

有关本公司产品的注意事项

请务必在使用本公司产品目录之前阅读。

⚠ 注意事项

■ 本产品目录中记载的内容是至2013年10月的内容。本产品目录记载的内容由于产品的改良等原因发生变更时，恕不另行通知。在您订购我司产品之前请确认最新的产品信息。

当您计划在本产品目录记载内容，或是《交货规格书》的规定范围以外使用我司产品时，由于使用我司产品引起的该应用设备的瑕疵我司将不承担任何责任。

■ 有关详细的产品规格我们准备有《交货规格书》，请向我司咨询相关事宜。

■ 在您使用我司产品时，请务必进行应用设备实装状态以及应用产品实际使用环境下的测评。

■ 本产品目录中记载的电子元器件，电路产品等产品适用于一般电子设备。

『AV设备，OA设备，家电及办公设备，信息/通讯设备（手机，电脑等）』

当您计划把本产品目录中记载的产品使用于可能会危及第三方生命安全的应用设备时，请务必提前与我公司取得联系，针对产品信息加以确认。

【运输用设备（火车控制设备，船舶控制设备等），交通用信号设备，防灾设备，医疗用设备，公共性高的信息通信设备等（电话程控交换机，电话，无线电，电视信号等基地局）】

另外，请不要在要求高度安全性，可靠性的应用设备上使用本产品目录中记载的产品。【航天设备，航空设备，核控制设备，用于海底的设备，军事设备等】

同时，应用于安全性，可靠性要求较高的一般电子设备/电路时，请充分进行安全性测评，必要时请在设计过程中追加保护电路。

■ 本产品目录中所记载的内容适用于通过我司营业所，销售子公司，销售代理店（即正规销售渠道）购买的我司产品。通过其他渠道购买的我司产品不在适用范围之内。

■ 由于使用本产品目录记载的产品引起的有关第三方知识产权的冲突，我司概不负责。本产品目录不代表相关权利的实施许诺。

■ 有关出口的注意事项

本产品目录中记载的产品中，部分产品在出口时会被归为“外汇及外贸管理法，美国出口管理法规”的管制货物，请及时实施相关手续，依据相关法律法规进行出口。需确认时，可向我司咨询。

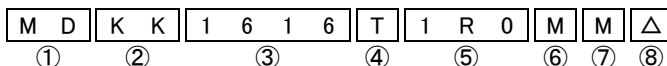
金属磁芯 SMD 功率电感器 (MCOIL™ MD 系列)



回流焊

■ 型号标示法

※使用温度范围: -40~+125°C (包含产品本身发热)



△=空格

① 类型

代码	类型
MD	基本金属线圈规格

② 尺寸(H)

代码	尺寸(H) [mm]
KK	1.0
MK	1.2
PK	1.4

③ 尺寸(L×W)

代码	尺寸(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 包装

代码	包装
T	卷盘带装

⑤ 标称电感值

代码(例)	标称电感值 [μH]
R47	0.47
1R0	1.0
4R7	4.7

※R=小数点

⑥ 电感量公差

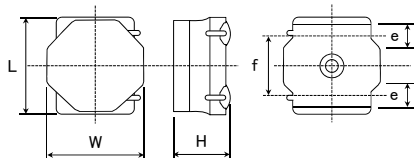
代码	电感量公差
M	±20%
N	±30%

⑦ 个别规格

代码	个别规格
F	铁氧体外涂品
M	金属外涂品

⑧ 本公司管理记号

■ 标准外型尺寸/标准数量



Type	L	W	H	e	f	标准数量 [pcs] 卷盘带装
MDKK1616	1.64±0.1 (0.065±0.004)	1.64±0.1 (0.065±0.004)	1.0 max (0.039 max)	0.40 +0.2/-0.1 (0.016 +0.008/-0.004)	1.0±0.2 (0.039±0.008)	2500
MDKK2020	2.0±0.15 (0.079±0.006)	2.0±0.15 (0.079±0.006)	1.0 max (0.039 max)	0.50±0.2 (0.02±0.008)	1.25±0.2 (0.049±0.008)	2500
MDMK2020	2.0±0.15 (0.079±0.006)	2.0±0.15 (0.079±0.006)	1.2 max (0.047 max)	0.50±0.2 (0.02±0.008)	1.25±0.2 (0.049±0.008)	2500
MDKK3030	3.0±0.1 (0.118±0.004)	3.0±0.1 (0.118±0.004)	1.0 max (0.039 max)	0.90±0.2 (0.035±0.008)	1.9±0.2 (0.075±0.008)	2000
MDMK3030	3.0±0.1 (0.118±0.004)	3.0±0.1 (0.118±0.004)	1.2 max (0.047 max)	0.90±0.2 (0.035±0.008)	1.9±0.2 (0.075±0.008)	2000
MDMK4040	4.0±0.2 (0.157±0.008)	4.0±0.2 (0.157±0.008)	1.2 max (0.047 max)	1.1±0.2 (0.043±0.008)	2.5±0.2 (0.098±0.008)	1000
MDPK5050	4.9±0.2 (0.193±0.008)	4.9±0.2 (0.193±0.008)	1.4 max (0.055 max)	1.20±0.2 (0.047±0.008)	3.3±0.2 (0.130±0.008)	1000

单位: mm (inch)

▶ 本产品目录根据版面大小, 仅记载了代表性产品规格, 若考虑使用本公司产品时, 请确认供货规格型号明细表中的详细规格。有关各商品的详细信息(特性图、可靠性信息、使用时的注意事项等), 请参阅本公司网站(<http://www.ty-top.com/>)。

●MDKK1616 型

型号	EHS	标称电感值 [μH]	电感量公差	自共振频率 [MHz] (min.)	直流电阻 [Ω] (max.)	额定电流 ※) [mA]		测试频率[MHz]
						直流重叠允许电流 Idc1	温度上升允许电流 Idc2	
MDKK1616TR47MM	RoHS	0.47	±20%	-	0.095	3,300	1,500	1
MDKK1616T1R0MM	RoHS	1.0	±20%	-	0.140	2,200	1,200	1
MDKK1616T1R5MM	RoHS	1.5	±20%	-	0.185	1,750	1,100	1
MDKK1616T2R2MM	RoHS	2.2	±20%	-	0.250	1,500	950	1
MDKK1616T3R3MM	RoHS	3.3	±20%	-	0.515	1,150	650	1
MDKK1616T4R7MM	RoHS	4.7	±20%	-	0.640	950	550	1

