CHIP COIL (CHIP INDUCTORS) LQG18HH□□□□00D SPECIFICATION
Murata Standard Reference Specification [AEC-Q200]

1. Scope

This reference specification applies to LQG18HH_00 series Chip coil (Chip inductors) for Automotive Electronics based on AEQ-Q200.

2. Part Numbering

(ex) LQ | G | 18 | H | H | 1N2 | S | 0 | 0 | D

Product ID	Structure	Dimension (L×W)	Applications and Characteristics	Category for Automotive Electronics	Inductance	Tolerance	Features	Electrode	Packaging
									D: Taping *B: BULK

*Bulk packing (B) also available

3. Rating

・Operating Temperature Range –55°C to +125°C

・Storage Temperature Range –55°C to +125°C

Customer Part Number	MURATA Part Number	Inductance (nH)	Tolerance	Q (min.)	DC Resistance (Ω max.)	Self Resonant Frequency (MHz min.)	Rated Current (mA)	ESD Rank 1C:1kV
		(*1) Refer to below comment						
	LQG18HH1N2S00D	1.2	±0.3nH	12	0.10	6000	1100	1C
	LQG18HH1N5S00D	1.5						
	LQG18HH1N8S00D	1.8				5000		
	LQG18HH2N2S00D	2.2						
	LQG18HH2N7S00D	2.7			0.13	4000	1000	
	LQG18HH3N3S00D	3.3			0.14		900	
	LQG18HH3N9S00D	3.9			0.15	3000		
	LQG18HH4N7S00D	4.7			0.16		800	
	LQG18HH5N6S00D	5.6			0.17			
	LQG18HH6N2S00D	6.2			0.18	2800		
	LQG18HH6N8J00D	6.8	±5%					
	LQG18HH8N2J00D	8.2			0.20	2600		
	LQG18HH10NJ00D	10			0.25	2400	700	
	LQG18HH12NJ00D	12			0.30	2200	600	
	LQG18HH15NJ00D	15			0.35	1800		
	LQG18HH18NJ00D	18						
	LQG18HH22NJ00D	22			0.50	1600	500	
	LQG18HH27NJ00D	27			0.54	1400		
	LQG18HH33NJ00D	33				1200		
	LQG18HH39NJ00D	39			0.60	1000	400	
	LQG18HH47NJ00D	47			0.70	900		
	LQG18HH56NJ00D	56				800		
	LQG18HH68NJ00D	68			0.80			
	LQG18HH82NJ00D	82			0.85	700	300	
	LQG18HHR10J00D	100			0.90	600		
	LQG18HHR12J00D	120		14	1.10	550		
	LQG18HHR15J00D	150			1.20			
	LQG18HHR18J00D	180			1.30	500		
	LQG18HHR22J00D	220			1.50	450		
	LQG18HHR27J00D	270			1.90	400	200	

(*1) Testing Conditions

《Unless otherwise specified》

Temperature : Ordinary Temperature / 15°C to 35°C

Humidity : Ordinary Humidity / 25% (RH) to 85% (RH)

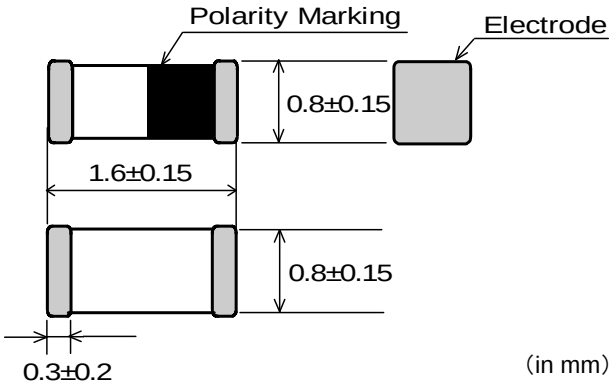
《In case of doubt》

Temperature : 20°C ± 2°C

Humidity : 60% (RH) to 70% (RH)

