

CHIP COIL (CHIP INDUCTORS) LQH3NPZ□□□□GRL REFERENCE SPECIFICATION
Murata Standard Specification 【AEC-Q200】

1.Scope

This reference specification applies to Chip coil (Chip Inductors) LQH3NPZ_GR series for Automotive Electronics based on AEC-Q200 except for Power train and Safety.

2.Part Numbering

| | | | | | | | | | |
|------------|-----------|--------------------|--|----------|------------|-----------|----------|-----------|----------------------------|
| LQ | H | 3N | P | Z | 220 | M | G | R | L |
| Product ID | Structure | Dimension (L×W) | Applications and Characteristics | Category | Inductance | Tolerance | Features | Electrode | Packaging L: Φ180Taping |

3.Rating

••Operating Temperature Range

(Ambient temperature; Self-temperature rise is not included) -40 to +105°C

(Product temperature; Self- temperature rise is included) -40 to +125°C

••Storage Temperature Range. -40 to +105°C

| Customer Part Number | Murata Part Number | Inductance | | DC Resistance (Ω) | Self Resonant Frequency (MHz min) | Rated Current(mA) | | | ESD 5A: 8kV |
|----------------------|--------------------|------------|---------------|-------------------|-----------------------------------|---------------------------------|-------------------------------|--------------------------------|-------------|
| | | (μH) | Tolerance (%) | | | *1 (Based on inductance change) | *2 Based on Temperature rise | | |
| | | | | | | | *3 Ambient temperature (85°C) | *4 Ambient temperature (105°C) | |
| | LQH3NPZR47NGRL | 0.47 | N:±30% | 0.047±20% | 180 | 2820 | 2540 | 1520 | 5A |
| | LQH3NPZ1R0MGRL | 1.0 | M:±20% | 0.062±20% | 100 | 1700 | 2080 | 1240 | |
| | LQH3NPZ1R5MGRL | 1.5 | | 0.074±20% | 80 | 1400 | 2040 | 1220 | |
| | LQH3NPZ2R2MGRL | 2.2 | | 0.087±20% | 50 | 1180 | 1730 | 1030 | |
| | LQH3NPZ3R3MGRL | 3.3 | | 0.12±20% | 30 | 1050 | 1580 | 940 | |
| | LQH3NPZ4R7MGRL | 4.7 | | 0.14±20% | 27 | 850 | 1520 | 910 | |
| | LQH3NPZ6R8MGRL | 6.8 | | 0.23±20% | 25 | 720 | 1140 | 680 | |
| | LQH3NPZ100MGRL | 10 | | 0.28±20% | 20 | 570 | 1120 | 670 | |
| | LQH3NPZ150MGRL | 15 | | 0.39±20% | 15 | 480 | 900 | 540 | |
| | LQH3NPZ220MGRL | 22 | | 0.53±20% | 10 | 390 | 750 | 450 | |
| | LQH3NPZ330MGRL | 33 | | 0.86±20% | 8 | 320 | 600 | 360 | |
| | LQH3NPZ470MGRL | 47 | | 1.4±20% | 5 | 260 | 460 | 270 | |

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

*2:Keep the temperature (ambient temperature plus self-generation of heat) under 125°C.

*3:When applied Rated current to the Products ,temperature rise caused by self-generated heat shall be limited to 40°C max. (Ambient temperature 85°C).

*4:When applied Rated current to the Products ,temperature rise caused by self-generated heat shall be limited to 20°Cmax. (Ambient temperature 85 to 105°C)..

4. Testing Conditions

《Unless otherwise specified》

Temperature : Ordinary Temperature (15 to 35°C)

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

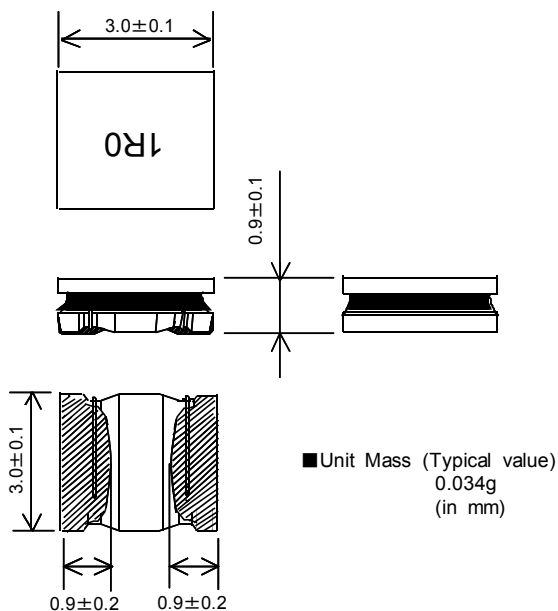
《In case of doubt》

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

Inductance (Three digits : $0.47\mu\text{H} \rightarrow \text{R47}$)

