# Specification for Approval

**Date:** 2016/12/11

**Customer :**

**TAI-TECH P/N:** **HCB-F-Series**

**CUSTOMER P/N:**

**DESCRIPTION:** **High Current Ferrite Chip Bead**

**QUANTITY:** pcs

| **REMARK:** | | |
|---|---|---|
| Customer Approval Feedback | | |
| | | |

Sales Dep.

| APPROVED | CHECKED |
|---|---|
| Andy Huang | Camilla Liu |

R&D Center

| APPROVED | CHECKED | DRAWN |
|---|---|---|
| Nick Chang | Vita Yeh | Alin Chang |

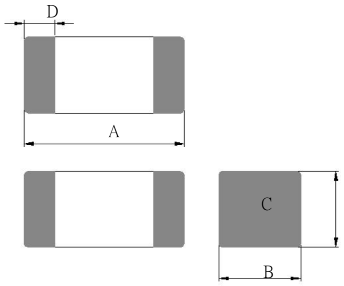
# High Current Ferrite Chip Bead(Lead Free)

HCB-F-Series

## 1.Features

1.Monolithic inorganic material construction.
2.Low DC resistance structure of electrode to prevent wasteful electric power consumption.
3.Closed magnetic circuit avoids crosstalk.
4.Suitable for flow and reflow soldering.
5.Shapes and dimensions follow E.I.A. spec.
6.Available in various sizes.
7.Excellent solderability and heat resistance.
8.High reliability.
9.This component is compliant with RoHS legislation and also support lead-free soldering.

## 2.Dimensions

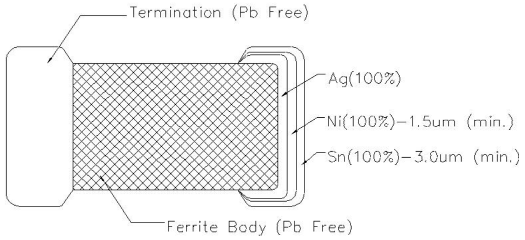


| Chip size | | | | |
|---|---|---|---|---|
| **Size** | **A(mm)** | **B(mm)** | **C(mm)** | **D(mm)** |
| **1608** | 1.6±0.15 | 0.8±0.15 | 0.8±0.15 | 0.3±0.2 |
| **2012** | 2.0±0.2 | 1.25±0.2 | 0.85±0.2 | 0.5±0.3 |
| **3216** | 3.2±0.2 | 1.6±0.2 | 1.1±0.2 | 0.5±0.3 |
| **3225** | 3.2±0.2 | 2.5±0.2 | 1.3±0.2 | 0.5±0.3 |
| **4516** | 4.5±0.2 | 1.6±0.2 | 1.6±0.2 | 0.5±0.3 |
| **4532** | 4.5±0.2 | 3.2±0.2 | 1.5±0.2 | 0.5±0.3 |
| **5750** | 5.7±0.2 | 5.0±0.3 | 1.8±0.2 | 0.5±0.3 |

## 3.Part Numbering

| HCB | 1608 | KF | - | 121 | T | 20 |
|---|---|---|---|---|---|---|
| A | B | C | | D | E | F |

A: Series
B: Dimension L x W
C: Material Lead Free Material
D: Impedance 121=120Ω
E: Packaging T=Taping and Reel, B=Bulk(Bags)
F: Rated Current 20=2000mA

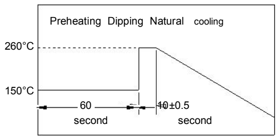
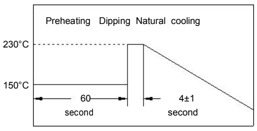
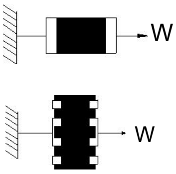
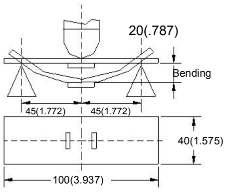
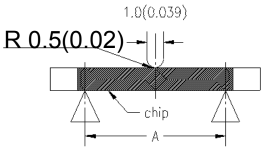


