

Chip Coil (Chip Inductors) LQM18DH□□□□70□ REFERENCE SPECIFICATION

1. Scope

This reference specification applies to chip coils (chip inductors) LQM18DH□□□□70□ series for automotive electronics based on AEC-Q200.

2. Part Numbering

(Ex.)

LQ	M	18	DH	6R8	M	70	L
Product ID	Type	Dimension (L × W)	Application and characteristic (H: for automotive electronics)	Inductance	Tolerance	Category	Packaging L: taping *B: bulk

*B: Bulk packing is also available.

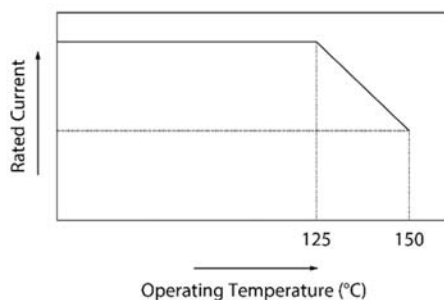
(The product sealed on the carrier tape is stored in a plastic bag.)

3. Part Number and Rating

Operating temperature range	-55°C to +150°C
Storage temperature range	-55°C to +150°C

Customer Part number	Murata Part number	Inductance		DC resistance (Ω)	Self-resonant frequency (MHz min.)	Rated current* (mA)			ESD rank
		Nominal value (μH)	Tolerance			Based on inductance change ¹⁾	Based on temperature rise		
							Ambient temperature 125°C	Ambient temperature 150°C	
	LQM18DH6R8M70L	6.8	±20%	0.74±0.22	40	120	330	10	4
	LQM18DH100M70L	10	±20%	1.05±0.32	32	100	300	10	4

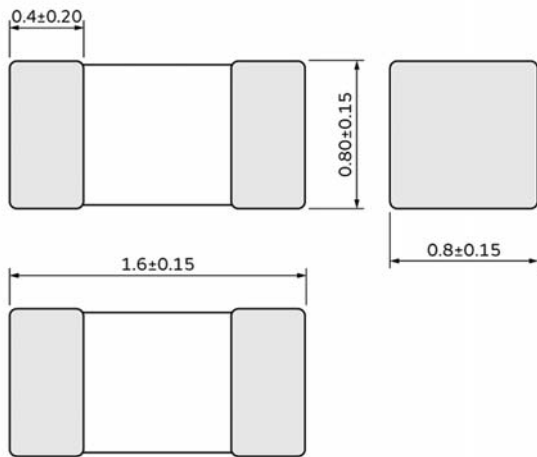
* As shown in the diagram below, derating is applied to the rated current based on the operating temperature.



ESD Rank	Maximum Withstand Voltage
4	6000 V (DC) to < 8000 V (DC)

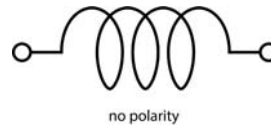
4. Testing Conditions

Unless otherwise specified	Temperature: ordinary temperature (15°C to 35°C) Humidity: ordinary humidity [25% to 85% (RH)]
In case of doubt	Temperature: 20°C±2°C Humidity: 60% to 70% (RH) Atmospheric pressure: 86 kPa to 106 kPa

5. Appearance and Dimensions

(in mm)

■ Equivalent Circuit



■ Unit mass (typical value): 0.005 g

6. Marking

No marking.

