

## 有关敝司产品的注意事项

请务必在使用敝司产品之前阅读。

### 注意

■ 本产品目录所记载的内容为2016年10月之内容。因改良等原因，可能会不经预告而变更记载内容，所以请务必在使用前先确认最新的产品信息。未按照本产品目录所记载的内容或交货规格说明书使用敝司产品的，即便其致使使用设备发生损害、瑕疵等时，敝司也不承担任何责任，敬请悉知。

■ 就规格相关的详细内容，敝司备有交货规格说明书，详情请向敝司咨询。

■ 使用敝司产品时，请务必事先安装到设备之后，在实际使用的环境下进行评估和确认。

■ 本产品目录中所记载的产品可使用于一般电子设备 [音像设备、办公自动化设备、家电产品、办公设备、信息/通讯设备 (手机、电脑等)]。因此，若考虑将本产品目录所记载的产品使用于可能会直接危及生命或身体的设备 [运输用设备 (汽车驱动控制设备、火车控制设备、船舶控制设备等)、交通信号设备、防灾设备、医疗用器械、高公共性信息通信设备 (电话交换机以及电话、无线、广播电视等基站)] 等时，请务必事先向敝司咨询。

另外，请勿将敝司产品使用于对安全性和可靠性要求较高的设备 (航天设备、航空设备、原子能控制设备、海底设备、军事设备等)。

且即便属于一般电子设备，使用于对安全性和可靠性要求较高的设备、电路上时，敝司建议进行充分的安全评估，并根据需要，在设计时追加保护电路等。

未经敝司的事先书面同意，把本产品目录中记载的产品使用于前述需要向敝司咨询的设备或敝司禁止使用的设备，从而给客户或第三方造成的损害的，敝司不承担任何责任，敬请悉知。

■ 因使用敝司产品，发生第三方的知识产权等权利相关问题的，敝司不承担责任。另外，并不代表授予这些权利的实施权，敬请悉知。

■ 除非书面合同中另有规定，敝司产品的保证范围仅限于交付的敝司产品单品，并且就敝司产品的故障或瑕疵所导致的损害，敝司不承担任何责任，敬请悉知。

■ 本产品目录所记载的内容适用于从敝司营业所、销售子公司、销售代理店 (即“正规销售渠道”) 购买的敝司产品，并不适用于从上述以外的渠道购买的敝司产品，敬请悉知。

#### 出口相关注意事项

本产品目录所记载的部分产品在出口时须事先确认《外汇和对外贸易法》以及美国出口管理的相关法规，并办理相关手续。如有不明之处，请向敝司咨询。

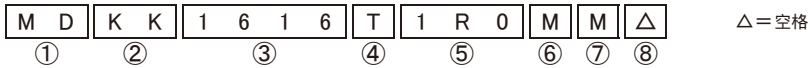
# 金属磁芯 SMD 功率电感器 (MCOIL™ MD 系列)



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)



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]
JE	0.95
KK	1.0
MK	1.2
PK	1.4
WK	2.0

