

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2023年3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的，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民用电子设备〔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或是敝公司另行承诺的设备的通用性，标准性用途。另外，面向下述设备的应用，敝公司也备有预设的产品系列，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。

用途	产品系列		品质等级 ^(注释3)
	对象设备 ^(注释1)	规格号 (型号标记 ^(注释2))	
车载	汽车用电子设备（控制系 / 安全系）	A	1
	汽车用电子设备（车身系 / 情报系）	C	2
工业	通信基础设备·工业设备	B	2
医疗	医疗设备（国际（GHTF）第三类）	M	2
	医疗设备（国际（GHTF）第一类、第二类）	L	3
民用	一般电子设备	S	3
	移动设备专用 ^(注释4)	E	4

注释1：基于敝公司所认知的该类设备对于电子元器件所需的一般要求规格，对于该产品系列进行的应用推荐。在讨论将各个产品系列使用在对象设备以外的设备上时，请务必事先向敝公司咨询。

注释2：在产品型号中左起第2位标注有上表中所记载的“规格号”。对于相关的详细内容，请参照有关各产品型号标示法的说明资料。

注释3：在各产品系列中，都设定了从上至下1至4的“品质等级”。另外，在未得到敝公司的事前书面承诺之前，请勿将敝公司的产品使用于相对于该产品的品质等级被设定为上位品质等级的设备。

注释4：本产品系列仅可应用于一般民用电子设备中的移动设备（智能手机、平板电脑、智能手表、掌上游戏机等）。由于其设计、规格和使用环境与面向“一般电子设备”的产品系列（规格号：S）不同，有关本产品系列的详细信息请参照交货规格说明书。另外，面向“一般电子设备”的产品系列（规格号：S）也可以应用于移动设备。

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符合交货规格说明书中所记载的产品规格且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，仅限于敝公司的产品作为通用性，标准性用途使用于本产品目录或是交货规格说明书中另行注明的设备，且以书面形式另行签署了交易基本合同书，品质保证协定时，敝公司将根据该合同等的条件提供保证。

■ 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。

▶ 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/>)。

车载用途使用指引

敝公司将汽车用电子设备划分为如下四个分类。而对于敝公司的每个产品，敝公司都设定了其可以被使用的分类，以及相对应的产品系列（左起第二位的产品型号的记号为“A”或是“C”）。因此，需在汽车用电子设备上使用敝公司的产品之前，请务必事先确认该产品系列是否适合使用该用途上。如有不明之处，请与敝公司取得联系。

产品系列 (左起第二位的产品型号的记号)	分类	汽车用电子设备（代表实例）
A	控制系	<ul style="list-style-type: none">• 发动机引擎控制装置（ECU）• 巡航定速控制装置• 四轮转向系统（4WS）• 自动变速箱（AT）• 动力转向装置• HEV/PHV/EV 基础控制（电池 / 逆变器 / DC-DC）• 汽车定位器（车辆位置情报提供装置） 等
	安全系	<ul style="list-style-type: none">• 防锁死刹车系统（ABS）• 车身动态稳定系统（ESC）• 安全气囊• ADAS（直接控制走动 / 转向 / 停车的装置） 等
C	车身系	<ul style="list-style-type: none">• 雨刷• 自动门锁• 电动车窗• 无钥匙进入系统（智能钥匙）• 电动后视镜• 汽车电子后视镜• 车内照明• 车内空调系统• 轮胎压力监测系统（TPMS）• 防盗装置• ADAS（与传感，安全 / 传动系统没有关联的装置） 等
	情报系	<ul style="list-style-type: none">• 车载信息娱乐装置（汽车导航 / 音响等）• 情报通讯装置（ITS/T-BOX）• 汽车仪表盘• 行车记录仪（车厂原装配件） 等

车载(控制系 / 安全系)用途 绕线型铁氧体系功率电感器 LAXH 系列

系列前的记号来自型号, 用来区分产品的种类和特性等。

AEC-Q200 Grade 1 (已完成 Grade 1 条件下的评价测试。)

*使用环境温度: -40~125°C

回流焊

AEC-Q200

■ 型号标示法

*使用温度范围 : -40~150°C (包含产品本身发热)

L	A	X	H	G	6	0	6	0	Y	E	L	1	0	0	M	M	R
①	②	③	④	⑤	⑥	⑦	⑧										

① 系列

代码 (1)(2)(3)(4)	
LAXH	车载(控制系 / 安全系)用途 绕线型铁氧体系功率电感器

(1) 产品群

代码	
L	电感器

(3) 类型

代码	
X	绕线型铁氧体系 鼓型

(2) 范畴

代码	推荐设备	品质等级
A	汽车用电子设备(控制系 / 安全系)	1

(4) 特效 / 特性

代码	
H	混合功率扼流

② 特征

代码	特征
G	底面电极(银×焊料)对应充填物 高温品

⑤ 包装

代码	包装
L	卷盘带装

③ 尺寸(L×W)

代码	尺寸(L×W) [mm]
6060	6.0×6.0

⑥ 标称电感值

代码(例)	标称电感值 [μH]
2R2	2.2
100	10
101	100

④ 尺寸(H)

代码	尺寸(H) [mm]
YE	4.5

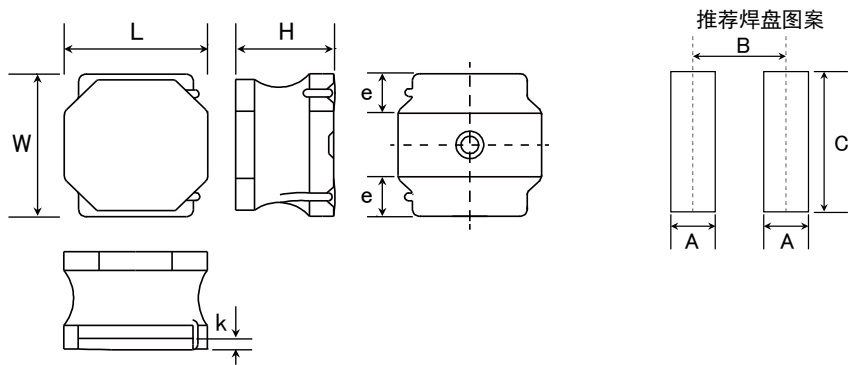
※R=小数点

⑦ 电感量公差

代码	电感量公差
M	±20%
N	±30%

⑧ 管理记号

■标准外型尺寸 / 标准数量



Type	A	B	C
6060	2.4	5.0	4.8

单位: mm

Type	L	W	H	e	k(参考值)	标准数量[pcs] 卷盘带装
6060YE	6.0±0.2 (0.236±0.008)	6.0±0.2 (0.236±0.008)	4.5 max (0.177 max)	1.65±0.3 (0.053±0.012)	0.3 min (0.012 min)	1500

单位: mm(inch)

PART NUMBER

• All the Wire-wound Ferrite Power Inductors of the catalog lineup are RoHS compliant.

Notes)

- The exchange of individual specifications is necessary depending on your application and/or circuit condition. Please contact TAIYO YUDEN's official sales channel.
- For Automotive (AEC-Q200 Qualified) products for POWERTRAIN, and SAFETY. Please check "Automotive Application Guide" for further details before using the products.

< AEC-Q200 : AEC-Q200 qualified >

All the Wire-wound Ferrite Power Inductors for Automotive products are tested based on the test conditions and methods defined in AEC-Q200 by family item.

Please consult with TAIYO YUDEN's official sales channel for the details of the product specifications and AEC-Q200 test results, etc.,

and please review and approve the product specifications before ordering.

6060YE type

New part number	Old part number (for reference)	Nominal inductance [μ H]	Inductance tolerance	DC Resistance [m Ω] Max (Typ)	Rated current ※) [A]			Measuring frequency [MHz]
					Saturation current Idc1 Max (Typ)	Temperature rise current① Idc2 Max (Typ)	Temperature rise current② Idc2 Max (Typ)	
LAXHG6060YEL1R0NMRR	NRT6045T 1R0NMRR	1	\pm 30%	13 (10)	13.50 (14.50)	5.00 (6.50)	6.20 (7.00)	0.1
LAXHG6060YEL1R5NMRR	NRT6045T 1R5NMRR	1.5	\pm 30%	19 (14)	10.00 (11.00)	4.00 (5.10)	5.50 (6.40)	0.1
LAXHG6060YEL2R2NMRR	NRT6045T 2R2NMRR	2.2	\pm 30%	23 (18)	8.50 (9.50)	3.50 (4.30)	4.40 (5.10)	0.1
LAXHG6060YEL3R3MMRR	NRT6045T 3R3MMRS	3.3	\pm 20%	27.6(23)	7.00 (7.50)	3.10 (3.80)	4.00 (4.50)	0.1
LAXHG6060YEL4R7MMRR	NRT6045T 4R7MMRR	4.7	\pm 20%	36 (30)	6.00 (6.50)	2.60 (3.30)	3.60 (3.90)	0.1
LAXHG6060YEL6R8MMRR	NRT6045T 6R8MMRR	6.8	\pm 20%	52 (43)	5.10 (5.60)	2.25 (2.85)	3.10 (3.50)	0.1
LAXHG6060YEL100MMRR	NRT6045T 100MMRS	10	\pm 20%	60 (50)	4.00 (4.40)	2.00 (2.65)	2.60 (3.20)	0.1
LAXHG6060YEL220MMRR	NRT6045T 220MMRR	22	\pm 20%	132 (110)	2.50 (3.00)	1.40 (1.80)	1.80 (2.00)	0.1
LAXHG6060YEL470MMRR	NRT6045T 470MMRR	47	\pm 20%	272 (227)	1.55 (1.70)	0.85 (1.00)	1.20 (1.30)	0.1
LAXHG6060YEL101MMRR	NRT6045T 101MMRR	100	\pm 20%	600 (475)	1.05 (1.15)	0.65 (0.80)	0.85 (0.95)	0.1
LAXHG6060YEL151MMRR	NRT6045T 151MMRR	150	\pm 20%	816 (680)	0.83 (0.90)	0.48 (0.65)	0.76 (0.85)	0.1
LAXHG6060YEL221MMRR	NRT6045T 221MMRR	220	\pm 20%	1320 (1100)	0.70 (0.75)	0.42 (0.55)	0.57 (0.65)	0.1
LAXHG6060YEL471MMRR	NRT6045T 471MMRR	470	\pm 20%	2760 (2300)	0.45 (0.50)	0.27 (0.35)	0.38 (0.45)	0.1

