

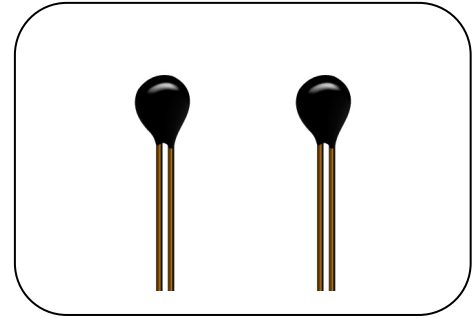
# NTC Thermistor : TTS Series



## Epoxy Bead Type for Temperature Sensing/Compensation

### ■ Features

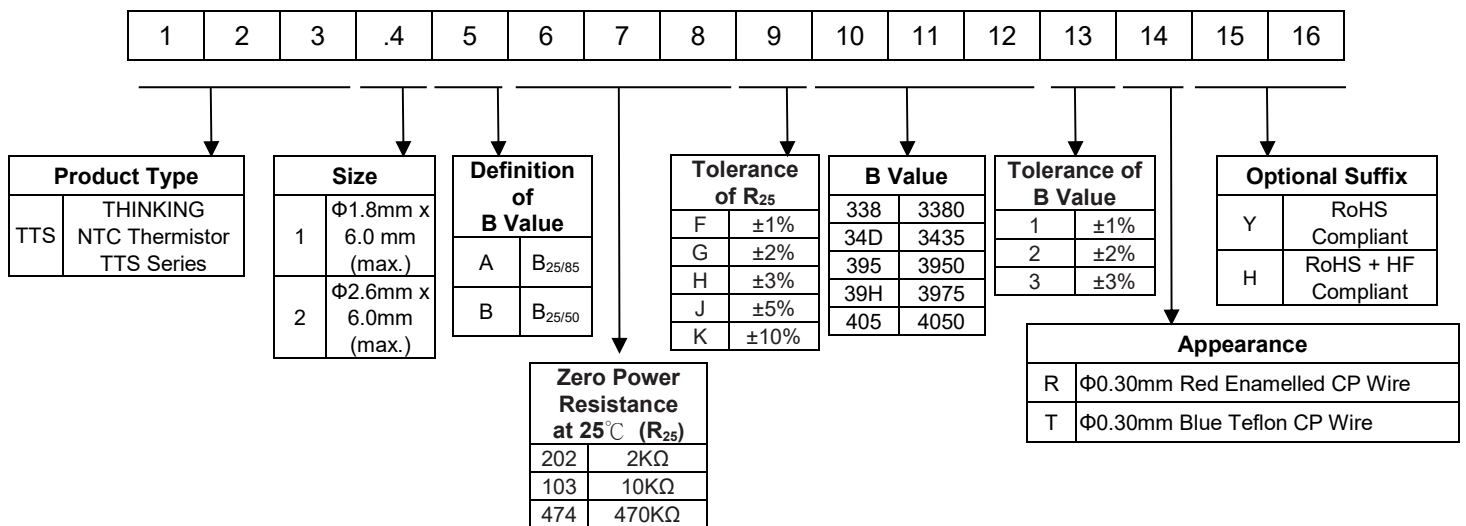
1. RoHS compliant
2. Halogen-Free (HF) series are available
3. Body size:  $\Phi 1.8\text{mm}$ ,  $\Phi 2.6\text{mm}$
4. Radial lead resin coated
5. Long leads for easy sensor placement
6. Operating temperature range:  $-40^{\circ}\text{C} \sim +100^{\circ}\text{C}$
7. Wide resistance range
8. Agency recognition: UL / cUL / TUV



