# Common Mode Noise Filter
# NFG0QHB□□□HS2□ Reference Specification

## 1. Scope

This reference specification applies to Common Mode Noise Filter NFG0QHB□□□HS2□ Series for differential signal interface in Electronics.

## 2. Part Numbering

(Ex.)

| NF | G | 0Q | HB | 242 | H | S | 2 | D |
|---|---|---|---|---|---|---|---|---|
| Product ID | Type | Dimension (L × W) | Application and characteristic | *Resonant frequency | Performance | Category | Number of line | Packaging D: taping *B: bulk |

*Resonant frequency (MHz)
The first and second figures are significant digits, and the third figure expresses the number of zeros that follow the two figures.

*B: Bulk packing is also available.

## 3. Part Number and Rating

| | |
|---|---|
| Operating temperature range | -40°C to +85°C |
| Storage temperature range | -40°C to +85°C |

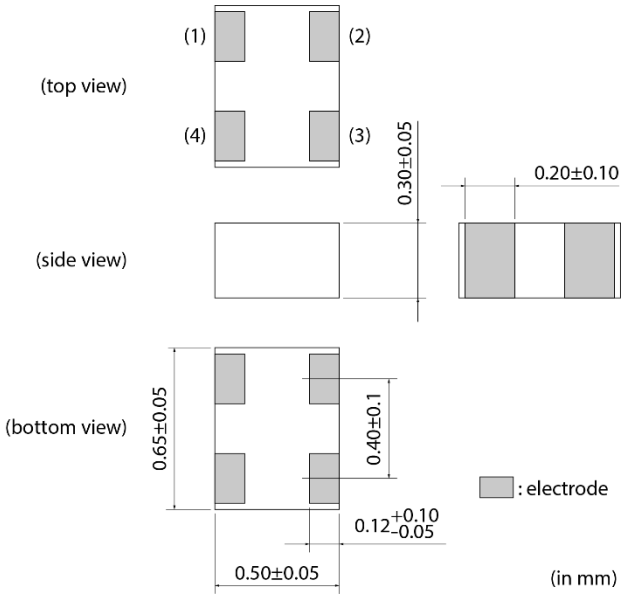
| Customer Part Number | MURATA Part Number | Common Mode Impedance (Ω) at 100MHz Typ. | Rated Voltage (VDC) | Withstanding Voltage (VDC) | Rated Current (mA) | DC Resistance (Ω) | Insulation Resistance (MΩ min.) |
|---|---|---|---|---|---|---|---|
| | NFG0QHB242HS2D | 15 | 5 | 12.5 | 100 | 2.5±25% | 100 |
| | NFG0QHB372HS2D | 9 | 5 | 12.5 | 100 | 1.9±25% | 100 |
| | NFG0QHB542HS2D | 5 | 5 | 12.5 | 100 | 1.3±25% | 100 |

| MURATA Part Number | Common Mode Insertion Loss Characteristic (dB) Typ. | | | Cut off Frequency (GHz) Typ. |
|---|---|---|---|---|
| | 2.4 GHz | 3.7 GHz | 5.4 GHz | |
| NFG0QHB242HS2D | 33 | - | - | 8 |
| NFG0QHB372HS2D | - | 30 | - | 11 |
| NFG0QHB542HS2D | - | - | 27 | 18 |

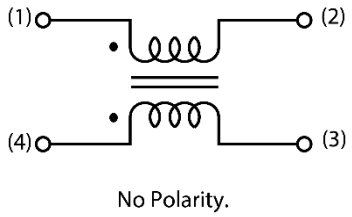
## 4. Testing Conditions

| | |
|---|---|
| Unless otherwise specified | Temperature: ordinary temperature (15°C to 35°C)<br>Humidity: ordinary humidity [25% to 85% (RH)] |
| In case of doubt | Temperature: 20°C±2°C<br>Humidity: 60% to 70% (RH)<br>Atmospheric pressure: 86 kPa to 106 kPa |

### 5.Style and Dimensions




■ Equivalent Circuits




No Polarity.

