

CUSTOMER: \_\_\_\_\_

DATE: \_\_\_\_\_

## APPROVAL SPECIFICATION

**RoHS+HSF**  
COMPLIANT

PRODUCT NAME: SMD power inductor

YOUR PART NO. :

OUR PART NO. : MPIT5040 Series

VERSION: V2.0

### RECEPTION

THE SPECIFICATION HAS BEEN ACCEPTED.

COMPANY:

DATE:

CFMD

CHKD

RCVD

MANUFACTURING NAME

SHENZHEN MICROGATE TECHNOLOGY CO., LTD

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|       |         |         |
|-------|---------|---------|
| CFMD. | CHKD.   | DSGD.   |
| Remo  | Huan Li | Wei Liu |

## CATALOG

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# Component SPEC Version Record

| Rev. | Effective Date | Changed Contents                      | Change Reasons                          | Approved By |
|------|----------------|---------------------------------------|-----------------------------------------|-------------|
| 1.0  | Dec. 10.2012   | New released                          | /                                       | Charles     |
| 2.0  | JUL. 31.2014   | Change the Electrical Characteristics | The Electrical Characteristics improved | Charles     |

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## 1. Scope

This specification applies to the MPIT5040 series of SMD power inductor.

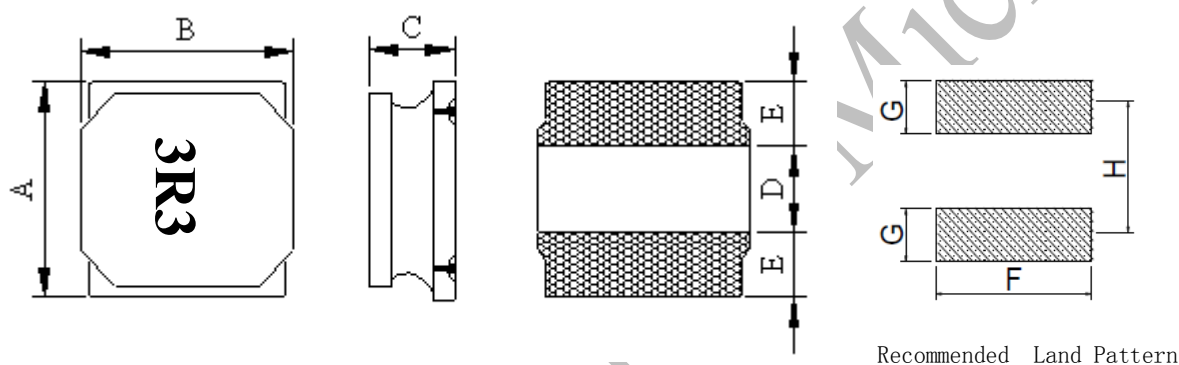
## 2. Product Identification

MPIT 5040 – 3R3 M - LF  
① ② ③ ④ ⑤

- ① Product Symbol (T type SMD power inductor)
- ② Product dimensions (5.0×5.0×4.0mm)
- ③ Inductance Value: (R82:0.82 uH 3R3: 3.3uH 330: 33uH; 101: 100uH)
- ④ Inductance Tolerance: (M: ±20% ; N: ±30%)
- ⑤ Lead free product.

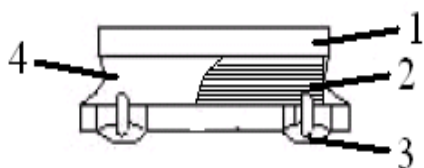
## 3. Appearance, Dimensions and Material

### 3.1 Appearance and dimensions



| Dimensions in mm |         |         |         |         |         |          |          |
|------------------|---------|---------|---------|---------|---------|----------|----------|
| A                | B       | C       | D       | E       | f       | g        | h        |
| 5.0±0.2          | 5.0±0.2 | 4.0Max. | 2.0±0.3 | 1.5±0.3 | 4.0Typ. | 1.5 Typ. | 3.6 Typ. |

### 3.2 Material List



| No. | Item               | Material                        |
|-----|--------------------|---------------------------------|
| 1   | Core               | Ni-Zn Ferrite                   |
| 2   | Wire               | Enameled Copper Wire            |
| 3   | Terminal Electrode | Ag/Ni/Sn/Cu                     |
| 4   | Magnetic Glue      | Epoxy resin and magnetic powder |

## 4. Testing Conditions

Unless otherwise specified, the standard conditions for measurement/test as:

Ambient Temperature : 5 to 35℃  
Relative Humidity: 25 to 85% RH  
Atmospheric Pressure: 86 to 106 kPa

If any doubt on the results, measurements/tests should be made within the following limits:

Ambient Temperature : 25±1℃  
Relative Humidity: 60 to 70% RH  
Atmospheric Pressure: 86 to 106 kPa

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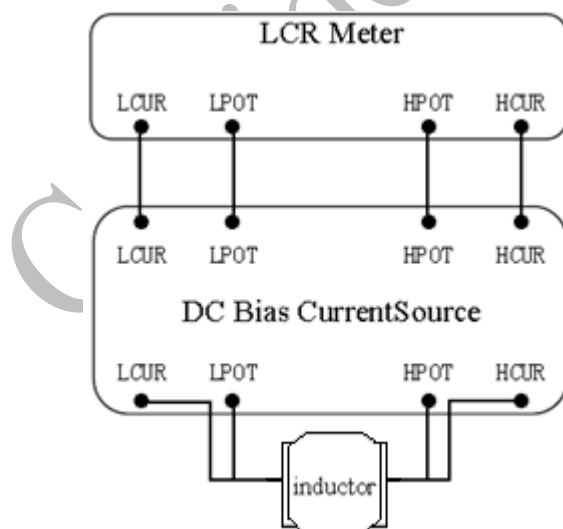
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## 5. Electrical Characteristics And Test Instruments

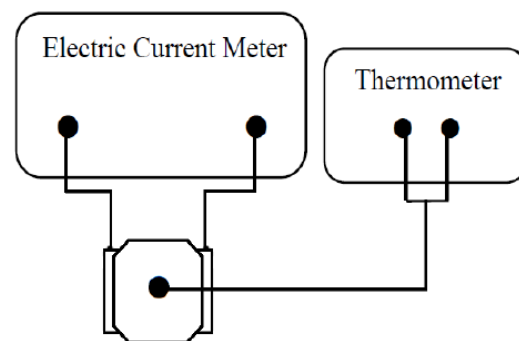
| Microgate Part No. | Inductance<br>L (uH)<br>100KHz/1V | DCR( $\Omega$ ) |       | Isat <sup>*1</sup><br>(A) |      | Irms <sup>*2</sup><br>(A) |      |
|--------------------|-----------------------------------|-----------------|-------|---------------------------|------|---------------------------|------|
|                    |                                   | Max.            | Typ.  | Max.                      | Typ. | Max.                      | Typ. |
| MPIT5040-1R0M-LF   | 1.0 $\pm$ 20%                     | 0.015           | 0.012 | 8.20                      | 8.60 | 4.90                      | 5.40 |
| MPIT5040-1R5M-LF   | 1.5 $\pm$ 20%                     | 0.019           | 0.015 | 6.50                      | 7.10 | 4.30                      | 4.80 |
| MPIT5040-2R2M-LF   | 2.2 $\pm$ 20%                     | 0.024           | 0.019 | 5.80                      | 6.30 | 3.80                      | 4.20 |
| MPIT5040-3R3M-LF   | 3.3 $\pm$ 20%                     | 0.031           | 0.024 | 4.60                      | 5.20 | 3.40                      | 3.70 |
| MPIT5040-4R7M-LF   | 4.7 $\pm$ 20%                     | 0.039           | 0.030 | 4.00                      | 4.30 | 3.00                      | 3.30 |
| MPIT5040-6R8M-LF   | 6.8 $\pm$ 20%                     | 0.053           | 0.041 | 3.20                      | 3.50 | 2.50                      | 2.75 |
| MPIT5040-100M-LF   | 10 $\pm$ 20%                      | 0.074           | 0.057 | 2.70                      | 3.00 | 2.10                      | 2.30 |
| MPIT5040-150M-LF   | 15 $\pm$ 20%                      | 0.112           | 0.086 | 2.20                      | 2.40 | 2.00                      | 2.20 |
| MPIT5040-220M-LF   | 22 $\pm$ 20%                      | 0.168           | 0.129 | 1.75                      | 1.90 | 1.50                      | 1.65 |
| MPIT5040-270M-LF   | 27 $\pm$ 20%                      | 0.194           | 0.162 | 1.50                      | 1.63 | 1.35                      | 1.50 |
| MPIT5040-330M-LF   | 33 $\pm$ 20%                      | 0.244           | 0.188 | 1.30                      | 1.50 | 1.20                      | 1.30 |
| MPIT5040-470M-LF   | 47 $\pm$ 20%                      | 0.350           | 0.270 | 1.15                      | 1.30 | 1.00                      | 1.10 |
| MPIT5040-680M-LF   | 68 $\pm$ 20%                      | 0.520           | 0.400 | 0.90                      | 1.05 | 0.80                      | 0.90 |
| MPIT5040-101M-LF   | 100 $\pm$ 20%                     | 0.660           | 0.550 | 0.85                      | 1.00 | 0.90                      | 1.00 |
| MPIT5040-151M-LF   | 150 $\pm$ 20%                     | 0.962           | 0.740 | 0.65                      | 0.70 | 0.60                      | 0.70 |
| MPIT5040-221M-LF   | 220 $\pm$ 20%                     | 1.250           | 1.040 | 0.50                      | 0.56 | 0.48                      | 0.53 |