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

※) The temperature rise current value (Idc2)① is the DC current value having temperature increase up to 25°C. (at 20°C)

※) The temperature rise current value (Idc2)② is the DC current value having temperature increase up to 40°C. (at 20°C)

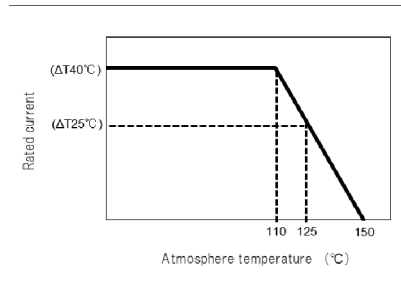
※) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

Derating of Rated Current

LAXH series

Derating of current is necessary for LAXH series depending on ambient temperature.

Please refer to the chart shown below for appropriate derating of current.



Wire-wound Ferrite Power Inductors LSXN/LSXP/LCXN/LCXP/LBXN/LBXP/
 LLXN/LLXP/LMXN/LMXP series
 Wire-wound Ferrite Power Inductors LAXH/LCXH/LBXH/LMXH series
 Wire-wound Ferrite Inductors for Class D Amplifier LCXA

■ PACKAGING

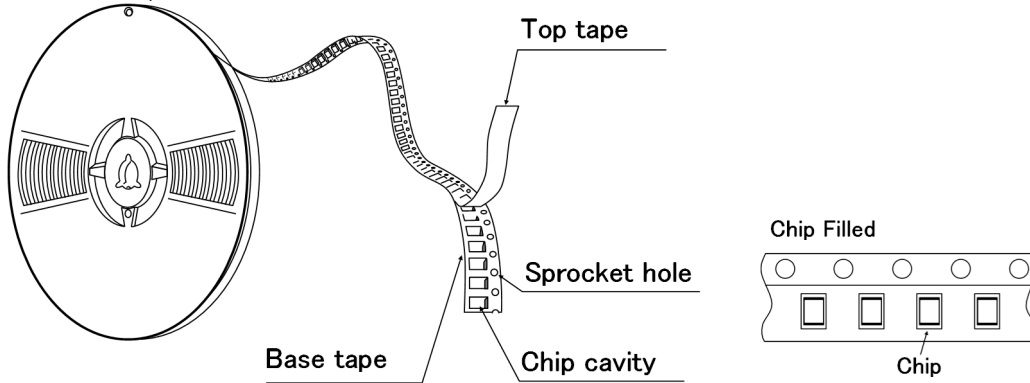
① Minimum Quantity

Type	Standard Quantity [pcs]
	Tape & Reel
2020KK	2500
2020MK	2500
2424KK	2500
2424MK	2500
3030KK	2000
3030MK	2000
3030QK	2000
4040KK	5000
4040MK	4500
4040TK	3500
4040WK	700

Type	Standard Quantity [pcs]
	Tape & Reel
5050KK	1000
5050MK	1000
5050PK	1000
5050WB	800
5050WK	800
5050WD	2500
5050WE	2500
5050XK	500
5050XA	500
5050YA	1500
5050YK	1500
6060KK	1000
6060MK	1000
6060PK	1000
6060WK	2500
6060WH	2000
6060XK	2000
6060YE	1500
8080XK	1000
8080YK	1000
8080YB	1000

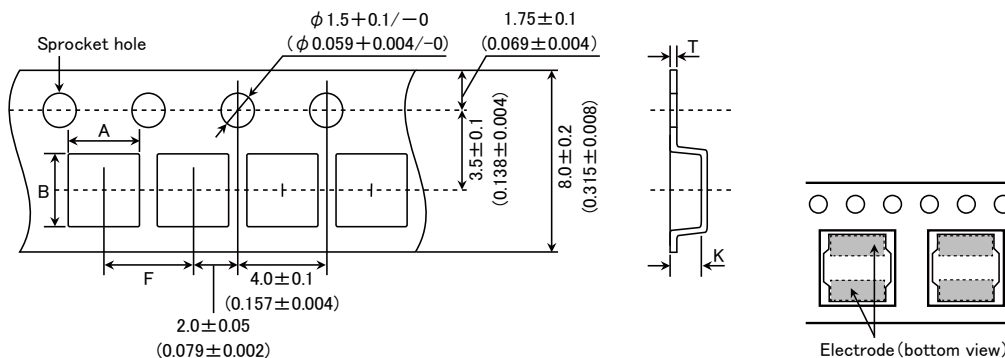
② Tape Material

● Embossed Tape



③ Taping dimensions

● Embossed tape 8mm wide (0.315 inches wide)

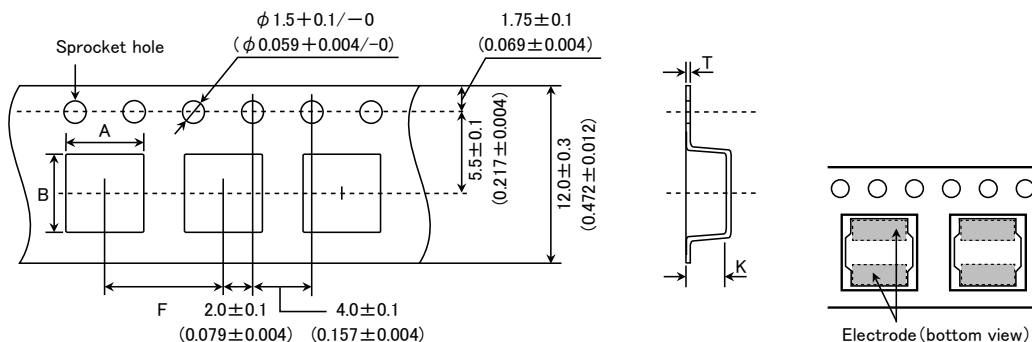


▶ This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>).

Type	Chip cavity		Insertion pitch F	Tape thickness	
	A	B		T	K
2020KK 2020MK	2.2±0.1 (0.102±0.004)	2.2±0.1 (0.102±0.004)	4.0±0.1 (0.157±0.004)	0.25±0.05 (0.009±0.002)	1.3±0.1 (0.051±0.004)
2424KK 2424MK	2.6±0.1 (0.087±0.004)	2.6±0.1 (0.102±0.004)		0.25±0.05 (0.009±0.002)	1.3±0.1 (0.051±0.004)
3030KK	3.2±0.1 (0.126±0.004)	3.2±0.1 (0.126±0.004)		0.3±0.05 (0.012±0.002)	1.4±0.1 (0.055±0.004)
3030MK					1.6±0.1 (0.063±0.004)
3030QK					1.9±0.1 (0.075±0.004)

Unit: mm (inch)

● Embossed tape 12mm wide (0.47 inches wide)

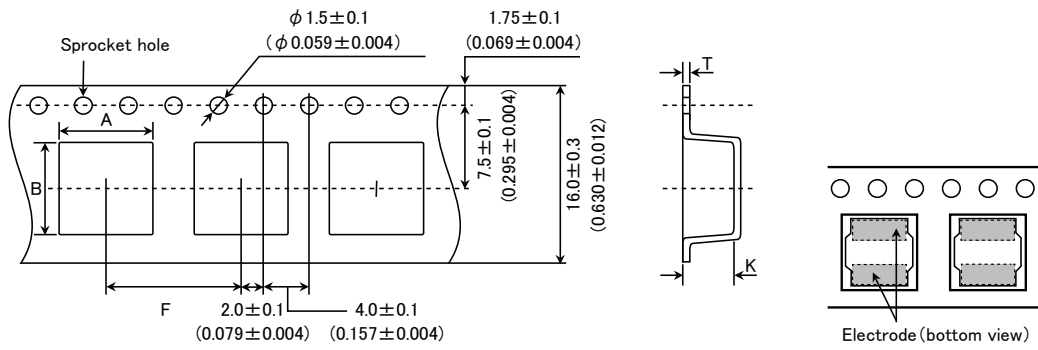


Type	Chip cavity		Insertion pitch F	Tape thickness		
	A	B		T	K	
4040KK	4.3±0.1 (0.169±0.004)	4.3±0.1 (0.169±0.004)	8.0±0.1 (0.315±0.004)	0.3±0.1 (0.012±0.004)	1.4±0.1 (0.055±0.004)	
4040MK					1.6±0.1 (0.063±0.004)	
4040TK 4040WK					2.1±0.1 (0.083±0.004)	
5050KK	5.25±0.1 (0.207±0.004)	5.25±0.1 (0.207±0.004)			1.4±0.1 (0.055±0.004)	
5050MK						1.4±0.1 (0.055±0.004)
5050PK						1.6±0.1 (0.063±0.004)
5050WB 5050WK				2.3±0.1 (0.091±0.004)		
5050WD 5050WE				2.7±0.1 (0.106±0.004)		
5050XK 5050XA				5.15±0.1 (0.203±0.004)		5.15±0.1 (0.203±0.004)
5050YK 5050YA	5.15±0.1 (0.203±0.004)	5.15±0.1 (0.203±0.004)		4.2±0.1 (0.165±0.004)		
6060KK	6.3±0.1 (0.248±0.004)	6.3±0.1 (0.248±0.004)		0.4±0.1 (0.016±0.004)	1.4±0.1 (0.055±0.004)	
6060MK					1.6±0.1 (0.063±0.004)	
6060PK			1.6±0.1 (0.063±0.004)			
6060WK			2.3±0.1 (0.090±0.004)			
6060WH 6060XK			3.1±0.1 (0.122±0.004)			
6060YE			4.7±0.1 (0.185±0.004)			