$1.0\mu\text{H} \rightarrow \text{1R0}$)

$10\mu\text{H} \rightarrow \text{100}$)

7.Electrical Performance

| No. | Item | Specification | Test Method |
|-----|--------------------------------|----------------------------------|--|
| 7.1 | Inductance | Inductance shall meet item 3. | Measuring Equipment : Agilent 4192A or equivalent Measuring Frequency: 1MHz |
| 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 4991A or equivalent |

8. AEC-Q200 Requirement

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

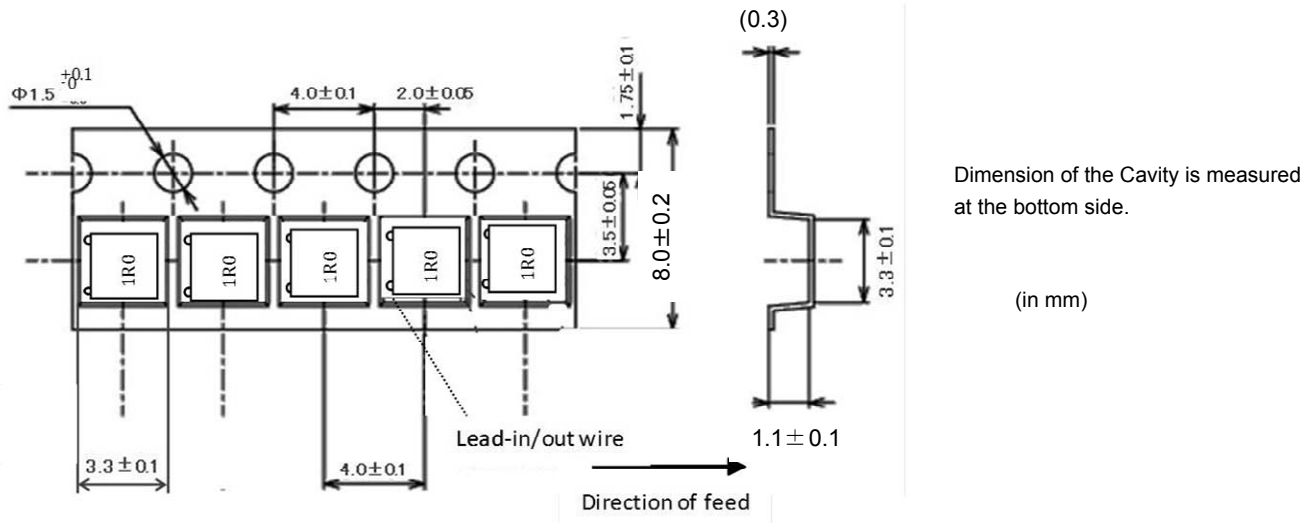
AEC-Q200 Rev.D issued June. 1 2010

| AEC-Q200 | | | Murata Specification / Deviation | | | | | | | |
|----------------------|------------------------------|--|--|---|------------|-----------|----------------------|-------------------|----------------------|-------------------|
| No | Stress | Test Method | | | | | | | | |
| 3 | High Temperature Exposure | 1000hours at 125 deg C Set for 24hours at room temperature, then measured. | Meet Table A after testing. Table A | <table border="1"> <tr> <td>Appearance</td> <td>No damage</td> </tr> <tr> <td>Inductance (at 1MHz)</td> <td>Within $\pm 10\%$</td> </tr> <tr> <td>DC Resistance Change</td> <td>Within $\pm 10\%$</td> </tr> </table> | Appearance | No damage | Inductance (at 1MHz) | Within $\pm 10\%$ | DC Resistance Change | Within $\pm 10\%$ |
| Appearance | No damage | | | | | | | | | |
| Inductance (at 1MHz) | Within $\pm 10\%$ | | | | | | | | | |
| DC Resistance Change | Within $\pm 10\%$ | | | | | | | | | |
| 4 | Temperature Cycling | 1000cycles -40 deg C to + 105deg C Set for 24hours at room temperature, then measured. | Meet Table A after testing. | | | | | | | |
| 7 | Biased Humidity | 1000hours at 85 deg C, 85%RH unpowered. | Meet Table A after testing. | | | | | | | |
| 8 | Operational Life | Apply Rated Current 85 deg C 1000 hours Set for 24hours at room temperature, then measured | Meet Table A after testing. | | | | | | | |
| 9 | External Visual | Visual inspection | No abnormalities | | | | | | | |
| 10 | Physical Dimension | Meet ITEM 5 (Style 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 100g's/6ms/Half sine | Meet Table A after testing. | | | | | | | |
| 14 | Vibration | 5g's for 20 minutes, 12cycles eah of 3 orientations Test from 10-2000Hz. | Meet Table A after testing. | | | | | | | |
