

Notice for TAIYO YUDEN Products

Please read this notice before using the TAIYO YUDEN products.

⚠ REMINDERS

Product Information in this Catalog

Product information in this catalog is as of March 2023. All of the contents specified herein and production status of the products listed in this catalog are subject to change without notice due to technical improvement of our products, etc. Therefore, please check for the latest information carefully before practical application or use of our products.

Please note that TAIYO YUDEN shall not be in any way responsible for any damages and defects in products or equipment incorporating our products, which are caused under the conditions other than those specified in this catalog or individual product specification sheets.

Approval of Product Specifications

Please contact TAIYO YUDEN for further details of product specifications as the individual product specification sheets are available. When using our products, please be sure to approve our product specifications or make a written agreement on the product specification with TAIYO YUDEN in advance.

Pre-Evaluation in the Actual Equipment and Conditions

Please conduct validation and verification of our products in actual conditions of mounting and operating environment before using our products.

Limited Application

1. Equipment Intended for Use

The products listed in this catalog are intended for general-purpose and standard use in general electronic equipment for consumer (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC) and other equipment specified in this catalog or the individual product specification sheets, or the equipment approved separately by TAIYO YUDEN.

TAIYO YUDEN has the product series intended for use in the following equipment. Therefore, when using our products for these equipment, please check available applications specified in this catalog or the individual product specification sheets and use the corresponding products.

Application	Product Series		Quality Grade ^{*3}
	Equipment ^{*1}	Category (Part Number Code ^{*2})	
Automotive	Automotive Electronic Equipment (POWERTRAIN, SAFETY)	A	1
	Automotive Electronic Equipment (BODY & CHASSIS, INFOTAINMENT)	C	2
Industrial	Telecommunications Infrastructure and Industrial Equipment	B	2
Medical	Medical Devices classified as GHTF Class C (Japan Class III)	M	2
	Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)	L	3
Consumer	General Electronic Equipment	S	3
	Only for Mobile Devices ^{*4}	E	4

*Notes: 1. Based on the general specifications required for electronic components for such equipment, which are recognized by TAIYO YUDEN, the use of each product series for the equipment is recommended. Please be sure to contact TAIYO YUDEN before using our products for equipment other than those covered by the product series.

2. On each of our part number, the 2nd code from the left is a code indicating the "Category" as shown in the above table. For details, please check the explanatory materials regarding the part numbering system of each of our products.

3. Each product series is assigned a "Quality Grade" from 1 to 4 in order of higher quality. Please do not incorporate a product into any equipment with a higher Quality Grade than the Quality Grade of such product without the prior written consent of TAIYO YUDEN.

4. The applications covered by this product series are limited to mobile devices (smartphone, tablet PC, smartwatch, handheld game console, etc.) among general electronic equipment for consumer. The design, specifications and operating environment, etc. differ from those of the product series for "General Electronic Equipment" (Category: S), so please check the individual product specification sheets for details. The product series for "General Electronic Equipment" (Category: S) can also be used for mobile devices.

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

2. Equipment Requiring Inquiry

Please be sure to contact TAIYO YUDEN for further information before using the products listed in this catalog for the following equipment (excluding intended equipment as specified in this catalog or the individual product specification sheets) which may cause loss of human life, bodily injury, serious property damage and/or serious public impact due to a failure or defect of the products and/or malfunction attributed thereto.

- (1) Transportation equipment (automotive powertrain control system, train control system, and ship control system, etc.)
- (2) Traffic signal equipment
- (3) Disaster prevention equipment, crime prevention equipment
- (4) Medical devices classified as GHTF Class C (Japan Class III)
- (5) Highly public information network equipment, data-processing equipment (telephone exchange, and base station, etc.)
- (6) Any other equipment requiring high levels of quality and/or reliability equal to the equipment listed above

3. Equipment Prohibited for Use

Please do not incorporate our products into the following equipment requiring extremely high levels of safety and/or reliability.

- (1) Aerospace equipment (artificial satellite, rocket, etc.)
- (2) Aviation equipment *1
- (3) Medical devices classified as GHTF Class D (Japan Class IV), implantable medical devices *2
- (4) Power generation control equipment (nuclear power, hydroelectric power, thermal power plant control system, etc.)
- (5) Undersea equipment (submarine repeating equipment, etc.)
- (6) Military equipment
- (7) Any other equipment requiring extremely high levels of safety and/or reliability equal to the equipment listed above

*Notes: 1. There is a possibility that our products can be used only for aviation equipment that does not directly affect the safe operation of aircraft (e.g., in-flight entertainment, cabin light, electric seat, cooking equipment) if such use meets requirements specified separately by TAIYO YUDEN. Please be sure to contact TAIYO YUDEN for further information before using our products for such aviation equipment.

2. Implantable medical devices contain not only internal unit which is implanted in a body, but also external unit which is connected to the internal unit.

4. Limitation of Liability

Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the products listed in this catalog for any equipment that is not intended for use by TAIYO YUDEN, or any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.

■ Safety Design

When using our products for high safety and/or reliability-required equipment or circuits, please fully perform safety and/or reliability evaluation. In addition, please install (i) systems equipped with a protection circuit and a protection device and/or (ii) systems equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault for a failsafe design to ensure safety.

■ Intellectual Property Rights

Information contained in this catalog is intended to convey examples of typical performances and/or applications of our products and is not intended to make any warranty with respect to the intellectual property rights or any other related rights of TAIYO YUDEN or any third parties nor grant any license under such rights.

