

# Reference Specification

Part Description: Chip Coil (Chip Inductors)

MURATA Part No: LQH88PN□□□□38□

**RoHS regulation conformity parts.**

Technical Dept.

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## CHIP COIL (CHIP INDUCTORS) LQH88PN□□□□38□ REFERENCE SPECIFICATION

**1.Scope**

This reference specification applies to LQH88PN\_38 Series, Chip coil (Chip Inductors).

**2.Part Numbering**

(ex)   LQ     H     88     P     N     4R7     N     3  8     L    
 Product ID Structure Dimension Applications Category Inductance Tolerance Dimension (T) Packaging  
 (L × W) and Characteristics L:Taping (φ 180mm/reel)  
 K:Taping (φ 330mm/reel)

**3.Rating**

- Operating Temperature Range.  
 (Ambient temperature; Self-temperature rise is not included) -40 to +85°C  
 (Product temperature; Self-temperature rise is included) -40 to +125°C
- Storage Temperature Range. -40 to +125°C

Customer Part Number	MURATA Part Number	Inductance		DC Resistance (Ω)	Self Resonant Frequency (MHz min)	Rated Current (A)	
		(μH)	Tolerance			*1 (Based on Inductance change)	*2 (Based on Temperature rise)
	LQH88PN1R0N38L	1.0	N:±30	0.006±30%	100	11.20	8.00
	LQH88PN1R0N38K						
	LQH88PN1R5N38L	1.5		0.008±30%	60	8.50	7.10
	LQH88PN1R5N38K						
	LQH88PN2R2N38L	2.2		0.009±30%	50	8.00	6.40
	LQH88PN2R2N38K						
	LQH88PN3R3N38L	3.3		0.013±30%	35	7.00	5.00
	LQH88PN3R3N38K						
	LQH88PN4R7N38L	4.7		0.017±30%	30	6.00	4.20
	LQH88PN4R7N38K						
	LQH88PN6R8N38L	6.8	0.022±30%	20	4.50	3.80	
	LQH88PN6R8N38K						
	LQH88PN100M38L	10	M:±20	0.029±30%	18	3.60	3.15
	LQH88PN100M38K						
	LQH88PN150M38L	15		0.041±30%	13	3.00	2.45
	LQH88PN150M38K						
	LQH88PN220M38L	22		0.066±30%	10	2.70	2.25
	LQH88PN220M38K						
	LQH88PN330M38L	33		0.095±30%	9	1.90	1.75
	LQH88PN330M38K						
	LQH88PN470M38L	47		0.157±30%	7	1.50	1.45
	LQH88PN470M38K						
	LQH88PN680M38L	68	0.190±30%	7	1.25	1.10	
	LQH88PN680M38K						
	LQH88PN101M38L	100	0.265±30%	4	1.00	1.00	
	LQH88PN101M38K						

\*1: When applied Rated current to the Products, Inductance will be within ±30% of nominal Inductance value.

\*2: When applied Rated current to the Products, self-generation of heat will rise to 40°C or less.

