FrelTec GmbH

Mathildenstr. 10A
82319 Starnberg
Germany

Multilayer Chip Inductor for Choke SMD

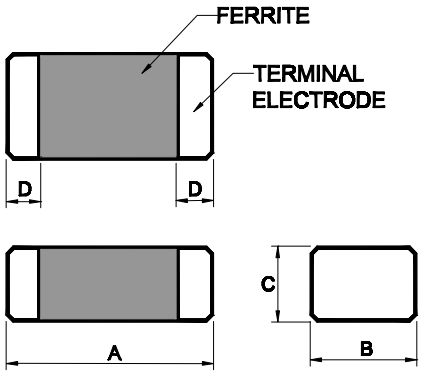
SPECIFICATION

Part Number

199	05*	151*	S*	M*	E02
Type	Size	Value	Feature Type	Tolerance	Packing
199 : SMD Multilayer Chip Inductor for Choke	03: 0603	The value is given in µH "N" indicates the decimal point for nH and "U" indicates the decimal point for µH. When higher than 100 µH the last digit is the multiplier	S: Standard	M : ±20%	T04: tape and reel, for 4kpcs, paper tape, 0603 and 0805 (≤4,7µH) size
	05: 0805	which denotes the number of zero following	H: IDC-Improved	N: ±30%	E03: tape and reel, for 3kpcs, embossed plastic tape, 0805 (>4,7µH) size
		Example:			
		10N : 10 nH			
		3U3 : 3300 nH			
		U68 : 680 nH			
		151 : 150 µH			* not all combination is possible

All products according to RoHS (2011/65/EU)

Dimensions:

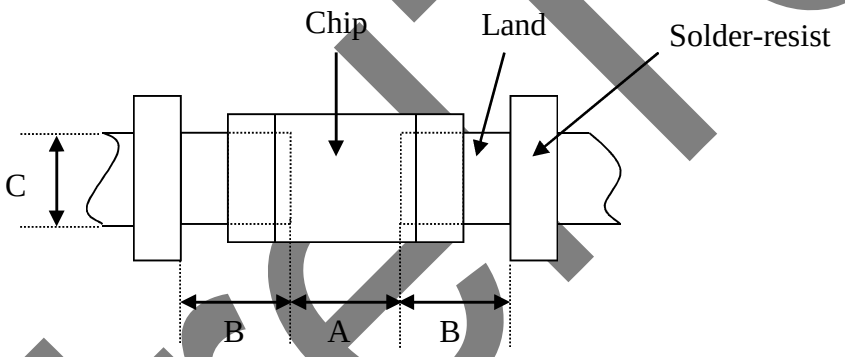


Unit: mm

Type	A	B	C	D
0603	1,60±0,15	1,60±0,15	1,60±0,15	1,60±0,15
0805 ≤4,7µH	2,0 +0,3 -0,1	1,25±0,2	0,85±0,2	0,5±0,3
0805>4,7µH	2,0 +0,3 -0,1	1,25±0,2	1,25±0,2	0,5±0,3

unit: mm

Recommended PCB pattern for reflow soldering:



Type	A	B	C
0603	0.60~0.80	0.60~0.80	0.60~0.80
0805	0.80~1.20	0.80~1.20	0.90~1.60

unit: mm

Standard Electrical Specifications

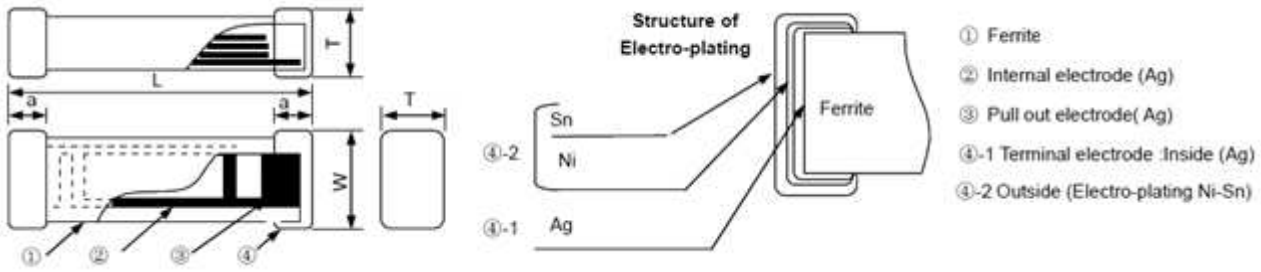
0603

L (µH)	Tolerance	L, Q Test. Freq. (MHz)	S.R.F Min. (MHz)	DCR Max. (Ω)	Ir Max. (mA)
0,1	±20%, ±30%	1	240	0,14±30%	700
0,22		1	150	0,27±30%	550
0,47		1	105	0,42±30%	400
1,0		1	75	0,20±30%	190
2,2		1	50	0,40±30%	140
4,7		1	35	0,60±30%	100
10		1	20	0,90±30%	50

0805

L(µH)	Tolerance	L, Q Test. Freq. (MHz)	S.R.F Min. (MHz)	DCR Max. (Ω)	Ir Max (mA)
0,1	±20%, ±30%*	1	235	0,07±30%	1000
0,22		1	170	0,13±30%	800
0,47		1	125	0,18±30%	550
1,0		1	75	0,20±30%	300
2,2		1	50	0,28±30%	220
4,7		1	25	0,30±30%	180
10		1	15	0,50±30%	60
10		1	20	0,50±30%	100

Construction



Material Information

Code	Part Name	Material Name
1	Ferrite Body	Ferrite Powder
2	Inner Coils	Silver Paste
3	Pull-out Electrode (Ag)	Silver Paste
4-1	Terminal Electrode: Inside Ag	Termination Silver Composition
4-2	Electro-Plating: Ni/Sn plating	Plating Chemicals

Test and Measurement Procedures

1 Test Conditions

Unless otherwise specified, the standard atmospheric conditions for measurement/test as:

a. Ambient Temperature: 20±15℃
b. Relative Humidity: 65±20%
c. Air Pressure: 86kPa to 106kPa

If any doubt on the results, measurements/tests should be made within the following limits:

a. Ambient Temperature: 20±2°C
b. Relative Humidity: 65±5%
c. Air Pressure: 86kPa to 106kPa

2 Visual Examination

a. Inspection Equipment: 20× magnifier

3 Electrical Test

3.1 DC Resistance (DCR)

a. Refer to tabel above.
b. Test equipment (Analyzer): High Accuracy Milliohmmeter-HP4338B or equivalent.

3.2 Inductance (L)

a. Refer to tabel above.
b. Test equipment: High Accuracy RF Impedance /Material Analyzer-HP4291B+HP16192A or equivalent.
c. Test signal: -20dBm or 50mV.
d. Test frequency refers to tabel above**.**

3.3 Self-Resonant Frequency (SRF)

a. Refer to tabel above.
b. Test equipment: High Accuracy RF Impedance /Material Analyzer-HP4911A+ HP16192A or equivalent.

c. Test signal: -20dBm or 50 mV.

3.4 Rated Current

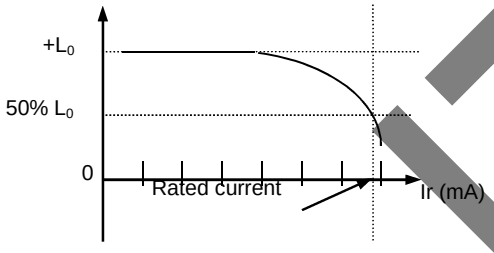
a. Refer to tabel above.

b. Test equipment: HP6632B system DC power supply, -E4991A +HP16192A+HP16200A or equivalent.

c. Measurement method:

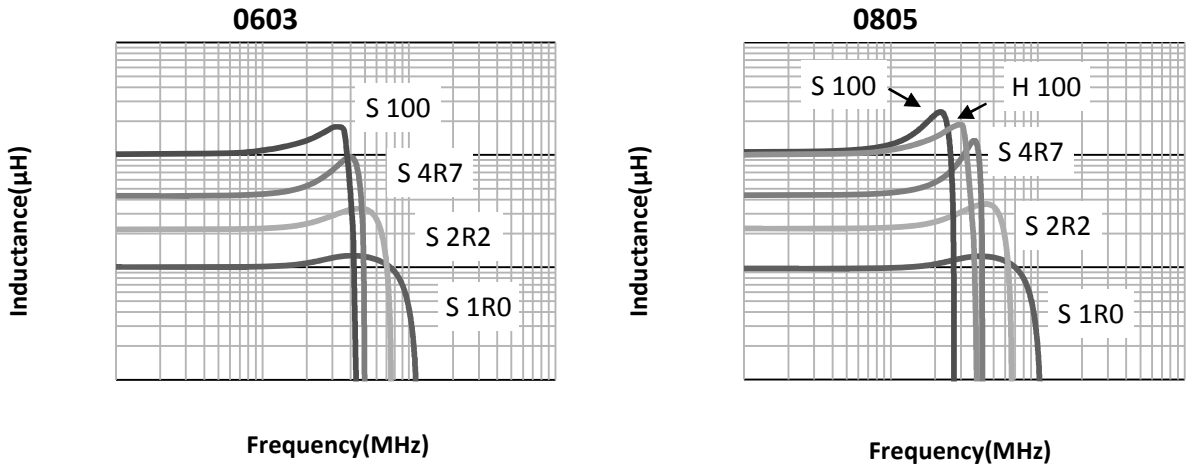
1. Measurement conditions of initial inductance L:
   Measuring Frequency: 1MHz,
   Test Current: 1.0μH~4.7μH, 1mA; 10μH, 0.1mA.
2. Raising the voltage of the DC power supply, measure the inductance at the various current.
   The rated current is the value of DC current at which the inductance will be 50% down compared with the initial inductance value.
   Note: In the period of raising voltage, voltage cannot be reduced.

a. Definition of Rated Current (Ir): Ir is direct electric current as inductance L (μH) decreased just 50% against initial value (see Fig. below).

