Chip EMIFIL LC Combined Type for Large Current for Automotive powertrain/safety equipment NFE61HT□□□□2A9□ Murata Standard REFERENCES pecification [AEC-Q200]

1. Scope

This reference specification applies to Chip EMIFIL LC Combined Type for Large Current NFE61H series based on AEC-Q200.

1.1 Specific applications:

- Automotive powertrain/safety equipment: Products that can be used for automotive equipment related to running, turning, stopping, safety devices, etc., or equipment whose structure, equipment, and performance are legally required to meet technical standards for safety assurance or environmental protection.
- Automotive infotainment/comfort equipment: Products that can be used for automotive equipment such as car navigation systems and car audio systems that do not directly relate to human life and whose structure, equipment, and performance are not specifically required by law to meet technical standards for safety assurance or environmental protection.
- Medical equipment (GHTF Class C) *Except for implant/surgery/auto injector: Products that can be used for medical equipment of Class C of the international classification class GHTF and whose malfunction is considered to pose a relatively high risk to the human body.
- Medical equipment (GHTF Class A and B): Products that can be used for medical equipment regulated by Class A and Class B of the international classification class GHTF and whose functions do not directly relate to the protection of human life and property.

1.2 Unsuitable application:

Applications listed in “Limitation of applications” in this reference specification.

2. Part Numbering

NF	E	61	HT	101	Z	2A	9	L
Product ID	Structure	Dimension (L× W)	Features	Capacitance	Characteristics	Rated Voltage	Electrode	Packaging Code (L: Taping / B: Bulk)

3. Rating

Customer Part Number	Murata Part Number	Capacitance	Rated Voltage	Withstanding Voltage	Rated Current	Insulation Resistance	ESD Rank 2:2kV
	NFE61HT330U2A9L	33pF ± 30%	100 V (DC)	250 V(DC)	2 A(DC)	1000 MΩ min.	2
	NFE61HT330U2A9B						
	NFE61HT680R2A9L	68pF ± 30%					
	NFE61HT680R2A9B						
	NFE61HT101Z2A9L	100pF ± 30%					
	NFE61HT101Z2A9B						
	NFE61HT181C2A9L	180pF ± 30%					
	NFE61HT181C2A9B						
	NFE61HT361C2A9L	360pF ± 20%					
	NFE61HT361C2A9B						
	NFE61HT681D2A9L	680pF ± 30%					
	NFE61HT681D2A9B						
	NFE61HT102F2A9L	1000pF $\pm^{80}_{20}$ %					
	NFE61HT102F2A9B						
	NFE61HT332Z2A9L	3300pF $\pm^{80}_{20}$ %					
	NFE61HT332Z2A9B						

• Operating Temperature: - 55 °C to + 125 °C • Storage Temperature: - 55 °C to + 125 °C

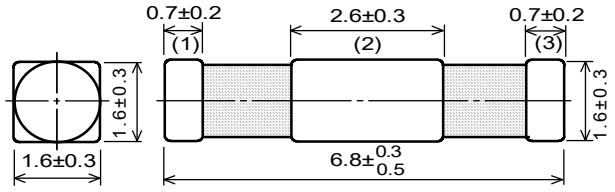
4. Standard Testing Condition

<Unless otherwise specified>
Temperature : Ordinary Temp. 15°C to 35°C
Humidity : Ordinary Humidity 25 %(RH) to 85 %(RH)

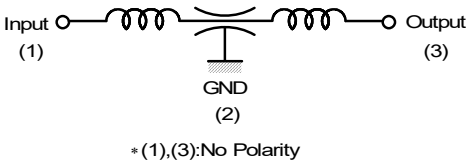
<In case of doubt>
Temperature: 20°C ± 2°C
Humidity : 60 %(RH) to 70 %(RH)

