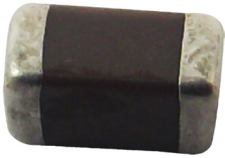


**RoHS
Compliant**



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. 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 (0402 to 1812)
- High capacitance in given case size
- Capacitor with lead-free termination (pure Tin)

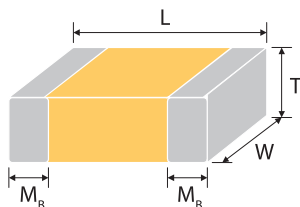
Applications:

- 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
Multi-comp	Inch (mm)	N = NP0 (C0G)	Two significant digits followed by no. of zeros. And R is in place of decimal point.	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.	C = Cu/Ni/Sn	T=7" reeled G=13" reeled
	0201 (0603)	B = X7R	eg.:	4R0=4 VDC			
	0402 (1005)	F = Y5V	0R5 = 0.5pF	6R3=6.3 VDC			
	0603 (1608)	X=X5R	1R0 = 1.0pF	100=10 VDC			
	0805 (2012)	S=X6S	104 = 10x10 ⁴ = 100nF	160=16 VDC			
	1206 (3216)			250=25 VDC			
	1210 (3225)			500=50 VDC			
1812 (4532)			101=100 VDC				

External Dimensions:



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Soldering Method *	MB (mm)			
01R5 (0402)	0.4±0.02	0.2±0.02	0.2±0.02	V	R	0.10±0.03		
0201 (0603)	0.6±0.03	0.3±0.03	0.3±0.03	L	R	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}					
0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	R	0.25 +0.05/-0.10		
			0.50±0.02/-0.05	Q	R			
0603 (1608)	1.00±0.20	0.50±0.20	0.5±0.20	E	R	0.40±0.15		
			1.60±0.10	0.80±0.10	0.80±0.07		S	R / W
			1.60+0.15/-0.10	0.80+0.15/-0.10	0.50±0.10		H	R / W
	1.60±0.20 ^{#1}	0.80±0.20 ^{#1}	0.8±0.20 ^{#1}	X	R / W			

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Soldering Method *	MB (mm)
0805 (2012)	2.00±0.15	1.25±0.10	0.50±0.10	H	R / W	0.50±0.20
			0.60±0.10	A	R / W	
			0.80±0.10	B	R / W	
			1.25±0.10	D	R	
	2.00±0.20	1.25±0.20	0.85±0.10 ^{#4}	T ^{#4}	R / W	
			1.25±0.20	I	R	
1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B	R / W	0.60±0.20 (0.5±0.25) ^{***}
			0.95±0.10	C	R	
			1.25±0.10	D	R	
	3.20±0.20	1.60±0.20	1.15±0.15	J	R	
			1.60±0.20	G	R	
	3.20+0.30/-0.10	1.60+0.30/-0.10	1.60+0.30/-0.10	P	R	
1210 (3225)	3.20±0.30	2.50±0.20	0.95±0.10	C	R	0.75±0.25
			0.85±0.10	T	R	
			1.25±0.10	D	R	
	3.20±0.40	2.50±0.30	1.60±0.20	G	R	
			2.00±0.20	K	R	
			2.50±0.30	M	R	
1808 (4520)	4.50±0.40 (4.5+0.5/-0.3) ^{**}	2.03±0.25	1.25±0.10	D	R	0.75±0.25 (0.5±0.25) ^{***}
			1.40±0.15	F	R	
			1.60±0.20	G	R	
			2.00±0.20	K	R	
1812 (4532)	4.50±0.40 (4.5+0.5/-0.3) ^{**}	3.20±0.30	1.25±0.10	D	R	0.75±0.25 (0.5±0.25) ^{***}
			1.60±0.20	G	R	
			2.00±0.20	K	R	
		3.20±0.40	2.50±0.30	M	R	
			2.80±0.30	U	R	

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

** For 1808_200V ~3kV, 1812_200V~3kV and safety certificated products.

*** For 1206_1000V ~3kV, 1808_200V ~3kV, 1812_200V~3kV and safety certificated products.

#1 : For 0603/Cap≥10µF or 0603(>10V)/Cap>1µF products.

#2 : For 0201/Cap≥0.68µF products.

#3 : For 0201/Cap≥1µF products.

#4 : For 0805/0.22µF/100V/ T thickness:0.85+0.15/-0.1(mm)

General Electrical Data:

Dielectric	NP0	X7R	Y5V	X5R	X6S
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812				
Capacitance range*	0.1pF to 0.1μF	100pF to 47μF	0.01μF to 100μF	100pF to 220μF	0.1μF to 100μF
Capacitance tolerance**	Cap≤5pF ^{#1} : A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	M (±20%), Z (-20/+80%)	K (±10%), M (±20%)	K (±10%), M (±20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	6.3V, 10V, 16V, 25V, 50V, 100V		4V, 6.3V, 10V, 16V, 25V, 50V	
DF(Tan δ)*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1			
Operating temperature	-55 to +125°C		-25°C to +85°C	-55°C to +85°C	-55°C to +105°C
Capacitance characteristic	±30ppm	±15%	+30/-80%	±15%	±22%
Termination	Ni/Sn (lead-free termination)				

#1: NP0, 0.1pF product only provide B tolerance; 0603N0R4 provide B&C tolerance; 0603N0R3 only provide 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: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature.

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

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

Note 1:

X7R/X5R/X6S

Rated vol.	D.F.≦	Exception of D.F.≦	
≧ 100V	≦ 2.5%	≦ 3%	1206 ≧ 0.47μF
		≦ 5%	0805 > 0.1μF; 0603 ≧ 0.068μF; 1206 > 1μF; 1210 ≧ 2.2μF; TT series
50V	≦ 2.5%	≦ 3%	0201(50V); 0603 ≧ 0.047μF; 0805 ≧ 0.18μF; 1206 ≧ 0.47μF
		≦ 5%	1210 ≧ 4.7μF
		≦ 10%	0402 ≧ 0.1μF; 0603 > 0.1μF; 0805 ≧ 1μF; 1206 ≧ 2.2μF; 1210 ≧ 10μF; TT series
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; 1206 ≧ 4.7μF
		≦ 10%	0201 ≧ 0.1μF; 0402 ≧ 0.10μF; 0603 ≧ 0.47μF; 0805 ≧ 2.2μF; 1206 ≧ 6.8μF; 1210 ≧ 22μF; TT series
		≦ 12.5%	0402 ≧ 0.47μF