■ Limited Warranty

Please note that the scope of warranty for our products is limited to the delivered our products themselves conforming to the product specifications specified in the individual product specification sheets, and TAIYO YUDEN shall not be in any way responsible for any damages resulting from a failure or defect in our products. Notwithstanding the foregoing, if there is a written agreement (e.g., supply and purchase agreement, quality assurance agreement) signed by TAIYO YUDEN and your company, TAIYO YUDEN will warrant our products in accordance with such agreement, provided, however, that our products shall be used for general-purpose and standard use in the equipment specified in this catalog or the individual product specification sheets.

■ TAIYO YUDEN's Official Sales Channel

The contents of this catalog are applicable to our products which are purchased from our sales offices or authorized distributors (hereinafter "TAIYO YUDEN's official sales channel"). Please note that the contents of this catalog are not applicable to our products purchased from any seller other than TAIYO YUDEN's official sales channel.

■ Caution for Export

Some of our products listed in this catalog may require specific procedures for export according to "U.S. Export Administration Regulations", "Foreign Exchange and Foreign Trade Control Law" of Japan, and other applicable regulations. Should you have any questions on this matter, please contact our sales staff.

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Automotive Application Guide

We classify automotive electronic equipment into the following four application categories and set usable application categories for each of our products. Therefore, we have the corresponding product series (the 2nd code from the left side of the part number is “A” or “C”). When using our products for automotive electronic equipment, please be sure to check such application categories and use the corresponding product series accordingly. Should you have any questions on this matter, please contact us.

Product Series (The 2nd Code from the Left Side of the Part Number)	Category	Automotive Electronic Equipment (Typical Example)
A	POWERTRAIN	<ul style="list-style-type: none"> • Engine ECU (Electronically Controlled Fuel Injector) • Cruise Control Unit • 4WS (4 Wheel Steering) • Transmission • Power Steering • HEV/PHV/EV Core Control (Battery, Inverter, DC-DC) • Automotive Locator (Car location information providing device), etc.
	SAFETY	<ul style="list-style-type: none"> • ABS (Anti-Lock Brake System) • ESC (Electronic Stability Control) • Airbag • ADAS (Equipment that directly controls running, turning and stopping), etc.
C	BODY & CHASSIS	<ul style="list-style-type: none"> • Wiper • Automatic Door • Power Window • Keyless Entry System • Electric Door Mirror • Automobile Digital Mirror • Interior Lighting • Automobile Air Conditioning System • TPMS (Tire Pressure Monitoring System) • Anti-Theft Device (Immobilizer) • ADAS (Sensor, Equipment that is not interlocked with safety equipment or powertrain), etc.
	INFOTAINMENT	<ul style="list-style-type: none"> • Car Infotainment System • ITS/Telematics System • Instrument Cluster Panel • Dashcam (genuine products for automotive manufacturer), etc.

Wire-wound Ferrite Bead Inductors for Power Lines LAMG series for Automotive Powertrain and Safety

Code in front of Series have been extracted from Part number, which describes the segment of products, such as kinds and characteristics.

AEC-Q200 Grade 1 (we conduct the evaluation at the test condition of Grade 1.)

*Operating environment Temp:-40~125°C

REFLOW

AEC-Q200

PART NUMBER

*Operating Temp. : -40~150°C (Including self-generated heat)

L	A	M	G	L	1	6	0	8	0	8	T	4	7	0	R	D	
①	②	③	④	⑤	⑥	⑦	⑧										

①Series

Code (1)(2)(3)(4)	
LAMG	Wire-wound Ferrite Bead Inductors for Power Lines, for Automotive Powertrain and Safety

(1) Product Group

Code	
L	Inductors

(3) Type

Code	
M	Ferrite Wire-wound bead

(2) Category

Code	Recommended equipment	Quality Grade
A	Automotive Electronic Equipment (Powertrain, Safety)	1

(4) Features, Characteristics

Code	
G	High frequency

②Features

Code	Feature
L	150°C (Wide frequency band)
M	150°C (High frequency)

⑤Packaging

Code	Packaging
T	Taping

③Dimensions (L × W)

Code	Type (inch)	Dimensions (L × W) [mm]
1608	1608 (0603)	1.6 × 0.8

⑦Nominal inductance

Code (example)	Nominal inductance [μH]
330	33
221	220
102	1000

④Dimensions (T)

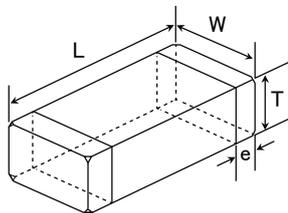
Code	Dimensions (T) [mm]
08	0.8

⑦Impedance tolerance

Code	Impedance tolerance
R	±25%

⑧Internal code

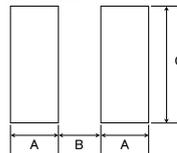
STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY



Recommended Land Patterns

Surface Mounting

• Mounting and soldering conditions should be checked beforehand.



Type	A	B	C
1608	1.0	1.0	1.0

Unit: mm

Type	L	W	T	e	Standard quantity [pcs]	
					Paper tape	Embossed tape
160808 (0603)	1.6±0.15 (0.063±0.006)	0.8±0.15 (0.031±0.006)	0.8±0.15 (0.031±0.006)	0.4±0.2 (0.015±0.008)	4000	—

Unit: mm (inch)

PART NUMBER

• All the Wire-wound Ferrite Bead Inductors for Power Lines 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 Bead Inductors for Power Lines 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.