Atmospheric Pressure : 86kPa to 106 kPa

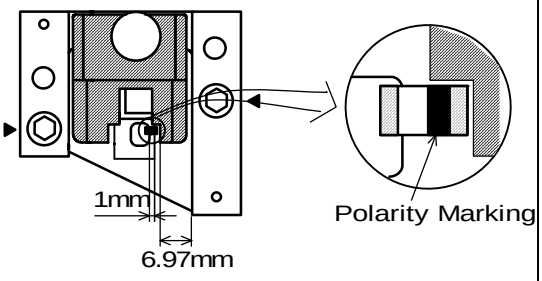
4. Appearance and Dimensions



(in mm)

■ Unit Mass (Typical value)
0.003g

5. Electrical Performance

No.	Item	Specification	Test Method
5.1	Inductance	Inductance shall meet item 3.	Measuring Equipment: Agilent 4291A or equivalent Measuring Frequency: 100MHz Measuring Condition: Test signal level/ about 7dBm Electrical length/ 0.94cm Weight/ about 1N to 5N Measuring Fixture: Agilent 16193A Position coil under test as shown in below and contact coil with each terminal by adding weight. Polarity marking should be a topside,and polarity marking should be in the direction of the fixture for position of chip coil.
5.2	Q	Q shall meet item 3.	 Measuring Method: See P.9 [Electrical Performance: Measuring Method of Inductance/ Q]
5.3	DC Resistance	DC Resistance shall meet item 3.	Measuring Equipment: Digital multi meter
5.4	Self Resonant Frequency (S.R.F)	S.R.F shall meet item 3.	Measuring Equipment: Agilent 8753C or equivalent
5.5	Rated Current	Self temperature rise shall be limited to 25°C max.	The rated current is applied.

6. Q200 Requirement

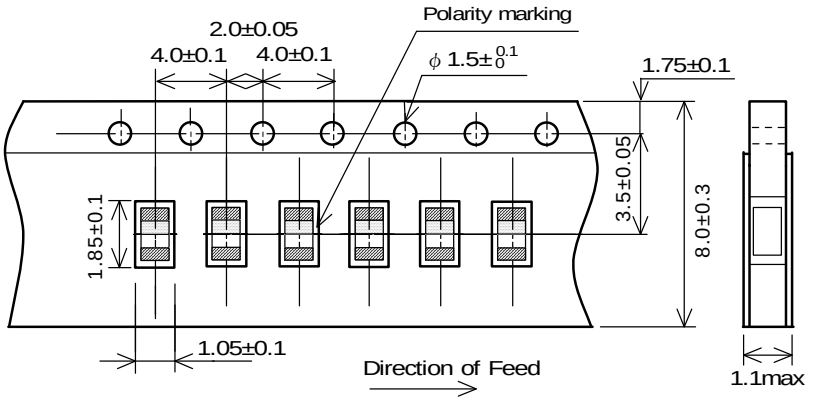
6.1. Performance (based on Table 5 for Magnetics (Inductors / Transformer)

