

SMD Multilayer Ceramic Capacitors **multicomp** PRO

**RoHS
Compliant**



Description

This middle and high voltage series MLCC is designed by a special internal electrode pattern, which can reduce voltage concentrations by distributing voltage gradients throughout the entire capacitor.

This special design also affords increased capacitance values in a given case size and voltage rating. Capacitors with X7R dielectrics are not intended for AC line filtering applications. Capacitors may require protective surface coating to prevent external arcing.

Features

- High voltage in a given case size.
- High stability and reliability.

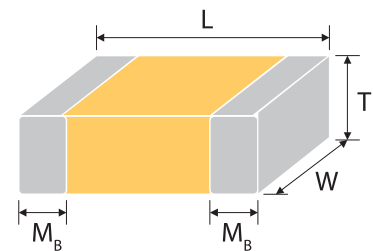
Applications

- Snubbers in high frequency power converters.
- High voltage coupling/DC blocking.
- DC-DC converters.
- Back-lighting inverters

External Dimensions:

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Remark	M _B (mm)
1808 (4520)	4.5 +0.5/-0.3	2.03±0.25	1.25±0.1 D	#	0.50±0.25
			1.6 ±0.2 G		
			2 ±0.2 K		

Reflow soldering only is recommended.



The outline of MLCC

General Electrical Data

Dielectric	X7R
Size	1808
Capacitance*	100pF to 1.0μF
Capacitance tolerance***	J (±5%) ^{#1} , K (±10%), M (±20%)
Rated voltage (WVDC)	200V to 4000V
Q/DF*	DF2.5%
Insulation resistance at Ur**	Ur=200~630V: 10G or RxC100-F whichever is smaller Ur=1000~3000V: 10G
Dielectric strength	200~300V: 2 x WVDC, 400V~450V: 1.2 x WVDC, 500~999V: 1.5 x WVDC 1000~3000V: 1.2 x WVDC, 4000: 1.1 x WVDC
Operating temperature	-55°C to +125°C
Capacitance characteristic	±15%
Termination	Ni/Sn (lead-free termination)

#1: X7R products can provide optional J(±5%) capacitance tolerance.

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

** 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.

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

multicomp PRO

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Capacitance Range (High Voltage - 1kV to 4kV)

Dielectric		X7R	
Size		1808	
Rated Voltage (V DC)		2000	3000
Capacitance	100pF (101)		
	120pF (121)		
	150pF (151)	D	D
	180pF (181)	D	D
	220pF (221)	D	D
	270pF (271)	D	D
	330pF (331)	D	K
	390pF (391)	D	K
	470pF (471)	D	K
	560pF (561)	D	K
	680pF (681)	D	K
	820pF (821)	D	K
	1,000pF (102)	K	K
	1,200pF (122)	K	K
	1,500pF (152)	K	K
	1,800pF (182)	K	K
	2,200pF (222)	K	K
	2,700pF (272)	K	K
	3,300pF (332)	K	K
	3,900pF (392)	K	
	4,700pF (472)	K	
	5,600pF (562)	K	
	6,800pF (682)	K	
	8,200pF (822)	K	
	0.010μF (103)	K	
	0.012μF (123)		
	0.015μF (153)		
	0.018μF (183)		
	0.022μF (223)		
	0.033μF (333)		
	0.039μF (393)		
	0.047μF (473)		
0.056μF (563)			
0.068μF (683)			
0.10μF (104)			

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

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Reliability Test Conditions And Requirements

No	Item	Test Condition	Requirements								
1	Visual and Mechanical	-	* No remarkable defect. * Dimensions to conform to individual specification sheet.								
2	Capacitance	* Test temp.: Room Temperature. Class I: (NP0) Cap1000pF, 1.0±0.2Vrms, 1MHz±10% Cap>1000pF, 1.0±0.2Vrms, 1KHz±10% Class II: (X7R) 1.0±0.2Vrms, 1kHz±10%	X7R: 2.5%								
3	Q/ D.F. (Dissipation Factor)	*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp .									
4	Dielectric Strength	* To apply voltage: 200V~300V ≥2 times VDC 400V~450V ≥1.2 times VDC 500V~999V ≥1.5 times VDC 1000V~3000V ≥1.2 times VDC 4000V ≥1.1 times VDC * Duration: 1 to 5 sec. * Charge & discharge current less than 50mA.	* No evidence of damage or flash over during test.								
5	Insulation Resistance	* Test temp.: Room Temperature. Rated voltage: 200~630V	To apply rated voltage (500V max.) for 60 sec.								
		* Test temp.: Room Temperature. Rated voltage: 630V	To apply 500V for 60 sec.								
6	Temperature Coefficient	With no electrical load. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> </thead> <tbody> <tr> <td>X7R</td> <td>-55~125°C at 25°C</td> </tr> </tbody> </table>	T.C.	Operating Temp	X7R	-55~125°C at 25°C	<table border="1" style="margin-left: 20px;"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>X7R</td> <td>Within ±15%</td> </tr> </tbody> </table>	T.C.	Capacitance Change	X7R	Within ±15%
T.C.	Operating Temp										
X7R	-55~125°C at 25°C										
T.C.	Capacitance Change										
X7R	Within ±15%										
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.) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp . *Cap./DF(Q) Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.								
9	Solderability	* Solder temperature: 235±5°C * Dipping time: 2±0.5 sec.	95% min. coverage of all metalized area.								

