	16	25
Capacitance	0.10μF (104)	L	L	L	L	L	N								
	0.15μF (154)														
	0.22μF (224)		L	L*			N								
	0.33μF (334)						N								
	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
	3.3μF (335)														
	4.7μF (475)						E	E			X	X	X	X	X
	6.8uF (685)														
	10μF (106)						E*				X*	X*	X*	X*	
	22μF (226)										X*	X*			
	47μF (476)														
100μF (107)															

Dielectric		X6S															
Size		0805						1206					1210				
Rated Voltage (VDC)		4	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	0.10μF (104)																
	0.15μF (154)																
	0.22μF (224)																
	0.33μF (334)																
	0.47μF (474)																
	0.68μF (684)																
	1.0μF (105)																
	1.5μF (155)																
	2.2μF (225)				I												
	3.3μF (335)																
	4.7μF (475)					I	I										
	6.8uF (685)																
	10μF (106)	I	I	I	I	I					P						
	22μF (226)	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.

General Purpose Multilayer Ceramic Capacitors 4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)

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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	6.3	10	16	25	10	16	25	50	100	6.3	10	16	25	50	6.3	10	16	25	50	
Capacitance	0.1μF (104)	L												I											
	1.0μF (105)			E				X																	
	1.5μF (155)																								
	2.2μF (225)		E	E					X																
	3.3μF (335)																								
	4.7μF (475)						X	X					I												
	6.8uF (685)																								
	10μF (106)										I	I													
	22μF (226)																P*								
	47μF (476)														P*										
	100μF (107)																			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.

Packaging Dimension And Quantity:

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0201 (0603)	0.3 ±0.03	L	15,000	70,000	-	-
	0.3 ±0.05	L	15,000	50,000	-	-
	0.3 ±0.09	L	15,000	50,000	-	-
0603 (1608)	0.5 ±0.05	N	10,000	50,000	-	-
	0.5 +0.02/-0.05	Q	10,000	50,000	-	-
	0.5 ±0.20	E	10,000	-	-	-
0805 (1212)	0.5 ±0.10	H	4,000	-	-	-
	0.8 ±0.07	S	4,000	15,000	-	-
	0.8 +0.15/-0.10	X	4,000	15,000	-	-
0805 (2012)	0.5 ±0.10	H	4,000	15,000	-	-
	0.6 ±0.10	A	4,000	15,000	-	-
	0.8 ±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)	0.8 ±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
	1.6 ±0.20	G	-	-	2,000	10,000
	1.6 +0.30/-0.10	P	-	-	2,000	9,000

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General Purpose Multilayer Ceramic Capacitors 4 to 100V (NP0, X5R, X7R & Y5V Dielectrics)

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Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
1210 (3225)	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
	1.6 ±0.20	G	-	-	2,000	-
	2 ±0.20	K	-	-	1,000	6,000
	2.5 ±0.30	M	-	-	1,000	6,000
1808 (4520)	1.25 ±0.10	D	-	-	2,000	10,000
	1.4 ±0.15	F	-	-	2,000	10,000
	1.6 ±0.20	G	-	-	2,000	8,000
	2 ±0.20	K	-	-	1,000	6,000
1812 (4532)	1.25±0.10	D	-	-	1,000	5,000
	1.6 ±0.20	G	-	-	1,000	-
	2 ±0.20	K	-	-	1,000	-
	2.5 ±0.30	M	-	-	500	3,000
	2.8 ±0.30	U	-	-	500	-

Unit : pieces

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		*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 temp.: Room Temperature. *Class I: (NP0) ≤1000pF, 1.0±0.2Vrms, 1MHz±10% >1000pF, 1.0±0.2Vrms, 1kHz±10% Class II: (X7R, X7E, X6S, X5R, X7S) C≤10μF, 1.0±0.2Vrms; 1kHz±10% ** C>10μF, 0.5±0.2Vrms; 120Hz±20% ** Test condition: 0.5±0.2Vrms; 1kHz±10% X7R: 0603/475(6.3V) X5R #1 : 0201≥224 (6.3V, 10V, 16V), 0402≥475 (6.3V, 16V), 0402≥225(10V), 0603=106 (6.3V) TT18X≥475(10V) , TT15X series	<table> <tr> <th>Rated vol.</th><th>D.F. ≤</th><th colspan="2">Exception of D.F. ≤</th></tr> <tr> <td rowspan="3">≥100V</td><td rowspan="3">≤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>0805>0.1μF, 0603≥0.068μF, 1206>1μF;</td></tr> <tr> <td rowspan="3">≥50V</td><td rowspan="3">≤2.5%</td><td>≤3%</td><td>0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td></tr> <tr> <td>≤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 rowspan="2">35V</td><td rowspan="2">≤3.5%</td><td>≤10%</td><td>0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td></tr> <tr> <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; 0805≥1μF; 1210≥10μF</td></tr> <tr> <td>≤7%</td><td>0603≥0.33μF; 1206≥4.7μF</td></tr> <tr> <td>≤10%</td><td>0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF;</td></tr> <tr> <td>≤12.5%</td><td>0402≥0.33μF</td></tr> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥100V	≤2.5%	≤3%	1206≥0.47μF	≤3.5%	1812≥4.7μF; 1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF	≤5%	0805>0.1μF, 0603≥0.068μF, 1206>1μF;	≥50V	≤2.5%	≤3%	0201(50V); 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	35V	≤3.5%	≤10%	0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF	≤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; 1206≥4.7μF	≤10%	0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF;	≤12.5%	0402≥0.33μF
Rated vol.	D.F. ≤	Exception of D.F. ≤																																					
≥100V	≤2.5%	≤3%	1206≥0.47μF																																				
		≤3.5%	1812≥4.7μF; 1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF																																				
		≤5%	0805>0.1μF, 0603≥0.068μF, 1206>1μF;																																				
≥50V	≤2.5%	≤3%	0201(50V); 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																																				
35V	≤3.5%	≤10%	0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF																																				
		≤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; 1206≥4.7μF																																				
		≤10%	0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF;																																				
		≤12.5%	0402≥0.33μF																																				

