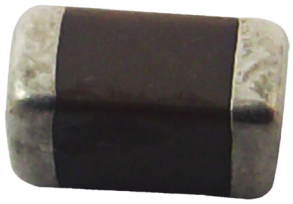
High Q / Low ESR Multilayer SMD Ceramic Capacitor
0402, 0603 & 0805 Sizes, NP0 Dielectric, (MCHH)Series

multicomp PRO

RoHS Compliant



Description:

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used. WTC HH series MLCC is used at high frequencies generally have a small temperature coefficient of capacitance, typical within the ±30ppm/°C required for NP0 (C0G) classification and have excellent conductivity internal electrode. Thus, WTC HH series MLCC will be with the feature of low ESR and high Q characteristics.

Features:

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

Applications:

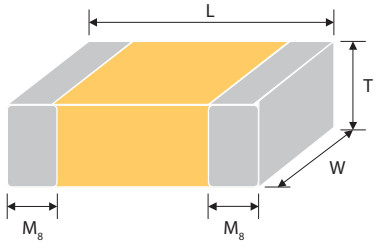
- Mobile telecommunication: Mobile phone, WLAN
- RF module: Power amplifier, VCO
- Tuners

How To Order:

MCHH	15	N	100	G	500	C	T
	Size	**Dielectric**	**Capacitance**	**Tolerance**	**Rated Voltage**	**Termination**	**Packaging style**
Type HH = High Q/ Low ESR	15 = 0402 (1005) 18 = 0603 (1608) 21 = 0805 (2012)	N = NP0 (C0G)	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: R47 = 0.47pF 0R5 = 0.5pF 1R0 = 1.0pF 100 = 10 × 10^0 = 10pF	A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 160 = 16 V DC 250 = 25 V DC 500 = 50 V DC 101 = 100 V DC 201 = 200 V DC 251 = 250 V DC 501 = 500 V DC 631 = 630 V DC	L = Ag/Ni/Sn C = Cu/Ni/Sn	T = 7" reeled G = 13" reeled

Partial NP0 items are with Ag/Ni/Sn terminations, please ref to below product range of NPO dielectric for detail.

External Dimensions:



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	M_B (mm)
0402 (1005)	1 ±0.05	0.5 ±0.05	0.5 ±0.05	N	#	0.25 +0.05/-0.1
0603 (1608)	1.6 ±0.1	0.8 ±0.1	0.8 ±0.07	S	-	0.4 ±0.15
	1.6 +0.15/-0.1	0.8 +0.15/-0.1	0.8 +0.15/-0.1	X	-	
0805 (2012)	2 ±0.15	1.25 ±0.1	0.6 ±0.1	A	-	0.5 ±0.2
			0.8 ±0.1	B	-	
			1.25 ±0.1	D	#	

Reflow soldering only is recommended.

General Electrical Data:

Dielectric	NP0
Size	0402, 0603, 0805
Capacitance*	0402: 0.5pF to 470pF** 0603: 0.5pF to 3300pF 0805: 0.5pF to 390pF
Capacitance tolerance	Cap ≤ 5pF#1: 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 ≥1,000
Insulation resistance at Ur	≥10GΩ or RxC ≥100Ω -F whichever is smaller.
Operating temperature	-55°C to +125°C
Capacitance change	±30ppm
Termination	Ni/Sn (lead-free termination)

#1: NP0, 0.1pF product only provide B tolerance
* Measured at the conditions of 25°C ambient temperature and 30% to 70% related humidity.
Apply 1 ±0.2Vrms, 1MHz ±10% for Cap ≤ 1,000pF and 1 ±0.2Vrms, 1kHz ±10% for Cap>1,000pF.
** 0402, Capacitance <0.5pF: On request.

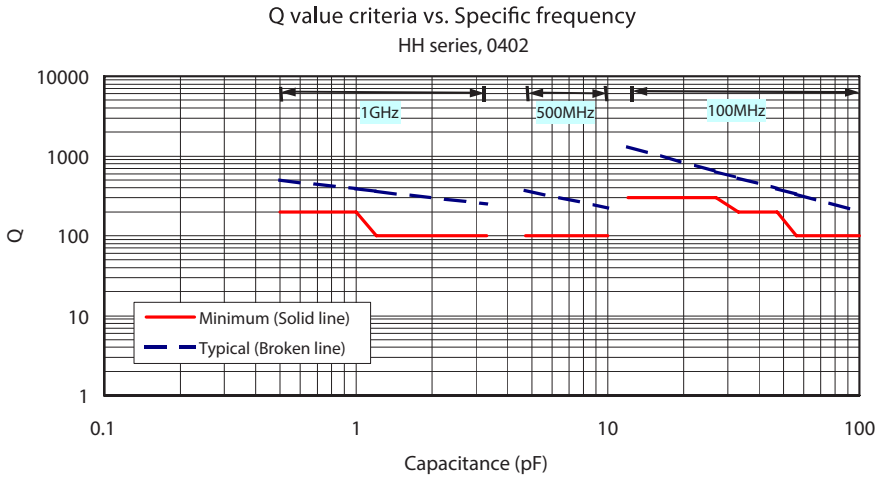
Packaging Dimension And Quantity:

