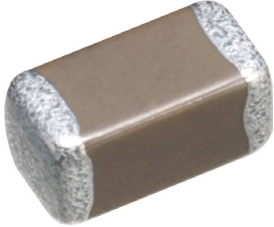


# General Purpose Multilayer Ceramic Capacitors 4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)



**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).

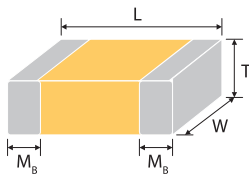
## Applications:

- 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	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 = $10 \times 10^4$ = 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 R=7" reeled (2mm pitch for 0603 size; paper tape) G=13" reeled

## External Dimensions:



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Soldering Method *	M <sub>B</sub> (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	R	0.15 ±0.05
	0.6±0.05#2	0.3 ±0.05#2	0.3 ±0.05#2			0.15 +0.1/-0.05
	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
			0.5 +0.02/-0.05	Q		
	1 ±0.2	0.5 ±0.2	0.5 ±0.2	E		



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



Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Soldering Method *	M <sub>B</sub> (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* <sup>1</sup>	0.8 ±0.2* <sup>1</sup>	0.8 ±0.2* <sup>1</sup>			
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) <sup>***</sup>
			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	R	
			1.6 ±0.2	G	R	
			0.85 ±0.1	T	R / W	
3.2 +0.3/-0.1	1.6 +0.30/-0.1	1.6 +0.3/-0.1	P	R		
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		
1808 (4520)	4.5 ±0.4 (4.5+0.5/- 0.3) <sup>**</sup>	2.03 ±0.25	1.25 ±0.1	D	R	0.75 ±0.25 (0.5±0.25) <sup>***</sup>
			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) <sup>**</sup>	3.2 ±0.3	1.25 ±0.1	D	R	0.75 ±0.25 0.5±0.25) <sup>***</sup>
			1.6 ±0.2	G	R	
			2 ±0.2	K	R	
		3.2 ±0.4	2.5 ±0.3	2.5 ±0.3	M	
	2.8 ±0.3			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.

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



## General Electrical Data:

Dielectric	NPO	X7R	Y5V	X5R	X6S
Size	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: NPO, 0.1pF product only provide B tolerance

\* Measured at the condition of 30~70% related humidity.

NPO: 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.

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



## Note 1:

X7R/X5R/X6S

Rated Vol.	D.F. $\leq$	Exception of D.F. $\leq$	
$\geq 100V$	$\leq 2.5\%$	$\leq 3\%$	1206 $\geq 0.47\mu F$
		$\leq 5\%$	0805 $> 0.1\mu F$ ; 0603 $\geq 0.068\mu F$ ; 1206 $> 1\mu F$ ; TT series
50V	$\leq 2.5\%$	$\leq 3\%$	0201(50V); 0603 $\geq 0.047\mu F$ ; 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$
		$\leq 5\%$	1210 $\geq 4.7\mu F$
		$\leq 10\%$	0402 $\geq 0.1\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$ ; TT series
35V	$\leq 3.5\%$	$\leq 10\%$	0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$
25V	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ ; 1210 $\geq 10\mu F$
		$\leq 7\%$	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$
		$\leq 10\%$	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ ; 1210 $\geq 22\mu F$ ; TT series
		$\leq 12.5\%$	0402 $\geq 1\mu F$
16V	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ ; 0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$
		$\leq 10\%$	0201 $\geq 0.1\mu F$ ; 0402 $\geq 0.22\mu F$ ; 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$ ; TT series
10V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ (0402/X7R $\geq 0.22\mu F$ ); TT series 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$
		$\leq 15\%$	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$
6.3V	$\leq 10\%$	$\leq 15\%$	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ ; 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ ; 1206 $\geq 47\mu F$ ; 1210 $\geq 100\mu F$ ; TT series
		$\leq 20\%$	0402 $\geq 2.2\mu F$
4V	$\leq 15\%$	---	---

Y5V

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

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



## Capacitance Range

NP0 Dielectric 0201, 0402, 0603, 0805 Sizes

Dielectric		NP0																	
Size		0201			0402					0603					0805				
Rated Voltage (V DC)		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											
	0.4pF (0R4)	L	L	L	N	N	N	N											
	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
	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	



