Chip Coil (Chip Inductors) DFE2HCAH□□□□J0L REFERENCE SPECIFICATION
Murata Standard Specification [AEC-Q200]

1. Scope
This reference specification applies to DFE2HCAH□□□□J0L, Chip Coil (Chip Inductors) for Automotive Electronic based on AEC-Q200.

2. Part Numbering

<table>
<thead>
<tr>
<th>(ex)</th>
<th>DF</th>
<th>E</th>
<th>2H</th>
<th>CA</th>
<th>H</th>
<th>1R0</th>
<th>M</th>
<th>J</th>
<th>0</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product ID</td>
<td>Structure</td>
<td>Dimension (L×W)</td>
<td>Applications and Characteristics</td>
<td>Inductance</td>
<td>Tolerance</td>
<td>Dimension (T)</td>
<td>Other Packaging</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Rating

Operating Temperature Range
(Ambient temperature; Self-temperature rise is not included) -40 to +110°C
(Product temperature; Self-temperature rise is included) -40 to +150°C
Storage Temperature Range. -40 to +110°C
It can be considered for use with DCDC converters with a maximum voltage of 40 V or less.

<table>
<thead>
<tr>
<th>Customer Part Number</th>
<th>Murata Part Number</th>
<th>Inductance (µH)</th>
<th>Tolerance (%)</th>
<th>DC Resistance (Ω)</th>
<th>*3 Rated Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max. (Ω)</td>
<td>+1 Based on Inductance change</td>
<td>+2 Based on Temperature rise</td>
</tr>
<tr>
<td>DFE2HCAHR33MJ0L</td>
<td>0.33</td>
<td>±20</td>
<td>0.021</td>
<td>5.8</td>
<td>4.9</td>
</tr>
<tr>
<td>DFE2HCAHR47MJ0L</td>
<td>0.47</td>
<td></td>
<td>0.025</td>
<td>5.1</td>
<td>4.5</td>
</tr>
<tr>
<td>DFE2HCAHR68MJ0L</td>
<td>0.68</td>
<td></td>
<td>0.031</td>
<td>4.4</td>
<td>3.6</td>
</tr>
<tr>
<td>DFE2HCAHR10MJ0L</td>
<td>1.0</td>
<td></td>
<td>0.050</td>
<td>3.4</td>
<td>3.0</td>
</tr>
<tr>
<td>DFE2HCAHR15MJ0L</td>
<td>1.5</td>
<td></td>
<td>0.074</td>
<td>2.9</td>
<td>2.3</td>
</tr>
<tr>
<td>DFE2HCAHR22MJ0L</td>
<td>2.2</td>
<td></td>
<td>0.101</td>
<td>2.5</td>
<td>1.9</td>
</tr>
</tbody>
</table>

*1: The saturation allowable DC current value is specified when the decrease of the initial Inductance value at 30%.
*2: Rated current (Based on Temperature rise) is the current value at which the product temperature rises to 40°C when direct current is applied to the inductor with the product mounted on our designated board.
*3: Value defined when DC current flows and Rated Current (Based on Inductance change) or when DC current flows and Rated Current (Based on Temperature rise) whichever is smaller.

4. Testing Conditions (Standard atmospheric conditions)

Temperature: Ordinary Temperature (5 to 35°C)
Humidity: Ordinary Humidity (45 to 85% (RH))

In case of doubt:
Temperature: ±2°C
Humidity: ±5% (RH)
Atmospheric Pressure: 86 to 106 kPa

5. Appearance and Dimensions

<table>
<thead>
<tr>
<th>Unit Mass (Typical value)</th>
<th>0.0324g</th>
</tr>
</thead>
<tbody>
<tr>
<td>no marking</td>
<td></td>
</tr>
</tbody>
</table>

(in mm)

MURATA MFG.CO., LTD
6. Electrical Performance

<table>
<thead>
<tr>
<th>No.</th>
<th>No.</th>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td></td>
<td>Inductance</td>
<td>Meet item 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measuring Equipment:</td>
<td>KEYSIGHT 4284A or equivalent (0.5V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measuring Frequency:</td>
<td>1MHz</td>
</tr>
<tr>
<td>6.2</td>
<td></td>
<td>DC Resistance</td>
<td>Measuring Equipment: Resistance Hitester 3541 (HIOKI) or equivalent</td>
</tr>
<tr>
<td>6.3</td>
<td></td>
<td>Withstand voltage</td>
<td>Inductance : Meet item 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>machine: impulse testing machine</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>applied voltage: 60-70V</td>
<td></td>
</tr>
</tbody>
</table>

