

# ANTREX Electronics

Electronic Components Sourcing Information

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## Product Reference Information

**Part Number:** PRG15BC4R7MM1RC  
**Manufacturer:** Murata Electronics  
**Package:** 0402 (1005 Metric)  
**Availability:** Please confirm with sales

### Product Page:

<https://antrexco.com/product/details/murata-electronics/prg15bc4r7mm1rc.html>

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### Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

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# PO SISO R<sup>®</sup> for Circuit Protection



**muRata**

*Innovator  
in Electronics*

Murata  
Manufacturing Co., Ltd.

Cat.No.R90E-9

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## ● Part Numbering

### PTC Thermistors (POSISTOR®) for Circuit Protection

|               |    |   |    |    |     |   |    |    |
|---------------|----|---|----|----|-----|---|----|----|
| (Part Number) | PR | G | 18 | BB | 470 | M | B1 | RB |
|               | ①  | ② | ③  | ④  | ⑤   | ⑥ | ⑦  | ⑧  |

#### ① Product ID

| Product ID |                           |
|------------|---------------------------|
| PR         | PTC Thermistors Chip Type |

#### ② Series

| Code | Series                     |
|------|----------------------------|
| G    | for Overcurrent Protection |

#### ③ Dimensions (L×W)

| Code | Dimensions (L×W) |
|------|------------------|
| 18   | 1.60×0.80mm      |
| 21   | 2.00×1.25mm      |

#### ④ Temperature Characteristics

| Code | Temperature Characteristics |
|------|-----------------------------|
| BB   | Curie Point 100°C           |
| BC   | Curie Point 90°C            |

#### ⑤ Resistance

Expressed by three-digit alphanumerics. The unit is ohm ( $\Omega$ ). The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures. If there is a decimal point, it is expressed by the capital letter "R". In this case, all figures are significant digits.

| Ex.) | Code | Resistance   |
|------|------|--------------|
|      | 470  | 47 $\Omega$  |
|      | 471  | 470 $\Omega$ |

#### ⑥ Resistance Tolerance

| Code | Resistance Tolerance |
|------|----------------------|
| M    | ±20%                 |
| Q    | Special Tolerance    |

#### ⑦ Individual Specifications

| Code | Individual Specifications |
|------|---------------------------|
| B1   | Structure, others         |

#### ⑧ Packaging

| Code | Packaging                               |
|------|-----------------------------------------|
| RA   | Embossed Taping (4mm Pitch) (4000 pcs.) |
| RB   | Paper Taping (4mm Pitch) (4000 pcs.)    |
| RK   | Embossed Taping (4mm Pitch) (3000 pcs.) |

### PTC Thermistors (POSISTOR®) for Overheat Sensing Chip Type

|               |    |   |    |    |     |   |    |    |
|---------------|----|---|----|----|-----|---|----|----|
| (Part Number) | PR | F | 18 | BB | 471 | Q | B1 | RB |
|               | ①  | ② | ③  | ④  | ⑤   | ⑥ | ⑦  | ⑧  |

#### ① Product ID

| Product ID |                           |
|------------|---------------------------|
| PR         | PTC Thermistors Chip Type |

#### ② Series

| Code | Series               |
|------|----------------------|
| F    | for Overheat Sensing |

#### ③ Dimensions (L×W)

| Code | Dimensions (L×W) |
|------|------------------|
| 15   | 1.00×0.50mm      |
| 18   | 1.60×0.80mm      |
| 21   | 2.00×1.25mm      |

#### ④ Temperature Characteristics

| Code | Temperature Characteristics |
|------|-----------------------------|
| AR   | Curie Point 120°C           |
| AS   | Curie Point 130°C           |
| BA   | Curie Point 110°C           |
| BB   | Curie Point 100°C           |
| BC   | Curie Point 90°C            |
| BD   | Curie Point 80°C            |
| BE   | Curie Point 70°C            |
| BF   | Curie Point 60°C            |
| BG   | Curie Point 50°C            |

#### ⑤ Resistance

Expressed by three figures. The unit is ohm ( $\Omega$ ). The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures.

| Ex.) | Code | Resistance   |
|------|------|--------------|
|      | 471  | 470 $\Omega$ |

#### ⑥ Resistance Tolerance

| Code | Resistance Tolerance | Sensing Temp. Tolerance |
|------|----------------------|-------------------------|
| Q    | Special Tolerance    | ±5°C                    |
| R    | Special Tolerance    | ±3°C                    |

#### ⑦ Individual Specifications

| Code | Individual Specifications |
|------|---------------------------|
| B1   | Structure, others         |

#### ⑧ Packaging

| Code | Packaging                               |
|------|-----------------------------------------|
| RA   | Embossed Taping (4mm Pitch) (4000 pcs.) |
| RB   | Paper Taping (4mm Pitch) (4000 pcs.)    |
| RC   | Paper Taping (2mm Pitch) (10000 pcs.)   |

## PTC Thermistors (POSISTOR®) for Circuit Protection / for Overheat Sensing Lead Type

(Part Number)

|    |    |    |    |     |   |      |    |
|----|----|----|----|-----|---|------|----|
| PT | GL | 07 | AR | 220 | M | 3P51 | A0 |
| ①  | ②  | ③  | ④  | ⑤   | ⑥ | ⑦    | ⑧  |

### ① Product ID

| Product ID |                 |
|------------|-----------------|
| PT         | PTC Thermistors |

### ② Series

| Code | Series                                 |
|------|----------------------------------------|
| FL   | for Overheat Sensing Lead Type         |
| FM   | for Overheat Sensing with Lug-terminal |
| GL   | for Circuit Protection Lead Type       |

### ③ Dimensions

| Code | Dimensions                        |
|------|-----------------------------------|
| 04   | Nominal Body Diameter 4mm Series  |
| 05   | Nominal Body Diameter 5mm Series  |
| 07   | Nominal Body Diameter 7mm Series  |
| 09   | Nominal Body Diameter 9mm Series  |
| 10   | Nominal Body Diameter 10mm Series |
| 12   | Nominal Body Diameter 12mm Series |
| 13   | Nominal Body Diameter 13mm Series |
| 14   | Nominal Body Diameter 14mm Series |
| 16   | Nominal Body Diameter 16mm Series |
| 18   | Nominal Body Diameter 18mm Series |

### ④ Temperature Characteristics

| Code | Temperature Characteristics |
|------|-----------------------------|
| AS   | Curie Point 130°C           |
| AR   | Curie Point 120°C           |
| BA   | Curie Point 110°C           |
| BB   | Curie Point 100°C           |
| BC   | Curie Point 90°C            |
| BD   | Curie Point 80°C            |
| BE   | Curie Point 70°C            |
| BF   | Curie Point 60°C            |
| BG   | Curie Point 50°C            |
| BH   | Curie Point 40°C            |

### ⑤ Resistance

Expressed by three-digit alphanumerics. The unit is ohm ( $\Omega$ ). The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures. If there is a decimal point, it is expressed by the capital letter "R". In this case, all figures are significant digits.

| Ex.) | Code | Resistance    |
|------|------|---------------|
|      | R22  | 0.22 $\Omega$ |
|      | 2R2  | 2.2 $\Omega$  |
|      | 220  | 22 $\Omega$   |

### ⑥ Resistance Tolerance

| Code | Resistance Tolerance |
|------|----------------------|
| H    | $\pm 25\%$           |
| K    | $\pm 10\%$           |
| M    | $\pm 20\%$           |
| N    | $\pm 30\%$           |
| Q    | Special Tolerance    |

### ⑦ Individual Specifications

| Code | Individual Specifications |
|------|---------------------------|
| 3P51 | Lead Type, others         |

### ⑧ Packaging

| Code | Packaging |
|------|-----------|
| A0   | Ammo Pack |
| B0   | Bulk      |

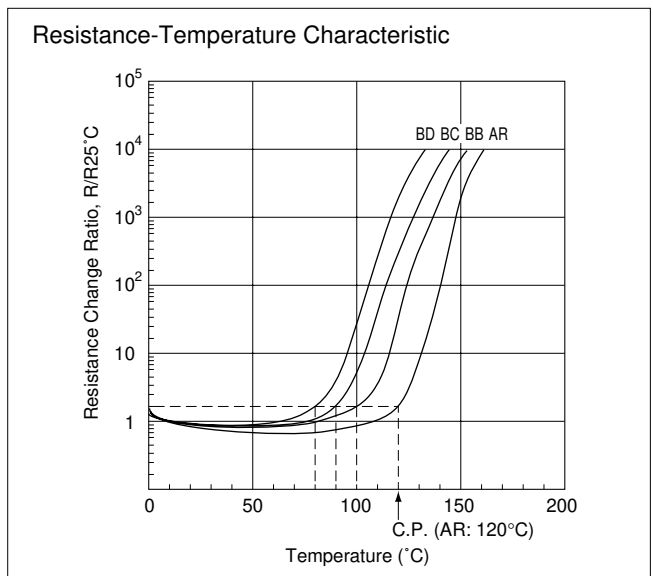
## Basic Characteristics of POSISTOR®

### ■ Basic Characteristics

POSISTOR® has three main characteristics.

#### 1. Resistance - Temperature Characteristics

Although there is a negligible difference between the normal and "Curie Point" temperature, POSISTOR® shows almost constant resistance-temperature characteristics. Yet they have resistance-temperature characteristics that cause resistance to sharply increase when the temperature exceeds the Curie Point. The Curie Point (C.P.) is defined as temperature which the resistance value is twice the one at 25 °C.



#### 2. Current - Voltage Characteristics (Static Characteristic)

This shows the relation between applied voltage when voltage applied to POSISTOR® causes balancing of inner heating and outer thermal dissipation and stabilized current. This has both a maximum point of current and constant output power.



#### 3. Current - Time Characteristics (Dynamic Characteristic)

This shows the relation between current and time before inner heating and outer thermal dissipation arrive at equilibrium state. This features having large initial current and abruptly continuous attenuating portion.



## Basic Characteristics of POSISTOR®

### Technical Terms

#### 1. Protective Threshold Current

The maximum current value is called the "Protective Threshold Current" for Voltage vs. Current characteristics (static).

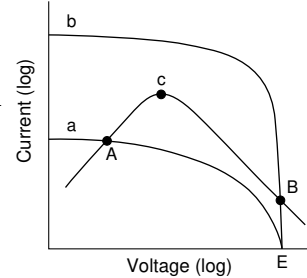
When smaller than the protective threshold current flows in POSISTOR®, it reaches its stability (as shown in figure on right) at the intersection (A) of the load curve (a) and voltage-current characteristics of POSISTOR®(c). And POSISTOR® works as normal fixed resistor.

However, when larger than protective threshold current flows, it stabilizes at the intersection (B) with the load curve (b).

Load Curve of Circuit and Voltage - current Characteristics of POSISTOR®



- a Load curve in normal state (normal current)
- b Load curve in abnormal state (abnormal current)
- c Voltage-current characteristics of POSISTOR®

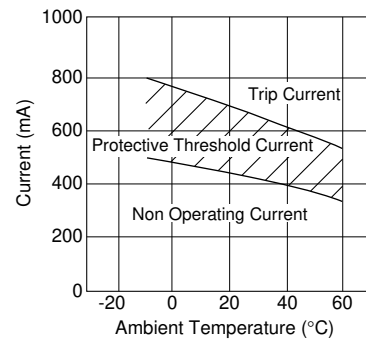


#### 2. Protective Threshold Current Range

Protective threshold current varies depending on the ambient temperature, resistance value, temperature characteristics and shape (Figure of right) The maximum value of trip current and the minimum value of the non-operating current are in the range of ambient temperature -10 to +60°C.

That is, when a current is smaller than the non-operating current, POSISTOR® works only as a fixed resistor. When larger than the trip current flows, however, POSISTOR® protects the circuit from overload.

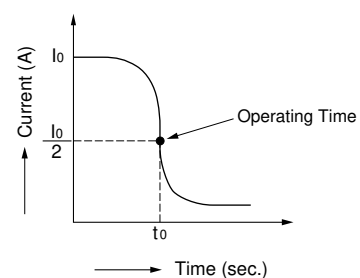
Protective Threshold Current Range



#### 3. Operating Time

A period starting from the voltage input to the moment current itself sharply attenuates is called "Operating Time". Conventionally, operation time ( $t_o$ ) is determined to be the period until inrush current ( $I_o$ ) decreases to a level one half the original inrush current ( $I_o/2$ ).

Operating Current



## Selection Guide

Please confirm the parameters according to the following questions.  
 The best selection is the product that is satisfied with three parameters.

### ● Confirmation Items



| Part Number          | Max. Voltage (V) | Non-operating Current at +60°C (mA) | Trip Current at -10°C (mA) | Max. Current (A) | Resistance (at 25°C) (ohm) | Body Diameter (D) (mm) | Thick. (T) (mm) |
|----------------------|------------------|-------------------------------------|----------------------------|------------------|----------------------------|------------------------|-----------------|
| PTGL18AR4R7M6B72B0   | 125              | 360                                 | 900                        | 1.7              | 4.7 $\pm$ 20%              | 18.5                   | 5.5             |
| PTGL18AR3R3M6B72B0   | 125              | 420                                 | 1050                       | 2.0              | 3.3 $\pm$ 20%              | 18.5                   | 5.5             |
| PTGL07AR330M6A51B0   | 140              | 100                                 | 230                        | 0.5              | 33 $\pm$ 20%               | 7.4                    | 6.0             |
| PTGL09AR220M6C61B0   | 140              | 140                                 | 330                        | 1.0              | 22 $\pm$ 20%               | 9.6                    | 6               |
| PTGL10AR150M6C61B0   | 140              | 170                                 | 400                        | 1.0              | 15 $\pm$ 20%               | 11.6                   |                 |
| → PTGL12AR100M6C01B0 | 140              | 220                                 | 510                        | 1.0              | 10 $\pm$ 20%               | 13.0                   |                 |
| PTGL13AR6R8M6C01B0   | 140              | 290                                 | 670                        | 1.0              | 6.8 $\pm$ 20%              | 14.0                   |                 |
| PTGL16AR5R6M6C01B0   | 140              | 340                                 | 780                        | 2.0              | 5.6 $\pm$ 20%              | 17.0                   |                 |

PTGL12AR100M6C01B0 is the best selection in this case.

Application Matrix

| Series<br><br>Application | Over Current Protection |            | Overheat Sensing           |            |
|---------------------------|-------------------------|------------|----------------------------|------------|
|                           | PTGL Series             | PRG Series | PTFL Series<br>PTFM Series | PRF Series |
| Color TV                  | ●                       | ●          | ●                          | ●          |
| CRT Display               | ●                       | ●          |                            |            |
| VCR                       | ●                       | ●          | ●                          | ●          |
| Audio                     | ●                       | ●          | ●                          | ●          |
| Speaker                   | ●                       |            |                            |            |
| Refrigerator              | ●                       | ●          | ●                          | ●          |
| Vacuum Cleaner            | ●                       | ●          |                            |            |
| Air Conditioner           | ●                       | ●          |                            | ●          |
| FAX                       | ●                       | ●          | ●                          | ●          |
| Personal Computer         | ●                       | ●          |                            | ●          |
| USB HUB                   | ●                       | ●          |                            |            |
| PDA                       |                         | ●          |                            | ●          |
| Lighting Equipment        | ●                       | ●          | ●                          | ●          |
| STB                       | ●                       | ●          | ●                          | ●          |
| DSL                       | ●                       | ●          | ●                          | ●          |
| Exchanger                 | ●                       | ●          |                            |            |
| Transceiver               | ●                       | ●          | ●                          | ●          |
| Security System           | ●                       | ●          | ●                          | ●          |
| Vending Machine           | ●                       | ●          | ●                          | ●          |
| Automobile                | ●                       | ●          | ●                          | ●          |
| Car Audio                 | ●                       | ●          | ●                          | ●          |
| Car Navigation            | ●                       | ●          | ●                          | ●          |
| Small DC Motor            | ●                       | ●          | ●                          | ●          |
| Fan Motor                 | ●                       | ●          | ●                          | ●          |
| Battery Pack              |                         | ●          |                            | ●          |
| Power Supply              | ●                       | ●          | ●                          | ●          |
| AC Adaptor                | ●                       |            | ●                          | ●          |
| Small Transformer         | ●                       | ●          | ●                          | ●          |

## Application Notes

### ■ Inrush Current Limit for Power Supply

#### POSISTOR® Lead type: PTGL series

##### 1. Applications

POSISTOR® is an integrated solution to work as both current limit resistor and over current fuse. It works as a stable resistor in normal operation and protects itself against over current situation.

- (1) High wattage power supply (Flat display panels etc.)
- (2) Power supply for fluorescent lights
- (3) Other switching power supplies

Replacement idea from a resistor and fuse solution



##### 2. Benefits

- (1) Protection against over current situation
- (2) Automatic reset from protective trip mode
- (3) Space-saving
- (4) Various characteristics to meet a suitable resistance value

##### 3. Recommended part numbers

Choose an appropriate part number based on the resistance value required to the inrush current limit.  
 Review the maximum voltage.

| Application                                         | Part Number        | Max. Voltage (V) | Resistance (at 25 °C) (ohm) | Body Diameter (mm) | Thickness (mm) | Lead Space (mm) | Lead Diameter (mm) | More Details |
|-----------------------------------------------------|--------------------|------------------|-----------------------------|--------------------|----------------|-----------------|--------------------|--------------|
| For high wattage power supply                       | PTGL13AR100H8B72B0 | 265              | 10 ±25%                     | 14.0               | 6.0            | 7.5             | 0.60               | page 51      |
|                                                     | PTGL12AR150H8B72B0 |                  | 15 ±25%                     | 12.5               | 6.0            | 7.5             | 0.60               | page 51      |
|                                                     | PTGL14AR180M9C01B0 |                  | 18 ±20%                     | 15.7               | 6.5            | 10.0            | 0.65               | page 51      |
|                                                     | PTGL09AR250H8B52B0 |                  | 25 ±25%                     | 10.0               | 6.0            | 5.0             | 0.60               | page 51      |
|                                                     | PTGL09AR390M9C61B0 |                  | 39 ±20%                     | 10.0               | 6.5            | 6.5             | 0.65               | page 50      |
| For power supply of electronic fluorescent ballasts | PTGL07AR560M9B51A0 | 265              | 56 ±20%                     | 8.2                | 6.5            | 5.0             | 0.60               | -            |
|                                                     | PTGL07AR820M9B51A0 |                  | 82 ±20%                     | 8.2                | 6.5            | 5.0             | 0.60               | -            |
|                                                     | PTGL07AS121M0N51A0 |                  | 120 ±20%                    | 6.5                | 6.5            | 5.0             | 0.50               | -            |
|                                                     | PTGL07AS181M0N51A0 |                  | 180 ±20%                    | 6.5                | 6.5            | 5.0             | 0.50               | -            |

Please ask for details.

**POSISTOR® Lead type: PTGL series**

POSISTOR® is an efficient device to protect a telephone line interface (SLIC: Subscriber-Loop-Interface-Circuit) against AC line contact.

- (1) Landline telephones or FAX machines
- (2) Telephone interface of STB, VoIP equipment
- (3) Any other equipment of communication facility having a phone line interface

Replacement idea from a current fuse.



## 2. Benefits

- (1) Automatic reset from protective trip up to 265V AC line contact
- (2) Compatible with the 600V over voltage test by UL60950
- (3) High resistance to the lighting surge (\*A surge absorber is still required to protect SLIC)

### 3. Recommended part numbers

Choose an appropriate part number based on the non-operating current and on the resistance value required to the operation current of SLIC.

| Part Numbers       | Max. Voltage (V) | Max. Current (A) | Non-Operating Current (at +60 °C) (mA) | Trip-Current (at -10 °C) (mA) | Resistance (at 25 °C) (ohm) | Body Diameter (mm) | Thickness (mm) | Lead Space (mm) | Lead Diameter (mm) | More Details |
|--------------------|------------------|------------------|----------------------------------------|-------------------------------|-----------------------------|--------------------|----------------|-----------------|--------------------|--------------|
| PTGL07BB220N0B52A0 | 250              | 0.5              | 90                                     | 300                           | 22 ±30%                     | 8.0                | 6.0            | 5.0             | 0.6                | page 50      |
| PTGL09AR390N0B52A0 | 250              | 0.6              | 100                                    | 280                           | 39 ±30%                     | 10.0               | 6.0            | 5.0             | 0.6                | page 50      |
| PTGL09AR250H8B52B0 | 265              | 1.0              | 118                                    | 330                           | 25 ±25%                     | 10.0               | 6.0            | 5.0             | 0.6                | page 51      |

Please ask for details.