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



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 ≧ 0.1μF; 0402 ≧ 0.22μF; 0603 ≧ 0.68μF; 0805 ≧ 2.2μF; 1206 ≧ 4.7μF; 1210 ≧ 22μF; TT series
10V	≦5%	≦10%	0201 ≧ 0.012μF; 0402 ≧ 0.33μF (0402/X7R ≧ 0.22μF); TT series 0603 ≧ 0.33μF; 0805 ≧ 2.2μF; 1206 ≧ 2.2μF; 1210 ≧ 22μF; 01R5
		≦15%	0201 ≧ 0.1μF; 0402 ≧ 1μF
6.3V	≦10%	≦15%	0201 ≧ 0.1μF; 0402 ≧ 1μF; 0603 ≧ 10μF; 0805 ≧ 4.7μF; 1206 ≧ 47μF; 1210 ≧ 100μF; TT series
		≦20%	0402 ≧ 2.2μF
4V	≦15%	-	-

Y5V

Rated vol.	D.F. ≦	Exception of D.F. ≦	
≧50V	≦5%	≦7%	0603 ≧ 0.1μF; 0805 ≧ 0.47μF; 1206 ≧ 4.7μF; TT series
		≦12.5%	1210 ≧ 6.8μF
35V	≦7%	-	-
25V	≦5%	≦7%	0402 ≧ 0.047μF; 0603 ≧ 0.1μF; 0805 ≧ 0.33μF; 1206 ≧ 1μF; 1210 ≧ 4.7μF
		≦9%	0402 ≧ 0.068μF; 0603 ≧ 0.47μF; 1206 ≧ 4.7μF; 1210 ≧ 22μF; TT series
16V (C<1.0μF)	≦7%	≦9%	0402 ≧ 0.068μF; 0603 ≧ 0.68μF
		≦12.5%	0402 ≧ 0.22μF
16V (C<1.0μF)	≦9%	≦12.5%	0603 ≧ 2.2μF; 0805 ≧ 3.3μF; 1206 ≧ 10μF; 1210 ≧ 22μF; 1812 ≧ 47μF; TT series
10V	≦12.5%	≦20%	0402 ≧ 0.47μF
6.3V	≦20%	-	-

Capacitance Range

NP0 Dielectric 0201, 0402, 0603, 0805 Sizes

Dielectric		NP0																	
Size		0201			0402					0603					0805				
Rated Voltage (VDC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	0.1pF (0R1)	L	L	L	N	N	N	N											
	0.2pF (0R2)	L	L	L	N	N	N	N											
	0.3pF (0R3)	L	L	L	N	N	N	N		S	S	S	S						
	0.4pF (0R4)	L	L	L	N	N	N	N		S	S	S	S						
	0.5pF (0R5)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.6pF (0R6)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.7pF (0R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.8pF (0R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.9pF (0R9)	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 Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		NP0																	
Size		0201			0402					0603					0805				
Rated Voltage (VDC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	1.0pF (1R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.2pF (1R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.5pF (1R5)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.8pF (1R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.0pF (2R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.2pF (2R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.7pF (2R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.0pF (3R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.3pF (3R3)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.9pF (3R9)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.0pF (4R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.7pF (4R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.0pF (5R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.6pF (5R6)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.0pF (6R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.8pF (6R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	7.0pF (7R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.0pF (8R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.2pF (8R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	9.0pF (9R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	10pF (100)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	12pF (120)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	15pF (150)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	18pF (180)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	22pF (220)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	27pF (270)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	33pF (330)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	39pF (390)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	47pF (470)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	56pF (560)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
68pF (680)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
82pF (820)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
100pF (101)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
120pF (121)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
150pF (151)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
180pF (181)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
220pF (221)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
270pF (271)				N	N	N	N		S	S	S	S	S	A	A	A	A	A	
330pF (331)				N	N	N	N		S	S	S	S	S	A	A	A	A	A	
390pF (391)				N	N	N	N		S	S	S	S	S	B	B	B	B	B	
470pF (471)				N	N	N	N		S	S	S	S	S	B	B	B	B	B	

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General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		NP0																	
Size		0201			0402					0603					0805				
Rated Voltage (VDC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	560pF (561)				N	N	N	N		S	S	S	S	S	B	B	B	B	B
	680pF (681)				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		B	B	B	B	B
	2,200pF (222)									X	X	X	X		B	B	B	B	B
	2,700pF (272)									X	X	X	X		D	D	D	D	D
	3,300pF (332)									X	X	X	X		D	D	D	D	D
	3,900pF (392)									X*	X*	X*	X*		D	D	D	D	D
	4,700pF (472)									X*	X*	X*	X*		D	D	D	D	D
	5,600pF (562)									X*	X*	X*	X*		D	D	D	D	D
	6,800pF (682)									X*	X*	X*	X*		D	D	D	D	D
	8,200pF (822)									X*	X*	X*	X*		D	D	D	D	
	0.010uF (103)									X*	X*	X*	X*		D	D	D	D	
	0.012uF (123)														T*	T*	T*	T*	
	0.015uF (153)														T*	T*	T*	T*	
	0.018uF (183)														D*	D*	D*	D*	
0.022uF (223)														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 (VDC)		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									
	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	

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General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		NP0													
Size		1206					1210					1812			
Rated Voltage (VDC)		10	16	25	50	100	10	16	25	50	100	16	25	50	100
Capacitance	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		K	K	K	K	K	D	D	D	D	
0.039µF (393)	P	P	P	P							M	M	M	M	

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General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		NP0													
Size		1206					1210					1812			
Rated Voltage (VDC)		10	16	25	50	100	10	16	25	50	100	16	25	50	100
Capacitance	0.047µF (473)	J*	J*	J*	J*							M	M	M	M
	0.056µF (563)	J*	J*	J*	J*							M	M	M	M
	0.068µF (683)	G*	G*	G*	G*							M	M	M	M
	0.082µF (823)	G*	G*	G*	G*							M	M	M	M
	0.1µF (104)	G*	G*	G*	G*							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 (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		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		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
	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		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			S	S	S	S	S		B	B	B	B	B
	0.012µF (123)							N	N	N				S	S	S	S	X		B	B	B	B	B
	0.015µF (153)							N	N	N				S	S	S	S	X		B	B	B	B	B
0.018µF (183)							N	N	N				S	S	S	S	X		B	B	B	B	B	
0.022µF (223)							N	N	N	N			S	S	S	S	X		B	B	B	B	B	
0.027µF (273)							N	N	N				S	S	S	S	X		B	B	B	B	D	

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General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



