HIGH Q/LOW ESR MULTILAYER CERAMIC CHIP CAPACITORS
- GHQ SERIES -

SCOPE

- Used at high frequencies, small temperature coefficient of capacitance, typical within +/-30ppm/C required for NPO (COG) classification.
- Excellent conductivity internal electrode

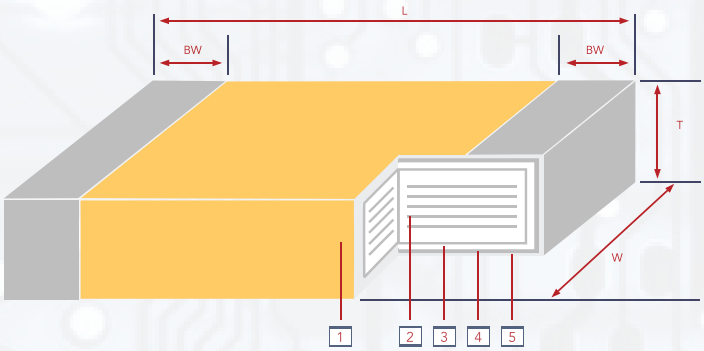
FEATURES

- High Q and low ESR performance at high frequency.
- Quality improvement of telephone calls for low power loss and better performance

APPLICATIONS

- Mobile telecommunication; mobile phones, WLAN
- RF module: power amplifier, VCO
- Tuners

CONSTRUCTION AND DIMENSIONS



NO.	NAME		NP0
1	Ceramic Material		$CaZrO_3$
2	Inner Electrode		Ni
3	Termination	Inner Layer	Cu
4		Middle Layer	Ni
5		Outer Layer	Sn

SIZE	L (MM)	W (MM)	T (MM)	REMARK	BW (MM)
0201 (0603)	0.6±0.03	0.3 ± 0.03	0.3 ± 0.03	#	0.15 ± 0.05
0402 (1005)	1.00 ± 0.05	0.50 ± 0.05	0.50 ± 0.05	#	0.25+0.05/-0.10
0603 (1608)	1.60 ± 0.10	0.80 ± 0.10	0.80 ± 0.07		0.40 ± 0.15
	1.60 ± 0.15/ -0.10	0.80 ± 0.15/ -0.10	0.80 ± 0.15/ -0.10		
0805 (2012)	2.00 ± 0.15	1.25 ± 0.10	0.60 ± 0.10		0.50 ± 0.20
			0.80 ± 0.10		
			1.25 ± 0.10	#	

Reflow soldering only is recommended

ORDERING INFORMATION

GHQ	10	CG	101	J	100	N	T
PRODUCT TYPE	SIZE	DIELECTRIC	CAPACITANCE	TOLERANCE	RATED VOLTAGE	TERMINATION	PACKAGING
	02 - 0201 (0603) 04 - 0402 (1005) 10 - 0603 (1608) 21 - 0805 (2012)	CG - NPO (C0G)	Two significant digits followed by no of zeros. Use R in place of decimal point.	A: ± 0.05pF B: ± 0.1pF C: ± 0.25pF D: ± 0.5pF F: ± 1% G: ± 2% J: ± 5%	25 - 25 VDC 50 - 50 VDC 100 - 100 VDC 200 - 200 VDC 250 - 250 VDC 500 - 500 VDC 630 - 630 VDC	N: Cu/Ni/Sn	T: 7" reel TD: 13"reel

Cal-Chip Electronics Inc.
59 Steamwhistle Drive, Ivyland, PA 18974 | p. 215.942.8900 | www.calchip.com | quotes@calchip.com