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



Dielectric		NPO																	
Size		0201			0402					0603					0805				
Rated Voltage (V DC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	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
	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		
0.018uF (183)														D	D	D	D		
0.022uF (223)														D	D	D	D		

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

## NPO Dielectric 1206, 1210, 1812 Sizes

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

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



Dielectric		NPO												
Size		1206					1210					1812		
Rated Voltage (V DC)		10	16	25	50	100	10	16	25	50	100	16	50	100
Capacitance	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
	12pF (120)	B	B	B	B	B	C	C	C	C	C	D	D	D
	15pF (150)	B	B	B	B	B	C	C	C	C	C	D	D	D
	18pF (180)	B	B	B	B	B	C	C	C	C	C	D	D	D
	22pF (220)	B	B	B	B	B	C	C	C	C	C	D	D	D
	27pF (270)	B	B	B	B	B	C	C	C	C	C	D	D	D
	33pF (330)	B	B	B	B	B	C	C	C	C	C	D	D	D
	39pF (390)	B	B	B	B	B	C	C	C	C	C	D	D	D
	47pF (470)	B	B	B	B	B	C	C	C	C	C	D	D	D
	56pF (560)	B	B	B	B	B	C	C	C	C	C	D	D	D
	68pF (680)	B	B	B	B	B	C	C	C	C	C	D	D	D
	82pF (820)	B	B	B	B	B	C	C	C	C	C	D	D	D
	100pF (101)	B	B	B	B	B	C	C	C	C	C	D	D	D
	120pF (121)	B	B	B	B	B	C	C	C	C	C	D	D	D
	150pF (151)	B	B	B	B	B	C	C	C	C	C	D	D	D
	180pF (181)	B	B	B	B	B	C	C	C	C	C	D	D	D
	220pF (221)	B	B	B	B	B	C	C	C	C	C	D	D	D
	270pF (271)	B	B	B	B	B	C	C	C	C	C	D	D	D
	330pF (331)	B	B	B	B	B	C	C	C	C	C	D	D	D
	390pF (391)	B	B	B	B	B	C	C	C	C	C	D	D	D
	470pF (471)	B	B	B	B	B	C	C	C	C	C	D	D	D
	560pF (561)	B	B	B	B	B	C	C	C	C	C	D	D	D
	680pF (681)	B	B	B	B	B	C	C	C	C	C	D	D	D
820pF (821)	B	B	B	B	B	C	C	C	C	C	D	D	D	
1,000pF (102)	B	B	B	B	B	C	C	C	C	C	D	D	D	
1,200pF (122)	B	B	B	B	B	C	C	C	C	C	D	D	D	
1,500pF (152)	B	B	B	B	B	C	C	C	C	C	D	D	D	
1,800pF (182)	B	B	B	B	B	C	C	C	C	C	D	D	D	
2,200pF (222)	B	B	B	B	B	C	C	C	C	C	D	D	D	
2,700pF (272)	B	B	B	B	B	C	C	C	C	C	D	D	D	
3,300pF (332)	B	B	B	B	B	C	C	C	C	C	D	D	D	
3,900pF (392)	B	B	B	B	B	C	C	C	C	C	D	D	D	
4,700pF (472)	B	B	B	B	B	C	C	C	C	C	D	D	D	
5,600pF (562)	B	B	B	B	B	C	C	C	C	C	D	D	D	
6,800pF (682)	C	C	C	C	C	C	C	C	C	C	D	D	D	

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



Dielectric		NPO													
Size		1206					1210					1812			
Rated Voltage (V DC)		10	16	25	50	100	10	16	25	50	100	16	50	100	
Capacitance	8,200pF (822)	D	D	D	D	D	C	C	C	C	C	C	D	D	D
	0.010µF (103)	D	D	D	D	D	C	C	C	C	C	D	D	D	
	0.012µF (123)	T	T	T	T	T	D	D	D	D	D	D	D	D	
	0.015µF (153)	T	T	T	T	T	D	D	D	D	D	D	D	D	
	0.018µF (183)	T	T	T	T	T						D	D	D	
	0.022µF (223)	T	T	T	T	T						D	D	D	
	0.027µF (273)	T	T	T	T							D	D	D	
	0.033µF (333)	T	T	T	T							D	D	D	
	0.039µF (393)	J	J	J	J										
	0.047µF (473)	J	J	J	J										
	0.056µF (563)	J	J	J	J										
	0.068µF (683)	G	G	G	G										
	0.082µF (823)	G	G	G	G										
	0.1µF (104)	G	G	G	G										

