

# FrelTec GmbH

Mathildenstr. 10A  
82319 Starnberg  
Germany

## **Multilayer Chip Ferrite Bead SMD**

### SMD

#### SPECIFICATION

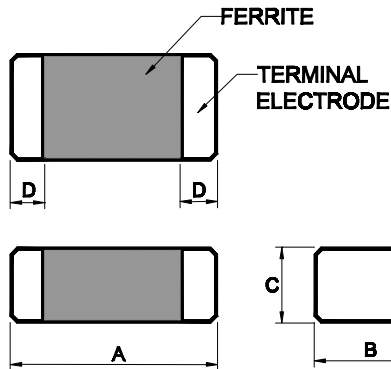
### Part Number

19C	03*	151*	A50	D*	Q*	T04	—
Type	Size	Impedance	Rated Current	Material	Tolerance	Packing	Optional
19C : SMD Multilayer Chip Ferrite Bead	02 : 0402	The value is given in Ohm. First two digits are significant The last digit is the multiplier	A50 : 0,5A	G, D, E, U	Q: ±25%	T10: tape and reel, for 10kpcs, paper tape, 0402	Internal code
	03 : 0603	which denotes the number of zero following	1A5 : 1,5A			T04: tape and reel, for 4kpcs, paper tape, 0603	
		Example: 060 : 60Ohm 470 : 470Ohm 151 : 150 Ohm					
						* not all combination is possible	

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

### SMD

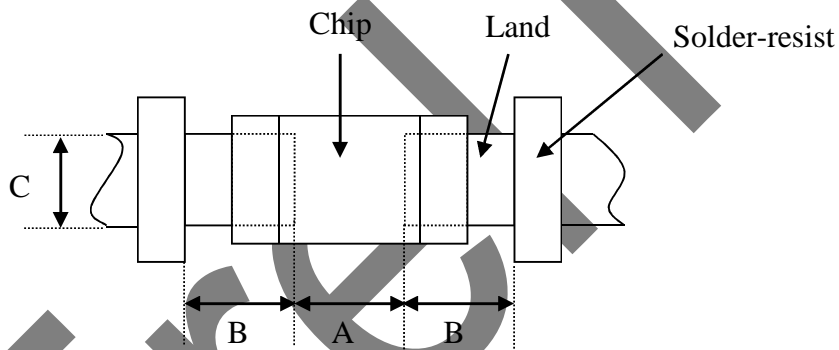
#### Dimensions:



Type	A	B	C	D
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

unit: mm

#### Recommended PCB pattern for reflow soldering:



Type	A	B	C
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

unit: mm

## SMD

## Electrical Characteristics

## 0402

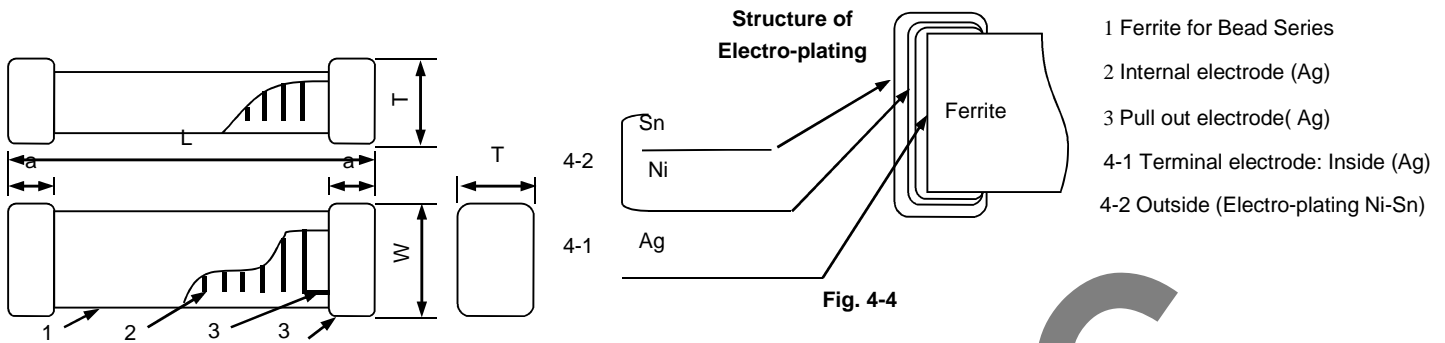
Part Number	Impedance ( $\Omega$ )		DCR ( $\Omega$ ) Max.	I <sub>r</sub> (mA) Max.	Tolerance @100MHz	Thickness (mm)
	@100MHz	@1GHz (Min.)				
19C02121A60DQT10	120	100	0,25	600	±25%	0,5±0,15
19C02221A50DQT10	220	300	0,38	500		
19C02121A60UQT10	120	100	0,25	600		
19C021211A1UQT10	120	100	0,13	1100		
19C02221A50UQT10	220	200	0,38	500		
19C02221A70UQT10	220	250	0,25	700		