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	6.3	10	16	25	50	100
Capacitance	0.033µF (333)						N	N	N	N			S	S	S	X	X		B	B	B	B	D							
	0.039µF (393)						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					S	S	S	X	X		B	B	B	B	D							
	0.068µF (683)						N	N		N			S	S	S	X	X		B	B	B	B	D							
	0.082µF (823)						N	N					S	S	S	X	X		B	B	B	B	D							
	0.10µF (104)						N	N	N	N	N		S	S	S	X	X		B	B	B	B	D							
	0.12µF (124)												S	S	X				B	B	B	D								
	0.15µF (154)												S	S	X				D	D	D	D								
	0.18µF (184)												S	S	X				D	D	D	D								
	0.22µF (224)						N	N	N	N			S	S	X	X			D	D	D	D	T							
	0.27µF (274)												X	X	X	X			D	D	D	I								
	0.33µF (334)												X	X	X	X			D	D	D	I								
	0.39µF (394)												X	X	X	X			D	D	D	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									
	0.82µF (824)												X	X	X				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	X	X				I	I	I	I	I							
	3.3µF (335)																													
4.7µF (475)																		I	I	I	I									
6.8µF (685)																														
10µF (106)																		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.

X7R Dielectric 1206, 1210, 1812 Sizes

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

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General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		X7R																	
Size		1206						1210						1812					
Rated Voltage (VDC)		6.3	10	16	25	35	50	100	6.3	10	16	25	50	100	10	16	25	50	100
Capacitance	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	C	D	D	D	D	D
	1,200pF (122)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	1,500pF (152)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	1,800pF (182)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	2,200pF (222)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	2,700pF (272)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	3,300pF (332)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	3,900pF (392)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	4,700pF (472)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	5,600pF (562)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	6,800pF (682)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	8,200pF (822)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.010µF (103)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.012µF (123)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.015µF (153)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.018µF (183)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.022µF (223)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.027µF (273)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.033µF (333)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.039µF (393)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.047µF (473)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.056µF (563)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.068µF (683)		B	B	B		B	B	C	C	C	C	C	C	D	D	D	D	D
	0.082µF (823)		B	B	B		B	D	C	C	C	C	C	C	D	D	D	D	D
	0.10µF (104)		B	B	B		B	D	C	C	C	C	C	C	D	D	D	D	D
	0.12µF (124)		B	B	B		B	D	C	C	C	C	C	C	D	D	D	D	D
	0.15µF (154)		C	C	C		C	G	C	C	C	C	C	D	D	D	D	D	D
	0.18µF (184)		C	C	C		C	G	C	C	C	C	C	D	D	D	D	D	D
	0.22µF (224)		C	C	C		C	G	C	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	D
	0.33µF (334)		C	C	C		D	G	C	C	C	D	G	D	D	D	D	D	D
	0.39µF (394)		C	C	J		P	G	C	C	C	D	M	D	D	D	D	D	D
	0.47µF (474)		J	J	J		P	G	C	C	C	D	M	D	D	D	D	D	K
	0.56µF (564)		J	J	J		P	P	D	D	D	D	M	D	D	D	D	D	K
	0.68µF (684)		J	J	J		P	P	D	D	D	D	K	D	D	D	D	K	K
	0.82µF (824)		J	J	J		P	P	D	D	D	D	K	D	D	D	D	K	K
	1.0µF (105)		J	J	J		P	P	D	D	D	D	K	D	D	D	D	K	K
	1.5µF (155)	J	J	J	P					K	G	M	M						K
2.2µF (225)	J	J	J	P		P	P		K	G	M	M					M	M	
3.3µF (335)		P	P	P					K	G									
4.7µF (475)	P	P	P	P		P			K	K	K	M							
6.8µF (685)																			

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General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		X7R																	
Size		1206						1210						1812					
Rated Voltage (VDC)		6.3	10	16	25	35	50	100	6.3	10	16	25	50	100	10	16	25	50	100
Capacitance	10µF (106)	P	P	P	P	P				K	K	K	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.

Y5V Dielectric 0402, 0603, 0805 Sizes

Dielectric		Y5V															
Size		0402					0603					0805					
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	100
Capacitance	0.010µF (103)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.015µF (153)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.022µF (223)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.033µF (333)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.047µF (473)		N	N	N			S	S	S	S		A	A	A	A	B
	0.068µF (683)		N	N	N			S	S	S	S		A	A	A	A	B
	0.10µF (104)		N	N	N			S	S	S	S		A	A	A	A	B
	0.15µF (154)		N	N				S	S	S	S		A	A	A	A	
	0.22µF (224)	N	N	N				S	S	S	S		A	A	A	A	
	0.33µF (334)	N	N	N				S	S	S	X		B	B	B	B	
	0.47µF (474)	N	N	N				S	S	X	X		B	B	B	B	
	0.68µF (684)	N						S	X	X			B	B	D	D	
	1.0µF (105)	N	N					S	X	X			B	B	D	D	
	1.5µF (155)							S					D	D			
	2.2µF (225)						S	S	X				D	D	I		
	3.3µF (335)												D	D			
4.7µF (475)						X	X					D	D	I			
6.8µF (685)												I					
10µF (106)											I	I	I				
22µF (226)											I	I					

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



General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Y5V Dielectric 1206, 1210, 1812 Sizes

Dielectric		Y5V																	
Size		1206					1210							1812					
Rated Voltage (VDC)		6.3	10	16	25	50	100	6.3	10	16	25	35	50	100	10	16	25	50	100
Capacitance	0.010µF (103)		B	B	B	B	B							C					D
	0.015µF (153)		B	B	B	B	B							C					D
	0.022µF (223)		B	B	B	B	B							C					D
	0.033µF (333)		B	B	B	B	B							C					D
	0.047µF (473)		B	B	B	B	B							C					D
	0.068µF (683)		B	B	B	B	B							C					D
	0.10µF (104)		B	B	B	B	B		C	C	C		C	C	D	D	D	D	D
	0.15µF (154)		B	B	B	B	C		C	C	C		C	C	D	D	D	D	D
	0.22µF (224)		B	B	B	B	C		C	C	C		C	C	D	D	D	D	D
	0.33µF (334)		B	B	B	B			C	C	C		C	C	D	D	D	D	D
	0.47µF (474)		B	B	B	B			C	C	C		C		D	D	D	D	D
	0.68µF (684)		B	B	B	B			C	C	C		C		D	D	D	D	D
	1.0µF (105)		C	C	C	C			C	C	C		C		D	D	D	D	D
	1.5µF (155)		C	C	C				C	C	C				D	D	D	D	
	2.2µF (225)		C	C	C	J			C	C	C		G		D	D	D	D	
	3.3µF (335)		J	J	J				C	C	C				D	D	D	D	
	4.7µF (475)		J	J	J	P			C	C	D		G		D	D	D	D	
	6.8µF (685)		J	J					C	C	D		K		D	D	D	D	
	10µF (106)		J	J	P				D	D	G	K	K		D	D	D	K	
22µF (226)		P	P						K	K									
47µF (476)	P							K	K						M				
100µF (107)							M												