Unit: mm (inch)

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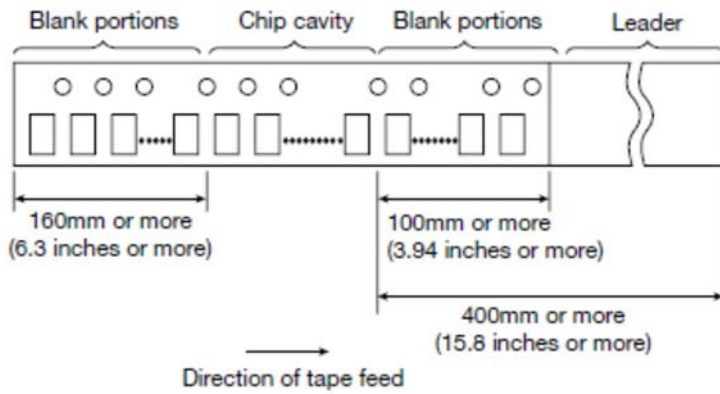
● Embossed tape 16mm wide (0.63 inches wide)



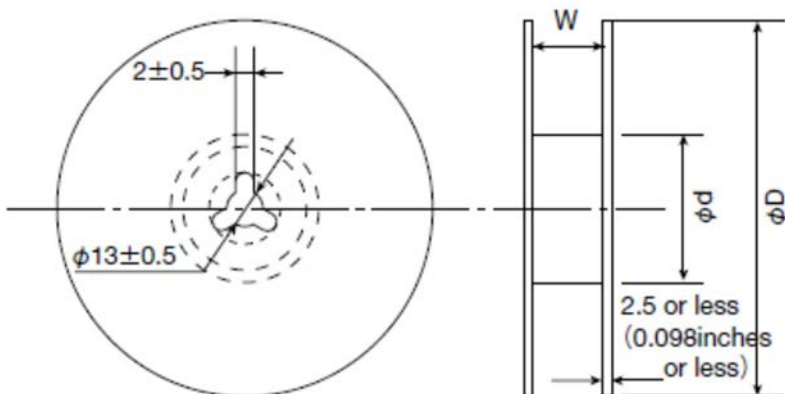
Type	Chip cavity		Insertion pitch F	Tape thickness	
	A	B		T	K
8080XK	8.3 ± 0.1 (0.327 ± 0.004)	8.3 ± 0.1 (0.327 ± 0.004)	12.0 ± 0.1 (0.472 ± 0.004)	0.5 ± 0.1 (0.020 ± 0.004)	3.4 ± 0.1 (0.134 ± 0.004)
8080YK					4.5 ± 0.1 (0.177 ± 0.004)
8080YB					4.5 ± 0.1 (0.177 ± 0.004)

Unit: mm (inch)

④ Leader and Blank portion



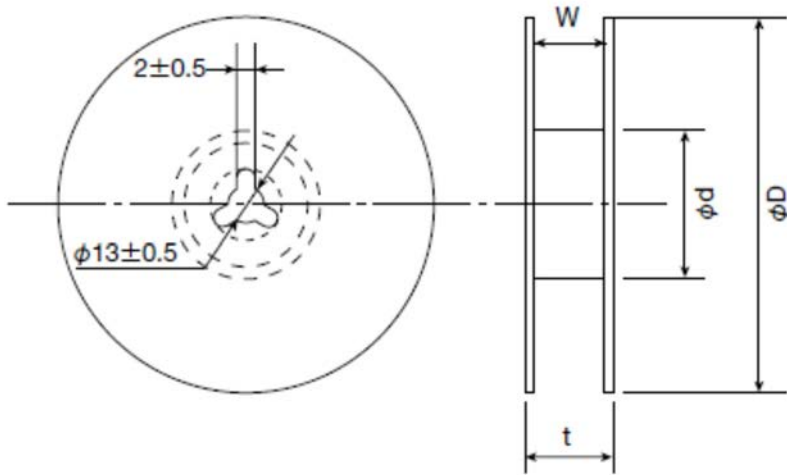
⑤ Reel size



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Type	Reel size (Reference values)		
	ϕD	ϕd	W
2020KK	180±0.5 (7.087±0.019)	60±1.0 (2.36±0.04)	10.0±1.5 (0.394±0.059)
2020MK			
2424KK			
2424MK			
3030KK			
3030MK			
3030QK			
4040WK	180±3.0 (7.087±0.118)	60±2.0 (2.36±0.08)	14.0±1.5 (0.551±0.059)
5050KK			
5050MK			
5050PK			
5050WB			
5050WK			
5050XK			
5050XA			
6060KK			
6060MK			
6060PK			

Unit: mm (inch)

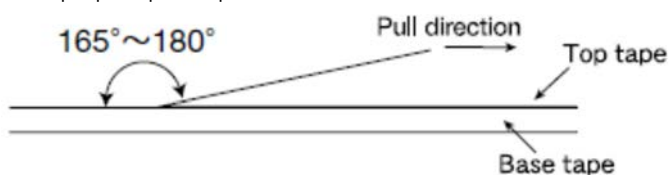


Type	Reel size (Reference values)			
	ϕD	ϕd	t (max.)	W
4040KK	330±3.0 (12.99±0.118)	80±2.0 (3.15±0.078)	18.5 (0.72)	13.5±1.0 (0.531±0.04)
4040MK				
4040TK				
5050WD				
5050WE				
5050YA				
5050YK				
6060WK				
6060WH				
6060XK				
6060YE				
8080XK			22.5 (0.89)	17.5±1.0 (0.689±0.04)
8080YK				
8080YB				
8080YB				

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.



Wire-wound Ferrite Power Inductors LAXH series for Automotive Powertrain and Safety

RELIABILITY DATA

1. Operating Temperature Range	
Specified Value	-40~+150°C (Including self-generated heat)
Test Methods and Remarks	Including self-generated heat
2. Storage Temperature Range	
Specified Value	-40~+125°C
Test Methods and Remarks	-5 to 40°C for the product with taping.
3. Rated current	
Specified Value	Within the specified tolerance
4. Inductance	
Specified Value	Within the specified tolerance
Test Methods and Remarks	Measuring equipment : LCR Meter (HP 4285A or equivalent) Measuring frequency : 100kHz, 1V
5. DC Resistance	
Specified Value	Within the specified tolerance
Test Methods and Remarks	Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)
6. Temperature characteristic	
Specified Value	Inductance change : Within $\pm 20\%$
Test Methods and Remarks	Measurement of inductance shall be taken at temperature range within -40°C~+150°C. With reference to inductance value at +20°C., change rate shall be calculated.
7. Board Flex	
Specified Value	No damage
Test Methods and Remarks	AEC-Q200 Test No.21 qualified (AEC-Q200-005) 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 for 60 s. Test board size : 100 × 40 × 1.6 Test board material : glass epoxy-resin
8. Terminal Strength	
Specified Value	Inductance change : Within $\pm 10\%$
Test Methods and Remarks	AEC-Q200 Test No.22 qualified (AEC-Q200-006) The test samples shall be soldered to the test board by the reflow soldering. Applied force : 17.7N Duration : 60 s

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9. Vibration

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.	
Test Methods and Remarks	AEC-Q200 Test No.14 qualified (MIL-STD-202 Method 204) The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions.	
	Frequency Range	10~2000Hz
	Total Amplitude	5G
	Sweeping Method	10Hz to 2000Hz to 10Hz for 20min.
Number of cycle	X	For 12 cycles on each X, Y, and Z axis.
	Y	
	Z	

10. Mechanical Shock

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.	
Test Methods and Remarks	AEC-Q200 Test No.13qualified (MIL-STD-202 Method213) The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions.	
	Acceleration	981m/s ²
	Duration	6msec(Half sine pulse)
	Direction	+X, +Y, +Z, -X, -Y, -Z
	Number of time	Each 3 times, Total 18 times

11. Solderability

Specified Value	At least 90% of surface of terminal electrode is covered by new solder.		
Test Methods and Remarks	AEC-Q200 Test No.18qualified (J-STD-002)		
		(a) Method B	(c) Method D
	Preconditioning	155°C_4hrs	Steam 8hrs \pm 15min
	Solder Temperature	235 \pm 5°C	260 \pm 5°C
	Time	5+0/-0.5 sec	30+0/-0.5 sec.

12. Resistance to Soldering Heat

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.	
Test Methods and Remarks	AEC-Q200 Test No.15 qualified (MIL-STD-202 Method210) Condition:K	
	The test sample shall be exposed to reflow oven at 183°C for 90-120 seconds, with peak temperature at 250 \pm 5°C for 30 \pm 5 seconds, 3 times.	