7. Electrical Performance

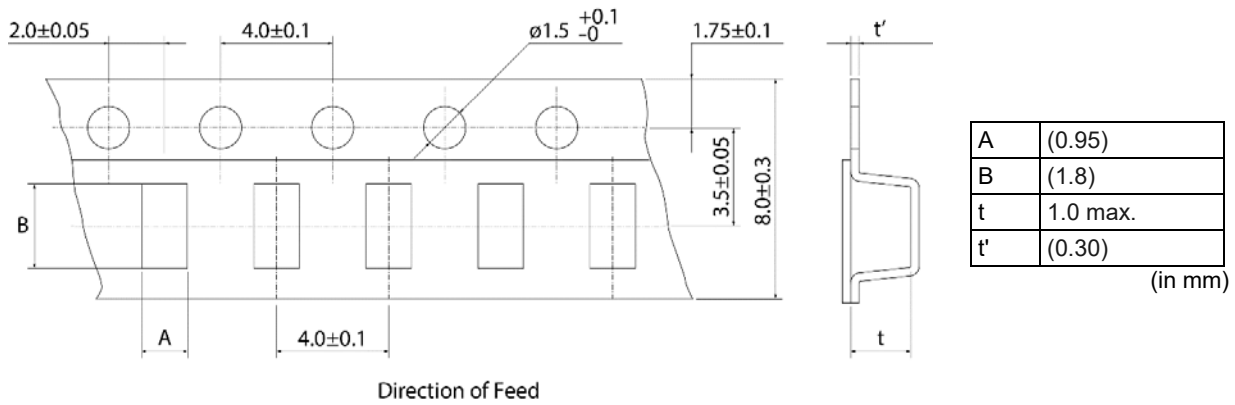
No.	Item	Specification	Test method
7.1	Inductance	Meet chapter 3 ratings.	Measuring equipment: Keysight 4294A or the equivalent Measuring frequency: 1 MHz
7.2	DC resistance	Meet chapter 3 ratings.	Measuring equipment: digital multimeter Measuring circuit: Digital multimeter Measure with the product set to terminal 2 and the switch pressed (open between a and b). When setting or removing the product, press the switch to short between a and b
7.3	Self-resonant frequency	Meet chapter 3 ratings.	Measuring equipment: Keysight E4294A or the equivalent
7.4	Rated current	When rated current is applied to the products, inductance will be within $\pm 50\%$ of initial inductance value range. Temperature rise caused by self-generated heat shall be limited to 40°C max.	Apply the rated current specified in chapter 3.

8. Q200 Requirement**Performance(based on Table 5 for Magnetics Inductors/Transformer)****Nasi) AEC-Q200 Rev.D issued June 1. 2010**

AEC-Q200		Murata Specification / Deviation
No.	Stress / Test Method	
3	High temperature exposure 1000 h at 150°C Set for 24 h at room condition, then measured.	Appearance: No damage Inductance change rate: within ±50%
4	Temperature cycling 1000 cycles -55°C to +150°C Set for 24 h at room condition, then measured.	Appearance: No damage Inductance change rate: within ±50%
7	Biased humidity 1000 h at 85°C, 85% (RH). Unpowered. Set for 24 h at room condition, then measured.	Appearance: No damage Inductance change rate: within ±50%
8	Operational life Apply 150°C 1000 h Set for 24 h at room condition, then measured.	Appearance: No damage Inductance change rate: within ±50%
9	External visual Visual inspection	No abnormalities
10	Physical dimension Meet chapter 5, "Appearance and Dimensions".	No defects
12	Resistance to solvents Per MIL-STD-202 Method 215	Not applicable
13	Mechanical shock Per MIL-STD-202 Method 213 Condition C: 100 g's/6 ms/half sine	Appearance: No damage Inductance change rate: within ±30%
14	Vibration 5 g's for 20 min, 12 cycles each of 3 orientations Test from 10 Hz to 2000 Hz	Appearance: No damage Inductance change rate: within ±30%
15	Resistance to Soldering Heat No-heating Solder temperature 260°C±5°C Immersion time 10 s	Appearance: No damage Inductance change rate: within ±30% <u>Deviation for AEC-Q200</u> Pre-heating: 150°C/60s
17	ESD Per AEC-Q200-002	ESD Rank: Refer to chapter 3, "Part Number and Rating". Appearance: No damage Inductance change rate: within ±50%
18	Solderability Per J-STD-002	95% or more of the outer electrode shall be covered with new solder seamlessly. <u>Deviation for AEC-Q200</u> Method b: Not applicable Pre-heating: 150°C/60s
19	Electrical Characterization Measured: inductance	No defects
20	Flammability Per UL-94	Not applicable
21	Board Flex Epoxy-PCB (1.6 mm) Deflection 2 mm (min.) 60 s minimum holding time	Appearance: No damage Inductance change rate: within ±30% <u>Deviation for AEC-Q200</u> Holding time: 30 s
22	Terminal Strength Per AEC-Q200-006 A force of 17.7 N for 60 s	Appearance: No damage <u>Deviation for AEC-Q200</u> Applying force: 10 N Holding time: 10 s