## 4.Specification

| Tai-Tech Part Number | Impedance (Ω) | Test Frequency (MHz) | DC Resistance (Ω) max. | Rated Current (mA) |
|---|---|---|---|---|
| HCB1608KF-300T30 | 30±25% | 100 | 0.04 | 3000 |
| HCB1608KF-800T30 | 80±25% | 100 | 0.04 | 3000 |
| HCB1608KF-121T20 | 120±25% | 100 | 0.10 | 2000 |
| HCB1608KF-151T20 | 150±25% | 100 | 0.10 | 2000 |
| HCB1608KF-221T20 | 220±25% | 100 | 0.10 | 2000 |
| HCB1608KF-301T10 | 300±25% | 100 | 0.20 | 1000 |
| HCB1608KF-471T10 | 470±25% | 100 | 0.20 | 1000 |
| HCB1608KF-601T10 | 600±25% | 100 | 0.20 | 1000 |
| HCB2012KF-300T30 | 30±25% | 100 | 0.04 | 3000 |
| HCB2012KF-800T30 | 80±25% | 100 | 0.04 | 3000 |
| HCB2012KF-121T20 | 120±25% | 100 | 0.10 | 2000 |
| HCB2012KF-151T20 | 150±25% | 100 | 0.10 | 2000 |
| HCB2012KF-221T20 | 220±25% | 100 | 0.10 | 2000 |
| HCB2012KF-301T10 | 300±25% | 100 | 0.20 | 1000 |
| HCB2012KF-471T10 | 470±25% | 100 | 0.20 | 1000 |

| Tai-Tech Part Number | Impedance (Ω) | Test Frequency (MHz) | DC Resistance (Ω) max. | Rated Current (mA) |
|---|---|---|---|---|
| HCB2012KF-601T10 | 600±25% | 100 | 0.20 | 1000 |
| HCB3216KF-300T30 | 30±25% | 100 | 0.04 | 3000 |
| HCB3216KF-500T30 | 50±25% | 100 | 0.04 | 3000 |
| HCB3216KF-800T30 | 80±25% | 100 | 0.04 | 3000 |
| HCB3216KF-121T20 | 120±25% | 100 | 0.10 | 2000 |
| HCB3216KF-151T20 | 150±25% | 100 | 0.10 | 2000 |
| HCB3216KF-301T10 | 300±25% | 100 | 0.20 | 1000 |
| HCB3216KF-471T10 | 470±25% | 100 | 0.20 | 1000 |
| HCB3216KF-501T30 | 500±25% | 100 | 0.04 | 3000 |
| HCB3216KF-601T20 | 600±25% | 100 | 0.10 | 2000 |
| HCB3225KF-600T40 | 60±25% | 100 | 0.03 | 4000 |
| HCB3225KF-900T20 | 90±25% | 100 | 0.10 | 2000 |
| HCB3225KF-151T50 | 150±25% | 100 | 0.02 | 5000 |
| HCB3225KF-201T40 | 200±25% | 100 | 0.03 | 4000 |