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No	Item	Test Condition	Requirements			
			Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$	
					$\leq 5\%$	0201 $\geq 0.01\mu\text{F}$; 0402 $\geq 0.033\mu\text{F}$; 0603 $\geq 0.15\mu\text{F}$; 0805 $\geq 0.68\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$
	Q/ D.F. (Dissipation Factor)	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$\pm 0.2\text{Vrms}$, 1kHz$\pm 10\%$) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24± 2 hrs at room temp.	16V	$\leq 3.5\%$	$\leq 10\%$	0201/X7R $\geq 0.022\mu\text{F}$; 0402 $\geq 0.15\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 22\mu\text{F}$
			10V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.012\mu\text{F}$; 0402 $\geq 0.15\mu\text{F}$; 0603 $\geq 0.33\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 22\mu\text{F}$
					$\leq 15\%$	0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 1\mu\text{F}$
			6.3V	$\leq 10\%$	$\leq 15\%$	0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 1\mu\text{F}$; 0603 $\geq 10\mu\text{F}$; 0805 $\geq 4.7\mu\text{F}$; 1206 $\geq 47\mu\text{F}$; 1210 $\geq 100\mu\text{F}$
					$\leq 20\%$	0402 $\geq 2.2\mu\text{F}$
			4V	$\leq 15\%$	-	-
			X5R:			
			Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$	
			$\geq 100\text{V}$	$\leq 2.5\%$	$\leq 3\%$	1206 $\geq 0.47\mu\text{F}$
					$\leq 5\%$	0603 $\geq 0.068\mu\text{F}$; 0805 $\geq 0.1\mu\text{F}$; 1206 $\geq 1\mu\text{F}$; 1210 $\geq 2.2\mu\text{F}$
					$\leq 10\%$	0805 $\geq 0.22\mu\text{F}$; 1210 $\geq 3.3\mu\text{F}$
			$\geq 50\text{V}$	$\leq 2.5\%$	$\leq 3\%$	0201(50V); 0603 $\geq 0.047\mu\text{F}$; 0805 $\geq 0.18\mu\text{F}$; 1206 $\geq 0.47\mu\text{F}$
					$\leq 5\%$	0201 $\geq 0.01\mu\text{F}$; 0402 $\geq 0.012\mu\text{F}$; 1210 $\geq 3.3\mu\text{F}$
					$\leq 10\%$	0402 $\geq 0.047\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 1\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$
					$\leq 12.5\%$	1206 $\geq 10\mu\text{F}$
			35V	$\leq 3.5\%$	$\leq 10\%$	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	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu\text{F}$; 0805 $\geq 1\mu\text{F}$
					$\leq 7\%$	0603 $\geq 0.33\mu\text{F}$
					$\leq 10\%$	0201 $\geq 0.01\mu\text{F}$; 0402 $\geq 0.10\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 10\mu\text{F}$
					$\leq 12.5\%$	0402 $\geq 0.33\mu\text{F}$; 0805 $\geq 10\mu\text{F}$
			16V	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu\text{F}$; 0402 $\geq 0.033\mu\text{F}$; 0603 $\geq 0.15\mu\text{F}$; 0805 $\geq 0.68\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$
					$\leq 10\%$	0201 $\geq 0.01\mu\text{F}$; 0402 $\geq 0.22\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 22\mu\text{F}$
					$\leq 12.5\%$	0402 $\geq 1\mu\text{F}$; 0805 $\geq 10\mu\text{F}$
			10V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.012\mu\text{F}$; 0402 $\geq 0.22\mu\text{F}$; 0603 $\geq 0.33\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 22\mu\text{F}$; 01R5/X5R
					$\leq 12.5\%$	0805 $\geq 10\mu\text{F}$
					$\leq 15\%$	0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 1\mu\text{F}$; 0603 $\geq 10\mu\text{F}$
			6.3V	$\leq 10\%$	$\leq 15\%$	0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 1\mu\text{F}$; 0603 $\geq 10\mu\text{F}$; 0805 $\geq 4.7\mu\text{F}$; 1206 $\geq 47\mu\text{F}$; 1210 $\geq 100\mu\text{F}$
					$\leq 20\%$	0402 $\geq 2.2\mu\text{F}$
			4V	$\leq 15\%$	-	-

**General Purpose Multilayer Ceramic Capacitors
4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)**

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No	Item	Test Condition	Requirements			
	Q/ D.F. (Dissipation Factor)		X6S:			
			Rated vol.	D.F. ≤	Exception of D.F. ≤	
			≥100V	≤2.5%	≤3%	1206≥0.47μF
					≤5%	0603≥0.068μF; 0805≥0.1μF; 1206≥1μF; 1210≥2.2μF
					≤10%	0805>0.22μF; 1210≥3.3μF
			≥50V	≤2.5%	≤3%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF
					≤5%	0201≥0.01μF; 1210≥3.3μF
					≤10%	0402≥0.012μF; 0603>0.1μF; 0805≥1μF; 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≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF
					≤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
					≤10%	0201>0.01μF; 0402≥0.22μF; 0603>0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF
					≤12.5%	0402≥1μF; 0805=10μF
			10V	≤5%	≤10%	0201≥0.012μF; 0402≥0.22μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF;
					≤12.5%	0805=10μF
					≤15%	0201>0.1μF; 0402≥1μF;
			6.3V	≤10%	≤15%	0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF
					≤20%	0402≥2.2μF
			4V	≤15%	-	-
			X7S:			
			Rated vol.	D.F. ≤	Exception of D.F. ≤	
			≥100V	≤2.5%	≤3%	1206≥0.47μF
					≤5%	0603≥0.068μF; 0805≥0.1μF; 1206≥1μF; 1210≥2.2μF
					≤10%	0805>0.22μF; 1210≥3.3μF
			≥50V	≤2.5%	≤3%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF
					≤5%	0201≥0.01μF; 1210≥3.3μF
					≤10%	0402≥0.012μF; 0603>0.1μF; 0805≥1μF; 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≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF
					≤12.5%	0402≥0.33μF

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4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)**