●MDKK2020 型

型号	EHS	标称电感值 [μH]	电感量公差	自共振频率 [MHz] (min.)	直流电阻 [Ω] (max.)	额定电流 ※) [mA]		测试频率[MHz]
						直流重叠允许电流 Idc1	温度上升允许电流 Idc2	
MDKK2020TR47MM	RoHS	0.47	±20%	-	0.046	3,500	2,200	1
MDKK2020TR68MM	RoHS	0.68	±20%	-	0.060	3,200	2,000	1
MDKK2020T1R0MM	RoHS	1.0	±20%	-	0.085	2,900	1,700	1
MDKK2020T1R5MM	RoHS	1.5	±20%	-	0.133	1,900	1,350	1
MDKK2020T2R2MM	RoHS	2.2	±20%	-	0.165	1,650	1,200	1
MDKK2020T3R3MM	RoHS	3.3	±20%	-	0.275	1,300	940	1
MDKK2020T4R7MM	RoHS	4.7	±20%	-	0.435	1,050	750	1
MDKK2020T100MM	RoHS	10	±20%	-	0.690	750	630	1

●MDMK2020 型

型号	EHS	标称电感值 [μH]	电感量公差	自共振频率 [MHz] (min.)	直流电阻 [Ω] (max.)	额定电流 ※) [mA]		测试频率[MHz]
						直流重叠允许电流 Idc1	温度上升允许电流 Idc2	
MDMK2020TR47MM	RoHS	0.47	±20%	-	0.046	4,200	2,300	1
MDMK2020TR68MM	RoHS	0.68	±20%	-	0.058	3,500	2,000	1
MDMK2020T1R0MM	RoHS	1.0	±20%	-	0.064	2,550	1,900	1
MDMK2020T1R5MM	RoHS	1.5	±20%	-	0.086	2,000	1,650	1
MDMK2020T2R2MM	RoHS	2.2	±20%	-	0.109	1,750	1,450	1
MDMK2020T3R3MM	RoHS	3.3	±20%	-	0.178	1,350	1,150	1
MDMK2020T4R7MM	RoHS	4.7	±20%	-	0.242	1,150	950	1

●MDKK3030 型

型号	EHS	标称电感值 [μH]	电感量公差	自共振频率 [MHz] (min.)	直流电阻 [Ω] (max.)	额定电流 ※) [mA]		测试频率[MHz]
						直流重叠允许电流 Idc1	温度上升允许电流 Idc2	
MDKK3030TR47MM	RoHS	0.47	±20%	-	0.039	5,400	3,500	1
MDKK3030T1R0MM	RoHS	1.0	±20%	-	0.086	4,400	2,400	1
MDKK3030T1R5MM	RoHS	1.5	±20%	-	0.100	3,000	2,100	1
MDKK3030T2R2MM	RoHS	2.2	±20%	-	0.144	2,500	1,900	1
MDKK3030T3R3MM	RoHS	3.3	±20%	-	0.265	2,000	1,250	1
MDKK3030T4R7MM	RoHS	4.7	±20%	-	0.362	1,700	1,100	1
MDKK3030T6R8MM	RoHS	6.8	±20%	-	0.437	1,400	1,000	1
MDKK3030T100MM	RoHS	10	±20%	-	0.575	1,100	850	1

●MDMK3030 型

型号	EHS	标称电感值 [μH]	电感量公差	自共振频率 [MHz] (min.)	直流电阻 [Ω] (max.)	额定电流 ※) [mA]		测试频率[MHz]
						直流重叠允许电流 Idc1	温度上升允许电流 Idc2	
MDMK3030TR30MM	RoHS	0.30	±20%	-	0.020	7,600	4,800	1
MDMK3030TR47MM	RoHS	0.47	±20%	-	0.027	6,300	4,200	1
MDMK3030T1R0MM	RoHS	1.0	±20%	-	0.050	4,300	3,100	1
MDMK3030T1R5MM	RoHS	1.5	±20%	-	0.074	3,400	2,500	1
MDMK3030T2R2MM	RoHS	2.2	±20%	-	0.112	2,800	2,000	1
MDMK3030T3R3MM	RoHS	3.3	±20%	-	0.173	2,100	1,600	1
MDMK3030T4R7MM	RoHS	4.7	±20%	-	0.263	1,800	1,300	1

●MDMK4040 型

型号	EHS	标称电感值 [μH]	电感量公差	自共振频率 [MHz] (min.)	直流电阻 [Ω] (max.)	额定电流 ※) [mA]		测试频率[kHz]
						直流重叠允许电流 Idc1	温度上升允许电流 Idc2	
MDMK4040TR47MF	RoHS	0.47	±20%	-	0.029	7,500	4,600	100
MDMK4040T1R0MF	RoHS	1.0	±20%	-	0.047	5,200	3,500	100
MDMK4040T1R2MF	RoHS	1.2	±20%	-	0.047	4,200	3,500	100
MDMK4040T1R5MF	RoHS	1.5	±20%	-	0.065	3,700	3,300	100
MDMK4040T2R2MF	RoHS	2.2	±20%	-	0.092	3,200	2,500	100

●MDPK5050 型

型号	EHS	标称电感值 [μH]	电感量公差	自共振频率 [MHz] (min.)	直流电阻 [Ω] (max.)	额定电流 ※) [mA]		测试频率[MHz]
						直流重叠允许电流 Idc1	温度上升允许电流 Idc2	
MDPK5050T4R7MM	RoHS	4.70	±20%	-	0.102	3,500	2,500	1

※)直流重叠允许电流(Idc1)为直流重叠带来的电感值下降,范围在30%以内的直流电感值(at 20°C)

※)温度上升允许电流(Idc2)为温度上升到40°C时的直流电感值(at 20°C)

※)最大额定电流值为能够满足直流重叠允许电流和温度上升允许电流的直流电流值

METAL CORE SMD POWER INDUCTORS (MCOIL™ MD SERIES)

