1. **Scope**

This reference specification applies to Chip EMIFIL LC Combined Type for Large Current NFL18ZT_H Series for Automotive Electronics based on AEC-Q200 except for Power train and Safety.

2. **Part Numbering**

   - **NF**
   - **L**
   - **18**
   - **ZT**
   - **506**
   - **H**
   - **1A**
   - **3**
   - **D**

   - **Product ID**
   - **Structure**
   - **Dimension**
   - **Features**
   - **Cut-off Frequency**
   - **Characteristics**
   - **Rated Voltage**
   - **Rated Current**
   - **Electrode**
   - **Packaging Code**

   (D: Taping / B: Bulk)

3. **Rating**

<table>
<thead>
<tr>
<th>Customer Part Number</th>
<th>Murata Part Number</th>
<th>Cut-off Frequency [MHz]</th>
<th>Insertion Loss (I.L.)[dB]</th>
<th>Rated Voltage [V(DC)]</th>
<th>Withstanding Voltage [V(DC)]</th>
<th>Rated Current [mA(DC)]</th>
<th>Insulation Resistance [MΩmin.]</th>
<th>ESD Rank</th>
<th>1C:1kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFL18ZT506H1A3D</td>
<td>NFL18ZT506H1A3B</td>
<td>50</td>
<td>6 max (0-50MHz)</td>
<td>30 min (200-1000MHz)</td>
<td>10</td>
<td>30</td>
<td>1000</td>
<td>1C</td>
<td></td>
</tr>
<tr>
<td>NFL18ZT706H1A3D</td>
<td>NFL18ZT706H1A3B</td>
<td>70</td>
<td>6 max (0-70MHz)</td>
<td>30 min (300-1000MHz)</td>
<td>10</td>
<td>30</td>
<td>1000</td>
<td>1C</td>
<td></td>
</tr>
<tr>
<td>NFL18ZT107H1A3D</td>
<td>NFL18ZT107H1A3B</td>
<td>100</td>
<td>6 max (0-100MHz)</td>
<td>30 min (400-1000MHz)</td>
<td>100</td>
<td>100</td>
<td>1000</td>
<td>1C</td>
<td></td>
</tr>
<tr>
<td>NFL18ZT207H1A3D</td>
<td>NFL18ZT207H1A3B</td>
<td>200</td>
<td>6 max (0-200MHz)</td>
<td>30 min (800-1000MHz)</td>
<td>300</td>
<td>300</td>
<td>1000</td>
<td>1C</td>
<td></td>
</tr>
<tr>
<td>NFL18ZT307H1A3D</td>
<td>NFL18ZT307H1A3B</td>
<td>300</td>
<td>6 max (0-300MHz)</td>
<td>30 min (1200-1000MHz)</td>
<td>500</td>
<td>500</td>
<td>1000</td>
<td>1C</td>
<td></td>
</tr>
</tbody>
</table>

   - Capacitance: NFL18ZT506H1A3D: 110pF (typ.)
   - Inductance: NFL18ZT506H1A3D: 350nH (typ.)

4. **Standard Testing Condition**

   - Operating Temperature: -55 °C to +125 °C (Includes self-heating.)
   - Storage Temperature: -55 °C to +125 °C

   **In case of doubt**

   - Temperature: 20°C ± 2°C
   - Humidity: 60 % (RH) to 70 % (RH)
   - Atmospheric pressure: 86kPa to 106kPa

---

MURATA MFG. CO., LTD.
5. Style and Dimensions

(Top View)

- Equivalent Circuits
- Unit Mass (Typical value)
- Insertion Loss Characteristics (I.L.) (Typ.) (50Ω system)

(Side View)

(Bottom View)

6. Marking

In case of polarity marking on the top, coils are placed in upper layer, and capacitor is placed in lower layer.
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>Insertion Loss (I.L.)</td>
<td>Meet item 3.</td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>Insulation Resistance(I.R.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3</td>
<td>Withstanding Voltage</td>
<td>Products shall not be damaged.</td>
<td>Test Voltage : 30V(DC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Time : 1 to 5s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Charge Current : 50 mA max.</td>
</tr>
</tbody>
</table>

7.1 Insertion Loss (I.L.)

Insertion Loss = 20 \log (E_0 / E_1)

E_0 : Level without FILTER (short)
E_1 : Level with FILTER

7.2 Insulation Resistance (I.R.)

- Voltage : Rated Voltage
- Time : 1 minutes max.

7.3 Withstanding Voltage

Products shall not be damaged.