## Application Notes

### ■ Overheat/Over Current Protection for High Brightness LED

#### Leaded POSISTOR®: PTGL series & Chip POSISTOR®: PRG series

##### 1. Applications

POSISTOR® is an effective solution to protect the LED against overheat and over current situation.

(1) LED lighting instruments (Appliances, Automotive etc.)



##### 2. Benefits

(1) Posistor installed in series with LED provides both overheat and over current protection

(2) No additional driver IC or software required

(3) Automatic reset from protective trip mode

(4) 0603 and 0805 SMD type available (smaller than 1/2W or 1W chip resistor)

##### 3. Recommended part numbers

Choose an appropriate part number having max. voltage and resistance value. Review the protective threshold

current range based on the operating current and temperature of the LED.

| Type      | Part Number Series | Max. Voltage (V) | Max. Current (A) | Non-Operating Current (at +60 °C) (mA) | Trip-Current (at -10 °C) (mA) | Resistance (at 25 °C) (ohm) | Curie Point (°C) * | More Details |
|-----------|--------------------|------------------|------------------|----------------------------------------|-------------------------------|-----------------------------|--------------------|--------------|
| SMD type  | PRG21BC0R2MM1RA    | 6                | 10               | 500                                    | 2000                          | 0.2 ±20%                    | 90                 | page 12      |
|           | PRG21BC6R8MM1RA    | 20               | 3.5              | 80                                     | 320                           | 6.8 ±20%                    | 90                 | page 12      |
|           | PRG21BC4R7MM1RA    | 20               | 5.0              | 100                                    | 400                           | 4.7 ±20%                    | 90                 | page 12      |
|           | PRG18BB471MB1RB    | 24               | 0.06             | 7                                      | 25                            | 470 ±20%                    | 100                | page 12      |
|           | PRG18BB221MB1RB    | 24               | 0.13             | 10                                     | 35                            | 220 ±20%                    | 100                | page 12      |
|           | PRG18BB101MB1RB    | 24               | 0.3              | 15                                     | 55                            | 100 ±20%                    | 100                | page 12      |
|           | PRG18BB470MB1RB    | 24               | 0.63             | 20                                     | 75                            | 47 ±20%                     | 100                | page 12      |
|           | PRG18BB330MB1RB    | 24               | 0.9              | 25                                     | 85                            | 33 ±20%                     | 100                | page 12      |
| Lead type | PTGL04AS100K2N51B0 | 30               | 1.5              | 122                                    | 240                           | 10 ±10%                     | 130                | page 19      |
|           | PTGL04AS100K2B51B0 | 30               | 2.0              | 167                                    | 330                           | 10 ±10%                     | 130                | page 19      |
|           | PTGL05AS3R9K2B51B0 | 30               | 3.5              | 269                                    | 530                           | 3.9 ±10%                    | 130                | page 19      |
|           | PTGL07AS2R7K2B51B0 | 30               | 4.5              | 336                                    | 663                           | 2.7 ±10%                    | 130                | page 19      |
|           | PTGL07AS1R8K2B51B0 | 30               | 5.0              | 420                                    | 829                           | 1.8 ±10%                    | 130                | page 19      |
|           | PTGL09AS1R2K2B51B0 | 30               | 6.0              | 556                                    | 1097                          | 1.2 ±10%                    | 130                | page 19      |
|           | PTGL12AS0R8K2B51B0 | 30               | 7.0              | 685                                    | 1352                          | 0.8 ±10%                    | 130                | page 19      |
|           | PTGL04AS100K3B51B0 | 51               | 1.0              | 168                                    | 332                           | 10 ±10%                     | 130                | page 22      |
|           | PTGL05AS6R8K3B51B0 | 51               | 1.5              | 197                                    | 388                           | 6.8 ±10%                    | 130                | page 22      |
|           | PTGL07AS3R3K3B51B0 | 51               | 3.0              | 307                                    | 606                           | 3.3 ±10%                    | 130                | page 22      |
|           | PTGL09AS2R2K3B51B0 | 51               | 4.0              | 412                                    | 814                           | 2.2 ±10%                    | 130                | page 22      |
|           | PTGL12AS1R2K3B51B0 | 51               | 5.0              | 592                                    | 1168                          | 1.2 ±10%                    | 130                | page 22      |
|           | PTGL07AR220M3P51B0 | 56               | 1.0              | 90                                     | 240                           | 22 ±20%                     | 120                | page 37      |
|           | PTGL07AR8R2M3P51B0 | 56               | 1.0              | 130                                    | 350                           | 8.2 ±20%                    | 120                | page 37      |
|           | PTGL09AR150M3B51B0 | 56               | 1.2              | 150                                    | 400                           | 15 ±20%                     | 120                | page 37      |
|           | PTGL10AR3R9M3P51B0 | 56               | 2.0              | 210                                    | 550                           | 3.9 ±20%                    | 120                | page 37      |
|           | PTGL09AR4R7M3B51B0 | 56               | 2.0              | 270                                    | 700                           | 4.7 ±20%                    | 120                | page 37      |
|           | PTGL10AR3R9M3B51B0 | 56               | 2.0              | 300                                    | 800                           | 3.9 ±20%                    | 120                | page 37      |
|           | PTGL14AR3R3M3B71B0 | 56               | 2.5              | 380                                    | 980                           | 3.3 ±20%                    | 120                | page 37      |

\* Curie Point means the temperature when the resistance value reaches twice the resistance at 25 °C. Please ask for details.

***muRata***

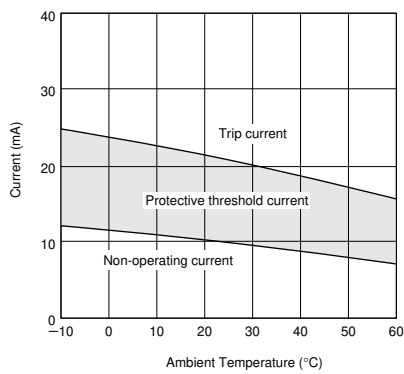
## Standard Land Pattern Dimensions



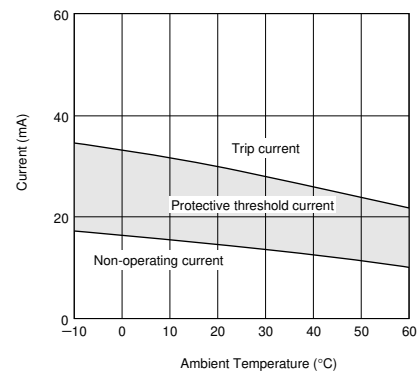
| Part Number | Soldering Methods | Dimensions (mm) |         |         |         |
|-------------|-------------------|-----------------|---------|---------|---------|
|             |                   | Chip (L×W)      | a       | b       | c       |
| PRG18       | Reflow Soldering  | 1.6×0.8         | 0.6-0.8 | 0.6-0.7 | 0.6-0.8 |
| PRG21       | Reflow Soldering  | 2.0×1.25        | 1.0-1.2 | 0.5-0.7 | 1.0-1.2 |

## Protective Threshold Current Range

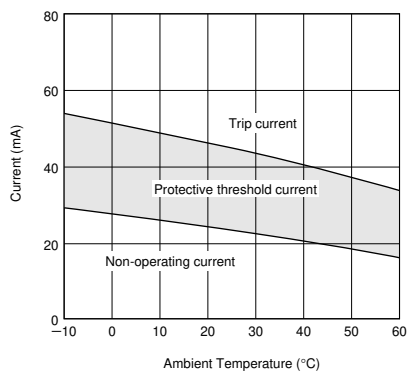
PRG18BB471MB1RB



PRG18BB221MB1RB



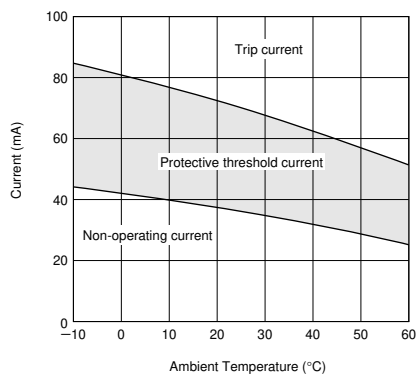
PRG18BB101MB1RB



PRG18BB470MB1RB



PRG18BB330MB1RB



PRG21BB220MB1RK



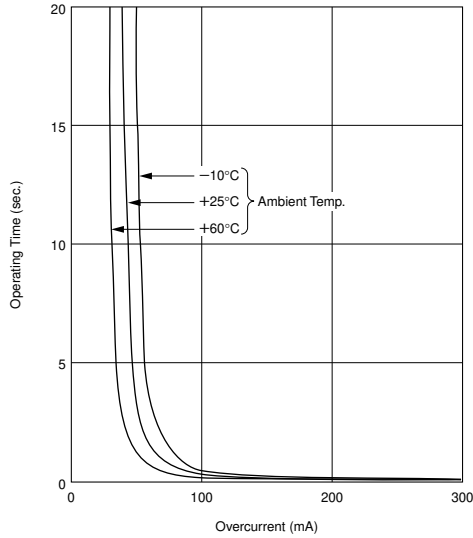
Continued on the following page.

1

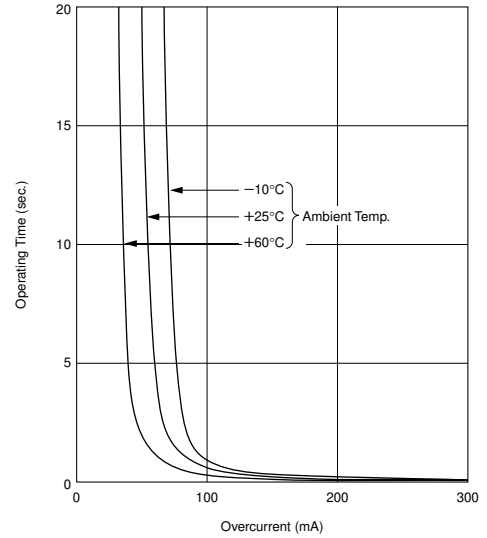
Continued from the preceding page.

## ■ Operating Time (Typical Curve)

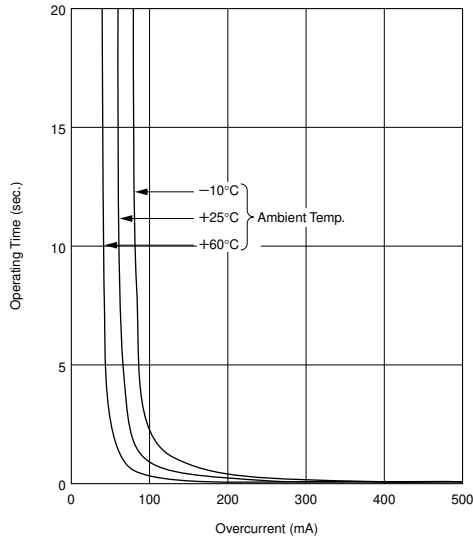
PRG18BB101MB1RB



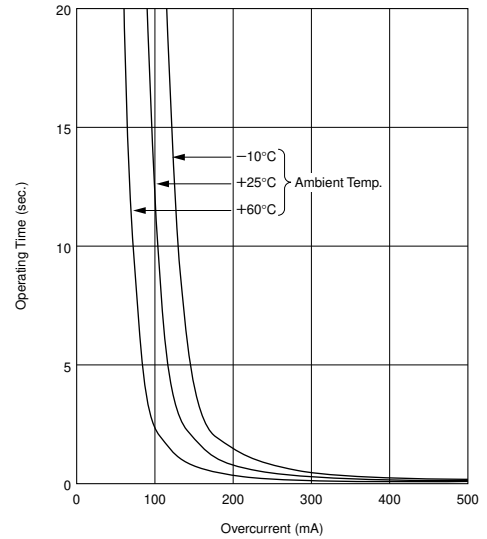
PRG18BB470MB1RB



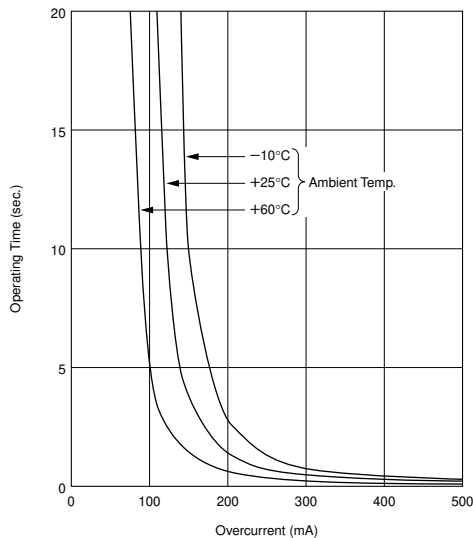
PRG18BB330MB1RB



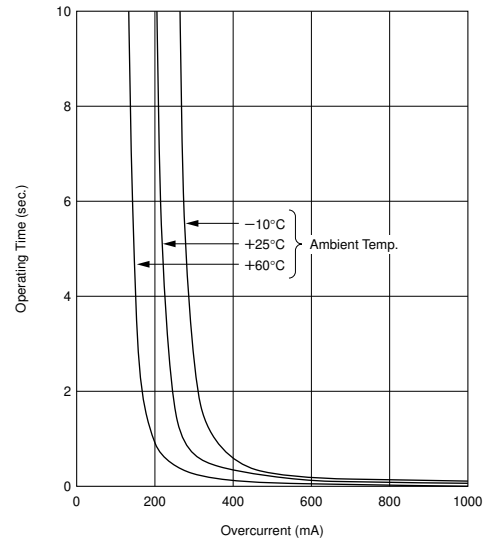
PRG21BB220MB1RK



PRG21BB150MB1RK



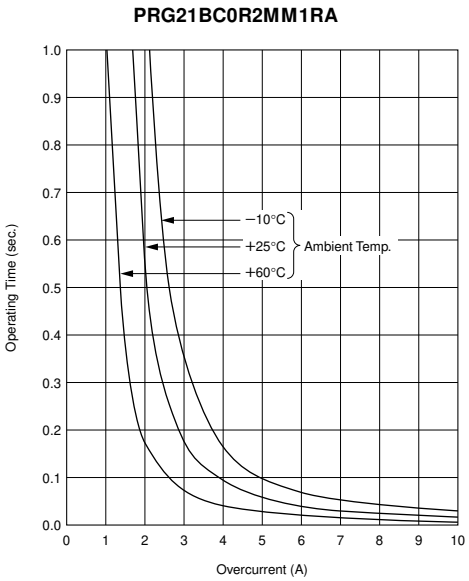
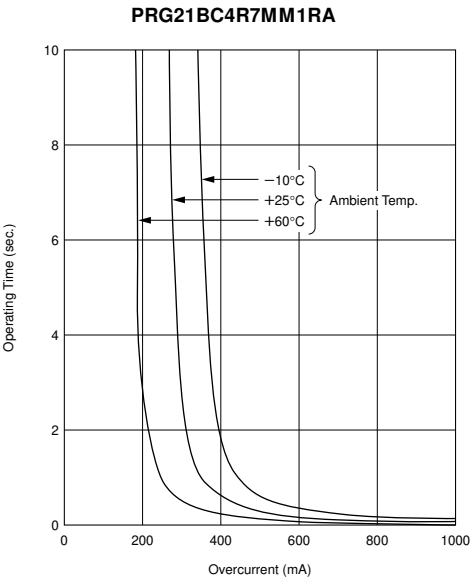
PRG21BC6R8MM1RA



Continued on the following page.

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■ Operating Time (Typical Curve)



## Chip Type Specifications and Test Methods

1

### ■ PRG18/21BB Series

| No.  | Item                       | Rating Value                                                                                | Method of Examination                                                                                                                                                                                                                                                                                                            |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
|------|----------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------|-------------|---|------------|----|---|------------|-------|---|------------|----|---|------------|-------|
| 1    | Operating Temp.            | -10 to 60°C                                                                                 | Temperature range with maximum voltage applied to PTC.                                                                                                                                                                                                                                                                           |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 2    | Resistance Value (at 25°C) | The resistance value should be within the specified tolerance.                              | After applying maximum operating voltage for 3 mins. and leaving for 2 hrs. in 25°C, measured by applying voltage of less than 1.5Vdc (by a direct current of less than 10mA).                                                                                                                                                   |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 3    | Withstanding Voltage       | Without damage                                                                              | We apply 120% of the maximum operating voltage to PTC by raising gradually for 180±5 secs. at 25°C. (A protective resistor is to be connected in series, and the inrush current through PTC must be limited below maximum rated value.)                                                                                          |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 4    | Adhesive Strength          | There is no exfoliation sign of electrode.                                                  | EIAJ ET-7403 term 9<br>Soldered PTC to PCB and add the force of 5.0N in the direction as shown below.<br> <p style="text-align: right;">Glass Epoxy PCB<br/>F=5.0N</p>                                                                         |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 5    | Vibration                  | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 8.2<br>Soldered PTC to PCB<br>Vibration: A 10-55-10Hz (1 min.)<br>Width: 1.5mm<br>Vibrate for 2 hrs. in each of 3 mutually perpendicular planes for a total of 6 hrs.                                                                                                                                            |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 6    | Solderability              | Min. 75% electrode is covered with new solder.<br>Resistance change: not to exceed ±20% (*) | JIS C 5102 term 8.4<br>Solder: Sn 63%/Pb 37% (or 60/40%)<br>Solder temp: 230±5°C<br>Soaking time: 3±0.5 s.<br>Soaking position: Until a whole electrode is soaked                                                                                                                                                                |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 7    | Solder-heatability         | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | Solder: Sn 63%/Pb 37% (or 60/40%)<br>Flux: Solder paste containing less than 0.2wt% of chlorine.<br>Preheating: 150±5°C 3mins.<br>Peak temp.: 260±5°C 10±5 s. (reflow)<br>PCB: Glass Epoxy PCB (JIS C 6484)                                                                                                                      |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 8    | Temperature Cycling        | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 9.3<br>Times: 5 cycles<br><table><tr><th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>-20 +0, -3</td><td>30</td></tr><tr><td>2</td><td>Room temp.</td><td>10-15</td></tr><tr><td>3</td><td>+85 +3, -0</td><td>30</td></tr><tr><td>4</td><td>Room temp.</td><td>10-15</td></tr></table> | Step | Temp. (°C) | Time (min.) | 1 | -20 +0, -3 | 30 | 2 | Room temp. | 10-15 | 3 | +85 +3, -0 | 30 | 4 | Room temp. | 10-15 |
| Step | Temp. (°C)                 | Time (min.)                                                                                 |                                                                                                                                                                                                                                                                                                                                  |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 1    | -20 +0, -3                 | 30                                                                                          |                                                                                                                                                                                                                                                                                                                                  |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 2    | Room temp.                 | 10-15                                                                                       |                                                                                                                                                                                                                                                                                                                                  |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 3    | +85 +3, -0                 | 30                                                                                          |                                                                                                                                                                                                                                                                                                                                  |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 4    | Room temp.                 | 10-15                                                                                       |                                                                                                                                                                                                                                                                                                                                  |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 9    | Humidity Test              | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 9.5<br>40±2°C, 90-95%RH leave for 500±4 hrs.                                                                                                                                                                                                                                                                     |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 10   | High Temperature Load Test | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 9.10<br>60±3°C (in air), PTC is applied maximum operating voltage for 1.5 hrs. on and 0.5 hrs. off. This cycle is repeated for 1000±10 hrs.                                                                                                                                                                      |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |

(\*) Measure resistance after the test by applying voltage of less than 1.5Vdc by a direct current of less than 10mA after product is left at 25±2°C for 2 hours.

Above mentioned soldering in "4. Adhesive Strength" and "5. Vibration" is done under the following conditions at our site.

- Glass-Epoxy PC board
- Standard land dimension
- Standard solder paste
- Standard solder profile

Above conditions are mentioned in Notice.