Atmospheric pressure : 86kPa to 106kPa

5. Style and Dimensions



■ Equivalent Circuit

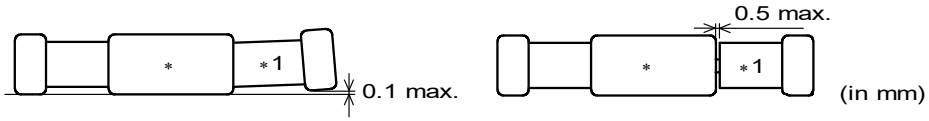


∗(1),(3):No Polarity

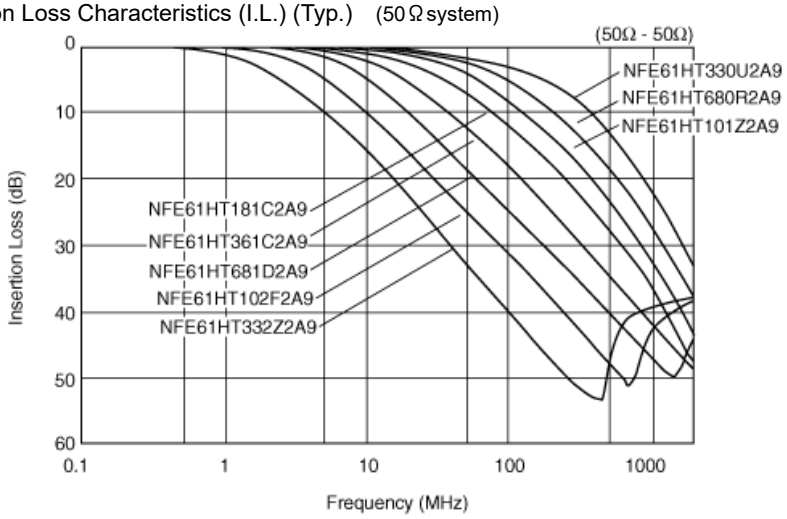
■ Unit Mass(Typical value)

0.062g

Note : Gap and bend between ceramic capacitor(∗) and ferrite bead(∗1) may come out as illustrated below, however, these are not affect the performance, mounting and reliability of the products.



■ Insertion Loss Characteristics (I.L.) (Typ.) (50Ωsystem)

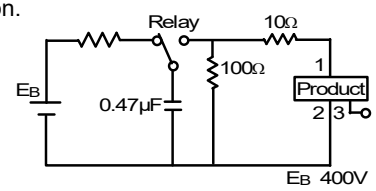


6. Marking

No marking.

7. Electrical Performance

No.	Item	Specification	Test Method
7.1	Capacitance	Meet item 3.	Table 1 Capacitance / Voltage / Frequency 33,68,100 (pF) / 1 to 5 V(rms) / 1MHz±10% 180,360,680 1000,3300 (pF) / 1±0.2 V(rms) / 1kHz±10%
7.2	Insulation Resistance(I.R.)	Meet item 3.	Voltage : 100 V(DC) Time : 60 ± 5 seconds
7.3	Withstanding Voltage	Products shall not be damaged.	Test Voltage : 250 V(DC) Testing Time : 1 to 5 seconds Limit the charging current: 10mA max.

<table>
<tr><th>No.</th><th>Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td>7.4</td><td>Resistance to Surge Voltage</td><td>Meet Table 2.
Table 2
<table>
<tr><td>Appearance</td><td colspan="2">No damaged</td></tr>
<tr><td rowspan="2">Cap. Change</td><td>33,68,100 180,360 680 (pF)</td><td>within ±15%</td></tr>
<tr><td>1000 3300 (pF)</td><td>within ±30%</td></tr>
<tr><td>I.R.</td><td colspan="2">1000 MΩ min.</td></tr>
<tr><td>Withstanding Voltage</td><td colspan="2">No damaged</td></tr>
</table></td><td>Attenuating transient voltage of exponential function shall be applied to products on the condition.
 

