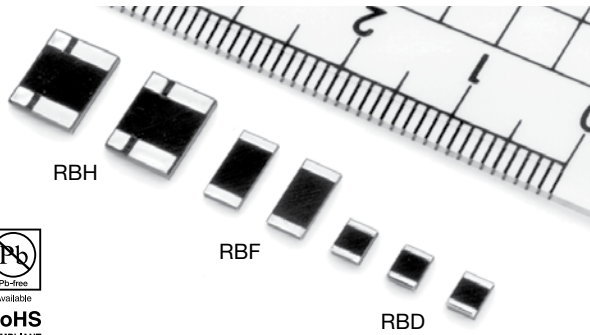


## Ultra Precision SMT Current Sense Resistor (Flip-Chip)



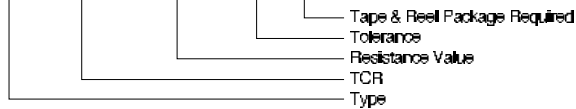
| TCR, RESISTANCE RANGE, TOLERANCE, RATED POWER |                                 |                      |                               |                         |
|---|---------------------------------|----------------------|-------------------------------|-------------------------|
| Type  | TCR (ppm/°C)<br>-25°C to 125°C* | Resistance Range (Ω) | Resistance Tolerance (%)*     | Rated Power (W) at 70°C |
| RBD   | 0±25 (J)                        | 0.01 to 0.1          | ±1 (F) ±2 (G) ±5 (J)          | 0.5                     |
|   | 0±10 (C)<br>0±25 (J)            | 0.1 to 1             | ±0.5 (D) ±1 (F) ±2 (G) ±5 (J) |                         |
| RBF   | 0±25 (J)                        | 0.01 to 0.1          | ±1 (F) ±2 (G) ±5 (J)          | 1                       |
|   | 0±10 (C)<br>0±25 (J)            | 0.1 to 1             | ±0.5 (D) ±1 (F) ±2 (G) ±5 (J) |                         |
| RBH   | 0±10 (C)<br>0±25 (J)            | 0.01 to 0.1          | ±0.5 (D) ±1 (F) ±2 (G) ±5 (J) | 1.5                     |

\*Symbols parenthesized are for type number composition.

### COMPOSITION OF TYPE NUMBER

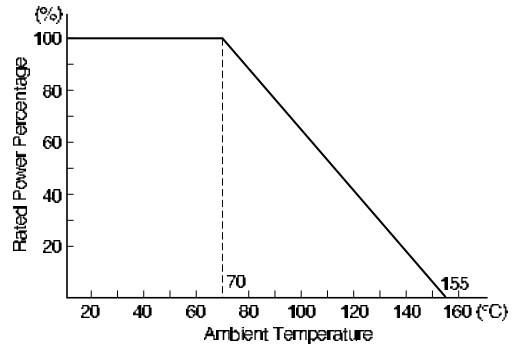
Example:

**RBF J R1000 F L**

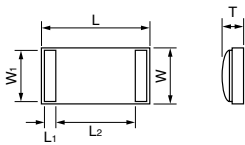


Resistance value in ohm is expressed by a series of four significant digits and an R designates the decimal point.

### POWER DERATING CURVE

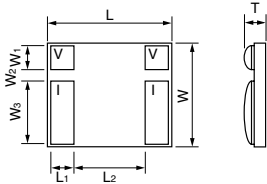


### CONFIGURATION (DIMENSIONS IN mm)



| Type           | RBD       | RBF     |
|----------------|-----------|---------|
| L              | 3.2±0.1   | 6.3±0.1 |
| W              | 2.5±0.1   | 3.2±0.1 |
| L <sub>1</sub> | 0.5±0.2   | 0.7±0.2 |
| L <sub>2</sub> | 2.1±0.2   | 4.7±0.2 |
| W <sub>1</sub> | 2.4±0.2   | 3.0±0.2 |
| T              | 1.05 max. |         |

Dimensions in mm

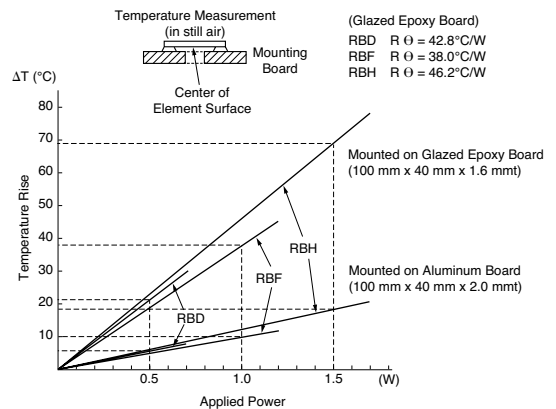


| Type           | RBH      |
|----------------|----------|
| L              | 7.5±0.1  |
| W              | 6.0±0.1  |
| L <sub>1</sub> | 1.4±0.2  |
| L <sub>2</sub> | 4.4±0.2  |
| W <sub>1</sub> | 1.4±0.2  |
| W <sub>2</sub> | 0.7±0.2  |
| W <sub>3</sub> | 3.6±0.2  |
| T              | 1.5 max. |