### ■ Recommended Applications

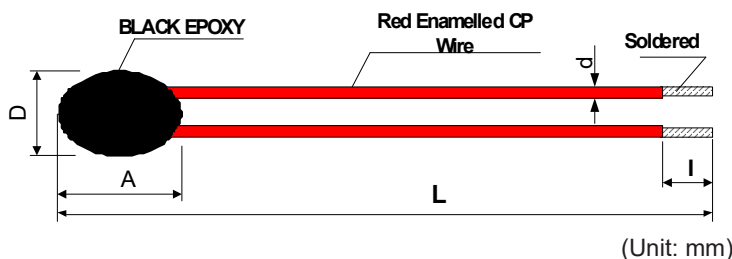
1. Home appliances
2. Computers
3. Battery packs
4. Thermometers

### ■ Part Number Code

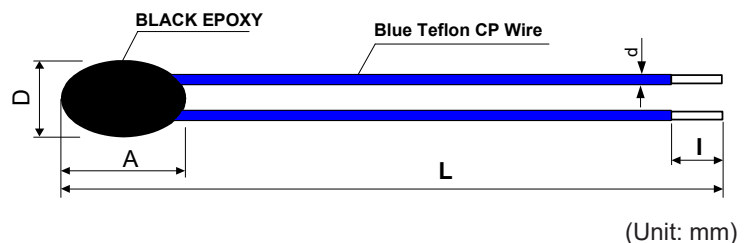


### ■ Structure and Dimensions

#### R Type



#### T Type



| Series | Dmax. | Amax. | d               | L          | I           |
|--------|-------|-------|-----------------|------------|-------------|
| TTS1   | 1.8   | 6.0   | $0.30 \pm 0.02$ | $70 \pm 5$ | $2 \pm 0.5$ |
| TTS2   | 2.6   | 6.0   |                 |            |             |

| Series | Dmax. | Amax. | d               | L          | I           |
|--------|-------|-------|-----------------|------------|-------------|
| TTS1   | 1.8   | 6.0   | $0.30 \pm 0.02$ | $70 \pm 5$ | $2 \pm 0.5$ |

Note: D: 1.5mm is available upon request.

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### Electrical Characteristics

| Part No.         | Zero Power Resistance at 25°C | Tolerance of R <sub>25</sub> | B Value | Tolerance of B value | Max. Power Dissipation at 25°C | Dissipation Factor | Thermal Time Constant | Operating Temperature Range         | Safety Approvals |         |   |   |
|------------------|-------------------------------|------------------------------|---------|----------------------|--------------------------------|--------------------|-----------------------|-------------------------------------|------------------|---------|---|---|
|                  | R <sub>25</sub> (KΩ)          | (±%)                         | (K)     | (±%)                 | P <sub>max</sub> (mW)          | δ(mW/°C)           | τ (Sec.)              | T <sub>L</sub> ~T <sub>U</sub> (°C) | UL cUL           | TUV     |   |   |
| TTS1(2)A202□34D* | 2                             | 1,2,3,5                      | 25/85   | 3435                 | 2, 3                           | 45                 | ≧ 1                   | ≧ 10                                | -40 ~ +100       | √       | √ |   |
| TTS1(2)A502□347* | 5                             |                              |         | 3470                 |                                |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)A502□395* | 5                             |                              |         | 3950                 |                                |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)A103□34D* | 10                            |                              |         | 3435                 |                                |                    |                       |                                     |                  | 1, 2, 3 | √ | √ |
| TTS1(2)A103□395* | 10                            |                              |         | 3950                 |                                |                    |                       |                                     |                  |         | √ | √ |
| TTS1(2)A103□39H* | 10                            |                              |         | 3975                 |                                |                    |                       |                                     |                  |         | √ | √ |
| TTS1(2)A113□39H* | 11                            |                              |         | 3975                 | √                              |                    |                       |                                     |                  |         | √ |   |
| TTS1(2)A223□374* | 22                            |                              |         | 3740                 | √                              |                    |                       |                                     |                  |         | √ |   |
| TTS1(2)A503□395* | 50                            |                              |         | 3950                 | √                              |                    |                       |                                     |                  |         | √ |   |
| TTS1(2)A503□409* | 50                            |                              |         | 4090                 | √                              |                    |                       |                                     |                  | √       |   |   |
| TTS1(2)A104□400* | 100                           |                              |         | 4000                 | 2, 3                           |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)A104□419* | 100                           |                              |         | 4190                 |                                |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)A104□436* | 100                           |                              |         | 4360                 |                                |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)A474□457* | 470                           |                              |         | 4570                 | 25/50                          |                    |                       |                                     |                  | 2, 3    | √ | √ |
| TTS1(2)B202□338* | 2                             |                              | 3380    | √                    |                                |                    |                       |                                     |                  |         | √ |   |
| TTS1(2)B502□342* | 5                             |                              | 3420    | √                    |                                |                    |                       |                                     |                  |         | √ |   |
| TTS1(2)B502□390* | 5                             |                              | 3900    | √                    |                                |                    |                       |                                     |                  |         | √ |   |
| TTS1(2)B103□338* | 10                            |                              | 3380    | 1, 2, 3              |                                |                    |                       |                                     |                  |         | √ | √ |
| TTS1(2)B103□391* | 10                            |                              | 3910    |                      |                                |                    |                       |                                     |                  |         | √ | √ |
| TTS1(2)B103□39D* | 10                            |                              | 3935    |                      |                                |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)B113□39D* | 11                            |                              | 3935    |                      |                                |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)B223□370* | 22                            |                              | 3700    |                      |                                |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)B503□392* | 50                            |                              | 3920    |                      |                                |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)B503□402* | 50                            |                              | 4020    | 2, 3                 |                                |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)B104□39D* | 100                           |                              | 3935    |                      |                                |                    |                       |                                     |                  | √       | √ |   |
| TTS1(2)B104□412* | 100                           |                              | 4120    |                      |                                |                    |                       |                                     |                  | √       | √ |   |