| 15 | Resistance to Soldering Heat | No-heating Solder temperature 260C+/-5 deg C Immersion time 10s | Pre-heating: 150 to 180C /90 \pm 30s Meet Table B after testing. Table B | <table border="1"> <tr> <td>Appearance</td> <td>No damage</td> </tr> <tr> <td>Inductance (at 1MHz)</td> <td>Within $\pm 20\%$</td> </tr> <tr> <td>DC Resistance Change</td> <td>Within $\pm 10\%$</td> </tr> </table> | Appearance | No damage | Inductance (at 1MHz) | Within $\pm 20\%$ | DC Resistance Change | Within $\pm 10\%$ |
| Appearance | No damage | | | | | | | | | |
| Inductance (at 1MHz) | Within $\pm 20\%$ | | | | | | | | | |
| DC Resistance Change | Within $\pm 10\%$ | | | | | | | | | |
| 17 | ESD | Per AEC-Q200-002 | ESD Rank: Refer to Item 3. Rating No defects | | | | | | | |
| 18 | Solderbility | Per J-STD-002 | Method b : Not Applicable 95% of the terminations is to be soldered. (Except exposed wire) | | | | | | | |
| 19 | Electrical Characterization | Measured : Inductance | No defects | | | | | | | |
| 20 | Flammability | Per UL-94 | Not Applicable | | | | | | | |

| AEC-Q200 | | | Murata Specification / Deviation |
|----------|-------------------|---|---|
| No | Stress | Test Method | |
| 21 | Board Flex | Epoxy-PCB(1.6mm) Deflection 2mm(min) 60s minimum holding time | Holding time: 5s Meet Table A after testing. |
| 22 | Terminal Strength | Per AEC-Q200-006 A force of 17.7N for 60s | No defect |

9. Specification of Packaging

9.1 Appearance and Dimensions of plastic tape



9.2 Specification of Taping

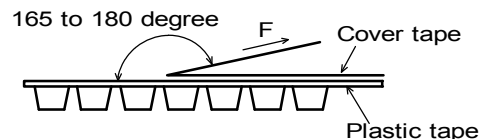
- (1) Packing quantity (standard quantity)
3,000 pcs / reel
- (2) Packing Method
Products shall be packed in the each embossed cavity of plastic tape and sealed by cover tape.
- (3) Sprocket hole
The sprocket holes are to the right as the tape is pulled toward the user.
- (4) Spliced point
Plastic tape 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.

9.3 Pull Strength

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

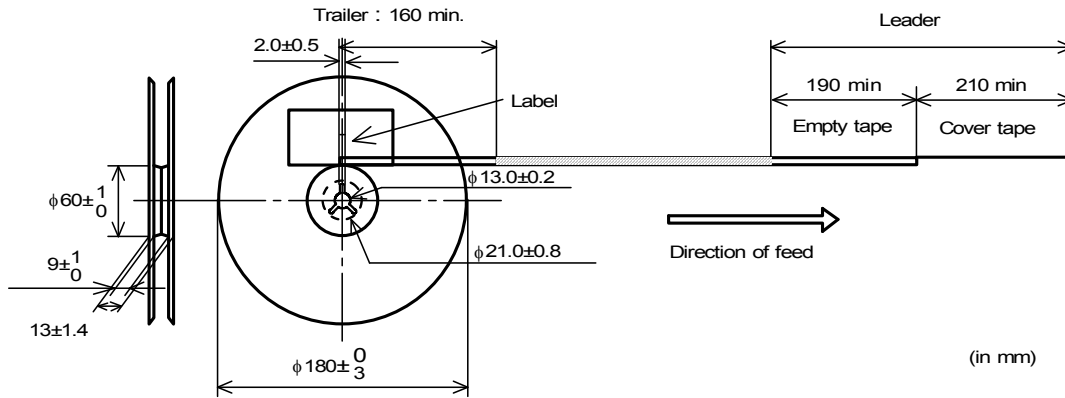
9.4 Peeling off force of cover tape

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



9.5 Dimensions of Leader-tape, Trailer and Reel

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



9.6 Marking for reel

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

- *1) « Expression of Inspection No. »

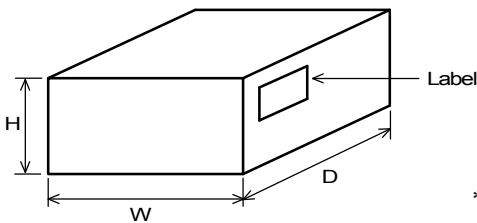
| | | | | | |
|-----|-----|-----|-----|-----|-----|
| | | | | | |
| (1) | (2) | (3) | (4) | (5) | (6) |

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

9.7 Marking for Outside package (corrugated paper box)

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

9.8. 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.