Dimensions in mm

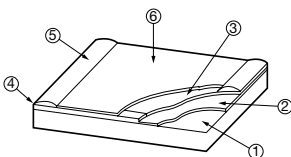
I: Current Sensing Terminal  
V: Voltage Terminal

### TEMPERATURE OF RESISTOR SURFACE



Please use board made of metal for continuous use with 2W at 70°C. Please keep the temperature of board less than 90°C when using the glazed epoxy board.

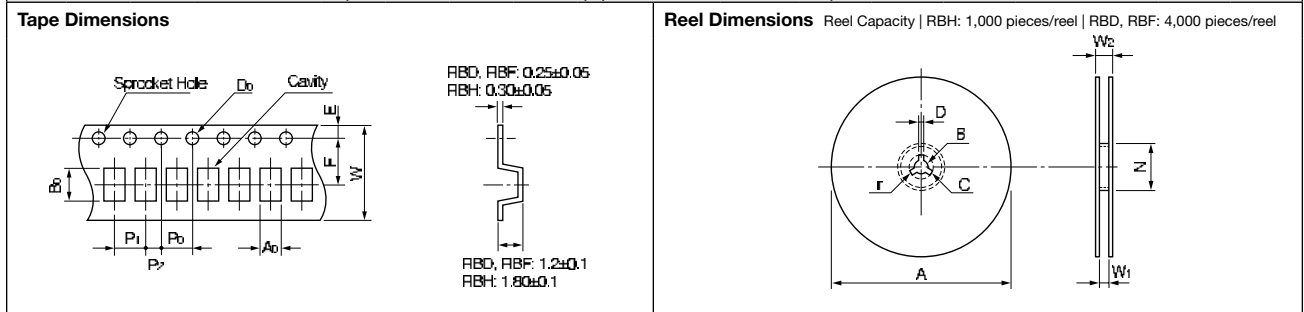
### CONSTRUCTION



- ① Ceramic Substrate (High-Purity Alumina)
- ② Heat-Resistant Bonding Layer
- ③ Bulk Metal® Foil
- ④ Metal Plating
- ⑤ Solder
- ⑥ Solder-Resist

| PERFORMANCE   |  |  |  |
|---|--|--|--|
| Parameters  | Test Condition   | ALPHA Specification                        | ALPHA Typical Test Data                      |
| Maximum Rated Operating Temperature<br>Working Temperature Range  |  |  | 70°C<br>-65°C to +155°C                      |
| Thermal Shock<br>Overload   | -65°C/30 min. ↔ +155°C/30 min., 5 cycles<br>Rated Power x 2.5, 5 sec.  | ±0.1%<br>±0.1%                             | ±0.03%<br>±0.03%                             |
| Low Temperature Storage and Operation<br>Substrate Bending Test   | -65°C, No Load, 24 hrs. → Rated Voltage, 45 min.<br>Substrate Bent 3 mm, 60 sec.   | ±0.1%<br>±0.1%                             | ±0.05%<br>±0.05%                             |
| Dielectric Withstanding Voltage<br>Insulation Resistance<br>Resistance to Soldering Heat<br>Moisture Resistance | Atmo. Pres.: AC 200V, 1 min.<br>DC 100V, 1 min.<br>260°C, 10 sec.<br>+65°C to -10°C, 90% RH to 98% RH, Rated Voltage, 10 cycles (240 hrs.) | ±0.05%<br>over 10,000 MΩ<br>±0.1%<br>±0.1% | ±0.01%<br>over 10,000 MΩ<br>±0.03%<br>±0.03% |
| Shock<br>Vibration, High Frequency  | 100G, 6 ms, Sawtooth Wave, X, Y, Z, each 10 shocks<br>20G, 10 Hz to 2,000 Hz to 10 Hz, 20 min., X, Y, Z, each 2.5 hrs.                     | ±0.05%<br>±0.05%                           | ±0.01%<br>±0.01%                             |
| Life  | 70°C, Rated Power, 1.5 hr. – ON, 0.5 hr. – OFF, 2,000 hrs  | ±0.1%                                      | ±0.05%                                       |
| Storage Life  | 15°C to 35°C, 15% RH to 75% RH, No Load, 10,000 hrs.   | ±0.05%                                     | ±0.01%                                       |
| High Temperature Exposure   | 155°C, No Load, 2,000 hrs.   | ±0.1%                                      | ±0.05%                                       |

