# **Notice for TAIYO YUDEN Products**

Please read this notice before using the TAIYO YUDEN products.

# REMINDERS

Product information in this catalog is as of October 2018. All of the contents specified herein are subject to change without notice due to technical improvements, 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.

- Please contact TAIYO YUDEN for further details of product specifications as the individual product specification sheets are available.
- Please conduct validation and verification of our products in actual condition of mounting and operating environment before using our products.
- The products listed in this catalog are intended for use in general electronic equipment (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC) and medical equipment classified as Class I or II by IMDRF. Please be sure to contact TAIYO YUDEN for further information before using the products for any equipment which may directly cause loss of human life or bodily injury (e.g., transportation equipment including, without limitation, automotive powertrain control system, train control system, and ship control system, traffic signal equipment, disaster prevention equipment, medical equipment classified as Class III by IMDRF, highly public information network equipment including, without limitation, telephone exchange, and base station).

Please do not incorporate our products into any equipment requiring high levels of safety and/or reliability (e.g., aerospace equipment, aviation equipment\*, medical equipment classified as Class IV by IMDRF, nuclear control equipment, undersea equipment, military equipment).

\*Note: 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.

When our products are used even for high safety and/or reliability-required devices or circuits of general electronic equipment, it is strongly recommended to perform a thorough safety evaluation prior to use of our products and to install a protection circuit as necessary.

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 requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.

- 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.
- Please note that the scope of warranty for our products is limited to the delivered our products themselves and TAIYO YUDEN shall not be in any way responsible for any damages resulting from a fault 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.
- 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.

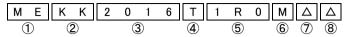
# METAL WIRE-WOUND CHIP POWER INDUCTORS(MCOIL™ ME SERIES)



REFLOW

# ■PARTS NUMBER

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



①Series name

Code	Series name
ME	Metal Wire-wound Chip Power Inductor

②Dimensions(T)

ZDIMENSIONS(1)					
Code	Dimensions(T)[mm]				
KK	1.0				

3Dimensions (L × W)

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

4 Packaging

UT dortuging						
Code	Packaging					
Т	Taping					

(5)Nominal inductance

△=Blank space

Code (example)	Nominal inductance [ $\mu$ H]
R47	0.47
1R0	1.0
4R7	4.7

※R=Decimal point

### **6**Inductance tolerance

Code	Inductance tolerance
М	±20%

7Special code

 © openial code						
Code	Special code					
Δ	Standard					

®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.



	Туре	Type A B		С	
2016		0.7	0.8	1.8	
	2520	0.9	1.0	2.2	
				Linit mana	

Type	L	W	Т	е	Standard quantity[pcs] Taping
MEKK2016	2.0±0.2 (0.079±0.008)	1.6±0.2 (0.063±0.008)	1.0 max (0.039 max)	$0.5\pm0.3$ $(0.020\pm0.012)$	3000
MEKK2520	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)

# ■PARTS NUMBER

WERKZOTO type [Thickness . T.Ohim max.]									
			Nominal inductance		Self-resonant	DC Resistance		※) [mA] (max.)	Manazzina
	Parts number	EHS	[ $\mu$ H]	Inductance tolerance	frequency	[Ω](max.)	Saturation current	Temperature rise current	Measuring
			[ H II]		[MHz] (min.)	[ It ] (IIIax.)	Idc1	Idc2	ir equency [wiriz]
	MEKK2016TR47M	RoHS	0.47	±20%	-	0.030	4,500	4,300	1
	MEKK2016TR68M	RoHS	0.68	±20%	-	0.052	3,800	3,300	1
	MEKK2016T1R0M	RoHS	1.0	±20%	_	0.060	3,600	3,100	1
	MEKK2016T2R2M	RoHS	2.2	±20%	-	0.150	2,400	1,900	1

	EHS	Nominal inductance [ μ H]	Inductance tolerance	Self-resonant frequency [MHz] (min.)	DC Resistance [Ω] (max.)	Rated current ※) [mA](max.)		Measuring
Parts number						Saturation current Idc1	Temperature rise current Idc2	frequency[MHz]
MEKK2520TR33M	RoHS	0.33	±20%	-	0.022	6,400	5,100	1
MEKK2520TR47M	R₀HS	0.47	±20%	-	0.025	5,900	4,800	1
MEKK2520T1R0M	RoHS	1.0	±20%	ı	0.053	4,300	3,300	1
MEKK2520T1R5M	RoHS	1.5	±20%	-	0.069	3,200	2,800	1
MEKK2520T2R2M	RoHS	2.2	±20%	ı	0.097	3,100	2,400	1
MEKK2520T4R7M	RoHS	4.7	±20%	-	0.240	1,600	1,500	1

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

ildc2 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  $\mu$  m

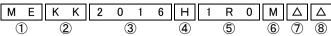
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# METAL WIRE-WOUND CHIP POWER INDUCTORS(MCOIL<sup>TM</sup> ME-H SERIES)



### PARTS NUMBER

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



△=Blank space

USeries name	
Code	Series name
ME	Metal Wire-wound Chip Power Inductor

②Dimensions (T)					
Code	Dimensions (T) [mm]				
KK	1.0				

③Dimensions (L × W)					
Code	Dimensions (L × W) [mm]				
2012	2.0 × 1.2				
2016	2.0 × 1.6				

4Packaging	
Code	Packaging
Н	Taping(special specification)

# **⑤**Nominal inductance

Code (example)	Nominal inductance[ μ H]
R47	0.47
1R0	1.0
2R2	2.2

※R=Decimal point

# **6**Inductance tolerance

Code	Inductance tolerance
М	±20%

### (7)Special code

Copecial code					
Code	Special code				
Δ	Standard				

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	0.8	1.8
			Unit:mm

Туре	L	W	Т	е	Standard quantity[pcs] Taping
MEKK2012H	2.0±0.2 (0.079±0.008)	1.2±0.2 (0.047±0.008)	1.0 max (0.039 max)	$0.5\pm0.3$ (0.020±0.012)	3000
MEKK2016H	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

Unit:mm(inch)

# ■PARTS NUMBER

### MEKK2012H type [Thickness: 1.0mm max.] Self-resonant Nominal inductance DC Resistance Measuring Parts number EHS Inductance tolerance Saturation current Temperature rise current equency[MHz] MEKK2012HR47M 0.030 0.47 ±20% 4.200 RoHS 4.500

MEKK2016H type [Thickness: 1.0mm max.]

	EHS	Nominal inductance $[\mu H]$	Inductance tolerance	Self-resonant frequency [MHz] (min.)	DC Resistance [Ω] (max.)	Rated current ※) [mA] (max.)		
Parts number						Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
MEKK2016HR47M	RoHS	0.47	±20%	-	0.026	5,300	4,700	1
MEKK2016H1R0M	RoHS	1.0	±20%	-	0.048	4,000	3,500	1
MEKK2016H2R2M	RoHS	2.2	±20%	-	0.100	2,300	2,300	1

- $\mbox{\%}$ ) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)
- $\label{eq:continuous} \begin{tabular}{ll} \b$
- XX) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.
- $\divideontimes$ ) Idc2 Measurement board data

Material:FR4 Board dimensions:  $100 \times 50 \times 1.6t$  mm

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

Pattern thickness: 70 µ m

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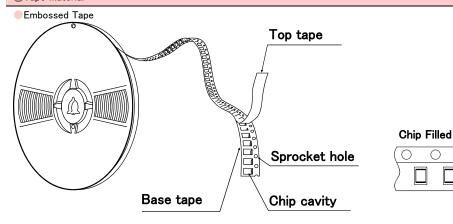
# METAL WIRE-WOUND CHIP POWER INDUCTORS (MCOIL™ ME SERIES ∕ MCOIL™ ME-H SERIES)

# **■**PACKAGING

# 1 Minimum Quantity

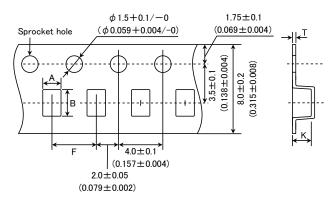
Туре	Standard Quantity [pcs]
	Tape & Reel
MEKK2012	3000
MEKK2016	3000
MEKK2520	3000

# **2**Tape Material



# **3**Taping dimensions

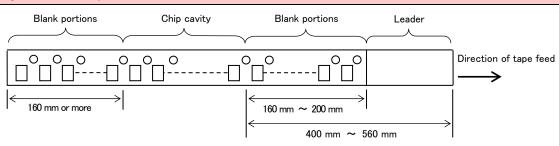
# Embossed tape 8mm wide (0.315 inches wide)



T	Chip	Chip cavity		Tape thickness	
Туре	Α	В	F	Т	K
MENNOO10	1.45±0.1	2.25±0.1	4.0±0.1	0.25±0.05	1.1±0.1
MEKK2012	$(0.057 \pm 0.004)$	$(0.089 \pm 0.004)$	$(0.157 \pm 0.004)$	$(0.009 \pm 0.002)$	$(0.043 \pm 0.004)$
MEKK0016	1.9±0.1	2.45±0.1	4.0±0.1	0.25±0.05	1.2±0.1
MEKK2016	$(0.075 \pm 0.004)$	$(0.097 \pm 0.004)$	$(0.157 \pm 0.004)$	$(0.009\pm0.002)$	$(0.047 \pm 0.004)$
MEKKOEOO	2.4±0.1	2.9±0.1	4.0±0.1	0.25±0.05	1.1±0.1
MEKK2520	$(0.094 \pm 0.004)$	$(0.114 \pm 0.004)$	$(0.157 \pm 0.004)$	$(0.009\pm0.002)$	$(0.043 \pm 0.004)$
					Unit:mm(inch)

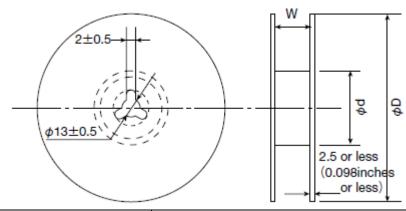
Chip

# 4 Leader and Blank portion



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# ⑤Reel size

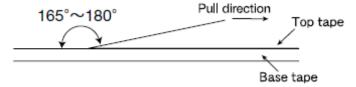


Туре	Reel size (Reference values)			
Туре	$\phi$ D	$\phi$ d	W	
MEKK2012	180+0/-3 (7.087+0/-0.118)	60+1/-0 (2.36+0.039/0)		
MEKK2016			$10.0 \pm 1.5$ (0.394 \pm 0.059)	
MEKK2520	(7.00710/ 0.110)	(2.3010.039/0)	(0.394 ± 0.039)	

Unit:mm(inch)

# **6**Top Tape Strength

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



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# METAL WIRE-WOUND CHIP POWER INDUCTORS (MCOIL™ ME SERIES ∕ MCOIL™ ME-H SERIES)

# ■RELIABILITY DATA

1. Operating Tempe	rature Range		
Specified Value	ME series		
	ME-H series	-40·3 + 123 C	
Test Methods and Remarks	Including self-generated heat		
0.00 T			
2. Storage Tempera			
Specified Value	ME series	-40~+85°C	
	ME-H series		
Test Methods and Remarks	0 to 40°C for the product with taping.		
3. Rated current			
5. Nated Current	ME series		
Specified Value	ME-H series	Within the specified tolerance	
	ME-H series		
4. Inductance			
	ME series		
Specified Value	ME-H series	Within the specified tolerance	
Test Methods and		I l294A or equivalent)	
Remarks	Measuring frequency : 1MHz, 0.5V		
5. DC Resistance			
5. DC Resistance	NE .		
Specified Value	ME series	Within the specified tolerance	
Test Methods and	ME-H series  Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)		
Remarks			
C C-14			
6. Self resonance fr	<u> </u>		
Specified Value	ME series	_	
	ME-H series		
7 Tamana	un at a viatio		
7. Temperature cha			
Specified Value	ME series	Inductance change : Within ±15%	
	ME-H series	1000 14000	
Test Methods and Remarks	Measurement of inductance shall be taken at With reference to inductance value at +20°C	t temperature range within −40°C~+125°C.	
Romans	man reference to inductance value at +200	S., Shango rate shall be calculated.	
8. Resistance to fle	xure of substrate		
	ME series		
Specified Value	ME-H series	No damage	
		Let board by the reflow. As illustrated below, apply force in the direction of the arrow indicating	
	until deflection of the test board reaches to		
Took Mathada and	Test board size : 100 × 40 × 1.0	10	
	Test board material : Glass epoxy-r	resin R230	
Test Methods and Remarks	Solder cream thickness : 0.12 mm	$\bigvee \mathcal{V}$	
		Board	
		R5 Test Sample	
		45±2mm 45±2mm	

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9. Insulation resista	nce : between wires		
0 :5 1)/1	ME series		
Specified Value	ME-H series	<u> </u>	
10. Insulation resist	ance : between wire and over-coating		
0 15 11/1	ME series	D0051/ 1001 O 1	
Specified Value	ME-H series	DC25V 100k Ωmin	
11. Withstanding vo	Itage : between wire and over-coating		
C :C 1)/ 1	ME series		
Specified Value	ME-H series	<u> </u>	
12. Adhesion of terr	minal electrode		
Specified Value	ME series	No abnormality.	
	ME-H series	·	
Took Mokkeds as 1	The test samples shall be soldered to the test	•	
Test Methods and Remarks	Applied force : 10N to X and Duration : 5s.	i directions.	
	Solder cream thickness : 0.12mm.		
13. Resistance to vi	ibration		
0 :5 1)/1	ME series	Inductance change : Within ±10%	
Specified Value	ME-H series	No significant abnormality in appearance.	
	The test samples shall be soldered to the test	st board by the reflow.	
	Then it shall be submitted to below test conditions.		
	Frequency Range 10~55Hz		
Test Methods and	1 7 3	t exceed acceleration 196m/s²)	
Remarks	Sweeping Method 10Hz to 55Hz to	o 10Hz for 1min.	
	X		
	Time Y 7	For 2 hours on ach X, Y, and Z axis.	
	_	he standard condition after the test, followed by the measurement within 48hrs.	
14. Solderability			
	ME series		
Specified Value	ME-H series	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.	
Test Methods and	Flux : Methanol solution containing rosin 25%	<u>.                                    </u>	
Remarks	Solder Temperature 245±5°C		
	Time 5±0.5 sec.		
	*Immersion depth : All sides of mounting ter	milital Stall De Immerseu.	
15. Resistance to se	oldering heat		
	ME series	Inductance change : Within ±10%	
Specified Value	ME-H series	No significant abnormality in appearance.	
		 ven at 230°C for 40 seconds, with peak temperature at 260 $\pm$ 0/ $\pm$ 5°C for 5 seconds, 2 times	
Test Methods and	Test board material : Glass epoxy-resin		
Remarks	Test board thickness : 1.0mm		

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

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16. Thermal shock					
	ME series		Inductance chan	ge : Within ±10%	
Specified Value	ME-H series			pnormality in appearance.	
	The test samples s	shall be soldered to	the test board by the refl	ow. The test samples shall be placed at specified temperature for specifie	
	-			The temperature cycle shall be repeated 100 cycles.	
		Conditions of 1	cycle		
Test Methods and Remarks	<del>                                     </del>	nperature (°C)	Duration (min)		
	1	-40±3	30±3		
	2 Roo	m temperature +85±2	Within 3 30±3		
	<b>-</b>	n temperature	Within 3		
	Recovery : At leas	t 2hrs of recovery ι	inder the standard condit	ion after the test, followed by the measurement within 48hrs.	
17. Damp heat					
	ME series		Inductance chan	ge : Within ±10%	
Specified Value	ME-H series			pnormality in appearance.	
		shall he soldered to	the test board by the ref	low	
	=			pecified temperature and humidity as shown in below table.	
Test Methods and	Temperature	60±2°C			
Remarks	Humidity	90∼95%RH			
	Time	500+24/-0 h			
	Recovery : At leas	t 2hrs of recovery ι	ınder the standard condit	ion after the test, followed by the measurement within 48hrs.	
18. Loading under d	amp heat				
Specified Value	ME series		Inductance chan	ge: Within ±10%	
opcomed value	ME-H series		No significant ab	pnormality in appearance.	
	The test samples	shall be soldered to	the test board by the ref	low.	
	The test samples shall be placed in thermostatic oven set at specified temperature and humidity and applied the rated current				
Test Methods and	Temperature	own in below table.			
Remarks	Humidity	90~95%RH			
	Applied current	Rated current			
	Time	500+24/-0 h	our		
	Recovery : At leas	t 2hrs of recovery ι	ınder the standard condit	ion after the test, followed by the measurement within 48hrs.	
19. Low temperatur	e life test				
0 :5 17/1	ME series		Inductance chan	ge : Within ±10%	
Specified Value	ME-H series		No significant ab	onormality in appearance.	
	The test samples s	shall be soldered to t	he test board by the refle	ow. After that, the test samples shall be placed at test conditions as show	
Test Methods and	in below table.				
Remarks	Temperature	-40±2°C			
	Time	500+24/-0 h			
	Recovery : At leas	t 2hrs of recovery t	inder the standard condit	ion after the test, followed by the measurement within 48hrs.	
20. High temperatur	e life test		1		
Specified Value	ME series		Inductance chan	ge: Within ±10%	
opcomou value	ME-H series		No significant ab	pnormality in appearance.	
	The test samples	shall be soldered to t	the test board by the refle	ow. After that, the test samples shall be placed at test conditions as show	
Test Methods and	in below table.	105 : 205			
Remarks	Temperature	125±2°C 500+24/-0 h	0115		
	Time Recovery : At leas			ion after the test, followed by the measurement within 48hrs.	
	. NOOOVERY . At leas	c zins or recovery t	the standard confult	and area, the test, renormed by the medistrement within 40115.	
01   1					
21. Loading at high	-				
21. Loading at high Specified Value	temperature life tes ME series ME-H series				

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22. Standard condition		
Specified Value	ME series	Standard test condition : Unless otherwise specified, temperature is $20\pm15^{\circ}$ C and $65\pm20\%$ of relative humidity.
	ME-H series	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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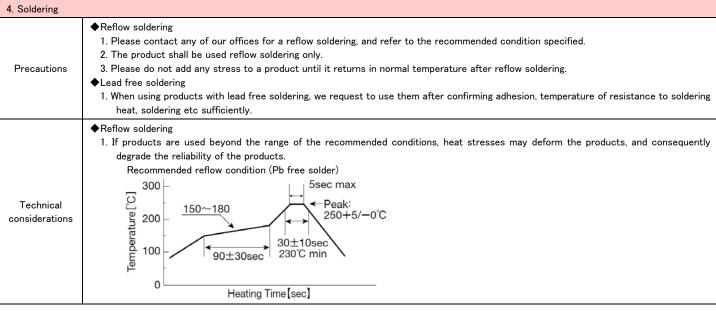
# METAL WIRE-WOUND CHIP POWER INDUCTORS (MCOIL™ ME SERIES ∕ MCOIL™ ME-H SERIES)

# PRECAUTIONS

# Precautions Operating environment 1. The products described in this specification are intended for use in general electronic equipment, (office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems,) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance. 2. PCB Design

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

3. Considerations for automatic placement		
Precautions	<ul> <li>◆Adjustment of mounting machine</li> <li>1. Excessive impact load should not be imposed on the products when mounting onto the PC boards.</li> <li>2. Mounting and soldering conditions should be checked beforehand.</li> </ul>	
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.		



