有关敝公司产品的注意事项

请务必在使用敝公司产品之前阅读。

⚠ 注意

产品目录中的记载内容

本产品目录中所记载的内容为2019年10月的内容。因产品改良等原因，可能会不经预告而变更其记载内容，或是停止供应本产品目录中所记载的产品。所以，请务必在使用前先确认最新的产品信息。

未按照本产品目录中所记载的内容或交货规格说明书使用敝公司产品，即便其致使用设备发生损害、不良情况等时，敝公司也不承担任何责任，敬请知悉。

签署交货规格说明书

就本产品目录中所记载产品的产品规格等相关内容，敝公司备有交货规格说明书，详情请向敝公司咨询。在使用敝公司产品前请务必就交货规格说明书之内容确认并批准之。

实装前的事前评估

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

用途的限定

1．可以使用的设备

本产品目录中所记载的产品预设为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）］以及面向本产品目录或是交货规格说明书中另行注明的设备的通用性、标准性用途。

另外，面向汽车用电子设备、电信基础设施／工业设备、医疗设备（国际（GHTF）第一类、第二类、第三类）方面的应用，敝公司也备有预设的产品线，请参考本产品目录或是交货规格说明书的内容，使用相对应的产品。

2．需要另行确认的设备

若考虑将本产品目录中所记载的产品使用于当产品发生故障、品质不良，或是由此引起的运转失常而可能会危及生命、身体或是财产，以及有可能给社会造成深刻影响的以下设备（不包括本产品目录或是交货规格说明书中另行注明可以使用设备）等时，请务必事先向敝公司咨询。

（1）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）
（2）交通信号设备
（3）防灾／保安设备
（4）医疗设备（国际（GHTF）第三类）
（5）高公共性信息通讯设备／信息处理设备（电话交换机、电话／无线／广播电视基站等）
（6）其他与上述设备有同等品质与可靠性要求的设备

3．禁止使用的设备

请勿将敝公司产品使用于对安全性和可靠性有着极高要求的以下设备。

（1）航天设备（人工卫星、火箭等）
（2）航空设备（注释1）
（3）医疗设备（国际（GHTF）第四类）、植体（体内植入型）医疗设备（注释2）
（4）发电控制设备（面向核能／水力／火力发电厂等的设备）
（5）海底设备（海底中继设备、海中的作业设备等）
（6）军事设备
（7）其他与上述设备有同等品质与可靠性要求的设备

注释１：仅限于对航空设备的安全运行不产生直接干扰的设备［机内娱乐设备、机内照明设备、电动座椅、餐饮设备等］，在满足敝公司另行指定的相关条件时，亦可将敝公司产品用于以上用途。在贵公司考虑将敝公司的产品用于以上用途时，请务必事先向敝公司咨询相关的信息。

注释２：包括注入人体内的部分和与此相连接的体外部分。

4．责任的限制

未经敝公司的事先书面同意，把本产品目录中所记载的产品使用于非敝公司预设用途的设备、前述需要向敝公司咨询的设备或敝公司禁止使用的设备，从而给客户或第三方造成损害的，敝公司不承担任何责任，敬请知悉。

安全设计

需将敝公司的产品使用于对安全性和可靠性要求较高的设备、电路上时，请进行充分的安全性评估和可靠性评估。另外，请通过设置保护电路、保护装置的系统，设置冗余电路不会被单一故障影响安全性的系统等失效导向安全（fail-safe）设计，确保充分的安全性。

有关知识产权

本产品目录中所记载的信息是用于说明相关产品的典型操作以及相关应用。此类信息的使用不代表对于敝公司以及第三方的知识产权以及其他权利的使用许可或是不侵权保证。

保证范围

敝公司产品的保证范围仅限于已经交付的敝公司产品本身，由敝公司产品的故障或不良情况所诱发的损害，敝公司不承担任何责任，敬请知悉。但是，以书面形式另行签署了交易基本合同书、品质保证协定书等时，敝公司将根据该合同的条件提供保证。

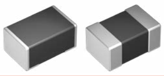
正规销售渠道

本产品目录中所记载的内容适用于从敝公司营业所、销售子公司、销售代理店（即“正规销售渠道”）购买的敝公司产品，并不适用于从其他渠道购买的敝公司产品，敬请知悉。

出口时的注意事项

本产品目录中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》以及美国在出口管理方面的相关法规，并办理相关手续。如有不明之处，请向敝公司咨询。

金属多层片状功率电感器 (MCOIL^{TM} MC 系列)



回流焊

■型号标示法

※使用温度范围: -40～+125℃ (包含产品本身发热)

M C	K K	2 0 1 2	T	1 R 0	M	△	△
①	②	③	④	⑤	⑥	⑦	⑧

△＝空格

①类型

代码	类型
MC	金属多层片状功率电感器

②产品厚度 (T)

代码	产品厚度 (T) [mm]
EK	0.50 max
EE	0.55 max
FK	0.60 max
FE	0.65 max
HK	0.80 max
KK	1.0 max

③尺寸 (L×W)

代码	外型 (inch)	尺寸 (L×W) [mm]
1005	1005(0402)	1.0×0.5
1210	1210(0504)	1.25 x 1.05
1608	1608(0603)	1.6×0.8
2012	2012(0805)	2.0×1.25

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]
R24	0.24
R47	0.47
1R0	1.0

※R＝小数点

⑥电感量公差

代码	电感量公差
M	±20%

⑦本公司管理记号 1

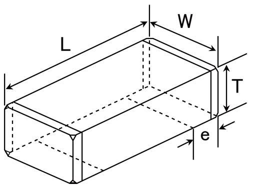
代码	本公司管理记号 1
△	标准品
G	电极5面品
H	标准品 (内部代码)
K	