#### 4. Testing Conditions

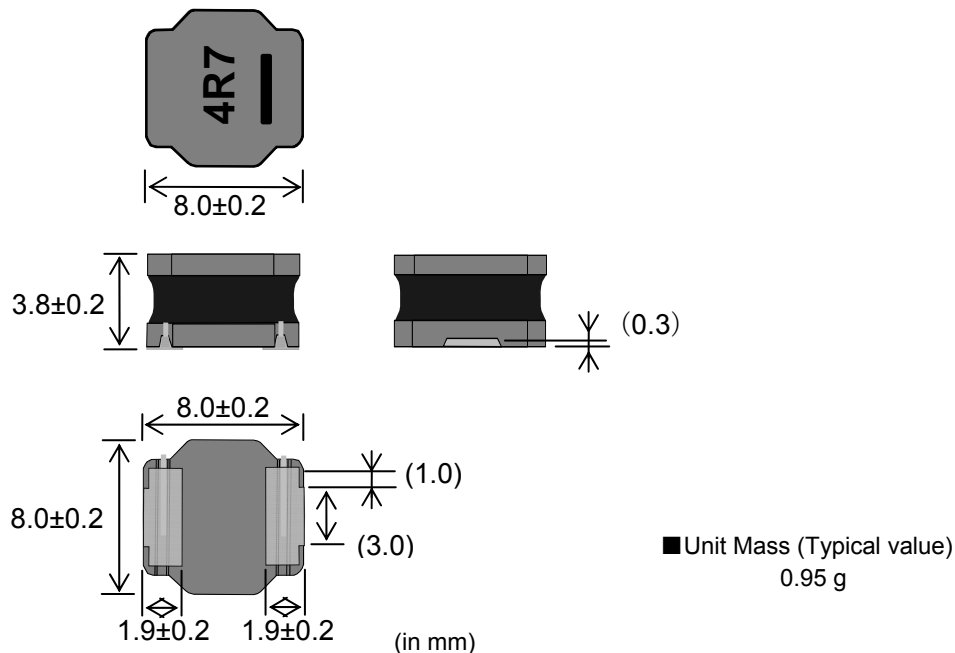
《Unless otherwise specified》

Temperature : Ordinary Temperature (15 to 35°C)  
Humidity : Ordinary Humidity (25 to 85 %(RH))

《In case of doubt》

Temperature :  $20 \pm 2^\circ\text{C}$   
Humidity : 60 to 70 %(RH)  
Atmospheric Pressure : 86 to 106 kPa

#### 5.Appearance and Dimensions



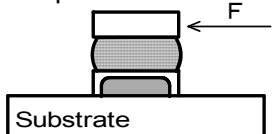
#### 6. Product Marking

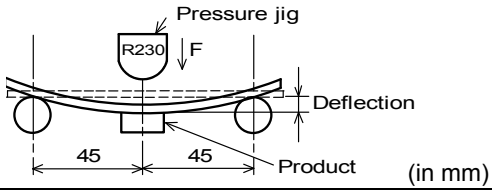
- (1) Inductance (Three digists :  $4.7 \mu\text{H} \rightarrow 4\text{R}7$ )  
 $10 \mu\text{H} \rightarrow 100$   
 $100 \mu\text{H} \rightarrow 101$
- (2) Mark " | " at the beginning point of wire- winding.

#### 7.Electrical Performance

No.	Item	Specification	Test Method
7.1	Inductance	Inductance shall meet item 3.	Measuring Equipment : Agilent 4284A or equivalent Measuring Frequency: 100kHz
7.2	DC Resistance	DC Resistance shall meet item 3.	Measuring Equipment: Digital multi meter
7.3	Self Resonant Frequency(S.R.F)	S.R.F shall meet item 3.	Measuring Equipment: Agilent 4291A or equivalent

#### 8.Mechanical Performance

No.	Item	Specification	Test Method
8.1	Shear Test	Chip coil shall not be damaged.	Substrate: Glass-epoxy substrate Applied Direction : Chip coil  Force: 10N Hold Duration: $5 \pm 1\text{s}$

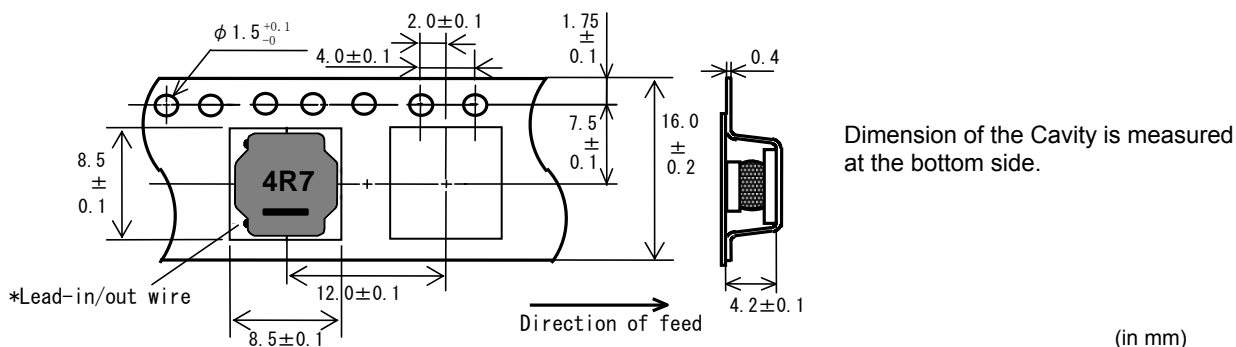
No.	Item	Specification	Test Method
8.2	Bending Test	Chip coil shall not be damaged.	Substrate: Glass-epoxy substrate(100×40×1.0mm) Speed of Applying Force: 0.5mm / s Deflection: 2mm Hold Duration: 5seconds. 
8.3	Vibration		Oscillation Frequency: 10~2000~10Hz for 20minutes Total Amplitude: 1.5mm Testing Time: A period of 2 hours in each of 3 mutually perpendicular directions. (Total 6 hours)
8.4	Solderability	The wetting area of the electrode shall be at least 90% covered with new solder coating.	Flux: Ethanol solution of rosin,25(wt)% (Immersed for 5s to 10s) Solder: Sn-3.0Ag-0.5Cu Pre-Heating: 150±10°C / 60 to 90seconds Solder Temperature: 240±5°C Immersion Time: 3±1 s
8.5	Resistance to Soldering Heat	Appearance:No damage Inductance Change: within ±10%	Flux: Ethanol solution of rosin,25(wt)% (Immersed for 5s to 10s) Solder: Sn-3.0Ag-0.5Cu Pre-Heating: 150±10°C / 60 to 90seconds Solder Temperature: 270±5°C Immersion Time: 10±1 s Then measured after exposure in the room condition for 24±2 hours.