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No	Item	Test Condition	Requirements																													
	Q/ D.F. (Dissipation Factor)		<table><tr><th>Rated vol.</th><th>D.F. ≦</th><th colspan="2">Exception of D.F. ≦</th></tr><tr><td rowspan="2">16V</td><td rowspan="2">≦3.5%</td><td>≦5%</td><td>0201=0.01μF; 0402≧0.033μF; 0603≧0.15μF; 0805≧0.68μF; 1206≧2.2μF; 1210≧4.7μF</td></tr><tr><td>≦10%</td><td>0201>0.01uF; 0402≧ 0.22uF; 0603>0.47μF; 0805≧2.2μF; 1206≧4.7μF; 1210≧22μF</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">≦5%</td><td>≦10%</td><td>0201≧0.012μF; 0402≧0.22μF; 0603≧0.33μF; 0805≧2.2μF; 1206≧2.2μF; 1210≧22μF;</td></tr><tr><td>≦15%</td><td>0201>0.1μF; 0402≧1μF;</td></tr><tr><td rowspan="2">6.3V</td><td rowspan="2">≦10%</td><td>≦15%</td><td>0201>0.1μF; 0402≧1μF; 0603≧10μF; 0805≧4.7μF; 1206≧47μF; 1210≧100μF</td></tr><tr><td>≦20%</td><td>0402≧2.2μF</td></tr><tr><td>4V</td><td>≦15%</td><td>-</td><td>-</td></tr></table>				Rated vol.	D.F. ≦	Exception of D.F. ≦		16V	≦3.5%	≦5%	0201=0.01μF; 0402≧0.033μF; 0603≧0.15μF; 0805≧0.68μF; 1206≧2.2μF; 1210≧4.7μF	≦10%	0201>0.01uF; 0402≧ 0.22uF; 0603>0.47μF; 0805≧2.2μF; 1206≧4.7μF; 1210≧22μF	10V	≦5%	≦10%	0201≧0.012μF; 0402≧0.22μF; 0603≧0.33μF; 0805≧2.2μF; 1206≧2.2μF; 1210≧22μF;	≦15%	0201>0.1μF; 0402≧1μF;	6.3V	≦10%	≦15%	0201>0.1μF; 0402≧1μF; 0603≧10μF; 0805≧4.7μF; 1206≧47μF; 1210≧100μF	≦20%	0402≧2.2μF	4V	≦15%	-	-
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4V	≦15%	-	-																													
4	Dielectric Strength	* To apply voltage (≤100V) 250%. * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.																													
5	Insulation Resistance	*Test temp.: Room Temperature. *To apply rated voltage for MAX. 120sec.	10GΩ or RxC ≧ 500Ω-F whichever is smaller. Class II (X7R, X7E, X5R,X6S,X7S,Y5V:) <table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: All X7R</td><td rowspan="7">10GΩ or RxC ≧ 100 Ω-F whichever is smaller.</td></tr><tr><td>50V:0402>0.01μF;0603≧1μF;0805≧1μF;1206≧4.7μF; 1210≧4.7μF</td></tr><tr><td>35V:0805≧2.2μF;1206 ≧ 2.2μF;1210 ≧ 10μF</td></tr><tr><td>25V:0402≧1μF;0603≧2.2μF;0805≧2.2μF;1206≧10μF; 1210≧10μF</td></tr><tr><td>16V: 0201≧0.1μF,0402≧0.22μF;0603≧1μF; 0805≧2.2μF;1206≧10μF;1210≧47μF</td></tr><tr><td>10V: 0201≧47nF;0402≧0.47μF;0603≧0.47μF; 0805≧2.2μF; 1206≧4.7μF;1210≧47μF</td></tr><tr><td>6.3V ; 4V ; Size≧1812</td></tr><tr><td>All X6S items, All X7S items</td><td rowspan="8">RxC≧50 Ω-F.</td></tr><tr><td>100V: 1210≧3.3μF</td></tr><tr><td>50V: 0402≧0.1μF; 0603≧2.2μF; 0805≧10μF;1206≧10μF</td></tr><tr><td>35V: 0603≧1μF;</td></tr><tr><td>25V: 0201≧0.1μF; 0402≧2.2μF;0603≧10μF; 0805≧10μF;1206≧22μF</td></tr><tr><td>16V: 0603≧10μF; 0402≧1μF; 0201≧0.22μF</td></tr><tr><td>10V: 0201>0.1μF; 0402≧1μF; 0603≧10μF; 0805≧47μF</td></tr><tr><td>6.3V:0201≧0.1μF; 0402≧1μF; 0603>4.7μF; 0805≧47μF; 1206≧10μF</td></tr><tr><td>4V: 0603≧22μF; 0805≧47μF; 1206≧100μF</td></tr></table>				Rated voltage	Insulation Resistance	100V: All X7R	10GΩ or RxC ≧ 100 Ω-F whichever is smaller.	