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

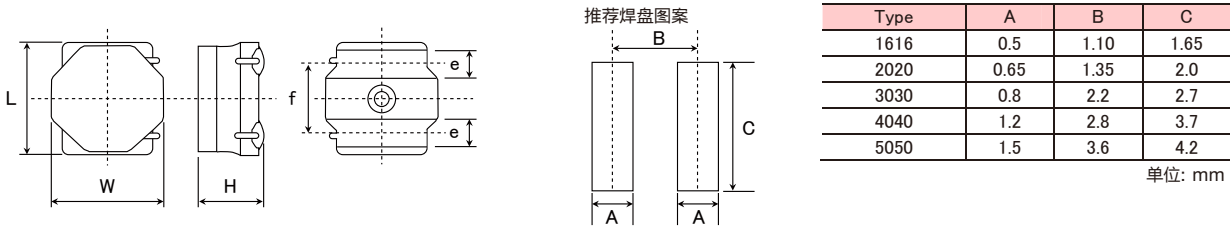
代码	电感量公差
M	±20%
N	±30%

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
MDJE2020	2.0±0.15 (0.079±0.006)	2.0±0.15 (0.079±0.006)	0.95 max (0.0374 max)	0.50±0.2 (0.02±0.008)	1.25±0.2 (0.049±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
MDJE4040	4.0±0.2 (0.157±0.008)	4.0±0.2 (0.157±0.008)	0.95 max (0.0374 max)	1.1±0.2 (0.043±0.008)	2.5±0.2 (0.098±0.008)	1000
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
MDWK4040	4.0±0.2 (0.157±0.008)	4.0±0.2 (0.157±0.008)	2.0 max (0.0787 max)	1.1±0.2 (0.043±0.008)	2.5±0.2 (0.098±0.008)	700
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)

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● MDKK1616 型 【厚度:1.0mm max.】

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]		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		
							Max.	Typ.	Max.	Typ.	
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

● MDJE2020 型 【厚度:0.95mm max.】

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]		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		
							Max.	Typ.	Max.	Typ.	
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

● MDKK2020 型 【厚度:1.0mm max.】

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]		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		
							Max.	Typ.	Max.	Typ.	
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

● MDMK2020 型 【厚度:1.2mm max.】

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]		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		
							Max.	Typ.	Max.	Typ.	
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	RoHS	4.7	±20%	-	0.242	0.210	1,150	1,300	950	1,050	1

● MDKK3030 型 【厚度:1.0mm max.】

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]		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		
							Max.	Typ.	Max.	Typ.	
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	RoHS	6.8	±20%	-	0.437	0.380	1,400	1,700	1,000	1,150	1
MDKK3030T100MM	RoHS	10	±20%	-	0.575	0.500	1,100	1,300	850	1,000	1

● MDMK3030 型 【厚度:1.2mm max.】

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]		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		
							Max.	Typ.	Max.	Typ.	
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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● MDJE4040 型 【厚度:0.95mm max.】

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]		额定电流 ※) [mA]				测试频率 [kHz]
					Max.	Typ.	直流重叠允许电流:Idc1		温度上升允许电流:Idc2		
							Max.	Typ.	Max.	Typ.	
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

● MDMK4040F 型 【厚度:1.2mm max.】

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]		额定电流 ※) [mA]				测试频率 [kHz]
					Max.	Typ.	直流重叠允许电流:Idc1		温度上升允许电流:Idc2		
							Max.	Typ.	Max.	Typ.	
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

● MDMK4040M 型 【厚度:1.2mm max.】

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]		额定电流 ※) [mA]				测试频率 [kHz]
					Max.	Typ.	直流重叠允许电流:Idc1		温度上升允许电流:Idc2		
							Max.	Typ.	Max.	Typ.	
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

● MDWK4040M 型 【厚度:2.0mm max.】

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]		额定电流 ※) [mA]				测试频率 [kHz]
					Max.	Typ.	直流重叠允许电流:Idc1		温度上升允许电流:Idc2		
							Max.	Typ.	Max.	Typ.	
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
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

● MDPK5050 型 【厚度:1.4mm max.】

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]		额定电流 ※) [mA]				测试频率 [kHz]
					Max.	Typ.	直流重叠允许电流:Idc1		温度上升允许电流:Idc2		
							Max.	Typ.	Max.	Typ.	
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

※) 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)

