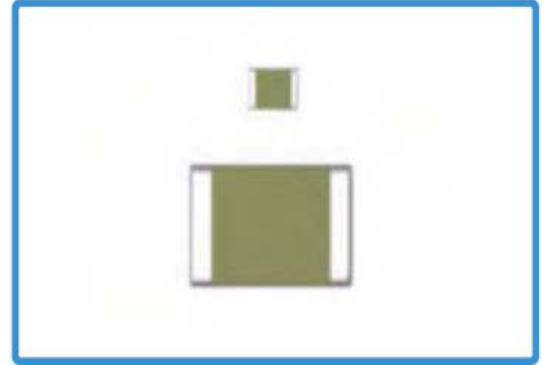




Feature

- Surface mount device with high reliability
- Hi-Q and low ESR at high frequencies
- Low capacitance with tight tolerance
- Excellent temperature characteristics

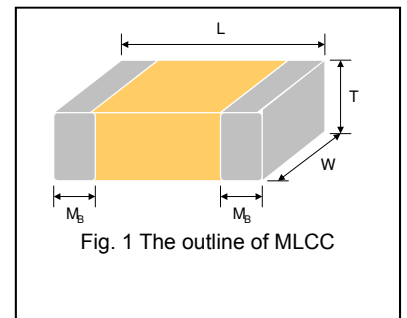


Part Numbering System

	HQ	0603	CG	4R7	B	500		
Meritek Series								
Chip Size: 0402 / 0603 / 0805								
Dielectric: CG=C0G (NPO)								
Capacitance								
Capacitance expressed in Pico farads (pF).								
First two digits are significant figures.								
Third digit denotes number of zeros.								
'R' denotes decimal point for values less than 10 pF								
ie. 4R7=4.2pF, 101=100pF								
Tolerance								
Code	B	C	D	F	F	J		
Value	±0.1pF	±0.25pF	±0.5pF	±1%	±2%	±5%		
Rated Voltage								
Code	160	250	500	101	201	251	501	631
Value	16V _{DC}	25V _{DC}	50V _{DC}	100V _{DC}	200V _{DC}	250V _{DC}	500V _{DC}	630V _{DC}

Dimensions

Size	L (mm)	W (mm)	T (mm)/Symbol		M _B (mm)
0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25
					-0.5
0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S	0.40±0.15
	1.60 +0.15/-0.10	0.80 +0.15/-0.10	0.80 +0.15/-0.10	X	
0805 (2012)	2.00±0.15	1.25±0.10	0.60±0.10	A	0.50±0.20
			0.80±0.10	B	
			1.25±0.10	D	



Constructions

No.	Name	NPO	
①	Ceramic material	BaTiO ₃ based	
②	Inner electrode	AgPd alloy	
③	Termination	Inner layer	Ag or Cu
④		Middle layer	Ni
⑤		Outer layer	Sn (Matt)