50V:0402>0.01μF;0603≧1μF;0805≧1μF;1206≧4.7μF; 1210≧4.7μF	35V:0805≧2.2μF;1206 ≧ 2.2μF;1210 ≧ 10μF	25V:0402≧1μF;0603≧2.2μF;0805≧2.2μF;1206≧10μF; 1210≧10μF	16V: 0201≧0.1μF,0402≧0.22μF;0603≧1μF; 0805≧2.2μF;1206≧10μF;1210≧47μF	10V: 0201≧47nF;0402≧0.47μF;0603≧0.47μF; 0805≧2.2μF; 1206≧4.7μF;1210≧47μF	6.3V ; 4V ; Size≧1812	All X6S items, All X7S items	RxC≧50 Ω-F.	100V: 1210≧3.3μF	50V: 0402≧0.1μF; 0603≧2.2μF; 0805≧10μF;1206≧10μF	35V: 0603≧1μF;	25V: 0201≧0.1μF; 0402≧2.2μF;0603≧10μF; 0805≧10μF;1206≧22μF	16V: 0603≧10μF; 0402≧1μF; 0201≧0.22μF	10V: 0201>0.1μF; 0402≧1μF; 0603≧10μF; 0805≧47μF	6.3V:0201≧0.1μF; 0402≧1μF; 0603>4.7μF; 0805≧47μF; 1206≧10μF	4V: 0603≧22μF; 0805≧47μF; 1206≧100μF						
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6	Temperature Coefficient	With no electrical load. <table><tr><td>T.C.</td><td>Operating Temp</td></tr><tr><td>NPO</td><td>-55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr><tr><td>X7S</td><td>-55 ~ 125°C at 25°C</td></tr><tr><td>X5R</td><td>-55~ 85°C at 25°C</td></tr><tr><td>X6S</td><td>-55~105°C at 25°C</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. * Measurement voltage for Class II:	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	<table><tr><td>T.C.</td><td>Capacitance Change</td></tr><tr><td>NPO</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>X7S</td><td>Within ±22%</td></tr><tr><td>X5R</td><td>Within ±15%</td></tr><tr><td>X6S</td><td>Within ±22%</td></tr></table> <table><tr><th>01005</th><th>0201</th></tr><tr><td>Cap≤0.01μF: 0.5V</td><td>Cap<0.1μF:1V</td></tr><tr><td>Cap>0.01μF: 0.2V</td><td>0.1μF≤Cap<1μF: 0.2V*</td></tr><tr><td></td><td>Cap≥1μF: 0.1V*</td></tr><tr><td>*0201X104/6.3V~25V: 0.5V 0201X224/10V~25V: 0.5V</td><td>*0201B104/6.3V~10V: 0.3V 0201S104/6.3V~16V: 0.3V 0201S224/6.3V: 0.3V 0201X334/474/105-6.3V&10V: 0.3V</td></tr><tr><th>0402</th><th>0603</th></tr><tr><td>Cap<1μF: 1V</td><td>Cap<1μF: 1V</td></tr><tr><td>Cap=1μF: 0.5V** 0402B224-16V: 0.5V 0402B334/474-6.3V&10V: 0.5V 0402S334/474-6.3V: 0.5V 0402X225/475-6.3V: 0.5V</td><td>1μF≤Cap≤4.7μF: 0.5V 0603X106-10V: 0.5V</td></tr><tr><td>1μF<Cap<10μF: 0.2V **0402B105M6R3V: 0.2V</td><td>Cap>4.7μF: 0.2V</td></tr><tr><td>Cap≥10μF: 0.1V</td><td></td></tr><tr><th>0805</th><th>1206/1210</th></tr><tr><td>Cap<10μF: 1V</td><td>Cap≤10μF: 1V</td></tr><tr><td>Cap=10μF: 0.5V 0805B475/6.3V~25V: 0.5V</td><td>10μF<Cap≤100μF: 0.5V</td></tr><tr><td>Cap>10μF: 0.2V</td><td>Cap>100μF: 0.2V 1206X107-6.3V: 0.2V 1206A476-6.3V: 0.1V 1210S107-6.3V: 0.2V</td></tr></table>	T.C.	Capacitance Change	NPO	Within ±30ppm/°C	X7R	Within ±15%	X7S	Within ±22%	X5R	Within ±15%	X6S	Within ±22%	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 0201X224/10V~25V: 0.5V	*0201B104/6.3V~10V: 0.3V 0201S104/6.3V~16V: 0.3V 0201S224/6.3V: 0.3V 0201X334/474/105-6.3V&10V: 0.3V	0402	0603	Cap<1μF: 1V	Cap<1μF: 1V	Cap=1μF: 0.5V** 0402B224-16V: 0.5V 0402B334/474-6.3V&10V: 0.5V 0402S334/474-6.3V: 0.5V 0402X225/475-6.3V: 0.5V	1μF≤Cap≤4.7μF: 0.5V 0603X106-10V: 0.5V	1μF<Cap<10μF: 0.2V **0402B105M6R3V: 0.2V	Cap>4.7μF: 0.2V	Cap≥10μF: 0.1V		0805	1206/1210	Cap<10μF: 1V	Cap≤10μF: 1V	Cap=10μF: 0.5V 0805B475/6.3V~25V: 0.5V	10μF<Cap≤100μF: 0.5V	Cap>10μF: 0.2V	Cap>100μF: 0.2V 1206X107-6.3V: 0.2V 1206A476-6.3V: 0.1V 1210S107-6.3V: 0.2V
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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.																																																				