⑧本公司管理记号 2

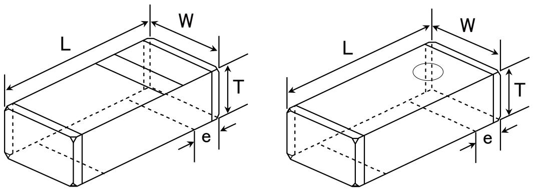
代码	本公司管理记号 2
△	无表示
N	有极性表示

■标准外型尺寸 / 标准数量

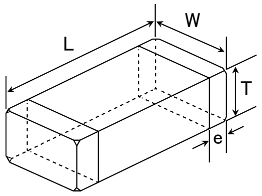
标准品



极性表示产品



电极5面品



型号	L	W	T	e	标准数量 [pcs]	
					纸带	压纹带
MCEE1005 (0402)	1.0±0.2 (0.039±0.008)	0.5±0.2 (0.020±0.008)	0.55 max (0.022 max)	0.25±0.15 (0.010±0.006)	10000	
MCEK1210 (0504)	1.25±0.1 (0.049±0.004)	1.05±0.1 (0.041±0.004)	0.50 max (0.020 max)	0.30±0.2 (0.012±0.008)	5000	—
MCFK1608 (0603)	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	0.60 max (0.024 max)	0.3±0.2 (0.012±0.008)	4000	—
MCFE1608 (0603)	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	0.65 max (0.026 max)	0.3±0.2 (0.012±0.008)	4000	—
MCHK1608 (0603)	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	0.80 max (0.031 max)	0.4±0.2 (0.016±0.008)	4000	—
MCKK1608 (0603)	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	1.0 max (0.039 max)	0.3±0.2 (0.012±0.008)	—	3000
MCHK2012 (0805)	2.0±0.2 (0.079±0.008)	1.25±0.2 (0.049±0.008)	0.80 max (0.031 max)	0.5±0.3 (0.02±0.012)	4000	—
MCKK2012 (0805)	2.0±0.2 (0.079±0.008)	1.25±0.2 (0.049±0.008)	1.0 max (0.039 max)	0.5±0.3 (0.02±0.012)	—	3000

单位: mm (inch)

▶由于篇幅有限，本产品目录中只记载了有代表性的产品规格，若考虑使用敝公司产品时，请确认交货规格说明书中的详细规格。
另外，有关各产品的详细信息(特性图、可靠性信息、使用时的注意事项等)，请参阅敝公司网站(http://www.ty-top.com/)。

■型号一览

●MC1005

型号	EHS	标称电感值 [μH]	电感量公差	直流电阻 [mΩ]		额定电流 (Idc1) [A] (max.)	额定电流 (Idc2) [A] (max.)	测试频率 [MHz]	厚度 [mm] (max.)
				(max.)	(typ.)				
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

●MC1210

型号	EHS	标称电感值 [μH]	电感量公差	直流电阻 [mΩ]		额定电流 (Idc1) [A] (max.)	额定电流 (Idc2) [A] (max.)	测试频率 [MHz]	厚度 [mm] (max.)
				(max.)	(typ.)				
MCEK1210TR47MHN	RoHS	0.47	±20%	82	70	2.30	1.60	1	0.50
MCEK1210T1R0MHN	RoHS	1.0	±20%	179	157	1.50	1.10	1	0.50
MCEK1210T1R5MHN	RoHS	1.5	±20%	240	200	1.20	0.90	1	0.50

●MC1608

型号	EHS	标称电感值 [μH]	电感量公差	直流电阻 [mΩ]		额定电流 (Idc1) [A] (max.)	额定电流 (Idc2) [A] (max.)	测试频率 [MHz]	厚度 [mm] (max.)
				(max.)	(typ.)				
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
MCHK1608TR24MKN	RoHS	0.24	±20%	24	20	4.30	3.70	1	0.80
MCHK1608TR47MKN	RoHS	0.47	±20%	43	38	3.30	2.70	1	0.80
MCHK1608TR56MKN	RoHS	0.56	±20%	55	45	2.70	2.60	1	0.80
MCHK1608T1R0MKN	RoHS	1.0	±20%	110	89	2.20	1.60	1	0.80
MCHK1608T1R5MKN	RoHS	1.5	±20%	200	160	1.70	1.30	1	0.80
MCHK1608T2R2MKN	RoHS	2.2	±20%	292	237	1.50	1.20	1	0.80
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

型号	EHS	标称电感值 [μH]	电感量公差	直流电阻 [mΩ]		额定电流 (Idc1) [A] (max.)	额定电流 (Idc2) [A] (max.)	测试频率 [MHz]	厚度 [mm] (max.)
				(max.)	(typ.)				
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

※) 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℃)
※) 额定电流(Idc2): 直流电流负载时, 由自发热引起的温度上升达40℃以下的电流值 (20℃)

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^{TM} MC series)