■ Unit Mass(Typical value)
0.0003g

## 6. Marking

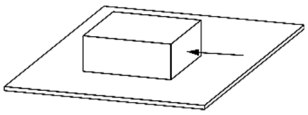
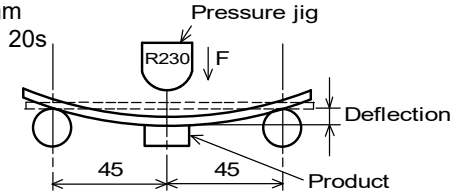
No marking.

## 7. Electrical Performance

| No. | Item | Specification | Test Method |
|---|---|---|---|
| 7.1 | Common Mode Impedance | Meet item 3. | Measuring Frequency : 100±1MHz<br>Measuring Equipment : KEYSIGHT4991A or the equivalents<br>(In case of doubt in standard condition, the heat treatment(200°C, about 10 minutes)shall be applied.<br>(ref. Appendix) |
| 7.2 | Withstanding Voltage | Products shall not be damaged. | Test Voltage : 2.5 times for Rated Voltage<br>Time : 1 to 5 s<br>Charge Current : 1 mA max.<br>(ref. Appendix) |
| 7.3 | DC Resistance | Meet item 3. | Measuring current : 20mA max.<br>(ref. Appendix) |
| 7.4 | Insulation Resistance | Meet item 3. | Measuring voltage : Rated Voltage<br>Measuring time : 3 s max.<br>(ref. Appendix) |

## 8.Mechanical Performance

It shall be soldered on the 6 Layer substrate (t0.8mm).（except Solderability）
Test shall be done using P.C.B., Flux, Solder and Soldering condition which are specified in item 12 except the case of being specified special condition.

| No. | Item | Specification | Test Method |
|---|---|---|---|
| 8.1 | Bonding Strength | Products shall not be damaged after tested as test method. | Applying Force: 2N<br>Applying Time : 5s<br>  |
| 8.2 | Bending Strenght | Products shall not be damaged after tested as test method. | Test substrate: glass-epoxy substrate (100 mm × 40 mm × 0.8 mm)<br>Speed of Applying Force : 1.0mm/s<br>Deflection : 2mm<br>Keeping Time : 20s<br>  |
| 8.3 | Vibration | Appearance: No damage | Oscillation Frequency : 10Hz to 2000Hz to 10Hz for 20min<br>Total amplitude 3.0mm or Acceleration amplitude 196 m/s2 whichever is smaller.<br>Testing Time : A period of 2h in each of 3 mutually perpendicular directions.(Total 6h) |
| 8.4 | Solderability | The electrodes shall be at least 95% covered with new solder coating. | Flux : Ethanol solution of rosin,25(wt)%<br>Pre-Heating : 150°C, 60s<br>Solder : Sn-3.0Ag-0.5Cu<br>Solder Temperature : 245°C±3°C<br>Immersion Time : 3s |