● LAMGL1608

New part number	Old part number (for reference)	Nominal impedance (Ω)	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]
LAMGL160808T470RD	FB TH1608HE470-T	47	$\pm 25\%$	100	0.020	2.5	0.8 ± 0.15
LAMGL160808T600RD	FB TH1608HE600-T	60	$\pm 25\%$	100	0.025	2.3	0.8 ± 0.15
LAMGL160808T101RD	FB TH1608HE101-T	100	$\pm 25\%$	100	0.035	1.9	0.8 ± 0.15
LAMGL160808T151RD	FB TH1608HE151-T	150	$\pm 25\%$	100	0.050	1.5	0.8 ± 0.15
LAMGL160808T221RD	FB TH1608HE221-T	220	$\pm 25\%$	100	0.070	1.3	0.8 ± 0.15
LAMGL160808T331RD	FB TH1608HE331-T	330	$\pm 25\%$	100	0.130	0.9	0.8 ± 0.15
LAMGL160808T471RD	FB TH1608HE471-T	470	$\pm 25\%$	100	0.150	0.7	0.8 ± 0.15
LAMGL160808T601RD	FB TH1608HE601-T	600	$\pm 25\%$	100	0.170	0.6	0.8 ± 0.15
LAMGL160808T102RD	FB TH1608HE102-T	1000	$\pm 25\%$	100	0.350	0.5	0.8 ± 0.15

