

# Wire-wound Ferrite Power Inductors LAYP series for Automotive Powertrain and Safety

## RELIABILITY DATA

### 1. Operating Temperature Range

Specified Value	−55~+150°C (Including self-generated heat)
Test Methods and Remarks	Including self-generated heat

### 2. Storage Temperature Range

Specified Value	−40~+85°C
Test Methods and Remarks	−5 to 40°C for the product with taping.

### 3. Rated current

Specified Value	Within the specified tolerance
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### 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 3541 or equivalent)

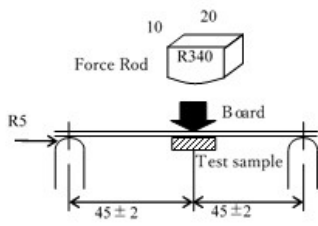
### 6. Self resonance frequency

Specified Value	—
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### 7. Temperature characteristic

Specified Value	Inductance change : Within $\pm 20\%$
Test Methods and Remarks	Measurement of inductance shall be taken at temperature range within $-55^{\circ}\text{C} \sim +150^{\circ}\text{C}$ . With reference to inductance value at $+20^{\circ}\text{C}$ ., change rate shall be calculated.

### 8. Board Flex

Specified Value	No 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 : <math>100 \times 40 \times 1.6</math></p> <p>Test board material : glass epoxy-resin</p> 

### 9. Insulation resistance : between wires

Specified Value	—
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### 10. Insulation resistance : between top side of sample and the terminal

Specified Value	DC100V 100M $\Omega$ minimum
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11. Withstanding voltage : between top side of sample and the terminal																	
Specified Value	AC100V      No break of insulation																
12. Terminal Strength																	
Specified Value	Inductance change : Within ±10%																
Test Methods and Remarks	AEC-Q200 Test No.22 qualified (AEC-Q200-006)																
	The test samples shall be soldered to the test board by the reflow soldering.																
	Applied force    : 17.7N																
	Duration            : 60 s																
13. Vibration																	
Specified Value	Inductance change : Within ±10%																
Test Methods and Remarks	No significant abnormality in appearance.																
	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.																
	<table><tr><td>Frequency Range</td><td colspan="2">10~2000Hz</td></tr><tr><td>Total Amplitude</td><td colspan="2">5G</td></tr><tr><td>Sweeping Method</td><td colspan="2">10Hz to 2000Hz to 10Hz for 20min.</td></tr><tr><td rowspan="3">Number of cycle</td><td>X</td><td rowspan="3">For 12 cycles on each X, Y, and Z axis.</td></tr><tr><td>Y</td></tr><tr><td>Z</td></tr></table>			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
	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																
14. Mechanical Shock																	
Specified Value	Inductance change : Within ±10%																
Test Methods and Remarks	No significant abnormality in appearance.																
	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.																
	<table><tr><td>Acceleration</td><td colspan="2">981m/s<sup>2</sup></td></tr><tr><td>Duration</td><td colspan="2">6msec(Half sine pulse)</td></tr><tr><td>Direction</td><td colspan="2">+X, +Y, +Z, -X, -Y, -Z</td></tr><tr><td>Number of time</td><td colspan="2">Each 3 times, Total 18 times</td></tr></table>			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			
	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																
15. Solderability																	
Specified Value	At least 90% of surface of terminal electrode is covered by new solder.																
Test Methods and Remarks	AEC-Q200 Test No.18qualified (J-STD-002)																
	<table><tr><td></td><td>(a) Method B</td><td>(c) Method D</td></tr><tr><td>Preconditioning</td><td>155°C 4hrs</td><td>Steam 8hrs±15min</td></tr><tr><td>Solder Temperature</td><td>235±5°C</td><td>260±5°C</td></tr><tr><td>Time</td><td>5+0/-0.5 sec</td><td>30+0/-0.5 sec.</td></tr></table>				(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.		
		(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.															
16. Resistance to Soldering Heat																	
Specified Value	Inductance change : Within ±10%																
Test Methods and Remarks	No significant abnormality in appearance.																
	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.																	

17. Temperature Cycling							
Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.						
Test Methods and Remarks	<p>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.</p> <table border="1"> <tr> <td>1Cycle</td><td><math>-55 \pm 3^{\circ}\text{C}/30 \text{ min} \rightleftharpoons 150 \pm 3^{\circ}\text{C}/30 \text{ min}</math></td></tr> <tr> <td>Number of cycle</td><td>1000 cycles</td></tr> </table>	1Cycle	$-55 \pm 3^{\circ}\text{C}/30 \text{ min} \rightleftharpoons 150 \pm 3^{\circ}\text{C}/30 \text{ min}$	Number of cycle	1000 cycles		
1Cycle	$-55 \pm 3^{\circ}\text{C}/30 \text{ min} \rightleftharpoons 150 \pm 3^{\circ}\text{C}/30 \text{ min}$						
Number of cycle	1000 cycles						
18. Biased Humidity							
Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.						
Test Methods and Remarks	<p>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.</p> <table border="1"> <tr> <td>Temperature</td><td><math>85 \pm 2^{\circ}\text{C}</math></td></tr> <tr> <td>Humidity</td><td>85%RH</td></tr> <tr> <td>Time</td><td>1000 + 24 / - 0 hour</td></tr> </table>	Temperature	$85 \pm 2^{\circ}\text{C}$	Humidity	85%RH	Time	1000 + 24 / - 0 hour
Temperature	$85 \pm 2^{\circ}\text{C}$						
Humidity	85%RH						
Time	1000 + 24 / - 0 hour						
19. High Temperature Exposure							
Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.						
Test Methods and Remarks	<p>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.</p> <table border="1"> <tr> <td>Temperature</td><td><math>150 \pm 3^{\circ}\text{C}</math></td></tr> <tr> <td>Time</td><td>1000 + 24 / - 0 hour</td></tr> </table>	Temperature	$150 \pm 3^{\circ}\text{C}$	Time	1000 + 24 / - 0 hour		
Temperature	$150 \pm 3^{\circ}\text{C}$						
Time	1000 + 24 / - 0 hour						
20. Operational Life							
Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.						
Test Methods and Remarks	<p>AEC-Q200 Test No.08 qualified (MIL-PRF-27) The test samples shall be soldered to the test board by the reflow soldering.</p> <table border="1"> <tr> <td>Temperature</td><td><math>125 \pm 3^{\circ}\text{C}</math></td></tr> <tr> <td>Applied current</td><td>Rated current</td></tr> <tr> <td>Time</td><td>1000 + 24 / - 0 hour</td></tr> </table>	Temperature	$125 \pm 3^{\circ}\text{C}$	Applied current	Rated current	Time	1000 + 24 / - 0 hour
Temperature	$125 \pm 3^{\circ}\text{C}$						
Applied current	Rated current						
Time	1000 + 24 / - 0 hour						
21. Standard condition							
Specified Value	<p>Standard test condition : Unless otherwise specified, temperature is <math>20 \pm 15^{\circ}\text{C}</math> and <math>65 \pm 20\%</math> of relative humidity. When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of <math>20 \pm 2^{\circ}\text{C}</math> of temperature, <math>65 \pm 5\%</math> relative humidity. Inductance is in accordance with our measured value.</p>						

● LAYP series

Derating of current is necessary for LAYP series depending on ambient temperature.

Please refer to the chart shown below for appropriate derating of current.

