# TPR
**Thermally Protected Resistor**

**TPR10 Series**


## Description

Thermally Protected Resistor (TPR) is an unique type of Power Resistor, with Over Temp. and Over Current Protections. TPR is a type of power resistor, where Alloy Thermal-Link (ATCO) and Fusible Wirewound Resistor (RXF) are in series encapsulated in a ceramic case with silicone cement.

TPR is widely used in products such as power supply, office appliances, converter.

SETsafe | SETfuse TPR has the same physical size as ordinary ceramic resistor while additionally providing fault current protection. TPR can also effectively protect against the damages to devices & equipment, caused by continuous heat dissipations by ceramic resistors due to fault currents. TPR10 series Rated Resistance from 1 Ω to 100 Ω, complies with RoHS and REACH.

## Features

- Over Temp. Protection
- Over Current Protection
- Small Fault Current Protection
- Inrush Current Protection
- RoHS & REACH Compliant

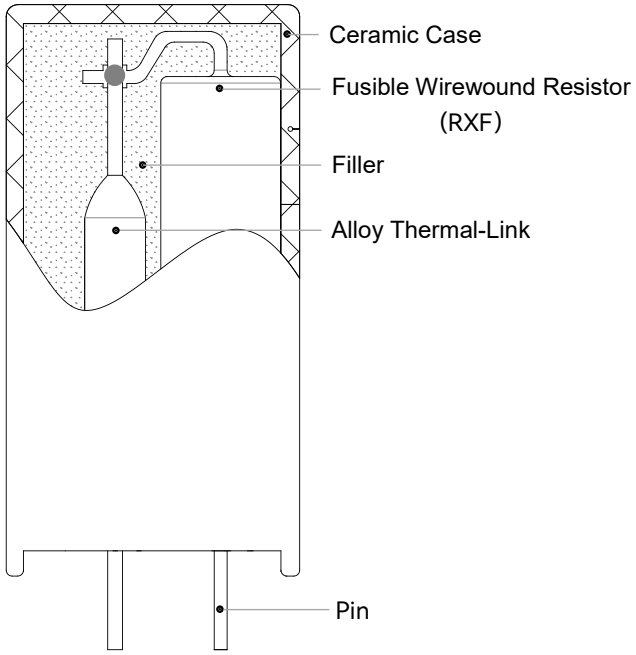
## Applications

- Power Supplies
- Office Appliances
- Converter

## Customization

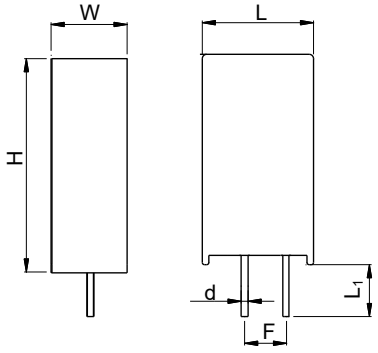
- Leads Forming Types

## Structure Diagrams



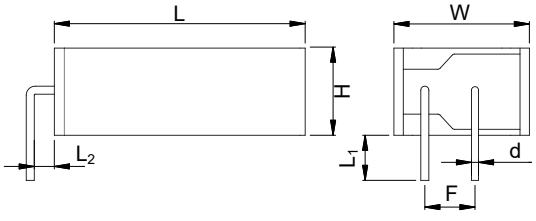

## Dimensions（mm）

**Vertical**




| L | W | H | $L_1$[a] | F | d |
|---|---|---|---|---|---|
| 15.0 ± 1.0 | 12.0 ± 1.0 | 32.0 ± 1.5 | 3.5 ± 0.5 | 6.0 ± 1.0 | Φ0.75 ± 0.08 |

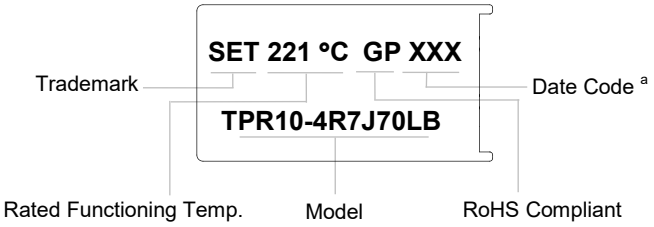
**Horizontal**




| L | W | H | $L_1$[a] | F | d | $L_2$ |
|---|---|---|---|---|---|---|
| 32.0 ± 1.5 | 15.0 ± 1.0 | 12.0 ± 1.0 | 3.5 ± 0.5 | 6.0 ± 1.0 | Φ0.75 ± 0.08 | 1.5 Max. |

Note: a - $L_1$ can be customized as required from 3.5 mm to 5.0 mm.