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

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

Dielectric		X5R														
Size		0201					0402					0603				
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	100pF (101)			L	L	L										
	120pF (121)			L	L	L										
	150pF (151)			L	L	L										
	180pF (181)			L	L	L										
	220pF (221)			L	L	L										
	270pF (271)			L	L	L										
	330pF (331)			L	L	L										
	390pF (391)			L	L	L										
	470pF (471)			L	L	L										
	560pF (561)			L	L	L										
	680pF (681)			L	L	L										
820pF (821)			L	L	L											

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General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		X5R														
Size		0201					0402					0603				
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	1,000pF (102)		L	L	L	L										
	1,500pF (152)		L	L												
	2,200pF (222)		L	L												
	2,700pF (272)		L	L												
	3,300pF (332)		L	L												
	4,700pF (472)		L	L												
	6,800pF (682)		L													
	0.010µF (103)	L	L	L	L											
	0.015µF (153)	L	L													
	0.022µF (223)	L	L													
	0.027µF (273)	L	L						N							
	0.033µF (333)	L	L						N							
	0.039µF (393)	L	L						N							
	0.047µF (473)	L	L						N							
	0.056µF (563)	L	L					N	N							
	0.068µF (683)	L	L					N	N							
	0.082µF (823)	L	L				N	N	N							
	0.10µF (104)	L	L	L	L		N	N	N	N	N					
	0.15µF (154)						N	N	N	N						
	0.22µF (224)	L	L				N	N	N	N	N			X	X	
	0.27µF (274)												X	X	X	
	0.33µF (334)						N	N				X	X	X	X	
	0.39µF (394)												X	X	X	
	0.47µF (474)	L					N	N	E	E	E	X	X	X	X	X
	0.68µF (684)						N	N				X	X	X	X	
	0.82µF (824)											X	X	X		
	1.0µF (105)	L	L*				N	N	N	N		X	X	X	X	X
	1.5µF (155)											X				
	2.2µF (225)	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		
6.8µF (685)																
10µF (106)						E*	E*				X	X	X	X*		
22µF (226)											X*	X*				
47µF (476)											X*					



General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		X5R																	
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	1.0µF (105)			D	D	D	I												
	1.5µF (155)		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			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
	22µF (226)		I	I*	I*	I*			P	P	P	P			M	M	M	M	
	47µF (476)		I*	I*					P	P					M	M	M		
	100µF (107)	I*							P*						M*	M*			
220µF (227)								P*						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.

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

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

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**General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics**



Size	Thickness (mm) Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
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
	1.60+0.30/-0.10	P	-	-	2,000	9,000
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
	1.60±0.20	G	-	-	2,000	-
	2.00±0.20	K	-	-	1,000	6,000
	2.50±0.30	M	-	-	1,000	6,000
1808 (4520)	1.25±0.10	D	-	-	2,000	10,000
	1.10±0.15	F	-	-	2,000	10,000
	1.60±0.20	G	-	-	2,000	8,000
	2.00±0.20	K	-	-	1,000	6,000
1812 (4532)	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	-

Dimensions : Millimetres

Reliability Test Conditions and Requirements:

No	Item	Test Condition	Requirements
1	Visual and Mechanical	-	No remarkable defect. Dimensions to conform to individual specification sheet.

