FrelTec GmbH

Mathildenstr. 10A
82319 Starnberg
Germany

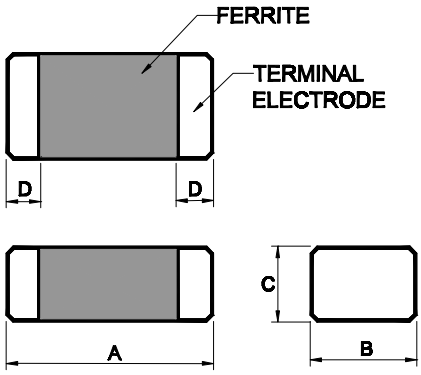
Multilayer Chip Ferrite Bead SMD

Part Number

196	05*	151*	S*	J*	E02	_
Type	Size	Impedance	Material	Tolerance	Packing	Optional
196 : SMD Multilayer Chip Ferrite Bead	01 : 0201	The value is given in Ohm. First two digits are significant The last digit is the multiplier which denotes the number of zero following Example: 060 : 6Ohm 470 : 47Ohm 151 : 150 Ohm	D, U, E	Q: ±25%	T15: tape and reel, for 15kpcs, paper tape, 0201	Internal code
	02 : 0402				T10: tape and reel, for 10kpcs, paper tape, 0402	
	03 : 0603				T04: tape and reel, for 4kpcs, paper tape, 0603, 0805	
	05 : 0805					
	06 : 1206				T03: tape and reel, for 3kpcs, paper tape, 1206	
					* not all combination is possible	

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

Dimensions:

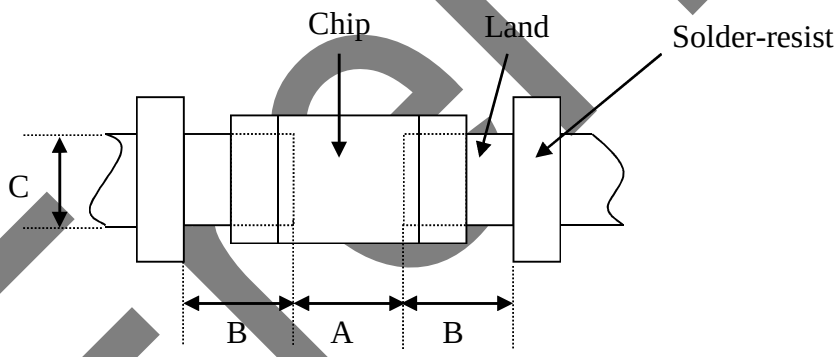


Unit: mm

Type	A	B	C	D
0201	0,6±0,05	0,3±0,05	0,3±0,05	0,15±0,05
0402	1,0±0,15	0,5±0,15	0,5±0,15	0,25±0,1
0603	1,6±0,15	0,8±0,15	0,8±0,15	0,3±0,2
0805	2,0 (+0,3, -0,1)	1,25±0,2	0,85±0,2	0,5±0,3
1206	3,2±0,2	1,6±0,2	0,85±0,2	0,5±0,3

unit: mm

Recommended PCB pattern for reflow soldering:



Type	A	B	C
0201	0,2~0,3	0,2~0,3	0,3~0,35
0402	0,45~0,55	0,40~0,50	0,45~0,55
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
1206	1,80~2,50	1,00~1,50	1,20~2,00

unit: mm

Electrical Characteristics

0201

Part Number	Impedance (Ω)	Z Test Freq. (MHz)	DCR (Ω) Max.	Ir (mA) Max.	Thickness (mm)
19601600DQT15	60±25%	100	0,40	200	0.3±0.05
19601800DQT15	80±25%	100	0,60	200	
19601121DQT15	120±25%	100	0,80	200	
19601241DQT15	240±25%	100	1,00	200	
19601601DQT15	600±25%	100	1,70	200	