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

## 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	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			S	S	S	S	S		B	B	B	B	B
	1,500pF (152)	L	L	L	L			N	N	N	N			S	S	S	S	S		B	B	B	B	B
	1,800pF (182)	L	L	L				N	N	N	N			S	S	S	S	S		B	B	B	B	B
	2,200pF (222)	L	L	L				N	N	N	N			S	S	S	S	S		B	B	B	B	B
	2,700pF (272)	L	L	L				N	N	N	N			S	S	S	S	S		B	B	B	B	B
3,300pF (332)	L	L	L				N	N	N	N			S	S	S	S	S		B	B	B	B	B	
3,900pF (392)	L	L	L				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 (NPO, X5R, X7R & Y5V Dielectrics)



Dielectric	X7R																							
	0201					0402					0603						0805							
	Size	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
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	50	100	
Capacitance	4,700pF (472)	L	L	L			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	
	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					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.



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



## X7R Dielectric 1206, 1210, 1812 Sizes

Dielectric		X7R																
Size		1206					1210					1812						
Rated Voltage (V DC)		6.3	10	16	25	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											
	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	D		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	



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



Dielectric		X7R																
Size		1206					1210					1812						
Rated Voltage (V DC)		6.3	10	16	25	50	100	6.3	10	16	25	50	100	10	16	25	50	100
Capacitance	0.18µF (184)		C	C	C	C	G		C	C	C	C	D	D	D	D	D	D
	0.22µF (224)		C	C	C	C	G		C	C	C	C	D	D	D	D	D	D
	0.27µF (274)		C	C	C	D	G		C	C	C	C	G	D	D	D	D	D
	0.33µF (334)		C	C	C	D	G		C	C	C	D	G	D	D	D	D	D
	0.39µF (394)		C	C	J	P	G		C	C	C	D	M	D	D	D	D	D
	0.47µF (474)		J	J	J	P	G		C	C	C	D	M	D	D	D	D	K
	0.56µF (564)		J	J	J	P	P		D	D	D	D	M	D	D	D	D	K
	0.68µF (684)		J	J	J	P	P		D	D	D	D	K	D	D	D	K	K
	0.82µF (824)		J	J	J	P	P		D	D	D	D	K	D	D	D	K	K
	1.0µF (105)		J	J	J	P	P		D	D	D	D	K	D	D	D	K	K
	1.5µF (155)	J	J	J	P					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)																	
	10µF (106)	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 (V DC)		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			

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



Dielectric		Y5V															
Size		0402					0603					0805					
Rated Voltage (V DC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	100
Capacitance	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.

## Y5V Dielectric 1206, 1210, 1812 Sizes

Dielectric		Y5V																
Size		1206					1210					1812						
Rated Voltage (V DC)		6.3	10	16	25	50	100	6.3	10	16	25	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			D	D	D	D	
	10μF (106)		J	J	P				D	D	G			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.



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



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

Dielectric		X5R														
		0201					0402					0603				
Size		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Rated Voltage (V DC)		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										
	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	X		
	0.33µF (334)					N	N				X	X	X	X		
	0.39µF (394)										X	X	X	X		
0.47µF (474)	L				N	N	E	E	E	X	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	
1.5µF (155)										X						
2.2µF (225)	L*				N	N	E*	E		X	X	X	X	X	X	
3.3µF (335)										X	X					



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



Dielectric		X5R														
Size		0201					0402					0603				
Rated Voltage (V DC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	4.7µF (475)						E*	E*				X	X	X	X	
	6.8µF (685)															
	10µF (106)						E*	E*				X	X	X	X*	
	22µF (226)											X*	X*			

Dielectric		X5R																	
Size		1206					1210					1812							
Rated Voltage (V DC)		4	6.3	10	16	25	50	6.3	10	16	25	50	4	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*			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)														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.

