



## ■ Limited Application

### 1. Equipment Intended for Use

The products listed in this catalog are intended for general-purpose and standard use in general electronic equipment for consumer (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC) and other equipment specified in this catalog or the individual product specification sheets, or the equipment approved separately by TAIYO YUDEN.

TAIYO YUDEN has the product series intended for use in the following equipment. Therefore, when using our products for these equipment, please check available applications specified in this catalog or the individual product specification sheets and use the corresponding products.

| Application | Product Series   |   | Quality Grade <sup>*3</sup> |
|-------------|--|---|-----------------------------|
|             | Equipment <sup>*1</sup>  | Category<br>(Part Number Code <sup>*2</sup> ) |                             |
| Automotive  | Automotive Electronic Equipment<br>(POWERTRAIN, SAFETY)                      | A   | 1                           |
|             | Automotive Electronic Equipment<br>(BODY & CHASSIS, INFOTAINMENT)            | C   | 2                           |
| Industrial  | Telecommunications Infrastructure and<br>Industrial Equipment                | B   | 2                           |
| Medical     | Medical Devices classified as GHTF Class C<br>(Japan Class III)              | M   | 2                           |
|             | Medical Devices classified as GHTF Classes A or B<br>(Japan Classes I or II) | L   | 3                           |
| Consumer    | General Electronic Equipment   | S   | 3                           |

\*Notes: 1. Based on the general specifications required for electronic components for such equipment, which are recognized by TAIYO YUDEN, the use of each product series for the equipment is recommended. Please be sure to contact TAIYO YUDEN before using our products for equipment other than those covered by the product series.

2. On each of our part number, the 2nd code from the left is a code indicating the "Category" as shown in the above table. For details, please check the explanatory materials regarding the part numbering system of each of our products.

3. Each product series is assigned a "Quality Grade" from 1 to 3 in order of higher quality. Please do not incorporate a product into any equipment with a higher Quality Grade than the Quality Grade of such product without the prior written consent of TAIYO YUDEN.

### 2. Equipment Requiring Inquiry

Please be sure to contact TAIYO YUDEN for further information before using the products listed in this catalog for the following equipment (excluding intended equipment as specified in this catalog or the individual product specification sheets) which may cause loss of human life, bodily injury, serious property damage and/or serious public impact due to a failure or defect of the products and/or malfunction attributed thereto.

- (1) Transportation equipment (automotive powertrain control system, train control system, and ship control system, etc.)
- (2) Traffic signal equipment
- (3) Disaster prevention equipment, crime prevention equipment
- (4) Medical devices classified as GHTF Class C (Japan Class III)
- (5) Highly public information network equipment, data-processing equipment (telephone exchange, and base station, etc.)
- (6) Any other equipment requiring high levels of quality and/or reliability equal to the equipment listed above

### 3. Equipment Prohibited for Use

Please do not incorporate our products into the following equipment requiring extremely high levels of safety and/or reliability.

- (1) Aerospace equipment (artificial satellite, rocket, etc.)
- (2) Aviation equipment <sup>\*1</sup>
- (3) Medical devices classified as GHTF Class D (Japan Class IV), implantable medical devices <sup>\*2</sup>
- (4) Power generation control equipment (nuclear power, hydroelectric power, thermal power plant control system, etc.)
- (5) Undersea equipment (submarine repeating equipment, etc.)
- (6) Military equipment
- (7) Any other equipment requiring extremely high levels of safety and/or reliability equal to the equipment listed above

\*Notes: 1. There is a possibility that our products can be used only for aviation equipment that does not directly affect the safe operation of aircraft (e.g., in-flight entertainment, cabin light, electric seat, cooking equipment) if such use meets requirements specified separately by TAIYO YUDEN. Please be sure to contact TAIYO YUDEN for further information before using our products for such aviation equipment.

2. Implantable medical devices contain not only internal unit which is implanted in a body, but also external unit which is connected to the internal unit.