9. Specification of Packaging

9.1 Appearance and dimensions of tape (8 mm width/plastic tape)



* The dimensions of the cavity are measured at its bottom.

9.2 Taping specifications

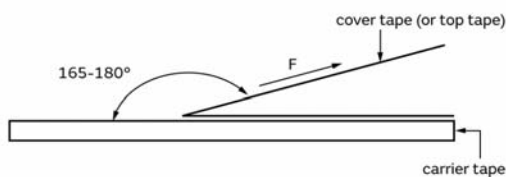
Packing quantity (Standard quantity)	4000 pcs/reel
Packing method	The products are placed in embossed cavities of a plastic tape and sealed by a cover tape.
Feed hole position	The feed holes on the plastic tape are on the right side when the cover tape is pulled toward the user.
Joint	The plastic tape and the cover tape are seamless.
Number of missing products	Number of missing products within 0.025% of the number per reel or 1 pc., whichever is greater, and are not continuous. The specified quantity per reel is kept.

9.3 Break down force of tape

Break down force of cover tape	5 N min.
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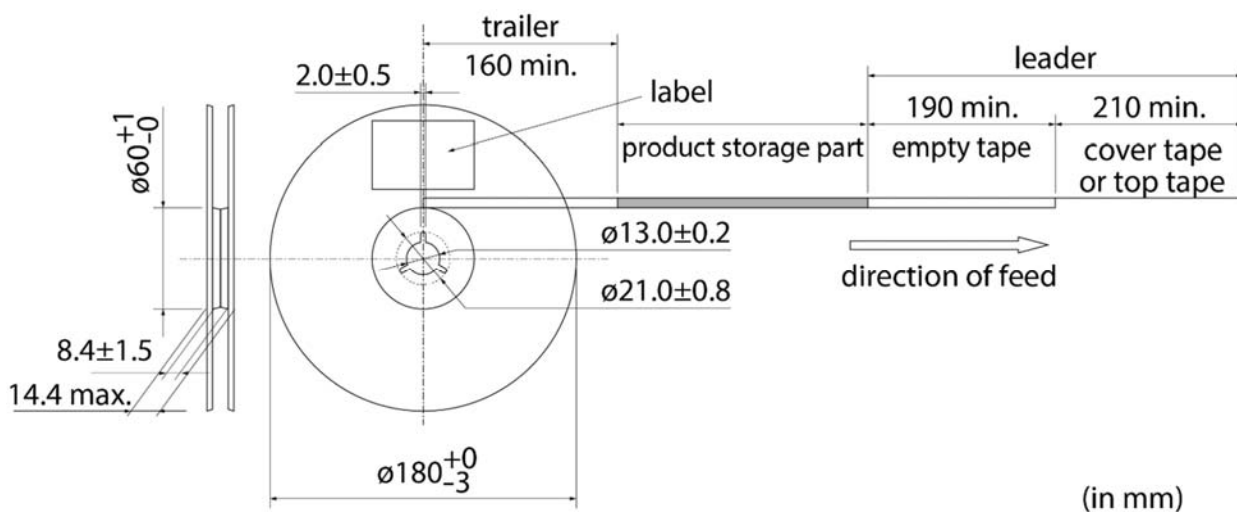
9.4 Peeling off force of tape

Speed of peeling off	300 mm/min
Peeling off force	0.1 N to 0.7 N (The lower limit is for typical value.)



