

Power Resistor for Mounting onto a Heatsink Thick Film Technology



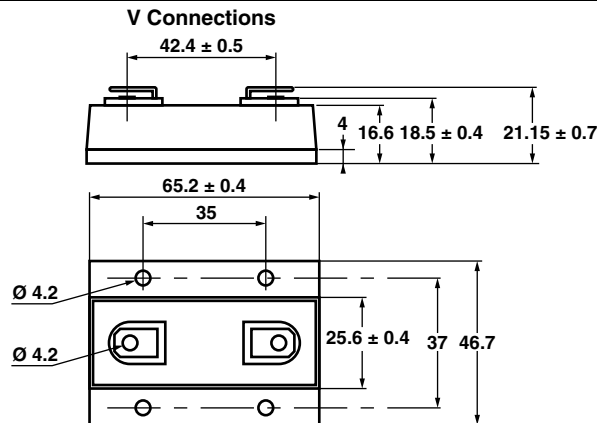
FEATURES

- 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 $P_{25\text{ }^\circ\text{C}}$ 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 M Ω
Inductance		< 0.1 μ H



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

RESISTANCE VALUE IN RELATION TO TOLERANCE AND TCR		
Ohmic Value	$< 1 \Omega$	$> 1 \Omega$
Standard Tolerance	$\pm 5 \%$	$\pm 5 \%$
Standard TCR	$\pm 300 \text{ ppm}/^\circ\text{C}$	$\pm 150 \text{ ppm}/^\circ\text{C}$
Tolerance On Request	$\pm 1 \% \text{ to } \pm 2 \%$	

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.

$$\Delta T \leq 125 \text{ }^\circ\text{C} - 40 \text{ }^\circ\text{C} \leq 85 \text{ }^\circ\text{C}$$

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

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



OVERLOADS

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

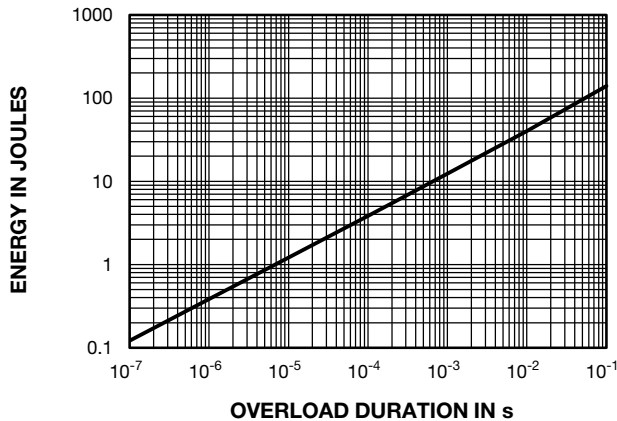
Short time overload: $4 \times Pr/5 s$

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

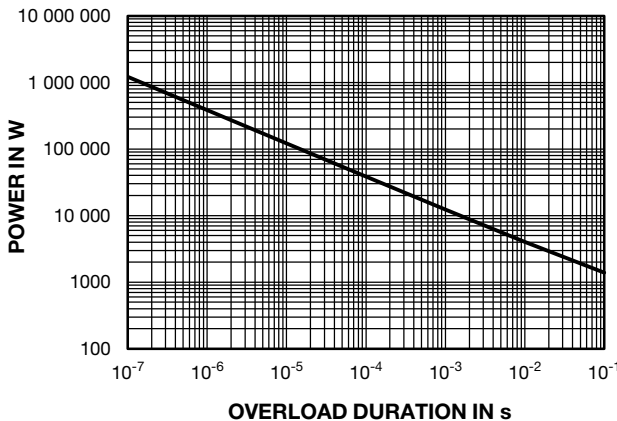
MARKING

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

ENERGY CURVE

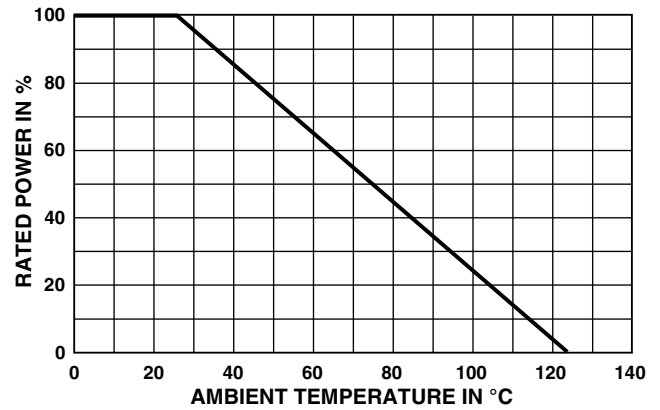


POWER CURVE



POWER RATING

For resistor mounted onto a heatsink with thermal resistance of $0.45 \text{ }^\circ\text{C/W}$.





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



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.