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

Dielectric		X6S																										
Size		0201		0402			0603			0805					1206					1210								
Rated Voltage (V DC)		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)			N																								
	0.68µF (684)																											
	1.0µF (105)	L*		N	E	E	E																					
	1.5µF (155)																											
	2.2µF (225)			N	E	E						X																
	3.3µF (335)																											
	4.7µF (475)											X	X	X					I	I								
6.8µF (685)																												
10µF (106)																											G	
22µF (226)																												
47µF (476)																												
100µF (107)																												

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with " \* " mark is expressed product not in 10% (code "K") tolerance.



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



## 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	-	-	-
	0.3 ±0.09	L	15,000	-	-	-
0402 (1005)	0.5 ±0.05	N	10,000	50,000	-	-
	0.5 +0.02/-0.05	Q	10,000	50,000	-	-
	0.5 ±0.2	E	10,000	-	-	-
0603 (1608)	0.5 ±0.1	H	4,000	-	-	-
	0.8 ±0.07	S	4,000	15,000	-	-
	0.8 +0.15/-0.1	X	4,000	15,000	-	-
0805 (2012)	0.5 ±0.1	H	4,000	15,000	-	-
	0.6 ±0.1	A	4,000	15,000	-	-
	0.8 ±0.1	B	4,000	15,000	-	-
	0.85 ±0.1	T	4,000	15,000	-	-
	1.25 ±0.1	D	-	-	3,000	10,000
	1.25 ±0.2	I	-	-	3,000	10,000
1206 (3216)	0.8 ±0.1	B	4,000	15,000	-	-
	0.85 ±0.1	T	4,000	15,000	-	-
	0.95 ±0.1	C	-	-	3,000	10,000
	1.15 ±0.15	J	-	-	3,000	10,000
	1.25 ±0.1	D	-	-	3,000	10,000
	1.6 ±0.2	G	-	-	2,000	10,000
	1.6 +0.30/-0.10	P	-	-	2,000	9,000
1210 (3225)	0.85 ±0.1	T	-	-	3,000	10,000
	0.95 ±0.1	C	-	-	3,000	10,000
	1.25 ±0.1	D	-	-	3,000	10,000
	1.6 ±0.2	G	-	-	2,000	-
	2 ±0.2	K	-	-	1,000	6,000
	2.5 ±0.3	M	-	-	1,000	6,000
1808 (4520)	1.25 ±0.1	D	-	-	2,000	10,000
	1.1 ±0.15	F	-	-	2,000	10,000
	1.6 ±0.2	G	-	-	2,000	8,000
	2 ±0.2	K	-	-	1,000	6,000
1812 (4532)	1.25 ±0.1	D	-	-	1,000	5,000
	1.6 ±0.2	G	-	-	1,000	-
	2 ±0.2	K	-	-	1,000	-
	2.5 ±0.3	M	-	-	500	3,000
	2.8 ±0.3	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.