## 0603

Part Number	Impedance ( $\Omega$ )		DCR ( $\Omega$ ) Max.	I <sub>r</sub> (mA) Max.	Tolerance @100MHz	Thickness (mm)
	@100MHz	@1GHz (Min.)				
19C03121A90GQT041	120	500	0,13	900	±25%	0,8±0,15
19C031211A5DQT04	120	200	0,07	1500		
19C03151A80DQT04	150	200	0,20	800		
19C031511A5DQT04	150	200	0,07	1500		
19C03221A60DQT04	220	300	0,25	600		
19C032211A2DQT04	220	300	0,12	1200		
19C03331A90DQT041	330	380	0,15	900		
19C03391A70DQT04	390	600	0,18	700		
19C03471A70DQT042	470	550	0,22	700		
19C03601A70DQT041	600	750	0,24	700		
19C03102A60DQT04	1000	1000	0,35	600		
19C03601A80EQT04	600	500	0,25	800		
19C03102A60EQT04	1000	600	0,35	600		
19C03152A50EQT04	1500	1000	0,50	500		
19C03101A80UQT04	100	100	0,20	800		
19C031012A0UQT04	100	100	0,055	2000		
19C031212A0UQT04	120	110	0,055	2000		
19C03221A60UQT04	220	220	0,25	600		
19C03471A50UQT04	470	400	0,32	500		
19C03601A50UQT04	600	450	0,35	500		
19C03102A15UQT04	1000	750	0,90	150		

# FrelTec Multilayer Chip Ferrite Bead

## SMD 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:

- Ambient Temperature:  $20 \pm 15^\circ\text{C}$
- Relative Humidity:  $65 \pm 20\%$
- Air Pressure: 86kPa to 106kPa

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

- Ambient Temperature:  $20 \pm 2^\circ\text{C}$
- Relative Humidity:  $65 \pm 5\%$
- Air Pressure: 86kPa to 106kPa

### 2 Visual Examination

- Inspection Equipment: 20x magnifier

### 3 Electrical Test

#### 3.1 DC Resistance (DCR)

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

#### 3.2 Inductance (L)

- Refer to tabel above.
- Test equipment: High Accuracy RF Impedance /Material Analyzer-E4991A or equivalent.

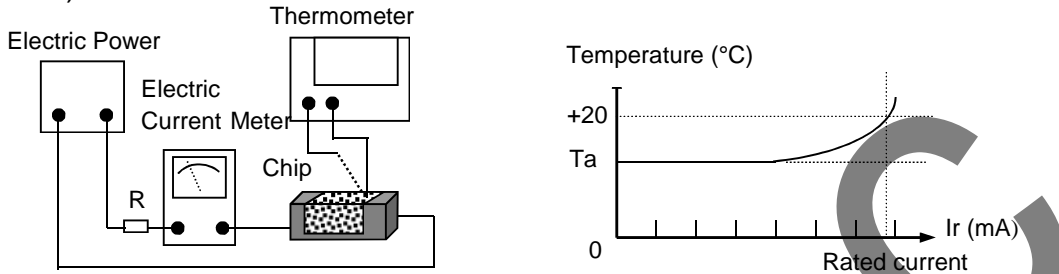
Test fixture: HP16192A

- Test signal: -20dBm or 50mV.
- Test frequency refers to tabel above.