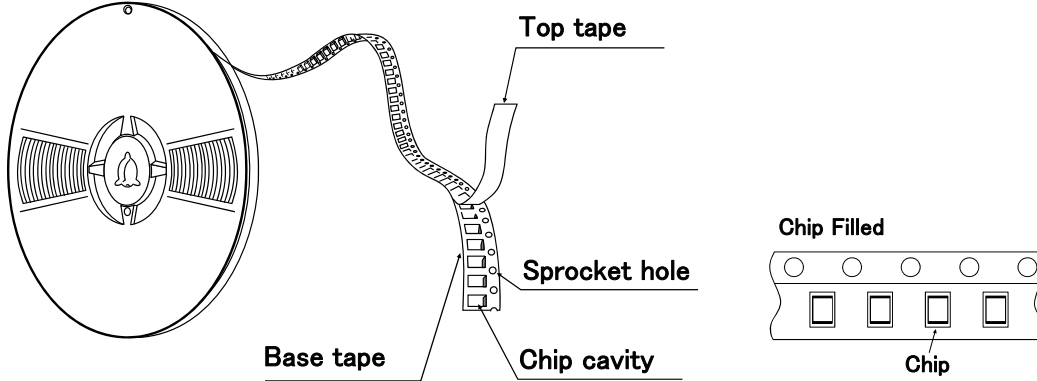
## PACKAGING

### ① Minimum Quantity

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

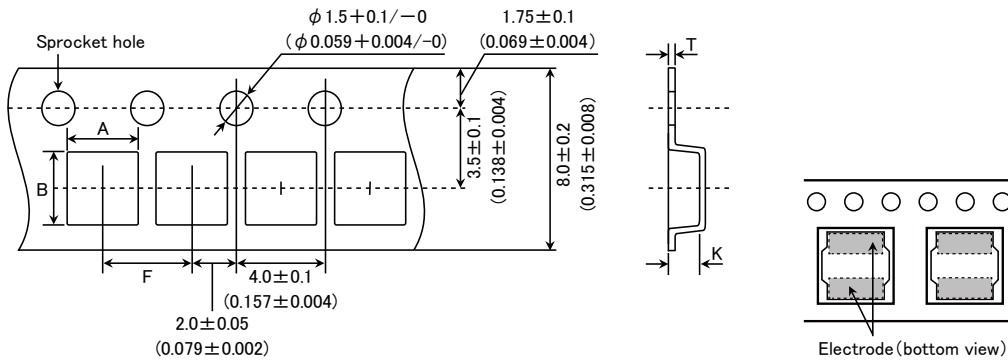
### ② Tape Material

#### ● Embossed Tape



### ③ Taping dimensions

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

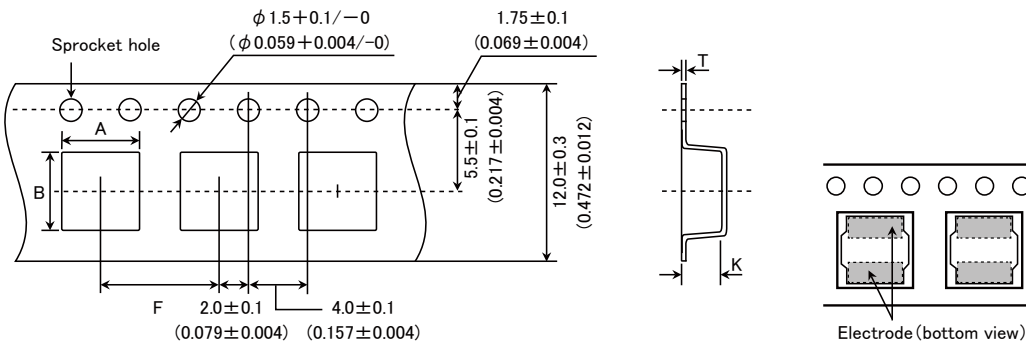


Type	Chip cavity		Insertion pitch	Tape thickness	
	A	B		T	K
MDKK1616	$1.79 \pm 0.1$ ( $0.071 \pm 0.004$ )	$1.79 \pm 0.1$ ( $0.071 \pm 0.004$ )	$4.0 \pm 0.1$ ( $0.157 \pm 0.004$ )	$0.25 \pm 0.05$ ( $0.010 \pm 0.002$ )	$1.1 \pm 0.1$ ( $0.043 \pm 0.004$ )
MDJE2020	$2.2 \pm 0.1$ ( $0.102 \pm 0.004$ )	$2.2 \pm 0.1$ ( $0.102 \pm 0.004$ )	$4.0 \pm 0.1$ ( $0.157 \pm 0.004$ )	$0.25 \pm 0.05$ ( $0.009 \pm 0.002$ )	$1.3 \pm 0.1$ ( $0.051 \pm 0.004$ )
MDKK2020					
MDMK2020					
MDKK3030	$3.2 \pm 0.1$ ( $0.126 \pm 0.004$ )	$3.2 \pm 0.1$ ( $0.126 \pm 0.004$ )	$4.0 \pm 0.1$ ( $0.157 \pm 0.004$ )	$0.3 \pm 0.05$ ( $0.012 \pm 0.002$ )	$1.4 \pm 0.1$ ( $0.055 \pm 0.004$ )
MDMK3030					