MS LEVEL 1

CONSTRUCTION AND DIMENSIONS

DIMENSION (MM)		GHQ02			GHQ04			GHQ10				GHQ21					
L (L1)		0.6 ± 0.03			1.00 ± 0.05			1.6 ± 0.10		1.60 + 0.15 / - 0.10		2.00 ± 0.15					
W		0.3 ± 0.03			0.50 ± 0.05			0.8 ± 0.10		0.80 + 0.15 / - 0.10		1.25 ± 0.10					
BW (L2/LW3)		0.15 ± 0.05			0.25 + 0.05 / -0.10			0.40 ± 0.15				0.50 ± 0.20					
DIELECTRIC		NP0			C0G			C0G				C0G					
H (MAX)		0.33			0.55			0.87		0.95		0.90			1.35		
RATED VOLTAGE		10	16	25	16	25	50	16	25	50	100	50	100	200	250	500	630
CAP. RANGE	0.3	0R3															
	0.4	0R4															
	0.5	0R5															
	0.6	0R6															
	0.7	0R7															
	0.8	0R8															
	0.9	0R9															
	1	1R0															
	1.2	1R2															
	1.5	1R5															
	1.8	1R8															
	2.2	2R2															
	2.7	2R7															
	3.3	3R3															
	3.9	3R9															
	4.7	4R7															
	5.6	5R6															
	6.8	6R8															
	8.2	8R2															
	10uF	100															
	12	120															
	15	150															
	18	180															
	22	220															
	27	270															
	33	330															
	39	390															
	47	470															
	56	560															
	68	680															
	82	820															
	100	101															
	120	121															
	150	151															
	180	181															
	220	221															
	270	271															
	330	331															
	390	391															
	470	471															
	560	561															
	680	681															
	820	821															
	1000	102															
	1200	122															
	1500	152															
	1800	182															
	2200	222															
	2700	272															
	3300	332															

1 - 0402, Capacitance <0.5pF, on request
2 - For more information about products with special capacitance or other data, please contacgt your Cal-Chip Sales Representative

MS LEVEL 1

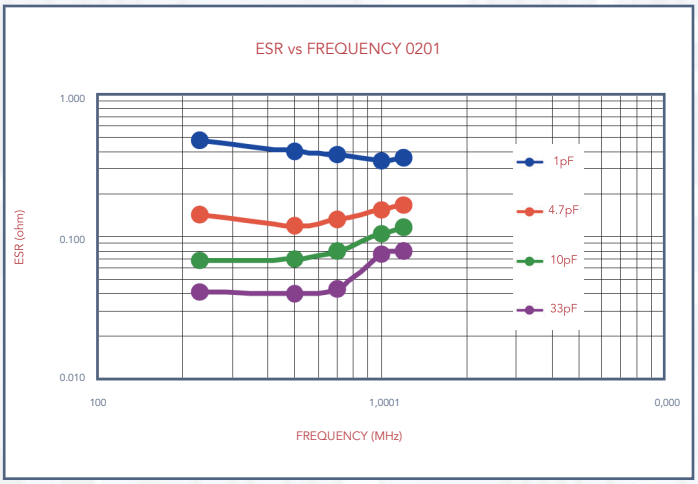
Cal-Chip Electronics Inc.
59 Steamwhistle Drive, Ivyland, PA 18974 | p. 215.942.8900 | www.calchip.com | quotes@calchip.com