## Chip Type Specifications and Test Methods

### ■ PRG21BC Series

| No.  | Item                       | Rating Value                                                                                                                       | Method of Examination                                                                                                                                                                                                                                                                                                            |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
|------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------|-------------|---|------------|----|---|------------|-------|---|------------|----|---|------------|-------|
| 1    | Operating Temp.            | -10 to 60°C                                                                                                                        | Temperature range with maximum voltage applied to PTC.                                                                                                                                                                                                                                                                           |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 2    | Resistance Value (at 25°C) | The resistance value should be within the specified tolerance.                                                                     | After leaving for 24 hrs. or more in 25°C, it measures by 4 wire measuring methods using the direct-current terminal current of 10mA or less (0.1 or less Vdcs).                                                                                                                                                                 |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 3    | Withstanding Voltage       | Without damage                                                                                                                     | We apply 120% of the maximum operating voltage to PTC by raising gradually for 180±5 secs. at 25°C. (A protective resistor is to be connected in series, and the inrush current through PTC must be limited below maximum rated value.)                                                                                          |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 4    | Adhesive Strength          | There is no exfoliation sign of electrode.                                                                                         | EIAJ ET-7403 term 9<br>Soldered PTC to PCB and add the force of 5.0N in the direction as shown below.<br> <p style="text-align: right;">Glass Epoxy PCB<br/>F=5.0N</p>                                                                         |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 5    | Vibration                  | Normal appearance<br>Resistance change: not to exceed ±20% (*)                                                                     | JIS C 5102 term 8.2<br>Soldered PTC to PCB<br>Vibration: A 10-55-10Hz (1 min.)<br>Width: 1.5mm<br>Vibrate for 2 hrs. in each of 3 mutually perpendicular planes for a total of 6 hrs.                                                                                                                                            |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 6    | Solderability              | Min. 75% electrode is covered with new solder.<br>Resistance change: not to exceed ±20% (*)                                        | JIS C 5102 term 8.4<br>Solder: Sn 63%/Pb 37% (or 60/40%)<br>Solder temp: 230±5°C<br>Soaking time: 3±0.5 secs.<br>Soaking position: Until a whole electrode is soaked.                                                                                                                                                            |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 7    | Solder-heatability         | Normal appearance<br>Resistance change: not to exceed ±20% (*)                                                                     | Solder: Sn 63%/Pb 37% (or 60/40%)<br>Flux: Solder paste containing less than 0.2wt% of chlorine.<br>Preheating: 150±5°C 3mins.<br>Peak temp.: 260±5°C 10±5 secs. (reflow)<br>PCB: Glass Epoxy PCB (JIS C 6484)                                                                                                                   |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 8    | High Temperature Test      | Normal appearance<br>Resistance change: not to exceed ±20% (*)                                                                     | 60±3°C leave for 1000±10 hrs.                                                                                                                                                                                                                                                                                                    |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 9    | Low Temperature Test       |                                                                                                                                    | -10±3°C leave for 1000±10 hrs.                                                                                                                                                                                                                                                                                                   |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 10   | Humidity Test              |                                                                                                                                    | 60±2°C, 90-95%RH leave for 500±4 hrs.                                                                                                                                                                                                                                                                                            |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 11   | Temperature Cycling        |                                                                                                                                    | JIS C 5102 term 9.3<br>Times: 5 cycles<br><table><tr><th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>-20 +0, -3</td><td>30</td></tr><tr><td>2</td><td>Room temp.</td><td>10-15</td></tr><tr><td>3</td><td>+85 +3, -0</td><td>30</td></tr><tr><td>4</td><td>Room temp.</td><td>10-15</td></tr></table> | Step | Temp. (°C) | Time (min.) | 1 | -20 +0, -3 | 30 | 2 | Room temp. | 10-15 | 3 | +85 +3, -0 | 30 | 4 | Room temp. | 10-15 |
| Step | Temp. (°C)                 |                                                                                                                                    | Time (min.)                                                                                                                                                                                                                                                                                                                      |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 1    | -20 +0, -3                 | 30                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                  |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 2    | Room temp.                 | 10-15                                                                                                                              |                                                                                                                                                                                                                                                                                                                                  |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 3    | +85 +3, -0                 | 30                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                  |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 4    | Room temp.                 | 10-15                                                                                                                              |                                                                                                                                                                                                                                                                                                                                  |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |
| 12   | High Temperature Load Test | 60±3°C (in air), PTC is applied maximum operating voltage for 1.5 hrs. on and 0.5 hrs. off. This cycle is repeated for 500±10 hrs. |                                                                                                                                                                                                                                                                                                                                  |      |            |             |   |            |    |   |            |       |   |            |    |   |            |       |

(\*) The resistance measurement after the test.

After leaving for 24 hours. or more in 25±2°C, it measures by 4 wire measuring methods using the direct-current terminal current of 10mA or less (0.1 or less Vdcs).

Above mentioned soldering in "4. Adhesive Strength" and "5. Vibration" is done under the following conditions at our site.

- Glass-Epoxy PC board
- Standard land dimension
- Standard solder paste
- Standard solder profile

Above conditions are mentioned in Notice.

***muRata***

## 2

Technical drawing of a 5102 2004 component. The drawing includes a photograph of the component and two technical views with dimensions.

**Dimensions:**

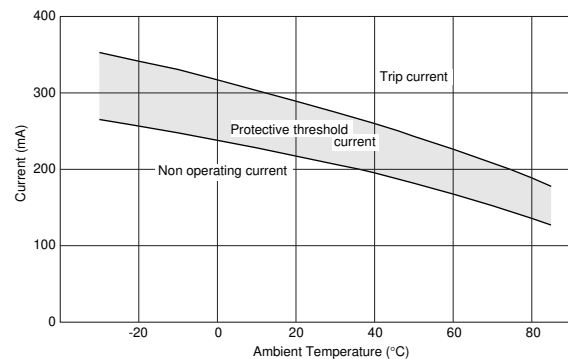
- D max.**: Maximum diameter of the top flange.
- H max.**: Maximum height of the top flange.
- F ±1.5**: Width of the base.
- 4.0 ±1.5**: Height of the base.
- T max.**: Maximum thickness of the base.
- ød ±0.05**: Diameter of the base hole.

(in mm)

1. Small fluctuation in the circuit due to resistance tolerance  $\pm 10\%$
2. Narrow current range (less than twice) between operating and non-operating current at  $-10$  to  $60$  degrees C.
3. Quick operating time due to small size compared with conventional products.
4. Best suited to meet the requirements for power supply and motor protector. Error-free operations are assured by rush current.
5. Circuit is protected until current is turned off.
6. Restores the original low resistance value automatically once the overload is removed.
7. Non-contact design leads to long life and no noise. Durable and strong against mechanical vibration and shock because it is a solid element.
8. Lead (Pb) is not contained in the terminations.

Maximum Current shows typical capacities of the transformer which can be used.  
30V Series are recognized by UL.  
Taping type is also available.

**PTGL04AS100K2B51B0**



***muRata***

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## Protective Threshold Current Range

PTGL05AS3R9K2B51B0



PTGL07AS2R7K2B51B0



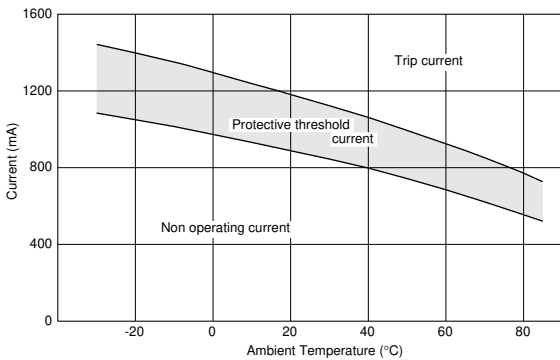
PTGL07AS1R8K2B51B0



PTGL09AS1R2K2B51B0



PTGL12AS0R8K2B51B0



## Operating Time (Typical Curve)

PTGL04AS100K2N51B0



PTGL04AS100K2B51B0



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Continued from the preceding page.

## Operating Time (Typical Curve)

PTGL05AS3R9K2B51B0



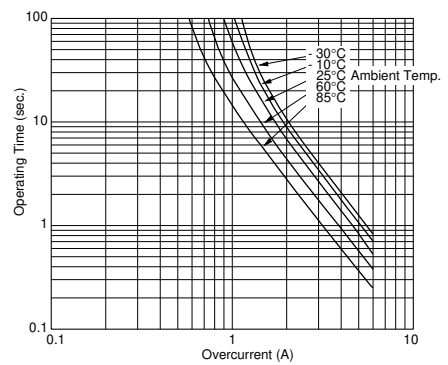
PTGL07AS2R7K2B51B0



PTGL07AS1R8K2B51B0



PTGL09AS1R2K2B51B0



PTGL12AS0R8K2B51B0



# POSISTOR<sup>®</sup> for Circuit Protection



## For Overcurrent Protection Narrow Current Band 51/60V Series

3

This product is leaded type PTC thermistor for overcurrent protection which is suitable for the current limiting resistor.

### Features

1. Small fluctuation in the circuit due to resistance tolerance +/-10%
2. Narrow current range (less than twice) between operating and non-operating current at -10 to 60 degrees C.
3. Quick operating time due to small size compared with conventional products.
4. Best suited to meet the requirements for power supply and motor protector. Error-free operations are assured by rush current.
5. Circuit is protected until current is turned off.
6. Restores the original low resistance value automatically once the overload is removed.
7. Non-contact design leads to long life and no noise.
 

Durable and strong against mechanical vibration and shock because it is a solid element.
8. Lead (Pb) is not contained in the terminations.

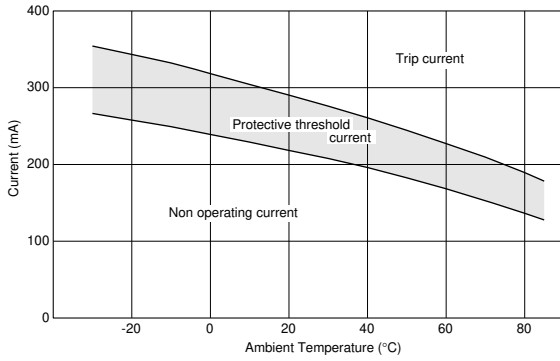


| Part Number        | Max. Voltage (V) | Non-operating Current (at +60°C)(mA) | Trip Current (at -10°C) (mA) | Max. Current (A) | Resistance (at 25°C) (ohm) | Body Diameter (D) (mm) | Thickness (T) (mm) | Height (H) (mm) | Lead Space (F) (mm) | Lead Diameter (phi d)(mm) |
|--------------------|------------------|--------------------------------------|------------------------------|------------------|----------------------------|------------------------|--------------------|-----------------|---------------------|---------------------------|
| PTGL04AS100K3B51B0 | 51               | 168                                  | 332                          | 1.0              | 10 ±10%                    | 4.5                    | 3.5                | 9.5             | 5.0                 | 0.6                       |
| PTGL05AS6R8K3B51B0 | 51               | 197                                  | 388                          | 1.5              | 6.8 ±10%                   | 5.5                    | 3.5                | 10.5            | 5.0                 | 0.6                       |
| PTGL07AS3R3K3B51B0 | 51               | 307                                  | 606                          | 3.0              | 3.3 ±10%                   | 7.3                    | 3.5                | 12.3            | 5.0                 | 0.6                       |
| PTGL09AS2R2K3B51B0 | 51               | 412                                  | 814                          | 4.0              | 2.2 ±10%                   | 9.3                    | 3.5                | 14.3            | 5.0                 | 0.6                       |
| PTGL12AS1R2K3B51B0 | 51               | 592                                  | 1168                         | 5.0              | 1.2 ±10%                   | 11.5                   | 3.5                | 16.5            | 5.0                 | 0.6                       |
| PTGL04AS220K4N51B0 | 60               | 88                                   | 175                          | 1.0              | 22 ±10%                    | 4.5                    | 3.5                | 9.5             | 5.0                 | 0.5                       |
| PTGL04AS220K4B51B0 | 60               | 115                                  | 226                          | 1.0              | 22 ±10%                    | 4.5                    | 3.5                | 9.5             | 5.0                 | 0.6                       |
| PTGL05AS100K4B51B0 | 60               | 170                                  | 335                          | 1.5              | 10 ±10%                    | 5.5                    | 3.5                | 10.5            | 5.0                 | 0.6                       |
| PTGL07AS5R6K4N51B0 | 60               | 186                                  | 368                          | 2.2              | 5.6 ±10%                   | 7.3                    | 3.5                | 12.3            | 5.0                 | 0.5                       |
| PTGL07AS5R6K4B51B0 | 60               | 229                                  | 452                          | 3.0              | 5.6 ±10%                   | 7.3                    | 3.5                | 12.3            | 5.0                 | 0.6                       |
| PTGL09AS3R3K4B51B0 | 60               | 333                                  | 656                          | 4.0              | 3.3 ±10%                   | 9.3                    | 3.5                | 14.3            | 5.0                 | 0.6                       |
| PTGL12AS2R2K4B51B0 | 60               | 439                                  | 867                          | 5.0              | 2.2 ±10%                   | 11.5                   | 3.5                | 16.5            | 5.0                 | 0.6                       |

Maximum Current shows typical capacities of the transformer which can be used.  
 51/60V Series are recognized by UL.  
 Taping type is also available.

## Protective Threshold Current Range (51V Series)

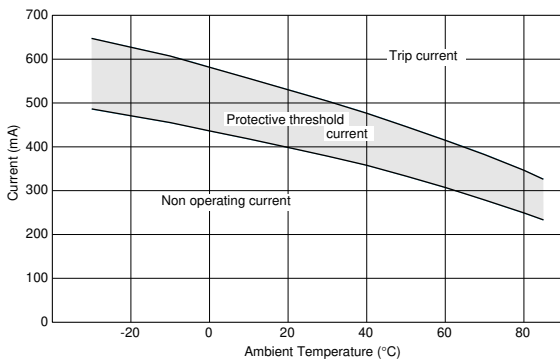
PTGL04AS100K3B51B0



PTGL05AS6R8K3B51B0



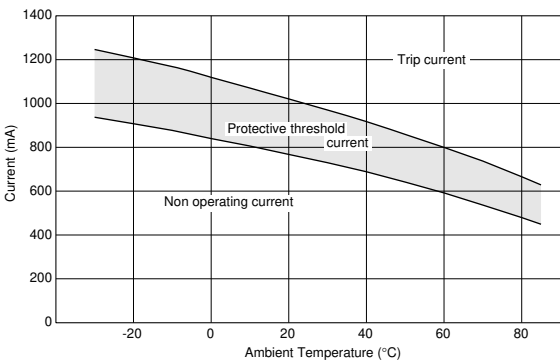
PTGL07AS3R3K3B51B0



PTGL09AS2R2K3B51B0

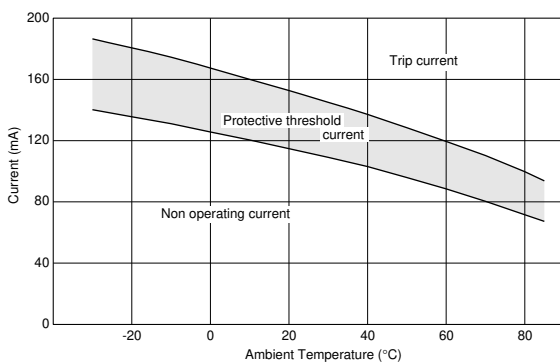


PTGL12AS1R2K3B51B0



## Protective Threshold Current Range (60V Series)

PTGL04AS220K4N51B0



PTGL04AS220K4B51B0



### Protective Threshold Current Range (60V Series)

PTGL05AS100K4B51B0



PTGL07AS5R6K4N51B0



PTGL07AS5R6K4B51B0



PTGL09AS3R3K4B51B0



PTGL12AS2R2K4B51B0



### Operating Time 51V Series (Typical Curve)

PTGL04AS100K3B51B0



PTGL05AS6R8K3B51B0



Continued from the preceding page.

## Operating Time 51V Series (Typical Curve)

PTGL07AS3R3K3B51B0



PTGL09AS2R2K3B51B0



PTGL12AS1R2K3B51B0



## Operating Time 60V Series (Typical Curve)

PTGL04AS220K4N51B0



PTGL04AS220K4B51B0



PTGL05AS100K4B51B0



PTGL07AS5R6K4N51B0



Continued on the following page.

# 3

***muRata***

## 27

Continued from the preceding page.

## Protective Threshold Current Range

PTGL07AS150K6B51B0



PTGL09AS120K6B51B0



PTGL09AS7R6K6B51B0



PTGL12AS4R7K6B51B0



## Operating Time (Typical Curve)

PTGL04AS560K6B51B0



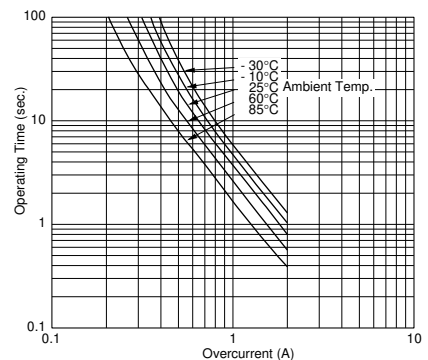
PTGL05AS270K6B51B0



PTGL07AS150K6B51B0



PTGL09AS120K6B51B0

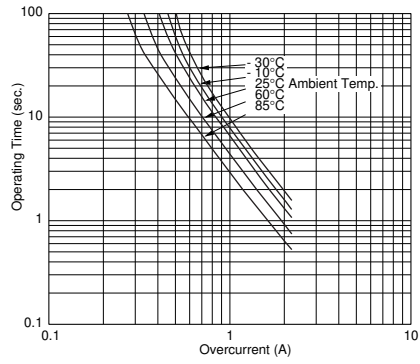


Continued on the following page.

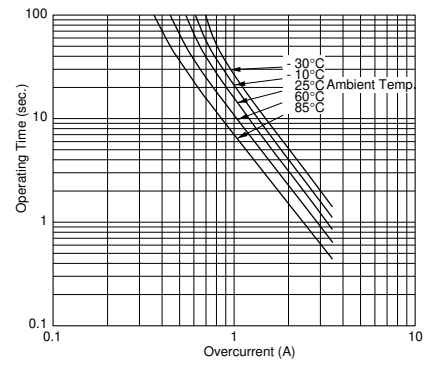
Continued from the preceding page.

### ■ Operating Time (Typical Curve)

PTGL09AS7R6K6B51B0



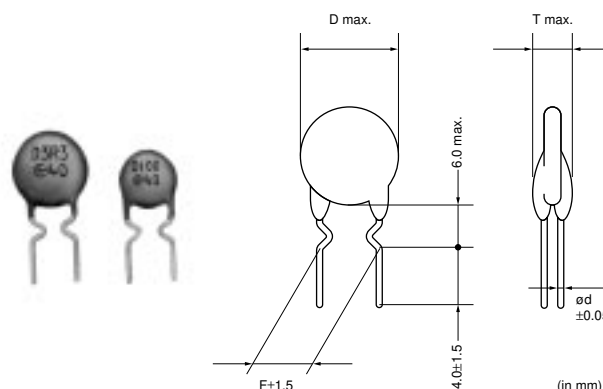
PTGL12AS4R7K6B51B0



**myRata**

Safety resistor "POSISTOR" is most suited to meet the requirements of the safety standard short-circuit tests such as IEC, VDE, BS, UL, CSA etc. all over the world.