**General Purpose Multilayer Ceramic Capacitors
4 to 100V (NP0, X5R, X7R & Y5V Dielectrics)**

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No	Item	Test Condition	Requirements															
9	Solderability	* Solder temperature: 235±5°C * 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 1mm per second until the deflection becomes 1mm 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±1sec * 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><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, X6S, X7S: within ±7.5% * 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																
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4	Room temp.	2~3																

No	Item	Test Condition	Requirements																																																										
13	Humidity (Damp Heat) Steady State	Test temp.: 40±2°C Humidity: 90~95% RH Test time: 500+24/-0hrs. Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and 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: ≥10V**, within ±12.5%; ≤6.3V 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, X6S, X7S: <table> <tr> <th>Rated vol.</th><th>D.F. ≤</th><th colspan="2">Exception of D.F. ≤</th></tr> <tr> <td rowspan="4">≥100V</td><td rowspan="4">≤3%</td><td>≤6%</td><td>1206 ≥ 0.47μF</td></tr> <tr> <td>≤7%</td><td>1812 ≥ 4.7μF; 1825 ≥ 4.7μF; 2220 ≥ 4.7μF; 2225 ≥ 4.7μF</td></tr> <tr> <td>≤7.5%</td><td>0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td></tr> <tr> <td>≤20%</td><td>0805 ≥ 0.22μF; 1210 ≥ 3.3μF</td></tr> <tr> <td rowspan="4">≥50V</td><td rowspan="4">≤3%</td><td>≤6%</td><td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td></tr> <tr> <td>≤7%</td><td>1812 ≥ 4.7μF; 1825 ≥ 4.7μF; 2220 ≥ 4.7μF; 2225 ≥ 4.7μF</td></tr> <tr> <td>≤10%</td><td>0201 ≥ 0.01μF; 0402 ≥ 0.012μF; 1210 ≥ 3.3μF</td></tr> <tr> <td>≤20%</td><td>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%</td><td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td></tr> <tr> <td rowspan="4">25V</td><td rowspan="4">≤5%</td><td>≤10%</td><td>0201 ≥ 0.01μF (0201/X5R = 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF)*</td></tr> <tr> <td>≤14%</td><td>0603 ≥ 0.33μF</td></tr> <tr> <td>≤15%</td><td>0201 ≥ 0.1μF (0201/X5R > 0.01μF); 0603 ≥ 0.47μF; 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%</td><td>0402 ≥ 0.33μF</td></tr> <tr> <td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td></tr> <tr> <td>≤15%</td><td>0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td></tr> <tr> <td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15%</td><td>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%</td><td>0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603/X5R ≥ 10μF; 01R5/X5R</td></tr> <tr> <td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201 ≥ 0.1μF; 0402 ≥ 1μF (0402/X6S ≥ 0.47μF); 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td></tr> <tr> <td>4V</td><td>≤20%</td><td>-</td><td>-</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 ≥ 0.01μF; 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	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	≤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%	-	-
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	Humidity (Damp Heat) Steady State		*I.R.: $\geq 10V$, $1G\Omega$ or $50\Omega\cdot F$ whichever is smaller. Class II (X7R, X5R, X6S, X7S) <table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: All X7R;1210$\geq 3.3\mu F$</td><td rowspan="7">1GΩ or RxC$\geq 10\Omega\cdot F$ whichever is smaller.</td></tr><tr><td>50V: 0402$>0.01\mu F$;0603$\geq 1\mu F$;0805$\geq 1\mu F$;1206$\geq 4.7\mu F$;1210$\geq 4.7\mu F$</td></tr><tr><td>35V:0603$\geq 1\mu F$;0805$\geq 2.2\mu F$; 1206$\geq 2.2\mu F$;1210$\geq 10\mu F$</td></tr><tr><td>25V:0201$\geq 0.1uF$; 0402$\geq 0.22\mu F$; 0603$\geq 2.2\mu F$; 0805$\geq 2.2\mu F$; 1206$\geq 10\mu F$;1210$\geq 10\mu F$</td></tr><tr><td>16V: 0201$\geq 0.1uF$;0402$\geq 0.22\mu F$;0603$\geq 1\mu F$;0805$\geq 2.2\mu F$; 1206$\geq 10\mu F$;1210$\geq 47\mu F$</td></tr><tr><td>10V: 0201$\geq 47nF$;0402$\geq 0.47\mu F$;0603$\geq 0.47\mu F$; 0805$\geq 2.2\mu F$; 1206$\geq 4.7\mu F$;1210$\geq 47\mu F$</td></tr><tr><td>6.3V ; 4V ; All X6S/X7S items; Size≥ 1812</td></tr></table>	Rated voltage	Insulation Resistance	100V: All X7R;1210 $\geq 3.3\mu F$	1G Ω or RxC $\geq 10\Omega\cdot F$ whichever is smaller.	50V: 0402 $>0.01\mu F$;0603 $\geq 1\mu F$;0805 $\geq 1\mu F$;1206 $\geq 4.7\mu F$;1210 $\geq 4.7\mu F$	35V:0603 $\geq 1\mu F$;0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$;1210 $\geq 10\mu F$	25V:0201 $\geq 0.1uF$; 0402 $\geq 0.22\mu F$; 0603 $\geq 2.2\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 10\mu F$;1210 $\geq 10\mu F$	16V: 0201 $\geq 0.1uF$;0402 $\geq 0.22\mu F$;0603 $\geq 1\mu F$;0805 $\geq 2.2\mu F$; 1206 $\geq 10\mu F$;1210 $\geq 47\mu F$	10V: 0201 $\geq 47nF$;0402 $\geq 0.47\mu F$;0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$;1210 $\geq 47\mu F$	6.3V ; 4V ; All X6S/X7S items; Size ≥ 1812																												