9.5 Dimensions of leader section, trailer section and reel

A vacant section is provided in the leader (start) section and trailer (end) section of the tape for the product. The leader section is further provided with an area consisting only of the cover tape (or top tape). (See the diagram below.)



9.6 Marking for reel

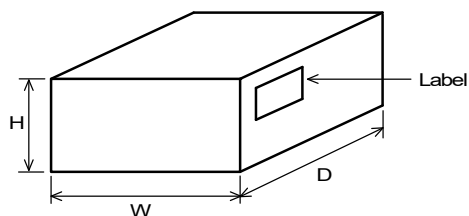
Customer part number, Murata part number, inspection number (*1), RoHS marking (*2), quantity, etc.

<p>*1 Expression of inspection No.:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">□□ (1)</div> <div style="text-align: center;">○○○○ (2)</div> <div style="text-align: center;">◇◇◇◇ (3)</div> </div>	<p>(1) Factory code (2) Date First digit: year/last digit of year Second digit: month/Jan. to Sep. → 1 to 9, Oct. to Dec. → O, N, D Third, Fourth digit: day (3) Serial No.</p>
<p>*2 Expression of RoHS marking:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">ROHS- Y (1)</div> <div style="text-align: center;">(△) (2)</div> </div>	<p>(1) RoHS regulation conformity (2) Murata classification number</p>

9.7 Marking on outer box (corrugated box)

Customer name, purchasing order number, customer part number, Murata part number, RoHS marking (*2), quantity, etc.

9.8 Specification of outer box



Dimensions of outer box (mm)			Standard reel quantity in outer box (reel)
W	D	H	
186	186	93	5
<p>* Above outer box size is typical. It depends on a quantity of an order.</p>			

10. ⚠Caution**10.1 Restricted applications**

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property.

- | | |
|-----------------------------------|---|
| (1) Aircraft equipment | (6) Transportation equipment (trains, ships, etc.) |
| (2) Aerospace equipment | (7) Traffic signal equipment |
| (3) Undersea equipment | (8) Disaster/crime prevention equipment |
| (4) Power plant control equipment | (9) Data-processing equipment |
| (5) Medical equipment | (10) Applications of similar complexity and/or reliability requirements to the applications listed in the above |

10.2 Precautions on rating

Do not use over the rated temperature range, rated voltage, or rated current.
If used beyond the rating, serious defects such as wire breakage and burnout may occur.

10.3 Surge current

Excessive surge current (pulse current or rush current) than specified rated current applied to the product may cause a critical failure, such as wire breakage, burnout caused by excessive temperature rise.

10.4 Fail-safe

Be sure to provide an appropriate fail-safe function on your product to prevent a second damage that may be caused by the abnormal function or the failure of our product.

11. Precautions for Use

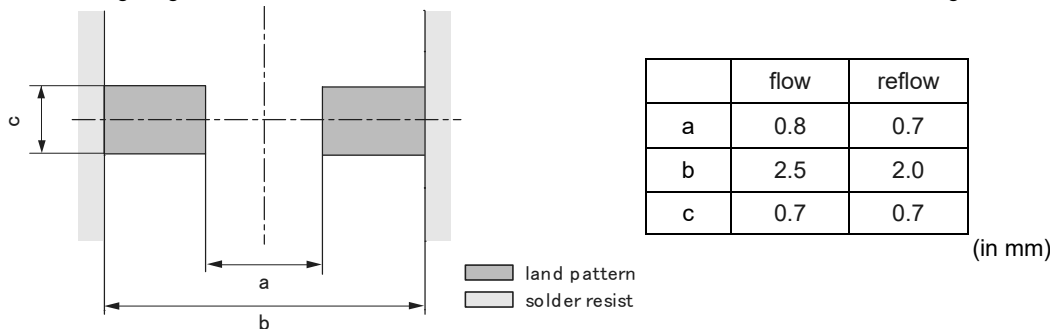
This product is designed to be mounted by soldering. If you want to use other mounting method, for example, using a conductive adhesive, please consult us beforehand.

