# Power Resistor for Mounting onto a Heatsink Thick Film Technology

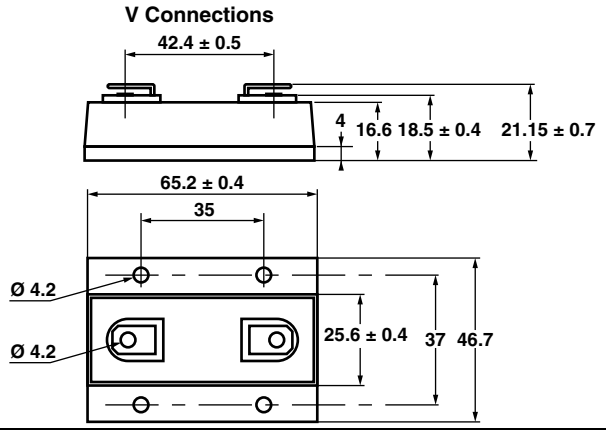
## FEATURES

- High power rating
- Low thermal radiation of the case
- Wide ohmic value range
- Easy mounting
- High overload capabilities
- Reduced size and weight
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

This new style has been developed as an extension to RCH range. Through the use of thick film technology, a non-inductive solution for power resistors is available which are rated up to 100 W at +25 °C. The terminations position prevents any risk of an electrical arc to the heatsink. This resistor series can replace and offer advantages to standard wirewound devices.

## DIMENSIONS in millimeters




**Note**

- Tolerances unless stated: ± 0.2 mm

## STANDARD ELECTRICAL SPECIFICATIONS

| MODEL | SIZE | RESISTANCE RANGE Ω | RATED POWER $P_{25\,°C}$ W | LIMITING ELEMENT VOLTAGE $U_L$ V | TOLERANCE ± % | TEMPERATURE COEFFICIENT ± ppm/°C |
|---|---|---|---|---|---|---|
| RPH 100 | 100 | 0.092 to 1M (1) | 100 | 1900 | 1, 2, 5, 10 | 150 |

**Note**

(1) E24 series

## MECHANICAL SPECIFICATIONS

| | |
|---|---|
| **Mechanical Protection** | Insulated case UL 94 V-0 |
| **Resistive Element** | Cermet |
| **Substrate** | Alumina on metallic base of nickel coated aluminum |
| **End Connections** | V connections: Screws M4 x 6 |
| **Tightening Torque Connections** | 1 Nm |
| **Tightening Torque Heatsink** | 3 Nm |
| **Weight** | 60 g ± 10 % |

## ENVIRONMENTAL SPECIFICATIONS

| | |
|---|---|
| **Thermal Resistance** | $R_{th\,(j-c)}$ 0.55 °C/W |
| **Temperature Range** | -55 °C to +125 °C |
| **Climatic Category** | 55/125/56 |

## TECHNICAL SPECIFICATIONS

| | | |
|---|---|---|
| **Power Rating** | **Continuous** | 100 W at 25 °C<br>chassis mounted 0.45 °C/W |
| | **Momentary** | 10 W at 25 °C free air |
| **Temperature Coefficient** | **Standard** | ± 300 ppm/°C < 1 Ω<br>± 150 ppm/°C > 1 Ω |
| **Thermal Resistance** | | 0.55 °C/W |
| **Dielectric Strength MIL STD 202** | | 5 $kV_{RMS}$, 1 min,<br>10 mA max. |
| **Insulation Resistance** | | > $10^6$ MΩ |
| **Inductance** | | < 0.1 µH |

| PERFORMANCE | | |
|---|---|---|
| **TESTS** | **CONDITIONS** | **REQUIREMENTS** |
| **Short Time Overload** | NF EN 140 000 CEI 115_1<br>4 Pr/5 s $U_S < 2\ U_L$ | < ± (0.25 % + 0.05 Ω) |
| **Rapid Temperature Change** | NF EN 140000 CEI 68214 Test Na<br>5 cycles -55 °C +125 °C | < ± (0.25 % + 0.05 Ω) |
| **Load Life**<br>**(Chassis Mounted 0.45 °C/W)** | NF EN 140 000<br>Pr at 25 °C 1000 h | < ± (0.5 % + 0.05 Ω) |
| **Humidity (Steady State)** | MIL STD 202 Method 103 B Test D<br>56 days 95 % RH | < ± (0.5 % + 0.05 Ω) |