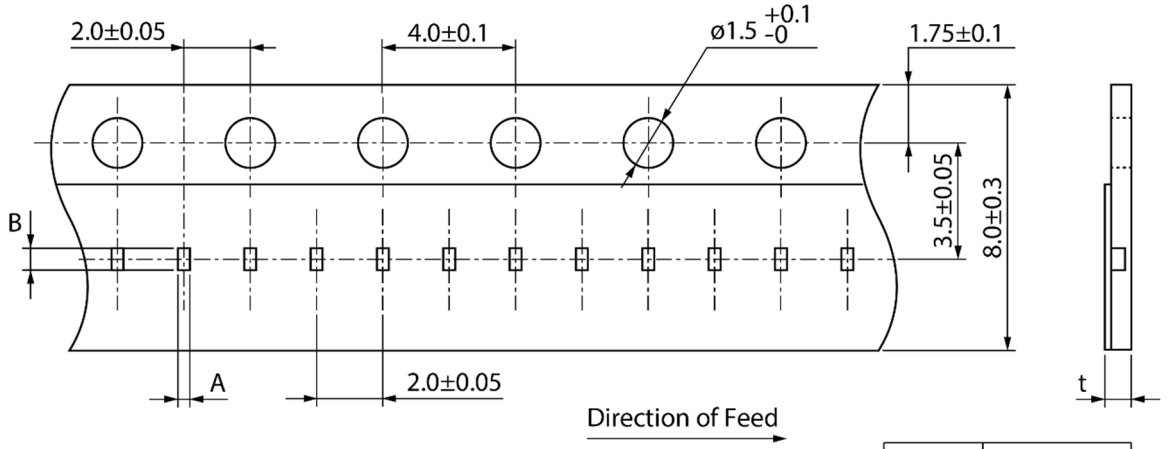
## 9.Environmental Performance

It shall be soldered on the 6 Layer substrate (t0.8mm).
Test shall be done using P.C.B., Flux, Solder and Soldering condition which are specified in item 12 except the case of being specified special condition.

| No. | Item | Specification | Test Method |
|---|---|---|---|
| 9.1 | Heat Life | Meet Table 1.<br>Table 1<br>Appearance: No damaged<br>Common Mode Impedance Change: Within ± 20%<br>I.R.: 100MΩ min.<br>DC Resistance Change: Within ± 30% | Temperature : 85°C±2°C<br>Applying Current : Rated Current<br>Time : 1000h(+48h,-0h)<br>Then measured after exposure in the room condition for 4 to 48 h.<br>(ref.item 16.) |
| 9.2 | Cold Resistance | | Temperature : -40°C±2°C<br>Time : 1000h(+48h,-0h)<br>Then measured after exposure in the room condition for 4 to 48 h. |
| 9.3 | Humidity | | Temperature : 40°C±2°C<br>Humidity : 90%(RH) to 95%(RH)<br>Time : 1000h(+48h,-0h)<br>Then measured after exposure in the room condition for 4 to 48 h. |
| 9.4 | Temperature Cycle | | 1 cycle :<br>1 step : -40 °C(+0 °C,-3 °C) /30min(+3min,-0min)<br>2 step : Ordinary temp. / 3 min max.<br>3 step : +85 °C(+3 °C,-0 °C) / 30min(+3min,-0min)<br>4 step : Ordinary temp. / 3 min max.<br>Total of 100 cycles<br>Then measured after exposure in the room condition for 4 to 48 h. |

## 10.Specification of Packaging

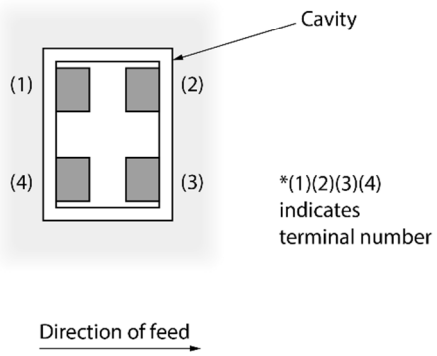
### 10.1 Appearance and Dimensions ( 8mm-wide, 2mm pitch paper tape)




■ Top view

| | |
|---|---|
| A | (0.60) |
| B | (0.73) |
| t | 0.55 max. |

(in mm)




### 10.2 Taping specifications

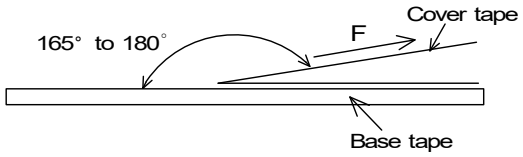
| | |
|---|---|
| Packing quantity (Standard quantity) | 15000 pcs/reel |
| Packing method | The products are placed in embossed cavities of a base tape and sealed by a cover tape. |
| Feed hole position | The feed holes on the base tape are on the right side when the cover tape is pulled toward the user. |
| Joint | The base tape and the cover tape are seamless. |
| Number of missing products | Number of missing products 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 Break down force of tape

