

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 March 2023. 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.

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
Application	Equipment *1	Category (Part Number Code *2)	Quality Grade 9
Automotive	Automotive Electronic Equipment (POWERTRAIN, SAFETY)	А	1
Adiomotive	Automotive Electronic Equipment (BODY & CHASSIS, INFOTAINMENT)	С	2
Industrial	Telecommunications Infrastructure and Industrial Equipment	В	2
Medical	Medical Devices classified as GHTF Class C (Japan Class III)	M	2
iviedicai	Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)	L	3
Consumer	General Electronic Equipment	S	3
Consumer	Only for Mobile Devices *4	E	4

^{*}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 4 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.

^{4.} The applications covered by this product series are limited to mobile devices (smartphone, tablet PC, smartwatch, handheld game console, etc.) among general electronic equipment for consumer. The design, specifications and operating environment, etc. differ from those of the product series for "General Electronic Equipment" (Category: S), so please check the individual product specification sheets for details. The product series for "General Electronic Equipment" (Category: S) can also be used for mobile devices.

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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.

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.

2023

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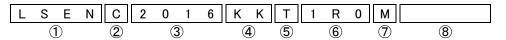
Wire-wound Metal Power Inductors MCOIL™ LSEN series for General Electronic Equipment for Consumer

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

REFLOW

■PART NUMBER

* Operating Temp.:-40 \sim +125 $^{\circ}$ C (Including self-generated heat)



(1)Series

<u>1</u> 001103	,001lc3		
Code			
(1)(2)(3)(4)			
LSFN	Wire-wound Metal Power Inductor for General Flectronic Equipment for Consumer		

(1) Product Group

	•
Code	
L	Inductors

(2) Category

Code	Recommended equipment	Quality Grade
S	General Electronic Equipment for Consumer	3

(3) Type

Code	
Е	Metal Wire-wound (High filling type)

(4) Features Characteristics

Code	
N	Standard Power choke

2Features

Code	Feature
С	Bottom electrode (Ag-resin × Sn-plate)

③Dimensions (L×W)

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

4 Dimensions (T)

©Binionolene (1)	
Code	Dimensions (T) [mm]
KK	1.0

5Packaging

Code	Packaging
Т	Taping

6 Nominal inductance

©140mmar madetanee		
Code (example)	Nominal inductance[μH]	
R47	0.47	
1R0	1.0	
4R7	4.7	

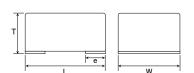
XR=Decimal point

7 Inductance tolerance

Code	Inductance tolerance
М	±20%

8 Internal code

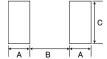
■STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY



Recommended Land Patterns

Surface Mounting

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



Type	Α	В	С
2016	0.7	8.0	1.8
2520	0.9	1.0	2.2
			Unit:mm

Туре	L	W	Т	е	Standard quantity[pcs] Taping
2016KK	2.0 ± 0.2 (0.079 ± 0.008)	1.6±0.2 (0.063±0.008)	1.0 max (0.039 max)	0.5±0.3 (0.020±0.012)	3000
2520KK	2.5±0.2 (0.098±0.008)	2.0±0.2 (0.079±0.008)	1.0 max (0.039 max)	0.65±0.3 (0.026±0.012)	3000

Unit:mm(inch)

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PART NUMBER

2016KK type		[Thickr	ess:1.0mm max.]						
	Old part number		Nominal inductance	Self-resonant		DC Resistance	Rated current ※) [mA](max.)		Measuring
New part number	(for reference)	EHS	[μ H]	Inductance tolerance	frequency [MHz] (min.)	[Ω] (max.)	Saturation current Idc1	Temperature rise current Idc2	frequency[MHz]
LSENC2016KKTR47M	MEKK2016TR47M	RoHS	0.47	±20%	ı	0.030	4,500	4,300	1
LSENC2016KKTR68M	MEKK2016TR68M	RoHS	0.68	±20%	ı	0.052	3,800	3,300	1
LSENC2016KKT1R0M	MEKK2016T1R0M	RoHS	1.0	±20%	-	0.060	3,600	3,100	1
LSENC2016KKT2R2M	MEKK2016T2R2M	R₀HS	2.2	±20%	ı	0.150	2,400	1,900	1

2520KK type		[Thickr	ess:1.0mm max.】						
	Old and another		Manada al Santa atama		Self-resonant	DO Decistores	Rated current ※) [mA](max.)		
New part number	Old part number (for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance	frequency [MHz] (min.)	DC Resistance [Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
LSENC2520KKTR33M	MEKK2520TR33M	R₀HS	0.33	±20%	-	0.022	6,400	5,100	1
LSENC2520KKTR47M	MEKK2520TR47M	RoHS	0.47	±20%	ı	0.025	5,900	4,800	1
LSENC2520KKT1R0M	MEKK2520T1R0M	RoHS	1.0	±20%	ı	0.053	4,300	3,300	1
LSENC2520KKT1R5M	MEKK2520T1R5M	RoHS	1.5	±20%	-	0.069	3,200	2,800	1
LSENC2520KKT2R2M	MEKK2520T2R2M	RoHS	2.2	±20%	-	0.097	3,100	2,400	1
L SENC2520KKT4R7M	MEKK2520T4R7M	RoHS.	4.7	+20%	_	0.240	1 600	1 500	1

- X) The temperature rise current value (Idc2) is the DC current value having temperature increase up to 40°C. (at 20°C)
 X) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.
 X) Idc2 Measurement board data

Board dimensions: $100\times50\times1.6$ t mm Pattern dimensions: 45×45 mm (Double side board) Pattern thickness: $70~\mu$ m

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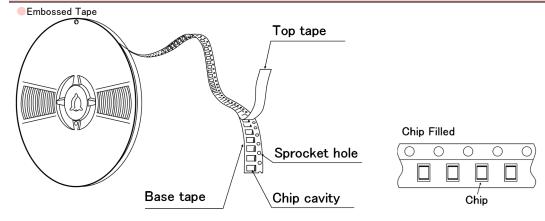
Wire-wound Metal Power Inductors MCOIL[™] LSEN/LLEN/LCEN/LBEN/LMEN series Wire-wound Metal Power Inductors MCOIL[™] LSEP/LLEP series Wire-wound Metal Power Inductors MCOIL[™] LSEU/LLEU series

PACKAGING

1 Minimum Quantity

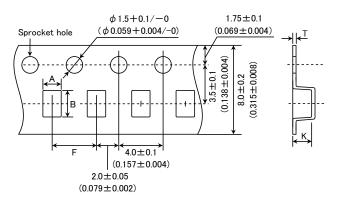
Туре	Standard Quantity [pcs]
туре	Tape & Reel
2012HK	3000
2012KK	3000
2016MK	3000
2016HK	3000
2016KK	3000
2520KK	3000
2520MK	3000
3225HK	3000

2Tape Material



③Taping dimensions

Embossed tape 8mm wide (0.315 inches wide)



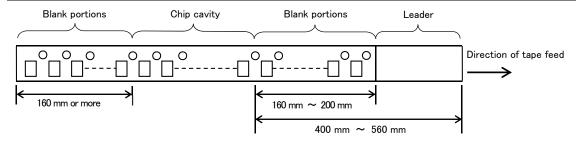
Tuna	Chip	cavity	Insertion pitch	Tape thickness	
Туре	Α	В	F	Т	К
2012HK	1.45±0.1	2.25±0.1	4.0±0.1	0.25±0.05	0.9+0.15/-0.1
2012HK	(0.057 ± 0.004)	(0.089 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.035+0.006/-0.004)
2012KK	1.45±0.1	2.25±0.1	4.0±0.1	0.25 ± 0.05	1.1±0.1
2012KK	(0.057 ± 0.004)	(0.089 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.043 ± 0.004)
2016MK	1.9±0.1	2.45±0.1	4.0±0.1	0.25 ± 0.05	1.4±0.1
2010MK	(0.075 ± 0.004)	(0.097 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.055 ± 0.004)
2016HK	1.9±0.1	2.45±0.1	4.0±0.1	0.25 ± 0.05	1.2±0.1
2010111	(0.075 ± 0.004)	(0.097 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.047 ± 0.004)
2016KK	1.9±0.1	2.45±0.1	4.0±0.1	0.25 ± 0.05	1.2±0.1
2010KK	(0.075 ± 0.004)	(0.097 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.047 ± 0.004)

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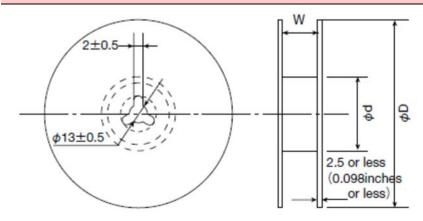
Type	Chip	cavity	Insertion pitch	Таре	thickness
туре	Α	В	F	Т	K
OFOOKK	2.4±0.1	2.9±0.1	4.0±0.1	0.25 ± 0.05	1.1±0.1
2520KK	(0.094 ± 0.004)	(0.114 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.043 ± 0.004)
2520MK	2.4±0.1	2.9±0.1	4.0±0.1	0.25±0.05	1.4±0.1
ZOZUWK	(0.094 ± 0.004)	(0.114 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.055 ± 0.004)
3225HK	2.8±0.1	3.5±0.1	4.0±0.1	0.25 ± 0.05	1.1±0.1
3225HK	(0.110 ± 0.004)	(0.138 ± 0.004)	(0.157 ± 0.004)	$(0.009 \pm 0.002$	(0.043 ± 0.004)

Unit:mm(inch)

4 Leader and Blank portion



⑤Reel size

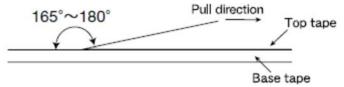


Type	Reel size (Reference values)						
туре	φD	ϕ d	W				
2012HK							
2012KK							
2016MK							
2016HK	180+0/-3	60+1/-0	10.0±1.5				
2016KK	(7.087+0/-0.118)	(2.36+0.039/0)	(0.394±0.059)				
2520KK							
2520MK							
3225HK							

Unit:mm(inch)

⑥Top 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[™] LSEN series for General Electronic Equipment for Consumer Wire-wound Metal Power Inductors MCOIL[™] LSEP series for General Electronic Equipment for Consumer Wire-wound Metal Power Inductors MCOIL[™] LLEN series

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

Wire-wound Metal Power Inductors MCOIL[™] LLEP series

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA

1. Operating Temp	erature Range
Specified Value	-40~+125°C
Test Methods	-40~+125 C
and Remarks	Including self-generated heat
2. Storage Temper	ature 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
4. Inductance	
Specified Value	Within the specified tolerance
Test Methods	Measuring equipment : LCR Meter (HP 4294A or equivalent)
and Remarks	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. Self resonance f	requency
Specified Value	_
7. Temperature ch	aracteristic
Specified Value	Inductance change: Within ±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.
8. Resistance to fle	exure of substrate
Specified Value	No damage
	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 mm Test board material : Glass epoxy-resin Force R340
Test Methods and Remarks	Solder cream thickness : 0.10 mm Rod Board Test sample 45 ± 2 45 ± 2 Unit[mm]
•	
9. Insulation resista	ance : between wires
Specified Value	_

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10. Insulation resist	ance : betv	ween wire and over-	-coating					
Specified Value	Ι –							
11. Withstanding vo	ltage : betv	ween wire and over-	-coating					
Specified Value	_							
	•							
12. Adhesion of ter	minal elect	rode						
Specified Value	No abnor	mality.						
		•		the test board by the reflow.				
Test Methods and Remarks	Applied Duration		: 10N to : 5s.	X and Y directions.				
Nomai No		cream thickness	: 0.10mm	1				
13. Resistance to v	ibration							
Specified Value	Inductan	ce change : Within :	±10%					
Specified value	No signif	icant abnormality in	appearan	ce.				
		•		the test board by the reflow.				
	I nen it s	hall be submitted to	b below te	st conditions.				
	Frequ	iency Range	10~55H	Z				
Test Methods		Amplitude		May not exceed acceleration 19	96m/s²)			
and Remarks	Swee	ping Method	X	55Hz to 10Hz for 1min.				
		Time	Y	For 2 hours on ach >	Κ, Υ, and Z axis.			
			Z					
	Recovery	y : At least 2hrs of i	recovery L	under the standard condition a	fter the test, followed by th	ne measurement within 48hrs.		
14. Solderability		000/ 5 5 5						
Specified Value		At least 90% of surface of terminal electrode is covered by new solder.						
				ux, and then immersed in molte n 25%.	en solder as shown in below	table.		
Test Methods and Remarks	Flux : Ethanol solution containing rosin 25%. Solder Temperature 245±5°C							
Remarks	Time 5±0.5 sec. **Immersion depth : All sides of mounting terminal shall be immersed.							
	XImmer:	sion depth : All side	s of moun	ting terminal shall be immersed	d.			
45.0								
15. Resistance to s			1.100/					
Specified Value		ce change : Within : icant abnormality in		ce.				
					seconds, with peak temper	rature at $260+0/-5^{\circ}$ C for 5 seconds, 2		
Test Methods	times.							
and Remarks	Test board material : Glass epoxy-resin Test board thickness : 1.6mm							
				under the standard condition at	fter the test, followed by th	ne measurement within 48hrs.		
	•							
16. Thermal shock								
Specified Value	Inductan	ce change : Within :	±10%					
opeonieu value	No signif	icant abnormality in	appearan	ce.				
		•				aced at specified temperature for specified		
	time by s		shown in b litions of	pelow table in sequence. The to 1 cycle	emperature cycle shall be r	epeated IUU cycles.		
Took Markland	Step	Temperature		Duration (min)				
Test Methods and Remarks	1	-40±3		30±3				
	2	Room tempera	ature	Within 3				
	3	+85±2		30±3				

Room temperature

Within 3

Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.

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17. Damp heat					
Specified Value	_	Inductance change : Within ±10% No significant abnormality in appearance.			
Test Methods		nall be soldered to the test nall be placed in thermosta	board by the reflow. tic oven set at specified temperature and humidity as shown in below table.		
and Remarks	Temperature	60±2°C			
and Remarks	Humidity	90~95%RH			
	Time	500+24/-0 hour			
	Recovery : At least	2hrs of recovery under the	e standard condition after the test, followed by the measurement within 48hrs.		

Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.					
Test Methods	· ·	·	t board by the reflow. tic oven set at specified temperature and humidity and applied the rated current continuously			
and Remarks	Temperature	60±2°C				
and Remarks	Humidity	90∼95%RH				
	Applied current	Rated current				
	Time	500+24/-0 hour				

19. Low temperatur	e life test		
Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.		
Test Methods	The test samples sha in below table.	all be soldered to the test b	poard by the reflow. After that, the test samples shall be placed at test conditions as shown
and Remarks	Temperature	-40±2°C	
	Time	500+24/-0 hour	
	Recovery : At least 2	2hrs of recovery under the	standard condition after the test, followed by the measurement within 48hrs.

Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.		
Test Methods	The test samples sin below table.	shall be soldered to the tes	t board by the reflow. After that, the test samples shall be placed at test conditions as shown
and Remarks	Temperature	125±2°C	
	Time	500+24/-0 hour	
	Recovery : At leas	t 2hrs of recovery under t	he standard condition after the test, followed by the measurement within 48hrs.

Specified Value	_
22. Standard condi	tion
	Standard test condition: Unless otherwise specified, temperature is 20±15°C and 65±20% of relative humidity.
Specified Value	When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of $20\pm2^{\circ}\text{C}$ of temperature, $65\pm5\%$ relative humidity.
	Inductance is in accordance with our measured value.

21. Loading at high temperature life test

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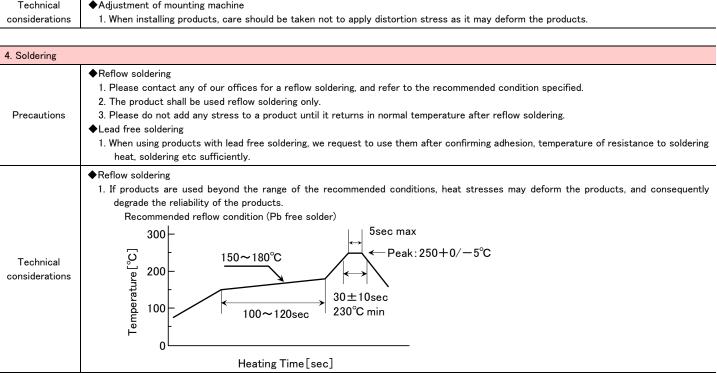
Wire-wound Metal Power Inductors MCOIL[™] LSEN/LLEN/LCEN/LBEN/LMEN series Wire-wound Metal Power Inductors MCOIL[™] LSEP/LLEP series Wire-wound Metal Power Inductors MCOIL[™] LSEU/LLEU series

PRECAUTIONS

Overification of operating environment, electrical rating and performance 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) 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 of power choke coil depends on the installation condition in end products. Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.

Precautions ◆Land pattern design 1. Please refer to a recommended land pattern.	
Technical considerations	 ◆Land pattern design Surface Mounting • Mounting and soldering conditions should be checked beforehand. • Applicable soldering process to this products is reflow soldering only.

3. Considerations for automatic placement		
Precautions	◆Adjustment of mounting machine 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	◆Adjustment of mounting machine 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.	



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5. Cleaning	
Precautions	◆Cleaning conditions 1. Washing by supersonic waves shall be avoided.
Technical considerations	◆Cleaning conditions 1. If washed by supersonic waves, the products might be broken.

6. Handling	
Precautions	 ◆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	 ◆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.

	♦Storage
Precautions	 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. Storage conditions Ambient temperature: 0~40°C Humidity: Below 70% RH The recommended ambient temperature is 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	◆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.

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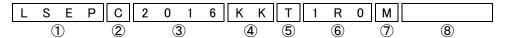
Wire-wound Metal Power Inductors MCOIL[™] LSEP series for General Electronic Equipment for Consumer

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

REFLOW

■PART NUMBER

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



①Series

Code	
(1)(2)(3)(4)	
LSFP	Wire-wound Metal Power Inductor for General Electronic Equipment for Consumer

(1) Product Group

<u> </u>	•
Code	
L	Inductors

(2) Category

Code	Recommended equipment	Quality Grade
S	General Electronic Equipment for Consumer	3

(3) Type

Code	
Е	Metal Wire-wound (High filling type)

(4) Features, Characteristics

	*
Code	
Р	High current power choke

2Features

Code	Feature
С	Bottom electrode (Ag-resin × Sn-plate)

3Dimensions (L × W)

Code	Dimensions $(L \times W)$ [mm]
2012	2.0 × 1.2
2016	2.0 × 1.6
2520	2.5 × 2.0

4 Dimensions (T)

Code	Dimensions (T) [mm]
HK	0.8
KK	1.0

5Packaging

Code	Packaging
Т	Taping

6 Nominal inductance

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

※R=Decimal point

7Inductance tolerance

O in a direction to the	
Code	Inductance tolerance
М	±20%

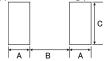
8Internal code

■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.



Туре	Α	В	С
2012	0.7	0.8	1.4
2016	0.7	8.0	1.8
2520	0.9	1.0	2.2

Unit:mm

Туре	L	W	Т	е	Standard quantity[pcs] Taping
2012HK	2.0±0.2	1.2±0.2	0.8 max	0.5±0.3	3000
20121110	(0.079 ± 0.008)	(0.047 ± 0.008)	(0.031 max)	(0.020 ± 0.012)	0000
2012KK	2.0 ± 0.2	1.2 ± 0.2	1.0 max	0.5 ± 0.3	3000
2012KK	(0.079 ± 0.008)	(0.047 ± 0.008)	(0.039 max)	(0.020 ± 0.012)	3000
2016KK	2.0±0.2	1.6±0.2	1.0 max	0.5 ± 0.3	3000
2010KK	(0.079 ± 0.008)	(0.063 ± 0.008)	(0.039 max)	(0.020 ± 0.012)	3000
2520KK	2.5±0.2	2.0±0.2	1.0 max	0.65 ± 0.3	3000
ZUZUKK	(0.098 ± 0.008)	(0.079 ± 0.008)	(0.039 max)	(0.026 ± 0.012)	3000

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Unit:mm(inch)

PART NUMBER

2012HK type			ess:0.8mm max.]						
	014		Manadara Dandara Assara		Self-resonant	DO Decisteres	Rated current	※) [mA](max.)	Managemen
New part number	Old part number (for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance	frequency [MHz] (min.)	DC Resistance [Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
LSEPC2012HKTR47M	MEHK2012HR47M	RoHS	0.47	±20%	-	0.035	4,100	3,700	1

2012KK type [Thickness: 1.0mm max.]									
	Old part number		Manainal industria		Self-resonant	DC Resistance		※) [mA](max.)	Measuring
New part number	(for reference)	EHS	[μ H]	Inductance tolerance	frequency	[Ω](max.)	Saturation current	Temperature rise current	frequency[MHz]
	(TOT TOTOTOTION)		L M I I J		[MHz] (min.)	[IL] (IIIdx.)	Idc1	Idc2	ir equerioy [iiii i2]
LSEPC2012KKTR47M	MEKK2012HR47M	RoHS	0.47	±20%	ı	0.030	4,500	4,200	1

2016KK type			ess:1.0mm max.						
	Old part number (for reference)	EHS	Manipal industria	Inductance tolerance	Self-resonant frequency [MHz] (min.)	DC Resistance [Ω](max.)		Manager	
New part number			[μ H]				Saturation current	Temperature rise current	Measuring frequency[MHz]
							Idc1	Idc2	oquooy [
SEPC2016KKTR47M	MEKK2016HR47M	RoHS	0.47	±20%	-	0.026	5,300	4,700	1
SEPC2016KKT1R0M	MEKK2016H1R0M	RoHS	1.0	±20%	-	0.048	4,000	3,500	1
SEPC2016KKT2R2M	MEKK2016H2R2M	RoHS	2.2	±20%	_	0.100	2,300	2,300	1
	- 71	New part number Old part number (for reference) SEPC2016KKTR47M MEKK2016HR47M SEPC2016KKT1R0M MEKK2016H1R0M	New part number Old part number (for reference) EHS SEPC2016KKTR47M MEKK2016HR47M RoHS SEPC2016KKT1R0M MEKK2016H1R0M RoHS	New part number Old part number (for reference) EHS Nominal inductance [μ Η] SEPC2016KKTR47M MEKK2016HR47M RoHS 0.47 SEPC2016KKT1R0M MEKK2016H1R0M RoHS 1.0	New part number (for reference) EHS Nominal inductance [μH] Inductance tolerance SEPC2016KKTR47M MEKK2016HR47M RoHS 0.47 ±20% SEPC2016KKT1R0M MEKK2016H1R0M RoHS 1.0 ±20%	New part number (for reference) EHS Nominal inductance [μ H] Inductance tolerance [MHz] (min.) Self-resonant frequency [MHz] (min.) SEPC2016KKTR47M MEKK2016HR47M RoHS 0.47 ±20% - SEPC2016KKT1R0M MEKK2016H1R0M RoHS 1.0 ±20% -	New part number $(for\ reference)$ EHS $(for\ reference)$ EHS $(for\ reference)$ $(for\ $	New part number (for reference) EHS Nominal inductance [μ H] Inductance tolerance Self-resonant frequency [MHz] (min.) EEPC2016KKTR47M MEKK2016HR47M RoHS 0.47 $\pm 20\%$ - 0.026 5.300 SEPC2016KKT1R0M MEKK2016H1R0M RoHS 1.0 $\pm 20\%$ - 0.048 4,000	New part number (for reference) EHS Nominal inductance $[\mu H]$ Inductance tolerance $[\mu H]$ SepC2016KKTR47M MEKK2016HR47M RoHS 0.47 $\pm 20\%$ - 0.026 5,300 4,700 SepC2016KKT1R0M MEKK2016H1R0M RoHS 1.0 $\pm 20\%$ - 0.048 4,000 3,500