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

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No	Item	Test Condition	Requirements															
10	Bending Test	<p>* 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.</p> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr 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>* No remarkable damage.</p> <p>* Cap change: NP0: within ±5.0% or ±0.5pF whichever is larger. X7R: within ±12.5%</p> <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>															
11	Resistance to Soldering Heat	<p>* Solder temperature: 260±5°C</p> <p>* Dipping time: 10±1 sec</p> <p>* Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder.</p> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp .</p> <p>*Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	<p>* No remarkable damage.</p> <p>* Cap change: NP0: within ±2.5% or ±0.25pF whichever is larger. X7R: within ±7.5%</p> <p>* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</p> <p>* 25% max. leaching on each edge.</p>															
12	Temperature Cycle	<p>Conduct the five cycles according to the temperatures and time.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp .</p> <p>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp .</p>	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	<p>* No remarkable damage.</p> <p>* Cap change: NP0: within ±2.5% or ±0.25pF whichever is larger. X7R: within ±7.5%</p> <p>* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</p>
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																
13.	Humidity (Damp Heat) Steady State	<p>* Test temp.: 40±2°C</p> <p>* Humidity: 90~95% RH</p> <p>* Test time: 500+24/-0hrs.</p> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp .</p> <p>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp .</p>	<p>* No remarkable damage.</p> <p>* Cap change: NP0: within ±5.0% or ±0.5pF whichever is larger. X7R: within ±12.5%</p> <p>* Q/D.F. value: NP0: Cap≥30pF, Q≥350; 10pF≤Cap<30pF, Q≥275+2.5C Cap<10pF; Q200+10C X7R: 3.0%</p> <p>* I.R.: ≥1G or RxC50Ω-F whichever is smaller.</p>															

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

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No	Item	Test Condition	Requirements
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 (Max. 500V) * Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp . * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp .	* No remarkable damage. * Cap change: NP0: within ±7.5% or ±0.75pF whichever is larger. X7R: within ±12.5% * Q/D.F. value: NP0: Cap≥30pF, Q≥200; Cap<30pF, Q≥100+10/3C X7R: 3.0% * I.R.: ≥500M or RxC≥25Ω-F whichever is smaller.
15	High Temperature Load (Endurance)	* Test temp.: NP0, X7R: 125±3°C * To apply voltage: (1) 1206/NP0 (3kV) 1.5pF: 100% of rated voltage. 1812N472&1812N562(1KV): 100% of rated voltage. (2) 200V~300V: 200% of rated voltage. (3) 400V~450V: 120% of rated voltage. (4) 500V: 150% of rated voltage. (5) 630V~3000V: 120% of rated voltage. (6) 4000V: 110% of rated voltage. * Test time: 1000+24/-0 hrs. * Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp . * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. * Cap change: NP0: within ±3.0% or ±0.3pF whichever is larger. X7R: within ±12.5% * Q/D.F. value: NP0: Cap≥30pF, Q≥350 10pF≤Cap<30pF, Q≥275+2.5C Cap<10pF, Q≥200+10C X7R: ≤3.0% * I.R.: ≥1G or RxC≥50Ω-F whichever is smaller.
16	ESR	The ESR should be measured at room temperature and tested at frequency 1±0.1 GHz.	0.2pF≤Cap≤1pF:< 700mΩ/pF 1pF<Cap≤2pF:< 600mΩ 2pF<Cap≤5pF:< 500mΩ 5pF<Cap≤10pF:< 300mΩ 10pF<Cap≤22pF:< 350mΩ
		The ESR should be measured at room temperature and tested at frequency 500±50 MHz.	0201, 22pF≤Cap≤33pF: < 300mΩ 1111, 100pF<Cap≤1000pF: < 150mΩ