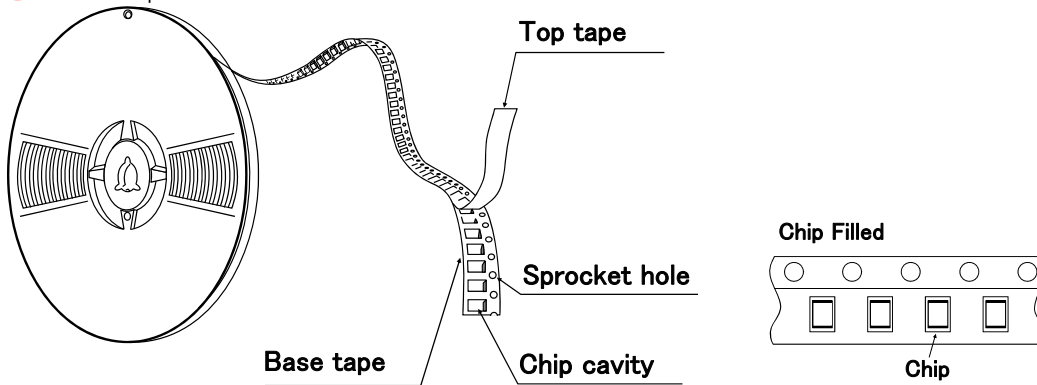
PACKAGING

① Minimum Quantity

Type	Standard Quantity [pcs]
	Tape & Reel
MDKK1616	2500
MDKK2020	2500
MDMK2020	2500
MDKK3030	2000
MDMK3030	2000
MDMK4040	1000
MDPK5050	1000

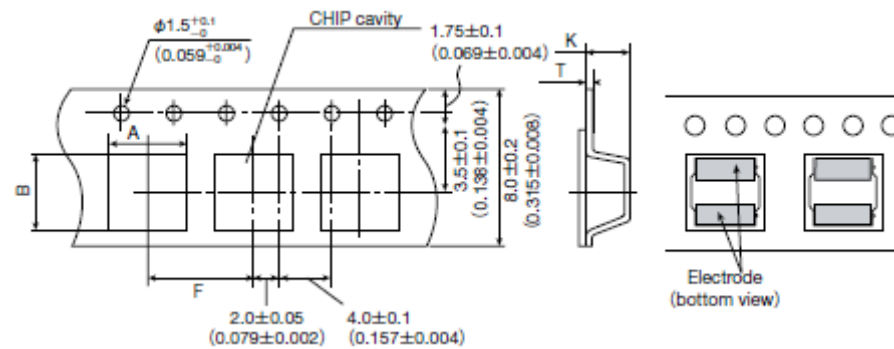
② Tape Material

● Embossed Tape



③ Taping dimensions

● Embossed tape 8mm wide (0.315 inches wide)

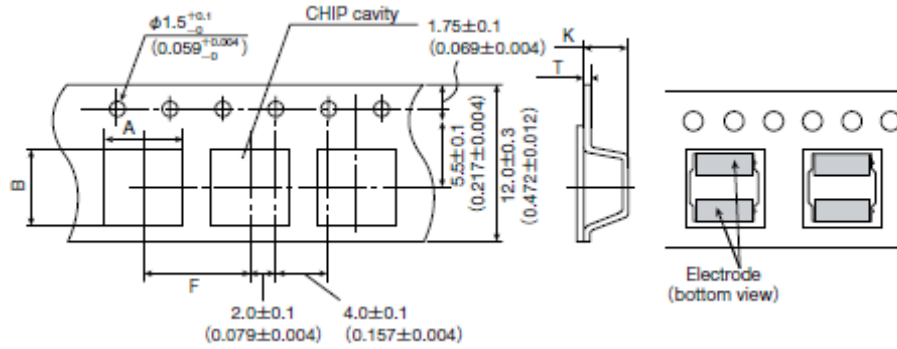


Type	Chip cavity		Insertion pitch F	Tape thickness	
	A	B		T	K
MDKK1616	1.79 ± 0.1 (0.071 ± 0.004)	1.79 ± 0.1 (0.071 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.25 ± 0.05 (0.010 ± 0.002)	1.1 ± 0.1 (0.043 ± 0.004)
MDKK2020	2.2 ± 0.1 (0.102 ± 0.004)	2.2 ± 0.1 (0.102 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.25 ± 0.05 (0.009 ± 0.002)	1.3 ± 0.1 (0.051 ± 0.004)
MDKK3030	3.2 ± 0.1 (0.126 ± 0.004)	3.2 ± 0.1 (0.126 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.3 ± 0.05 (0.012 ± 0.002)	1.4 ± 0.1 (0.055 ± 0.004)

Unit : mm (inch)

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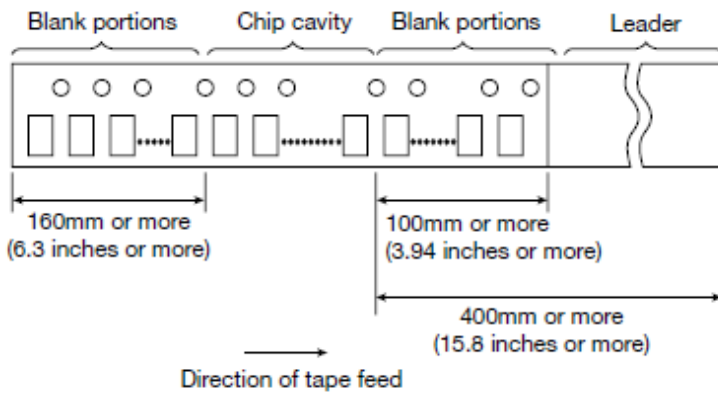
● Embossed tape 12mm wide (0.47 inches wide)



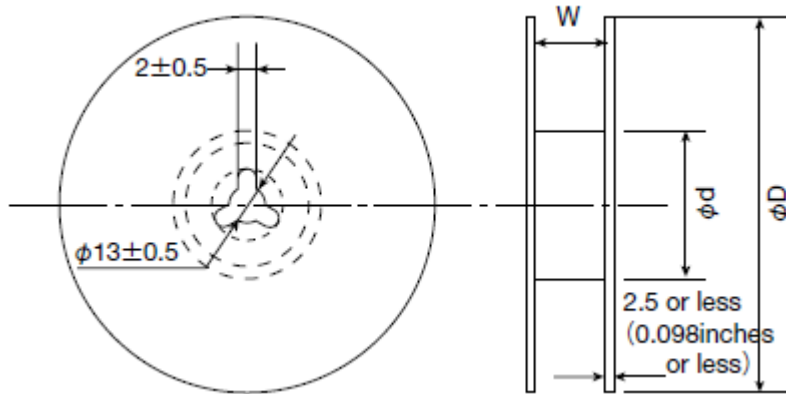
Type	Chip cavity		Insertion pitch	Tape thickness	
	A	B		T	K
MDMK4040	4.3 ± 0.1 (0.169 ± 0.004)	4.3 ± 0.1 (0.169 ± 0.004)	8.0 ± 0.1 (0.315 ± 0.004)	0.3 ± 0.1 (0.012 ± 0.004)	1.6 ± 0.1 (0.063 ± 0.004)
MDPK5050	5.25 ± 0.1 (0.207 ± 0.004)	5.25 ± 0.1 (0.207 ± 0.004)	8.0 ± 0.1 (0.315 ± 0.004)	0.3 ± 0.1 (0.012 ± 0.004)	1.6 ± 0.1 (0.063 ± 0.004)