AEC-Q200 Rev.D issued June 1. 2010

<table>
<tr><th colspan="3">AEC-Q200</th><th rowspan="2">Murata Specification / Deviation</th></tr>
<tr><th>No</th><th>Stress</th><th>Test Method</th></tr>
<tr><td>3</td><td>High Temperature Exposure</td><td>1000hours at 125 deg C
Set for 24hours at room temperature, then measured.</td><td>Meet Table A after testing.
Table A
<table><tr><td>Appearance</td><td>No damage</td></tr><tr><td>Inductance (at 100MHz)</td><td>Within ±10%</td></tr></table></td></tr>
<tr><td>4</td><td>Temperature Cycling</td><td>1000cycles
-40 deg C to +125 deg C
Set for 24hours at room temperature, then measured.</td><td>Meet Table A after testing.</td></tr>
<tr><td>7</td><td>Biased Humidity</td><td>1000hours at 85 deg C, 85%RH unpowered.</td><td>Meet Table A after testing.</td></tr>
<tr><td>8</td><td>Operational Life</td><td>Apply 125 deg C 1000hours
Set for 24hours at room temperature, then measured</td><td>Meet Table A after testing.</td></tr>
<tr><td>9</td><td>External Visual</td><td>Visual inspection</td><td>No abnormalities</td></tr>
<tr><td>10</td><td>Physical Dimension</td><td>Meet ITEM 4
（Style and Dimensions）</td><td>No defects</td></tr>
<tr><td>12</td><td>Resistance to Solvents</td><td>Per
MIL-STD-202
Method 215</td><td>Not Applicable</td></tr>
<tr><td>13</td><td>Mechanical Shock</td><td>Per MIL-STD-202
Method 213
Condition C : 100g’s(0.98N), 6ms, Half sine, 12.3ft/s</td><td>Meet Table A after testing.</td></tr>
<tr><td>14</td><td>Vibration</td><td>5g's (0.049N) for 20 minutes,
12cycles each of 3 oritentations
Test from 10-2000Hz.</td><td>Meet Table A after testing.</td></tr>
<tr><td>15</td><td>Resistance to Soldering Heat</td><td>No-heating
Solder temperature
260C+/-5 deg C
Immersion time 10s</td><td>Meet Table A after testing.
Pre-heating 150C +/-10 deg C, 60s to 90s</td></tr>
<tr><td>17</td><td>ESD</td><td>Per AEC-Q200-002</td><td>Meet Table A after testing.
ESD Rank: refer to the Item3 (Rating).</td></tr>
<tr><td>18</td><td>Solderbility</td><td>Per J-STD-002</td><td>Method b: Not Applicable
90% of the terminations is to be soldered.</td></tr>
<tr><td>19</td><td>Electrical Characterization</td><td>Measured: Inductance</td><td>No defects</td></tr>
<tr><td>20</td><td>Flammability</td><td>Per UL-94</td><td>Not Applicable</td></tr>
<tr><td>21</td><td>Board Flex</td><td>Epoxy-PCB (1.6mm)
Deflection 2mm (min)
Holding time 60s</td><td>Meet Table B after testing.
Table B
<table><tr><td>Appearance</td><td>No damage</td></tr><tr><td>DC Resistance</td><td>Within ±10%</td></tr></table></td></tr>
<tr><td>22</td><td>Terminal Strength</td><td>Per AEC-Q200-006
A force of 17.7N
for 60s</td><td>No defects</td></tr>
</table>

7. Specification of Packaging

7.1 Appearance and Dimensions of paper tape (8mm-wide)



(in mm)

7.2 Specification of Taping

(1) Packing quantity (standard quantity)
4,000 pcs. / reel

(2) Packing Method
Products shall be packed in the cavity of the base tape and sealed by top tape and bottom tape.

(3) Sprocket hole
The sprocket holes are to the right as the tape is pulled toward the user.

(4) Spliced point
Base tape and Top tape has no spliced point.

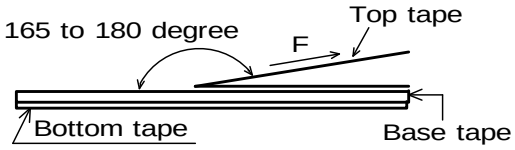
(5) Missing components number
Missing components number within 0.1 % of the number per reel or 1 pc., whichever is greater, and are not continuous. The Specified quantity per reel is kept.

7.3 Pull Strength

Top tape	5N min.
Bottom tape	

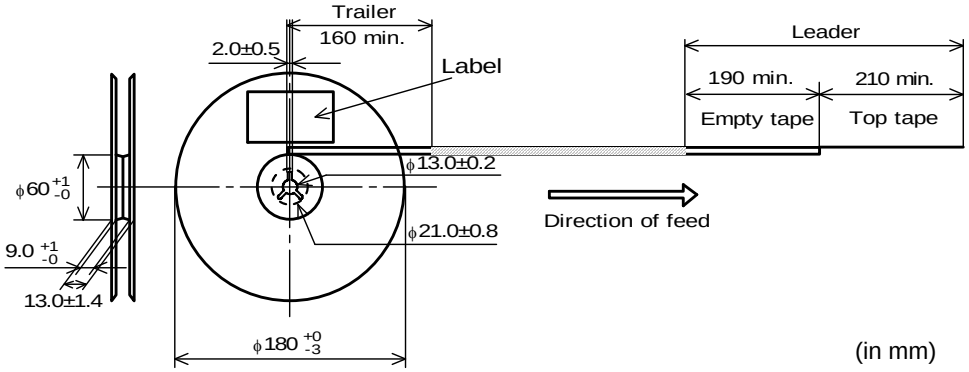
7.4 Peeling off force of cover tape

Speed of Peeling off	300mm/min
Peeling off force	0.1N to 0.6N (minimum value is typical)



