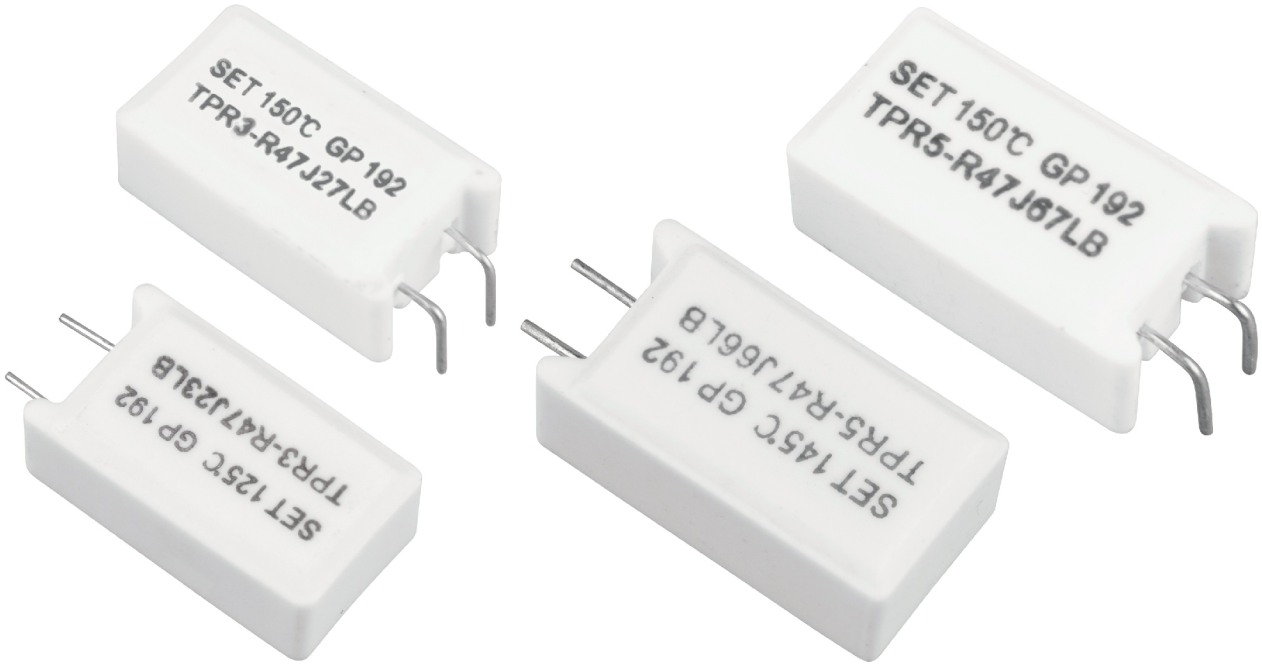
Thermally Protected Resistor

TPR

- Over Temp. Protection
- Short Circuit Protection
- Over Current Protection
- Inrush Current Protection
- Small Fault Current Protection
- Halogen free and RoHS compliant

Please refer to the datasheet of each series.



https://setsafe.com/Product/Over-Current-Protection/Thermally-Protected-Resistor-TPR.html

2024

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Providing a Total Solution for High Standard Safety Circuit Protection

Thermally Protected Resistor（TPR）

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, household 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. TPR covers Rated Resistance from 0.27 Ω to 1,000 Ω, complies with RoHS and REACH.

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Product Description, Features, Applications, Customization, Structure Diagrams, Dimensions, Making, Part Number System, Technical Parameter, Agency, Specifications, Fusing Time Curve, Packaging Information

5.1 TPR3 Series 5

5.2 TPR5 Series 10

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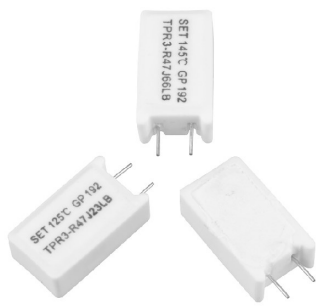
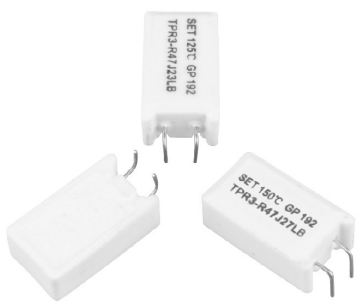
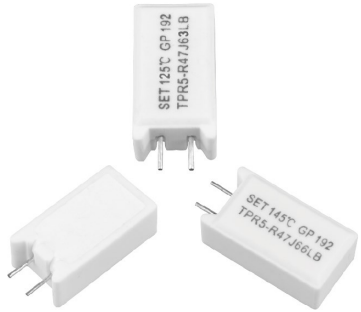
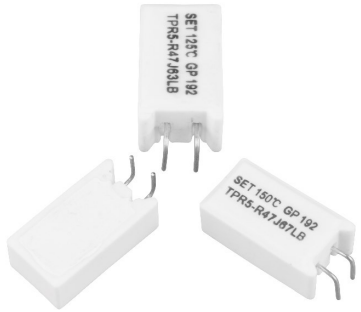
Thermally Protected Resistor (TPR) Features Overview

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

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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. — (SETsafe | SETfuse Standards)
ATCO	**Alloy Thermal-Link** Alloy Type Thermal-Link, Alloy is the thermal element. — (GB/T 9816.3)
R	**Rated Resistance** Resistance value for which the resistor has been designed, and which is generally used for denomination of the resistor. — (IEC60115-1)
P_0	**Actual Power** The Max. power of TPR can be used within the allowable operating Temp. range. — (SETsafe | SETfuse Standards)
I_N	**Rated Current** $I_N = \sqrt{P_0 / R}$ — (SETsafe | SETfuse Standards)
U_N	**Rated Voltage** 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. — (IEC60115-1)
T_f	**Rated Functioning Temp.** 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. Tolerance: T_f + 0 / -10 °C (GB 9816.1, EN 60691, K60691) Tolerance: T_f ± 7 °C (J60691) — (IEC 60691)
T_F	**Fusing Temp.** 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. — (IEC 60691)
TCR	**Temp. Coefficient of Resistance** Relative variation of resistance between two given temp. divided by the difference in the temp. producing it. — (IEC60115-1)