2520KK type		Thickr	ess:1.0mm max.						
Old part number		nber Nominal inductance			Self-resonant	DC Resistance	Rated current ※) [mA](max.)		Maranitan
New part number	(for reference)	EHS	[μ H]	Inductance tolerance	frequency	[Ω](max.)	Saturation current	Temperature rise current	Measuring frequency[MHz]
	(IOI TOTOTOTIOO)		L M 113		[MHz] (min.)	[It] (max.)	Idc1	Idc2	ir equality [ivii i2]
LSEPC2520KKT1R0M	MEKK2520H1R0M	RoHS	1	±20%	ı	0.039	4,400	3,800	1

Material:FR4

Board dimensions:100 × 50 × 1.6t mm

Pattern dimensions:45 × 45 mm (Double side board)

Pattern thickness: 70 μ m

[%]) The saturation current value (ldc1) is the DC current value having inductance decrease down to 30%, (at 20°C) %) The temperature rise current value (ldc2) is the DC current value having temperature increase up to 40°C. (at 20°C)

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

^{ealse}) Idc2 Measurement board data

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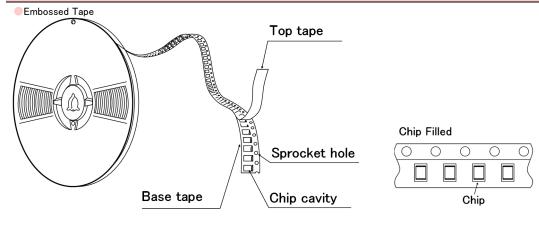
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PACKAGING

1 Minimum Quantity

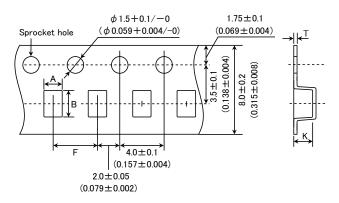
Type	Standard Quantity [pcs]
туре	Tape & Reel
2012HK	3000
2012KK	3000
2016MK	3000
2016HK	3000
2016KK	3000
2520KK	3000
2520MK	3000
3225HK	3000

2Tape Material



③Taping dimensions

Embossed tape 8mm wide (0.315 inches wide)



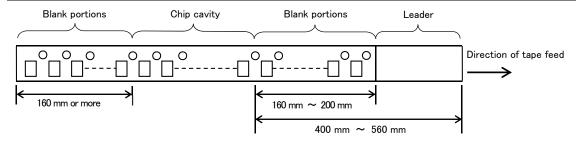
Turne	Chip o	cavity	Insertion pitch	Tape thickness	
Туре	Α	В	F	Т	K
2012HK	1.45±0.1	2.25±0.1	4.0±0.1	0.25 ± 0.05	0.9+0.15/-0.1
2012HK	(0.057 ± 0.004)	(0.089 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.035+0.006/-0.004)
2012KK	1.45±0.1	2.25±0.1	4.0±0.1	0.25 ± 0.05	1.1±0.1
2012NN	(0.057 ± 0.004)	(0.089 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.043 ± 0.004)
2016MK	1.9±0.1	2.45±0.1	4.0±0.1	0.25 ± 0.05	1.4±0.1
2010MK	(0.075 ± 0.004)	(0.097 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.055 ± 0.004)
2016HK	1.9±0.1	2.45±0.1	4.0±0.1	0.25 ± 0.05	1.2±0.1
	(0.075 ± 0.004)	(0.097 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.047 ± 0.004)
2016KK	1.9±0.1	2.45±0.1	4.0±0.1	0.25 ± 0.05	1.2±0.1
2010KK	(0.075 ± 0.004)	(0.097 ± 0.004)	(0.157±0.004)	(0.009 ± 0.002)	(0.047 ± 0.004)

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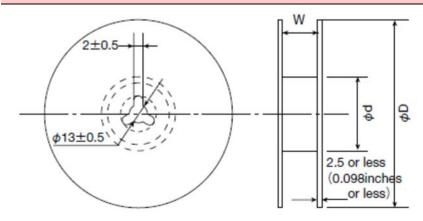
Type	Chip	cavity	Insertion pitch	Таре	thickness
Туре	Α	В	F	Т	K
DEDOVIA	2.4±0.1	2.9±0.1	4.0±0.1	0.25 ± 0.05	1.1±0.1
2520KK	(0.094 ± 0.004)	(0.114 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.043 ± 0.004)
2520MK	2.4±0.1	2.9±0.1	4.0±0.1	0.25±0.05	1.4±0.1
2520WK	(0.094 ± 0.004)	(0.114 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.055 ± 0.004)
2005111/	2.8±0.1	3.5±0.1	4.0±0.1	0.25±0.05	1.1±0.1
3225HK	(0.110 ± 0.004)	(0.138 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.043 ± 0.004)

Unit:mm(inch)

4 Leader and Blank portion



⑤Reel size

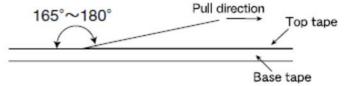


Type	Re	Reel size (Reference values)					
туре	φD	ϕ d	W				
2012HK							
2012KK							
2016MK							
2016HK	180+0/-3	60+1/-0	10.0±1.5				
2016KK	(7.087+0/-0.118)	(2.36+0.039/0)	(0.394 ± 0.059)				
2520KK							
2520MK							
3225HK							

Unit:mm(inch)

⑥Top 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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for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

Wire-wound Metal Power Inductors MCOIL[™] LLEP series

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA

1. Operating Temp	erature Range
Specified Value	-40~+125°C
Test Methods	-40~+125 C
and Remarks	Including self-generated heat
2. Storage Temper	ature 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
4. Inductance	
Specified Value	Within the specified tolerance
Test Methods	Measuring equipment : LCR Meter (HP 4294A or equivalent)
and Remarks	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. Self resonance f	requency
Specified Value	_
7. Temperature ch	aracteristic
Specified Value	Inductance change: Within ±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.
8. Resistance to fle	exure of substrate
Specified Value	No damage
	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 mm Test board material : Glass epoxy-resin Force R340
Test Methods and Remarks	Solder cream thickness : 0.10 mm Rod Board Test sample 45 ± 2 45 ± 2 Unit[mm]
•	
9. Insulation resista	ance : between wires
Specified Value	_

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10. Insulation resist	ance : betv	ween wire and over-	-coating			
Specified Value	Ι –					
11. Withstanding vo	ltage : betv	ween wire and over-	-coating			
Specified Value	_					
	•					
12. Adhesion of ter	minal elect	rode				
Specified Value	No abnor	mality.				
		•		the test board by the reflow.		
Test Methods and Remarks	Applied Duration		: 10N to : 5s.	X and Y directions.		
Nomai No		cream thickness	: 0.10mm	1		
13. Resistance to v	ibration					
Specified Value	Inductan	ce change : Within :	±10%			
Specified value	No signif	icant abnormality in	appearan	ce.		
		•		the test board by the reflow.		
	I nen it s	hall be submitted to	b below te	st conditions.		
	Frequ	iency Range	10~55H	Z		
Test Methods		Amplitude		May not exceed acceleration 19	96m/s²)	
and Remarks	Swee	ping Method	X	55Hz to 10Hz for 1min.		
		Time	Y	For 2 hours on ach >	Κ, Υ, and Z axis.	
			Z			
	Recovery	y : At least 2hrs of i	recovery L	under the standard condition a	fter the test, followed by th	ne measurement within 48hrs.
14. Solderability		000/ 5 5 5				
Specified Value				lectrode is covered by new so		
		samples shall be di nanol solution conta		ux, and then immersed in molte n 25%.	en solder as shown in below	table.
Test Methods and Remarks		Temperature	245±5			
Remarks	Time		5±0.5			
	XImmer:	sion depth : All side	s of moun	ting terminal shall be immersed	d.	
45.0						
15. Resistance to s			1.100/			
Specified Value		ce change : Within : icant abnormality in		ce.		
					seconds, with peak temper	rature at $260+0/-5^{\circ}$ C for 5 seconds, 2
Test Methods	times.					
and Remarks			lass epox .6mm	y-resin		
				under the standard condition at	fter the test, followed by th	ne measurement within 48hrs.
	•					
16. Thermal shock						
Specified Value	Inductan	ce change : Within :	±10%			
opeonieu value	No signif	icant abnormality in	appearan	ce.		
		•				aced at specified temperature for specified
	time by s		shown in b litions of	pelow table in sequence. The to 1 cycle	emperature cycle shall be r	epeated IUU cycles.
Took Markland	Step	Temperature		Duration (min)		
Test Methods and Remarks	1	-40±3		30±3		
	2	Room tempera	ature	Within 3		
	3	+85±2		30±3		

Room temperature

Within 3

Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.

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17. Damp heat						
Specified Value	_	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.				
Test Methods		nall be soldered to the test nall be placed in thermosta	board by the reflow. tic oven set at specified temperature and humidity as shown in below table.			
and Remarks	Temperature	60±2°C				
and Remarks	Humidity	90~95%RH				
	Time	500+24/-0 hour				
	Recovery : At least	2hrs of recovery under the	e standard condition after the test, followed by the measurement within 48hrs.			

Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.				
Test Methods	· ·	·	t board by the reflow. tic oven set at specified temperature and humidity and applied the rated current continuously		
and Remarks	Temperature	60±2°C			
and Remarks	Humidity	90∼95%RH			
	Applied current	Rated current			
	Time	500+24/-0 hour			

19. Low temperatur	re life test					
Specified Value	_	Inductance change : Within ±10% No significant abnormality in appearance.				
Test Methods	The test samples sha in below table.	all be soldered to the test b	poard by the reflow. After that, the test samples shall be placed at test conditions as shown			
and Remarks	Temperature	-40±2°C				
	Time	500+24/-0 hour				
	Recovery : At least 2	2hrs of recovery under the	standard condition after the test, followed by the measurement within 48hrs.			

Specified Value	Inductance change No significant abno	e: Within $\pm 10\%$ ormality in appearance.	
Test Methods	The test samples sin below table.	shall be soldered to the tes	t board by the reflow. After that, the test samples shall be placed at test conditions as shown
and Remarks	Temperature	125±2°C	
	Time	500+24/-0 hour	
	Recovery : At leas	t 2hrs of recovery under t	he standard condition after the test, followed by the measurement within 48hrs.

Specified Value	_
22. Standard condi	tion
	Standard test condition: Unless otherwise specified, temperature is 20±15°C and 65±20% of relative humidity.
Specified Value	When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of $20\pm2^{\circ}\text{C}$ of temperature, $65\pm5\%$ relative humidity.
	Inductance is in accordance with our measured value.

21. Loading at high temperature life test

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Wire-wound Metal Power Inductors MCOIL[™] LSEN/LLEN/LCEN/LBEN/LMEN series Wire-wound Metal Power Inductors MCOIL[™] LSEP/LLEP series Wire-wound Metal Power Inductors MCOIL[™] LSEU/LLEU series

PRECAUTIONS

1. Circuit Design ◆ Verification of operating environment, electrical rating and performance 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) 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 of power choke coil depends on the installation condition in end products. Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.

Precautions A Land pattern design 1. Please refer to a recommended land pattern.			
Technical considerations	 ◆Land pattern design Surface Mounting Mounting and soldering conditions should be checked beforehand. Applicable soldering process to this products is reflow soldering only. 		

3. Considerations for automatic placement					
Precautions	◆Adjustment of mounting machine 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	◆Adjustment of mounting machine 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.				

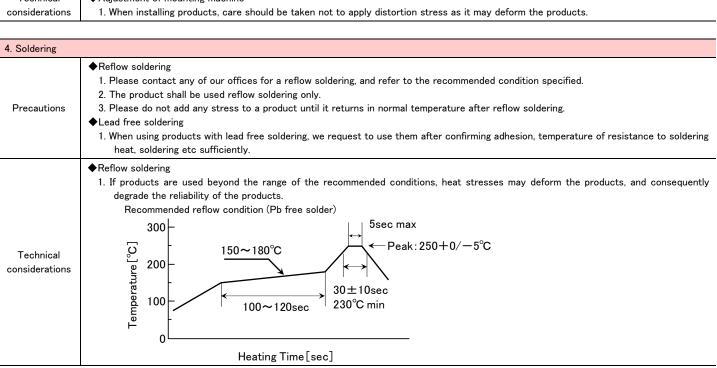


Fig. 2. This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (http://www.ty-top.com/).

5. Cleaning	5. Cleaning					
Precautions	◆Cleaning conditions 1. Washing by supersonic waves shall be avoided.					
Technical considerations	◆Cleaning conditions 1. If washed by supersonic waves, the products might be broken.					

6. Handling	
Precautions	 ✦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	 ✦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 condi	tions
Precautions	 ♦ Storage 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. Storage conditions
Technical considerations	◆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.

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Wire-wound Metal Power Inductors MCOIL[™] LSEU series for General Electronic Equipment for Consumer

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

REFLOW

■PART NUMBER

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

L	S	Е	U	С	2	0	1	6	K	K	Т	1	R	0 M	
	()		(2)		(3	3)		(2	4)	(5)		6	(7)	8

(1)Series

<u> </u>	
Code	
(1)(2)(3)(4)	
LSFII	Wire-wound Metal Power Inductor for General Electronic Equipment for Consumer

(1) Product Group

	•
Code	
L	Inductors

(2) Category

(1) 545585.						
Code	Recommended equipment	Quality Grade				
S	General Electronic Equipment for Consumer	3				

(3) Type

Code	
Е	Metal Wire-wound (High filling type)

(4) Features, Characteristics

Code	
U	High strength power choke

2Features

~	
Code	Feature
С	Bottom electrode (Ag-resin X Sn-plate)

3Dimensions (L × W)

Code	Dimensions (L × W) [mm]
2012	2.0 × 1.25
2016	2.0 × 1.6
2520	2.5 × 2.0
3225	3.2 × 2.5

4 Dimensions (T)

Code	Dimensions (T) [mm]
HK	0.8
KK	1.0

5Packaging

Code	Packaging
Т	Taping

6 Nominal inductance

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

※R=Decimal point

7 Inductance tolerance

Code	Inductance tolerance
М	±20%

8Internal code

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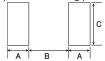
■STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY

T Fee

Recommended Land Patterns

Surface Mounting

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



Type	Α	В	С
2012	0.8	0.6	1.4
2016	0.8	0.6	1.8
2520	1.0	8.0	2.2
3225	1.1	1.3	2.7

Unit:mm

Туре	L W		Т	е	Standard quantity[pcs] Taping
2012HK	2.0±0.2 (0.079±0.008)	1.2±0.2 (0.047±0.008)	0.8 max (0.031 max)	0.6±0.3 (0.024±0.012)	3000
2012KK	2.0±0.2 (0.079±0.008)	1.2±0.2 (0.047±0.008)	1.0 max (0.039 max)	0.6±0.3 (0.024±0.012)	3000
2016HK	2.0±0.2 (0.079±0.008)	1.6±0.2 (0.063±0.008)	0.8 max (0.031 max)	0.6±0.3 (0.024±0.012)	3000
2016KK	2.0±0.2 (0.079±0.008)	1.6±0.2 (0.063±0.008)	1.0 max (0.039 max)	0.6±0.3 (0.024±0.012)	3000
2520KK	2.5±0.2 (0.098±0.008)	2.0±0.2 (0.079±0.008)	1.0 max (0.039 max)	0.8±0.3 (0.031±0.012)	3000
3225HK	3.2±0.2 (0.126±0.008)	2.5±0.2 (0.098±0.008)	0.8 max (0.031 max)	1.0±0.3 (0.039±0.012)	3000

Unit:mm(inch)

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4,300

3.000

PART NUMBER

LSEUC2012KKTR47M

LSEUC2016HKT1R0M

MEKK2012UR47M

MEHK2016U1R0M

R₀HS

RoHS

0.47

1.0

<pre>2012HK type</pre> [Thickness: 0.8mm max.]										
		Old part number		Nominal inductance		Self-resonant	DC Resistance		※) [mA](max.)	Managara
	New part number	(for reference)	EHS	[μ H]	Inductance tolerance	frequency [MHz] (min.)	[Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
	LSEUC2012HKTR47M	MEHK2012UR47M	RoHS	0.47	±20%	-	0.033	4,500	3,800	1

2012KK type [Thickness: 1.0mm max.] Self-resonant Rated current ※) [mA](max.) Measuring frequency[MHz] DC Resistance $[\Omega]$ (max.) Old part number Nominal inductance New part number EHS Inductance tolerance frequency [MHz] (min.) Saturation current Idc1 Temperature rise current Idc2 (for reference) [μ H] LSEUC2012KKTR33M MEKK2012UR33M RoHS 0.33 ±20% 0.024 5,800 4,600

±20%

±20%

●2016HK type		【Thickn	ness:0.8mm max.】						
New part number	Old part number (for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance	Self-resonant frequency [MHz] (min.)	DC Resistance [Ω](max.)		**) [mA] (max.) Temperature rise current Idc2	Measuring frequency[MHz]
L SELIC2016HKTR47M	MEHK2016LIR47M	R ₀ HS	0.47	+20%	-	0.028	4 900	4 200	1

0.027

0.050

5,000

3.200

	2016KK type		[Thickr	ess:1.0mm max.】						
Ī	New part number	Old nest susselves		Nominal inductance		Self-resonant	DC Resistance	Rated current	※) [mA](max.)	Manazurina
		Old part number (for reference)	EHS	[μ H]	Inductance tolerance	frequency [MHz] (min.)	[Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
	LSEUC2016KKTR47M	MEKK2016UR47M	RoHS	0.47	±20%	-	0.026	6,300	4,700	1
	LSEUC2016KKT1R0M	MEKK2016U1R0M	RoHS	1.0	±20%	-	0.048	4,100	3,500	1

2520KK type		[Thickr	ess:1.0mm max.】						
	Old part number		Nominal inductance [μ H]		Self-resonant frequency [MHz] (min.)	DC Resistance [Ω] (max.)	Rated current ※) [mA](max.)		Measuring
New part number	(for reference)	EHS		Inductance tolerance			Saturation current Idc1	Temperature rise current Idc2	frequency[MHz]
LSEUC2520KKT1R0M	MEKK2520U1R0M	RoHS	1.0	±20%	-	0.037	4,400	3,600	1
LSEUC2520KKT2R2M	MEKK2520U2R2M	RoHS	2.2	±20%	-	0.076	3,000	2,500	1
LSEUC2520KKT4R7M	MEKK2520U4R7M	RoHS	4.7	±20%	-	0.160	2,200	1,800	1
LSEUC2520KKT6R8M	MEKK2520U6R8M	RoHS	6.8	±20%	_	0.265	1,200	1,300	1
LSEUC2520KKT100M	MEKK2520U100M	RoHS	10	±20%	-	0.432	1,000	1,000	1

	3225HK type		Thickr	ess:0.8mm max.						
Ī		Old part number (for reference)		EHS Nominal inductance [μ H]	Inductance tolerance	Self-resonant frequency [MHz] (min.)	DC Resistance [Ω] (max.)	Rated current ※) [mA](max.)		Managara
	New part number		EHS					Saturation current	Temperature rise current	Measuring frequency[MHz]
			iloronoo)					Idc1	Idc2	oquooy [iiii iz]
	LSEUC3225HKT1R0M	MEHK3225U1R0M	RoHS	1.0	±20%	1	0.043	5,200	4,200	1
	_								_	

- $\frak{\%}$) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)
- $\begin{tabular}{ll} \ref{table} \end{tabular} \begin{tabular}{ll} \ref{table} \end{tabular} \begin{tabular}{ll} \ref{table} \begin{tabular}{ll} \ref{tabular} \begin{ta$
- 💥) 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: $100 \times 50 \times 1.6t$ mm

Pattern dimensions: $45 \times 45~\text{mm}$ (Double side board)

Pattern thickness: 70 μ m

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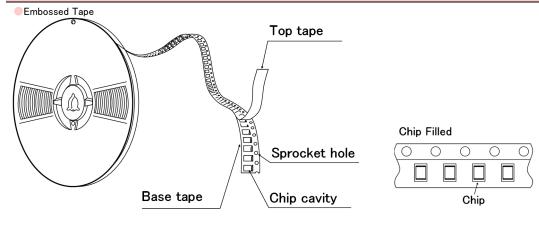
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PACKAGING

1 Minimum Quantity

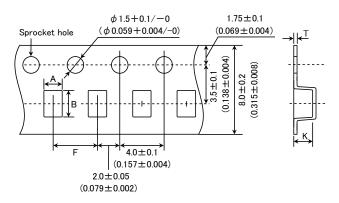
Type	Standard Quantity [pcs]
туре	Tape & Reel
2012HK	3000
2012KK	3000
2016MK	3000
2016HK	3000
2016KK	3000
2520KK	3000
2520MK	3000
3225HK	3000

2Tape Material



③Taping dimensions

Embossed tape 8mm wide (0.315 inches wide)



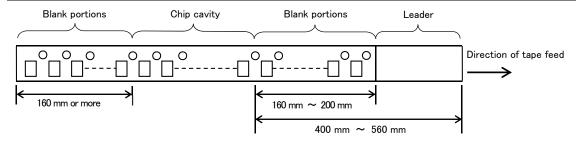
Turne	Chip o	cavity	Insertion pitch	Tape thickness	
Туре	Α	В	F	Т	K
2012HK	1.45±0.1	2.25±0.1	4.0±0.1	0.25 ± 0.05	0.9+0.15/-0.1
2012HK	(0.057 ± 0.004)	(0.089 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.035+0.006/-0.004)
2012KK	1.45±0.1	2.25±0.1	4.0±0.1	0.25 ± 0.05	1.1±0.1
2012NN	(0.057 ± 0.004)	(0.089 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.043 ± 0.004)
2016MK	1.9±0.1	2.45±0.1	4.0±0.1	0.25 ± 0.05	1.4±0.1
2010MK	(0.075 ± 0.004)	(0.097 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.055 ± 0.004)
2016HK	1.9±0.1	2.45±0.1	4.0±0.1	0.25 ± 0.05	1.2±0.1
2010HK	(0.075 ± 0.004)	(0.097 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.047 ± 0.004)
2016KK	1.9±0.1	2.45±0.1	4.0±0.1	0.25 ± 0.05	1.2±0.1
2010KK	(0.075 ± 0.004)	(0.097 ± 0.004)	(0.157±0.004)	(0.009 ± 0.002)	(0.047 ± 0.004)

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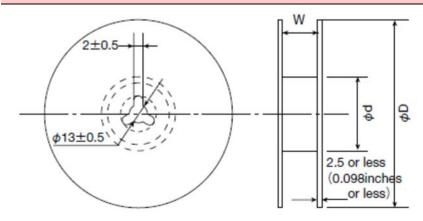
Type	Chip cavity		Insertion pitch	Tape thickness	
Туре	Α	В	F	Т	K
2520KK	2.4±0.1	2.9±0.1	4.0±0.1	0.25 ± 0.05	1.1±0.1
252UKK	(0.094 ± 0.004)	(0.114 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.043 ± 0.004)
2520MK	2.4±0.1	2.9±0.1	4.0±0.1	0.25±0.05	1.4±0.1
2520WK	(0.094 ± 0.004)	(0.114 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.055 ± 0.004)
2005111/	2.8±0.1	3.5±0.1	4.0±0.1	0.25±0.05	1.1±0.1
3225HK	(0.110 ± 0.004)	(0.138 ± 0.004)	(0.157 ± 0.004)	(0.009 ± 0.002)	(0.043 ± 0.004)

Unit:mm(inch)

4 Leader and Blank portion



⑤Reel size

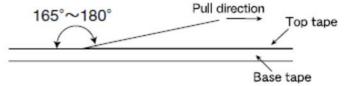


Type	Re	Reel size (Reference values)				
туре	φD	ϕ d	W			
2012HK						
2012KK						
2016MK						
2016HK	180+0/-3	60+1/-0	10.0±1.5			
2016KK	(7.087+0/-0.118)	(2.36+0.039/0)	(0.394 ± 0.059)			
2520KK						
2520MK						
3225HK						

Unit:mm(inch)

⑥Top 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[™] LSEU series for General Electronic Equipment for Consumer Wire-wound Metal Power Inductors MCOIL[™] LLEU series

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA

1. Operating Temp	erature Range
Specified Value	-40~+125°C
Test Methods and Remarks	Including self-generated heat
0 Ct T	· B
2. Storage Temper	
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
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 cha	
Specified Value	Inductance change: Within ±15%
Test Methods and Remarks	Measurement of inductance shall be taken at temperature range within −40°C ~ +125°C. With reference to inductance value at +20°C., change rate shall be calculated.
7. Resistance to fle	surves of authorizate
Specified Value	
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 mm Test board material : Glass epoxy-resin Solder cream thickness : 0.10 mm Force R340 R0 R0 R1 Test board Board Unit[mm]
	1
8. Adhesion of term	sinal alastrada

o. Adriesion of term	inai electrode		
Specified Value	No abnormality.		
	The test samples shall be s	soldered to the test board by the reflow.	
Test Methods and	Applied force	: 10N	
Remarks	Duration	: 5s.	
	Solder cream thickness	: 0.10mm	
	•		

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9. Resistance to vibration Inductance change: Within $\pm 10\%$ Specified Value No significant abnormality in appearance. The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions. 10~55Hz Frequency Range 1.5mm (May not exceed acceleration 196m/s²) Total Amplitude Test Methods and Remarks Sweeping Method 10Hz to 55Hz to 10Hz for 1min. Time For 2 hours on ach X, Y, and Z axis. 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. 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%. Test Methods and 245±5°C Solder Temperature Remarks Time 5±0.5 sec. *Immersion depth : All sides of mounting terminal shall be immersed.