13. Temperature Cycling

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.	
Test Methods and Remarks	AEC-Q200 Test No.04 qualified (JESD22 Method JA-104) 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 following condition.	
	1Cycle	-40 \pm 3°C/30 min \leftrightarrow 125 \pm 3°C/30 min
	Number of cycle	1000 cycles

14. Biased Humidity

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.						
Test Methods and Remarks	AEC-Q200 Test No.07 qualified (MIL-STD-202 Method 103) 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"> <tr> <td>Temperature</td> <td>85\pm2$^{\circ}$C</td> </tr> <tr> <td>Humidity</td> <td>85%RH</td> </tr> <tr> <td>Time</td> <td>1000\pm24/-0 hour</td> </tr> </table>	Temperature	85 \pm 2 $^{\circ}$ C	Humidity	85%RH	Time	1000 \pm 24/-0 hour
Temperature	85 \pm 2 $^{\circ}$ C						
Humidity	85%RH						
Time	1000 \pm 24/-0 hour						

15. High Temperature Exposure

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.				
Test Methods and Remarks	AEC-Q200 Test No.03 qualified (MIL-STD-202 Method 108) The test samples shall be soldered to the test board by the reflow soldering. <table border="1"> <tr> <td>Temperature</td> <td>150\pm3$^{\circ}$C</td> </tr> <tr> <td>Time</td> <td>1000\pm24/-0 hour</td> </tr> </table>	Temperature	150 \pm 3 $^{\circ}$ C	Time	1000 \pm 24/-0 hour
Temperature	150 \pm 3 $^{\circ}$ C				
Time	1000 \pm 24/-0 hour				

16. Operational Life

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.						
Test Methods and Remarks	AEC-Q200 Test No.08 qualified (MIL-PRF-27) The test samples shall be soldered to the test board by the reflow soldering. <table border="1"> <tr> <td>Temperature</td> <td>1) 125\pm3$^{\circ}$C 2) 110\pm3$^{\circ}$C</td> </tr> <tr> <td>Applied current</td> <td>1) Rated current(+25$^{\circ}$C) 2) Rated current(+40$^{\circ}$C)</td> </tr> <tr> <td>Time</td> <td>1000\pm24/-0 hour</td> </tr> </table>	Temperature	1) 125 \pm 3 $^{\circ}$ C 2) 110 \pm 3 $^{\circ}$ C	Applied current	1) Rated current(+25 $^{\circ}$ C) 2) Rated current(+40 $^{\circ}$ C)	Time	1000 \pm 24/-0 hour
Temperature	1) 125 \pm 3 $^{\circ}$ C 2) 110 \pm 3 $^{\circ}$ C						
Applied current	1) Rated current(+25 $^{\circ}$ C) 2) Rated current(+40 $^{\circ}$ C)						
Time	1000 \pm 24/-0 hour						

17. Low temperature life test

Specified Value	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. <table border="1"> <tr> <td>Temperature</td> <td>-40\pm2$^{\circ}$C</td> </tr> <tr> <td>Time</td> <td>1000\pm24/-0 hour</td> </tr> </table>	Temperature	-40 \pm 2 $^{\circ}$ C	Time	1000 \pm 24/-0 hour
Temperature	-40 \pm 2 $^{\circ}$ C				
Time	1000 \pm 24/-0 hour				

18. Standard condition

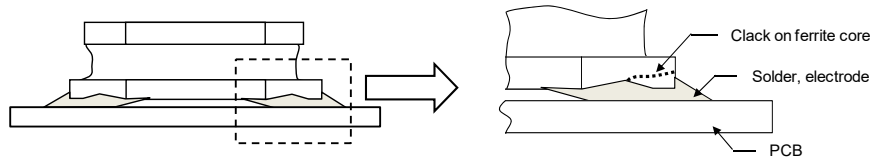
Specified Value	Standard test condition : Unless otherwise specified, temperature is 20 \pm 15 $^{\circ}$ C and 65 \pm 20%of relative humidity. When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of 20 \pm 2 $^{\circ}$ C of temperature, 65 \pm 5% relative humidity. Inductance is in accordance with our measured value.
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Wire-wound Ferrite Power Inductors LAYP series for Automotive Powertrain and safety
 Wire-wound Ferrite Power Inductors LAXH series for Automotive Powertrain and safety
 Wire-wound Ferrite Power Inductors LCXN/LCXP series for Automotive Body & Chassis and Infotainment
 Wire-wound Ferrite Power Inductors LCXH series for Automotive Body & Chassis and Infotainment
 Wire-wound Ferrite Inductors for Class D Amplifier LCXA for Automotive Body & Chassis and Infotainment
 Wire-wound Ferrite Power Inductors LCRN series for Automotive Body & Chassis and Infotainment
 Wire-wound Ferrite Power Inductors LBXN/LBXP series
 for Telecommunications Infrastructure and Industrial Equipment
 Wire-wound Ferrite Power Inductors LBXH series
 for Telecommunications Infrastructure and Industrial Equipment
 Wire-wound Ferrite Power Inductors LBRN series
 for Telecommunications Infrastructure and Industrial Equipment
 Wire-wound Ferrite Power Inductors LMXN/LMXP series
 for Medical Devices classified as GHTF Class C (Japan Class III)
 Wire-wound Ferrite Power Inductors LMXH series
 for Medical Devices classified as GHTF Class C (Japan Class III)
 Wire-wound Ferrite Power Inductors LMRN series
 for Medical Devices classified as GHTF Class C (Japan Class III)

■ PRECAUTIONS

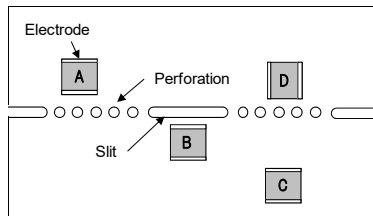
1. Circuit Design	
Precautions	<ul style="list-style-type: none"> ◆ Verification of operating environment, electrical rating and performance <ol style="list-style-type: none"> 1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications. As such, any inductors to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications. 2. When inductors are used in places where dew condensation develops and/or where corrosive gas such as hydrogen sulfide, sulfurous acid, or chlorine exists in the air, characteristic deterioration may occur. Please do not use inductors under such environmental conditions. ◆ Operating Current (Verification of Rated current) <ol style="list-style-type: none"> 1. The operating current including inrush current for inductors must always be lower than their rated values. 2. Do not apply current in excess of the rated value because the inductance may be reduced due to the magnetic saturation effect. ◆ Temperature rise <p style="margin-left: 20px;">Temperature rise of power choke coil depends on the installation condition in end products. Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.</p>
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. 2. There is stress, which has been caused by distortion of a PCB, to the inductor. (LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH) 3. Please consider the arrangement of parts on a PCB. (LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH)
Technical considerations	<ul style="list-style-type: none"> ◆ Land pattern design <p>Surface Mounting</p> <ol style="list-style-type: none"> 1. Mounting and soldering conditions should be checked beforehand. 2. Applicable soldering process to this products is reflow soldering only. 3. Please use the recommended land pattern shown as below. Electrical characteristics and the mounting ability of the product are being considered in the recommended land pattern. If a PCB is designed with other dimensions, defective soldering and stress to a product may occur due to misalignment. The performance of the product may not be brought out. If an adopted land pattern is different from the recommended land pattern, stress to the product will increase. It may cause cracks or defective electrical characteristics of the product. Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility. (LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH) 4. As coefficients of thermal expansion between an inductor and a PCB differs, cracks may occur on a ferrite core when thermal stress is applied to them after mounting an inductor. (Please refer to the drawings below.) Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility. (LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH)

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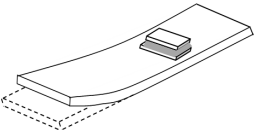
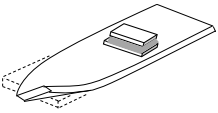
5. SMD inductors should be located to minimize any possible mechanical stresses from board warp or deflection. When splitting the PC board after mounting inductors and other components, care is required so as not to give any stresses of deflection or twisting to the board.

(LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH)

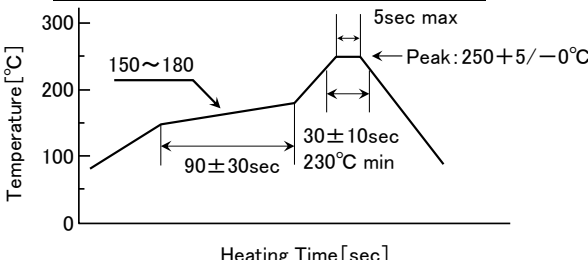
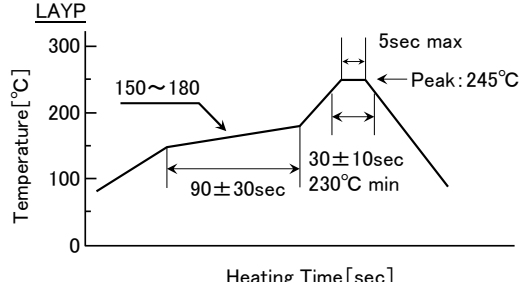


A product tends to undergo stress in order "A>C>B≡D". Please consider the layouts of a product to minimize any stresses.