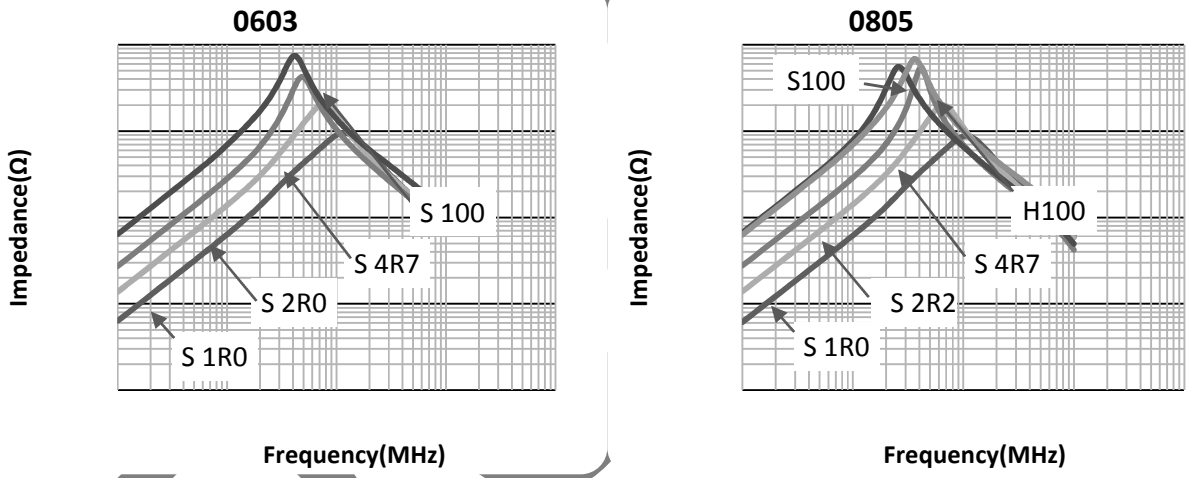


Typical Electrical Characteristics

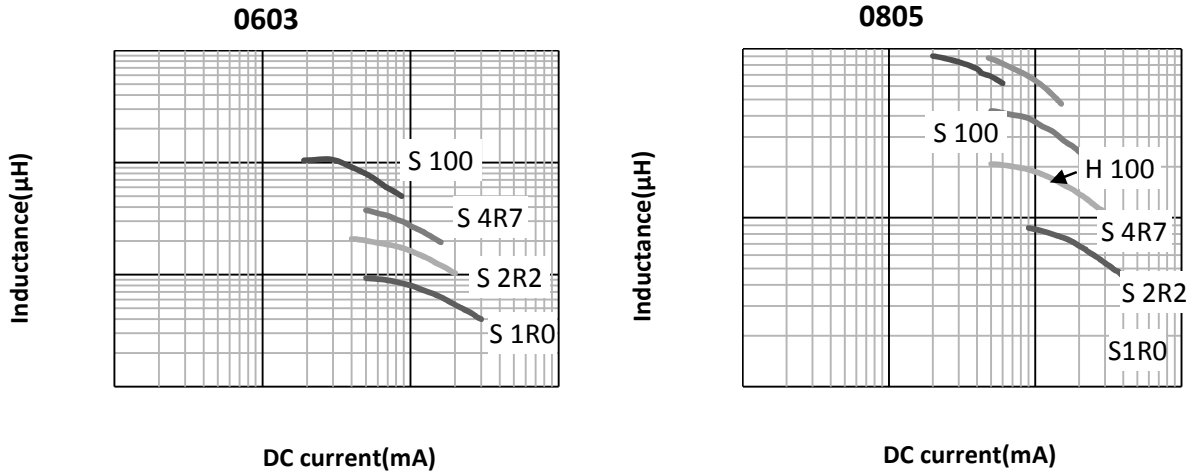
Inductance vs. Frequency Characteristics