11. Resistance to s	oldering heat
Specified Value	Inductance change: Within ±10% No significant abnormality in appearance.
Test Methods and Remarks	The test sample shall be exposed to reflow oven at 230°C for 40 seconds, with peak temperature at 260+0/-5°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.			
T . M .:			pelow table in sequence. The	The test samples shall be placed at specified temperature for specified temperature cycle shall be repeated 100 cycles.
Test Methods	Step	Temperature (°C)	Duration (min)	
and Remarks	1	-40±5	30±3	
	2	+85±5	30±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 ±10% No significant abnormality in appearance.		
	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.			
Test Methods	Temperature	85±2°C		
and Remarks	Humidity	85±5%RH		
	Time	500 hour		
	Recovery : At leas	t 2hrs of recovery un	der the standard condition after the test, followed by the measurement within 48hrs.	

Specified Value	Inductance change No significant abno	e : Within ±10% ormality in appearanc	ee.	
Test Methods	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.			
and Remarks	Temperature	125±2°C		
	Time	500 hour		

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Specified Value	_	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.		
	The test samples shin below table.	nall be soldered to the tes	t board by the reflow. After that, the test samples shall be placed at test conditions as show	
Test Methods	Temperature	85±2°C		
and Remarks	Applied current	Rated current		
	Time	500hour		

	Time	500hour	
	Recovery : At least	2hrs of recovery under	er the standard condition after the test, followed by the measurement within 48hrs.
	, II		
16. Standard cond	tion		
	Standard test condi	tion :	
	Unless otherwise sp	ecified, temperature is	s 20±15°C and 65±20%of relative humidity.
Specified Value	When there is any q	uestion concerning me	easurement result: In order to provide correlation data, the test shall be condition of $20\pm2^\circ\! C$ of
	temperature, 65±59	% relative humidity.	
	Inductance is in acc	ordance with our meas	sured value.

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PRECAUTIONS

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Precautions	◆Land pattern design 1. Please refer to a recommended land pattern.
Technical considerations	 ◆Land pattern design Surface Mounting Mounting and soldering conditions should be checked beforehand. Applicable soldering process to this products is reflow soldering only.

3. Considerations for automatic placement						
Precautions	◆Adjustment of mounting machine 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	◆Adjustment of mounting machine 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.					

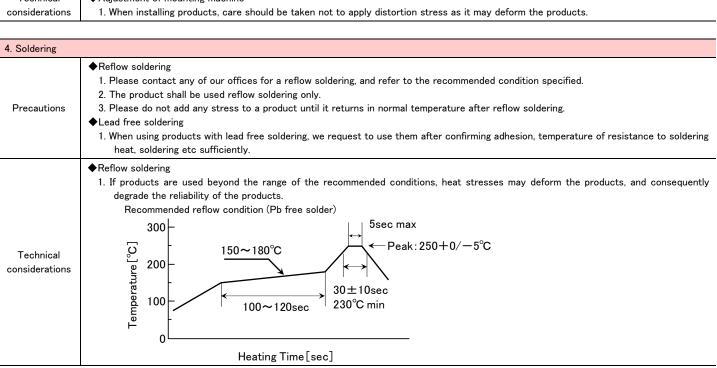


Fig. 2. This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (http://www.ty-top.com/).

5. Cleaning	
Precautions	◆Cleaning conditions 1. Washing by supersonic waves shall be avoided.
Technical considerations	◆Cleaning conditions 1. If washed by supersonic waves, the products might be broken.

6. Handling	
Precautions	 ✦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	 ✦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 condi	tions
Precautions	 ♦ Storage 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. Storage conditions
Technical considerations	◆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.

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Multilayer Metal Power Inductors MCOIL[™] LSCN series for General Electronic Equipment for Consumer

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

REFLOW

■PART NUMBER

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

L	S	С	N	Α	2	0	1	2	Н	K	Т	1	R	0	М	
	Ć)		2			3)		(2	1)	(5)		6		7	8

1)Series

<u> </u>	
Code	
(1)(2)(3)(4)	
LSCN	Multilayer Metal Power Inductor for General Electronic Equipment for Consumer

(1) Product Group

Code	
L	Inductors

(2) Category

Code	Recommended equipment	Quality Grade
S	General Electronic Equipment for Consumer	3

2Features

Code	Feature
Α	L-shape electrode
В	L-shape electrode with polarity marking
D	Bottom electrode with polarity marking
E	5-surface electrode

3Dimensions (L × W)

Code	Type (inch)	Dimensions (L×W)[mm]
1005	1005(0402)	1.0 × 0.5
1210	1210(0504)	1.25 × 1.05
1412	1412(0505)	1.4 × 1.2
1608	1608(0603)	1.6 × 0.8
2012	2012 (0805)	2.0 × 1.25
2016	2016(0806)	2.0 × 1.6

4 Thickness

Code	Thickness[mm]
EK	0.50 max
EE	0.55 max
FK	0.60 max
FE	0.65 max
HK	0.80 max
KK	1.0 max
	<u> </u>

(3)	Туре	

-	С	Metal Multilaver
	Code	

(4) Features, Characteristics

Code	,
N	Standard Power choke

(5) Packaging

Code	Packaging
Т	Taping

6 Nominal inductance

Code (example)	Nominal inductance[μH]							
R24	0.24							
R47	0.47							
1R0	1.0							

 ▼R=Decimal point | Poin

7 Inductance tolerance

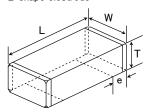
Code	Inductance tolerance
М	±20%

8Internal code

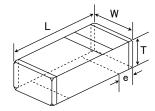
This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification.

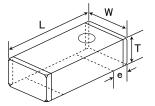
■STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY

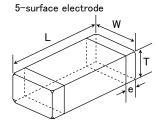
L-shape electrode



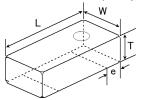
L-shape electrode with polarity marking







Bottom electrode with polarity marking



T		w	т		Standard quantity[pcs]			
Туре	L	VV	l	е	Paper tape	Embossed tape		
1005EE	1.0±0.2	0.5 ± 0.2	0.55 max	0.25±0.15	10000	_		
(0402)	(0.039 ± 0.008)	(0.020 ± 0.008)	(0.022 max)	(0.010 ± 0.006)	10000			
1210EK	1.25±0.1	1.05±0.1	0.50 max	0.30 ± 0.2	5000	_		
(0504)	(0.049 ± 0.004)	(0.041 ± 0.004)	(0.020 max)	(0.012 ± 0.008)	3000			
1412FE	1.4±0.2	1.2±0.2	0.65 max	0.50 ± 0.2	4000	_		
(0505)	(0.055 ± 0.008)	(0.047 ± 0.008)	(0.026 max)	(0.02 ± 0.008)	4000	_		
1608FK	1.6±0.2	0.8 ± 0.2	0.60 max	0.3 ± 0.2	4000	_		
(0603)	(0.063 ± 0.008)	(0.031 ± 0.008)	(0.024 max)	(0.012±0.008)	4000			
1608FE	1.6±0.2	0.8 ± 0.2	0.65 max	0.3 ± 0.2	4000	_		
(0603)	(0.063 ± 0.008)	(0.031 ± 0.008)	(0.026 max)	(0.012 ± 0.008)	4000			
1608HK	1.6±0.2	0.8 ± 0.2	0.80 max	0.4 ± 0.2	4000	_		
(0603)	(0.063 ± 0.008)	(0.031 ± 0.008)	(0.031 max)	(0.016 ± 0.008)	4000	_		
1608KK	1.6±0.2	0.8 ± 0.2	1.0 max	0.3 ± 0.2	_	3000		
(0603)	(0.063 ± 0.008)	(0.031 ± 0.008)	(0.039 max)	(0.012 ± 0.008)		3000		
2012HK	2.0±0.2	1.25±0.2	0.80 max	0.5 ± 0.3	4000	_		
(0805)	(0.079 ± 0.008)	(0.049 ± 0.008)	(0.031 max)	(0.02 ± 0.012)	4000			
2012KK	2.0±0.2	1.25±0.2	1.0 max	0.5±0.3		3000		
(0805)	(0.079 ± 0.008)	(0.049 ± 0.008)	(0.039 max)	(0.02 ± 0.012)		3000		
2016FE	2.0±0.2	1.6±0.2	0.65 max	0.5±0.3	4000			
(0806)	(0.079 ± 0.008)	(0.063 ± 0.008)	(0.026 max)	(0.02 ± 0.012)	4000	_		

Unit:mm(inch)

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■PART NUMBER

1005	type	

New part number	Old part number (for reference)												EHS	Nominal inductance		DC Resistance [mΩ]		Rated current(Idc1)	Rated current(Idc2)	Measuring frequency	Thickness [mm] (max.)
			[[[]		(max.)	(typ.)	[A] (max.)	[A] (max.)	[MHz]	Emmi (maxi)											
LSCNB1005EETR10MB	MCEE1005TR10MHN	RoHS	0.10	±20%	50	41	2.0	2.0	1	0.55											
LSCNB1005EETR22MB	MCEE1005TR22MHN	RoHS	0.22	±20%	80	65	1.6	1.6	1	0.55											
LSCNB1005EETR47MB	MCEE1005TR47MHN	RoHS	0.47	±20%	140	114	1.2	1.2	1	0.55											
LSCNB1005EET1R0MB	MCEE1005T1R0MHN	RoHS	1.0	±20%	300	244	1.0	0.8	1	0.55											

1210 type

New part number	Old part number (for reference)	EHS	Nominal inductance	Inductance tolerance	DC Resistance [mΩ]		Rated current(Idc1)	Rated current(Idc2)	Measuring frequency	Thickness
			[[[11]		(max.)	(typ.)	[A] (max.)	[A] (max.)	[MHz]	[mm] (max.)
LSCNB1210EKTR47MB	MCEK1210TR47MHN	RoHS	0.47	±20%	82	70	2.3	1.6	1	0.50
LSCNB1210EKT1R0MB	MCEK1210T1R0MHN	RoHS	1.0	±20%	179	157	1.5	1.1	1	0.50
LSCNB1210EKT1R5MB	MCEK1210T1R5MHN	RoHS	1.5	±20%	240	200	1.2	0.9	1	0.50

1412 type

New part number	Old part number (for reference)	EHS	Nominal inductance	Inductance tolerance	DC Resistance [mΩ]		Rated current(Idc1)	Rated current(Idc2)	Measuring frequency	Thickness [mm] (max.)
					(max.)	(typ.)	[A] (max.)	[A] (max.)	[MHz]	[IIIII] (IIIax.)
LSCND1412FETR33MC	MCFE1412TR33MJB	RoHS	0.33	±20%	32	29	5.0	3.7	1	0.65
LSCND1412FETR47MC	MCFE1412TR47MJB	RoHS	0.47	±20%	42	39	3.0	3.1	1	0.65

■1608 type

New part number	Old part number (for reference)	EHS	Nominal inductance	Inductance tolerance	DC Resistance $[m\Omega]$		Rated current(Idc1)	Rated current(Idc2)	Measuring frequency	Thickness [mm] (max.)
	(101 1010101100)		C 24 113		(max.)	(typ.)	[A] (max.)	[A] (max.)	[MHz]	Emmi (maxi)
LSCNA1608FKTR24MA	MCFK1608TR24M	RoHS	0.24	±20%	50	40	2.3	2.1	1	0.60
LSCNA1608FKTR47MA	MCFK1608TR47M	RoHS	0.47	±20%	85	69	1.9	1.6	1	0.60
LSCNA1608FKT1R0MA	MCFK1608T1R0M	RoHS	1.0	±20%	224	182	1.5	0.9	1	0.60
LSCNE1608FETR24MA	MCFE1608TR24MG	RoHS	0.24	±20%	100	75	2.6	1.5	1	0.65
LSCNE1608FETR47MA	MCFE1608TR47MG	RoHS	0.47	±20%	150	114	2.0	1.2	1	0.65
LSCNE1608FET1R0MA	MCFE1608T1R0MG	RoHS	1.0	±20%	340	270	1.4	0.8	1	0.65
LSCNB1608HKTR24MD	MCHK1608TR24MKN	RoHS	0.24	±20%	24	20	4.3	3.7	1	0.80
LSCNB1608HKTR47MD	MCHK1608TR47MKN	RoHS	0.47	±20%	43	38	3.3	2.7	1	0.80
LSCNB1608HKTR56MD	MCHK1608TR56MKN	RoHS	0.56	±20%	55	45	2.7	2.6	1	0.80
LSCNB1608HKT1R0MD	MCHK1608T1R0MKN	RoHS	1.0	±20%	110	89	2.2	1.6	1	0.80
LSCNB1608HKT1R5MD	MCHK1608T1R5MKN	RoHS	1.5	±20%	200	160	1.7	1.3	1	0.80
LSCNB1608HKT2R2MD	MCHK1608T2R2MKN	RoHS	2.2	±20%	292	237	1.5	1.2	1	0.80
LSCNB1608KKTR24MA	MCKK1608TR24M N	RoHS	0.24	±20%	38	35	2.8	2.6	1	1.00
LSCNB1608KKTR47MA	MCKK1608TR47M N	RoHS	0.47	±20%	55	44	2.4	2.0	1	1.00
LSCNB1608KKT1R0MA	MCKK1608T1R0M N	RoHS	1.0	±20%	123	100	2.0	1.3	1	1.00

2012 type

New part number	Old part number (for reference)	EHS	Nominal inductance	Inductance tolerance		Ω]	Rated current(Idc1) [A] (max.)	Rated current(Idc2) [A] (max.)	Measuring frequency [MHz]	Thickness [mm] (max.)
L CONTACCIONICE DO MAIA	MOUNTOON	D 110	0.04	1.000/	(max.)	(typ.)			[1411 12]	0.00
LSCNA2012HKTR24MA	MCHK2012TR24M	RoHS	0.24	±20%	24	19	4.32	3.60		0.80
LSCNA2012HKTR47MA	MCHK2012TR47M	RoHS	0.47	±20%	36	30	3.21	3.15	1	0.80
LSCNA2012HKT1R0MA	MCHK2012T1R0M	RoHS	1.0	±20%	111	90	2.26	1.47	1	0.80
LSCNA2012KKTR24MA	MCKK2012TR24M	RoHS	0.24	±20%	25	20	6.2	4.0	1	1.00
LSCNA2012KKTR47MA	MCKK2012TR47M	RoHS	0.47	±20%	39	32	4.5	3.1	1	1.00
LSCNA2012KKT1R0MA	MCKK2012T1R0M	RoHS	1.0	±20%	90	73	3.6	2.1	1	1.00
LSCNE2012HKTR11MD	MCHK2012TR11MKG	RoHS	0.11	±20%	12	9.1	6.9	5.8	1	0.80
LSCNE2012HKTR24MD	MCHK2012TR24MKG	RoHS	0.24	±20%	17	14	6.0	4.8	1	0.80
LSCNE2012HKTR47MD	MCHK2012TR47MKG	RoHS	0.47	±20%	32	26	4.8	4.0	1	0.80
LSCND2012HKTR47MD	MCHK2012TR47MKB	R ₀ HS	0.47	±20%	26	21	4.8	4.0	1	0.80

2016 type

₹2010 cype										
New part number	Old part number (for reference)	EHS	Nominal inductance	Inductance tolerance	DC Resistance [m Ω]		Rated Rated current(Idc1) current(Idc2)	Measuring frequency	Thickness [mm] (max.)	
					(max.)	(typ.)	[A] (max.)	[A] (max.)	[MHz]	[IIIII] (IIIAX.)
LSCNE2016FETR47MCB	MCFE2016TR47MJG B	RoHS	0.47	±20%	45	40	4.0	3.2	1	0.65
LSCNE2016FETR68MCB	MCFE2016TR68MJG B	RoHS	0.68	±20%	60	50	3.0	2.5	1	0.65
LSCNE2016FET1R0MCB	MCFE2016T1R0MJG B	RoHS	1.0	±20%	70	60	2.8	2.3	1	0.65

 $\frac{1}{2}$ Idc1 is the DC value at which the initial L value is decreased within 30% by the application of DC bias. (at 20°C) $\frac{1}{2}$ Idc2 is the DC value at which the temperature of element is increased within $\frac{40}{C}$ by the application of DC bias. (at $\frac{20}{C}$)

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Multilayer Metal Power Inductors MCOIL™ LSCN/LCCN/LBCN/LLCN/LMCN series

PACKAGING

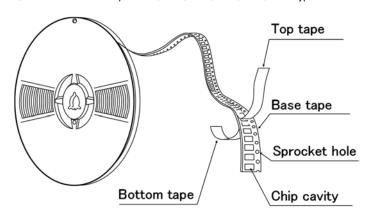
1Minimum Quantity

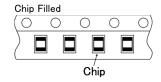
Tape & Reel Packaging

Type		Thickness	Standard Quantity [pcs]		
Туре	Code	mm (inch)	Paper Tape	Embossed Tape	
1005 (0402)	EE	0.55 max (0.022 max)	10000	1	
1210 (0504)	EK	0.5 max (0.020 max)	5000	_	
1412 (0505)	FE	0.65 max (0.026 max)	4000	-	
1608 (0603)	FK	0.6 max (0.024 max)	4000	1	
1608 (0603)	FE	0.65 max (0.026 max)	4000	1	
1608 (0603)	HK	0.8 max (0.031 max)	4000	1	
1608 (0603)	KK	1.0 max (0.039 max)	-	3000	
2012 (0806)	HK	0.8 max (0.031 max)	4000	-	
2012 (0805)	KK	1.0 max (0.039 max)	_	3000	
2016 (0806)	FE	0.65 max (0.026 max)	4000	_	

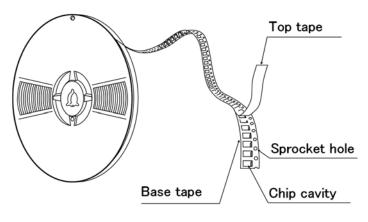
2Taping material

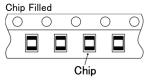
Card board carrier tape 1005/1210/1412/1608/2012/2016 type





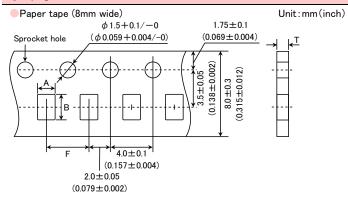
Embossed Tape 1608/2012 type





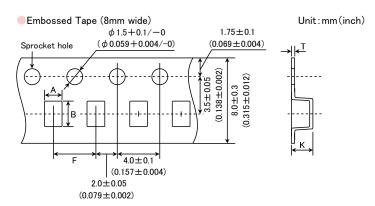
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3Taping Dimensions



Type		Thickness	Chip	cavity	Insertion Pitch	Tape Thickness
Type	Code	mm(inch)	Α	В	F	Т
1005 (0402)	EE	0.55 max (0.021 max)	0.8 (0.031)	1.3 (0.051)	2.0 ± 0.05 (0.079 ± 0.002)	0.64max (0.025max)
1210 (0504)	EK	0.5 max (0.020 max)	1.3 (0.051)	1.55 (0.061)	4.0±0.1 (0.157±0.004)	0.64max (0.025max)
1412 (0505)	FE	0.65 max (0.026 max)	1.6 (0.063)	1.8 (0.071)	4.0±0.1 (0.157±0.004)	0.72max (0.028max)
1608 (0603)	FK	0.6 max (0.024 max)	1.1 (0.043)	1.9 (0.075)	4.0±0.1 (0.157±0.004)	0.72max (0.028max)
1608 (0603)	FE	0.65 max (0.026 max)	1.1 (0.043)	1.9 (0.075)	4.0±0.1 (0.157±0.004)	0.72max (0.028max)
1608 (0603)	НК	0.8 max (0.031 max)	1.2 (0.047)	2.0 (0.079)	4.0±0.1 (0.157±0.004)	0.9max (0.035max)
2012 (0805)	НК	0.8 max (0.031 max)	1.65 (0.065)	2.4 (0.094)	4.0±0.1 (0.157±0.004)	0.9max (0.035max)
2016 (0806)	FE	0.65 max (0.026 max)	1.95 (0.077)	2.3 (0.091)	4.0±0.1 (0.157±0.004)	0.72max (0.028max)

Unit: mm(inch)

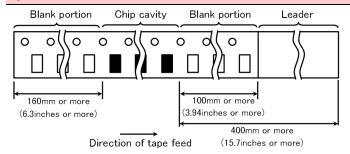


T	Thickness		Chip	cavity	Insertion Pitch	Tape Th	ickness
Туре	Code	mm(inch)	Α	В	F	K	Т
1608 (0603)	KK	1.0 max (0.039 max)	1.15 (0.045)	1.95 (0.077)	4.0±0.1 (0.157±0.004)	1.5 max (0.059 max)	0.3 max (0.012 max)
2012 (0805)	KK	1.0 max (0.039 max)	1.55 (0.061)	2.35 (0.093)	4.0±0.1 (0.157±0.004)	1.5 max (0.059 max)	0.3 max (0.012 max)

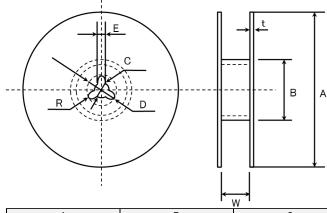
Unit : mm(inch)

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4LEADER AND BLANK PORTION



⑤Reel Size



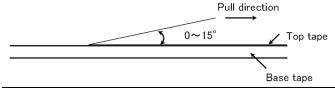
Α	В	С	D	E	R			
ϕ 178 ± 2.0	ϕ 50 or more	ϕ 13.0 \pm 0.2	ϕ 21.0 ± 0.8	2.0±0.5	1.0			

	t	W
4mm width tape	1.5max.	5±1.0
8mm width tape	2.5max.	10±1.5

(Unit:mm)

6 Top tape strength

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



Multilayer Metal Power Inductors MCOIL[™] LSCN series for General Electronic Equipment for Consumer Multilayer Metal Power Inductors MCOIL[™] LLCN series for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA

Flux

Recovery

1. Operating Temp	perature Range
Specified Value	-40~+125°C (Including self-generated heat)
2. Storage Tempe	rature Range
Specified Value	-40~+85°C
3. Rated Current	
C:E V-	Idc1: The decreasing-rate of inductance value is within 30 %
Specified Value	Idc2: The temperature of the element is increased within 40°C
4. Inductance	
Specified Value	Refer to each specification.
Test Methods	Measuring frequency : 1MHz
and Remarks	Measuring equipment : E4991 (or its equivalent)
5. DC Resistance	
Specified Value	Refer to each specification.
Test Methods	Measuring equipment: HIOKI RM3545 (or its equivalent)
and Remarks	moasuring equipment. There this equivalent/
6. Resistance to I	lexure of Substrate
Specified Value	No mechanical damage.
	Warp : 2mm
	Testing board : glass epoxy-resin substrate
	Thickness : 0.8mm
	20
Test Methods	R-230
and Remarks	Board Warp
	Deviation ± 1
	45 45
	(Unit: mm)
	(Onit, min)
7.0.11 133	
7. Solderability	At least 000% of the milest standards are seen at least standards.
Specified Value	At least 90% of terminal electrode is covered by new solder.
Test Methods	Solder temperature : $245\pm3^{\circ}$ C (Sn/3.0Ag/0.5Cu)
and Remarks	Duration : 4±1 sec.
8. Resistance to S	Soldering
Specified Value	Appearance: No significant abnormality
Specified value	Inductance change: Within ±10%
	Solder temperature : 260±5°C
	Duration : 10±0.5 sec.
Test Methods	Preheating temperature : 150 to 180°C
and Remarks	Preheating time : 3 min.