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. 2. Stress may be applied to a product with a warp or a twist in handling of the product. Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility. <p>(LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH)</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><Wrap></p>  </div> <div style="text-align: center;"> <p><Twist></p>  </div> </div>

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(Repair) <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. <p>Recommended reflow condition (Pb free solder) <u>LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP,</u> <u>LCXH/LCXA/LBXH/LMXH, LCRN/LBRN/LMRN</u></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div>

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5. Cleaning	
Precautions	<ul style="list-style-type: none"> ◆ Cleaning conditions 1. Washing by supersonic waves shall be avoided.
Technical considerations	<ul style="list-style-type: none"> ◆ Cleaning conditions 1. If washed by supersonic waves, the products might be broken.
6. Handling	
Precautions	<ul style="list-style-type: none"> ◆ Handling 1. Keep the product away from all magnets and magnetic objects. ◆ Breakaway PC boards (splitting along perforations) 1. When splitting the PC board after mounting product, care should be taken not to give any stresses of deflection or twisting to the board. 2. Board separation should not be done manually, but by using the appropriate devices. ◆ Mechanical considerations 1. Please do not give the product any excessive mechanical shocks. 2. Please do not add any shock and power to a product in transportation. ◆ Pick-up pressure 1. Please do not push to add any pressure to a winding part. Please do not give any shock and push into a ferrite core exposure part. ◆ Packing 1. Please avoid accumulation of a packing box as much as possible.
Technical considerations	<ul style="list-style-type: none"> ◆ Handling 1. There is a case that a characteristic varies with magnetic influence. ◆ Breakaway PC boards (splitting along perforations) 1. The position of the product on PCBs shall be carefully considered to minimize the stress caused from splitting of the PCBs. ◆ Mechanical considerations 1. There is a case to be damaged by a mechanical shock. 2. There is a case to be broken by the handling in transportation. ◆ Pick-up pressure 1. Damage and a characteristic can vary with an excessive shock or stress. ◆ Packing 1. If packing boxes are accumulated, that could cause a deformation on packing tapes or a damage on the products.
7. Storage conditions	
Precautions	<ul style="list-style-type: none"> ◆ Storage 1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled. <ul style="list-style-type: none"> ▪ Storage conditions Ambient temperature : $-5\sim 40^{\circ}\text{C}$ Humidity : Below 70% RH ▪ The recommended ambient temperature is below 30°C. Even under ideal storage conditions, solderability of products electrodes may decrease as time passes. For this reason, product should be used within 6 months from the time of delivery. In case of storage over 6 months, solderability shall be checked before actual usage.
Technical considerations	<ul style="list-style-type: none"> ◆ Storage 1. Under a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place.

车载(控制系 / 安全系)用途 绕线型铁氧体系功率电感器 LAYP 系列

系列前的记号来自型号, 用来区分产品的种类和特性等。

AEC-Q200 Grade 1 (已完成 Grade 1 条件下的评价测试。)

*使用环境温度: -55~125°C

回流焊

AEC-Q200

■ 型号标示法

*使用温度范围: -55~150°C (包含产品本身发热)

L	A	Y	P	H	1	0	0	6	0	D	L	1	0	0	M	G	A
①	②	③	④	⑤	⑥	⑦	⑧	⑨									

① 系列

代码 (1)(2)(3)(4)	
LAYP	车载(控制系 / 安全系)用途 绕线型铁氧体系功率电感器

(1) 产品群

代码	
L	电感器

(3) 类型

代码	
Y	绕线型铁氧体系 鼓形筒状固定夹座型

(2) 范畴

代码	推荐设备	品质等级
A	汽车用电子设备(控制系 / 安全系)	1

(4) 特效 / 特性

代码	
P	大电流功率扼流

② 特征

代码	特征
H	底面电极(框型)

⑥ 包装

代码	包装
L	卷盘带装

③ 尺寸(L×W)

代码	尺寸(L×W) [mm]
060	6.3×6.0
100	10.1×10.0

⑦ 标称电感值

代码(例)	标称电感值 [μH]
1R0	1.0
100	10
101	100

※R=小数点

④ 尺寸(H)

代码	尺寸(H) [mm]
40	4.0
45	4.5
60	6.0

⑧ 电感量公差

代码	电感量公差
M	±20%
N	±30%

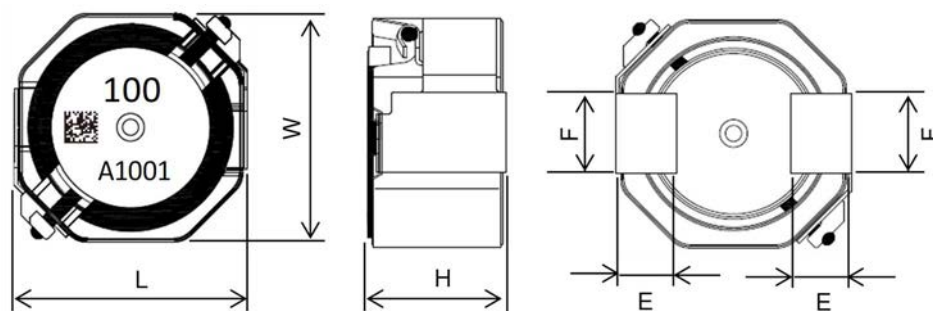
⑤ 使用温度范围

代码	使用温度范围 [°C]
D	-55~150

⑨ 管理记号

▶ 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/>)。

■标准外形尺寸 / 最小订货单位数量



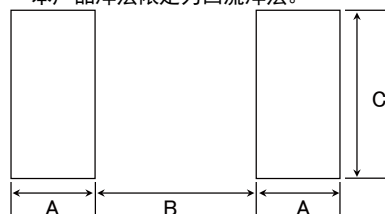
Type	L	W	H	E	F	最小订货单位数量 [pcs]
06045	6.3±0.3 (0.248±0.012)	6.0±0.3 (0.236±0.012)	4.5±0.3 (0.177±0.012)	1.7±0.2 (0.067±0.008)	2.0±0.15 (0.079±0.006)	1000
10040	10.1±0.3 (0.398±0.012)	10.0±0.3 (0.394±0.012)	4.0±0.3 (0.157±0.012)	2.65±0.2 (0.104±0.008)	3.5±0.15 (0.138±0.006)	700
10060	10.1±0.3 (0.398±0.012)	10.0±0.3 (0.394±0.012)	6.0±0.3 (0.236±0.012)	2.65±0.2 (0.104±0.008)	3.5±0.15 (0.138±0.006)	500

单位: mm (inch)

推荐焊盘图案

安装上的注意

- 请确认实装状态后使用。
- 本产品焊法限定为回流焊法。



Type	A	B	C
06045	2.2	2.8	2.3
10040	3.2	4.6	3.8
10060	3.2	4.6	3.8

单位: mm

PART NUMBER

• All the Wire-wound Ferrite Power Inductors of the catalog lineup are RoHS compliant.

Notes)

- The exchange of individual specifications is necessary depending on your application and/or circuit condition. Please contact TAIYO YUDEN's official sales channel.
- For Automotive (AEC-Q200 Qualified) products for POWERTRAIN, and SAFETY. Please check "Automotive Application Guide" for further details before using the products.
< AEC-Q200 :AEC-Q200 qualified >
- All the Wire-wound Ferrite Power Inductors for Automotive products are tested based on the test conditions and methods defined in AEC-Q200 by family item.
Please consult with TAIYO YUDEN's official sales channel for the details of the product specifications and AEC-Q200 test results, etc.,
and please review and approve the product specifications before ordering.

06045 type

New part number	Old part number (for reference)	Nominal Inductance [μH]	Inductance tolerance	DC Resistance [mΩ] Typ	Rated current ※) [A]			Measuring frequency [kHz]
					Saturation current Idc1 Max (Typ)	Temperature rise current① Idc2 Max (Typ)	Temperature rise current② Idc2 Max (Typ)	
LAYPH06045DL1R0NGA	EST0645T1R0NDGA	1	±30%	9±30%	6.70 (8.00)	3.50 (4.00)	4.20 (5.30)	100
LAYPH06045DL1R5NGA	EST0645T1R5NDGA	1.5	±30%	10±30%	5.50 (6.40)	3.20 (3.80)	4.00 (5.10)	100
LAYPH06045DL2R2NGA	EST0645T2R2NDGA	2.2	±30%	13±30%	4.20 (5.40)	2.80 (3.30)	3.60 (4.40)	100
LAYPH06045DL3R3NGA	EST0645T3R3NDGA	3.3	±30%	15±30%	3.50 (4.00)	2.50 (3.00)	3.30 (4.15)	100
LAYPH06045DL4R7NGA	EST0645T4R7NDGA	4.7	±30%	20±30%	3.10 (3.50)	2.30 (2.80)	3.00 (3.50)	100
LAYPH06045DL6R8NGA	EST0645T6R8NDGA	6.8	±30%	29±30%	2.50 (3.00)	2.00 (2.40)	2.60 (3.00)	100
LAYPH06045DL100MGA	EST0645T100MDGA	10	±20%	38±20%	2.00 (2.30)	1.70 (2.00)	2.10 (2.50)	100
LAYPH06045DL150MGA	EST0645T150MDGA	15	±20%	64±20%	1.70 (2.00)	1.40 (1.60)	1.70 (1.90)	100
LAYPH06045DL220MGA	EST0645T220MDGA	22	±20%	79±20%	1.30 (1.60)	1.10 (1.30)	1.50 (1.75)	100
LAYPH06045DL330MGA	EST0645T330MDGA	33	±20%	100±20%	1.10 (1.30)	0.95 (1.10)	1.40 (1.60)	100
LAYPH06045DL470MGA	EST0645T470MDGA	47	±20%	135±20%	0.85 (1.10)	0.86 (1.00)	1.20 (1.35)	100
LAYPH06045DL680MGA	EST0645T680MDGA	68	±20%	210±20%	0.80 (0.92)	0.73 (0.84)	0.90 (1.10)	100
LAYPH06045DL101MGA	EST0645T101MDGA	100	±20%	320±20%	0.55 (0.77)	0.56 (0.65)	0.70 (0.86)	100
LAYPH06045DL151MGA	EST0645T151MDGA	150	±20%	475±20%	0.50 (0.64)	0.49 (0.56)	0.65 (0.72)	100
LAYPH06045DL221MGA	EST0645T221MDGA	220	±20%	670±20%	0.44 (0.53)	0.36 (0.42)	0.50 (0.59)	100
LAYPH06045DL331MGA	EST0645T331MDGA	330	±20%	950±20%	0.36 (0.43)	0.30 (0.34)	0.40 (0.48)	100

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

※) The temperature rise current value (Idc2)① is the DC current value having temperature increase up to 25°C. (at 20°C)

※) The temperature rise current value (Idc2)② is the DC current value having temperature increase up to 40°C. (at 20°C)

※) The temperature rise current value (Idc2)② is a reference value.