### 9.Environmental Performance (It shall be soldered on the substrate.)

No.	Item	Specification	Test Method
9.1	Heat Resistance	Appearance:No damage Inductance Change: within ± 10% DC Resistance Change: within ± 10%	Temperature: 85±2°C Time: 1000± <sub>0</sub> <sup>48</sup> hours Then measured after exposure in the room condition for 24±2 hours.
9.2	Cold Resistance		Temperature: -40±2°C Time: 1000± <sub>0</sub> <sup>48</sup> hours Then measured after exposure in the room condition for 24±2 hours.
9.3	Humidity		Temperature: 70±2°C Humidity: 90~95%(RH) Time: 1000± <sub>0</sub> <sup>48</sup> hours Then measured after exposure in the room condition for 24±2 hours.
9.4	Temperature Cycle		1 cycle: 1 step: -40±2°C / 30±3 minutes 2 step: Ordinary temp. / 10 to 15 minutes 3 step: +85±2°C / 30±3 min 4 step: Ordinary temp. / 10 to 15 minutes Total of 10 cycles Then measured after exposure in the room condition for 24±2 hours.

## 10. Specification of Packaging

### 10.1 Appearance and Dimensions of plastic tape



### 10.2 Specification of Taping

- (1) Packing quantity (standard quantity)
  - $\phi$  180 mm reel : 250 pcs. / reel
  - $\phi$  330 mm reel : 1000 pcs. / reel
- (2) Packing Method
 

Products shall be packed in the each embossed cavity of plastic tape and sealed by cover tape.
- (3) Sprocket hole
 

Sprocket hole shall be located on the left hand side toward the direction of feed.
- (4) Spliced point
 

Plastic tape and Cover tape has no spliced point.
- (5) Missing components number
 

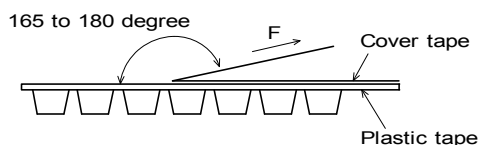
Missing components number within 0.1 % of the number per reel or 1 pc., whichever is greater, and are not continuous. The specified quantity per reel is kept.

### 10.3 Pull Strength

Embossed carrier tape	10N min.
Cover tape	5N min.