Unit: mm (inch)

④ Leader and Blank portion



⑤ Reel size



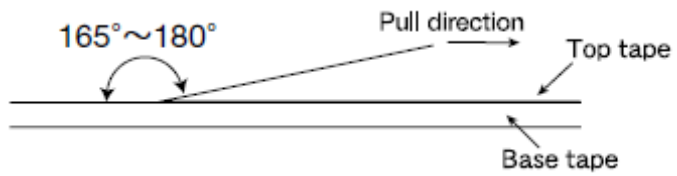
Type	Reel size (Reference values)		
	ϕD	ϕd	W
MDKK1616	180 ± 0.5 (7.087 ± 0.019)	60 ± 1.0 (2.36 ± 0.04)	10.0 ± 1.5 (0.394 ± 0.059)
MDKK2020			
MDMK2020			
MDKK3030			
MDMK3030	180 ± 3.0 (7.087 ± 0.118)	60 ± 2.0 (2.36 ± 0.08)	14.0 ± 1.5 (0.551 ± 0.059)
MDMK4040			
MDPK5050			

Unit: mm (inch)

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⑥ Top Tape Strength

The top tape requires a peel-off force of 0.1 to 1.3N in the direction of the arrow as illustrated below.



METAL CORE SMD POWER INDUCTORS (MCOIL™ MD SERIES)

RELIABILITY DATA

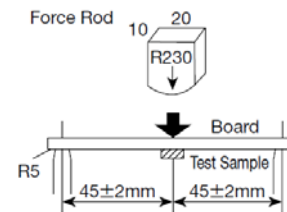
1. Operating Temperature Range		
Specified Value	MDKK1616	-40~+125°C
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	Including self-generated heat	
2. Storage Temperature Range		
Specified Value	MDKK1616	-40~+85°C
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
	MDKK1616	
Test Methods and Remarks	-5 to 40°C for the product with taping.	
3. Rated current		
Specified Value	MDKK1616	Within the specified tolerance
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
4. Inductance		
Specified Value	MDKK1616	Within the specified tolerance
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	MDKK1616, MDKK2020, MDMK2020, MDKK3030, MDMK3030, MDPK50550 type Measuring equipment : LCR Meter (HP 4285A or equivalent) Measuring frequency : 1MHz 1V MDMK4040 type Measuring equipment : LCR Meter (HP 4285A or equivalent) Measuring frequency : 100kHz 1V	
5. DC Resistance		
Specified Value	MDKK1616	Within the specified tolerance
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)	

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6. Self resonance frequency		
Specified Value	MDKK1616	—
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	

7. Temperature characteristic		
Specified Value	MDKK1616	Inductance change : Within $\pm 10\%$
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	Measurement of inductance shall be taken at temperature range within $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$. With reference to inductance value at $+20^{\circ}\text{C}$., change rate shall be calculated.	

8. Resistance to flexure of substrate		
Specified Value	MDKK1616	No damage
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	<p>The test samples shall be soldered to the test board by the reflow. As illustrated below, apply force in the direction of the arrow indicating until deflection of the test board reaches to 2 mm.</p> <p>Test board size : $100 \times 40 \times 1.0$ mm Test board material : glass epoxy-resin Solder cream thickness : 0.10 mm</p>	



9. Insulation resistance : between wires		
Specified Value	MDKK1616	—
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	

10. Insulation resistance : between wire and core		
Specified Value	MDKK1616	—
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	

11. Withstanding voltage : between wire and core		
Specified Value	MDKK1616	—
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	

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12. Adhesion of terminal electrode		
Specified Value	MDKK1616	Shall not come off PC board
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. Applied force : 10N to X and Y directions. Duration : 5s. Solder cream thickness : 0.10mm.	

13. Resistance to vibration					
Specified Value	MDKK1616	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.			
	MDKK2020, MDMK2020				
	MDKK3030, MDMK3030				
	MDMK4040				
	MDPK5050				
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions.				
	Frequency Range	10~55Hz			
	Total Amplitude	1.5mm (May not exceed acceleration 196m/s ²)			
	Sweeping Method	10Hz to 55Hz to 10Hz for 1min.			
	Time	<table border="1"> <tr><td>X</td><td rowspan="3">For 2 hours on each X, Y, and Z axis.</td></tr> <tr><td>Y</td></tr> <tr><td>Z</td></tr> </table>	X	For 2 hours on each X, Y, and Z axis.	Y
X	For 2 hours on each X, Y, and Z axis.				
Y					
Z					
Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.					

14. Solderability		
Specified Value	MDKK1616	At least 90% of surface of terminal electrode is covered by new solder.
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	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 \pm 5 $^{\circ}$ C
	Time	5 \pm 1.0 sec.
※Immersion depth : All sides of mounting terminal shall be immersed.		

15. Resistance to soldering heat		
Specified Value	MDKK1616	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	The test sample shall be exposed to reflow oven at 230 \pm 5 $^{\circ}$ C for 40 seconds, with peak temperature at 260 \pm 5 $^{\circ}$ C for 5 seconds, 2 times.	
	Test board material	: glass epoxy-resin
	Test board thickness	: 1.0mm

16. Thermal shock		
Specified Value	MDKK1616	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. The test samples shall be placed at specified temperature for specified time by step 1 to step 4 as shown in below table in sequence. The temperature cycle shall be repeated 100 cycles.	
	Conditions of 1 cycle	
	Step	Temperature ($^{\circ}\text{C}$)
	1	-40 ± 3
	2	Room temperature
	3	$+85 \pm 2$
4	Room temperature	

17. Damp heat		
Specified Value	MDKK1616	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow.	
	The test samples shall be placed in thermostatic oven set at specified temperature and humidity as shown in below table.	
	Temperature	$60 \pm 2^{\circ}\text{C}$
	Humidity	90~95%RH
	Time	500+24/-0 hour

18. Loading under damp heat		
Specified Value	MDKK1616	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow.	
	The test samples shall be placed in thermostatic oven set at specified temperature and humidity and applied the rated current continuously as shown in below table.	
	Temperature	$60 \pm 2^{\circ}\text{C}$
	Humidity	90~95%RH
	Applied current	Rated current
	Time	500+24/-0 hour

19. Low temperature life test		
Specified Value	MDKK1616	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. After that, the test samples shall be placed at test conditions as shown in below table.	
	Temperature	$-40 \pm 2^{\circ}\text{C}$
	Time	500+24/-0 hour

20. High temperature life test		
Specified Value	MDKK1616	-
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	

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For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>).