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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

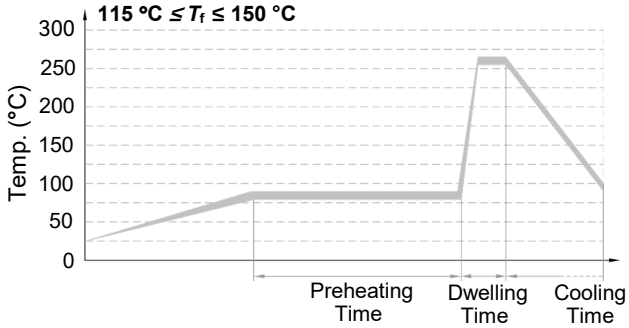
1. Do not touch the resistor body or pins directly when power is on, to avoid burn or electric shock.
2. When air pressure is from 80 kPa to 106 kPa, the relative altitude shall be +2000 m to - 500 m.

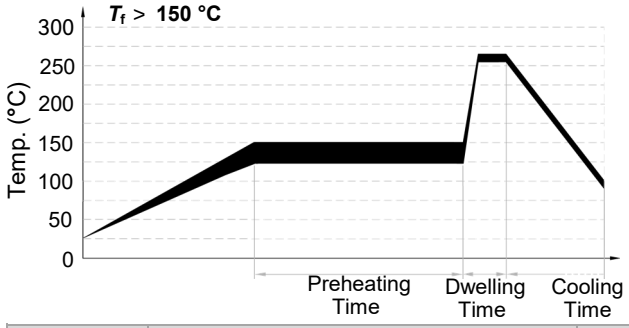
Storage

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	115 °C ≤ T_f ≤ 150°C	T_f > 150 °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 > 150 °C)
≤3 s (115 °C ≤ T_f ≤ 150 °C)

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Operating Principle

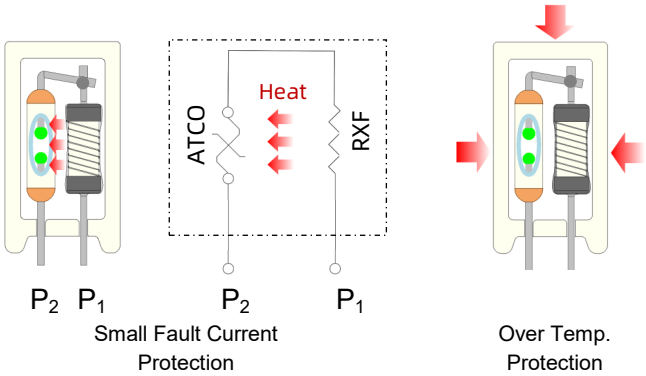
Instruction

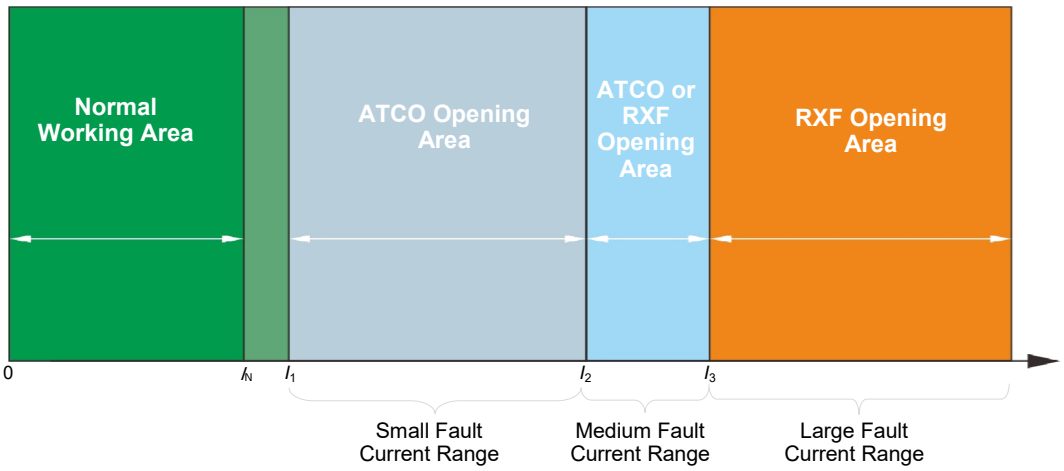
$R_{RXF} \geq 100R_{ATCO}$

- R_{RXF}: the resistance value of RXF
- R_{ATCO}: the resistance value of the Alloy Thermal-Link (ATCO)

$T_{RXF} \geq 5T_{ATCO}$

- The Fusing Temp. of RXF (T_{RXF}): 1200 °C ~ 1500 °C
- The Fusing Temp. of ATCO (T_{ATCO}): 115 °C ~ 221 °C





I_N: Rated Current
I_1: Conventional Fusing Current

- **Small Fault Current Protection**

  Under small fault current, $I_1 < I < I_2$, ATCO senses the heat that generated by RXF. When the ATCO reaches the fusing temp., ATCO opens the circuit quickly. In this case, RXF keeps intact and ATCO opens.

- **Medium Fault Current Protection**

  Under medium fault current, $I_2 < I < I_3$, RXF opens in a short time due to the large heat generated, meanwhile, RXF conducts its residual heat to ATCO. In this case, both RXF and ATCO open.

- **Large Fault Current Protection (Short Circuit Protection)**

  Under large fault current, $I > I_3$, such as short circuit, RXF opens instantly, but ATCO keeps intact because the fusing time of RXF is too short to generate enough heat. In this case, RXF opens and ATCO keeps intact.