Also, if repeatedly subjected to temperature cycles or other thermal stress, due to the difference in the coefficient of thermal expansion with the mounting substrate, the solder (solder fillet part) in the mounting part may crack.

The occurrence of cracks due to thermal stress is affected by the size of the land where mounted, the solder volume, and the heat dissipation of the mounting substrate. Carefully design it when a large change in ambient temperature is assumed.

11.1 Land dimensions

The following diagram shows the recommended land dimensions for flow and reflow soldering:

**11.2 Flux and solder used**

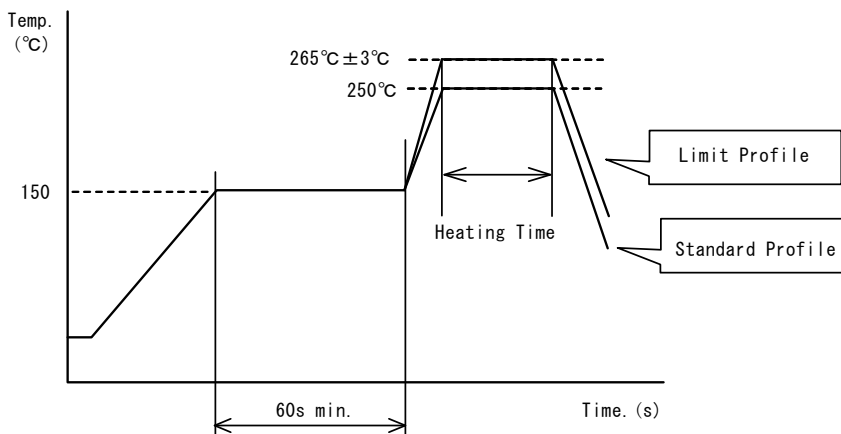
Flux	<ul style="list-style-type: none"> • Use a rosin-based flux. • Do not use a highly acidic flux with a halide content exceeding 0.2(wt)% (chlorine conversion value). • Do not use a water-soluble flux.
Solder	<ul style="list-style-type: none"> • Use Sn-3.0Ag-0.5Cu solder. • Standard thickness of solder paste: 100 μm to 150 μm

If you want to use a flux other than the above, please consult our technical department.

11.3 Soldering conditions (flow, reflow)

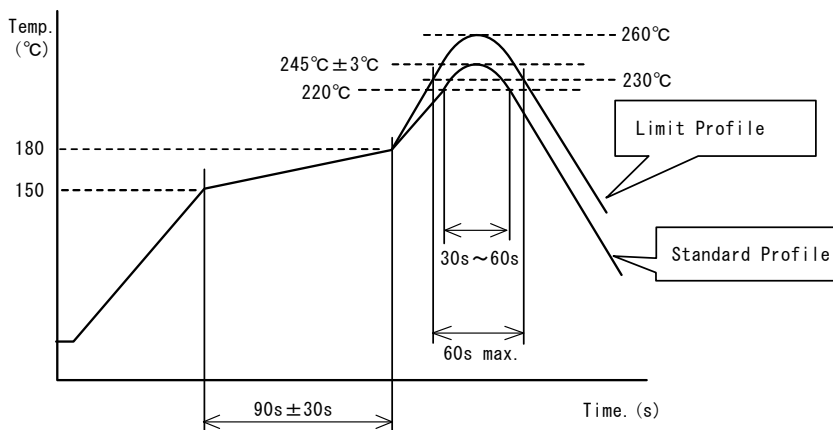
- Pre-heating should be in such a way that the temperature difference between solder and product surface is limited to 100°C max.
Cooling into solvent after soldering also should be in such a way that the temperature difference is limited to 100°C max. Insufficient pre-heating may cause cracks on the product, resulting in the deterioration of product quality.
- Standard soldering profile and the limit soldering profile is as follows.
The excessive limit soldering conditions may cause leaching of the electrode and/or resulting in the deterioration of product quality.