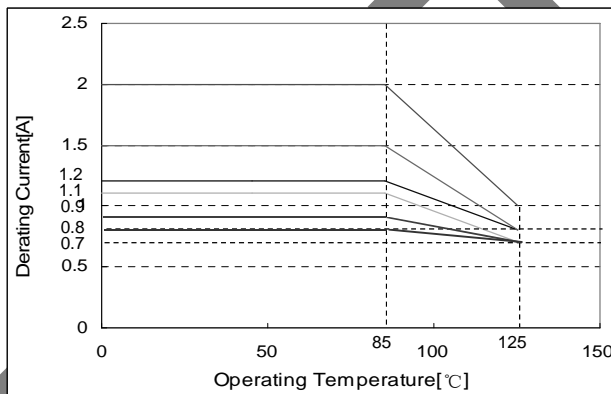
#### 3.3 Rated Current

- Refer to tabel above
- 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 ( $I_r$ ):  $I_r$  is direct electric current as chip surface temperature rose just  $20^\circ\text{C}$  against chip initial surface temperature ( $T_a$ ). (see Fig below):

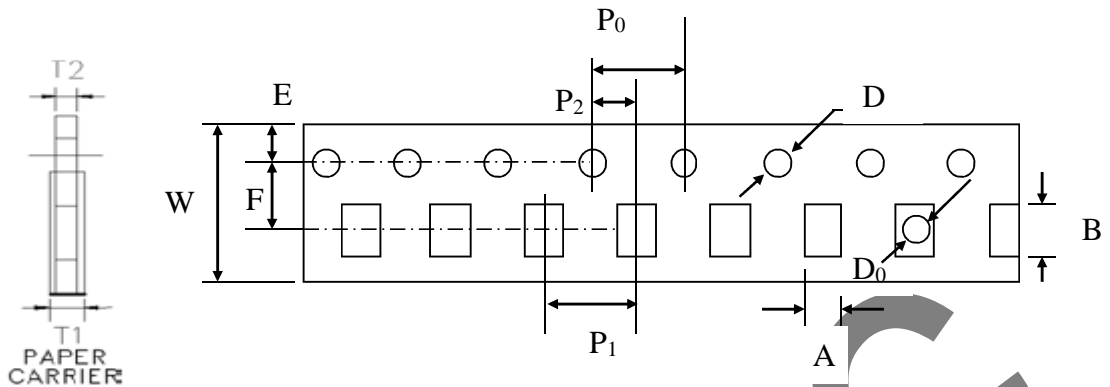


- e. In operating temperatures exceeding  $+85^\circ\text{C}$ , derating of current is necessary for chip ferrite beads for which rated current is 800mA over. Please apply the derating curve shown in chart according to the operating temperature.



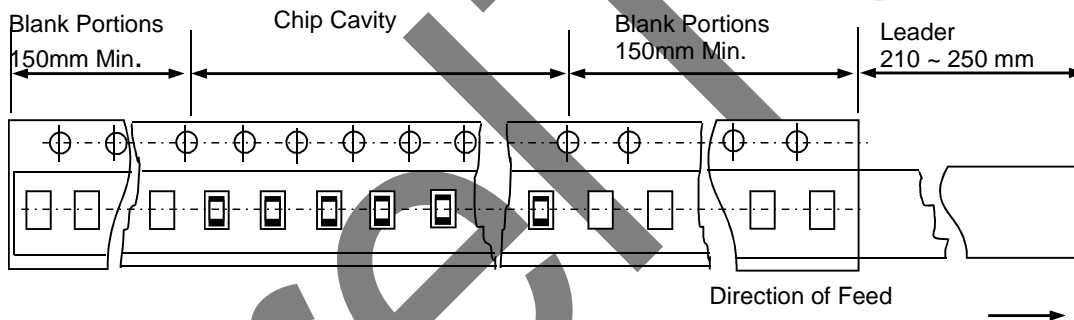
### SMD

### Tape Dimensions



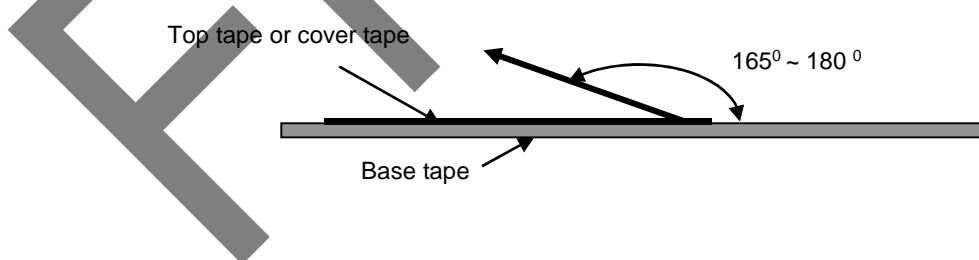
Packing	Size	A	B	W	F	E	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	D	T <sub>1</sub> (Max)
Paper Tape (T)	0402	0,65±0,1	1,15±0,1	8,0±0,3	3,5±0,05	1,75±0,1	2,0±0,05	2,0±0,05	4,0±0,1	1,50+0,1/-0	0,8
	0603	1,0±0,2	1,8±0,2	8,0±0,3	3,5±0,05	1,75±0,1	4,0±0,1	2,0±0,05	4,0±0,1	1,50+0,1/-0	1,1