## Marking




[a]: The first XX means production year code, the last X means production quarter code.
eg: "241" means that the production time is the first quarter of Y2024.

## Part Numbering System

TPR 10 - 4R7 J 70 L B V - 001

| Other Options | |
|---|---|
| **Shape** | |
| V: | Vertical Installation |
| H: | Horizontal Installation |

| Shape | |
|---|---|
| B : | Square |

| Pin Type | |
|---|---|
| L : | Two pins |

| ATCO Code | |
|---|---|
| 66: | 145 °C |
| 70: | 221 °C |

| Resistance Tolerance | | | |
|---|---|---|---|
| J : | ±5% | K : | ±10% |

| Rated Resistance (Ω) | | | |
|---|---|---|---|
| R47 : | 0.47 | 47R : | 47 |
| 4R7 : | 4.7 | 100R : | 100 |

| Power Type | |
|---|---|
| 10: | 10 W |

| Product Category |
|---|

## Technical Parameter

| Item | Parameter |
|---|---|
| Power Type ( ***P*** ) | 10 W |
| Rated Resistance ( ***R*** ) | 1 Ω ~ 100 Ω |
| Resistance Tolerance | 5% (E24) , 10% (E12) |
| Derating Factor ( ***f*** ) | See Rated Power Derating Curve |
| Actual Power ( $P_0$ ) | $P_0 = P \times f$ |
| Rated Current ( $I_N$ ) | $I_N = \sqrt{P_0 / R}$ |
| Rated Voltage ( $U_N$) | $U_N = \sqrt{P_0 \times R}$ |
| Fusing Time (less than 60 seconds) | 60 W, ($T_f$ = 145 °C) |
| | 80 W, ($T_f$ = 221 °C) |
| Rated Functioning Temp. ($T_f$) | 145 °C, 221 °C |
| Fusing Temp. ($T_F$) | See Specifications |
| Surge (For Reference) **Note: Combination Wave** | 6 kV ($R$ > 10 Ω) |
| | 4 kV ($R$ ≤ 10 Ω) |

## Agency Approvals of ATCO

| Code | Model | Rated Functioning Temp. | Agency Information | | | | |
|---|---|---|---|---|---|---|---|
| | | | cURus | TUV | PSE | CCC | KC |
| | | (°C) | cURus | TUV | PSE | CCC | KC |
| 70 | C31 | 221 | ● | ● | N/A | ● | N/A |
| 66 | C6 | 145 | ● | ● | ● | ● | ● |

## Specifications

| Model | Power Type | Derating Factor (25 °C) | Rated Functioning Temp. ($T_f$) | Fuse Temp. ($T_F$) | Resistance Range (R) | Resistance Tolerance | Environmental Status | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | RoHS | REACH |
| | (W) | (%) | (°C) | (°C) | (Ω) | (%) | | |
| TPR10-xxxx70LB | 10 | 70 | 221 | 216 ~ 221 | 1 ~ 100 | ±5 / ±10 | ● | ● |
| TPR10-xxxx66LB | 10 | 40 | 145 | 138 ~ 145 | 1 ~ 100 | ±5 / ±10 | ● | ● |