### Test instruments and remarks

- \* All test data is referenced to 25°C ambient.
- \* L test by CHROMA 3302 meter or equivalent.
- \* DCR test by Tonghui TH2516B meter or equivalent.
- \* CHROMA 3302 and 1320 meter for IDC.
- \* Isat: DC current (A) that will cause L0 to drop approximately 30%.
- \* Irms: DC current (A) that will cause an temperature rise  $\Delta T$  approximate to 40°C.
- \* The rated current as listed is either the saturation current or the heating current depending on which value is lower.
- \* Operating temperature: -40°C to +125°C (Including self-heating)
- \* The part temperature (ambient + temp rise) should not exceed 125°C under worse case operating conditions. Circuit design, component placement, PCB trace size and thickness, airflow and other cooling provision all affect the part temperature. Part temperature should be verified in the end application.



Isat test schematic diagram



Irms test schematic diagram

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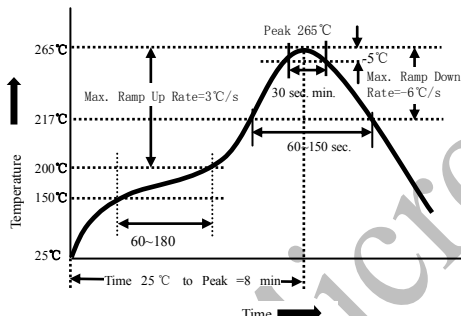
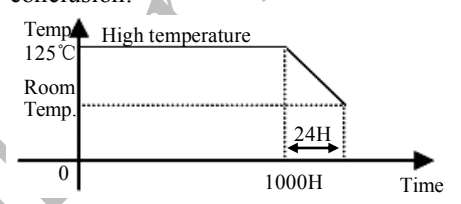
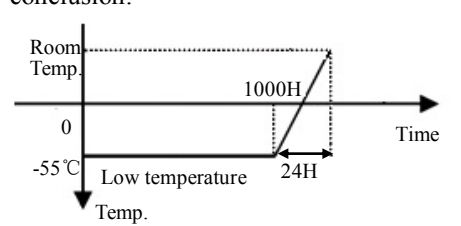
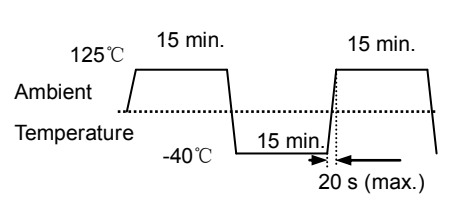
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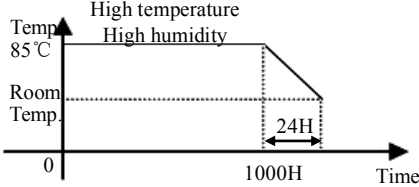
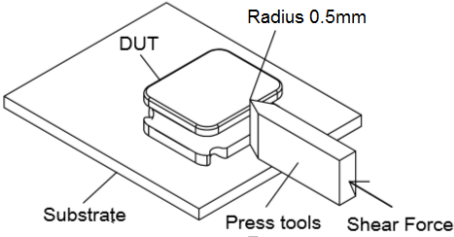
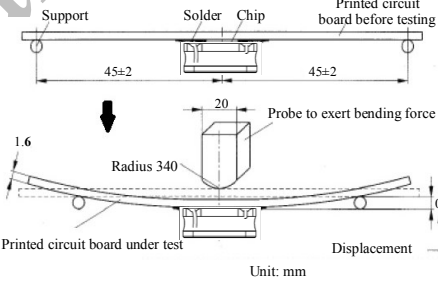
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## 6. Reliability