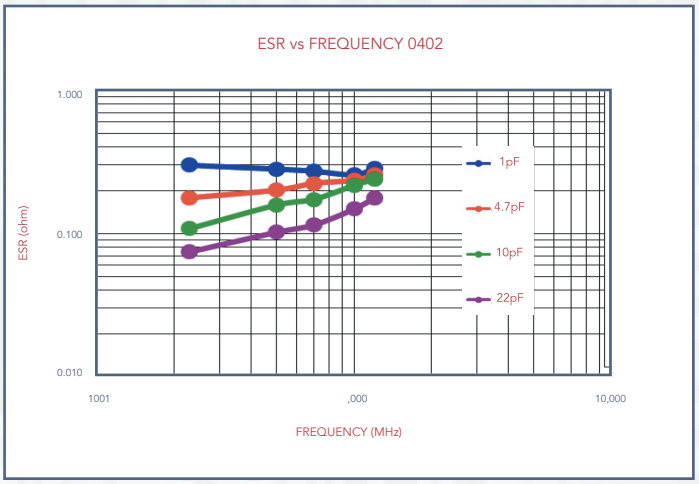
ELECTRICAL DATA

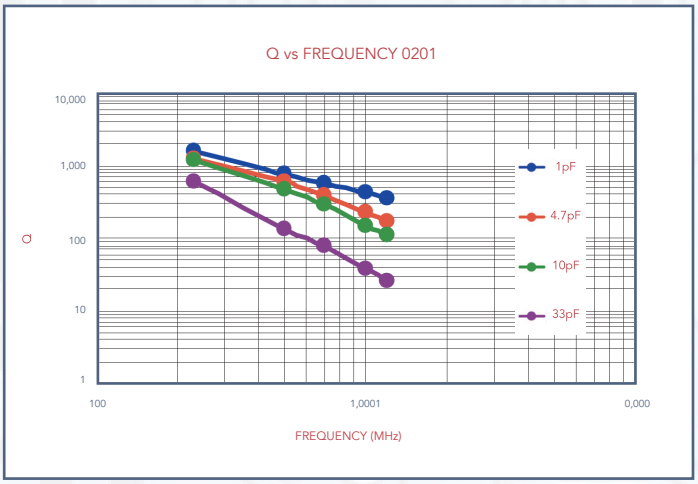
DIALECTIC	NP0
SIZE	0201, 0402, 0603, 0805
CAPACITANCE RANGE	0201: 0.1pF to 3300pF 0402: 0.5pF to 470pF** 0603: 0.5pF to 3300pF 0805: 0.5pF to 390pF
CAPACITANCE TOLERANCE**	Cap≤5pF: A(±0.05PF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)
RATED VOLTAGE (WVDC)	16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V
Q	Cap<30pF: Q≥400+20C Cap:≥30pF: Q≥1000
INSULATION RESISTANCE AT UR	≥10GΩ or RxC≥100Ω - F whichever is smaller
OPERATING TEMPERATURE	-55° to +125°C
CAPACITANCE CHARACTERISTICS	±30ppm/°C
TERMINATION	Ni/Si (lead-free termination)

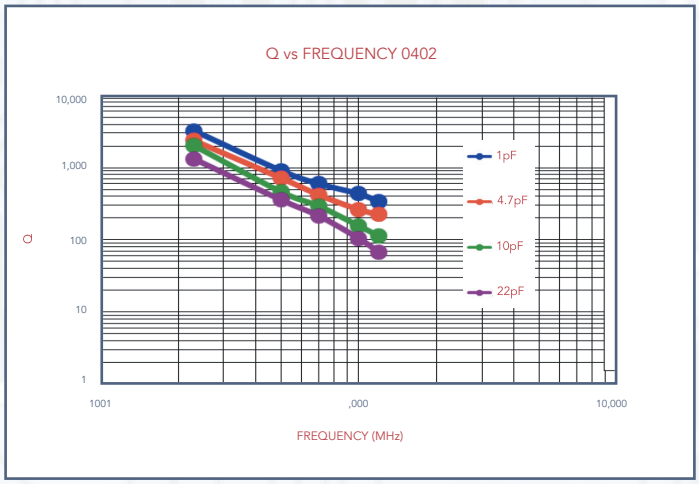
#1: NP0, 0.1pF product only provide B tolerance
*Measured at the condition of 25°C ambient temperature 30~70% related humidity.
Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF.
**0402, Capacitance <0.5pF: On request.