0402

Part Number	Impedance (Ω)	Z Test Freq. (MHz)	DCR (Ω) Max.	Ir (mA) Max.	Thickness (mm)
19602100DQT10	0~15	100	0,05	500	0.5±0.15
19602310DQT10	31±25%	100	0,20	300	
19602600DQT10	60±25%	100	0,30	200	
19602800DQT10	80±25%	100	0,35	200	
19602121DQT10	120±25%	100	0,40	200	
19602221DQT10	220±25%	100	0,45	150	
19602301DQT10	300±25%	100	0,50	100	
19602421DQT10	420±25%	100	0,60	100	
19602501DQT10	500±25%	100	0,80	100	
19602601DQT10	600±25%	100	0,90	100	
19602751DQT10	750±25%	100	1,00	100	
19602102DQT10	1000±25%	100	1,20	100	
19602152DQT10	1500±25%	100	1,60	100	
19602800EQT10	80±25%	100	0,35	200	
19602121EQT10	120±25%	100	0,40	200	
19602241EQT10	240±25%	100	0,50	200	
19602601EQT10	600±25%	100	0,90	100	
19602100UQT10	0~15	100	0,05	500	
19602300UQT10	30±25%	100	0,20	300	
19602700UQT10	70±25%	100	0,30	200	
19602121UQT10	120±25%	100	0,40	200	
19602221UQT10	220±25%	100	0,50	100	
19602301UQT10	300±25%	100	0,60	100	
19602421UQT10	420±25%	100	0,80	100	
19602601UQT10	600±25%	100	0,90	100	
19602102UQT10	1000±25%	100	1,20	100	
19602400DQT10C	40±25%	100	0,12	550	
19602800DQT10C	80±25%	100	0,16	450	
19602121DQT10C	120±25%	100	0,18	400	
19602241DQT10C	240±25%	100	0,30	300	
19602301DQT10C	300±25%	100	0,38	250	
19602421DQT10C	420±25%	100	0,45	250	
19602471DQT10C	470±25%	100	0,45	250	
19602501DQT10C	500±25%	100	0,50	250	
19602601DQT10C	600±25%	100	0,50	250	

19602751DQT10C	750±25%	100	0,65	150	
19602102DQT10C	1000±25%	100	0,70	150	
19602152DQT10C	1500±25%	100	1,15	100	
19602800EQT10C	80±25%	100	0,2	500	
19602121EQT10C	120±25%	100	0,25	500	
19602241EQT10C	240±25%	100	0,40	400	
19602601EQT10C	600±25%	100	0,60	300	
19602100UQT10C	0~15	100	0,03	1000	
19602300UQT10C	30±25%	100	0,06	700	
19602700UQT10C	70±25%	100	0,10	700	
19602121UQT10C	120±25%	100	0,20	500	
19602221UQT10C	220±25%	100	0,30	400	
19602301UQT10C	300±25%	100	0,50	300	
19602421UQT10C	420±25%	100	0,52	300	
19602601UQT10C	600±25%	100	0,55	300	
19602102UQT10C	1000±25%	100	0,58	300	

0603

Part Number	Impedance (Ω)	Z Test Freq. (MHz)	DCR (Ω) Max.	Ir (mA) Max.	Thickness (mm)
19603110DQT04	0~15	100	0,05	2000	
19603300DQT04	30±25%	100	0,05	2000	
19603600DQT04	60±25%	100	0,10	500	
19603800DQT04	80±25%	100	0,15	400	
19603101DQT04	100±25%	100	0,20	300	
19603121DQT04	120±25%	100	0,20	300	
19603221DQT04	220±25%	100	0,30	300	
19603301DQT04	300±25%	100	0,35	200	
19603471DQT04	470±25%	100	0,45	200	
19603601DQT04	600±25%	100	0,45	200	
19603751DQT04	750±25%	100	0,50	200	
19603102DQT04	1000±25%	100	0,60	200	
19603152DQT04	1500±25%	100	0,70	150	
19603182DQT04	1800±25%	100	0,90	100	
19603202DQT04	2000±25%	100	1,20	100	0.8±0.15
19603222DQT04	2200±25%	100	1,20	100	
19603121EQT04	120±25%	100	0,20	300	
19603181EQT04	180±25%	100	0,30	300	
19603601EQT04	600±25%	100	0,45	200	
19603102EQT04	1000±25%	100	0,60	200	
19603100UQT04	0~15	100	0,05	2000	
19603300UQT04	30±25%	100	0,05	2000	
19603600UQT04	60±25%	100	0,10	500	
19603121UQT04	120±25%	100	0,20	300	
19603221UQT04	220±25%	100	0,30	300	
19603301UQT04	300±25%	100	0,35	200	
19603471UQT04	470±25%	100	0,40	200	
19603601UQT04	600±25%	100	0,50	200	
19603102UQT04	1000±25%	100	0,60	200	