Peak Voltage : 400 V
Force Period : 1 s
The number of Surges : 10^5</td></tr>
</table>

8. Q200 Requirement

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

AEC-Q200 Rev.D issued June. 1 2010

<table>
<tr><th colspan="3">AEC-Q200</th><th rowspan="2">Murata Specification / Deviation</th></tr>
<tr><th>No.</th><th>Stress</th><th>Test Method</th></tr>
<tr><td>3</td><td>High Temperature Exposure (Storage)</td><td>1000hours at 125C
Set for 24hours
at room temperature,
then measured.</td><td>Meet TABLE A after testing.
Table A
<table>
<tr><td colspan="2">Appearance</td><td>No damage</td></tr>
<tr><td rowspan="2">Capacitance Change (33pF-100pF: 1MHz+/-10%) (180pF-3300pF: 1kHz+/-10%)</td><td>33pF to 680pF</td><td>Within +/-15% at 20C</td></tr>
<tr><td>1000pF to 3300pF</td><td>Within +/-30% at 20C</td></tr>
<tr><td colspan="2">I.R.</td><td>1000M ohm min.</td></tr>
<tr><td colspan="2">Withstanding Voltage</td><td>No damage</td></tr>
</table></td></tr>
<tr><td>4</td><td>Temperature Cycling</td><td>1000cycles(-55C to 125C)
Measurement at 24±2 hours after test conclusion.</td><td>Meet Table B after testing.
Table B
<table>
<tr><td colspan="2">Appearance</td><td>No damage</td></tr>
<tr><td rowspan="2">Capacitance Change (33pF-100pF: 1MHz+/-10%) (180pF-3300pF: 1kHz+/-10%)</td><td>33pF to 680pF</td><td>Within +/-15% at 20C</td></tr>
<tr><td>1000pF to 3300pF</td><td>Within +/-30% at 20C</td></tr>
<tr><td colspan="2">I.R.</td><td>100M ohm min</td></tr>
<tr><td colspan="2">Withstanding Voltage</td><td>No damage</td></tr>
</table></td></tr>
<tr><td>5</td><td>Destructive Physical Analysis</td><td>Per EIA469
No electrical tests</td><td>No defects</td></tr>
<tr><td>7</td><td>Biased Humidity</td><td>1000hours 85C/85%RH.
Apply Maximum rated Voltage and current.

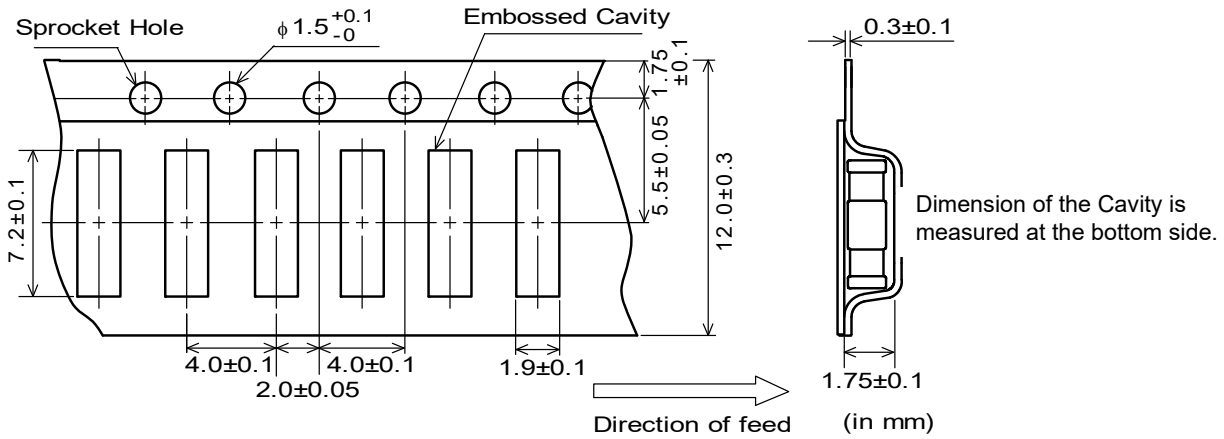
Measurement at 24+/-2 hours after test conclusion.</td><td>Meet Table B after testing.</td></tr>
<tr><td>8</td><td>Operational Life</td><td>1000hours at 125C
Apply Maximum rated Current.