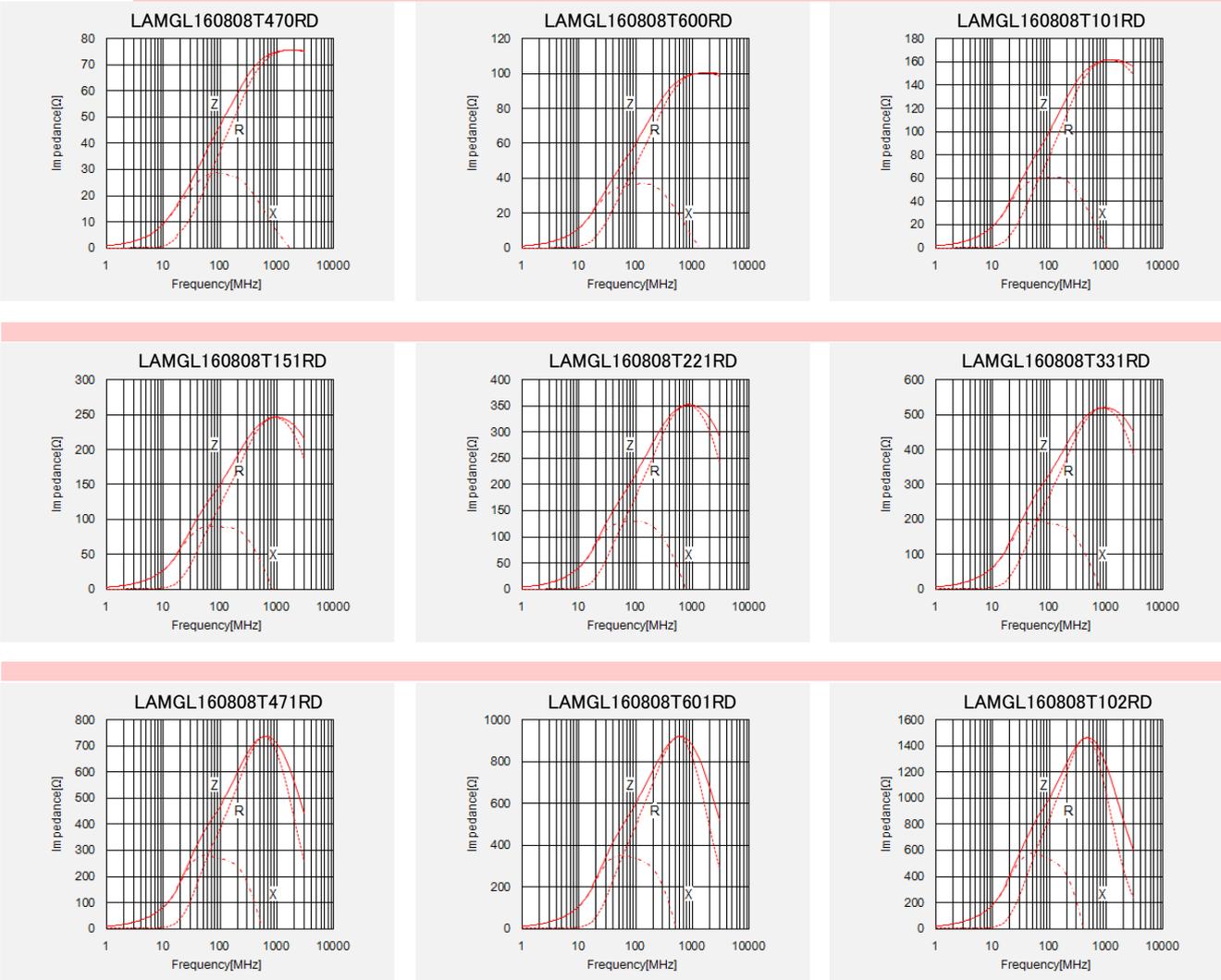
● LAMGM1608

New part number	Old part number (for reference)	Nominal impedance (Ω)	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]
LAMGM160808T300RD	FB TH1608HL300-T	30	$\pm 25\%$	100	0.028	2.00	0.8 ± 0.15
LAMGM160808T600RD	FB TH1608HL600-T	60	$\pm 25\%$	100	0.045	1.60	0.8 ± 0.15
LAMGM160808T121RD	FB TH1608HL121-T	120	$\pm 25\%$	100	0.130	0.95	0.8 ± 0.15
LAMGM160808T221RD	FB TH1608HL221-T	220	$\pm 25\%$	100	0.170	0.65	0.8 ± 0.15
LAMGM160808T331RD	FB TH1608HL331-T	330	$\pm 25\%$	100	0.210	0.60	0.8 ± 0.15
LAMGM160808T471RD	FB TH1608HL471-T	470	$\pm 25\%$	100	0.350	0.50	0.8 ± 0.15
LAMGM160808T601RD	FB TH1608HL601-T	600	$\pm 25\%$	100	0.450	0.42	0.8 ± 0.15

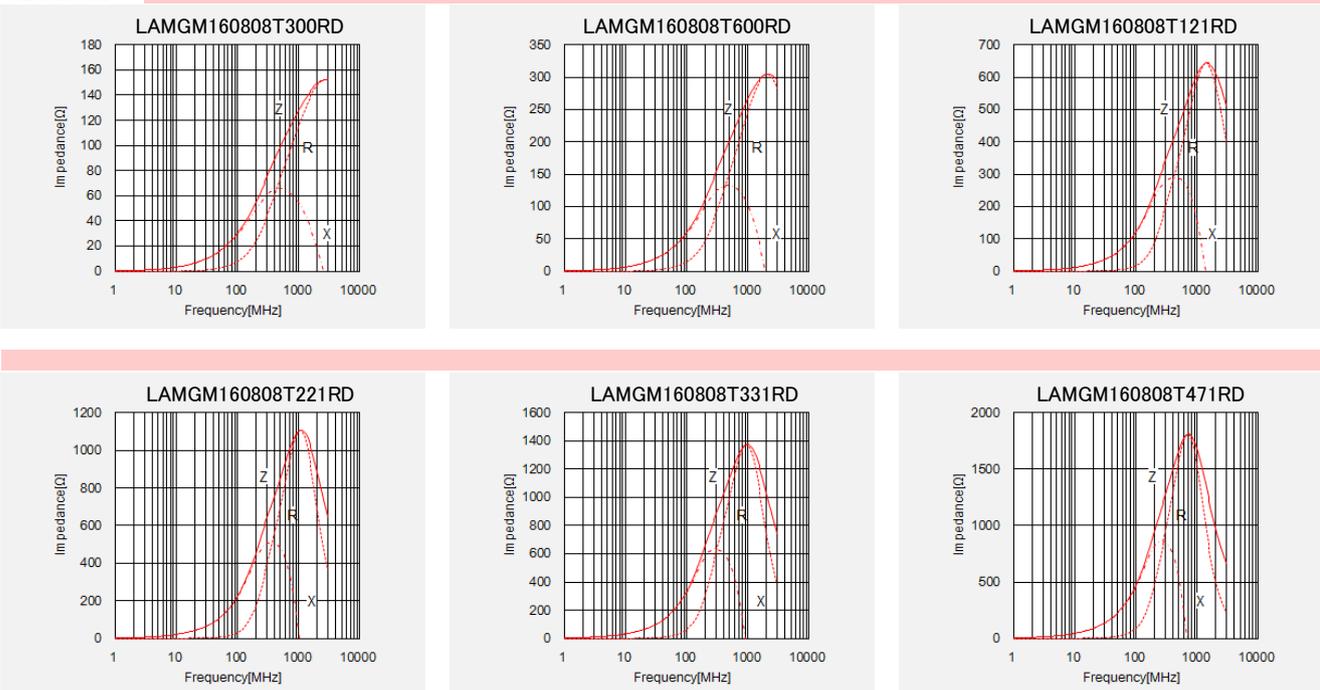
※) The rated current is the value of current at which the temperature of the element is increased by 25 deg.

■ ELECTRICAL CHARACTERISTICS

■ LAMGL1608

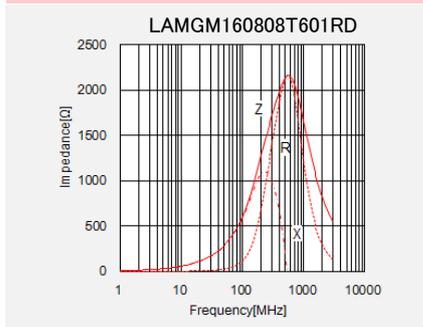


■ LAMGM1608



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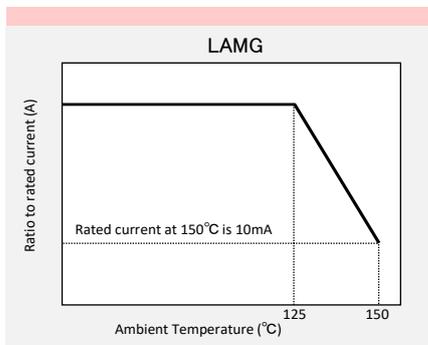
ELECTRICAL CHARACTERISTICS



Derating of Rated Current

LAMG series

Derating of current is necessary for LAMG series T type depending on ambient temperature. Please refer to the chart shown below for appropriate derating of current.