10. ⚠ 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) Disaster prevention / crime prevention equipment
- (7) Traffic signal equipment
- (8) Transportation equipment (trains, ships, etc.)
- (9) Applications of similar complexity and /or reliability requirements to the applications listed in the above.

11. Notice

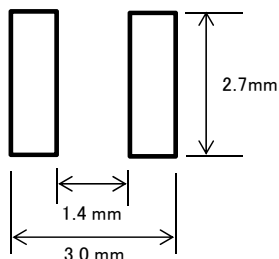
This product is designed for solder mounting. (Reflow soldering only)
 Please consult us in advance for applying other mounting method such as conductive adhesive.

11.1 Land pattern designing (Reflow Soldering)

Recommended land pattern for reflow soldering is as follows:

It has been designed for Electric characteristics and solderability.

Please follow the recommended patterns. Otherwise, their performance which includes electrical performance or solderability may be affected, or result to "position shift" in soldering process.



(in mm)

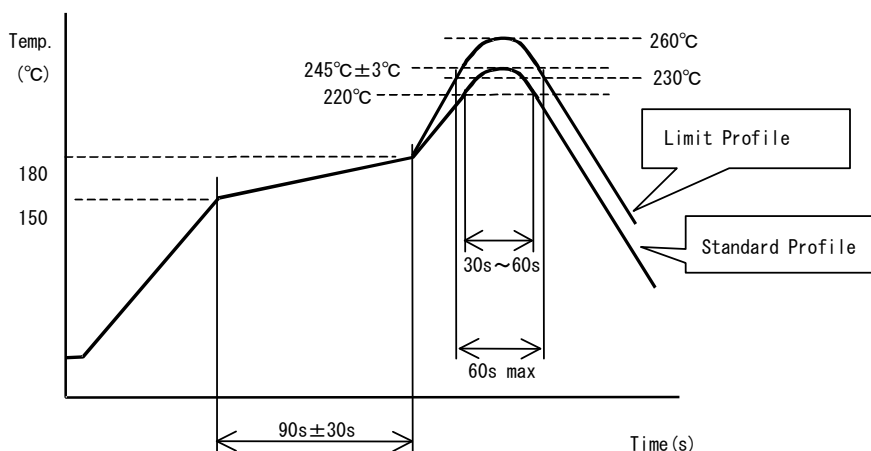
11.2 Flux, Solder

| | |
|--------|--|
| Flux | <ul style="list-style-type: none"> • 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. |
| Solder | <ul style="list-style-type: none"> • Use Sn-3.0Ag-0.5Cu solder • Standard thickness of solder paste : 100 μm to 150 μm |

Other flux (except above) Please contact us for details, then use.

11.3 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.



| | 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 | 2 times |

11.4 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 | φ 3mm max. |
| Soldering time | 3 (+1, -0)s |
| Times | 2 times |

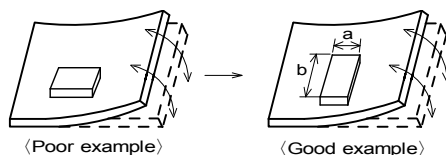
Note :Do not directly touch the products with the tip of the soldering iron in order to prevent the crack on the products due to the thermal shock.

11.5 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.

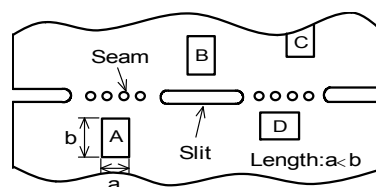
[Products direction]



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 $A > C > B \cong D$.



11.6 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 minutes max.
- (3) Cleaner
 1. Alternative 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.

11.7 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.

11.8 Temperature rating of the circuit board and components located around

Temperature may rise up to max. 40 °C when applying the rated current to the Products. Be careful of the temperature rating of the circuit board and components located around.

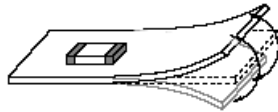
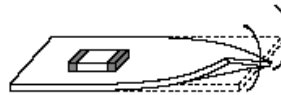
11.9 Caution for use

- 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.

11.10 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****11.11 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.

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 ordering.