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

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Appendixes

Tape & Reel Dimensions

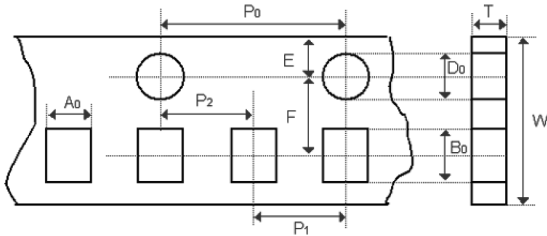


Fig. 2 The dimension of paper tape

Size	1808	
Thickness	D,F	G,K
A ₀	< 2.5	
B ₀	< 5.3	
T	0.25 +/-0.1	
K ₀	< 2	< 2.5
W	12 +/-0.3	
P ₀	4 +/-0.1	
10xP ₀	40 +/-0.2	
P ₁	4 +/-0.1	
P ₂	2 +/-0.1	
D ₀	1.5 +0.1/-0	
D ₁	1.5 +/-0.1	
E	1.75 +/-0.1	
F	5.5 +/-0.1	

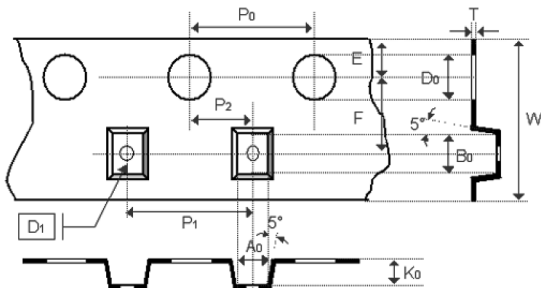


Fig. 3 The dimension of plastic tape

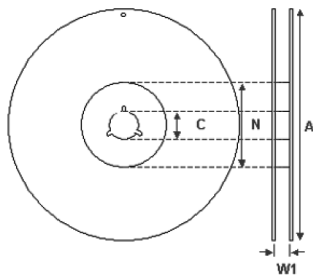
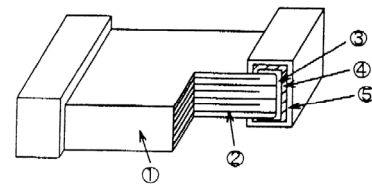


Fig. 4 The dimension of reel

Size	0402
Reel size	7"
C	13 ±0.5
W ₁	12.4+2/-0
A	178 ±2
N	60 +1/-0

Constructions

No.	Name	X7R	
1	Ceramic material	BaTiO ₃ based	
2	Inner electrode	Ni	
3	Termination	Inner layer	Cu
4		Middle layer	Ni
5		Outer layer	Sn



The construction of MLCC

Storage and handling conditions

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

Cautions:

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

Recommended soldering conditions

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

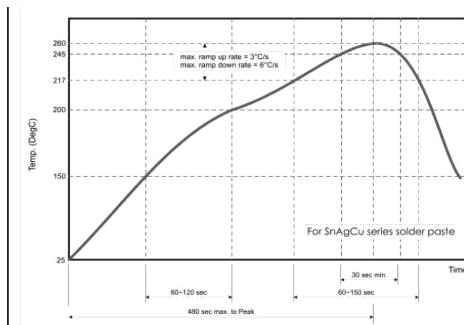


Fig. 25 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

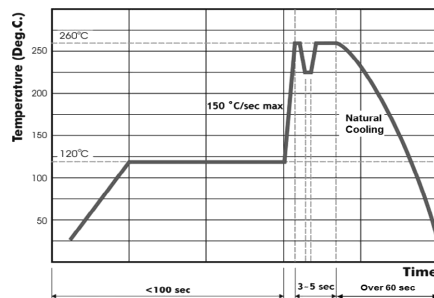


Fig. 26 Recommended wave soldering profile for SMT process with SnAgCu series solder.

Part Number Table

Description	Part Number
SMD Multilayer Ceramic Capacitors, 1808, X7R, 1nF, 10%, 2KV	MC1808B102K202CT
SMD Multilayer Ceramic Capacitors, 1808, X7R, 220pF, 10%, 3KV	MC1808B221K302CT
SMD Multilayer Ceramic Capacitors, 1808, X7R, 680pF, 10%, 3KV	MC1808B681K302CT

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