| No. | Item                         | Requirements                                                                     | Test Methods and Remarks                                                                                                                                                                                                                                                                                     | Reference                         | Sample Size |
|-----|------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------|
| 1   | Solderability                | (1) No physical damage.<br>(2) Terminal area must have 95% min. solder coverage. | ①Temperature: $245 \pm 5^{\circ}\text{C}$ , flux 5-10 s.<br>②Sample immersion tin furnace $5 \pm 0.5\text{s}$ .<br>③Immersed and in and out of speed: $25 \pm 6\text{mm/s}$ .                                                                                                                                | AEC-Q200 (J-STD-002)              | 15          |
| 2   | Resistance to Soldering Heat |                                                                                  | ①The peak temperature: $260 \pm 5/-0^{\circ}\text{C}$ .<br>②Reflow: 3 times.<br>③Temperature curve is as below:<br>                                                                                                        | AEC-Q200 (MIL-STD-202 Method 210) | 30          |
| 3   | High Temperature Storage     |                                                                                  | ①Temperature: $125 \pm 2^{\circ}\text{C}$ .<br>②Time : 1000 hours.<br>③Measurement at $24 \pm 4$ hours after test conclusion.<br>                                                                                         | AEC-Q200 (MIL-STD-202 Method 108) | 77          |
| 4   | Low Temperature Storage      | (1) No physical damage.<br>(2) $ \Delta L_0/L_0  \leq 10\%$                      | ①Temperature: $-55 \pm 2^{\circ}\text{C}$ .<br>②Time : 1000 hours.<br>③Measurement at $24 \pm 4$ hours after test conclusion.<br>                                                                                        | JESD22-A119                       | 77          |
| 5   | Thermal shock                |                                                                                  | ①First $-40^{\circ}\text{C}$ for 15 minutes, last $125^{\circ}\text{C}$ 15 minutes as 1 cycle. Go through 300 cycles.<br>②Max transfer time is 20 second.<br>③Measurement at $24 \pm 4$ hours after test conclusion.<br> | MIL-STD-202 Method 107            | 30          |

| No. | Item                | Requirements                                                                   | Test Methods and Remarks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Reference                         | Sample Size |
|-----|---------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------|
| 6   | Humidity Resistance |                                                                                | <p>①1000 hours, 85°C/85%RH.<br/>②Unpowered.<br/>③Measurement at 24±4 hours after test conclusion.</p>  <p>The graph shows a temperature profile over time. It starts at 0, rises to 85°C, stays at 85°C for 1000H, then drops to Room Temp. and stays there for 24H. The area under the curve is labeled 'High temperature High humidity'.</p>                                                                                          | AEC-Q200 (MIL-STD-202 Method 103) | 77          |
| 7   | Terminal Strength   |                                                                                | <p>①The test samples shall be soldered to the board.<br/>②17.64N, 60s.</p>  <p>The diagram shows a DUT (Device Under Test) soldered to a substrate. A press tool is applying a shear force to the solder joint. The radius of the solder joint is 0.5mm.</p>                                                                                                                                                                            | AEC-Q200 (AEC-Q200-006)           | 30          |
| 8   | Board Flex          | <p>(1) No physical damage.<br/>(2) <math> \Delta L_0/L_0  \leq 10\%</math></p> | <p>①Part mounted on a 100mm*40mm FR4 PCB board, which is 1.6±0.2 mm thick and as a Layer-thickness 35 μm ± 10 μm.<br/>②Bending speed is 1mm/s.<br/>③Keeping the P.C Board 2 mm minimum for 60 seconds.</p>  <p>The diagram shows a printed circuit board being bent. The board is supported by two points, and a probe is exerting a bending force. The radius of the bend is 340 mm. The displacement is 1.6 mm. The unit is mm.</p> | AEC-Q200 (AEC-Q200-005)           | 30          |
| 9   | Drop                |                                                                                | <p>①Height: 1 m, Free fall, 10times.<br/>②Direction: 1 Angle, 1side, 2surface.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                        | JESD22-B111                       | 30          |
| 10  | Vibration           |                                                                                | <p>①Frequency range : 10~2000Hz.<br/>②Amplitude: 1.5mm , 5g.<br/>③Sweep time and duration: 10~2000~10Hz for 20 minutes.<br/>④Each four hours(12 times) in X,Y,Z direction, 12 hours in total.</p>                                                                                                                                                                                                                                                                                                                         | AEC-Q200 (MIL-STD-202 Method 204) | 30          |

