Power Resistor for Mounting onto a Heatsink Thick Film Technology

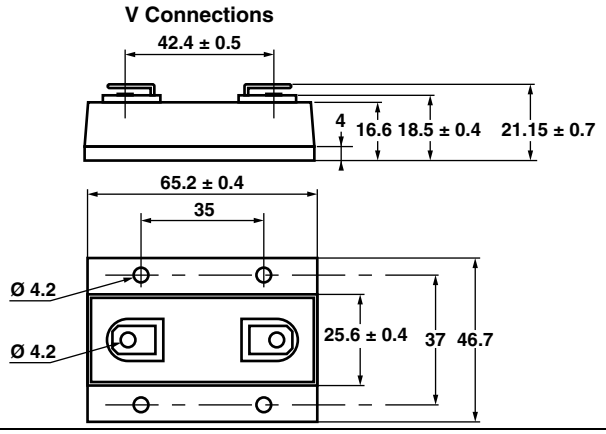
FEATURES

- 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
	Momentary	chassis mounted 0.45 °C/W 10 W at 25 °C free air
Temperature Coefficient	**Standard**	± 300 ppm/°C < 1 Ω ± 150 ppm/°C > 1 Ω
Thermal Resistance		0.55 °C/W
Dielectric Strength MIL STD 202		5 kV_{RMS}, 1 min, 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 4 Pr / 5 s $U_S < 2\ U_L$	< ± (0.25 % + 0.05 Ω)
Rapid Temperature Change	NF EN 140000 CEI 68214 Test Na 5 cycles, -55 °C, +125 °C	< ± (0.25 % + 0.05 Ω)
Load Life **(Chassis Mounted 0.45 °C/W)**	NF EN 140 000 Pr at 25 °C, 1000 h	< ± (0.5 % + 0.05 Ω)
Humidity (Steady State)	MIL STD 202 Method 103 B Test D 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
Tolerance 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.

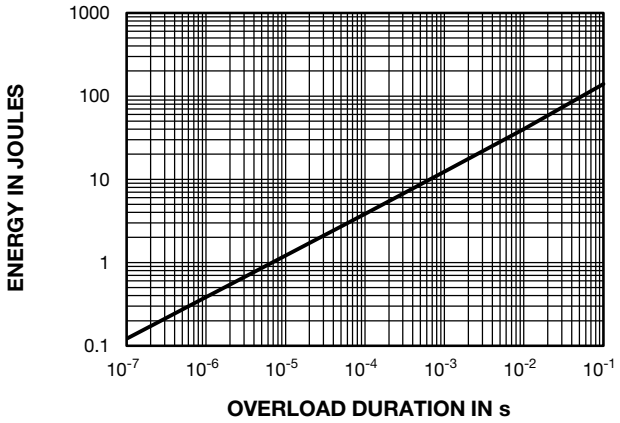
Short time overload: 4 x Pr/5 s

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

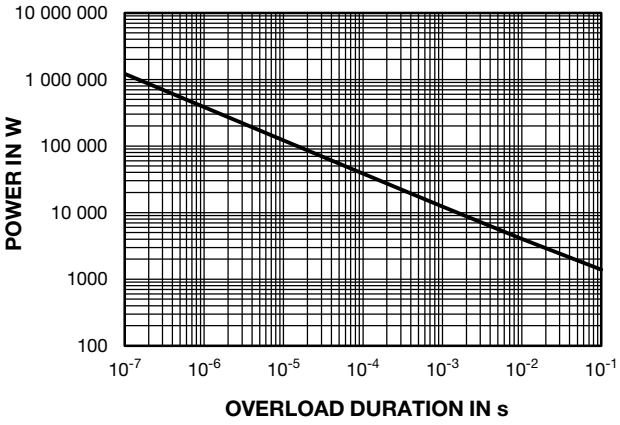
MARKING

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

ENERGY CURVE

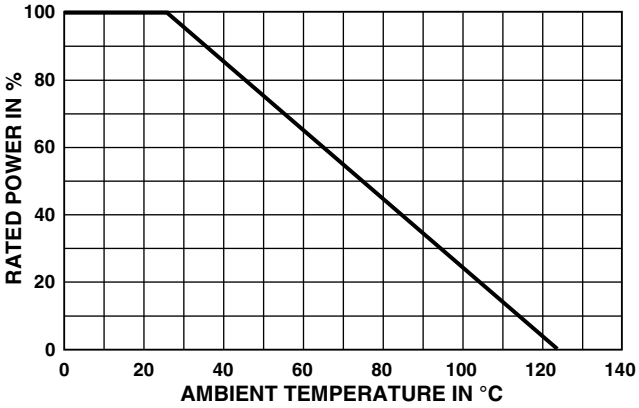


POWER CURVE



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	CONNECTIONS	CUSTOM DESIGN
			± 1 % ± 2 % ± 5 %	V: M4 screw	optional on request: special TCR, shape etc.

GLOBAL PART NUMBER INFORMATION

R	P	H	1	0	0	V	1	0	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. **48R70** = 48.7 Ω **48701** = 48 700 Ω **10002** = 100 kΩ **R0100** = 0.01 Ω **R6800** = 0.68 Ω **27000** = 2700 Ω = 2.7 kΩ	**F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**B** = Box 5 pieces	As applicable **Ex** = XXX

RELATED DOCUMENTS

APPLICATION NOTES	
Pulse Capabilities for Thick Film Power Resistors	www.vishay.com/doc?50060
Guidelines for Vishay Sfernice Resistive and Inductive Components	www.vishay.com/doc?52029

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