

Multilayer SMD Ceramic Capacitors

General Purpose Series



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 and Y5V dielectric material and which provides product with high electrical precision, stability and reliability.

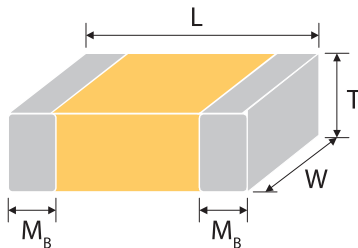
Features:

- A wide selection of sizes is available (0603, 0805, 1206).
- 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.

External Dimensions:



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	MB (mm)
0603 (1608)	1.6 ±0.1	0.8 ±0.1	0.8 ±0.07	S	-	0.4 ±0.15
	1.6 +0.15/-0.1	0.8 +0.15/-0.1	0.8 +0.15/-0.1	X	-	
0805 (2012)	2 ±0.15	1.25 ±0.1	0.6 ±0.1	A	-	0.5 ±0.2
			0.8 ±0.1	B	-	
			1.25 ±0.1	D	#	
	2 ±0.2	1.25 ±0.2	1.25 ±0.2	I	#	
1206 (3216)	3.2 ±0.15	1.6 ±0.15	0.8 ±0.1	B	-	0.6 ±0.2
			0.95 ±0.1	C	-	
			1.15 ±0.15	J	#	
			1.25 ±0.1	D	#	
			1.6 ±0.2	G	#	
	3.2 +0.3/-0.1	1.6 +0.3/0.1	1.6 +0.3/-0.1	P	#	

Reflow soldering only is recommended.

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General Electrical Data:

Dielectric	NP0	X7R	Y5V
Size	0603, 0805, 1206		
Capacitance*	0.5pF to 0.1μF	100pF to 0.82μF	10nF to 0.68μF
Capacitance tolerance**	Cap≤5pF: 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%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	6.3V, 10V, 16V, 25V, 50V, 100V	
DF (Tan δ)*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1	
Insulation resistance at Ur	≥ 10GΩ or R × C ≥ 500 Ω × F Whichever is less		
Operating temperature	-55°C to +125°C		-25°C to +85°C
Capacitance change	±30ppm	±15%	+30 / -80%
Termination	Ni/Sn (lead-free termination)		

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

NP0: Apply 1 ±0.2Vrms, 1MHz ±10% for Cap≤1,000pF and 1 ±0.2Vrms, 1kHz ±10% for Cap>1,000pF, 25°C at ambient temperature

X7R: 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

Rated vol.	D.F.	Exception of D.F	
≥50V	≤2.5%	≤3%	0603≥0.047μF; 0805≥0.18μF;1206≥0.47μF
25V	≤3.5%	≤7%	0603≥0.33μF
		≤10%	0402≥0.10μF;0603≥0.47μF
16V	≤3.5%	≤5%	0402≥0.033μF;0603≥0.15μF; 0805≥0.68μF
		≤10%	0603≥0.68μF
10V	≤5.0%	≤10%	0402≥0.33μF;0603≥0.33μF
6.3V	≤10%	---	--

Y5V

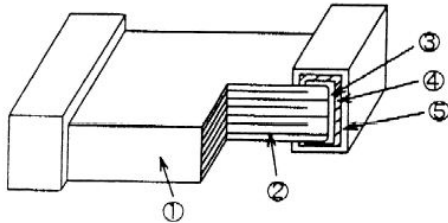
Rated vol.	D.F.	Exception of D.F	
≥50V	≤5.0%	≤7%	0603≥0.1μF; 0805≥0.47μF
25V	≤5.0%	≤7%	0402≥0.047μF;0603≥0.1μF; 0805≥0.33μF
		≤9%	0402≥0.068μF; 0603≥0.47μF
16V (C<1.0μF)	≤7.0%	≤9%	0402≥0.068μF; 0603≥0.68μF
10V	≤12.5%	---	--
6.3V	≤20%	---	--

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Constructions:



No.	Name	NP0*	NP0
1	Ceramic material	BaTiO ₃ based	
2	Inner electrode	AgPd alloy	Ni
3	Termination	Inner layer	Ag
4		Middle layer	Ni
5		Outer layer	Sn

* Partial NPO items are with Ag/Ni/Sn terminations, please ref to product range of NPO dielectric for detail.