### 10.4 Peeling off force of cover tape

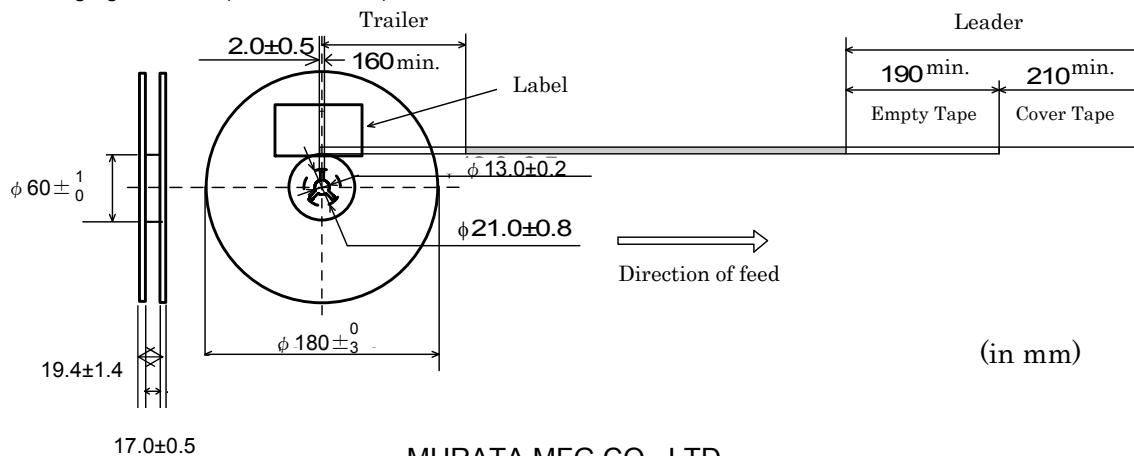
Speed of Peeling off	300mm/min
Peeling off force	0.2 to 0.7N (minimum value is typical)



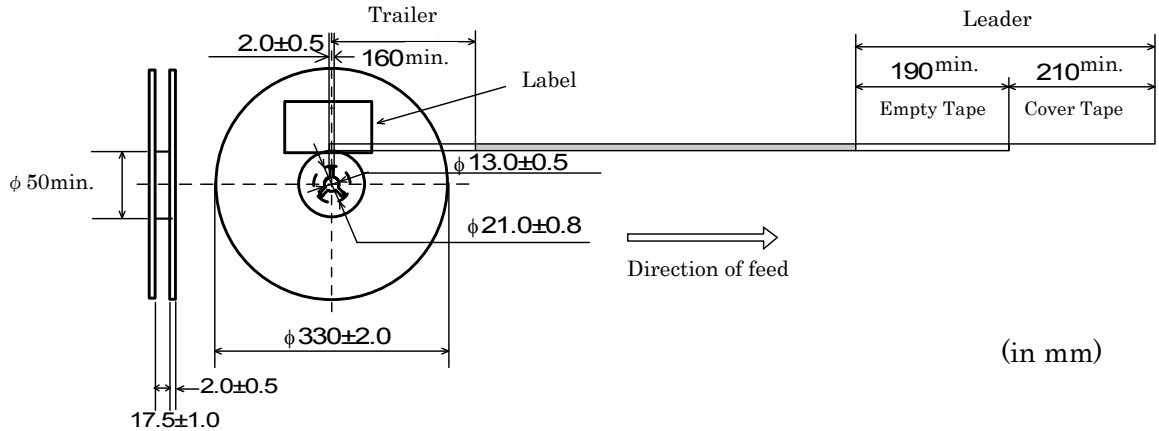
### 10.5 Dimensions of Leader-tape, Trailer and Reel

There shall be leader-tape(cover tape) and trailer-tape (empty tape) as follows.

« Packaging Code : L (  $\phi$  180mm reel ) »



« Packaging Code : K ( φ 330mm reel ) »

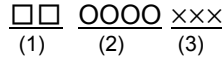


(in mm)

**10.6 Marking for reel**

Customer part number, MURATA part number, Inspection number(\*1), RoHS discrimination(\*2), Quantity etc ...

\*1) <Expression of Inspection No.>



(1) Factory Code

(2) Date

(3) Serial No.

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

\*2) « Expression of RoHS discrimination » ROHS - Y (△)

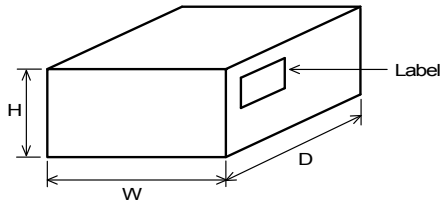
(1) (2)

(1) RoHS regulation conformity parts.  
 (2) MURATA classification number

**10.7 Marking for Outside package (corrugated paper box)**

Customer name, Purchasing order number, Customer part number, MURATA part number, RoHS discrimination(\*2), Quantity, etc ...