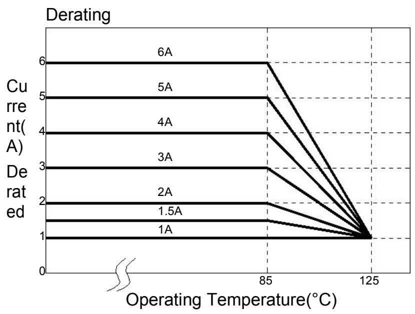
# 5. Reliability and Test Condition

| Item | Performance | | | | | | | | | | Test Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Series No.** | FCB | FCM | HCB | HPB | HFB | FCA | FCI | FHI | FCH | HCI | -- |
| **Operating Temperature** | -55~+125℃ | | | | | | -40~+85℃ | | | | -- |
| **Storage Temperature** | -55~+125℃ | | | | | | -40~+85℃ | | | | -- |
| **Impedance (Z)** | Refer to standard electrical characteristics list | | | | | | | | | | HP4291A, HP4287A+16092A |
| **Inductance (Ls)** | | | | | | | | | | | |
| **Q Factor** | | | | | | | | | | | |
| **DC Resistance** | | | | | | | | | | | HP4338B |
| **Rated Current** | | | | | | | | | | | ** |
| **Temperature Rise Test** | 30℃ max. (  T) | | | | | | | | | | 1. Applied the allowed DC current.<br>2. Temperature measured by digital surface thermometer. |
| **Solder heat Resistance** | Appearance: No significant abnormality.<br>Impedance change: Within ± 30%. | | | | | No mechanical damage.<br>Remaining terminal electrode:70% min. | | | | | Preheat: 150℃,60sec.<br>Solder: Sn-Ag3.0-Cu0.5<br>Solder tamperature: 260±5℃<br>Flux for lead free: rosin<br>Dip time: 10±0.5sec.<br> |
| **Solderability** | More than 90% of the terminal electrode should be covered with solder. | | | | |  | | | | | Preheat: 150℃,60sec.<br>Solder: Sn-Ag3.0-Cu0.5<br>Solder tamperature: 230±5℃<br>Flux for lead free: rosin<br>Dip time: 4±1sec. |
| **Terminal strength** | The terminal electrode and the dielectric must not be damaged by the forces applied on the right conditions. | | | | | |  | | | | For FCB FCM HCB HPB HFB FCI FHI FCH HCI:<br>Size  Force (Kfg)  Time(sec)<br>1005  0.2<br>1608  0.5<br>2012  0.6<br>3216  1.0  >25<br>3225  1.0<br>4516  1.0<br>4532  1.5<br>5750  2.0<br>For FCA:<br>Size  Force (Kfg)  Time(sec)<br>3216  0.5  >25 |
| **Flexture strength** | The terminal electrode and the dielectric must not be damaged by the forces applied on the right conditions. | | | | | |  | | | | Solder a chip on a test substrate, bend the substrate by 2mm (0.079in)and return. |
| **Bending Strength** | The ferrite should not be damaged by Forces applied on the right condition. | | | | |  | | | | | Size / mm(inches) / P-Kgf<br>1608 / 0.80(0.033) / 0.3<br>2012 / 1.40(0.055) / 1.0<br>FCA3216 / 2.00(0.079) / 1.5<br>3216 3225 / 2.00(0.079) / 2.5<br>4516 4532 5750 / 2.70(0.106) / 2.5 |
| **Random Vibration Test** | Appearance: Cracking, shipping and any other defects harmful to the characteristics should not be allowed.<br>Impedance: within±30% | | | | | | | | | | Frequency: 10-55-10Hz for 1 min.<br>Amplitude: 1.52mm<br>Directions and times: X, Y, Z directions for 2 hours.<br>A period of 2 hours in each of 3 mutually perpendicular directions (Total 6 hours). |
| **Drop** | Drop 10 times on a concrete floor from a height of 75cm | | | | | | | | | | a: No mechanical damage<br>b: Impedance change: ±30% |

<table>
<tr><th>Item</th><th>Performace</th><th>Test Condition</th></tr>
<tr><td><b>Loading at High Temperature</b></td><td rowspan="2">Appearance: no damage.<br>Impedance: within±30%of initial value.<br>Inductance: within±10%of initial value.<br>Q: within±30%of initial value. (FCI FHI FCH)<br>Q: within±20%of initial value. (HCI )</td><td>Temperature: 125±5℃(bead),85±5℃(inductor)<br>Applied current: rated current.<br>Duration: 500±12hrs.<br>Measured at room temperature after placing for 2 to 3hrs.</td></tr>
<tr><td><b>Humidity</b></td><td>Humidity: 90~95%RH.<br>Temperature: 40±2℃.<br>Temperature: 60±2℃.(HCI)<br>Duration: 500±12hrs.<br>Measured at room temperature after placing for 2 to 3hrs.</td></tr>
<tr><td><b>Thermal shock</b></td><td rowspan="2">Appearance: no damage.<br>Impedance: within±30%of initial value.<br>Inductance: within±10%of initial value.<br>Q: within±30%of initial value. (FCI FHI FCH)<br>Q: within±20%of initial value. (HCI)<br>For Bead：<table><tr><th>Phase</th><th>Temperature(℃)</th><th>Time(min.)</th></tr><tr><td>1</td><td>-55±2℃</td><td>30±3</td></tr><tr><td>2</td><td>+125±5℃</td><td>30±3</td></tr></table>Measured: 5 times<br>For Inductor：<table><tr><th>Phase</th><th>Temperature(℃)</th><th>Time(min.)</th></tr><tr><td>1</td><td>-40±2℃</td><td>30±3</td></tr><tr><td>2</td><td>+85±5℃</td><td>30±3</td></tr></table>Measured: 100 times</td><td>For FCB FCM HCB HPB HFB FCA：<br>Condition for 1 cycle<br>Step1: -55±2℃ 30±3 min.<br>Step2: +125±5℃ 30±3 min.<br>Number of cycles: 5<br>For FCI FHI FCH HCI：<br>Condition for 1 cycle<br>Step1: -40±2℃ 30±3 min.<br>Step2: +85±5℃ 30±3 min.<br>Number of cycles: 100<br>Measured at room temperature after placing for 2 to 3 hrs.</td></tr>
<tr><td><b>Low temperature storage test</b></td><td>Temperature: -55±2℃.<br>Duration: 500±12hrs.<br>Measured at room temperature after placing for 2 to 3hrs.</td></tr>
<tr><td><b>Drop</b></td><td>Drop 10 times on a concrete floor from a height of 75cm</td><td>a: No mechanical damage<br>b: Impedance change: ±30%</td></tr>
</table>