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14	Humidity (Damp Heat) Load	*Test temp.:40$\pm 2^{\circ}C$ *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$^{\circ}C$ 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$^{\circ}C$ for 1hr then set for 24± 2 hrs at room temp.	* No remarkable damage. Cap change: NP0: $\pm 7.5\%$ or 0.75pF whichever is larger. X7R, X5R, X6S, X7S: $\geq 10V^{**}$,within $\pm 12.5\%$; $\leq 6.3V$ within $\pm 25\%$; **10V: 0603$\geq 4.7\mu F$;0402 $\geq 1\mu F$;0201$\geq 0.1\mu F$, within $\pm 25\%$; Y5V: $\geq 10V$, within $\pm 30\%$; $\leq 6.3V$, within +30/-40% Q/D.F. value: NP0: C$\geq 30pF$,Q≥ 200;C$< 30pF$, Q$\geq 100+10/3C$ X7R, X5R, X6S, X7S: <table><tr><th>Rated vol.</th><th>D.F. $\leq$</th><th colspan="2">Exception of D.F. $\leq$</th></tr><tr><td rowspan="4">$\geq 100V$</td><td rowspan="4">$\leq 3\%$</td><td>$\leq 6\%$</td><td>1206$\geq 0.47\mu F$</td></tr><tr><td>$\leq 7\%$</td><td>1812$\geq 4.7\mu F$;1825$\geq 4.7\mu F$; 2220$\geq 4.7\mu F$; 2225$\geq 4.7\mu F$</td></tr><tr><td>$\leq 7.5\%$</td><td>0603$\geq 0.068\mu F$;0805$\geq 0.1\mu F$;1206$\geq 1\mu F$; 1210$\geq 2.2\mu F$</td></tr><tr><td>$\leq 20\%$</td><td>0805$\geq 0.22\mu F$;1210$\geq 3.3\mu F$</td></tr><tr><td rowspan="4">$\geq 50V$</td><td rowspan="4">$\leq 3\%$</td><td>$\leq 6\%$</td><td>0201(50V);0603$\geq 0.047\mu F$;0805$\geq 0.18\mu F$; 1206$\geq 0.47\mu F$</td></tr><tr><td>$\leq 7\%$</td><td>1812$\geq 4.7\mu F$;1825$\geq 4.7\mu F$; 2220$\geq 4.7\mu F$; 2225$\geq 4.7\mu F$</td></tr><tr><td>$\leq 10\%$</td><td>0201$\geq 0.01uF$; 0402$\geq 0.012\mu F$;1210$\geq 3.3\mu F$</td></tr><tr><td>$\leq 20\%$</td><td>0402$\geq 0.047\mu F$;0603$>0.1\mu F$;0805$\geq 1\mu F$ (0805/X7R$>0.47\mu F$); 1206$\geq 2.2\mu F$;1210$\geq 10\mu F$;</td></tr><tr><td>35V</td><td>$\leq 5\%$</td><td>$\leq 20\%$</td><td>0603$\geq 1\mu F$;0805$\geq 2.2\mu F$;1206$\geq 2.2\mu F$;1210$\geq 10\mu F$</td></tr><tr><td rowspan="4">25V</td><td rowspan="4">$\leq 5\%$</td><td>$\leq 10\%$</td><td>0201$\geq 0.01\mu F$(0201/X5R$=0.01\mu F$;0805$\geq 1\mu F$; 1210$\geq 10\mu F$*)</td></tr><tr><td>$\leq 14\%$</td><td>0603$\geq 0.33\mu F$</td></tr><tr><td>$\leq 15\%$</td><td>0201$\geq 0.1\mu F$(0201/X5R$>0.01\mu F$);0603$\geq 0.47\mu F$; TT series 0402$\geq 0.10\mu F$(0402/X7R$\geq 0.056\mu F$); 0805$\geq 2.2\mu F$; 1206$\geq 4.7\mu F$;1210$\geq 22\mu F$ (1210/X5R$\geq 10\mu F$*)</td></tr><tr><td>$\leq 20\%$</td><td>0402$\geq 0.33\mu F$</td></tr></table>	Rated vol.	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 100V$	$\leq 3\%$	$\leq 6\%$	1206 $\geq 0.47\mu F$	$\leq 7\%$	1812 $\geq 4.7\mu F$;1825 $\geq 4.7\mu F$; 2220 $\geq 4.7\mu F$; 2225 $\geq 4.7\mu F$	$\leq 7.5\%$	0603 $\geq 0.068\mu F$;0805 $\geq 0.1\mu F$;1206 $\geq 1\mu F$; 1210 $\geq 2.2\mu F$	$\leq 20\%$	0805 $\geq 0.22\mu F$;1210 $\geq 3.3\mu F$	$\geq 50V$	$\leq 3\%$	$\leq 6\%$	0201(50V);0603 $\geq 0.047\mu F$;0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$	$\leq 7\%$	1812 $\geq 4.7\mu F$;1825 $\geq 4.7\mu F$; 2220 $\geq 4.7\mu F$; 2225 $\geq 4.7\mu F$	$\leq 10\%$	0201 $\geq 0.01uF$; 0402 $\geq 0.012\mu F$;1210 $\geq 3.3\mu F$	$\leq 20\%$	0402 $\geq 0.047\mu F$;0603 $>0.1\mu F$;0805 $\geq 1\mu F$ (0805/X7R $>0.47\mu F$); 1206 $\geq 2.2\mu F$;1210 $\geq 10\mu F$;	35V	$\leq 5\%$	$\leq 20\%$	0603 $\geq 1\mu F$;0805 $\geq 2.2\mu F$;1206 $\geq 2.2\mu F$;1210 $\geq 10\mu F$	25V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.01\mu F$ (0201/X5R $=0.01\mu F$;0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$ *)	$\leq 14\%$	0603 $\geq 0.33\mu F$	$\leq 15\%$	0201 $\geq 0.1\mu F$ (0201/X5R $>0.01\mu F$);0603 $\geq 0.47\mu F$; TT series 0402 $\geq 0.10\mu F$ (0402/X7R $\geq 0.056\mu F$); 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$;1210 $\geq 22\mu F$ (1210/X5R $\geq 10\mu F$ *)	$\leq 20\%$	0402 $\geq 0.33\mu F$
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			<table><tr><th>Rated vol.</th><th>D.F. ≤</th><th colspan="2">Exception of D.F. ≤</th></tr><tr><td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td></tr><tr><td>≤15%</td><td>0201≥0.01μF(0201/X7R≥0.022μF);0402≥0.033μF;0603>0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15%</td><td>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%</td><td>0201≥0.1μF;0402≥1μF;0603/X5R≥10μF;01R5/X5R</td></tr><tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201≥0.1μF;0402≥1μF(0402/X6S≥0.47μF);0603≥10μF;0805≥4.7μF;1206≥47μF;1210≥100μF</td></tr><tr><td>4V</td><td>≤20%</td><td>-</td><td>-</td></tr></table> *I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, X7S) <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 vol.	D.F. ≤	Exception of D.F. ≤		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 ≥ 0.1uF; 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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6.3V ; 4V ; All X6S/X7S items; Size≥1812																																					
15	High Temperature Load (Endurance)	*Test temp.: NP0, X7R/X7E/X7S: 125±3°C X6S: 105±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, 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: NP0: More than 30pF, Q≥350 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C X7R, X5R, X6S, X7S:																																		