Capacitance Range (NP0 Dielectric)

Dielectric		NP0														
Size		0603					0805					1206				
Rated Voltage (VDC)		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	0.5pF (0R5)	S	S	S	S	S	A	A	A	A	A					
	0.6pF (0R6)	S	S	S	S	S	A	A	A	A	A					
	0.7pF (0R7)	S	S	S	S	S	A	A	A	A	A					
	0.8pF (0R8)	S	S	S	S	S	A	A	A	A	A					
	0.9pF (0R9)	S	S	S	S	S	A	A	A	A	A					
	1.0pF (1R0)	S	S	S	S	S	A	A	A	A	A					
	1.2pF (1R2)	S	S	S	S	S	A	A	A	A	A					
	1.5pF (1R5)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	1.8pF (1R8)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	2.2pF (2R2)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	2.7pF (2R7)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	3.3pF (3R3)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	3.9pF (3R9)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	4.7pF (4R7)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	5.6pF (5R6)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	6.8pF (6R8)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	8.2pF (8R2)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	10pF (100)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	12pF (120)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	15pF (150)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	18pF (180)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	22pF (220)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	27pF (270)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	33pF (330)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	39pF (390)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B

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Dielectric		NP0														
Size		0603					0805					1206				
Rated Voltage (VDC)		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	47pF (470)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	56pF (560)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	68pF (680)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	82pF (820)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	100pF (101)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	120pF (121)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	150pF (151)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	180pF (181)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	220pF (221)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	270pF (271)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	330pF (331)	S	S	S	S	S	A	A	A	A	A	B	B	B	B	B
	390pF (391)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	470pF (471)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	560pF (561)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	680pF (681)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	820pF (821)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	1,000pF (102)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	1,200pF (122)	X	X	X	X		B	B	B	B	B	B	B	B	B	B
	1,500pF (152)	X	X	X	X		B	B	B	B	B	B	B	B	B	B
	1,800pF (182)	X	X	X	X		B	B	B	B	B	B	B	B	B	B
	2,200pF (222)	X	X	X	X		B	B	B	B	B	B	B	B	B	B
	2,700pF (272)	X	X	X	X		D	D	D	D	D	B	B	B	B	B
	3,300pF (332)	X	X	X	X		D	D	D	D	D	B	B	B	B	B
	3,900pF (392)						D	D	D	D	D	B	B	B	B	B
	4,700pF (472)						D	D	D	D		B	B	B	B	B
	5,600pF (562)						D^	D^				B	B	B	B	B
	6,800pF (682)						D^	D^				C	C	C	C	C
	8,200pF (822)						D^	D^				D	D	D	D	D
	0.010μF (103)						D^	D^				D	D	D	D	
	0.012μF (123)						D^	D^				D^	D^			
	0.015μF (153)											D^	D^			
	0.018μF (183)											D^	D^			
	0.022μF (223)											D^	D^			
	0.027μF (273)											D^	D^			
	0.033μF (333)											D^	D^			
	0.039μF (393)											G^	G^			

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1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "A" mark is expressed product with Ag/Ni/Sn terminations.

Capacitance Range (X7R Dielectric)