### 4. Limitation of Liability

Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the products listed in this catalog for any equipment that is not intended for use by TAIYO YUDEN, or any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.







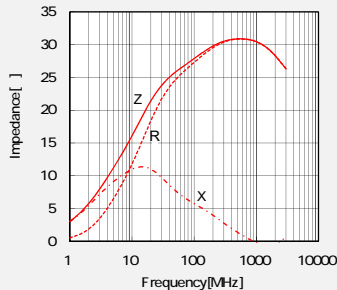




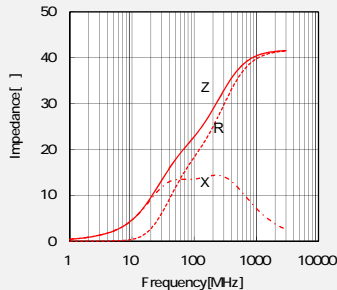
ELECTRICAL CHARACTERISTICS

Standard type  
1608 type

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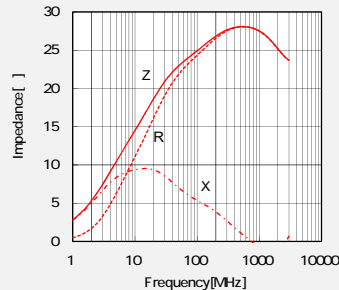


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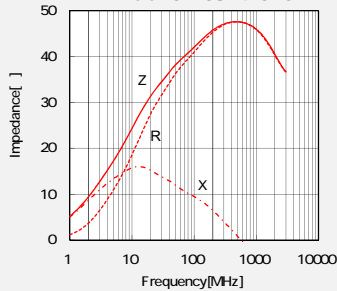


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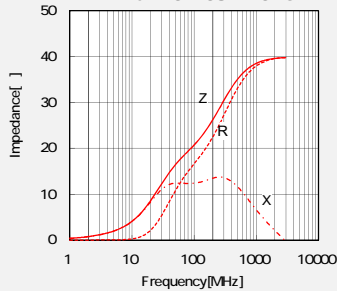
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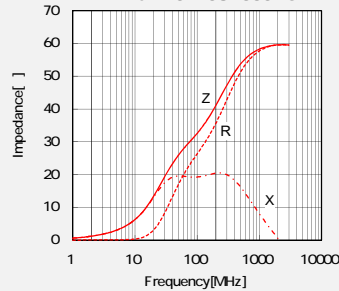
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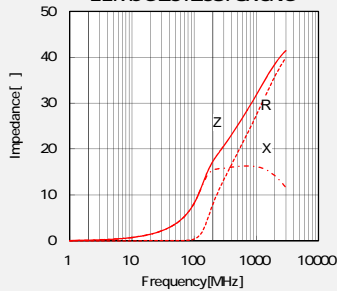


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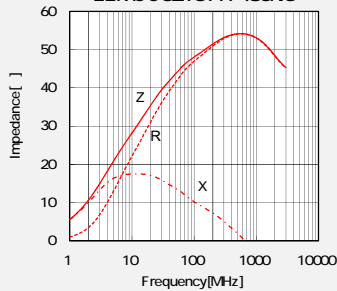