■PACKAGING

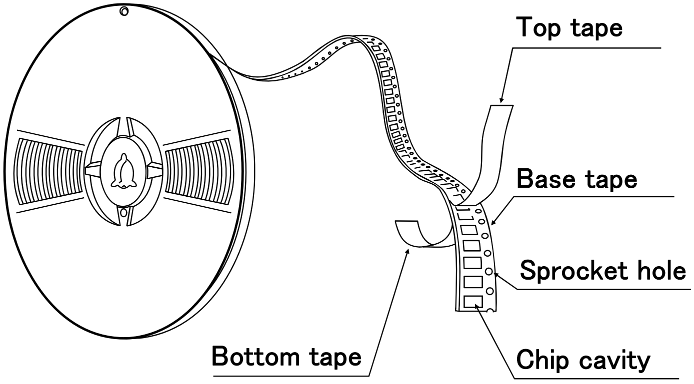
①Minimum Quantity

●Tape & Reel Packaging

Type	Thickness mm（inch）	Standard Quantity ［pcs］	
		Paper Tape	Embossed Tape
CK1608（0603）	0.8 （0.031）	4000	—
CK2125（0805）	0.85（0.033）	4000	—
	1.25（0.049）	—	2000
CKS2125（0805）	0.85（0.033）	4000	—
	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
CKP2520（1008）	0.7 （0.028）	—	3000
	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	—
	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	—
HK2125（0805）	0.85（0.033）	—	4000
	1.0 （0.039）	—	3000
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	—
BK2125（0805）	0.85（0.033）	4000	—
	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	—
MCF0806（0302）	0.4 （0.016）	—	10000
MCF1210（0504）	0.55（0.022）	—	5000
MCF2010（0804）	0.45（0.018）	—	4000
MCEE1005（0402）	0.55（0.022）	10000	—
MCEK1210(0504)	0.5 （0.020）	5000	—
MCFK1608（0603）	0.6 （0.024）	4000	—
MCFE1608（0603）	0.65（0.026）	4000	—
MCHK1608(0603)	0.8 （0.031）	4000	—
MCKK1608（0603）	1.0 （0.039）		3000
MCHK2012（0806）	0.8 （0.031）	4000	—
MCKK2012（0805）	1.0 （0.039）	-	3000

②Taping material

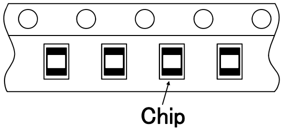
Card board carrier tape



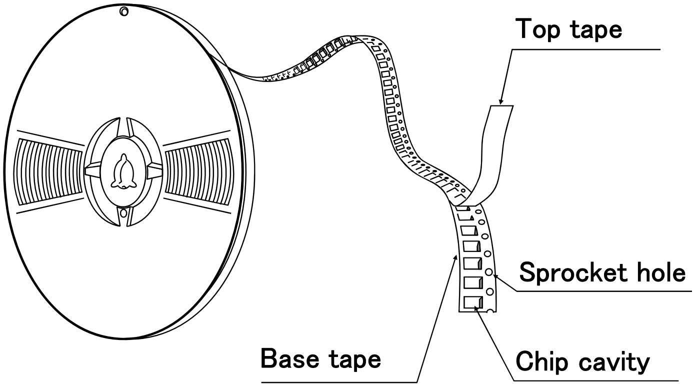
CK	1608
CKP	1608
CK	2125
CKS	2125
LK	1005
LK	1608
LK	2125
HK	0603
HK	1005
HK	1608
HKQ	0603
AQ	105

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	1210
MC	1608
MC	2012

Chip Filled



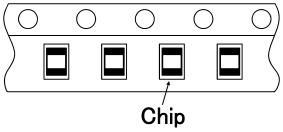
Embossed Tape



CK	2125
CKS	2125
CKP	2012
CKP	2016
CKP	2520
LK	2125
HK	2125

BK	2125
BK	3216
MCF	0806
MCF	1210
MCF	2010
MC	1608
MC	2012

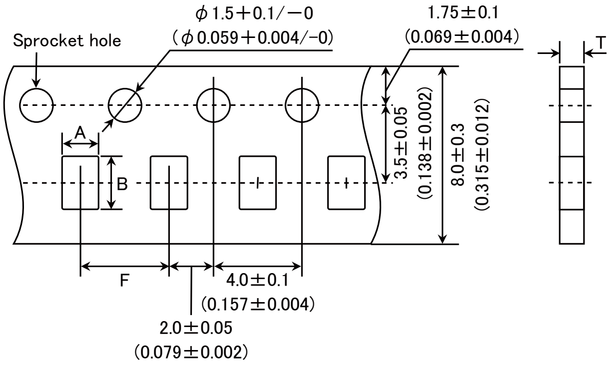
Chip Filled



③Taping Dimensions

Paper tape (8mm wide)