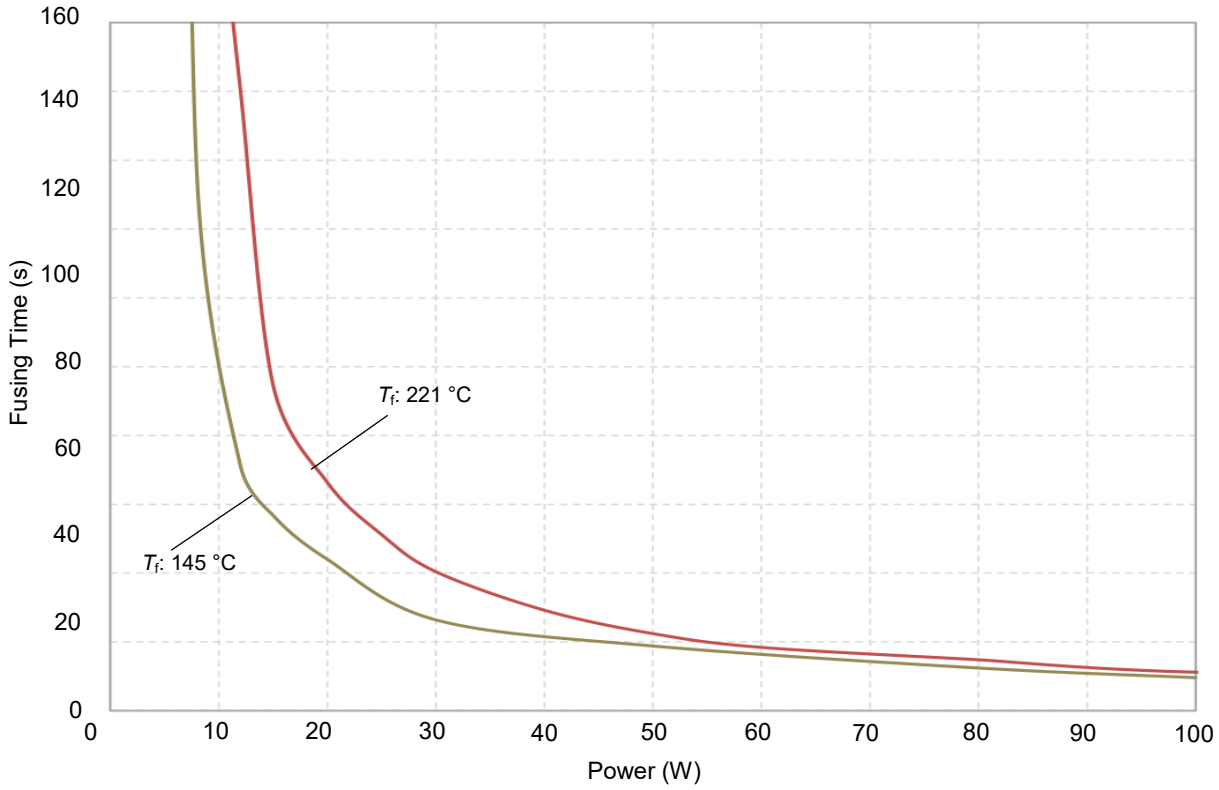
Note: "●"Means certificated, RoHS & REACH Compliant. Blue Font Is SETsafe | SETfuse Common Specifications

Resistance Selection Table (According to IEC60063-2015 E24)

| Rated Resistance (Ω) | Code | Rated Resistance (Ω) | Code | Rated Resistance (Ω) | Code |
|---|---|---|---|---|---|
| 1.0 | 1R0 | 5.1 | 5R1 | 27 | 27R |
| 1.1 | 1R1 | 5.6 | 5R6 | 30 | 30R |
| 1.2 | 1R2 | 6.2 | 6R2 | 33 | 33R |
| 1.3 | 1R3 | 6.8 | 6R8 | 36 | 36R |
| 1.5 | 1R5 | 7.5 | 7R5 | 39 | 39R |
| 1.6 | 1R6 | 8.2 | 8R2 | 43 | 43R |
| 1.8 | 1R8 | 9.1 | 9R1 | 47 | 47R |
| 2.0 | 2R0 | 10 | 10R | 51 | 51R |
| 2.2 | 2R2 | 11 | 11R | 56 | 56R |
| 2.4 | 2R4 | 12 | 12R | 62 | 62R |
| 2.7 | 2R7 | 13 | 13R | 68 | 68R |
| 3.0 | 3R0 | 15 | 15R | 75 | 75R |
| 3.3 | 3R3 | 16 | 16R | 82 | 82R |
| 3.6 | 3R6 | 18 | 18R | 91 | 91R |
| 3.9 | 3R9 | 20 | 20R | 100 | 100R |
| 4.3 | 4R3 | 22 | 22R | | |
| 4.7 | 4R7 | 24 | 24R | | |