Unit: mm (inch)

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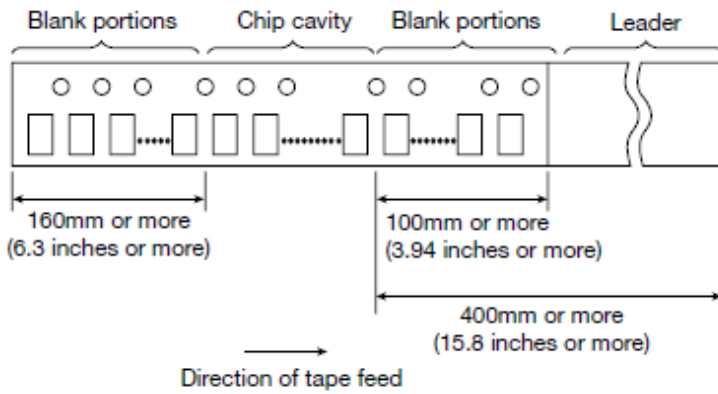
● Embossed tape 12mm wide (0.47 inches wide)



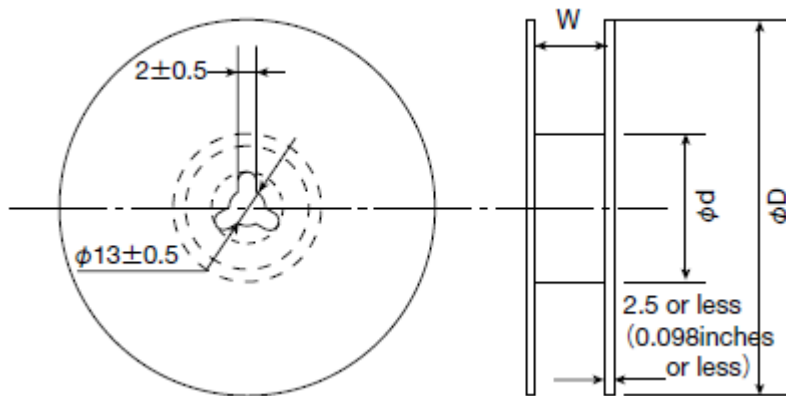
Type	Chip cavity		Insertion pitch F	Tape thickness	
	A	B		T	K
MDJE4040	$4.3 \pm 0.1$ ( $0.169 \pm 0.004$ )	$4.3 \pm 0.1$ ( $0.169 \pm 0.004$ )	$8.0 \pm 0.1$ ( $0.315 \pm 0.004$ )	$0.3 \pm 0.1$ ( $0.012 \pm 0.004$ )	$1.6 \pm 0.1$ ( $0.063 \pm 0.004$ )
MDMK4040					
MDWK4040					
MDPK5050	$5.25 \pm 0.1$ ( $0.207 \pm 0.004$ )	$5.25 \pm 0.1$ ( $0.207 \pm 0.004$ )	$8.0 \pm 0.1$ ( $0.315 \pm 0.004$ )	$0.3 \pm 0.1$ ( $0.012 \pm 0.004$ )	$1.6 \pm 0.1$ ( $0.063 \pm 0.004$ )

Unit : mm (inch)