| RESISTANCE VALUE IN RELATION TO TOLERANCE AND TCR | | |
|---|---|---|
| **Ohmic Value** | < 1 Ω | > 1 Ω |
| **Standard Tolerance** | ± 5 % | ± 5 % |
| **Standard TCR** | ± 300 ppm/°C | ± 150 ppm/°C |
| **Toleranc On Request** | ± 1 % to ± 2 % | |

## RECOMMENDATIONS FOR MOUNTING ONTO A HEATSINK

- Surfaces in contact must be carefully cleaned.
- The heatsink must have an acceptable flatness: From 0.05 mm to 0.1 mm/100 mm.
- Roughness of the heatsink must be around 6.3 µm. In order to improve thermal conductivity, surfaces in contact (alumina, heatsink) should be coated with a silicone grease (type SI 340 from Rhône-Poulenc or Dow 340 from Dow Corning).
- The fastening of the resistor to the heatsink is under pressure control of two screws (not supplied).

| **Tightening Torque on Heatsink** | RPH 100 |
|---|---|
| | 3 Nm |

- In order to improve the dissipation, either forced-air cooling or liquid cooling may be used.
- Do not forget to respect an insulation value between two resistors (dielectric strength in dry air 1 kV/mm).

## CHOICE OF THE HEATSINK

The user must choose the heatsink according to the working conditions of the component (power, room temperature). Maximum working temperature must not exceed 125 °C. The dissipated power is simply calculated by the following ratio:

$$P = \frac{\Delta T}{R_{TH\ (j\ -\ c)} + R_{TH\ (c\ -\ h)} + R_{TH\ (h\ -\ a)}}$$

P: Expressed in W

ΔT: Difference between maximum working temperature and room temperature

$R_{TH\ (j\ -\ c)}$: Thermal resistance value measured between resistive layer and outer side of the resistor. It is the thermal resistance of the component: 0.55 °C/W.

$R_{TH\ (c\ -\ h)}$: Thermal resistance value measured between outer side of the resistor and upper side of the heatsink. This is the thermal resistance of the interface (grease, thermal pad), and the quality of the fastening device.

$R_{TH\ (h\ -\ a)}$: Thermal resistance of the heatsink.

**Example:**

$R_{TH\ (c\ -\ a)}$ for RPH 100 power rating 80 W at ambient temperature +40 °C.

$\Delta T \leq 125\ °C - 40\ °C \leq 85\ °C$

$R_{TH\ (j\ -\ c)} + R_{TH\ (c\ -\ h)} + R_{TH\ (h\ -\ a)} = \frac{\Delta T}{P} = \frac{85}{80} = 1.06\ °C/W$

$R_{TH\ (c\ -\ h)} + R_{TH\ (h\ -\ a)} \leq 1.06°C/W - 0.55\ °C/W \leq 0.51\ °C/W$

## OVERLOADS

In any case the applied voltage must be lower than 2 $U_n$. $U_{max.} < 2\ U_n < 3800$ V.

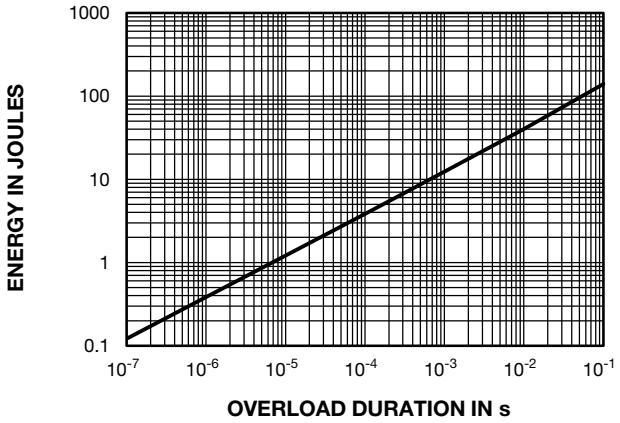
**Short time overload:** 4 x Pr/5 s

**Accidental overload:** The values indicated on the following graph are applicable to resistors in air or mounted onto a heatsink.