1. Best suited to meet the requirements of the short-circuit test. Quick response compared with current fuse and resistor and error-free operation are assured.
2. Small size does not need a large space. Capable of being mounted to any place because replacement is not required.
3. Actuates by excessive current during the short-circuit test to restrain abnormal heat generation in other circuit components and printed boards. This state will be maintained until the abnormal state is removed or power is turned off to reset the "POSISTOR" to the original state. Surface temperature of "POSISTOR" is kept low, below a certain value, during the actuation.
4. Non-contact design leads to long life and no noise. Durable and strong against mechanical vibration and shock because it is a solid element.



| Part Number        | Max. Voltage (V) | Non-operating Current (at +60°C)(mA) | Trip Current (at -10°C) (mA) | Max. Current (A) | Resistance (at 25°C) (ohm) | Body Diameter (D) (mm) | Thickness (T) (mm) | Lead Space (F) (mm) | Lead Diameter (phi d)(mm) |
|--------------------|------------------|--------------------------------------|------------------------------|------------------|----------------------------|------------------------|--------------------|---------------------|---------------------------|
| PTGL07BD100N2B51B0 | 24               | 80                                   | 320                          | 2.0              | 10 ±30%                    | 7.4                    | 4.0                | 5.0                 | 0.6                       |
| PTGL07BD6R8N2B51B0 | 24               | 90                                   | 370                          | 2.0              | 6.8 ±30%                   | 7.4                    | 4.0                | 5.0                 | 0.6                       |
| PTGL09BD4R7N2B51B0 | 24               | 120                                  | 500                          | 2.0              | 4.7 ±30%                   | 9.5                    | 4.0                | 5.0                 | 0.6                       |
| PTGL09BD3R3N2B51B0 | 24               | 140                                  | 580                          | 2.0              | 3.3 ±30%                   | 9.5                    | 4.0                | 5.0                 | 0.6                       |
| PTGL09BD2R2N2B51B0 | 24               | 180                                  | 710                          | 2.0              | 2.2 ±30%                   | 9.5                    | 4.0                | 5.0                 | 0.6                       |
| PTGL04AR130H2B51B0 | 30               | 145                                  | 400                          | 0.7              | 13 ±25%                    | 5.5                    | 4.0                | 5.0                 | 0.6                       |
| PTGL07AR4R6H2B51B0 | 30               | 250                                  | 700                          | 2.0              | 4.6 ±25%                   | 7.4                    | 4.0                | 5.0                 | 0.6                       |
| PTGL09AR1R8H2B51B0 | 30               | 410                                  | 1120                         | 3.0              | 1.8 ±25%                   | 9.5                    | 4.0                | 5.0                 | 0.6                       |
| PTGL12AR1R2H2B51B0 | 30               | 520                                  | 1420                         | 4.3              | 1.2 ±25%                   | 12.0                   | 4.0                | 5.0                 | 0.6                       |
| PTGL13AR0R8H2B71B0 | 30               | 680                                  | 1900                         | 5.5              | 0.8 ±25%                   | 13.5                   | 4.0                | 7.5                 | 0.6                       |
| PTGL07BD470N3B51B0 | 32               | 30                                   | 140                          | 1.5              | 47 ±30%                    | 7.4                    | 4.0                | 5.0                 | 0.6                       |
| PTGL07BD330N3B51B0 | 32               | 40                                   | 170                          | 1.5              | 33 ±30%                    | 7.4                    | 4.0                | 5.0                 | 0.6                       |
| PTGL07BD220N3B51B0 | 32               | 45                                   | 200                          | 1.5              | 22 ±30%                    | 7.4                    | 4.0                | 5.0                 | 0.6                       |
| PTGL07BD150N3B51B0 | 32               | 60                                   | 240                          | 1.5              | 15 ±30%                    | 7.4                    | 4.0                | 5.0                 | 0.6                       |

PTGL 51B0 series are available in taping type.

## ■ Protective Threshold Current Range (24V Series)

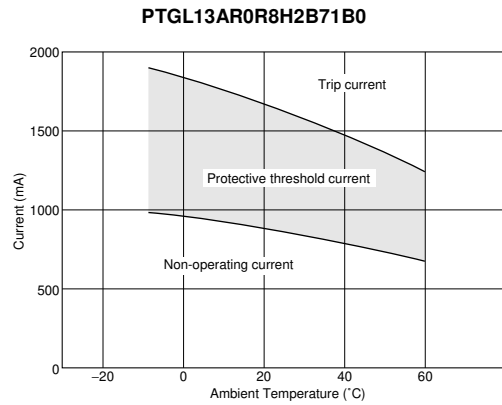
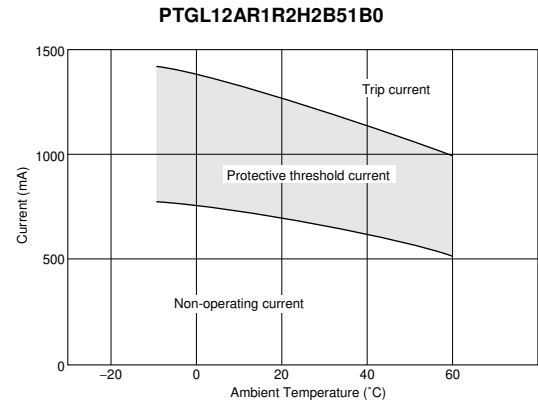
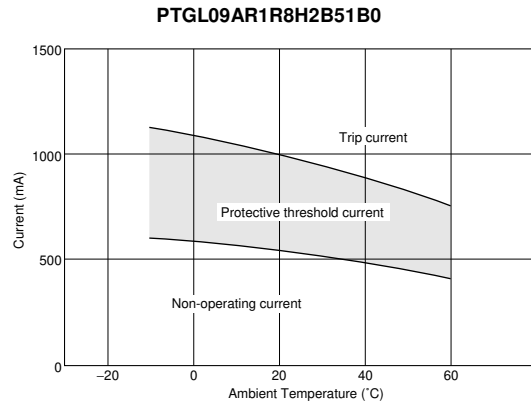


## ■ Protective Threshold Current Range (30V Series)

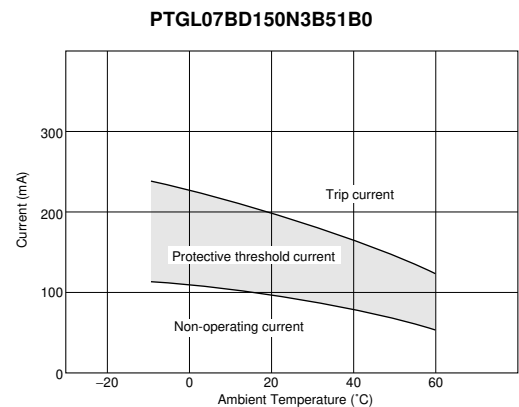
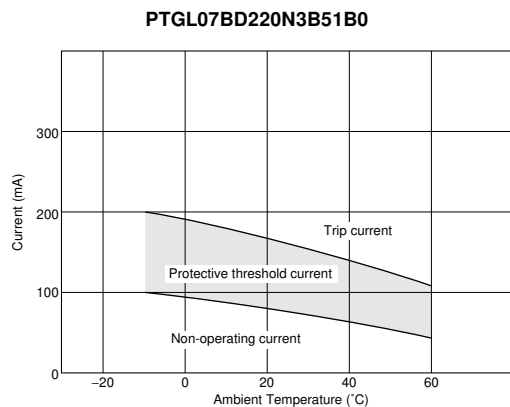
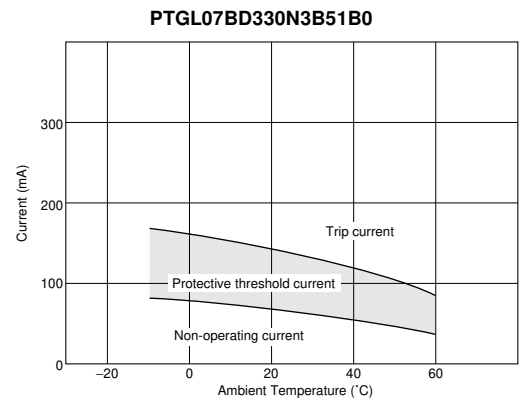


Continued from the preceding page.

## ■ Protective Threshold Current Range (30V Series)



## ■ Protective Threshold Current Range (32V Series)

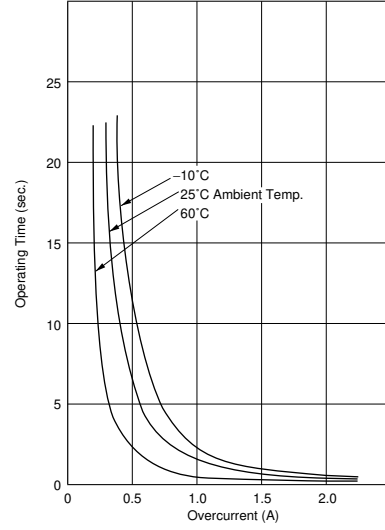


## ■ Operating Time 24V Series (Typical Curve)

PTGL07BD100N2B51B0



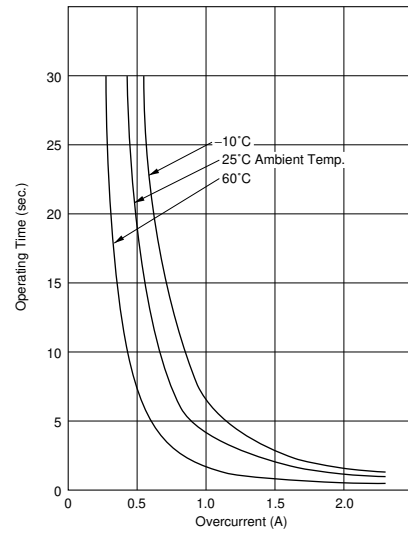
PTGL07BD6R8N2B51B0



PTGL09BD4R7N2B51B0



PTGL09BD3R3N2B51B0



PTGL09BD2R2N2B51B0



## ■ Operating Time 30V Series (Typical Curve)

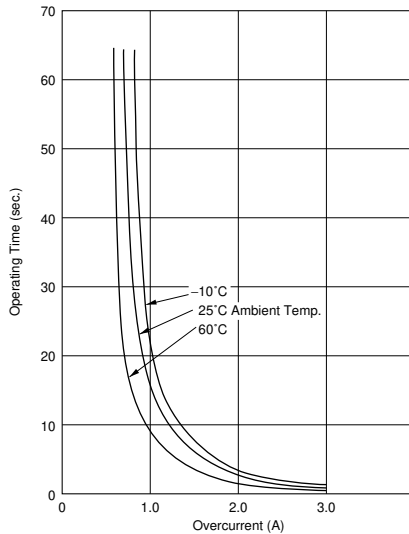
PTGL04AR130H2B51B0



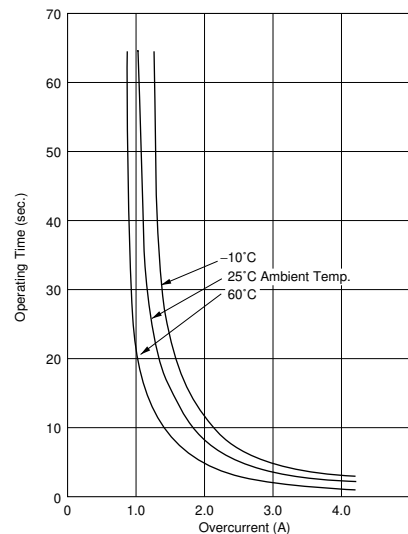
PTGL07AR4R6H2B51B0



PTGL09AR1R8H2B51B0



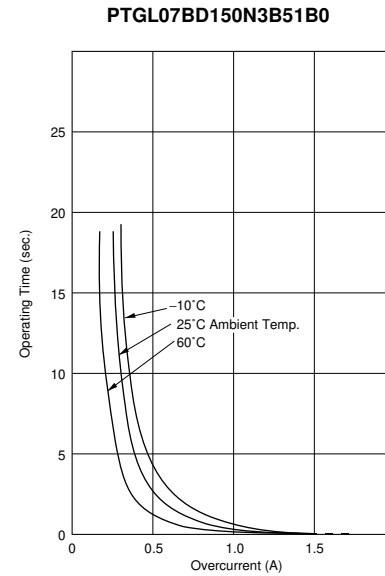
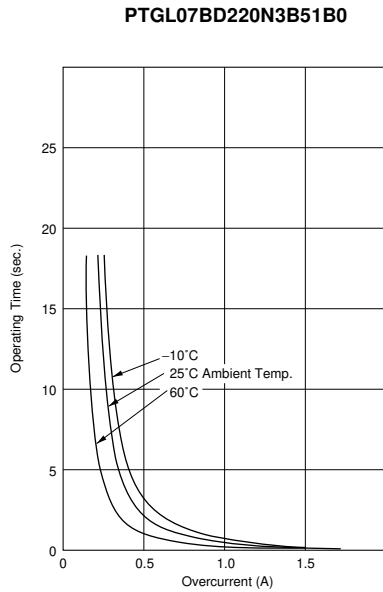
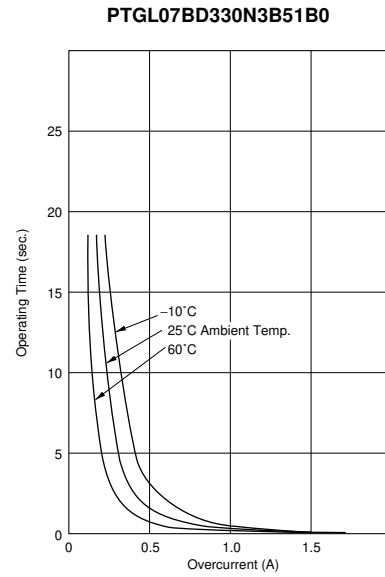
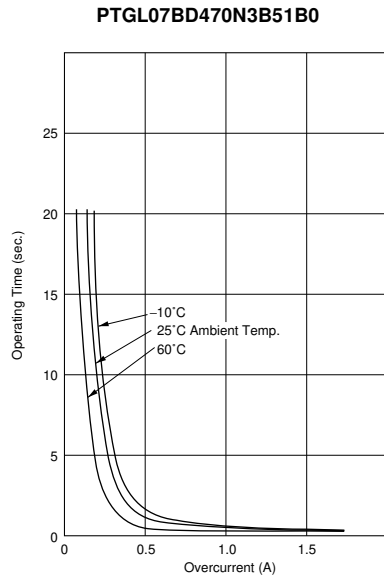
PTGL12AR1R2H2B51B0



PTGL13AR0R8H2B71B0

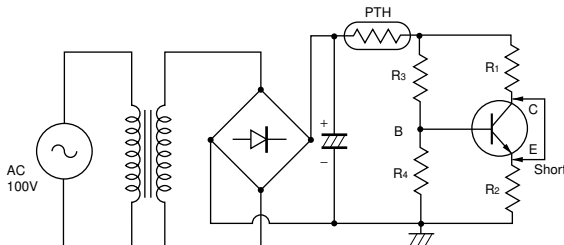


## Operating Time 32V Series (Typical Curve)

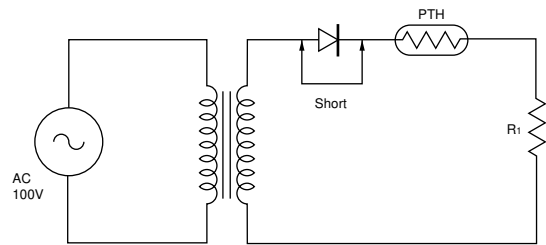


## Application Circuit

### (1) Short-Circuit Test of Transistor



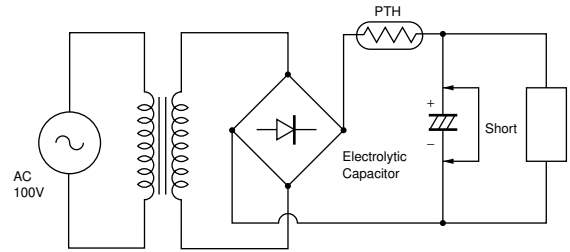
### (2) Short-Circuit Test of Diode



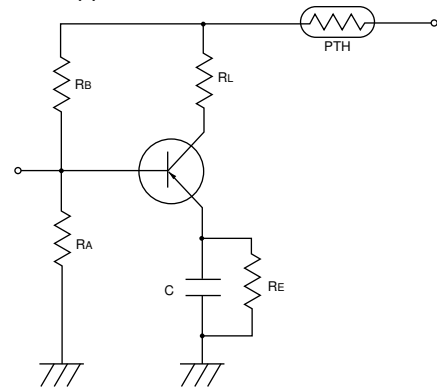
Continued on the following page.

## ■ Application Circuit

#### (4) Short-Circuit Test of Electrolytic Capacitor



### (6) Transistor Protection Circuit



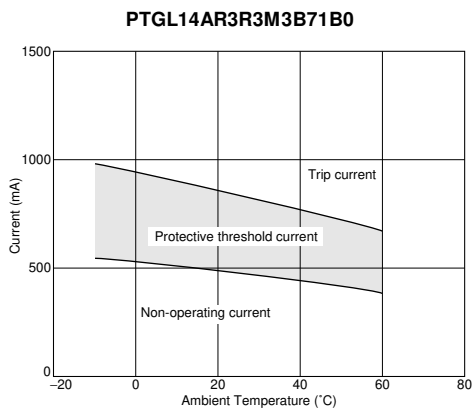
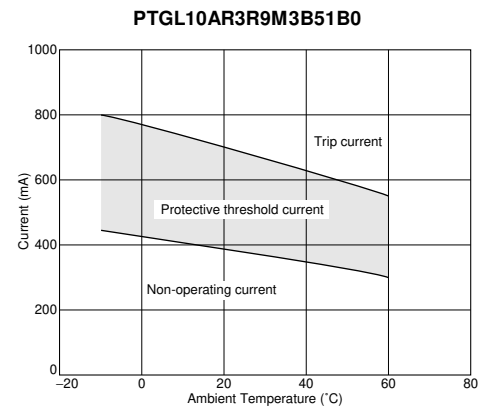
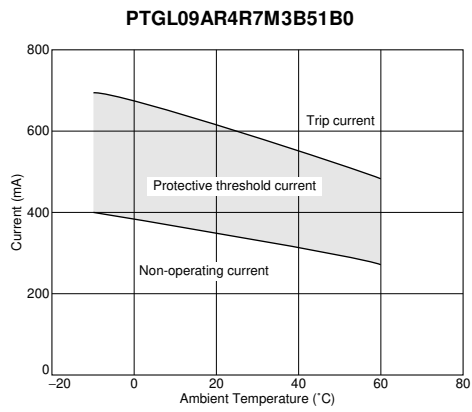
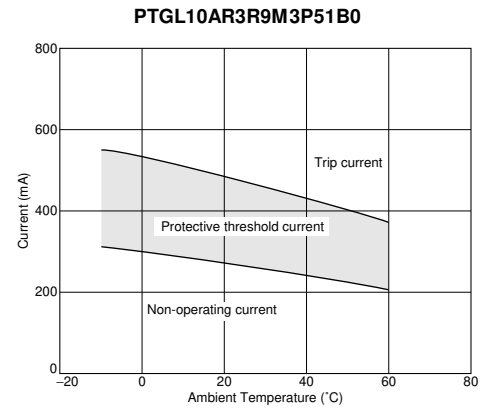
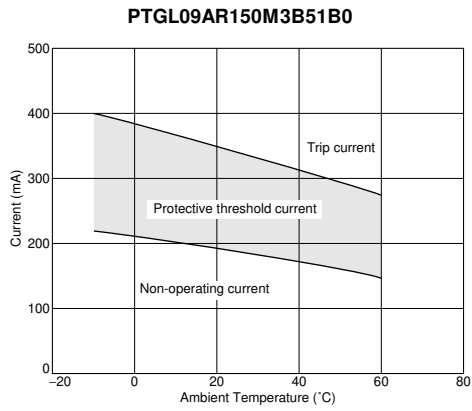
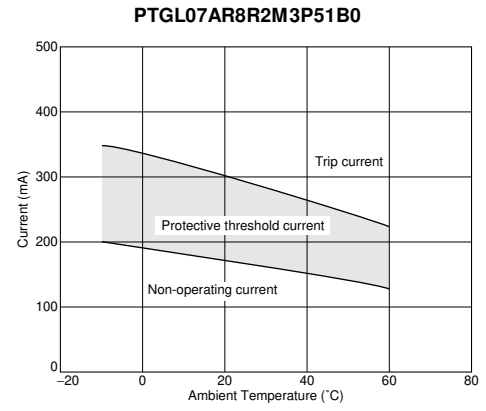
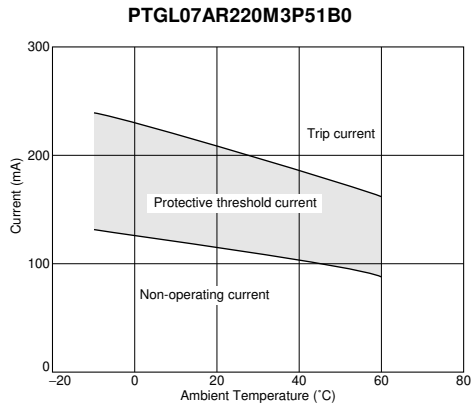
***muRata***

Technical drawing of the 2520 package showing top, side, and detail views with dimensions:

- Top View:** Shows the circular body with dimensions  $D \text{ max.}$  and  $F \pm 1.5$ .
- Side View:** Shows the package height with dimensions  $T \text{ max.}$ ,  $6.0 \text{ max.}$ , and  $4.0 \pm 1.5$ .
- Detail View:** Shows the lead profile with a dimension of  $\phi d \pm 0.05$ .

