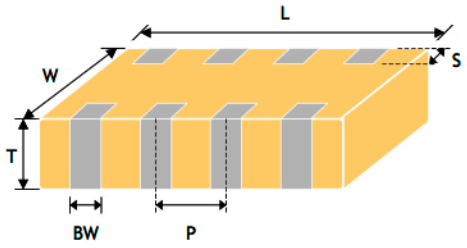
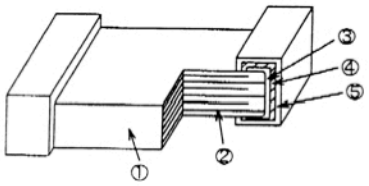
Multilayer Ceramic Capacitor Array - GMY Series

Cal-Chip Electronics Inc.

RoHS

Construction and Dimensions





No.	Name		NP0, X7R, Y5V
①	Ceramic material		$BaTiO_3$ based
②	Inner electrode		Ni
③	Termination	Inner layer	Cu
④		Middle layer	Ni
⑤		Outer layer	Sn (Matte)

Scope

- Cal-Chip's capacitor arrays are developed to offer designers the opportunity to lower placement costs and increase assembly line output through lower component count per board.

Features

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

Size Inch(mm)	L (mm)	W (mm)	T (mm)	S (mm)	BW (mm)	P (mm)
4x0402 0508 (1220)	2.00±0.15	1.25±0.15	0.85±0.10	0.20±0.10	0.25±0.10	0.50±0.10
4x0603 0612 (1632)	3.20±0.15	1.60±0.15	0.80±0.10	0.30±0.20	0.40±0.15	0.80±0.15

Applications

- Use as a bypass for digital and analog signal line noise
- Computer motherboards and peripherals
- Common electronic circuits

GMY	4C	3	CG	101	J	50	N	T
Product Type	Capacitor Number	Termination Pitch	Dielectric	Capacitance	Tolerance	Rated Voltage	Termination	Packaging
	4C: 4xCap	3: 0.03" pitch 2: 0.02" pitch	CG: NPO (COG) X7R: X7R Y5V: Y5V	Two significant digits followed by no. of zeros. Use R in place of decimal point	J: ±5% K: ±10% M: ±20% Z: ±-20/+80%	10: 10VDC 16: 16VDC 25: 25VDC 50: 50VDC 100: 100VDC	N: Cu/Ni/Sn	T: 7" reel

** Y4C3: 4x0603 (0612)
** Y4C2: 4x0402 (0508)

Calchip Electronics, INC.
Phone: (215) 942-8900

www.calchipelectronics.com
Fax : (215) 942-6400

Capacitance Range

DIMENSION (MM)		GMY4C2							GMY4C3							
L(L1)		2.00±0.15							3.20±0.15							
W		1.25±0.15							1.60±0.15							
Dielectric		COG			X7R				COG			X7R			Y5V	
H (max)		0.95			0.95				0.90			0.9			0.90	
Rated Voltage		25	50	100	10	16	25	50	25	50	100	16	25	50	16	50
Cap. Range																
10pF	100	■	■	■					■	■	■					
15	150	■	■	■					■	■	■					
22	220	■	■	■					■	■	■					
33.0	330	■	■	■					■	■	■					
47	470	■	■	■					■	■	■					
68	680	■	■	■					■	■	■					
100	101	■	■	■					■	■	■					
150	151	■	■	■					■	■	■					
180	181	■	■	■					■	■	■		■	■		
220	221	■	■	■					■	■	■		■	■		
270	271	■	■	■					■	■	■		■	■		
330	331								■	■	■		■	■		
470	471								■	■	■		■	■		
680	681												■	■		
1000	102				■	■	■	■					■	■		
1500	152				■	■	■	■					■	■		
2200	222				■	■	■	■					■	■		
3300	332				■	■	■	■					■	■		
4700	472				■	■	■	■					■	■		
6800	682				■	■	■	■					■	■		
0.010uF	103				■	■	■	■					■	■		■
0.015	153				■	■	■					■	■	■		■
0.022	223				■	■	■					■	■	■		■
0.033	333				■	■	■					■				■
0.047	473				■	■	■					■				■
0.068	683				■	■	■					■				■
0.10	104				■	■	■					■			■	■