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.	

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# 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. 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 Technical 1. There is a case to be damaged by a mechanical shock. considerations 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	<ul> <li>♦ Storage         <ol> <li>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.</li> <li>Recommended conditions</li></ol></li></ul>
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.

# METAL MULTILAYER CHIP POWER INDUCTORS(MCOIL<sup>TM</sup> MC SERIES)



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



 $\Delta$  =Blank space

a -		
(1)Se	Pries	name

Code	Series name
MC	Metal base multilayer chip power inductor

### 2Thickness

Code	Thickness [mm]
EE	0.55 max
FK	0.60 max
FE	0.65 max
HK	0.80 max
KK	1.0 max

### Code

1R0	1.0		
*R=Decimal point			
Arr Booma pome			
No. 4 4 4-1			
⑥Inductance tolerance			
Code	Inductance tolerance		

Nominal inductance [  $\mu$  H]

0.24

0.47

±20%

# ③Dimensions (L×W)

Code	Type (inch)	Dimensions (L×W)[mm]
1005	1005(0402)	1.0 × 0.5
1608	1608 (0603)	1.6 × 0.8
2012	2012 (0805)	2.0 × 1.25

### 7Special code1

М

5Nominal inductance Code

> (example) R24

> > R47

Code	Special code1
Δ	Standard
G	5 surface terminal
Н	Standard (Internal Code)

# (A) Dackaring

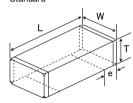
- I ackaging	
Code	Packaging
T	Taping

# Special code2

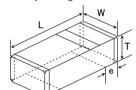
Code	Special code2
Δ	Non Polarity
N	Polarity Marking

# ■STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY

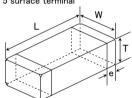












Туре		w T	т		Standard quantity[pcs]		
Type	L	VV	'	е	Paper tape	Embossed tape	
MCEE1005	1.0±0.2	0.5±0.2	0.55 max	0.25±0.15	10000		
(0402)	$(0.039 \pm 0.008)$	$(0.020\pm0.008)$	(0.022 max)	$(0.010\pm0.006)$	10000		
MCFK1608	1.6±0.2	$0.8 \pm 0.2$	0.60 max	$0.3 \pm 0.2$	4000	_	
(0603)	$(0.063 \pm 0.008)$	$(0.031 \pm 0.008)$	(0.024 max)	$(0.012\pm0.008)$	4000	_	
MCFE1608	1.6±0.2	0.8±0.2	0.65 max	$0.3 \pm 0.2$	4000	_	
(0603)	$(0.063 \pm 0.008)$	$(0.031 \pm 0.008)$	(0.026 max)	$(0.012\pm0.008)$	4000	_	
MCKK1608	1.6±0.2	0.8±0.2	1.0 max	$0.3 \pm 0.2$	_	3000	
(0603)	$(0.063 \pm 0.008)$	$(0.031 \pm 0.008)$	(0.039 max)	$(0.012\pm0.008)$	_	3000	
MCHK2012	2.0±0.2	1.25±0.2	0.80 max	0.5±0.3	4000	_	
(0805)	$(0.079 \pm 0.008)$	$(0.049 \pm 0.008)$	(0.031 max)	$(0.02\pm0.012)$	4000	_	
MCKK2012	2.0±0.2	1.25±0.2	1.0 max	0.5±0.3		2000	
(0805)	$(0.079 \pm 0.008)$	$(0.049 \pm 0.008)$	(0.039 max)	$(0.02\pm0.012)$	_	3000	

Unit:mm(inch)

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# MC1005

■MC1003										
Parts number	EHS	EHS	Nominal inductance	Inductance tolerance		sistance Ω ]	Rated current(Idc1)	Rated current(Idc2)	Measuring frequency	Thickness [mm] (max.)
		[#11]		(max.)	(typ.)	[A] (max.)	[A] (max.)	[MHz]	[IIIII] (IIIAX.)	
MCEE1005TR10MHN	RoHS	0.10	±20%	50	41	2.00	2.00	1	0.55	
MCEE1005TR22MHN	RoHS	0.22	±20%	80	65	1.60	1.60	1	0.55	
MCEE1005TR47MHN	RoHS	0.47	±20%	140	114	1.20	1.20	1	0.55	
MCEE1005T1R0MHN	RoHS	1.0	±20%	300	244	1.00	0.80	1	0.55	

# MC1608

Parts number	Nominal inductance		Nominal inductance Inductance tolerance		DC Resistance [mΩ]		Rated current(Idc2)	Measuring frequency	Thickness [mm] (max.)
		[ [ [ 11]		(max.)	(typ.)	[A] (max.)	[A] (max.)	[MHz]	[IIIII] (IIIax.)
MCFK1608TR24M	RoHS	0.24	±20%	50	40	2.30	2.10	1	0.60
MCFK1608TR47M	RoHS	0.47	±20%	85	69	1.90	1.60	1	0.60
MCFK1608T1R0M	RoHS	1.0	±20%	224	182	1.50	0.90	1	0.60
MCFE1608TR24MG	RoHS	0.24	±20%	100	75	2.60	1.50	1	0.65
MCFE1608TR47MG	RoHS	0.47	±20%	150	114	2.00	1.20	1	0.65
MCFE1608T1R0MG	RoHS	1.0	±20%	340	270	1.40	0.80	1	0.65
MCKK1608TR24M N	RoHS	0.24	±20%	38	35	2.80	2.60	1	1.00
MCKK1608TR47M N	RoHS	0.47	±20%	55	44	2.40	2.00	1	1.00
MCKK1608T1R0M N	RoHS	1.0	±20%	123	100	2.00	1.30	1	1.00

# MC2012

- INOLUIE	WINDER TE								
Parts number	EHS	Nominal inductance Inductance tolerance		DC Resistance [mΩ]		Rated Rated current(Idc1) current(Idc2)		Measuring frequency	Thickness [mm] (max.)
		[μπ]		(max.)	(typ.)	[A] (max.)	[A] (max.)	[MHz]	[IIIII] (IIIax.)
MCHK2012TR24M	RoHS	0.24	±20%	24	19	4.32	3.60	1	0.80
MCHK2012TR47M	RoHS	0.47	±20%	36	30	3.21	3.15	1	0.80
MCHK2012T1R0M	RoHS	1.0	±20%	111	90	2.26	1.47	1	0.80
MCKK2012TR24M	RoHS	0.24	±20%	25	20	6.20	4.00	1	1.00
MCKK2012TR47M	RoHS	0.47	±20%	39	32	4.50	3.10	1	1.00
MCKK2012T1R0M	RoHS	1.0	±20%	90	73	3.60	2.10	1	1.00

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

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# Multilayer chip inductors Multilayer chip inductors for high frequency, Multilayer chip bead inductors Multilayer common mode choke coils (MC series F type) Metal Multilayer Chip Power Inductors (MCOIL<sup>TM</sup> MC series)

PACKAGING

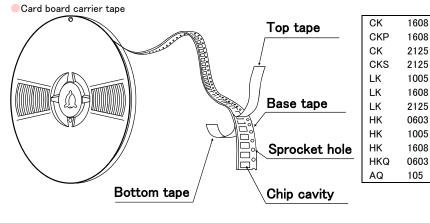
1 Minimum Quantity

Tape & Reel Packaging

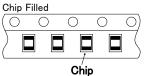
Туре	Thickness	Standard Q	uantity [pcs]
туре	mm(inch)	Paper Tape	Embossed Tape
CK1608(0603)	0.8 (0.031)	4000	_
CK2125 (0805)	0.85(0.033)	4000	_
OK2123 (0003)	1.25 (0.049)	_	2000
CKS2125(0805)	0.85 (0.033)	4000	_
ONO2120 (0000)	1.25 (0.049)	_	2000
CKP1608 (0603)	0.8 (0.031)	4000	_
CKP2012 (0805)	0.9 (0.035)	_	3000
CKP2016 (0806)	0.9 (0.035)	_	3000
	0.7 (0.028)	_	3000
CKP2520 (1008)	0.9 (0.035)	_	3000
	1.1 (0.043)	_	2000
LK1005(0402)	0.5 (0.020)	10000	
LK1608(0603)	0.8 (0.031)	4000	
LK2125(0805)	0.85(0.033)	4000	_
LNZ1Z3(U0U3)	1.25(0.049)	_	2000
HK0603(0201)	0.3 (0.012)	15000	
HK1005(0402)	0.5 (0.020)	10000	_
HK1608 (0603)	0.8 (0.031)	4000	_
LUK010E (000E)	0.85(0.033)	_	4000
HK2125(0805)	1.0 (0.039)	_	3000
HKQ0603W(0201)	0.3 (0.012)	15000	_
HKQ0603S(0201)	0.3 (0.012)	15000	_
HKQ0603U(0201)	0.3 (0.012)	15000	_
AQ105(0402)	0.5 (0.020)	10000	_
BK0603(0201)	0.3 (0.012)	15000	_
BK1005(0402)	0.5 (0.020)	10000	_
BKH0603(0201)	0.3 (0.012)	15000	_
BKH1005(0402)	0.5 (0.020)	10000	_
BK1608 (0603)	0.8 (0.031)	4000	_
	0.85(0.033)	4000	_
BK2125 (0805)	1.25(0.049)	_	2000
BK2010(0804)	0.45 (0.018)	4000	_
BK3216(1206)	0.8 (0.031)	_	4000
BKP0603 (0201)	0.3 (0.012)	15000	_
BKP1005 (0402)	0.5 (0.020)	10000	_
BKP1608 (0603)	0.8 (0.031)	4000	_
BKP2125 (0805)	0.85 (0.033)	4000	_
MCF0605 (0202)	0.3 (0.012)	15000	<u> </u>
MCF0806 (0302)	0.4 (0.016)	-	10000
MCF1210 (0504)	0.55(0.022)	_	5000
MCF2010(0804)	0.45(0.018)	_	4000
MCEE1005 (0402)	0.45(0.018)	10000	-
MCFK1608(0603)	0.6 (0.024)	4000	<del>  _</del>
MCFE1608 (0603)	0.65 (0.024)	4000	
		4000	
MCKK1608 (0603)	1.0 (0.039)	4000	3000
MCHK2012 (0806)	0.8 (0.031)	4000	2000
MCKK2012 (0805)	1.0 (0.039)	=	3000

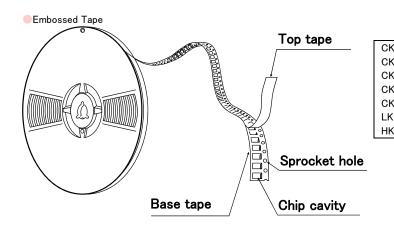
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# **2**Taping material

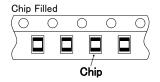


BK	0603	
BK	1005	
BK	1608	
BK	2125	
BK	2010	
BKP	0603	
BKP	1005	
BKP	1608	
BKP	2125	
BKH	0603	
BKH	1005	
MCF	0605	
MC	1005	
MC	1608	
MC	2012	

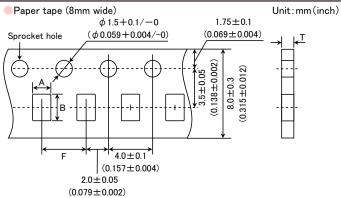




Κ	2125	Ī	BK	2125	
ΚS	2125		BK	3216	
ΚP	2012		MCF	0806	
ΚP	2016		MCF	1210	
ΚP	2520		MCF	2010	
(	2125		MC	1608	
<	2125		MC	2012	