7.5 Dimensions of Leader-tape, Trailer and Reel

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



(in mm)

7.6 Marking for reel

Customer part number, MURATA part number, Inspection number (*1), RoHS marking (*2), Quantity etc ・・・

*1) <Expression of Inspection No.> □□ OOOO ×××
(1) (2) (3)

(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.

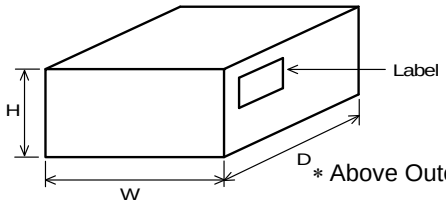
*2) <Expression of RoHS marking> ROHS – Y (△)
(1) (2)

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

7.7 Marking for Outside package (corrugated paper box)

Customer name, Purchasing order number, Customer part number, MURATA part number, RoHS marking(*2), Quantity, etc ・・・

7.8. Specification of Outer Case



Outer Case Dimensions (mm)			Standard Reel Quantity in Outer Case (Reel)
W	D	H	
186	186	93	5

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

8. ⚠Caution

8.1 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 (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

8.2 Caution (Rating)

Do not exceed maximum rated current of the product. Thermal stress may be transmitted to the product and short/open circuit of the product or falling off the product may be occurred.

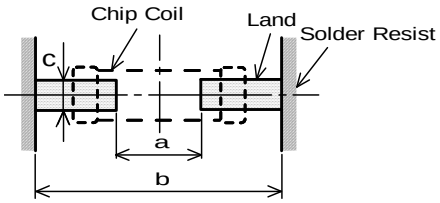
8.3 Fail-safe

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.

9. Notice

Products can only be soldered with reflow.
This product is designed for solder mounting.
Please consult us in advance for applying other mounting method such as conductive adhesive.

9.1 Land pattern designing



a	0.6 to 0.8
B	1.8 to 2.2
c	0.6 to 0.8

(in mm)

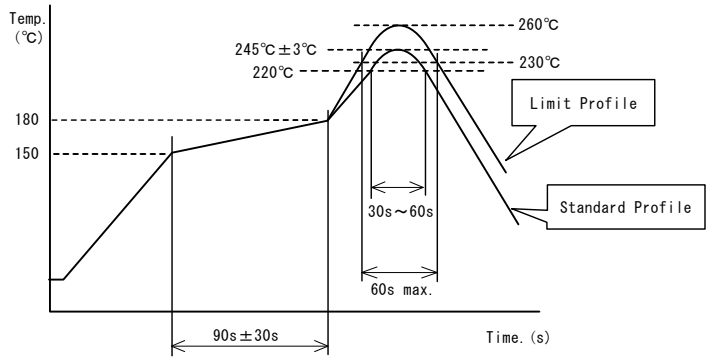
9.2 Flux, Solder

・Use rosin-based flux.
Don't use highly acidic flux with halide content exceeding 0.2(wt) % (chlorine conversion value).
Don't use water-soluble flux.
・Use Sn-3.0Ag-0.5Cu solder.
・Standard thickness of solder paste : 100 μm to 150 μm.

9.3 Reflow soldering conditions

・Inductance value may be changed a little due to the amount of solder.
So, the chip coil shall be soldered by reflow so that the solder volume can be controlled.
・Pre-heating should be in such a way that the temperature difference between solder and product surface is limited to 150°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 products 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.

・Reflow soldering profile



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

9.4 Reworking with soldering iron

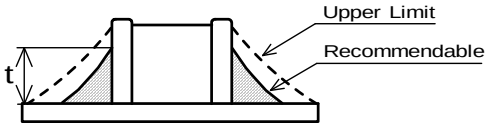
The following conditions must be strictly followed when using a soldering iron.