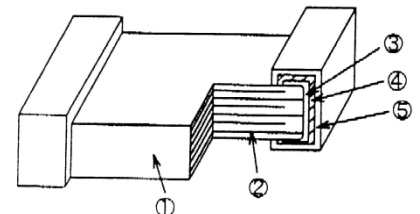


Fig. 11 The construction of MLCC



Capacitance Range

DIELECTRIC SIZE		NPO												
		0402			0603				0805					
		16	25	50	16	25	50	100	50	100	200	250	500	630
Capacitance	0.5pF (0R5)	N^	N^	N^	S^	S^	S^	S^	B	B				
	0.6pF (0R6)	N^	N^	N^	S^	S^	S^	S^	B	B				
	0.7pF (0R7)	N^	N^	N^	S^	S^	S^	S^	B	B				
	0.8pF (0R8)	N^	N^	N^	S^	S^	S^	S^	B	B				
	0.9pF (0R9)	N^	N^	N^	S^	S^	S^	S^	B	B				
	1.0pF (1R0)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	1.2pF (1R2)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	1.5pF (1R5)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	1.8pF (1R8)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	2.2pF (2R2)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	2.7pF (2R7)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	3.3pF (3R3)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	3.9pF (3R9)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	4.7pF (4R7)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	5.6pF (5R6)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	6.8pF (6R8)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	8.2pF (8R2)	N^	N^	N^	S^	S^	S^	S^	B	B	B	B	B	B
	10pF (100)	N	N	N	S	S	S	S	B	B	B	B	B	B
	12pF (120)	N	N	N	S	S	S	S	B	B	B	B	B	B
	15pF (150)	N	N	N	S	S	S	S	B	B	B	B	B	B
	18pF (180)	N	N	N	S	S	S	S	B	B	B	B	B	B
	22pF (220)	N	N	N	S	S	S	S	B	B	B	B	B	B
	27pF (270)	N	N	N	S	S	S	S	B	B	B	B	B	B
	33pF (330)	N	N	N	S	S	S	S	B	B	B	B	B	B
	39pF (390)	N	N	N	S	S	S	S	B	B	B	B	B	B
	47pF (470)	N	N	N	S	S	S	S	B	B	B	B	B	B
	56pF (560)	N	N	N	S	S	S	S	B	B	B	B	B	B
	68pF (680)	N	N	N	S	S	S	S	B	B	B	B	B	B
	82pF (820)	N	N	N	S	S	S	S	B	B	B	B	B	B
	100pF (101)	N	N	N	S	S	S	S	B	B	B	B	B	B
	120pF (121)	N	N	N	S	S	S	S	D	D	D	D	D	D
	150pF (151)	N	N	N	S	S	S	S	D	D	D	D	D	D
	180pF (181)	N	N	N	S	S	S	S			D	D	D	D
220pF (221)	N	N	N	S	S	S	S			D	D	D	D	
270pF (271)	N	N	N	S	S	S	S			D	D	D	D	
330pF (331)	N	N	N	S	S	S	S			D	D	D	D	
390pF (391)	N	N	N	S	S	S	S			D	D	D	D	
470pF (471)	N	N	N	S	S	S	S							
560pF (561)				S	S	S	S							
680pF (681)				S	S	S	S							
820pF (821)				S	S	S	S							
1,000pF (102)				S	S	S	S							
1,200pF (122)				X	X	X								
1,500pF (152)				X	X	X								
1,800pF (182)				X	X	X								
2,200pF (222)				X	X	X								
2,700pF (272)				X	X	X								
3,300pF (332)				X	X	X								

- 0402, Capacitance <0.5pF: On request.
- The letter in cell with “^” mark is expressed product with Ag/Ni/Sn terminations.
- The letter in cell is expressed the symbol of product thickness.