19603121DQT04C	120±25%	100	0,20	500	
19603241DQT04C	240±25%	100	0,30	500	
19603301DQT04C	300±25%	100	0,35	500	
19603471DQT04C	470±25%	100	0,40	500	
19603601DQT04C	600±25%	100	0,40	500	
19603102DQT04C	1000±25%	100	0,50	400	
19603152DQT04C	1500±25%	100	0,60	300	
19603121EQT04C	120±25%	100	0,20	500	
19603102EQT04C	1000±25%	100	0,50	400	
19603600UQT04C	60±25%	100	0,10	800	
19603800UQT04C	80±25%	100	0,10	600	
19603121UQT04C	120±25%	100	0,18	500	
19603151UQT04C	150±25%	100	0,25	500	
19603221UQT04C	220±25%	100	0,25	500	
19603301UQT04C	300±25%	100	0,25	500	
19603471UQT04C	470±25%	100	0,35	500	
19603601UQT04C	600±25%	100	0,38	500	
19603102UQT04C	1000±25%	100	0,50	400	

0805

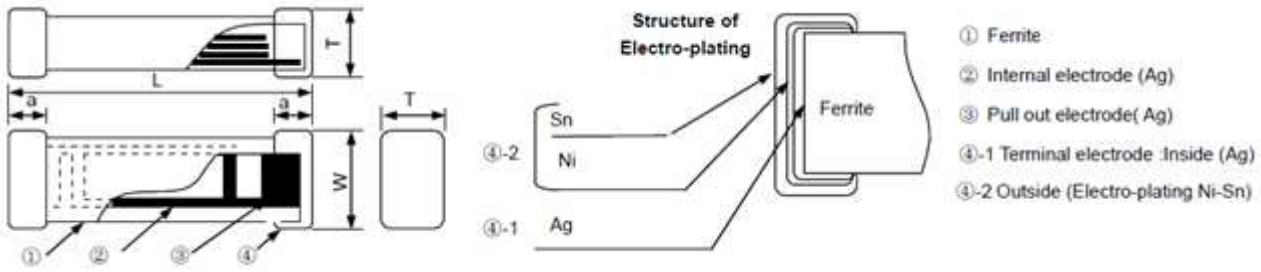
Part Number	Impedance (Ω)	Z Test Freq. (MHz)	DCR (Ω) Max.	Ir (mA) Max.	Thickness (mm)
19605070DQT04	0~15	100	0,04	2000	
19605190DQT04	19±25%	100	0,04	2000	
19605300DQT04	30±25%	100	0,05	1500	
19605800DQT04	80±25%	100	0,10	1000	
19605121DQT04	120±25%	100	0,15	800	
19605181DQT04	180±25%	100	0,18	700	
19605221DQT04	220±25%	100	0,20	600	
19605301DQT04	300±25%	100	0,20	500	
19605421DQT04	420±25%	100	0,30	500	
19605501DQT04	500±25%	100	0,30	500	
19605601DQT04	600±25%	100	0,30	500	
19605751DQT04	750±25%	100	0,35	500	
19605102DQT04	1000±25%	100	0,35	500	
19605152DQT04	1500±25%	100	0,40	500	0.85±0.2
19605202DQT04	2000±25%	100	0,50	500	
19605800EQT04	80±25%	100	0,10	1000	
19605181EQT04	180±25%	100	0,20	600	
19605301EQT04	300±25%	100	0,20	500	
19605501EQT04	500±25%	100	0,30	500	
19605601EQT04	600±25%	100	0,30	500	
19605102EQT04	1000±25%	100	0,35	500	
19605100UQT04	0~15	100	0,04	2200	
19605170UQT04	17±25%	100	0,04	2000	
19605300UQT04	30±25%	100	0,05	1500	
19605700UQT04	70±25%	100	0,10	1000	
19605121UQT04	120±25%	100	0,15	800	