(in mm)

## Protective Threshold Current Range (56V Series)

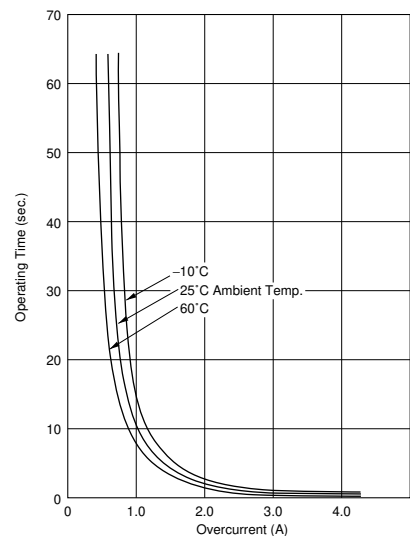


## ■ Protective Threshold Current Range (80V Series)





### ■ Operating Time 56V Series (Typical Curve)



 Continued from the preceding page.

### ■ Operating Time 80V Series (Typical Curve)

PTGL13AR3R7H4B71B0



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## ■ Application Circuit

### (1) DC Motor Protection Circuit



## (2) Transistor Protection Circuit



### (3) Transformer Protection Circuit



# POSISTOR® for Circuit Protection

**muRata**

## For Overcurrent Protection 125/140V Series

"POSISTOR" is a circuit protector whose resistance value in normal operation is very low and in abnormal situations like overcurrent or overheating, will be increased to restrain overcurrent. "POSISTOR" can be used for overcurrent protection against current fuse or temperature fuse, due to its ability to return to its initial condition when overcurrent is removed.

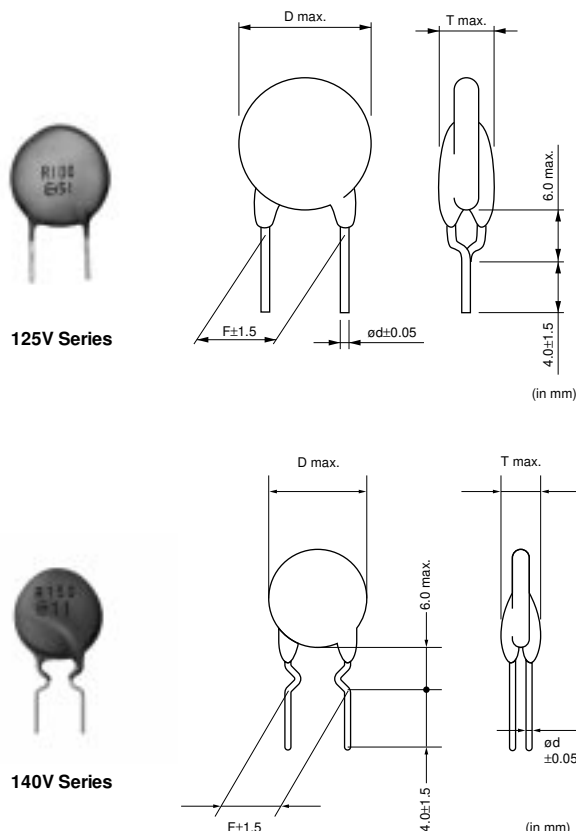
### ■ Features

1. Best suited to meet the requirements for power supply and motor protector. Error-free operations are assured by rush current.
2. Circuit is protected until current is turned off.
3. Restores the original low resistance value automatically once the overload is removed.
4. Non-contact design leads to long life and no noise. Durable and strong against mechanical vibration and shock because it is a solid element.

### ■ Applications

Circuit Protection:

1. Transformers
2. Transistors
3. Fluorescent Lamps



| Part Number        | Max. Voltage (V) | Non-operating Current (at +60°C)(mA) | Trip Current (at -10°C) (mA) | Max. Current (A) | Resistance (at 25°C) (ohm) | Body Diameter (D) (mm) | Thickness (T) (mm) | Lead Space (F) (mm) | Lead Diameter (phi d)(mm) |
|--------------------|------------------|--------------------------------------|------------------------------|------------------|----------------------------|------------------------|--------------------|---------------------|---------------------------|
| PTGL05AR181M7P52B0 | 125              | 30                                   | 75                           | 0.3              | 180 ±20%                   | 6.0                    | 5.0                | 5.0                 | 0.6                       |
| PTGL07AR750M7B52B0 | 125              | 65                                   | 165                          | 0.3              | 75 ±20%                    | 8.0                    | 6.0                | 5.0                 | 0.6                       |
| PTGL09AR470M6B52B0 | 125              | 90                                   | 230                          | 0.5              | 47 ±20%                    | 10.0                   | 5.5                | 5.0                 | 0.6                       |
| PTGL09AR220M6B52B0 | 125              | 135                                  | 340                          | 0.8              | 22 ±20%                    | 10.0                   | 5.5                | 5.0                 | 0.6                       |
| PTGL12AR150M6B72B0 | 125              | 175                                  | 440                          | 1.0              | 15 ±20%                    | 12.5                   | 5.5                | 7.5                 | 0.6                       |
| PTGL14AR100M6B72B0 | 125              | 220                                  | 550                          | 1.2              | 10 ±20%                    | 15.0                   | 5.5                | 7.5                 | 0.6                       |
| PTGL18AR6R8M6B72B0 | 125              | 300                                  | 750                          | 1.4              | 6.8 ±20%                   | 18.5                   | 5.5                | 7.5                 | 0.6                       |
| PTGL18AR4R7M6B72B0 | 125              | 360                                  | 900                          | 1.7              | 4.7 ±20%                   | 18.5                   | 5.5                | 7.5                 | 0.6                       |
| PTGL18AR3R3M6B72B0 | 125              | 420                                  | 1050                         | 2.0              | 3.3 ±20%                   | 18.5                   | 5.5                | 7.5                 | 0.6                       |
| PTGL07AR330M6A51B0 | 140              | 100                                  | 230                          | 0.5              | 33 ±20%                    | 7.4                    | 6.0                | 5.0                 | 0.5                       |
| PTGL09AR220M6C61B0 | 140              | 140                                  | 330                          | 1.0              | 22 ±20%                    | 9.6                    | 6.0                | 6.5                 | 0.65                      |
| PTGL10AR150M6C61B0 | 140              | 170                                  | 400                          | 1.0              | 15 ±20%                    | 11.6                   | 6.0                | 6.5                 | 0.65                      |
| PTGL12AR100M6C01B0 | 140              | 220                                  | 510                          | 1.0              | 10 ±20%                    | 13.0                   | 6.0                | 10.0                | 0.65                      |
| PTGL13AR6R8M6C01B0 | 140              | 290                                  | 670                          | 1.0              | 6.8 ±20%                   | 14.0                   | 6.0                | 10.0                | 0.65                      |
| PTGL16AR5R6M6C01B0 | 140              | 340                                  | 780                          | 2.0              | 5.6 ±20%                   | 17.0                   | 6.0                | 10.0                | 0.65                      |

Maximum Current shows typical capacities of the transformer which can be used.  
Please contact us for UL recognized products.  
PTGL\_52B0 series are available in taping type.

## Protective Threshold Current Range (125V Series)



### ■ Protective Threshold Current Range (125V Series)



## ■ Operating Time 125V Series (Typical Curve)

PTGL05AR181M7P52B0



PTGL07AR750M7B52B0



PTGL09AR470M6B52B0



PTGL09AR220M6B52B0



PTGL12AR150M6B72B0

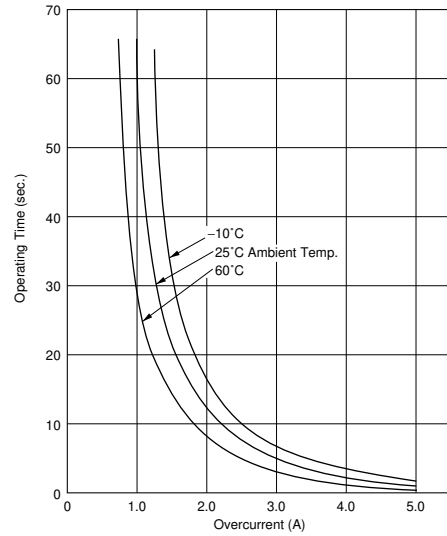


PTGL14AR100M6B72B0



### ■ Operating Time 125V Series (Typical Curve)

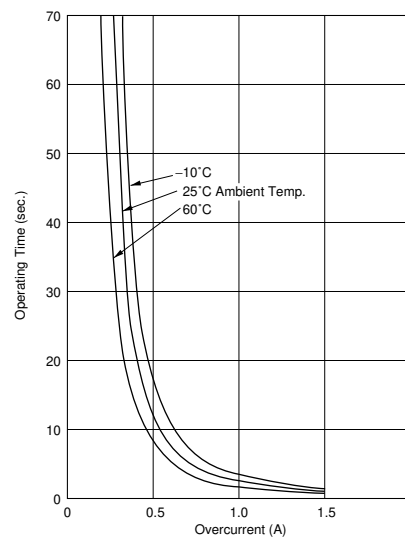
PTGL18AR4R7M6B72B0



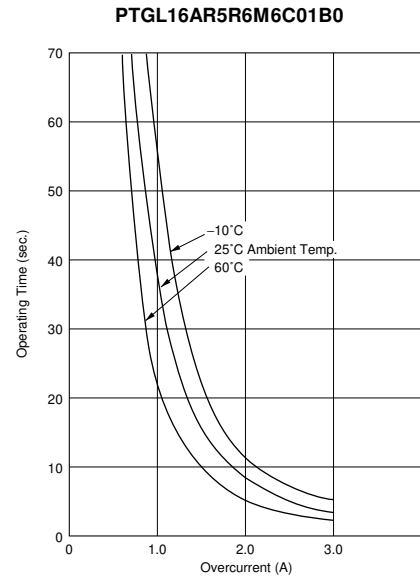
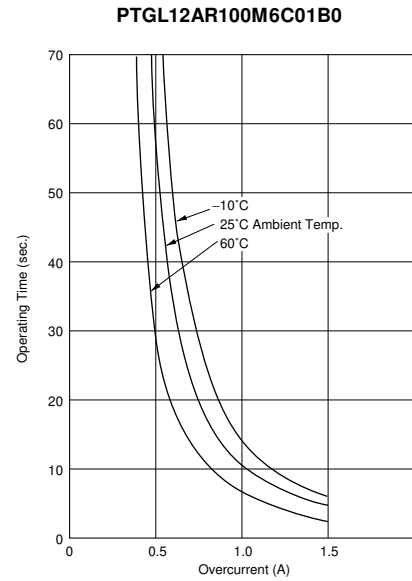
The graph shows the operating time in seconds as a function of overcurrent in amperes for a 1000-watt, 250-volt, 40-ampere circuit breaker. The y-axis represents Operating Time (sec.) from 0 to 70. The x-axis represents Overcurrent (A) from 0 to 5.0. Three curves are plotted for different ambient temperatures: -10°C, 25°C, and 60°C. The operating time decreases as the overcurrent increases and as the ambient temperature increases.

| Overcurrent (A) | Operating Time (sec.) at -10°C | Operating Time (sec.) at 25°C | Operating Time (sec.) at 60°C |
|-----------------|--------------------------------|-------------------------------|-------------------------------|
| 1.0             | 63                             | 50                            | 45                            |
| 2.0             | 20                             | 12                            | 10                            |
| 3.0             | 8                              | 5                             | 4                             |
| 4.0             | 4                              | 3                             | 2                             |
| 5.0             | 3                              | 2                             | 1                             |

## PTGL09AR220M6C61B0



### ■ Operating Time 140V Series (Typical Curve)



## ■ Application Circuit

(1) Transformer Protection Circuit 1)



(2) Transformer Protection Circuit 2)



(3) Transistor Protection Circuit



(4) Fluorescent Lamp Protection Circuit



# POSISTOR® for Circuit Protection

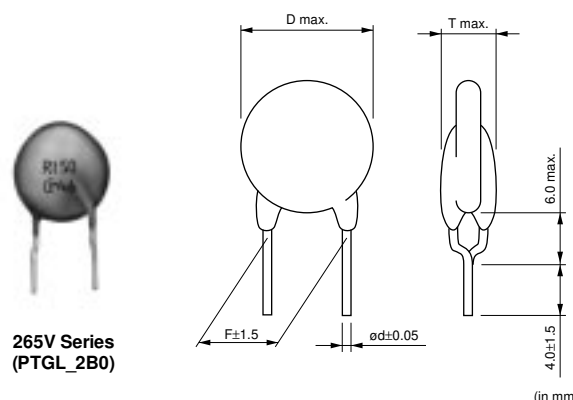
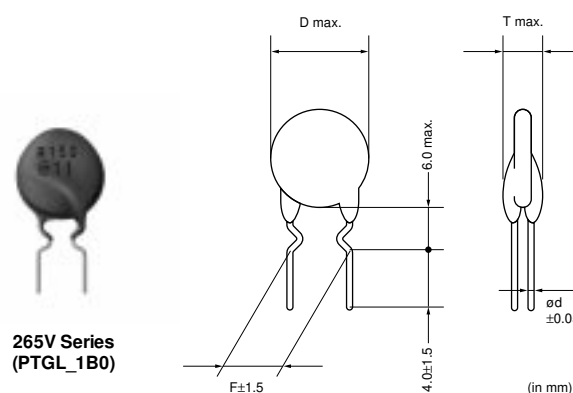
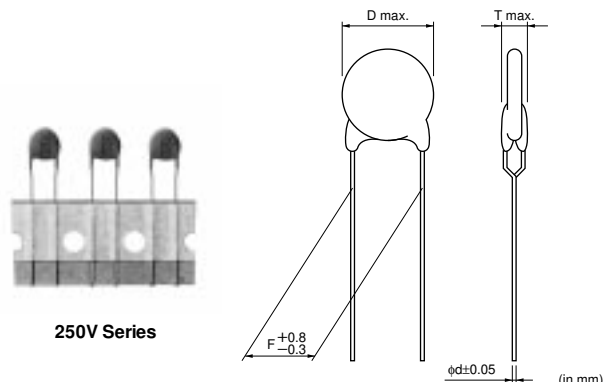
**muRata**

## For Overcurrent Protection 250/265V Series

"POSISTOR" is a circuit protector whose resistance value in normal operation is very low and in abnormal situations like overcurrent or overheating, will be increased to restrain overcurrent. "POSISTOR" can be used for overcurrent protection against current fuse or temperature fuse, due to its ability to return to its initial condition when overcurrent is removed.

### ■ Features

1. Best suited to meet the requirements for power supply and motor protector. Error-free operations are assured by rush current.
2. Circuit is protected until current is turned off.
3. Restores the original low resistance value automatically once the overload is removed.
4. Non-contact design leads to long life and no noise. Durable and strong against mechanical vibration and shock because it is a solid element.



| Part Number        | Max. Voltage (V) | Non-operating Current (at +60°C)(mA) | Trip Current (at -10°C) (mA) | Max. Current (A) | Resistance (at 25°C) (ohm) | Body Diameter (D) (mm) | Thickness (T) (mm) | Lead Space (F) (mm) | Lead Diameter (phi d)(mm) |
|--------------------|------------------|--------------------------------------|------------------------------|------------------|----------------------------|------------------------|--------------------|---------------------|---------------------------|
| PTGL07BB220N0B52A0 | 250              | 90                                   | 300                          | 0.5              | 22 ±30%                    | 8.0                    | 6.0                | 5.0                 | 0.6                       |
| PTGL10BB120N0P52A0 | 250              | 90                                   | 300                          | 0.6              | 12 ±30%                    | 11.0                   | 6.0                | 5.0                 | 0.6                       |
| PTGL09AR390N0B52A0 | 250              | 100                                  | 280                          | 0.6              | 39 ±30%                    | 10.0                   | 6.0                | 5.0                 | 0.6                       |
| PTGL05AR151H8P52B0 | 265              | 28                                   | 78                           | 0.2              | 150 ±25%                   | 6.0                    | 6.0                | 5.0                 | 0.6                       |
| PTGL05AR181M9N51B0 | 265              | 29                                   | 70                           | 0.3              | 180 ±20%                   | 6.5                    | 6.5                | 5.0                 | 0.5                       |
| PTGL05AR121M9N51B0 | 265              | 35                                   | 85                           | 0.3              | 120 ±20%                   | 6.5                    | 6.5                | 5.0                 | 0.5                       |
| PTGL07AR820M9A51B0 | 265              | 60                                   | 150                          | 0.5              | 82 ±20%                    | 8.2                    | 6.5                | 5.0                 | 0.5                       |
| PTGL07AR700H8B52B0 | 265              | 66                                   | 185                          | 0.4              | 70 ±25%                    | 8.0                    | 6.0                | 5.0                 | 0.6                       |
| PTGL07AR650H8B52B0 | 265              | 68                                   | 190                          | 1.0              | 65 ±25%                    | 8.0                    | 6.0                | 5.0                 | 0.6                       |
| PTGL07AR450H8B52B0 | 265              | 80                                   | 220                          | 1.0              | 45 ±25%                    | 8.0                    | 6.0                | 5.0                 | 0.6                       |
| PTGL07AR560M9A51B0 | 265              | 80                                   | 190                          | 0.8              | 56 ±20%                    | 8.2                    | 6.5                | 5.0                 | 0.5                       |
| PTGL09AR390M9C61B0 | 265              | 100                                  | 240                          | 1.2              | 39 ±20%                    | 10.0                   | 6.5                | 6.5                 | 0.65                      |

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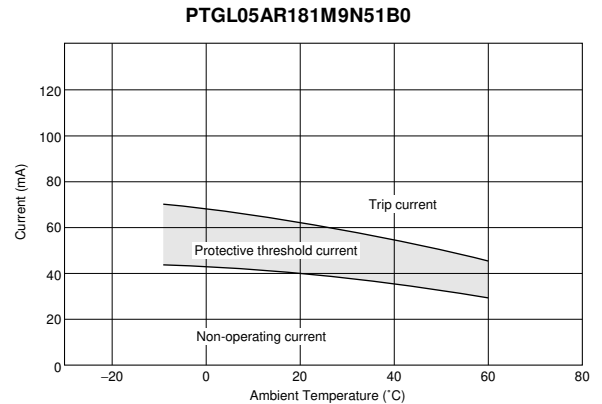
| Part Number        | Max. Voltage (V) | Non-operating Current (at +60°C)(mA) | Trip Current (at -10°C) (mA) | Max. Current (A) | Resistance (at 25°C) (ohm) | Body Diameter (D) (mm) | Thickness (T) (mm) | Lead Space (F) (mm) | Lead Diameter (phi d)(mm) |
|--------------------|------------------|--------------------------------------|------------------------------|------------------|----------------------------|------------------------|--------------------|---------------------|---------------------------|
| PTGL09AR250H8B52B0 | 265              | 118                                  | 330                          | 1.0              | 25 ±25%                    | 10.0                   | 6.0                | 5.0                 | 0.6                       |
| PTGL12AR270M9C01B0 | 265              | 150                                  | 360                          | 1.5              | 27 ±20%                    | 14.0                   | 6.5                | 10.0                | 0.65                      |
| PTGL12AR150H8B72B0 | 265              | 165                                  | 460                          | 1.5              | 15 ±25%                    | 12.5                   | 6.0                | 7.5                 | 0.6                       |
| PTGL14AR180M9C01B0 | 265              | 180                                  | 440                          | 1.8              | 18 ±20%                    | 15.7                   | 6.5                | 10.0                | 0.65                      |
| PTGL13AR100H8B72B0 | 265              | 200                                  | 560                          | 2.2              | 10 ±25%                    | 14.0                   | 6.0                | 7.5                 | 0.6                       |
| PTGL18AR6R0H8B72B0 | 265              | 300                                  | 830                          | 4.1              | 6.0 ±25%                   | 18.5                   | 6.0                | 7.5                 | 0.6                       |

Maximum Current shows typical capacities of the transformer which can be used.  
 Please contact us for UL recognized products.  
 PTGL\_5\*B0 series are available in taping type.