No	Item	Test Condition	Requirements																																																						
2	Capacitance		*Shall not exceed the limits given in the detailed spec.																																																						
			NP0: Cap \geq 30pF, Q \geq 1000; Cap $<$ 30pF, Q \geq 400+20C X7R, X5R, X6S:																																																						
			<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.\leq</th> <th colspan="2">Exception of D.F.\leq</th> </tr> </thead> <tbody> <tr> <td rowspan="2">\geq100V</td> <td rowspan="2">\leq2.5%</td> <td>\leq3%</td> <td>1206 \geq 0.47μF</td> </tr> <tr> <td>\leq5%</td> <td>0805 $>$ 0.1μF; 0603 \geq 0.068μF; 1206 $>$1μF; 1210 \geq 2.2μF; TT series</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">\leq2.5%</td> <td>\leq3%</td> <td>0201(50V); 0603 \geq 0.047μF; 0805 \geq 0.18μF; 1206 \geq 0.47μF</td> </tr> <tr> <td>\leq5%</td> <td>1210 \geq 4.7μF</td> </tr> <tr> <td>\leq10%</td> <td>0402 \geq 0.1μF; 0603 $>$ 0.1μF; 0805 \geq 1μF; 1206 \geq 2.2μF; 1210 \geq 10μF; TT series</td> </tr> <tr> <td>35V</td> <td>\leq3.5%</td> <td>\leq10%</td> <td>0603 \geq 1μF; 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 10μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">\leq3.5%</td> <td>\leq5%</td> <td>0201 \geq 0.01μF; 0805 \geq 1μF; 1210 \geq 10μF</td> </tr> <tr> <td>\leq7%</td> <td>0603 \geq 0.33μF; 1206 \geq 4.7μF</td> </tr> <tr> <td>\leq10%</td> <td>0201 \geq 0.1μF; 0402 \geq 0.10μF; 0603 \geq 0.47μF; 0805 \geq 2.2μF; 1206 \geq 6.8μF; 1210 \geq 22μF; TT series</td> </tr> <tr> <td>\leq12.5%</td> <td>0402 \geq 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">\leq3.5%</td> <td>\leq5%</td> <td>0201 \geq 0.01μF; 0402 \geq 0.033μF; 0603 \geq 0.15μF; 0805 \geq 0.68μF; 1206 \geq 2.2μF; 1210 \geq 4.7μF</td> </tr> <tr> <td>\leq10%</td> <td>0201 \geq 0.1μF; 0402 \geq 0.22μF; 0603 \geq 0.68μF; 0805 \geq 2.2μF; 1206 \geq 4.7μF; 1210 \geq 22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">\leq5%</td> <td>\leq10%</td> <td>0201 \geq 0.012μF; 0402 \geq 0.33μF (0402/X7R \geq 0.22μF); TT series; 0603 \geq 0.33μF; 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 22μF; 01R5</td> </tr> <tr> <td>\leq15%</td> <td>0201 \geq 0.1μF; 0402 \geq 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">\leq10%</td> <td>\leq15%</td> <td>0201 \geq 0.1μF; 0402 \geq 1μF; 0603 \geq 10μF; 0805 \geq 4.7μF; 1206 \geq 47μF; 1210 \geq 100μF; TT series</td> </tr> <tr> <td>\leq20%</td> <td>0402 \geq 2.2μF</td> </tr> <tr> <td>4V</td> <td>\leq15%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F. \leq	Exception of D.F. \leq		\geq 100V	\leq 2.5%	\leq 3%	1206 \geq 0.47 μ F	\leq 5%	0805 $>$ 0.1 μ F; 0603 \geq 0.068 μ F; 1206 $>$ 1 μ F; 1210 \geq 2.2 μ F; TT series	50V	\leq 2.5%	\leq 3%	0201(50V); 0603 \geq 0.047 μ F; 0805 \geq 0.18 μ F; 1206 \geq 0.47 μ F	\leq 5%	1210 \geq 4.7 μ F	\leq 10%	0402 \geq 0.1 μ F; 0603 $>$ 0.1 μ F; 0805 \geq 1 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F; TT series	35V	\leq 3.5%	\leq 10%	0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F	25V	\leq 3.5%	\leq 5%	0201 \geq 0.01 μ F; 0805 \geq 1 μ F; 1210 \geq 10 μ F	\leq 7%	0603 \geq 0.33 μ F; 1206 \geq 4.7 μ F	\leq 10%	0201 \geq 0.1 μ F; 0402 \geq 0.10 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 6.8 μ F; 1210 \geq 22 μ F; TT series	\leq 12.5%	0402 \geq 0.47 μ F	16V	\leq 3.5%	\leq 5%	0201 \geq 0.01 μ F; 0402 \geq 0.033 μ F; 0603 \geq 0.15 μ F; 0805 \geq 0.68 μ F; 1206 \geq 2.2 μ F; 1210 \geq 4.7 μ F	\leq 10%	0201 \geq 0.1 μ F; 0402 \geq 0.22 μ F; 0603 \geq 0.68 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F; TT series	10V	\leq 5%	\leq 10%	0201 \geq 0.012 μ F; 0402 \geq 0.33 μ F (0402/X7R \geq 0.22 μ F); TT series; 0603 \geq 0.33 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 22 μ F; 01R5	\leq 15%	0201 \geq 0.1 μ F; 0402 \geq 1 μ F	6.3V	\leq 10%	\leq 15%	0201 \geq 0.1 μ F; 0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 4.7 μ F; 1206 \geq 47 μ F; 1210 \geq 100 μ F; TT series	\leq 20%	0402 \geq 2.2 μ F	4V	\leq 15%	-	-
Rated vol.	D.F. \leq	Exception of D.F. \leq																																																							
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50V	\leq 2.5%	\leq 3%	0201(50V); 0603 \geq 0.047 μ F; 0805 \geq 0.18 μ F; 1206 \geq 0.47 μ F																																																						
		\leq 5%	1210 \geq 4.7 μ F																																																						
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25V	\leq 3.5%	\leq 5%	0201 \geq 0.01 μ F; 0805 \geq 1 μ F; 1210 \geq 10 μ F																																																						
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16V	\leq 3.5%	\leq 5%	0201 \geq 0.01 μ F; 0402 \geq 0.033 μ F; 0603 \geq 0.15 μ F; 0805 \geq 0.68 μ F; 1206 \geq 2.2 μ F; 1210 \geq 4.7 μ F																																																						
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10V	\leq 5%	\leq 10%	0201 \geq 0.012 μ F; 0402 \geq 0.33 μ F (0402/X7R \geq 0.22 μ F); TT series; 0603 \geq 0.33 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 22 μ F; 01R5																																																						
		\leq 15%	0201 \geq 0.1 μ F; 0402 \geq 1 μ F																																																						
6.3V	\leq 10%	\leq 15%	0201 \geq 0.1 μ F; 0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 4.7 μ F; 1206 \geq 47 μ F; 1210 \geq 100 μ F; TT series																																																						
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Rated vol.	D.F. \leq	Exception of D.F. \leq																																																							
\geq 50V	5%	7%	0603 \geq 0.1 μ F; 0805 \geq 0.47 μ F; 1206 \geq 4.7 μ F; TT series																																																						
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	Q/ D.F. (Dissipation Factor)	Class I: NP0 Cap \leq 1000pF 1.0 \pm 0.2Vrms, 1MHz \pm 10% Cap $>$ 1000pF 1.0 \pm 0.2Vrms, 1kHz \pm 10% Class II: X7R, X5R, X6S, Y5V Cap \leq 10 μ F, 1.0 \pm 0.2Vrms, 1kHz \pm 10% ** Cap $>$ 10 μ F, 0.5 \pm 0.2Vrms, 120Hz \pm 20% ** Test condition: 0.5 \pm 0.2Vrms, 1kHz \pm 10% X7R: 0805=106(6.3V&10V) X5R: 01R5 \geq 103, 0201 \geq 224(6.3V, 10V)#1, 0402 \geq 475 (6.3V, 16V), 0402 \geq 225(10V), 0603=106 (6.3V, 10V), TT18X \geq 475(10V) , TT15X series X6S:0201 \geq 104 (6.3V), 0402 \geq 225 (6.3V), 0603 \geq 106 (6.3V), #1 Excluding 0201X105K6R3(1.0 \pm 0.2Vrms, 1kHz \pm 10%)																																																							