21. Loading at high temperature life test		
Specified Value	MDKK1616	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. The test samples shall be placed in thermostatic oven set at specified temperature and applied the rated current continuously as shown in below table.	
	Temperature	$85 \pm 2^\circ\text{C}$
	Applied current	Rated current
	Time	$500 + 24 / - 0$ hour

22. Standard condition		
Specified Value	MDKK1616	Standard test condition : Unless otherwise specified, temperature is $20 \pm 15^\circ\text{C}$ and $65 \pm 20\%$ of relative humidity. When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of $20 \pm 2^\circ\text{C}$ of temperature, $65 \pm 5\%$ relative humidity. Inductance is in accordance with our measured value.
	MDKK2020, MDMK2020	
	MDKK3030, MDMK3030	
	MDMK4040	
	MDPK5050	

METAL CORE SMD POWER INDUCTORS (MCOIL™ MD SERIES)

■ PRECAUTIONS

1. Circuit Design	
Precautions	<ul style="list-style-type: none"> ◆ Operating environment <ol style="list-style-type: none"> 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	<ul style="list-style-type: none"> ◆ Land pattern design <ol style="list-style-type: none"> 1. Please refer to a recommended land pattern.
Technical considerations	<ul style="list-style-type: none"> ◆ Land pattern design <ul style="list-style-type: none"> Surface Mounting <ul style="list-style-type: none"> • Mounting and soldering conditions should be checked beforehand. • Applicable soldering process to this products is reflow soldering only.
3. Considerations for automatic placement	
Precautions	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine <ol style="list-style-type: none"> 1. Excessive impact load should not be imposed on the products when mounting onto the PC boards. 2. Mounting and soldering conditions should be checked beforehand.
Technical considerations	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine <ol style="list-style-type: none"> 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.
4. Soldering	
Precautions	<ul style="list-style-type: none"> ◆ Reflow soldering <ol style="list-style-type: none"> 1. Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified. 2. The product shall be used reflow soldering only. 3. Please do not add any stress to a product until it returns in normal temperature after reflow soldering. ◆ Lead free soldering <ol style="list-style-type: none"> 1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently. ◆ Recommended conditions for using a soldering iron (NR10050 Type) <ul style="list-style-type: none"> • 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.
Technical considerations	<ul style="list-style-type: none"> ◆ Reflow soldering <ol style="list-style-type: none"> 1. If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products. <ul style="list-style-type: none"> • NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type <p style="margin-left: 20px;">Recommended reflow condition (Pb free solder)</p> <p style="margin-left: 20px;">Temperature [°C]</p> <p style="margin-left: 20px;">Heating Time [sec]</p>
5. Cleaning	
Precautions	<ul style="list-style-type: none"> ◆ Cleaning conditions <ol style="list-style-type: none"> 1. Washing by supersonic waves shall be avoided.
Technical considerations	<ul style="list-style-type: none"> ◆ Cleaning conditions <ol style="list-style-type: none"> 1. If washed by supersonic waves, the products might be broken.

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6. Handling	
Precautions	<ul style="list-style-type: none"> ◆ Handling <ol style="list-style-type: none"> 1. Keep the product away from all magnets and magnetic objects. ◆ Breakaway PC boards (splitting along perforations) <ol style="list-style-type: none"> 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 <ol style="list-style-type: none"> 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 <ol style="list-style-type: none"> 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 <ol style="list-style-type: none"> 1. Please avoid accumulation of a packing box as much as possible. ◆ Board mounting <ol style="list-style-type: none"> 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.
Technical considerations	<ul style="list-style-type: none"> ◆ Handling <ol style="list-style-type: none"> 1. There is a case that a characteristic varies with magnetic influence. ◆ Breakaway PC boards (splitting along perforations) <ol style="list-style-type: none"> 1. The position of the product on PCBs shall be carefully considered to minimize the stress caused from splitting of the PCBs. ◆ Mechanical considerations <ol style="list-style-type: none"> 1. There is a case to be damaged by a mechanical shock. 2. There is a case to be broken by the handling in transportation. ◆ Pick-up pressure <ol style="list-style-type: none"> 1. Damage and a characteristic can vary with an excessive shock or stress. ◆ Packing <ol style="list-style-type: none"> 1. If packing boxes are accumulated, that could cause a deformation on packing tapes or a damage on the products. ◆ Board mounting <ol style="list-style-type: none"> 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	
Precautions	<ul style="list-style-type: none"> ◆ Storage <ol style="list-style-type: none"> 1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled. <ul style="list-style-type: none"> ▪ Recommended conditions <ul style="list-style-type: none"> Ambient temperature : $-5\sim 40^{\circ}\text{C}$ 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. <p style="margin-left: 20px;">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.</p>
Technical considerations	<ul style="list-style-type: none"> ◆ Storage <ol style="list-style-type: none"> 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.

金属磁芯绕线型片状功率电感器 (MCOIL™ MA 系列)



回流焊

■ 型号标示法

※使用温度范围: -40~+105°C (包含产品本身发热)

M	A	KK	2016	T	1R0	M	△	△
①	②	③	④	⑤	⑥	⑦	⑧	

△=空格

① 类型

代码	类型
MA	金属磁芯绕线型片状功率电感器

② 尺寸(T)

代码	尺寸(T) [mm]
KK	1.0
MK	1.2

③ 尺寸(L×W)

代码	尺寸(L×W) [mm]
2016	2.0×1.6
2520	2.5×2.0

④ 包装

代码	包装
T	卷盘带装

⑤ 标称电感值

代码(例)	标称电感值 [μH]
R47	0.47
1R0	1.0
4R7	4.7

※R=小数点

⑥ 电感量公差

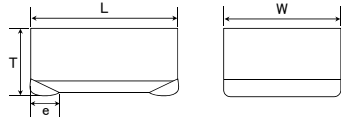
代码	电感量公差
M	±20%

⑦ 个别规格

代码	个别规格
△	标准品

⑧ 本公司管理记号

■ 标准外型尺寸/标准数量



Type	L	W	T	e	标准数量[pcs] 卷盘带装
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±0.3 (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

单位: mm (inch)