General Purpose Multilayer Ceramic Capacitors 4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)

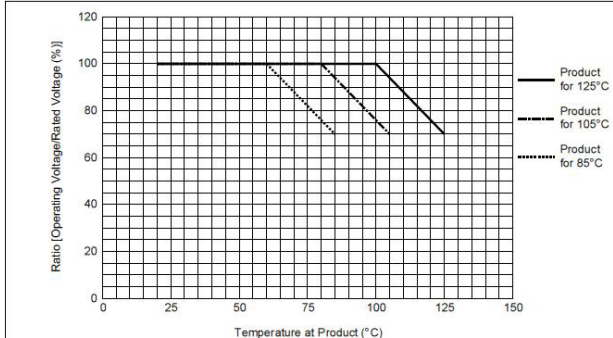
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No	Item	Test Condition				Requirements					
						Rated vol.	D.F. ≤	Exception of D.F. ≤			
		Size	Dielectric	Rated Voltage	Capacitance	≥100V	≤3%	≤6%	1206≥0.47μF		
		01R5	X5R	≐10V	C≐0.1μF			≤7%	1812≥4.7μF;1825≥4.7μF; 2220≥4.7μF; 2225≥4.7μF		
		0201	X5R/X7R/ X6S/X7S	≤10V	C≐0.1μF			≤7.5%	0603≐0.068μF;0805≐0.1μF;1206≐1μF; 1210≐2.2μF		
				≐16V	C >0.1μF			≤20%	0805≐0.22μF;1210≐3.3μF		
		0402	X5R	≤16V	C >1.0μF	≥50V	≤3%	≤6%	0201(50V);0603≐0.047μF;0805≐0.18μF; 1206≐0.47μF		
				25V,50V	C ≐1.0μF			≤7%	1812≐4.7μF;1825≐4.7μF; 2220≐4.7μF; 2225≐4.7μF		
			X6S	6.3V,10V	C >1.0μF			≤10%	0201≐0.01μF; 0402≐0.012μF;1210≐3.3μF		
				16V,25V	C ≐1.0μF			≤20%	0402≐0.047μF;0603>0.1μF;0805≐1μF(0805/ X7R>0.47μF); 1206≐2.2μF;1210≐10μF;		
		0603	X7R/X7S	6.3V,10V	C ≐1.0μF	35V	≤5%	≤20%	0603≐1μF;0805≧2.2μF;1206≐2.2μF;1210≐10μF		
				X5R/X7R/ X6S/X7S	4V			C ≧22μF	≤10%	0201≐0.01μF(0201/X5R=0.01μF;0805≐1μF; 1210≐10μF*	
			X5R/X6S/X7S	6.3V,10V	C ≧4.7μF ^{#1}			≤14%	0603≐0.33μF		
		X7R	35V	C ≐1.0μF	≤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)*			
		0805	X5R/X7R/ X6S/X7S	4V	C ≐47μF	25V	≤5%	≤20%	0402≐0.33μF		
				6.3V	C ≐22μF			≤10%	0603≐0.15μF;0805≐0.68μF;1206≐2.2μF; 1210≐4.7μF		
				10V,50V	C ≐10μF			≤15%	0201≐0.01μF(0201/X7R≐0.022μF);0402≐0.033μF; 0603>0.47μF;0805≐2.2μF;1206≐4.7μF;1210≐22μF		
			X6S	16V	C >10μF			≤15%	0201≐0.012μF;0402≐0.22μF (0402/X7R≐0.15μF); 0603≐0.33μF;0805≐2.2μF;1206≐2.2μF;1210≐22μF		
				25V	C ≐10μF	≤20%	0201≐0.1μF;0402≐1μF;0603/X5R≐10μF;01R5/X5R				
			X7R/X7S	16V,25V	C ≐10μF	16V	≤5%	≤10%	0603≐0.15μF;0805≐0.68μF;1206≐2.2μF; 1210≐4.7μF		
		X5R	C ≐22μF		≤15%			0201≐0.01μF(0201/X7R≐0.022μF);0402≐0.033μF; 0603>0.47μF;0805≐2.2μF;1206≐4.7μF;1210≐22μF			
		1206	X5R/X7R/X6S	≐6.3V	C ≐47μF			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
		1210	X5R/X7R/X6S	16V	C ≐47μF					≤20%	0201≐0.1μF;0402≐1μF;0603/X5R≐10μF;01R5/X5R
			X7R	100V	C ≐3.3μF	6.3V	≤15%	≤30%	0201≐0.1μF;0402≐1μF(0402/X6S≐0.47μF); 0603≐10μF;0805≐4.7μF;1206≐47μF;1210≐100μF		
		TT15	X5R	6.3V	C >1.0μF	4V	≤20%	-	-		
		TT21	X5R/X7R/X6S	≐10V	C ≐10μF						
	**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.										
		Size	Dielectric	Rated Voltage	Capacitance						
		0201	X5R/X6S	16V,25V	C=0.1μF						
			X7R	16V	C ≐0.022μF						
		0402	X7R/X5R/X6S	50V	C>0.01μF						
				10~25V	C ≐0.22μF						
		0603	X7S	50V~100V	C>0.22μF						
				X5R	50V	C>0.1μF					
			25V		C=1.0μF						
			X5R	50V	C ≐1.0μF						
		0805	X5R/X7R/ X6S/ X7S	X7R/X5R/ X6S/ X7S	10V,16V	C ≐1.0μF					
				100V	C ≐0.47μF						
				50V	C ≐0.68μF						
				35V	C ≐2.2μF						
				10~25V	C ≐4.7μF						

*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.
Class II (X7R, X5R, X6S, X7S)

Rated voltage	Insulation Resistance
100V: All X7R;1210≧3.3μF	1GΩ or RxC ≧ 10Ω-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	

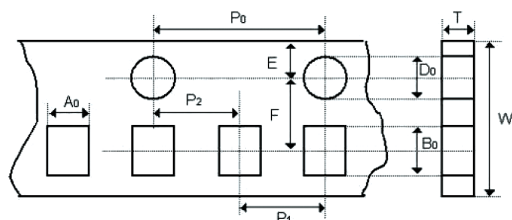
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No	Item	Test Condition	Requirements																													
		<table border="1"> <thead> <tr> <th>Size</th><th>Dielectric</th><th>Rated Voltage</th><th>Capacitance</th></tr> </thead> <tbody> <tr> <td rowspan="4">1206</td><td rowspan="2">X7R</td><td>100V</td><td>$C \geq 1.0\mu\text{F}$</td></tr> <tr> <td>50V</td><td>$C \geq 2.2\mu\text{F}$</td></tr> <tr> <td rowspan="2">X5R/X6S/X7S</td><td>100V</td><td>$C > 1.0\mu\text{F}$</td></tr> <tr> <td>50V</td><td>$C \geq 4.7\mu\text{F}$</td></tr> <tr> <td>1210</td><td>X5R/X7R/ X6S/ X7S</td><td>50V~100V</td><td>$C \geq 2.2\mu\text{F}$</td></tr> <tr> <td rowspan="2">1812</td><td rowspan="2">X7R</td><td>$\leq 50\text{V}$</td><td>$C \geq 4.7\mu\text{F}$</td></tr> <tr> <td>100V</td><td>$C \geq 1.0\mu\text{F}$</td></tr> <tr> <td>1825 2220 2225</td><td>X7R</td><td>100V~250V</td><td>$C \geq 1.0\mu\text{F}$</td></tr> </tbody> </table> (3) $\leq 6.3\text{V}$ or $C \geq 10\mu\text{F}$ or TT series: 150% of rated voltage. (4) 10V~250V: 200% of rated voltage. Excluding 1812/NP0(250V)/104: 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 1210/X7R(2kV)/103: 110% of rated voltage. 1210/NP0(1kV)/333: 100% of rated voltage. 1812/NP0(1kV)/472~562: 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	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	$C \geq 4.7\mu\text{F}$	1210	X5R/X7R/ X6S/ X7S	50V~100V	$C \geq 2.2\mu\text{F}$	1812	X7R	$\leq 50\text{V}$	$C \geq 4.7\mu\text{F}$	100V	$C \geq 1.0\mu\text{F}$	1825 2220 2225	X7R	100V~250V	$C \geq 1.0\mu\text{F}$	** 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.
Size	Dielectric	Rated Voltage	Capacitance																													
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	$C \geq 4.7\mu\text{F}$																													
1210	X5R/X7R/ X6S/ X7S	50V~100V	$C \geq 2.2\mu\text{F}$																													
1812	X7R	$\leq 50\text{V}$	$C \geq 4.7\mu\text{F}$																													
		100V	$C \geq 1.0\mu\text{F}$																													
1825 2220 2225	X7R	100V~250V	$C \geq 1.0\mu\text{F}$																													