****Derating Curve**

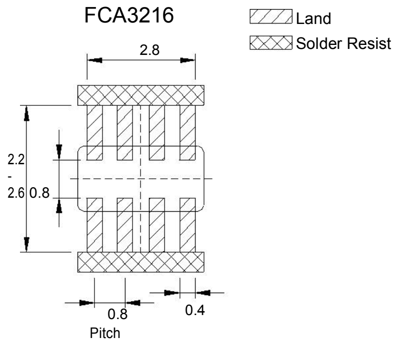
For the ferrite chip bead which withstanding current over 1.5A, as the operating temperature over 85℃, the derating current information is necessary to consider with. For the detail derating of current, please refer to the Derated Current vs. Operating Temperature curve.

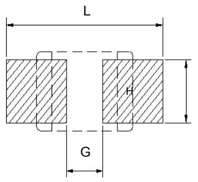


# 6.Soldering and Mounting

## 6-1. Recommended PC Board Pattern

| Chip Size | | | | | | Land Patterns For Reflow Soldering | | |
|---|---|---|---|---|---|---|---|---|
| **Series** | **Type** | **A(mm)** | **B(mm)** | **C(mm)** | **D(mm)** | **L(mm)** | **G(mm)** | **H(mm)** |
| FCB | 1005 | 1.0±0.10 | 0.50±0.10 | 0.50±0.10 | 0.25±0.10 | 2.10 | 0.50 | 0.55 |
| FCM | 1608 | 1.6±0.15 | 0.80±0.15 | 0.80±0.15 | 0.30±0.20 | 2.60 | 0.60 | 0.80 |
| HCB | 2012 | 2.0±0.20 | 1.25±0.20 | 0.85±0.20 | 0.50±0.30 | 3.00 | 1.00 | 1.00 |
| HPB | | 2.0±0.20 | 1.25±0.20 | 1.25±0.20 | 0.50±0.30 | | | |
| HFB | 2520 | 2.5±0.20 | 2.00±0.20 | 1.60±0.20 | 0.50±0.30 | 3.90 | 1.50 | 1.50 |
| FCI | 3216 | 3.2±0.20 | 1.60±0.20 | 1.10±0.20 | 0.50±0.30 | 4.40 | 2.20 | 1.40 |
| FHI | 3225 | 3.2±0.20 | 2.50±0.20 | 1.30±0.20 | 0.50±0.30 | 4.40 | 2.20 | 3.40 |
| FCH | 4516 | 4.5±0.20 | 1.60±0.20 | 1.60±0.20 | 0.50±0.30 | 5.70 | 2.70 | 1.40 |
| HCI | 4532 | 4.5±0.20 | 3.20±0.20 | 1.50±0.20 | 0.50±0.30 | 5.90 | 2.57 | 4.22 |
| UHI | 5750 | 5.7±0.20 | 5.00±0.30 | 1.80±0.20 | 0.50±0.30 | 8.00 | 4.00 | 5.80 |





PC board should be designed so that products are not sufficient under mechanical stress as warping the board.
Products shall be positioned in the sideway direction against the mechanical stress to prevent failure.

### 6-2. Soldering

Mildly activated rosin fluxes are preferred. The minimum amount of solder can lead to damage from the stresses caused by the difference in coefficients of expansion between solder, chip and substrate. The terminations are suitable for all wave and re -flow soldering systems. If hand soldering cannot be avoided, the preferred technique is the utilization of hot air soldering tools.

#### 6-2.1 Lead Free Solder re-flow:

Recommended temperature profiles for lead free re-flow soldering in Figure 1.