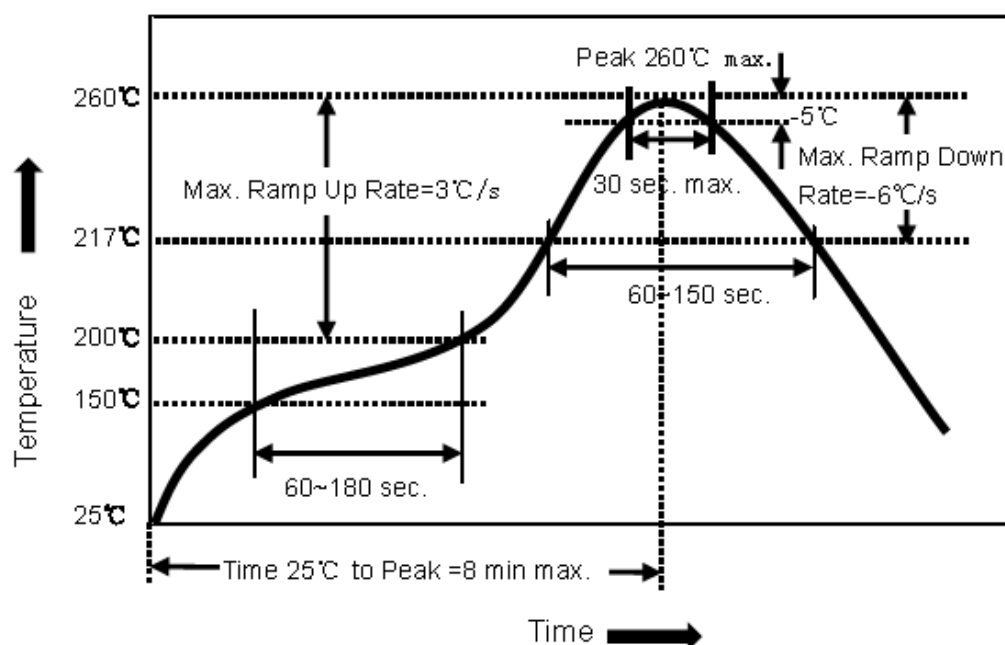
| No. | Item                        | Requirements                                                | Test Methods and Remarks                                                                                                                                            | Reference                | Sample Size |
|-----|-----------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------|
| 11  | Loading at High Temperature | (1) No physical damage.<br>(2) $ \Delta L_0/L_0  \leq 10\%$ | ① Temperature: $85 \pm 2^\circ\text{C}$ .<br>② Time : 1000 hours.<br>③ Applied Current : Rated current.<br>④ Measurement at $24 \pm 4$ hours after test conclusion. | AEC-Q200<br>(MIL-PRF-27) | 77          |

\*All above experiments items need 3 Lot., sample size is as specified in the table above.

\*Sample size standard is from AEC-Q200 : qualification sample size requirements.

## 7. Recommended Soldering Conditions

### (1) Reflow soldering conditions



\*Above reflow soldering curve is from J-STD-020D.

### (2) Iron soldering

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

|                       |                |
|-----------------------|----------------|
| Pre-heating           | 150°C 1 minute |
| Tip temperature       | 350°C max      |
| Soldering iron output | 30w max        |
| End of soldering iron | Φ 1mm max      |
| Soldering time        | 3 seconds max  |

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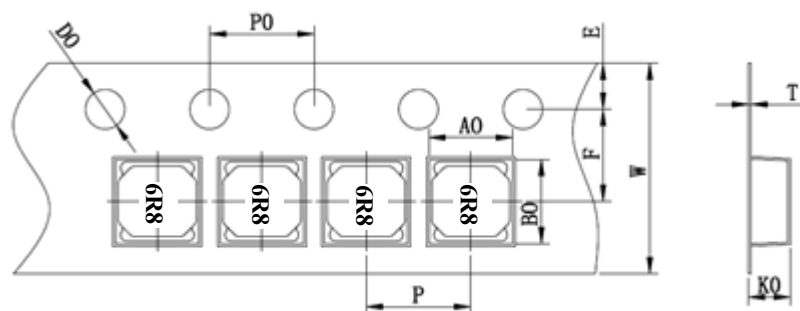
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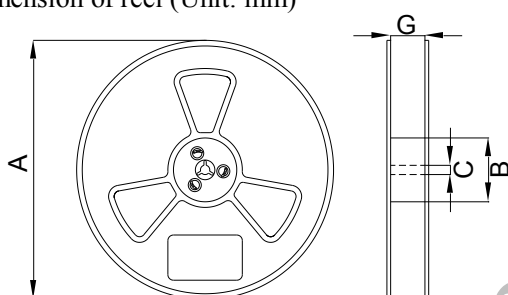
## 8. Package Information