**TAPE AND REEL PACKAGE (BASED ON EIA-481-1) (DIMENSIONS IN mm)**



| Type | A0           | B0          | W            | F            | E            | P1          | P2           | P0          | Do                | Type | A             | N              | B              | C              | D           | W1             | W2           | r           |
|------|--------------|-------------|--------------|--------------|--------------|-------------|--------------|-------------|-------------------|------|---------------|----------------|----------------|----------------|-------------|----------------|--------------|-------------|
| RBD  | 2.85<br>±0.1 | 3.7<br>±0.1 | 8.0<br>±0.2  | 3.5<br>±0.05 | 1.75<br>±0.1 | 4.0<br>±0.1 | 2.0<br>±0.05 | 4.0<br>±0.1 | Dia.1.5<br>+0.1-0 | RBD  | Dia.178<br>±2 | Dia.60<br>min. | Dia.13<br>±0.5 | Dia.21<br>±0.8 | 2.0<br>±0.5 | 8.4<br>+2.0-0  | 14.4<br>max. | 1.0<br>±0.5 |
| RBF  | 3.4<br>±0.1  | 6.7<br>±0.1 | 12.0<br>±0.2 | 5.5<br>±0.05 | 1.75<br>±0.1 | 4.0<br>±0.1 | 2.0<br>±0.05 | 4.0<br>±0.1 | Dia.1.5<br>+0.1-0 | RBF  | Dia.178<br>±2 | Dia.60<br>min. | Dia.13<br>±0.5 | Dia.21<br>±0.8 | 2.0<br>±0.5 | 12.4<br>+2.0-0 | 18.4<br>max. | 1.0<br>±0.5 |
| RBH  | 6.3<br>±0.1  | 7.8<br>±0.1 | 16.0<br>±0.2 | 7.5<br>±0.1  | 1.75<br>±0.1 | 8.0<br>±0.1 | 2.0<br>±0.1  | 4.0<br>±0.1 | Dia.1.5<br>+0.1-0 | RBH  | Dia.178<br>±2 | Dia.60<br>min. | Dia.13<br>±0.5 | Dia.21<br>±0.8 | 2.0<br>±0.5 | 17.0<br>±0.3   | 19.4<br>±0.1 | 1.0<br>±0.5 |

**PRECAUTION IN USING SMD CURRENT SENSE RESISTORS**

**1. Storage**

Storage condition or environment may adversely affect solderability of the exterior terminals. Do not store in high temperature and humidity. The recommended storage environment is lower than 40°C, has less than 70% RH humidity and is free from harmful gases such as sulphur and chlorine.

**2. Caution in Soldering**

- ① Solder Reflow in Furnace Recommended
  - Peak Temperature: 250+0/-5°C
  - Holding time: 10 sec. max.
  - To cool gradually at room temperature.
- ② Dipping in Solder (Wave or Still) Recommended
  - Temp. of Solder: 260°C max.
  - Length of Dipping: 10 sec.
- ③ Other

Soldering iron is never recommended. Corrosion-free flux such as rosin is recommended.

**3. Cleaning**

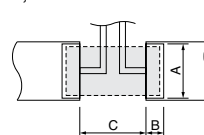
Use volatile cleaner such as methylalcohol or propylalcohol.

**4. Circuit Board Design**

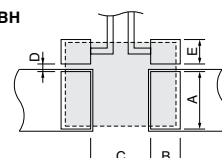
① Solder Land Dimensions

The dimensions of solder land must be determined in conformity with the size of resistors and with the soldering method. They are also subject to the mounting machine and the material of the substrate. See example at right.

RBD, RBF



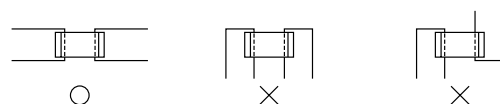
RBH



| Type | Dimensions in mm |     |     |   |   |
|------|------------------|-----|-----|---|---|
|      | A                | B   | C   | D | E |
| RBD  | 2.6 to 2.8       | 0.8 | 2.0 | / | / |
| RBF  | 3.4 to 3.6       | 1.2 | 4.5 |   |   |
| RBH  | 3.8 to 4.0       | 2.0 | 4.0 |   |   |

② Circuit Design

It is recommended that the circuit be drawn so that current may approach, cross and go away from the mounted resistor in one direction as illustrated below. Thicker copper foil should be used if possible.



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