Electrical Characteristics

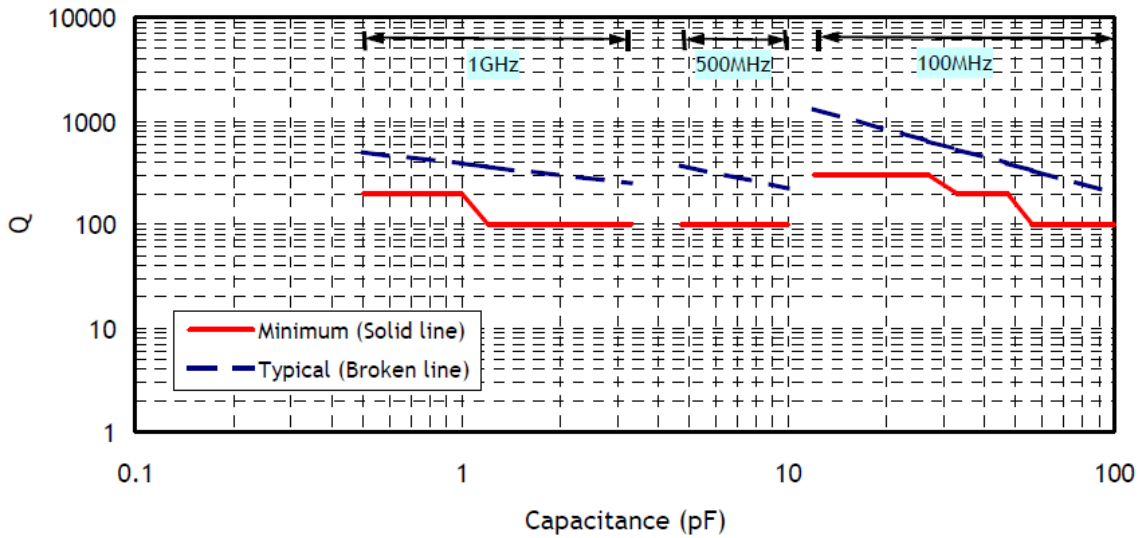


Fig. 2 Q factor specification vs. Specific frequency for 0402

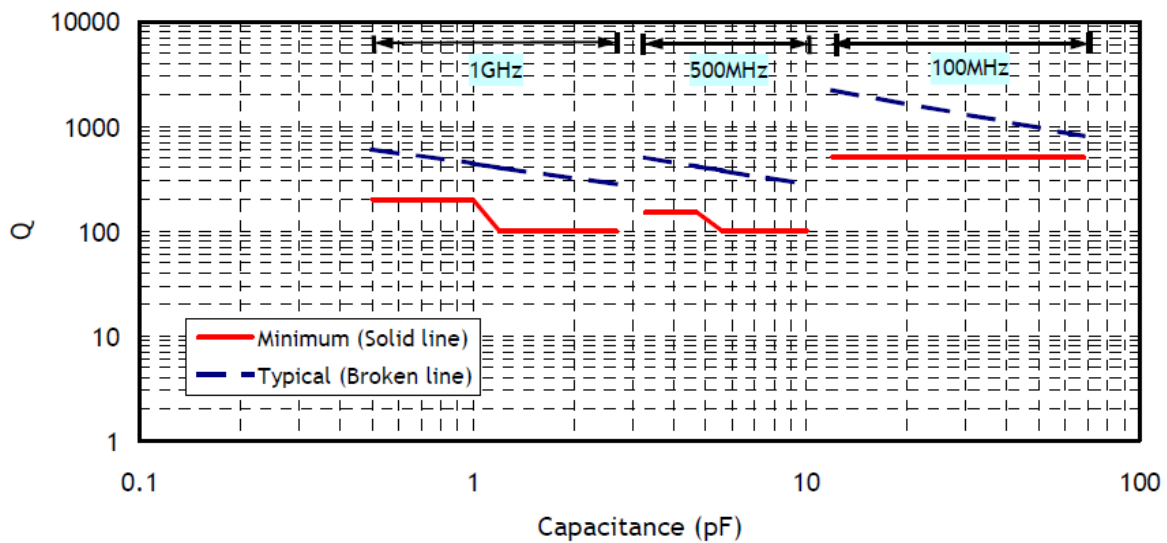


Fig. 3 Q factor specification vs. Specific frequency for 0603

Typical ESR vs. Frequency

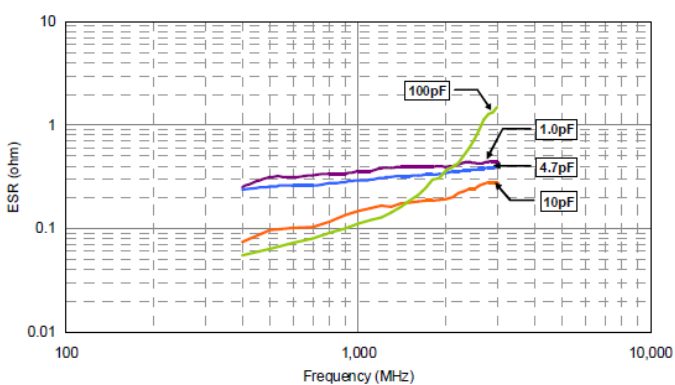


Fig. 4 ESR vs. Frequency 0402

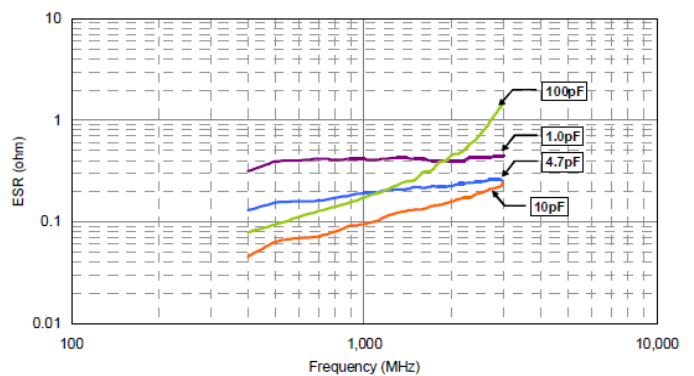


Fig. 5 ESR vs. Frequency 0603



Typical Impedance vs. Frequency

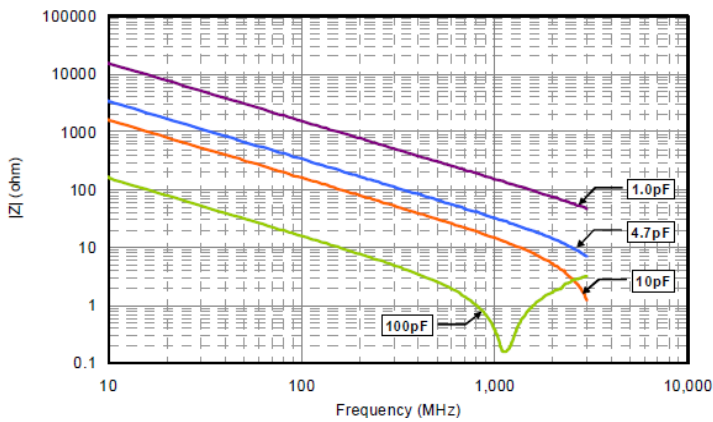


Fig. 6 Impedance vs. Frequency 0402

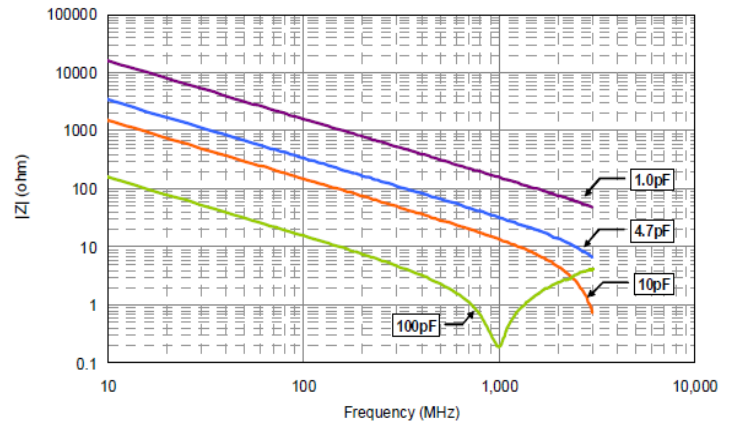


Fig. 7 Impedance vs. Frequency 0603

SRF vs. Capacitance

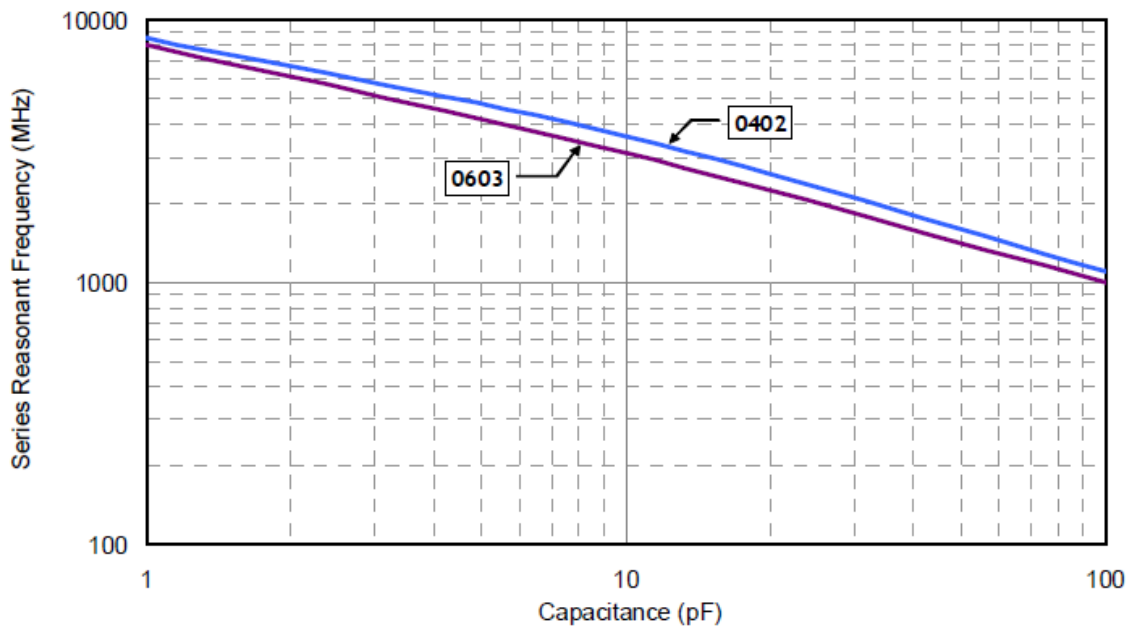


Fig. 8 SRF vs. Capacitance

Reliability Test Conditions and Requirements

No.	Item	Test Conditions	Requirements
1.	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.
2.	Capacitance	Cap ≤ 1000pF, 1.0 ± 0.2Vrms, 1MHz ± 10%	* Shall not exceed the limits given in the detailed spec.