# **3**Taping Dimensions

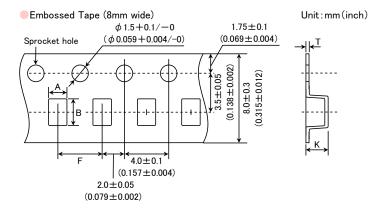


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<b>T</b>	Thickness	Chip	cavity	Insertion Pitch	Tape Thickness
Туре	mm(inch)	Α	В	F	Т
OK1600 (0603)	0.0 (0.021)	1.0±0.2	1.8±0.2	4.0±0.1	1.1max
CK1608 (0603)	0.8 (0.031)	$(0.039 \pm 0.008)$	$(0.071 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.043max)
OK010E (000E)	0.05(0.022)	1.5±0.2	2.3±0.2	4.0±0.1	1.1max
CK2125 (0805)	0.85(0.033)	$(0.059 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.043max)
OV0010E (000E)	0.05(0.000)	1.5±0.2	2.3±0.2	4.0±0.1	1.1max
CKS2125 (0805)	0.85(0.033)	$(0.059 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.043max)
OVD1000(0000)	0.0 (0.001)	1.0±0.2	1.8±0.2	4.0±0.1	1.1max
CKP1608(0603)	0.8 (0.031)	$(0.039 \pm 0.008)$	$(0.071 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.043max)
1.1/1005 (0.100)	0.5 (0.000)	0.65±0.1	1.15±0.1	2.0±0.05	0.8max
LK1005 (0402)	0.5 (0.020)	$(0.026 \pm 0.004)$	$(0.045\pm0.004)$	$(0.079 \pm 0.002)$	(0.031max)
1.144.000 (0000)	0.0 (0.001)	1.0±0.2	1.8±0.2	4.0±0.1	1.1max
LK1608 (0603)	0.8 (0.031)	$(0.039 \pm 0.008)$	$(0.071 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.043max)
	0.05 (0.000)	1.5±0.2	2.3±0.2	4.0±0.1	1.1max
LK2125 (0805)	0.85(0.033)	$(0.059 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.043max)
		0.40±0.06	0.70±0.06	2.0±0.05	0.45max
HK0603(0201)	0.3 (0.012)	$(0.016 \pm 0.002)$	$(0.028 \pm 0.002)$	$(0.079 \pm 0.002)$	(0.018max)
		0.65±0.1	1.15±0.1	2.0±0.05	0.8max
HK1005 (0402)	0.5 (0.020)	$(0.026\pm0.004)$	$(0.045 \pm 0.004)$	$(0.079 \pm 0.002)$	(0.031max)
		1.0±0.2	1.8±0.2	4.0±0.1	1.1max
HK1608 (0603)	0.8 (0.031)	$(0.039 \pm 0.008)$	$(0.071 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.043max)
		0.40±0.06	0.70±0.06	2.0±0.05	0.45max
HKQ0603W(0201)	0.3 (0.012)	(0.016±0.002)	$(0.028 \pm 0.002)$	$(0.079 \pm 0.002)$	(0.018max)
		0.40±0.06	0.70±0.06	2.0±0.05	0.45max
HKQ0603S(0201)	0.3 (0.012)	(0.016±0.002)	$(0.028 \pm 0.002)$	$(0.079 \pm 0.002)$	(0.018max)
		0.40±0.06	0.70±0.06	2.0±0.05	0.45max
HKQ0603U(0201)	0.3 (0.012)	$(0.016 \pm 0.002)$	$(0.028 \pm 0.002)$	(0.079±0.002)	(0.45max (0.018max)
		· · · · · · · · · · · · · · · · · · ·			
AQ105(0402)	0.5 (0.020)	0.75±0.1	1.15±0.1	2.0±0.05	0.8max
		(0.030±0.004)	(0.045±0.004)	(0.079±0.002)	(0.031max)
BK0603(0201)	0.3 (0.012)	$0.40 \pm 0.06$	0.70±0.06	2.0±0.05	0.45max
· · ·	, ,	(0.016±0.002)	$(0.028 \pm 0.002)$	(0.079±0.002)	(0.018max)
BK1005 (0402)	0.5 (0.020)	0.65±0.1	1.15±0.1	2.0±0.05	0.8max
· · ·	, ,	$(0.026 \pm 0.004)$	$(0.045 \pm 0.004)$	(0.079±0.002)	(0.031max)
BK1608(0603)	0.8 (0.031)	1.0±0.2	1.8±0.2	4.0±0.1	1.1max
		$(0.039 \pm 0.008)$	$(0.071 \pm 0.008)$	(0.157±0.004)	(0.043max)
BK2125 (0805)	0.85 (0.033)	1.5±0.2	2.3±0.2	4.0±0.1	1.1max
B1(2120 (0000)	0.00 (0.000)	$(0.059 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.043max)
BK2010(0804)	0.45 (0.018)	1.2±0.1	2.17±0.1	4.0±0.1	0.8max
B1(2010 (0004)	0.40 (0.010)	$(0.047 \pm 0.004)$	$(0.085 \pm 0.004)$	$(0.157 \pm 0.004)$	(0.031max)
BKP0603(0201)	0.3 (0.012)	$0.40 \pm 0.06$	$0.70 \pm 0.06$	2.0±0.05	0.45max
DICF 0003 (0201)	0.5 (0.012)	$(0.016 \pm 0.002)$	$(0.028\pm0.002)$	$(0.079 \pm 0.002)$	(0.018max)
BKP1005 (0402)	0.5 (0.020)	$0.65 \pm 0.1$	1.15±0.1	2.0±0.05	0.8max
DRP 1003 (0402)	0.5 (0.020)	$(0.026 \pm 0.004)$	$(0.045\pm0.004)$	$(0.079 \pm 0.002)$	(0.031max)
DKD1600 (0602)	0.0 (0.021)	1.0±0.2	1.8±0.2	4.0±0.1	1.1max
BKP1608 (0603)	0.8 (0.031)	$(0.039 \pm 0.008)$	$(0.071 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.043max)
DI/D040E (000E)	0.05 (0.000)	1.5±0.2	2.3±0.2	4.0±0.1	1.1max
BKP2125 (0805)	0.85(0.033)	$(0.059 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.043max)
		0.40±0.06	0.70±0.06	2.0±0.05	0.45max
BKH0603(0201)	0.3 (0.012)	$(0.016\pm0.002)$	$(0.028 \pm 0.002)$	$(0.079 \pm 0.002)$	(0.018max)
		0.65±0.1	1.15±0.1	2.0±0.05	0.8max
BKH1005 (0402)	0.5 (0.020)	$(0.026 \pm 0.004)$	$(0.045 \pm 0.004)$	$(0.079 \pm 0.002)$	(0.031max)
		0.62±0.03	0.77±0.03	2.0±0.05	0.45max
MCF0605 (0202)	0.3 (0.012)	$(0.02\pm0.03)$	$(0.030 \pm 0.001)$	$(0.079 \pm 0.002)$	(0.018max)
		1.1±0.05	1.9±0.05	4.0±0.1	0.72max
MCFK1608 (0603)	0.6 (0.024)	$(0.043 \pm 0.002)$	$(0.075 \pm 0.002)$	(0.157±0.004)	(0.028max)
		· · · · · · · · · · · · · · · · · · ·			
MCEE1005 (0402)	0.55(0.021)	$0.8 \pm 0.05$	$1.3 \pm 0.05$	2.0±0.05	0.6max
		(0.031±0.002)	$(0.051 \pm 0.002)$	(0.079±0.002)	(0.016max)
MCFE1608 (0603)	0.65(0.026)	1.1±0.05	1.9±0.05	4.0±0.1	0.9max
. ,		(0.043±0.002)	(0.075±0.002)	(0.157±0.004)	(0.035max)
MCHK2012 (0805)	0.8 (0.031)	1.55±0.2	2.3±0.2	4.0±0.1	0.9max
	· \	$(0.061 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.035max)

Unit: mm(inch)

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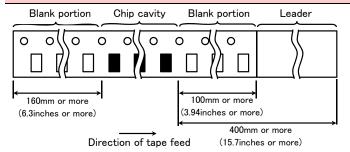


Type	Thickness	Chip	cavity	Insertion Pitch	Tape T	nickness
туре	mm(inch)	Α	В	F	K	T
CK2125(0805)	1.25(0.049)	1.5±0.2	2.3±0.2	4.0±0.1	2.0	0.3
OR2120 (0000)	1.23 (0.049)	$(0.059 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.079)	(0.012)
CKS2125 (0805)	1.25(0.049)	$1.5 \pm 0.2$	$2.3 \pm 0.2$	4.0±0.1	2.0	0.3
ON32123 (0003)	1.23 (0.049)	$(0.059 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.079)	(0.012)
CKP2012 (0805)	0.9 (0.035)	1.55±0.2	$2.3 \pm 0.2$	$4.0 \pm 0.1$	1.3	0.3
ORF2012 (0003)	0.9 (0.033)	$(0.061 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.051)	(0.012)
CKP2016 (0806)	0.9 (0.035)	1.8±0.1	2.2±0.1	4.0±0.1	1.3	0.25
GRP2010 (0600)	0.9 (0.033)	$(0.071 \pm 0.004)$	$(0.087 \pm 0.004)$	$(0.157 \pm 0.004)$	(0.051)	(0.01)
	0.7 (0.028)				1.4	
	0.7 (0.028)				(0.055)	
	0.9 (0.035)				1.4	
OKD0200 (1000)	0.9 (0.035)	$2.3 \pm 0.1$	$2.8 \pm 0.1$	$4.0 \pm 0.1$	(0.055)	0.3 (0.012)
CKP2520(1008)	1.1 (0.040)	$(0.091 \pm 0.004)$	$(0.110 \pm 0.004)$	$(0.157 \pm 0.004)$	1.7	
	1.1 (0.043)				(0.067)	
	1.1 (0.010)				1.7	
	1.1 (0.043)				(0.067)	
11(0405 (0005)	1.05(0.040)	1.5±0.2	2.3±0.2	4.0±0.1	2.0	0.3
LK2125 (0805)	1.25(0.049)	$(0.059 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.079)	(0.012)
	0.85 (0.033)				1.5	
LUZ010E (000E)		1.5±0.2	2.3±0.2 (0.091±0.008)	$4.0 \pm 0.1$	(0.059)	0.3
HK2125 (0805)	1.0 (0.039)	$(0.059 \pm 0.008)$		$(0.157 \pm 0.004)$	2.0	(0.012)
					(0.079)	
DV0105 (0005)	1.05(0.040)	1.5±0.2	2.3±0.2	4.0±0.1	2.0	0.3
BK2125(0805)	1.25 (0.049)	$(0.059 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.079)	(0.012)
DK0010(1000)	0.8 (0.031)	1.9±0.1	3.5±0.1	4.0±0.1	1.4	0.3
BK3216(1206)		$(0.075 \pm 0.004)$	$(0.138 \pm 0.004)$	$(0.157 \pm 0.004)$	(0.055)	(0.012)
MOE0000 (0000)	0.4 (0.010)	0.75±0.05	0.95±0.05	2.0±0.05	0.55	0.3
MCF0806(0302)	0.4 (0.016)	$(0.030 \pm 0.002)$	$(0.037 \pm 0.002)$	$(0.079 \pm 0.002)$	(0.022)	(0.012)
MOE1010/0504)	0.55 (0.000)	1.15±0.05	1.40±0.05	4.0±0.1	0.65	0.3
MCF1210(0504)	0.55(0.022)	$(0.045\pm0.002)$	$(0.055 \pm 0.002)$	$(0.157 \pm 0.004)$	(0.026)	(0.012)
MOE0010 (0004)	0.45(0.010)	1.1±0.1	2.3±0.1	4.0±0.1	0.85	0.3
MCF2010(0804)	0.45(0.018)	$(0.043 \pm 0.004)$	$(0.091 \pm 0.004)$	$(0.157 \pm 0.004)$	(0.033)	(0.012)
MOKK1000 (0000)	1.0 (0.000)	1.1±0.1	1.95±0.1	4.0±0.1	1.4	0.25
MCKK1608(0603)	1.0 (0.039)	$(0.043 \pm 0.004)$	$(\pm 0.004)$	$(0.157 \pm 0.004)$	(0.055)	(0.01)
MOKK0040 (000E)	10 (0000)	1.55±0.2	2.3±0.2	4.0±0.1	1.35	0.25
MCKK2012 (0805)	1.0 (0.039)	$(0.061 \pm 0.008)$	$(0.091 \pm 0.008)$	$(0.157 \pm 0.004)$	(0.053)	(0.010)

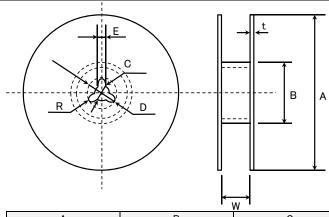
Unit : mm(inch)

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# **4**LEADER AND BLANK PORTION



# ⑤Reel Size



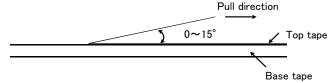
Α	В	С	D	Е	R
$\phi$ 178 ± 2.0	<i>ф</i> 50 or more	$\phi$ 13.0 $\pm$ 0.2	$\phi$ 21.0±0.8	2.0±0.5	1.0

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

(Unit : mm)

# ⑥Top tape strength

The top tape requires a peel-off force of  $0.1 \sim 0.7 N$  in the direction of the arrow as illustrated below.



# Multilayer chip inductors

HK1608, HK2125

MCOIL<sup>™</sup> MC series

HKQ0603 AQ105

# Multilayer chip inductors for high frequency, Multilayer chip bead inductors

Multilayer common mode choke coils (MC series F type)

Metal Multilayer Chip Power Inductors (MCOIL™ MC series)

RELIABILITY DAT	A	
1. Operating Temper	rature Range	
	BK series	_55~+125°C
	BKH series	-55~+125 C
	BKP series	-55~+85°C
	MCF series	-40~+85°C
	CK series	
	CKS series	-40~+85°C
Specified Value	CKP series	-40~ +85 C
	LK series	
	HK0603, HK1005	-55∼+125°C
	HK1608, HK2125	-40∼+85°C
	HKQ0603	
	AQ105	-55~+125 C
	MCOIL <sup>™</sup> MC series	-40~+125°C (Including self-generated heat)
2. Storage Tempera	ture Range	
	BK series	-55~+125°C
	BKH series	-35° 3 + 123 G
	BKP series	-55~+85°C
	MCF series	-40~+85°C
	CK series	
	CKS series	
Specified Value	CKP series	-40·3 1 83 C
	LK series	
	HK0603, HK1005	-55~+125°C
	HK1608, HK2125	-40~+85°C
	HKQ0603	
	AQ105	-35.3 + 123 G
	MCOIL <sup>™</sup> MC series	-40~+85°C
0.0.10		
3. Rated Current	T pr	
	BK series	The temperature of the element is increased within 20°C.
	BKH series	T1
	BKP series	The temperature of the element is increased within 40°C
	MCF series	Refer to each specification.
	CK series	The temperature of the element is increased within 20°C.
	CKS series	
Specified Value	CKP series	The temperature of the element is increased within 40°C
	LK series	The decreasing-rate of inductance value is within 5 %
	HK0603, HK1005	

within  $20^{\circ}\text{C}$ 

The decreasing-rate of inductance value is within 5 %, or the temperature of the element is increased

Idc1: The decreasing-rate of inductance value is within 30 %

Idc2: The temperature of the element is increased within  $40^{\circ}\text{C}$ 

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1 Impedance				
4. Impedance	BK series			
Specified Value	BKH series BKP series		Refer to each specification.	
	MCF series BK0603Series, BKP0603Series, BKH Series			
		: 100±1MHz		
	Measuring equipment : 4991A (or its equ			
	Measuring jig : 16193A(or its eq BK1005Series, BKP1005Series ,BKH1005Series		ivalent)	
	Measuring frequency : 100±1MHz Measuring equipment : 4291A(or its equi		Australia	
	Measuring equipment Measuring jig			
	BK1608 • 2125 Series, BKP1608		ivalent), HW:16193A(or its equivalent)	
Test Methods and	Measuring frequency	: 100±1MHz		
Remarks	Measuring requerity  Measuring equipment		valent), 4195A(or its equivalent)	
	Measuring jig		ivalent), 4193A(or its equivalent)	
	BK2010 • 3216Series	. 10032A (or its equ	ivalency, Tim. 10132A (of its equivalency	
	Measuring frequency	: 100±1MHz		
	Measuring equipment		valent), 4195A(or its equivalent)	
	Measuring jig : 16192A(or its equivalent)			
	MCF Series			
	Measuring frequency : 100±1MHz			
	Measuring equipment : 4291A(or its equ		valent)	
		· · · · · · · · · · · · · · · · · · ·		
5. Inductance				
	CK series			
	CKS series			
	CKP series		Refer to each specification.	
	LK series			
Specified Value	HK0603, HK1005			
	HK1608, HK2125			
	HKQ0603			
	AQ105			
	MCOIL <sup>™</sup> MC series			
	CK, CKS, LK Series			
	Measuring frequency	: Refer to each s	pecification.	
	Measuring equipment /jig	: 1608,2125⇒419	4A+16085B+16092A(or its equivalent) , 4195A+41951+16092A(or its equivalent)	
		1005⇒4291A+	16193A(or its equivalent)	
	Measuring current	: 047∼4.7 µH ⇒	1mArms 、 5.6~33 µH ⇒0.1mArms	
	CKP、MCOIL <sup>™</sup> MC Series			
	Measuring frequency	: 1MHz		
	Measuring equipment	: 4285A(or its ed	uivalent)	
Test Methods and	HK0603, HK1005, AQ Series			
Remarks	Measuring frequency	: 100MHz		
	Measuring equipment /jig		⇒4291A+16197A(or its equivalent)	
		HK1005⇒4291	A+16193A(or its equivalent)	
	HK1608, HK2125 Series			
	Measuring frequency		MHz 、120nH~⇒50MHz	
	Measuring equipment /jig	: 4195A + 16092A	N(or its equivalent)	
	HKQ Series		2000011 - F20111	
	Measuring frequency		Q0603U⇒ 500MHz	
	Measuring frequency	: HKQ0603W⇒ 3		
	Measuring equipment /jig	: E4991A + 16197	A(or its equivalent)	

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6. Q		
	CK series	
	CKS series	-
	CKP series	
	LK series	
Specified Value	HK0603, HK1005	
	HK1608, HK2125	Refer to each specification.
	HKQ0603	
	AQ105	
	MCOIL <sup>™</sup> MC series	-
	LK Series	
	Measuring frequency : Refer to each	·
		194A+16085B+16092A(or its equivalent)  4195A+41951+16092A(or its equivalent)
		+16193A(or its equivalent)
	Measuring current : 047∼4.7 µH =	⇒1mArms 、 5.6~33 μH ⇒0.1mArms
	HK0603、HK1005、AQ Series	
	Measuring frequency : 100MHz	
Test Methods and		1105⇒4291A+16197A(or its equivalent)
Remarks		291A+16193A(or its equivalent)
	HK1608、HK2125 Series	
	Measuring frequency : ~100nH⇒	100MHz 、120nH~⇒50MHz
	Measuring equipment /jig : 4195A+16	992A(or its equivalent)
	HKQ Series	
	Measuring frequency : HKQ0603S	HKQ0603U⇒ 500MHz
	Measuring frequency : HKQ0603W	⇒ 300/500MHz
	Measuring equipment /jig : E4991A+1	3197A(or its equivalent)
7. DC Resistance	Law	
-	BK series	
	BKH series	
	BKP series	
	MCF series	
	CK series	
C: G 1 \/-1	CKS series	Defeate and see 'Feeting
Specified Value	CKP series  LK series	Refer to each specification.
	HK0603, HK1005 HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL™ MC series	
Test Methods and	WIGGIE WIG Series	
Remarks	Measuring equipment: VOAC-7412, VOAC-751	2, VOAC-7521 (made by Iwasaki Tsushinki), HIOKI3227 (or its equivalent)
Tromaino		
8. Self Resonance Fre	quency(SRF)	
	BK series	
	BKH series	
	BKP series	<del>_</del> _
	MCF series	
	CK series	
	CKS series	Refer to each specification.
Specified Value	CKP series	-
	LK series	
	HK0603, HK1005	
	HK1608, HK2125	Refer to each specification.
	HKQ0603	
	AQ105	
	MCOIL <sup>™</sup> MC series	-
<u> </u>	LK, CK Series :	
Test Methods and	Measuring equipment : 4195A (or its	
Remarks		A(or its equivalent)
	HK, HKQ, AQ Series :	
	Measuring equipment : 8719C (or its	equivalent) • 8753D (or its equivalent) /HK2125