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



No	Item	Test Condition	Requirements																																																																																										
2	Capacitance		*Shall not exceed the limits given in the detailed spec.																																																																																										
		<p>Class I: NPO Cap≤1000pF 1.0±0.2Vrms, 1MHz±10% Cap&gt;1000pF 1.0±0.2Vrms, 1KHz±10% Class II: X7R, X5R, X6S, Y5V Cap≤10μF, 1.0±0.2Vrms, 1KHz±10% ** Cap&gt;10μF, 0.5±0.2Vrms, 120Hz±20%</p> <p>** Test condition: 0.5±0.2Vrms, 1KHz±10% X7R: 0603≥225(10V), 0805=106(6.3V&amp;10V) X5R: 01R5≥103, 0201≥224 (6.3V,10V), 0402≥475 (6.3V), 0402≥225(10V), 0603=106 (6.3V,10V), TT18X ≥475(10V) , TT15X series X6S:0201≥224 (6.3V),0402≥225 (6.3V),</p>	<p>NP0: Cap≥30pF, Q≥1000; Cap&lt;30pF,Q≥400+20C 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">≤2.5%</td> <td>≤3%</td> <td>1206≥0.47μF</td> </tr> <tr> <td>≤5%</td> <td>0805&gt;0.1μF, 0603≥0.068μF, 1206&gt;1μF; TT series</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>≤5%</td> <td>1210≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF TT series</td> </tr> <tr> <td>35V</td> <td>≤3.5%</td> <td>≤10%</td> <td>0603≥1μF; 0805≥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≥2.2 μF; 1206≥6.8μF ; 1210≥22μF; TT series</td> </tr> <tr> <td>≤12.5%</td> <td>0402≥1μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤3.5%</td> <td>≤5%</td> <td>0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td> </tr> <tr> <td>≤10%</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">≤5%</td> <td>≤10%</td> <td>0201≥0.012μF;0402≥0.33μF(0402/ X7R≥0.22μF); TT series 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; TT series</td> </tr> <tr> <td>≤20%</td> <td>0402≥2.2μF</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>Y5V:</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>≥50V</td> <td>5%</td> <td>7%</td> <td>0603≥0.1μF; 0805≥0.47μF; 1206≥4.7μF</td> </tr> <tr> <td>35V</td> <td>7%</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">5%</td> <td>7%</td> <td>0402≥0.047μF;0603≥0.1μF; 0805≥0.33μF;1206≥1μF; 1210≥4.7μF</td> </tr> <tr> <td>9%</td> <td>0402≥0.068μF; 0603≥0.47μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td rowspan="2">16V (C&lt;1μF)</td> <td rowspan="2">7%</td> <td>9%</td> <td>0402≥0.068μF; 0603≥0.68μF</td> </tr> <tr> <td>12.5%</td> <td>0402≥0.22μF</td> </tr> <tr> <td>16V (C≥1.0μF)</td> <td>9%</td> <td>12.5%</td> <td>0603≥2.2μF; 0805≥3.3μF; 1206≥10μF; 1210≥22μF; 1812≥47μF</td> </tr> <tr> <td>10V</td> <td>12.5%</td> <td>20%</td> <td>0402≥0.47μF</td> </tr> <tr> <td>6.3V</td> <td>20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F.≤	Exception of D.F. ≤		≥100V	≤2.5%	≤3%	1206≥0.47μF	≤5%	0805>0.1μF, 0603≥0.068μF, 1206>1μF; 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≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF TT series	35V	≤3.5%	≤10%	0603≥1μF; 0805≥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≥2.2 μF; 1206≥6.8μF ; 1210≥22μF; TT series	≤12.5%	0402≥1μF	16V	≤3.5%	≤5%	0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF;1206≥2.2μF;1210≥4.7μF	≤10%	0201≥0.1μF; 0402≥0.47μF; 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	≤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%	-	-	Rated vol.	D.F.≤	Exception of D.F. ≤		≥50V	5%	7%	0603≥0.1μF; 0805≥0.47μF; 1206≥4.7μF	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%	-	-
Rated vol.	D.F.≤	Exception of D.F. ≤																																																																																											
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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																																																																																										
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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%	-	-																																																																																										
Rated vol.	D.F.≤	Exception of D.F. ≤																																																																																											
≥50V	5%	7%	0603≥0.1μF; 0805≥0.47μF; 1206≥4.7μF																																																																																										
35V	7%	-	-																																																																																										
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16V (C<1μF)	7%	9%	0402≥0.068μF; 0603≥0.68μF																																																																																										
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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%	-	-																																																																																										
	Q/ D.F. (Dissipation Factor)																																																																																												





