

MULTILAYER CERAMIC CAPACITOR ARRAY

- GMY SERIES -

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.

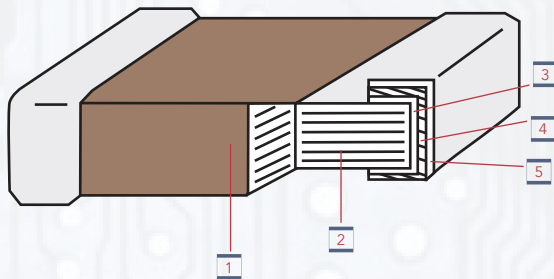
FEATURES

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

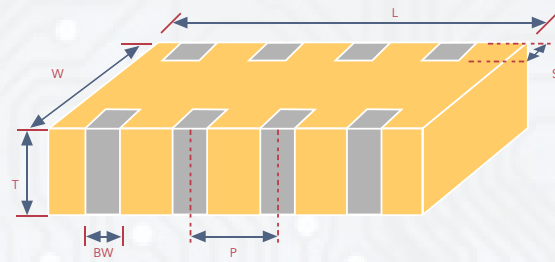
APPLICATIONS

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

DIMENSIONS



CONSTRUCTION AND DIMENSIONS



SIZE INCH (MM)	L (MM)	W (MM)	T (MM)	S (MM)	BW (MM)	P (MM)
4X0402 0612 (1632)	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 0508 (1220)	3.20±0.15	1.60±0.15	0.80±0.10	0.30±0.20	0.40±0.15	0.80±0.15

	NAME	NP0, X7R, Y5V
1	Ceramic Material	BaTiO ₃ based
2	Inner electrode	Ni
3	Termination	Inner layer
		Middle layer
		Outer layer
		Sn (Matte)

PART NUMBER GUIDE

GMY	4C	3	CG	101	J	50	N	T
PRODUCT TYPE	CAPACITOR NUMBER 4C: 4xCap	TERMINATION PITCH 3: 0.03" pitch 2: 0.02" pitch	DIELECTRIC CG: NP0 (COG) X7R: X7R Y5V: Y5V	CAPACITANCE Two significant digits followed by no. of zeros. Use R in place of decimal point	TOLERANCE J: ±5% K: ±10% M: ±20% Z: ±-20/+80%	RATED VOLTAGE 10: 10VDC 16: 16VDC 25: 25VDC 50: 50VDC 100: 100VDC	TERMINATION N: Cu/Ni/Sn	PACKAGING T: 7" reel

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



CAPACITANCE RANGE

DIMENSION (MM)		GMY4C2								GMY6C2							
L(L1)		2.00±0.15								2.00 ± 0.2							
W		1.25±0.15								1.25 ± 0.2							
Dielectric		COG				X7R				COG				X7R		Y5V	
H (max)		0.95								0.90				0.90		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

DIALECTRIC	NPO		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.

NPO: Apply 1.0±0.2Vrms, 1.0MHz±10% at the conditions of 25°C ambient temperature.

X7R: Apply 1.0±0.2Vrms, 1.0MHz±10% at the conditions of 25°C ambient temperature.

Y5V: Apply 1.0±0.2Vrms, 1.0MHz±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.