Measurement at 24+/-2 hours after test conclusion.</td><td>Meet Table B after testing.</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>
<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 F(1500g's/0.5ms/Half sine)
Three times each 6 direction.</td><td>Meet Table A after testing.</td></tr>
</table>

AEC-Q200			Murata Specification / Deviation
No.	Stress	Test Method	
14	Vibration	5g's for 20 minutes, 12cycles each of 3 oritentations Osscillation Frequency : 10-2000Hz.	Meet Table A after testing.
15	Resistance to Soldering Heat	No heating. 260C +/- degree C Immersion time 10s	Pre-heating: 150C+/-5C, 60s+/-5s Meet Table A after testing.
17	ESD	Per AEC-Q200-002	Meet Table C after testing. ESD Rank: Refer to Item 3. Rating. Table C Appearance: No damage I.R.: 1000M ohm min Withstanding Voltage: No damage
18	Solderbility	Per J-STD-002	Method b : Not Applicable 75% of the terminations is to be soldered.
19	Electrical Characterization	Measured :Capacitance	No defects
20	Flammability	Per UL-94	Not Applicable
21	Board Flex	Epoxy-PCB(1.6mm) Deflection 2mm(min) 60s minimum holding time	Meet Table D after testing. Table D Capacitance Change (33pF-100pF: 1MHz+/-10%) (180pF-3300pF: 1kHz+/-10%): 33pF to 680pF: Within +/-15% at 20C 1000pF to 3300pF: Within +/-30% at 20C
22	Terminal Strength	Per AEC-Q200-006 A force of 17.7N for 60sec	17.7N for 60sec No defects
30	Electrical Transient Conduction	Per ISO-7637-2	Not Applicable

9. Specification of Packaging

9.1. Appearance and Dimensions (12mm-wide plastic tape)



9.2. Specification of Taping

(1) Packing quantity (standard quantity)

2500 pcs. / reel

(2) Packing Method

Products shall be packaged in the cavity of the plastic tape and sealed with cover tape.

(3) Sprocket Hole

The sprocket holes are to the right as the tape is pulled toward the user.

(4) Spliced point

The cover tape have no spliced point.

(5) Missing components number

Missing components number within 0.025% of the number per reel or 1 pc., whichever is greater, and are not continuous. The specified quantity per reel is kept.

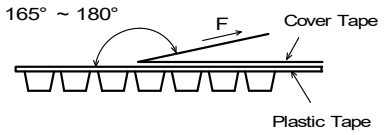
9.3. Pull Strength of Plastic Tape and Cover Tape

Plastic tape	5N min.
Cover tape	10N min.

9.4. Peeling off force of cover tape

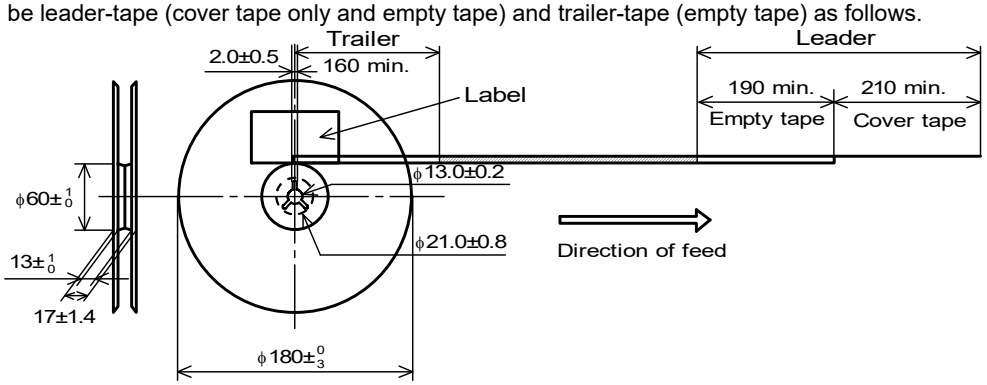
0.2N to 0.7N (minimum value is typical)

∗ Speed of Peeling off : 300 mm / min



9.5. Dimensions of Leader-tape, Trailer and Reel

There shall be leader-tape (cover tape only and empty tape) and trailer-tape (empty tape) as follows.