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

10040 type

New part number	Old part number (for reference)	Nominal Inductance [μH]	Inductance tolerance	DC Resistance [mΩ] Typ	Rated current ※) [A]			Measuring frequency [kHz]
					Saturation current Idc1 Max (Typ)	Temperature rise current① Idc2 Max (Typ)	Temperature rise current② Idc2 Max (Typ)	
LAYPH10040DL1R0NGA	EST1040T1R0NDGA	1	±30%	8.0±30%	10.70 (11.70)	3.60 (4.60)	5.00 (5.50)	100
LAYPH10040DL1R5NGA	EST1040T1R5NDGA	1.5	±30%	9.6±30%	8.60 (9.80)	3.30 (4.30)	4.60 (5.10)	100
LAYPH10040DL2R2NGA	EST1040T2R2NDGA	2.2	±30%	11.0±30%	7.50 (8.30)	3.10 (4.00)	4.30 (4.70)	100
LAYPH10040DL3R3NGA	EST1040T3R3NDGA	3.3	±30%	13.0±30%	6.60 (7.20)	2.90 (3.60)	3.90 (4.20)	100
LAYPH10040DL4R7NGA	EST1040T4R7NDGA	4.7	±30%	19.0±30%	5.20 (5.70)	2.70 (3.40)	3.60 (3.90)	100
LAYPH10040DL6R8NGA	EST1040T6R8NDGA	6.8	±30%	24.0±30%	4.30 (4.80)	2.30 (2.90)	3.10 (3.40)	100
LAYPH10040DL100MGA	EST1040T100MDGA	10	±20%	29.0±20%	3.70 (3.90)	2.00 (2.60)	2.70 (3.00)	100
LAYPH10040DL150MGA	EST1040T150MDGA	15	±20%	43.0±20%	2.90 (3.40)	1.60 (2.10)	2.20 (2.50)	100
LAYPH10040DL220MGA	EST1040T220MDGA	22	±20%	62.0±20%	2.50 (2.90)	1.50 (1.80)	2.00 (2.10)	100
LAYPH10040DL330MGA	EST1040T330MDGA	33	±20%	96.0±20%	2.00 (2.30)	1.10 (1.40)	1.50 (1.60)	100
LAYPH10040DL470MGA	EST1040T470MDGA	47	±20%	135.0±20%	1.70 (2.00)	0.76 (1.10)	1.15 (1.30)	100
LAYPH10040DL680MGA	EST1040T680MDGA	68	±20%	180.0±20%	1.40 (1.60)	0.74 (1.00)	1.10 (1.20)	100
LAYPH10040DL101MGA	EST1040T101MDGA	100	±20%	285.0±20%	1.10 (1.30)	0.59 (0.77)	0.83 (0.91)	100
LAYPH10040DL151MGA	EST1040T151MDGA	150	±20%	395.0±20%	0.94 (1.10)	0.44 (0.61)	0.66 (0.74)	100
LAYPH10040DL221MGA	EST1040T221MDGA	220	±20%	530.0±20%	0.77 (0.88)	0.41 (0.54)	0.59 (0.65)	100
LAYPH10040DL331MGA	EST1040T331MDGA	330	±20%	960.0±20%	0.61 (0.70)	0.29 (0.38)	0.41 (0.45)	100
LAYPH10040DL471MGA	EST1040T471MDGA	470	±20%	1200.0±20%	0.53 (0.61)	0.25 (0.35)	0.38 (0.40)	100

※) The saturation current value (Idc1) is the DC current value having inductance decrease down to 10%. (at 20°C)

※) The temperature rise current value (Idc2)① is the DC current value having temperature increase up to 25°C. (at 20°C)

※) The temperature rise current value (Idc2)② is the DC current value having temperature increase up to 30°C. (at 20°C)

※) The temperature rise current value (Idc2)② is a reference value.

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

■ PART NUMBER

● 10060 type

New part number	Old part number (for reference)	Nominal Inductance [μ H]	Inductance tolerance	DC Resistance [m Ω] Typ	Rated current ※) [A]			Measuring frequency [kHz]
					Saturation current Idc1 Max (Typ)	Temperature rise current① Idc2 Max (Typ)	Temperature rise current② Idc2 Max (Typ)	
LAYPH10060DL1R0NGA	EST1060T1R0NDGA	1	$\pm 30\%$	4.5 $\pm 30\%$	9.70 (15.00)	6.00 (7.00)	9.00 (11.00)	100
LAYPH10060DL1R5NGA	EST1060T1R5NDGA	1.5	$\pm 30\%$	5.6 $\pm 30\%$	9.00 (14.00)	5.60 (6.40)	8.00 (10.00)	100
LAYPH10060DL2R2NGA	EST1060T2R2NDGA	2.2	$\pm 30\%$	6.6 $\pm 30\%$	7.50 (11.00)	5.20 (6.00)	7.50 (9.00)	100
LAYPH10060DL3R3NGA	EST1060T3R3NDGA	3.3	$\pm 30\%$	9.0 $\pm 30\%$	7.00 (9.50)	4.70 (5.50)	6.50 (8.00)	100
LAYPH10060DL4R7NGA	EST1060T4R7NDGA	4.7	$\pm 30\%$	11.0 $\pm 30\%$	5.80 (8.00)	4.20 (4.90)	5.50 (6.80)	100
LAYPH10060DL6R8NGA	EST1060T6R8NDGA	6.8	$\pm 30\%$	16.0 $\pm 30\%$	5.50 (6.60)	3.50 (4.20)	5.00 (6.10)	100
LAYPH10060DL100MGA	EST1060T100MDGA	10	$\pm 20\%$	22.0 $\pm 20\%$	4.30 (5.20)	3.00 (3.70)	4.30 (5.10)	100
LAYPH10060DL150MGA	EST1060T150MDGA	15	$\pm 20\%$	31.0 $\pm 20\%$	3.70 (4.40)	2.50 (3.20)	3.60 (4.30)	100
LAYPH10060DL220MGA	EST1060T220MDGA	22	$\pm 20\%$	44.0 $\pm 20\%$	3.10 (3.60)	2.10 (2.60)	2.80 (3.30)	100
LAYPH10060DL330MGA	EST1060T330MDGA	33	$\pm 20\%$	61.0 $\pm 20\%$	2.40 (3.10)	1.80 (2.10)	2.60 (3.10)	100
LAYPH10060DL470MGA	EST1060T470MDGA	47	$\pm 20\%$	82.0 $\pm 20\%$	2.10 (2.35)	1.40 (1.80)	2.20 (2.60)	100
LAYPH10060DL680MGA	EST1060T680MDGA	68	$\pm 20\%$	101.0 $\pm 20\%$	1.70 (2.05)	1.30 (1.60)	2.00 (2.40)	100
LAYPH10060DL101MGA	EST1060T101MDGA	100	$\pm 20\%$	169.0 $\pm 20\%$	1.40 (1.65)	0.93 (1.20)	1.50 (1.70)	100
LAYPH10060DL151MGA	EST1060T151MDGA	150	$\pm 20\%$	246.0 $\pm 20\%$	1.20 (1.35)	0.72 (0.95)	1.30 (1.50)	100
LAYPH10060DL221MGA	EST1060T221MDGA	220	$\pm 20\%$	320.0 $\pm 20\%$	0.95 (1.15)	0.66 (0.86)	1.00 (1.30)	100
LAYPH10060DL331MGA	EST1060T331MDGA	330	$\pm 20\%$	458.0 $\pm 20\%$	0.75 (0.90)	0.58 (0.72)	0.90 (1.00)	100
LAYPH10060DL471MGA	EST1060T471MDGA	470	$\pm 20\%$	775.0 $\pm 20\%$	0.65 (0.75)	0.39 (0.50)	0.70 (0.80)	100

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

※) The temperature rise current value (Idc2)① is the DC current value having temperature increase up to 25°C. (at 20°C)

※) The temperature rise current value (Idc2)② is the DC current value having temperature increase up to 40°C. (at 20°C)

※) The temperature rise current value (Idc2)② is a reference value.

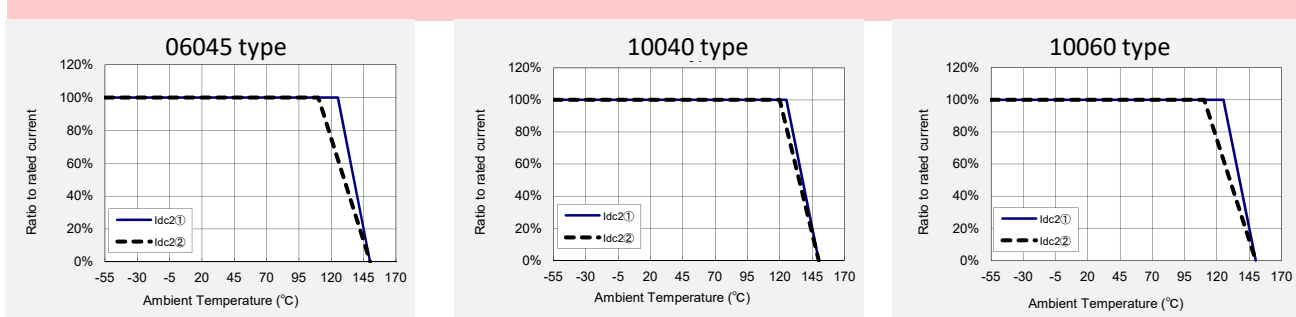
※) The rated current is the DC current value that satisfies both of current value saturation current value and temperature rise current value.

■ Derating of Rated Current

● LAYP series

Derating of current is necessary for LAYP series depending on ambient temperature.

Please refer to the chart shown below for appropriate derating of current.