3.	Q/ D.F. (Dissipation Factor)	Cap > 1000pF, 1.0 ± 0.2Vrms, 1KHz ± 10% At 25°C ambient temperature.	* NP0: Cap ≥ 30pF, Q ≥ 1000; Cap < 30pF, Q ≥ 400 + 20C



No.	Item	Test Conditions	Requirements															
4.	Dielectric Strength	* To apply voltage: 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.															
5.	Insulation Resistance	To apply rated voltage for max. 120 sec.	≥10GΩ															
6.	Temperature Coefficient	With no electrical load. Operating temperature: -55~125°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 hours each in three mutually perpendicular directions.)	* 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.)															
11.	Resistance to Soldering Heat	* Solder temperature: 270±5°C * Dipping time: 10±1 sec * Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. * 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: 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. <table border="1" style="margin-left: 20px;"> <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>Max operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> * 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	Max operating temp. +3/-0	30±3	4	Room temp.	2~3	* 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.
Step	Temp. (°C)	Time (min.)																
1	Min. operating temp. +0/-3	30±3																
2	Room temp.	2~3																
3	Max operating temp. +3/-0	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/-0hrs. * 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. * Q/D.F. value: NP0: Cap≥30pF, Q≥350; 10pF≤Cap<30pF, Q≥275+2.5C Cap<10pF; Q≥200+10C * I.R.: ≥1GΩ.															
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.	* 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.															



No.	Item	Test Conditions	Requirements
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.	* 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.