: Immersion into ethanol solution with colophony for 3 to 5 sec.

2 to 3 hrs of recovery under the standard condition after the test. (See Note 1)

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9. Thermal Shock Appearance: No significant abnormality Specified Value Inductance change: Within $\pm 10\%$ Conditions for 1 cycle Step $temperature (^{\circ}\!C)$ time (min.) -40 + 0/-31 30 ± 3 2 Room temperature 2~3 Test Methods 3 +85 +3/-0 30±3 and Remarks 4 Room temperature 2~3

	Number of cycles: 100
	Recovery: 2 to 3 hrs of recovery under the standard condition after the test.(See Note 1)
10. Damp Heat (§	Steady state)
C:::	Appearance: No significant abnormality
Specified Value	Inductance change: Within ±10%
	Temperature : 60±2°C
Test Methods	Humidity : 90 to 95%RH
and Remarks	Duration : 500 +24/-0 hrs
	Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber. (See Note 1)
11. Loading under	Damp Heat
Specified Value	Appearance: No significant abnormality
Specified value	Inductance change: Within ±10%
	Temperature : 60±2°C
Test Methods	Humidity : 90 to 95%RH
and Remarks	Applied current : Idc2max
and Remarks	Duration : 500 +24/-0 hrs
	Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber. (See Note 1)
12. Loading at Hig	h Temperature
Specified Value	Appearance: No significant abnormality
Specified value	Inductance change: Within ±10%
·	Temperature : 85±2°C
Test Methods	Applied current: Idc2max
and Remarks	Duration : 500 +24/-0 hrs
	Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber. (See Note 1)

(Note 1) Measurement shall be made after 48 ± 2 hrs of recovery under the standard condition.

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

5 to 35°C of temperature, 25 to 85% relative humidity.

When there are questions concerning measurement results:

In order to provide correlation data, the test shall be conducted under condition of $20\pm2^{\circ}C$ 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."

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Multilayer Metal Power Inductors MCOIL[™] LSCN series for General Electronic Equipment for Consumer Multilayer Metal Power Inductors MCOIL[™] LLCN series for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

PRECAUTIONS

1. Circuit Design

Precautions

- ◆Verification of operating environment, electrical rating and performance
- 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)
- 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

Temperature rise of power choke coil depends on the installation condition in end products.

Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.

2. PCB Design

Precautions

◆Pattern configurations (Design of Land-patterns)

When inductors are mounted on a PCB, the size of land patterns and the amount of solder used (size of fillet) can directly affect inductor performance. Therefore, the following items must be carefully considered in the design of solder land patterns:

- (1) The amount of solder applied can affect the ability of chips to withstand mechanical stresses which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets.
- (2) When more than one part is jointly soldered onto the same land or pad, the pad must be designed so that each component's soldering point is separated by solder-resist.
- ◆Pattern configurations(Inductor layout on panelized[breakaway] PC boards)

After inductors have been mounted on the boards, chips can be subjected to mechanical stresses in subsequent manufacturing processes (PCB cutting, board inspection, mounting of additional parts, assembly into the chassis, wave soldering the reflow soldered boards etc.) For this reason, planning pattern configurations and the position of SMD inductors should be carefully performed to minimize stress

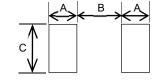
◆Pattern configurations(Design of Land-patterns)

The following diagrams and tables show some examples of recommended patterns to prevent excessive solder amounts. Examples of improper pattern designs are also shown.

(1) Recommended land dimensions for a typical chip inductor land patterns for PCBs

(Unit:mm)

					(Offic.	111117
Type	1005	1210	1412	1608	2012	2016
Α	0.4	0.45	0.55	0.45	0.5	0.7
В	0.5	0.6	0.4	1.0	1.2	0.8
С	0.7	1.15	1.3	1.0	1.45	1.8

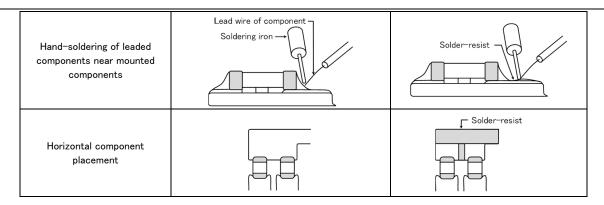


Note: The values in the table above are representative. Recommended land dimensions are different by part numbers.

Technical considerations

(2)Examples of good and bad solder a	application	
Item	Not recommended	Recommended
Mixed mounting of SMD and leaded components	Lead wire of component	Solder-resist
Component placement close to the chassis	Chassis Solder (for grounding) Electrode pattern	Solder-resist

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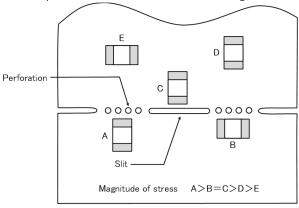


- ◆Pattern configurations (Inductor layout on panelized[breakaway] PC boards)
 - 1. The following are examples of good and bad inductor layout; SMD inductors should be located to minimize any possible mechanical stresses from board warp or deflection.

Item	Not recommended	Recom	nmended
Deflection of the board			Position the component at a right angle to the direction of the mechanical stresses that are anticipated.

2. To layout the inductors for the breakaway PC board, it should be noted that the amount of mechanical stresses given will vary depending on inductor layout.

An example below should be counted for better design.



3. When breaking PC boards along their perforations, the amount of mechanical stress on the inductors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, slit, V-grooving, and perforation. Thus, any ideal SMD inductor layout must also consider the PCB splitting procedure.

3. Considerations for automatic placement

Precautions

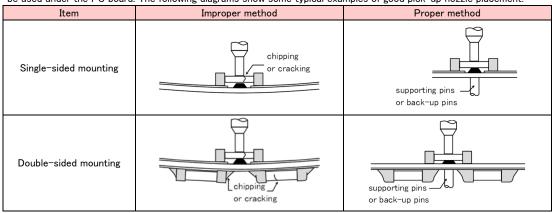
◆Adjustment of mounting machine

- 1. Excessive impact load should not be imposed on the inductors when mounting onto the PC boards.
- 2. The maintenance and inspection of the mounter should be conducted periodically.

◆Adjustment of mounting machine

- 1. If the lower limit of the pick-up nozzle is low, too much force may be imposed on the inductors, causing damage. To avoid this, the following points should be considered before lowering the pick-up nozzle:
 - The lower limit of the pick-up nozzle should be adjusted to the surface level of the PC board after correcting for deflection of the board.
 - (2) The pick-up pressure should be adjusted between 1 and 3N static loads.
 - (3) To reduce the amount of deflection of the board caused by impact of the pick-up nozzle, supporting pins or back-up pins should be used under the PC board. The following diagrams show some typical examples of good pick-up nozzle placement:

Technical considerations



2. As the alignment pin wears out, adjustment of the nozzle height can cause chipping or cracking of the inductors because of mechanical impact on the inductors. To avoid this, the monitoring of the width between the alignment pin in the stopped position, and maintenance, inspection and replacement of the pin should be conducted periodically.

4. Soldering

◆Reflow soldering

- · Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified.
- · The product shall be used reflow soldering only.
- · Please do not add any stress to a product until it returns in normal temperature after reflow soldering.

Precautions

◆Lead free soldering

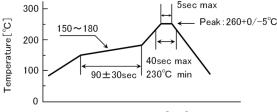
- When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently.
- ◆The conditions for Reworking with soldering irons
- •Put the soldering iron on the land-pattern and don't touch it to the inductor directly.
- Soldering iron's temperature below 350 $^{\circ}\text{C}$, Duration 3 seconds or less

◆Reflow soldering

• 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.

Recommended reflow condition (Pb free solder)

Technical considerations



Heating Time[sec]

The allowable number of reflow soldering is 3 times.

5. Cleaning

◆Cleaning conditions

Precautions

Washing by supersonic waves shall be avoided.

Technical considerations

◆Cleaning conditions

• If washed by supersonic waves, the products might be broken.

6. Resin coating and mold

Precautions

- 1. With some type of resins a decomposition gas or chemical reaction vapor may remain inside the resin during the hardening period or while left under normal storage conditions resulting in the deterioration of the inductor's performance.
- 2. Thermal expansion and thermal shrinkage characteristics of resins may lead to the deterioration of inductors' performance.
- When a resin hardening temperature is higher than inductor operating temperature, the stresses generated by the excessive heat may lead to damage in inductors.
- 4. In prior to use, please make the reliability evaluation with the product mounted in your application set.

7. Handling

- ◆Breakaway PC boards(splitting along perforations)
 - 1. When splitting the PC board after mounting inductors and other components, care is required so as 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.
- ♦General handling precautions
 - ·Always wear static control bands to protect against ESD.
 - · Keep the inductors away from all magnets and magnetic objects.
- Precautions
- Use non-magnetic tweezers when handling inductors.

· Any devices used with the inductors (soldering irons, measuring instruments) should be properly grounded.

- · Keep bare hands and metal products (i.e., metal desk) away from inductor electrodes or conductive areas that lead to chip electrodes.
- · Keep inductors away from items that generate magnetic fields such as speakers or coils.
- ◆Mechanical considerations

Be careful not to subject the inductors to excessive mechanical shocks.

- (1) If inductors are dropped on the floor or a hard surface they should not be used.
- (2) When handling the mounted boards, be careful that the mounted components do not come in contact with or bump against other boards or components.

8. Storage conditions

◆Storage

Precautions

To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible.

Recommended conditions

Ambient temperature: 30°C or below Humidity: 30% to 70%

The ambient temperature must be kept -5° C to $+40^{\circ}$ C. Even under ideal storage conditions, solderability of inductor is deteriorated as time passes, so inductors should be used within 6 months from the time of delivery.

*Inductor should be kept where no chlorine or sulfur exists in the air.

Technical considerations

◆Storage

If the parts are stocked in 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. For this reason, components should be used within 6 months from the time of delivery. If exceeding the above period, please check solderability before using the inductors.

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Wire-wound Metal Power Inductors MCOIL[™] LSDN series for General Electronic Equipment for Consumer

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

REFLOW

■PART NUMBER

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

L	S	D	N	D	1	6	1	6	K	K	Т	1	R	0	М	М	
	(()		2			3)		(2	1)	(5)		6		7	8	9

(1)Series

1001103	
Code	
(1)(2)(3)(4)	
LSDN	Wire-wound Metal Power Inductor for General Flectronic Equipment for Consumer

(1) Product Group

	•
Code	
L	Inductors

(2) Category

(2) 5 0 0 0 0 0 0								
	Code	Recommended equipment	Quality Grade					
	S	General Electronic Equipment for Consumer	3					

(3) Type Code

Code	
D	Metal Wire-wound (Drum type)

(4) Features, Characteristics

Code	
N	Standard Power choke

2Features

Code	Feature
D	Bottom electrode (Ag × solder)

3Dimensions (L × W)

Code	Dimensions (L × W) [mm]
1616	1.6 × 1.6
2020	2.0 × 2.0
3030	3.0 × 3.0
4040	4.0 × 4.0
5050	4.9 × 4.9

4Dimensions (H)

Code	Dimensions (H) [mm]
JE	0.95
KK	1.0
MK	1.2
PK	1.4
WK	2.0

5Packaging

Code	Packaging
Т	Taning

6 Nominal inductance

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

7 Inductance tolerance

Code	Inductance tolerance
М	±20%
N	±30%

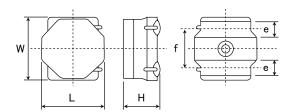
®Special code

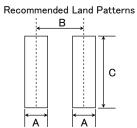
Ì	Code	Special code
٠	F	Ferrite coating
•	М	Metal coating

9Internal code

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■STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY





Туре	Α	В	С
1616	0.5	1.10	1.65
2020	0.65	1.35	2.0
3030	0.8	2.2	2.7
4040	1.2	2.8	3.7
5050	1.5	3.6	4.2

 $\mathsf{Unit}\!:\!\mathsf{mm}$

Туре	L	W	Н	e f		Standard quantity [pcs]Taping
10101/1/	1.64±0.1	1.64±0.1	1.0 max	0.40 +0.2/-0.1	1.0±0.2	0500
1616KK	(0.065 ± 0.004)	(0.065 ± 0.004)	(0.039 max)	(0.016 +0.008/-0.004)	(0.039 ± 0.008)	2500
2020JE	2.0±0.15	2.0±0.15	0.95 max	0.50±0.2	1.25±0.2	2500
2020JE	(0.079 ± 0.006)	(0.079 ± 0.006)	(0.037 max)	(0.02 ± 0.008)	(0.049 ± 0.008)	2500
000000	2.0±0.15	2.0±0.15	1.0 max	0.50±0.2	1.25±0.2	2500
2020KK	(0.079 ± 0.006)	(0.079 ± 0.006)	(0.039 max)	(0.02 ± 0.008)	(0.049 ± 0.008)	2500
2020MK	2.0±0.15	2.0±0.15	1.2 max	0.50±0.2	1.25±0.2	2500
2020MK	(0.079 ± 0.006)	(0.079 ± 0.006)	(0.047 max)	(0.02 ± 0.008)	(0.049 ± 0.008)	2500
3030KK	3.0±0.1	3.0±0.1	1.0 max	0.90 ± 0.2	1.9±0.2	2000
3030KK	(0.118 ± 0.004)	(0.118 ± 0.004)	(0.039 max)	(0.035 ± 0.008)	(0.075 ± 0.008)	2000
3030MK	3.0±0.1	3.0±0.1	1.2 max	0.90±0.2	1.9±0.2	2000
SUSUIVIN	(0.118 ± 0.004)	(0.118 ± 0.004)	(0.047 max)	(0.035 ± 0.008)	(0.075 ± 0.008)	2000
4040JE	4.0±0.2	4.0±0.2	0.95 max	1.1±0.2	2.5±0.2	1000
4040JE	(0.157 ± 0.008)	(0.157 ± 0.008)	(0.037 max)	(0.043 ± 0.008)	(0.098 ± 0.008)	1000
4040MK	4.0±0.2	4.0±0.2	1.2 max	1.1±0.2	2.5±0.2	1000
4040WK	(0.157 ± 0.008)	(0.157 ± 0.008)	(0.047 max)	(0.043 ± 0.008)	(0.098 ± 0.008)	1000
40.40\\\	4.0±0.2	4.0±0.2	2.0 max	1.1±0.2	2.5±0.2	700
4040WK	(0.157 ± 0.008)	(0.157 ± 0.008)	(0.079 max)	(0.043 ± 0.008)	(0.098 ± 0.008)	/00
EUEUDK	4.9±0.2	4.9±0.2	1.4 max	1.20±0.2	3.3±0.2	1000
5050PK	(0.193 ± 0.008)	(0.193 ± 0.008)	(0.055 max)	(0.047 ± 0.008)	(0.130 ± 0.008)	1000

Unit:mm(inch)

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■PART NUMBER

1616KK type	[Thickness:1.0mm max.]										
	Old part number		Nominal inductance		DC Resistance[Ω]			Rated curren	nt ※)[mA]		Managemen
New part number	(for reference)	EHS	[μ H]	Inductance tolerance			Saturation current: Idc1		Temperature rise current: Idc2		Measuring frequency[MHz]
	(101 1010101100)		£ 74.113		Max.	Тур.	Max.	Тур.	Max.	Тур.	in oquonoy [iiii iz]
LSDND1616KKTR47MM	MDKK1616TR47MM	RoHS	0.47	±20%	0.095	0.080	3,300	4,100	1,500	1,780	1
LSDND1616KKT1R0MM	MDKK1616T1R0MM	RoHS	1.0	±20%	0.140	0.120	2,200	2,750	1,200	1,490	1
LSDND1616KKT1R5MM	MDKK1616T1R5MM	RoHS	1.5	±20%	0.185	0.160	1,750	2,200	1,100	1,330	1
LSDND1616KKT2R2MM	MDKK1616T2R2MM	RoHS	2.2	±20%	0.250	0.215	1,500	1,800	950	1,110	1
LSDND1616KKT3R3MM	MDKK1616T3R3MM	RoHS	3.3	±20%	0.515	0.450	1,150	1,450	650	730	1
LSDND1616KKT4R7MM	MDKK1616T4R7MM	RoHS	4.7	±20%	0.640	0.550	950	1,200	550	630	1
LSDND1616KKT6R8MM	MDKK1616T6R8MM	RoHS	6.8	±20%	0.820	0.710	630	880	520	600	1
LSDND1616KKT100MM	MDKK1616T100MM	RoHS	10	±20%	1.120	0.970	550	800	450	500	1
LSDND1616KKT150MM	MDKK1616T150MM	RoHS	15	±20%	1.800	1.600	460	640	400	440	1

2020JE type Thickness: 0.95mm max

	Old part number		EHS Nominal inductance [μ H]		DC Resistance[Ω]		Rated current ※) [mA]				Measuring
New part number (for reference)		EHS		Inductance tolerance			Saturation current: Idc1		Temperature rise current: Idc2		frequency[MHz]
		LMIIJ		Max.	Тур.	Max.	Тур.	Max.	Тур.	in equency [Williz]	
LSDND2020JET1R0MM	MDJE2020T1R0MM	RoHS	1.0	±20%	0.121	0.106	3,100	3,800	1,550	1,800	1
LSDND2020JET2R2MM	MDJE2020T2R2MM	RoHS	2.2	±20%	0.266	0.230	1,550	1,900	1,050	1,200	1
LSDND2020JET3R3MM	MDJE2020T3R3MM	RoHS	3.3	±20%	0.340	0.290	1,350	1,600	950	1,100	1
LSDND2020JET4R7MM	MDJE2020T4R7MM	RoHS	4.7	±20%	0.475	0.410	1,200	1,550	850	950	1
LSDND2020JET6R8MM	MDJE2020T6R8MM	RoHS	6.8	±20%	0.630	0.550	800	1,100	750	850	1
LSDND2020JET100MM	MDJE2020T100MM	RoHS	10	±20%	1.040	0.910	700	900	550	600	1

<u> </u>	•										
	011		Manada al fasticata a ca		DC Resistance[Ω]		Rated current ※) [mA]				
New part number	Old part number (for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance			Saturation current: Idc1		Temperature rise current: Idc2		Measuring frequency[MHz]
	(for reference)		[[[11]		Max.	Тур.	Max.	Typ.	Max.	Typ.	irequericy [wir i2]
LSDND2020KKTR47MM	MDKK2020TR47MM	RoHS	0.47	±20%	0.046	0.040	3,500	4,150	2,200	2,500	1
LSDND2020KKTR68MM	MDKK2020TR68MM	RoHS	0.68	±20%	0.060	0.052	3,200	3,650	2,000	2,100	1
LSDND2020KKT1R0MM	MDKK2020T1R0MM	RoHS	1.0	±20%	0.085	0.074	2,900	3,400	1,700	1,900	1
LSDND2020KKT1R5MM	MDKK2020T1R5MM	RoHS	1.5	±20%	0.133	0.115	1,900	2,250	1,350	1,500	1
LSDND2020KKT2R2MM	MDKK2020T2R2MM	RoHS	2.2	±20%	0.165	0.139	1,650	1,950	1,200	1,350	1
LSDND2020KKT3R3MM	MDKK2020T3R3MM	RoHS	3.3	±20%	0.275	0.240	1,300	1,550	940	1,050	1
LSDND2020KKT4R7MM	MDKK2020T4R7MM	RoHS	4.7	±20%	0.435	0.375	1,050	1,250	750	850	1
LSDND2020KKT100MM	MDKK2020T100MM	RoHS	10	±20%	0.690	0.600	750	900	630	680	1
LSDND2020KKT150MM	MDKK2020T150MM	RoHS	15	±20%	1.180	1.020	550	750	480	550	1

	•										
	Old nort more or		Nominal inductance		DC Resis	101		Rated curren	t ※)[mA]		Measuring
New part number	Old part number (for reference)	EHS	[μ H]	Inductance tolerance	DC Resis	rance[32]	Saturation of	current: Idc1	Temperature ri	se current: Idc2	Measuring frequency[MHz]
	(101 Telefelice)		[[[11]		Max.	Тур.	Max.	Тур.	Max.	Тур.	irequericy[wiri2]
LSDND2020MKTR47MM	MDMK2020TR47MM	RoHS	0.47	±20%	0.046	0.040	4,200	4,800	2,300	2,450	1
LSDND2020MKTR68MM	MDMK2020TR68MM	RoHS	0.68	±20%	0.058	0.050	3,500	4,100	2,000	2,200	1
LSDND2020MKT1R0MM	MDMK2020T1R0MM	RoHS	1.0	±20%	0.064	0.056	2,550	2,900	1,900	2,050	1
LSDND2020MKT1R5MM	MDMK2020T1R5MM	RoHS	1.5	±20%	0.086	0.075	2,000	2,300	1,650	1,750	1
LSDND2020MKT2R2MM	MDMK2020T2R2MM	RoHS	2.2	±20%	0.109	0.095	1,750	2,000	1,450	1,550	1
LSDND2020MKT3R3MM	MDMK2020T3R3MM	RoHS	3.3	±20%	0.178	0.155	1,350	1,550	1,150	1,200	1
LSDND2020MKT4R7MM	MDMK2020T4R7MM	RoHS	4.7	±20%	0.242	0.210	1,150	1,300	950	1.050	1