(in: mm)

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 ××× (1) (2) (3)

(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 (△) (1) (2)

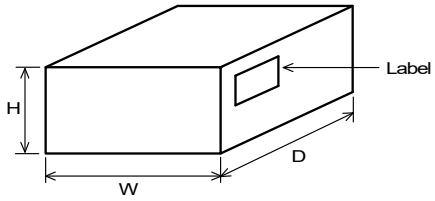
(1) RoHS regulation conformity parts.

(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



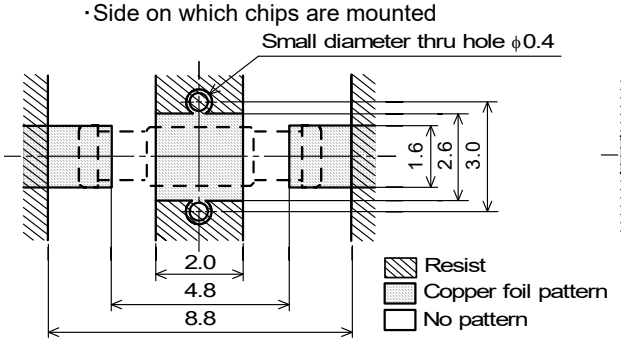
Outer Case Dimensions (mm)			Standard Reel Quantity in Outer Case (Reel)
W	D	H	
186	186	93	4

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

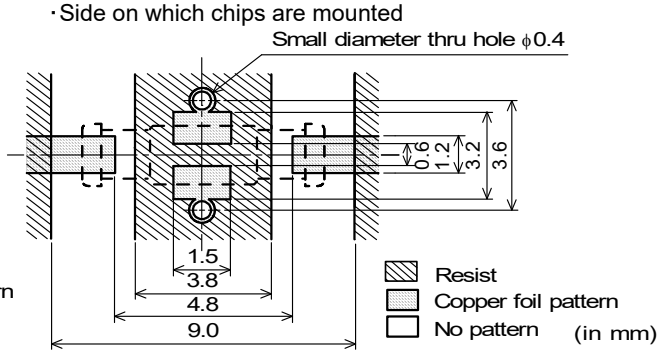
10. Standard Land Dimensions

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.

(a) Standard land dimensions for reflow



(b) Standard land dimensions for flow
(But, NFE61HT332Z2A9□ is not applicable.)



11. ⚠Caution

11.1 Limitation of applications

The products listed in the reference specification (hereinafter the product(s) is called as the “Product(s)”) are designed and manufactured for applications specified in the reference specification (hereinafter called as the “Specific Application”).
We shall not warrant anything in connection with the Products including fitness, performance, adequateness, safety, or quality, in the case of applications listed in from (1) to (11) written at the end of this precautions, which may generally require high performance, function, quality, management of production or safety. Therefore, the Product shall be applied in compliance with the specific application.
WE DISCLAIM ANY LOSS AND DAMAGES ARISING FROM OR IN CONNECTION WITH THE PRODUCTS INCLUDING BUT NOT LIMITED TO THE CASE SUCH LOSS AND DAMAGES CAUSED BY THE UNEXPECTED ACCIDENT, IN EVENT THAT (i) THE PRODUCT IS APPLIED FOR THE PURPOSE WHICH IS NOT SPECIFIED AS THE SPECIFIC APPLICATION FOR THE PRODUCT, AND/OR (ii) THE PRODUCT IS APPLIED FOR ANY FOLLOWING APPLICATION PURPOSES FROM (1) TO (11) (EXCEPT THAT SUCH APPLICATION PURPOSE IS UNAMBIGUOUSLY SPECIFIED AS SPECIFIC APPLICATION FOR THE PRODUCT IN OUR CATALOG SPECIFICATION FORMS, DATASHEETS, OR OTHER DOCUMENTS OFFICIALLY ISSUED BY US*).

(1) Aircraft equipment
(2) Aerospace equipment
(3) Undersea equipment
(4) Power plant control equipment
(5) Medical equipment
(6) Transportation equipment
(7) Traffic control equipment
(8) Disaster prevention/security equipment
(9) Industrial data-processing equipment
(10) Combustion/explosion control equipment
(11) Equipment with complexity and/or required reliability equivalent to the applications listed in the above.