Wire-wound Ferrite Bead Inductors for Power Lines LSMC/LSMG/LAMG/LCMC/LCMG/LBMC/LBMG/LLMC/LLMG/LMMC/LMMG series

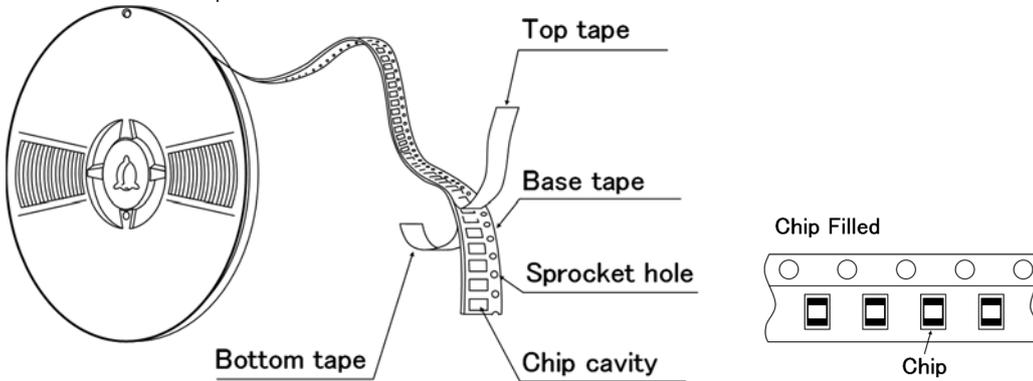
PACKAGING

① Minimum Quantity

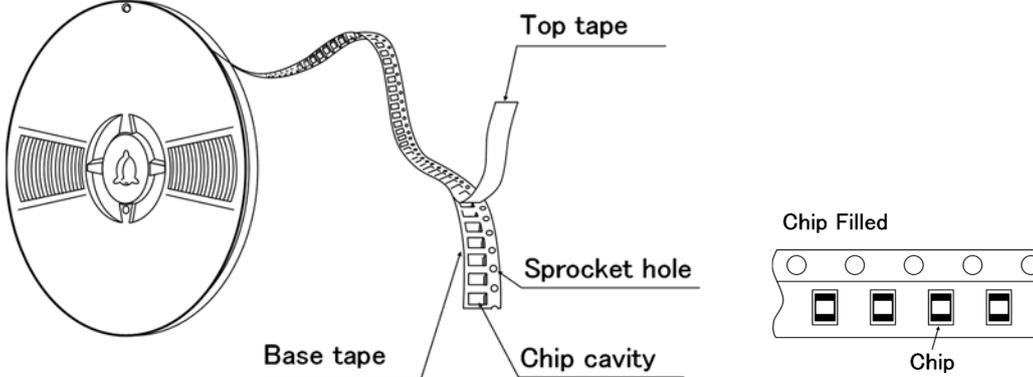
Type	Standard Quantity [pcs]	
	Paper Tape	Embossed Tape
1608(0603)	4000	—
2125(0805)	4000	—
2012(0805)	4000	—
2016(0806)	—	2000
3216(1206)	—	2000
3225(1210)	—	1000
4516(1806)	—	2000
4525(1810)	—	1000
4532(1812)	—	2000

② Tape Material

- Card board carrier tape

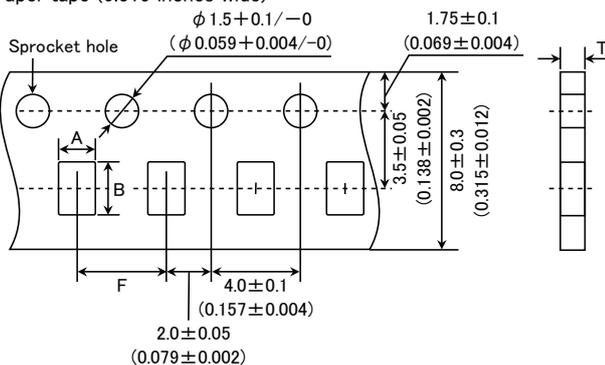


- Embossed tape



③ Taping Dimensions

- Paper tape (0.315 inches wide)

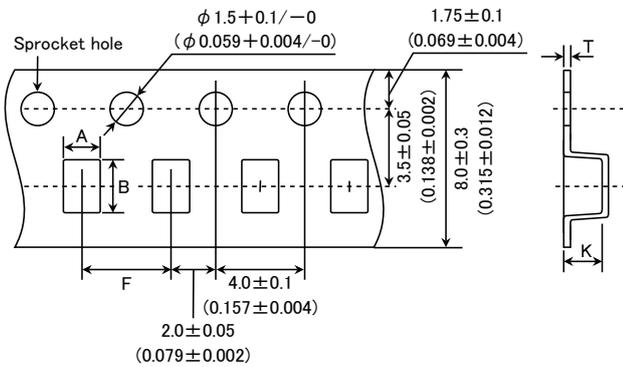


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Type	Chip Cavity		Insertion Pitch	Tape Thickness
	A	B		
1608 (0603)	1.0 ± 0.2 (0.039 ± 0.008)	1.8 ± 0.2 (0.071 ± 0.008)	4.0 ± 0.2 (0.157 ± 0.008)	1.1max (0.043max)
2012 (0805)	1.5 ± 0.2 (0.059 ± 0.008)	2.3 ± 0.2 (0.091 ± 0.008)	4.0 ± 0.2 (0.157 ± 0.008)	1.1max (0.043max)

Unit : mm (inch)

● Embossed tape (0.315 inches wide)