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Wire-wound Ferrite Power Inductors LAYP series

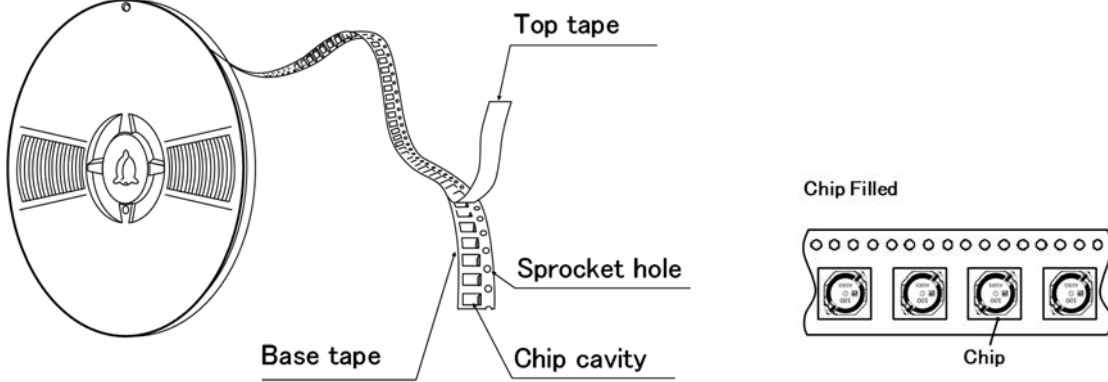
PACKAGING

① Packing Quantity

Type	Standard Quantity (1reel) [pcs]	Minimum Quantity [pcs]
	Embossed Tape	Embossed Tape
06045	1000	1000
10040	700	700
10060	500	500

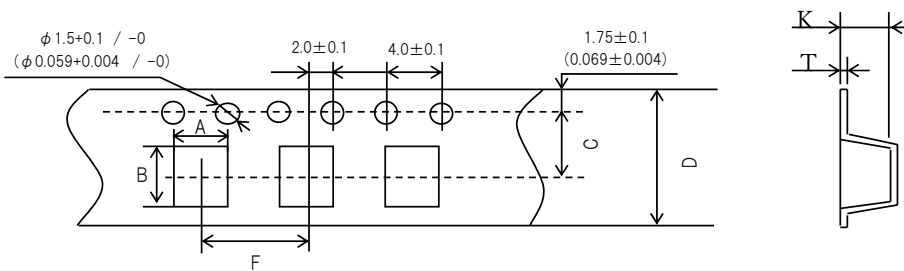
② Tape Material

● Embossed Tape



③ Taping dimensions

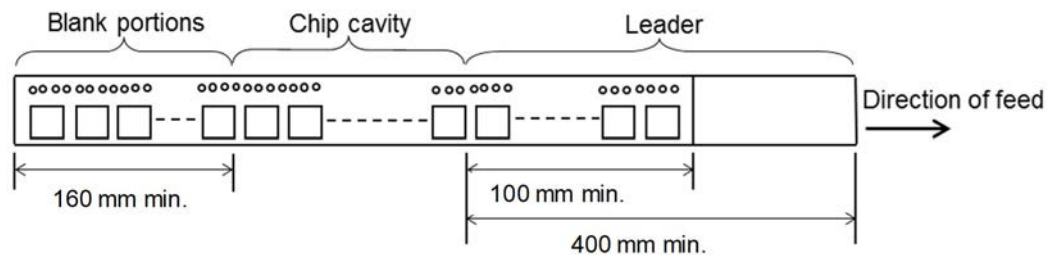
● Embossed tape



Type	Chip cavity		C	D	Insertion pitch F	Tape thickness	
	A	B				T	K
06045	6.5 ± 0.1 (0.256 ± 0.004)	6.1 ± 0.1 (0.240 ± 0.004)	7.5 ± 0.1 (0.295 ± 0.004)	16.0 ± 0.2 (0.630 ± 0.008)	12.0 ± 0.1 (0.472 ± 0.004)	0.5 ± 0.05 (0.020 ± 0.002)	4.8 ± 0.1 (0.189 ± 0.004)
10040	10.5 ± 0.1 (0.413 ± 0.004)	10.5 ± 0.1 (0.413 ± 0.004)	11.5 ± 0.1 (0.453 ± 0.004)	24.0 ± 0.2 (0.945 ± 0.008)	16.0 ± 0.1 (0.630 ± 0.004)	0.5 ± 0.05 (0.020 ± 0.002)	4.6 ± 0.1 (0.181 ± 0.004)
10060	10.5 ± 0.1 (0.413 ± 0.004)	10.5 ± 0.1 (0.413 ± 0.004)	11.5 ± 0.1 (0.453 ± 0.004)	24.0 ± 0.2 (0.945 ± 0.008)	16.0 ± 0.1 (0.630 ± 0.004)	0.5 ± 0.05 (0.020 ± 0.002)	6.5 ± 0.1 (0.256 ± 0.004)

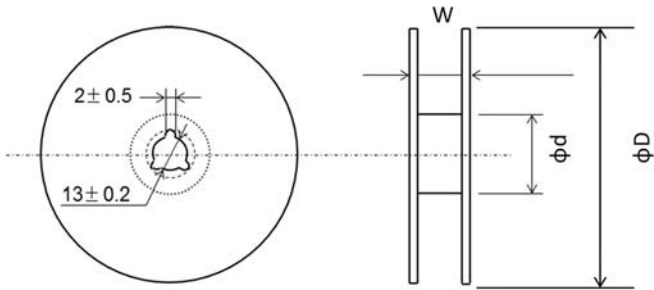
Unit: mm (inch)

④ Leader and Blank portion



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⑤ Reel size

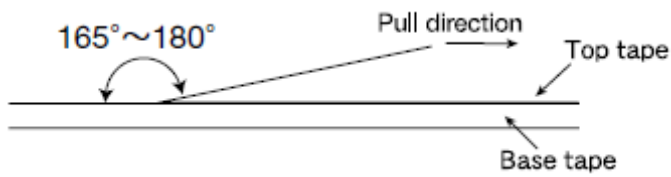


Type	Reel size (Reference values)		
	ϕD	ϕd	W
06045	330 ± 2.0 (12.99 ± 0.079)	80 ± 1.0 (3.15 ± 0.039)	21.5 ± 1.0 (0.846 ± 0.039)
10040	330 ± 2.0 (12.99 ± 0.079)	100 ± 1.0 (3.937 ± 0.039)	29.5 ± 1.0 (1.161 ± 0.039)
10060	330 ± 2.0 (12.99 ± 0.079)	100 ± 1.0 (3.937 ± 0.039)	29.5 ± 1.0 (1.161 ± 0.039)

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.



Wire-wound Ferrite Power Inductors LAYP series for Automotive Powertrain and Safety

RELIABILITY DATA

1. Operating Temperature Range	
Specified Value	-55~+150°C (Including self-generated heat)
Test Methods and Remarks	Including self-generated heat
2. Storage Temperature Range	
Specified Value	-40~+85°C
Test Methods and Remarks	-5 to 40°C for the product with taping.
3. Rated current	
Specified Value	Within the specified tolerance
4. Inductance	
Specified Value	Within the specified tolerance
Test Methods and Remarks	Measuring equipment : LCR Meter (HP 4285A or equivalent) Measuring frequency : 100kHz, 1V
5. DC Resistance	
Specified Value	Within the specified tolerance
Test Methods and Remarks	Measuring equipment : DC ohmmeter (HIOKI 3541 or equivalent)
6. Self resonance frequency	
Specified Value	—
7. Temperature characteristic	
Specified Value	Inductance change : Within $\pm 20\%$
Test Methods and Remarks	Measurement of inductance shall be taken at temperature range within -55°C~+150°C. With reference to inductance value at +20°C., change rate shall be calculated.
8. Board Flex	
Specified Value	No damage
Test Methods and Remarks	AEC-Q200 Test No.21 qualified (AEC-Q200-005) 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 for 60 s. Test board size : 100 × 40 × 1.6 Test board material : glass epoxy-resin
9. Insulation resistance : between wires	
Specified Value	—
10. Insulation resistance : between top side of sample and the terminal	
Specified Value	DC100V 100M Ω minimum

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11. Withstanding voltage : between top side of sample and the terminal

Specified Value	AC100V No break of insulation
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12. Terminal Strength

Specified Value	Inductance change : Within $\pm 10\%$
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Test Methods and Remarks	AEC-Q200 Test No.22 qualified (AEC-Q200-006) The test samples shall be soldered to the test board by the reflow soldering. Applied force : 17.7N Duration : 60 s
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13. Vibration

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
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Test Methods and Remarks	AEC-Q200 Test No.14 qualified (MIL-STD-202 Method 204) The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions.				
	Frequency Range	10~2000Hz			
	Total Amplitude	5G			
	Sweeping Method	10Hz to 2000Hz to 10Hz for 20min.			
	Number of cycle	<table border="1"> <tr> <td>X</td> <td rowspan="3">For 12 cycles on each X, Y, and Z axis.</td> </tr> <tr> <td>Y</td> </tr> <tr> <td>Z</td> </tr> </table>	X	For 12 cycles on each X, Y, and Z axis.	Y
X	For 12 cycles on each X, Y, and Z axis.				
Y					
Z					

14. Mechanical Shock

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
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Test Methods and Remarks	AEC-Q200 Test No.13qualified (MIL-STD-202 Method213) The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions.	
	Acceleration	981m/s ²
	Duration	6msec(Half sine pulse)
	Direction	+X, +Y, +Z, -X, -Y, -Z
	Number of time	Each 3 times, Total 18 times

15. Solderability

Specified Value	At least 90% of surface of terminal electrode is covered by new solder.
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Test Methods and Remarks	AEC-Q200 Test No.18qualified (J-STD-002)		
		(a) Method B	(c) Method D
	Preconditioning	155°C 4hrs	Steam 8hrs \pm 15min
	Solder Temperature	235 \pm 5°C	260 \pm 5°C
	Time	5+0/-0.5 sec	30+0/-0.5 sec.