(1) Flow



	Standard profile	Limit profile
Pre-heating	150°C/60 s min.	150°C/60 s min.
Heating	250°C/4 s to 6 s	265°C±3°C/5 s
Number of flow cycles	2 times	2 times

(2) Reflow



	Standard profile	Limit profile
Pre-heating	150°C to 180°C/90 s±30 s	150°C to 180°C/90 s±30 s
Heating	Above 220°C/30 s to 60 s	Above 230°C/60 s max.
Peak temperature	245°C±3°C	260°C/10 s
Number of reflow cycles	2 times	2 times

11.4 Reworking with soldering iron

The following requirements must be met to rework a soldered product using a soldering iron.

Item	Requirement
Pre-heating	150°C/approx. 1 min
Tip temperature of soldering iron	350°C max.
Power consumption of soldering iron	60 W max.
Tip diameter of soldering iron	ø3 mm max.
Soldering time	3 s (+1 s, -0 s)
Number of reworking operations	2 times max.
* Avoid a direct contact of the tip of the soldering iron with the product. Such a direction contact may cause cracks in the ceramic body due to thermal shock.	

11.5 Solder volume

Solder shall be used not to increase the volume too much.

An increased solder volume increases mechanical stress on the product. Exceeding solder volume may cause the failure of mechanical or electrical performance.

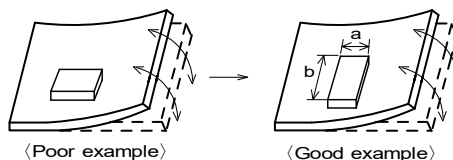
11.6 Product's location

The following shall be considered when designing and laying out PCBs.

(1) PCB shall be designed so that products are not subject to mechanical stress due to warping the board.

[Products direction]

Products shall be located in the sideways direction (length: $a < b$) to the mechanical stress.

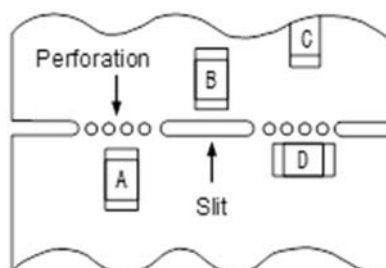


(2) Components location on PCB separation

It is effective to implement the following measures, to reduce stress in separating the board.

It is best to implement all of the following three measures; however, implement as many measures as possible to reduce stress.

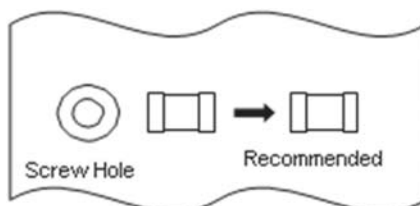
Contents of measures	Stress level
(1) Turn the mounting direction of the component parallel to the board separation surface.	$A > D^{*1}$
(2) Add slits in the board separation part.	$A > B$
(3) Keep the mounting position of the component away from the board separation surface.	$A > C$
*1 $A > D$ is valid when stress is added vertically to the perforation as with hand separation. If a cutting disc is used, stress will be diagonal to the PCB, therefore $A > D$ is invalid.	



(3) Mounting components near screw holes

When a component is mounted near a screw hole, it may be affected by the board deflection that occurs during the tightening of the screw.

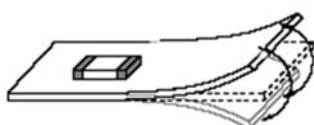
Mount the component in a position as far away from the screw holes as possible.