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9. Temperature Charac			
	BK series		
	BKH series		
	BKP series		
	MCF series CK series		
	CKS series		
	CKP series	-	
	LK series		
	HK0603, HK1005		
Specified Value	HK1608, HK2125		
	HKQ0603		
	AQ105		
	MCOIL™ MC series		
	HK0603, HK1005		
	HK1608, HK2125	Inductance change:Within ±10%	
	HKQ0603	Inductance change. Within 12 1070	
	AQ105		
	MCOIL <sup>™</sup> MC series	Inductance change: Within ±15%	
	HK, HKQ, AQ Series:		
<b>-</b>	Temperature range : −30~+85°C		
Test Methods and	Reference temperature : +20°C MCOIL™ MC series:		
Remarks	Temperature range : -40~+85°C		
	Reference temperature : +20°C		
	Note the competition of the comp		
10. Resistance to Flex	ure of Substrate		
'	BK series		
	BKH series		
	BKP series		
	MCF series		
	CK series		
	CKS series		
Specified Value	CKP series	No mechanical damage.	
	LK series		
	HK0603, HK1005		
	HK1608, HK2125		
	HKQ0603		
	AQ105  MCOIL™ MC series		
		05, CK, CKS, CKP, LK, HK, HKQ0603S, HKQ0603U, AQ Series, MCF1210, MC Series)	
	: 1mm(BKH0603, HKQ0603W, I		
	Testing board : glass epoxy-resin substrate	, and the second	
	Thickness : 0.8mm		
	20		
Test Methods and	R-230		
Remarks	Board	Warp	
	,		
	Deviation±	1△ ↑	
	45 45		
	<del>← → </del> <del>− · · · · · · · · · · · · · · · · · · </del>	<b>→</b>	
	'	(Unit:mm)	
	1		
11. Solderability			
	BK series		
	BKH series		
	BKP series		
	MCF series		
	CK series		
	CKS series		
Specified Value	CKP series	At least 90% of terminal electrode is covered by new solder.	
	LK series		
	HK0603, HK1005		
	HK1608, HK2125		
	HKQ0603		
	AQ105		
	MCOIL <sup>™</sup> MC series  Solder temperature :230±5°C (JIS Z 326	22 H60A or H62A)	
Test Methods and			
Remarks	L Solder temperature :245±3°C (Sn/30Ag/05Cu)		

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12. Resistance to Solo	dering			
	BK series		A N. 1. 100 at 1 120	
	BKH series		Appearance: No significant abnormality	
	BKP series		Impedance change: Within $\pm 30\%$	
	MCF series		Appearance:No significant abnormality Impedance change:Within ±20%	
	CK series		Appearance: No significant abnormality Inductance change: R10~4R7⇒Within ±10%、6R8~100⇒Within ±15%	
	CKS series		Appearance: No significant abnormality Inductance change: Within ±20%	
Specified Value	CKP series		Appearance: No significant abnormality Inductance change: Within ±30%	
	LK series		Appearance: No significant abnormality Inductance change: 1005⇒Within ±15% 1608,2125⇒ 47N~4R7: Within ±10% 5R6~330: Within ±15%	
	HK0603, HK1005			
	HK1608, HK2125		Appearance: No significant abnormality	
	HKQ0603		Inductance change: Within ±5%	
	AQ105			
	MCOIL <sup>™</sup> MC series		Appearance: No significant abnormality Inductance change: Within ±10%	
	Solder temperature	:260±5°C		
	Duration	$:10\pm0.5\;{\rm sec.}$		
Test Methods and	Preheating temperature	:150 to 180°C		
Remarks	Preheating time	: 3 min.		
	Flux :Immersion into		methanol solution with colophony for 3 to 5 sec.	
	Recovery	:2 to 3 hrs of re	covery under the standard condition after the test. (See Note 1)	

(Note 1) When there are questions concerning measurement result; measurement shall be made after 48±2 hrs of recovery under the standard condition.

13. Thermal Shock						
	BK series					
	BKH series	BKH series		Appearance: No significant abnormality		
	BKP series		Impedance change	e: Within ±30%		
	MCF series	MCF series		ignificant abnormality e: Within ±20%		
	CK series		Appearance: No sig	ignificant abnormality		
	CKS series		Inductance change	ge:Within ±20%		
Specified Value	CKP series		Appearance: No sign Inductance change	significant abnormality ge: Within ±30%		
	LK series		Appearance: No significant abnormality Inductance change: Within ±10% Q change: Within ±30%			
	HK0603, HK1005					
	HK1608, HK2125		Appearance: No significant abnormality			
	HKQ0603		Inductance change: Within ±10% Q change: Within ±20%			
	AQ105	AQ105				
	MCOIL TM M	MCOIL™ MC series		significant abnormality		
	MCOIL MC series		Inductance change: Within ±10%			
	Conditions f	for 1 cycle				
	Step	temperature (°C)		time (min.)		
	1	Minimum operating temperatur	re +0/-3	30±3		
Test Methods and	2	Room temperature		2~3		
Remarks	3	Maximum operating temperature	re +3/-0	30±3		
	4	Room temperature		2~3		
	Number of o	cycles:5				
	Recovery: 2 to 3 hrs of recovery under the standar		rd condition after the	e test.(See Note 1)		

(Note 1) When there are questions concerning measurement result; measurement shall be made after 48 ± 2 hrs of recovery under the standard condition.

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14. Damp Heat (Steam	dy state)				
	BK series				
	BKH series	Appearance: No significant abnormality			
	BKP series	Impedance change: Within ±30%			
	MCF series	Appearance: No significant abnormality Impedance change: Within ±20%			
	CK series	Appearance: No significant abnormality			
	CKS series	Inductance change: Within ±20%			
0 '6 17/1	CKP series	Appearance: No significant abnormality Inductance change: Within ±30%			
Specified Value	LK series	Appearance: No significant abnormality Inductance change: 1005,1608⇒Within ±10% 2125⇒Within ±20% Q change: Within ±30%			
	HK0603, HK1005				
	HK1608, HK2125	Appearance: No significant abnormality			
	HKQ0603	Inductance change: Within ±10% Q change: Within ±20%			
	AQ105				
	MCOIL™ MC series	Appearance: No significant abnormality			
	MCOIL MC series	Inductance change: Within ±10%			
Test Methods and Remarks	HK、HKQ、AQ、MCOIL™ MC series: Temperature :60±2°C Humidity :90 to 95%RH	:40±2°C :90 to 95%RH :500 +24/-0 hrs :2 to 3 hrs of recovery under the standard condition after the removal from test chamber.(See Note 1)  ICOIL™ MC series: :60±2°C :90 to 95%RH			
	Duration :500 +24/-0 hrs	by the standard condition ofter the removal from test shamber (See Note 1)			
(1) (1)	Recovery :2 to 3 hrs of recovery under	:2 to 3 hrs of recovery under the standard condition after the removal from test chamber.(See Note 1)			

(Note 1) When there are questions concerning measurement result; measurement shall be made after 48 ± 2 hrs of recovery under the standard condition.

15. Loading under Dar	·		<u></u>		
	BK series BKH series		Appearance: No significant abnormality		
			Impedance change: Within ±30%		
	BKP series		Impedance change. Within ±3070		
	MCF series		_		
	CK series		Appearance: No significant abnormality		
	CKS series		Inductance change: Within ±20%		
	CKP series		Appearance: No significant abnormality		
	OIN Series		Inductance change: Within ±30%		
			Appearance: No significant abnormality		
Specified Value			Inductance change: 1005⇒Within ±10%		
	LK series		1608⇒0.047~12.0 $\mu$ H: Within ±10% 15.0~33.0 $\mu$ H: Within ±15%		
			2125⇒Within ±20%		
			Q change: Within ±30%		
	HK0603, HK1005				
	HK1608, HK2125		Appearance: No significant abnormality		
	HKQ0603		Inductance change: Within ±10% Q change: Within ±20%		
	AQ105				
	MCOIL™ MC series※		Appearance: No significant abnormality		
	· ·		Inductance change: Within ±10%		
		CK, CKS, CKP Series:			
	Temperature	:40±2°C			
	Humidity	:90 to 95%RH			
	Applied current				
	Duration	:500 +24/-0 hrs			
Test Methods and	Recovery	:2 to 3 hrs of recovery un	der the standard condition after the removal from test chamber. (See Note 1)		
Remarks	HK, HKQ, AQ, MCO	IL™ MC Series:			
	Temperature	:60±2°C			
	Humidity	:90 to 95%RH			
	Applied current	: Rated current ※MC ser	ies ; Idc2max		
	Duration	:500 +24/-0 hrs			
	Recovery	:2 to 3 hrs of recovery un	ry :2 to 3 hrs of recovery under the standard condition after the removal from test chamber. (See Note 1)		

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

5 to  $35^{\circ}\!C$  of temperature, 45 to 85% relative humidity, and 86 to 106kPa of air pressure.

When there are questions concerning measurement results:

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

(Note 1) Measurement shall be made after  $48\pm2$  hrs of recovery under the standard condition.

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16. Loading at High Te	emperature		
	BK series		
	BKH series	Appearance: No significant abnormality	
	BKP series	Impedance change: Within ±30%	
	MCF series	Appearance: No significant abnormality Impedance change: Within ±20%	
	CK series	Appearance: No significant abnormality	
	CKS series	Inductance change: Within ±20%	
	CKP series	Appearance: No significant abnormality Inductance change: Within ±30%	
Specified Value	LK series	Appearance: No significant abnormality Inductance change: 1005⇒Within ±10%	
	HK0603, HK1005		
	HK1608, HK2125	Appearance: No significant abnormality	
	HKQ0603	Inductance change: Within ±10% Q change: Within ±20%	
	AQ105		
	MCOIL™ MC series※	Appearance: No significant abnormality Inductance change: Within ±10%	
Test Methods and Remarks	Temperature : Maximum operating temperature Applied current : Rated current : Rated current : SMC series ; Idc2max 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 on standard condition: "standard condition" referred to herein is defined as follows:

5 to  $35^{\circ}\text{C}\,$  of temperature, 45 to 85% relative humidity, and 86 to 106kPa of air pressure.

When there are questions concerning measurement results:

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

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

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# Metal Multilayer Chip Power Inductors (MCOIL™ MC series)

# **■**PRECAUTIONS

# 1. Circuit Design

# ◆Operating environment

# Precautions

The products described in this specification are intended for use in general electronic equipment, (office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems,) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance.

# 2. PCB Design

## Precautions

- ◆Land pattern design
  - · Please refer to a recommended land pattern specified.

# 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
  - · Excessive impact load should not be imposed on the products when mounting onto the PC boards.
  - · Mounting and soldering conditions should be checked beforehand.

# Technical considerations

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

# 4. Soldering

### ◆Reflow soldering

# Precautions

Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified.

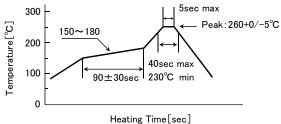
- The product shall be used reflow soldering only.
- · Please do not add any stress to a product until it returns in normal temperature after reflow soldering.
- **♦**Lead free soldering
  - When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently.

# ◆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



# 5. Cleaning

# Precautions

- ◆Cleaning conditions
- Washing by supersonic waves shall be avoided.

# Technical considerations

◆Cleaning conditions

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

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# 6. Handling ◆Handling · Keep the product away from all magnets and magnetic objects. ◆Breakaway PC boards (splitting along perforations) · When splitting the PC board after mounting product, care should be taken not to give any stresses of deflection or twisting to the board. Board separation should not be done manually, but by using the appropriate devices. Precautions ◆Mechanical considerations Please do not give the product any excessive mechanical shocks. Please do not add any shock and power to a product in transportation. ◆Application of resin coatings, moldings, etc. to the PCB and components. · Please avoid operation, which apply excessive stress and/or temperature to the products such as resin molding. There is a case that a characteristic varies with magnetic influence. ◆Breakaway PC boards (splitting along perforations) The position of the product on PCBs shall be carefully considered to minimize the stress caused from splitting of the PCBs. Technical Mechanical considerations considerations There is a case to be damaged by a mechanical shock. There is a case to be broken by the handling in transportation. ◆Application of resin coatings, moldings, etc. to the PCB and components. · Damage and a characteristic can vary with an excessive stress and/or temperature

	♦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.
	Recommended conditions
Precautions	Ambient temperature : 0∼40°C
Precautions	Humidity: Below 70% RH
	The ambient temperature must be kept below 30°C. Even under ideal storage conditions, solderability of products electrodes ma
	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.
T 1 : 1	♦Storage
Technical	• Under a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrode
considerations	and deterioration of taping/packaging materials may take place.

# METAL CORE SMD POWER INDUCTORS(MCOIL™ MD SERIES)

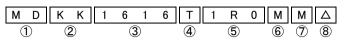


REFLOW

### ■PARTS NUMBER

MD

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



Metal base coil specification

2.0

USeries name	
Code	Series name

②Dimensions (H)	
Code	Dimensions (H) [mm]
JE	0.95
KK	1.0
MK	1.2
DI	

③Dimensions (L × W)

WK

©= (=	***
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

# 4 Packaging

- ackaging	
Code	Packaging
Т	Taping

### **⑤**Nominal inductance

△=Blank space

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

※R=Decimal point

### 6 Inductance tolerance

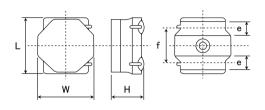
Code	Inductance tolerance
М	±20%
N	±30%

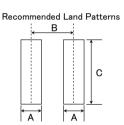
### 7 Special code

<u> </u>	
Code	Special code
F	Ferrite coating
М	Metal coating

®Internal code

### ■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	
	•		Unit:mm	

Standard quantity W Type [pcs] Taping 1.64±0.1 1.64±0.1 0.40 +0.2/-0.1 1.0±0.2 1.0 max MDKK1616 2500 (0.016 +0.008/-0.004)  $(0.039 \pm 0.008)$ (0.039 max) $(0.065 \pm 0.004)$  $(0.065 \pm 0.004)$ 1.25±0.2 2.0±0.15 2.0±0.15 0.95 max  $0.50 \pm 0.2$ MDJE2020 2500 (0.037 max)  $(0.079 \pm 0.006)$  $(0.079 \pm 0.006)$  $(0.02 \pm 0.008)$  $(0.049 \pm 0.008)$ 2.0±0.15 2.0±0.15  $0.50 \pm 0.2$ 1.0 max 1.25±0.2 MDKK2020 2500  $(0.079 \pm 0.006)$  $(0.079 \pm 0.006)$ (0.039 max) $(0.02 \pm 0.008)$  $(0.049 \pm 0.008)$ 2.0±0.15 2.0±0.15  $0.50 \pm 0.2$ 1.25±0.2 1.2 max MDMK2020 2500  $(0.079 \pm 0.006)$  $(0.079 \pm 0.006)$ (0.047 max)  $(0.02 \pm 0.008)$  $(0.049 \pm 0.008)$ 3.0±0.1 3.0±0.1 1.0 max  $0.90 \pm 0.2$ 1.9±0.2 MDKK3030 2000 (0.118±0.004) (0.118±0.004) (0.039 max) (0.075±0.008)  $(0.035 \pm 0.008)$ 3.0±0.1 3.0±0.1 1.2 max  $0.90 \pm 0.2$ 1.9±0.2 MDMK3030 2000 (0.075±0.008)  $(0.118 \pm 0.004)$  $(0.118 \pm 0.004)$  $(0.035 \pm 0.008)$ (0.047 max) 4.0±0.2 4.0±0.2 0.95 max 1.1±0.2 2.5±0.2 MDJE4040 1000 (0.037 max)  $(0.043\pm0.008)$  $(0.098 \pm 0.008)$  $(0.157 \pm 0.008)$  $(0.157 \pm 0.008)$ 4.0±0.2 4.0±0.2 1.2 max 1.1±0.2 2.5±0.2 MDMK4040 1000  $(0.157 \pm 0.008)$  $(0.157 \pm 0.008)$  $(0.043 \pm 0.008)$  $(0.098 \pm 0.008)$ (0.047 max) 4.0±0.2 4.0±0.2 2.0 max 1.1±0.2  $2.5 \pm 0.2$ MDWK4040 700 (0.079 max)  $(0.098 \pm 0.008)$  $(0.157 \pm 0.008)$  $(0.157 \pm 0.008)$  $(0.043 \pm 0.008)$ 4.9±0.2 4.9±0.2 1.4 max 1.20±0.2 3.3±0.2 MDPK5050 1000  $(0.193 \pm 0.008)$  $(0.193 \pm 0.008)$ (0.130±0.008) (0.055 max)  $(0.047 \pm 0.008)$ 

Unit:mm(inch)

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														Nominal inductance		DC Resistance[Ω]		Rated current ※)[mA]				Measuring
Parts number	EHS	S Nominal inductance	Inductance tolerance	DO Resistance[ \( \Omega \)		Saturation current: Idc1		Temperature rise current: Idc2		frequency[MHz]												
		LμIIJ		Max.	Тур.	Max.	Тур.	Max.	Тур.	irequerioy [iiii i2]												
MDKK1616TR47MM	RoHS	0.47	±20%	0.095	0.080	3,300	4,100	1,500	1,780	1												
MDKK1616T1R0MM	RoHS	1.0	±20%	0.140	0.120	2,200	2,750	1,200	1,490	1												
MDKK1616T1R5MM	RoHS	1.5	±20%	0.185	0.160	1,750	2,200	1,100	1,330	1												
MDKK1616T2R2MM	RoHS	2.2	±20%	0.250	0.215	1,500	1,800	950	1,110	1												
MDKK1616T3R3MM	RoHS	3.3	±20%	0.515	0.450	1,150	1,450	650	730	1												
MDKK1616T4R7MM	RoHS	4.7	±20%	0.640	0.550	950	1,200	550	630	1												
MDKK1616T6R8MM	RoHS	6.8	±20%	0.820	0.710	630	880	520	600	1												
MDKK1616T100MM	RoHS	10	±20%	1.120	0.970	550	800	450	500	1												
MDKK1616T150MM	RoHS	15	±20%	1.800	1.600	460	640	400	440	1												

