Multilayer Ceramic Capacitors
Capacitor Arrays Series

RoHS Compliant

Description:

WTC 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. WTC capacitor arrays are developed to offer designers the opportunity to lower placement costs increase assembly line output through lower component count per board.

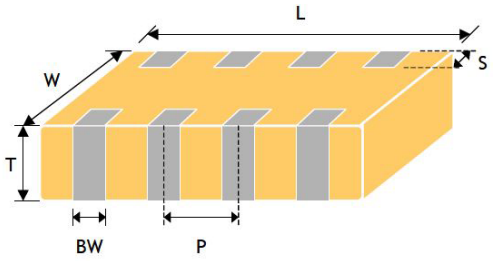
Features:

- High density mounting due to mounting space saving.
- Mounting cost saving.
- Increased throughput.

Applications:

- For use as a bypass for digital and analog signal line noise
- Computer motherboards and peripherals.
- The other common electronic circuits.

External Dimensions:



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		S (mm)	BW (mm)	P (mm)
0508 (1220)	2 ±0.15	1.25 ±0.15	0.85 ±0.1	T	0.2 ±0.1	0.25 ±0.1	0.5 ±0.1
0612 (1632)	3.2 ±0.15	1.6 ±0.15	0.8 ±0.1	B	0.3 ±0.2	0.4 ±0.15	0.8 ±0.15

Reflow soldering process only.

Multilayer Ceramic Capacitors
Capacitor Arrays Series

General Electrical Data:

Dielectric	NP0		X7R	
Size	4x0402	4x0603	4x0402	4x0603
Capacitance*	10pF to 270pF	10pF to 470pF	1,000pF to 100nF	180pF to 100nF
Capacitance tolerance**	J (±5%), K (±10%)		K (±10%), M (±20%)	
Rated voltage (WVDC)	50V	25, 50V	10V, 16V, 25V, 50V	16V, 25V, 50V
Q/Tan δ*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000		Ur=50V, ≤2.5% Ur=25V&16V, ≤3.5% Ur=10V, ≤5.0%	
Insulation resistance at Ur	≥10G		≥10G or RxC≥500xF whichever is less	
Operating temperature	-55°C to +125°C			
Capacitance characteristic	±30ppm			
Termination	Ni/Sn (lead-free termination)			

* Measured at 30~70% related humidity.
NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% at the conditions of 25°C ambient temperature.
X7R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at the conditions of 25°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.

Packaging Dimension And Quantity:

Size	Thickness/Symbol (mm)		Paper Tape	
			7" reel	13" reel
4 x 0402	0.85 ±0.1	T	4k	-
4 x 0603	0.8 ±0.1	B	4k	-

Unit: pieces

Capacitance Range:

Size		4 x 0402					4 x 0603				
Dielectric		NP0	X7R				NP0		X7R		
Rated Voltage (VDC)		50	10	16	25	50	25	50	16	25	50
Capacitance	10pF (100)	T					B	B			
	15pF (150)	T					B	B			
	22pF (220)	T					B	B			
	33pF (330)	T					B	B			
	47pF (470)	T					B	B			
	68pF (680)	T					B	B			
	100pF (101)	T					B	B			
	150pF (151)	T					B	B			
	180pF (181)	T					B	B		B	B

Capacitance Range:

Size		4 x 0402					4 x 0603				
Dielectric		NP0	X7R				NP0		X7R		
Rated Voltage (VDC)		50	10	16	25	50	25	50	16	25	50
Capacitance	220pF (221)	T					B	B		B	B
	270pF (271)	T					B	B		B	B
	330pF (331)						B	B		B	B
	470pF (471)						B	B		B	B
	6,80pF (681)									B	B
	1,000pF (102)		T	T	T	T				B	B
	1,500pF (152)		T	T	T	T				B	B
	2,200pF (222)		T	T	T	T				B	B
	3,300pF (332)		T	T	T	T				B	B
	4,700pF (472)		T	T	T	T				B	B
	6,800pF (682)		T	T	T	T				B	B
	0.010μF (103)		T	T	T	T				B	B
	0.015μF (153)		T	T	T				B	B	B
	0.022μF (223)		T	T	T				B	B	B
	0.033μF (333)		T	T	T				B		
	0.047μF (473)		T	T	T				B		
	0.068μF (683)		T	T	T				B		
	0.10μF (104)		T	T	T				B		

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

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: NP0 1 ±0.2Vrms, 1MHz ±10% Class II: (X7R) 1 ±0.2Vrms, 1kHz ±10%	* Shall not exceed the limits given in the detailed spec.
3	Q/ D.F. (Dissipation Factor)		NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R: Ur=50V, ≤2.5%; Ur=25V&16V, ≤3.5%; Ur=10V, ≤5.0%
4	Dielectric Strength	* To apply voltage (≤100V) 250%. * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.
5	Insulation Resistance	To apply rated voltage for max. 120 sec.	≥10GΩ or RxC≥500-F whichever is smaller.