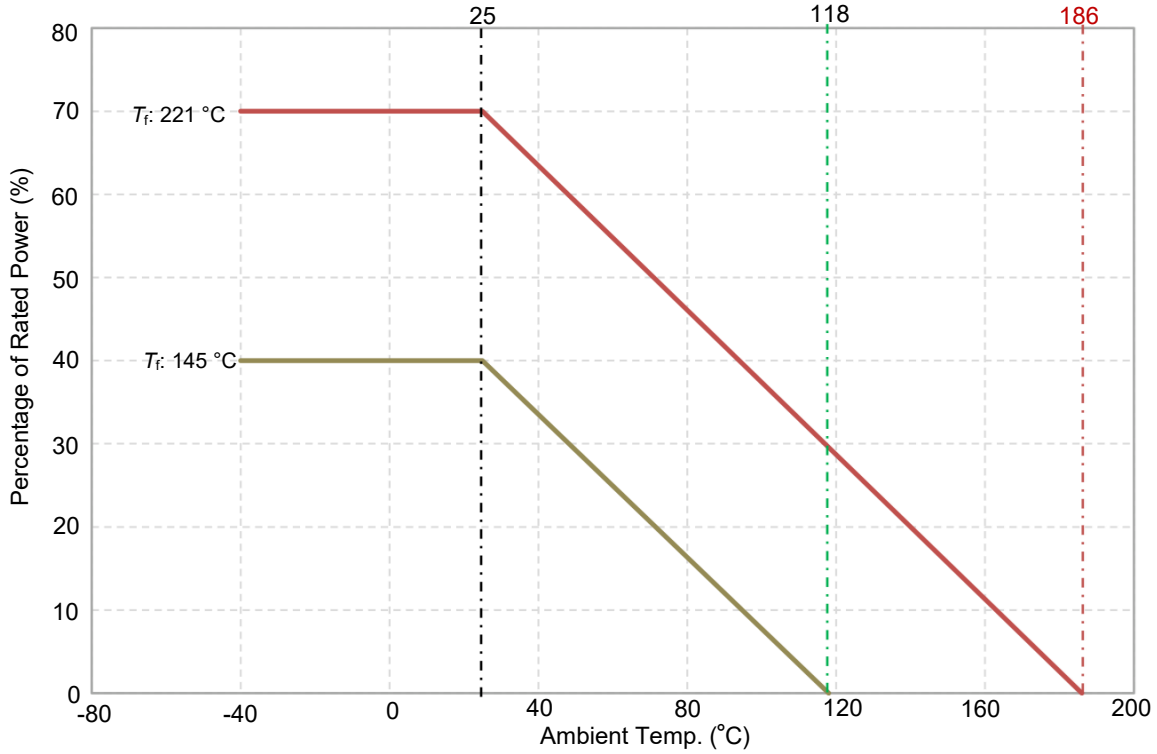
## Fusing Time Curve (For Reference Only)

TPR can open effectively at lower power multiples to protect the circuit timely (ambient temp.: 25 °C ± 2°C).



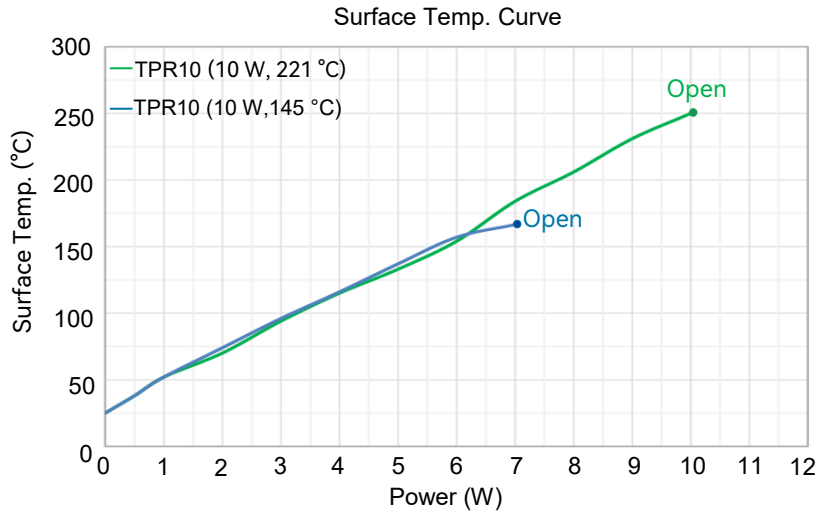

## Rated Power Derating Curve (For Reference Only)

When the ambient temp. exceeds 25 ºC, the rated power value declines as the following curve.