### Lead Dimensions:



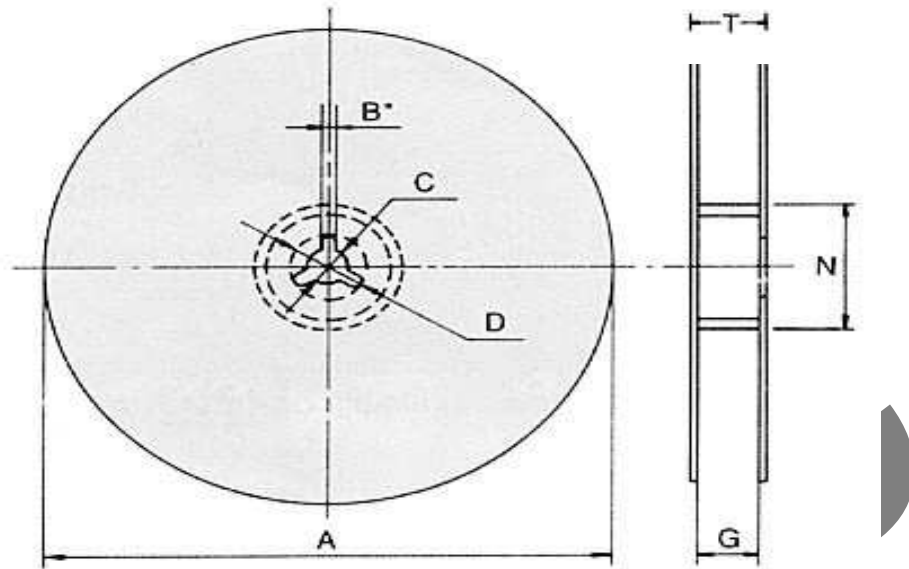
### Cover Tape Peel off Strength

Specifications: 10gf to 70gf



SMD

# FrelTec Multilayer Chip Ferrite Bead



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

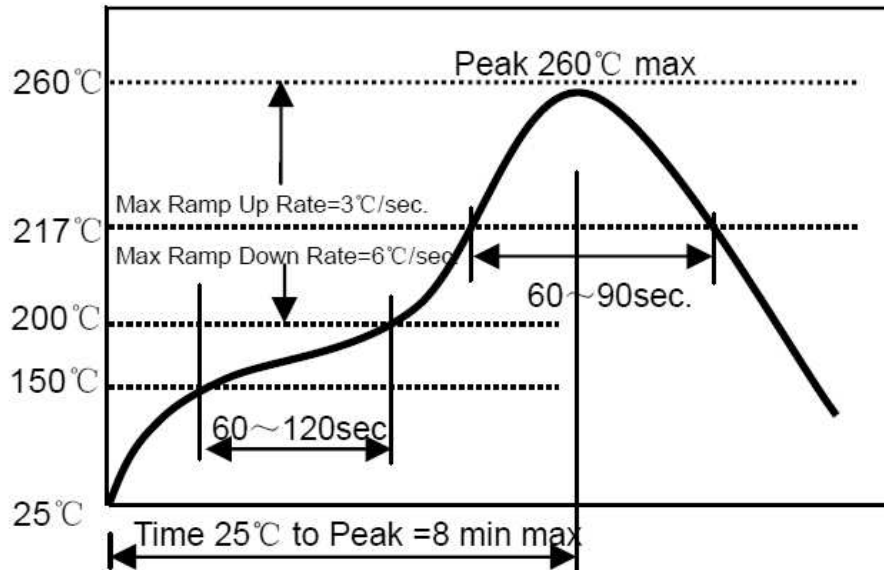
### Stock period

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. The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to dust or harmful gas (e.g. HCl, sulfurous gas of H<sub>2</sub>S). Packaging material may be deformed if packages are stored where they are exposed to heat or direct sunlight.