Reliability Test Conditions and Requirements:

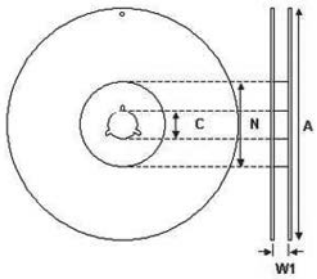
<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>6</td><td>Temperature Coefficient</td><td>With no electrical load.<table><tr><th>T.C.</th><th>Operating Temperature</th></tr><tr><td>NP0)</td><td>55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr></table></td><td><table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>NP0</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr></table></td></tr>
<tr><td>7</td><td>Adhesive Strength of Termination</td><td>Pressurizing force:
5N (≤0603) and 10N (>0603)
Test time: 10 ±1 sec.</td><td>No remarkable damage or removal of the terminations.</td></tr>
<tr><td>8</td><td>Vibration Resistance</td><td>Vibration frequency: 10~55 Hz/min.
Total amplitude: 1.5mm
Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)</td><td>No remarkable damage.
Cap change and Q/D.F.: To meet initial spec.</td></tr>
<tr><td>9</td><td>Solderability</td><td>Solder temperature: 235 ±5°C
Dipping time: 2 ±0.5 sec.</td><td>95% min. coverage of all metalized area.</td></tr>
<tr><td>10</td><td>Bending Test</td><td>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.</td><td>No remarkable damage.
Cap change
NP0: within ±5.0% or ±0.5pF whichever is larger.
X7R: within ±12.5%
(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</td></tr>
<tr><td>11</td><td>Resistance to Soldering Heat</td><td>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 48 ±4hrs at room temp.
Measurement to be made after keeping at room temp. for 24 ±2 hrs. (Class I) or 48 ±4 hrs. (Class II).</td><td>No remarkable damage.
Cap change:
NP0: within ±2.5% or ±0.25pF whichever is larger.
X7R: within ±7.5%
Q/D.F., I.R. and dielectric strength: To meet initial requirements.
25% max. leaching on each edge.</td></tr>
<tr><td>12</td><td>Temperature Cycle</td><td>Conduct the five cycles according to the temperatures and time.<table><tr><th>Step</th><th>Temp. (°C)</th><th>Time (Min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table>Before initial measurement (Class II only): Perform 150+0/-10°C for 1hour and then set for 24±2 hrs at room temp. Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td><td>No remarkable damage.
Cap change:
NP0: within ±2.5% or ±0.25pF whichever is larger.
X7R: within ±7.5%
Q/D.F., I.R. and dielectric strength: To meet initial requirements.</td></tr>
</table>

Reliability Test Conditions and Requirements:

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 24±2 hrs. (Class I) or 48±4 hrs. (Class II).	No remarkable damage. Cap change: NP0: within ±5.0% or ±0.5pF 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: Ur=50V, ≤3%; Ur=25V&16V, ≤5%; Ur=10V, ≤7.5% I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.
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. Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).	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: Ur=50V, ≤3%; Ur=25V&16V, ≤5%; Ur=10V, ≤7.5% I.R.: ≥500MΩor RxC≥25Ω-F whichever is smaller.
15	High Temperature Load (Endurance)	Test temp.: NP0, X7R: 125±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 24±2 hrs. (Class I) or 48±4 hrs. (Class II).	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: Ur=50V, ≤3%; Ur=25V&16V, ≤5%; Ur=10V, ≤7.5% I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.

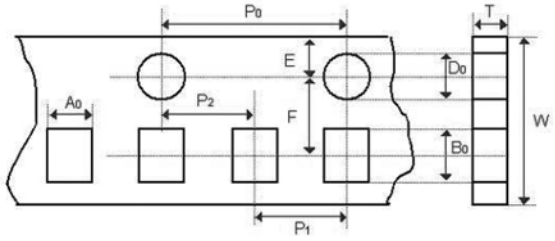
Appendixes

Reel Dimensions



Size	4x0402, 4x0603
Reel size	7”
C	13 +0.5/-0.2
W_1	8.4 +1.5/-0
A	178 ±0.1
N	60 +1/-0

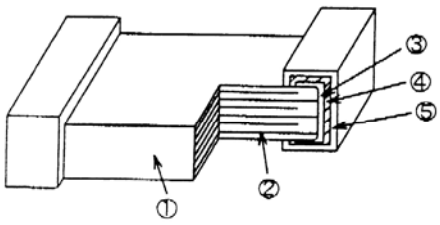
Tape Dimensions



The dimension of paper tape

Size	4x0402	4x0603
Thickness	T	B
A_0	1.5 ±0.1	2 ±0.1
B_0	2.3 ±0.1	3.5 ±0.1
T	0.95 ±0.05	0.95 ±0.05
K_0	-	-
W	8 ±0.1	8 ±0.1
P_0	4 ±0.1	4 ±0.1
10xP_0	40 ±0.1	40 ±0.1
P_1	4 ±0.1	4 ±0.1
P_2	2 ±0.05	2 ±0.05
D_0	1.55 ±0.05	1.5 ±0.05
D_1	-	-
E	1.75 ±0.05	1.75 ±0.1
F	3.5 ±0.05	3.5 ±0.05

Constructions:



No.	Name		NP0 & X7R,
1	Ceramic material		$BaTiO_3$ based
2	Inner electrode		Ni
3	Termination	Inner layer	Cu
4		Middle layer	Ni
5		Outer layer	Sn (Matt)

Storage and handling conditions

(1) To store products at 5 to 40°C ambient temperature and 20 to 70%. related humidity conditions.