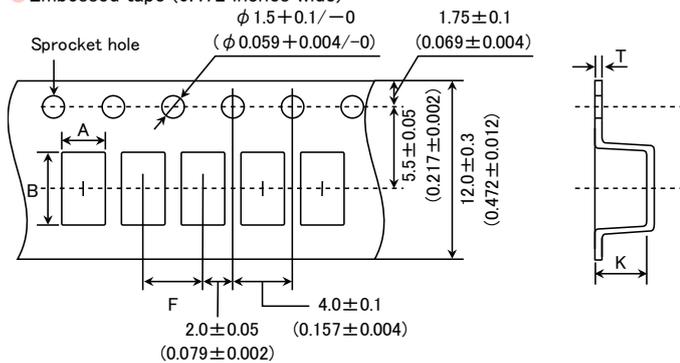
Type	Chip Cavity		Insertion Pitch	Tape Thickness	
	A	B		K	T
2016 (0806)	1.8 ± 0.2 (0.071 ± 0.008)	2.2 ± 0.2 (0.087 ± 0.008)	4.0 ± 0.2 (0.157 ± 0.008)	2.6max (0.102max)	0.6max (0.024max)
3216 *1 (1206)	1.9 ± 0.2 (0.075 ± 0.008)	3.5 ± 0.2 (0.138 ± 0.008)	4.0 ± 0.2 (0.157 ± 0.008)	1.5max (0.059max)	0.3max (0.012max)
3216 *2 (1206)	1.9 ± 0.2 (0.075 ± 0.008)	3.5 ± 0.2 (0.138 ± 0.008)	4.0 ± 0.2 (0.157 ± 0.008)	2.6max (0.102max)	0.6max (0.024max)
3225 (1210)	2.8 ± 0.2 (0.110 ± 0.008)	3.5 ± 0.2 (0.138 ± 0.008)	4.0 ± 0.2 (0.157 ± 0.008)	4.0max (0.157max)	0.6max (0.024max)

Unit : mm (inch)

*1 LSMC/LCMC/LBMC/LLMC/LMMC

*2 LSMG/LAMG/LCMG/LBMG/LLMG/LMMG

● Embossed tape (0.472 inches wide)



Type	Chip Cavity		Insertion Pitch	Tape Thickness	
	A	B		K	T
4516 *1 (1806)	1.9 ± 0.2 (0.075 ± 0.008)	4.9 ± 0.2 (0.193 ± 0.008)	4.0 ± 0.2 (0.157 ± 0.008)	1.5max (0.059max)	0.3max (0.012max)
4516 *2 (1806)	1.9 ± 0.2 (0.075 ± 0.008)	4.9 ± 0.2 (0.193 ± 0.008)	4.0 ± 0.2 (0.157 ± 0.008)	2.6max (0.102max)	0.6max (0.024max)
4525 (1810)	2.9 ± 0.2 (0.114 ± 0.008)	4.9 ± 0.2 (0.193 ± 0.008)	4.0 ± 0.2 (0.157 ± 0.008)	4.0max (0.157max)	0.6max (0.024max)
4532 (1812)	3.6 ± 0.2 (0.142 ± 0.008)	4.9 ± 0.2 (0.193 ± 0.008)	8.0 ± 0.2 (0.315 ± 0.008)	4.0max (0.157max)	0.6max (0.024max)

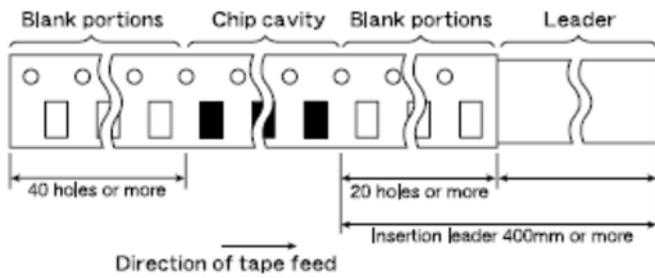
Unit : mm (inch)

*1 LSMC/LCMC/LBMC/LLMC/LMMC

*2 LSMG/LAMG/LCMG/LBMG/LLMG/LMMG

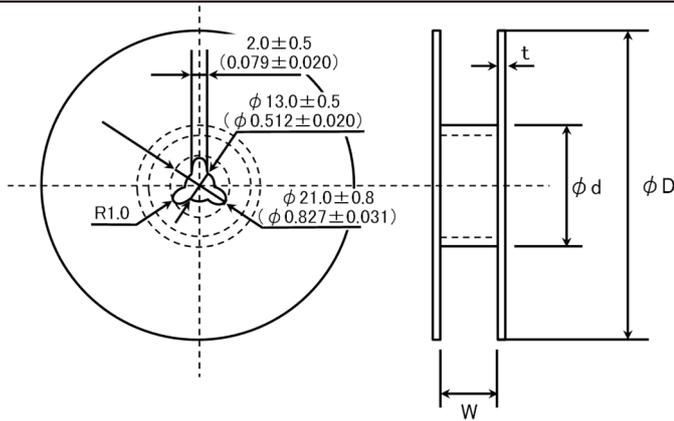
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④ Leader and Blank portion



Insertion leader is 400 mm or more (including 20 empty cavities)
 Empty cavities at end of reel: 40 holes or more

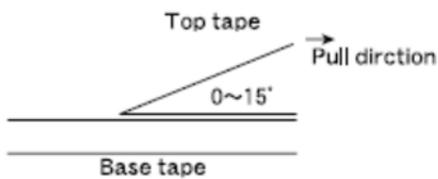
⑤ Reel size



Type	ϕD	ϕd	W	t
1608(0603) 2012(0805) 2016(0806) 3216(1206) 3225(1210)	180+0/-3 (7.09+0/-0.118)	60+1/-0 (2.36+0.039/-0)	10.0±1.5 (0.394±0.059)	2.5max (0.098max)
4516(1806) 4525(1810)			14.0±1.5 (0.551±0.059)	
4532(1812)	330±2.0 (12.99±0.080)	100±1.0 (3.94±0.039)	14.0±2.0 (0.551±0.080)	3.0max (1.181max)

Unit : mm (inch)

⑥ Top tape strength



The top tape requires a peel-off force of 0.1 to 1.0N (0.315 inches wide) / 0.1 to 1.3N (0.472 inches wide) in the direction of the arrow as illustrated below.