Dielectric		X7R														
Size		0603					0805					1206				
Rated Voltage (VDC)		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	100pF (101)	S	S	S	S	S	B	B	B	B	B					
	120pF (121)	S	S	S	S	S	B	B	B	B	B					
	150pF (151)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	180pF (181)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	220pF (221)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	270pF (271)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	330pF (331)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	390pF (391)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	470pF (471)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	560pF (561)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	680pF (681)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	820pF (821)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	1,000pF (102)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	1,200pF (122)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	1,500pF (152)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	1,800pF (182)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	2,200pF (222)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	2,700pF (272)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	3,300pF (332)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	3,900pF (392)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	4,700pF (472)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	5,600pF (562)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	6,800pF (682)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	8,200pF (822)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	0.010μF (103)	S	S	S	S	S	B	B	B	B	B	B	B	B	B	B
	0.012μF (123)	S	S	S	S		B	B	B	B	B	B	B	B	B	B
	0.015μF (153)	S	S	S	S		B	B	B	B	B	B	B	B	B	B
	0.018μF (183)	S	S	S	S		B	B	B	B	B	B	B	B	B	B
	0.022μF (223)	S	S	S	S		B	B	B	B	B	B	B	B	B	B
	0.027μF (273)	S	S	S	S		B	B	B	B	D	B	B	B	B	B
	0.033μF (333)	S	S	S	X		B	B	B	B	D	B	B	B	B	B

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Dielectric		X7R														
Size		0603					0805					1206				
Rated Voltage (VDC)		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	0.039µF (393)	S	S	S	X		B	B	B	B	D	B	B	B	B	B
	0.047µF (473)	S	S	S	X		B	B	B	B	D	B	B	B	B	B
	0.056µF (563)	S	S	S	X		B	B	B	B	D	B	B	B	B	B
	0.068µF (683)	S	S	S	X		B	B	B	B	D	B	B	B	B	B
	0.082µF (823)	S	S	S	X		B	B	B	B	D	B	B	B	B	D
	0.10µF (104)	S	S	S	X		B	B	B	B	D	B	B	B	B	D
	0.12µF (124)	S	S	X			B	B	B	D		B	B	B	B	D
	0.15µF (154)	S	S	X			D	D	D	D		C	C	C	C	G
	0.18µF (184)	S	S	X			D	D	D	D		C	C	C	C	G
	0.22µF (224)	S	S	X			D	D	D	D		C	C	C	C	G
	0.27µF (274)	X	X	X			D	D	D			C	C	C	D	
	0.33µF (334)	X	X	X			D	D	D	I		C	C	C	D	
	0.39µF (394)	X	X	X			D	D	D			C	C	J	P	
	0.47µF (474)	X	X	X			D	D	D	I		J	J	J	P	
	0.56µF (564)						D	D	D			J	J	J	P	
	0.68µF (684)						D	D	D			J	J	J	P	
	0.82µF (824)						D	D	D			J	J	J	P	

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

Capacitance Range (Y5V Dielectric)

Dielectric		Y5V														
Size		0603					0808					1206				
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	10	16	25	50	100
Capacitance	0.010µF (103)		S	S	S	S	A	A	A	A	B	B	B	B	B	B
	0.015µF (153)		S	S	S	S	A	A	A	A	B	B	B	B	B	B
	0.022µF (223)		S	S	S	S	A	A	A	A	B	B	B	B	B	B
	0.033µF (333)		S	S	S	S	A	A	A	A	B	B	B	B	B	B
	0.047µF (473)		S	S	S	S	A	A	A	A	B	B	B	B	B	B
	0.068µF (683)		S	S	S	S	A	A	A	A	B	B	B	B	B	B
	0.10µF (104)		S	S	S	S	A	A	A	A	B	B	B	B	B	B
	0.15µF (154)		S	S	S	S	A	A	A	A		B	B	B	B	C
	0.22µF (224)	S	S	S	S	S	A	A	A	A		B	B	B	B	C
	0.33µF (334)		S	S	S		B	B	B	B		B	B	B	B	
	0.47µF (474)		S	S			B	B	B	B		B	B	B	B	
	0.68µF (684)		S	X			B	B	D	D		B	B	B	B	

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

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Packaging Dimension And Quantity:

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0603 (1608)	0.8 ±0.07	S	4k	15k	-	-
	0.8 +0.15/-0.1	X	4k	15k	-	-
0805 (2012)	0.6 ±0.1	A	4k	15k	-	-
	0.8 ±0.1	B	4k	15k	-	-
	1.25 ±0.1	D	-	-	3k	10k
	1.25 ±0.2	I	-	-	3k	10k
1206 (3216)	0.8 ±0.1	B	4k	15k	-	-
	0.95 ±0.1	C	-	-	3k	10k
	1.15 ±0.15	J	-	-	3k	10k
	1.25 ±0.1	D	-	-	3k	10k
	1.6 ±0.2	G	-	-	2k	10k
	1.6 +0.3/-0.1	P	-	-	2k	9k

Reliability Test Conditions And Requirements

No	Item	Test Condition	Requirements																												
1	Visual and Mechanical	-	No remarkable defect. Dimensions to conForm to individual specification sheet.																												
2	Capacitance	Class I:NPO Cap≤1,000pF 1.0±0.2Vrms, 1MHz±10% Cap>1,000pF 1.0±0.2Vrms, 1kHz±10% Class II:X7R, X5R, Y5V Cap≤10μF, 1.0±0.2Vrms, 1kHz±10% Cap>10μF, 0.5±0.2Vrms, 120Hz±20%	NPO: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C X7R																												
3	Q/ D.F. (Dissipation Factor)		<table><tr><th>Rated vol.</th><th>D.F</th><th colspan="2">Exception of D.F.</th></tr><tr><td>≥50V</td><td>≤2.5%</td><td>≤3%</td><td>0603≥0.047μF; 0805≥0.18μF,1206≥0.47μF</td></tr><tr><td rowspan="2">25V</td><td rowspan="2">≤3.5%</td><td>≤7%</td><td>0603≥0.33μF</td></tr><tr><td>≤10%</td><td>0603≥0.47μF</td></tr><tr><td rowspan="2">16V</td><td rowspan="2">≤3.5%</td><td>≤5%</td><td>0603≥0.15μF; 0805≥0.68μF</td></tr><tr><td>≤10%</td><td>0603≥0.68μF</td></tr><tr><td>10V</td><td>≤5.0%</td><td>≤10%</td><td>0603≥0.33μF</td></tr><tr><td>6.3V</td><td>≤10%</td><td>-</td><td>-</td></tr></table>	Rated vol.	D.F	Exception of D.F.		≥50V	≤2.5%	≤3%	0603≥0.047μF; 0805≥0.18μF,1206≥0.47μF	25V	≤3.5%	≤7%	0603≥0.33μF	≤10%	0603≥0.47μF	16V	≤3.5%	≤5%	0603≥0.15μF; 0805≥0.68μF	≤10%	0603≥0.68μF	10V	≤5.0%	≤10%	0603≥0.33μF	6.3V	≤10%	-	-
			Rated vol.	D.F	Exception of D.F.																										
			≥50V	≤2.5%	≤3%	0603≥0.047μF; 0805≥0.18μF,1206≥0.47μF																									
			25V	≤3.5%	≤7%	0603≥0.33μF																									
					≤10%	0603≥0.47μF																									
			16V	≤3.5%	≤5%	0603≥0.15μF; 0805≥0.68μF																									
					≤10%	0603≥0.68μF																									
			10V	≤5.0%	≤10%	0603≥0.33μF																									
			6.3V	≤10%	-	-																									
Y5V:																															
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Multilayer SMD Ceramic Capacitors

