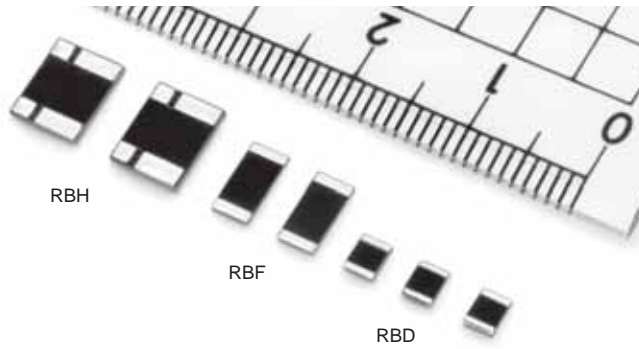
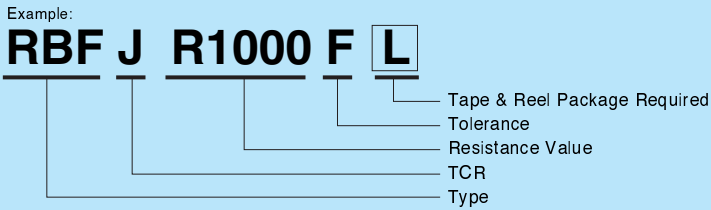


# Ultra-Precision SMT Current Sense Resistor (Flip-Chip)

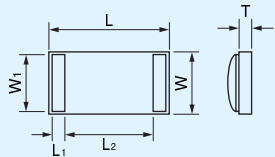


## Composition of Type Number



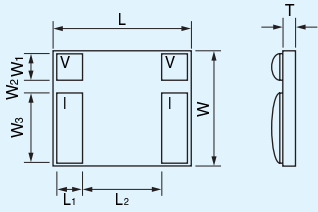
Resistance value, in ohm, is expressed by a series of five characters, four of which represent significant digits. The fifth R or K is a dual-purpose letter that designates both the value range (R for ohmic; K for kilo-ohm) and the location of decimal point.

## Configuration



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	0.635±0.1	

Dimensions in mm

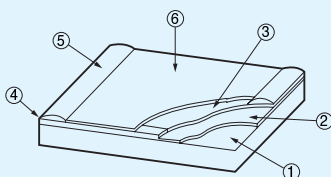


Type	RBH
L	7.5±0.1
W	6.0±0.1
L <sub>1</sub>	1.4±0.2
L <sub>2</sub>	4.4±0.2
W <sub>1</sub>	1.4±0.2
W <sub>2</sub>	0.7±0.2
W <sub>3</sub>	3.6±0.2
T	0.8±0.1

Dimensions in mm

I: Current Sensing Terminal  
V: Voltage Terminal

## Construction



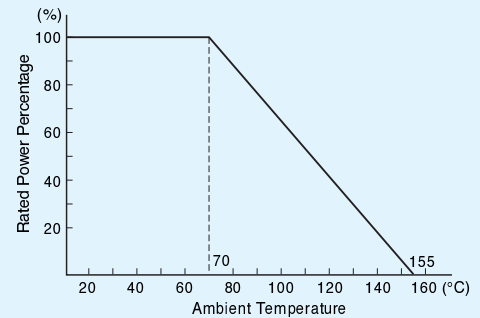
- ① Ceramic Substrate (High-Purity Alumina)
- ② Heat-Resistant Bonding Layer
- ③ Metal Foil (Etched to Pattern)
- ④ Metal Plating
- ⑤ Solder
- ⑥ Solder-Resist

## TCR, Resistance Range, Tolerance, Rated Power

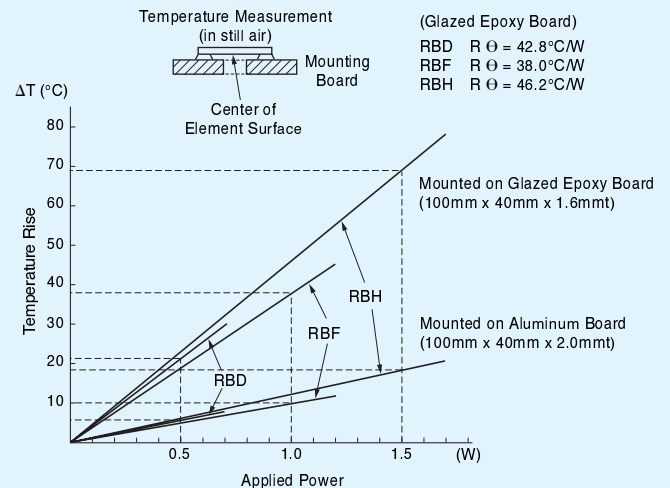
Type	TCR (ppm/°C) -55°C to +125°C	Resistance Range (Ω)	Resistance Tolerance (%)	Rated Power (W) at 70°C
RBD	0±50 (H)	0.005 to 0.01	±5 (J)	0.5
	0±25 (J)	0.01 to 0.1	±1 (F) ±2 (G) ±5 (J)	
RBF	0±50 (H)	0.005 to 0.01	±5 (J)	1
	0±25 (J)	0.01 to 0.1	±1 (F) ±2 (G) ±5 (J)	
RBH	0±50 (H)	0.001 to 0.01	±1 (F) ±2 (G) ±5 (J)	1.5
	0±10 (C) 0±25 (J)	0.01 to 0.1	±0.5 (D) ±1 (F) ±2 (G) ±5 (J)	