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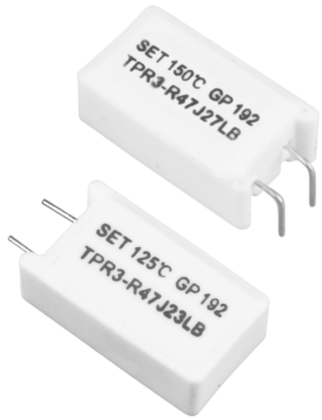

Description

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Features

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

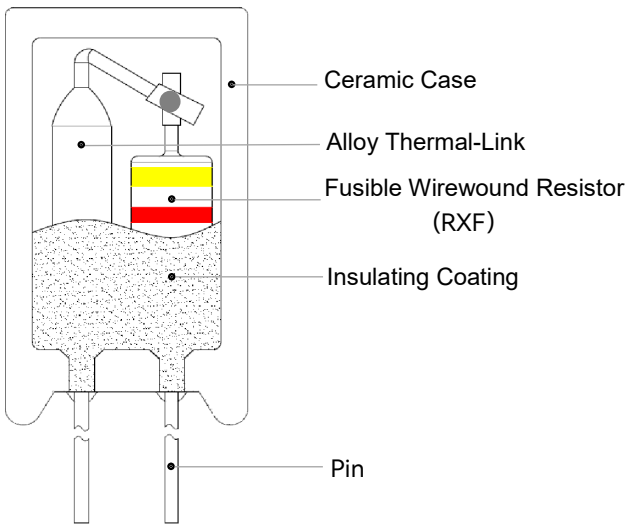
Applications

- Power Supplies
- Office Appliances
- Household Appliances
- Converter

Customization

- Leads Forming Types

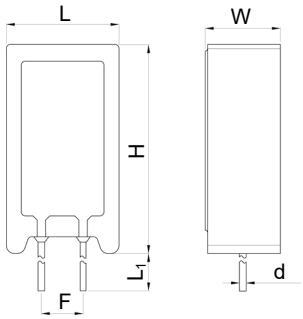
Structure Diagrams



Note: The color of schematic diagram is for reference only

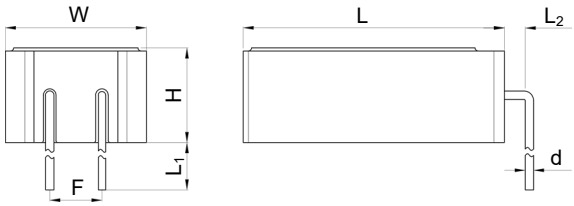
Dimensions（mm）

Vertical



L	W	H	L_1[a]	F	d
11.5 ± 1.0	7.0 ± 1.0	20.5 ± 1.5	3.5 ± 0.5	5.0 ± 1.0	Φ0.55 ± 0.08

Horizontal



L	W	H	L_1[a]	F	d	L_2
20.5 ± 1.5	11.5 ± 1.0	7.0 ± 1.0	3.5 ± 0.5	5.0 ± 1.0	Φ0.55 ± 0.08	1.5 Max.

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

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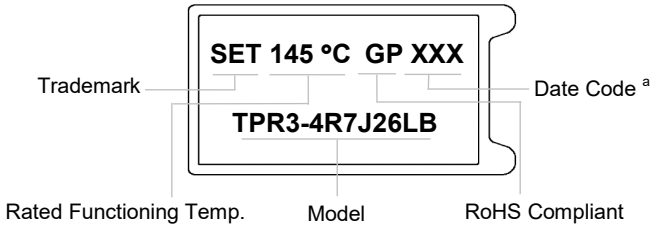
Marking



[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 3 - 4R7 J 30 L B V - 001

Other Options

Shape

V:	Vertical Installation
H:	Horizontal Installation

Shape

B :	Square

Pin Type

L :	Two pins

ATCO Code

22:	115 °C	23:	125 °C
24:	130 °C	25:	135 °C
26:	145 °C	27:	150 °C
30:	221 °C		

Resistance Tolerance

J :	±5%	K :	±10%

Rated Resistance (Ω)

R47 :	0.47	47R :	47
4R7 :	4.7	470R :	470

Power Type

3:	3 W

Product Category

Technical Parameter

Item	Parameter
Power Type (***P***)	3 W
Rated Resistance (***R***)	0.27 Ω ~ 800 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)	25 W, (115 °C ≤ T_f ≤ 135 °C)
	30 W, (145 °C ≤ T_f ≤ 150 °C)
	35 W, (T_f = 221 °C)
Rated Functioning Temp. (T_f)	115 °C, 125 °C, 130 °C, 135 °C 145 °C, 150 °C, 221 °C
Fusing Temp. (T_F)	See Specifications
Surge (For Reference) **Note: Combination Wave**	2.5 kV (R > 10 Ω)
	1.5 kV (R ≤ 10 Ω)

Note: The blue font is the recommended temp. specification.

Agency Approvals of RXF

Rated Power	Resistance Range	Agency Information		
		cURus	VDE (REG E012)	CQC
(W)	(Ω)	cURus	VDE	CQC
1	0.47 to 51	●	●	●
	0.27 to 800	●	●	N/A

Agency Approvals of ATCO

Code	Model	Rated Functioning Temp.	Agency Information				
			cURus	TUV	PSE	CCC	KC
		(°C)	cURus	TUV	PSE	CCC	KC
30	H31	221	●	●	N/A	●	N/A
27	H7	150	●	●	●	●	●
26	H6	145	●	●	●	●	●
25	H5	135	●	●	●	●	●
24	H4	130	●	●	●	●	●
23	H3	125	●	●	●	●	●
22	H2	115	●	●	●	●	●