Unit：mm（inch）

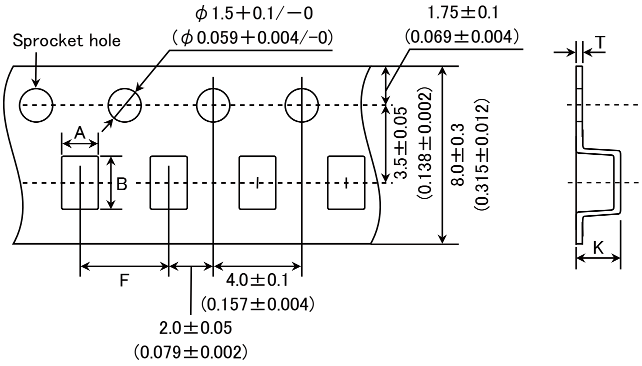


Type	Thickness mm(inch)	Chip cavity		Insertion Pitch	Tape Thickness
		A	B	F	T
CK1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
CK2125(0805)	0.85(0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
CKS2125(0805)	0.85(0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
CKP1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
LK1005(0402)	0.5 (0.020)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)
LK1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
LK2125(0805)	0.85(0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
HK0603(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
HK1005(0402)	0.5 (0.020)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)
HK1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
HKQ0603S(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
HKQ0603U(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
AQ105(0402)	0.5 (0.020)	0.75±0.1 (0.030±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)
BK0603(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
BK1005(0402)	0.5 (0.020)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)
BK1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
BK2125(0805)	0.85(0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
BK2010(0804)	0.45(0.018)	1.2±0.1 (0.047±0.004)	2.17±0.1 (0.085±0.004)	4.0±0.1 (0.157±0.004)	0.8max (0.031max)
BKP0603(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
BKP1005(0402)	0.5 (0.020)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)
BKP1608(0603)	0.8 (0.031)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
BKP2125(0805)	0.85(0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.1max (0.043max)
BKH0603(0201)	0.3 (0.012)	0.40±0.06 (0.016±0.002)	0.70±0.06 (0.028±0.002)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
BKH1005(0402)	0.5 (0.020)	0.65±0.1 (0.026±0.004)	1.15±0.1 (0.045±0.004)	2.0±0.05 (0.079±0.002)	0.8max (0.031max)
MCF0605(0202)	0.3 (0.012)	0.62±0.03 (0.024±0.001)	0.77±0.03 (0.030±0.001)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)
MCFK1608(0603)	0.6 (0.024)	1.1±0.05 (0.043±0.002)	1.9±0.05 (0.075±0.002)	4.0±0.1 (0.157±0.004)	0.72max (0.028max)
MCEE1005(0402)	0.55(0.021)	0.8±0.05 (0.031±0.002)	1.3±0.05 (0.051±0.002)	2.0±0.05 (0.079±0.002)	0.64max (0.025max)
MCEK1210(0504)	0.5 (0.020)	1.3±0.1 (0.051±0.004)	1.55±0.1 (0.061±0.004)	4.0±0.1 (0.157±0.004)	0.64max (0.025max)
MCFK1608(0603)	0.6 (0.024)	1.1±0.05 (0.043±0.002)	1.9±0.05 (0.075±0.002)	4.0±0.1 (0.157±0.004)	0.72max (0.028max)
MCFE1608(0603)	0.65(0.026)	1.1±0.05 (0.043±0.002)	1.9±0.05 (0.075±0.002)	4.0±0.1 (0.157±0.004)	0.72max (0.028max)
MCHK1608(0603)	0.8 (0.031)	1.2±0.05 (0.047±0.002)	2.0±0.05 (0.079±0.002)	4.0±0.1 (0.157±0.004)	0.9max (0.035max)
MCHK2012(0805)	0.8 (0.031)	1.65±0.1 (0.065±0.004)	2.4±0.1 (0.094±0.004)	4.0±0.1 (0.157±0.004)	0.9max (0.035max)

Unit : mm(inch)

Embossed Tape (8mm wide)

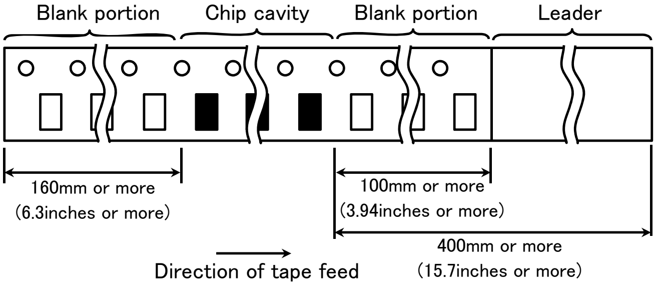
Unit:mm(inch)



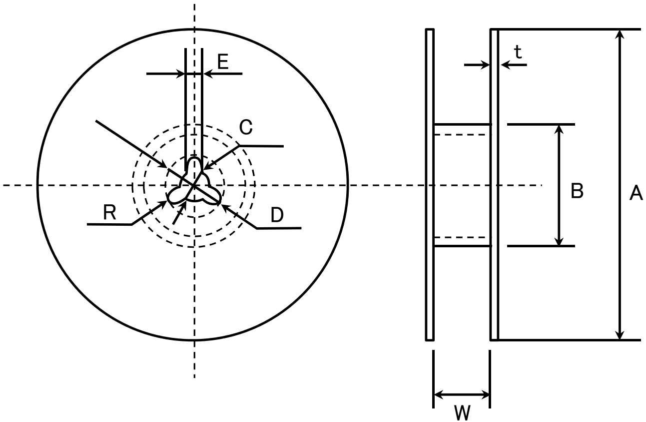
Type	Thickness mm(inch)	Chip cavity		Insertion Pitch	Tape Thickness	
		A	B	F	K	T
CK2125(0805)	1.25(0.049)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	2.0 (0.079)	0.3 (0.012)
CKS2125(0805)	1.25(0.049)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	2.0 (0.079)	0.3 (0.012)
CKP2012(0805)	0.9 (0.035)	1.55±0.2 (0.061±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.3 (0.051)	0.3 (0.012)
CKP2016(0806)	0.9 (0.035)	1.8±0.1 (0.071±0.004)	2.2±0.1 (0.087±0.004)	4.0±0.1 (0.157±0.004)	1.3 (0.051)	0.25 (0.01)
CKP2520(1008)	0.7 (0.028)	2.3±0.1 (0.091±0.004)	2.8±0.1 (0.110±0.004)	4.0±0.1 (0.157±0.004)	1.4 (0.055)	0.3 (0.012)
	0.9 (0.035)				1.4 (0.055)	
	1.1 (0.043)				1.7 (0.067)	
	1.1 (0.043)				1.7 (0.067)	
LK2125(0805)	1.25(0.049)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	2.0 (0.079)	0.3 (0.012)
HK2125(0805)	0.85(0.033)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.5 (0.059)	0.3 (0.012)
	1.0 (0.039)				2.0 (0.079)	
BK2125(0805)	1.25(0.049)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	2.0 (0.079)	0.3 (0.012)
BK3216(1206)	0.8 (0.031)	1.9±0.1 (0.075±0.004)	3.5±0.1 (0.138±0.004)	4.0±0.1 (0.157±0.004)	1.4 (0.055)	0.3 (0.012)
MCF0806(0302)	0.4 (0.016)	0.75±0.05 (0.030±0.002)	0.95±0.05 (0.037±0.002)	2.0±0.05 (0.079±0.002)	0.55 (0.022)	0.3 (0.012)
MCF1210(0504)	0.55(0.022)	1.15±0.05 (0.045±0.002)	1.40±0.05 (0.055±0.002)	4.0±0.1 (0.157±0.004)	0.65 (0.026)	0.3 (0.012)
MCF2010(0804)	0.45(0.018)	1.1±0.1 (0.043±0.004)	2.3±0.1 (0.091±0.004)	4.0±0.1 (0.157±0.004)	0.85 (0.033)	0.3 (0.012)
MCKK1608(0603)	1.0 (0.039)	1.1±0.1 (0.043±0.004)	1.95±0.1 (±0.004)	4.0±0.1 (0.157±0.004)	1.4 (0.055)	0.25 (0.01)
MCKK2012(0805)	1.0 (0.039)	1.55±0.1 (0.061±0.004)	2.35±0.1 (0.093±0.004)	4.0±0.1 (0.157±0.004)	1.35 (0.053)	0.25 (0.010)