(2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

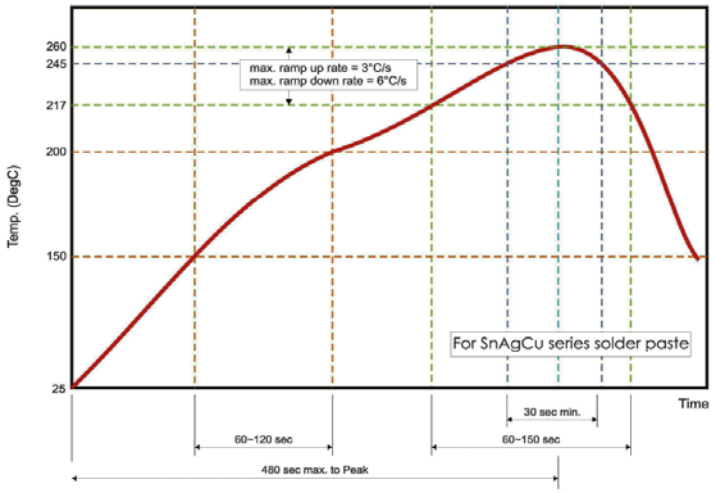
a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)

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

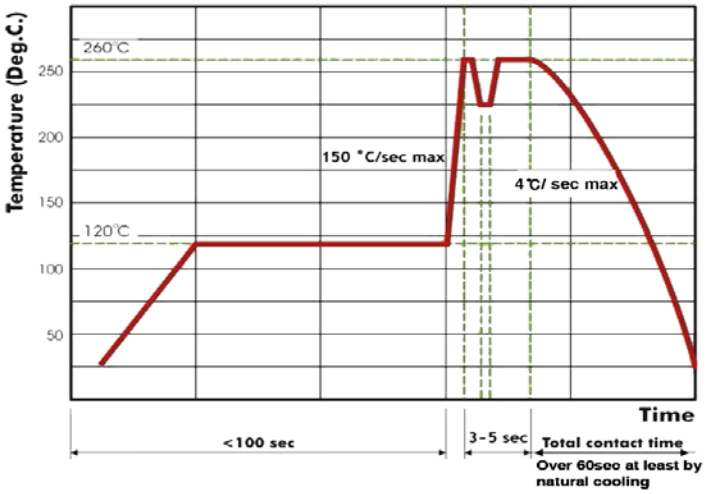
c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight,the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

Recommended Soldering Conditions:

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N_2 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.

Part Number Table

Description	Partnumber
Capacitor, RF, 0.1UF, 10V, X7R, 4x0402	MC000249
Capacitor, RF, 0.01UF, 50V, X7R, 4x0603	MC000250
Capacitor, RF, 0.01UF, 50V, X7R, 4x0603	MC000251
Capacitor, RF, 0.01UF, 50V, X7R, 4x0603	MC000252
Capacitor, RF, 100PF, 50V, NP0, 4x0603	MC000253
Capacitor, RF, 150PF, 50V, NP0, 4x0603	MC000254
Capacitor, RF, 180PF, 50V, NP0, 4x0603	MC000255
Capacitor, RF, 220PF, 50V, NP0, 4x0603	MC000256
Capacitor, RF, 33PF, 50V, NP0, 4x0603	MC000257
Capacitor, RF, 330PF, 50V, NP0, 4x0603	MC000258
Capacitor, RF, 100PF, 50V, NP0, 4x0603	MC000259
Capacitor, RF, 220PF, 50V, NP0, 4x0603	MC000260
Capacitor, RF, 47PF, 50V, NP0, 4x0603	MC000261
Capacitor, RF, 470PF, 50V, NP0, 4x0603	MC000262
Capacitor, RF, 470PF, 50V, NP0, 4x0603	MC000263
Capacitor, RF, 0.01UF, 25V, X7R, 4x0603	MC000264
Capacitor, RF, 0.047UF, 16V, X7R, 4x0603	MC000265
Capacitor, RF, 1000PF, 50V, X7R, 4x0603	MC000266
Capacitor, RF, 1000PF, 50V, X7R, 4x0603	MC000267
Capacitor, RF, 0.022UF, 50V, X7R, 4x0603	MC000268