Symbols parenthesized are for type number composition.

## Power Derating Curve



## Temperature of Resistor Surface



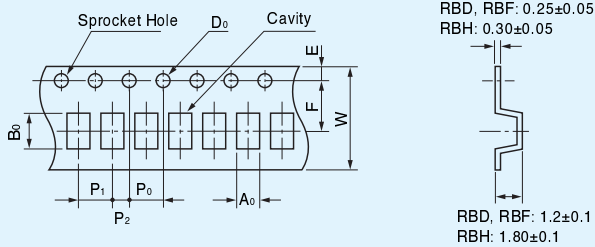
Please use board made of metal for continuous use with 2W at 70°C. Please keep the temperature of board less than 90°C when using the glazed epoxy board.

## Performance

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

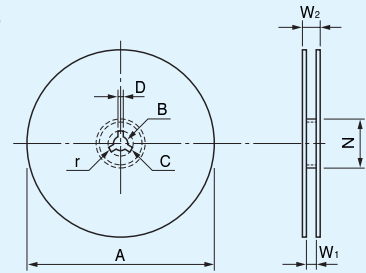
### Tape Dimensions



Type	A <sub>0</sub>	B <sub>0</sub>	W	F	E	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	D <sub>0</sub>
RBD	2.85 ±0.1	3.7 ±0.1	8.0 ±0.2	3.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.1	φ1.5 +0.1-0
RBF	3.4 ±0.1	6.7 ±0.1	12.0 ±0.2	5.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.1	φ1.5 +0.1-0
RBH	6.3 ±0.1	7.8 ±0.1	16.0 ±0.2	7.5 ±0.1	1.75 ±0.1	8.0 ±0.1	2.0 ±0.1	4.0 ±0.1	φ1.5 +0.1-0

Dimensions in mm

### Reel Dimensions



Type	A	N	B	C	D	W <sub>1</sub>	W <sub>2</sub>	r
RBD	φ178 ±2	φ60 min.	φ13 ±0.5	φ21 ±0.8	2.0 ±0.5	8.4 +2.0-0	14.4 max.	1.0 ±0.5
RBF	φ178 ±2	φ60 min.	φ13 ±0.5	φ21 ±0.8	2.0 ±0.5	12.4 +2.0-0	18.4 max.	1.0 ±0.5
RBH	φ178 ±2	φ60 min.	φ13 ±0.5	φ21 ±0.8	2.0 ±0.5	17.0 ±0.3	19.4 ±0.1	1.0 ±0.5

Reel Capacity RBH: 1,000 pieces/reel RBD, RBF: 4,000 pieces/reel

Dimensions in mm

## 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: 245°C
- Holding time: 220°C (40sec.max.)
- To cool gradually at room temperature.

#### ② Dipping in Solder (Wave or Still)

Recommended

- Temp. of Solder: 240°C to 250°C
- Length of Dipping: 3 sec. to 4 sec.

#### ③ Other

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

### 3. Cleaning

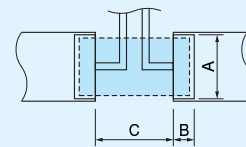
Use volatile cleaner such as methylalcohol or propylalcohol.

### 4. Circuit Board Design

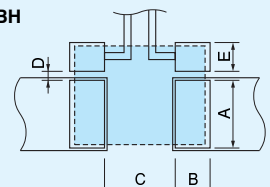
#### ① Solder Land Dimensions

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				
	A	B	C	D	E
RBD	2.6 to 2.8	0.8	2.0	0.5	1.7
RBF	3.4 to 3.6	1.2	4.5		
RBH	3.8 to 4.0	2.0	4.0		

Dimensions in mm

### 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.