<u> </u>										
		Nominal inductance		DC Resistance[ $\Omega$ ]		Rated current ※) [mA]				Measuring
Parts number	EHS	[ $\mu$ H]	Inductance tolerance			Saturation current: Idc1		Temperature rise current: Idc2		frequency[MHz]
		2,111		Max.	Тур.	Max.	Тур.	Max.	Тур.	moduomo y [mm.2]
MDJE2020T1R0MM	RoHS	1.0	±20%	0.121	0.106	3,100	3,800	1,550	1,800	1
MDJE2020T2R2MM	RoHS	2.2	±20%	0.266	0.230	1,550	1,900	1,050	1,200	1
MDJE2020T3R3MM	RoHS	3.3	±20%	0.340	0.290	1,350	1,600	950	1,100	1
MDJE2020T4R7MM	RoHS	4.7	±20%	0.475	0.410	1,200	1,550	850	950	1
MDJE2020T6R8MM	RoHS	6.8	±20%	0.630	0.550	800	1,100	750	850	1
MDJE2020T100MM	RoHS	10	±20%	1.040	0.910	700	900	550	600	1

WIDTRIZOZO type Trilickiless. 1.0miin max.										
		Nominal inductance		DC Posis	DC Resistance[Ω]		Rated current ※) [mA]			
Parts number	EHS	[ $\mu$ H]	Inductance tolerance	DO Nesistance[ 32 ]		Saturation current: Idc1		Temperature rise current: Idc2		Measuring frequency[MHz]
		[ [ [ ]		Max.	Typ.	Max.	Тур.	Max.	Тур.	in equency [initiz]
MDKK2020TR47MM	RoHS	0.47	±20%	0.046	0.040	3,500	4,150	2,200	2,500	1
MDKK2020TR68MM	RoHS	0.68	±20%	0.060	0.052	3,200	3,650	2,000	2,100	1
MDKK2020T1R0MM	RoHS	1.0	±20%	0.085	0.074	2,900	3,400	1,700	1,900	1
MDKK2020T1R5MM	RoHS	1.5	±20%	0.133	0.115	1,900	2,250	1,350	1,500	1
MDKK2020T2R2MM	RoHS	2.2	±20%	0.165	0.139	1,650	1,950	1,200	1,350	1
MDKK2020T3R3MM	RoHS	3.3	±20%	0.275	0.240	1,300	1,550	940	1,050	1
MDKK2020T4R7MM	RoHS	4.7	±20%	0.435	0.375	1,050	1,250	750	850	1
MDKK2020T100MM	RoHS	10	±20%	0.690	0.600	750	900	630	680	1
MDKK2020T150MM	RoHS	15	±20%	1.180	1.020	550	750	480	550	1

		Nominal inductance		DC Posis	tance[Ω]		Rated curren	t ※)[mA]	Measuring	
Parts number EHS	EHS	EHS [ $\mu$ H]	Inductance tolerance	Inductance tolerance		Saturation (	current: Idc1	Temperature rise current: Idc2		frequency[MHz]
		[ [ [ ]		Max.	Тур.	Max.	Тур.	Max.	Тур.	irequency [iiii iz]
MDMK2020TR47MM	RoHS	0.47	±20%	0.046	0.040	4,200	4,800	2,300	2,450	1
MDMK2020TR68MM	RoHS	0.68	±20%	0.058	0.050	3,500	4,100	2,000	2,200	1
MDMK2020T1R0MM	RoHS	1.0	±20%	0.064	0.056	2,550	2,900	1,900	2,050	1
MDMK2020T1R5MM	RoHS	1.5	±20%	0.086	0.075	2,000	2,300	1,650	1,750	1
MDMK2020T2R2MM	RoHS	2.2	±20%	0.109	0.095	1,750	2,000	1,450	1,550	1
MDMK2020T3R3MM	RoHS	3.3	±20%	0.178	0.155	1,350	1,550	1,150	1,200	1
MDMK2020T4R7MM	R₀HS	4.7	±20%	0.242	0.210	1.150	1.300	950	1.050	1

- INDITITOOOD Cypo		Trinoranoco . r.omini	max.								
		Nominal inductance		DC Danie	tance[Ω]		Rated currer	nt ※)[mA]	: ※)[mA]		
Parts number	EHS	[ $\mu$ H]	Inductance tolerance	Inductance tolerance		Saturation	current: Idc1	Temperature r	ise current: Idc2	Measuring frequency[MHz]	
		[ [ [ ]		Max.	Typ.	Max.	Тур.	Max.	Typ.	in equency [ivin iz]	
MDKK3030TR47MM	RoHS	0.47	±20%	0.039	0.033	5,400	6,500	3,900	4,500	1	
MDKK3030T1R0MM	RoHS	1.0	±20%	0.086	0.074	4,400	5,200	2,400	2,800	1	
MDKK3030T1R5MM	RoHS	1.5	±20%	0.100	0.087	3,000	3,500	2,100	2,400	1	
MDKK3030T2R2MM	RoHS	2.2	±20%	0.144	0.125	2,500	3,000	1,900	2,200	1	
MDKK3030T3R3MM	RoHS	3.3	±20%	0.248	0.215	2,000	2,400	1,350	1,500	1	
MDKK3030T4R7MM	RoHS	4.7	±20%	0.345	0.300	1,700	2,000	1,150	1,300	1	
MDKK3030T6R8MM	R₀HS	6.8	±20%	0.437	0.380	1,400	1,700	1,000	1,150	1	
MDKK3030T100MM	R <sub>0</sub> HS	10	+20%	0.575	0.500	1 100	1.300	850	1 000	1	

		Nominal inductance		DC Daaia	t[0]		Rated currer	Measuring		
Parts number	EHS	[ $\mu$ H]	Inductance tolerance	inductance tolerance DC Resistance[Ω]		Saturation	current: Idc1	Temperature r	ise current: Idc2	Measuring frequency[MHz]
		LMIII		Max.	Тур.	Max.	Typ.	Max.	Typ.	in equency [ivii iz]
MDMK3030TR30MM	RoHS	0.30	±20%	0.020	0.017	7,600	9,200	5,500	6,400	1
MDMK3030TR33MM	RoHS	0.33	±20%	0.020	0.017	6,400	8,700	5,500	6,400	1
MDMK3030TR47MM	RoHS	0.47	±20%	0.027	0.023	6,300	7,500	4,700	5,500	1
MDMK3030T1R0MM	RoHS	1.0	±20%	0.050	0.043	4,300	5,100	3,300	3,900	1
MDMK3030T1R5MM	RoHS	1.5	±20%	0.074	0.064	3,400	4,100	2,500	3,000	1
MDMK3030T2R2MM	RoHS	2.2	±20%	0.112	0.097	2,800	3,600	2,100	2,400	1
MDMK3030T3R3MM	RoHS	3.3	±20%	0.167	0.145	2,100	2,700	1,650	1,900	1
MDMK3030T4R7MM	RoHS	4.7	±20%	0.263	0.228	1,800	2,300	1,350	1,550	1

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### 

	. Nominal inductance			DO D :	[0]		Managemina			
Parts number	EHS	[ $\mu$ H] Inductance tolerance		DC Resis	tance[ \( \frac{1}{2} \)	Saturation (	current: Idc1	Temperature ri	ise current: Idc2	Measuring frequency[MHz]
		Lμii		Max.	Тур.	Max.	Тур.	Max.	Тур.	ir equency [iiii iz]
MDJE4040TR47MM	RoHS	0.47	±20%	0.040	0.035	6,000	7,900	4,000	4,500	1
MDJE4040T1R0MM	RoHS	1.0	±20%	0.069	0.060	4,700	5,700	3,000	3,500	1
MDJE4040T1R5MM	RoHS	1.5	±20%	0.084	0.073	3,000	4,000	2,700	3,100	1
MDJE4040T2R2MM	RoHS	2.2	±20%	0.115	0.100	2,400	3,100	2,400	2,700	1
MDJE4040T3R3MM	RoHS	3.3	±20%	0.200	0.175	2,000	2,600	1,800	2,000	1
MDJE4040T4R7MM	RoHS	4.7	±20%	0.250	0.220	1,900	2,300	1,600	1,900	1
MDJE4040T6R8MM	RoHS	6.8	±20%	0.370	0.320	1,500	1,800	1,300	1,500	1
MDJE4040T100MM	RoHS	10	±20%	0.510	0.440	1.400	1.700	1,100	1,300	1

- mbinition cyp										
		Nominal inductance		DC Posis	tongo [ O ]		Rated curren	it ※)[mA]		Measuring
Parts number	Parts number EHS Nominal inductance		Inductance tolerance	DC Resistance[Ω]		Saturation current: Idc1		Temperature ri	se current: Idc2	frequency[kHz]
		[μп]		Max.	Тур.	Max.	Тур.	Max.	Typ.	requericy[kHZ]
MDMK4040TR47MF	RoHS	0.47	±20%	0.029	0.025	7,500	10,000	4,600	5,400	100
MDMK4040T1R0MF	RoHS	1.0	±20%	0.047	0.041	5,200	7,500	3,500	4,200	100
MDMK4040T1R2MF	RoHS	1.2	±20%	0.047	0.041	4,200	6,200	3,500	4,200	100
MDMK4040T1R5MF	RoHS	1.5	±20%	0.065	0.056	3,700	5,400	3,300	3,600	100
MDMK4040T2R2MF	RoHS	2.2	±20%	0.092	0.080	3,200	4,500	2,500	2,900	100

MDMK4040 type [Thickness: 1.2mm max.]

		•								
		Nominal inductance		DC Posis	tanaa[O]		Rated curren	it ※)[mA]		Measuring
Parts number	number EHS Nonlina Inductance				DC Resistance[Ω]		Saturation current: Idc1		se current: Idc2	frequency[MHz]
		LμII		Max.	Тур.	Max.	Тур.	Max.	Тур.	irequeriey [iiiriz]
MDMK4040TR68MM	RoHS	0.68	±20%	0.029	0.025	6,700	7,800	5,000	5,700	1
MDMK4040T1R0MM	RoHS	1.0	±20%	0.036	0.031	5,000	6,200	4,500	5,100	1
MDMK4040T1R5MM	RoHS	1.5	±20%	0.065	0.056	4,500	5,600	3,200	3,600	1
MDMK4040T2R2MM	RoHS	2.2	±20%	0.079	0.069	3,800	4,500	2,800	3,200	1
MDMK4040T3R3MM	RoHS	3.3	±20%	0.130	0.113	3,200	4,000	2,200	2,500	1
MDMK4040T4R7MM	RoHS	4.7	±20%	0.160	0.140	2,500	3,000	1,900	2,200	1
MDMK4040T6R8MM	RoHS	6.8	±20%	0.230	0.200	1,900	2,200	1,600	1,800	1
MDMK4040T100MM	RoHS	10	±20%	0.330	0.280	1,700	2,000	1,400	1,600	1

		Nominal inductance		DC Resis	101		Rated curren	t ※)[mA]		Measuring
Parts number	EHS	[ $\mu$ H]	Inductance tolerance	DC Resis	rance [ 32 ]	Saturation of	Saturation current: Idc1		Temperature rise current: Idc2	
		[ MII]		Max.	Тур.	Max.	Тур.	Max.	Тур.	in equency [iminz]
MDWK4040TR33NM	RoHS	0.33	±30%	0.013	0.011	16,000	21,000	7,800	8,800	1
MDWK4040TR47NM	RoHS	0.47	±30%	0.013	0.011	10,000	15,000	7,800	8,800	1
MDWK4040TR56NM	RoHS	0.56	±30%	0.016	0.014	9,000	13,000	6,500	7,500	1
MDWK4040TR68MM	RoHS	0.68	±20%	0.016	0.014	8,000	12,000	7,300	8,300	1
MDWK4040T1R0MM	RoHS	1.0	±20%	0.027	0.023	7,000	9,400	5,100	5,800	1
MDWK4040T1R5MM	RoHS	1.5	±20%	0.041	0.035	7,000	9,400	4,100	4,700	1
MDWK4040T2R2MM	RoHS	2.2	±20%	0.054	0.047	5,400	7,500	3,500	4,000	1
MDWK4040T3R3MM	RoHS	3.3	±20%	0.075	0.066	3,700	5,200	3,000	3,300	1
MDWK4040T4R7MM	RoHS	4.7	±20%	0.107	0.093	3,500	5,000	2,500	2,800	1
MDWK4040T6R8MM	RoHS	6.8	±20%	0.158	0.138	2,900	4,000	2,000	2,300	1
MDWK4040T100MM	RoHS	10	±20%	0.194	0.169	2,200	3,100	1,600	1,900	1
MDWK4040T220MM	RoHS	22	±20%	0.460	0.400	1,500	2,100	1,200	1,400	1
MDWK4040T330MM	RoHS	33	±20%	0.720	0.625	1,200	1,700	800	1,000	1

WIDT ROOSE type	Wild Roose type Trilleriless: 1.4-min max.									
		Nominal inductance		DC Posis	tance[Ω]			Typ.         Max.         Typ.           10,000         4,300         4,700           5,000         3,600         4,200		
Parts number	EHS	[ $\mu$ H]			tance[32]	Saturation of	current: Idc1	Temperature ri	se current: Idc2	Measuring frequency[MHz]
		£ # 113		Max.	Тур.	Max.	Тур.	Max.	Тур.	oquooy [iz]
MDPK5050T1R0MM	RoHS	1.0	±20%	0.040	0.034	8,500	10,000	4,300	4,700	1
MDPK5050T2R2MM	RoHS	2.2	±20%	0.055	0.047	4,100	5,000	3,600	4,200	1
MDPK5050T3R3MM	RoHS	3.3	±20%	0.086	0.073	3,800	4,500	2,900	3,400	1
MDPK5050T4R7MM	RoHS	4.7	±20%	0.102	0.088	3,500	4,200	2,500	3,000	1
MDPK5050T6R8MM	RoHS	6.8	±20%	0.138	0.12	2,700	3,200	2,200	2,500	1
MDPK5050T100MM	RoHS	10	±20%	0.225	0.19	2,200	2,600	1,700	2,000	1

- \*X) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)
- \*\times\) The temperature rise current value(Idc2) is the DC current value having temperature increase up to 40°C. (at 20°C)
- \*) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

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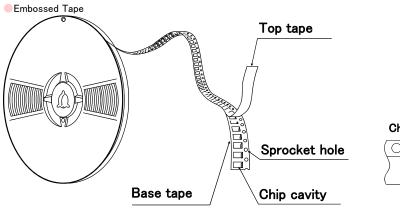
# METAL CORE SMD POWER INDUCTORS (MCOIL™ MD SERIES)

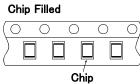
# ■PACKAGING

# 1)Minimum Quantity

Type	Standard Quantity [pcs]
туре	Tape & Reel
MDKK1616	2500
MDJE2020	
MDKK2020	2500
MDMK2020	
MDKK3030	2000
MDMK3030	2000
MDJE4040	1000
MDMK4040	1000
MDWK4040	700
MDPK5050	1000

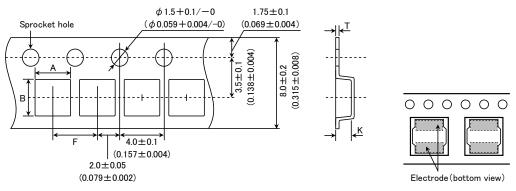
# 2Tape Material





# 3 Taping dimensions

Embossed tape 8mm wide (0.315 inches wide)

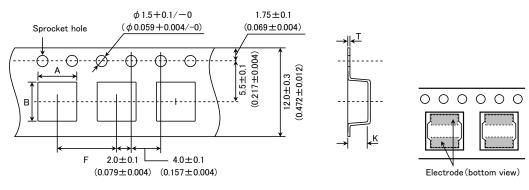


Type	Chip	cavity	Insertion pitch	Tape thickness		
туре	Α	В	F	Т	K	
MDKK1616	1.79±0.1 (0.071±0.004)	1.79±0.1 (0.071±0.004)	4.0±0.1 (0.157±0.004)	$0.25 \pm 0.05$ (0.010 \pm 0.002)	1.1±0.1 (0.043±0.004)	
MDJE2020 MDKK2020 MDMK2020	2.2±0.1 (0.102±0.004)	2.2±0.1 (0.102±0.004)	4.0±0.1 (0.157±0.004)	0.25±0.05 (0.009±0.002)	1.3±0.1 (0.051±0.004)	
MDKK3030	3.2±0.1	3.2±0.1	4.0±0.1	0.3±0.05	1.4±0.1	
MDMK3030	$(0.126 \pm 0.004)$	$(0.126 \pm 0.004)$	$(0.157 \pm 0.004)$	$(0.012\pm0.002)$	$(0.055 \pm 0.004)$	

Unit:mm(inch)

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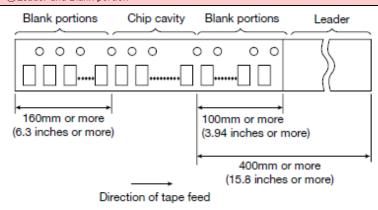
# Embossed tape 12mm wide (0.47 inches wide)