General Purpose Series



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.	$\geq 10GX$ or $RxC \geq 500X-F$ whichever is smaller.																		
6	Temperature Coefficient	With no electrical load. NPO : $-55^{\circ}C$ to $125^{\circ}C$ at $25^{\circ}C$ X7R : $-55^{\circ}C$ to $125^{\circ}C$ at $25^{\circ}C$ Y5V : $-25^{\circ}C$ to $85^{\circ}C$ at $20^{\circ}C$	NPO : Within $\pm 30ppm/^{\circ}C$ X7R : Within $\pm 15\%$ Y5V : Within $+30\%/-80\%$																		
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.)	No remarkable damage. Cap change and Q/D.F.: To meet initial spec.																		
9	Solderability	Solder temperature: $235 \pm 5^{\circ}C$ Dipping time: 2 ± 0.5 sec.	95% min. coverage of all metalized area.																		
10	Bending Test	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5 ± 1 sec. Measurement to be made after keeping at room temp. for 24 ± 2 hrs.	No remarkable damage. Cap change: NPO: within $\pm 5\%$ or $\pm 0.5pF$ whichever is larger X7R, : within $\pm 12.5\%$ Y5V: within $\pm 30\%$ (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: $270 \pm 5^{\circ}C$ Dipping time: 10 ± 1 sec Preheating: 120 to $150^{\circ}C$ for 1min before immerse the capacitor in a eutectic solder. Before initial measurement (Class II only): Perform $150+0/-10^{\circ}C$ for 1 hr and then set for 48 ± 4 hrs at room temp. Measurement to be made after keeping at room temp. for 48 ± 4 hrs.	No remarkable damage. Cap change: NPO: within $\pm 2.5\%$ or $\pm 0.25pF$ whichever is larger X7R : within $\pm 7.5\%$ Y5V: within $\pm 20\%$ Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25% max. leaching on each edge.																		
12	Temperature Cycle	<table><tr><td colspan="3">Conduct the five cycles according to the temperatures and time.</td></tr><tr><td>Step</td><td>Temp. ($^{\circ}C$)</td><td>Time (min.)</td></tr><tr><td>1</td><td>Min. operating temp. $+0/-3$</td><td>30 ± 3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. $+3/-0$</td><td>30 ± 3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table> Before initial measurement (Class II only): Perform $150+0/-10^{\circ}C$ for 1 hr and then set for 48 ± 4 hrs at room temp. Measurement to be made after keeping at room temp. for 48 ± 4 hrs.	Conduct the five cycles according to the temperatures and time.			Step	Temp. ($^{\circ}C$)	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 $\pm 2.5\%$ or $\pm 0.25pF$ whichever is larger X7R : within $\pm 7.5\%$ Y5V : within $\pm 20\%$ Q/D.F., I.R. and dielectric strength: To meet initial requirements.
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Multilayer SMD Ceramic Capacitors

General Purpose Series



No	Item	Test Condition	Requirements																																																												
13	Humidity (Damp Heat) Steady State	Test temp.: 40±2°C Humidity: 90~95% RH Test time: 500+24/-0hrs. Measurement to be made after keeping at room temp. for 48 ±4 hrs.	No remarkable damage. Cap change: NPO: within ±5% or ±0.5pF whichever is larger X7R: ≥10V, within ±12.5%; 6.3V, 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: <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>≤3%</td><td>≤6%</td><td>0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td></tr> <tr> <td>25V</td><td>≤5%</td><td>≤14%</td><td>0603≥0.33μF</td></tr> <tr> <td></td><td></td><td>≤15%</td><td>0603≥0.47μF</td></tr> <tr> <td>16V</td><td>≤5%</td><td>≤10%</td><td>0603≥0.15μF; 0805≥0.68μF</td></tr> <tr> <td></td><td></td><td>≤15%</td><td>0603≥0.68μF</td></tr> <tr> <td>10V</td><td>≤7.5%</td><td>≤15%</td><td>0603≥0.33μF</td></tr> <tr> <td>6.3V</td><td>≤15%</td><td>-</td><td>-</td></tr> </tbody> </table> Y5V: <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>≤7.5%</td><td>≤10%</td><td>0603≥0.1μF; 0805≥0.47μF</td></tr> <tr> <td>25V</td><td>≤7.5%</td><td>≤10%</td><td>0603≥0.1μF; 0805≥0.33μF</td></tr> <tr> <td></td><td></td><td>≤15%</td><td>0603≥0.47μF</td></tr> <tr> <td>16V (C<1.0μF)</td><td>≤10%</td><td>≤12.5%</td><td>0603≥0.68μF</td></tr> <tr> <td>10V</td><td>≤20%</td><td>-</td><td>-</td></tr> <tr> <td>6.3V</td><td>≤30%</td><td>-</td><td>-</td></tr> </tbody> </table> I.R.: ≥10V, ≥1GΩ or RxC≥50Ω-F whichever is smaller. 6.3V, RxC≥10Ω-F	Rated vol.	D.F.	Exception of D.F.		≥50V	≤3%	≤6%	0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	25V	≤5%	≤14%	0603≥0.33μF			≤15%	0603≥0.47μF	16V	≤5%	≤10%	0603≥0.15μF; 0805≥0.68μF			≤15%	0603≥0.68μF	10V	≤7.5%	≤15%	0603≥0.33μF	6.3V	≤15%	-	-	Rated vol.	D.F.	Exception of D.F.		≥50V	≤7.5%	≤10%	0603≥0.1μF; 0805≥0.47μF	25V	≤7.5%	≤10%	0603≥0.1μF; 0805≥0.33μF			≤15%	0603≥0.47μF	16V (C<1.0μF)	≤10%	≤12.5%	0603≥0.68μF	10V	≤20%	-	-	6.3V	≤30%	-	-
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Multilayer SMD Ceramic Capacitors