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Specifications

Model	Power Type	Derating Factor (25 °C)	Rated Functioning Temp. (T_f)	Fusing Temp. (T_F)	Resistance Range (R)	Resistance Tolerance	Environmental Status	
							RoHS	REACH
	(W)	(%)	(°C)	(°C)	(Ω)	(%)		
TPR3-xxxx30LB	3	100	221	216 ~ 221	0.27 ~ 800	±5 / ±10	●	●
TPR3-xxxx27LB	3	55	150	143 ~ 150	0.27 ~ 800	±5 / ±10	●	●
TPR3-xxxx26LB	3	50	145	138 ~ 145	0.27 ~ 800	±5 / ±10	●	●
TPR3-xxxx25LB	3	40	135	128 ~ 135	0.27 ~ 800	±5 / ±10	●	●
TPR3-xxxx24LB	3	35	130	123 ~ 130	0.27 ~ 800	±5 / ±10	●	●
TPR3-xxxx23LB	3	30	125	119 ~ 125	0.27 ~ 800	±5 / ±10	●	●
TPR3-xxxx22LB	3	20	115	109 ~ 115	0.27 ~ 800	±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	Rated Resistance (Ω)	Code
0.10	R10	1.0	1R0	10	10R	100	100R
0.11	R11	1.1	1R1	11	11R	110	110R
0.12	R12	1.2	1R2	12	12R	120	120R
0.13	R13	1.3	1R3	13	13R	130	130R
0.15	R15	1.5	1R5	15	15R	150	150R
0.16	R16	1.6	1R6	16	16R	160	160R
0.18	R18	1.8	1R8	18	18R	180	180R
0.20	R20	2.0	2R0	20	20R	200	200R
0.22	R22	2.2	2R2	22	22R	220	220R
0.24	R24	2.4	2R4	24	24R	240	240R
0.27	R27	2.7	2R7	27	27R	270	270R
0.30	R30	3.0	3R0	30	30R	300	300R
0.33	R33	3.3	3R3	33	33R	330	330R
0.36	R36	3.6	3R6	36	36R	360	360R
0.39	R39	3.9	3R9	39	39R	390	390R
0.43	R43	4.3	4R3	43	43R	430	430R
0.47	R47	4.7	4R7	47	47R	470	470R
0.51	R51	5.1	5R1	51	51R	510	510R
0.56	R56	5.6	5R6	56	56R	560	560R
0.62	R62	6.2	6R2	62	62R	620	620R
0.68	R68	6.8	6R8	68	68R	680	680R
0.75	R75	7.5	7R5	75	75R	750	750R
0.82	R82	8.2	8R2	82	82R	800	800R
0.91	R91	9.1	9R1	91	91R	N/A	N/A

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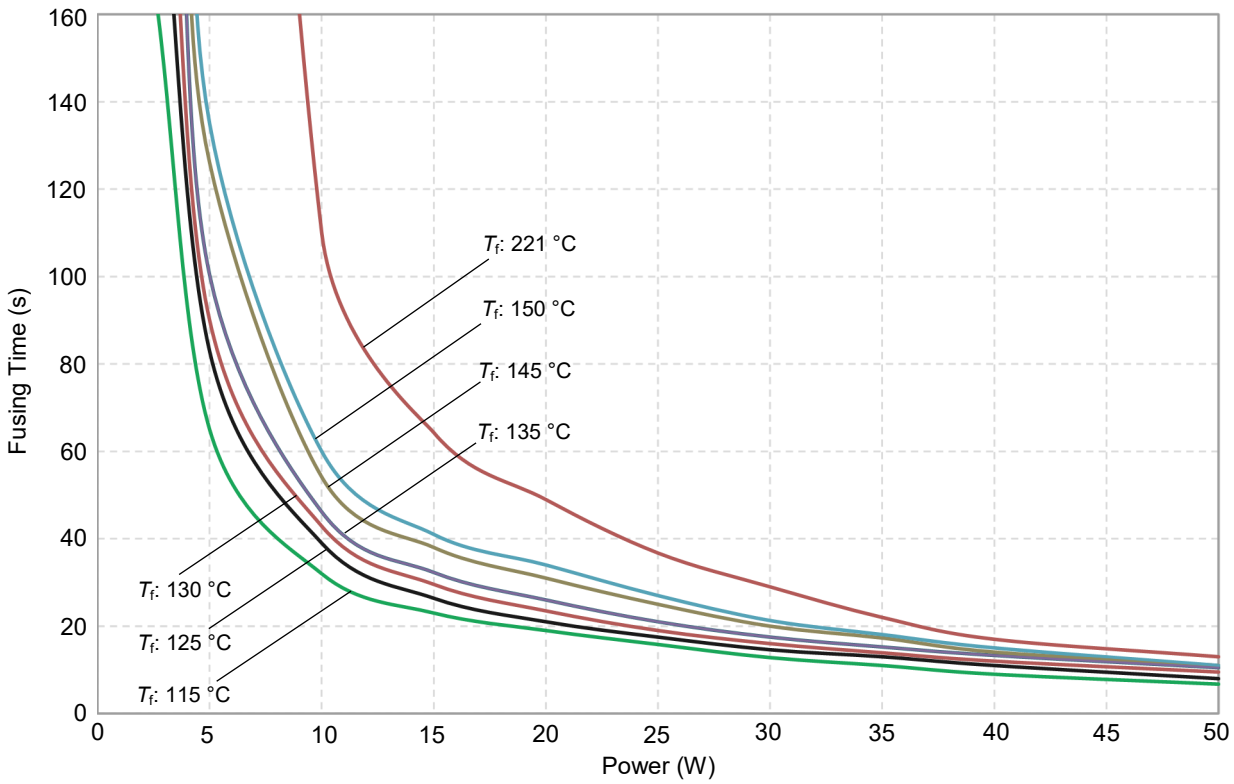
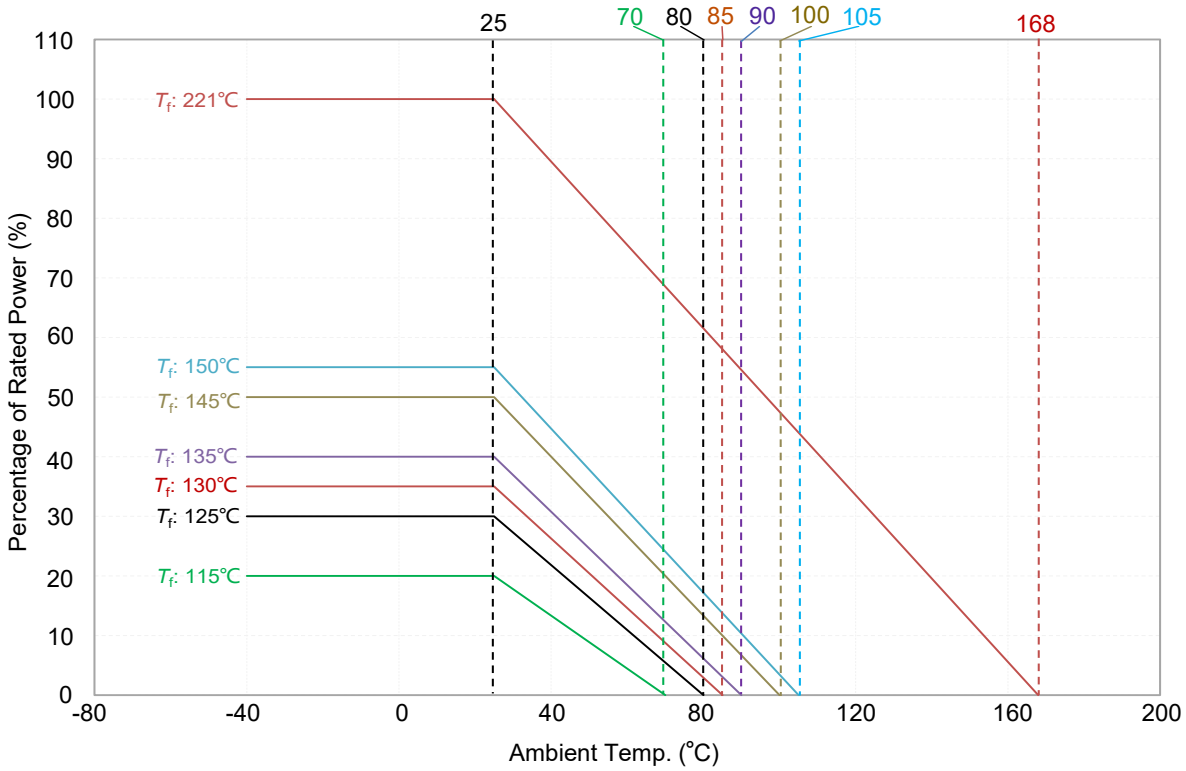
Fusing Time Curve (For Reference Only)