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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.																																										
5	Insulation Resistance	To apply rated voltage for max. 120 sec.	<p>10GΩ or $RxC \geq 500\Omega \cdot F$ whichever is smaller. Class II (X7R, X5R, X6S, Y5V)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="4">10GΩ or $RxC \geq 100\Omega \cdot F$ whichever is smaller.</td> </tr> <tr> <td>50V: 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: 0805$\geq 2.2\mu F$; 1206$\geq 2.2\mu F$; 1210$\geq 10\mu F$</td> </tr> <tr> <td>25V: 0402$\geq 1\mu F$; 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$\geq 0.1\mu F$; 0402$\geq 0.22\mu F$; 0603$\geq 1\mu F$</td> <td rowspan="10">10GΩ or $RxC \geq 50 \Omega \cdot F$ whichever is smaller.</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; TT series</td> </tr> <tr> <td>All X6S items</td> </tr> <tr> <td>50V: 0402$\geq 0.1\mu F$; 0603$\geq 2.2\mu F$; 0805$\geq 10\mu F$; 1206$\geq 10\mu F$</td> </tr> <tr> <td>35V: 0603$\geq 1\mu F$</td> </tr> <tr> <td>25V: 0201$\geq 0.1\mu F$; 0402$\geq 0.22\mu F$; 0603$\geq 10\mu F$; 0805$\geq 10\mu F$; 1206$\geq 22\mu F$</td> </tr> <tr> <td>16V: 0603$\geq 10\mu F$</td> </tr> <tr> <td>10V: 0201$\geq 0.1\mu F$; 0603$\geq 10\mu F$; 0805$\geq 47\mu F$; TT21$\geq 4.7\mu F$</td> </tr> <tr> <td>6.3V: 0201$\geq 0.1\mu F$; 0603$\geq 4.7\mu F$; 1206$\geq 10\mu F$</td> </tr> <tr> <td>4V: 0603$\geq 22\mu F$; 0805$\geq 47\mu F$</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: X7R	10G Ω or $RxC \geq 100\Omega \cdot F$ whichever is smaller.	50V: 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 4.7\mu F$	35V: 0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$	25V: 0402 $\geq 1\mu F$; 0603 $\geq 2.2\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 10\mu F$; 1210 $\geq 10\mu F$	16V: 0201 $\geq 0.1\mu F$; 0402 $\geq 0.22\mu F$; 0603 $\geq 1\mu F$	10G Ω or $RxC \geq 50 \Omega \cdot F$ whichever is smaller.	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; TT series	All X6S items	50V: 0402 $\geq 0.1\mu F$; 0603 $\geq 2.2\mu F$; 0805 $\geq 10\mu F$; 1206 $\geq 10\mu F$	35V: 0603 $\geq 1\mu F$	25V: 0201 $\geq 0.1\mu F$; 0402 $\geq 0.22\mu F$; 0603 $\geq 10\mu F$; 0805 $\geq 10\mu F$; 1206 $\geq 22\mu F$	16V: 0603 $\geq 10\mu F$	10V: 0201 $\geq 0.1\mu F$; 0603 $\geq 10\mu F$; 0805 $\geq 47\mu F$; TT21 $\geq 4.7\mu F$	6.3V: 0201 $\geq 0.1\mu F$; 0603 $\geq 4.7\mu F$; 1206 $\geq 10\mu F$	4V: 0603 $\geq 22\mu F$; 0805 $\geq 47\mu F$																							
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7	Adhesive Strength of Termination	Pressurizing force: 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.) Measurement to be made after keeping at room temp. for 24±2 hrs.	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 metalized area.															
10.	Bending Test	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec. 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: within ±12.5% Y5V: within ±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)															
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): 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 ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5% Y5V: within ±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25% max. leaching on each edge.															
12	Temperature Cycle	Conduct the five cycles according to the temperatures and time.	No remarkable damage. Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5% Y5V: within ±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements.															
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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.	<p>No remarkable damage. Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; TT series & C≥ 1uF, within ±25% **10V: 0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%; Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40% Q/D.F. value: NP0: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C X7R, X5R, X6S:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥100V</td> <td rowspan="2">≤3%</td> <td>≤6%</td> <td>1206≥0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0805>0.1μF, 0603≥0.068μF 1206>1μF;1210≥2.2μF;TT series</td> </tr> <tr> <td rowspan="3">≥50V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>0201(50V); 0603≥0.047μF; 0805≥0.18μF;1206≥0.47μF</td> </tr> <tr> <td>≤10%</td> <td>1210≥4.7μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.1μF; 0603≥1μF; 0805≥1μF;1206≥4.7μF; 1210≥10μF TT series</td> </tr> <tr> <td>35V</td> <td>≤5%</td> <td>≤20%</td> <td>0603≥1μF; 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">≤5%</td> <td>≤10%</td> <td>0201≥0.01μF;0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>≤14%</td> <td>0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0402≥0.10μF;0603≥0.47μF;0805≥2.2μF; 1206≥6.8μF ; 1210≥22μF; TT series</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.1μF; 0402≥0.47μF; 0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201≥0.012μF 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>≤20%</td> <td>0201≥0.1μF; 0402≥1μF TT series</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30%</td> <td>0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF; 1206≥47μF :1210≥100μF; TT series</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F.≤	Exception of D.F. ≤		≥100V	≤3%	≤6%	1206≥0.47μF	≤7.5%	0805>0.1μF, 0603≥0.068μF 1206>1μF;1210≥2.2μF;TT series	≥50V	≤3%	≤6%	0201(50V); 0603≥0.047μF; 0805≥0.18μF;1206≥0.47μF	≤10%	1210≥4.7μF	≤20%	0402≥0.1μF; 0603≥1μF; 0805≥1μF;1206≥4.7μF; 1210≥10μF TT series	35V	≤5%	≤20%	0603≥1μF; 0805≥2.2μF; 1210≥10μF	25V	≤5%	≤10%	0201≥0.01μF;0805≥1μF; 1210≥10μF	≤14%	0603≥0.33μF; 1206≥4.7μF	≤15%	0402≥0.10μF;0603≥0.47μF;0805≥2.2μF; 1206≥6.8μF ; 1210≥22μF; TT series	≤20%	0402≥0.47μF	16V	≤5%	≤10%	0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF;1206≥2.2μF;1210≥4.7μF	≤15%	0201≥0.1μF; 0402≥0.47μF; 0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series	10V	≤7.5%	≤15%	0201≥0.012μF 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤20%	0201≥0.1μF; 0402≥1μF TT series	6.3V	≤15%	≤30%	0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF; 1206≥47μF :1210≥100μF; TT series	4V	≤20%	-	-
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14	Humidity (Damp Heat) Load	Test temp.: 40±2°C Humidity: 90~95%RH Test time: 500+24/-0 hrs. To apply voltage : rated voltage. Before initial measurement (Class II only): To apply test voltage for 1hr at 40°C 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: ±7.5% or 0.75pF whichever is larger. X7R, X5R, X6S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; TT series & C≥ 1uF, within ±25% **10V: 0603≥4.7μF; 0402≥1μF; 0201≥0.1μF, within ±25%; Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40% Q/D.F. value: NP0: C≥30pF, Q≥200; C<30pF, Q≥100+10/3C																																															