16. Resistance to Soldering Heat

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.
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Test Methods and Remarks	AEC-Q200 Test No.15 qualified (MIL-STD-202 Method210) Condition:K The test sample shall be exposed to reflow oven at 183°C for 90-120 seconds, with peak temperature at 250 \pm 5°C for 30 \pm 5 seconds, 3 times.
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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/>).

17. Temperature Cycling

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.	
Test Methods and Remarks	AEC-Q200 Test No.04 qualified (JESD22 Method JA-104) 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 following condition.	
	1Cycle	$-55 \pm 3^{\circ}\text{C}/30 \text{ min} \Leftrightarrow 150 \pm 3^{\circ}\text{C}/30 \text{ min}$
	Number of cycle	1000 cycles

18. Biased Humidity

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.	
Test Methods and Remarks	AEC-Q200 Test No.07 qualified (MIL-STD-202 Method 103) 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	$85 \pm 2^{\circ}\text{C}$
	Humidity	85%RH
	Time	1000 +24/ -0 hour

19. High Temperature Exposure

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.	
Test Methods and Remarks	AEC-Q200 Test No.03 qualified (MIL-STD-202 Method 108) The test samples shall be soldered to the test board by the reflow soldering.	
	Temperature	$150 \pm 3^{\circ}\text{C}$
	Time	1000 +24/ -0 hour

20. Operational Life

Specified Value	Inductance change : Within $\pm 10\%$ No significant abnormality in appearance.	
Test Methods and Remarks	AEC-Q200 Test No.08 qualified (MIL-PRF-27) The test samples shall be soldered to the test board by the reflow soldering.	
	Temperature	$125 \pm 3^{\circ}\text{C}$
	Applied current	Rated current
	Time	1000 +24/ -0 hour

21. Standard condition

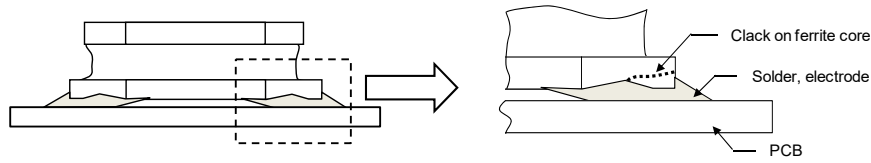
Specified Value	Standard test condition : Unless otherwise specified, temperature is $20 \pm 15^{\circ}\text{C}$ and $65 \pm 20\%$ of relative humidity. When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of $20 \pm 2^{\circ}\text{C}$ of temperature, $65 \pm 5\%$ relative humidity. Inductance is in accordance with our measured value.
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Wire-wound Ferrite Power Inductors LAYP series for Automotive Powertrain and safety
 Wire-wound Ferrite Power Inductors LAXH series for Automotive Powertrain and safety
 Wire-wound Ferrite Power Inductors LCXN/LCXP series for Automotive Body & Chassis and Infotainment
 Wire-wound Ferrite Power Inductors LCXH series for Automotive Body & Chassis and Infotainment
 Wire-wound Ferrite Inductors for Class D Amplifier LCXA for Automotive Body & Chassis and Infotainment
 Wire-wound Ferrite Power Inductors LCRN series for Automotive Body & Chassis and Infotainment
 Wire-wound Ferrite Power Inductors LBXN/LBXP series
 for Telecommunications Infrastructure and Industrial Equipment
 Wire-wound Ferrite Power Inductors LBXH series
 for Telecommunications Infrastructure and Industrial Equipment
 Wire-wound Ferrite Power Inductors LBRN series
 for Telecommunications Infrastructure and Industrial Equipment
 Wire-wound Ferrite Power Inductors LMXN/LMXP series
 for Medical Devices classified as GHTF Class C (Japan Class III)
 Wire-wound Ferrite Power Inductors LMXH series
 for Medical Devices classified as GHTF Class C (Japan Class III)
 Wire-wound Ferrite Power Inductors LMRN series
 for Medical Devices classified as GHTF Class C (Japan Class III)

■ PRECAUTIONS

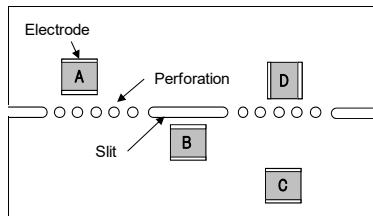
1. Circuit Design	
Precautions	<ul style="list-style-type: none"> ◆ Verification of operating environment, electrical rating and performance <ol style="list-style-type: none"> 1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications. As such, any inductors to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications. 2. When inductors are used in places where dew condensation develops and/or where corrosive gas such as hydrogen sulfide, sulfurous acid, or chlorine exists in the air, characteristic deterioration may occur. Please do not use inductors under such environmental conditions. ◆ Operating Current (Verification of Rated current) <ol style="list-style-type: none"> 1. The operating current including inrush current for inductors must always be lower than their rated values. 2. Do not apply current in excess of the rated value because the inductance may be reduced due to the magnetic saturation effect. ◆ Temperature rise <p style="margin-left: 20px;">Temperature rise of power choke coil depends on the installation condition in end products. Make sure that temperature rise of power choke coils in actual end products is within the specified temperature range.</p>
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. 2. There is stress, which has been caused by distortion of a PCB, to the inductor. (LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH) 3. Please consider the arrangement of parts on a PCB. (LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH)
Technical considerations	<ul style="list-style-type: none"> ◆ Land pattern design <p>Surface Mounting</p> <ol style="list-style-type: none"> 1. Mounting and soldering conditions should be checked beforehand. 2. Applicable soldering process to this products is reflow soldering only. 3. Please use the recommended land pattern shown as below. Electrical characteristics and the mounting ability of the product are being considered in the recommended land pattern. If a PCB is designed with other dimensions, defective soldering and stress to a product may occur due to misalignment. The performance of the product may not be brought out. If an adopted land pattern is different from the recommended land pattern, stress to the product will increase. It may cause cracks or defective electrical characteristics of the product. Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility. (LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH) 4. As coefficients of thermal expansion between an inductor and a PCB differs, cracks may occur on a ferrite core when thermal stress is applied to them after mounting an inductor. (Please refer to the drawings below.) Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility. (LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH)

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



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

(LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH)



A product tends to undergo stress in order "A>C>B≡D". Please consider the layouts of a product to minimize any stresses.

3. Considerations for automatic placement

Precautions	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine 1. Excessive impact load should not be imposed on the products when mounting onto the PC boards. 2. Mounting and soldering conditions should be checked beforehand.
Technical considerations	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine 1. When installing products, care should be taken not to apply distortion stress as it may deform the products. 2. Stress may be applied to a product with a warp or a twist in handling of the product. Please conduct validation completely before studying adoption of this product and please judge the pros and cons of adoption of this product with taking on responsibility. (LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP, LCXH/LCXA/LBXH/LMXH) <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p><Wrap></p> </div> <div style="text-align: center;"> <p><Twist></p> </div> </div>

4. Soldering

Precautions	<ul style="list-style-type: none"> ◆ Reflow soldering 1. Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified. 2. The product shall be used reflow soldering only. 3. Please do not add any stress to a product until it returns in normal temperature after reflow soldering. ◆ Lead free soldering 1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently. ◆ Recommended conditions for using a soldering iron(Repair) <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 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 style="text-align: center;">Recommended reflow condition (Pb free solder) <u>LAXH/LCXN/LCXP/LBXN/LBXP/LMXN/LMXP,</u> <u>LCXH/LCXA/LBXH/LMXH, LCRN/LBRN/LMRN</u></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> </div> </div>

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5. Cleaning	
Precautions	<ul style="list-style-type: none"> ◆Cleaning conditions 1. Washing by supersonic waves shall be avoided.
Technical considerations	<ul style="list-style-type: none"> ◆Cleaning conditions 1. If washed by supersonic waves, the products might be broken.
6. Handling	
Precautions	<ul style="list-style-type: none"> ◆Handling 1. Keep the product away from all magnets and magnetic objects. ◆Breakaway PC boards (splitting along perforations) 1. When splitting the PC board after mounting product, care should be taken not to give any stresses of deflection or twisting to the board. 2. Board separation should not be done manually, but by using the appropriate devices. ◆Mechanical considerations 1. Please do not give the product any excessive mechanical shocks. 2. Please do not add any shock and power to a product in transportation. ◆Pick-up pressure 1. Please do not push to add any pressure to a winding part. Please do not give any shock and push into a ferrite core exposure part. ◆Packing 1. Please avoid accumulation of a packing box as much as possible.
Technical considerations	<ul style="list-style-type: none"> ◆Handling 1. There is a case that a characteristic varies with magnetic influence. ◆Breakaway PC boards (splitting along perforations) 1. The position of the product on PCBs shall be carefully considered to minimize the stress caused from splitting of the PCBs. ◆Mechanical considerations 1. There is a case to be damaged by a mechanical shock. 2. There is a case to be broken by the handling in transportation. ◆Pick-up pressure 1. Damage and a characteristic can vary with an excessive shock or stress. ◆Packing 1. If packing boxes are accumulated, that could cause a deformation on packing tapes or a damage on the products.
7. Storage conditions	
Precautions	<ul style="list-style-type: none"> ◆Storage 1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled. <ul style="list-style-type: none"> ▪ Storage conditions Ambient temperature : $-5\sim 40^{\circ}\text{C}$ Humidity : Below 70% RH ▪ The recommended ambient temperature is below 30°C. Even under ideal storage conditions, solderability of products electrodes may decrease as time passes. For this reason, product should be used within 6 months from the time of delivery. In case of storage over 6 months, solderability shall be checked before actual usage.
Technical considerations	<ul style="list-style-type: none"> ◆Storage 1. Under a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place.