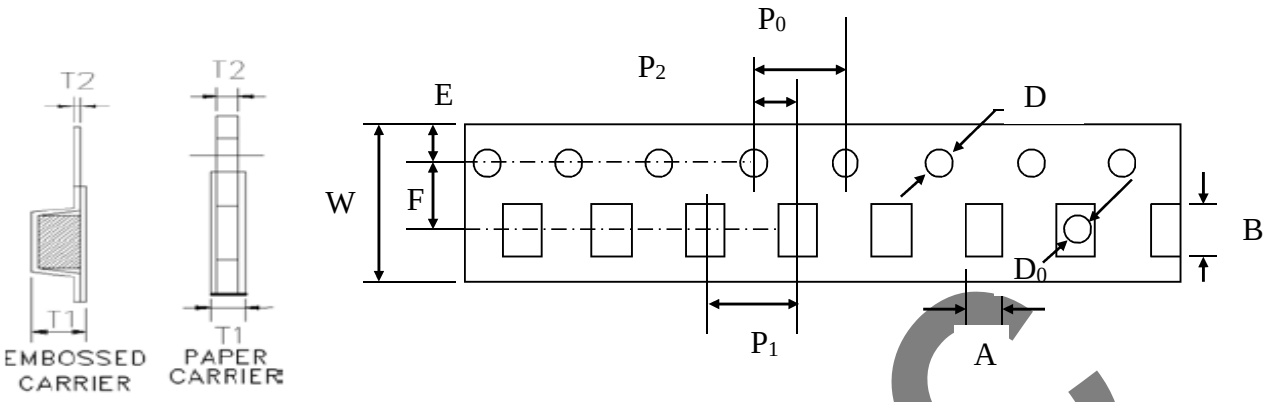
Impedance vs. Frequency Characteristics



Inductance vs. DC Current Characteristics

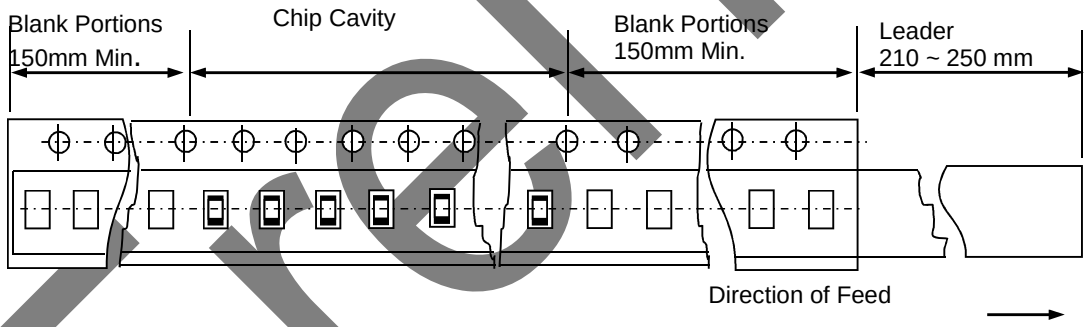


Tape Dimensions



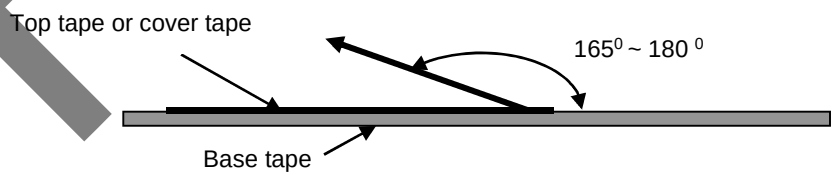
Packing	Size	A	B	W	F	E	P_1	P_2	P_0	D	T_1 (Max)	T_2
Paper Tape (T)	0603	1,0±0,2	1,8±0,2	8,0±0,3	3,5±0,05	1,75±0,1	4,0±0,1	2,0±0,05	4,0±0,1	1,50+0,1/-0	1,1	
	0805	1,5±0,2	2,3±0,2	8,0±0,3	3,5±0,05	1,75±0,1	4,0±0,1	2,0±0,05	4,0±0,1	1,50+0,1/-0	1,1	
Embossed Tape (E)	0805	1,55±0,2	2,25±0,2	8,0±0,3	3,5±0,05	1,75±0,1	4,0±0,1	2,0±0,05	4,0±0,1	1,50+0,1/-0	1,45	0,3

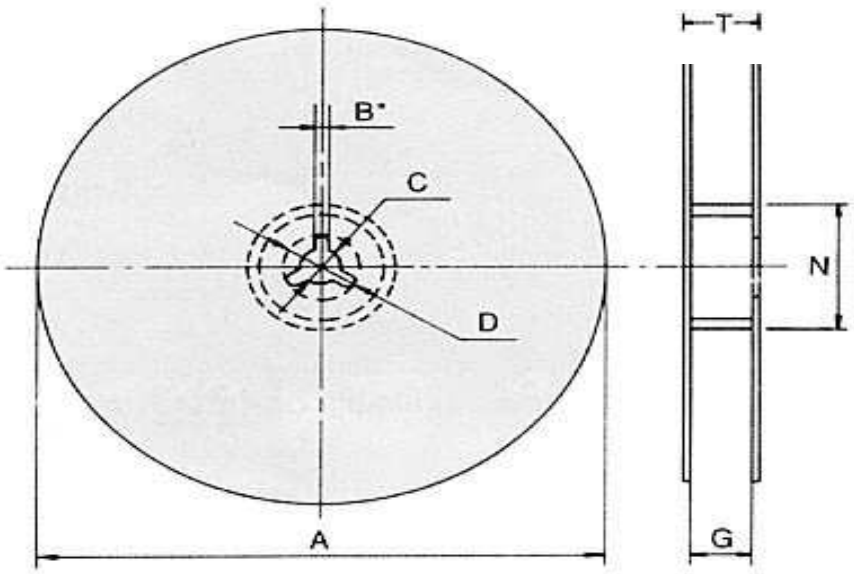
Lead Dimensions:



Cover Tape Peel off Strength

Specifications: 10gf to 70fg





Symbol	Reel Type / Tape	A	N	C	B	T (max)	G
Dimension	7" reel	178±2,0	58,0±2,0	13,5±0,2	2,45±0,2	14,4	8,4+1,5/-0,0

in mm

Stock period

The performance of these products, including the solderability, is guaranteed for 12 month, provided that they remain packed as they were when delivered and stored at a temperature of maximum 40°C (minimum -10°C) and a relative humidity less than 70%RH For those parts, which passed more than 12 months shall be checked solder-ability before use.