No	Item	Test Condition	Requirements					
14	Humidity (Damp Heat) Load		X7R, X5R, X6S:					
			Rated vol.	D.F. ≤	Exception of D.F. ≤			
			≥100V	≤3%	≤6%	1206 ≥ 0.47μF		
					≤7.5%	0805 > 0.1μF; 0603 ≥ 0.068μF 1206 > 1μF; 1210 ≥ 2.2μF; TT series		
			≥50V	≤3%	≤6%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF		
					≤10%	1210 ≥ 4.7μF		
					≤20%	0402 ≥ 0.1μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF TT series		
			35V	≤5%	≤20%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1210 ≥ 10μF		
			25V	≤5%	≤10%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF		
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			10V	≤7.5%	≤15%	0201 ≥ 0.012μF 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF; TT series		
					≤20%	0201 ≥ 0.1μF; 0402 ≥ 1μF		
			6.3V	≤15%	≤30%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF; TT series		
			4V	≤20%	-	-		
			Y5V:					
			Rated vol.	D.F. ≤	Exception of D.F. ≤			
			≥50V	5%	7%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF;		
					12.5%	1210 ≥ 6.8μF		
			35V	7%	-	-		
25V	5%	7%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF					
		9%	0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF;					
16V (C < 1μF)	7%	9%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF					
		12.5%	0402 ≥ 0.22μF					
16V (C ≥ 1.0μF)	9%	12.5%	0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF					
10V	12.5%	20%	0402 ≥ 0.47μF					
6.3V	20%	-	-					

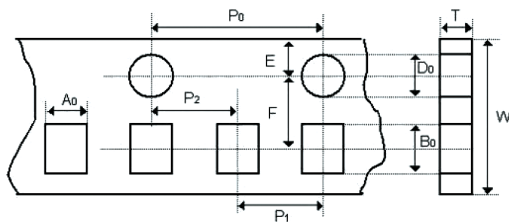
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14	Humidity (Damp Heat) Load		<p>*I.R.: $\geq 10V$, $500M\Omega$ or $25 \Omega\text{-F}$ whichever is smaller. Class II (X7R, X5R, X6S, Y5V)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="8">1GΩ or RxC$\geq 10 \Omega\text{-F}$ whichever is smaller.</td> </tr> <tr> <td>50V: 0402$\geq 0.1\mu\text{F}$; 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$\geq 2.2\mu\text{F}$; 1210$\geq 10\mu\text{F}$</td> </tr> <tr> <td>25V: 0402$\geq 1\mu\text{F}$; 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: 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$\geq 2.2\mu\text{F}$;</td> </tr> <tr> <td>1206$\geq 4.7\mu\text{F}$; 1210$\geq 47\mu\text{F}$</td> </tr> <tr> <td>6.3V ; 4V TT series ; All X6S items</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: X7R	1G Ω or RxC $\geq 10 \Omega\text{-F}$ whichever is smaller.	50V: 0402 $\geq 0.1\mu\text{F}$; 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 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$	25V: 0402 $\geq 1\mu\text{F}$; 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: 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 TT series ; All X6S items																																				
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15.	High Temperature Load (Endurance)	<p>*Test temp.: NP0, X7R/X7E: $125\pm 3^{\circ}\text{C}$ X6S: $105\pm 3^{\circ}\text{C}$ X5R, Y5V: $85\pm 3^{\circ}\text{C}$ *Test time: 1000+24/-0 hrs. *To apply voltage: (1) $\leq 6.3V$ or C$\geq 10\mu\text{F}$ or TT series: 150% of rated voltage. (2) $10V \leq U_r < 500V$: 200% of rated voltage. (3) 500V: 150% of rated voltage. (4) $U_r \geq 630V$: 120% of rated voltage. (5) 100% of rated voltage for below range.</p> <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R/X7R/ X6S</td> <td>$\leq 10V$</td> <td>C$\geq 0.1\mu\text{F}$</td> </tr> <tr> <td>0402</td> <td>X5R/X7R/ X6S Y5V</td> <td>6.3V, 10V 16V, 25V</td> <td>C$\geq 1.0\mu\text{F}$</td> </tr> <tr> <td rowspan="3">0603</td> <td rowspan="3">X5R/X7R/ X6S</td> <td>4V</td> <td>C$\geq 22\mu\text{F}$</td> </tr> <tr> <td>6.3V, 10V</td> <td>C$\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>25V, 35V</td> <td>C$\geq 1.0\mu\text{F}$</td> </tr> <tr> <td rowspan="3">0805</td> <td rowspan="3">X5R/X7R/ X6S</td> <td>4V</td> <td>C$\geq 47\mu\text{F}$</td> </tr> <tr> <td>6.3V</td> <td>C$\geq 22\mu\text{F}$</td> </tr> <tr> <td>10V~50V</td> <td>C$\geq 10\mu\text{F}$</td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R/X7R/</td> <td>6.3V</td> <td>C$\geq 47\mu\text{F}$</td> </tr> <tr> <td>NP0</td> <td>3,000V</td> <td>C$\geq 1.5\text{pF}$</td> </tr> <tr> <td>TT18</td> <td>Y5V</td> <td>6.3V, 10</td> <td>C$\geq 2.2\mu\text{F}$</td> </tr> <tr> <td>TT21</td> <td>Y5V</td> <td>6.3V</td> <td>C$\geq 10\mu\text{F}$</td> </tr> <tr> <td>TT31</td> <td>Y5V</td> <td>6.3V</td> <td>C$\geq 22\mu\text{F}$</td> </tr> </tbody> </table>	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R/X7R/ X6S	$\leq 10V$	C $\geq 0.1\mu\text{F}$	0402	X5R/X7R/ X6S Y5V	6.3V, 10V 16V, 25V	C $\geq 1.0\mu\text{F}$	0603	X5R/X7R/ X6S	4V	C $\geq 22\mu\text{F}$	6.3V, 10V	C $\geq 4.7\mu\text{F}$	25V, 35V	C $\geq 1.0\mu\text{F}$	0805	X5R/X7R/ X6S	4V	C $\geq 47\mu\text{F}$	6.3V	C $\geq 22\mu\text{F}$	10V~50V	C $\geq 10\mu\text{F}$	1206	X5R/X7R/	6.3V	C $\geq 47\mu\text{F}$	NP0	3,000V	C $\geq 1.5\text{pF}$	TT18	Y5V	6.3V, 10	C $\geq 2.2\mu\text{F}$	TT21	Y5V	6.3V	C $\geq 10\mu\text{F}$	TT31	Y5V	6.3V	C $\geq 22\mu\text{F}$	<p>No remarkable damage. Cap change: NP0: $\pm 3.0\%$ or $\pm 0.3\text{pF}$ whichever is larger X7R, X5R, X6S: $\geq 10V^{**}$ within $\pm 12.5\%$; $\leq 6.3V$ within $\pm 25\%$; TT series & C$\geq 1\mu\text{F}$, within $\pm 25\%$ **10V: 0603$\geq 4.7\mu\text{F}$; 0402$\geq 1\mu\text{F}$; 0201$\geq 0.1\mu\text{F}$, within $\pm 25\%$; Y5V: $\geq 10V$, within $\pm 30\%$; $\leq 6.3V$, within $+30/-40\%$ Q/D.F. value: NP0: More than 30pF, Q≥ 350 10pF$\leq C < 30\text{pF}$, Q$\geq 275+2.5C$ Less than 10pF, Q$\geq 200+10C$</p>
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	NP0	3,000V	C $\geq 1.5\text{pF}$																																															
TT18	Y5V	6.3V, 10	C $\geq 2.2\mu\text{F}$																																															
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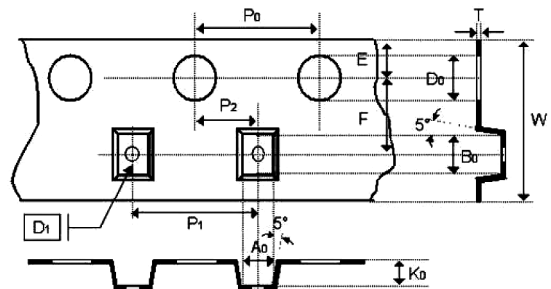
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Appendixes