Note 1: □ = Tolerance of R<sub>25</sub>  
 \* = Tolerance of B value

Note 2: UL/cUL File No: E138827  
 TUV File No:R 50236283

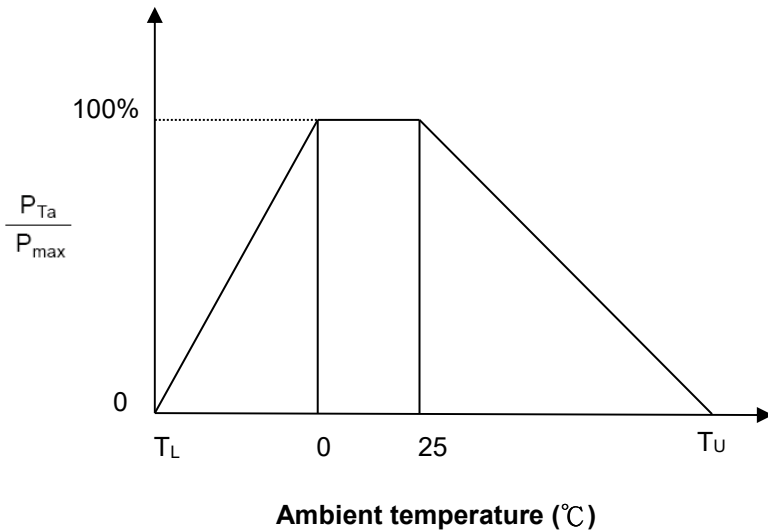
Note 3: Special specifications are available upon request.