## Protective Threshold Current Range (250V Series)



## Protective Threshold Current Range (265V Series)



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## Protective Threshold Current Range (265V Series)

PTGL05AR121M9N51B0



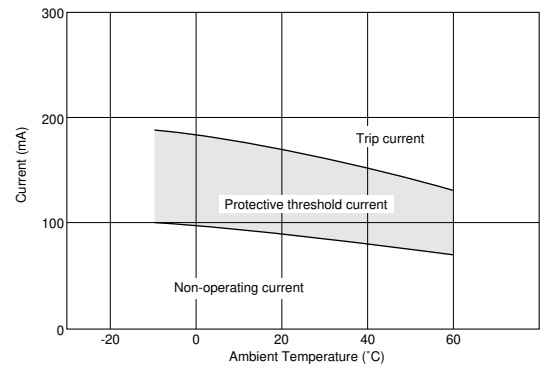
PTGL07AR820M9A51B0



PTGL07AR700H8B52B0



PTGL07AR650H8B52B0



PTGL07AR450H8B52B0



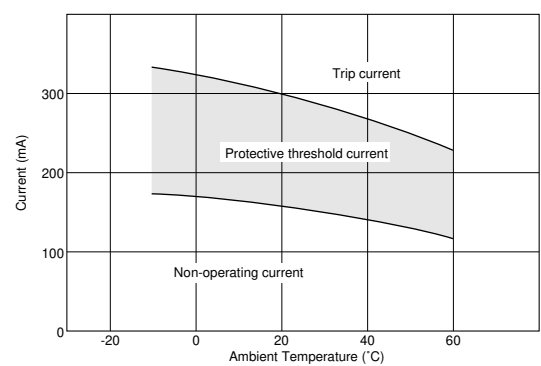
PTGL07AR560M9A51B0



PTGL09AR390M9C61B0

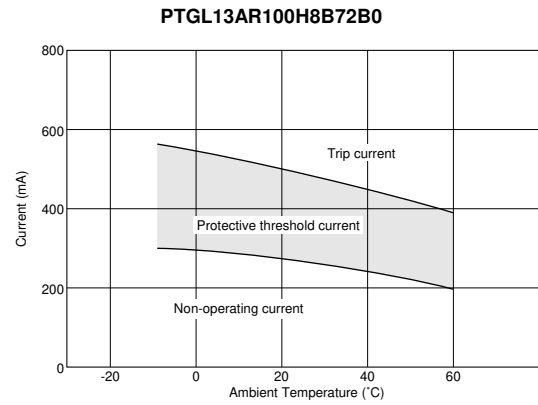


PTGL09AR250H8B52B0



Continued on the following page.

### ■ Protective Threshold Current Range (265V Series)





### ■ Operating Time 265V Series (Typical Curve)

PTGL07AR820M9A51B0



PTGL07AR650H8B52B0



PTGL07AR560M9A51B0



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## Operating Time 265V Series (Typical Curve)

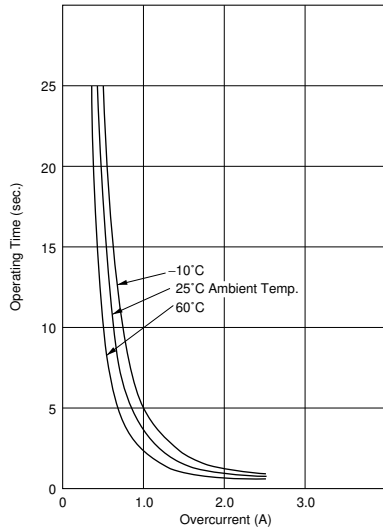
PTGL09AR390M9C61B0



PTGL09AR250H8B52B0



PTGL12AR270M9C01B0



PTGL12AR150H8B72B0



PTGL14AR180M9C01B0



PTGL13AR100H8B72B0



Continued on the following page.

Continued from the preceding page.

## Operating Time 265V Series (Typical Curve)

PTGL18AR6R0H8B72B0



## Application Circuit

### (1) Transistor Protection Circuit



### (2) Transformer Protection Circuit 1)



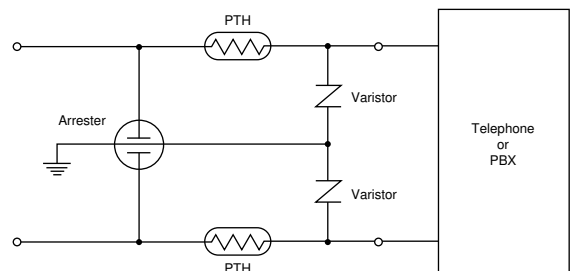
### (3) Transformer Protection Circuit 2)



### (4) Fluorescent Lamp Protection Circuit



### (5) Telecommunication Circuit



## PTGL Series Narrow Current Band Specifications and Test Methods

| No.           | Item                                   | Rating Value                                                                                                         | Method of Examination                                                                                                                                                                                                                                                                                                                                                                                                                             |               |       |              |       |              |       |
|---------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------|--------------|-------|--------------|-------|
| 1             | Operating Temperature                  | -30 to +85°C                                                                                                         | The temperature range with maximum voltage applied to the POSISTOR®.                                                                                                                                                                                                                                                                                                                                                                              |               |       |              |       |              |       |
| 2             | Storage Temperature                    | -40 to +125°C                                                                                                        | The temperature range with zero voltage.                                                                                                                                                                                                                                                                                                                                                                                                          |               |       |              |       |              |       |
| 3             | Resistance Value (at 25°C)             | Satisfies ratings                                                                                                    | Resistance value is measured by applying voltage under 1.0Vdc (by a direct current of less than 10mA) at 25°C. (But it must be measured after maximum voltage is applied for 180 seconds and then is left for 2 hours at 25°C.)                                                                                                                                                                                                                   |               |       |              |       |              |       |
| 4             | Withstanding Voltage                   | No problem                                                                                                           | We apply AC voltage 120% that of the maximum voltage to POSISTOR® by raising voltage gradually for 180±5 seconds at 25°C. (A protective resistor is to be connected in series, and the inrush current through POSISTOR® must be limited below maximum rated value.)                                                                                                                                                                               |               |       |              |       |              |       |
| 5             | Protective Threshold Current           | Satisfies ratings<br>(Trip Current, Non-operating Current)                                                           | Maximum current measured in this examination. Voltage is applied to POSISTOR® in 3 minutes step by step on still air based on "Protective Threshold Current Test Conditions" shown in next page. Stable current is measured at each step.                                                                                                                                                                                                         |               |       |              |       |              |       |
| 6             | Tensile Strength of Lead Wire Terminal | No damage                                                                                                            | <p>The load is gradually applied to each terminal of POSISTOR® until the force of the following table in the axial direction with fixing POSISTOR®'s body itself and this load is kept for 10 seconds.</p> <table><tr><th>Lead Diameter</th><th>Force</th></tr><tr><td>ø0.60mm max.</td><td>4.90N</td></tr><tr><td>ø0.65mm min.</td><td>9.80N</td></tr></table>                                                                                   | Lead Diameter | Force | ø0.60mm max. | 4.90N | ø0.65mm min. | 9.80N |
| Lead Diameter | Force                                  |                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |       |              |       |              |       |
| ø0.60mm max.  | 4.90N                                  |                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |       |              |       |              |       |
| ø0.65mm min.  | 9.80N                                  |                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |       |              |       |              |       |
| 7             | Bending Strength of Lead Wire Terminal | Lead wire does not come off                                                                                          | <p>POSISTOR® is held so that it is perpendicular to the lead wire with the following lead hanging in the axial direction of the lead wire.</p> <p>The lead wire is slowly bent toward 90° and returned. Then it is slowly bent in the opposite direction and returned to original state.</p> <table><tr><th>Lead Diameter</th><th>Force</th></tr><tr><td>ø0.60mm max.</td><td>2.45N</td></tr><tr><td>ø0.65mm min.</td><td>4.90N</td></tr></table> | Lead Diameter | Force | ø0.60mm max. | 2.45N | ø0.65mm min. | 4.90N |
| Lead Diameter | Force                                  |                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |       |              |       |              |       |
| ø0.60mm max.  | 2.45N                                  |                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |       |              |       |              |       |
| ø0.65mm min.  | 4.90N                                  |                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |       |              |       |              |       |
| 8             | Solderability                          | Solder is applied around the lead wire covering 3/4 or more of the circumference without gap in the axial direction. | The Lead wire of POSISTOR® is soaked in an Isopropyl Alcohol (JIS K 8839) solution (about 25wt%) of colophony (JIS K 5902) for 5-10 sec. Each lead wire is soaked in Molten solder (JIS Z 3282 H60A) at 235±5°C from the bottom to a point of 2.0-2.5mm for 2±0.5 seconds.                                                                                                                                                                        |               |       |              |       |              |       |
| 9             | Terminal Durability of Soldering       | ΔR/R25≤±15%                                                                                                          | <p>The lead wire of POSISTOR® is soaked in Molten solder (JIS Z 3282 H60A) at 350±10°C from the bottom to a point of 2.0-2.5mm for 3.5±0.5 seconds.</p> <p>After the device is left at room temperature (25°C) for 24±4 hours, the resistance is then measured.</p>                                                                                                                                                                               |               |       |              |       |              |       |
| 10            | Humidity Test                          | ΔR/R25≤±20%                                                                                                          | <p>POSISTOR® is set in an environmental chamber at 60±2°C and 90-95% humidity for 500±4 hours.</p> <p>After the device is left at room temperature (25°C) for one hour, the resistance measurement is then performed.</p>                                                                                                                                                                                                                         |               |       |              |       |              |       |
| 11            | Load Test at High Temperature          | ΔR/R25≤±20%                                                                                                          | POSISTOR® is set in an environmental chamber at 85±3°C with maximum voltage applied for 500±4 hours. After the device is left at room temperature (25°C) for one hour, the resistance measurement is performed. (A protective resistor is to be connected in series and the inrush current through POSISTOR® must be limited below maximum rated value.)                                                                                          |               |       |              |       |              |       |
| 12            | Load Cycle Test at Room Temperature    | ΔR/R25≤±20%                                                                                                          | POSISTOR® is set in a room temperature at 25±2°C with maximum voltage applied for 1 minute and then is left without voltage applied for 5 minutes. This cycle is repeated for 100 cycles, and after the device is left at room temperature (25°C) for one hour, the resistance measurement is performed. (A protective resistor is to be connected in series and the inrush current through POSISTOR® must be limited below maximum rated value.) |               |       |              |       |              |       |

Continued on the following page. 

## PTGL Series Narrow Current Band Specifications and Test Methods

Continued from the preceding page.

### ■ Protective Threshold Current Test Conditions

#### 1. Substrate

Materials: Phenol

Size: 50x50x1.6mm

Land Pattern: Cu land without through hole



#### 2. Measurement condition

Solder POSISTOR® on the substrate, then put the cover (150mm cubed) surround POSISTOR® to prevent flow of wind.



#### 3. Measurement circuit



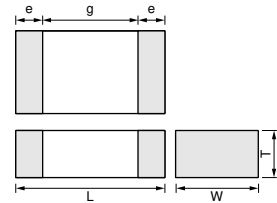
## PTGL Series Specifications and Test Methods

| Item                                   | Rating Value                                                                                                         | Method of Examination                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |       |              |       |              |       |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------|--------------|-------|--------------|-------|
| Continuous Operating Temperature       | -10 to +60 °C                                                                                                        | The temperature range with maximum voltage applied to the POSISTOR®.                                                                                                                                                                                                                                                                                                                                                                                     |               |       |              |       |              |       |
| Resistance Value (at 25°C)             | Satisfies ratings                                                                                                    | Resistance value is measured by applying voltage under 1.5Vdc (by a direct current of less than 10mA) at 25°C. (But it must be measured after maximum voltage is applied for 180 seconds and then is left for 2 hours at 25°C.)                                                                                                                                                                                                                          |               |       |              |       |              |       |
| Withstanding Voltage                   | No problem                                                                                                           | We apply AC voltage 120% that of the maximum voltage to POSISTOR® by raising voltage gradually for 180±5 seconds at 25°C. (A protective resistor is to be connected in series, and the inrush current through POSISTOR® must be limited below max. rated value.)                                                                                                                                                                                         |               |       |              |       |              |       |
| Tensile Strength of Lead Wire Terminal | No damage                                                                                                            | <div>The load is gradually applied to each terminal of POSISTOR® until the force of the following table in the axial direction with fixing POSISTOR®'s body itself and this load is being kept for 10 seconds.</div> <table><tr><th>Lead Diameter</th><th>Force</th></tr><tr><td>ø0.60mm max.</td><td>4.90N</td></tr><tr><td>ø0.65mm min.</td><td>9.80N</td></tr></table>                                                                                | Lead Diameter | Force | ø0.60mm max. | 4.90N | ø0.65mm min. | 9.80N |
| Lead Diameter                          | Force                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |       |              |       |              |       |
| ø0.60mm max.                           | 4.90N                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |       |              |       |              |       |
| ø0.65mm min.                           | 9.80N                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |       |              |       |              |       |
| Bending Strength of Lead Wire Terminal | Lead wire does not come off.                                                                                         | <div>POSISTOR® is held so that it is perpendicular to the lead wire with the following lead hanging in the axial direction of the lead wire. The lead wire is slowly bent toward 90° and returned. Then it is slowly bent in the opposite direction and returned to original state.</div> <table><tr><th>Lead Diameter</th><th>Force</th></tr><tr><td>ø0.60mm max.</td><td>2.45N</td></tr><tr><td>ø0.65mm min.</td><td>4.90N</td></tr></table>           | Lead Diameter | Force | ø0.60mm max. | 2.45N | ø0.65mm min. | 4.90N |
| Lead Diameter                          | Force                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |       |              |       |              |       |
| ø0.60mm max.                           | 2.45N                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |       |              |       |              |       |
| ø0.65mm min.                           | 4.90N                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |       |              |       |              |       |
| Solderability                          | Solder is applied around the lead wire covering 3/4 or more of the circumference without gap in the axial direction. | The Lead wire of POSISTOR® is soaked in an Isopropyl alcohol (JIS K 8839) or ethanol (JIS K 8101) solution (about 25wt%) of colophony (JIS K 5902) for 5 to 10 sec. And, each lead wire is soaked in Molten solder (JIS Z 3282 H60A) at 235±5°C from the bottom to a point of 2.0 to 2.5mm for 2±0.5 sec.                                                                                                                                                |               |       |              |       |              |       |
| Terminal Durability of Soldering       | ΔR/R25≤±15%                                                                                                          | The lead wire of POSISTOR® is soaked in Molten solder (JIS Z 3282 H60A) at 350±10°C from the bottom to a point of 2.0 to 2.5mm for 3.5±0.5 sec. And, after the device is being left at room temperature (25°C) for 24±4 hours, the resistance is measured.                                                                                                                                                                                               |               |       |              |       |              |       |
| Humidity Test                          | ΔR/R25≤±20%                                                                                                          | POSISTOR® is set in an environmental chamber at 40±2°C and 90 to 95% humidity for 500±4 hours. And after the device is being left at room temperature (25°C) for one hour, the resistance measurement is performed.                                                                                                                                                                                                                                      |               |       |              |       |              |       |
| Load Cycle Test at High Temperature    | ΔR/R25≤±20%                                                                                                          | POSISTOR® is set in an environmental chamber at 60±3°C with maximum voltage applied for 1.5 hours and then is left without voltage applied for 0.5 hours. This cycle is repeated for 1000±10 hours, and after the device is left at room temperature (25°C) for one hour, the resistance measurement is performed. (A protective resistor is to be connected in series and the inrush current through POSISTOR® must be limited below max. rated value.) |               |       |              |       |              |       |

***muRata***

This chip PTC Thermistor is reflow soldering SMD type for overheat sensing for power transistors, power diodes and power ICs in hybrid circuits.

1. SMD type is helpful for miniaturizing circuits because of its small size and light weight.
2. Excellent thermal response due to small size
3. Solid-state construction provides excellent mechanical vibration and impact resistance.
4. Contactless operation provides noiseless operation.
5. Lead is not contained in the terminations.



| Part Number     | Dimensions (mm) |          |          |             |          |
|-----------------|-----------------|----------|----------|-------------|----------|
|                 | L               | W        | T        | e           | g        |
| <b>PRF15 RC</b> | 1.0±0.05        | 0.5±0.05 | 0.5±0.05 | 0.15 to 0.4 | 0.3 min. |
| <b>PRF18 RB</b> | 1.6±0.15        | 0.8±0.15 | 0.8±0.15 | 0.1 to 0.6  | -        |
| <b>PRF21 RA</b> | 2.0±0.2         | 1.25±0.2 | 0.9±0.2  | 0.2 min.    | 0.5 min. |

| Part Number     | Sensing Temperature<br>(at 4.7k ohm)<br>(°C) | Maximum<br>Voltage<br>(V) | Resistance<br>(at 25°C)<br>(ohm) | Temperature Range<br>(°C) |
|-----------------|----------------------------------------------|---------------------------|----------------------------------|---------------------------|
| PRF15BC471QB1RC | 105 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 120                |
| PRF15BB471QB1RC | 115 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 130                |
| PRF15BA471QB1RC | 125 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 140                |

| Part Number     | Sensing Temperature<br>(at 4.7k ohm)<br>(°C) | Maximum<br>Voltage<br>(V) | Resistance<br>(at 25°C)<br>(ohm) | Temperature Range<br>(°C) |
|-----------------|----------------------------------------------|---------------------------|----------------------------------|---------------------------|
| PRF18BG471QB1RB | 65 ±5°C                                      | 32                        | 470 ±50%                         | -20 to 80                 |
| PRF18BF471QB1RB | 75 ±5°C                                      | 32                        | 470 ±50%                         | -20 to 90                 |
| PRF18BE471QB1RB | 85 ±5°C                                      | 32                        | 470 ±50%                         | -20 to 100                |
| PRF18BD471QB1RB | 95 ±5°C                                      | 32                        | 470 ±50%                         | -20 to 110                |
| PRF18BC471QB1RB | 105 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 120                |
| PRF18BB471QB1RB | 115 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 130                |
| PRF18BA471QB1RB | 125 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 140                |
| PRF18AR471QB1RB | 135 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 150                |
| PRF18AS471QB1RB | 145 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 160                |

| Part Number     | Sensing Temperature<br>(at 4.7k ohm)<br>(°C) | Maximum<br>Voltage<br>(V) | Resistance<br>(at 25°C)<br>(ohm) | Temperature Range<br>(°C) |
|-----------------|----------------------------------------------|---------------------------|----------------------------------|---------------------------|
| PRF21BE471QB1RA | 85 ±5°C                                      | 32                        | 470 ±50%                         | -20 to 100                |
| PRF21BD471QB1RA | 95 ±5°C                                      | 32                        | 470 ±50%                         | -20 to 110                |
| PRF21BC471QB1RA | 105 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 120                |
| PRF21BB471QB1RA | 115 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 130                |
| PRF21BA471QB1RA | 125 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 140                |
| PRF21AR471QB1RA | 135 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 150                |
| PRF21AS471QB1RA | 145 ±5°C                                     | 32                        | 470 ±50%                         | -20 to 160                |