#### 6-2.2 Solder Wave:

Wave soldering is perhaps the most rigorous of surface mount soldering processes due to the steep rise in temperature seen by the circuit when immersed in the molten solder wave , typical at 230℃. Due to the risk of thermal damage to products, wave soldering of large size products is discouraged. Recommended temperature profile for wave soldering is shown in Figure 2.

#### 6-2.3 Soldering Iron(Figure 3):

Products attachment with a soldering iron is discouraged due to the inherent process control limitations. In the event that a soldering iron must be employed the following precautions are recommended.

Note：
- Preheat circuit and products to 150℃
- 350℃ tip temperature for Ferrite chip bead (max)
- Never contact the ceramic with the iron tip
- 1.0mm tip diameter (max)
- Use a 20 watt soldering iron with tip diameter of 1.0mm
- Limit soldering time to 3 sec.

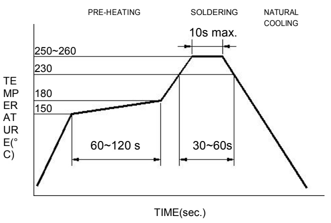


Figure 1. Re-flow Soldering(Lead Free)

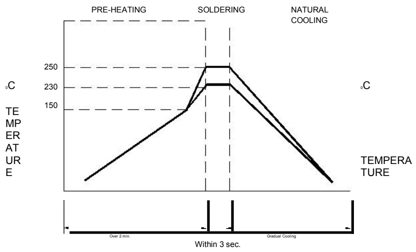


Figure 2. Wave Soldering

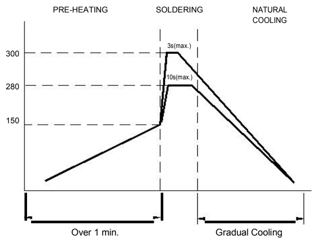
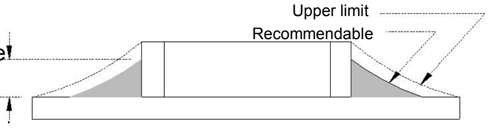


Figure 3. Hand Soldering

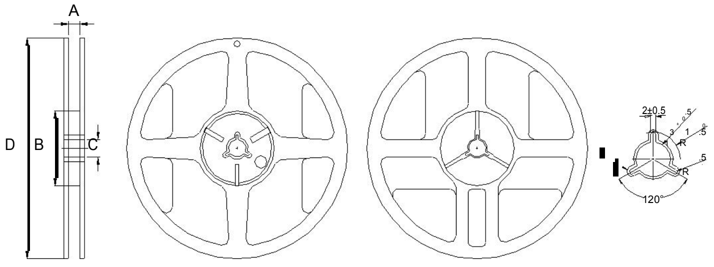
#### 6-2.4 Solder Volume:

Accordingly increasing the solder volume, the mechanical stress to product is also increased. Exceeding solder volume may cause the failure of mechanical or electrical performance. Solder shall be used t not to be exceed as shown in right side:



## 7.Packaging Information

### 7-1. Reel Dimension

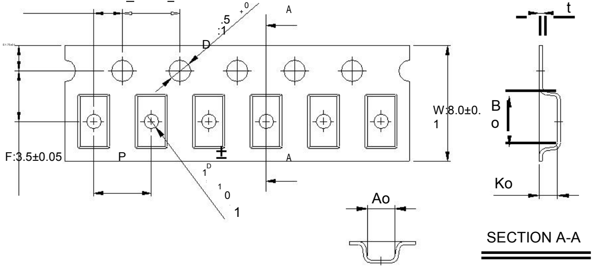


7"x8mm

7"x12mm

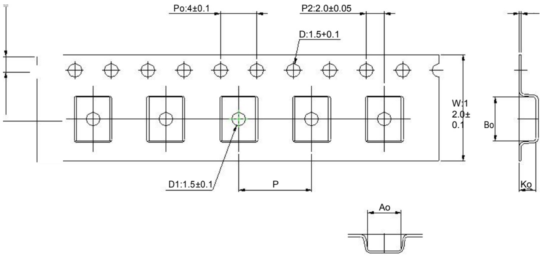
| Type | A(mm) | B(mm) | C(mm) | D(mm) |
|---|---|---|---|---|
| 7”x8mm | 9.0±0.5 | 60±2 | 13.5±0.5 | 178±2 |
| 7”x12mm | 13.5±0.5 | 60±2 | 13.5±0.5 | 178±2 |

