

Notice for TAIYO YUDEN Products

Please read this notice before using the TAIYO YUDEN products.



REMINDERS

■ Product Information in this Catalog

Product information in this catalog is as of October 2021. All of the contents specified herein and production status of the products listed in this catalog are subject to change without notice due to technical improvement of our products, etc. Therefore, please check for the latest information carefully before practical application or use of our products.

Please note that TAIYO YUDEN shall not be in any way responsible for any damages and defects in products or equipment incorporating our products, which are caused under the conditions other than those specified in this catalog or individual product specification sheets.

■ Approval of Product Specifications

Please contact TAIYO YUDEN for further details of product specifications as the individual product specification sheets are available. When using our products, please be sure to approve our product specifications or make a written agreement on the product specification with TAIYO YUDEN in advance.

■ Pre-Evaluation in the Actual Equipment and Conditions

Please conduct validation and verification of our products in actual conditions of mounting and operating environment before using our products.

■ Safety Design

When using our products for high safety and/or reliability-required equipment or circuits, please fully perform safety and/or reliability evaluation. In addition, please install (i) systems equipped with a protection circuit and a protection device and/or (ii) systems equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault for a failsafe design to ensure safety.

■ Intellectual Property Rights

Information contained in this catalog is intended to convey examples of typical performances and/or applications of our products and is not intended to make any warranty with respect to the intellectual property rights or any other related rights of TAIYO YUDEN or any third parties nor grant any license under such rights.

■ Limited Warranty

Please note that the scope of warranty for our products is limited to the delivered our products themselves conforming to the product specifications specified in the individual product specification sheets, and TAIYO YUDEN shall not be in any way responsible for any damages resulting from a failure or defect in our products. Notwithstanding the foregoing, if there is a written agreement (e.g., supply and purchase agreement, quality assurance agreement) signed by TAIYO YUDEN and your company, TAIYO YUDEN will warrant our products in accordance with such agreement, provided, however, that our products shall be used for general-purpose and standard use in the equipment specified in this catalog or the individual product specification sheets.

■ TAIYO YUDEN's Official Sales Channel

The contents of this catalog are applicable to our products which are purchased from our sales offices or authorized distributors (hereinafter "TAIYO YUDEN's official sales channel"). Please note that the contents of this catalog are not applicable to our products purchased from any seller other than TAIYO YUDEN's official sales channel.

■ Caution for Export

Some of our products listed in this catalog may require specific procedures for export according to "U.S. Export Administration Regulations", "Foreign Exchange and Foreign Trade Control Law" of Japan, and other applicable regulations. Should you have any questions on this matter, please contact our sales staff.

■ Limited Application

1. Equipment Intended for Use

The products listed in this catalog are intended for general-purpose and standard use in general electronic equipment for consumer (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC) and other equipment specified in this catalog or the individual product specification sheets, or the equipment approved separately by TAIYO YUDEN.

TAIYO YUDEN has the product series intended for use in the following equipment. Therefore, when using our products for these equipment, please check available applications specified in this catalog or the individual product specification sheets and use the corresponding products.

Application	Product Series		Quality Grade ^{*3}
	Equipment ^{*1}	Category (Part Number Code ^{*2})	
Automotive	Automotive Electronic Equipment (POWERTRAIN, SAFETY)	A	1
	Automotive Electronic Equipment (BODY & CHASSIS, INFOTAINMENT)	C	2
Industrial	Telecommunications Infrastructure and Industrial Equipment	B	2
Medical	Medical Devices classified as GHTF Class C (Japan Class III)	M	2
	Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)	L	3
Consumer	General Electronic Equipment	S	3

*Notes: 1. Based on the general specifications required for electronic components for such equipment, which are recognized by TAIYO YUDEN, the use of each product series for the equipment is recommended. Please be sure to contact TAIYO YUDEN before using our products for equipment other than those covered by the product series.

2. On each of our part number, the 2nd code from the left is a code indicating the "Category" as shown in the above table. For details, please check the explanatory materials regarding the part numbering system of each of our products.