19605221UQT04	220±25%	100	0,20	600	
19605301UQT04	300±25%	100	0,20	500	
19605421UQT04	420±25%	100	0,25	500	
19605601UQT04	600±25%	100	0,30	500	
19605102UQT04	1000±25%	100	0,40	500	

1206

Part Number	Impedance (Ω)	Z Test Freq. (MHz)	DCR (Ω) Max.	Ir (mA) Max.	Thickness (mm)
19606000DQT03	0~15	100	0,03	2200	0.85±0.2
19606310DQT03	31±25%	100	0,05	2000	
19606600DQT03	60±25%	100	0,10	1000	
19606800DQT03	80±25%	100	0,10	1000	
19606121DQT03	120±25%	100	0,10	1000	
19606221DQT03	220±25%	100	0,20	600	
19606301DQT03	300±25%	100	0,20	600	
19606501DQT03	500±25%	100	0,30	600	
19606601DQT03	600±25%	100	0,30	600	
19606102DQT03	1000±25%	100	0,60	500	
19606122DQT03	1200±25%	100	0,60	300	
19606601UQT03	600±25%	100	0,30	600	

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-E4991A or equivalent.
   Test fixture: HP16197A for 0201 all other HP16192A
c. Test signal: -20dBm or 50mV.
d. Test frequency refers to tabel above**.**

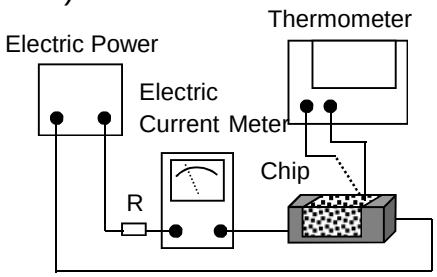
3.3 Rated Current

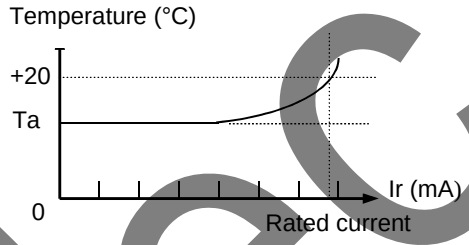
a. Refer to table above

b. Test equipment (see Fig below): Electric Power, Electric current meter, Thermometer.

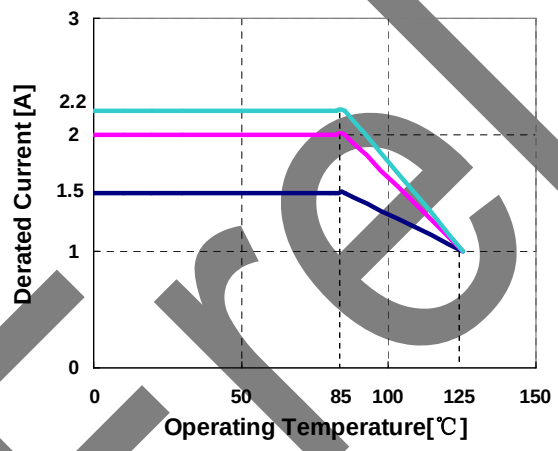
c. Measurement method (see Fig below):
   i. Set test current to be 0 mA.
   ii. Measure initial temperature of chip surface.
   iii. Gradually increase voltage and measure chip temperature for corresponding current.