### 7-2.1 Tape Dimension / 8mm



| Series | Size | Bo(mm) | Ao(mm) | Ko(mm) | P(mm) | t(mm) | D1(mm) |
|---|---|---|---|---|---|---|---|
| FCB,FCM | 100505 | 1.12±0.05 | 0.67±0.05 | 0.54±0.05 | 2.0±0.1 | 0.23±0.05 | none |
| HCB,HPB | 160808 | 1.80±0.10 | 1.01±0.10 | 1.02±0.10 | 4.0±0.1 | 0.22±0.05 | none |
| HFB | 201209 | 2.25±0.10 | 1.42±0.10 | 1.04±0.10 | 4.0±0.1 | 0.22±0.05 | 1.0±0.1 |
| FCI | 201212 | 2.35±0.10 | 1.50±0.10 | 1.45±0.10 | 4.0±0.1 | 0.22±0.05 | 1.0±0.1 |
| FHI, FCH | 321611 | 3.50±0.10 | 1.88±0.10 | 1.27±0.10 | 4.0±0.1 | 0.22±0.05 | 1.0±0.1 |
| HCI | 322513 | 3.42±0.10 | 2.77±0.10 | 1.55±0.10 | 4.0±0.1 | 0.22±0.05 | 1.0±0.1 |
| FCA | 321609 | 3.40±0.10 | 1.77±0.10 | 1.04±0.1 | 4.0±0.10 | 0.22±0.05 | 1.0±0.1 |

## 7-2.2 Tape Dimension / 12mm

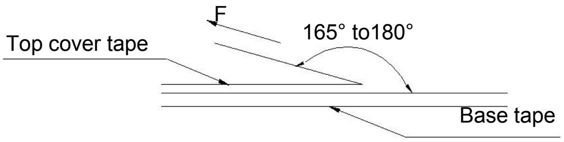


| Series | Size | Bo(mm) | Ao(mm) | Ko(mm) | P(mm) | t(mm) | D1(mm) |
|---|---|---|---|---|---|---|---|
| FCB, | 451616 | 4.95±0.1 | 1.93±0.1 | 1.93±0.1 | 4.0±0.1 | 0.24±0.05 | 1.5±0.1 |
| HCB.FCM | 453215 | 4.95±0.1 | 3.66±0.1 | 1.85±0.1 | 8.0±0.1 | 0.24±0.05 | 1.5±0.1 |
| FCI | 575018 | 6.10±0.1 | 5.40±0.1 | 2.00±0.1 | 8.0±0.1 | 0.30±0.05 | 1.5±0.1 |

### 7-3. Packaging Quantity

| Chip Size | 575018 | 453215 | 451616 | 322513 | 321611 | 201212 | 201209 | 160808 | 100505 |
|---|---|---|---|---|---|---|---|---|---|
| **Chip / Reel** | 1000 | 1000 | 2000 | 2500 | 3000 | 2000 | 4000 | 4000 | 10000 |
| **Inner box** | 4000 | 4000 | 8000 | 12500 | 15000 | 10000 | 20000 | 20000 | 50000 |
| **Middle box** | 20000 | 20000 | 40000 | 62500 | 75000 | 50000 | 100000 | 100000 | 250000 |
| **Carton** | 40000 | 40000 | 80000 | 125000 | 150000 | 100000 | 200000 | 200000 | 500000 |
| **Bulk (Bags)** | 7000 | 12000 | 20000 | 30000 | 50000 | 100000 | 150000 | 200000 | 300000 |

### 7-4. Tearing Off Force



The force for tearing off cover tape is 15 to 60 grams in the arrow direction under the following conditions.

| Room Temp. (℃) | Room Humidity (%) | Room atm (hPa) | Tearing Speed mm/min |
|---|---|---|---|
| 5~35 | 45~85 | 860~1060 | 300 |

**Application Notice**

- Storage Conditions
  To maintain the solderability of terminal electrodes:
  1. Temperature and humidity conditions: -10~ 40℃ and 30~70% RH.
  2. Recommended products should be used within 6 months from the time of delivery.
  3. The packaging material should be kept where no chlorine or sulfur exists in the air.

- Transportation
  1.Products should be handled with care to avoid damage or contamination from perspiration and skin oils.
  2. The use of tweezers or vacuum pick up is strongly recommended for individual components.
  3. Bulk handling should ensure that abrasion and mechanical shock are minimized.