3. Each product series is assigned a "Quality Grade" from 1 to 3 in order of higher quality. Please do not incorporate a product into any equipment with a higher Quality Grade than the Quality Grade of such product without the prior written consent of TAIYO YUDEN.

2. Equipment Requiring Inquiry

Please be sure to contact TAIYO YUDEN for further information before using the products listed in this catalog for the following equipment (excluding intended equipment as specified in this catalog or the individual product specification sheets) which may cause loss of human life, bodily injury, serious property damage and/or serious public impact due to a failure or defect of the products and/or malfunction attributed thereto.

- (1) Transportation equipment (automotive powertrain control system, train control system, and ship control system, etc.)
- (2) Traffic signal equipment
- (3) Disaster prevention equipment, crime prevention equipment
- (4) Medical devices classified as GHTF Class C (Japan Class III)
- (5) Highly public information network equipment, data-processing equipment (telephone exchange, and base station, etc.)
- (6) Any other equipment requiring high levels of quality and/or reliability equal to the equipment listed above

3. Equipment Prohibited for Use

Please do not incorporate our products into the following equipment requiring extremely high levels of safety and/or reliability.

- (1) Aerospace equipment (artificial satellite, rocket, etc.)
- (2) Aviation equipment ^{*1}
- (3) Medical devices classified as GHTF Class D (Japan Class IV), implantable medical devices ^{*2}
- (4) Power generation control equipment (nuclear power, hydroelectric power, thermal power plant control system, etc.)
- (5) Undersea equipment (submarine repeating equipment, etc.)
- (6) Military equipment
- (7) Any other equipment requiring extremely high levels of safety and/or reliability equal to the equipment listed above

*Notes: 1. There is a possibility that our products can be used only for aviation equipment that does not directly affect the safe operation of aircraft (e.g., in-flight entertainment, cabin light, electric seat, cooking equipment) if such use meets requirements specified separately by TAIYO YUDEN. Please be sure to contact TAIYO YUDEN for further information before using our products for such aviation equipment.

2. Implantable medical devices contain not only internal unit which is implanted in a body, but also external unit which is connected to the internal unit.

4. Limitation of Liability

Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the products listed in this catalog for any equipment that is not intended for use by TAIYO YUDEN, or any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.

Automotive Application Guide

We classify automotive electronic equipment into the following four application categories and set usable application categories for each of our products. Therefore, we have the corresponding product series (the part number code of 2nd digit from the left side is "A" or "C"). When using our products for automotive electronic equipment, please be sure to check such application categories and use the corresponding product series accordingly. Should you have any questions on this matter, please contact us.

Product Series (Part Number Code of 2nd digit from the Left Side)	Category	Automotive Electronic Equipment (Typical Example)
A	POWERTRAIN	<ul style="list-style-type: none"> • Engine ECU (Electronically Controlled Fuel Injector) • Cruise Control Unit • 4WS (4 Wheel Steering) • Transmission • Power Steering • HEV/PHV/EV Core Control (Battery, Inverter, DC-DC) • Automotive Locator (Car location information providing device), etc.
	SAFETY	<ul style="list-style-type: none"> • ABS (Anti-Lock Brake System) • ESC (Electronic Stability Control) • Airbag • ADAS (Equipment that directly controls running, turning and stopping), etc.
C	BODY & CHASSIS	<ul style="list-style-type: none"> • Wiper • Automatic Door • Power Window • Keyless Entry System • Electric Door Mirror • Automobile Digital Mirror • Interior Lighting • Automobile Air Conditioning System • TPMS (Tire Pressure Monitoring System) • Anti-Theft Device (Immobilizer), etc.
	INFOTAINMENT	<ul style="list-style-type: none"> • Car Infotainment System • ITS/Telematics System • Instrument Cluster • ADAS (Sensor, Equipment that is not interlocked with safety equipment or powertrain) • Dashcam (genuine products for automotive manufacturer), etc.