●3030KK type 【Thickness:1.0mm max.】

	Old part number		Nominal inductance		DC Resis	LO Jacque		Rated curren			Measuring
New part number	(for reference)	EHS	[μ H]	Inductance tolerance	DC Resis	rance[32]	Saturation of	current: Idc1	Temperature ri	se current: Idc2	Measuring frequency[MHz]
	(101 TOTOTOTIOO)		ניו		Max.	Тур.	Max.	Typ.	Max.	Тур.	in equality [iiii iz]
LSDND3030KKTR47MM	MDKK3030TR47MM	RoHS	0.47	±20%	0.039	0.033	5,400	6,500	3,900	4,500	1
LSDND3030KKT1R0MM	MDKK3030T1R0MM	RoHS	1.0	±20%	0.086	0.074	4,400	5,200	2,400	2,800	1
LSDND3030KKT1R5MM	MDKK3030T1R5MM	RoHS	1.5	±20%	0.100	0.087	3,000	3,500	2,100	2,400	1
LSDND3030KKT2R2MM	MDKK3030T2R2MM	RoHS	2.2	±20%	0.144	0.125	2,500	3,000	1,900	2,200	1
LSDND3030KKT3R3MM	MDKK3030T3R3MM	RoHS	3.3	±20%	0.248	0.215	2,000	2,400	1,350	1,500	1
LSDND3030KKT4R7MM	MDKK3030T4R7MM	RoHS	4.7	±20%	0.345	0.300	1,700	2,000	1,150	1,300	1
LSDND3030KKT6R8MM	MDKK3030T6R8MM	RoHS	6.8	±20%	0.437	0.380	1,400	1,700	1,000	1,150	1
LSDND3030KKT100MM	MDKK3030T100MM	RoHS	10	±20%	0.575	0.500	1,100	1,300	850	1,000	1

●3030MK type 【Thickness:1.2mm max.】

- ooooiviik type	THIORIESS. I.ZIIII	i ilian.									
	Old part number		Nominal inductance		DC Resis	tance[Ω]		Rated curren	t ※)[mA]		Measuring
New part number	(for reference)	EHS	[μ H]	Inductance tolerance	DO Resis	tance[32]	Saturation of	current: Idc1	Temperature ri	se current: Idc2	Measuring frequency[MHz]
	(101 1010101100)		2,111		Max.	Тур.	Max.	Тур.	Max.	Тур.	in oquonoy [iiii iz]
LSDND3030MKTR30MM	MDMK3030TR30MM	RoHS	0.30	±20%	0.020	0.017	7,600	9,200	5,500	6,400	1
LSDND3030MKTR33MM	MDMK3030TR33MM	RoHS	0.33	±20%	0.020	0.017	6,400	8,700	5,500	6,400	1
LSDND3030MKTR47MM	MDMK3030TR47MM	RoHS	0.47	±20%	0.027	0.023	6,300	7,500	4,700	5,500	1
LSDND3030MKT1R0MM	MDMK3030T1R0MM	RoHS	1.0	±20%	0.050	0.043	4,300	5,100	3,300	3,900	1
LSDND3030MKT1R5MM	MDMK3030T1R5MM	RoHS	1.5	±20%	0.074	0.064	3,400	4,100	2,500	3,000	1
LSDND3030MKT2R2MM	MDMK3030T2R2MM	RoHS	2.2	±20%	0.112	0.097	2,800	3,600	2,100	2,400	1
LSDND3030MKT3R3MM	MDMK3030T3R3MM	RoHS	3.3	±20%	0.167	0.145	2,100	2,700	1,650	1,900	1
LSDND3030MKT4R7MM	MDMK3030T4R7MM	RoHS	4.7	±20%	0.263	0.228	1,800	2,300	1,350	1,550	1

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PART NUMBER

4040JE type	[Thickness: 0.95mi	m max.]								
	Old part number		Nominal inductance		DC Resist	1012222		Rated curren	t ※)[mA]		Measuring
New part number	(for reference)	EHS	[μ H]	Inductance tolerance	DO Nesisi	.ance[32]	Saturation of	urrent: Idc1	Temperature ris	se current: Idc2	Measuring frequency[MHz]
	(101 1010101100)		2,11		Max.	Тур.	Max.	Тур.	Max.	Typ.	oquonoy [
LSDND4040JETR47MM	MDJE4040TR47MM	RoHS	0.47	±20%	0.040	0.035	6,000	7,900	4,000	4,500	1
LSDND4040JET1R0MM	MDJE4040T1R0MM	RoHS	1.0	±20%	0.069	0.060	4,700	5,700	3,000	3,500	1
LSDND4040JET1R5MM	MDJE4040T1R5MM	RoHS	1.5	±20%	0.084	0.073	3,000	4,000	2,700	3,100	1
LSDND4040JET2R2MM	MDJE4040T2R2MM	RoHS	2.2	±20%	0.115	0.100	2,400	3,100	2,400	2,700	1
LSDND4040JET3R3MM	MDJE4040T3R3MM	RoHS	3.3	±20%	0.200	0.175	2,000	2,600	1,800	2,000	1
LSDND4040JET4R7MM	MDJE4040T4R7MM	RoHS	4.7	±20%	0.250	0.220	1,900	2,300	1,600	1,900	1
LSDND4040JET6R8MM	MDJE4040T6R8MM	RoHS	6.8	±20%	0.370	0.320	1,500	1,800	1,300	1,500	1
LSDND4040JET100MM	MDJE4040T100MM	RoHS	10	±20%	0.510	0.440	1.400	1.700	1.100	1.300	1

4040MK F type	Thickness: 1.2mm max.	.]

	Old namb mountain		Nominal inductance		DC Basis	tance[Ω]		Rated curren	t ※)[mA]		Managuring
New part number	Old part number (for reference)	EHS	[μ H]	Inductance tolerance	DC Resis	rance[32]	Saturation of	urrent: Idc1	Temperature ri	se current: Idc2	Measuring frequency[kHz]
	(for reference)		[µn]		Max.	Typ.	Max.	Тур.	Max.	Тур.	irequency[kH2]
LSDND4040MKTR47MF	MDMK4040TR47MF	RoHS	0.47	±20%	0.029	0.025	7,500	10,000	4,600	5,400	100
LSDND4040MKT1R0MF	MDMK4040T1R0MF	RoHS	1.0	±20%	0.047	0.041	5,200	7,500	3,500	4,200	100
LSDND4040MKT1R2MF	MDMK4040T1R2MF	RoHS	1.2	±20%	0.047	0.041	4,200	6,200	3,500	4,200	100
LSDND4040MKT1R5MF	MDMK4040T1R5MF	RoHS	1.5	±20%	0.065	0.056	3,700	5,400	3,300	3,600	100
LSDND4040MKT2R2MF	MDMK4040T2R2MF	RoHS	2.2	±20%	0.092	0.080	3,200	4,500	2,500	2,900	100

4040MK type [Thickness: 1.2mm max.]

	Old part number		Nominal inductance		DC Basis	tance[Ω]		Rated curren	t ※)[mA]		Measuring
New part number	(for reference)	EHS	[μ H]	Inductance tolerance	DC Resis	rance[32]	Saturation of	current: Idc1	Temperature ri	se current: Idc2	Measuring frequency[MHz]
	(101 1010101100)		2,11		Max.	Тур.	Max.	Тур.	Max.	Typ.	ii oquoiioy [iii iz]
LSDND4040MKTR68MM	MDMK4040TR68MM	RoHS	0.68	±20%	0.029	0.025	6,700	7,800	5,000	5,700	1
LSDND4040MKT1R0MM	MDMK4040T1R0MM	RoHS	1.0	±20%	0.036	0.031	5,000	6,200	4,500	5,100	1
LSDND4040MKT1R5MM	MDMK4040T1R5MM	RoHS	1.5	±20%	0.065	0.056	4,500	5,600	3,200	3,600	1
LSDND4040MKT2R2MM	MDMK4040T2R2MM	RoHS	2.2	±20%	0.079	0.069	3,800	4,500	2,800	3,200	1
LSDND4040MKT3R3MM	MDMK4040T3R3MM	RoHS	3.3	±20%	0.130	0.113	3,200	4,000	2,200	2,500	1
LSDND4040MKT4R7MM	MDMK4040T4R7MM	RoHS	4.7	±20%	0.160	0.140	2,500	3,000	1,900	2,200	1
LSDND4040MKT6R8MM	MDMK4040T6R8MM	RoHS	6.8	±20%	0.230	0.200	1,900	2,200	1,600	1,800	1
LSDND4040MKT100MM	MDMK4040T100MM	RoHS	10	±20%	0.330	0.280	1,700	2,000	1,400	1,600	1

4040WK type [Thickness: 2.0mm max.]

	Old part number		Nominal inductance		DC Resis	101		Rated curren	t ※)[mA]		Manageria
New part number	(for reference)	EHS	[μ H]	Inductance tolerance	DC Resis	rance[32]	Saturation of	urrent: Idc1	Temperature ri	se current: Idc2	Measuring frequency[MHz]
	(101 TOTOTOTIOO)		[μπ]		Max.	Typ.	Max.	Typ.	Max.	Typ.	ir equerioy [iiii iz]
LSDND4040WKTR33NM	MDWK4040TR33NM	RoHS	0.33	±30%	0.013	0.011	16,000	21,000	7,800	8,800	1
LSDND4040WKTR47NM	MDWK4040TR47NM	RoHS	0.47	±30%	0.013	0.011	10,000	15,000	7,800	8,800	1
LSDND4040WKTR56NM	MDWK4040TR56NM	RoHS	0.56	±30%	0.016	0.014	9,000	13,000	6,500	7,500	1
LSDND4040WKTR68MM	MDWK4040TR68MM	RoHS	0.68	±20%	0.016	0.014	8,000	12,000	7,300	8,300	1
LSDND4040WKT1R0MM	MDWK4040T1R0MM	RoHS	1.0	±20%	0.027	0.023	7,000	9,400	5,100	5,800	1
LSDND4040WKT1R5MM	MDWK4040T1R5MM	RoHS	1.5	±20%	0.041	0.035	7,000	9,400	4,100	4,700	1
LSDND4040WKT2R2MM	MDWK4040T2R2MM	RoHS	2.2	±20%	0.054	0.047	5,400	7,500	3,500	4,000	1
LSDND4040WKT3R3MM	MDWK4040T3R3MM	RoHS	3.3	±20%	0.075	0.066	3,700	5,200	3,000	3,300	1
LSDND4040WKT4R7MM	MDWK4040T4R7MM	RoHS	4.7	±20%	0.107	0.093	3,500	5,000	2,500	2,800	1
LSDND4040WKT6R8MM	MDWK4040T6R8MM	RoHS	6.8	±20%	0.158	0.138	2,900	4,000	2,000	2,300	1
LSDND4040WKT100MM	MDWK4040T100MM	RoHS	10	±20%	0.194	0.169	2,200	3,100	1,600	1,900	1
LSDND4040WKT220MM	MDWK4040T220MM	RoHS	22	±20%	0.460	0.400	1,500	2,100	1,200	1,400	1
LSDND4040WKT330MM	MDWK4040T330MM	R ₀ HS	33	+20%	0.720	0.625	1 200	1 700	800	1 000	1

●5050PK type [Thickness: 1.4mm max.]

	Old part number		Nominal inductance		DC Resis	tongo [O]		Rated curren	t ※)[mA]		Measuring
New part number	(for reference)	EHS	[μ H]	Inductance tolerance	DO Nesis	rance[32]	Saturation of	urrent: Idc1	Temperature ri	se current: Idc2	Measuring frequency[MHz]
	(for forerende)		[[[]		Max.	Тур.	Max.	Тур.	Max.	Тур.	ir equeries [initiz]
LSDND5050PKT1R0MM	MDPK5050T1R0MM	RoHS	1.0	±20%	0.040	0.034	8,500	10,000	4,300	4,700	1
LSDND5050PKT2R2MM	MDPK5050T2R2MM	RoHS	2.2	±20%	0.055	0.047	4,100	5,000	3,600	4,200	1
LSDND5050PKT3R3MM	MDPK5050T3R3MM	RoHS	3.3	±20%	0.086	0.073	3,800	4,500	2,900	3,400	1
LSDND5050PKT4R7MM	MDPK5050T4R7MM	RoHS	4.7	±20%	0.102	0.088	3,500	4,200	2,500	3,000	1
LSDND5050PKT6R8MM	MDPK5050T6R8MM	RoHS	6.8	±20%	0.138	0.12	2,700	3,200	2,200	2,500	1
LSDND5050PKT100MM	MDPK5050T100MM	RoHS	10	±20%	0.225	0.19	2,200	2,600	1,700	2,000	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) is the DC current value having temperature increase up to 40°C. (at 20°C)
- XX) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

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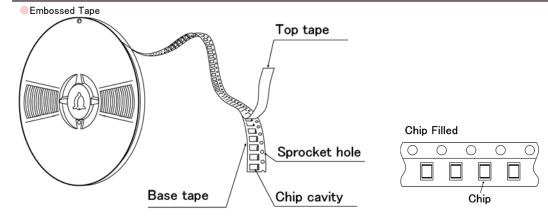
Wire-wound Metal Power Inductors MCOIL™ LSDN/LCDN/LBDN/LLDN/LMDN series

PACKAGING

1Minimum Quantity

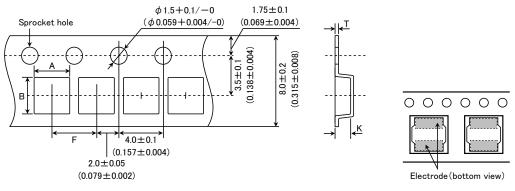
Туре	Standard Quantity [pcs]
туре	Tape & Reel
1616KK	2500
2020JE	
2020KK	2500
2020MK	
3030KK	2000
3030MK	2000
4040JE	1000
4040MK	1000
4040WK	700
5050PK	1000

2Tape Material



3 Taping dimensions

Embossed tape 8mm wide (0.315 inches wide)

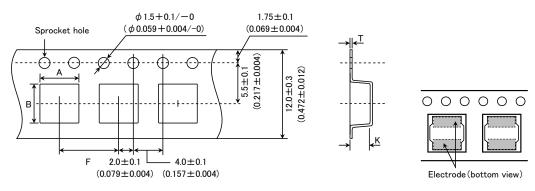


Type	Chip	cavity	Insertion pitch	Tape th	ickness
туре	Α	В	F	Т	K
1616KK	1.79±0.1	1.79±0.1	4.0±0.1	0.25±0.05	1.1±0.1
1616KK	(0.071 ± 0.004)	(0.071 ± 0.004)	(0.157 ± 0.004)	(0.010 ± 0.002)	(0.043 ± 0.004)
2020JE 2020KK 2020MK	2.2±0.1 (0.102±0.004)	2.2±0.1 (0.102±0.004)	4.0±0.1 (0.157±0.004)	0.25±0.05 (0.009±0.002)	1.3±0.1 (0.051±0.004)
3030KK 3030MK	3.2±0.1 (0.126±0.004)	3.2±0.1 (0.126±0.004)	4.0±0.1 (0.157±0.004)	0.3±0.05 (0.012±0.002)	1.4±0.1 (0.055±0.004)

Unit:mm(inch)

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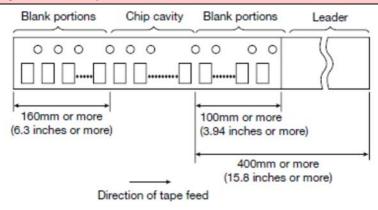
Embossed tape 12mm wide (0.47 inches wide)



Tura	Chip	cavity	Insertion pitch	Tape thickness			
Туре	Α	В	F	Т	K		
4040JE	4.3±0.1	4.3±0.1	8.0±0.1	0.3±0.05	1.6±0.1		
4040MK	(0.169 ± 0.004)	(0.169 ± 0.004)	(0.315 ± 0.004)	(0.012 ± 0.002)	(0.063 ± 0.004)		
4040WK	4.3±0.1 (0.169±0.004)	4.3±0.1 (0.169±0.004)	8.0±0.1 (0.315±0.004)	0.3±0.05 (0.012±0.002)	2.3±0.1 (0.091±0.004)		
5050PK	5.25±0.1 (0.207±0.004)	5.25±0.1 (0.207±0.004)	8.0±0.1 (0.315±0.004)	0.3±0.1 (0.012±0.004)	1.6±0.1 (0.063±0.004)		

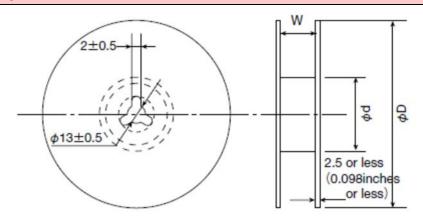
Unit:mm(inch)

4 Leader and Blank portion



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⑤Reel size



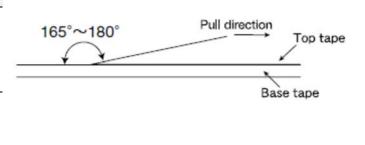
Type	Reel size (Reference values)			
туре	ϕ D	Ød	W	
1616KK				
2020JE				
2020KK	180±0.5	60±1.0	10.0 ± 1.5	
2020MK	(7.087 ± 0.019)	(2.36 ± 0.04)	(0.394 ± 0.059)	
3030KK				
3030MK				
4040JE				
4040MK	180±3.0	60±2.0	14.0 ± 1.5	
4040WK	(7.087 ± 0.118)	(2.36 ± 0.08)	(0.551 ± 0.059)	
5050PK				

Unit:mm(inch)

6Top Tape Strength

Top tape strength

Туре	Peel-off strength	
MDKK1616		
MDJE2020		
MDKK2020	0.1N~1.0N	
MDMK2020	U.TN~1.UN	
MDKK3030		
MDMK3030		
MDJE4040		
MDMK4040	0.1N~1.3N	
MDWK4040	0.1N~1.3N	
MDPK5050		



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Wire-wound Metal Power Inductors MCOIL[™] LSDN series for General Electronic Equipment for Consumer Wire-wound Metal Power Inductors MCOIL[™] LLDN series for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA

1. Operating Temp	erating Temperature Range				
Specified Value	-40~+125°C				
Test Methods and Remarks	Including self-generated heat				
2. Storage Temper	ature Range				
Specified Value					
Test Methods and Remarks	-5 to 40°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 condition : Please see item list.				
5. DC Resistance					
Specified Value	Within the specified tolerance				
Test Methods and Remarks	Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)				
6. Self resonance Specified Value	requency —				
7. Temperature ch					
Specified Value Test Methods and Remarks	Inductance change: Within ±10% Measurement of inductance shall be taken at temperature range within -40°C~+125°C. With reference to inductance value at +20°C., change rate shall be calculated.				
8. Resistance to fl	exure 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 mm Test board material : Glass epoxy-resin Solder cream thickness : 0.10 mm				
0 Inquistics					
9. Insulation resist Specified Value	ance : between wires				
opecined value					
10. Insulation resis	tance : between wire and core				
Specified Value					

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	Itage : between wire and core
Specified Value	_
12. Adhesion of ter	minal electrode
Specified Value	Shall not come off PC board
	The test samples shall be soldered to the test board by the reflow.
Test Methods	Applied force : 10N to X and Y directions.
and Remarks	Duration : 5s.
	Solder cream thickness : 0.10mm.
13. Resistance to v	ibration
C:::	Inductance change : Within ±10%
Specified Value	No significant abnormality in appearance.
	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
Test Methods	Total Amplitude 1.5mm (May not exceed acceleration 196m/s²)
and Remarks	Sweeping Method 10Hz to 55Hz to 10Hz for 1min.
	Time Y For 2 hours on each X, Y, and Z axis.
	Z
	Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.
14. Solderability	
Specified Value	At least 90% of surface of terminal electrode is covered by new solder.
- Promou raido	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%.
Test Methods and	Solder Temperature 245±5°C
Remarks	Time 5±1.0 sec.
	※Immersion depth : All sides of mounting terminal shall be immersed. ■ The immersion depth is a side of mounting terminal shall be immersed.
15. Resistance to s	oldering heat
0 '6 1741	Inductance change : Within ±10%
Specified Value	No significant abnormality in appearance.
Took Mathada	The test sample shall be exposed to reflow oven at $230\pm5^{\circ}$ C for 40 seconds, with peak temperature at $260\pm5^{\circ}$ C for 5 seconds, 2 times
Test Methods and Remarks	Test board material : Glass epoxy-resin
and marks	Test board thickness : 1.0mm
16. Thermal shock	
Specified Value	Inductance change : Within ±10%
Specified Value	No significant abnormality in appearance.
	The test samples shall be soldered to the test board by the reflow. The test samples shall be placed at specified temperature for specifie
	time by step 1 to step 4 as shown in below table in sequence. The temperature cycle shall be repeated 100 cycles.
T . M .! !	Conditions of 1 cycle
Test Methods and Remarks	Step Temperature (°C) Duration (min) 1 -40±3 30±3
and Remarks	2 Room temperature Within 3
	3 +85±2 30±3
	4 Room temperature Within 3
17. Damp heat	
· · · · · · · · · · · · · · · · · · ·	Inductance change : Within ±10%
Specified Value	No significant abnormality in appearance.
	The test samples shall be soldered to the test board by the reflow.
Test Methods	The test samples shall be placed in thermostatic oven set at specified temperature and humidity as shown in below table.

60±2°C

90~95%RH 500+24/-0 hour

Temperature

Humidity

Time

and Remarks

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18. Loading under damp heat				
Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.			
Test Methods	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.			
and Remarks	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	The test samples sha in below table.	ll be soldered to the test	board by the reflow. After that, the test samples shall be placed at test conditions as shown
and Remarks	Temperature	-40±2°C	
	Time	500+24/-0 hour	

Specified Value	
21. Loading at high	temperature life test
Specified Value	Inductance change : Within $\pm10\%$ No significant abnormality in appearance.
Test Methods	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 applied the rated current continuously as shown in below table.

in below table.		
85±2°C		
Rated current		
500+24/-0 hour		

20. High temperature life test

and Remarks

22. Standard condition			
Specified Value	Standard test condition: Unless otherwise specified, temperature is $20\pm15^{\circ}$ C and $65\pm20\%$ of relative humidity. When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of $20\pm2^{\circ}$ C of temperature, $65\pm5\%$ relative humidity. Inductance is in accordance with our measured value.		

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Wire-wound Metal Power Inductors MCOIL™ LSDN/LCDN/LBDN/LLDN/LMDN series

PRECAUTIONS

1. Circuit Design

Precautions

- ◆ Verification of operating environment, electrical rating and performance
 - 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)
 - 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

Temperature rise of power choke coil depends on the installation condition in end products.

Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.

2. PCB Design

Precautions

♦Land pattern design

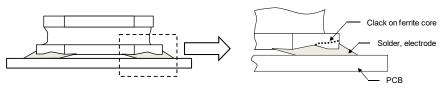
- 1. Please refer to a recommended land pattern.
- 2. There is stress, which has been caused by distortion of a PCB, to the inductor.
- 3. Please consider the arrangement of parts on a PCB.

◆Land pattern design

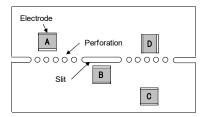
Surface Mounting

- 1. Mounting and soldering conditions should be checked beforehand.
- 2. Applicable soldering process to this products is reflow soldering only.
- 3. Please use the recommended land pattern shown as below. Electrical characteristics and the mounting ability of the product are being considered in the recommended land pattern. If a PCB is designed with other dimensions, defective soldering and stress to a product may occur due to misalignment. The performance of the product may not be brought out. If an adopted land pattern is different from the recommended land pattern, stress to the product will increase. It may cause cracks or defective electrical characteristics of the product. Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility.
- 4. As coefficients of thermal expansion between an inductor and a PCB differs, cracks may occur on a core when thermal stress is applied to them after mounting an inductor. (Please refer to the drawings below.) Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility.