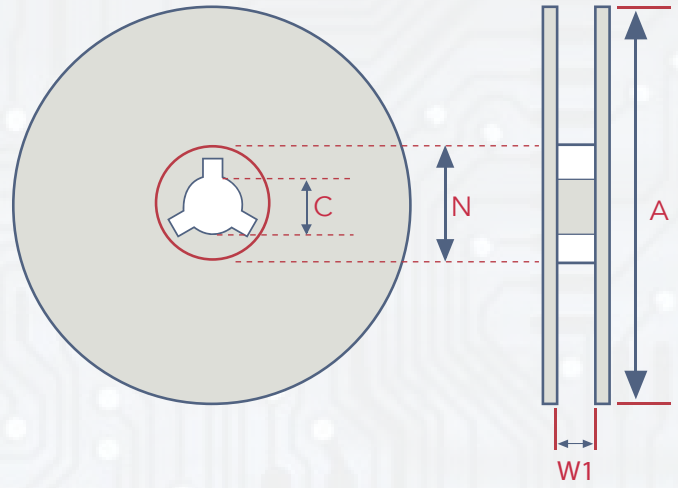


RELIABILITY TEST CONDITIONS AND DIMENSIONS

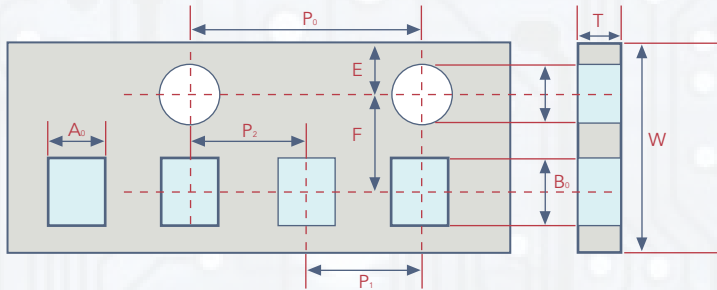
NO.	ITEM	TEST CONDITION	REQUIREMENTS																
1.	Visual and Mechanical	----	- No remarkable defect. - Dimensions to conform to individual specification sheet.																
2.	Capacitance	Class I: (NP0) 1.0±0.2Vrms, 1MHz±10% Class II: (X7R, Y5V) - 1.0±0.2Vrms, 1kHz±10%	- Shall not exceed the 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, ≤3.5%; Ur=25V & 16V, ≤3.5%; Ur=10V, ≤5.0% Y5V: Ur=50V, ≤5%; Ur=16V, ≤7%																
4.	Dielectric Strength	- To apply 250% rated voltage. - Duration 1 to 5 seconds - Charge and discharge current less than 50mA.	- No evidence of damage or fls over during test.																
5.	Insulation Resistance	- To apply rated voltage for max. 120 seconds	≥10GΩ or RxC≥500ΩF Whichever is smaller																
6.	Temperature Coefficient	With no electrical load. <table border="1"> <thead> <tr> <th>T.C.</th> <th>OPERATING TEMP</th> </tr> </thead> <tbody> <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> </tbody> </table>	T.C.	OPERATING TEMP	NP0	-55-125°C at 25°C	X7R	-55-125°C at 25°C	Y5V	-25-85°C at 20°C	<table border="1"> <thead> <tr> <th>T.C.</th> <th>CAPACITANCE CHANGE</th> </tr> </thead> <tbody> <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> </tbody> </table>	T.C.	CAPACITANCE CHANGE	NP0	Within ±30ppm/°C	X7R	Within ±15%	Y5V	Within +30%/ -80%
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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: 6hrs. (Two hrs each in three mutually perpendicular directions.) - Measurement to be made after keeping at room temp. for 24±2 hrs.	- 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.																
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±4 hrs.	- No remarkable damage - Cap change: NP0: within ±2.5% or ±0.5pF whichever is larger X7R: within ±12.5% Y5V: within ±30% (This capacitance change the means 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±1sec - Preheating: 120 to 150°C for 1 minute before immerse teh 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: NP0: within ±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.																
12.	Temperature Cycle	- Conduct the five cycles according to the temperatures and time. <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>Min. operating temp. +0/-3</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	Min. operating temp. +0/-3	30±3	4	Room Temp	2-3	- 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.	
STEP	TEMP. (°C)	TIME (MIN.)																	
1	Min. operating temp. +0/-3	30±3																	
2	Room Temp	2-3																	
3	Min. operating temp. +0/-3	30±3																	
4	Room Temp	2-3																	
13.	Humidity (Damp Heat) Steady State	- Test temp.: 40±2°C - Humidity 90-95% RH - Test time: 500+24/-0 hrs - Before initial measurement (Class II only): Perform 150+0/-10C 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: 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≥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.: ≥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. - 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.	- 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; 10pF≤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.																
15.	High Temperature Load (Endurance)	- Test temp.: NP0, X7R: 125±3°C Y5V: 85±3°C - To apply voltage: 200% of rated vltage - Test time: 1000+24/-0 hrs - Before initial measurement (Class II only): To apply test voltage for 1 hr 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	- 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 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.																