General Electrical Data

Dielectric	NP0		X7R		Y5V
Size Inch (mm)	4x0402 0508 (1220)	4x0603 0612 (1632)	4x0402 0508 (1220)	4x0603 0612 (1632)	4x0603 0612 (1632)
Capacitance*	10pF to 270pF	10pF to 470pF	1000pF to 100nF	180pF to 100nF	10nF to 100nF
Capacitance tolerance**	J (±5%), K (±10%)		K (±10%), M (±20%)		Z (-20/+80%)
Rated voltage (WVDC)	25, 50V, 100V		10V, 16V, 25V, 50V	16V, 25V, 50V	16V, 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%		Ur=50V, ≤5% Ur=16V, ≤7%
Insulation resistance at Ur	≥10GΩ		≥10GΩ or RxC≥500ΩxF whichever is less		
Operating temperature	-55 to +125°C				-25 to +85°C
Capacitance characteristic	±30ppm		±15%		+30/-80%
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.

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

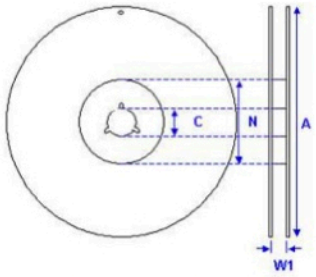
** Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement.

■ Reliability Test Conditions and Dimensions

<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Visual and Mechanical</td><td>---</td><td>* No remarkable defect.
* Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>2.</td><td>Capacitance</td><td>Class I: (NP0)
1.0±0.2Vrms, 1MHz±10%
Class II: (X7R, Y5V)
1.0±0.2Vrms, 1kHz±10%</td><td>* Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3.</td><td>Q/ D.F. (Dissipation Factor)</td><td></td><td>NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C
X7R: Ur=50V, ≤2.5%; Ur=25V&16V, ≤3.5%; Ur=10V, ≤5.0%
Y5V: Ur=50V, ≤5%; Ur=16V, ≤7%</td></tr>
<tr><td>4.</td><td>Dielectric Strength</td><td>* To apply 250% rated voltage.
* Duration: 1 to 5 sec.
* Charge and discharge current less than 50mA.</td><td>* No evidence of damage or flash over during test.</td></tr>
<tr><td>5.</td><td>Insulation Resistance</td><td>To apply rated voltage for max. 120 sec.</td><td>≥10GΩ or RxC≥500Ω-F whichever is smaller.</td></tr>
<tr><td>6.</td><td>Temperature Coefficient</td><td>With no electrical load.
<table><tr><th>T.C.</th><th>Operating Temp</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><tr><td>Y5V</td><td>-25~85°C at 20°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><tr><td>Y5V</td><td>Within +30%/-80%</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.)
* Measurement to be made after keeping at room temp. for 24±2 hrs.</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 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.</td><td>* No remarkable damage.
* Cap change：
NP0: within ±5.0% or ±0.5pF whichever is larger.
X7R: 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.)</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 24±2 hrs at room temp.
* Measurement to be made after keeping at room temp. for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change:
NP0: within ±2.5% or ±0.25pF whichever is larger.
X7R: within ±7.5%
Y5V: within ±20%
* Q/D.F., I.R. and dielectric strength: To meet initial requirements.
* 25% max. leaching on each edge.</td></tr>
</table>