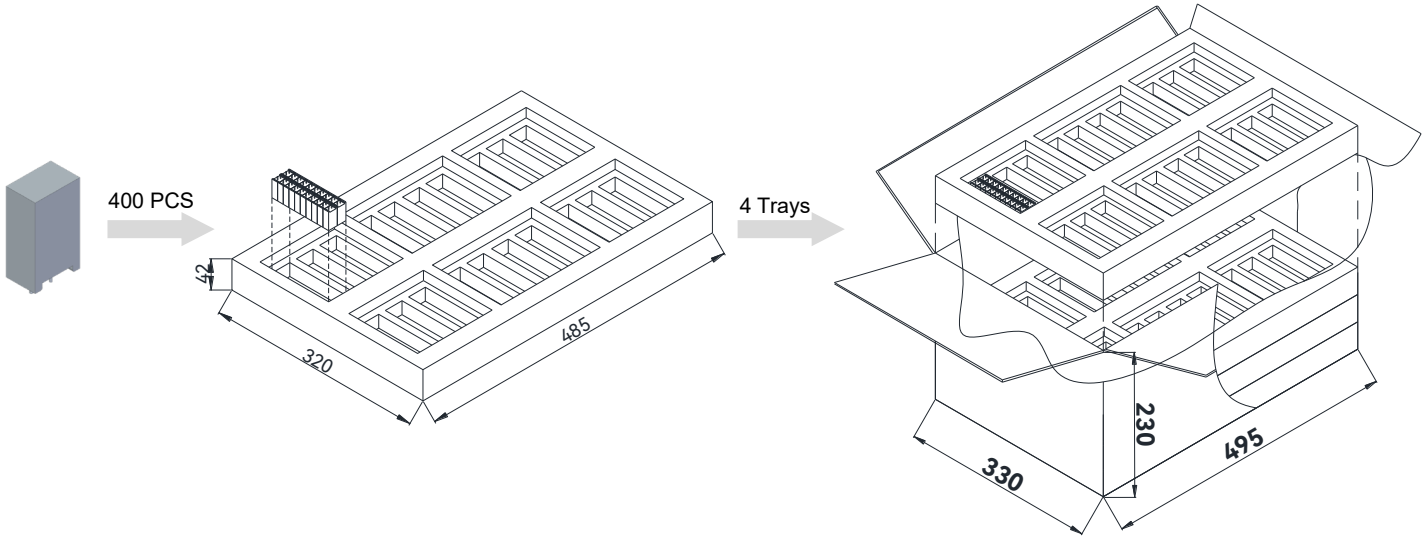
## Surface Temp. Curve (For Reference Only)

The surface temp. of TPR is always at a lower level, when small fault current happens to the device, TPR is able to open the circuit timely without additional damage (ambient temp.: 25 °C ± 2 °C).




## Packaging Information (For Reference Only)

| Item | Tray | Carton |
|---|---|---|
| Dimension | 485 × 320 × 55 | 495 × 330 × 230 |
| Quantity (PCS) | 250 | 1000 |
| Gross Weight (kg) | | 13 ± 10% |



## Glossary

| Item | Description |
|---|---|
| **RXF** | A power resistor which is made by winding a resistive element on a ceramic core, and the core is coated by insulation coating. It intends to interrupt a current flow at a predetermined time when the current exceeds a predetermined value.<br>— (SETsafe | SETfuse Standards) |
| **ATCO** | **Alloy Thermal-Link**<br>Alloy Type Thermal-Link, Alloy is the thermal element.<br>— (GB/T 9816.3) |
| ***R*** | **Rated Resistance**<br>Resistance value for which the resistor has been designed, and which is generally used for denomination of the resistor.<br>— (IEC60115-1) |
| $P_0$ | **Actual Power**<br>The Max. power of TPR can be used within the allowable operating Temp. range.<br>— (SETsafe | SETfuse Standards) |
| $I_N$ | **Rated Current**<br>$I_N = \sqrt{P_0 / R}$<br>— (SETsafe | SETfuse Standards) |
| $U_N$ | **Rated Voltage**<br>The d.c. or a.c. r.m.s. voltage calculated from the square root of the product of the rated resistance and the rated dissipation.<br>— (IEC60115-1) |
| $T_f$ | **Rated Functioning Temp.**<br>The temp. of the Alloy Thermal-Link which causes it to change the state of conductivity with a detection current up to 10 mA as the only load.<br>Tolerance: $T_f$ + 0 / -10 °C (GB 9816.1, EN 60691, K60691)<br>Tolerance: $T_f$ ± 7 °C (J60691)<br>— (IEC 60691) |
| $T_F$ | **Fusing Temp.**<br>The temp. of the Alloy Thermal-Link which causes it to change its state of conductivity is measured with silicone oil bath in which the temp. is increased at the rate of 0.5 °C to 1 °C / minute, with a detection current up to 10 mA as the only load.<br>— (IEC 60691) |
| **TCR** | **Temp. Coefficient of Resistance**<br>Relative variation of resistance between two given temp. divided by the difference in the temp. producing it.<br>— (IEC60115-1) |

# ATTENTION

## Cold Resistance Test

1. If product TCR is not less than 350 ($10^{-6}$/°C), the measured resistance value shall be corrected as the relative resistance value under 25 °C according to TCR formula.
2. Resistance Measurement (4-terminal test)

## Replacement

As TPR is a non-resettable product, for safety sake, please use the same type of TPR for replacement.