3216 type

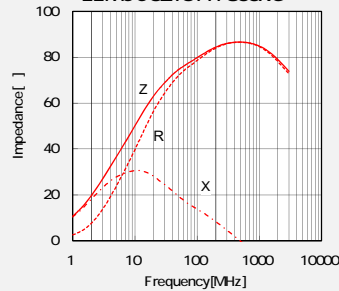
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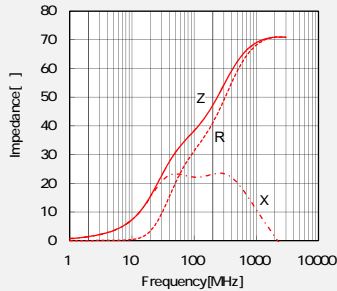
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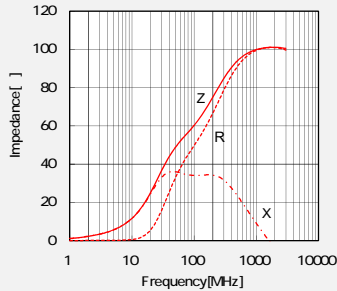
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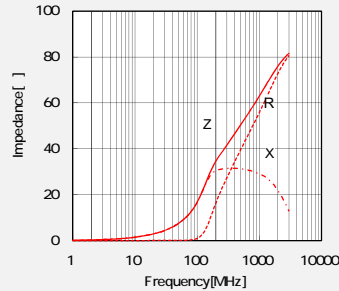
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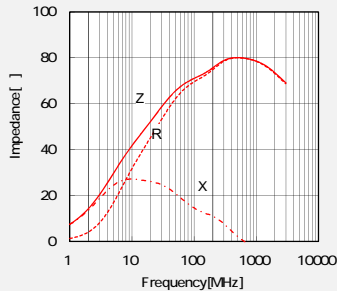


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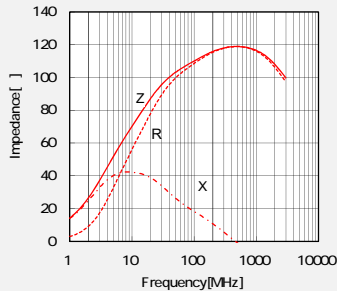


4516 type

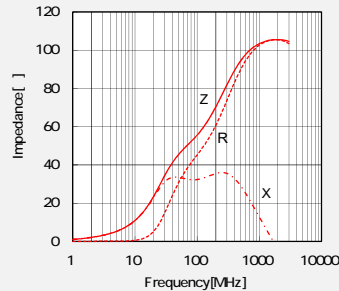
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LLMCC451611T111RG



LLMCA451611T560NG



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# Wire-wound Ferrite Bead Inductors for Power Lines LSMC/LSMG/LAMG/LCMC/LCMG/LBMC/LBMG/LLMC/LLMG/LMMC/LMMG series