Unit : mm(inch)

④LEADER AND BLANK PORTION



⑤Reel Size



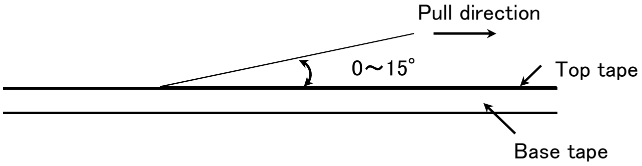
A	B	C	D	E	R
ϕ178±2.0	ϕ50 or more	ϕ13.0±0.2	ϕ21.0±0.8	2.0±0.5	1.0

	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 0.1～0.7N in the direction of the arrow as illustrated below.



■RELIABILITY DATA

1. Operating Temperature Range

Specified Value	BK series	－55～＋125℃
	BKH series	
	BKP series	－55～＋85℃
	MCF series	－40～＋85℃
	CK series	－40～＋85℃
	CKS series	
	CKP series	
	LK series	
	HK0603, HK1005	－55～＋125℃
	HK1608, HK2125	－40～＋85℃
	HKQ0603	－55～＋125℃
	AQ105	
	MCOIL$^{\text{TM}}$ MC series	－40～＋125℃（Including self-generated heat）

2. Storage Temperature Range

Specified Value	BK series	－55～＋125℃
	BKH series	
	BKP series	－55～＋85℃
	MCF series	－40～＋85℃
	CK series	－40～＋85℃
	CKS series	
	CKP series	
	LK series	
	HK0603, HK1005	－55～＋125℃
	HK1608, HK2125	－40～＋85℃
	HKQ0603	－55～＋125℃
	AQ105	
	MCOIL$^{\text{TM}}$ MC series	－40～＋85℃

3. Rated Current

Specified Value	BK series	The temperature of the element is increased within 20℃.
	BKH series	
	BKP series	The temperature of the element is increased within 40℃
	MCF series	Refer to each specification.
	CK series	The temperature of the element is increased within 20℃.
	CKS series	
	CKP series	The temperature of the element is increased within 40℃
	LK series	The decreasing-rate of inductance value is within 5 ％
	HK0603, HK1005	The decreasing-rate of inductance value is within 5 ％, or the temperature of the element is increased within 20℃
	HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL$^{\text{TM}}$ MC series	Idc1: The decreasing-rate of inductance value is within 30 ％ Idc2: The temperature of the element is increased within 40℃

4. Impedance

Specified Value	BK series	Refer to each specification.
	BKH series	
	BKP series	
	MCF series	
Test Methods and Remarks	BK0603Series, BKP0603Series, BKH Series Measuring frequency : 100±1MHz Measuring equipment : 4991A(or its equivalent) Measuring jig : 16193A(or its equivalent) BK1005Series, BKP1005Series ,BKH1005Series Measuring frequency : 100±1MHz Measuring equipment : 4291A(or its equivalent) Measuring jig : 16192A (or its equivalent) , HW:16193A (or its equivalent) BK1608・2125Series, BKP1608・2125Series Measuring frequency : 100±1MHz Measuring equipment : 4291A(or its equivalent), 4195A(or its equivalent) Measuring jig : 16192A(or its equivalent), HW:16193A(or its equivalent) BK2010・3216Series Measuring frequency : 100±1MHz Measuring equipment : 4291A(or its equivalent), 4195A(or its equivalent) Measuring jig : 16192A(or its equivalent) MCF Series Measuring frequency : 100±1MHz Measuring equipment : 4291A(or its equivalent)	

5. Inductance

Specified Value	CK series	Refer to each specification.
	CKS series	
	CKP series	
	LK series	
	HK0603, HK1005	
	HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL™ MC series	
Test Methods and Remarks	CK、CKS、LK Series Measuring frequency : Refer to each specification. Measuring equipment /jig : 1608,2125⇒4294A＋16092A(or its equivalent) 1005⇒4291A＋16193A(or its equivalent) Measuring current : 047～4.7μH ⇒1mArms 、 5.6～33μH ⇒0.1mArms CKP、MCOIL™ MC Series Measuring frequency : 1MHz Measuring equipment : 4285A(or its equivalent) HK0603、HK1005、AQ Series Measuring frequency : 100MHz Measuring equipment /jig : HK0603⇒ E4991A+16197A(or its equivalent) , AQ105⇒4291A＋16197A(or its equivalent) HK1005⇒ 4291A＋16193A(or its equivalent) HK1608、HK2125 Series Measuring frequency : ～100nH⇒100MHz 、120nH～⇒50MHz Measuring equipment /jig : 4291A＋16092A(or its equivalent) HKQ Series Measuring frequency : 500MHz Measuring equipment /jig : E4991A＋16197A(or its equivalent)	