Wire-wound Metal Power Inductors MCOIL™ LCEN series for Automotive Body & Chassis and Infotainment

Code in front of Series have been extracted from Part number, which describes the segment of products, such as kinds and characteristics.

AEC-Q200 Grade 2 (we conduct the evaluation at the test condition of Grade 2.)

*Operating environment Temp:-40~105°C

REFLOW

AEC-Q200

PART NUMBER

* Operating Temp.: -40~+125°C (Including self-generated heat)

L	C	E	N	A	2	5	2	0	M	K	T	1	R	0	M	
①	②	③	④	⑤	⑥	⑦	⑧									

① Series

Code (1)(2)(3)(4)	
LCEN	Wire-wound Metal Power Inductor for Automotive Body & Chassis and Infotainment

(1) Product Group

Code	
L	Inductors

(2) Category

Code	Recommended equipment	Quality Grade
C	Automotive Electronic Equipment (Body & Chassis, Infotainment)	2

② Features

Code	Feature
A	5-surface electrode (Ag-resin × Sn-plate)

③ Dimensions (L × W)

Code	Dimensions (L × W) [mm]
2016	2.0 × 1.6
2520	2.5 × 2.0

④ Dimensions (T)

Code	Dimensions (T) [mm]
MK	1.2

(3) Type

Code	
E	Metal Wire-wound (High filling type)

(4) Features, Characteristics

Code	
N	Standard Power choke

⑤ Packaging

Code	Packaging
T	Taping

⑥ Nominal inductance

Code (example)	Nominal inductance [μH]
R47	0.47
1R0	1.0
4R7	4.7

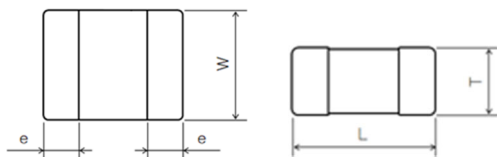
※R=Decimal point

⑦ Inductance tolerance

Code	Inductance tolerance
M	±20%

⑧ Internal code

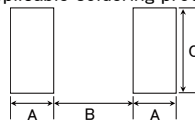
STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY



Recommended Land Patterns

Surface Mounting

- Mounting and soldering conditions should be checked beforehand.
- Applicable soldering process to these products is reflow soldering only.



Type	A	B	C
2016	0.8	0.8	1.8
2520	0.85	1.2	2.2

Unit : mm

Type	L	W	T	e	Standard quantity [pcs] Taping
2016MK	2.0±0.2 (0.079±0.008)	1.6±0.2 (0.063±0.008)	1.2 max (0.047 max)	0.5±0.2 (0.020±0.008)	3000
2520MK	2.5±0.2 (0.098±0.008)	2.0±0.2 (0.079±0.008)	1.2 max (0.047 max)	0.6±0.3 (0.020±0.012)	3000

Unit : mm (inch)

■ PART NUMBER

• All the Wire-wound Metal Power Inductors of the catalog lineup are RoHS compliant.

Notes)

- The exchange of individual specifications is necessary depending on your application and/or circuit condition. Please contact TAIYO YUDEN's official sales channel.
- For Automotive (AEC-Q200 Qualified) products for BODY & CHASSIS, and INFOTAINMENT. Please check "Automotive Application Guide" for further details before using the products.

< AEC-Q200 :AEC-Q200 qualified>

All the Wire-wound Metal Power Inductors for Automotive products are tested based on the test conditions and methods defined in AEC-Q200 by family item.

Please consult with TAIYO YUDEN's official sales channel for the details of the product specifications and AEC-Q200 test results, etc.,

and please review and approve the product specifications before ordering.