For exploring information of the Products which will be compatible with the particular purpose other than those specified in the reference specification, please contact our sales offices, distribution agents, or trading companies with which you make a deal, or via our web contact form.
Contact form: https://www.murata.com/contactform

* We may design and manufacture particular Products for applications listed in (1) to (11). Provided that, in such case we shall unambiguously specify such Specific Application in the reference specification without any exception. Therefore, any other documents and/or performances, whether exist or non-exist, shall not be deemed as the evidence to imply that we accept the applications listed in (1) to (11).

11.2. 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.

11.3. 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. Notice

This product is designed for solder mounting.

Please consult us in advance for applying other mounting method such as conductive adhesive.

12.1. Flux and Solder

Flux	Use rosin-based flux, Do not use highly acidic flux (with chlorine content exceeding 0.2(wt)%). Do not use water-soluble flux.
Solder	Use Sn-3.0Ag-0.5Cu solder

12.2. 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.

<Consideration for mounting of 2.5mm pitch>

The mounting of 2.5mm pitch should be prevented on flow soldering to avoid an excess of solder volume.

< Exclusive Use of Reflow Soldering >

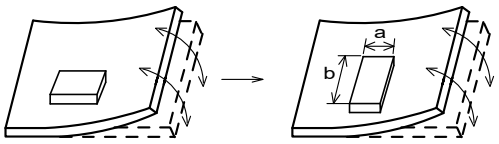
NFE61HT332Z2A9□ can only be soldered with reflow.
If it were soldered with flow, cracks might be caused in the ceramic body.
So, reflow soldering shall be applied for products.

12.3. 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〕



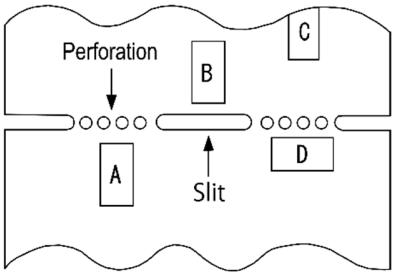
〈Poor example〉 〈Good example〉

Products shall be located in the sideways direction (Length:a<b) 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.

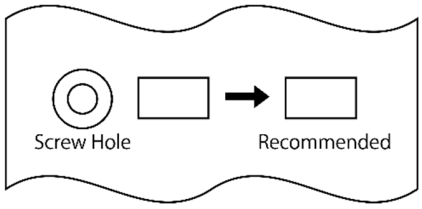
Contents of Measures	Stress Level
(1) Turn the mounting direction of the component parallel to the board separation surface.	A > D *1
(2) Add slits in the board separation part.	A > B
(3) Keep the mounting position of the component away from the board separation surface.	A > C



*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.



12.4. Standard Soldering Conditions

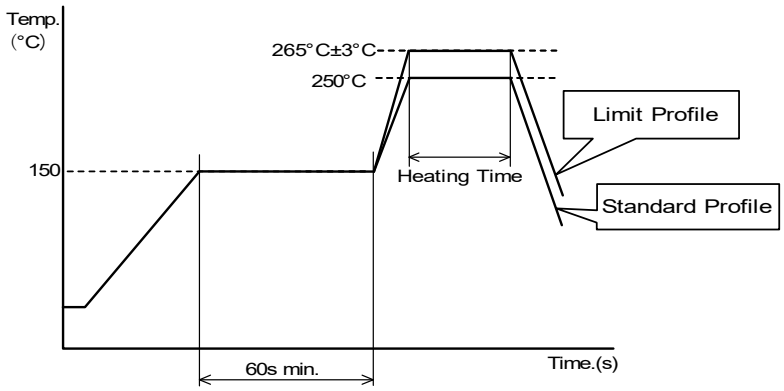
On flow soldering (e.g. double wave soldering), use the product in consideration of the conditions of solder, solder temperature and immersion time (melting time) because longer soldering time may cause the corrosion of the electrode.

On dipping soldering, use the product in consideration of the conditions of solder, solder temperature, flux, preheat and so on because de-wetting may be caused.

Standard soldering profile and the limit soldering profile is as follows.

