

**Wire-wound Ferrite Power Inductors LBRN series  
for Telecommunications Infrastructure and Industrial Equipment**  
**Wire-wound Ferrite Power Inductors LMRN series  
for Medical Devices classified as GHTF Class C (Japan Class III)**

■ RELIABILITY DATA

1. Operating Temperature Range

Specified Value       $-40\sim +125^{\circ}\text{C}$  (Including self-generated heat)

Test Methods and Remarks      Including self-generated heat

2. Storage Temperature Range

Specified Value       $-40\sim +85^{\circ}\text{C}$

Test Methods and Remarks       $-5$  to  $40^{\circ}\text{C}$  for the product with taping.

3. Rated current

Specified Value      Within the specified tolerance

4. Inductance

Specified Value      Within the specified tolerance

Test Methods and Remarks      Measuring equipment      : LCR Meter (HP 4285A or equivalent)  
Measuring frequency      : 100kHz, 1V

5. DC Resistance

Specified Value      Within the specified tolerance

Test Methods and Remarks      Measuring equipment      : DC ohmmeter (HIOKI 3227 or equivalent)

6. Self resonance frequency

Specified Value      —

7. Temperature characteristic

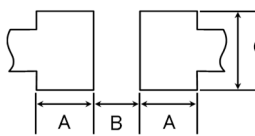
Specified Value      Inductance change : Within  $\pm 15\%$

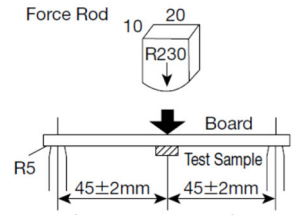
Test Methods and Remarks      Measurement of inductance shall be taken at temperature range within  $-40^{\circ}\text{C}\sim +125^{\circ}\text{C}$ .  
With reference to inductance value at  $+20^{\circ}\text{C}$ ., change rate shall be calculated.  
Change of maximum inductance deviation in step 1 to 5

Step	Temperature ( $^{\circ}\text{C}$ )
1	20
2	Minimum operating temperature
3	20 (Standard temperature)
4	Maximum operating temperature
5	20

► This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification.  
For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>).

**8. Resistance to flexure of substrate**

Specified Value	No damage														
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. As illustrated below, apply force in the direction of the arrow indicating until deflection of the test board reaches to 2 mm.														
	Test board size	: 100 × 40 × 1.0													
	Test board material	: glass epoxy-resin													
	Solder cream thickness	: 0.15 mm													
	Land dimension	<table border="1" style="display: inline-table;"> <thead> <tr> <th>Type</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>101</td> <td>2.5</td> <td>5.6</td> <td>3.2</td> </tr> <tr> <td>125</td> <td>2.5</td> <td>8.6</td> <td>3.2</td> </tr> </tbody> </table>		Type	A	B	C	101	2.5	5.6	3.2	125	2.5	8.6	3.2
Type	A	B	C												
101	2.5	5.6	3.2												
125	2.5	8.6	3.2												
															



**9. Insulation resistance : between wires**

Specified Value	—
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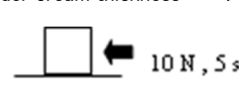
**10. Insulation resistance : between wire and core**

Specified Value	—
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**11. Withstanding voltage : between wire and core**

Specified Value	—
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**12. Adhesion of terminal electrode**

Specified Value	Shall not come off PC board
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow.
	Applied force : 10N to X and Y directions. Duration : 5s. Solder cream thickness : 0.15mm
	

**13. Resistance to vibration**

Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.						
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow.						
	Then it shall be submitted to below test conditions.						
	<table border="1" style="display: inline-table;"> <tr> <td>Frequency Range</td> <td>10~55Hz</td> </tr> <tr> <td>Total Amplitude</td> <td>1.5mm (May not exceed acceleration 196m/s<sup>2</sup>)</td> </tr> <tr> <td>Sweeping Method</td> <td>10Hz to 55Hz to 10Hz for 1min.</td> </tr> </table>	Frequency Range	10~55Hz	Total Amplitude	1.5mm (May not exceed acceleration 196m/s <sup>2</sup> )	Sweeping Method	10Hz to 55Hz to 10Hz for 1min.
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	Total Amplitude	1.5mm (May not exceed acceleration 196m/s <sup>2</sup> )					
Sweeping Method	10Hz to 55Hz to 10Hz for 1min.						
<table border="1" style="display: inline-table;"> <tr> <td rowspan="3">Time</td> <td>X</td> <td rowspan="3">For 2 hours on each X, Y, and Z axis.</td> </tr> <tr> <td>Y</td> </tr> <tr> <td>Z</td> </tr> </table>	Time	X	For 2 hours on each X, Y, and Z axis.	Y	Z		
Time		X		For 2 hours on each X, Y, and Z axis.			
		Y					
	Z						
Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.							

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#### 14. Solderability

Specified Value	At least 90% of surface of terminal electrode is covered by new solder.				
Test Methods and Remarks	<p>The test samples shall be dipped in flux, and then immersed in molten solder as shown in below table. Flux : Ethanol solution containing rosin 25%.</p> <table border="1"> <tr> <td>Solder Temperature</td> <td>245±5°C</td> </tr> <tr> <td>Time</td> <td>5±1.0 sec.</td> </tr> </table> <p>※Immersion depth : All sides of mounting terminal shall be immersed.</p>	Solder Temperature	245±5°C	Time	5±1.0 sec.
Solder Temperature	245±5°C				
Time	5±1.0 sec.				