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0402	0.5 ±0.05	N	10k	50k	-	-
0603	0.8 ±0.07	S	4k	15k	-	-
	0.8 +0.15/-0.1	X			-	-
0805	0.6 ±0.1	A	4k	15k	-	-
	0.8 ±0.1	B			-	-
	1.25 ±0.1	D	-	-	3k	10k

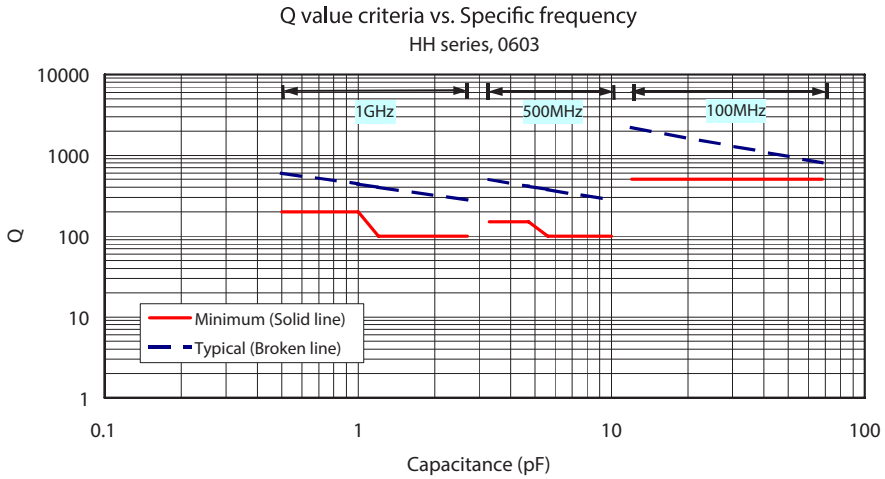
Unit : pieces

Electrical Characteristics:

Q Factor Specification vs. Specific Frequency:

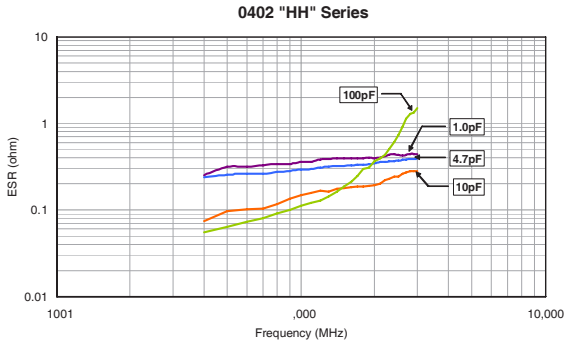


Q Factor Specification vs. Specific Frequency:

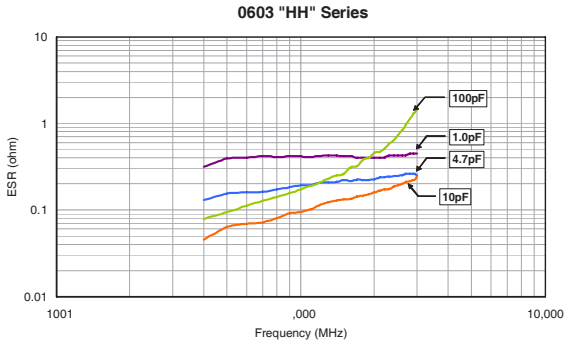


Q factor specification vs. Specific frequency for 0603

Typical ESR vs. Frequency

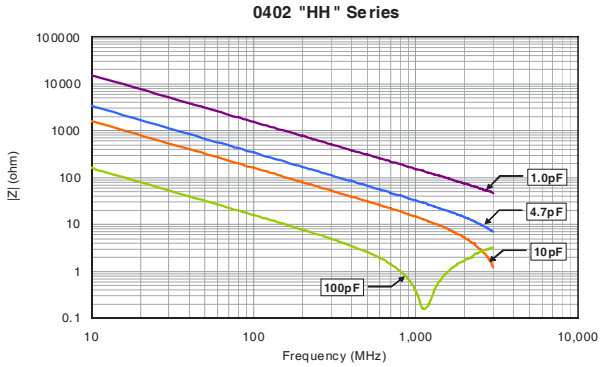


ESR vs. Frequency 0402

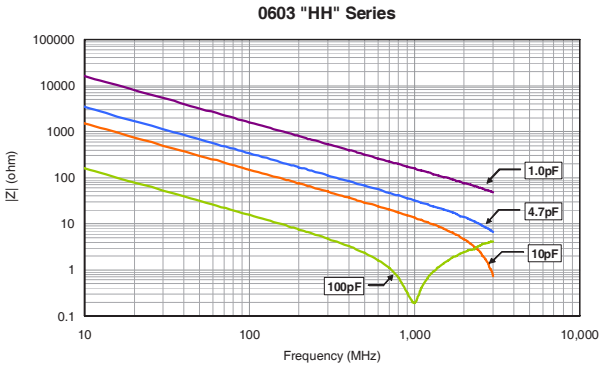


ESR vs. Frequency 0603

Typical Impedance vs. Frequency

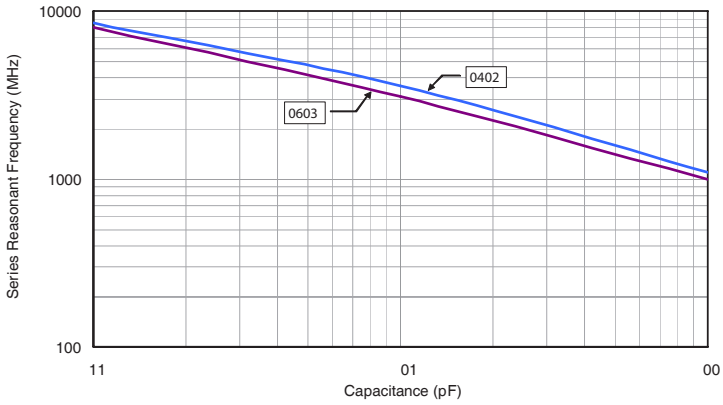


Impedance vs. Frequency 0402



Impedance vs. Frequency 0603

SRF vs. Capacitance



SRF vs. Capacitance

Reliability Test Conditions and Requirements:

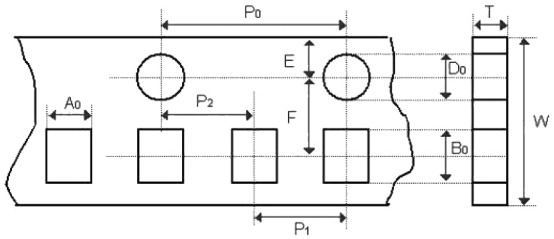
No	Item	Test Condition	Requirements
1	Visual and Mechanical	-	No remarkable defect. Dimensions to conform to individual specification sheet.
2	Capacitance	Cap ≤1,000pF, 1 ±0.2Vrms, 1MHz ±10% Cap >1,000pF, 1 ±0.2Vrms, 1KHz ±10% At 25°C ambient temperature.	Shall not exceed the limits given in the detailed spec.
3	Q/ D.F. (Dissipation Factor)		NP0: Cap ≥30pF, Q ≥1,000; Cap <30pF, Q ≥400 +20C
4	Dielectric Strength	To apply voltage: (≤100V) 250% of rated voltage. Duration: 1 to 5 sec. Charge and discharge current less than 50mA.	No evidence of damage or flash over during test.
		To apply voltage: 200V~300V ≥2 times V DC 500V~999V ≥1.5 times V DC * 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:200V to 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°C ~ 125°C at 25°C	Capacitance change: within ±30ppm/°C
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.) 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 ±5.0% or ±0.5pF whichever is larger. (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>11</td><td>Resistance to Soldering Heat</td><td>Solder temperature: 260 ±5°C
Dipping time: 10 ±1 sec
Preheating: 120°C 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: 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.</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 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: within ±2.5% or ±0.25pF whichever is larger.
* 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: within ±5.0% 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.</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 (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.</td><td>No remarkable damage.
Cap change: within ±7.5% or ±0.75pF whichever is larger.
Q/D.F. value:
NP0: Cap ≥30pF, Q ≥200; Cap <30pF, Q ≥100 +10/3C
I.R.: ≥500MΩ or RxC ≥25Ω -F whichever is smaller.</td></tr>
</table>

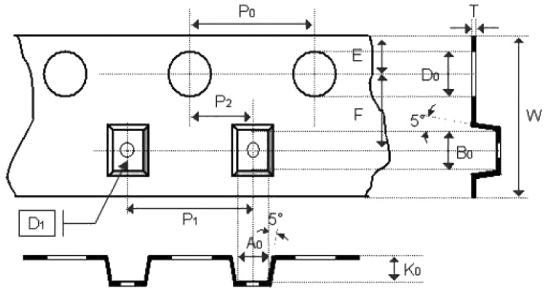
No	Item	Test Condition	Requirements
15.	High Temperature Load (Endurance)	Test temp.: NP0: 125±3°C To apply voltage: (1) <500V: 200% of rated voltage. (2) 500V: 150% of rated voltage. (3) ≥630V: 120% of rated voltage. Test time: 1,000 +24/-0 hrs. *Before initial measurement (Class II only): To apply 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	No remarkable damage. Cap change: within ±3.0% or ±0.3pF 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