Technical considerations



5. SMD inductors should be located to minimize any possible mechanical stresses from board warp or deflection. When splitting the PC board after mounting inductors and other components, care is required so as not to give any stresses of deflection or twisting to the board.

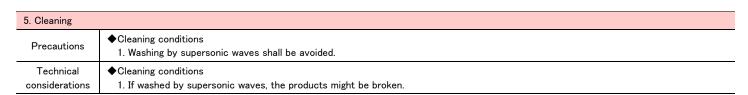


A product tends to undergo stress in order "A>C>B \equiv D".

Please consider the layouts of a product to minimize any stresses.

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4. Soldering ◆Reflow soldering 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. Precautions ◆Lead free soldering 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. ◆Reflow soldering 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. Recommended reflow condition (Pb free solder) 300 5sec max [°C] Peak: Technical 250+5/-0°C 200 considerations 30±10sec 230°C min 90±30sec 0 Heating Time [sec]



6. Handling

- ◆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
- Precautions
- 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.
- **◆**Board mounting
 - 1. There shall be no pattern or via between terminals at the bottom of product.
- 2. Components which are located in peripheral of product shall not make contact with surface (top, side) of product.
- ◆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.
- Technical considerations
 - 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.
 - ◆Board mounting
 - 1. If there is pattern or via between terminals at the bottom of product, it may cause characteristics change.
 - 2. If components which are located in peripheral of product make contact with surface (top, side) of product, it may cause damage or characteristics change.

7. Storage conditions

lackStorage

- 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.
 - Storage conditions
 - Ambient temperature : −5~40°C
 - Humidity: Below 70% RH
 - The recommended ambient temperature is 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 ${\bf 6}$ months from the time of delivery.
 - In case of storage over 6 months, solderability shall be checked before actual usage.

Technical considerations

Precautions

◆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.

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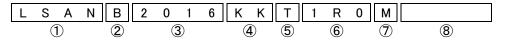
Wire-wound Metal Power Inductors MCOIL[™] LSAN series for General Electronic Equipment for Consumer

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

REFLOW

■PART NUMBER

* Operating Temp.:-40 \sim +105 $^{\circ}$ C (Including self-generated heat)



1)Series

Code	
(1)(2)(3)(4)	
LSAN	

Wire-wound Metal Power Inductor for General Electronic Equipment for Consumer

(1) Product Group

	•
Code	
L	Inductors

(2) Category

(2) Gatogory				
Code	Recommended equipment	Quality Grade		
S	General Electronic Equipment for Consumer	3		

(3) Type

Code	
Α	Metal Wire-wound

(4) Features, Characteristics

() ,	,
Code	
N	Standard Power choke

2Features

Code	Feature
В	L-shape electrode (Ag-resin × Sn-plate)

3Dimensions (L × W)

Code	Type(inch)	Dimensions (L×W)[mm]		
2016	2016(0806)	2.0 × 1.6		
2520	2520(1008)	2.5 × 2.0		

4Dimensions (T)

<u> </u>	
Code	Dimensions (T) [mm]
KK	1.0
MK	1.2

(5)Packaging

©:	
Code	Packaging
Т	Taping

6 Nominal inductance

©1101111141 111440 14110 0						
Code (example)	Nominal inductance[μH]					
R47	0.47					
1R0	1.0					
4R7	4.7					

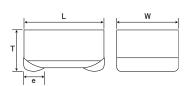
※R=Decimal point

7 Inductance tolerance

<u> </u>					
Code	Inductance tolerance				
М	±20%				

8Internal 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.



Туре	Α	В	С
2016	0.7	0.8	1.8
2520	0.8	1.2	2.0

Unit:mm

Туре	L	W	Т	е	Standard quantity[pcs] Taping
2016KK	2.0±0.1	1.6±0.1	1.0 max	0.5±0.3	3000
2010KK	(0.079 ± 0.004)	(0.063 ± 0.004)	(0.039 max)	(0.020 ± 0.012)	3000
2520KK	2.5±0.2	2.0±0.2	1.0 max	0.5±0.3	3000
2320KK	(0.098 ± 0.008)	(0.079 ± 0.008)	(0.039 max)	(0.020 ± 0.012)	3000
DEDOMIC	2.5±0.2	2.0±0.2	1.2 max	0.5±0.3	2000
2520MK	(0.098 ± 0.008)	(0.079 ± 0.008)	(0.047 max)	(0.020 ± 0.012)	3000

Unit:mm(inch)

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PART NUMBER

2016KK type		[Thickn	iess:1.0mm max.】						
	011		N		Self-resonant	DC Resistance [Ω](max.)	Rated current ※) [mA](max.)		
New part number	Old part number (for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance	frequency [MHz] (min.)		Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
LSANB2016KKTR24M	MAKK2016TR24M	R₀HS	0.24	±20%	ı	0.037	4,200	3,000	2
LSANB2016KKTR33M	MAKK2016TR33M	R₀HS	0.33	±20%	ı	0.040	3,600	3,200	2
LSANB2016KKTR47M	MAKK2016TR47M	RoHS	0.47	±20%	ı	0.460	3,200	2,800	2
LSANB2016KKTR68M	MAKK2016TR68M	RoHS	0.68	±20%	ı	0.065	2,500	2,500	2
LSANB2016KKT1R0M	MAKK2016T1R0M	RoHS	1.0	±20%	ı	0.075	2,200	2,200	2
LSANB2016KKT1R5M	MAKK2016T1R5M	R₀HS	1.5	±20%	-	0.130	1,600	1,650	2
LSANB2016KKT2R2M	MAKK2016T2R2M	RoHS	2.2	±20%	ı	0.160	1,500	1,500	2
LSANB2016KKT3R3M	MAKK2016T3R3M	RoHS	3.3	±20%	ı	0.255	1,150	1,200	2
LSANB2016KKT4R7M	MAKK2016T4R7M	RoHS	4.7	±20%	ı	0.380	1,000	950	2

2520KK type	[Thickness:1.0mm max.]
- LoLoitit Cypo	THIONHOUS TROUBLE

	Old part number		Nominal inductance		Self-resonant	DO D istana	Rated current	Management	
New part number			DC Resistance [Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]			
LSANB2520KKTR33M	MAKK2520TR33M	RoHS	0.33	±20%	-	0.038	4,700	3,500	2
LSANB2520KKTR47M	MAKK2520TR47M	RoHS	0.47	±20%	-	0.046	3,900	3,200	2
LSANB2520KKTR68M	MAKK2520TR68M	RoHS	0.68	±20%	-	0.059	3,700	2,900	2
LSANB2520KKT1R0M	MAKK2520T1R0M	RoHS	1.0	±20%	-	0.072	2,700	2,500	2
LSANB2520KKT1R5M	MAKK2520T1R5M	RoHS	1.5	±20%	-	0.125	2,300	1,800	2
LSANB2520KKT2R2M	MAKK2520T2R2M	RoHS	2.2	±20%	-	0.156	1,900	1,500	2
LSANB2520KKT3R3M	MAKK2520T3R3M	RoHS	3.3	±20%	_	0.200	1,550	1,300	2
LSANB2520KKT4R7M	MAKK2520T4R7M	RoHS	4.7	±20%	-	0.300	1,300	1,100	2

2520MK type	[Thickness: 1.2mm max.]
- ZoZowii Cype	THIOMICSS. I.ZIIIII IIIAX.

	Old next acceptan		Manada al Cardo de como		Self-resonant	DO De cietamen	Rated current		
New part number	Old part number (for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance	frequency [MHz] (min.)	DC Resistance [Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
LSANB2520MKTR47M	MAMK2520TR47M	RoHS	0.47	±20%	ı	0.039	4,200	3,400	2
LSANB2520MKTR68M	MAMK2520TR68M	RoHS	0.68	±20%	ı	0.048	3,200	3,200	2
LSANB2520MKT1R0M	MAMK2520T1R0M	RoHS	1.0	±20%	ı	0.059	3,100	2,700	2
LSANB2520MKT2R2M	MAMK2520T2R2M	RoHS	2.2	±20%	-	0.110	2,000	1,900	2
LSANB2520MKT3R3M	MAMK2520T3R3M	RoHS	3.3	±20%	ı	0.156	1,800	1,700	2
LSANB2520MKT4R7M	MAMK2520T4R7M	RoHS	4.7	±20%	ı	0.260	1,500	1,300	2

 $[\]frak{\%}$) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)

 $^{lap{\%}}$ The temperature rise current value (Idc2) is the DC current value having temperature increase by 40°C. (at 20°C)

 $[\]divideontimes$) The rated current value is following either Idc1 or Idc2, which is the lower one.

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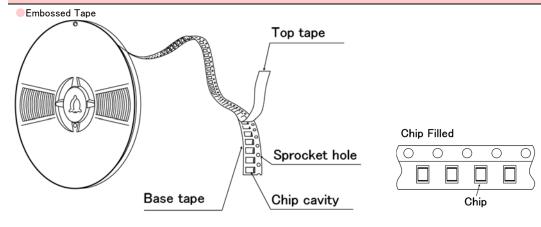
Wire-wound Metal Power Inductors MCOIL[™] LSAN/LLAN series Wire-wound Metal Power Inductors MCOIL[™] LSAP/LLAP series

■PACKAGING

①Minimum Quantity

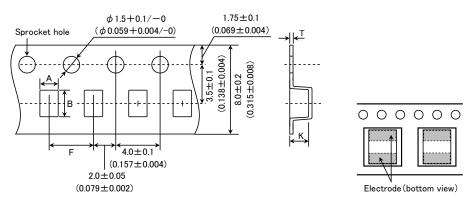
Turna	Standard Quantity [pcs]		
Type	Tape & Reel		
2016KK	3000		
2520KK	3000		
2520MK	3000		

2Tape Material



3 Taping dimensions

Embossed tape 8mm wide (0.315 inches wide)

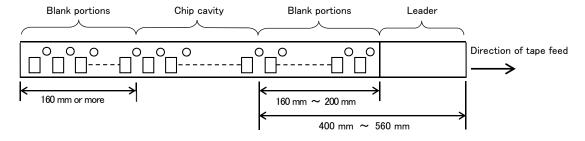


Turna	Chip	cavity	Insertion pitch	Tape thickness		
Туре	Α	В	F	T	K	
2016KK	1.9±0.1	2.3±0.1	4.0±0.1	0.25 ± 0.05	1.2 max	
	(0.075±0.004)	(0.091±0.004)	(0.157±0.004)	(0.009±0.002)	(0.047 max)	
2520KK	2.3±0.1	2.8±0.1	4.0±0.1	0.3±0.05	1.25 max	
	(0.091±0.004)	(0.110±0.004)	(0.157±0.004)	(0.012±0.002)	(0.049 max)	
2520MK	2.3±0.1	2.8±0.1	4.0±0.1	0.3±0.05	1.4 max	
	(0.091±0.004)	(0.110±0.004)	(0.157±0.004)	(0.012±0.002)	(0.055 max)	

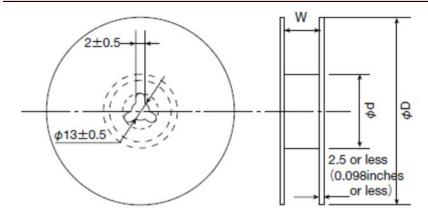
 $\mathsf{Unit}\!:\!\mathsf{mm}(\mathsf{inch})$

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4Leader and Blank portion



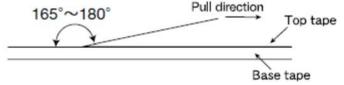
⑤Reel size



Type	F	Reel size (Reference values)					
туре	ϕ D	ϕ d	W				
2016KK	100+0 / 2	60.1/ 0	10.0±1.5				
2520KK	180+0/-3 (7.087+0/-0.118)	60+1/-0 (2.36+0.039/0)	(0.394 ± 0.059)				
2520MK	(7.007+0/-0.110)	(2.30+0.039/0)	(0.394±0.039)				
			Unit:mm(inch)				

©Top Tape Strength

The top The top tape requires a peel-off force of 0.1 to 1.2N in the direction of the arrow as illustrated below.



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Wire-wound Metal Power Inductors MCOIL[™] LSAN series for General Electronic Equipment for Consumer Wire-wound Metal Power Inductors MCOIL[™] LSAP series for General Electronic Equipment for Consumer Wire-wound Metal Power Inductors MCOIL[™] LLAN series

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

Wire-wound Metal Power Inductors MCOIL[™] LLAP series

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA

1. Operating Temp	erature Range					
operacing remp	-40~+105°C:LSAN/LLAN					
Specified Value	-40~+105 C:LSAN/LLAN -40~+125°C:LSAP/LLAP					
Test Methods and Remarks	Including self-generated heat					
2. Storage Temper	rature 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					
	•					
4. Inductance						
Specified Value	Within the specified tolerance					
Test Methods	Measuring equipment : LCR Meter (HP 4285A or equivalent)					
and Remarks	Measuring frequency : 2MHz, 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 ch						
Specified Value	Inductance change: Within ±15%					
Test Methods and Remarks	Measurement of inductance shall be taken at temperature range within $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$. With reference to inductance value at $+20^{\circ}\text{C}$., change rate shall be calculated.					
and Remarks	with reference to inductance value at +20 C., change rate shall be calculated.					
8. Resistance to fl	exure of substrate					
Specified Value	No damage					
	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 mm Force Rod					
Test Methods and Remarks	Test board material : Glass epoxy-resin Solder cream thickness : 0.12 mm					
and nomaino	Board					
	R5 Test Sample 45±2mm 45±2mm					

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9. Insulation resista	nce : betw	een wires					
Specified Value	_						
10. Insulation resist	ance : betv	veen wire and core					
Specified Value	_						
11. Withstanding vo	ltage : betv	veen wire and core					
Specified Value	_						
12. Adhesion of terr	I						
Specified Value	No abnor						
Test Methods and		samples shall be soldered force : 10N		-			
Remarks	Applied force : 10N to X and Y directions. Duration : 5s.						
	Solder	cream thickness : 0.12	mm.				
13. Resistance to v	1						
Specified Value		ce change : Within ±10% icant abnormality in appea	rance				
	_	samples shall be soldered		t hoard by the reflow			
		hall be submitted to below					
		iency Range 10~5					
Test Methods				exceed acceleration 19 10Hz for 1min.	96m/s²)		
and Remarks	Swee	ping Method 10Hz	.0 33H2 10	TOPIZ FOR TIMIN.			
		Time		For 2 hours on each	X, Y, and Z axis.		
		Z	<u> </u>		6		
	Recovery	/ : At least 2hrs of recove	y under the	e standard condition a	fter the test, followed by th	e measurement within 48hrs.	
14. Solderability							
Specified Value	At least	90% of surface of termin	l electrode	is covered by new so	lder		
Opcomed value					en solder as shown in below	table	
Test Methods and		nanol solution containing r		_			
Remarks	Solder Temperature $245\pm5^{\circ}$ CTime 5 ± 0.5 sec.						
	Time XImmer	5± sion depth : All sides of m		_ minal shall be immerse	d		
	71(2		arrang sarr		.		
15. Resistance to s	oldering he	at					
C:::	Inductan	ce change : Within ±10%					
Specified Value	No signif	icant abnormality in appea	rance.				
		sample shall be exposed	to reflow o	oven at 230°C for 40	seconds, with peak temper	vature at $260+0/-5^{\circ}C$ for 5 seconds, 3	
Test Methods	times. Test boa	rd material : Glass e	oxy-resin				
and Remarks		rd thickness : 1.0mm					
	Recovery	/: At least 2hrs of recove	y under th	e standard condition a	fter the test, followed by th	e measurement within 48hrs.	
16. Thermal shock							
Specified Value		ce change : Within ±10% icant abnormality in appea	rance.				
				board by the reflow. T	he test samples shall be pla	ced at specified temperature for specified	
					emperature cycle shall be r		
		Conditions					
Test Methods	Step 1	Temperature (°C) -40±3		Duration (min) 30±3			
and Remarks	2	Room temperature		Within 3			
	3	+85±2		30±3			
	11 /	Room temperature	1	Within 3	İ		

Room temperature

4

Within 3

Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.

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17. Damp heat						
Specified Value	_	Inductance change : Within ±10% No significant abnormality in appearance.				
T . M .! . !	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.					
Test Methods and Remarks	Temperature	60±2°C				
and Remarks	Humidity	90∼95%RH				
	Time	500+24/-0 hour				
	Recovery : At least	Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.				

18. Loading under d	amp heat				
Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.				
Test Methods and Remarks	The test samples sh as shown in below to Temperature Humidity Applied current Time	able. 60±2°C 90~95%RH Rated current 500+24/-0 hour	t board by the reflow. cic oven set at specified temperature and humidity and applied the rated current continuously description: e standard condition after the test, followed by the measurement within 48hrs.		

19. Low temperatur	re life test				
Specified Value		nductance change : Within $\pm 10\%$ No significant abnormality in appearance.			
Test Methods	The test samples s in below table.	hall be soldered to the test	board by the reflow. After that, the test samples shall be placed at test conditions as shown		
and Remarks	Temperature	-40±2°C			
	Time	500+24/-0 hour			
	Recovery : At leas	t 2hrs of recovery under the	e standard condition after the test, followed by the measurement within 48hrs.		

20. High temperatu	re life test				
Specified Value	_	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.			
Test Methods	The test samples s in below table.	hall be soldered to the test	board by the reflow. After that, the test samples shall be placed at test conditions as shown		
and Remarks	Temperature	85±2°C			
	Time	500+24/-0 hour			
	Recovery : At leas	t 2hrs of recovery under th	e standard condition after the test, followed by the measurement within 48hrs.		

Specified Value	
22. Standard cond	ition
	Standard test condition : Unless otherwise specified, temperature is $20\pm15^{\circ}$ C and $65\pm20\%$ of relative humidity.
Specified Value	When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of 20±2°C temperature, 65±5% relative humidity.
	Inductance is in accordance with our measured value.

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Wire-wound Metal Power Inductors MCOIL[™] LSAN/LLAN series Wire-wound Metal Power Inductors MCOIL[™] LSAP/LLAP series

PRECAUTIONS

1. Circuit Design

Precautions

- ◆ Verification of operating environment, electrical rating and performance
 - 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)
 - 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

Temperature rise of power choke coil depends on the installation condition in end products.

Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.

2. PCB Design Precautions A Land pattern design 1. Please refer to a recommended land pattern. A Land pattern design Surface Mounting • Mounting and soldering conditions should be checked beforehand. • Applicable soldering process to this products is reflow soldering only. 3. Considerations for automatic placement

3. Considerations for automatic placement Precautions Precautions Adjustment of mounting machine 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 Adjustment of mounting machine 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.

4. Soldering

Precautions

◆Reflow soldering

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

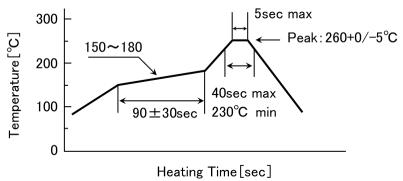
1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently.

◆Reflow soldering

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.

Recommended reflow condition (Pb free solder)





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5. Cleaning		
Precautions	◆Cleaning conditions 1. Washing by supersonic waves shall be avoided.	
Technical considerations	◆Cleaning conditions 1. If washed by supersonic waves, the products might be broken.	

6. Handling	
Precautions	 ✦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	 ✦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.

Precautions	 ♦ 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. • Storage conditions Ambient temperature: 0~40°C Humidity: Below 70% RH • The recommended ambient temperature is 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	◆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.

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Wire-wound Metal Power Inductors MCOIL™ LSAP series for General Electronic Equipment for Consumer

シリーズ前の記号は、品番から抽出したものであり、製品の種類や特性などの区分を示すためのものです。

REFLOW

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

* Operating Temp.:-40~+105°C (Including self-generated heat) %1Parts Number reference



1)Series

Code	
(1)(2)(3)(4)	
LSAP	Wire-wound Metal Power Inductor for General Electronic Equipment for Consumer

(1) Product Group

■PART NUMBER

	· · · · · · · · · · · · · · · · · · ·
Code	
L	Inductors

(2) Category

Code	Recommended equipment	Quality Grade
S	General Electronic Equipment for Consumer	3

Code	e	
Α	Metal Wire-wound	

(4) Features. Characteristics

Code		
Р	High current power choke	

2Features

Code	Feature	
В	L-shape electrode (Ag-resin × Sn-plate)	

3Dimensions (L × W)

<u> </u>			
Code	Type (inch)	Dimensions (L×W)[mm]	
2016	2016(0806)	2.0 × 1.6	
2520	2520(1008)	2.5 × 2.0	

(4)Dimensions (T)

G Birrich Sions (1)		
Code	Dimensions (T) [mm]	
KK	1.0	
MK	1.2	

5Packaging

(3) Type

Code	Packaging
Т	Taping

6 Nominal inductance

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

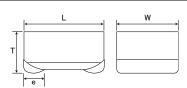
※R=Decimal point

7 Inductance tolerance

_	
Code	Inductance tolerance
М	±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	Α	В	С
2016	0.7	0.8	1.8
2520	0.8	1.2	2.0
			Unit:mm

Туре	L	W	Т	е	Standard quantity[pcs] Taping
2016KK	2.0±0.1 (0.079±0.004)	1.6±0.1 (0.063±0.004)	1.0 max (0.039 max)	0.5±0.3 (0.020±0.012)	3000
2520KK	2.5±0.2 (0.098±0.008)	2.0±0.2 (0.079±0.008)	1.0 max (0.039 max)	0.5±0.3 (0.020±0.012)	3000
2520MK	2.5±0.2 (0.098±0.008)	2.0±0.2 (0.079±0.008)	1.2 max (0.047 max)	0.5±0.3 (0.020±0.012)	3000

Unit:mm(inch)

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PART NUMBER

2016KK type		Thickr	ess:1.0mm max.]						
	Old part number	EHS	Nominal inductance		Self-resonant frequency [MHz] (min.)	DC Resistance [Ω] (max.)		※) [mA](max.)	Measuring frequency[MHz]
New part number	(for reference)		[μ H]	Inductance tolerance			Saturation current Idc1	Temperature rise current Idc2	
LSAPB2016KKTR22M	MAKK2016HR22M	RoHS	0.22	±20%	-	0.026	5,800	4,000	2
LSAPB2016KKTR24M	MAKK2016HR24M	RoHS	0.24	±20%	ı	0.026	5,800	4,000	2
LSAPB2016KKTR33M	MAKK2016HR33M	RoHS	0.33	±20%	ı	0.030	4,700	3,500	2
LSAPB2016KKTR47M	MAKK2016HR47M	RoHS	0.47	±20%	ı	0.036	4,300	3,300	2
LSAPB2016KKTR68M	MAKK2016HR68M	RoHS	0.68	±20%	ı	0.050	3,200	2,700	2
LSAPB2016KKT1R0M	MAKK2016H1R0M	RoHS	1.0	±20%	ı	0.070	2,700	2,300	2
LSAPB2016KKT1R5M	MAKK2016H1R5M	RoHS	1.5	±20%	_	0.105	2,100	1,800	2

2520KK type [Thickness: 1.0mm]									
	Old part number		N		Self-resonant	DO D	Rated current	※) [mA](max.)	
New part number	(for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance	frequency	DC Resistance [Ω](max.)	Saturation current	Temperature rise current	Measuring frequency[MHz]
	(TOT TETETETICE)		[μ11]		[MHz] (min.)	[]t] (IIIax.)	Idc1	Idc2	ir equency [wir iz]
LSAPB2520KKTR22M	MAKK2520HR22M	R₀HS	0.22	±20%	-	0.021	7500	4900	2
LSAPB2520KKTR33M	MAKK2520HR33M	R₀HS	0.33	±20%	-	0.026	6200	4300	2
LSAPB2520KKTR47M	MAKK2520HR47M	R₀HS	0.47	±20%	-	0.029	5700	4000	2
LSAPB2520KKTR68M	MAKK2520HR68M	R ₀ HS	0.68	±20%	-	0.043	4300	3400	2
LSAPB2520KKT1R0M	MAKK2520H1R0M	R₀HS	1.0	±20%	-	0.053	3800	3000	2
LSAPB2520KKT1R5M	MAKK2520H1R5M	RoHS	1.5	±20%	-	0.078	3000	2400	2
LSAPB2520KKT2R2M	MAKK2520H2R2M	R₀HS	2.2	±20%	-	0.120	2500	1800	2
LSAPB2520KKT100M	MAKK2520H100M ※1	R₀HS	10	±20%	-	0.650	1100	750	2

2520MK type			Thickn	ess:1.2mm max.】						
		Old part number				Self-resonant	DC Resistance	Rated current	※) [mA] (max.)	
New part number	(for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance	frequency [MHz] (min.)	[Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]	
	LSAPB2520MKTR22M	MAMK2520HR22M	RoHS	0.22	±20%	-	0.021	7500	5000	2
	LSAPB2520MKTR33M	MAMK2520HR33M	RoHS	0.33	±20%	-	0.023	6600	4400	2
	LSAPB2520MKTR47M	MAMK2520HR47M	RoHS	0.47	±20%	-	0.026	5800	4100	2
	LSAPB2520MKTR68M	MAMK2520HR68M	RoHS	0.68	±20%	-	0.036	5100	3500	2
	LSAPB2520MKT1R0M	MAMK2520H1R0M	RoHS	1.0	±20%	-	0.045	4300	3100	2
	LSAPB2520MKT1R5M	MAMK2520H1R5M	RoHS	1.5	±20%	-	0.065	3300	2600	2
	LSAPB2520MKT2R2M	MAMK2520H2R2M	RoHS	2.2	±20%	-	0.090	2800	2200	2

[%]) 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) is the DC current value having temperature increase by 40°C. (at 20°C)

^{*)} The rated current value is following either Idc1 or Idc2, which is the lower one.