④ Leader and Blank portion



⑤ Reel size



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

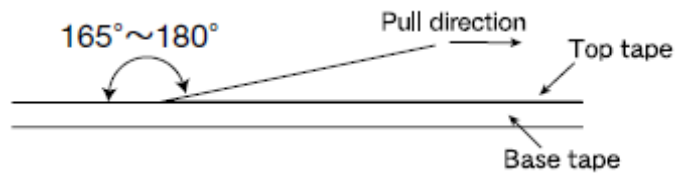
Unit : mm (inch)

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## ⑥ Top Tape Strength

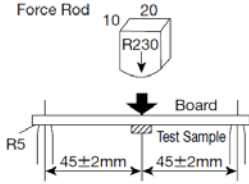
Top tape strength

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



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

## RELIABILITY DATA

1. Operating Temperature Range		
Specified Value	MD series	-40~+125°C
Test Methods and Remarks	Including self-generated heat	
2. Storage Temperature Range		
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 Remarks	Measuring equipment : LCR Meter (HP 4285A or equivalent) Measuring condition : Please see item list.	
5. DC Resistance		
Specified Value	MD series	Within the specified tolerance
Test Methods and Remarks	Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)	
6. Self resonance frequency		
Specified Value	MD series	—
7. Temperature characteristic		
Specified Value	MD series	Inductance change : Within ±10%
Test Methods and Remarks	Measurement of inductance shall be taken at temperature range within -40°C~+125°C. With reference to inductance value at +20°C., change rate shall be calculated.	
8. Resistance to flexure of substrate		
Specified Value	MD series	No damage
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. As illustrated below, apply force in the direction of the arrow indicating until deflection of the test board reaches to 2 mm. Test board size : 100×40×1.0 mm Test board material : Glass epoxy-resin Solder cream thickness : 0.10 mm	
		
9. Insulation resistance : between wires		
Specified Value	MD series	—
10. Insulation resistance : between wire and core		
Specified Value	MD series	—
11. Withstanding voltage : between wire and core		
Specified Value	MD series	—

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12. Adhesion of terminal electrode		
Specified Value	MD series	Shall not come off PC board
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	MD series	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.														
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions. <table border="1" style="margin-left: 20px;"> <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/s<sup>2</sup>)</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 each X, Y, and Z axis.</td> </tr> <tr> <td>Y</td> </tr> <tr> <td>Z</td> </tr> </table> Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs.		Frequency Range	10~55Hz		Total Amplitude	1.5mm (May not exceed acceleration 196m/s <sup>2</sup> )		Sweeping Method	10Hz to 55Hz to 10Hz for 1min.		Time	X	For 2 hours on each X, Y, and Z axis.	Y	Z
Frequency Range	10~55Hz															
Total Amplitude	1.5mm (May not exceed acceleration 196m/s <sup>2</sup> )															
Sweeping Method	10Hz to 55Hz to 10Hz for 1min.															
Time	X	For 2 hours on each X, Y, and Z axis.														
	Y															
	Z															

14. Solderability						
Specified Value	MD series	At least 90% of surface of terminal electrode is covered by new solder.				
Test Methods and Remarks	The test samples shall be dipped in flux, and then immersed in molten solder as shown in below table. Flux : Methanol solution containing rosin 25%. <table border="1" style="margin-left: 20px;"> <tr> <td>Solder Temperature</td> <td>245<math>\pm</math>5<math>^{\circ}</math>C</td> </tr> <tr> <td>Time</td> <td>5<math>\pm</math>1.0 sec.</td> </tr> </table> ※Immersion depth : All sides of mounting terminal shall be immersed.		Solder Temperature	245 $\pm$ 5 $^{\circ}$ C	Time	5 $\pm$ 1.0 sec.
Solder Temperature	245 $\pm$ 5 $^{\circ}$ C					
Time	5 $\pm$ 1.0 sec.					