d. Definition of Rated Current (Ir): Ir is direct electric current as chip surface temperature rose just 20°C against chip initial surface temperature(Ta). (see Fig below):

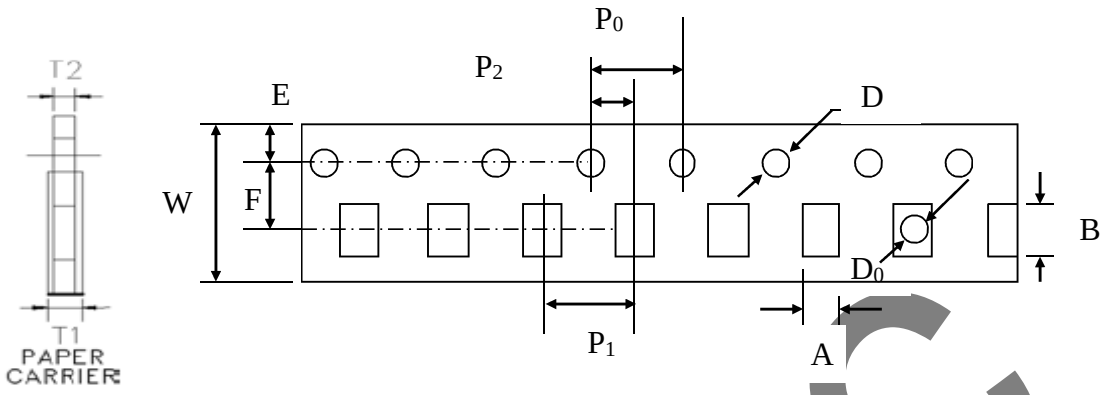




e. When operating temperatures exceeding +85℃, derating of current is necessary for chip ferrite beads for which rated current is 1000mA over. Please apply the derating curve shown in chart according to the operating temperature.

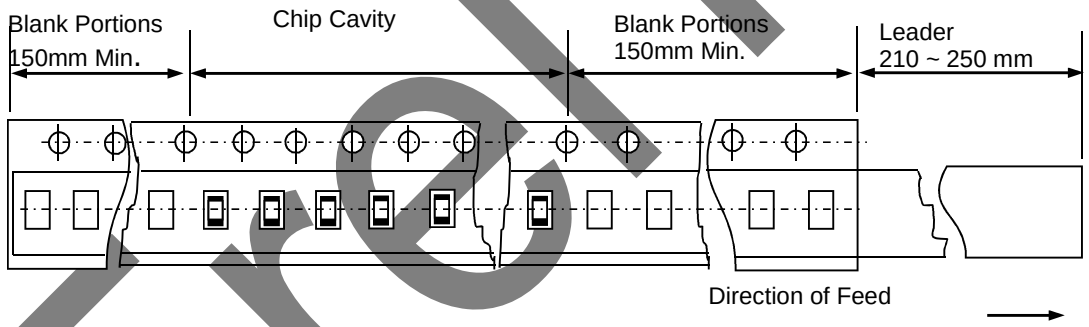


Tape Dimensions



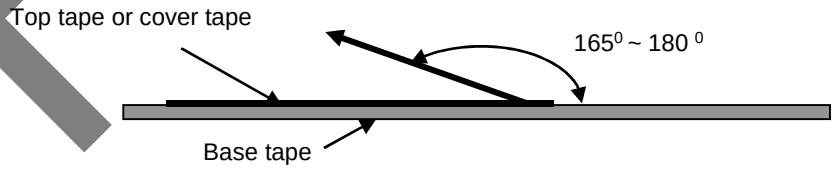
Packing	Size	A	B	W	F	E	P_1	P_2	P_0	D	T_1 (Max)
Paper Tape (T)	0201	0,40±0,1	0,70±0,1	8,0±0,3	3,5±0,05	1,75±0,1	2,0±0,1	2,0±0,05	4,0±0,1	1,50+0,1/-0	0,55
	0402	0,65±0,1	1,15±0,1	8,0±0,3	3,5±0,05	1,75±0,1	2,0±0,05	2,0±0,05	4,0±0,1	1,50+0,1/-0	0,8
	0603	1,0±0,2	1,8±0,2	8,0±0,3	3,5±0,05	1,75±0,1	4,0±0,1	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
	1206	1,9±0,2	3,5±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