(1) Dimension of tape (Unit: mm)



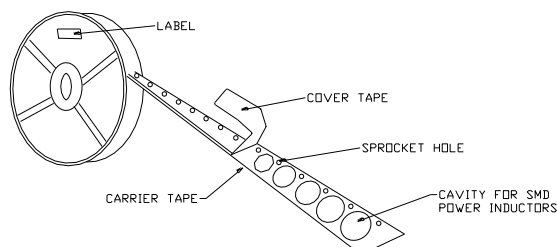
| W      | A0      | B0      | K0      | E        | F       | P       | P0      | D0      | T         |
|--------|---------|---------|---------|----------|---------|---------|---------|---------|-----------|
| 12±0.3 | 5.4±0.1 | 5.4±0.1 | 4.2±0.1 | 1.75±0.1 | 5.5±0.1 | 8.0±0.1 | 4.0±0.1 | 1.5±0.1 | 0.40±0.05 |

(2) Dimension of reel (Unit: mm)



| Symbol | Dimension |
|--------|-----------|
| A      | 330±2     |
| B      | 100±2     |
| C      | 13.5±0.2  |
| G      | 14.3±0.5  |

(3) Taping figure and drawing direction

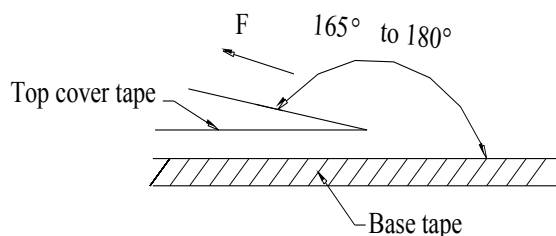


(4) Packaging quantities: 1500PCS/Reel.

(5) Peeling strength of cover tape:

The peel force of top cover tape shall be between 0.10N to 1.3N

\*the peel force standard is from EIA-481-D



| Room Temp.<br>(°C) | Room Humidity<br>(%) | Room aim<br>(hpa) | Peel Speed<br>mm/min |
|--------------------|----------------------|-------------------|----------------------|
| 5-35               | 45-85                | 860-1060          | 300                  |

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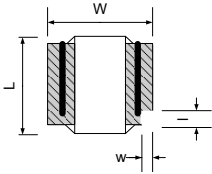
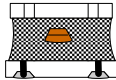
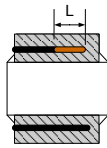
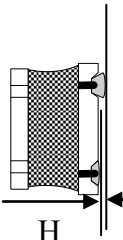
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## 9. Visual inspection standard of product

| No. | Defect Item   | Graphic                                                                            | Rejection identification                                | Acceptance |
|-----|---------------|------------------------------------------------------------------------------------|---------------------------------------------------------|------------|
| 1   | Core defect   |   | $l > L/6$ or $w > W/6$ , NG.                            | AQL=0.65   |
| 2   | Missing resin |   | The area of missing resin more than 1/3 single face, NG | AQL=0.65   |
| 3   | Cold solder   |   | L more than 1 mm, NG.                                   | AQL=0.65   |
| 4   | Solder uneven |  | $H > 0.1\text{mm}$ . NG.                                | AQL=0.65   |

## 10. Products Storage

### (1) Storage period

Products which inspected in MICROGATE over 12 months ago should be examined and used, which can be confirmed with inspection No. marked on the container. Solderability should be checked if this period is exceeded.

### (2) Storage conditions

Products should be storage in the warehouse on the following conditions:

Temperature:  $-10 \sim +35^{\circ}\text{C}$

Humidity: Less than 70% relative and humidity

No rapid change on temperature and humidity.

### (3) 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.

### (4) Products should be storage on the palette for the prevention of the influence from humidity, dust and so on.

### (5) Products should be storage in the warehouse without heat shock, vibration, direct sunlight and so on.

### (6) Products should be storage under the airtight packaged condition.

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