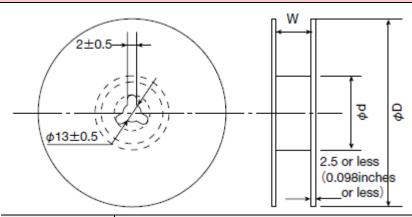
Tuna	Chip	cavity	Insertion pitch	Tape th	nickness	
Туре	Α	В	F	T	K	
MDJE4040 MDMK4040 MDWK4040	4.3±0.1 (0.169±0.004)	4.3±0.1 (0.169±0.004)	8.0±0.1 (0.315±0.004)	0.3±0.1 (0.012±0.004)	1.6±0.1 (0.063±0.004)	
MDPK5050	5.25±0.1 (0.207±0.004)	5.25±0.1 (0.207±0.004)	8.0±0.1 (0.315±0.004)	0.3±0.1 (0.012±0.004)	1.6±0.1 (0.063±0.004)	

Unit:mm(inch)

# 4 Leader and Blank portion



# ⑤Reel size



Type	R	eel size (Reference value	s)
туре	$\phi$ D	$\phi$ d	W
MDKK1616			
MDJE2020			
MDKK2020	$180 \pm 0.5$	60±1.0	$10.0 \pm 1.5$
MDMK2020	$(7.087 \pm 0.019)$	$(2.36 \pm 0.04)$	$(0.394 \pm 0.059)$
MDKK3030			
MDMK3030			
MDJE4040			
MDMK4040	$180 \pm 3.0$	60±2.0	$14.0 \pm 1.5$
MDWK4040	$(7.087 \pm 0.118)$	$(2.36 \pm 0.08)$	$(0.551 \pm 0.059)$
MDPK5050			

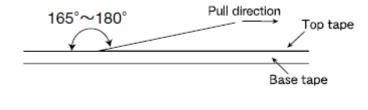
Unit:mm(inch)

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# **©**Top Tape Strength

Top tape strength

Туре	Peel-off strength
MDKK1616	
MDJE2020	
MDKK2020	0.1N~1.0N
MDMK2020	0.1N~1.0N
MDKK3030	
MDMK3030	
MDJE4040	
MDMK4040	0.1N~1.3N
MDWK4040	0.11N~1.3N
MDPK5050	



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# METAL CORE SMD POWER INDUCTORS (MCOIL™ MD SERIES)

# ■RELIABILITY DATA

RELIABILITY DA	<u>IA</u>	
1. Operating Tempe	erature Range	
Specified Value	MD series	-40~+125°C
Test Methods and Remarks	Including self-generated heat	
	_	
2. Storage Tempera		
Specified Value	MD series	-40~+85°C
Test Methods and Remarks	-5 to 40°C for the product with taping.	
3. Rated current		
Specified Value	MD series	Within the specified tolerance
4. Inductance		
Specified Value	MD series	Within the specified tolerance
Test Methods and	Measuring equipment : LCR Meter (HP 4	·
Remarks	Measuring condition : Please see item li	st.
5. DC Resistance		
	MD series	Within the constitution of
Specified Value Test Methods and	MD series	Within the specified tolerance
Remarks	Measuring equipment : DC ohmmeter (H	IOKI 3227 or equivalent)
6. Self resonance fr	requency	
Specified Value	MD series	_
7. Temperature cha	racteristic	
Specified Value	MD series	Inductance change : Within ±10%
Test Methods and Remarks	Measurement of inductance shall be taken at With reference to inductance value at $\pm 20^\circ$	t temperature range within $-40^{\circ}\text{C}\sim+125^{\circ}\text{C}$ . C., change rate shall be calculated.
0.0		
8. Resistance to fle		N. I
Specified Value	MD series	No damage
Test Methods and Remarks	until deflection of the test board reaches to Test board size : 100 × 40 × 1.0 Test board material : Glass epoxy- Solder cream thickness : 0.10 mm	mm Force Rod 10, 20
9. Insulation resista	nce : between wires	
Specified Value	MD series	-
10. Insulation resist	ance : between wire and core	
Specified Value	MD series	_
11. Withstanding vo	ltage : between wire and core	
Specified Value	MD series	_

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Specified Value	MD series		Shall not come off PC board	
	The test samples shall be s	soldered to the tes	st board by the reflow.	
Test Methods and	Applied force	: 10N to X and	Y directions.	
Remarks	Duration	: 5s.		
	Solder cream thickness	: 0.10mm.		
13. Resistance to v	ibration			
Specified Value	MD series		Inductance change : Within ±10%  No significant abnormality in appearance.	
			110 Significant abnormancy in appearance.	
	The test samples shall be s	soldered to the tes	7	
	The test samples shall be s Then it shall be submitted		st board by the reflow.	
	•		st board by the reflow.	
T . M . I . I	Then it shall be submitted	to below test cond 10~55Hz	st board by the reflow.	
Test Methods and Remarks	Then it shall be submitted to Frequency Range	to below test cond 10~55Hz	exceed acceleration 196m/s²)	

14. Solderability			
Specified Value	MD series		At least 90% of surface of terminal electrode is covered by new solder.
T . M	The test samples shall be dipped in flux, and then immersed Flux: Methanol solution containing rosin 25%.		
Test Methods and Remarks	Solder Temperature	245±5°C	
Remarks	Time	5±1.0 sec.	
	XImmersion depth : All side	es of mounting ter	minal shall be immersed.

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

15. Resistance to se	oldering heat	
Specified Value	MD series	Inductance change : Within ±10%
Specified value	MD series	No significant abnormality in appearance.
Test Methods and	The test sample shall be exposed to reflow ov	ven at 230±5°C for 40 seconds, with peak temperature at 260±5°C for 5 seconds, 2 times.
Remarks	Test board material : Glass epoxy-resin	
Remarks	Test board thickness : 1.0mm	

16. Thermal shock					
Specified Value	MD serie	series		Inductance change : No significant abnorm	
				=	he test samples shall be placed at specified temperature for specified emperature cycle shall be repeated 100 cycles.
		Conditions of 1	cycle		
Test Methods and	Step	Temperature (°C)		Duration (min)	
Remarks	1	-40±3		30±3	
	2	Room temperature		Within 3	
	3	+85±2		30±3	
	4	Room temperature		Within 3	

17. Damp heat			
Specified Value	MD series		Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
Test Methods and	•	all be soldered to the tes all be placed in thermosta	t board by the reflow. atic oven set at specified temperature and humidity as shown in below table.
Remarks	Temperature	60±2°C	
	Humidity	90~95%RH	
	Time	500+24/-0 hour	

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18. Loading under o	lamp heat			
Specified Value	MD series		Inductance change: Within ±10%	
			No significant abnormality in appearance.	
	1	all be soldered to the te	•	
	· ·	•	mostatic oven set at specified temperature and humidity and applied the rated currer	
Test Methods and	continuously as show			
Remarks	Temperature	60±2°C 90∼95%RH		
	Humidity Applied current	Rated current	_	
	Time	500+24/-0 hour	_	
	Tillle	300 + 24/ - 0 Hour		
40.1				
19. Low temperatur	re life test			
Specified Value	MD series		Inductance change : Within ±10%	
·			No significant abnormality in appearance.	
Test Methods and	1	all be soldered to the te	st board by the reflow. After that, the test samples shall be placed at test conditions as show	
Remarks	in below table.			
	Temperature	-40±2°C		
	Time	500+24/-0 hour		
20. High temperatur	ra lifa taat			
20. High temperatur	re me test		·	
Specified Value	MD series		_	
			_	
Specified Value			_	
Specified Value  21. Loading at high	MD series temperature life test		Inductance change : Within ±10%	
Specified Value	MD series		Inductance change : Within ±10% No significant abnormality in appearance.	
Specified Value  21. Loading at high	MD series  temperature life test  MD series	all be soldered to the te	No significant abnormality in appearance.	
Specified Value  21. Loading at high  Specified Value	MD series  temperature life test  MD series  The test samples sha		No significant abnormality in appearance.	
Specified Value  21. Loading at high  Specified Value  Test Methods and	MD series  temperature life test  MD series  The test samples sha		No significant abnormality in appearance.	
Specified Value  21. Loading at high Specified Value  Test Methods and	MD series  temperature life test  MD series  The test samples shall		No significant abnormality in appearance.	
Specified Value  21. Loading at high Specified Value  Test Methods and	MD series  temperature life test  MD series  The test samples shabelow table.	all be placed in thermost	No significant abnormality in appearance.	
Specified Value  21. Loading at high  Specified Value  Test Methods and	MD series  temperature life test  MD series  The test samples shadelow table.  Temperature	all be placed in thermost	No significant abnormality in appearance.	
Specified Value  21. Loading at high Specified Value  Test Methods and	MD series  temperature life test  MD series  The test samples shadelow table.  Temperature Applied current	all be placed in thermost 85±2°C Rated current	No significant abnormality in appearance.	
Specified Value  21. Loading at high Specified Value  Test Methods and	MD series  temperature life test  MD series  The test samples shabelow table.  Temperature  Applied current  Time	all be placed in thermost 85±2°C Rated current	No significant abnormality in appearance.	
Specified Value  21. Loading at high Specified Value  Test Methods and Remarks	MD series  temperature life test  MD series  The test samples shabelow table.  Temperature  Applied current  Time	all be placed in thermost 85±2°C Rated current	No significant abnormality in appearance.	
Specified Value  21. Loading at high Specified Value  Test Methods and Remarks	MD series  temperature life test  MD series  The test samples shabelow table.  Temperature  Applied current  Time	all be placed in thermost 85±2°C Rated current	No significant abnormality in appearance.  est board by the reflow. tatic oven set at specified temperature and applied the rated current continuously as shown	
Specified Value  21. Loading at high Specified Value  Test Methods and Remarks	MD series  temperature life test  MD series  The test samples shabelow table.  Temperature  Applied current  Time	all be placed in thermost 85±2°C Rated current	No significant abnormality in appearance.  est board by the reflow. tatic oven set at specified temperature and applied the rated current continuously as shown  Standard test condition:	
Specified Value  21. Loading at high  Specified Value  Test Methods and Remarks	MD series  temperature life test  MD series  The test samples shabelow table.  Temperature Applied current Time	all be placed in thermost 85±2°C Rated current	No significant abnormality in appearance.  est board by the reflow.  tatic oven set at specified temperature and applied the rated current continuously as shown  Standard test condition:  Unless otherwise specified, temperature is 20±15°C and 65±20% of relative humidity.	

#### METAL CORE SMD POWER INDUCTORS (MCOIL™ MD SERIES)

#### **■**PRECAUTIONS

#### 1. Circuit Design

#### ◆Operating environment

#### Precautions

1. The products described in this specification are intended for use in general electronic equipment, (office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems,) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance.

# 2. PCB Design Precautions ◆Land pattern design 1. Please refer to a recommended land pattern.

#### ◆Land pattern design Surface Mounting

# Technical considerations

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.

#### 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.

#### **♦**Lead free soldering

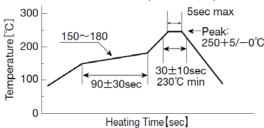
#### Precautions

- 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.
- ◆Recommended conditions for using a soldering iron (NR10050 Type)
  - Put the soldering iron on the land-pattern.
  - Soldering iron's temperature Below 350°C
  - Duration 3 seconds or less
- · The soldering iron should not directly touch the inductor.

#### ◆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.
  - •NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type Recommended reflow condition (Pb free solder)

## Technical considerations



#### 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.

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# 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.
- ◆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

  Technical 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.
  - ◆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

#### **♦**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.
  - · Recommended conditions

Ambient temperature : −5~40°C

Humidity: Below 70% RH

- The ambient temperature must be kept below 30°C. Even under ideal storage conditions, solderability of products electrodes may
  decrease as time passes.
  - For this reason, product should be used within 6 months from the time of delivery.
  - In case of storage over 6 months, solderability shall be checked before actual usage.

# Technical considerations

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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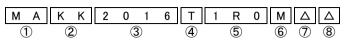
# METAL CORE WIRE-WOUND CHIP POWER INDUCTORS(MCOIL™ MA SERIES)



REFLOW

#### ■PARTS NUMBER

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



①Series name

Code	Series name
MA	Metal Core Wire-wound Chip Power Inductor

2Dimensions(T)

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

③Dimensions(L×W)

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

4 Packaging

Tr doridging	
Code	Packaging
Т	Taping

(5)Nominal inductance

△=Blank space

Code (example)	Nominal inductance [ $\mu$ H]
R47	0.47
1R0	1.0
4R7	4.7

6 Inductance tolerance

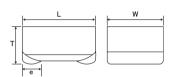
Code	Inductance tolerance
М	±20%

(7)Special code

Code	Special code
Δ	Standard

®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.



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
MAKK2016	2.0±0.1 (0.079±0.004)	1.6±0.1 (0.063±0.004)	1.0 max (0.039 max)	$0.5\pm0.3$ (0.020±0.012)	3000
MAKK2520	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
MAMK2520	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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#### MAKK2016 type [Thickness: 1.0mm max.] Rated current ※) [mA](max.) Self-resonant Nominal inductance DC Resistance [Ω] (max.) Measuring frequency[MHz] Parts number Inductance tolerance frequency [MHz] (min.) Saturation current Temperature rise current MAKK2016TR24M RoHS 0.24 ±20% 0.037 4,200 3,000 MAKK2016TR33M RoHS 0.33 ±20% 0.040 3,600 3,200 MAKK2016TR47M RoHS 0.47 ±20% 0.460 3,200 2,800 MAKK2016TR68M RoHS 0.68 ±20% 0.065 2.500 2.500 2 MAKK2016T1R0M R<sub>0</sub>HS 1.0 ±20% 0.075 2.200 2.200 MAKK2016T1R5M RoHS 1.5 ±20% 0.130 1.600 1.650 MAKK2016T2R2M RoHS 0.160 ±20% 1.500 2.2 1.500 MAKK2016T3R3M RoHS 3.3 ±20% 0.255 1,150 1,200 MAKK2016T4R7M RoHS ±20% 0.380 4.7 1,000 950 2

MAKK2520 type [Thickness: 1.0mm max.]

MAKK2520 type		I hickness: I.Umm	max. ]					
		EHS Nominal inductance $[\mu {\rm H}]$	Inductance tolerance fr	Self-resonant	DC Resistance	Rated current	※) [mA] (max.)	Measuring frequency[MHz]
Parts number	EHS			frequency [MHz] (min.)	[Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	
MAKK2520TR33M	RoHS	0.33	±20%	-	0.038	4,700	3,500	2
MAKK2520TR47M	RoHS	0.47	±20%	-	0.046	3,900	3,200	2
MAKK2520TR68M	RoHS	0.68	±20%	-	0.059	3,700	2,900	2
MAKK2520T1R0M	RoHS	1.0	±20%	-	0.072	2,700	2,500	2
MAKK2520T1R5M	RoHS	1.5	±20%	-	0.125	2,300	1,800	2
MAKK2520T2R2M	RoHS	2.2	±20%	-	0.156	1,900	1,500	2
MAKK2520T3R3M	R <sub>0</sub> HS	3.3	±20%	_	0.200	1,550	1,300	2
MAKK2520T4R7M	RoHS	4.7	±20%	-	0.300	1,300	1,100	2

ennum teete sype								
		Nominal inductance [ μ H]	Inductance tolerance	Self-resonant frequency [MHz] (min.)	DC Resistance [Ω](max.)	Rated current ※) [mA](max.)		Measuring
Parts number EHS	EHS					Saturation current Idc1	Temperature rise current Idc2	frequency[MHz]
MAMK2520TR47M	RoHS	0.47	±20%	-	0.039	4,200	3,400	2
MAMK2520TR68M	RoHS	0.68	±20%	-	0.048	3,200	3,200	2
MAMK2520T1R0M	RoHS	1.0	±20%	-	0.059	3,100	2,700	2
MAMK2520T2R2M	RoHS	2.2	±20%	-	0.110	2,000	1,900	2
MAMK2520T3R3M	RoHS	3.3	±20%	ı	0.156	1,800	1,700	2
MAMK2520T4R7M	RoHS	4.7	±20%	ı	0.260	1,500	1,300	2

- X) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)
- $\mbox{\%}$ ) 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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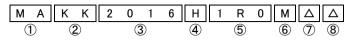
# METAL CORE WIRE-WOUND CHIP POWER INDUCTORS(MCOIL<sup>TM</sup> MA-H SERIES)



REFLOW

#### PARTS NUMBER

- \* Operating Temp.: -40~+125°C (Including self-generated heat)
- \* Operating Temp.:-40~+105°C (Including self-generated heat) \infty 1Parts Number reference



△=Blank space

#### 1)Series name

Code	Series name			
MA	Metal Core Wire-wound Chip Power Inductor			

#### ②Dimensions(T)

E/DIMENSIONS (1)						
Code	Dimensions(T)[mm]					
KK	1.0					
MK	1.2					

#### ③Dimensions (L × W)

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

#### 4 Packaging

Code	Packaging or Special specification
Н	Taping(High characteristics)

#### **⑤**Nominal inductance

Code (example)	Nominal inductance [ $\mu$ H]
R47	0.47
1R0	1.0
4R7	4.7

※R=Decimal point

#### 6 Inductance tolerance

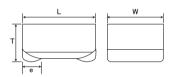
Code	Inductance tolerance
М	±20%

#### 7Special code

Code	Special code
Δ	Standard

®Internal code

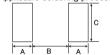
#### ■STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY



#### Recommended Land Patterns

Surface Mounting

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



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
MAKKOO16II	2.0±0.1	1.6±0.1	1.0 max	$0.5 \pm 0.3$	3000
MAKK2016H	$(0.079 \pm 0.004)$	$(0.063 \pm 0.004)$	(0.039 max)	$(0.020\pm0.012)$	3000
MAKKOFOOLI	2.5±0.2	2.0±0.2	1.0 max	0.5±0.3	2000
MAKK2520H	$(0.098 \pm 0.008)$	$(0.079 \pm 0.008)$	(0.039 max)	$(0.020\pm0.012)$	3000
MAMK2520H	2.5±0.2	2.0±0.2	1.2 max	0.5±0.3	3000
	$(0.098 \pm 0.008)$	$(0.079 \pm 0.008)$	(0.047 max)	$(0.020\pm0.012)$	3000

Unit:mm(inch)

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MAKK2016H type			Thickness: 1.0mm	max.					
	Parts number	EHS	Nominal inductance [ μ H]	Inductance tolerance	Self-resonant frequency [MHz] (min.)	DC Resistance [Ω] (max.)	Rated current ※) [mA](max.)		Measuring
							Saturation current Idc1	Temperature rise current Idc2	frequency[MHz]
	MAKK2016HR22M	RoHS	0.22	±20%	-	0.026	5,800	4,000	2
	MAKK2016HR24M	RoHS	0.24	±20%	-	0.026	5,800	4,000	2
	MAKK2016HR33M	RoHS	0.33	±20%	-	0.030	4,700	3,500	2
	MAKK2016HR47M	RoHS	0.47	±20%	-	0.036	4,300	3,300	2
	MAKK2016HR68M	RoHS	0.68	±20%	-	0.050	3,200	2,700	2
	MAKK2016H1R0M	RoHS	1.0	±20%	=	0.070	2,700	2,300	2
	MAKK2016H1R5M	RoHS	1.5	±20%	-	0.105	2,100	1,800	2

MAKK2520H type	)	[Thickness: 1.0mm	max.]					
Parts number		S Nominal inductance [ μ H]		Self-resonant	DC Resistance	Rated current	Rated current ※)[mA](max.)	
	EHS		Inductance tolerance	frequency [MHz] (min.)	[Ω] (max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
MAKK2520HR22M	RoHS	0.22	±20%	-	0.021	7500	4900	2
MAKK2520HR33M	RoHS	0.33	±20%	-	0.026	6200	4300	2
MAKK2520HR47M	RoHS	0.47	±20%	-	0.029	5700	4000	2
MAKK2520HR68M	RoHS	0.68	±20%	-	0.043	4300	3400	2
MAKK2520H1R0M	RoHS	1.0	±20%	-	0.053	3800	3000	2
MAKK2520H1R5M	RoHS	1.5	±20%	-	0.078	3000	2400	2
MAKK2520H2R2M	RoHS	2.2	±20%	-	0.120	2500	1800	2
MAKK2520H100M ※1	R₀HS	10	±20%	-	0.650	1100	750	2

MAMK2520H type	е	[Thickness: 1.2mm	max.]					
		Nominal inductance [ μ H]	Inductance tolerance	Self-resonant	DC Resistance	Rated current ※) [mA](max.)		
Parts number	EHS			frequency [MHz] (min.)	[Ω] (max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
MAMK2520HR22M	RoHS	0.22	±20%	-	0.021	7500	5000	2
MAMK2520HR33M	RoHS	0.33	±20%	-	0.023	6600	4400	2
MAMK2520HR47M	RoHS	0.47	±20%	-	0.026	5800	4100	2
MAMK2520HR68M	RoHS	0.68	±20%	1	0.036	5100	3500	2
MAMK2520H1R0M	RoHS	1.0	±20%	-	0.045	4300	3100	2
MAMK2520H1R5M	RoHS	1.5	±20%	-	0.065	3300	2600	2
MAMK2520H2R2M	RoHS	2.2	±20%	_	0.090	2800	2200	2

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

<sup>\*\*)</sup> The temperature rise current value (Idc2) is the DC current value having temperature increase by 40°C. (at 20°C)

X) The rated current value is following either Idc1 or Idc2, which is the lower one.

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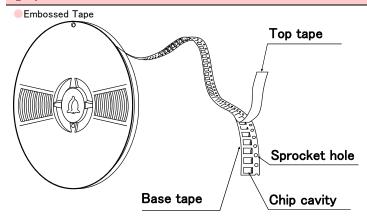
# METAL CORE WIRE-WOUND CHIP POWER INDUCTORS (MCOIL™ MA SERIES / MCOIL™ MA-H SERIES)

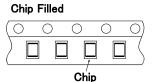
#### PACKAGING

#### 1 Minimum Quantity

Туре	Standard Quantity [pcs]
	Tape & Reel
MAKK2016	3000
MAKK2520	3000
MAMK2520	3000

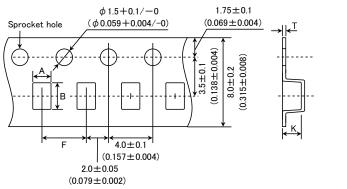
#### **2**Tape Material

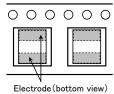




#### 3 Taping dimensions

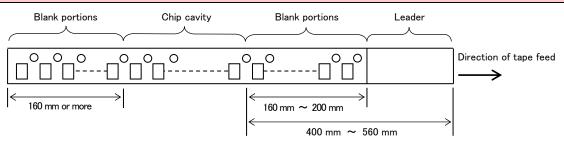
#### Embossed tape 8mm wide (0.315 inches wide)





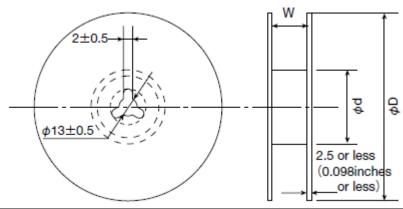
Туре	Chip cavity		Insertion pitch	Tape thickness	
туре	Α	В	F	Т	K
MAKK2016	1.9±0.1	2.3±0.1	4.0±0.1	0.25±0.05	1.2 max
WIANNZUTO	$(0.075 \pm 0.004)$	$(0.091 \pm 0.004)$	$(0.157 \pm 0.004)$	$(0.009 \pm 0.002)$	(0.047 max)
MAKK2520	2.3±0.1	2.8±0.1	4.0±0.1	0.3±0.05	1.25 max
WARRZJZU	$(0.091 \pm 0.004)$	$(0.110 \pm 0.004)$	$(0.157 \pm 0.004)$	$(0.012\pm0.002)$	(0.049 max)
MANIZOEOO	2.3±0.1	2.8±0.1	4.0±0.1	0.3±0.05	1.4 max
MAMK2520	$(0.091 \pm 0.004)$	$(0.110 \pm 0.004)$	$(0.157 \pm 0.004)$	$(0.012\pm0.002)$	(0.055 max)
	•			•	Unit:mm(inch)

#### 4 Leader and Blank portion



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#### ⑤Reel size

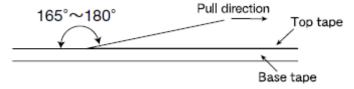


Type	Reel size (Reference values)		
Туре	$\phi$ D	$\phi$ d	W
MAKK2016	100+0 / 2	60+1/-0	10.0±1.5
MAKK2520	180+0/-3 (7.087+0/-0.118)	(2.36+0.039/0)	$(0.394 \pm 0.059)$
MAMK2520	(7.087+0/-0.118)		
•			

Unit:mm(inch)

#### **6**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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# METAL CORE WIRE-WOUND CHIP POWER INDUCTORS (MCOIL™ MA SERIES / MCOIL™ MA-H SERIES)

#### ■RELIABILITY DATA

1. Operating Tempe	rature Range		
Specified Value	MA series	-40~+105°C	
Specified Value	MA-H series	-40~+125°C	
Test Methods and Remarks	Including self-generated heat		
2. Storage Tempera			
Specified Value	MA series	-40~+85°C	
Test Methods and	MA-H series		
Remarks	0 to 40°C for the product with taping.		
3. Rated current			
0	MA series		
Specified Value	MA-H series	Within the specified tolerance	
	W/ TI Solies	<u>I</u>	
4. Inductance			
0 10 111	MA series	West of the Control o	
Specified Value	MA-H series	Within the specified tolerance	
Test Methods and	Measuring equipment : LCR Meter (HP 4	285A or equivalent)	
Remarks	Measuring frequency : 2MHz、1V		
5. DC Resistance			
Specified Value	MA series	Within the specified tolerance	
	MA-H series		
Test Methods and Remarks	Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)		
6. Self resonance fr	requency		
Specified Value	MA series	_	
	MA-H series		
7. Temperature cha	racteristic		
Specified Value	MA series	Inductance change : Within ±15%	
	MA-H series		
Test Methods and Remarks	Measurement of inductance shall be taken at With reference to inductance value at +20°		
8. Resistance to fle			
Specified Value	MA series	No damage	
	MA-H series		
Test Methods and Remarks	The test samples shall be soldered to the test until deflection of the test board reaches to Test board size : 100 × 40 × 1.0  Test board material : Glass epoxy-rescriptions : 0.12 mm	resin Force Rod	
		R5 Board Test Sample 45±2mm 45±2mm	

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9. Insulation resista	nce : between wires		
	MA series		
Specified Value	MA-H series	-	
	L		
10. Insulation resist	ance : between wire and core		
	MA series	_	
Specified Value	MA-H series	DC25V 100kΩ min	
		L	
11. Withstanding vo	Itage : between wire and core		
	MA series		
Specified Value	MA-H series	_	
12. Adhesion of ter	minal electrode		
	MA series		
Specified Value	MA-H series	No abnormality.	
	The test samples shall be soldered to the test	st board by the reflow.	
Test Methods and	Applied force : 10N to X and	Y directions.	
Remarks	Duration : 5s. Solder cream thickness : 0.12mm.		
	Solder cream thickness : 0.12mm.		
12 Di-t	9		
13. Resistance to v			
Specified Value	MA series	Inductance change : Within ±10%  No significant abnormality in appearance.	
	MA-H series		
	The test samples shall be soldered to the test.  Then it shall be submitted to below test cond.	·	
	Frequency Range 10~55Hz		
Test Methods and		exceed acceleration 196m/s²)	
Remarks	Sweeping Method 10Hz to 55Hz to	10Hz for 1min.	
	Time X	For 2 hours on each X, Y, and Z axis.	
	Z	Tot 2 hours on caon X, 1, and 2 axis.	
	Recovery : At least 2hrs of recovery under the	he standard condition after the test, followed by the measurement within 48hrs.	
14. Solderability			
Specified Value	MA series	At least 90% of surface of terminal electrode is covered by new solder.	
Specified value	MA-H series	At least 50% 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.		then immersed in molten solder as shown in below table.	
Test Methods and	Flux: Methanol solution containing rosin 25%.		
Remarks	Solder Temperature         245±5°C           Time         5±0.5 sec.	_	
	*Immersion depth : All sides of mounting ter	l minal shall be immersed.	
	T S		
15. Resistance to s	oldering heat		
	MA series	Inductance change : Within ±10%	
Specified Value	MA-H series	No significant abnormality in appearance.	
	The test sample shall be exposed to reflow ov	ven at 230°C for 40 seconds, with peak temperature at $260+0/-5$ °C for 5 seconds, 3 times.	
Test Methods and	Test board material : Glass epoxy-resin		
Remarks	Test board thickness : 1.0mm	he standard condition after the test, followed by the measurement within 48hrs.	
	Necovery . At least zrirs of recovery under the	ie standard condition after the test, followed by the measurement within 40nrs.	

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#### 16. Thermal shock MA series Inductance change: Within ±10% Specified Value No significant abnormality in appearance. MA-H series 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 Duration (min) Step Temperature (°C) Test Methods and -40±3 $30\pm3$ 1 Remarks 2 Room temperature Within 3 3 +85±2 $30\pm3$ 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 MA series Inductance change: Within ±10% Specified Value No significant abnormality in appearance. MA-H series 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 60±2°C Temperature Remarks Humidity 90~95%RH 500+24/-0 hour Time Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. 18. Loading under damp heat MA series Inductance change : Within $\pm 10\%$ Specified Value No significant abnormality in appearance. MA-H series 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. Test Methods and Temperature 60±2°C Remarks Humidity 90∼95%RH Applied current Rated current Time 500+24/-0 hour Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. 19. Low temperature life test MA series Inductance change : Within $\pm 10\%$ Specified Value No significant abnormality in appearance. MA-H series 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. Test Methods 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 temperature life test MA series Inductance change: Within ±10% Specified Value No significant abnormality in appearance. MA-H series 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 and in below table 85 ± 2°C Remarks Temperature 500+24/-0 hour Time Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. 21. Loading at high temperature life test MA series

Specified Value

MA-H series

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22. Standard condition		
	MA series	Standard test condition : Unless otherwise specified, temperature is 20±15°C and 65±20% of relative humidity.
Specified Value	MA-H series	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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## METAL CORE WIRE-WOUND CHIP POWER INDUCTORS (MCOIL™ MA SERIES / MCOIL™ MA-H SERIES)

#### PRECAUTIONS 1. Circuit Design Operating environment 1. The products described in this specification are intended for use in general electronic equipment, office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical Precautions equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems,) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance. 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. 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) 5sec max 300 - Peak∶260+0/−5°C $\mathsf{Cemperature}[\mathsf{^{\circ}C}]$ 150~180 Technical 200 considerations 40sec max 100 $90 \pm 30 sec$ 230°C min

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

Heating Time [sec]

0

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#### 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. 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 Technical 1. There is a case to be damaged by a mechanical shock. considerations 2. There is a case to be broken by the handling in transportation. ◆Pick-up pressure 1. Damage and a characteristic can vary with an excessive shock or stress. **♦**Packing 1. If packing boxes are accumulated, that could cause a deformation on packing tapes or a damage on the products.

7. Storage conditions		
Precautions	<ul> <li>♦ Storage         <ol> <li>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.</li> <li>Recommended conditions</li></ol></li></ul>	
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.	

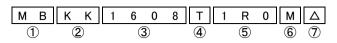
# METAL WIRE-WOUND CHIP POWER INDUCTORS(MCOIL<sup>TM</sup> MB SERIES)



REFLOW

#### ■PARTS NUMBER

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



△=Blank space

①Series name

Code	Series name
MB	Metal Wire-Wound chip power inductor

②Dimensions(T)

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

③Dimensions (L × W)

©Billionologic (E · · · · · · · )		
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

#### 4Packaging

Code	Packaging
Т	Taping

#### ⑤Nominal inductance

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

#### **6**Inductance tolerance

Code	Inductance tolerance
М	±20%
N	±30%

7Internal 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
1608	0.55	0.70	1.00
2012	0.60	1.00	1.45
2520	0.60	1.50	2.00

Unit:mm

Type	L W T e		Standard qu	antity[pcs]		
Type	L	VV	'	е	Paper tape	Embossed tape
MBKK1608	1.6±0.2	$0.8 \pm 0.2$	1.0 max	0.45±0.15	_	3000
MIDICKTOOO	$(0.063\pm0.008)$	$(0.031 \pm 0.008)$	(0.040 max)	$(0.016\pm0.006)$	_	3000
MBKK2012	2.0±0.2	1.25±0.2	1.0 max	0.5±0.2	_	3000
MIDICINZUTZ	$(0.079 \pm 0.008)$	$(0.049\pm0.008)$	(0.040 max)	$(0.020\pm0.008)$	_	3000
MBMK2520	2.5±0.2	2.0±0.2	1.2 max	0.5±0.2	_	3000
INIDINIVADIA	$(0.098 \pm 0.008)$	$(0.079 \pm 0.008)$	(0.047 max)	$(0.020\pm0.008)$	_	3000
	Unit:mm(inch)					

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#### 

Name of Sec		Manada al Carlo de Arras	Nominal inductance	Self-resonant DC Resistance		Rated current	Managemen	
Parts number	EHS	[ $\mu$ H]	Inductance tolerance	frequency [MHz] (min.)	[Ω] (max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
MBKK1608TR24N	RoHS	0.24	±30%	-	0.049	1,650	2,300	1.0
MBKK1608TR47N	RoHS	0.47	±30%	-	0.104	1,100	1,400	1.0
MBKK1608TR68N	RoHS	0.68	±30%	-	0.120	950	1,200	1.0
MBKK1608T1R0M	RoHS	1.0	±20%	1	0.150	800	1,150	1.0
MBKK1608T1R5M	RoHS	1.5	±20%	1	0.200	650	1,000	1.0
MBKK1608T2R2M	RoHS	2.2	±20%	-	0.345	520	750	1.0
MBKK1608T3R3M	RoHS	3.3	±20%	-	0.512	450	600	1.0
MBKK1608T4R7M	RoHS	4.7	±20%	-	0.730	370	500	1.0

- INDICATE (COCC) Cypo		L TIMORATOGO . T.OTTIMI						
		Nominal inductance		Self-resonant	DC Resistance	Rated current	Rated current ※)[mA](max.)	
Parts number	EHS	[ $\mu$ H]	Inductance tolerance	frequency [MHz] (min.)	[Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
				[141112] (111111.)		IdC1	IdCZ	
MBKK2012TR24N	RoHS	0.24	±30%	-	0.041	3,000	2,400	1.0
MBKK2012TR47N	RoHS	0.47	±30%	-	0.078	2,000	1,650	1.0
MBKK2012TR68N	RoHS	0.68	±30%	-	0.090	1,800	1,500	1.0
MBKK2012T1R0M	RoHS	1.0	±20%	-	0.106	1,500	1,450	1.0
MBKK2012T1R5M	RoHS	1.5	±20%	-	0.173	1,200	1,100	1.0
MBKK2012T2R2M	RoHS	2.2	±20%	-	0.290	900	850	1.0
MBKK2012T3R3M	RoHS	3.3	±20%	-	0.500	700	650	1.0
MBKK2012T4R7M	R₀HS	4.7	±20%	-	0.615	600	600	1.0