ELECTRICAL CHARACTERISTICS



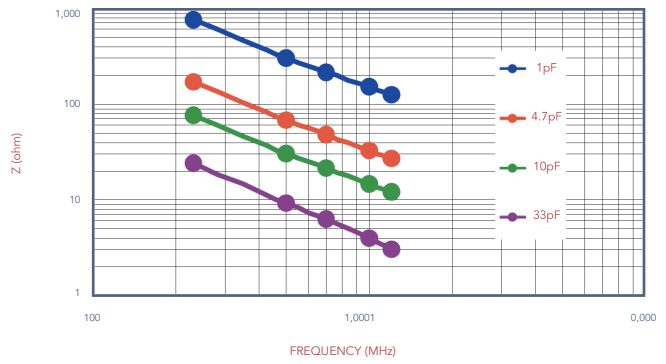




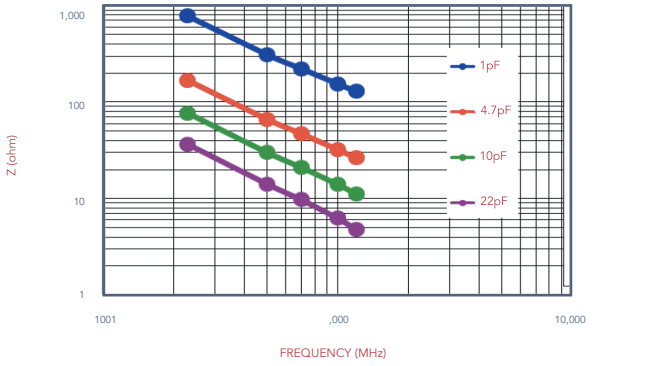


ELECTRICAL CHARACTERISTICS

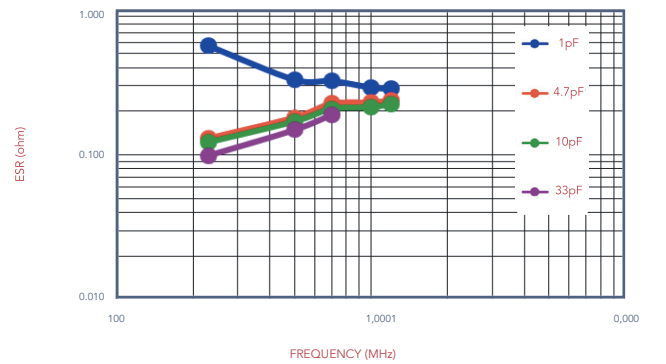
Z vs FREQUENCY 0201



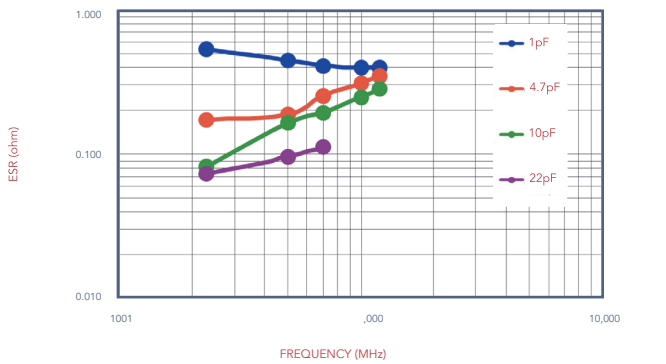
Z vs FREQUENCY 0402



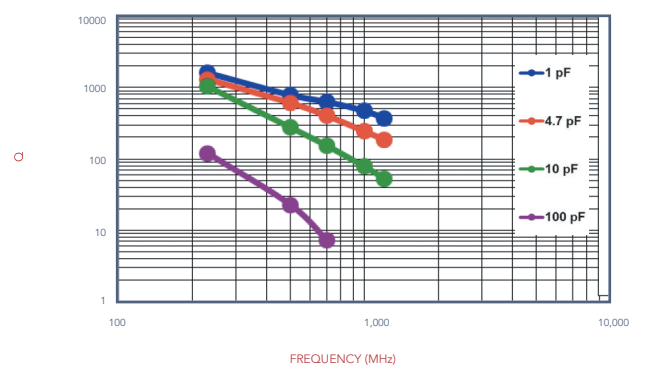
ESR vs FREQUENCY 0603



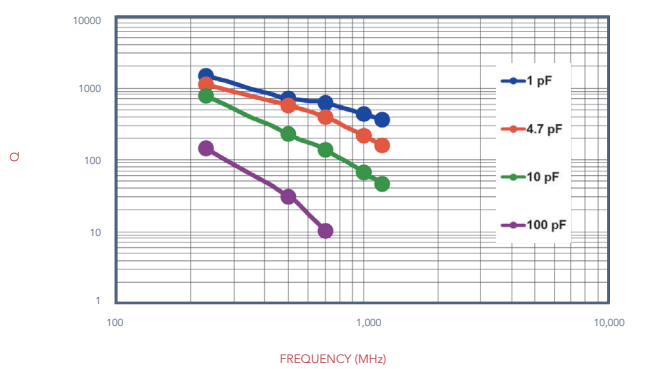
ESR vs FREQUENCY 0805



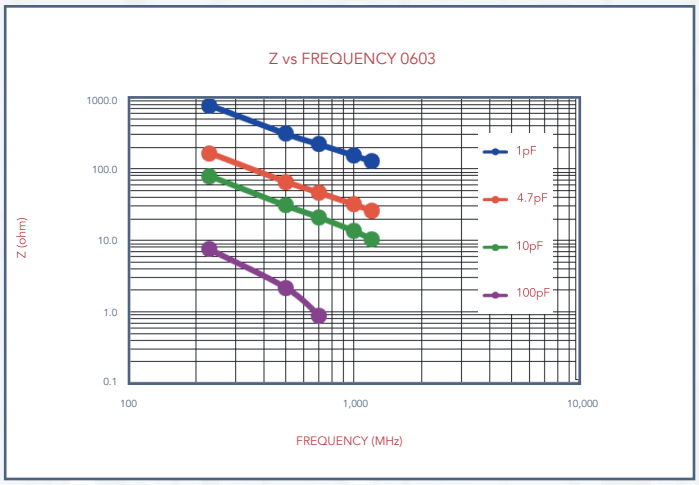
ESR vs FREQUENCY 0603

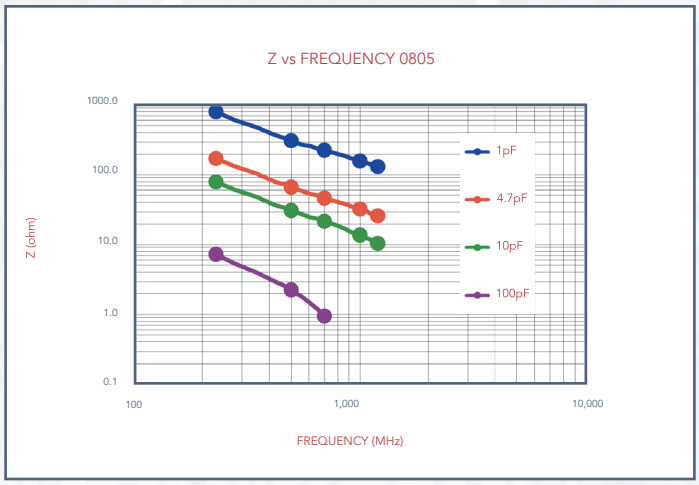


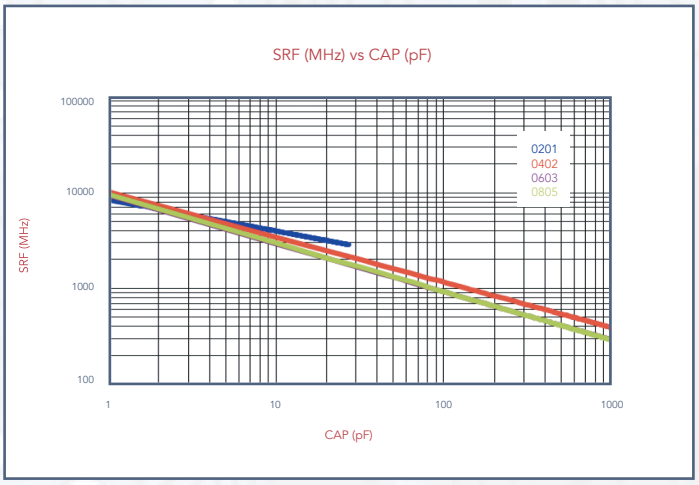
ESR vs FREQUENCY 0805



ELECTRICAL CHARACTERISTICS





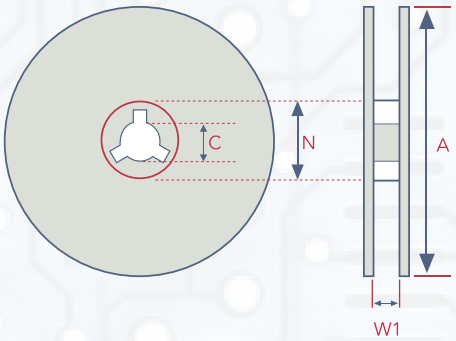


RELIABILITY TEST CONDITIONS AND REQUIREMENTS

NO.	ITEM	TEST CONDITION	REQUIREMENTS
1.	Visual and Mechanical	----	- No remarkable defect. - Dimensions to conform to individual specification sheet.
2.	Capacitance	- Cap≤1000pF, 1.0±0.2Vrms I 1MHz±10% - Cap>1000pF, 1.0±0.2Vrms I 1KHz±10% - At 25°C ambient temperature.	- 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
4.	Dielectric Strength	- To apply (≤100V) 250% of rated voltage. - Duration 1 to 5 seconds - Charge and discharge current less than 50mA.	- No evidence of damage or flas over during test.