8. Q200 Requirement

8-1. Performance (based on Table 13 for Ferrite EMI SUPPRESSORS/FILTERS)

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>1000hours at 125C</td>
<td>Meet TABLE A after testing.</td>
</tr>
<tr>
<td></td>
<td>(Storage)</td>
<td>Set for 24hours at room temperature, then measured.</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>Cap. Change (%∆C)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inductance Change (%∆L)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I.R.</td>
</tr>
<tr>
<td>4</td>
<td>Temperature Cycling</td>
<td>1000cycles(-40C to 125C)</td>
<td>Meet TABLE A after testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measurement at 24±2 hours after test conclusion.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Destructive Physical Analysis</td>
<td>Per EIA469</td>
<td>No defects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No electrical tests</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Biased Humidity</td>
<td>1000hours 85C/85%RH.</td>
<td>Meet Table A after testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apply Maximum rated Voltage.</td>
<td>Measurement at 24+/-2 hours after test conclusion.</td>
</tr>
<tr>
<td>8</td>
<td>Operational Life</td>
<td>1000hours at 125C</td>
<td>Meet Table A after testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apply Maximum rated Current.</td>
<td>Measurement at 24+/-2 hours after test conclusion.</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>
</tbody>
</table>

MURATA MFG. CO., LTD.
### Table: AEC-Q200 Test Methods

<table>
<thead>
<tr>
<th>No.</th>
<th>Stress</th>
<th>Test Method</th>
<th>Murata Specification / Deviation</th>
</tr>
</thead>
<tbody>
<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 Figure 1 of Method 213. Condition C (100g/s/6ms/Half sine) Three times each 6 direction.</td>
<td>Meet Table A after testing.</td>
</tr>
<tr>
<td>14</td>
<td>Vibration</td>
<td>5g/s for 20 minutes, 12cycles each of 3 orientations Oscillation Frequency: 10-2000Hz</td>
<td>Meet Table A after testing.</td>
</tr>
<tr>
<td>15</td>
<td>Resistance to Soldering Heat</td>
<td>No Pre-heating. 260C +/- 5degree C Immersion time 10 +/-1sec</td>
<td>Meet Table A after testing.</td>
</tr>
<tr>
<td>17</td>
<td>ESD</td>
<td>Per AEC-Q200-002</td>
<td>Meet Table B after testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ESD Rank: Refer to Item 3. Rating. Table B</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appearance: No damage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I.R.: 1000 Ohm min</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Withstanding Voltage: No damage</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Solderability</td>
<td>Per J-STD-002</td>
<td>95% of the terminations is to be soldered.</td>
</tr>
<tr>
<td>19</td>
<td>Electrical Characterization</td>
<td></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 60s minimum holding time</td>
<td>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 60sec</td>
<td>10N for 60sec</td>
</tr>
<tr>
<td>30</td>
<td>Electrical Transient Conduction</td>
<td>Per ISO-7637-2</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

### 10. Specification of Packaging

10.1. Appearance and Dimensions (8mm-wide paper tape)

- Sporocket Hole: 1.85 ± 0.0
- Width: 8.0 ± 0.3
- Height: 3.75 ± 0.1

![Diagram of dimensions](image)
10.2. Specification of Taping

(1) Packing quantity (standard quantity)
4000 pcs. / reel

(2) Packing Method
Products shall be packaged 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) Base tape and Top tape
The base tape and top tape have no spliced point.

(5) Cavity
There shall not be burr in the cavity.

(6) 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 of Top Tape and Bottom Tape

<table>
<thead>
<tr>
<th></th>
<th>Top tape</th>
<th>5N min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom tape</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10.4. Peeling off force of top tape
0.1N to 0.6N (minimum value is typical)
Speed of Peeling off : 300 mm / min

10.5. Dimensions of Leader-tape, Trailer and Reel
There shall be leader-tape (top tape and empty tape) and trailer-tape (empty tape) as follows.

10.6. Marking for reel
Customer part number, MURATA part number, Inspection number (+1), RoHS marking (+2), Quantity, etc

+1) « Expression of Inspection No. »
(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

+2) « Expression of RoHS marking »
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 marking (+2), Quantity, etc
10.8. Specification of Outer Case

Outer Case Dimensions (mm) Standard Reel Quantity in Outer Case (Reel)

<table>
<thead>
<tr>
<th>W</th>
<th>D</th>
<th>H</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>186</td>
<td>186</td>
<td>93</td>
<td>5</td>
</tr>
</tbody>
</table>

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

11. Standard Land Dimensions

The chip EMI filter suppresses noise by conducting the high-frequency noise element to ground. Therefore, to get enough noise reduction, feed through holes which is connected to ground-plane should be arranged according to the figure to reinforce the ground-pattern.