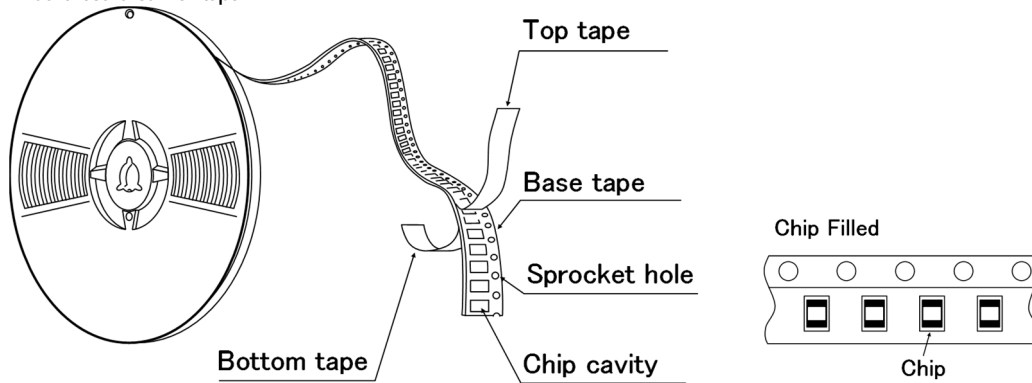
## PACKAGING

### Minimum Quantity

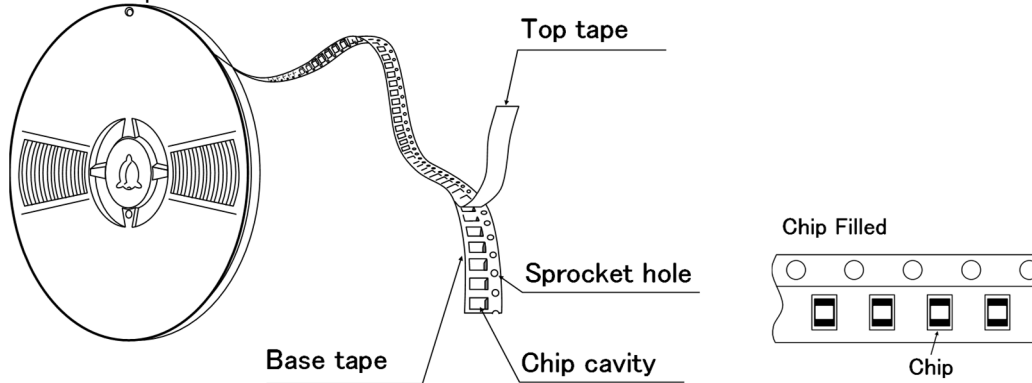
| Type      | Standard Quantity pcs |               |
|-----------|-----------------------|---------------|
|           | Paper Tape            | Embossed Tape |
| 1608 0603 | 4000                  |               |
| 2125 0805 | 4000                  |               |
| 2012 0805 | 4000                  |               |
| 2016 0806 |                       | 2000          |
| 3216 1206 |                       | 2000          |
| 3225 1210 |                       | 1000          |
| 4516 1806 |                       | 2000          |
| 4525 1810 |                       | 1000          |
| 4532 1812 |                       | 2000          |

### Tape Material

Card board carrier tape

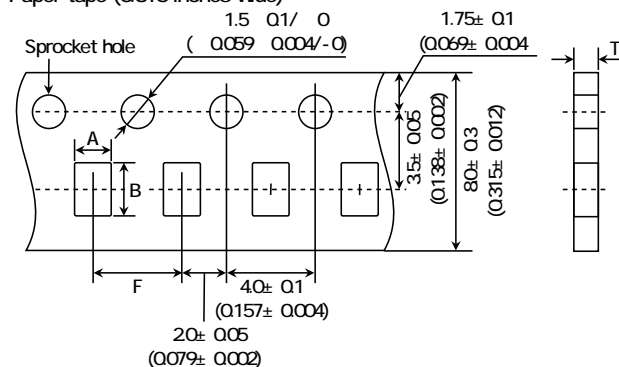


Embossed tape



### Taping Dimensions

Paper tape (0.315 inches wide)

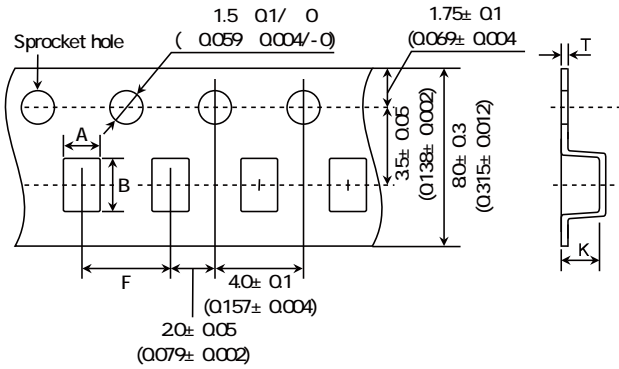


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| Type         | Chip Cavity              |                          | Insertion Pitch          | Tape Thickness     |
|--------------|--------------------------|--------------------------|--------------------------|--------------------|
|              | A                        | B                        |                          |                    |
| 1608<br>0603 | 1.0± 0.2<br>0.039± 0.008 | 1.8± 0.2<br>0.071± 0.008 | 4.0± 0.2<br>0.157± 0.008 | 1.1max<br>0.043max |
| 2012<br>0805 | 1.5± 0.2<br>0.059± 0.008 | 2.3± 0.2<br>0.091± 0.008 | 4.0± 0.2<br>0.157± 0.008 | 1.1max<br>0.043max |

Unit : mm inch

Embossed tape (0.315 inches wide)