● 2016MK type 【厚み: 1.2mm max.】

New part number	Old part number (for reference)	Nominal inductance [μ H]	Inductance tolerance	Self-resonant frequency [MHz] (min.)	DC Resistance [Ω] (max.)	Rated current ※) [mA] (max.)			Measuring frequency [MHz]
						Saturation current Idc1	Temperature rise current① Idc2	Temperature rise current② Idc2	
LCENA2016MKTR24M0NK	MEMK2016TR24MGNKV	0.24	±20%	-	0.018	6,800	3,500	5,500	1
LCENA2016MKTR33M0NK	MEMK2016TR33MGNKV	0.33	±20%	-	0.022	5,400	3,000	4,900	1
LCENA2016MKTR47M0NK	MEMK2016TR47MGNKV	0.47	±20%	-	0.025	4,800	2,900	4,700	1
LCENA2016MKT1R0M0NK	MEMK2016T1R0MGNKV	1.0	±20%	-	0.045	3,100	2,000	3,200	1
LCENA2016MKT2R2M0NK	MEMK2016T2R2MGNKV	2.2	±20%	-	0.120	2,200	1,100	1,800	1

● 2520MK type 【Thickness: 1.2mm max.】

New part number	Old part number (for reference)	Nominal inductance [μ H]	Inductance tolerance	Self-resonant frequency [MHz] (min.)	DC Resistance [Ω] (max.)	Rated current ※) [mA] (max.)			Measuring frequency [MHz]
						Saturation current Idc1	Temperature rise current① Idc2	Temperature rise current② Idc2	
LCENA2520MKTR15M0NK	MEMK2520TR15MGNKV	0.15	±20%	-	0.009	10,200	4,900	6,700	1
LCENA2520MKTR33M0NK	MEMK2520TR33MGNKV	0.33	±20%	-	0.015	7,000	4,000	5,600	1
LCENA2520MKTR47M0NK	MEMK2520TR47MGNKV	0.47	±20%	-	0.020	5,900	3,700	5,000	1
LCENA2520MKT1R0M0NK	MEMK2520T1R0MGNKV	1.0	±20%	-	0.042	4,400	2,400	3,200	1
LCENA2520MKT1R5M0NK	MEMK2520T1R5MGNKV	1.5	±20%	-	0.057	3,300	2,100	2,800	1
LCENA2520MKT2R2M0NK	MEMK2520T2R2MGNKV	2.2	±20%	-	0.077	3,000	1,700	2,400	1
LCENA2520MKT3R3M0NK	MEMK2520T3R3MGNKV	3.3	±20%	-	0.131	2,300	1,300	1,800	1
LCENA2520MKT4R7M0NK	MEMK2520T4R7MGNKV	4.7	±20%	-	0.185	2,100	1,100	1,500	1

※) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)

※) The temperature rise current value (Idc2)① is the DC current value having temperature increase up to 20°C. (at 20°C)

※) The temperature rise current value (Idc2)② is the DC current value having temperature increase up to 40°C. (at 20°C)

※) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

※) Idc2 Measurement board data

Material:FR4

Board dimensions: 100 × 50 × 1.6t mm

Pattern dimensions: 43 × 59.2 mm

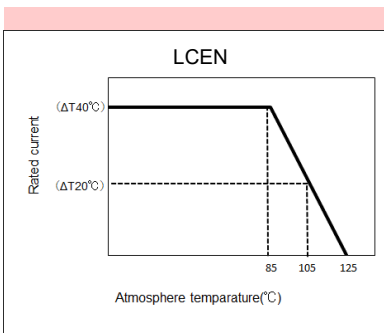
Pattern thickness: 50 μ m

■ Derating of Rated Current

● LCEN series

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

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



Wire-wound Metal Power Inductors MCOIL™ LSEN/LLEN/LCEN series

Wire-wound Metal Power Inductors MCOIL™ LSEP/LLEP series

Wire-wound Metal Power Inductors MCOIL™ LSEU/LLEU series

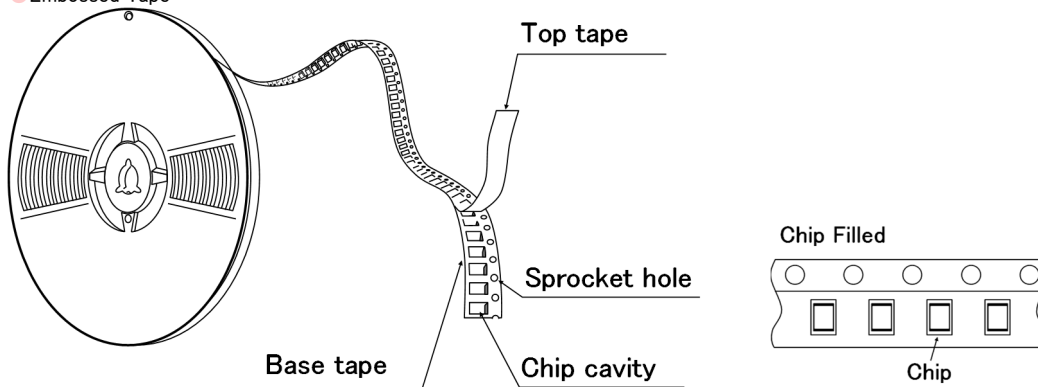
PACKAGING

① Minimum Quantity

Type	Standard Quantity [pcs]
	Tape & Reel
2012HK	3000
2012KK	3000
2016MK	3000
2016HK	3000
2016KK	3000
2520KK	3000
2520MK	3000
3225HK	3000

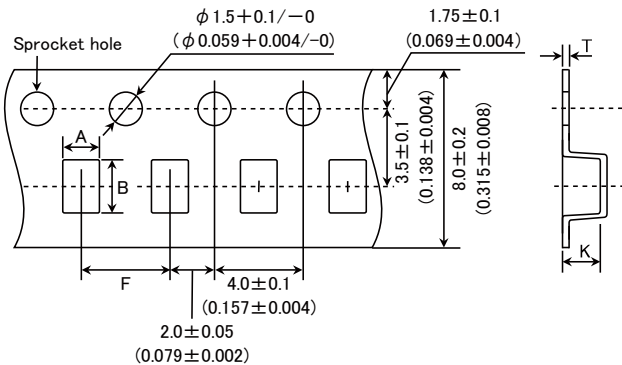
② Tape Material

● Embossed Tape



③ Taping dimensions

● Embossed tape 8mm wide (0.315 inches wide)



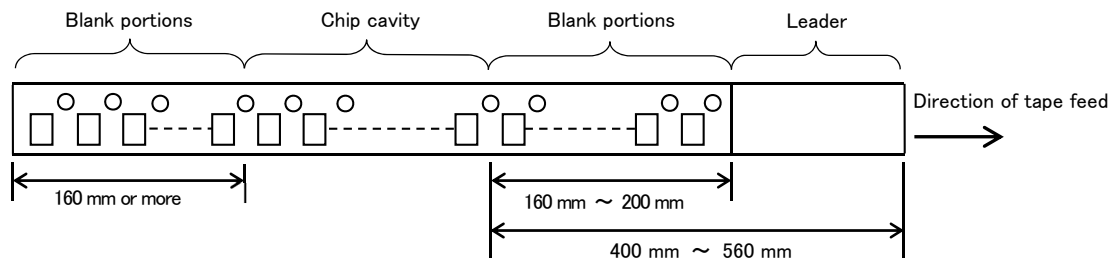
Type	Chip cavity		Insertion pitch	Tape thickness	
	A	B	F	T	K
2012HK	1.45 ± 0.1 (0.057 ± 0.004)	2.25 ± 0.1 (0.089 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.25 ± 0.05 (0.009 ± 0.002)	$0.9 + 0.15 / -0.1$ ($0.035 + 0.006 / -0.004$)
2012KK	1.45 ± 0.1 (0.057 ± 0.004)	2.25 ± 0.1 (0.089 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.25 ± 0.05 (0.009 ± 0.002)	1.1 ± 0.1 (0.043 ± 0.004)
2016MK	1.9 ± 0.1 (0.075 ± 0.004)	2.45 ± 0.1 (0.097 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.25 ± 0.05 (0.009 ± 0.002)	1.4 ± 0.1 (0.055 ± 0.004)
2016HK	1.9 ± 0.1 (0.075 ± 0.004)	2.45 ± 0.1 (0.097 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.25 ± 0.05 (0.009 ± 0.002)	1.2 ± 0.1 (0.047 ± 0.004)
2016KK	1.9 ± 0.1 (0.075 ± 0.004)	2.45 ± 0.1 (0.097 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.25 ± 0.05 (0.009 ± 0.002)	1.2 ± 0.1 (0.047 ± 0.004)