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



No	Item	Test Condition	Requirements																								
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>10G<math>\Omega</math> or <math>RxC \geq 500\Omega\text{-F}</math> 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="7">10G or <math>RxC \geq 100\Omega\text{F}</math> whichever is smaller.</td> </tr> <tr> <td>50V: 0603<math>\geq 1\mu\text{F}</math>; 0805<math>\geq 1\mu\text{F}</math>; 1206<math>\geq 4.7\mu\text{F}</math>; 1210<math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td>35V: 0805<math>\geq 2.2\mu\text{F}</math>; 1210<math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>25V: 0402<math>\geq 1\mu\text{F}</math>; 0603<math>\geq 2.2\mu\text{F}</math>; 0805<math>\geq 2.2\mu\text{F}</math>; 1206<math>\geq 10\mu\text{F}</math>; 1210<math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>16V: 0402<math>\geq 0.22\mu\text{F}</math>; 0603<math>\geq 1\mu\text{F}</math>; 0805<math>\geq 2.2\mu\text{F}</math>; 1206<math>\geq 10\mu\text{F}</math>; 1210<math>\geq 47\mu\text{F}</math></td> </tr> <tr> <td>10V: 0201<math>\geq 47\text{nF}</math>; 0402<math>\geq 0.47\mu\text{F}</math>; 0603<math>\geq 0.47\mu\text{F}</math>; 0805<math>\geq 2.2\mu\text{F}</math>; 1206<math>\geq 4.7\mu\text{F}</math>; 1210<math>\geq 47\mu\text{F}</math></td> </tr> <tr> <td>6.3V ; 4V</td> </tr> <tr> <td>All X6S items</td> <td rowspan="7"><math>RxC \geq 50\Omega\text{-F}</math>.</td> </tr> <tr> <td>50V: 0402<math>\geq 0.1\mu\text{F}</math>; 0603<math>\geq 2.2\mu\text{F}</math>; 0805<math>\geq 10\mu\text{F}</math>; 1206<math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>35V: 0603<math>\geq 1\mu\text{F}</math>;</td> </tr> <tr> <td>25V: 0201<math>\geq 0.1\mu\text{F}</math>; 0402<math>\geq 0.22\mu\text{F}</math>; 0603<math>\geq 10\mu\text{F}</math>; 1206<math>\geq 22\mu\text{F}</math></td> </tr> <tr> <td>16V: 0603<math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>10V: 0201<math>&gt; 0.1\mu\text{F}</math>; 0603<math>\geq 10\mu\text{F}</math>; 0805<math>\geq 47\mu\text{F}</math></td> </tr> <tr> <td>6.3V: 0201<math>\geq 0.1\mu\text{F}</math>; 1206<math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>4V: 0603<math>\geq 22\mu\text{F}</math>; 0805<math>\geq 47\mu\text{F}</math></td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: X7R	10G or $RxC \geq 100\Omega\text{F}$ whichever is smaller.	50V: 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: 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	All X6S items	$RxC \geq 50\Omega\text{-F}$ .	50V: 0402 $\geq 0.1\mu\text{F}$ ; 0603 $\geq 2.2\mu\text{F}$ ; 0805 $\geq 10\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$	35V: 0603 $\geq 1\mu\text{F}$ ;	25V: 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 0.22\mu\text{F}$ ; 0603 $\geq 10\mu\text{F}$ ; 1206 $\geq 22\mu\text{F}$	16V: 0603 $\geq 10\mu\text{F}$	10V: 0201 $> 0.1\mu\text{F}$ ; 0603 $\geq 10\mu\text{F}$ ; 0805 $\geq 47\mu\text{F}$	6.3V: 0201 $\geq 0.1\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$	4V: 0603 $\geq 22\mu\text{F}$ ; 0805 $\geq 47\mu\text{F}$					
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6	Temperature Coefficient	With no electrical load.	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>NPO</td> <td>-55~125°C at 25°C</td> <td>NPO</td> <td>Within <math>\pm 30\text{ppm}/^\circ\text{C}</math></td> </tr> <tr> <td>X7R</td> <td>-55~125°C at 25°C</td> <td>X7R</td> <td>Within <math>\pm 15\%</math></td> </tr> <tr> <td>X5R</td> <td>-55~ 85°C at 25°C</td> <td>X5R</td> <td>Within <math>\pm 15\%</math></td> </tr> <tr> <td>X6S</td> <td>-55~105°C at 25°C</td> <td>X6S</td> <td>Within <math>\pm 22\%</math></td> </tr> <tr> <td>Y5V</td> <td>-25~ 85°C at 20°C</td> <td>Y5V</td> <td>Within +30%/-80%</td> </tr> </tbody> </table>	T.C.	Operating Temp	T.C.	Capacitance Change	NPO	-55~125°C at 25°C	NPO	Within $\pm 30\text{ppm}/^\circ\text{C}$	X7R	-55~125°C at 25°C	X7R	Within $\pm 15\%$	X5R	-55~ 85°C at 25°C	X5R	Within $\pm 15\%$	X6S	-55~105°C at 25°C	X6S	Within $\pm 22\%$	Y5V	-25~ 85°C at 20°C	Y5V	Within +30%/-80%
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7	Adhesive Strength of Termination	Pressurizing force: 1N (0201) and 5N ( $\leq 0603$ ) and 10N ( $> 0603$ ) * Test time: 10 $\pm$ 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 $\pm$ 2 hrs.	No remarkable damage. Cap change and Q/D.F.: To meet initial spec.																								