***muRata***

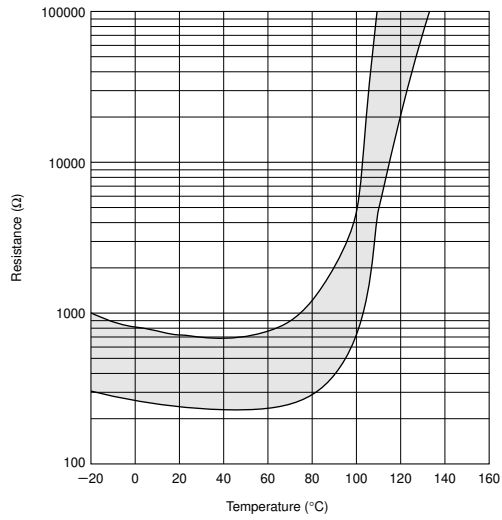
***muRata***



## Chip Type (Ref. Only)

### Resistance - Temperature Characteristics Range

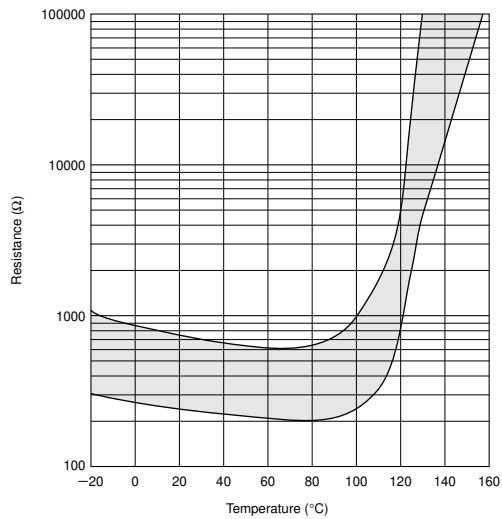
PRF15BC471QB1RC



PRF15BB471QB1RC



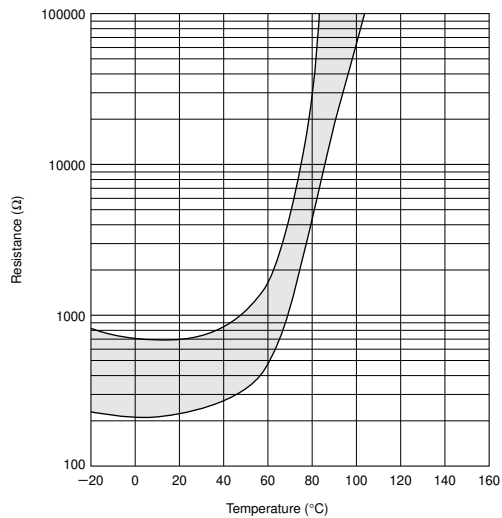
PRF15BA471QB1RC



PRF18/21BG471Q Type



PRF18/21BF471Q Type



PRF18/21BE471Q Type

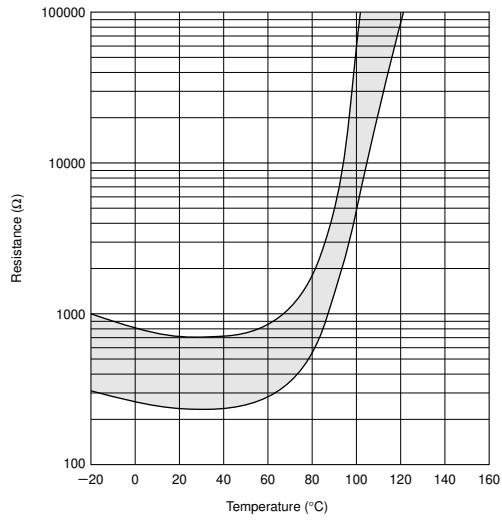


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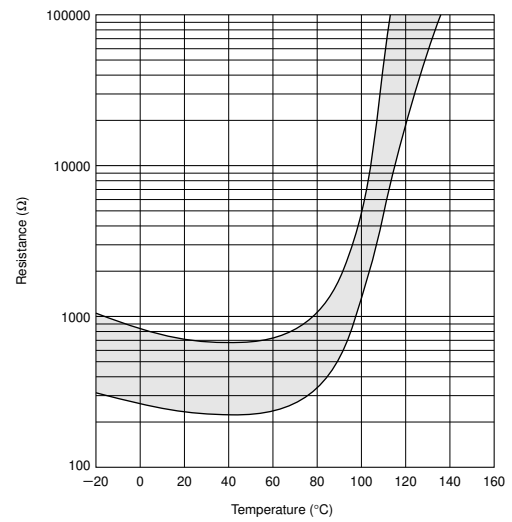
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### ■ Resistance - Temperature Characteristics Range

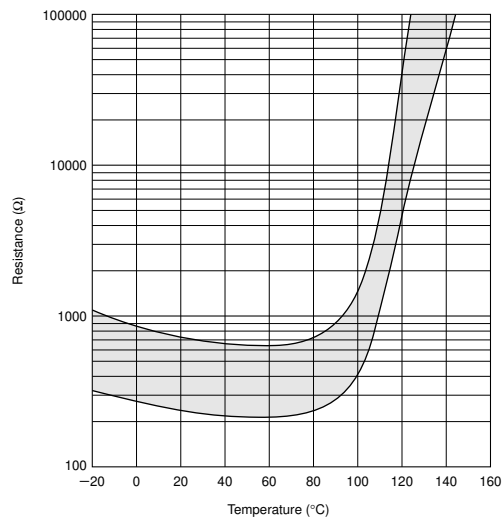
**PRF18/21BD471Q Type**



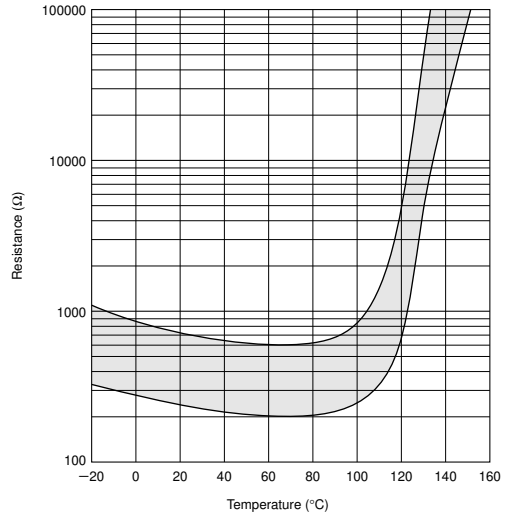
PRF18/21BC471Q Type



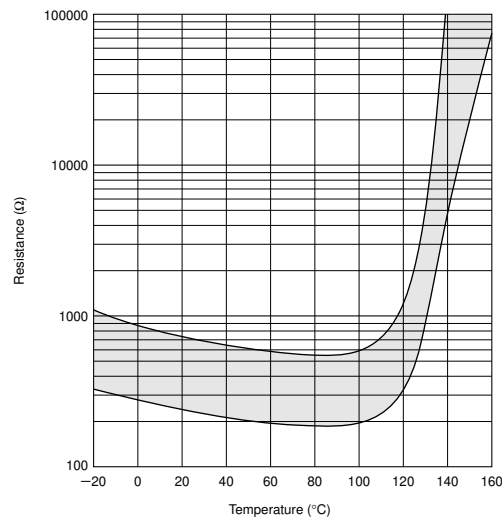
PRF18/21BB471Q Type



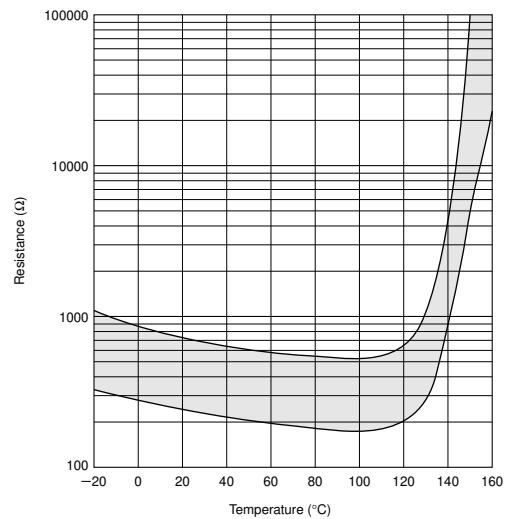
PRF18/21BA471Q Type



**PRF18/21AR471Q Type**



PRF18/21AS471Q Type



## Chip Tight Tolerance Type (Ref. Only)

### Resistance - Temperature Characteristics Range

PRF18BE471RB1RB



PRF18BD471RB1RB



PRF18BC471RB1RB



PRF18BB471RB1RB



## Chip Type Specifications and Test Methods (PRF15 Series)

### ■ PRF15 Series

| No.  | Item                       | Rating Value                                                                                | Method of Examination                                                                                                                                                                                                                                                                                                            |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
|------|----------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------|---------------|---|------------|----|---|------------|-------|---|-------------|----|---|------------|-------|
| 1    | Resistance Value (at 25°C) | The resistance value should be within the specified tolerance.                              | After applying maximum operating voltage for 3 minutes and leaving for 2 hours at 25°C, measured by applying voltage of less than 1.5Vdc (by a direct current of less than 10mA).                                                                                                                                                |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 2    | Vibration                  | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 8.2<br>Soldered PTC to PCB<br>Vibration: 10-55-10Hz (1 min.)<br>Width: 1.5mm<br>Vibrate for 2 hours in each of 3 mutually perpendicular planes for a total of 6 hours.                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 3    | Solderability              | Min. 75% electrode is covered with new solder.<br>Resistance change: not to exceed ±20% (*) | JIS C 5102 term 8.4<br>Solder: Sn 63%/Pb 37% (or 60/40%)<br>Solder temp: 230±5°C<br>Soaking time: 3±0.5 seconds.<br>Soaking position: Until a whole electrode is soaked.                                                                                                                                                         |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 4    | Solder-heatability         | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | Solder: Sn 63%/Pb 37% (or 60/40%)<br>Flux: Solder paste containing less than 0.2wt% of chlorine.<br>Preheating: 150±5°C 3 minutes.<br>Peak temp.: 260±5°C 10±5 seconds. (reflow)<br>PCB: Glass Epoxy PCB (JIS C 6484)                                                                                                            |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 5    | Temperature Cycling        | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 9.3<br>Times: 5 cycles <table><tr><th>Step</th><th>Temp. (°C)</th><th>Time (minute)</th></tr><tr><td>1</td><td>-20 +0, -3</td><td>30</td></tr><tr><td>2</td><td>Room temp.</td><td>10-15</td></tr><tr><td>3</td><td>+150 +3, -0</td><td>30</td></tr><tr><td>4</td><td>Room temp.</td><td>10-15</td></tr></table> | Step | Temp. (°C) | Time (minute) | 1 | -20 +0, -3 | 30 | 2 | Room temp. | 10-15 | 3 | +150 +3, -0 | 30 | 4 | Room temp. | 10-15 |
| Step | Temp. (°C)                 | Time (minute)                                                                               |                                                                                                                                                                                                                                                                                                                                  |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 1    | -20 +0, -3                 | 30                                                                                          |                                                                                                                                                                                                                                                                                                                                  |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 2    | Room temp.                 | 10-15                                                                                       |                                                                                                                                                                                                                                                                                                                                  |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 3    | +150 +3, -0                | 30                                                                                          |                                                                                                                                                                                                                                                                                                                                  |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 4    | Room temp.                 | 10-15                                                                                       |                                                                                                                                                                                                                                                                                                                                  |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 6    | Humidity Test              | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 9.5<br>40±2°C, 90-95%RH leave for 500±8 hours.                                                                                                                                                                                                                                                                   |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 7    | High Temperature Load Test | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 9.10<br>85±5°C (in air), load maximum operating voltage for 1000±12 hours.                                                                                                                                                                                                                                       |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |

(\*) Measurement resistance after the test by applying voltage of less than 1.5Vdc by a direct current of less than 10mA after product is left at 25 $\pm 2^\circ\text{C}$  for 2 hours.

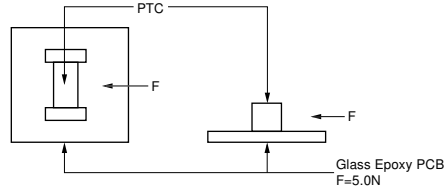
Above mentioned soldering in "2. Vibration" is done following condition at our side.

- Glass-Epoxy PC board
- Standard land dimension
- Standard solder paste
- Standard solder profile

Above conditions are mentioned in Notice.

## Chip Type Specifications and Test Methods (PRF18/21 Series)

### ■ PRF18/21 Series

| No.  | Item                       | Rating Value                                                                                | Method of Examination                                                                                                                                                                                                                                                                                                                                                     |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
|------|----------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------|---------------|---|------------|----|---|------------|-------|---|-------------|----|---|------------|-------|
| 1    | Resistance Value (at 25°C) | The resistance value should be within the specified tolerance.                              | After applying maximum operating voltage for 3 minutes and leaving for 2 hours at 25°C, measured by applying voltage of less than 1.5Vdc (by a direct current of less than 10mA).                                                                                                                                                                                         |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 2    | Adhesive Strength          | There is no sign of electrode exfoliation                                                   | EIAJ ET-7403 term 9<br>Solder PTC to PCB and add a force of 5.0N in the direction shown below.<br>                                                                                                                                                                                      |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 3    | Vibration                  | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 8.2<br>Soldered PTC to PCB<br>Vibration: 10-55-10Hz (1 min.)<br>Width: 1.5mm<br>Vibrate for 2 hours in each of 3 mutually perpendicular planes for a total of 6 hours.                                                                                                                                                                                    |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 4    | Solderability              | Min. 75% electrode is covered with new solder.<br>Resistance change: not to exceed ±20% (*) | JIS C 5102 term 8.4<br>Solder: Sn 63%/Pb 37% (or 60/40%)<br>Solder temp: 230±5°C<br>Soaking time: 3±0.5 seconds.<br>Soaking position: Until a whole electrode is soaked.                                                                                                                                                                                                  |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 5    | Solder-heatability         | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | Solder: Sn 63%/Pb 37% (or 60/40%)<br>Flux: Solder paste containing less than 0.2wt% of chlorine.<br>Preheating: 150±5°C 3 minutes.<br>Peak temp.: 260±5°C 10±5 seconds. (reflow)<br>PCB: Glass Epoxy PCB (JIS C 6484)                                                                                                                                                     |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 6    | Temperature Cycling        | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 9.3<br>Times: 5 cycles <table border="1"><thead><tr><th>Step</th><th>Temp. (°C)</th><th>Time (minute)</th></tr></thead><tbody><tr><td>1</td><td>-20 +0, -3</td><td>30</td></tr><tr><td>2</td><td>Room temp.</td><td>10-15</td></tr><tr><td>3</td><td>+150 +3, -0</td><td>30</td></tr><tr><td>4</td><td>Room temp.</td><td>10-15</td></tr></tbody></table> | Step | Temp. (°C) | Time (minute) | 1 | -20 +0, -3 | 30 | 2 | Room temp. | 10-15 | 3 | +150 +3, -0 | 30 | 4 | Room temp. | 10-15 |
| Step | Temp. (°C)                 | Time (minute)                                                                               |                                                                                                                                                                                                                                                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 1    | -20 +0, -3                 | 30                                                                                          |                                                                                                                                                                                                                                                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 2    | Room temp.                 | 10-15                                                                                       |                                                                                                                                                                                                                                                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 3    | +150 +3, -0                | 30                                                                                          |                                                                                                                                                                                                                                                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 4    | Room temp.                 | 10-15                                                                                       |                                                                                                                                                                                                                                                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 7    | Humidity Test              | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 9.5<br>40±2°C, 90-95%RH leave for 500±8 hours.                                                                                                                                                                                                                                                                                                            |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 8    | High Temperature Load Test | Normal appearance<br>Resistance change: not to exceed ±20% (*)                              | JIS C 5102 term 9.10<br>85±5°C (in air), load maximum operating voltage for 1000±12 hours.                                                                                                                                                                                                                                                                                |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |

(\*) Measurement resistance after the test by applying voltage of less than 1.5Vdc by a direct current of less than 10mA after product is left at 25 $\pm$ 2°C for 2 hours.

Above mentioned soldering in "2. Adhesive Strength" and "3. Vibration" is done following condition at our side.

- Glass-Epoxy PC board
- Standard land dimension
- Standard solder paste
- Standard solder profile

Above conditions are mentioned in Notice.

## Chip Tight Tolerance Type Specifications and Test Methods

| No.  | Item                       | Rating Value                                                                                 | Method of Examination                                                                                                                                                                                                                                                                                                                                                     |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
|------|----------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------|---------------|---|------------|----|---|------------|-------|---|-------------|----|---|------------|-------|
| 1    | Resistance Value (at 25°C) | The resistance value should be within the specified tolerance.                               | After applying maximum operating voltage for 3 minutes and leaving for 2 hours at 25°C, measured by applying voltage of less than 1.5Vdc. (by a direct current of less than 10mA).                                                                                                                                                                                        |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 2    | Adhesive Strength          | There is no sign of electrode exfoliation                                                    | EIAJ ET-7403 term 9<br>Solder PTC to PCB and add a force of 5.0N in the direction shown below.<br>                                                                                                                                                                                      |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 3    | Vibration                  | Normal appearance<br>Resistance change: not to exceed ±20% (*1)                              | JIS C 5102 term 8.2<br>Soldered PTC to PCB<br>Vibration: 10-55-10Hz (1 min.)<br>Width: 1.5mm<br>Vibrate for 2 hours in each of 3 mutually perpendicular planes for a total of 6 hours.                                                                                                                                                                                    |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 4    | Solderability              | Min. 75% electrode is covered with new solder.<br>Resistance change: not to exceed ±20% (*1) | JIS C 5102 term 8.4<br>Solder: Sn 63%/Pb 37% (or 60/40%)<br>Solder temp: 230±5°C<br>Soaking time: 3±0.5 seconds.<br>Soaking position: Until a whole electrode is soaked                                                                                                                                                                                                   |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 5    | Solder-heatability         | Normal appearance<br>Resistance change: not to exceed ±20% (*1)                              | Solder: Sn 63%/Pb 37% (or 60/40%)<br>Flux: Solder paste containing less than 0.2wt% of chlorine.<br>Preheating: 150±5°C 3 minutes.<br>Peak temp.: 260±5°C 10±5 seconds. (reflow)<br>PCB: Glass Epoxy PCB (JIS C 6484)                                                                                                                                                     |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 6    | Temperature Cycling        | Normal appearance<br>Resistance change: not to exceed ±20% (*1, 2)                           | JIS C 5102 term 9.3<br>Times: 5 cycles <table border="1"><thead><tr><th>Step</th><th>Temp. (°C)</th><th>Time (minute)</th></tr></thead><tbody><tr><td>1</td><td>-20 +0, -3</td><td>30</td></tr><tr><td>2</td><td>Room temp.</td><td>10-15</td></tr><tr><td>3</td><td>+150 +3, -0</td><td>30</td></tr><tr><td>4</td><td>Room temp.</td><td>10-15</td></tr></tbody></table> | Step | Temp. (°C) | Time (minute) | 1 | -20 +0, -3 | 30 | 2 | Room temp. | 10-15 | 3 | +150 +3, -0 | 30 | 4 | Room temp. | 10-15 |
| Step | Temp. (°C)                 | Time (minute)                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 1    | -20 +0, -3                 | 30                                                                                           |                                                                                                                                                                                                                                                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 2    | Room temp.                 | 10-15                                                                                        |                                                                                                                                                                                                                                                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 3    | +150 +3, -0                | 30                                                                                           |                                                                                                                                                                                                                                                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 4    | Room temp.                 | 10-15                                                                                        |                                                                                                                                                                                                                                                                                                                                                                           |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 7    | Humidity Test              | Normal appearance<br>Resistance change: not to exceed ±20% (*1, 2)                           | JIS C 5102 term 9.5<br>40±2°C, 90-95%RH leave for 500±8 hours.                                                                                                                                                                                                                                                                                                            |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |
| 8    | High Temperature Load Test | Normal appearance<br>Resistance change: not to exceed ±20% (*1, 2)                           | JIS C 5102 term 9.10<br>85±5°C (in air), load maximum operating voltage for 1000±12 hours.                                                                                                                                                                                                                                                                                |      |            |               |   |            |    |   |            |       |   |             |    |   |            |       |

(\*1) Measurement resistance after the test by applying voltage of less than 1.5Vdc by a direct current of less than 10mA after product is left at  $25 \pm 2^\circ\text{C}$  for 2 hours.

(\*2) Sensing temp. change: not to exceed  $\pm 1^\circ\text{C}$

Above mentioned soldering in "2. Adhesive Strength" and "3. Vibration" is done following condition at our side.

- Glass-Epoxy PC board
- Standard land dimension
- Standard solder paste
- Standard solder profile

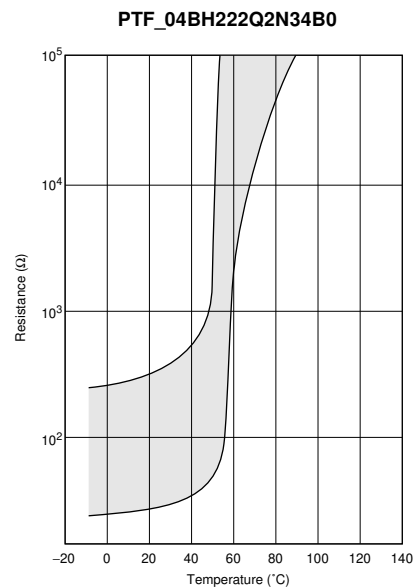
Above conditions are mentioned in Notice.