15. Resistance to soldering heat		
Specified Value	MD series	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
Test Methods and Remarks	The test sample shall be exposed to reflow oven at 230 $\pm$ 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	MD series	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.																		
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. The test samples shall be placed at specified temperature for specified time by step 1 to step 4 as shown in below table in sequence. The temperature cycle shall be repeated 100 cycles. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="3">Conditions of 1 cycle</th> </tr> <tr> <th>Step</th> <th>Temperature (<math>^{\circ}</math>C)</th> <th>Duration (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40<math>\pm</math>3</td> <td>30<math>\pm</math>3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>Within 3</td> </tr> <tr> <td>3</td> <td>+85<math>\pm</math>2</td> <td>30<math>\pm</math>3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>Within 3</td> </tr> </tbody> </table>		Conditions of 1 cycle			Step	Temperature ( $^{\circ}$ C)	Duration (min)	1	-40 $\pm$ 3	30 $\pm$ 3	2	Room temperature	Within 3	3	+85 $\pm$ 2	30 $\pm$ 3	4	Room temperature	Within 3
Conditions of 1 cycle																				
Step	Temperature ( $^{\circ}$ C)	Duration (min)																		
1	-40 $\pm$ 3	30 $\pm$ 3																		
2	Room temperature	Within 3																		
3	+85 $\pm$ 2	30 $\pm$ 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 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. <table border="1" style="margin-left: 20px;"> <tr> <td>Temperature</td> <td>60<math>\pm</math>2<math>^{\circ}</math>C</td> </tr> <tr> <td>Humidity</td> <td>90~95%RH</td> </tr> <tr> <td>Time</td> <td>500+24/-0 hour</td> </tr> </table>		Temperature	60 $\pm$ 2 $^{\circ}$ C	Humidity	90~95%RH	Time	500+24/-0 hour
Temperature	60 $\pm$ 2 $^{\circ}$ C							
Humidity	90~95%RH							
Time	500+24/-0 hour							

18. Loading under damp heat		
Specified Value	MD series	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. The test samples shall be placed in thermostatic oven set at specified temperature and humidity 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	MD series	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. After that, the test samples shall be placed at test conditions as shown in below table.	
	Temperature	$-40 \pm 2^\circ\text{C}$
	Time	500+24/-0 hour
20. High temperature life test		
Specified Value	MD series	—
21. Loading at high temperature life test		
Specified Value	MD series	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
Test Methods and Remarks	The test samples shall be soldered to the test board by the reflow. The test samples shall be placed in thermostatic oven set at specified temperature and 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	MD series	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.

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

## PRECAUTIONS

1. Circuit Design	
Precautions	<ul style="list-style-type: none"> <li>◆ Operating environment               <ol style="list-style-type: none"> <li>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.</li> </ol> </li> </ul>
2. PCB Design	
Precautions	<ul style="list-style-type: none"> <li>◆ Land pattern design               <ol style="list-style-type: none"> <li>1. Please refer to a recommended land pattern.</li> </ol> </li> </ul>
Technical considerations	<ul style="list-style-type: none"> <li>◆ Land pattern design               <ul style="list-style-type: none"> <li>Surface Mounting                   <ul style="list-style-type: none"> <li>• Mounting and soldering conditions should be checked beforehand.</li> <li>• Applicable soldering process to this products is reflow soldering only.</li> </ul> </li> </ul> </li> </ul>
3. Considerations for automatic placement	
Precautions	<ul style="list-style-type: none"> <li>◆ Adjustment of mounting machine               <ol style="list-style-type: none"> <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> </ol> </li> </ul>
Technical considerations	<ul style="list-style-type: none"> <li>◆ Adjustment of mounting machine               <ol style="list-style-type: none"> <li>1. When installing products, care should be taken not to apply distortion stress as it may deform the products.</li> </ol> </li> </ul>
4. Soldering	
Precautions	<ul style="list-style-type: none"> <li>◆ Reflow soldering               <ol style="list-style-type: none"> <li>1. Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified.</li> <li>2. The product shall be used reflow soldering only.</li> <li>3. Please do not add any stress to a product until it returns in normal temperature after reflow soldering.</li> </ol> </li> <li>◆ Lead free soldering               <ol style="list-style-type: none"> <li>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.</li> </ol> </li> <li>◆ Recommended conditions for using a soldering iron (NR10050 Type)               <ul style="list-style-type: none"> <li>• Put the soldering iron on the land-pattern.</li> <li>• Soldering iron's temperature - Below 350°C</li> <li>• Duration - 3 seconds or less</li> <li>• The soldering iron should not directly touch the inductor.</li> </ul> </li> </ul>
Technical considerations	<ul style="list-style-type: none"> <li>◆ Reflow soldering               <ol style="list-style-type: none"> <li>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"> <li>• NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type</li> </ul> </li> </ol> <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> </li> </ul>
5. Cleaning	
Precautions	<ul style="list-style-type: none"> <li>◆ Cleaning conditions               <ol style="list-style-type: none"> <li>1. Washing by supersonic waves shall be avoided.</li> </ol> </li> </ul>
Technical considerations	<ul style="list-style-type: none"> <li>◆ Cleaning conditions               <ol style="list-style-type: none"> <li>1. If washed by supersonic waves, the products might be broken.</li> </ol> </li> </ul>