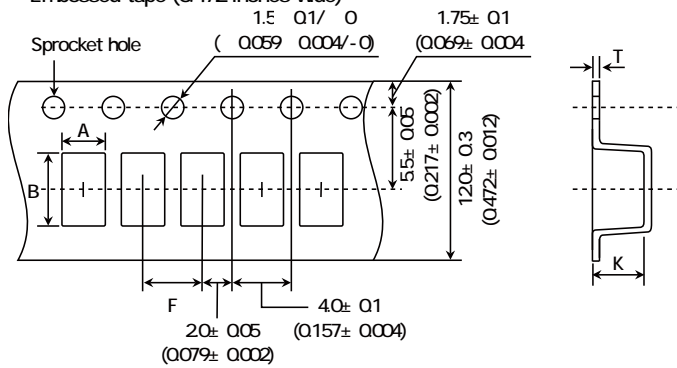


| Type           | Chip Cavity              |                          | Insertion Pitch          | Tape Thickness     |                    |
|----------------|--------------------------|--------------------------|--------------------------|--------------------|--------------------|
|                | A                        | B                        |                          | K                  | T                  |
| 2016<br>0806   | 1.8± 0.2<br>0.071± 0.008 | 2.2± 0.2<br>0.087± 0.008 | 4.0± 0.2<br>0.157± 0.008 | 2.6max<br>0.102max | 0.6max<br>0.024max |
| 3216 1<br>1206 | 1.9± 0.2<br>0.075± 0.008 | 3.5± 0.2<br>0.138± 0.008 | 4.0± 0.2<br>0.157± 0.008 | 1.5max<br>0.059max | 0.3max<br>0.012max |
| 3216 2<br>1206 | 1.9± 0.2<br>0.075± 0.008 | 3.5± 0.2<br>0.138± 0.008 | 4.0± 0.2<br>0.157± 0.008 | 2.6max<br>0.102max | 0.6max<br>0.024max |
| 3225<br>1210   | 2.8± 0.2<br>0.110± 0.008 | 3.5± 0.2<br>0.138± 0.008 | 4.0± 0.2<br>0.157± 0.008 | 4.0max<br>0.157max | 0.6max<br>0.024max |

Unit : mm inch

- 1 LSMC/LCMC/LBMC/LLMC/LMMC  
2 LSMG/LAMG/LCMG/LBMG/LLMG/LMMG

Embossed tape (0.472 inches wide)

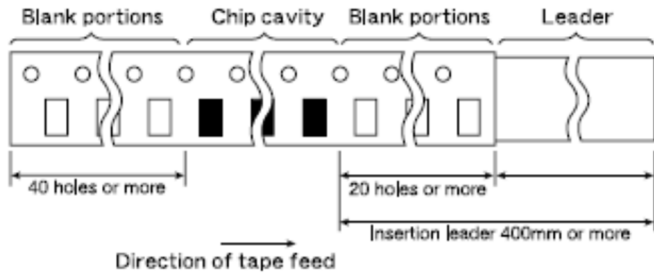


| Type           | Chip Cavity              |                          | Insertion Pitch          | Tape Thickness     |                    |
|----------------|--------------------------|--------------------------|--------------------------|--------------------|--------------------|
|                | A                        | B                        |                          | K                  | T                  |
| 4516 1<br>1806 | 1.9± 0.2<br>0.075± 0.008 | 4.9± 0.2<br>0.193± 0.008 | 4.0± 0.2<br>0.157± 0.008 | 1.5max<br>0.059max | 0.3max<br>0.012max |
| 4516 2<br>1806 | 1.9± 0.2<br>0.075± 0.008 | 4.9± 0.2<br>0.193± 0.008 | 4.0± 0.2<br>0.157± 0.008 | 2.6max<br>0.102max | 0.6max<br>0.024max |
| 4525<br>1810   | 2.9± 0.2<br>0.114± 0.008 | 4.9± 0.2<br>0.193± 0.008 | 4.0± 0.2<br>0.157± 0.008 | 4.0max<br>0.157max | 0.6max<br>0.024max |
| 4532<br>1812   | 3.6± 0.2<br>0.142± 0.008 | 4.9± 0.2<br>0.193± 0.008 | 8.0± 0.2<br>0.315± 0.008 | 4.0max<br>0.157max | 0.6max<br>0.024max |