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### ■ Resistance - Temperature Characteristics Range (Ref. Only)



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### ■ Resistance - Temperature Characteristics Range (Ref. Only)

## For Temperature Sensor Lead Type Specifications and Test Methods

| No.    | Item                                   | Rating Value                                                                                                                                                                        | Method of Examination                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |       |      |       |      |       |
|--------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|------|-------|------|-------|
| 1      | Resistance Value                       | Satisfies specification                                                                                                                                                             | Resistance value is measured by applying voltage under 1.5Vdc (by a direct current of less than 10mA) in a silicone oil vessel.                                                                                                                                                                                                                                                                                                                                                |        |       |      |       |      |       |
| 2      | Withstanding Voltage                   | No problem                                                                                                                                                                          | We apply AC voltage 120% that of the maximum voltage to POSISTOR® by raising voltage gradually for 180±5 seconds at 25°C. (A protective resistor is to be connected in series, and the inrush current through POSISTOR® must be limited below max. rated value.)                                                                                                                                                                                                               |        |       |      |       |      |       |
| 3      | Tensile Strength of Lead Wire Terminal | No damage                                                                                                                                                                           | <p>The load is gradually applied to each terminal of POSISTOR® until the force of the following table in the axial-direction with fixing POSISTOR®'s body itself and this load is kept for 10 seconds.</p> <table><tr><th>Series</th><th>Force</th></tr><tr><td>PTFL</td><td>4.90N</td></tr><tr><td>PTFM</td><td>9.80N</td></tr></table>                                                                                                                                       | Series | Force | PTFL | 4.90N | PTFM | 9.80N |
| Series | Force                                  |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |       |      |       |      |       |
| PTFL   | 4.90N                                  |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |       |      |       |      |       |
| PTFM   | 9.80N                                  |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |       |      |       |      |       |
| 4      | Bending Strength of Lead Wire Terminal | Lead wire does not come off.                                                                                                                                                        | <p>POSISTOR® is held so that it is perpendicular to the lead wire with the following load hanging in the axial direction of the lead wire. The lead wire is slowly bent toward 90° and returned; then it is slowly bent in the opposite direction and returned to original state. (Above mentioned procedure is done slowly with one cycle.)</p> <table><tr><th>Series</th><th>Force</th></tr><tr><td>PTFL</td><td>2.45N</td></tr><tr><td>PTFM</td><td>4.90N</td></tr></table> | Series | Force | PTFL | 2.45N | PTFM | 4.90N |
| Series | Force                                  |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |       |      |       |      |       |
| PTFL   | 2.45N                                  |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |       |      |       |      |       |
| PTFM   | 4.90N                                  |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |       |      |       |      |       |
| 5      | Solderability                          | Solder is applied around the lead wire covering 3/4 or more of the circumference without gap in the axial-direction.                                                                | The lead wire of POSISTOR® is soaked in a Isopropyl Alcohol (JIS K 8839) or ethanol (JIS K 8101) solution (about 25wt%) of colophony (JIS K 5902) for 5-10 sec. And, each lead wire is soaked in molten solder (JIS Z 3282 H60A) at 235±5°C from the bottom to a point of 2.0-2.5mm for 2±0.5 seconds.                                                                                                                                                                         |        |       |      |       |      |       |
| 6      | Terminal Durability of Soldering       | $\Delta R/R25 \leq \pm 15\%$                                                                                                                                                        | The lead wire of POSISTOR® is soaked in molten solder (JIS Z 3282 H60A) at 350±10°C from the bottom to a point of 2.0-2.5 mm for 3.5±0.5 seconds. And, after the device is left at room temperature (25°C) for 24±4 hours, the resistance is measured.                                                                                                                                                                                                                         |        |       |      |       |      |       |
| 7      | Humidity Test                          | $\Delta R/R25 \leq \pm 20\%$                                                                                                                                                        | POSISTOR® is set in an environmental chamber at 40±2°C and 90-95% humidity for 500±4 hours. And after the device is left at room temperature (25°C) for one hour, the resistance measurement is performed.                                                                                                                                                                                                                                                                     |        |       |      |       |      |       |
| 8      | Load Cycle Test at High Temperature    | $\Delta R/R25 \leq \pm 20\%$ <div><p style="text-align: center;">S.W.<br/>Test circuit</p></div> | <p>POSISTOR® is set in an environmental chamber at 85±3°C with maximum voltage applied for 1.5 hours and then is left without voltage applied for 0.5 hours. This cycle is repeated for 1000±10 hours, and after the device is left at room temperature (25°C) for one hour, the resistance measurement is performed. (A protective resistor is to be connected in series and the inrush current through POSISTOR® must be limited below max. rated value.)</p>                |        |       |      |       |      |       |

## ⚠ Caution/Notice

### ■ ⚠ Caution (Storage and Operating Condition)

This product is designed for application in an ordinary environment (normal room temperature, humidity and atmospheric pressure). Do not use under the following conditions because all these factors can deteriorate the characteristics or cause product failure and burn-out.

1. Corrosive gas or deoxidizing gas (Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
2. Volatile or flammable gas
3. Dusty conditions
4. Under vacuum, or under high or low-pressure
5. Wet or humid conditions
6. Places with salt water, oils, chemical liquids or organic solvents
7. Strong vibrations
8. Other places where similar hazardous conditions exist

### ■ ⚠ Caution (Other)

Be sure to provide an appropriate fail-safe function on your product to prevent secondary damage that may be caused by the abnormal function or the failure of our product.

### ■ Notice (Storage and Operating Condition)

To keep solderability of product from declining, following storage condition is recommended.

1. Storage condition:
  - Temperature -10 to +40 degrees C
  - Humidity less than 75%RH (not dewing condition)
2. Storage term:
  - Use this product within 6 months after delivery by first-in and first-out stocking system.
3. Handling after unpacking:
  - After unpacking, promptly reseal this product or store it in a sealed container with a drying agent.
4. Storage place:
  - Do not store this product in corrosive gas (sulfuric acid, chlorine, etc.) or in direct sunlight.

### ■ Notice (Soldering and Mounting)

#### PTGL Series

When the lead of this product is soldered, pay attention as follows to avoid the decline of element characteristics or break-down of the element.

1. Use Rosin type flux or non-activated flux
2. Do not dip the body into flux.
  - (flux should be coated to lead wire only for soldering.)
3. Be sure that preheating does not melt the soldering of this product.

### ■ Notice (Soldering and Mounting)

#### PTFL/PTFM Series

1. PTFM type is to be screwed beside the Power Transistor on the radiative plate.
2. If PTFL type is to be mounted with thermal cement, the cement should not be of the Cyano Acrylate family.
3. Please bend the lead wire far from the root of the body and do not apply force to the lead wire of the product.
4. When the lead of this product is soldered, pay attention as follows to avoid the decline of element characteristics or break-down of the element.
  - (1) Use Rosin type flux or non-activated flux.
  - (2) Do not dip the body into flux.
    - (Flux should be coated to lead wire only for soldering.)
  - (3) Be sure that preheating does not melt the soldering of this product.

## ■ Notice (Soldering and Mounting) PRG/PRF Series

### (1) Solder Paste

For your reference, we are using

manufactured by Alpha Metals Japan Ltd.

manufactured by Senju Metal Industry Co., LTD for any

Internal tests of this product.

(2) Flux

(with halide content exceeding 0.2wt%).

To remove the flux after soldering, observe the following points in order to avoid deterioration of the characteristics or any change to the external electrodes quality.

| Solvent    | Dipping Cleaning                                                                  | Ultrasonic Cleaning                                                     |
|------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 2-propanol | Less than 5 minutes<br>at room temp.<br>or<br>Less than 2 minutes<br>at 40°C max. | Less than 1 minute<br>20W/L Frequency<br>of several 10kHz<br>to 100kHz. |

## (2) Drying

In your mounting process, observe the following points in order to avoid deterioration of the characteristics or destruction of this product. The mounting quality of this product may also be affected by the mounting conditions, shown in the points below.

### (1) Printing Conditions of Solder Paste

- (a) Standard thickness of solder paste printing should be from 0.15 to 0.20 mm.
- (b) After soldering, the solder fillet should be a height from 0.2 mm to the thickness of this product (see the figure at right).
- (c) Too much solder gives too strong mechanical stress to this product. Such stress may cause cracking or other mechanical damage. Also, it can destroy the electrical performance of this product.



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## ⚠ Caution/Notice

Continued from the preceding page.

### (2) Allowable Soldering Temperature and Time

- Solder within the temperature and time combinations, indicated by the slanted lines in the graphs at right.
- The excessive soldering conditions may cause dissolution of metallization or deterioration of solder-wetting on the external electrode.
- In the event that soldering is repeated more than twice, the allowable reflow soldering time should be the accumulated soldering time.

Allowable Reflow Soldering Temp. and Time



### (3) Standard Temperature Profile for Soldering

- Insufficient preheating may cause a crack on ceramic body. Difference between preheating temperature and maximum temperature in the profile should be 100°C.
- Rapid cooling by dipping in solvent or by other means is not recommended.

Reflow Soldering Conditions



Preheating: 150±10°C, 1 to 2 minutes  
 Soldering: 240°C, 20 seconds max.

\*In the event that soldering is repeated more than twice the accumulated soldering time should be in the above allowable soldering time (2).

- There may be a risk of unexpected failures (tombstone, insufficient solder-wetting, etc.) in the mounting process, caused by the mounting conditions. Please make sure that this product is correctly mounted under specified mounting conditions.

## ⚠Caution/Notice

### ■ Notice (Handling)

#### PTGL Series

1. Do not apply an excessive force to the lead.  
Otherwise, it may cause the junction between lead and element to break, or may crack the element.  
Therefore, holding the element side lead wire is recommended when lead wire is bent or cut.
2. This product does not have waterproof construction. Splashed water may cause failure mode such as decline of characteristics or current leak.
3. When this product is operated, temperature of some area may be over 100 to 160 degrees C. Be sure that surrounding parts and inserting material can withstand the temperature. If the surrounding part and material are kept under such condition, they may deteriorate or produce harmful gas (Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.). And such harmful gas may deteriorate the element.

### ■ Notice (Handling)

#### PTFL/PTFM Series

1. Do not apply an excessive force to the lead.  
Otherwise, it may cause the junction between lead and element to break, or may crack the element.  
Therefore, holding the element side lead wire is recommended when lead wire is bent or cut.
2. This product does not have waterproof construction.  
Splashed water may cause failure mode such as decline of characteristics or current leak.

### ■ Notice (Handling)

#### PRG/PRF Series

1. When this product is operated, temperature of some area may be over 100 to 150 degrees C. Be sure that surrounding parts and inserting material can withstand the temperature. If the surrounding part and material are kept under such condition, they may deteriorate or produce harmful gas (Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.). And such harmful gas may deteriorate the element.
2. Do not assemble this product with air-sealing or resin casting. Such sealing may deteriorate element.

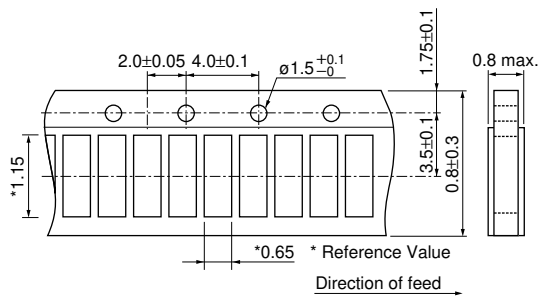
## PRG/PRF Series Package

### Minimum Quantity Guide

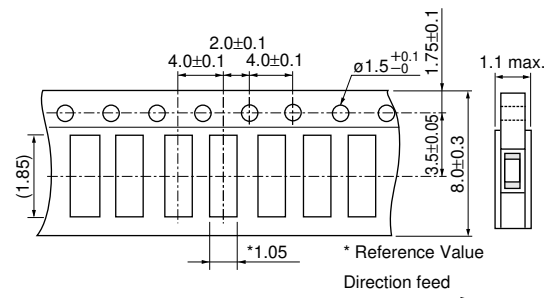
| Part Number | Quantity (pcs.) |               |
|-------------|-----------------|---------------|
|             | Paper Tape      | Embossed Tape |
| PRF15_RC    | 10000           | -             |
| PR*18_RB    | 4000            | -             |
| PR*21_RA    | -               | 4000          |
| PR*21_RK    | -               | 3000          |

### Tape Dimensions

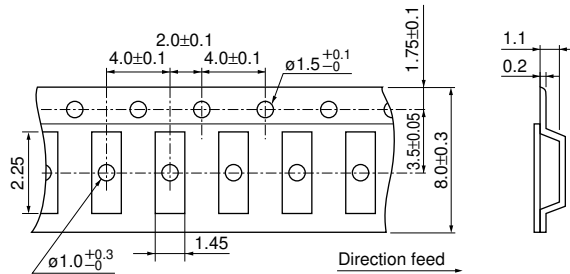
PRF15\_RC Series: Paper Tape



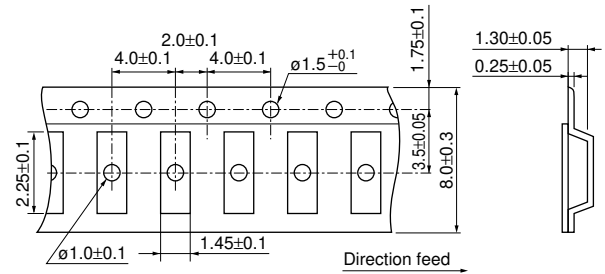
PR\*18\_RB Series: Paper Tape



PR\*21\_RA Series: Embossed Tape

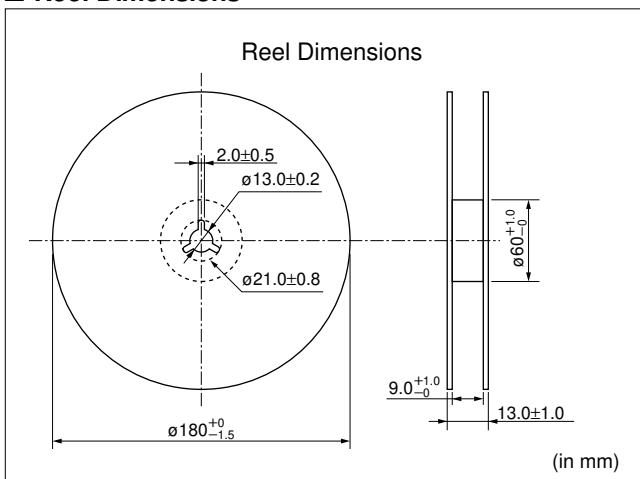


PR\*21\_RK Series: Embossed Tape



(in mm)

### Reel Dimensions



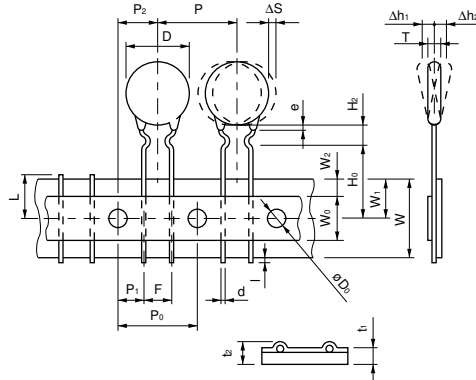
(in mm)



## Lead Type PTGL Series Package

Continued from the preceding page.

### ■ 24 - 80V/Narrow Current Band 30 - 140V Series Taping Dimensions



| Item                                              | Code                              | Dimensions (mm)                      | Note                                             |
|---------------------------------------------------|-----------------------------------|--------------------------------------|--------------------------------------------------|
| Pitch of Component                                | P                                 | 12.7                                 | Tolerance is determined by ΔS.                   |
| Pitch of Sprocket Hole                            | P <sub>0</sub>                    | 12.7±0.3                             |                                                  |
| Lead Spacing                                      | F                                 | 5.0 <sup>+0.8</sup> <sub>-0.3</sub>  |                                                  |
| Length from Hole Center to Lead                   | P <sub>1</sub>                    | 3.85±0.8                             |                                                  |
| Length from Hole Center to Component Center       | P <sub>2</sub>                    | 6.35±1.3                             | Deviation in the feeding direction               |
| Body Diameter                                     | D                                 | Please see in Ratings                |                                                  |
| Body Thickness                                    | T                                 | Please see in Ratings                |                                                  |
| Deviation along Tape, Left or Right Defect        | ΔS                                | ±1.5                                 | Including the inclination caused by lead bending |
| Carrier Tape Width                                | W                                 | 18.0±0.5                             |                                                  |
| Position of Sprocket Hole                         | W <sub>1</sub>                    | 9.0 <sup>+0.5</sup> <sub>-0.75</sub> | Deviation of tape width                          |
| Lead Distance between Reference and Bottom Planes | H <sub>0</sub>                    | 16.0±1.0                             |                                                  |
|                                                   | H <sub>2</sub>                    | 6.0 max.                             |                                                  |
| Protrusion Length                                 | I                                 | +0.5 to -1.0                         |                                                  |
| Diameter of Sprocket Hole                         | D <sub>0</sub>                    | 4.0±0.2                              |                                                  |
| Lead Diameter                                     | d                                 | Please see in Ratings                |                                                  |
| Total Tape Thickness                              | t <sub>1</sub>                    | 0.6±0.3                              |                                                  |
| Total Thickness of Tape and Lead Wire             | t <sub>2</sub>                    | 2.0 max.                             |                                                  |
| Deviation across Tape                             | Δh <sub>1</sub> , Δh <sub>2</sub> | 1.5 max.                             |                                                  |
| Portion to cut in Case of Defect                  | L                                 | 11.0 <sup>+0</sup> <sub>-2.0</sub>   |                                                  |
| Hold Down Tape Width                              | W <sub>0</sub>                    | 11.0 min.                            |                                                  |
| Hold Down Tape Position                           | W <sub>2</sub>                    | 4.0 max.                             |                                                  |
| Coating Extension on Lead                         | e                                 | Up to the center of crimp            |                                                  |

Continued on the following page. ↗

## Lead Type PTGL Series Package

Continued from the preceding page.

### ■ 125/250/265V Series Taping Dimensions



| Item                                              | Code                              | Dimensions (mm)                      | Note                                              |
|---------------------------------------------------|-----------------------------------|--------------------------------------|---------------------------------------------------|
| Pitch of Component                                | P                                 | 12.7                                 | Tolerance is determined by ΔS.                    |
| Pitch of Sprocket Hole                            | P <sub>0</sub>                    | 12.7±0.3                             |                                                   |
| Lead Spacing                                      | F                                 | 5.0 <sup>+0.8</sup> <sub>-0.3</sub>  |                                                   |
| Length from Hole Center to Lead                   | P <sub>1</sub>                    | 3.85±0.8                             |                                                   |
| Length from Hole Center to Component Center       | P <sub>2</sub>                    | 6.35±1.3                             | Deviation in the feeding direction                |
| Body Diameter                                     | D                                 | Please see Ratings                   |                                                   |
| Body Thickness                                    | T                                 | Please see Ratings                   |                                                   |
| Deviation along Tape, Left or Right               | ΔS                                | ±1.5                                 | Including the inclination caused by lead bending. |
| Carrier Tape Width                                | W                                 | 18.0±0.5                             |                                                   |
| Position of Sprocket Hole                         | W <sub>1</sub>                    | 9.0 <sup>+0.5</sup> <sub>-0.75</sub> | Deviation of tape width.                          |
| Lead Distance between Reference and Bottom Planes | H <sub>0</sub>                    | 16.0±1.0                             |                                                   |
|                                                   | H <sub>2</sub>                    | 6.0 max.                             |                                                   |
| Protrusion Length                                 | l                                 | +0.5 to -1.0                         |                                                   |
| Diameter of Sprocket Hole                         | D <sub>0</sub>                    | 4.0±0.2                              |                                                   |
| Lead Diameter                                     | d                                 | 0.6±0.05                             |                                                   |
| Total Tape Thickness                              | t <sub>1</sub>                    | 0.6±0.3                              |                                                   |
| Total Thickness of Tape and Lead Wire             | t <sub>2</sub>                    | 2.0 max.                             |                                                   |
| Deviation across Tape                             | Δh <sub>1</sub> , Δh <sub>2</sub> | 1.5 max.                             |                                                   |
| Portion to cut in Case of Defect                  | L                                 | 11.0 <sup>+0</sup> <sub>-2.0</sub>   |                                                   |
| Hold Down Tape Width                              | W <sub>0</sub>                    | 11.0 min.                            |                                                   |
| Hold Down Tape Position                           | W <sub>2</sub>                    | 4.0 max.                             |                                                   |
| Coating Extension on Lead                         | e                                 | Up to the center of crimp            |                                                   |

△Note:

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