7. Q200 Requirement

AEC-Q200 Rev.D issued June 1. 2010

<table>
<thead>
<tr>
<th>No.</th>
<th>Stress</th>
<th>Test Method</th>
<th>Murata Specification / Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>High Temperature Exposure</td>
<td>1000±12h at 150±2 deg C Set for 24±2hours at room temperature, then measured.</td>
<td>Meet Table A after testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Table A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Appearance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inductance</td>
</tr>
<tr>
<td>4</td>
<td>Temperature Cycling</td>
<td>1000cycles ~40 deg C for 30 min and 150 deg C for 30 min with the transit period of 2min or less Measured within 24±2hours at room temperature.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Damp heat</td>
<td>1000±12h at 85±2 deg C, 85%RH Measured within 24±2hours at room temperature.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Operational Life</td>
<td>Apply 110±2 deg C 1000±12h Measured within 24±2h at room temperature.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Physical Dimension</td>
<td>Measures using digital slide calipers and an optical microscope.</td>
<td>According to specification</td>
</tr>
<tr>
<td>No.</td>
<td>Stress</td>
<td>Test Method</td>
<td>Murata Specification / Deviation</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 13  | Mechanical Shock              | Peak acceleration: 981 m/s² (≒100G)  
Duration of pulse: 6 ms  
3 times in each of 6(±X, ±Y, ±Z) axes  
Three successive shock shall be applied in the perpendicular direction of each surface of the specimen. | Meet Table A after testing. |
| 14  | Vibration                     | 5G for 20 min;  
for 4 hours in each of 3(X, Y, Z) axes  
Test from 10-2000Hz |                                                     |
| 15  | Resistance to Soldering Heat  | Pre-heating: 150 to 180 deg C / 90±30sec  
Reflow soldering method  
above 220 deg C, 60±30 sec  
Temperature condition  
above 255 deg C, above 30sec  
Peak: above 260deg C  
The specimen shall be subjected to the reflow process under the above condition 3 times. Test board shall be 1.6 mm thick.  
Base material shall be glass epoxy resin.  
The specimen shall be stored at standard atmospheric conditions for 1 h in prior to the measurement. |                                                     |
| 17  | ESD(HBM)                      | Per AEC-Q200-002  
1 time in each of terminals | Meet Table A after testing.  
ESD level: Meet Item 3 (Rating) |
| 18  | Solderability                  | Per J-STD-002 Condition SMD)C Method D  
Electrode shall be immersed in flux at room temperature and then shall be immersed in solder bath after preheat.  
Soldering 245±5 deg C, 5sec | New solder shall cover 90% minimum of the surface immersed. |
| 21  | Board Flex                    | Board: 40 × 100mm  
Thickness 1.6mm  
Apply pressure gradually in the direction of the arrow at a rate of about 0.5mm/s until bent depth reaches 2mm and hold for 60 sec. | Meet Table A after testing. |
| 22  | Terminal Strength             | A static load using a R0.5 pressing tool shall be applied to the body of the specimen in the direction of the arrow and shall be hold for 60s. Measure after removing pressure.  
Pressure 18N |                                                     |
8. Specification of Packaging

8.1 Appearance and Dimensions of plastic tape

Unreeling direction

8.2 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.

8.3 Peeling off force of cover tape
The force to peel away the fixing seal tape 0.1~1.0N

8.4 Dimensions of Leader-tape, Trailer and Reel
There shall be leader-tape (cover tape) and trailer-tape (empty tape) as follows.
8.5 Marking for reel
Customer part number, MURATA part number, Inspection number(*1), RoHS marking(*2), Quantity etc.

*1) <Expression of Inspection No.> \[ LL \quad OOOO \quad \times \times \]

(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" \[ ROHS – Y \quad (\Delta) \]

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

8.6 Marking for Outside package (corrugated paper box)
Customer name, Purchasing order number, Customer part number, MURATA part number, RoHS marking (*2), Quantity, etc.

8.7 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>
<tr>
<td>200</td>
<td>185</td>
</tr>
</tbody>
</table>

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

9. Caution

9.1 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

9.2 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.

9.3 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.

10. Notice
This product is designed for solder mounting.
Please consult us in advance for applying other mounting method such as conductive adhesive.
This product employs a core with low insulation resistance, Pay strict attention when use it.
a) Do not make any through holes and copper pattern under the coil except a copper pattern to the electrode.
b) Design/mount any components not to contact this product.
10.1 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.

![Land pattern diagram]

UNIT : mm

10.2 Flux, Solder

<table>
<thead>
<tr>
<th>Flux</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use rosin-based flux.</td>
<td></td>
</tr>
<tr>
<td>Don't use highly acidic flux with halide content exceeding 0.2(wt)% (chlorine conversion value).</td>
<td></td>
</tr>
<tr>
<td>Don't use water-soluble flux.</td>
<td></td>
</tr>
</tbody>
</table>

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

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

10.3 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 profile is as follows.

![Soldering profile diagram]

<table>
<thead>
<tr>
<th>Standard Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-heating</td>
</tr>
<tr>
<td>Heating</td>
</tr>
<tr>
<td>Peak temperature</td>
</tr>
<tr>
<td>Cycle of reflow</td>
</tr>
</tbody>
</table>
10.4 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.

![Solder Volume Diagram]

- \(1/3T \leq t \leq T\)
  - \(T\): thickness of electrode

10.5 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 to the mechanical stress.

(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 &gt;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>

+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.

![Components Location Diagram]

10.6 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.

10.7 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.

10.8 Caution for use
There is possibility that the Impedance value change due to magnetism. Don’t use a magnet or a pair of tweezers with magnetism when chip coil are handled. (The tip of the tweezers should be molded with resin or pottery.)
10.9 Magnetic Saturation
   When the excessive current over rated current is applied, the Impedance value may change due to magnetism.

10.10 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.

10.11 Storage and Handling 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.

10.12 Derating
   Max. current (DC, AC) as function of product temperature (derating curve)
   \[ I_{OP} : \text{Loaded Current} \]
   \[ I_R : \text{Rated Current} \]
11. ▲ 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.