#### 15. Resistance to soldering heat

Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.
Test Methods and Remarks	<p>The test sample shall be exposed to reflow oven at 230±5°C for 40 seconds, with peak temperature at 260±5°C for 5 seconds, 2 times.</p> <p>Test board material : glass epoxy-resin Test board thickness : 1.0mm Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.</p>

#### 16. Thermal shock

Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.																		
Test Methods and Remarks	<p>The test samples shall be soldered to the test board by the reflow. The test samples shall be placed at specified temperature for specified time by step 1 to step 4 as shown in below table in sequence. The temperature cycle shall be repeated 100 cycles.</p> <table border="1"> <thead> <tr> <th colspan="3">Conditions of 1 cycle</th> </tr> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Duration (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40±3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>Within 3</td> </tr> <tr> <td>3</td> <td>+85±2</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>Within 3</td> </tr> </tbody> </table> <p>Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.</p>	Conditions of 1 cycle			Step	Temperature (°C)	Duration (min)	1	-40±3	30±3	2	Room temperature	Within 3	3	+85±2	30±3	4	Room temperature	Within 3
Conditions of 1 cycle																			
Step	Temperature (°C)	Duration (min)																	
1	-40±3	30±3																	
2	Room temperature	Within 3																	
3	+85±2	30±3																	
4	Room temperature	Within 3																	

#### 17. Damp heat

Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.						
Test Methods and Remarks	<p>The test samples shall be soldered to the test board by the reflow. The test samples shall be placed in thermostatic oven set at specified temperature and humidity as shown in below table.</p> <table border="1"> <tr> <td>Temperature</td> <td>60±2°C</td> </tr> <tr> <td>Humidity</td> <td>90~95%RH</td> </tr> <tr> <td>Time</td> <td>500+24/-0 hour</td> </tr> </table> <p>Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.</p>	Temperature	60±2°C	Humidity	90~95%RH	Time	500+24/-0 hour
Temperature	60±2°C						
Humidity	90~95%RH						
Time	500+24/-0 hour						

#### 18. Loading under damp heat

Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.								
Test Methods and Remarks	<p>The test samples shall be soldered to the test board by the reflow. The test samples shall be placed in thermostatic oven set at specified temperature and humidity and applied the rated current continuously as shown in below table.</p> <table border="1"> <tr> <td>Temperature</td> <td>60±2°C</td> </tr> <tr> <td>Humidity</td> <td>90~95%RH</td> </tr> <tr> <td>Applied current</td> <td>Rated current</td> </tr> <tr> <td>Time</td> <td>500+24/-0 hour</td> </tr> </table> <p>Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.</p>	Temperature	60±2°C	Humidity	90~95%RH	Applied current	Rated current	Time	500+24/-0 hour
Temperature	60±2°C								
Humidity	90~95%RH								
Applied current	Rated current								
Time	500+24/-0 hour								

**19. Low temperature life test**

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.				
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. After that, the test samples shall be placed at test conditions as shown in below table. <table border="1" style="margin-left: 20px;"> <tr> <td>Temperature</td> <td><math>-40 \pm 2^\circ\text{C}</math></td> </tr> <tr> <td>Time</td> <td>500+24/-0 hour</td> </tr> </table> Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.	Temperature	$-40 \pm 2^\circ\text{C}$	Time	500+24/-0 hour
Temperature	$-40 \pm 2^\circ\text{C}$				
Time	500+24/-0 hour				

**20. High temperature life test**

Specified Value	—
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**21. Loading at high temperature life test**

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.						
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow soldering. <table border="1" style="margin-left: 20px;"> <tr> <td>Temperature</td> <td><math>85 \pm 2^\circ\text{C}</math></td> </tr> <tr> <td>Applied current</td> <td>Rated current</td> </tr> <tr> <td>Time</td> <td>500+24/-0 hour</td> </tr> </table> Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.	Temperature	$85 \pm 2^\circ\text{C}$	Applied current	Rated current	Time	500+24/-0 hour
Temperature	$85 \pm 2^\circ\text{C}$						
Applied current	Rated current						
Time	500+24/-0 hour						

**22. Standard condition**

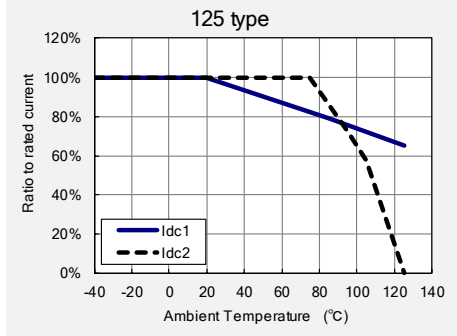
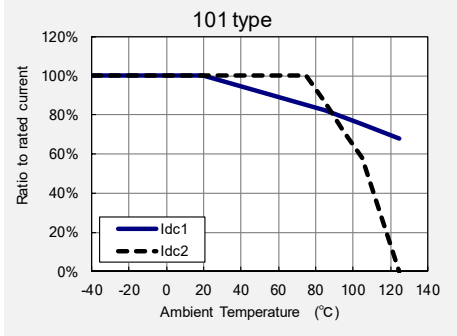
Specified Value	Standard test condition : Unless otherwise specified, temperature is $20 \pm 15^\circ\text{C}$ and $65 \pm 20\%$ of relative humidity. When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of $20 \pm 2^\circ\text{C}$ of temperature, $65 \pm 5\%$ relative humidity. Inductance is in accordance with our measured value.
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Derating of Rated Current

LBRN/LMRN series

Derating of current is necessary for LBRN/LMRN series depending on ambient temperature. Please refer to the chart shown below for appropriate derating of current.

LBRN series



LMRN series