电感器 / 功率电感器

■ 型号一览

● MAKK2016 型

型号	EHS	标称电感值 [μH]	电感量公差	自共振频率 [MHz] (min.)	直流电阻 [Ω] (max.)	额定电流 ※) [mA] (max.)		测试频率 [MHz]
						直流重叠允许电流 Idc1	温度上升允许电流 Idc2	
MAKK2016TR24M	RoHS	0.24	±20%	-	0.042	4,200	3,000	2
MAKK2016TR47M	RoHS	0.47	±20%	-	0.046	3,200	2,800	2
MAKK2016T1R0M	RoHS	1.0	±20%	-	0.075	2,200	2,200	2
MAKK2016T1R5M	RoHS	1.5	±20%	-	0.130	1,600	1,650	2
MAKK2016T2R2M	RoHS	2.2	±20%	-	0.160	1,500	1,500	2
MAKK2016T3R3M	RoHS	3.3	±20%	-	0.255	1,150	1,200	2
MAKK2016T4R7M	RoHS	4.7	±20%	-	0.380	1,000	950	2

● MAKK2520 型

型号	EHS	标称电感值 [μH]	电感量公差	自共振频率 [MHz] (min.)	直流电阻 [Ω] (max.)	额定电流 ※) [mA] (max.)		测试频率 [MHz]
						直流重叠允许电流 Idc1	温度上升允许电流 Idc2	
MAKK2520T1R0M	RoHS	1.0	±20%	-	0.072	2,700	2,500	2
MAKK2520T2R2M	RoHS	2.2	±20%	-	0.156	1,900	1,500	2
MAKK2520T4R7M	RoHS	4.7	±20%	-	0.300	1,300	1,100	2

● MAMK2520 型

型号	EHS	标称电感值 [μH]	电感量公差	自共振频率 [MHz] (min.)	直流电阻 [Ω] (max.)	额定电流 ※) [mA] (max.)		测试频率 [MHz]
						直流重叠允许电流 Idc1	温度上升允许电流 Idc2	
MAMK2520TR47M	RoHS	0.47	±20%	-	0.039	4,200	3,400	2
MAMK2520T1R0M	RoHS	1.0	±20%	-	0.059	3,100	2,700	2
MAMK2520T2R2M	RoHS	2.2	±20%	-	0.117	2,000	1,900	2
MAMK2520T3R3M	RoHS	3.3	±20%	-	0.156	1,800	1,700	2
MAMK2520T4R7M	RoHS	4.7	±20%	-	0.260	1,500	1,300	2

※) 直流重叠允许电流 (Idc1) 为直流重叠带来的电感值下降, 范围在30%以内的直流电感值 (at 20°C)

※) 温度上升允许电流 (Idc2) 为温度上升到40°C时的直流电感值 (at 20°C)

※) 最大额定电流值为能够满足直流重叠允许电流和温度上升允许电流的直流电流值

▶ 本产品目录根据版面大小, 仅记载了代表性产品规格, 若考虑使用本公司产品时, 请确认供货规格型号明细表中的详细规格。有关各商品的详细信息 (特性图、可靠性信息、使用时的注意事项等), 请参阅本网站 (<http://www.ty-top.com/>)。

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

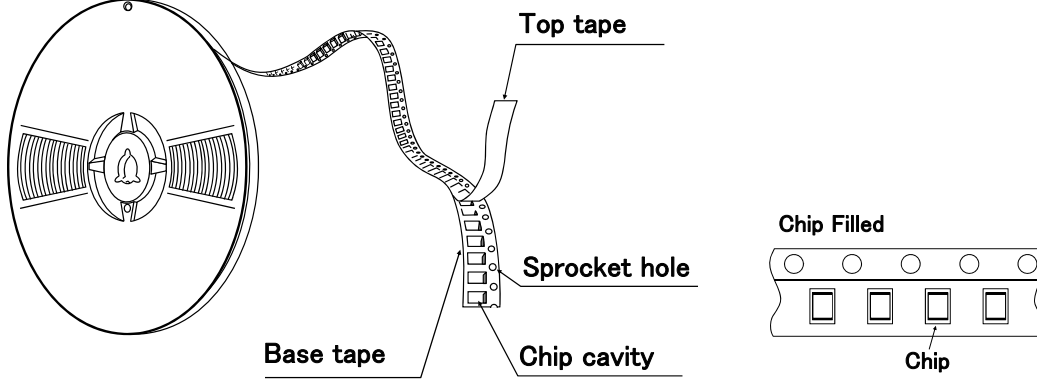
PACKAGING

① Minimum Quantity

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

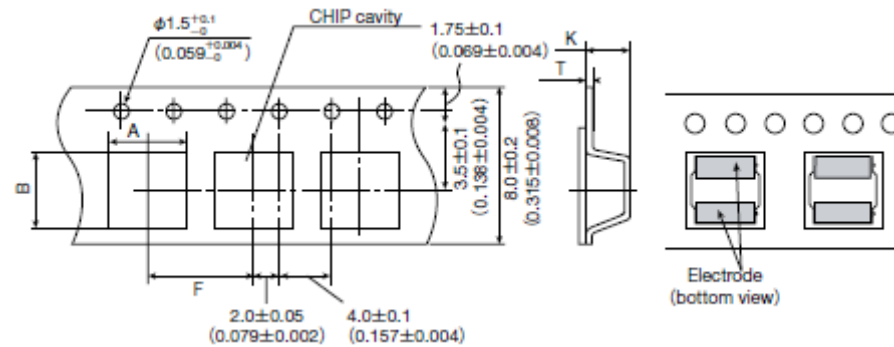
② Tape Material

● Embossed Tape



③ Taping dimensions

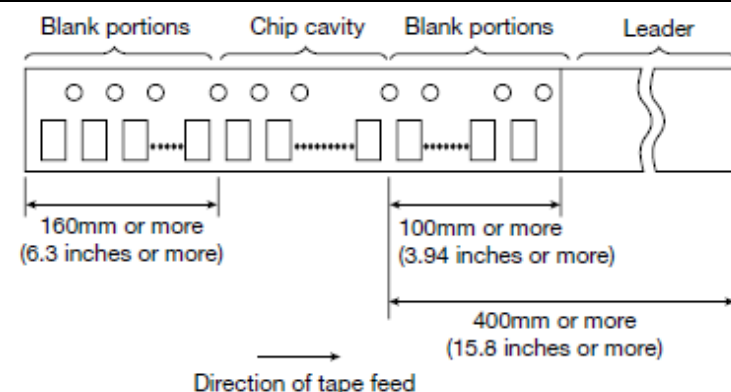
● Embossed tape 8mm wide (0.315 inches wide)