# NTC Thermistor : TTS Series

## Epoxy Bead Type for Temperature Sensing/Compensation



### Max. Power Dissipation Derating Curve



$T_U$  : Maximum operating temperature (°C)

$T_L$  : Minimum operating temperature (°C)

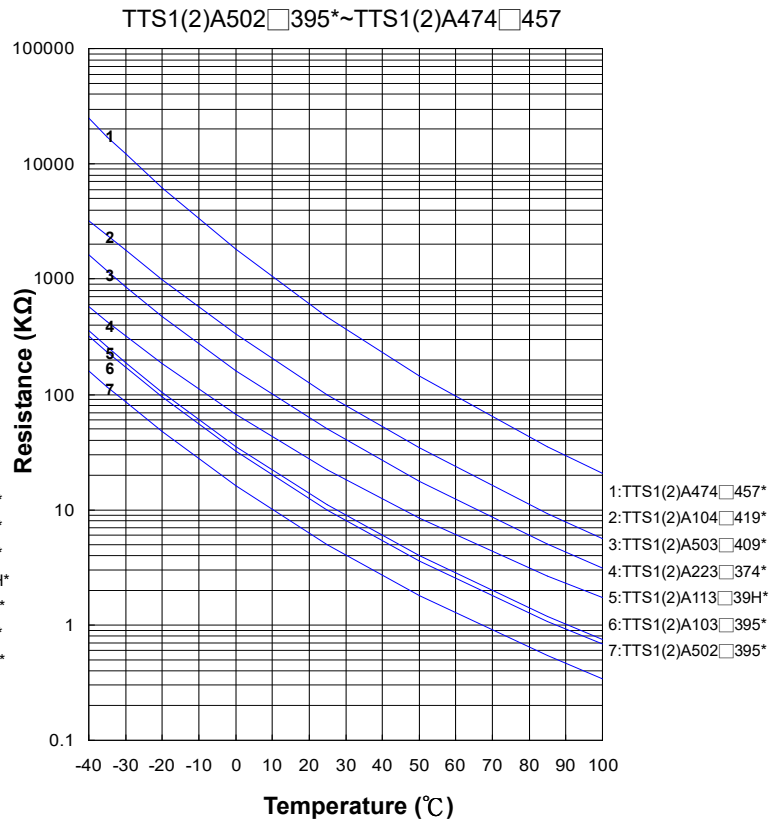
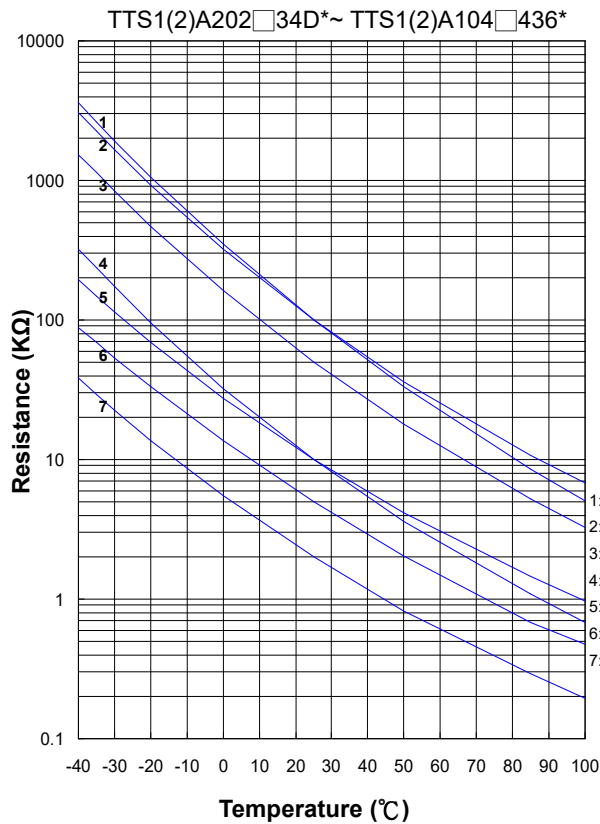
For example:

Ambient temperature( $T_a$ ) = 55°C

Maximum operating temperature( $T_U$ ) = 100°C

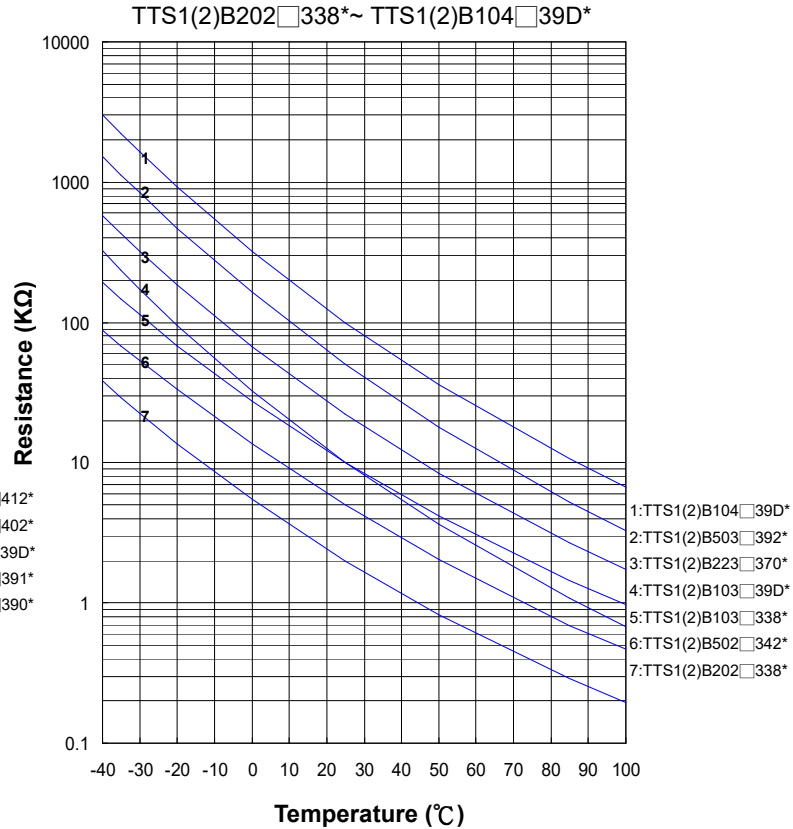
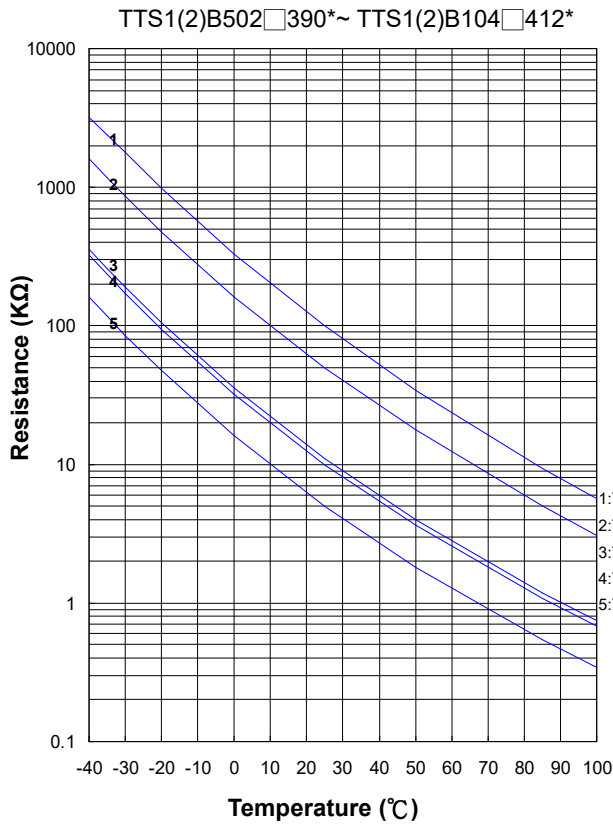
$$P_{Ta} = (T_U - T_a) / (T_U - 25) \times P_{max} = 60\% P_{max}$$