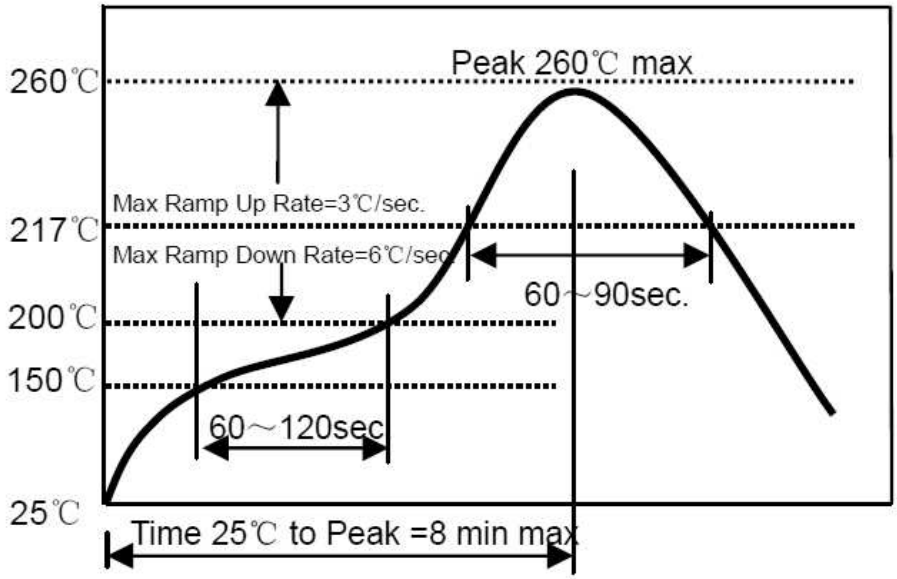
The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to dust of harmful gas (e.g. HCl, sulfurous gas of H_2S).

Packaging material may be deformed if package are stored where they are exposed to heat of direct sunlight.

Operating and storage temperature range

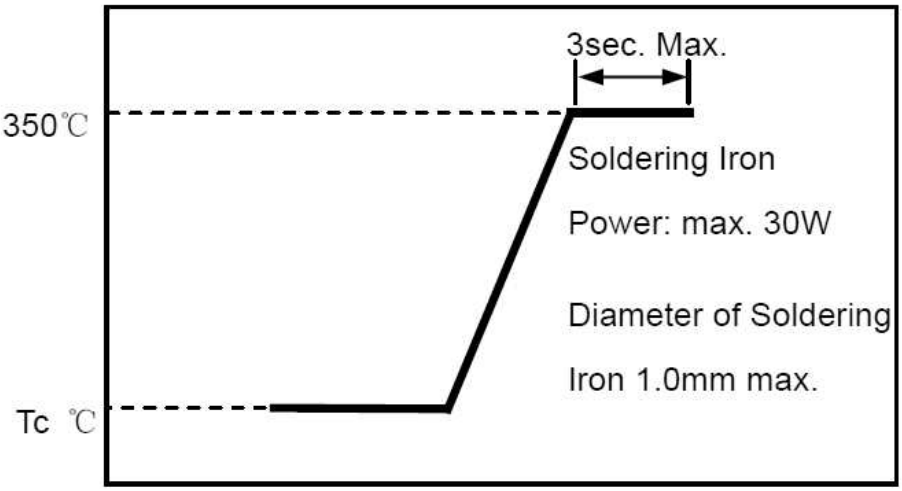
(individual chip without packing): -40°C ~ +85°C

Lead Free Reflow Soldering Profile



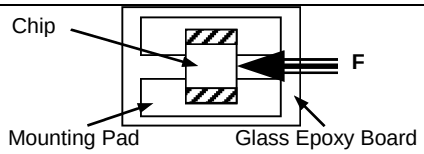
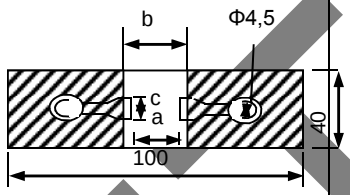
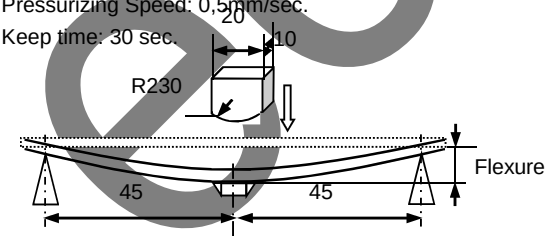
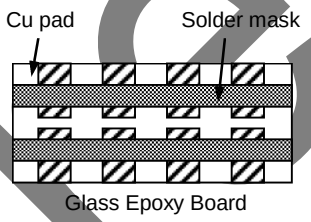
- 1~2 °C/sec. Ramp
- Pre-heating: 150~190°C/90±30 sec.
- Time above 240°C: 20~40sec
- Peak temperature: 260°C Max. /10sec.
- Solder paste: Sn/3,0Ag/0,5Cu
- Max.2 times for re-flowing

