CHIP COIL (CHIP INDUCTORS) LQH3NPZ□□□□GRL SPECIFICATION
Murata Standard Reference 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
(ex)  LQ  H  3N  P  Z  220  M  G  R  L
Product ID  Structure  Dimension  Applications  Category  Inductance  Tolerance  Dimensions  Other  Packaging
(L×W)  and  (T)  L:
Characteristics  Φ
Taping

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

4. Testing Conditions
(Unless otherwise specified)  (In case of doubt)
Temperature : Ordinary Temperature (15 to 35°C)  Temperature : 20 ± 2°C
Humidity  : Ordinary Humidity (25 to 85 % (RH))  Humidity  : 60 to 70 % (RH)
Atmospheric Pressure : 86 to 106 kPa

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5. Appearance and Dimensions

![Diagram of an inductor with dimensions and unit mass]

6. Product Marking

Inductance

Three digits: 0.47 $\mu$H $\rightarrow$ R47
1.0 $\mu$H $\rightarrow$ 1R0
10 $\mu$H $\rightarrow$ 100

7. Electrical Performance

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Specification</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Inductance</td>
<td>Inductance shall meet item 3.</td>
<td>Measuring Equipment: KEYSIGHT 4192A or equivalent Measuring Frequency: 1MHz</td>
</tr>
<tr>
<td>7.2</td>
<td>DC Resistance</td>
<td>DC Resistance shall meet item 3.</td>
<td>Measuring Equipment: Digital multi meter</td>
</tr>
<tr>
<td>7.3</td>
<td>Self Resonant Frequency(S.R.F)</td>
<td>S.R.F shall meet item 3.</td>
<td>Measuring Equipment: KEYSIGHT E4991A or equivalent</td>
</tr>
</tbody>
</table>

8. AEC-Q200 Requirement

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

AEC-Q200 Rev.D issued June. 1 2010

<table>
<thead>
<tr>
<th>AEC-Q200</th>
<th>Murata Specification / Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>High Temperature Exposure</td>
</tr>
<tr>
<td></td>
<td>1000hours at 125 deg C</td>
</tr>
<tr>
<td></td>
<td>Set for 24hours at room</td>
</tr>
<tr>
<td></td>
<td>temperature, then measured.</td>
</tr>
<tr>
<td>4</td>
<td>Temperature Cycling</td>
</tr>
<tr>
<td></td>
<td>1000cycles -40 deg C to + 105deg C</td>
</tr>
<tr>
<td></td>
<td>Set for 24hours at room</td>
</tr>
<tr>
<td></td>
<td>temperature,then measured.</td>
</tr>
<tr>
<td>7</td>
<td>Biased Humidity</td>
</tr>
<tr>
<td></td>
<td>1000hours at 85 deg C, 85%RH</td>
</tr>
<tr>
<td></td>
<td>unpowered.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Operational Life</td>
</tr>
<tr>
<td></td>
<td>Apply Rated Current 85 deg C</td>
</tr>
<tr>
<td></td>
<td>1000 hours</td>
</tr>
<tr>
<td></td>
<td>Set for 24hours at room</td>
</tr>
<tr>
<td></td>
<td>temperature, then measured</td>
</tr>
<tr>
<td>9</td>
<td>External Visual</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>No</th>
<th>Stress</th>
<th>Test Method</th>
<th>Murata Specification / Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Physical Dimension</td>
<td>Meet ITEM 5 (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/6ms/Half sine</td>
<td>Meet Table A after testing.</td>
</tr>
<tr>
<td>14</td>
<td>Vibration</td>
<td>5g’s for 20 minutes, 12cycles eah of 3 orientations 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>Pre-heating: 150 to 180C/90±30s Meet Table B after testing. Table B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Appearance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inductance (at 1MHz)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DC Resistance Change</td>
</tr>
<tr>
<td>17</td>
<td>ESD</td>
<td>Per AEC-Q200-002</td>
<td>ESD Rank: Refer to Item 3. Rating No defects</td>
</tr>
<tr>
<td>18</td>
<td>Solderbility</td>
<td>Per J-STD-002</td>
<td>Method b : Not Applicable 95% of the terminations is to be soldered. (Except exposed wire)</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) 80s minimum holding time</td>
<td>Holding time: 5s Meet Table A after testing.</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 defect</td>
</tr>
</tbody>
</table>
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 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

<table>
<thead>
<tr>
<th></th>
<th>Embossed carrier tape</th>
<th>Cover tape</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10N min.</td>
<td>5N min.</td>
</tr>
</tbody>
</table>

9.4 Peeling off force of cover tape

<table>
<thead>
<tr>
<th>Speed of Peeling off</th>
<th>300mm/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peeling off force</td>
<td>0.2 to 0.7N (minimum value is typical)</td>
</tr>
</tbody>
</table>

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.>
□□ OOOO XXX (1) (2) (3)

(1) Factory Code
(2) Date
(3) Serial No.
First digit : Year / Last digit of year
Year : 1 to 9, Oct. to Dec. → O, N, D
Second digit : Month / Jan. to Sep. → 1 to 9, Oct. to Dec. 
Third, Fourth digit : Day

+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

<table>
<thead>
<tr>
<th>Outer Case Dimensions (mm)</th>
<th>Standard Reel Quantity in Outer Case (Reel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>D</td>
</tr>
</tbody>
</table>

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

10. Caution

10.1 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

10.2 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.

10.3 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.
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
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.

11.2 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.

<table>
<thead>
<tr>
<th>Flux</th>
<th>Use Sn-3.0Ag-0.5Cu solder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solder</td>
<td>Standard thickness of solder paste: 100μm to 150μm</td>
</tr>
</tbody>
</table>

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

11.3 Reflow soldering conditions
- 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.

<table>
<thead>
<tr>
<th>Standard Profile</th>
<th>Limit Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-heating</td>
<td>150~180°C, 90s±30s</td>
</tr>
<tr>
<td>Heating</td>
<td>above 220°C, 30s~60s max.</td>
</tr>
<tr>
<td>Peak temperature</td>
<td>245±3°C</td>
</tr>
<tr>
<td>Cycle of reflow</td>
<td>2 times</td>
</tr>
<tr>
<td></td>
<td>2 times</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Condition</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-heating</td>
<td>150°C, 1 min</td>
</tr>
<tr>
<td>Tip temperature</td>
<td>350°C max.</td>
</tr>
<tr>
<td>Soldering iron output</td>
<td>80W max.</td>
</tr>
<tr>
<td>Tip diameter</td>
<td>φ 3mm max.</td>
</tr>
<tr>
<td>Soldering time</td>
<td>3(±1,-0)s</td>
</tr>
<tr>
<td>Times</td>
<td>2 times</td>
</tr>
</tbody>
</table>

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.

![Diagram of products direction](Poor example)  
Electrod  
(Poor example)  
Electrod  
(Good example)  

(2) Components location on P.C.B. 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.

<table>
<thead>
<tr>
<th>Contents of Measures</th>
<th>Stress Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Turn the mounting direction of the component parallel to the board separation surface.</td>
<td>A &gt; D*1</td>
</tr>
<tr>
<td>(2) Add slits in the board separation part.</td>
<td>A &gt; B</td>
</tr>
<tr>
<td>(3) Keep the mounting position of the component away from the board separation surface.</td>
<td>A &gt; C</td>
</tr>
</tbody>
</table>

![Diagram of components location](Poor example)  
Electrod  
(Poor example)  
Electrod  
(Good example)  

*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.
11.6 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,
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 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.

11.9 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.

11.10 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, it may cause oxidation 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.

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