Packaging Dimension and Quality

Size	Thickness (mm)		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0402	0.50±0.05	N	10K	20K		
0603	0.80±0.07	S	4K	15K		
	0.80 +0.15/-0.10	X				
0805	0.60±0.10	A	4k	15k		
	0.80±0.10	B	4k	15k		
	1.25±0.10	D			3K	10K

Tape & Reel Dimensions

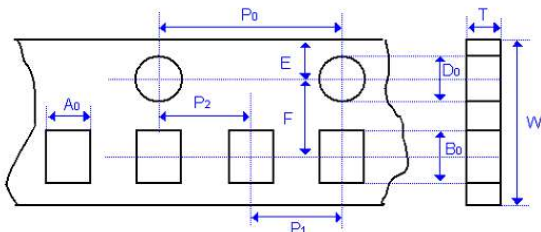


Fig. 9 The dimension of paper tape

Size	0402	0603	0805
Thickness	N	S,X	A
A ₀	0.62±0.05	1.02±0.05	1.50±0.10
B ₀	1.12±0.05	1.82±0.05	2.30±0.10
T	0.60±0.05	0.95±0.05	0.75±0.05
K ₀	-	-	-
W	8.00±0.10	8.00±0.10	8.00±0.10
P ₀	4.00±0.10	4.00±0.10	4.00±0.10
10xP ₀	40.0±0.10	40.0±0.10	40.0±0.10
P ₁	2.00±0.05	4.00±0.10	4.00±0.10
P ₂	2.00±0.05	2.00±0.05	2.00±0.05
D ₀	1.55±0.05	1.55±0.05	1.55±0.05
D ₁	-	-	-
E	1.75±0.05	1.75±0.05	1.75±0.05
F	3.50±0.05	3.50±0.05	3.50±0.05

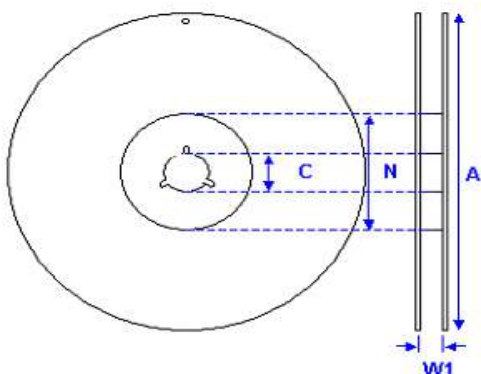


Fig. 10 The dimension of reel

Size	0402, 0603, 0805	
Reel size	7"	13"
C	13.0+0.5/-0.2	13.0+0.5/-0.2
W ₁	8.4+1.5/-0	8.4+1.5/-0
A	178.0±0.10	330.0±1.0
N	60.0+1.0/-0	100±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 solder ability in case of shelf life extension is needed.

Cautions:

- a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidization of electrode, which easily be resulted in poor soldering.
- b. To store products on the shelf and avoid exposure to moisture.
- c. Don't expose products to excessive shock, vibration, direct sunlight and so on.

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.