Tape & Reel Dimensions



The dimension of paper tape



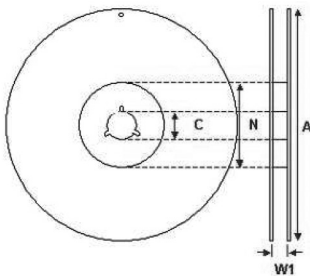
The dimension of plastic tape

Size	0201	0402	0603	0805			1206			1210			1808	1812	
Thickness	L	N,E	S,H,X	A,H	B,T	D,I	B,T	C,J,D	G,P	T	C,D,G,K	M	D,F,G,K	D,F,G,K	M,U
A ₀	0.39 +/-0.07	0.70 +/-0.2	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	< 2.30	< 3.05	< 3.05	< 3.20	< 2.50	< 3.90	< 3.90
B ₀	0.69 +/-0.07	1.20 +/-0.2	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	< 2.70	3.50 +/-0.50	< 3.70	< 4.00	< 3.80	< 3.80	< 3.95	< 5.30	< 5.30	< 5.30
T	≤ 0.50	≤ 0.80	≤ 1.20	≤ 1.15	≤ 1.30	0.23 +/-0.1	≤ 1.30	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1
K ₀	-	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 1.50	< 2.50	< 3.00	< 2.50	< 2.50	< 3.50
W	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.20	8.00 +/-0.10	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	12.00 +/-0.20	12.00 +/-0.20	12.00 +/-0.20
P ₀	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
10xP ₀	40.00 +/-0.10	40.00 +/-0.10	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20
P ₁	2.00 +/-0.05	2.00 +/-0.05	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10
P ₂	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.10	2.00 +/-0.10	2.00 +/-0.10

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



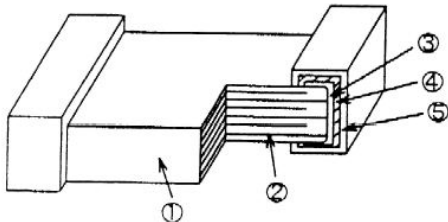
Size	0201	0402	0603	0805			1206			1210			1808	1812	
Thickness	L	N,E	S,H,X	A,H	B,T	D,I	B,T	C,J,D	G,P	T	C,D,G,K	M	D,F,G,K	D,F,G,K	M,U
D ₀	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.50 +0.1/-0	1.55 +/-0.05	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0
D ₁	-	-	-	-	-	1.00 +/-0.10	-	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.50 +/-0.10	1.50 +/-0.10	1.50 +/-0.10
E	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.10	1.75 +/-0.05	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10
F	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	5.50 +/-0.10	5.50 +/-0.10	5.50 +/-0.10



Size	0201, 0402, 0603, 0805, 1206, 1210			1812
Reel size	7"	10"	13"	7"
C	13 +0.5/-0.2	13 +0.5/-0.2	13 +0.5/-0.2	13 +0.5/-0.2
W ₁	8.4 +1.5/-0	8.4 +1.5/-0	8.4 +1.5/-0	12.4 +2.0/-0
A	178 ±0.10	250 ±1	330 ±1	178 ±0.10
N	60 +1/-0	100 ±1	100 ±1	60 +1.0/-0

The dimension of reel

Constructions:



No.	Name	NP0, X7R, X5R, X6S, Y5V
1	Ceramic material	BaTiO ₃ based
2	Inner electrode	Ni
3	Termination	Inner layer
4		Middle layer
5		Outer layer

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.

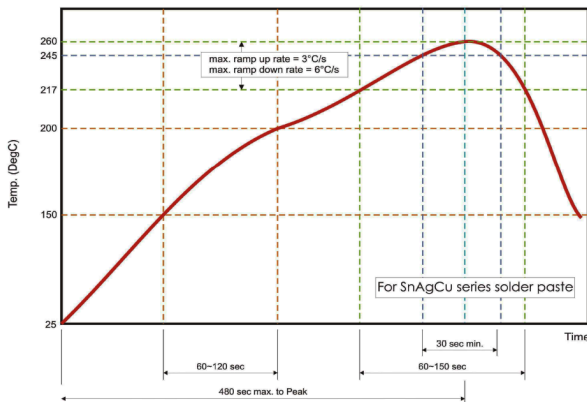
Cautions:

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

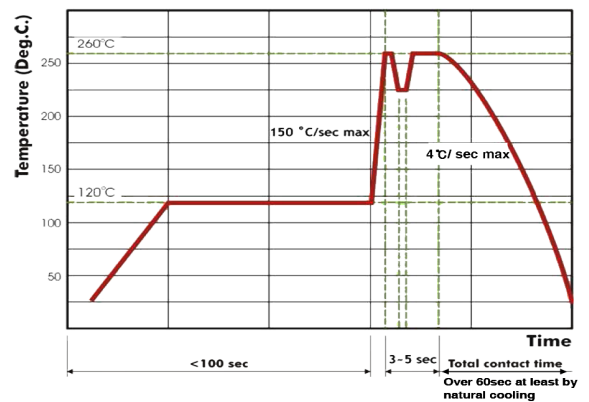


Recommended Soldering Conditions:

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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