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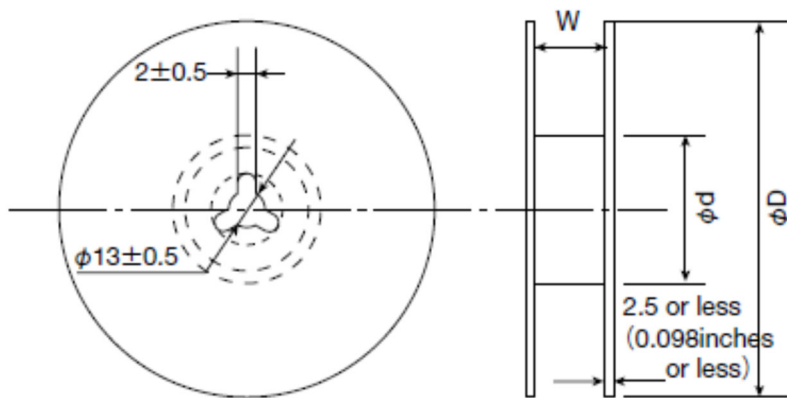
Type	Chip cavity		Insertion pitch	Tape thickness	
	A	B		T	K
2520KK	2.4±0.1 (0.094±0.004)	2.9±0.1 (0.114±0.004)	4.0±0.1 (0.157±0.004)	0.25±0.05 (0.009±0.002)	1.1±0.1 (0.043±0.004)
2520MK	2.4±0.1 (0.094±0.004)	2.9±0.1 (0.114±0.004)	4.0±0.1 (0.157±0.004)	0.25±0.05 (0.009±0.002)	1.4±0.1 (0.055±0.004)
3225HK	2.8±0.1 (0.110±0.004)	3.5±0.1 (0.138±0.004)	4.0±0.1 (0.157±0.004)	0.25±0.05 (0.009±0.002)	1.1±0.1 (0.043±0.004)

Unit: mm (inch)

④ Leader and Blank portion



⑤ Reel size

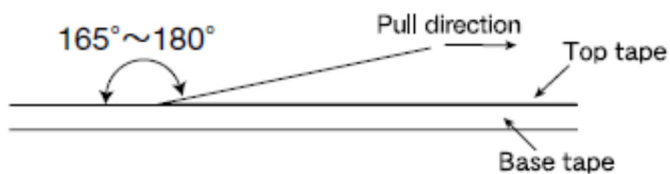


Type	Reel size (Reference values)		
	ϕD	ϕd	W
2012HK	180+0/-3 (7.087+0/-0.118)	60+1/-0 (2.36+0.039/0)	10.0±1.5 (0.394±0.059)
2012KK			
2016MK			
2016HK			
2016KK			
2520KK			
2520MK			
3225HK			

Unit: mm (inch)

⑥ Top Tape Strength

The top The top tape requires a peel-off force of 0.1 to 1.0N in the direction of the arrow as illustrated below.



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Wire-wound Metal Power Inductors MCOIL™ LCEN series for Automotive Body & Chassis and Infotainment

RELIABILITY DATA

1. Operating Temperature Range

Specified Value	-40~+125°C
Test Methods and Remarks	Including self-generated heat

2. Storage Temperature Range

Specified Value	-40~+85°C
Test Methods and Remarks	0 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 4294A or equivalent) Measuring frequency : 1MHz, 0.5V

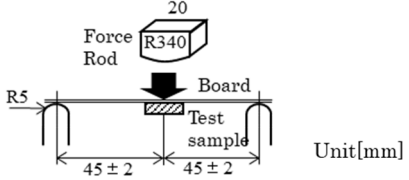
5. DC Resistance

Specified Value	Within the specified tolerance
Test Methods and Remarks	Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)

6. 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.