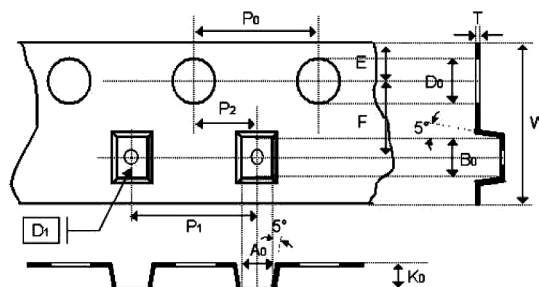
* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa

Appendixes

Tape & Reel Dimensions



The dimension of paper tape



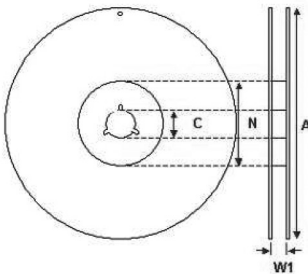
The dimension of plastic tape

General Purpose Multilayer Ceramic Capacitors 4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)

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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	0.4 ±0.1	0.7 ±0.2	1.05 ±0.3	1.5 ±0.20	1.5 ±0.20	< 1.8	1.9 ±0.5	< 2	< 2.3	< 3.05	< 3.05	< 3.05	< 3.20	< 2.50	< 2.50	< 3.90	< 3.90	< 3.9
B ₀	0.7 ±0.1	1.2 ±0.2	1.8 ±0.3	2.3 ±0.2	2.3 ±0.2	< 2.7	3.5 ±0.5	< 3.7	< 4	< 3.8	< 3.8	< 3.8	< 4	< 5.3	< 5.3	< 5.3	< 5.3	< 5.3
T	≤ 0.55	≤ 0.8	≤ 1.2	≤ 1.15	≤ 1.2	0.23 ±0.1	≤ 1.2	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	0.44 ±0.05	-	-	-	-	< 2.5	-	< 2.5	< 2.5	< 1.5	< 2	< 2.5q	< 3.2	< 2.5	< 2.5	< 2.5	< 2.5	< 3.5
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 ±0.3
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 ±0.1
10xP ₀	40 ±0.1	40 ±0.1	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2	40 ±0.2
P ₁	2 ±0.05	2 ±0.05	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1
P ₂	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.1	2 ±0.1	2 ±0.1	2 ±0.1	2 ±0.1
D ₀	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0	1.5 ±0.1/-0
D ₁	-	-	-	-	-	1 ±0.1	-	1 ±0.1	1 ±0.1	1 ±0.1	1 ±0.1	1 ±0.1	1 ±0.1	1.5 ±0.1	1.5 ±0.1	1.5 ±0.1	1.5 ±0.1	1.5 ±0.1
E	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1
F	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	5.5 ±0.1	5.5 ±0.1	5.5 ±0.1	5.5 ±0.1	5.5 ±0.1

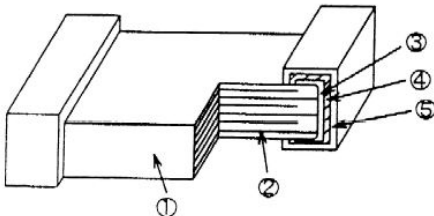
Dimensions : Millimetres



The dimension of reel

Size	0201, 0402, 0603, 0805, 1206, 1210			1812
Reel size	7"	10"	13"	7"
C	13 ±0.5	13 ±0.5	13 ±0.5	13 ±0.5
W1	10 ±1.5	10 ±1.5	10 ±1.5	12.4 +2.0/-0
A	178 ±2	250 ±2	330 ±2	178 ±2.0
N	60 +1.0/-0	50 min	50 min	60 +1.0/-0

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

Newark.com/multicomp-pro
Farnell.com/multicomp-pro
sg.element14.com/b/multicomp-pro

multicompPRO

Storage and handling conditions

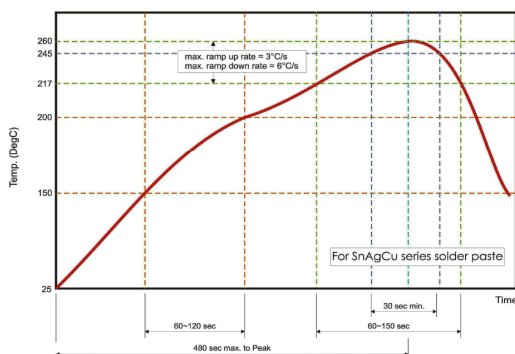
- (1) To store products at 5°C to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

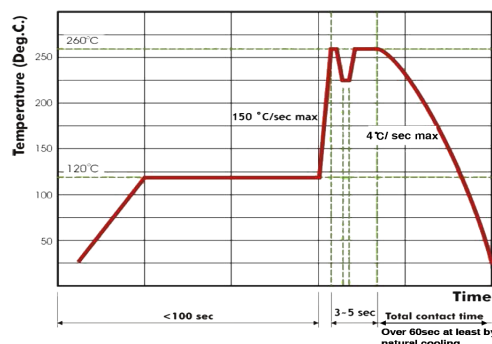
- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.
- c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

Recommended Soldering Conditions:

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N₂ within oven are recommended.



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



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

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