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.



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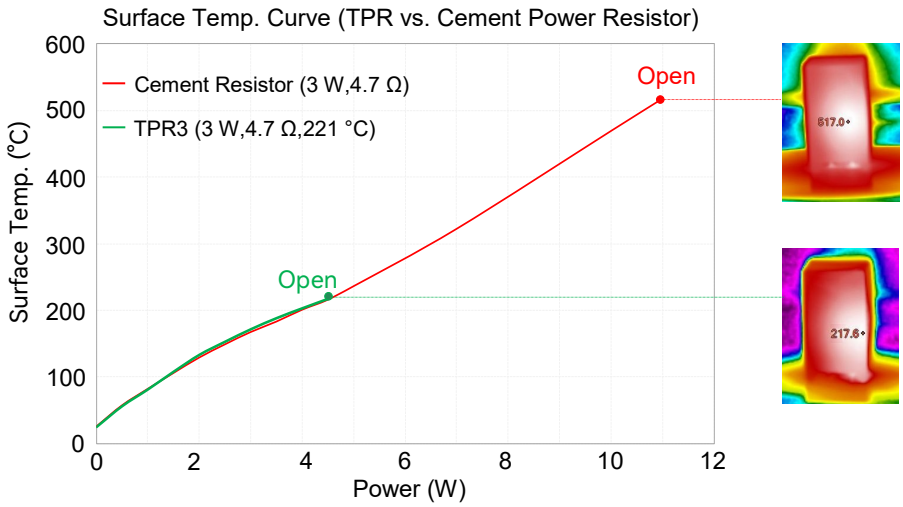
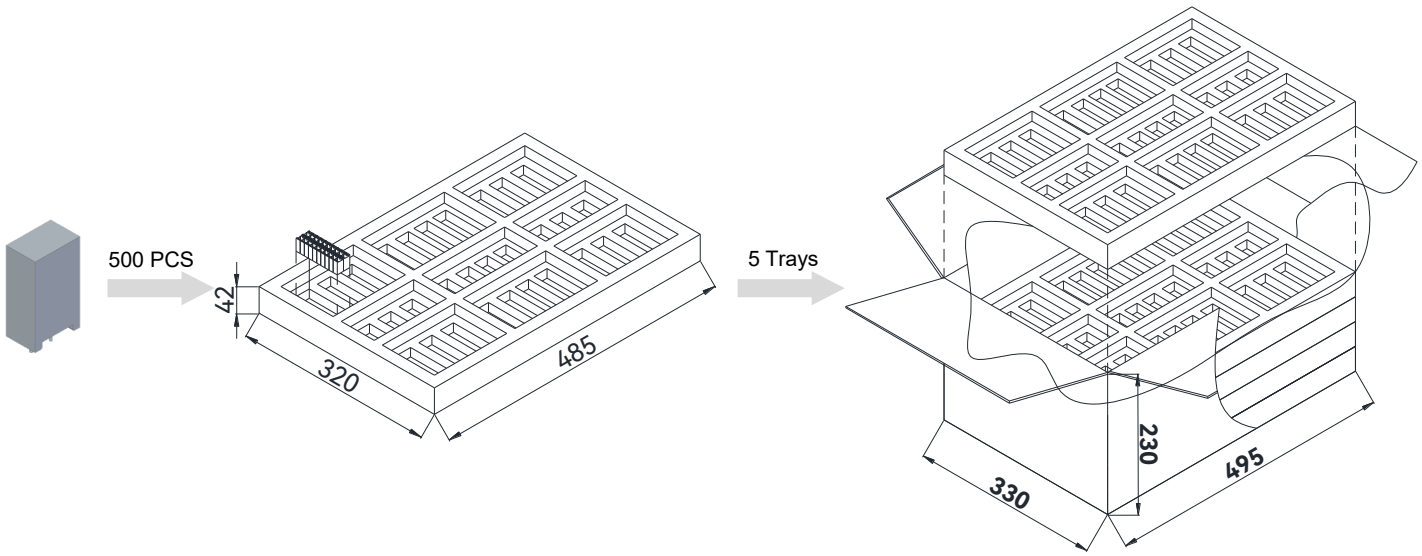
Surface Temp. Curve (For Reference Only)