7. Resistance to flexure of substrate

Specified Value	No damage
Test Methods and Remarks	<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.</p> <p>Test board size : $100 \times 40 \times 1.6$ mm Test board material : Glass epoxy-resin Solder cream thickness : 0.1 mm</p>  <p style="text-align: right;">Unit[mm]</p>

8. Adhesion of terminal electrode

Specified Value	No abnormality.
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. Applied force : 17.7N Duration : 60s. Solder cream thickness : 0.10mm.

9. Resistance to vibration

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. Then it shall be submitted to below test conditions.	
	Frequency Range	10~55Hz
	Total Amplitude	1.5mm (May not exceed acceleration 196m/s ²)
	Sweeping Method	10Hz to 55Hz to 10Hz for 1min.
Time	X	For 2 hours on ach 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.		

10. Solderability

Specified Value	At least 90% of surface of terminal electrode is covered by new solder.	
Test Methods and Remarks	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%.	
	Solder Temperature	245 \pm 5 $^{\circ}$ C
	Time	5 \pm 0.5 sec.
	※Immersion depth : All sides of mounting terminal shall be immersed.	

11. Resistance to soldering heat

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.	
Test Methods and Remarks	The test sample shall be exposed to reflow oven at 230 $^{\circ}$ C for 40 seconds, with peak temperature at 260+0/-5 $^{\circ}$ C for 5 seconds, 2 times.	
	Test board material	: Glass epoxy-resin
	Test board thickness	: 1.6mm
	Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.	

12. Thermal shock

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. The test samples shall be placed at specified temperature for specified time by step 1 to step 2 as shown in below table in sequence. The temperature cycle shall be repeated 1000 cycles.		
	Conditions of 1 cycle		
	Step	Temperature ($^{\circ}$ C)	Duration (min)
	1	-40 \pm 5	30 \pm 3
	2	+125 \pm 5	30 \pm 3
Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.			

13. Damp heat

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. The test samples shall be placed in thermostatic oven set at specified temperature and humidity as shown in below table.	
	Temperature	85 \pm 2 $^{\circ}$ C
	Humidity	85 \pm 5%RH
	Time	1000 hour
Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.		

14. 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. After that, the test samples shall be placed at test conditions as shown in below table.	
	Temperature	125 \pm 2 $^{\circ}$ C
	Time	1000 hour
Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.		

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15. 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. After that, the test samples shall be placed at test conditions as shown in below table.								
	<table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Temperature</td> <td>1). $85 \pm 2^\circ\text{C}$ 2). $105 \pm 3^\circ\text{C}$</td> </tr> <tr> <td>Applied current</td> <td>1). Rated current(+40°C) 2). Rated current(+20°C)</td> </tr> <tr> <td>Time</td> <td>1000hour</td> </tr> <tr> <td></td> <td></td> </tr> </table>	Temperature	1). $85 \pm 2^\circ\text{C}$ 2). $105 \pm 3^\circ\text{C}$	Applied current	1). Rated current(+40°C) 2). Rated current(+20°C)	Time	1000hour		
	Temperature	1). $85 \pm 2^\circ\text{C}$ 2). $105 \pm 3^\circ\text{C}$							
	Applied current	1). Rated current(+40°C) 2). Rated current(+20°C)							
Time	1000hour								
Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.									

16. 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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Wire-wound Metal Power Inductors MCOIL™ LSEN/LLEN/LCEN series