**10.8. Specification of Outer Case**



Reel	Outer Case Dimensions (mm)			Standard Reel Quantity in Outer Case (Reel)
	W	D	H	
φ 180mm	186	186	93	4
φ 330mm	340	340	95	4

\* Above Outer Case size is typical. It depends on a quantity of an order.

**11. ⚠ Caution**

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

**12. Notice**

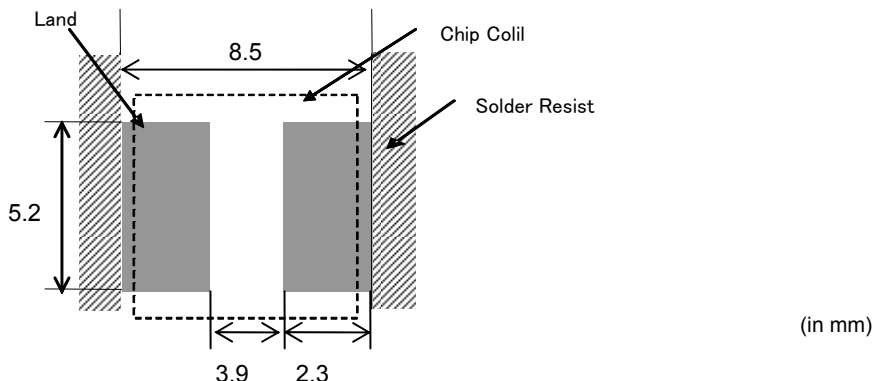
This product is designed for solder mounting.  
Please consult us in advance for applying other mounting method such as conductive adhesive.

**11.1 Land pattern designing (Reflow Soldering)**

Recommended land patterns for reflow soldering are as follows:

These have been designed for Electric characteristics and solderability.

Please follow the recommended patterns as designated performance(s), including solderability, may be affected.



**12.2 Flux, Solder**

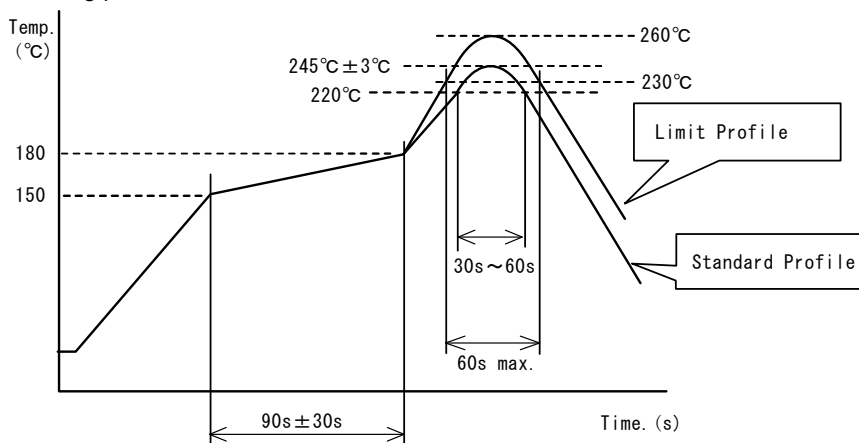
Flux	<ul style="list-style-type: none"> <li>• Use rosin-based flux.</li> <li>• Don't use highly acidic flux with halide content exceeding 0.2(wt)% (chlorine conversion value).</li> <li>• Don't use water-soluble flux.</li> </ul>
Solder	<ul style="list-style-type: none"> <li>• Use Sn-3.0Ag-0.5Cu solder.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

**12.3 Soldering conditions (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.

soldering profile

Reflow soldering profile



	Standard Profile	Limit Profile
Pre-heating	150~180°C、90s±30s	
Heating	above 220°C、30s~60s	above 230°C、60s max.
Peak temperature	245±3°C	260°C、10s
Cycle of reflow	2 times	

### 12.4 Reworking with soldering iron.

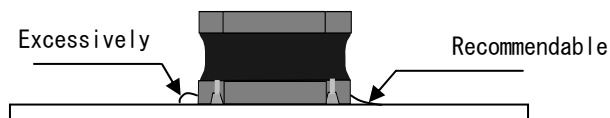
The following conditions must be strictly followed when using a soldering iron.