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 × 42	495 × 330 × 230
Quantity (PCS)	500	2,500
Gross Weight (kg)		10 ± 10%



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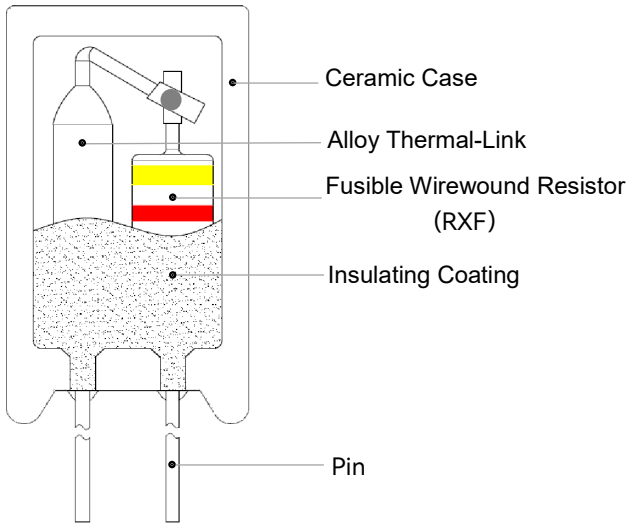
- Office Appliances
- Household Appliances
- Converter

Customization

- Leads Forming Types

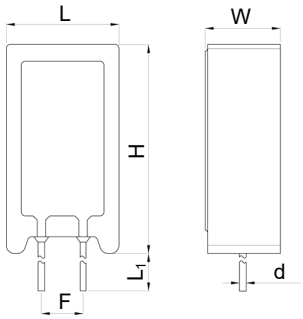
Structure Diagrams



Note: The color of schematic diagram is for reference only

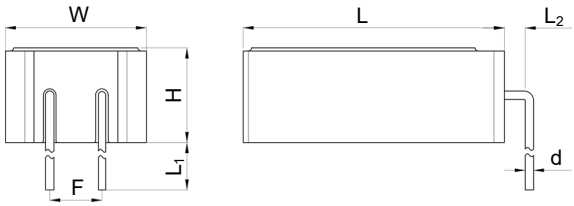
Dimensions（mm）

Vertical



L	W	H	L_1[a]	F	d
14.0 ± 1.0	9.5 ± 1.0	27.0 ± 1.5	3.5 ± 0.5	5.0 ± 1.0	Φ0.75 ± 0.08

Horizontal



L	W	H	L_1[a]	F	d	L_2
27.0 ± 1.5	14.0 ± 1.0	9.5 ± 1.0	3.5 ± 0.5	5.0 ± 1.0	Φ0.55 ± 0.08	1.5 Max.

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

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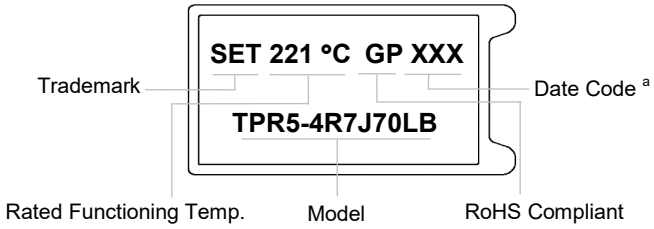
Marking



[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 5 - 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

62:	115 °C	63:	125 °C
64:	130 °C	65:	135 °C
66:	145 °C	67:	150 °C
70:	221 °C		

Resistance Tolerance

J :	±5%	K :	±10%

Rated Resistance (Ω)

R47 :	0.47	47R :	47
4R7 :	4.7	470R :	470

Power Type

5:	5 W

Product Category

Technical Parameter

Item	Parameter
Power Type (***P***)	5 W
Rated Resistance (***R***)	0.27 Ω ~ 1,000 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)	35 W, (115 °C ≤ T_f ≤ 135 °C)
	40 W, (145 °C ≤ T_f ≤ 150 °C)
	50 W, (T_f = 221 °C)
Rated Functioning Temp. (T_f)	115 °C, 125 °C, 130 °C, 135 °C 145 °C, 150 °C, 221 °C
Fusing Temp. (T_F)	See Specifications
Surge (For Reference) **Note: Combination Wave**	2.5 kV (R > 10 Ω)
	2 kV (R ≤ 10 Ω)

Note: The blue font is the recommended temp. specification.

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
67	C7	150	●	●	●	●	●
66	C6	145	●	●	●	●	●
65	C5	135	●	●	●	●	●
64	C4	130	●	●	●	●	●
63	C3	125	●	●	●	●	●
62	C2	115	●	●	●	●	●