#### 

WBWINZ520 (1000) type Trilickiness. 1.2min max.							
Naminal industria		Self-resonant	DC Besistense	Rated current ※) [mA](max.)		Measuring	
EHS	[ $\mu$ H]	Inductance tolerance	frequency	[Ω] (max.)	Saturation current	Temperature rise current	frequency[MHz]
			[WII 12] (IIIIII.)		Idel	IdcZ	
RoHS	0.24	±30%	-	0.026	4,750	3,500	1.0
RoHS	0.47	±30%	-	0.042	3,900	2,600	1.0
RoHS	0.68	±30%	-	0.058	3,150	2,150	1.0
RoHS	1.0	±20%	-	0.072	2,350	1,850	1.0
RoHS	1.5	±20%	-	0.106	2,050	1,500	1.0
RoHS	2.2	±20%	-	0.159	1,800	1,250	1.0
RoHS	3.3	±20%	-	0.260	1,400	970	1.0
RoHS	4.7	±20%	-	0.380	1,150	800	1.0
	RoHS RoHS RoHS ROHS ROHS ROHS ROHS ROHS ROHS	EHS         Nominal inductance [μH]           RoHS         0.24           RoHS         0.47           RoHS         0.68           RoHS         1.0           RoHS         2.2           RoHS         3.3	EHS         Nominal inductance [μH]         Inductance tolerance           RoHS         0.24         ±30%           RoHS         0.47         ±30%           RoHS         0.68         ±30%           RoHS         1.0         ±20%           RoHS         1.5         ±20%           RoHS         2.2         ±20%           RoHS         3.3         ±20%	EHS         Nominal inductance [μH]         Inductance tolerance frequency [MHz] (min.)           RoHS         0.24         ±30%         -           RoHS         0.47         ±30%         -           RoHS         0.68         ±30%         -           RoHS         1.0         ±20%         -           RoHS         1.5         ±20%         -           RoHS         2.2         ±20%         -           RoHS         3.3         ±20%         -	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$

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

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

 $<sup>\</sup>ensuremath{\mbox{\%}}\xspace) The rated current value is following either Idc1 or Idc2, which is the lower one.$ 

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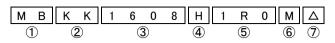
# METAL WIRE-WOUND CHIP POWER INDUCTORS(MCOIL™ MB-H SERIES)



REFLOW

#### ■PARTS NUMBER

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



△=Blank space

①Series name

Code	Series name
MB	Metal Wire-Wound chip power inductor

#### ②Dimensions(T)

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

#### ③Dimensions (L × W)

@2e.ie.ie.e.(2 11)				
Code	Type (inch)	Dimensions (L×W)[mm]		
1608	1608 (0603)	1.6 × 0.8		
2520	2520(1008)	2.5 × 2.0		

#### 4 Packaging

	Code	Packaging
•	Н	Taping(Special specification)

#### ⑤Nominal inductance

©11-11-11-11-11-11-11-11-11-11-11-11-11-		
Code (example)	Nominal inductance [ $\mu$ H ]	
R24	0.24	
1R0	1.0	
4R7	4.7	

※R=Decimal point

#### **6**Inductance tolerance

Code	Inductance tolerance
М	±20%
N	±30%

7Internal code

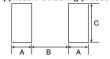
#### ■ STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY

#### 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
1608	0.55	0.70	1.00
2520	0.60	1.50	2.00
			Unit:mm

Т		w	т		Standard quantity[pcs]		
Туре	L	VV	l	е	Paper tape	Embossed tape	
MBKK1608	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	1.0 max (0.040 max)	0.45±0.15 (0.016±0.006)	_	3000	
MBMK2520	2.5±0.2 (0.098±0.008)	2.0±0.2 (0.079±0.008)	1.2 max (0.047 max)	0.5±0.2 (0.020±0.008)	_	3000	
						Unit:mm(inch)	

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#### MBKK1608H(0603) type [Thickness:1.0mm max.]

		N		Self-resonant	DO D	Rated current	M	
Parts number EH	EHS	Nominal inductance [ μ H]	Inductance tolerance	frequency [MHz] (min.)	DC Resistance [Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	Measuring frequency[MHz]
MBKK1608HR24N	RoHS	0.24	±30%	-	0.049	1,650	2,300	1.0
MBKK1608HR47N	RoHS	0.47	±30%	-	0.104	1,100	1,400	1.0
MBKK1608HR68N	R₀HS	0.68	±30%	-	0.120	950	1,200	1.0
MBKK1608H1R0M	RoHS	1.0	±20%	-	0.150	800	1,150	1.0
MBKK1608H1R5M	RoHS	1.5	±20%	-	0.200	650	1,000	1.0
MBKK1608H2R2M	RoHS	2.2	±20%	-	0.345	520	750	1.0
MBKK1608H3R3M	RoHS	3.3	±20%	-	0.512	450	600	1.0
MBKK1608H4R7M	RoHS	4.7	±20%	-	0.730	370	500	1.0

MBMK2520H(1008) type [Thickness:1.2mm max.]

Parts number		Nominal inductance	Inductance tolerance	Self-resonant	DC Resistance	Rated current	※) [mA] (max.)	Measuring
	EHS	[ $\mu$ H]		frequency [MHz] (min.)	[Ω](max.)	Saturation current Idc1	Temperature rise current Idc2	frequency[MHz]
MBMK2520HR24N	RoHS	0.24	±30%	-	0.026	4,750	3,500	1.0
MBMK2520HR47N	RoHS	0.47	±30%	-	0.042	3,900	2,600	1.0
MBMK2520HR68N	RoHS	0.68	±30%	-	0.058	3,150	2,150	1.0
MBMK2520H1R0M	RoHS	1.0	±20%	-	0.072	2,350	1,850	1.0
MBMK2520H1R5M	RoHS	1.5	±20%	-	0.106	2,050	1,500	1.0
MBMK2520H2R2M	RoHS	2.2	±20%	-	0.159	1,800	1,250	1.0
MBMK2520H3R3M	R₀HS	3.3	±20%	=	0.260	1,400	970	1.0
MBMK2520H4R7M	R <sub>0</sub> HS	4.7	±20%	-	0.380	1,150	800	1.0

<sup>%</sup>) 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)

<sup>\*</sup>X) The rated current value is following either Idc1 or Idc2, which is the lower one.

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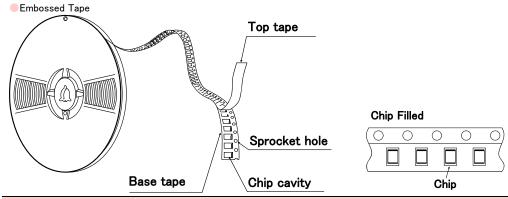
# METAL WIRE-WOUND CHIP POWER INDUCTORS (MCOIL™ MB SERIES / MCOIL™ MB-H SERIES)

#### **■**PACKAGING

#### 1 Minimum Quantity

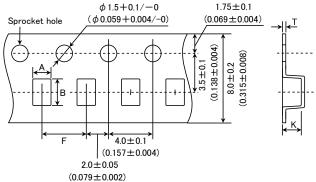
Type	Standard Quantity [pcs]		
туре	Tape & Reel		
MBKK1608/MBKK1608H	3000		
MBKK2012	3000		
MBMK2520/MBMK2520H	3000		

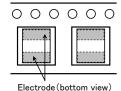
#### **2**Tape Material



#### 3 Taping dimensions

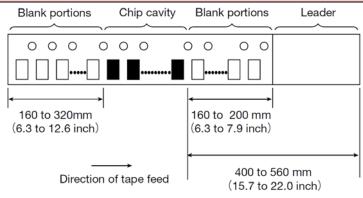
#### Embossed tape 8mm wide (0.315 inches wide)





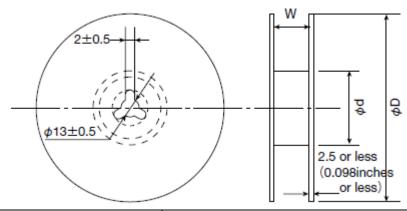
T	Chip cavity		Insertion pitch	Tape thickness	
Туре	Α	В	F	Т	K
MBKK1608/MBKK1608H	1.1	1.9	4.0±0.1	0.25±0.05	1.2 max
	(0.043)	(0.075)	$(0.157 \pm 0.004)$	$(0.010\pm0.002)$	(0.047 max)
MBKK2012	1.45	2.2	4.0±0.1	0.25±0.05	1.2 max
	(0.057)	(0.087)	$(0.157 \pm 0.004)$	$(0.010\pm0.002)$	(0.047 max)
MDMK0500 ZMDMK0500U	2.3	2.8	4.0±0.1	0.3±0.05	1.45 max
MBMK2520/MBMK2520H	(0.091)	(0.110)	$(0.157 \pm 0.004)$	$(0.012\pm0.002)$	(0.057 max)
					Unit:mm(inch)

#### 4 Leader and Blank portion



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#### ⑤Reel size

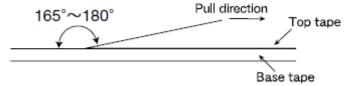


Type	Reel size (Reference values)			
Туре	$\phi$ D	$\phi$ d	W	
MBKK1608/MBKK1608H	180+0/-3	60+1/-0	100-15	
MBKK2012	(7.087+0/-0.118)	(2.36+0.039/0)	$10.0 \pm 1.5$ (0.394 \pm 0.059)	
MBMK2520/MBMK2520H	(7.067+0/-0.116)	(2.30+0.039/0)	(0.394±0.039)	

Unit:mm(inch)

#### **6**Top Tape Strength

The top The top tape requires a peel-off force of 0.2 to 0.7N in the direction of the arrow as illustrated below.



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# METAL WIRE-WOUND CHIP POWER INDUCTORS (MCOIL™ MB SERIES ✓ MCOIL™ MB-H SERIES)

Specified Value

Remarks

Test Methods and

MB-H series

Measuring equipment

#### RELIABILITY DATA 1. Operating Temperature Range -40~+105°C MB series Specified Value -40~+125°C MB-H series Test Methods and Including self-generated heat Remarks 2. Storage Temperature Range MB series -40~+85°C Specified Value MB-H series Test Methods and 0 to $40^{\circ}$ C for the product with taping. Remarks 3. Rated current MB series Specified Value Within the specified tolerance MB-H series 4. Inductance MB series Specified Value Within the specified tolerance MB-H series Test Methods and : LCR Meter (HP 4285A or equivalent) Measuring equipment Remarks Measuring frequency : 1MHz, 1V 5. DC Resistance MB series

6. Self resonance frequency				
Specified Value	MB series			
	MP-H corios			

: DC ohmmeter (HIOKI 3227 or equivalent)

Within the specified tolerance

7. Temperature characteristic					
Specified Value  MB series  MB-H series	MB series	Inductance change : Within ±15%			
	MB-H series	Inductance change : Within 12.10%			
Test Methods and	MB series : 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.				
Remarks	MB-H series : Measurement of inductance shall be taken at With reference to inductance value at $\pm 20^{\circ}$ C	temperature range within $-40^{\circ}\text{C}\sim+125^{\circ}\text{C}$ . C., change rate shall be calculated.			

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#### 8. Resistance to flexure of substrate MB series Specified Value No damage MB-H series 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. $: 100 \times 40 \times 1.0 \text{ mm} (1608:0.8 \text{mm})$ Test board size Test board material : Glass epoxy-resin Test Methods and Solder cream thickness : 0.1 mm Remarks Board 9. Insulation resistance : between wires MB series Specified Value MB-H series 10. Insulation resistance: between wire and core DC25V $100k\Omega$ min MB series Specified Value MB-H series DC50V $100k\Omega$ min 11. Withstanding voltage: between wire and core MB series Specified Value MB-H series 12. Adhesion of terminal electrode MB series Specified Value No abnormality. MB-H series The test samples shall be soldered to the test board by the reflow. Test Methods and Applied force : 10N (1608:5N) to X and Y directions. Remarks Duration : 5s. Solder cream thickness : 0.1mm 13. Resistance to vibration MB series 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. Frequency Range 10∼55Hz Total Amplitude 1.5mm (May not exceed acceleration 196m/s<sup>2</sup>) Test Methods and Sweeping Method 10Hz to 55Hz to 10Hz for 1min. Remarks Χ Υ Time For 2 hours on each X, Y, and Z axis. Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. 14. Solderability MB series Specified Value At least 90% of surface of terminal electrode is covered by new solder. MB-H series The test samples shall be dipped in flux, and then immersed in molten solder as shown in below table. Flux: Methanol solution containing rosin 25%. Solder Temperature 245±5°C Test Methods and Remarks Immersing speed 25mm/s Time $5\pm0.5$ sec.

XImmersion depth: All sides of mounting terminal shall be immersed.

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#### 15. Resistance to soldering heat MB series Inductance change: Within ±10% Specified Value No significant abnormality in appearance. MB-H series 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 Methods and Test board material : Glass epoxy-resin Remarks 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							
C:61 \/-l	MB serie	s		Inductance change : Within ±10%			
Specified Value	MB-H se	eries		No significant a	bnorma	ality in app	earance.
Test Methods and Remarks	MB serie The test The test specified sequence Step 1 2 3 4	s: samples shall be soldered samples shall be placed time by step 1 to step e. The temperature cycle s Conditions of 1 Temperature (°C) -40±3 Room temperature +85±2 Room temperature	I at speci 4 as sho hall be rep cycle Duri	ified temperatur wn in below tab beated 100 cycle ation (min) 30±3 Within 3 30±3 Within 3	e for ole in s.	Step 1 2 3 4	samples st samples st samples st samples st samples st samples to sample st
	Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.						y:At leas test, follo

#### MB-H series:

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							
C:E1 \/-!	MB series		Inductance change : V	Inductance change : Within ±10%			
Specified Value	MB-H series		No significant abnorm	No significant abnormality in appearance.			
Test Methods and	MB series: The test samples shall be soldered to the test board by the reflection. The test samples shall be placed in thermostatic oven set specified temperature and humidity as shown in below table.						
Remarks	Temperature	60±2°C		Temperature	85±2°C	]	
	Humidity	90∼95%RH		Humidity	85%RH		
	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, followed by the measurement within 48hrs.			

18. Loading under damp heat							
Specified Value	MB series		Inductance change : Within ±10%				
	MB-H series		No significant abnormality in appearance.				
Test Methods and Remarks	MB series:			MB-H series:			
	The test samples sh	all be soldered to the tes	t board by the reflow.	The test samples shall be soldered to the test board by the reflow.			
	The test samples	shall be placed in therr	nostatic 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			
	continuously as shown in below table.			continuously as shown in below table.			
	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, followed by the measurement within 48hrs.			

19. Low temperature life test						
Specified Value	MB series		Inductance change : Within ±10%			
Specified value	MB-H series		No significant abnormality 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 and	in below table.					
Remarks	Temperature	-40±2°C				
	Time	1000+24/-0 hour				
	Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.					

<sup>▶</sup> 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/) .

20. High temperatur	re life test			
Specified Value	MB series		Inductance change : Within ±10%	
	MB-H series		No significant abnormality in appearance.	
Test Methods and	The test samples sha in below table.	all be soldered to the tes	t board by the reflow. After that, the test samples shall be placed at test conditions as shown	
Remarks	Temperature	85±2°C		
	Time	1000+24/-0 hour		
	Recovery: At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.			
21. Loading at high	temperature life test			
Specified Value	MB series			
	MB-H series			
22. Standard condit	ion			
Specified Value	MB series		Standard test condition : Unless otherwise specified, temperature is 20±15°C and 65±20% of relative humidity.	
	MB-H series		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.	

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# METAL WIRE-WOUND CHIP POWER INDUCTORS (MCOIL™ MB SERIES ∕ MCOIL™ MB-H SERIES)

#### PRECAUTIONS

#### 1. Circuit Design

### Precautions

#### ◆Operating environment

1. The products described in this specification are intended for use in general electronic equipment, (office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems,) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance.

#### 2. PCB Design

#### 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.

#### 4. Soldering

#### ◆Reflow soldering

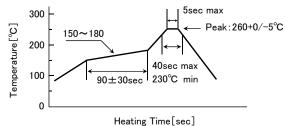
- 1. Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified.
- 2. The product shall be used reflow soldering only.

#### 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)

# Technical considerations



#### 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.

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#### 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. 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 Technical 1. There is a case to be damaged by a mechanical shock. considerations 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	<ul> <li>♦ Storage</li> <li>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.</li> <li>• Recommended conditions         <ul> <li>Ambient temperature : 0~40°C</li> <li>Humidity : Below 70% RH</li> </ul> </li> <li>• The ambient temperature must be kept below 30°C. Even under ideal storage conditions, solderability of products electrodes may decrease as time passes.</li> <li>For this reason, product should be used within 6 months from the time of delivery.</li> <li>In case of storage over 6 months, solderability shall be checked before actual usage.</li> </ul>
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.