Type	Chip cavity		Insertion pitch	Tape thickness	
	A	B	F	T	K
MAKK2016	1.9 ± 0.1 (0.075 ± 0.004)	2.3 ± 0.1 (0.091 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.25 ± 0.05 (0.009 ± 0.002)	1.1 max (0.043 max)
MAKK2520	2.3 ± 0.1 (0.091 ± 0.004)	2.8 ± 0.1 (0.110 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.3 ± 0.05 (0.012 ± 0.002)	1.1 max (0.043 max)
MAMK2520	2.3 ± 0.1 (0.091 ± 0.004)	2.8 ± 0.1 (0.110 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)	0.3 ± 0.05 (0.012 ± 0.002)	1.45 max (0.057 max)

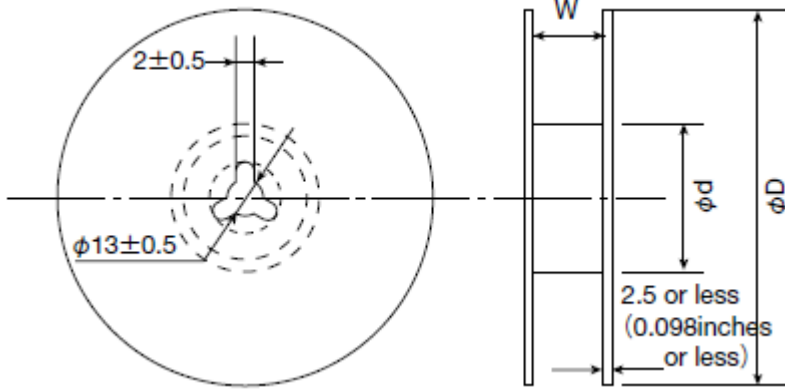
Unit: mm (inch)

④ Leader and Blank portion



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⑤ Reel size

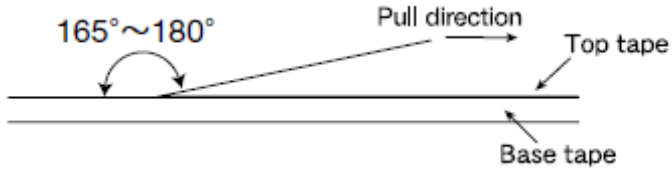


Type	Reel size (Reference values)		
	ϕD	ϕd	W
MAKK2016	180+0/-3 (7.087+0/-0.118)	60+1/-0 (2.36+0.039/0)	10.0±1.5 (0.394±0.059)
MAKK2520			
MAMK2520			

Unit: mm (inch)

⑥ Top Tape Strength

The top tape requires a peel-off force of 0.1 to 1.3N in the direction of the arrow as illustrated below.



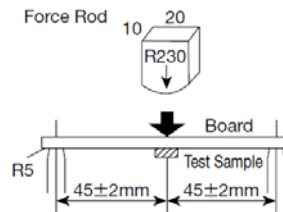
METAL CORE WOUND CHIP POWER INDUCTORS (MCOIL™ MA SERIES)

RELIABILITY DATA

1. Operating Temperature Range		
Specified Value	MAKK2016	-40~+105°C
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	Including self-generated heat	
2. Storage Temperature Range		
Specified Value	MAKK2016	-40~+85°C
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	0 to 40°C for the product with taping.	
3. Rated current		
Specified Value	MAKK2016	Within the specified tolerance
	MAKK2520	
	MAMK2520	
4. Inductance		
Specified Value	MAKK2016	Within the specified tolerance
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	Measuring equipment : LCR Meter (HP 4285A or equivalent) Measuring frequency : 2MHz, 1V	
5. DC Resistance		
Specified Value	MAKK2016	Within the specified tolerance
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)	
6. Self resonance frequency		
Specified Value	MAKK2016	-
	MAKK2520	
	MAMK2520	
7. Temperature characteristic		
Specified Value	MAKK2016	Inductance change : Within $\pm 15\%$
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	Measurement of inductance shall be taken at temperature range within -40°C~+85°C. With reference to inductance value at +20°C., change rate shall be calculated.	

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8. Resistance to flexure of substrate		
Specified Value	MAKK2016	No damage
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	<p>The test samples shall be soldered to the test board by the reflow. As illustrated below, apply force in the direction of the arrow indicating until deflection of the test board reaches to 2 mm.</p> <p>Test board size : 100 × 40 × 1.0 mm Test board material : glass epoxy-resin Solder cream thickness : 0.12 mm</p>	



9. Insulation resistance : between wires		
Specified Value	MAKK2016	—
	MAKK2520	
	MAMK2520	

10. Insulation resistance : between wire and core		
Specified Value	MAKK2016	DC25V 100k Ω min
	MAMK2520	
	MAKK2520	DC20V 100k Ω min

11. Withstanding voltage : between wire and core		
Specified Value	MAKK2016	—
	MAKK2520	
	MAMK2520	

12. Adhesion of terminal electrode		
Specified Value	MAKK2016	No abnormality.
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	<p>The test samples shall be soldered to the test board by the reflow.</p> <p>Applied force : 10N to X and Y directions. Duration : 5s. Solder cream thickness : 0.12mm.</p>	

13. Resistance to vibration																
Specified Value	MAKK2016	Inductance change : Within ±10% No significant abnormality in appearance.														
	MAKK2520															
	MAMK2520															
Test Methods and Remarks	<p>The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions.</p> <table border="1" style="width: 100%;"> <tr> <td>Frequency Range</td> <td colspan="2">10~55Hz</td> </tr> <tr> <td>Total Amplitude</td> <td colspan="2">1.5mm (May not exceed acceleration 196m/s²)</td> </tr> <tr> <td>Sweeping Method</td> <td colspan="2">10Hz to 55Hz to 10Hz for 1min.</td> </tr> <tr> <td rowspan="3">Time</td> <td>X</td> <td rowspan="3">For 2 hours on ach X, Y, and Z axis.</td> </tr> <tr> <td>Y</td> </tr> <tr> <td>Z</td> </tr> </table> <p>Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.</p>		Frequency Range	10~55Hz		Total Amplitude	1.5mm (May not exceed acceleration 196m/s ²)		Sweeping Method	10Hz to 55Hz to 10Hz for 1min.		Time	X	For 2 hours on ach X, Y, and Z axis.	Y	Z
Frequency Range	10~55Hz															
Total Amplitude	1.5mm (May not exceed acceleration 196m/s ²)															
Sweeping Method	10Hz to 55Hz to 10Hz for 1min.															
Time	X	For 2 hours on ach X, Y, and Z axis.														
	Y															
	Z															

14. Solderability		
Specified Value	MAKK2016	At least 90% of surface of terminal electrode is covered by new solder.
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	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
	Time	5±0.5 sec.
※Immersion depth : All sides of mounting terminal shall be immersed.		