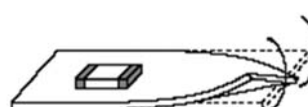
11.7 Handling of substrate

After mounting products on a substrate, do not apply any stress to the product caused by bending or twisting to the substrate when cropping the substrate, inserting and removing a connector from the substrate or tightening screw to the substrate.

Excessive mechanical stress may cause cracking in the product.



Bending



Twisting

11.8 Cleaning

When cleaning this product, observe the following conditions:

- (1) The cleaning temperature shall be 60°C max. If isopropyl alcohol (IPA) is used, the cleaning temperature shall be 40°C max.
- (2) During ultrasonic cleaning, under some cleaning conditions, the resonance of PCB should be caused by its vibration. Be sure to do the test cleaning with actual cleaning equipment before production and confirm that product does not be damaged by cleaning.
- (3) Cleaner
 Alcohol-based cleaner: IPA
 Aqueous agent: PINE ALPHA ST-100S
- (4) There shall be no residual flux or residual cleaner. When using aqueous agent, rinse the product with deionized water adequately and completely dry it so that no cleaner is left.

* For other cleaning, consult our technical department.

11.9 Storage and transportation

Storage period	Use the product within 6 months after delivery. If you do not use the product for more than 6 months, check solderability before using it.
Storage conditions	<ul style="list-style-type: none"> • The products shall be stored in a room not subject to rapid changes in temperature and humidity. The recommended temperature range is -10°C to +40°C. The recommended relative humidity range is 15% to 85%. Keeping the product in corrosive gases, such as sulfur, chlorine gas or acid may cause the poor solderability. • Do not place the products directly on the floor; they should be placed on a palette so that they are not affected by humidity or dust. • Avoid keeping the products in a place exposed to direct sunlight, heat or vibration. • Do not keep products in bulk packaging. Doing so may cause collision between the products or between the products and other products, resulting in chipping or wire breakage. • Avoid storing the product by itself bare (i.e. exposed directly to air).
Transportation	Excessive vibration and impact reduces the reliability of the products. Exercise caution when handling the products.

11.10 Resin coating (including moistureproof coating)

Coating/molding the product with resin may change electrical characteristics.

A wire breakage issue may occur by mechanical stress caused by the resin, amount/cured shape of resin, or operating condition etc. Some resin contains some impurities or chloride possible to generate chlorine by hydrolysis under some operating condition may cause corrosion of conductor, leading to wire breakage.

Prior to use the coating resin, please make sure no reliability issue is observed by evaluating products mounted on your board.

11.11 Mounting Conditions

- Please check the mounting condition before using.
- Using mounting conditions (nozzles, equipment conditions, etc.) that are not suitable for products may lead to pick up errors, misalignment, or damage to the product.

11.12 Operating Environment

Do not use this product under the following environmental conditions as it may cause deterioration of product quality.

- (1) in the corrodible atmosphere such as acidic gases, alkaline gases, chlorine, sulfur gases, organic gases and etc. (the sea breeze, Cl₂, H₂S, NH₃, SO₂, NO₂, etc)
- (2) in the atmosphere where liquid such as organic solvent, may splash on the products.
- (3) in the atmosphere where the temperature / humidity changes rapidly and it is easy to dew.

11.13 Implementation density

When placing this product near parts with heat generation, take sufficient heat radiation countermeasures.

If the heat received from other parts is large, the characteristics of this product may deteriorate, causing circuit operational failure or deterioration of the joints.

Be sure to use this product below the maximum rated operating temperature even when heat received from other parts is applied.

11.14 Handling of product

Inductance could change due to the effect of magnetism. Do not use magnetized tweezers, magnets, or other similar tools when handling the product (instead, use tweezers with resin or ceramic tips).

12.  Note

- (1) Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
 - (2) You are requested not to use our product deviating from the reference specifications.
 - (3) The contents of this reference specification are subject to change without advance notice.
- Please approve our product specifications or transact the approval sheet for product specifications before order