| | |
|---|---|
| Break down force of cover tape | 5 N min. |

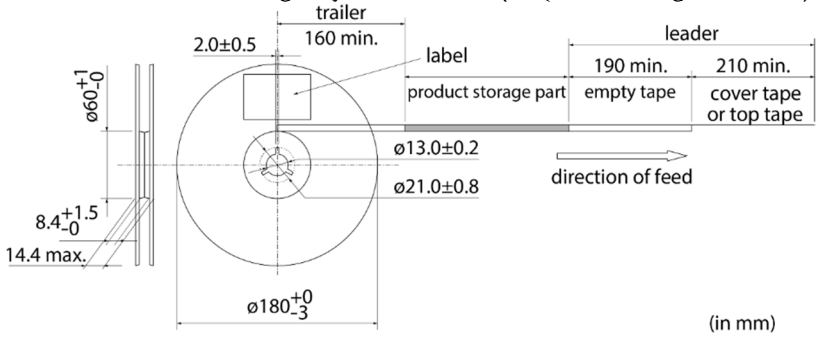
### 10.4 Peeling off force of cover tape

| | |
|---|---|
| Speed of peeling off | 300 mm/min |
| Peeling off force | 0.1 N to 0.7 N (The lower limit is for typical value.) |



### 10.5 Dimensions of leader section, trailer section and reel

A vacant section is provided in the leader (start) section and trailer (end) section of the tape for the product. The leader section is further provided with an area consisting only of the cover tape. (See the diagram below.)




### 10.6 Marking for reel

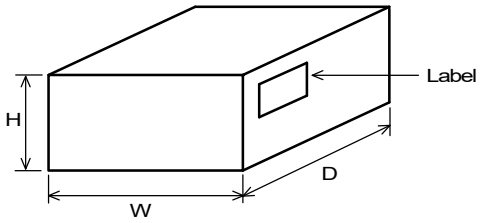
Customer part number, Murata part number, inspection number (*1), RoHS marking (*2), quantity, etc.

| | |
|---|---|
| *1 Expression of inspection No.:<br>□□ (1) ○○○○ (2) ◇◇◇ (3) | (1) Factory code<br>(2) Date<br>First digit: year/last digit of year<br>Second digit: month/Jan. to Sep.→1 to 9, Oct. to Dec.→O, N, D<br>Third, Fourth digit: day<br>(3) Serial No. |
| *2 Expression of RoHS marking:<br>ROHS- Y (1) (△) (2) | (1) RoHS regulation conformity<br>(2) Murata classification number |

### 10.7 Marking on outer box (corrugated box)

Customer name, purchasing order number, customer part number, Murata part number, RoHS marking (*2), quantity, etc.

### 10.8 Specification of outer box




| Dimensions of outer box (mm) | | | Standard reel quantity in outer box (reel) |
|---|---|---|---|
| W | D | H | |
| 186 | 186 | 93 | 5 |
| * Above outer box size is typical. It depends on a quantity of an order. | | | |

## 11. ⚠Caution

### 11.1 Restricted 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.

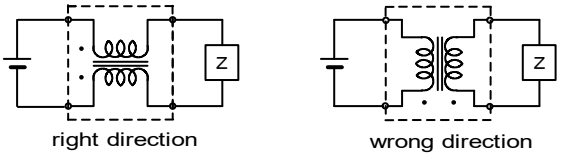
(1) Aircraft equipment
(2) Aerospace equipment
(3) Undersea equipment
(4) Power plant control equipment
(5) Medical equipment
(6) Transportation equipment (vehicles, trains, ships, etc.)
(7) Traffic signal equipment
(8) Disaster/crime prevention equipment
(9) Data-processing equipment
(10) Applications of similar complexity and/or reliability requirements to the applications listed in the above

### 11.2 Precautions on rating

Do not use over the rated temperature range, rated voltage, or rated current.
If used beyond the rating, serious defects such as wire breakage and burnout may occur.