		- To apply (≤100V) 250% 200V - 300V ≥2 times VDC 500V - 999V ≥1.5 times VDC - Cut-off, set at 10mA - TEST = 15 sec. - RAMP = 0	
5.	Insulation Resistance	- Rated Voltage: <200V - To Apply rated voltage for max. 120 sec.	≥10GΩ
		- Rated Voltage: 200~630V - To Apply rated voltage (500V max.) for 60 sec.	≥10GΩ or RxC≥100Ω-F whichever is smaller
6.	Temperature Coefficient	- With no electrical load. - Operating temperature: -55°~125°C at 25°C	- Capacitance change: within ±30ppm/°C

RELIABILITY TEST CONDITIONS AND REQUIREMENTS

NO.	ITEM	TEST CONDITION	REQUIREMENTS
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±2 hrs.	- No remarkable damage - Cap change: within ±5% or 0.5pF whichever is larger (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 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.	- No remarkable damage - Cap change: within ±2.5% or ±0.25pF whichever is larger - 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. 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 - Before initial measurement (Class II only): perform 150+0/-10°C for 1hr 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: within ±2.5% or ±0.25pF whichever is larger - Q/D.F., I.R. and dielectric strength: To meet initial requirements.
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: within ±5% or ±0.5pF whichever is larger - Q/D.F. value NP0: Cap≥30pF, Q≥350, 10pF≤Cap≤30pF, Q≥275+2.5C Cap<10pF, Q≥200+10C -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 (Max. 500V) - 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: within ±7.5% or ±0.75pF whichever is larger - Q/D.F. value: NP0: Cap≥30pF, Q≥350; 10pF≤Cap<30pF, Q≥100+10/3C -I.R: ≥1GΩ or RxC≥25Ω- F whichever is smaller
15.	Humidity Temperature Load (Endurance)	- Test temp.: NP0: 125±3°C - To Apply Voltage: (1) <500V: 200% of rated voltage. (2) 500V: 150% of rated voltage. (3) ≥630V: 120% of rated voltage. - Test time: 1000+24/-0 hrs - To apply voltage: rated voltage. - 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: within ±3.0% or ±0.3pF whichever is larger - Q/D.F. value: NP0: Cap30pF Q≥350 10pF≤Cap<30pF, Q≥275+2.5C Cap<10pF, q≥200+10C -I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.