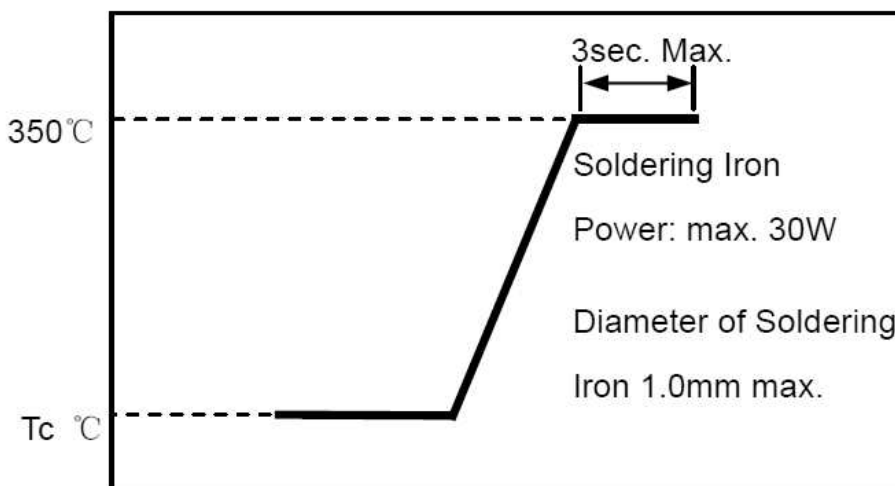
## SMD

## Lead Free Reflow Soldering Profile

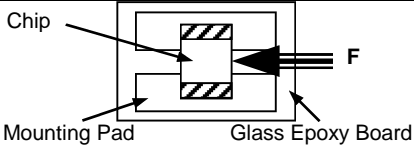
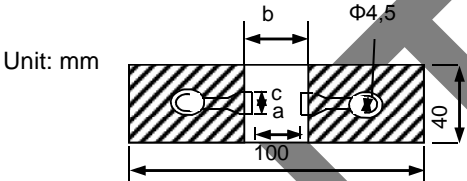
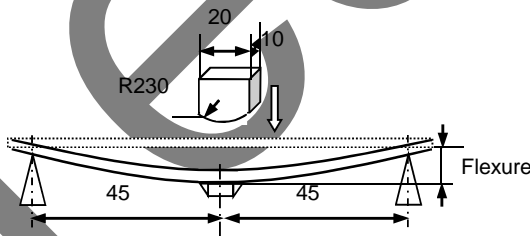
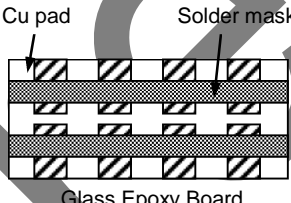


- Pre-heating: 150~200°C/60~120 sec.
- Time above 217°C: 60~90sec
- Max temp: 260°C
- Max time at max temp: 10s.
- Solder paste: Sn/3,0Ag/0,5Cu
- Max.2 times for re-flowing

## 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.

Items	Requirements	Test Methods and Remarks												
Terminal Strength	No removal or split of the termination or other defects shall occur. 	<ol style="list-style-type: none"> <li>Solder the inductor to the testing jig (glass epoxy board shown using leadfree solder. Then apply a force in the direction of the arrow.</li> <li>5N force for 0402 and 0603 series 10N force.</li> <li>Keep time: 10±1s.</li> <li>Speed: 1,0mm/s.</li> </ol>												
Resistance to Flexure	No visible mechanical damage. <table border="1" data-bbox="363 674 799 790"> <thead> <tr> <th>Type</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>0402</td> <td>0,4</td> <td>1,5</td> <td>0,5</td> </tr> <tr> <td>0603</td> <td>1,0</td> <td>3,0</td> <td>1,2</td> </tr> </tbody> </table>  Unit: mm	Type	a	b	c	0402	0,4	1,5	0,5	0603	1,0	3,0	1,2	<ol style="list-style-type: none"> <li>Solder the inductor to the test jig (glass epoxy board shown) Using a eutectic solder. Then apply a force in the direction shown.</li> <li>Flexure: 2mm.</li> <li>Pressurizing Speed: 0,5mm/sec.</li> <li>Keep time: 30 sec.</li> </ol> 
Type	a	b	c											
0402	0,4	1,5	0,5											
0603	1,0	3,0	1,2											
Vibration	<ol style="list-style-type: none"> <li>No visible mechanical damage.</li> <li>Inductance change: Within ±20%</li> </ol> 	<ol style="list-style-type: none"> <li>Solder the inductor to the testing jig (glass epoxy board shown) using eutectic solder.</li> <li>The bead 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.</li> <li>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).</li> </ol>												
Dropping	<ol style="list-style-type: none"> <li>No visible mechanical damage.</li> <li>Inductance change: Within ±20%.</li> </ol>	Drop chip bead 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	<ol style="list-style-type: none"> <li>No visible mechanical damage.</li> <li>Wetting shall exceed 95% coverage</li> </ol>	<ol style="list-style-type: none"> <li>Solder temperature: 240±2°C</li> <li>Duration: 3sec.</li> <li>Solder: Sn/3,0Ag/0,5Cu.</li> <li>Flux: 25% Resin and 75% ethanol in weight.</li> </ol>												