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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)	(%)		
TPR5-xxxx70LB	5	80	221	216 ~ 221	0.27 ~ 1000	±5 / ±10	●	●
TPR5-xxxx67LB	5	45	150	143 ~ 150	0.27 ~ 1000	±5 / ±10	●	●
TPR5-xxxx66LB	5	40	145	138 ~ 145	0.27 ~ 1000	±5 / ±10	●	●
TPR5-xxxx65LB	5	35	135	128 ~ 135	0.27 ~ 1000	±5 / ±10	●	●
TPR5-xxxx64LB	5	30	130	123 ~ 130	0.27 ~ 1000	±5 / ±10	●	●
TPR5-xxxx63LB	5	25	125	119 ~ 125	0.27 ~ 1000	±5 / ±10	●	●
TPR5-xxxx62LB	5	20	115	109 ~ 115	0.27 ~ 1000	±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	Rated Resistance (Ω)	Code
0.10	R10	1.0	1R0	10	10R	100	100R
0.11	R11	1.1	1R1	11	11R	110	110R
0.12	R12	1.2	1R2	12	12R	120	120R
0.13	R13	1.3	1R3	13	13R	130	130R
0.15	R15	1.5	1R5	15	15R	150	150R
0.16	R16	1.6	1R6	16	16R	160	160R
0.18	R18	1.8	1R8	18	18R	180	180R
0.20	R20	2.0	2R0	20	20R	200	200R
0.22	R22	2.2	2R2	22	22R	220	220R
0.24	R24	2.4	2R4	24	24R	240	240R
0.27	R27	2.7	2R7	27	27R	270	270R
0.30	R30	3.0	3R0	30	30R	300	300R
0.33	R33	3.3	3R3	33	33R	330	330R
0.36	R36	3.6	3R6	36	36R	360	360R
0.39	R39	3.9	3R9	39	39R	390	390R
0.43	R43	4.3	4R3	43	43R	430	430R
0.47	R47	4.7	4R7	47	47R	470	470R
0.51	R51	5.1	5R1	51	51R	510	510R
0.56	R56	5.6	5R6	56	56R	560	560R
0.62	R62	6.2	6R2	62	62R	620	620R
0.68	R68	6.8	6R8	68	68R	680	680R
0.75	R75	7.5	7R5	75	75R	750	750R
0.82	R82	8.2	8R2	82	82R	800	800R
0.91	R91	9.1	9R1	91	91R	910	910R

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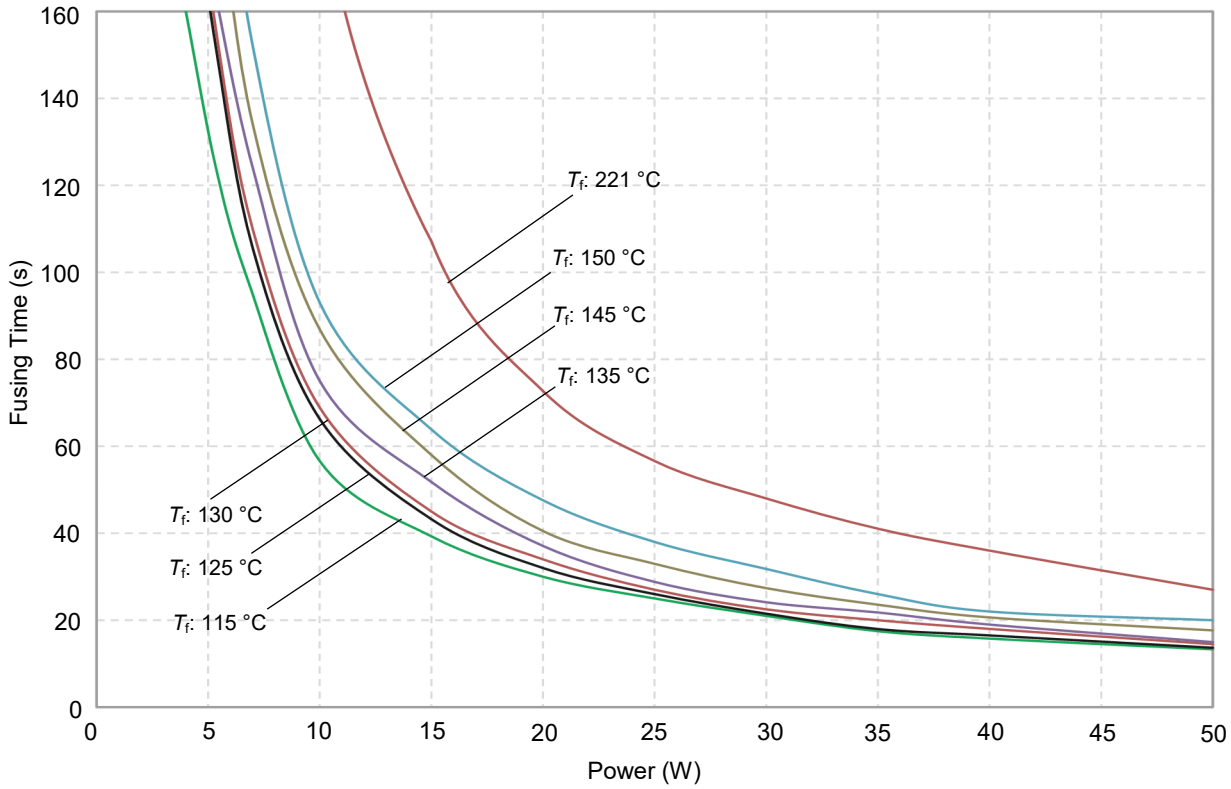
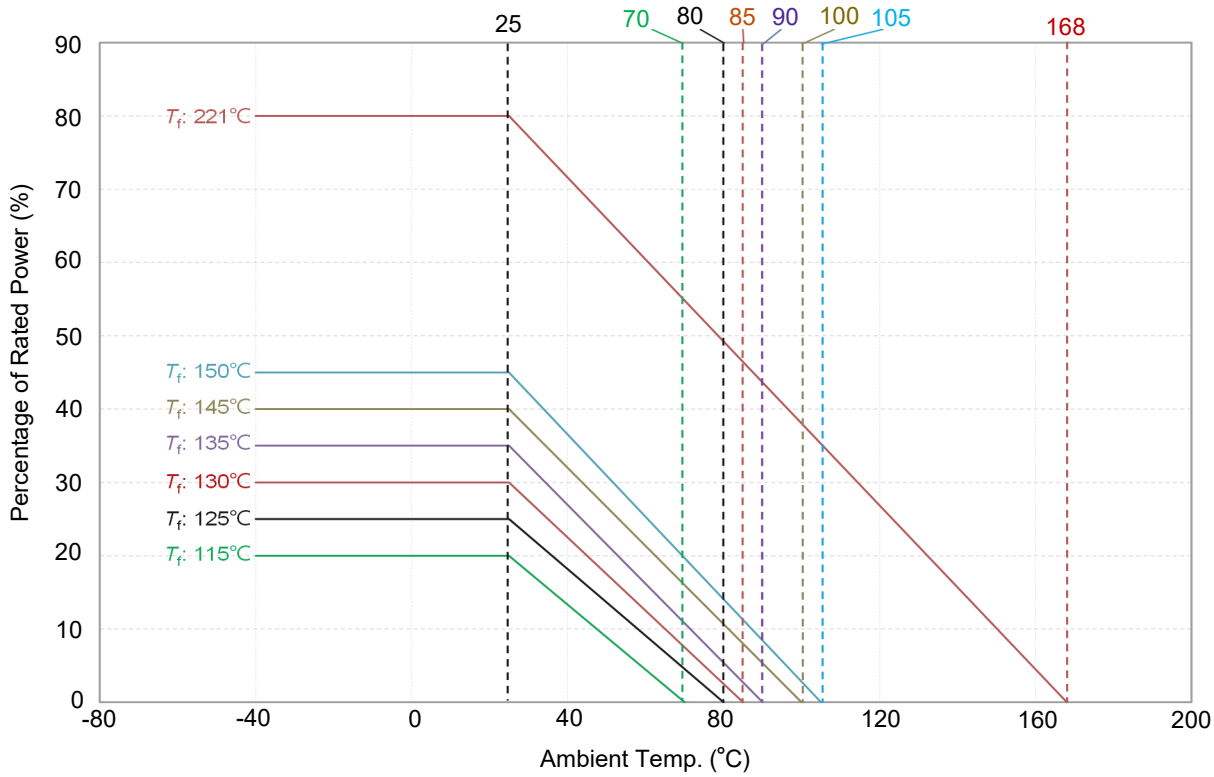
Fusing Time Curve (For Reference Only)