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



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 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: NPO: 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: NPO: 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. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> Before initial measurement (Class II only): 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.	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: NPO: 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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**General Purpose Multilayer Ceramic Capacitors  
4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)**



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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.	No remarkable damage. Cap change: NPO: 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: NPO: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C X7R, X5R, X6S:																																																				
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4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)**



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14	Humidity (Damp Heat) Load	<p>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.</p>	<p>No remarkable damage. Cap change: NPO: ±7.5% or 0.75pF whichever is larger. X7R, X5R, X6S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; TT series &amp; 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: NPO: C≥30pF,Q≥200;C&lt;30pF, Q≥100+10/3C</p>																																															



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



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



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



No	Item	Test Condition	Requirements	
14	Humidity (Damp Heat) Load		*I.R.: $\geq 10V$ , $500M\Omega$ or $25 \Omega\text{-F}$ whichever is smaller. Class II (X7R, X5R, X6S, Y5V)	
			<b>Rated voltage</b>	<b>Insulation Resistance</b>
			100V: X7R	500G $\Omega$ or RxC $\geq 5 \Omega\text{-F}$ 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				
15.	High Temperature Load (Endurance)	*Test temp.: NPO, 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) $\leq$ % 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.	No remarkable damage. Cap change: NPO: $\pm 3.0\%$ 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: NPO: More than 30pF, $Q \geq 350$ $10\text{pF} \leq C < 30\text{pF}$ , $Q \geq 275 + 2.5C$ Less than 10pF, $Q \geq 200 + 10C$	

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



No	Item	Test Condition	Requirements																																																																																																	
15	High Temperature Load (Endurance)	5) 100% of rated voltage for below range.	X7R, X5R, X6S:																																																																																																	
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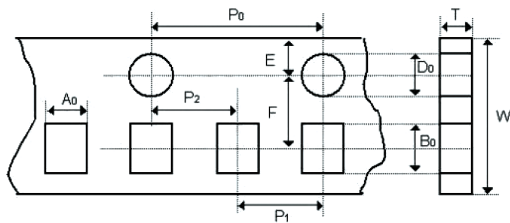
# General Purpose Multilayer Ceramic Capacitors 4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)



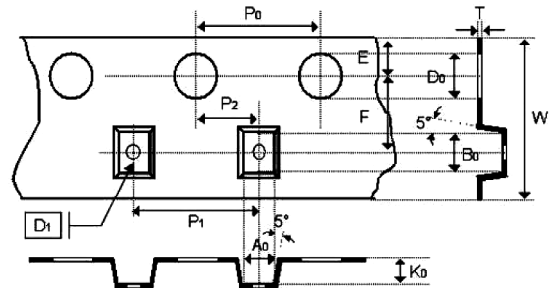
No	Item	Test Condition	Requirements											
15	High Temperature Load (Endurance)	<p>*Before initial measurement (Class II only): To apply test voltage for 1hr at test temp. and then set for 24±2 hrs at room temp.</p> <p>*Measurement to be made after keeping at room temp. for 24±2 hrs</p>	<p>*I.R.: ≥10V, 1GΩ or 50 Ω-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="6">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 ≥ 0.1μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF; 0805 ≥ 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: 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;</td> </tr> <tr> <td colspan="2">6.3V ; 4V ; TT series ; All X6S items</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: X7R	1GΩ or RxC ≥ 10 Ω-F whichever is smaller.	50V: 0402 ≥ 0.1μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF	35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF;	6.3V ; 4V ; TT series ; All X6S items	
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## Appendixes