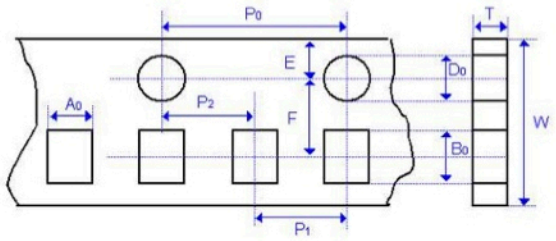
<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>12.</td><td>Temperature Cycle</td><td>* Conduct the five cycles according to the temperatures and time.
<table><tr><th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. +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 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.</td><td>* No remarkable damage.
* Cap change：
NP0: within ±2.5% or ±0.25pF whichever is larger.
X7R: within ±7.5%
Y5V: within ±20%
* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</td></tr>
<tr><td>13.</td><td>Humidity (Damp Heat) Steady State</td><td>* 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</td><td>* No remarkable damage.
* Cap change: NP0: within ±5.0% or ±0.5pF whichever is larger.
X7R: within ±12.5%
Y5V: within ±30%
* 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%
Y5V: Ur=50V, ≤7.5%; Ur=16V, ≤10%
* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.</td></tr>
<tr><td>14.</td><td>Humidity (Damp Heat) Load</td><td>* 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.</td><td>* No remarkable damage.
* Cap change: NP0: within ±7.5% or ±0.75pF whichever is larger.
X7R: within ±12.5%
Y5V: within ±30%
* 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%
Y5V: Ur=50V, ≤7.5%; Ur=16V, ≤10%
* I.R.: ≥500MΩ or RxC≥25Ω-F whichever is smaller.</td></tr>
<tr><td>15.</td><td>High Temperature Load (Endurance)</td><td>* Test temp.:
NP0, X7R: 125±3°C
Y5V: 85±3°C
* To apply voltage: 200% of rated voltage.
* Test time: 1000+24/-0 hrs.
*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.
Measurement to be made after keeping at room temp. for 24±2 hrs</td><td> No remarkable damage.
* Cap change: NP0: within ±3.0% or ±0.3pF whichever is larger.
X7R: within ±12.5%
Y5V: within ±30%
* 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%
Y5V: Ur=50V, ≤7.5%; Ur=16V, ≤10%
* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.</td></tr>
</table>

Packaging



Size	Thickness	Paper Tape
4x0402 0508 (1220)	0.85±0.10	4K
4x0603 0612 (1632)	0.80±0.10	4K

Paper Tape Specifications



SIZE Inch (mm)	4x0402 0508 (1220)	4x0603 0612 (1632)
Thickness	T	B
A_0	1.50±0.10	2.00±0.10
B_0	2.30±0.10	3.50±0.10
T	0.95±0.05	0.95±0.05
K_0	-	-
W	8.00±0.10	8.00±0.10
P_0	4.00±0.10	4.00±0.10
$10xP_0$	40.0±0.10	40.0±0.10
P_1	4.00±0.10	4.00±0.10
P_2	2.00±0.05	2.00±0.05
D_0	1.55±0.05	1.50±0.05
D_1	-	-
E	1.75±0.05	1.75±0.10
F	3.50±0.05	3.50±0.05

Reel size	7”
C	13.0+0.5/-0.2
W_1	8.4+1.5/-0
A	178.0±0.10
N	60.0+1/-0

Storage and Handling Conditions

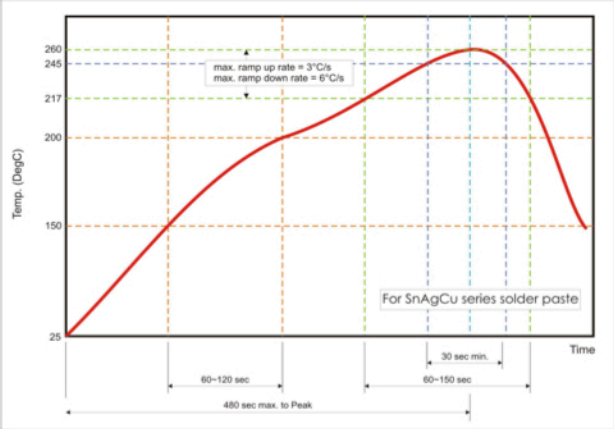
(1) To store products at 5 to 40°C ambient temperature and 20 to 70%. related humidity conditions.
(2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

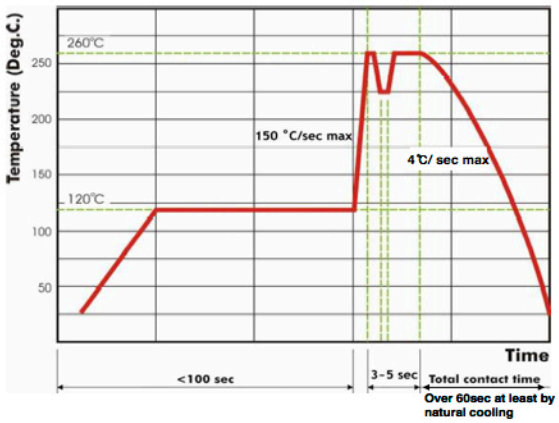
a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
b. In corrosive atmosphere, solderability might be degraded, and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