< Standard land dimensions for reflow >

- Side on which chips are mounted

12. **Caution**

12.1. 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.

- Aircraft equipment
- Aerospace equipment
- Undersea equipment
- Power plant control equipment
- Medical equipment
- Transportation equipment (trains, ships, etc.)
- Traffic signal equipment
- Disaster prevention / crime prevention equipment
- Data-processing equipment
- Applications of similar complexity or with reliability requirements comparable to the applications listed in the above

12.2. Fail Safe

Be sure to provide an appropriate fail-safe function on your product to prevent from a second damage that may be caused by the abnormal function or the failure of our products.

13. **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.

13.1. Flux and Solder

<table>
<thead>
<tr>
<th>Flux</th>
<th>Use rosin-based flux, Do not use highly acidic flux (with chlorine content exceeding 0.2(wt)%). Do not use water-soluble flux.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solder</td>
<td>Use Sn-3.0Ag-0.5Cu solder</td>
</tr>
</tbody>
</table>

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

13.2. Note for Assembling

< Thermal Shock >

Pre-heating should be in such a way that the temperature difference between solder and products surface is limited to 100°C max. Also cooling into solvent after soldering should be in such a way that the temperature difference is limited to 100°C max.

MURATA MFG. CO., LTD.
13.3. Attention Regarding P.C.B. Bending
The following shall be considered when designing P.C.B.'s and laying out products.

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

[Products direction]

(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>

*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.

13.4. Pre-heating Temperature
Soldering shall be handled so that the difference between pre-heating temperature and solder temperature shall be limited to 100°C max. to avoid the heat stress for the products.

13.5. Reflow Soldering
1) Soldering paste printing for reflow
   - Standard thickness of solder paste: 100µm to 150µm.
   - Use the solder paste printing pattern of the right pattern.
   - For the resist and copper foil pattern, use standard land dimensions.

   - Standard printing pattern of solder paste.
2) Soldering Conditions

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>Temperature</th>
<th>Standard Profile</th>
<th>Limit Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-heating</td>
<td>150°C ~ 180°C , 90s ± 30s</td>
<td></td>
</tr>
<tr>
<td>Heating</td>
<td>above 220°C , 30s ~ 60s</td>
<td>above 230°C , 60s max.</td>
</tr>
<tr>
<td>Peak temperature</td>
<td>245°C ± 3°C</td>
<td>260°C , 10s</td>
</tr>
<tr>
<td>Cycle of reflow</td>
<td>2 times</td>
<td>2 times</td>
</tr>
</tbody>
</table>

13.6. Reworking with Soldering iron

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

- Pre-heating : 150°C, 1 min
- Tip temperature : 350°C max.
- Soldering time : 3(+1,-0) s
- Soldering iron output : 30W max.
- Tip diameter : φ3mm max.
- Times : 2times max.

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

13.7. Solder Volume

Solder shall be used not to be exceeded as shown below.

Accordingly increasing the solder volume, the mechanical stress to product is also increased. Excessive solder volume may cause the failure of mechanical or electrical performance.

13.8. Cleaning Conditions

Products shall be cleaned on the following conditions.

1) Cleaning temperature shall be limited to 60°C max. (40°C max. for Isopropyl alcohol (IPA))
2) Ultrasonic cleaning shall comply with the following conditions, with avoiding the resonance phenomenon at the mounted products and P.C.B.
   - Power: 20W / l max.
   - Frequency: 28kHz to 40kHz
   - Time: 5 minutes max.
3) Cleaner
   1. 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.

13.9. Operating Environment
Do not use this product under the following environmental conditions, on deterioration of the performance, such as insulation resistance may result from the use.
(1) in the corrovable atmosphere (acidic gases, alkaline gases, chlorine, sulfur gases, organic gases and etc.)
(2) in the atmosphere where liquid such as organic solvent, may splash on the products.
(3) in the atmosphere where the temperature / humidity changes rapidly and it is easy to dew.

13.10. Resin coating
The capacitance and 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.

13.11. 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.

13.12. Storage condition
(1) Storage period
   Use the products within 12 months after delivered.
   Solderability should be checked if this period is exceeded.

(2) Storage environment condition
   · Products should be stored in the warehouse on the following conditions.
     Temperature : -10 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) Delivery
   Care should be taken when transporting or handling product to avoid excessive vibration or mechanical shock.

14.  ¡  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.