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.



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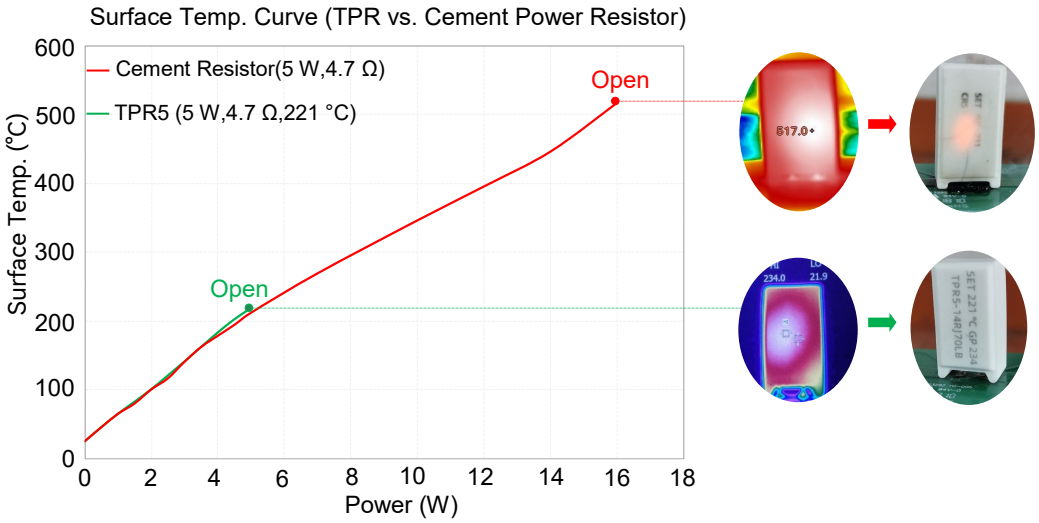
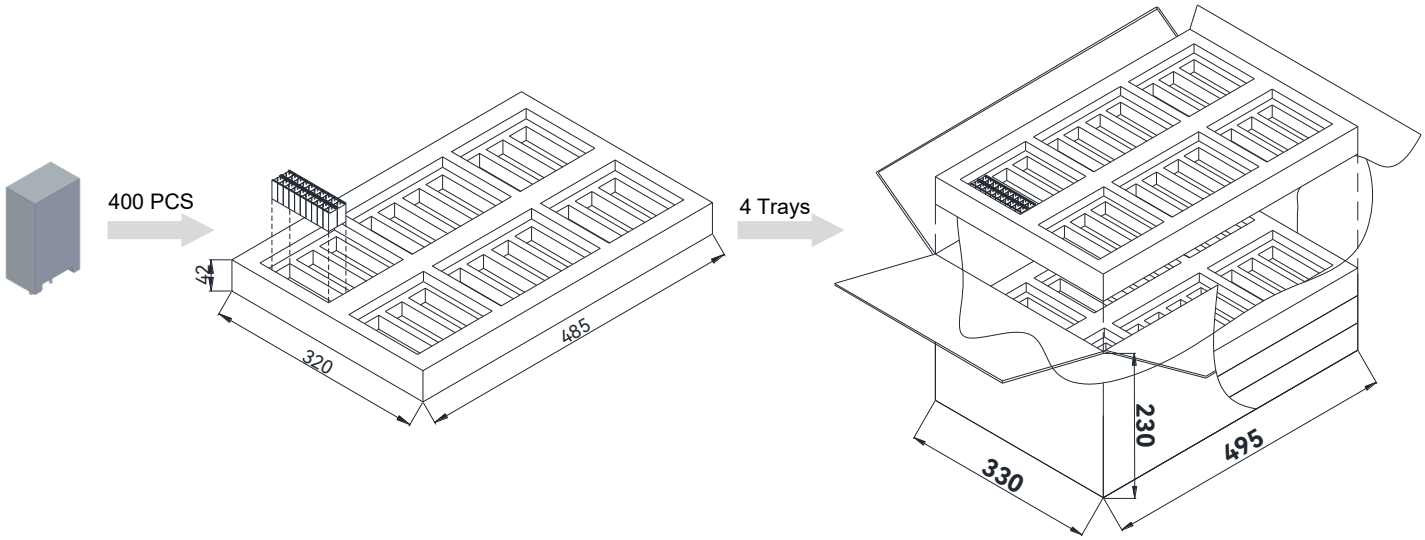
Surface Temp. Curve (For Reference Only)

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 × 50	495 × 330 × 230
Quantity (PCS)	400	1,600
Gross Weight (kg)		13 ± 10%



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