Unit : mm inch

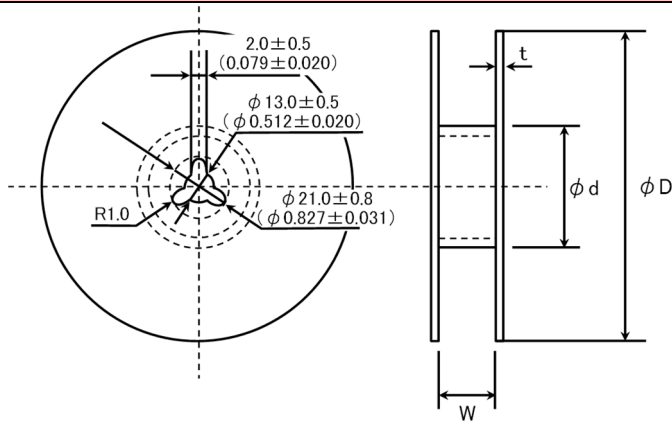
- 1 LSMC/LCMC/LBMC/LLMC/LMMC  
2 LSMG/LAMG/LCMG/LBMG/LLMG/LMMG

Leader and Blank portion



Insertion leader is 400 mm or more (including 20 empty cavities)  
 Empty cavities at end of reel: 40 holes or more

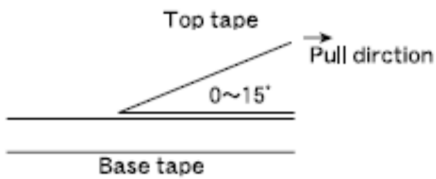
Reel size



| Type      | D                         | d                         | W                           | t                    |
|-----------|---------------------------|---------------------------|-----------------------------|----------------------|
| 1608 0603 | 180 0/ 3<br>7.09 0/ 0.118 | 60 1/ 0<br>2.36 0.039/ 0  | 100 ± 1.5<br>0.394 ± 0.059  | 2.5max<br>(0.098max) |
| 2012 0805 |                           |                           |                             |                      |
| 2016 0806 |                           |                           |                             |                      |
| 3216 1206 |                           |                           |                             |                      |
| 3225 1210 |                           |                           |                             |                      |
| 4516 1806 | 330 ± 20<br>12.99 ± 0.080 | 100 ± 1.0<br>3.94 ± 0.039 | 14.0 ± 1.5<br>0.551 ± 0.059 | 3.0max<br>(1.181max) |
| 4525 1810 |                           |                           |                             |                      |
| 4532 1812 |                           |                           | 14.0 ± 2.0<br>0.551 ± 0.080 |                      |

Unit : mm inch

Top tape strength



The top tape requires a peel-off force of 0.1 to 0.7N in the direction of the arrow as illustrated below

Wire-wound Ferrite Bead Inductors for Power Lines LSMC/LSMG series  
for General Electronic Equipment for Consumer  
Wire-wound Ferrite Bead Inductors for Power Lines LLMC/LLMG series  
for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA

1. Operating Temperature Range

Specified Value      40      125      Including self-generated heat

2. Storage Temperature Range

Specified Value      40      85

Test Methods and Remarks      \*Note: -5 to 40 in taped packaging

3. Impedance

Specified Value      Within the specified range

Test Methods and Remarks      Measuring equipment : Impedance analyzer (HP4291A) or its equivalent  
Measuring frequency : 100± 1 MHz

4. DC Resistance

Specified Value      Within the specified range

Test Methods and Remarks      Four-terminal method  
Measuring equipment : Milliohm High-Tester 3226 (Hioki Denki) or its equivalent

5. Rated Current

Specified Value      Within the specified range

6. Vibration

Specified Value      Appearance : No significant abnormality  
Impedance change : Within ± 30% of the initial value