### Tape & Reel Dimensions



The dimension of paper tape



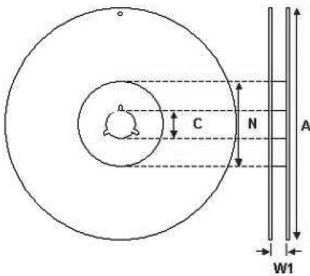
The dimension of plastic tape

Size	0201	0402	0603	0805	1206			1210			1812					
Thick-ness	L	N	E	S, X	A	B	C, D, I	B	C, J, D	G, P	C, D	G, K	M	D, K	M	U
A0	0.38±0.05	0.62±0.05	0.7±0.1	1.02±0.05	1.5±0.1	1.5±0.1	<1.57	2±0.1	<1.85	<1.95	<2.97	<2.97	<2.97	<3.81	<3.81	<3.9
B0	0.68±0.05	1.12±0.05	1.2±0.1	1.8±0.05	2.3±0.1	2.3±0.1	<2.40	3.5±0.1	<3.46	<3.67	<3.73	<3.73	<3.73	<5.3	<5.3	<5.3
T	0.42±0.05	0.6±0.05	0.7±0.1	0.95±0.05	0.75±0.05	0.95±0.05	0.23±0.05	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.25±0.05	0.25±0.05	0.25±0.05
K0	-	-	-	-	-	-	<2.5	-	<2.5	<2.5	<2.5	<2.5	<3	<2.5	<3	<3.5
W	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	12±0.2	12±0.2	12±0.2
P0	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	4±0.1	4±0.1	4±0.1
10xP0	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.2
P1	2±0.05	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±0.10	4±0.1	8±0.1	8±0.1	8±0.1
P2	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±0.05	2±0.05	2±0.05
D0	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.5±0.05	1.5±0.05	1.5±0.05	1.5±0.05	1.5±0.05	1.5±0.05	1.5±0.05	1.5±0.05	1.5±0.05	1.5±0.1
D1	-	-	-	-	-	-	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
E	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	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	3.50±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±0.05	5.5±0.05	5.5±0.05





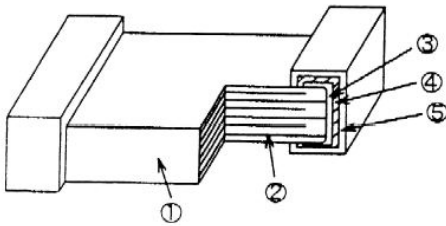
# General Purpose Multilayer Ceramic Capacitors 4 to 100V (NPO, X5R, X7R & Y5V Dielectrics)



The dimension of reel

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
W1	8.4 +1.5/-0	8.4+1.5/-0	8.4 +1.5/-0	12.4+2.0/-0
A	178 ±0.1	250 ±1	330 ±1	178 ±0.1
N	60 +1/-0	100 ±1	100 ±1	60 +1/-0

## Constructions:



No.	Name	NPO, X7R, X5R, X6S, Y5V
1	Ceramic material	BaTiO <sub>3</sub> 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:

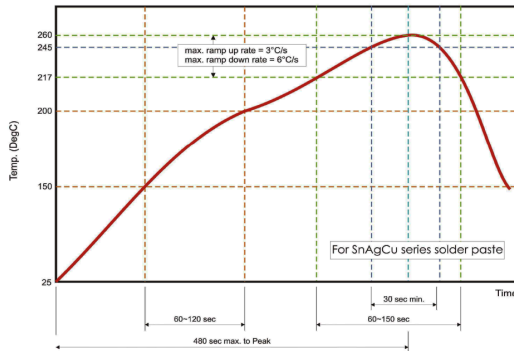
- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded,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

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

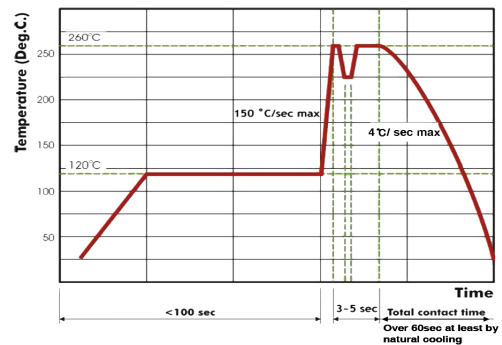


## Recommended Soldering Conditions:

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N<sub>2</sub> 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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