15. Resistance to soldering heat		
Specified Value	MAKK2016	Inductance change : Within ±10% No significant abnormality in appearance.
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	The test sample shall be exposed to reflow oven at 230°C for 40 seconds, with peak temperature at 260+0/-5°C for 5 seconds, 3 times.	
	Test board material	: glass epoxy-resin substrate
	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			
Specified Value	MAKK2016	Inductance change : Within ±10% No significant abnormality in appearance.	
	MAKK2520		
	MAMK2520		
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. The test samples shall be placed at specified temperature for specified time by step 1 to step 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	+85±2	30±3
4	Room temperature	Within 3	
Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.			

17. Damp heat		
Specified Value	MAKK2016	Inductance change : Within ±10% No significant abnormality in appearance.
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow.	
	The test samples shall be placed in thermostatic oven set at specified temperature and humidity as shown in below table.	
	Temperature	60±2°C
	Humidity	90~95%RH
	Time	500+24/-0 hour
Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.		

18. Loading under damp heat		
Specified Value	MAKK2016	Inductance change : Within ±10% No significant abnormality in appearance.
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow.	
	The test samples shall be placed in thermostatic oven set at specified temperature and humidity and applied the rated current continuously as shown in below table.	
	Temperature	60±2°C
	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		
Specified Value	MAKK2016	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. After that, the test samples shall be placed at test conditions as shown in below table.	
	Temperature	$-40 \pm 2^{\circ}\text{C}$
	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		
Specified Value	MAKK2016	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
	MAKK2520	
	MAMK2520	
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. After that, the test samples shall be placed at test conditions as shown in below table.	
	Temperature	$85 \pm 2^{\circ}\text{C}$
	Time	$500 + 24 / - 0$ hour
Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.		
21. Loading at high temperature life test		
Specified Value	MAKK2016	—
	MAKK2520	
	MAMK2520	
22. Standard condition		
Specified Value	MAKK 2016	Standard test condition : Unless otherwise specified, temperature is $20 \pm 15^{\circ}\text{C}$ and $65 \pm 20\%$ of relative humidity. When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of $20 \pm 2^{\circ}\text{C}$ of temperature, $65 \pm 5\%$ relative humidity. Inductance is in accordance with our measured value.
	MAKK 2520	
	MAMK 2520	

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

■ PRECAUTIONS

1. Circuit Design	
Precautions	<p>◆ Operating environment</p> <p>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.</p>
2. PCB Design	
Precautions	<p>◆ Land pattern design</p> <p>1. Please refer to a recommended land pattern.</p>
Technical considerations	<p>◆ Land pattern design</p> <p>Surface Mounting</p> <ul style="list-style-type: none"> • Mounting and soldering conditions should be checked beforehand. • Applicable soldering process to this products is reflow soldering only.
3. Considerations for automatic placement	
Precautions	<p>◆ Adjustment of mounting machine</p> <p>1. Excessive impact load should not be imposed on the products when mounting onto the PC boards.</p> <p>2. Mounting and soldering conditions should be checked beforehand.</p>
Technical considerations	<p>◆ Adjustment of mounting machine</p> <p>1. When installing products, care should be taken not to apply distortion stress as it may deform the products.</p>
4. Soldering	
Precautions	<p>◆ Reflow soldering</p> <p>1. Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified.</p> <p>2. The product shall be used reflow soldering only.</p> <p>3. Please do not add any stress to a product until it returns in normal temperature after reflow soldering.</p> <p>◆ Lead free soldering</p> <p>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.</p>
Technical considerations	<p>◆ Reflow soldering</p> <p>1. If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products.</p> <p>Recommended reflow condition (Pb free solder)</p> <p>Temperature [°C]</p> <p>Heating Time [sec]</p> <p>150~180</p> <p>90±30sec</p> <p>30±10sec</p> <p>230°C min</p> <p>5sec max</p> <p>Peak: 250+5/-0°C</p>
5. Cleaning	
Precautions	<p>◆ Cleaning conditions</p> <p>1. Washing by supersonic waves shall be avoided.</p>
Technical considerations	<p>◆ Cleaning conditions</p> <p>1. If washed by supersonic waves, the products might be broken.</p>

6. Handling	
Precautions	<ul style="list-style-type: none"> ◆Handling <ol style="list-style-type: none"> 1. Keep the product away from all magnets and magnetic objects. ◆Breakaway PC boards (splitting along perforations) <ol style="list-style-type: none"> 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 <ol style="list-style-type: none"> 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 <ol style="list-style-type: none"> 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 <ol style="list-style-type: none"> 1. Please avoid accumulation of a packing box as much as possible.
Technical considerations	<ul style="list-style-type: none"> ◆Handling <ol style="list-style-type: none"> 1. There is a case that a characteristic varies with magnetic influence. ◆Breakaway PC boards (splitting along perforations) <ol style="list-style-type: none"> 1. The position of the product on PCBs shall be carefully considered to minimize the stress caused from splitting of the PCBs. ◆Mechanical considerations <ol style="list-style-type: none"> 1. There is a case to be damaged by a mechanical shock. 2. There is a case to be broken by the handling in transportation. ◆Pick-up pressure <ol style="list-style-type: none"> 1. Damage and a characteristic can vary with an excessive shock or stress. ◆Packing <ol style="list-style-type: none"> 1. If packing boxes are accumulated, that could cause a deformation on packing tapes or a damage on the products.
7. Storage conditions	
Precautions	<ul style="list-style-type: none"> ◆Storage <ol style="list-style-type: none"> 1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled. <ul style="list-style-type: none"> ▪ Recommended conditions <ul style="list-style-type: none"> Ambient temperature : 0~40°C Humidity : Below 70% RH ▪ The ambient temperature must be kept below 30°C. Even under ideal storage conditions, solderability of products electrodes may decrease as time passes. <ul style="list-style-type: none"> For this reason, product should be used within 6 months from the time of delivery. In case of storage over 6 months, solderability shall be checked before actual usage.
Technical considerations	<ul style="list-style-type: none"> ◆Storage <ol style="list-style-type: none"> 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.