Resistance to Soldering Heat	<ul style="list-style-type: none"> <li>① No visible mechanical damage.</li> <li>② Wetting shall exceed 95% coverage</li> <li>③ Impedance change: Within <math>\pm 20\%</math>.</li> </ul>	<ul style="list-style-type: none"> <li>① Solder temperature: <math>260 \pm 3^\circ\text{C}</math>.</li> <li>② Duration: 5sec.</li> <li>③ Solder: Sn/3,0Ag/0,5Cu.</li> <li>④ Flux: 25% Resin and 75% ethanol in weight.</li> <li>⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.</li> </ul>
Thermal Shock	<ul style="list-style-type: none"> <li>① No mechanical damage.</li> <li>② Inductance change: Within <math>\pm 20\%</math>.</li> </ul> <div style="text-align: center; margin-top: 10px;"> <p>The graph shows a square wave for ambient temperature. It starts at a baseline, rises to 125°C, stays there for 30 minutes, drops to -55°C, stays there for 30 minutes, and returns to the baseline. The transition times between 125°C and -55°C are labeled as 20sec. (max.).</p> </div>	<ul style="list-style-type: none"> <li>① Temperature, Time: -55°C for <math>30 \pm 3</math> min → 125°C for <math>30 \pm 3</math> min.</li> <li>② Transforming interval: 20 sec. (max.).</li> <li>③ Tested cycle: 100 cycles.</li> <li>④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.</li> </ul>
Resistance to Low Temperature	<ul style="list-style-type: none"> <li><input type="checkbox"/> No mechanical damage.</li> <li>② Inductance change: Within <math>\pm 20\%</math>.</li> </ul>	<ul style="list-style-type: none"> <li>① Temperature: <math>-55 \pm 2^\circ\text{C}</math></li> <li>② Duration: <math>1000^{+24}</math> hours.</li> <li>③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.</li> </ul>
Resistance to High Temperature	<ul style="list-style-type: none"> <li><input type="checkbox"/> No mechanical damage.</li> <li>② Inductance change: Within <math>\pm 20\%</math>.</li> </ul>	<ul style="list-style-type: none"> <li>① Temperature: <math>125 \pm 2^\circ\text{C}</math></li> <li>② Duration: <math>1000^{+24}</math> hours.</li> <li>③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.</li> </ul>
Damp Heat (Steady States)	<ul style="list-style-type: none"> <li>① No visible mechanical damage.</li> <li>② Inductance change: Within <math>\pm 20\%</math>.</li> </ul>	<ul style="list-style-type: none"> <li>① Temperature: <math>60 \pm 2^\circ\text{C}</math></li> <li>② Humidity: 90% to 95% RH.</li> <li>③ Duration: <math>1000^{+24}</math> hours.</li> <li>④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.</li> </ul>
Loading Under Damp Heat	<ul style="list-style-type: none"> <li>① No visible mechanical damage.</li> <li>② Impedance change: within <math>\pm 20\%</math>.</li> </ul>	<ul style="list-style-type: none"> <li>① Temperature: <math>60 \pm 2^\circ\text{C}</math></li> <li>② Humidity: 90% to 95% RH.</li> <li>③ Duration: <math>1000^{+24}</math> hours.</li> <li>④ Applied current: Rated current.</li> <li>⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.</li> </ul>
Loading at High Temperature (Life Test)	<ul style="list-style-type: none"> <li>① No visible mechanical damage.</li> <li>② Impedance change: within <math>\pm 20\%</math>.</li> </ul>	<ul style="list-style-type: none"> <li>① Temperature: <math>85 \pm 2^\circ\text{C}</math></li> <li>② Duration: <math>1000^{+24}</math> hours.</li> <li>③ Applied current: Rated current.</li> <li>④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.</li> </ul>

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