General Purpose Series



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15	High Temperature Load Endurance)	Test temp.: NPO,X7R: 125±3°C X5R, Y5V: 85±3°C To apply voltage: 200% of rated voltage. Test time: 1000+24/-0 hrs. Measurement to be made after keeping at room temp. for 48±4 hrs.	No remarkable damage. Cap change: NPO: ±3.0% or ±0.3pF whichever is larger X7R : ≥10V, within ±12.5%; 6.3V, 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: <table> <tr> <th>Rated vol.</th><th>D.F</th><th colspan="2">Exception of D.F</th></tr> <tr> <td>≥50V</td><td>≤3%</td><td>≤6%</td><td>0603≥0.047μF; 0805≥0.18μF;1206≥0.47μF</td></tr> <tr> <td rowspan="2">25V</td><td rowspan="2">≤5%</td><td>≤14%</td><td>0603≥0.33μF</td></tr> <tr> <td>≤15%</td><td>0603≥0.47μF</td></tr> <tr> <td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0603≥0.15μF; 0805≥0.68μF</td></tr> <tr> <td>≤15%</td><td>0603≥0.68μF</td></tr> <tr> <td>10V</td><td>≤7.5%</td><td>≤15%</td><td>0603≥0.33μF</td></tr> <tr> <td>6.3V</td><td>≤15%</td><td>-</td><td>-</td></tr> </table>	Rated vol.	D.F	Exception of D.F		≥50V	≤3%	≤6%	0603≥0.047μF; 0805≥0.18μF;1206≥0.47μF	25V	≤5%	≤14%	0603≥0.33μF	≤15%	0603≥0.47μF	16V	≤5%	≤10%	0603≥0.15μF; 0805≥0.68μF	≤15%	0603≥0.68μF	10V	≤7.5%	≤15%	0603≥0.33μF	6.3V	≤15%	-	-																										
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Multilayer SMD Ceramic Capacitors

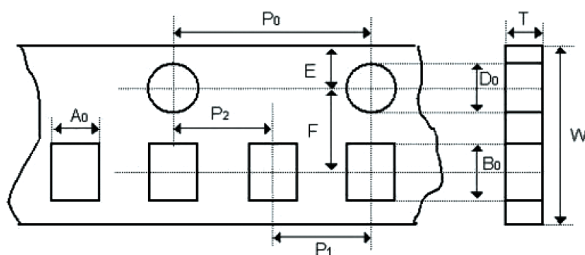
General Purpose Series



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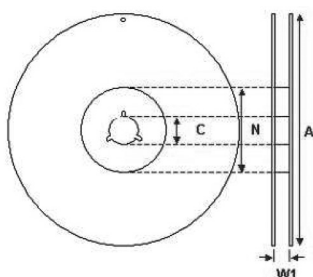
Appendixes