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6. Handling	
Precautions	<ul style="list-style-type: none"> <li>◆ Handling               <ol style="list-style-type: none"> <li>1. Keep the product away from all magnets and magnetic objects.</li> </ol> </li> <li>◆ Breakaway PC boards (splitting along perforations)               <ol style="list-style-type: none"> <li>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.</li> <li>2. Board separation should not be done manually, but by using the appropriate devices.</li> </ol> </li> <li>◆ Mechanical considerations               <ol style="list-style-type: none"> <li>1. Please do not give the product any excessive mechanical shocks.</li> <li>2. Please do not add any shock and power to a product in transportation.</li> </ol> </li> <li>◆ Pick-up pressure               <ol style="list-style-type: none"> <li>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.</li> </ol> </li> <li>◆ Packing               <ol style="list-style-type: none"> <li>1. Please avoid accumulation of a packing box as much as possible.</li> </ol> </li> <li>◆ Board mounting               <ol style="list-style-type: none"> <li>1. There shall be no pattern or via between terminals at the bottom of product.</li> <li>2. Components which are located in peripheral of product shall not make contact with surface (top, side) of product.</li> </ol> </li> </ul>
Technical considerations	<ul style="list-style-type: none"> <li>◆ Handling               <ol style="list-style-type: none"> <li>1. There is a case that a characteristic varies with magnetic influence.</li> </ol> </li> <li>◆ Breakaway PC boards (splitting along perforations)               <ol style="list-style-type: none"> <li>1. The position of the product on PCBs shall be carefully considered to minimize the stress caused from splitting of the PCBs.</li> </ol> </li> <li>◆ Mechanical considerations               <ol style="list-style-type: none"> <li>1. There is a case to be damaged by a mechanical shock.</li> <li>2. There is a case to be broken by the handling in transportation.</li> </ol> </li> <li>◆ Pick-up pressure               <ol style="list-style-type: none"> <li>1. Damage and a characteristic can vary with an excessive shock or stress.</li> </ol> </li> <li>◆ Packing               <ol style="list-style-type: none"> <li>1. If packing boxes are accumulated, that could cause a deformation on packing tapes or a damage on the products.</li> </ol> </li> <li>◆ Board mounting               <ol style="list-style-type: none"> <li>1. If there is pattern or via between terminals at the bottom of product, it may cause characteristics change.</li> <li>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.</li> </ol> </li> </ul>
7. Storage conditions	
Precautions	<ul style="list-style-type: none"> <li>◆ Storage               <ol style="list-style-type: none"> <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.                   <ul style="list-style-type: none"> <li>▪ Recommended conditions                       <ul style="list-style-type: none"> <li>Ambient temperature : -5~40°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.                           <ul style="list-style-type: none"> <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> </li> </ul> </li> </ol> </li> </ul>
Technical considerations	<ul style="list-style-type: none"> <li>◆ Storage               <ol style="list-style-type: none"> <li>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.</li> </ol> </li> </ul>