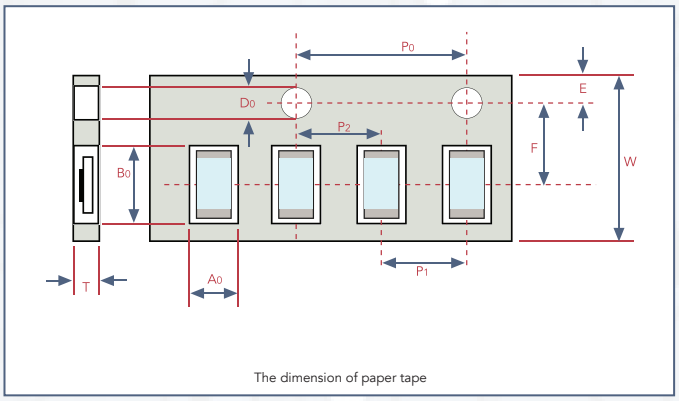


SIZE	THICKNESS (MM) / SYMBOL	PAPER TAPE		PLASTIC TAPE	
		7" REEL	13" REEL	7" REEL	13" REEL
0201	0.30 ± 0.3	15k	70k		
0402	0.50±0.5	10k	50k		
0603	0.80±0.07	4k	15k		
	0.80±0.15/-0.10	4k	15k		
0805	0.80±0.10	4k	15k		
	1.25±0.10			3k	10k

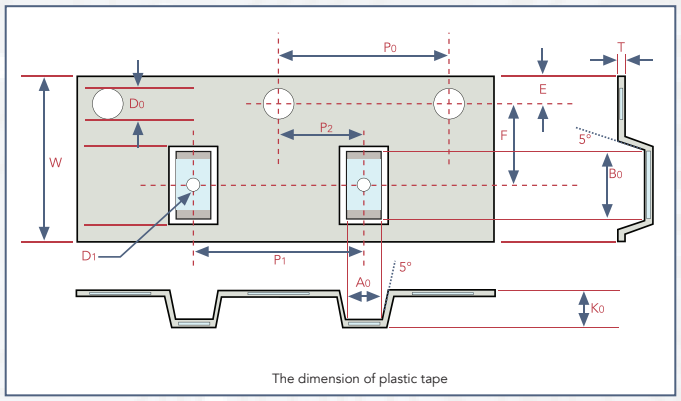
MS LEVEL 1

59 Steamwhistle Drive, Ivyland, PA 18974 | p. 215.942.8900 | www.calchip.com | quotes@calchip.com

PACKAGING



The dimension of paper tape



The dimension of plastic tape

SIZE	THICKNESS (MM) / SYMBOL	PAPER TAPE		PLASTIC TAPE	
		7" REEL	13" REEL	7" REEL	13" REEL
0201	0.30 ± 0.3	15k	70k		
0402	0.50±0.5	10k	50k		
0603	0.80±0.07	4k	15k		
	0.80±0.15/-0.10	4k	15k		
0805	0.80±0.10	4k	15k		
	1.25±0.10			3k	10k

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:

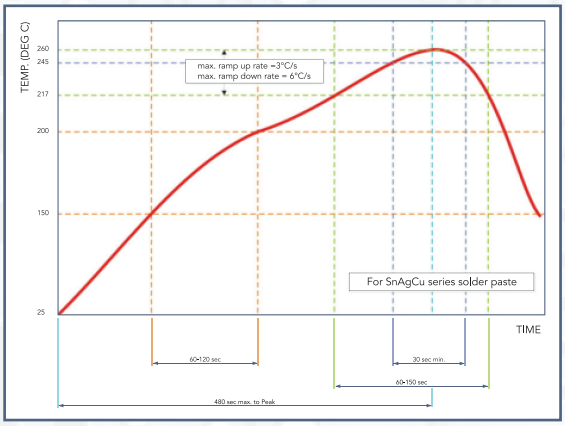
a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambiance of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)

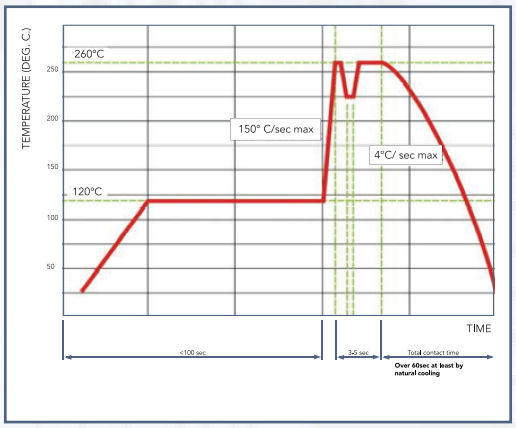
b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.

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.





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