6. Q

Specified Value	CK series	—
	CKS series	
	CKP series	
	LK series	Refer to each specification.
	HK0603, HK1005	
	HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL™ MC series	—
Test Methods and Remarks	LK Series Measuring frequency : Refer to each specification. Measuring equipment /jig : 1608,2125⇒4294A＋16092A(or its equivalent) 1005⇒4291A＋16193A(or its equivalent) Measuring current : 047～4.7μH ⇒1mArms 、 5.6～33μH ⇒0.1mArms HK0603、HK1005、AQ Series Measuring frequency : 100MHz Measuring equipment /jig : HK0603⇒E4991A＋16197A(or its equivalent) , AQ105⇒4291A＋16197A(or its equivalent) HK1005⇒4291A＋16193A(or its equivalent) HK1608、HK2125 Series Measuring frequency : ～100nH⇒100MHz 、120nH～⇒50MHz Measuring equipment /jig : 4291A＋16092A(or its equivalent) HKQ Series Measuring frequency : 500MHz Measuring equipment /jig : E4991A＋16197A(or its equivalent)	

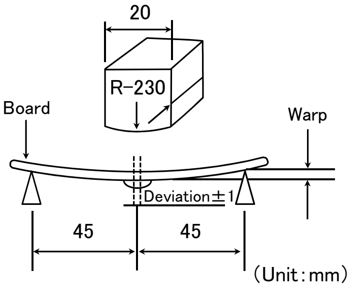
7. DC Resistance

Specified Value	BK series	Refer to each specification.
	BKH series	
	BKP series	
	MCF series	
	CK series	
	CKS series	
	CKP series	
	LK series	
	HK0603, HK1005	
	HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL™ MC series	
Test Methods and Remarks	Measuring equipment:IWATSU VOAC7512, HIOKI RM3545 (or its equivalent)	

8. Self Resonance Frequency(SRF)

Specified Value	BK series	—
	BKH series	
	BKP series	
	MCF series	
	CK series	Refer to each specification.
	CKS series	
	CKP series	—
	LK series	Refer to each specification.
	HK0603, HK1005	
	HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL™ MC series	—
Test Methods and Remarks	LK、CK Series : Measuring equipment : 4195A(or its equivalent) Measuring jig : 16092A(or its equivalent) HK、HKQ、AQ Series : Measuring equipment : 8719C(or its equivalent)	

9. Resistance to Flexure of Substrate

Specified Value	BK series	No mechanical damage.
	BKH series	
	BKP series	
	MCF series	
	CK series	
	CKS series	
	CKP series	
	LK series	
	HK0603, HK1005	
	HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL™ MC series	
Test Methods and Remarks	Warp : 2mm（BK Series、BKP、BKH1005、CK、CKS、CKP、LK、HK、HKQ0603S、HKQ0603U、AQ Series、MCF1210、MC Series） : 1mm（BKH0603、MCF Series without 1210 size,） Testing board : glass epoxy-resin substrate Thickness : 0.8mm  	

10. Solderability

Specified Value	BK series	At least 90% of terminal electrode is covered by new solder.
	BKH series	
	BKP series	
	MCF series	
	CK series	
	CKS series	
	CKP series	
	LK series	
	HK0603, HK1005	
	HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL™ MC series	
Test Methods and Remarks	Solder temperature :230±5℃ (JIS Z 3282 H60A or H63A) Solder temperature :245±3℃ (Sn/3.0Ag/0.5Cu) Duration :4±1 sec.	

11. Resistance to Soldering

Specified Value	BK series BKH series BKP series	Appearance：No significant abnormality Impedance change：Within ±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%
	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 HKQ0603 AQ105	Appearance：No significant abnormality Inductance change： Within ±5%
	MCOIL^{TM} MC series	Appearance：No significant abnormality Inductance change： Within ±10%
Test Methods and Remarks	Solder temperature	：260±5℃
	Duration	：10±0.5 sec.
	Preheating temperature	：150 to 180℃
	Preheating time	：3 min.
	Flux	：Immersion into methanol solution with colophony for 3 to 5 sec.
	Recovery	：2 to 3 hrs of recovery 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.

12. Thermal Shock

Specified Value	BK series BKH series BKP series	Appearance：No significant abnormality Impedance change： Within ±30%
	MCF series	Appearance：No significant abnormality Impedance change： Within ±20%
	CK series CKS series	Appearance：No significant abnormality Inductance change：Within ±20%
	CKP series	Appearance：No significant abnormality Inductance change： Within ±30%
	LK series	Appearance：No significant abnormality Inductance change： Within ±10% Q change： Within ±30%
	HK0603, HK1005 HK1608, HK2125 HKQ0603 AQ105	Appearance：No significant abnormality Inductance change： Within ±10% Q change： Within ±20%
	MCOIL^{TM} MC series	Appearance：No significant abnormality Inductance change： Within ±10%

Test Methods and Remarks

Conditions for 1 cycle

Step	temperature（℃）	time（min.）
1	Minimum operating temperature ＋0/－3	30±3
2	Room temperature	2～3
3	Maximum operating temperature ＋3/－0	30±3
4	Room temperature	2～3