### R-T Characteristic Curves



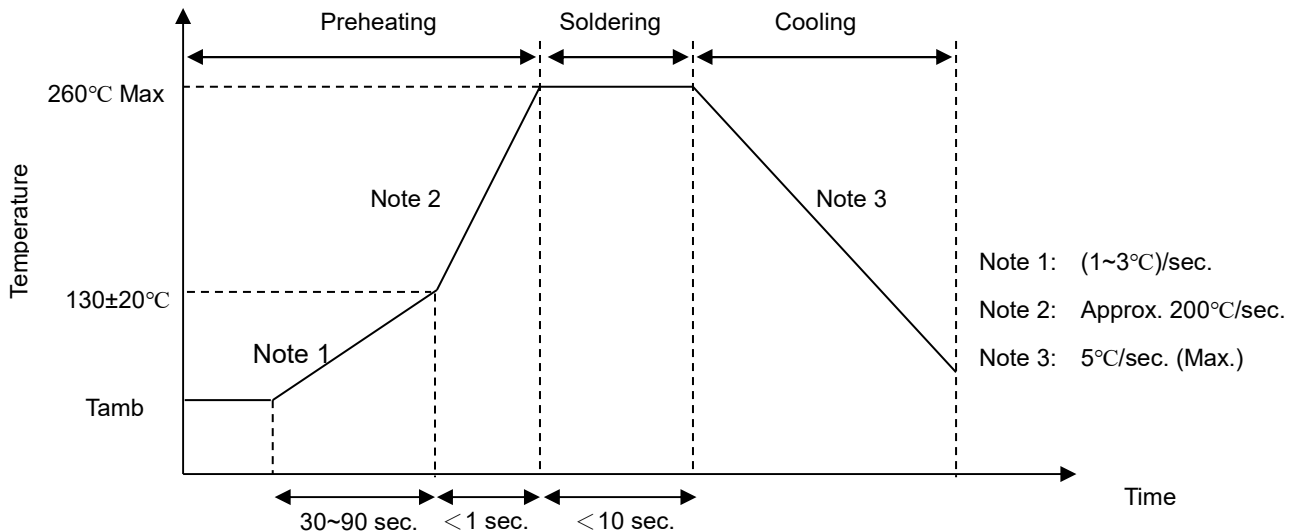
# NTC Thermistor : TTS Series

Epoxy Bead Type for Temperature Sensing/Compensation



## ■ Soldering Recommendation

### ● Wave Soldering Profile



### ● Recommended Reworking Conditions With Soldering Iron

| Item                              | Conditions    |
|-----------------------------------|---------------|
| Temperature of Soldering Iron-tip | 360°C (max.)  |
| Soldering Time                    | 3 sec. (max.) |
| Distance from Thermistor          | 10 mm (min.)  |