Wire-wound Ferrite Bead Inductors for Power Lines LAMG series for Automotive Powertrain and Safety

RELIABILITY DATA

1. Operating Temperature Range															
Specified Value	-40°C ~ +150°C (Including self-generated heat)														
Test Methods and Remarks	Including self-generated heat														
2. Storage Temperature Range															
Specified Value	-40°C ~ +125°C														
Test Methods and Remarks	*Note: -5 to +40°C in taped packaging														
3. Impedance															
Specified Value	Within the specified range														
Test Methods and Remarks	Measuring equipment : Impedance analyzer (E4991) or its equivalent Measuring frequency : 100±1 MHz														
4. DC Resistance															
Specified Value	Within the specified range														
Test Methods and Remarks	Four-terminal method Measuring equipment : Milliohm High-Tester 3226 (Hioki Denki) or its equivalent														
5. Rated Current															
Specified Value	Within the specified range														
6. Vibration															
Specified Value	Appearance : No significant abnormality Impedance change : Within ±30% of the initial value														
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. <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Frequency Range</td> <td colspan="2">10~2000Hz</td> </tr> <tr> <td>Total Amplitude</td> <td colspan="2">5G</td> </tr> <tr> <td>Sweeping Method</td> <td colspan="2">10Hz to 2000Hz to 10Hz for 20min.</td> </tr> <tr> <td rowspan="3">Number of cycle</td> <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>	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
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														
7. Mechanical Shock															
Specified Value	Appearance : No significant abnormality Impedance change : Within ±30% of the initial value														
Test Methods and Remarks	AEC-Q200 Test No.13 qualified (MIL-STD-202 Method 213) The test samples shall be soldered to the test board by the reflow. Then it shall be submitted to below test conditions. <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Acceleration</td> <td>981m/s²</td> </tr> <tr> <td>Duration</td> <td>6msec(Half sine pulse)</td> </tr> <tr> <td>Direction</td> <td>+X, +Y, +Z, -X, -Y, -Z</td> </tr> <tr> <td>Number of time</td> <td>Each 3 times, Total 18 times</td> </tr> </table>	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						
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														

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8. Solderability

Specified Value	90% or more of immersed surface of terminal electrode shall be covered with fresh solder.		
Test Methods and Remarks	AEC-Q200 Test No.18 qualified (J-STD-002)		
		(a) Method B	(c) Method D
	Preconditioning	155°C 4hrs	Steam 8hrs±15min
	Solder Temperature	235±5°C	260±5°C
	Time	5+0/-0.5 sec	30+0/-0.5 sec.

9. Resistance to Soldering Heat

Specified Value	Appearance : No significant abnormality Impedance change : Within ±30% of the initial value
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±5°C for 30±5 seconds, 3 times.

10. Thermal Shock

Specified Value	Appearance : No significant abnormality Impedance change : Within ±50% of the initial value				
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.				
	<table border="1"> <tr> <td>1 Cycle</td> <td>-40±3°C/30 min ⇄ 150±3°C/30 min</td> </tr> <tr> <td>Number of cycle</td> <td>1000 cycles</td> </tr> </table>	1 Cycle	-40±3°C/30 min ⇄ 150±3°C/30 min	Number of cycle	1000 cycles
	1 Cycle	-40±3°C/30 min ⇄ 150±3°C/30 min			
Number of cycle	1000 cycles				

11. Resistance to Humidity (steady state)

Specified Value	Appearances : No significant abnormality Impedance change : Within ±50% of the initial value						
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±2°C</td> </tr> <tr> <td>Humidity</td> <td>85%RH</td> </tr> <tr> <td>Time</td> <td>1000+24/-0 hour</td> </tr> </table>	Temperature	85±2°C	Humidity	85%RH	Time	1000+24/-0 hour
	Temperature	85±2°C					
	Humidity	85%RH					
Time	1000+24/-0 hour						

12. High Temperature Exposure

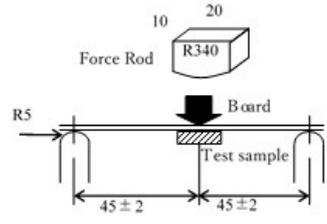
Specified Value	Appearances : No significant abnormality Impedance change : Within ±50% of the initial value				
Test Methods and Remarks	AEC-Q200 Test No.03 qualified (MIL-STD-202 Method 108) The test samples shall be soldered to the test board by the reflow soldering. The test samples shall be placed in thermostatic oven set at specified temperature as shown in below table.				
	<table border="1"> <tr> <td>Temperature</td> <td>150±3°C</td> </tr> <tr> <td>Time</td> <td>1000+24/-0 hour</td> </tr> </table>	Temperature	150±3°C	Time	1000+24/-0 hour
	Temperature	150±3°C			
Time	1000+24/-0 hour				