### 11.3 Mounting Direction

Mount products in right direction.
Wrong direction which is 90° rotated from right direction causes not only open or short circuit but also flames or other serious trouble.




### 11.4 Corrosive gas

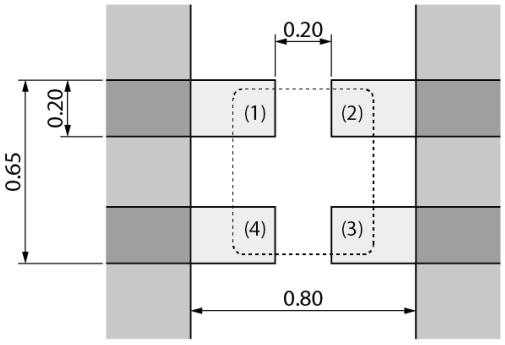
Please refrain from use since contact with environments with corrosive gases (sulfur gas [hydrogen sulfide, sulfur dioxide, etc.], chlorine, ammonia, etc.) or oils (cutting oil, silicone oil, etc.) that have come into contact with the previously stated corrosive gas environment will result in deterioration of product quality or an open from deterioration due to corrosion of product electrode, etc. We will not bear any responsibility for use under these environments.

## 12. Precautions for Use

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

### 12.1 Land dimensions

The following diagram shows the recommended land dimensions for reflow soldering.




*(1)(2)(3)(4) indicates terminal number
: resist
: copper foil pattern
: no pattern
(in mm)

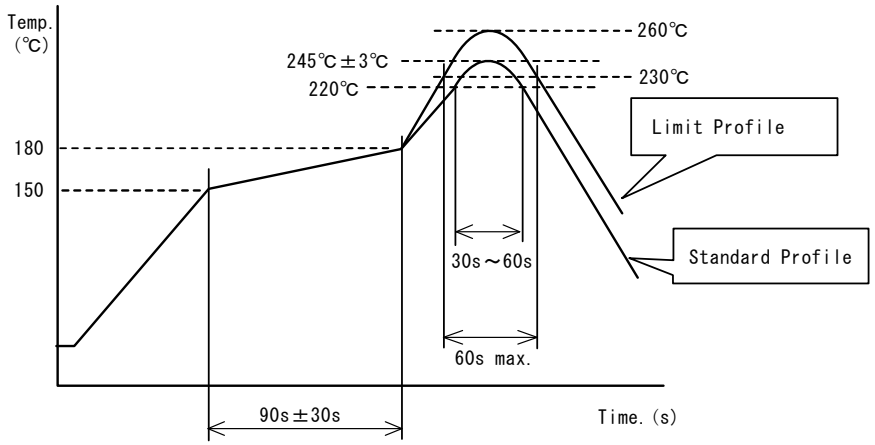
### 12.2 Flux and solder used

| | |
|---|---|
| Flux | • Use a rosin-based flux.<br>• Do not use a highly acidic flux with a halide content exceeding 0.2(wt)% (chlorine conversion value).<br>• Do not use a water-soluble flux. |
| Solder | • Use Sn-3.0Ag-0.5Cu solder.<br>• Standard thickness of solder paste: 80 μm |

If you want to use a flux other than the above, please consult our technical department.

### 12.3 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°C to 180°C/90 s±30 s | 150°C to 180°C/90 s±30 s |
| Heating | Above 220°C/30 s to 60 s | Above 230°C/60 s max. |
| Peak temperature | 245°C±3°C | 260°C/10 s |
| Number of reflow cycles | 2 times | 2 times |

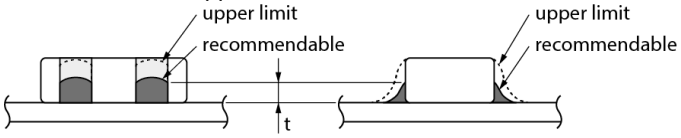
### 12.4 Reworking with soldering iron

The following requirements must be met to rework a soldered product using a soldering iron.

| Item | Requirement |
|---|---|
| Pre-heating | 150°C/approx. 1 min |
| Tip temperature of soldering iron | 380°C max. |
| Power consumption of soldering iron | 30 W max. |
| Tip diameter of soldering iron | ø3 mm max. |
| Soldering time | 3 s (+1 s, -0 s) |
| Number of reworking operations | 2 times max. |
| * Avoid a direct contact of the tip of the soldering iron with the product. Such a direction contact may cause cracks in the ceramic body due to thermal shock. | |

### 12.5 Solder volume

Solder shall be used not to be exceeded the upper limits as shown below.