Pre-heating	150°C, 1 min
Tip temperature	380°C max.
Soldering iron output	80W max.
Tip diameter	φ 3mm max.
Soldering time	3(+1,-0)s
Times	2 times

Note : Do not directly touch the products with the tip of the soldering iron in order to prevent the crack on the products due to the thermal shock.

### 12.5 Solder Volume

- Solder shall be used not to exceed the upper limits as shown below.
- Accordingly increasing the solder volume, the mechanical stress to Chip is also increased. Exceeding solder volume may cause the failure of mechanical or electrical performance.

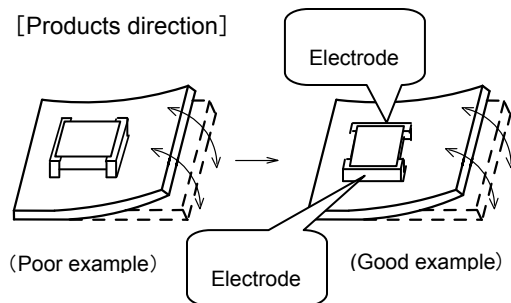


### 12.6 Product's location

The following shall be considered when designing and laying out P.C.B.'s.

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

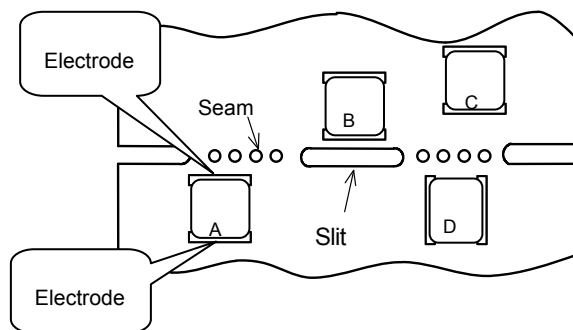
[Products direction]



The electrode part of the products should be located like the picture to the mechanical stress.

- (2) Products location on P.C.B. separation

Products (A,B,C,D) shall be located carefully so that products are not subject to the mechanical stress due to warping the board. Because they may be subjected the mechanical stress in order of  $A > C > B \cong D$ .



### 12.7 Cleaning Conditions

Products shall be cleaned on the following conditions.

- (1) Cleaning temperature shall be limited to 40°C max.
- (2) Ultrasonic cleaning shall comply with the following conditions with avoiding the resonance phenomenon at the mounted products and P.C.B.  
Power : 20 W / l max.    Frequency : 28kHz to 40kHz    Time : 5 minutes max.
- (3) Cleaner  
Alternative cleaner
  - Isopropyl alcohol (IPA)
- (4) There shall be no residual flux and residual cleaner after cleaning.  
In the case of using aqueous agent, products shall be dried completely after rinse with de-ionized water in order to remove the cleaner.
- (5) Other cleaning  
Please contact us.



**12.8 Resin coating**

The inductance value may change due to high cure-stress of resin to be used for coating/molding products. An open circuit 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 wire of coil, leading to open circuit. So, please pay your careful attention when you select resin in case of coating/molding the products with the resin. Prior to use the coating resin, please make sure no reliability issue is observed by evaluating products mounted on your board.

**12.9 Caution for use**

- Sharp material such as a pair of tweezers or other material such as bristles of cleaning brush, shall not be touched to the winding portion to prevent the breaking of wire.
- Mechanical shock should not be applied to the products mounted on the board to prevent the breaking of the core

**12.10 Storage and Handling Requirements****(1) Storage period**

Use the products within 12 months after delivered.  
Solderability should be checked if this period is exceeded.

**(2) Storage conditions**

- Products should be stored in the warehouse on the following conditions.  
Temperature : -10 ~ 40°C  
Humidity : 15 to 85% relative humidity No rapid change on temperature and humidity  
The electrode of the products is coated with solder. Don't keep products in corrosive gases such as sulfur, chlorine gas or acid, or it may cause oxidization of electrode, resulting in poor solderability.
- Products should not be stored on bulk packaging condition to prevent the chipping of the core and the breaking of winding wire caused by the collision between the products.
- Products should be stored on the palette for the prevention of the influence from humidity, dust and so on.
- Products should be stored in the warehouse without heat shock, vibration, direct sunlight and so on.

**(3) Handling Condition**

Care should be taken when transporting or handling product to avoid excessive vibration or mechanical shock.

**13.  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 ordering.

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