Appendixes

Tape & Reel Dimensions

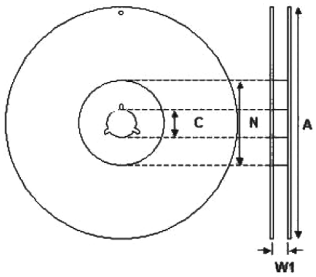


The dimension of paper tape



The dimension of plastic tape

Size	0402	0603	0805		
Thickness	N	S, X	A	B	C, D, I
A_0	0.62 ±0.05	1.02 ±0.05	1.5 ±0.1	1.5 ±0.1	< 1.57
B_0	1.12 ±0.05	1.8 ±0.05	2.3 ±0.1	2.3 ±0.1	< 2.4
T	0.6 ±0.05	0.95 ±0.05	0.75 ±0.05	0.95 ±0.05	0.23 ±0.05
K_0	-	-	-	-	< 2.5
W	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1
P_0	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1
10 × P_0	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1
P_1	2 ±0.05	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1
P_2	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05
D_0	1.55 ±0.05	1.55 ±0.05	1.55 ±0.05	1.55 ±0.05	1.5 ±0.05
D_1	-	-	-	-	1 ±0.1
E	1.75 ±0.05	1.75 ±0.05	1.75 ±0.05	1.75 ±0.05	1.75 ±0.1
F	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05



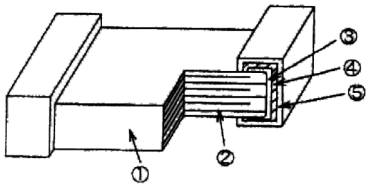
The dimension of reel

Size	0402, 0603, 0805		
Reel size	7"	10"	13"
C	13 +0.5/-0.2	13 +0.5/-0.2	13 +0.5/-0.2
W_1	8.4 +1.5/-0	8.4 +1.5/-0	8.4 +1.5/-0
A	178 ±0.10	250 ±1	330 ±1
N	60 +1/-0	100 ±1	100 ±1

Constructions:

No.	Name		NP0*	NPO
1	Ceramic material		CaZrO3 / BaTiO3 based	
2	Inner electrode		AgPd alloy	Ni
3	Termination	Inner layer	Ag	Cu
4		Middle layer	Ni	
5		Outer layer	Sn	

* Partial NP0 items are with Ag/Ni/Sn(NME) terminations, please ref to product range for detail.



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.

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

Cautions:

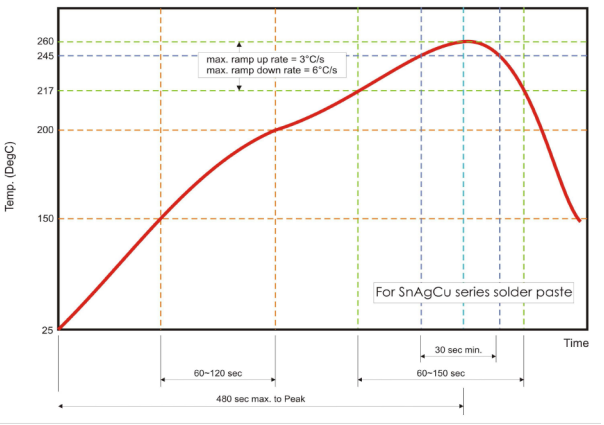
a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)

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

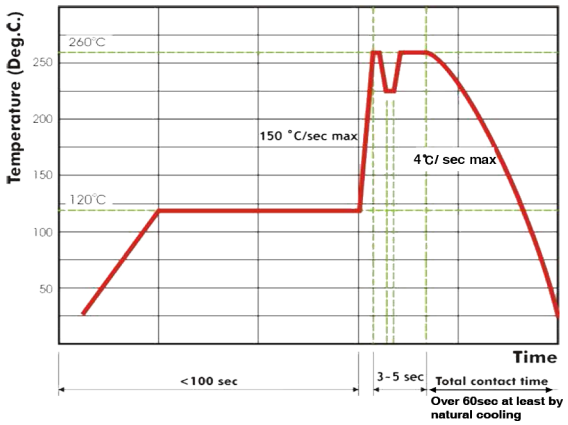
c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight,the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to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