Number of cycles：5

Recovery：2 to 3 hrs of recovery 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. Damp Heat（ Steady state）		
Specified Value	BK series	Appearance：No significant abnormality Impedance change： Within ±30%
	BKH series	
	BKP series	
	MCF series	Appearance：No significant abnormality Impedance change： Within ±20%
	CK series	Appearance：No significant abnormality Inductance change： Within ±20%
	CKS series	
	CKP series	Appearance：No significant abnormality Inductance change： Within ±30%
	LK series	Appearance：No significant abnormality Inductance change： 1005,1608⇒Within ±10% 2125⇒Within ±20% Q change： Within ±30%
	HK0603, HK1005	Appearance：No significant abnormality Inductance change： Within ±10% Q change： Within ±20%
	HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL$^{\text{TM}}$ MC series	Appearance：No significant abnormality Inductance change： Within ±10%
Test Methods and Remarks	BK、BKP、BKH、LK、CK、CKS、CKP、MCF Series： Temperature ：40±2℃ Humidity ：90 to 95%RH 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） HK、HKQ、AQ、MCOIL$^{\text{TM}}$ MC series： Temperature ：60±2℃ Humidity ：90 to 95%RH Duration ：500 +24/−0 hrs Recovery ：2 to 3 hrs of recovery under the standard condition after the removal from test chamber.（See Note 1）	

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

14. Loading under Damp Heat

Specified Value	BK series	Appearance：No significant abnormality Impedance change： Within ±30%
	BKH series	
	BKP series	
	MCF series	—
	CK series	Appearance：No significant abnormality Inductance change： Within ±20%
	CKS series	
	CKP series	Appearance：No significant abnormality Inductance change： Within ±30%
	LK series	Appearance：No significant abnormality Inductance change： 1005⇒Within ±10% 1608⇒0.047～12.0 μH： Within ±10% 15.0～33.0 μH： Within ±15% 2125⇒Within ±20% Q change： Within ±30%
	HK0603, HK1005	Appearance：No significant abnormality Inductance change： Within ±10% Q change： Within ±20%
	HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL^{TM} MC series※	Appearance：No significant abnormality Inductance change： Within ±10%
Test Methods and Remarks	BK、BKP、BKH、LK、CK、CKS、CKP Series： Temperature ：40±2℃ Humidity ：90 to 95%RH Applied current ：Rated current 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) HK、HKQ、AQ、MCOIL^{TM} MC Series： Temperature ：60±2℃ Humidity ：90 to 95%RH Applied current ：Rated current ※MC 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℃ 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±2℃ 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.

15. Loading at High Temperature

Specified Value	BK series	Appearance : No significant abnormality Impedance change : Within ±30%
	BKH series	
	BKP series	
	MCF series	Appearance : No significant abnormality Impedance change : Within ±20%
	CK series	Appearance : No significant abnormality Inductance change : Within ±20%
	CKS series	
	CKP series	Appearance : No significant abnormality Inductance change : Within ±30%
	LK series	Appearance : No significant abnormality Inductance change : 1005⇒Within ±10% 1608⇒0.047～12.0 μH : Within ±10% 15.0～33.0 μH : Within ±15% 2125⇒Within ±20% Q change : Within ±30%
	HK0603, HK1005	Appearance : No significant abnormality Inductance change : Within ±10% Q change : Within ±20%
	HK1608, HK2125	
	HKQ0603	
	AQ105	
	MCOIL$^{\text{TM}}$ MC series※	Appearance : No significant abnormality Inductance change : Within ±10%
Test Methods and Remarks	Temperature : Maximum operating temperature Applied current : Rated current ※MC 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℃ 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±2℃ 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.

PRECAUTIONS

1. Circuit Design

Precautions

◆Verification of operating environment, electrical rating and performance

1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications. As such, any inductors to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications.

◆Operating Current (Verification of Rated current)

1. The operating current including inrush current for inductors must always be lower than their rated values.
2. Do not apply current in excess of the rated value because the inductance may be reduced due to the magnetic saturation effect.

2. PCB Design

Precautions

◆Pattern configurations (Design of Land-patterns)

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

(1) The amount of solder applied can affect the ability of chips to withstand mechanical stresses which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets.

(2) When more than one part is jointly soldered onto the same land or pad, the pad must be designed so that each component's soldering point is separated by solder-resist.

◆Pattern configurations (Inductor layout on panelized [breakaway] PC boards)

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

Technical considerations

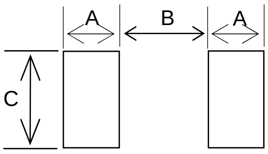
◆Pattern configurations (Design of Land-patterns)

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

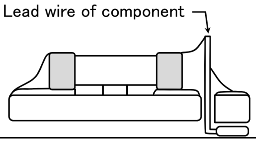
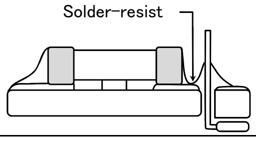
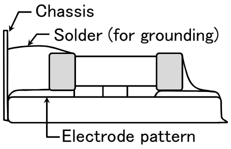
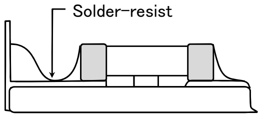
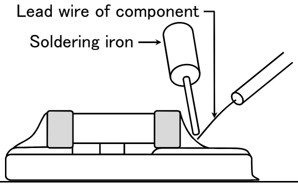
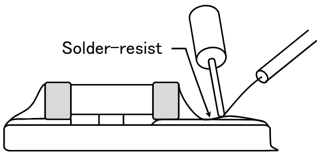
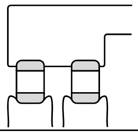
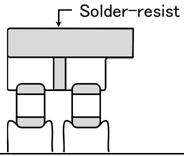
(1) Recommended land dimensions for a typical chip inductor land patterns for PCBs