PACKAGING

SIZE	THICKNESS	PAPER TAPE
4X0402 0508 (1220)	0.85±0.10	4K
4X0603 0612 (1632)	0.85±0.10	4K



Paper Tape Specifications



REEL SIZE	C	W ₀	A	N
7"	13.0+0.5/-0.2	8.4+1.5/-0	178.0±0.10	60.0+1/-0

SIZE INCH (MM)	THICKNESS	A ₀	B ₀	T	K ₀	W	P ₀	10xP ₀	P ₁	P ₂	D ₀	D ₁	E	F
4X0402 0508 (1220)	T	1.50±0.10	2.30±0.10	0.95±0.05	-	8.00±0.10	4.00±0.10	40.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	-	1.75±0.05	3.50±0.05
4X0603 0612 (1632)	B	2.00±0.10	3.50±0.10	0.95±0.05	-	8.00±0.10	4.00±0.10	40.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	-	1.75±0.05	3.50±0.05

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.

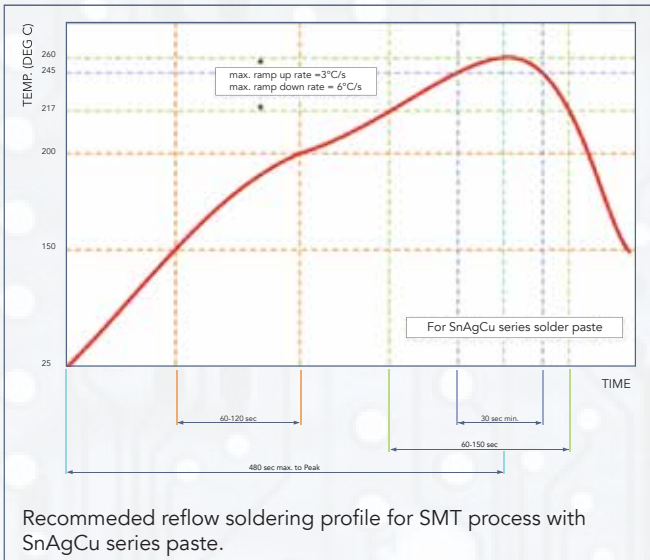
Cautions:

- 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.

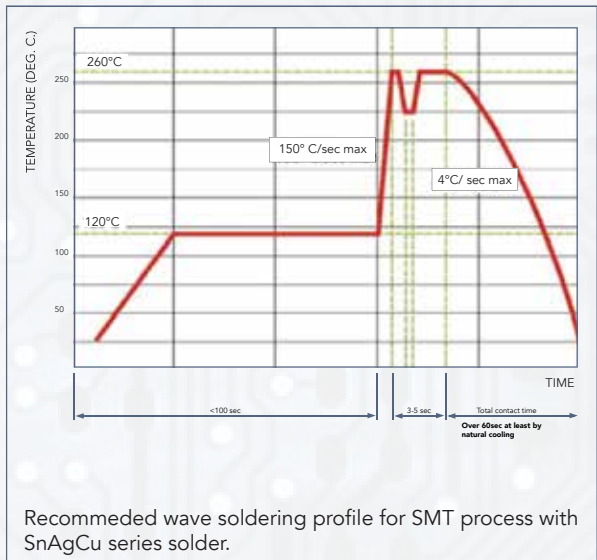


RECOMMENDED SOLDERING CONDITIONS

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 N₂ within oven are recommended.



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



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