Pre-heating	150°C, 1 min
Tip temperature	350°C max.
Soldering iron output	80W max.
Tip diameter	ϕ3mm max.
Soldering time	3(+1,-0)s
Time	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.

9.5 Solder Volume

- Solder shall be used not to be exceeded 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.



1/3T≦t≦T
T: thickness of product

9.6 Mount Shock

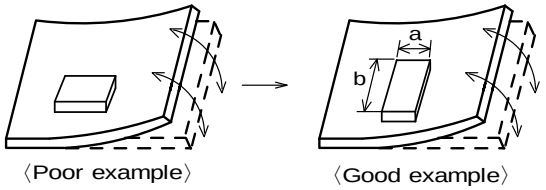
Over Mechanical stress to products at mounting process causes crack and electrical failure etc.

9.7 Product's location

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

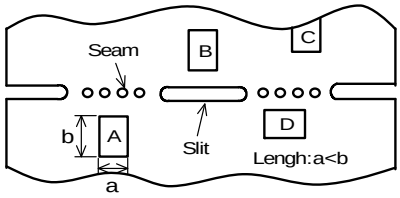
(1) P.C.B. shall be designed so that products are not subject to the mechanical stress due to warping the board.

[Products direction]



Products shall be located in the sideways direction (Length: a＜b) 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 ≅ D.

9.8 Cleaning Conditions

Products shall be cleaned on the following conditions.

(1) Cleaning temperature shall be limited to 60°C max. (40°C max for IPA.)
(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 min max.
(3) Cleaner
1. Alcohol type cleaner
Isopropyl alcohol (IPA)
2. Aqueous agent
PINE ALPHA ST-100S
(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.

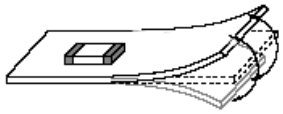
9.9 Resin coating

The inductance value may change and/or it may affect on the product's performance due to high cure-stress of resin to be used for coating / molding products. So please pay your careful attention when you select resin.
In prior to use, please make the reliability evaluation with the product mounted in your application set.

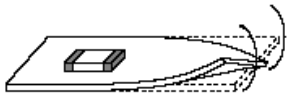
9.10 Handling of a substrate

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



9.11 Storage and Handing Requirements

(1) Storage period

Use the products within 6 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°C to 40°C
Humidity : 15% to 85% relative humidity No rapid change on temperature and humidity

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 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.
・Products should be stored under the airtight packaged condition.

(3) Handling Condition

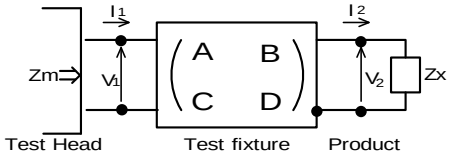
Care should be taken when transporting or handling product to avoid excessive vibration or mechanical shock.

10. ⚠Notes

(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.

<Electrical Performance:Measuring Method of Inductance/Q>

(1) Residual elements and stray elements of test fixture can be described by F-parameter shown in following.



$$\begin{pmatrix} V_1 \\ I_1 \end{pmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{pmatrix} V_2 \\ I_2 \end{pmatrix}$$

(2) The impedance of chip coil Zx and measured value Zm can be described by input/output current/voltage.

$$Zm = \frac{V_1}{I_1} \quad , \quad Zx = \frac{V_2}{I_2}$$

(3) Thus,the relation between Zx and Zm is following;

$$Zx = \alpha \frac{Zm - \beta}{1 - Zm\,\Gamma}$$

where, α = D / A =1
β = B / D =Zsm-(1-Yom Zsm)Zss
Γ = C / A =Yom

(Zsm:measured impedance of short chip
Zss:residual impedance of short chip (0nH)
Yom:measured admittance when opening the fixture)

(4) Lx and Qx shall be calculated with the following equation.

$$Lx = \frac{Im(Zx)}{2\pi f} \quad , \quad Qx = \frac{Im(Zx)}{Re(Zx)}$$

Lx : Inductance of chip coil
Qx: Q of chip coil
f : Measuring frequency