(Unit:mm)

Type	1005	1210	1608 (Except MCHK)	1608 (MCHK)	2012
A	0.4	0.45	0.45	0.55	0.5
B	0.5	0.6	1.0	0.8	1.2
C	0.7	1.15	1.0	1.0	1.45

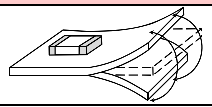
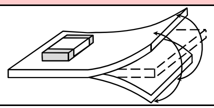


(2) Examples of good and bad solder application

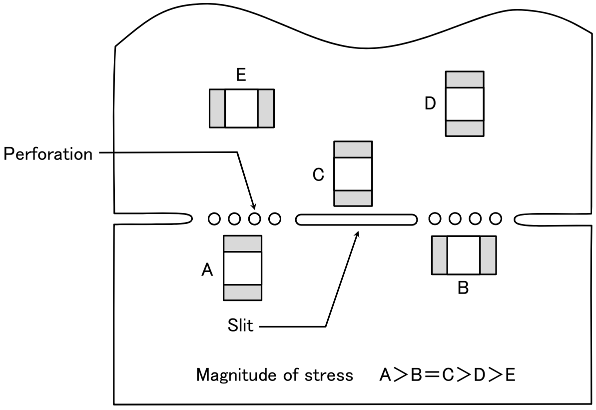
Item	Not recommended	Recommended
Mixed mounting of SMD and leaded components		
Component placement close to the chassis		
Hand-soldering of leaded components near mounted components		
Horizontal component placement		

◆Pattern configurations (Inductor layout on panelized [breakaway] PC boards)

1. The following are examples of good and bad inductor layout; SMD inductors should be located to minimize any possible mechanical stresses from board warp or deflection.

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

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



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

3. Considerations for automatic placement

Precautions

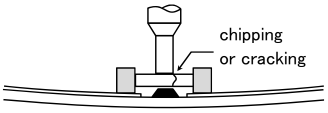
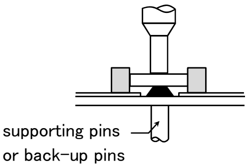
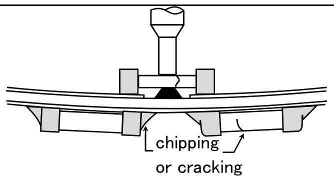
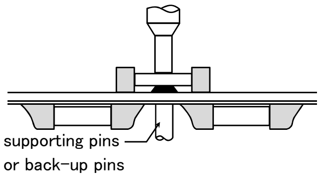
◆Adjustment of mounting machine

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

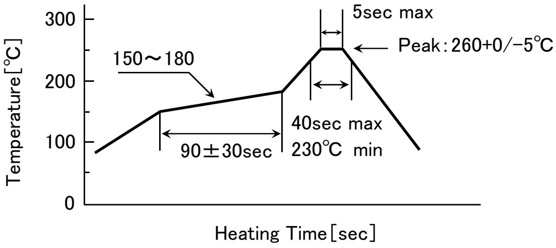
Technical considerations

◆Adjustment of mounting machine

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

Item	Improper method	Proper method
Single-sided mounting	 chipping or cracking	 supporting pins or back-up pins
Double-sided mounting	 chipping or cracking	 supporting pins or back-up pins

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

4. Soldering	
Precautions	◆Reflow soldering ・ Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified. ・ The product shall be used reflow soldering only. ・ Please do not add any stress to a product until it returns in normal temperature after reflow soldering. ◆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.
Technical considerations	◆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) 

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.

6. Resin coating and mold	
Precautions	1. With some type of resins a decomposition gas or chemical reaction vapor may remain inside the resin during the hardening period or while left under normal storage conditions resulting in the deterioration of the inductor's performance. 2. Thermal expansion and thermal shrinkage characteristics of resins may lead to the deterioration of inductors' performance. 3. When a resin hardening temperature is higher than inductor operating temperature, the stresses generated by the excessive heat may lead to damage in inductors.

7. Handling	
Precautions	◆Breakaway PC boards(splitting along perforations) 1. When splitting the PC board after mounting inductors and other components, care is required so as not to give any stresses of deflection or twisting to the board. 2. Board separation should not be done manually, but by using the appropriate devices. ◆General handling precautions ・Always wear static control bands to protect against ESD. ・ Keep the inductors away from all magnets and magnetic objects. ・ Use non-magnetic tweezers when handling inductors. ・ Any devices used with the inductors(soldering irons, measuring instruments) should be properly grounded. ・ Keep bare hands and metal products(i.e., metal desk)away from inductor electrodes or conductive areas that lead to chip electrodes. ・ Keep inductors away from items that generate magnetic fields such as speakers or coils. ◆Mechanical considerations Be careful not to subject the inductors to excessive mechanical shocks. (1) If inductors are dropped on the floor or a hard surface they should not be used. (2) When handling the mounted boards, be careful that the mounted components do not come in contact with or bump against other boards or components.

8. Storage conditions	
Precautions	◆Storage To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible. ・Recommended conditions Ambient temperature: 30℃ or below Humidity: 70% RH or below The ambient temperature must be kept below 40℃. Even under ideal storage conditions, solderability of inductor is deteriorated as time passes, so inductors should be used within 6 months from the time of delivery. ・Inductor should be kept where no chlorine or sulfur exists in the air.
Technical considerations	◆Storage If the parts are stocked in a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place. For this reason, components should be used within 6 months from the time of delivery. If exceeding the above period, please check solderability before using the inductors.