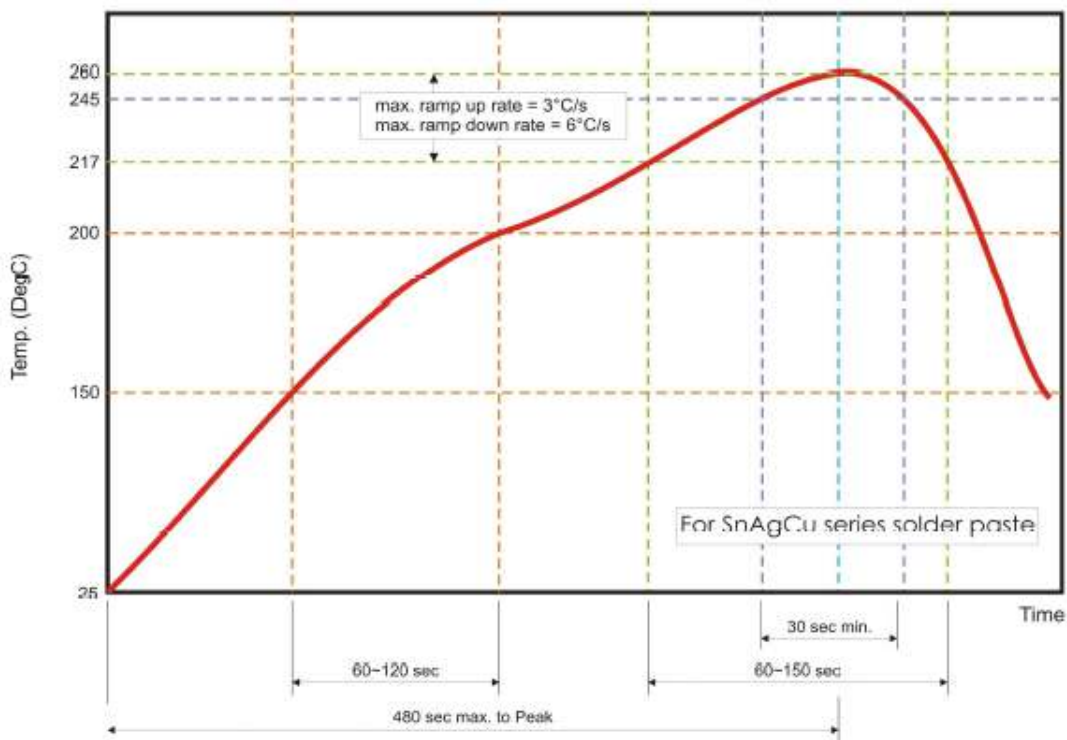


Fig. 12 Recommended IR reflow soldering profile for SMT process with SnAgCu series solder paste.

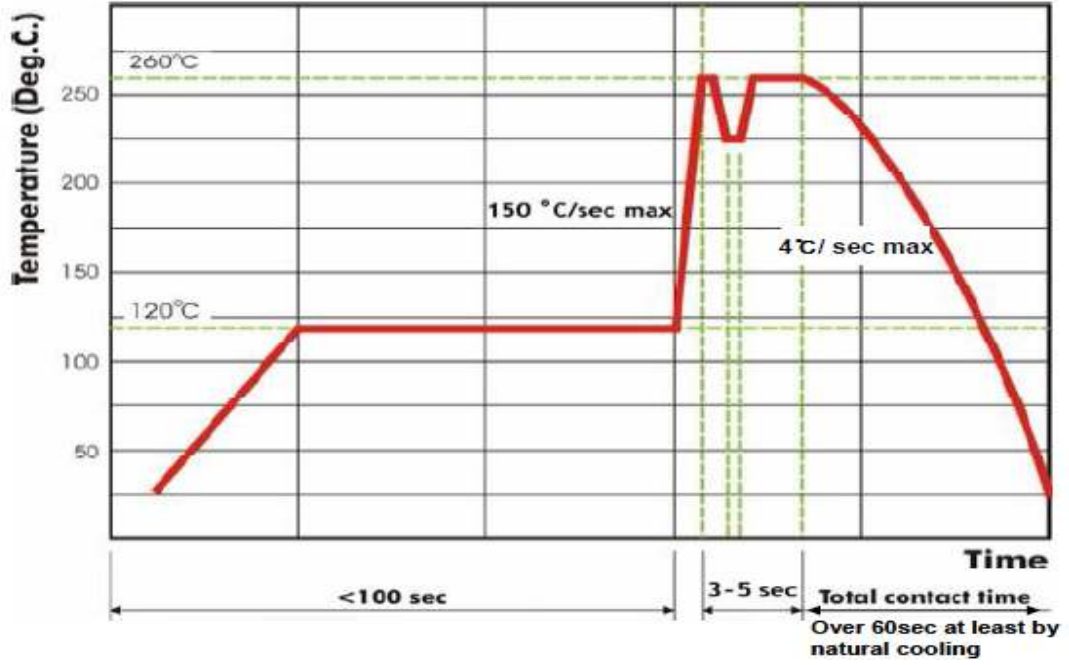


Fig. 13 Recommended wave soldering profile for SMT process with SnAgCu series solder.