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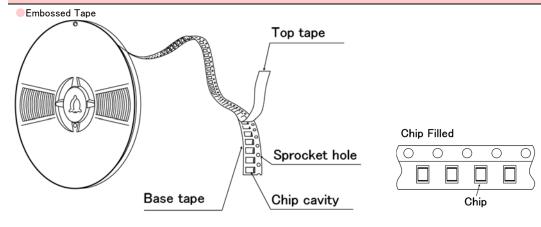
Wire-wound Metal Power Inductors MCOIL[™] LSAN/LLAN series Wire-wound Metal Power Inductors MCOIL[™] LSAP/LLAP series

■PACKAGING

①Minimum Quantity

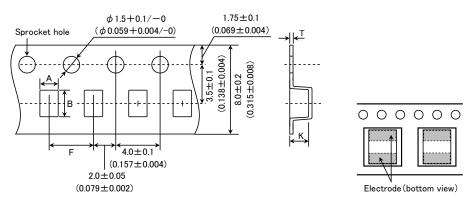
Turna	Standard Quantity [pcs]
Туре	Tape & Reel
2016KK	3000
2520KK	3000
2520MK	3000

2Tape Material



3 Taping dimensions

Embossed tape 8mm wide (0.315 inches wide)

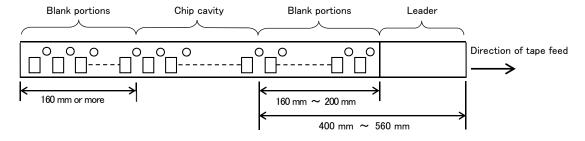


Turna	Chip	cavity	Insertion pitch	Insertion pitch Tape thick		
Туре	Α	В	F	T	K	
2016KK	1.9±0.1	2.3±0.1	4.0±0.1	0.25 ± 0.05	1.2 max	
	(0.075±0.004)	(0.091±0.004)	(0.157±0.004)	(0.009±0.002)	(0.047 max)	
2520KK	2.3±0.1	2.8±0.1	4.0±0.1	0.3±0.05	1.25 max	
	(0.091±0.004)	(0.110±0.004)	(0.157±0.004)	(0.012±0.002)	(0.049 max)	
2520MK	2.3±0.1	2.8±0.1	4.0±0.1	0.3±0.05	1.4 max	
	(0.091±0.004)	(0.110±0.004)	(0.157±0.004)	(0.012±0.002)	(0.055 max)	

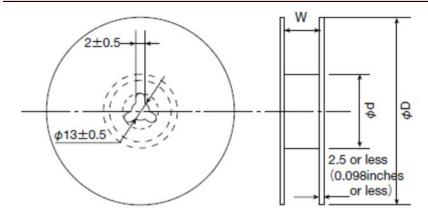
 $\mathsf{Unit}\!:\!\mathsf{mm}(\mathsf{inch})$

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4Leader and Blank portion



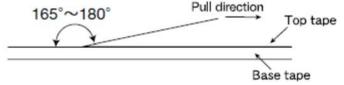
⑤Reel size



Type	Reel size (Reference values)					
туре	ϕ D	ϕ d	W			
2016KK	100+0 / 2	60+1/-0	100115			
2520KK	180+0/-3 (7.087+0/-0.118)	(2.36+0.039/0)	10.0±1.5 (0.394±0.059)			
2520MK	(7.007+0/-0.110)	(2.30+0.039/0)	(0.394±0.039)			
			Unit:mm(inch)			

©Top Tape Strength

The top The top tape requires a peel-off force of 0.1 to 1.2N in the direction of the arrow as illustrated below.



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Wire-wound Metal Power Inductors MCOIL[™] LSAN series for General Electronic Equipment for Consumer Wire-wound Metal Power Inductors MCOIL[™] LSAP series for General Electronic Equipment for Consumer Wire-wound Metal Power Inductors MCOIL[™] LLAN series

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

Wire-wound Metal Power Inductors MCOIL[™] LLAP series

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA

1. Operating Temp	erature Range				
operacing remp	-40~+105°C:LSAN/LLAN				
Specified Value	-40~+105 C:LSAN/LLAN -40~+125°C:LSAP/LLAP				
Test Methods and Remarks	Including self-generated heat				
2. Storage Temper	rature 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				
	•				
4. Inductance					
Specified Value	Within the specified tolerance				
Test Methods	Measuring equipment : LCR Meter (HP 4285A or equivalent)				
and Remarks	Measuring frequency : 2MHz, 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 ch					
Specified Value	Inductance change: Within ±15%				
Test Methods and Remarks	Measurement of inductance shall be taken at temperature range within $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$. With reference to inductance value at $+20^{\circ}\text{C}$., change rate shall be calculated.				
and Remarks	with reference to inductance value at +20 C., change rate shall be calculated.				
8. Resistance to fl	exure of substrate				
Specified Value	No damage				
	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 mm Force Rod				
Test Methods and Remarks	Test board material : Glass epoxy-resin Solder cream thickness : 0.12 mm				
and nomaino	Board				
	R5 Test Sample 45±2mm 45±2mm				

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9. Insulation resista	nce : betwe	een wires					
Specified Value	_						
10. Insulation resist	ance : betv	veen wire and core					
Specified Value	_						
11. Withstanding vo	ltage : betv	veen wire and core					
Specified Value	_						
12. Adhesion of terr	minal electi	rode					
Specified Value	No abnor	mality.					
To at Matheda and		samples shall be soldere					
Test Methods and Remarks	Applied Duration		i to A and	Y directions.			
			2mm.				
13. Resistance to v	ibration						
Specified Value		ce change : Within ±10%					
	_	icant abnormality in appe					
		samples shall be soldere hall be submitted to belo					
		ency Range 10~		arcions.			
Test Methods	Total	Amplitude 1.5m	n (May not	exceed acceleration 1	96m/s²)		
and Remarks	Swee		to 55Hz to	10Hz for 1min.			
and nomano		Time X	4	F 0 h	V V17		
		Z	-	For 2 hours on each	A, T, and Z axis.		
	Recovery	: At least 2hrs of recov	ry under th	ne standard condition a	fter the test, followed by th	e measurement within 48hrs.	
14. Solderability							
Specified Value	At least	90% of surface of termi	al electrod	le is covered by new so	lder.		
				then immersed in molte	en solder as shown in below	table.	
Test Methods and	Flux: Ethanol solution containing rosin 25%.						
Remarks	Solder Temperature $245\pm5^{\circ}$ CTime 5 ± 0.5 sec.						
	*Immersion depth : All sides of mounting terminal shall be immersed.						
15. Resistance to s	oldering he	at					
Specified Value	Inductan	ce change : Within ±10%					
- Opcomed Value		o significant abnormality in appearance.					
	The test sample shall be exposed to reflow oven at 230°C for 40 seconds, with peak temperature at $260+0/-5$ °C for 5 seconds, 3						
Test Methods	times. Test board material : Glass epoxy-resin						
and Remarks	Test board thickness : 1.0mm						
	Recovery	: At least 2hrs of recov	ry under th	ne standard condition a	fter the test, followed by th	e measurement within 48hrs.	
16. Thermal shock	Γ						
Specified Value		ce change : Within $\pm 10\%$ icant abnormality in appe	rance.				
	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.						
	Step	Conditions Temperature (°C)	of 1 cycle	Duration (min)			
Test Methods	Step 1	-40±3		30±3			
and Remarks	2	Room temperature		Within 3			
	3	+85±2		30±3			
		Room temperature	1	Within 3	Ì		

Room temperature

4

Within 3

Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.

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17. Damp heat					
Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.				
T . M .! . !	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.				
Test Methods and Remarks	Temperature	60±2°C			
and Remarks	Humidity	90∼95%RH			
	Time	500+24/-0 hour			
	Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.				

18. Loading under d	amp heat		
Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.		
Test Methods and Remarks	The test samples sh as shown in below to Temperature Humidity Applied current Time	able. 60±2°C 90~95%RH Rated current 500+24/-0 hour	t board by the reflow. ic oven set at specified temperature and humidity and applied the rated current continuously e standard condition after the test, followed by the measurement within 48hrs.

19. Low temperatur	re life test				
Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.				
Test Methods	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.				
and Remarks	Temperature	-40±2°C			
	Time	500+24/-0 hour			
	Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.				

20. High temperatu	re life test				
Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.				
Test Methods	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.				
and Remarks	Temperature	85±2°C			
	Time	500+24/-0 hour			
	Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.				

Specified Value	
22. Standard cond	ition
Specified Value	Standard test condition : Unless otherwise specified, temperature is $20\pm15^{\circ}$ C and $65\pm20\%$ of relative humidity.
	When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of 20±2°C temperature, 65±5% relative humidity.
	Inductance is in accordance with our measured value.

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Wire-wound Metal Power Inductors MCOIL[™] LSAN/LLAN series Wire-wound Metal Power Inductors MCOIL[™] LSAP/LLAP series

PRECAUTIONS

1. Circuit Design

Precautions

- ◆ Verification of operating environment, electrical rating and performance
 - 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)
 - 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

Temperature rise of power choke coil depends on the installation condition in end products.

Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.

2. PCB Design Precautions A Land pattern design 1. Please refer to a recommended land pattern. A Land pattern design Surface Mounting • Mounting and soldering conditions should be checked beforehand. • Applicable soldering process to this products is reflow soldering only. 3. Considerations for automatic placement

3. Considerations for automatic placement Precautions Precautions Adjustment of mounting machine 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 Adjustment of mounting machine 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.

4. Soldering

Precautions

◆Reflow soldering

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

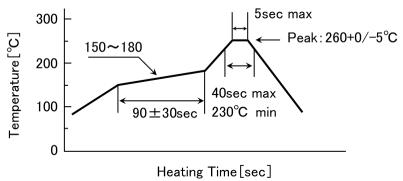
1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently.

◆Reflow soldering

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.

Recommended reflow condition (Pb free solder)





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5. Cleaning	
Precautions	◆Cleaning conditions 1. Washing by supersonic waves shall be avoided.
Technical considerations	◆Cleaning conditions 1. If washed by supersonic waves, the products might be broken.

6. Handling	
Precautions	 ◆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	 ♦ 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	 ♦ Storage 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. Storage conditions	
Technical considerations	◆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.	

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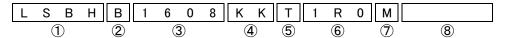
Wire-wound Metal Power Inductors MCOIL[™] LSBH series for General Electronic Equipment for Consumer

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

REFLOW

■PART NUMBER

* Operating Temp.: -40~+105°C (Including self-generated heat)



1)Series

y-enter		
Code		
(1)(2)(3)(4)		
LSBH	Wire-wound Metal Power Inductor for General Electronic Equipment for Consumer	

(1) Product Group

	•
Code	
L	Inductors

(2) Category

Code	Recommended equipment	Quality Grade
S	General Electronic Equipment for Consumer	3

(3) Type

Code	
В	Metal Wire-wound (Horizontal type)

(4) Features, Characteristics

Code	
Н	Hybrid power choke

2Features

Code	Feature
B	L-shape electrode (Ag-resin X Sn-plate)

3Dimensions (L × W)

Code	Type(inch)	Dimensions (L×W)[mm]
1608	1608(0603)	1.6 × 0.8
2012	2012 (0805)	2.0 × 1.25
2520	2520(1008)	2.5 × 2.0

4 Dimensions (T)

Code	Dimensions (T) [mm]
KK	1.0
MK	1.2

5Packaging

Code	Packaging
Т	Taping

6 Nominal inductance

© 110111111ai III aa Gaarigo					
Code (example)	Nominal inductance[μH]				
R24	0.24				
1R0	1.0				
4R7	4.7				

7 Inductance tolerance

Code	Inductance tolerance
М	±20%
N	±30%

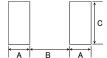
⁸Internal code

■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



•	p			
	Туре	Α	В	С
	1608	0.55	0.70	1.00
	2012	0.60	1.00	1.45
	2520	0.60	1.50	2.00

Unit:mm

T	Type L W T e		l W	L W T		Standard qu	uantity[pcs]
Туре	ype L W I e	G	Paper tape	Embossed tape			
1608KK	1.6±0.2	0.8 ± 0.2	1.0 max	0.45±0.15	_	3000	
TOUGKK	(0.063 ± 0.008)	(0.031 ± 0.008)	(0.040 max)	(0.016 ± 0.006)	_	3000	
2012KK	2.0±0.2 1.25±		1.0 max	0.5±0.2		2000	
2012NN	(0.079 ± 0.008)	(0.049 ± 0.008)	(0.040 max)	(0.020 ± 0.008)	_	3000	
2520MK	2.5±0.2	2.0±0.2	1.2 max	0.5±0.2	_	3000	
ZOZUWK	(0.098 ± 0.008)	(0.079 ± 0.008)	(0.047 max)	(0.020 ± 0.008)	_	3000	
						Unit:mm(inch)	

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PART NUMBER

1608KK type		[Thickr	ess:1.0mm max.】						
	Old mark mark an		Manada al fanda akan a		Self-resonant	DC Resistance	Rated current	※) [mA](max.)	
New part number	Old part number (for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance	frequency	[Ω](max.)	Saturation current	Temperature rise current	Measuring frequency[MHz]
	(for reference)		[[[]		[MHz] (min.)	[JE] (IIIAX.)	Idc1	Idc2	irequericy[wiri2]
LSBHB1608KKTR24N	MBKK1608TR24N	R₀HS	0.24	±30%	-	0.049	1,650	2,300	1.0
LSBHB1608KKTR47N	MBKK1608TR47N	RoHS	0.47	±30%	-	0.104	1,100	1,400	1.0
LSBHB1608KKTR68N	MBKK1608TR68N	R₀HS	0.68	±30%	-	0.120	950	1,200	1.0
LSBHB1608KKT1R0M	MBKK1608T1R0M	RoHS	1.0	±20%	-	0.150	800	1,150	1.0
LSBHB1608KKT1R5M	MBKK1608T1R5M	RoHS	1.5	±20%	-	0.200	650	1,000	1.0
LSBHB1608KKT2R2M	MBKK1608T2R2M	RoHS	2.2	±20%	-	0.345	520	750	1.0
LSBHB1608KKT3R3M	MBKK1608T3R3M	R₀HS	3.3	±20%	-	0.512	450	600	1.0
LSBHB1608KKT4R7M	MBKK1608T4R7M	RoHS	4.7	±20%	-	0.730	370	500	1.0

2012KK type	ess:1.0mm max.】								
	Old part number		Nominal inductance		Self-resonant	DC Resistance	Rated current	※) [mA](max.)	
New part number	(for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance	frequency	[Ω](max.)	Saturation current	Temperature rise current	Measuring frequency[MHz]
	(IOI Telefelice)		[[[11]		[MHz] (min.)	[JE] (IIIAX.)	Idc1	Idc2	irequency [wiriz]
LSBHB2012KKTR24N	MBKK2012TR24N	RoHS	0.24	±30%	ı	0.041	3,000	2,400	1.0
LSBHB2012KKTR47N	MBKK2012TR47N	RoHS	0.47	±30%	ı	0.078	2,000	1,650	1.0
LSBHB2012KKTR68N	MBKK2012TR68N	RoHS	0.68	±30%	ı	0.090	1,800	1,500	1.0
LSBHB2012KKT1R0M	MBKK2012T1R0M	RoHS	1.0	±20%	ı	0.106	1,500	1,450	1.0
LSBHB2012KKT1R5M	MBKK2012T1R5M	RoHS	1.5	±20%	ı	0.173	1,200	1,100	1.0
LSBHB2012KKT2R2M	MBKK2012T2R2M	R₀HS	2.2	±20%	ı	0.290	900	850	1.0
LSBHB2012KKT3R3M	MBKK2012T3R3M	R₀HS	3.3	±20%	ı	0.500	700	650	1.0
LSBHB2012KKT4R7M	MBKK2012T4R7M	RoHS	4.7	±20%	ı	0.615	600	600	1.0

2520MK type		[Thickn	ess:1.2mm max.】						
	Old part number		Nominal inductance		Self-resonant	DC Resistance	Rated current	※) [mA](max.)	
New part number	(for reference)	EHS [μH]	Inductance tolerance	frequency [MHz] (min.)	[Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]	
LSBHB2520MKTR24N	MBMK2520TR24N	RoHS	0.24	±30%	-	0.026	4,750	3,500	1.0
LSBHB2520MKTR47N	MBMK2520TR47N	RoHS	0.47	±30%	-	0.042	3,900	2,600	1.0
LSBHB2520MKTR68N	MBMK2520TR68N	RoHS	0.68	±30%	-	0.058	3,150	2,150	1.0
LSBHB2520MKT1R0M	MBMK2520T1R0M	RoHS	1.0	±20%	-	0.072	2,350	1,850	1.0
LSBHB2520MKT1R5M	MBMK2520T1R5M	RoHS	1.5	±20%	-	0.106	2,050	1,500	1.0
LSBHB2520MKT2R2M	MBMK2520T2R2M	RoHS	2.2	±20%	-	0.159	1,800	1,250	1.0
LSBHB2520MKT3R3M	MBMK2520T3R3M	RoHS	3.3	±20%	-	0.260	1,400	970	1.0
LSBHB2520MKT4R7M	MBMK2520T4R7M	RoHS	4.7	±20%	_	0.380	1,150	800	1.0

[%]) 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) is the DC current value having temperature increase by 40°C. (at 20°C)

^{*)} The rated current value is following either Idc1 or Idc2, which is the lower one.

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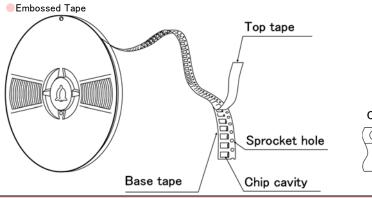
Wire-wound Metal Power Inductors MCOIL[™] LSBH/LLBH series Wire-wound Metal Power Inductors MCOIL[™] LSBH/LLBH series (125°C guaranteed product)

■PACKAGING

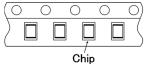
1 Minimum Quantity

T	Standard Quantity [pcs]
Туре	Tape & Reel
1608KK	3000
2012KK	3000
2520MK	3000

2Tape Material

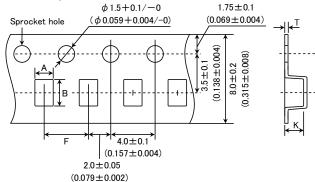


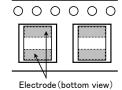
Chip Filled



3Taping dimensions

Embossed tape 8mm wide (0.315 inches wide)



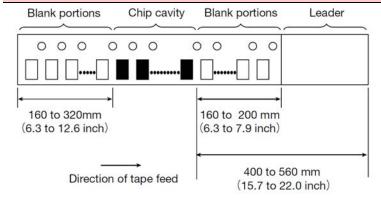


Time	Chip	cavity	Insertion pitch	Tape thickness		
Туре	Α	В	F	Т	K	
1608KK	1.1	1.9	4.0±0.1	0.25±0.05	1.2 max	
IOOOKK	(0.043)	(0.075)	(0.157 ± 0.004)	(0.010 ± 0.002)	(0.047 max)	
2012KK	1.45	2.2	4.0±0.1	0.25±0.05	1.2 max	
2012KK	(0.057)	(0.087)	(0.157 ± 0.004)	(0.010 ± 0.002)	(0.047 max)	
2520MK	2.3	2.8	4.0±0.1	0.3±0.05	1.45 max	
2320WIK	(0.091)	(0.110)	(0.157 ± 0.004)	(0.012 ± 0.002)	(0.057 max)	

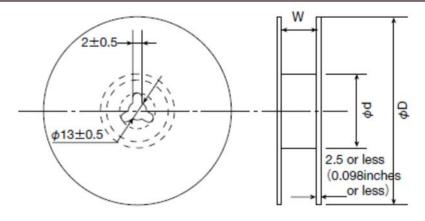
Unit:mm(inch)

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4 Leader and Blank portion



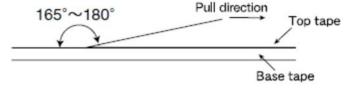
⑤Reel size



Туре	Reel size (Reference values)				
туре	ϕ D	ϕ d	W		
1608KK	180+0/-3	60+1/-0	100±15		
2012KK	(7.087+0/-0.118)	(2.36+0.039/0)	10.0 ± 1.5 (0.394 ± 0.059)		
2520MK	(7.087+0/-0.118)	(2.30+0.039/0)			
			Unit:mm(inch)		

6Top 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[™] LSBH series

for General Electronic Equipment for Consumer

Wire-wound Metal Power Inductors MCOIL[™] LSBH series (125°C guaranteed product)

for General Electronic Equipment for Consumer

Wire-wound Metal Power Inductors MCOIL[™] LLBH series

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

Wire-wound Metal Power Inductors MCOIL[™] LLBH series (125°C guaranteed product)

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA

1. Operating Temp	erature Range					
Specified Value	-40~+105°C:LSBH/LLBH					
Specified value	-40~+125°C:LSBH/LLBH (125°C guaranteed product)					
Test Methods and Remarks	Including self-generated heat					
0.01 T						
2. Storage Temper						
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					
	1					
4. Inductance						
Specified Value	Within the specified tolerance					
Test Methods	Measuring equipment : LCR Meter (HP 4285A or equivalent)					
and Remarks	Measuring frequency : 1MHz、1V					
5. DC Resistance						
Specified Value	Within the specified tolerance					
Test Methods and Remarks	Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)					
0.016						
6. Self resonance f	requency					
Specified Value						
7. Temperature ch	aracteristic					
Specified Value	Inductance change: Within ±15%					
Test Methods and Remarks	LSBH/LLBH: Measurement of inductance shall be taken at temperature range within $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$. With reference to inductance value at $+20^{\circ}\text{C}$., change rate shall be calculated. LSBH/LLBH (125°C guaranteed product): 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.					