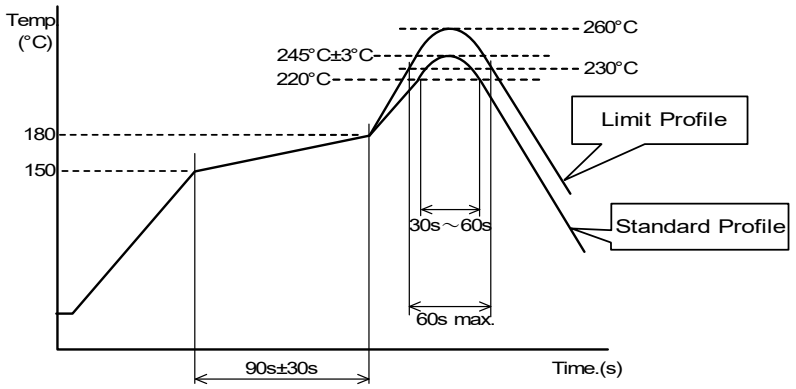
The excessive soldering conditions may cause leaching of the electrode and/or resulting in the deterioration of product quality.

< Flow Soldering Profile >



	Standard Profile	Limit Profile
Pre-heating	150°C , 60s min.	
Heating	250°C , 4s ~ 6s	265°C ± 3°C , 5s max.
Cycle of flow	2 times	2 times

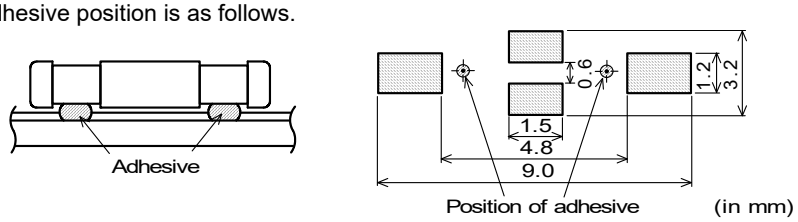
< Reflow Soldering Profile >



	Standard Profile	Limit Profile
Pre-heating	150°C ~ 180°C , 90s ± 30s	
Heating	above 220°C , 30s ~ 60s	above 230°C , 60s max.
Peak temperature	245°C ± 3°C	260°C , 10s
Cycle of reflow	2 times	2 times

12.5. Printing of Adhesive (Flow Soldering)

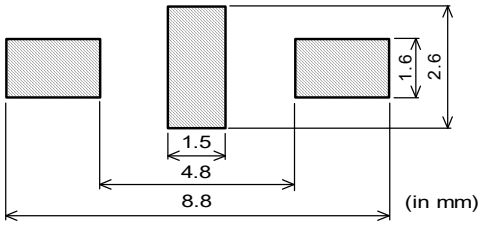
Adhesive amount shall be about 0.5mg for one position to obtain enough adhesive strength.
The adhesive position is as follows.



12.6. Solder paste printing for reflow

· Standard thickness of the solder paste should be 150μm to 200μm.
· 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.



12.7. Reworking with Soldering iron

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

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

12.8. Cleaning Conditions

Products shall be cleaned on the following conditions.

(1) Cleaning temperature shall be limited to 60°C max. (40°C max. for 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.

12.9. Operating Environment

Do not use this product under the following environmental conditions, on deterioration of the Insulation Resistance of the Ferrite material and/or corrosion of Inner Electrode 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.

(3) in the atmosphere where the temperature / humidity changes rapidly and it is easy to dew.

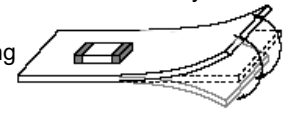
12.10. Resin coating

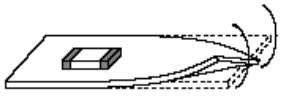
It may affect on the product's performance when using resin for coating / molding products. So please pay your careful attention when you select resin. In prior to use, please make the reliability evaluation with the product mounted in your application set.

12.11. 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.

Bending 

Twisting 

12.12. 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 °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.
- Avoid storing the product by itself bare (i.e.exposed directly to air).

(3) Delivery

Care should be taken when transporting or handling product to avoid excessive vibration or mechanical shock.

13. ⚠ Notes

(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.