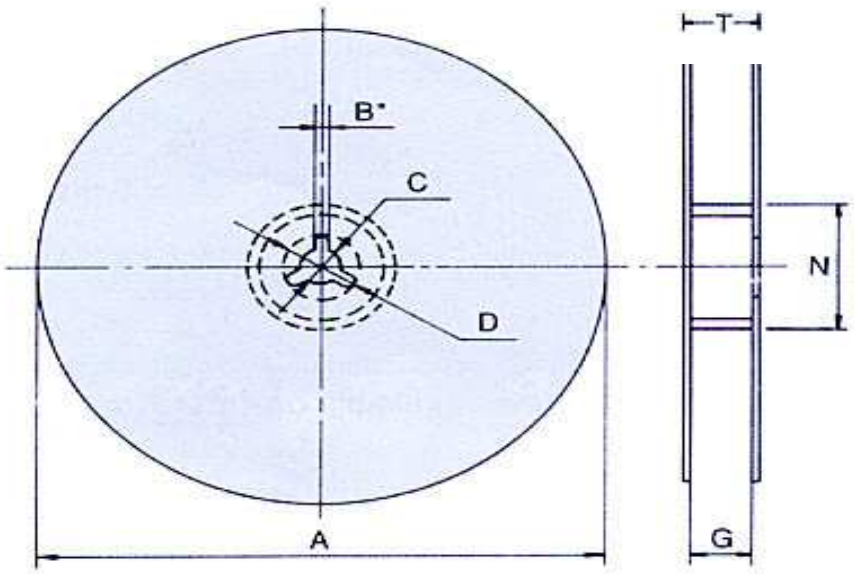
Lead Dimensions:



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

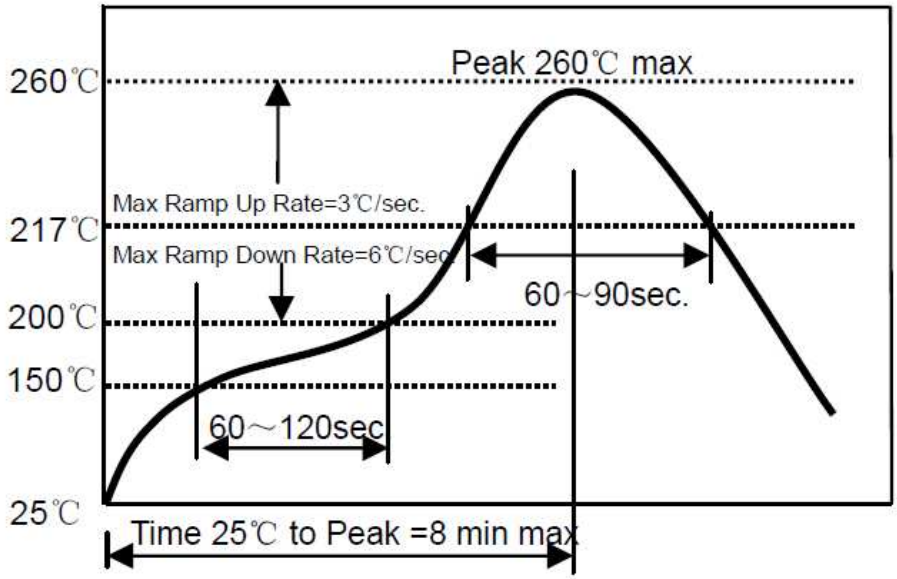
Stock period

The performance of these products, including the solderability, is guaranteed for 12 month, size 0201 is 6 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

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).