Tape & Reel Dimensions



Multilayer SMD Ceramic Capacitors

General Purpose Series



The dimension of reel

Size	0603, 0805, 1206		
Reel size	7"	10"	13"
C	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
A	178 ±0.10	250 ±1	330 ±1
N	60 +1/-0	100 ±1	100 ±1

Storage and handling conditions

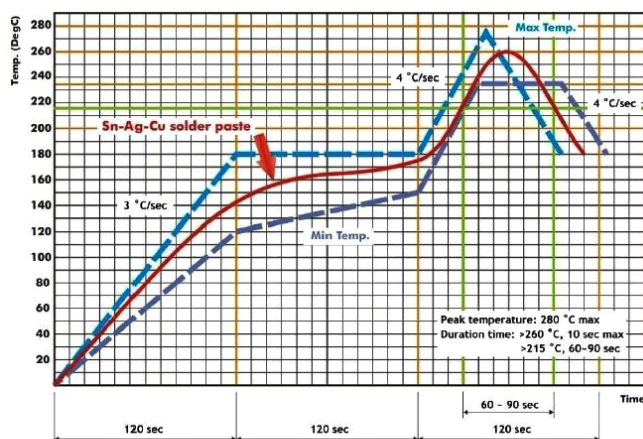
- (1) To store products at 5°C to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

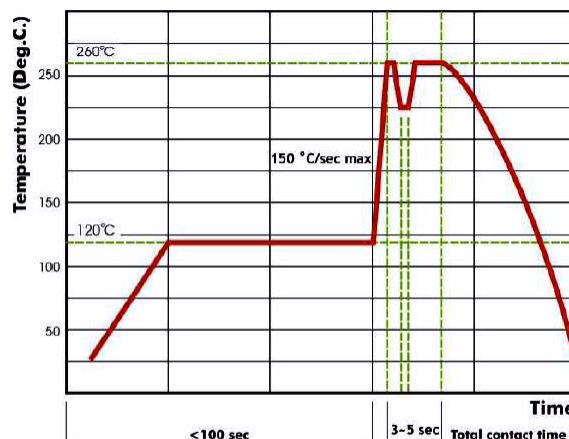
- a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidization of electrode, which easily be resulted in poor soldering.
- b. To store products on the shelf and avoid exposure to moisture.
- c. Don't expose products to excessive shock, vibration, direct sunlight and so on.

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



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

Part Number Table

Description	Part Number
CAP, Ceramic, 0.1µF, 16V, X7R, 0603	B0603R104KCT
CAP, Ceramic, 22pF, 50V, C0G/NP0, 0603	U0603C220JCT
Capacitor, 0603, 100pF, 50V	U0603C101JCT

Description	Part Number
CAP, Ceramic, 0.01µF, 50V, X7R, 0603	U0603R103KCT
CAP, Ceramic, 1,000pF, 50V, X7R, 0805	U0805R102KCT
CAP, Ceramic, 0.01µF, 50V, X7R, 0805	U0805R103KCT