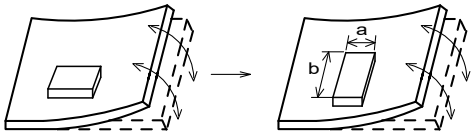

1/3 T ≦ t ≦ T (T: chip thickness)

An increased solder volume increases mechanical stress on the product. Exceeding solder volume may cause the failure of mechanical or electrical performance.

### 12.6 Product's location

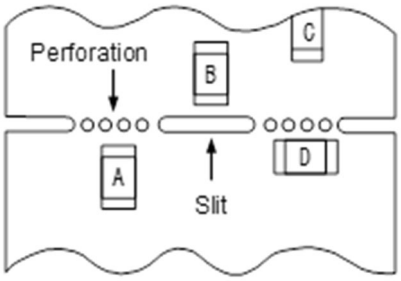
The following shall be considered when designing and laying out PCBs.

(1) PCB shall be designed so that products are not subject to mechanical stress due to warping the board.
[Products direction]
Products shall be located in the sideways direction (length: a < b) to the mechanical stress.

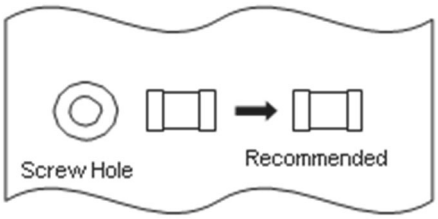



(2) Components location on PCB separation
It is effective to implement the following measures, to reduce stress in separating the board.
It is best to implement all of the following three measures; however, implement as many measures as possible to reduce stress.

| Contents of measures | Stress level |
|---|---|
| (1) Turn the mounting direction of the component parallel to the board separation surface. | A > D*1 |
| (2) Add slits in the board separation part. | A > B |
| (3) Keep the mounting position of the component away from the board separation surface. | A > C |
| *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. | |

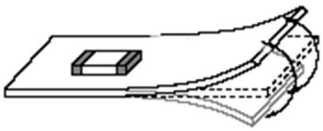



(3) Mounting components near screw holes
When a component is mounted near a screw hole, it may be affected by the board deflection that occurs during the tightening of the screw.
Mount the component in a position as far away from the screw holes as possible.

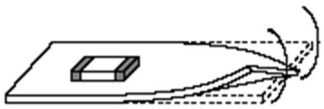


### 12.7 Handling of substrate

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

### 12.8 Cleaning

When cleaning this product, observe the following conditions:
(1) The cleaning temperature shall be 60°C max. If isopropyl alcohol (IPA) is used, the cleaning temperature shall be 40°C max.
(2) During ultrasonic cleaning, under some cleaning conditions, the resonation of PCB should be caused by its vibration. Be sure to do the test cleaning with actual cleaning equipment before production and confirm that product does not be damaged by cleaning.
(3) Cleaner
Alcohol-based cleaner: IPA
Aqueous agent: PINE ALPHA ST-100S
(4) There shall be no residual flux or residual cleaner. When using aqueous agent, rinse the product with deionized water adequately and completely dry it so that no cleaner is left.
* For other cleaning, consult our technical department.