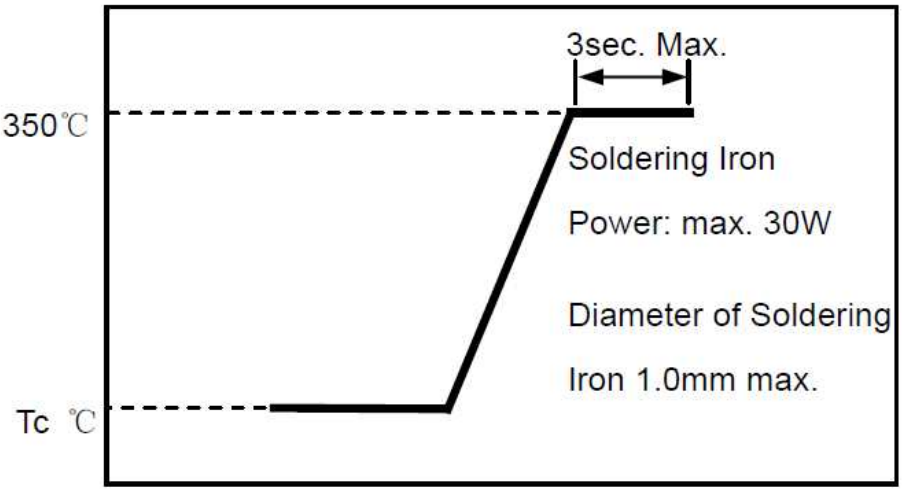
Packaging material may be deformed if package are stored where they are exposed to heat of direct sunlight.

Lead Free Reflow Soldering Profile



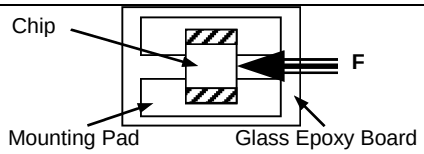
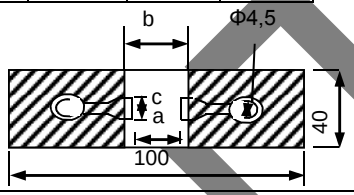
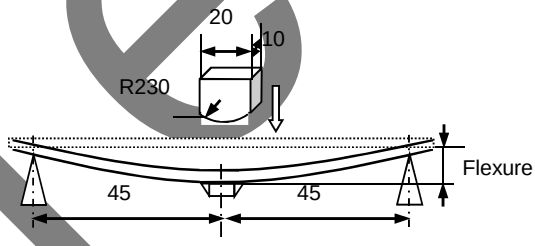
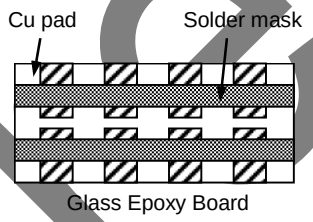
- Pre-heating: 150~200°C/60~120 sec.
- Time above 217°C: 60~90sec
- Max temp: 260°C
- Max time at max temp: 10s.
- Solder paste: Sn/3,0Ag/0,5Cu
- Max.2 times for re-flowing

Iron Soldering Profile

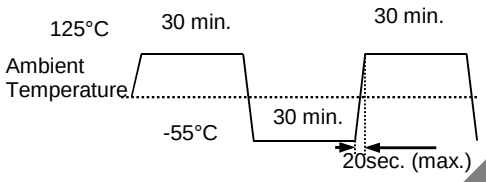


- Iron soldering power: Max.30W.
- Pre-heating: 150°C / 60sec.
- Soldering Tip temperature: 350°C Max.
- Soldering time: 3sec Max.
- Solder paste: Sn/3,0Ag/0,5Cu.
- Max.1 times for iron soldering.
- Take care not to apply the tip of the soldering iron to the terminal electrodes.