Wire-wound Metal Power Inductors MCOIL™ LSEP/LLEP series

Wire-wound Metal Power Inductors MCOIL™ LSEU/LLEU series

■ PRECAUTIONS

1. Circuit Design

Precautions	<ul style="list-style-type: none"> ◆ Verification of operating environment, electrical rating and performance <ol style="list-style-type: none"> 1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications. As such, any inductors to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications. 2. When inductors are used in places where dew condensation develops and/or where corrosive gas such as hydrogen sulfide, sulfurous acid, or chlorine exists in the air, characteristic deterioration may occur. Please do not use inductors under such environmental conditions. ◆ Operating Current (Verification of Rated current) <ol style="list-style-type: none"> 1. The operating current including inrush current for inductors must always be lower than their rated values. 2. Do not apply current in excess of the rated value because the inductance may be reduced due to the magnetic saturation effect. ◆ Temperature rise <p>Temperature rise of power choke coil depends on the installation condition in end products.</p> <p>Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.</p>
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2. PCB Design

Precautions	<ul style="list-style-type: none"> ◆ Land pattern design <ol style="list-style-type: none"> 1. Please refer to a recommended land pattern.
Technical considerations	<ul style="list-style-type: none"> ◆ Land pattern design <p>Surface Mounting</p> <ul style="list-style-type: none"> • Mounting and soldering conditions should be checked beforehand. • Applicable soldering process to this products is reflow soldering only.

3. Considerations for automatic placement

Precautions	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine <ol style="list-style-type: none"> 1. Excessive impact load should not be imposed on the products when mounting onto the PC boards. 2. Mounting and soldering conditions should be checked beforehand.
Technical considerations	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine <ol style="list-style-type: none"> 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.

4. Soldering

Precautions	<ul style="list-style-type: none"> ◆ Reflow soldering <ol style="list-style-type: none"> 1. Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified. 2. The product shall be used reflow soldering only. 3. Please do not add any stress to a product until it returns in normal temperature after reflow soldering. ◆ Lead free soldering <ol style="list-style-type: none"> 1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently.
Technical considerations	<ul style="list-style-type: none"> ◆ Reflow soldering <ol style="list-style-type: none"> 1. If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products. <p>Recommended reflow condition (Pb free solder)</p>

▶ 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/>).

5. Cleaning	
Precautions	<ul style="list-style-type: none"> ◆ Cleaning conditions 1. Washing by supersonic waves shall be avoided.
Technical considerations	<ul style="list-style-type: none"> ◆ Cleaning conditions 1. If washed by supersonic waves, the products might be broken.
6. Handling	
Precautions	<ul style="list-style-type: none"> ◆ Handling 1. Keep the product away from all magnets and magnetic objects. ◆ Breakaway PC boards (splitting along perforations) 1. When splitting the PC board after mounting product, care should be taken not to give any stresses of deflection or twisting to the board. 2. Board separation should not be done manually, but by using the appropriate devices. ◆ Mechanical considerations 1. Please do not give the product any excessive mechanical shocks. 2. Please do not add any shock and power to a product in transportation. ◆ Pick-up pressure 1. Please do not push to add any pressure to a winding part. Please do not give any shock and push into a ferrite core exposure part. ◆ Packing 1. Please avoid accumulation of a packing box as much as possible.
Technical considerations	<ul style="list-style-type: none"> ◆ Handling 1. There is a case that a characteristic varies with magnetic influence. ◆ Breakaway PC boards (splitting along perforations) 1. The position of the product on PCBs shall be carefully considered to minimize the stress caused from splitting of the PCBs. ◆ Mechanical considerations 1. There is a case to be damaged by a mechanical shock. 2. There is a case to be broken by the handling in transportation. ◆ Pick-up pressure 1. Damage and a characteristic can vary with an excessive shock or stress. ◆ Packing 1. If packing boxes are accumulated, that could cause a deformation on packing tapes or a damage on the products.
7. Storage conditions	
Precautions	<ul style="list-style-type: none"> ◆ Storage 1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled. <ul style="list-style-type: none"> ▪ Recommended conditions Ambient temperature : 0~40°C Humidity : Below 70% RH ▪ The ambient temperature must be kept below 30°C. Even under ideal storage conditions, solderability of products electrodes may decrease as time passes. For this reason, product should be used within 6 months from the time of delivery. In case of storage over 6 months, solderability shall be checked before actual usage.
Technical considerations	<ul style="list-style-type: none"> ◆ Storage 1. Under a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place.