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8. Resistance to flexure of substrate Specified Value No damage 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 mm (1608 type: 0.8mm) Test Methods and Remarks Solder cream thickness : 0.1 mm

9. Insulation resistance : between wires

Specified Value -

10. Insulation resistance : between wire and core

LSBH/LLBH:

Specified Value

DC25V 100kΩ min

LSBH/LLBH (125°C guaranteed product):

DC50V 100kΩ min

11. Withstanding voltage: between wire and core

Specified Value

12. Adhesion of terminal electrode

Specified Value	No abnormality.				
	The test samples shall be soldered to the test board by the reflow.				
Test Methods and	Applied force	: 10N (1608 type∶5N) to X and Y directions.			
Remarks	Duration	: 5s.			
	Solder cream thickness	: 0.1mm.			

13. Resistance to vibration

Specified Value

Inductance change: Within ±10%

No significant abnormality in appearance.

The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions.

Test Methods and Remarks

Frequency Range	10∼55Hz			
Total Amplitude	1.5mm	1.5mm (May not exceed acceleration 196m/s ²)		
Sweeping Method	10Hz t	o 55Hz to 10Hz for 1min.		
	Χ			
Time	Υ	For 2 hours on each X, Y, and Z axis.		
	Z			

Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.

14. Solderability

Specified Value	At least 90%	of surface of terminal	l electrode is covered by new solder.
-----------------	--------------	------------------------	---------------------------------------

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%.

Test Methods and Remarks

Solder Temperature	245±5°C
Immersing speed	25mm/s
Time	5±0.5 sec.

*Immersion depth : All sides of mounting terminal shall be immersed.

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15. Resistance to s	oldering heat
Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.
Test Methods and Remarks	The test sample shall be exposed to reflow oven at 230°C for 40 seconds, with peak temperature at 260+0/-5°C for 5 seconds, 3 times. 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.

16. Thermal shock Inductance change : Within $\pm 10\%$ Specified Value No significant abnormality in appearance. LSBH/LLBH: 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. Conditions of 1 cycle Test Methods Step Temperature (°C) Duration (min) and Remarks -40±3 30 ± 3 Within 3 Room temperature 3 +85±2 30 ± 3 4 Room temperature Within 3 Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.

LSBH/LLBH (125°C guaranteed product):

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.

Conditions of 1 cycle					
Step	Temperature (°C)	Duration (min)			
1	-40 ± 3	30±3			
2	Room temperature	Within 3			
3	+125±2	30±3			
4	Room temperature	Within 3			

Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.

17. Damp heat						
Specified Value	Inductance change No significant abnor	: Within ±10% rmality in appearance.				
Test Methods	The test samples	hall be soldered to the tes shall be placed in therm are and humidity as shown	nostatic oven set at	The test samples s The test samples	C guaranteed product): hall be soldered to the test shall be placed in thermoure and humidity as shown in	ostatic oven set at
and Remarks	Temperature Humidity Time	60±2°C 90~95%RH 1000+24/-0 hour 2hrs of recovery under the		Temperature Humidity Time	$85\pm2^{\circ}\text{C}$ 85RH $1000+24/-0 \text{ hour}$ t 2hrs of recovery under the	
	after the test, follow	wed by the measurement v	vithin 48hrs.	after the test, follo	wed by the measurement wi	thin 48hrs.

18. Loading under	damp heat					
Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.					
	LSBH/LLBH:			LSBH/LLBH (125°C guaranteed product):		
	The test samples shall be soldered to the test board by the reflow.			The test samples shall be soldered to the test board by the reflow.		
	The test samples shall be placed in thermostatic oven set at			The test samples shall be placed in thermostatic oven set at		
	specified temperature and humidity and applied the rated current			specified temperature and humidity and applied the rated current		
Test Methods	continuously as show	wn in below table.	_	continuously as sho	wn in below table.	_
and Remarks	Temperature	60±2°C		Temperature	85±2°C	
	Humidity	90∼95%RH		Humidity	85%RH	
	Applied current	Rated current		Applied current	Rated current	
	Time	1000+24/-0 hour		Time	1000+24/-0 hour	
	Recovery: At least 2hrs of recovery under the standard condition			Recovery: At least 2hrs of recovery under the standard condition		
	after the test, followed by the measurement within 48hrs.			after the test, follow	ved by the measurement wi	thin 48hrs.

19. Low temperatu	re life test		
Specified Value	Inductance change No significant abno	e : Within ±10% ormality in appearance.	
	The test samples s	shall be soldered to the test	board by the reflow. After that, the test samples shall be placed at test conditions as shown
Test Methods	in below table.		
and Remarks	Temperature	-40±2°C	
	Time	1000+24/-0 hour	
	Recovery : At leas	t 2hrs of recovery under th	e standard condition after the test, followed by the measurement within 48hrs.

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Specified Value	Inductance change No significant abno	e : Within ±10% ormality in appearance.	
Test Methods	The test samples s in below table.	shall be soldered to the tes	t board by the reflow. After that, the test samples shall be placed at test conditions as shown
and Remarks	Temperature	85±2°C	
	Time	1000+24/-0 hour	
	Recovery : At leas	t 2hrs of recovery under t	ne standard condition after the test, followed by the measurement within 48hrs.

21. Loading at high	n temperature life test
Specified Value	-
22. Standard cond	ition
Specified Value	Standard test condition: Unless otherwise specified, temperature is 20±15°C and 65±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±2°C of temperature, 65±5% relative humidity. Inductance is in accordance with our measured value.

Wire-wound Metal Power Inductors MCOIL™ LSBH/LLBH series Wire-wound Metal Power Inductors MCOIL™ LSBH/LLBH series (125°C guaranteed product)

PRECAUTIONS

1. Circuit Design

- ◆ Verification of operating environment, electrical rating and performance
 - 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.
- Precautions ◆Operating Current (Verification of Rated current)
 - 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

Temperature rise of power choke coil depends on the installation condition in end products.

Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.

2. PCB Design Land pattern design Precautions 1. Please refer to a recommended land pattern. ◆Land pattern design Technical Surface Mounting · Mounting and soldering conditions should be checked beforehand. considerations · Applicable soldering process to this products is reflow soldering only. 3. Considerations for automatic placement

◆Adjustment of mounting machine Precautions 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 ◆Adjustment of mounting machine considerations 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.

4. Soldering

◆Reflow soldering

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.

Precautions

3. Please do not add any stress to a product until it returns in normal temperature after reflow soldering.

◆Lead free soldering

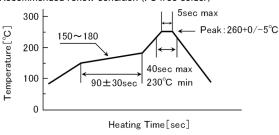
1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently.

◆Reflow soldering

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.

Recommended reflow condition (Pb free solder)





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5. Cleaning	
Precautions	◆Cleaning conditions 1. Washing by supersonic waves shall be avoided.
Technical considerations	◆Cleaning conditions 1. If washed by supersonic waves, the products might be broken.

6. Handling	
Precautions	 ◆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	 ♦ 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	 ♦ Storage 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. Storage conditions	
Technical	◆Storage 1. Under a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes	

considerations

and deterioration of taping/packaging materials may take place.

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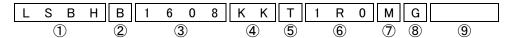
Wire-wound Metal Power Inductors MCOIL[™] LSBH series (125°C guaranteed product) for General Electronic Equipment for Consumer

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

REFLOW

■PART NUMBER

* Operating Temp.:-40 \sim +125 $^{\circ}$ C (Including self-generated heat)



1)Series

	y conse		
	Code		
(1)	(2)(3)(4)		
	LSBH	Wire-wound Metal Power Inductor for General Electronic Equipment for Consumer	

(1) Product Group

(1) 1 1 2 2	(1)	
Code		
L	Inductors	

(2) Category

Code	Recommended equipment	Quality Grade
S	General Electronic Equipment for Consumer	3

(3) Type

Code	
В	Metal Wire-wound (Horizontal type)

(4) Features, Characteristics

Code	
Н	Hybrid power choke

2Features

Code	Feature
В	L-shape electrode (Ag-resin × Sn-plate)

3Dimensions (L × W)

Code	Type(inch)	Dimensions (L × W) [mm]
1608	1608(0603)	1.6 × 0.8
2520	2520(1008)	2.5 × 2.0

4Dimensions (T)

Code	Dimensions (T) [mm]
KK	1.0
MK	1.2

5Packaging

Code	Packaging
Т	Taping

6 Nominal inductance

©1101111111111111111111111111111111111		
Code (example)	Nominal inductance[μH]	
R24	0.24	
1R0	1.0	
4R7	4.7	

7Inductance tolerance

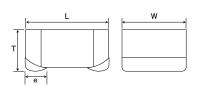
Code	Inductance tolerance
М	±20%
N	±30%

Special code

Sebesiai seas	
Code	Special code
G	High characteristic specification

9Internal 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	Α	В	С
1608	0.55	0.70	1.00
2520	0.60	1.50	2.00
			Unit:mm

Туре		W)A/ T	т	_	Standard quantity[pcs]		
Type		VV	'	е	Paper tape	Embossed tape		
1608KK	1.6±0.2	0.8±0.2	1.0 max	0.45±0.15	_	3000		
IUUOKK	(0.063 ± 0.008)	(0.031 ± 0.008)	(0.040 max)	(0.016 ± 0.006)	_	ა000		
2520MK	2.5±0.2	2.0±0.2	1.2 max	0.5±0.2		3000		
ZOZUWK	(0.098 ± 0.008)	(0.079 ± 0.008)	(0.047 max)	(0.020 ± 0.008)	_	3000		
						Unit:mm(inch)		

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PART NUMBER

1608KK type		[Thickr	ess:1.0mm max.】						
	Old part number		N		Self-resonant	DO D	Rated current ※) [mA](max.)		
New part number	(for reference)	EHS	Nominal inductance [μ H]	Inductance tolerance	frequency [MHz] (min.)	DC Resistance [Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
LSBHB1608KKTR24NG	MBKK1608HR24N	RoHS	0.24	±30%	ı	0.049	1,650	2,300	1.0
LSBHB1608KKTR47NG	MBKK1608HR47N	RoHS	0.47	±30%	ı	0.104	1,100	1,400	1.0
LSBHB1608KKTR68NG	MBKK1608HR68N	RoHS	0.68	±30%	-	0.120	950	1,200	1.0
LSBHB1608KKT1R0MG	MBKK1608H1R0M	RoHS	1.0	±20%	-	0.150	800	1,150	1.0
LSBHB1608KKT1R5MG	MBKK1608H1R5M	RoHS	1.5	±20%	-	0.200	650	1,000	1.0
LSBHB1608KKT2R2MG	MBKK1608H2R2M	RoHS	2.2	±20%	-	0.345	520	750	1.0
LSBHB1608KKT3R3MG	MBKK1608H3R3M	RoHS	3.3	±20%	ı	0.512	450	600	1.0
LSBHB1608KKT4R7MG	MBKK1608H4R7M	RoHS	4.7	±20%	-	0.730	370	500	1.0

2520MK type	[I hickn	ess:1.2mm max.							
	Old part number (for reference)		Manada al fanda akan a	inductance u Inductance tolerance	Self-resonant	DC Resistance [Ω](max.)	Rated current ※) [mA](max.)		
New part number		EHS	[μ H]		frequency [MHz] (min.)		Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
LSBHB2520MKTR24NG	MBMK2520HR24N	RoHS	0.24	±30%	ı	0.026	4,750	3,500	1.0
LSBHB2520MKTR47NG	MBMK2520HR47N	RoHS	0.47	±30%	ı	0.042	3,900	2,600	1.0
LSBHB2520MKTR68NG	MBMK2520HR68N	RoHS	0.68	±30%	ı	0.058	3,150	2,150	1.0
LSBHB2520MKT1R0MG	MBMK2520H1R0M	RoHS	1.0	±20%	ı	0.072	2,350	1,850	1.0
LSBHB2520MKT1R5MG	MBMK2520H1R5M	RoHS	1.5	±20%	ı	0.106	2,050	1,500	1.0
LSBHB2520MKT2R2MG	MBMK2520H2R2M	RoHS	2.2	±20%	ı	0.159	1,800	1,250	1.0
LSBHB2520MKT3R3MG	MBMK2520H3R3M	RoHS	3.3	±20%	ı	0.260	1,400	970	1.0
LSBHB2520MKT4R7MG	MBMK2520H4R7M	RoHS	4.7	±20%		0.380	1,150	800	1.0

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

 $[\]frak{\%}$) The temperature rise current value (Idc2) is the DC current value having temperature increase by 40°C. (at 20°C)

 $[\]fint \%$) The rated current value is following either Idc1 or Idc2, which is the lower one.

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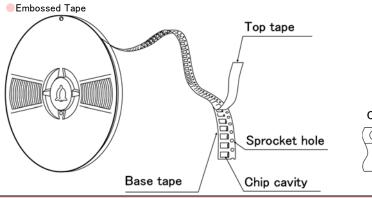
Wire-wound Metal Power Inductors MCOIL[™] LSBH/LLBH series Wire-wound Metal Power Inductors MCOIL[™] LSBH/LLBH series (125°C guaranteed product)

■PACKAGING

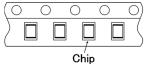
1 Minimum Quantity

Time	Standard Quantity [pcs]
Туре	Tape & Reel
1608KK	3000
2012KK	3000
2520MK	3000

2Tape Material

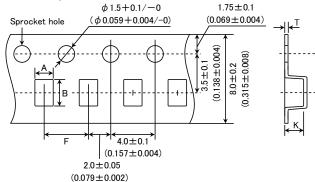


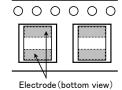
Chip Filled



3Taping dimensions

Embossed tape 8mm wide (0.315 inches wide)



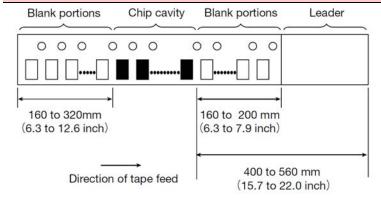


Time	Chip cavity		Insertion pitch	Tape thickness	
Туре	Α	В	F	Т	K
1608KK	1.1	1.9	4.0±0.1	0.25±0.05	1.2 max
1008KK	(0.043)	(0.075)	(0.157 ± 0.004)	(0.010 ± 0.002)	(0.047 max)
2012KK	1.45	2.2	4.0±0.1	0.25±0.05	1.2 max
2012KK	(0.057)	(0.087)	(0.157 ± 0.004)	(0.010 ± 0.002)	(0.047 max)
2520MK	2.3	2.8	4.0±0.1	0.3±0.05	1.45 max
2320WIK	(0.091)	(0.110)	(0.157 ± 0.004)	(0.012 ± 0.002)	(0.057 max)

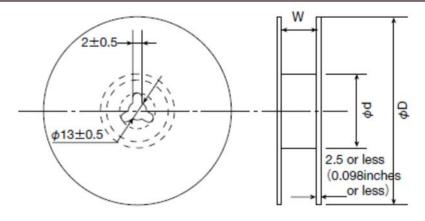
Unit:mm(inch)

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4 Leader and Blank portion



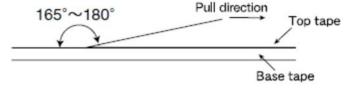
⑤Reel size



Type	Reel size (Reference values)				
Туре	ϕ D	ϕ d	W		
1608KK	180+0/-3	60+1/-0	10.0±1.5		
2012KK	(7.087+0/-0.118)	(2.36+0.039/0)	(0.394 ± 0.059)		
2520MK	(7.067+0/-0.116)	(2.30+0.039/0)	(0.394±0.039)		
			Unit:mm(inch)		

6Top 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[™] LSBH series

for General Electronic Equipment for Consumer

Wire-wound Metal Power Inductors MCOIL[™] LSBH series (125°C guaranteed product)

for General Electronic Equipment for Consumer

Wire-wound Metal Power Inductors MCOIL[™] LLBH series

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

Wire-wound Metal Power Inductors MCOIL[™] LLBH series (125°C guaranteed product)

for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA

1. Operating Temp	erature Range					
Specified Value	-40~+105°C:LSBH/LLBH					
Specified value	-40~+125°C:LSBH/LLBH (125°C guaranteed product)					
Test Methods and Remarks	Including self-generated heat					
0.01 T						
2. Storage Temper						
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					
	1					
4. Inductance						
Specified Value	Within the specified tolerance					
Test Methods	Measuring equipment : LCR Meter (HP 4285A or equivalent)					
and Remarks	Measuring frequency : 1MHz、1V					
5. DC Resistance						
Specified Value	Within the specified tolerance					
Test Methods and Remarks	Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)					
0.016						
6. Self resonance f	requency					
Specified Value						
7. Temperature ch	aracteristic					
Specified Value	Inductance change: Within ±15%					
Test Methods and Remarks	LSBH/LLBH: Measurement of inductance shall be taken at temperature range within $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$. With reference to inductance value at $+20^{\circ}\text{C}$., change rate shall be calculated. LSBH/LLBH (125°C guaranteed product): 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.					

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8. Resistance to flexure of substrate Specified Value No damage 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 mm (1608 type: 0.8mm) Test Methods and Remarks Solder cream thickness : 0.1 mm

9. Insulation resistance : between wires

Specified Value -

10. Insulation resistance : between wire and core

LSBH/LLBH:

Specified Value

DC25V 100kΩ min

LSBH/LLBH (125°C guaranteed product):

DC50V 100kΩ min

11. Withstanding voltage: between wire and core

Specified Value

12. Adhesion of terminal electrode

Specified Value	No abnormality.	o abnormality.				
	The test samples shall be s	he test samples shall be soldered to the test board by the reflow.				
Test Methods and	Applied force	: 10N (1608 type∶5N) to X and Y directions.				
Remarks	Duration	: 5s.				
	Solder cream thickness	: 0.1mm.				

13. Resistance to vibration

Specified Value

Inductance change: Within ±10%

No significant abnormality in appearance.

The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions.

Test Methods and Remarks

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	Υ	For 2 hours on each X, Y, and Z axis.			
	Z				

Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.

14. Solderability

Specified Value	At least 90%	of surface of terminal	l electrode is covered by new solder.
-----------------	--------------	------------------------	---------------------------------------

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%.

Test Methods and Remarks

Solder Temperature	245±5°C
Immersing speed	25mm/s
Time	5±0.5 sec.

*Immersion depth : All sides of mounting terminal shall be immersed.

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15. Resistance to s	oldering 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°C for 40 seconds, with peak temperature at 260+0/-5°C for 5 seconds, 3 times. 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.	

16. Thermal shock Inductance change : Within $\pm 10\%$ Specified Value No significant abnormality in appearance. LSBH/LLBH: 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. Conditions of 1 cycle Test Methods Step Temperature (°C) Duration (min) and Remarks -40±3 30 ± 3 Within 3 Room temperature 3 +85±2 30 ± 3 4 Room temperature Within 3 Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.

LSBH/LLBH (125°C guaranteed product):

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.

Conditions of 1 cycle				
Step	Temperature (°C)	Duration (min)		
1	-40 ± 3	30±3		
2	Room temperature	Within 3		
3	+125±2	30±3		
4	Room temperature	Within 3		

Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.

17. Damp heat						
Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.					
Test Methods	LSBH/LLBH: 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.			LSBH/LLBH (125°C guaranteed product): 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.		
and Remarks	Temperature Humidity Time	60±2°C 90~95%RH 1000+24/-0 hour 2 thrs of recovery under the		Temperature Humidity Time	85±2°C 85%RH 1000+24/-0 hour t 2hrs of recovery under the	
	after the test, follow	wed by the measurement v	within 48hrs.	after the test, follo	wed by the measurement wit	thin 48hrs.

18. Loading under	damp heat					
Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.					
	LSBH/LLBH:			LSBH/LLBH (125°C	guaranteed product):	
	The test samples shall be soldered to the test board by the reflow.		The test samples shall be soldered to the test board by the reflow.			
	The test samples shall be placed in thermostatic oven set at			The test samples shall be placed in thermostatic oven set at		
	specified temperature and humidity and applied the rated current			specified temperature and humidity and applied the rated current		
Test Methods	continuously as show	wn in below table.	_	continuously as sho	wn in below table.	_
and Remarks	Temperature	60±2°C		Temperature	85±2°C	
	Humidity	90∼95%RH		Humidity	85%RH	
	Applied current	Rated current		Applied current	Rated current	
	Time	1000+24/-0 hour		Time	1000+24/-0 hour	
	Recovery: At least 2hrs of recovery under the standard condition		Recovery: At least 2hrs of recovery under the standard condition			
	after the test, followed by the measurement within 48hrs.		after the test, follow	ved by the measurement wi	ithin 48hrs.	

19. Low temperature life test				
Specified Value	Inductance change No significant abno	e : Within ±10% ormality in appearance.		
	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			
Test Methods	in below table.			
and Remarks	Temperature	-40±2°C		
	Time	1000+24/-0 hour		
	Recovery : At leas	t 2hrs of recovery under th	e standard condition after the test, followed by the measurement within 48hrs.	

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Specified Value	Inductance change : Within ±10% No significant abnormality in appearance.		
Test Methods	The test samples s in below table.	hall be soldered to the test	board by the reflow. After that, the test samples shall be placed at test conditions as shown
and Remarks	Temperature	85±2°C	
	Time	1000+24/-0 hour	
	Recovery : At leas	t 2hrs of recovery under th	e standard condition after the test, followed by the measurement within 48hrs.

21. Loading at high	temperature life test
Specified Value	-
22. Standard cond	ition
Specified Value	Standard test condition: Unless otherwise specified, temperature is 20±15°C and 65±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±2°C of temperature, 65±5% relative humidity. Inductance is in accordance with our measured value.

Wire-wound Metal Power Inductors MCOIL™ LSBH/LLBH series Wire-wound Metal Power Inductors MCOIL™ LSBH/LLBH series (125°C guaranteed product)

PRECAUTIONS

1. Circuit Design

- ◆ Verification of operating environment, electrical rating and performance
 - 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.
- Precautions ◆Operating Current (Verification of Rated current)
 - 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

Temperature rise of power choke coil depends on the installation condition in end products.

Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.

2. PCB Design Land pattern design Precautions 1. Please refer to a recommended land pattern. ◆Land pattern design Technical Surface Mounting · Mounting and soldering conditions should be checked beforehand. considerations · Applicable soldering process to this products is reflow soldering only. 3. Considerations for automatic placement

◆Adjustment of mounting machine Precautions 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 ◆Adjustment of mounting machine considerations 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.

4. Soldering

◆Reflow soldering

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.

Precautions

3. Please do not add any stress to a product until it returns in normal temperature after reflow soldering.

◆Lead free soldering

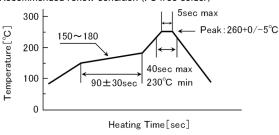
1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently.

◆Reflow soldering

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.

Recommended reflow condition (Pb free solder)





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5. Cleaning	
Precautions	◆Cleaning conditions 1. Washing by supersonic waves shall be avoided.
Technical considerations	◆Cleaning conditions 1. If washed by supersonic waves, the products might be broken.

6. Handling	
Precautions	 ◆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	 ◆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 condi	tions
Precautions	 ♦ Storage 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. Storage conditions
Technical considerations	◆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.

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