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 2N force for 0201 series, 5N force for 0402 and 0603 series 10N force for 0805 and 1206 series. ③ Keep time: 10±1s. ④ Speed: 1,0mm/s.
Resistance to Flexure	No visible mechanical damage. Unit: mm 	① Solder the inductor to the test jig (glass epoxy board shown) Using a eutectic solder. Then apply a force in the direction shown. ② Flexure: 2mm. ③ Pressurizing Speed: 0,5mm/sec. ④ Keep time: 30 sec. 
Vibration	① No visible mechanical damage. ② Inductance change: Within ±20% 	① Solder the inductor to the testing jig (glass epoxy board shown) using eutectic solder. ② The beat 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).
Dropping	① No visible mechanical damage. ② Inductance change: Within ±20%.	Drop chip beat 10 times on a concrete floor from a height of 100 cm.
Temperature	Inductance change should be within ±20% of initial value measuring at 20°C.	Temperature range: -55°C~ +125°C Reference temperature: +20□
Solderability	① No visible mechanical damage. ② Wetting shall exceed 95% coverage, 0201 75%.	① Solder temperature: 240±2°C ② Duration: 3sec. ③ Solder: Sn/3,0Ag/0,5Cu. ④ Flux: 25% Resin and 75% ethanol in weight.

Type	a	b	c
0201	0,25	0,8	0,3
0402	0,4	1,5	0,5
0603	1,0	3,0	1,2
0805	1,2	4,0	1,65
1206	2,2	5,0	2,0

Resistance to Soldering Heat	① No visible mechanical damage. ② Wetting shall exceed 95% coverage, 0201 75%. ③ Impedance 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: -55°C for 30±3 min→ 125°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. ② Inductance change: Within ±20%.	① Temperature: -55±2°C ② Duration: 1000^{+24} hours. ③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
Resistance to High Temperature	□ No mechanical damage. ② Inductance change: Within ±20%.	① Temperature: 125±2°C ② Duration: 1000^{+24} hours. ③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
Damp Heat (Steady States)	① No visible mechanical damage. ② Inductance change: Within ±20%.	① Temperature: 60±2°C ② Humidity: 90% to 95% RH. ③ Duration: 1000^{+24} hours. ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
Loading Under Damp Heat	① No visible mechanical damage. ② Impedance change: within ±20%.	① Temperature: 60±2℃ 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. ② Impedance change: within ±20%.	① Temperature: 125±2℃ 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
Mathildenstr. 10A; 82319 Starnberg; Germany

The following applies to all products named in this publication:

1. The information describes the type of component and shall not be considered as assured characteristics.
2. Terms of delivery and rights to change design reserved.
3. Some parts of this publication contain statements about the suitability of our products for certain areas of application. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. Nevertheless, we explicitly point out that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application. As a rule, FrelTec® is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether a FrelTec® product with the properties described in the product specification is suitable for use in a particular customer application.
4. We also point out that in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
5. The warnings, cautions and product-specific notes must be observed.
6. In order to satisfy certain technical requirements, some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as “hazardous”). Useful information on this will be found in our Material Data Sheets. Should you have any more detailed questions, please contact our sales offices.
7. We constantly strive to improve our products. Consequently, the products described in this publication may change from time to time. The same is true for the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order. We also reserve the right to discontinue production and delivery of products. Consequently, we cannot guarantee that all products named in this publication will always be available.
8. Unless otherwise agreed in individual contracts, all orders are subject to the current version of the “General conditions for the supply of products and services of the electrical and electronics industry” published by the German Electrical and Electronics Industry Association (ZVEI), available at www.freltec.com.
9. As far as patents or other rights of third parties are concerned, liability is only assumed for components per se, not for applications, processes and circuits implemented within components or assemblies.
10. The trade name FrelTec® is a trademark registered or pending in Europe and in other countries.