# NTC Thermistor : TTS Series



## Epoxy Bead Type for Temperature Sensing/Compensation

### ■ Reliability

| Item                             | Standard              | Test conditions / Methods  | Specifications  |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
|----------------------------------|-----------------------|--|---|------------------|------------------|------|---------------------|--------|--------------------|------------------|-------------------|---|---------|--------|---|------------------|-----|---|
| Tensile Strength of Terminations | IEC 60068-2-21        | <p>Gradually apply the specified force and keep the unit fixed for 10±1 sec.</p> <table border="1"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (Kg)</th> </tr> </thead> <tbody> <tr> <td><math>d \leq 0.25</math></td> <td>0.10</td> </tr> <tr> <td><math>0.25 &lt; d \leq 0.3</math></td> <td>0.25</td> </tr> <tr> <td><math>0.3 &lt; d \leq 0.5</math></td> <td>0.5</td> </tr> </tbody> </table>   | Terminal diameter (mm)                                      | Force (Kg)       | $d \leq 0.25$    | 0.10 | $0.25 < d \leq 0.3$ | 0.25   | $0.3 < d \leq 0.5$ | 0.5              | No visible damage |   |         |        |   |                  |     |   |
| Terminal diameter (mm)           | Force (Kg)            |  |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| $d \leq 0.25$                    | 0.10                  |  |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| $0.25 < d \leq 0.3$              | 0.25                  |  |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| $0.3 < d \leq 0.5$               | 0.5                   |  |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| Bending Strength of Terminations | IEC 60068-2-21        | <p>Hold specimen and apply the force specified below to each lead. Bend the specimen to 90°, and then return to the original position. Repeat the procedure in the opposite direction.</p> <table border="1"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (Kg)</th> </tr> </thead> <tbody> <tr> <td><math>d \leq 0.25</math></td> <td>0.05</td> </tr> <tr> <td><math>0.25 &lt; d \leq 0.3</math></td> <td>0.125</td> </tr> <tr> <td><math>0.3 &lt; d \leq 0.5</math></td> <td>0.25</td> </tr> </tbody> </table> | Terminal diameter (mm)                                      | Force (Kg)       | $d \leq 0.25$    | 0.05 | $0.25 < d \leq 0.3$ | 0.125  | $0.3 < d \leq 0.5$ | 0.25             | No visible damage |   |         |        |   |                  |     |   |
| Terminal diameter (mm)           | Force (Kg)            |  |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| $d \leq 0.25$                    | 0.05                  |  |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| $0.25 < d \leq 0.3$              | 0.125                 |  |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| $0.3 < d \leq 0.5$               | 0.25                  |  |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| Solderability                    | IEC 60068-2-20        | 245 ± 3°C, 3 ± 0.3 sec.  | At least 95% of terminal electrode is covered by new solder |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| Resistance to Soldering Heat     | IEC 60068-2-20        | 260 ± 3°C, 10 ± 1 sec.   | No visible damage<br>  $\Delta R_{25}/R_{25}$   ≤ 3 %       |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| High Temperature Storage         | IEC 60068-2-2         | 100 ± 2°C , 1000 ± 24 hrs  | No visible damage<br>  $\Delta R_{25}/R_{25}$   ≤ 5 %       |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| Damp Heat, Steady State          | IEC 60068-2-78        | 40 ± 2°C, 90~95% RH, 1000 ± 24 hrs   | No visible damage<br>  $\Delta R_{25}/R_{25}$   ≤ 3 %       |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| Rapid Change of Temperature      | IEC 60068-2-14        | <p>The conditions shown below shall be repeated 5 cycles.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</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>≤ 3</td> </tr> <tr> <td>3</td> <td>100 ± 2</td> <td>30 ± 3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>≤ 3</td> </tr> </tbody> </table>   | Step  | Temperature (°C) | Period (minutes) | 1    | -40 ± 3             | 30 ± 3 | 2                  | Room temperature | ≤ 3               | 3 | 100 ± 2 | 30 ± 3 | 4 | Room temperature | ≤ 3 | No visible damage<br>  $\Delta R_{25}/R_{25}$   ≤ 3 % |
| Step                             | Temperature (°C)      | Period (minutes)   |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| 1                                | -40 ± 3               | 30 ± 3   |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| 2                                | Room temperature      | ≤ 3  |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| 3                                | 100 ± 2               | 30 ± 3   |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| 4                                | Room temperature      | ≤ 3  |   |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |
| Max. Power Dissipation           | IEC 60539-1<br>4.26.3 | 25 ± 5°C, Pmax. , 1000 ± 24 hrs  | No visible damage<br>  $\Delta R_{25}/R_{25}$   ≤ 5 %       |                  |                  |      |                     |        |                    |                  |                   |   |         |        |   |                  |     |   |

### ■ Packaging

- Bulk Packing: 500 pcs/bag

### ■ Warehouse Storage Conditions of Products

- Storage Conditions :
  1. Storage Temperature: -10°C ~ +40°C
  2. Relative Humidity: ≤ 75%RH
  3. Keep away from corrosive atmosphere and sunlight.
- Period of Storage : 1 year