

# Wire-wound Ferrite Bead Inductors for Power Lines LAMG series for Automotive Powertrain and Safety

## ■ RELIABILITY DATA

### 1. Operating Temperature Range

Specified Value       $-40^{\circ}\text{C} \sim +150^{\circ}\text{C}$  (Including self-generated heat)

Test Methods and Remarks      Including self-generated heat

### 2. Storage Temperature Range

Specified Value       $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$

Test Methods and Remarks      \*Note:  $-5$  to  $+40^{\circ}\text{C}$  in taped packaging

### 3. Impedance

Specified Value      Within the specified range

Test Methods and Remarks      Measuring equipment : Impedance analyzer (E4991) or its equivalent  
Measuring frequency :  $100 \pm 1$  MHz

### 4. DC Resistance

Specified Value      Within the specified range

Test Methods and Remarks      Four-terminal method  
Measuring equipment : Milliohm High-Tester 3226 (Hioki Denki) or its equivalent

### 5. Rated Current

Specified Value      Within the specified range

### 6. Vibration

Specified Value      Appearance : No significant abnormality  
Impedance change : Within  $\pm 30\%$  of the initial value

Test Methods and Remarks      AEC-Q200 Test No.14 qualified (MIL-STD-202 Method 204)  
The test samples shall be soldered to the test board by the reflow.  
Then it shall be submitted to below test conditions.

Frequency Range	10~2000Hz	
Total Amplitude	5G	
Sweeping Method	10Hz to 2000Hz to 10Hz for 20min.	
Number of cycle	X	For 12 cycles on each X, Y, and Z axis.
	Y	
	Z	

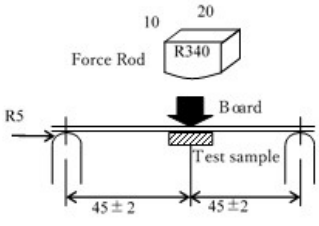
### 7. Mechanical Shock

Specified Value      Appearance : No significant abnormality  
Impedance change : Within  $\pm 30\%$  of the initial value

Test Methods and Remarks      AEC-Q200 Test No.13qualified (MIL-STD-202 Method213)  
The test samples shall be soldered to the test board by the reflow.  
Then it shall be submitted to below test conditions.

Acceleration	981m/s <sup>2</sup>
Duration	6msec(Half sine pulse)
Direction	+X, +Y, +Z, -X, -Y, -Z
Number of time	Each 3 times, Total 18 times

8. Solderability			
Specified Value	90% or more of immersed surface of terminal electrode shall be covered with fresh solder.		
Test Methods and Remarks	AEC-Q200 Test No.18qualified (J-STD-002)		
		(a) Method B	(c) Method D
	Preconditioning	155°C_4hrs	Steam 8hrs±15min
	Solder Temperature	235±5°C	260±5°C
	Time	5+0/-0.5 sec	30+0/-0.5 sec.
9. Resistance to Soldering Heat			
Specified Value	Appearance : No significant abnormality Impedance change : Within ±30% of the initial value		
Test Methods and Remarks	AEC-Q200 Test No.15 qualified (MIL-STD-202 Method210) Condition:K The test sample shall be exposed to reflow oven at 183°C for 90-120 seconds, with peak temperature at 250±5°C for 30±5 seconds, 3 times.		
10. Thermal Shock			
Specified Value	Appearance : No significant abnormality Impedance change : Within±50% of the initial value		
Test Methods and Remarks	AEC-Q200 Test No.04 qualified (JESD22 Method JA-104) 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 following condition.		
	1Cycle	-40±3°C/30 min⇄150±3°C/30 min	
	Number of cycle	1000 cycles	
11. Resistance to Humidity (steady state)			
Specified Value	Appearances : No significant abnormality Impedance change : Within ±50% of the initial value		
Test Methods and Remarks	AEC-Q200 Test No.07 qualified (MIL-STD-202 Method 103) 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.		
	Temperature	85±2°C	
	Humidity	85%RH	
	Time	1000+24/-0 hour	
12. High Temperature Exposure			
Specified Value	Appearances : No significant abnormality Impedance change : Within ±50% of the initial value		
Test Methods and Remarks	AEC-Q200 Test No.03 qualified (MIL-STD-202 Method 108) The test samples shall be soldered to the test board by the reflow soldering. The test samples shall be placed in thermostatic oven set at specified temperature as shown in below table.		
	Temperature	150±3°C	
	Time	1000+24/-0 hour	
13. High Temperature Loading Test			
Specified Value	Appearance No ignificant abnormality Impedance change Within ±50% of the initial value		
Test Methods and Remarks	AEC-Q200 Test No.08 qualified (MIL-PRF-27) The test samples shall be soldered to the test board by the reflow soldering. The test samples shall be placed in thermostatic oven set at specified temperature and applied the rated current continuously as shown in below table.		
	Temperature	125±3°C	
	Applied current	Rated current	
	Time	1000+24/-0 hour	

14. Bending Strength	
Specified Value	Appearance : No mechanical damage.
Test Methods and Remarks	<p>AEC-Q200 Test No.21 qualified (AEC-Q200-005)</p> <p>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 for 60 s.</p> <p>Test board size : 100 × 40 × 1.6</p> <p>Test board material : glass epoxy-resin</p> 

15. Adhesion of Electrode	
Specified Value	Impedance change : Within $\pm 30\%$ of the initial value
Test Methods and Remarks	<p>AEC-Q200 Test No.22 qualified (AEC-Q200-006)</p> <p>The test samples shall be soldered to the test board by the reflow soldering.</p> <p>Applied force : 10N</p> <p>Duration : 60 sec.</p>

Note on standard condition: "standard condition" referred to herein is defined as follows:

5 to 35°C of temperature, 45 to 85% relative humidity and 86 to 106kPa of air pressure.

When there are questions concerning measurement results:

In order to provide correlation data, the test shall be conducted under condition of  $20 \pm 2^\circ\text{C}$  of temperature, 60 to 70% relative humidity and 86 to 106kPa of air pressure. Unless otherwise specified, all the tests are conducted under the "standard condition."

## Derating of Rated Current

### LAMG series

Derating of current is necessary for LAMG series T type depending on ambient temperature. Please refer to the chart shown below for appropriate derating of current.