Multilayer SMD Ceramic Capacitors

General Purpose Series



Description	Part Number
CAP, Ceramic, 0.1µF, 50V, X7R, 0805	U0805R104KCT
CAP, Ceramic, 0.1µF, 50V, Y5V, 0805	U0805F104ZCT
Capacitor, 0805, 100pF, 100V	A0805C101JCT
Capacitor, 0805, 220pF, 100V	A0805C221JCT
Capacitor, 0805, 1µF, 10V	MCCA000269
Capacitor, 0805, 1µF, 25V	MCCA000305
Capacitor, 0805, 1µF, 10V	MCCA000269
Capacitor, 0805, 1µF, 25V	MCCA000305
Capacitor, 0805, 10pF, 100V	MCCA000390
Capacitor, 1206, 2.2µF, 10V	MCCA000415
Capacitor, 1206, 1µF, 16V	MCCA000429
Capacitor, 1206, 2.2µF, 16V	MCCA000430
Capacitor, 1206, 4.7µF, 16V	MCCA000431
Capacitor, 1206, 4.7nF, 25V	MCCA000432
Capacitor, 1206, 10nF, 25V	MCCA000433
Capacitor, 0603, 470nF, 10V	MCCA000145
Capacitor, 1206, 10pF, 100V	MCCA000480
Capacitor, 1206, 22pF, 100V	MCCA000481
Capacitor, 1206, 100pF, 100V	MCCA000482
Capacitor, 0805 33pF 100V	A0805C330JNT
Capacitor, 0805 47pF 100V	A0805C470JNT
Capacitor, 1206, 220pF, 100V	MCCA000483
Capacitor, 1206, 330pF, 100V	MCCA000484
Capacitor, 1206, 470pF, 100V	MCCA000485
Capacitor, 1206, 1nF, 100V	MCCA000486
Capacitor, 0805, 10pF, 100V	MCCA000390
Capacitor, 1206, 4.7nF, 25V	MCCA000432
Capacitor, 1206, 10nF, 25V	MCCA000433
Capacitor, 1206, 2.2µF, 10V	MCCA000415
Capacitor, 1206, 1µF, 16V	MCCA000429
Capacitor, 1206, 2.2µF, 16V	MCCA000430
Capacitor, 1206, 4.7µF, 16V	MCCA000431
Capacitor, 0603, 470nF, 10V	MCCA000145
Capacitor, 0805, 22pF, 100V	A0805C220JCT
Capacitor, 0805, 33pF, 100V	A0805C330JCT
Capacitor, 0805, 47pF, 100V	A0805C470JCT

Description	Part Number
Capacitor, 0805, 470pF, 100V	A0805C471JCT
Capacitor, 0805 0.22µF 16V	B0805R224KNT
Capacitor, 1206 47pF 100V	A1206C470JNT
Capacitor, 1206 220pF 100V	A1206C221JNT
Capacitor, 1206 1µF 16V	B1206R105KNT
Capacitor, 0805, 0.22µF, 16V	B0805R224KCT
Capacitor, 0805, 0.33µF, 16V	B0805R334KCT
Capacitor, 0805, 0.47µF, 16V	B0805R474KCT
Capacitor, 1206, 10pF, 100V	MCCA000480
Capacitor, 1206, 22pF, 100V	MCCA000481
Capacitor, 1206, 100pF, 100V	MCCA000482
Capacitor, 1206, 220pF, 100V	MCCA000483
Capacitor, 1206, 330pF, 100V	MCCA000484
Capacitor, 1206, 470pF, 100V	MCCA000485
Capacitor, 1206, 1nF, 100V	MCCA000486
Capacitor, 0603 22nF 25V	T0603R223KNT
Capacitor, 0603 47nF 25V	T0603R473KNT
Capacitor, 0603 1.0nF 50V	U0603R102KNT
Capacitor, 0603 470nF 10V	N0603F474ZNT
Capacitor, 0805 1µF 10V	N0805R105KNT
Capacitor, 0805 10nF 50V	U0805R103KNT
Capacitor, 1206 0.47µF 25V	T1206R474KNT
Capacitor, 0603, 220pF, 50V	U0603C221JCT
Capacitor, 0603, 1nF, 50V	U0603C102JCT
Capacitor, 0603, 22nF, 25V	T0603R223KCT
Capacitor, 0603, 47nF, 25V	T0603R473KCT
Capacitor, 0603, 1nF, 50V	U0603R102KCT
Capacitor, 0603, 100nF, 25V	T0603F104ZCT
Capacitor, 0805, 1nF, 50V	U0805C102JCT
Capacitor, 0805, 2.2nF, 50V	U0805C222JCT
Capacitor, 0805, 22nF, 50V	U0805R223KCT
Capacitor, 0805, 47nF, 50V	U0805R473KCT
Capacitor, 1206, 0.33µF, 25V	T1206R334KCT
Capacitor, 1206, 0.47µF, 25V	T1206R474KCT
Capacitor, 1206, 10nF, 50V	U1206R103KCT
Capacitor, 1206, 100nF, 50V	U1206R104KCT

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