Test Methods and Remarks      The test samples shall be soldered to the test board by the reflow  
Then it shall be submitted to below test conditions.

|                   |  |        |
|-------------------|--|--------|
| Frequency         | 10 55Hz  |        |
| Overall Amplitude | 1.5mm (Shall not exceed acceleration 196m/s <sup>2</sup> ) |        |
| Sweeping Method   | 1min 10 55 10Hz  |        |
| Time              | X  | 2hours |
|                   | Y  |        |
|                   | Z  |        |

7. Solderability

Specified Value      90% or more of immersed surface of terminal electrode shall be covered with fresh solder.

|                          |                    |                      |
|--------------------------|--------------------|----------------------|
| Test Methods and Remarks | Solder Temperature | 230± 5               |
|                          | Time               | 4± 1                 |
|                          | Preconditioning    | Immersion into flux. |
|                          | Immersing Speed    | 25mm/s               |

8. Resistance to Soldering Heat

Specified Value      Appearance : No significant abnormality  
Impedance change : Within ± 30% of the initial value

Test Methods and Remarks      The test sample shall be exposed to reflow oven at 230 for 40 seconds, with peak temperature  
at 260 O/ 5 for 10 seconds, 2times.  
Test board material : Glass epoxy-resin  
Test board thickness : 1.6mm

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**9. Thermal Shock**

| Specified Value          | Appearance : No significant abnormality<br>Impedance change : Within 50/ 10%of the initial value   |                |                 |                |   |       |       |   |                  |          |   |       |       |   |                  |          |
|--------------------------|--|----------------|-----------------|----------------|---|-------|-------|---|------------------|----------|---|-------|-------|---|------------------|----------|
| Test Methods and Remarks | <p>Conditions for 1 cycle</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature ( )</th> <th>Duration (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>40± 3</td> <td>30± 3</td> </tr> <tr> <td>2</td> <td>Room Temperature</td> <td>Within 3</td> </tr> <tr> <td>3</td> <td>85± 2</td> <td>30± 3</td> </tr> <tr> <td>4</td> <td>Room Temperature</td> <td>Within 3</td> </tr> </tbody> </table> <p>Number of cycles : 100<br/>Mounting method : Soldering onto PC board<br/>The measurement, after the test, shall be carried out the test sample has been left for 2 to 3 hours</p> | Step           | Temperature ( ) | Duration (min) | 1 | 40± 3 | 30± 3 | 2 | Room Temperature | Within 3 | 3 | 85± 2 | 30± 3 | 4 | Room Temperature | Within 3 |
| Step                     | Temperature ( )  | Duration (min) |                 |                |   |       |       |   |                  |          |   |       |       |   |                  |          |
| 1                        | 40± 3  | 30± 3          |                 |                |   |       |       |   |                  |          |   |       |       |   |                  |          |
| 2                        | Room Temperature   | Within 3       |                 |                |   |       |       |   |                  |          |   |       |       |   |                  |          |
| 3                        | 85± 2  | 30± 3          |                 |                |   |       |       |   |                  |          |   |       |       |   |                  |          |
| 4                        | Room Temperature   | Within 3       |                 |                |   |       |       |   |                  |          |   |       |       |   |                  |          |

**10. Resistance to Humidity (steady state)**

|                          |  |             |       |          |          |      |                |
|--------------------------|--|-------------|-------|----------|----------|------|----------------|
| Specified Value          | Appearances : No significant abnormality<br>Impedance change : Within ± 30%of the initial value  |             |       |          |          |      |                |
| Test Methods and Remarks | <p>The test samples shall be soldered to the test board by the reflow<br/>The test samples shall be placed in thermostatic oven set at specified temperature and humidity as shown in below table.</p> <table border="1"> <tbody> <tr> <td>Temperature</td> <td>40± 2</td> </tr> <tr> <td>Humidity</td> <td>90 95 RH</td> </tr> <tr> <td>Time</td> <td>500 24/ 0 hour</td> </tr> </tbody> </table> <p>The measurement, after the test, shall be carried out the test sample has been left for 2 to 3 hours</p> | Temperature | 40± 2 | Humidity | 90 95 RH | Time | 500 24/ 0 hour |
| Temperature              | 40± 2  |             |       |          |          |      |                |
| Humidity                 | 90 95 RH   |             |       |          |          |      |                |
| Time                     | 500 24/ 0 hour   |             |       |          |          |      |                |