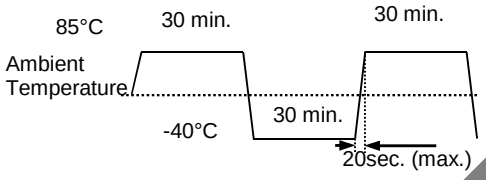
Iron Soldering Profile



- Iron soldering power: Max.30W.
- Pre-heating: 150°C / 60sec.
- Soldering Tip temperature: 350°C Max.
- Soldering time: 3sec Max.
- Solder paste: Sn/3,0Ag/0,5Cu.
- Max.1 times for iron soldering.
- Take care not to apply the tip of the soldering iron to the terminal electrodes.

Reliability Test

Items	Requirements	Test Methods and Remarks
Terminal Strength	No removal or split of the termination or other defects shall occur. 	① Solder the inductor to the testing jig (glass epoxy board shown using leadfree solder. Then apply a force in the direction of the arrow. ② 5N force for 0603 series. 10N force for 0805 series. ③ Keep time: 10±1s. ④ Speed: 1.0mm/s.
Resistance to Flexure	No visible mechanical damage. Type / a / b / c 0603 / 1.0 / 3.0 / 1.2 0805 / 1.2 / 4.0 / 1.65 Unit: mm 	① Solder the inductor to the test jig (glass epoxy board shown) Using a leadfree solder. Then apply a force in the direction shown. ② Flexure: 2mm. ③ Pressurizing Speed: 0,5mm/sec. ④ Keep time: 30 sec. 
Vibration	No visible mechanical damage. 	① Solder the inductor to the testing jig (glass epoxy board shown) using leadfree solder. ② The inductor shall be subjected to a simple harmonic motion having total amplitude of 1,5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz. ③ The frequency range from 10 to 55 Hz and return to 10 Hz shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours).
Temperature	Inductance change should be within ±20% of initial value measuring at 20°C.	Temperature range: -40°C~ +85°C Reference temperature: +20□
Solderability	① No visible mechanical damage. ② Wetting shall exceed 95% coverage.	① Solder temperature: 240±2°C ② Duration: 3sec. ③ Solder: Sn/3,0Ag/035Cu. ④ Flux: 25% Resin and 75% ethanol in weight.

Resistance to Soldering Heat	① No visible mechanical damage. ② Wetting shall exceed 95% coverage. ③ Inductance change: Within ±20%.	① Solder temperature: 260±3°C. ② Duration: 5sec. ③ Solder: Sn/3,0Ag/0,5Cu. ④ Flux: 25% Resin and 75% ethanol in weight. ⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
Thermal Shock	① No mechanical damage. ② Inductance change: Within ±20%. 	① Temperature, Time: -40°C for 30±3 min→ 85°C for 30±3min. ② Transforming interval: 20 sec.(max.). ③ Tested cycle: 100 cycles. ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
Resistance to Low Temperature	□ No mechanical damage. □ Inductance change: Within ±20%.	① Temperature: -40±2°C ② Duration: 1000^{+24} hours. ③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
Loading Under Damp Heat	② No visible mechanical damage. ③ Inductance change: within ±20%	① Temperature: 60±2°C ② Humidity: 90% to 95% RH. ③ Duration: 1000^{+24} hours. ④ Applied current: Rated current. ⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
Loading at High Temperature (Life Test)	① No visible mechanical damage. ②Inductance change: within ±20%	① Temperature: 85±2°C ② Duration: 1000^{+24} hours. ③ Applied current: Rated current. ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.

Published by FrelTec® GmbH
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