## Usage

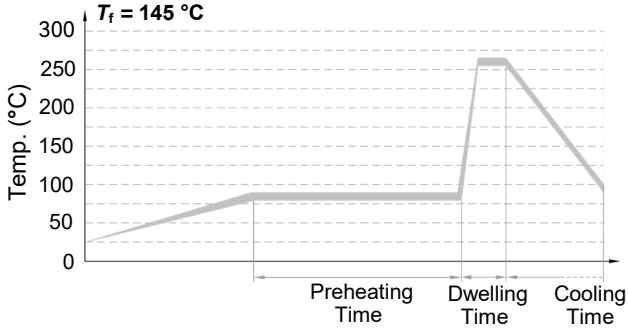
1. Do not touch the resistor body or pins directly when power is on, to avoid burn or electric shock.
2. When air pressure is from 80 kPa to 106 kPa, the relative altitude shall be +2000 m to - 500 m.

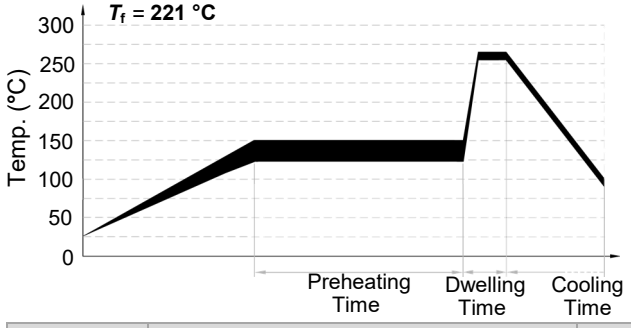
## Storage

1. Please store TPR with ambient temp. 10 °C ~ 30 °C and relative humidity 30% ~ 75%.
2. Do not store the TPR at the high temp., high humidity or corrosive gas environment, avoid influencing the solderability of the pins, please use them up within 1 year after receiving the goods.

## Soldering Parameters

**Wave Soldering Parameters (For Reference Only)**




| Item | Temp. (°C) | | Time (s) |
|---|---|---|---|
| Preheating | $T_f$ = 145°C | $T_f$ = 221 °C | 60 ~ 100 |
| | 80 ~ 90 | 120 ~ 150 | |
| Dwelling | 260 ± 5 | 260 ± 5 | 4 ~ 5 |

## Hand-Soldering Parameters

| | |
|---|---|
| Solder Iron Temp.: | (350 ± 5) °C |
| Soldering Time: | ≤5 s ($T_f$ = 145 °C)<br>≤3 s ($T_f$ = 221 °C) |

## Thermally Protected Resistor ( TPR ) Features Overview

| | | | | | | |
|---|---|---|---|---|---|---|
| **Shape** |  | |  | |  | |
| **Structure** | Vertical | Horizontal | Vertical | Horizontal | Vertical | Horizontal |
| ***R*<br>Resistance Range** | (0.27 ~ 800) Ω | | (0.27 ~ 1000) Ω | | (1 ~ 100) Ω | |
| | According to IEC60063-2015，resistance can be customized. | | | | | |
| ***P*<br>Power Type** | 3 W | | 5 W | | 10 W | |
| **Dimensions (mm)** | 11.5 × 7.0 × 20.5 | 20.5 × 11.5 × 7.0 | 13.5 × 9.0 × 25.0 | 27.0 × 14.0 × 9.5 | 15.0 × 12.0 × 32.0 | 32.0 × 15.0 × 12.0 |
| | The forming modes and length of lead wires can be customized. | | | | | |
| **$T_f$<br>Rated Functioning Temp.** | 115 °C, 125 °C, 130 °C, 135 °C, 145 °C, 150 °C, 221 °C | | | | 145 °C, 221 °C | |

+86-592-571-5838 www.SETfuse.com www.SETsafe.com E-mail : sales@SETfuse.com