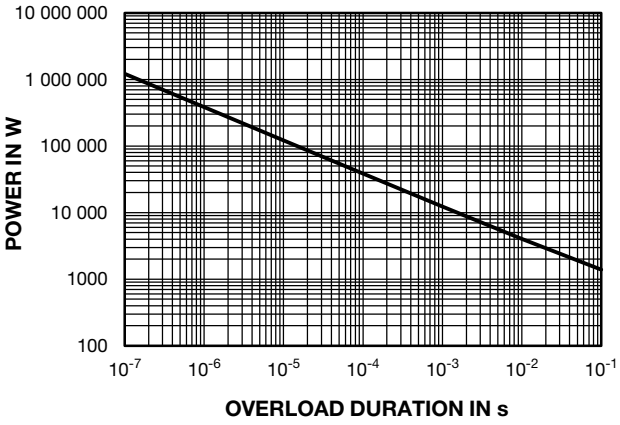
## MARKING

Series, style, ohmic value (in Ω), tolerance (in %), manufacturing date, Vishay Sfernice trademark.

## ENERGY CURVE

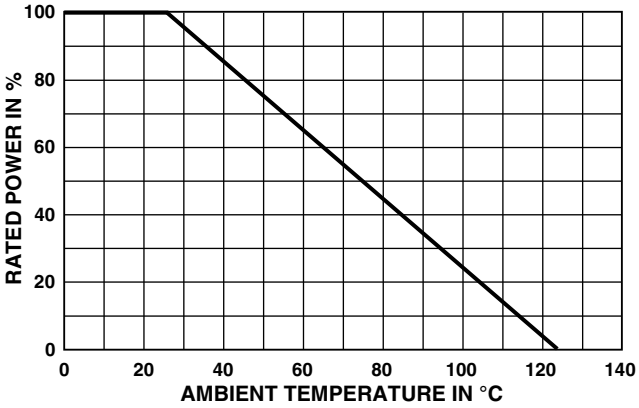



## POWER CURVE




## POWER RATING

For resistor mounted onto a heatsink with thermal resistance of 0.45 °C/W.



## ORDERING INFORMATION

| RPH | 100 | 3.3 kΩ | ± 5 % | V | xxx |
|---|---|---|---|---|---|
| MODEL | STYLE | RESISTANCE VALUE | TOLERANCE<br><br>± 1 %<br>± 2 %<br>± 5 % | CONNECTIONS<br><br>V: M4 screw | CUSTOM DESIGN<br>Optional<br>on request:<br>Special TCR,<br>shape etc. |

## GLOBAL PART NUMBER INFORMATION

| R | P | H | 1 | 0 | 0 | V | 1 | 0 | 0 | 0 | J | B | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| GLOBAL MODEL | SIZE | LEADS | OHMIC VALUE | TOLERANCE | PACKAGING | SPECIAL |
|---|---|---|---|---|---|---|
| **RPH** | **100** | **V** = M4 screw | The first four digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point.<br>**48R70** = 48.7 Ω<br>**48701** = 48 700 Ω<br>**10002** = 100 kΩ<br>**R0100** = 0.01 Ω<br>**R6800** = 0.68 Ω<br>**27000** = 2700 Ω = 2.7 kΩ | **F** = 1 %<br>**G** = 2 %<br>**J** = 5 %<br>**K** = 10 % | **B** = Box<br>5 pieces | As applicable<br>**Ex** = XXX |

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