13. High Temperature Loading Test

Specified Value	Appearance : No significant abnormality Impedance change : Within ±50% of the initial value						
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. The test samples shall be placed in thermostatic oven set at specified temperature and applied the rated current continuously as shown in below table.						
	<table border="1"> <tr> <td>Temperature</td> <td>125±3°C</td> </tr> <tr> <td>Applied current</td> <td>Rated current</td> </tr> <tr> <td>Time</td> <td>1000+24/-0 hour</td> </tr> </table>	Temperature	125±3°C	Applied current	Rated current	Time	1000+24/-0 hour
	Temperature	125±3°C					
	Applied current	Rated current					
Time	1000+24/-0 hour						

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14. Bending Strength	
Specified Value	Appearance : No mechanical damage.
Test Methods and Remarks	<p>AEC-Q200 Test No.21 qualified (AEC-Q200-005)</p> <p>The test samples shall be soldered to the test board by the reflow. As illustrated below, apply force in the direction of the arrow indicating until deflection of the test board reaches to 2 mm for 60 s.</p> <p>Test board size : 100 × 40 × 1.6</p> <p>Test board material : glass epoxy-resin</p>



15. Adhesion of Electrode

Specified Value	Impedance change : Within $\pm 30\%$ of the initial value
Test Methods and Remarks	<p>AEC-Q200 Test No.22 qualified (AEC-Q200-006)</p> <p>The test samples shall be soldered to the test board by the reflow soldering.</p> <p>Applied force : 10N</p> <p>Duration : 60 sec.</p>

Note on standard condition: "standard condition" referred to herein is defined as follows:
 5 to 35°C of temperature, 45 to 85% relative humidity and 86 to 106kPa of air pressure.

When there are questions concerning measurement results:

In order to provide correlation data, the test shall be conducted under condition of $20 \pm 2^\circ\text{C}$ of temperature, 60 to 70% relative humidity and 86 to 106kPa of air pressure. Unless otherwise specified, all the tests are conducted under the "standard condition."

Wire-wound Ferrite Bead Inductors for Power Lines LSMC/LSMG/LAMG/LCMC/LCMG/LBMC/LBMG/LLMC/LLMG/LMMC/LMMG series

■ 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.
 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)
 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

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.

2. PCB Design

Precautions

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

3. Considerations for automatic placement

Precautions

- ◆ Adjustment of mounting machine
 1. Excessive impact load should not be imposed on the products when mounting onto the PC boards.
 2. Mounting and soldering conditions should be checked beforehand.

Technical considerations

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

4. Soldering

Precautions

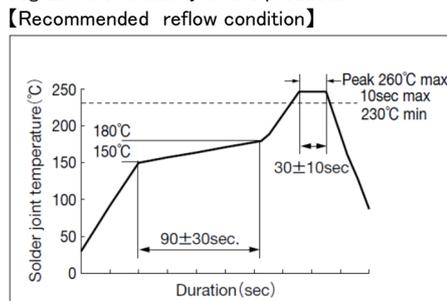
- ◆ Wave soldering
 1. Please refer to the specifications in the catalog for a wave soldering.
- ◆ Reflow soldering
 1. Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified.
- ◆ Lead free soldering
 1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, etc. sufficiently.
- ◆ Preheating when soldering

Heating : The temperature difference between soldering and remaining heat should not be greater than 150°C.
Cooling : The temperature difference between the components and cleaning process should not be greater than 100°C.
- ◆ Recommended conditions for using a soldering iron

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

- ◆ Wave, Reflow, Lead free 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.



- ◆ Preheating when soldering
 1. There is a case that products get damaged by a heat shock.

	<ul style="list-style-type: none"> ◆ Recommended conditions for using a soldering iron <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.
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5. Handling

Precautions	<ul style="list-style-type: none"> ◆ Handling <ol style="list-style-type: none"> 1. Keep the inductors away from all magnets and magnetic objects. ◆ Setting PC boards <ol style="list-style-type: none"> 1. When setting a chip mounted base board, please make sure that there is no residual stress to the chip by distortion in the board or at screw part. ◆ Breakaway PC boards (splitting along perforations) <ol style="list-style-type: none"> 1. When splitting the PC board after mounting inductors, care should be taken not to give any stresses of deflection or twisting to the board. 2. Board separation should not be done manually, but by using the appropriate devices. ◆ Mechanical considerations <ol style="list-style-type: none"> 1. Please do not give the inductors any excessive mechanical shocks.
Technical considerations	<ul style="list-style-type: none"> ◆ Handling <ol style="list-style-type: none"> 1. There is a case that a characteristic varies with magnetic influence. ◆ Setting PC boards <ol style="list-style-type: none"> 1. There is a case that a characteristic varies with residual stress. ◆ Breakaway PC boards (splitting along perforations) <ol style="list-style-type: none"> 1. Planning pattern configurations and the position of products should be carefully performed to minimize stress. ◆ Mechanical considerations <ol style="list-style-type: none"> 1. There is a case to be damaged by a mechanical shock.

6. Storage conditions

Precautions	<ul style="list-style-type: none"> ◆ Storage <ol style="list-style-type: none"> 1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled. <ul style="list-style-type: none"> • Storage conditions <ul style="list-style-type: none"> Ambient temperature -5~40°C Humidity Below 70% RH <p>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, inductors should be used within 6 months from the time of delivery.</p>
Technical considerations	<ul style="list-style-type: none"> ◆ Storage <ol style="list-style-type: none"> 1. Under a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place.

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