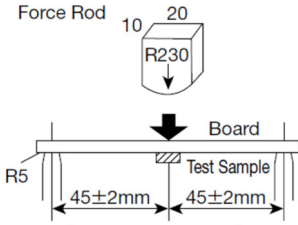
**11. Loading under Damp Heat**

|                          |   |             |       |          |          |                 |               |      |                |
|--------------------------|---|-------------|-------|----------|----------|-----------------|---------------|------|----------------|
| Specified Value          | Appearance : No significant abnormality<br>Impedance change : Within ± 30%of the initial value  |             |       |          |          |                 |               |      |                |
| Test Methods and Remarks | <p>The test samples shall be soldered to the test board by the reflowsoldering<br/>The test samples shall be placed in thermostatic oven set at specified temperature, humidity, and applied the rated current continuously as shown in below table.</p> <table border="1"> <tbody> <tr> <td>Temperature</td> <td>40± 2</td> </tr> <tr> <td>Humidity</td> <td>90 95 RH</td> </tr> <tr> <td>Applied current</td> <td>Rated current</td> </tr> <tr> <td>Time</td> <td>500 24/ 0 hour</td> </tr> </tbody> </table> <p>The measurement, after the test, shall be carried out the test sample has been left for 2 to 3 hours</p> | Temperature | 40± 2 | Humidity | 90 95 RH | Applied current | Rated current | Time | 500 24/ 0 hour |
| Temperature              | 40± 2   |             |       |          |          |                 |               |      |                |
| Humidity                 | 90 95 RH  |             |       |          |          |                 |               |      |                |
| Applied current          | Rated current   |             |       |          |          |                 |               |      |                |
| Time                     | 500 24/ 0 hour  |             |       |          |          |                 |               |      |                |

**12. High Temperature Loading Test**

|                          |  |             |       |                 |               |      |                |
|--------------------------|--|-------------|-------|-----------------|---------------|------|----------------|
| Specified Value          | Appearance : No significant abnormality<br>Impedance change : Within ± 30%of the initial value   |             |       |                 |               |      |                |
| Test Methods and Remarks | <p>The test samples shall be soldered to the test board by the reflow soldering<br/>The test samples shall be placed in thermostatic oven set at specified temperature and applied the rated current continuously as shown in below table.</p> <table border="1"> <tbody> <tr> <td>Temperature</td> <td>85± 2</td> </tr> <tr> <td>Applied current</td> <td>Rated current</td> </tr> <tr> <td>Time</td> <td>500 24/ 0 hour</td> </tr> </tbody> </table> <p>The measurement, after the test, shall be carried out the test sample has been left for 2 to 3 hours</p> | Temperature | 85± 2 | Applied current | Rated current | Time | 500 24/ 0 hour |
| Temperature              | 85± 2  |             |       |                 |               |      |                |
| Applied current          | Rated current  |             |       |                 |               |      |                |
| Time                     | 500 24/ 0 hour   |             |       |                 |               |      |                |

**13. Bending Strength**

|                          |  |
|--------------------------|--|
| Specified Value          | Appearance : No mechanical damage.   |
| Test Methods and Remarks | <p>The test samples shall be soldered to the test board by the reflow. As illustrated below, apply force in the direction of the arrow indicating until deflection of the test board reaches to 2 mm</p> <p>Warp : 2mm<br/>Testing board : Glass epoxy- resin substrate<br/>Thickness : 0.8mm</p>  |

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