### 12.9 Storage and transportation

| | |
|---|---|
| Storage period | Use the product within 6 months after delivery.<br>If you do not use the product for more than 6 months, check solderability before using it. |
| Storage conditions | • The products shall be stored in a room not subject to rapid changes in temperature and humidity. The recommended temperature range is -10°C to +40°C. The recommended relative humidity range is 15% to 85%.<br>Keeping the product in corrosive gases, such as sulfur, chlorine gas or acid may cause the poor solderability.<br>• Do not place the products directly on the floor; they should be placed on a palette so that they are not affected by humidity or dust.<br>• Avoid keeping the products in a place exposed to direct sunlight, heat or vibration.<br>• Do not keep products in bulk packaging. Doing so may cause collision between the products or between the products and other products, resulting in chipping or wire breakage.<br>• Avoid storing the product by itself bare (i.e. exposed directly to air). |
| Transportation | Excessive vibration and impact reduces the reliability of the products. Exercise caution when handling the products. |

### 12.10 Resin coating (including moistureproof coating)

Coating/molding the product with resin may change electrical characteristics.
A wire breakage 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 conductor, leading to wire breakage.
Prior to use the coating resin, please make sure no reliability issue is observed by evaluating products mounted on your board.

### 12.11 Mounting Conditions

・Please check the mounting condition before using.
・Using mounting conditions (nozzles, equipment conditions, etc.) that are not suitable for products may lead to pick up errors, misalignment, or damage to the product.

### 12.12 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 corrodible atmosphere such as acidic gases, alkaline gases, chlorine, sulfur gases, organic gases and etc. (the sea breeze, Cl2, H2S, NH3, SO2, NO2,etc)

(2) in the atmosphere where liquid such as organic solvent, may splash on the products.

## 13. ⚠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 agreed specifications.

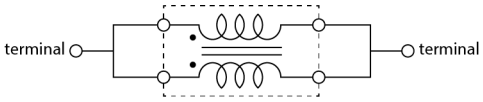
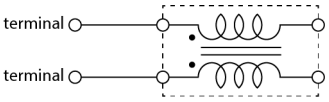
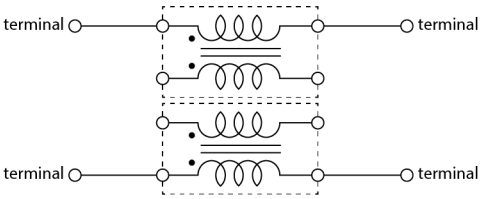
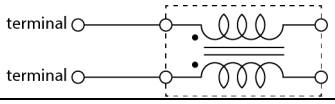
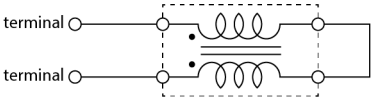
(3)The contents of this reference specification are subject to change without advance notice. Please approve our product specifications or transact the approval sheet for product specifications before ordering.

## Appendix

<Measurement method>

### ■Terminal to be Tested.

When measuring and suppling the voltage(or the current),the following terminal is applied.

| No. | Item | Terminal to be Tested |
|---|---|---|
| 7.1 | Common Mode Impedance (Measurement Terminal) |   |
| 7.2 | Withstanding Voltage (Supply Terminal) |   |
| 7.3 | DC Resistance (Measurement Terminal) |   |
| 7.4 | Insulation Resistance (Measurement Terminal) |   |
| 9.1 | Heat Life (Supply Terminal) |   |

### ■Measuring method for common mode impedance.

Measured common mode impedance may be included measurement error due to stray capacitance, residual inductance of test fixture.

To correct this error, the common mode impedance should be calculate as follows;

(1) Measure admittance of the fixture(opened), Go Bo.

(2) Measure impedance of the fixture(shorted), Rs Xs.

(3) Measure admittance of the specimen, Gm Bm.

(4) Calculate corrected impedance $|Z|$ using the formula below.

$$|Z| = (Rx^2+Xx^2)^{1/2}$$

Where

$$Rx = \frac{Gm - Go}{(Gm-Go)^2 + (Bm-Bo)^2} - Rs$$

$$Xx = \frac{-(Bm - Bo)}{(Gm-Go)^2 + (Bm-Bo)^2} - Xs$$

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