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

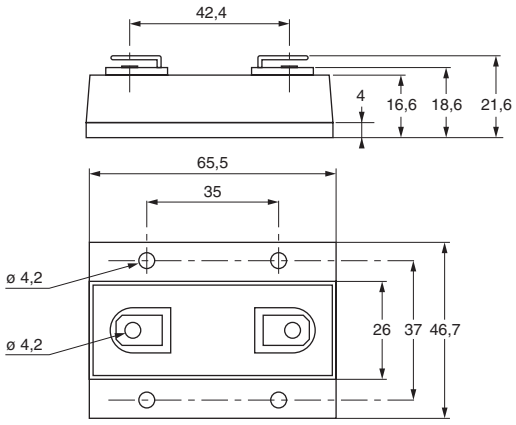
This new style has been developed as an extension to RCH range. Through the use of thick film technology, a non-inductive solution for power resistors is available which are rated up to 100 W at + 25 °C. The terminations position prevents any risk of an electrical arc to the heatsink.

This resistor series can replace and offer advantages to standard wirewound devices.

DIMENSIONS in millimeters

RPH 100

V Connections



MECHANICAL SPECIFICATIONS

Mechanical Protection	Insulated case
Substrate	Alumina on metallic base of nickel coated aluminum
Resistive Element	Cermet
End Connections	V connections: screws M4 x 6
Tightening Torque Connections	1 Nm
Tightening Torque Heatsink	3 Nm
Weight	60 g

ENVIRONMENTAL SPECIFICATIONS

Thermal Resistance	R_{TH} (j-c) 0.55 °C/W
Temperature Range	- 55 °C + 125 °C
Climatic Category	55/125/56

ELECTRICAL SPECIFICATIONS

Resistance Range	0.092 Ω to 1 MΩ E24 series
Tolerances	± 1 % to ± 10 %
Power Rating:	
Continuous	100 W at 25 °C chassis mounted 0.45°C/W 10 W at 25 °C Free air
Momentary	400 W at 25 °C for 5 seconds
Temperature Coefficient	
Standard	± 300 ppm/°C < 1 Ω ± 150 ppm/°C > 1 Ω
Limiting Element Voltage	1900 V_{RMS}
Dielectric Strength MIL STD 202	5 kV_{RMS} 1minute 10 mA Max
Insulation Resistance	$> 10^6$ MΩ
Inductance	< 0.1 µH

For technical questions, contact sfer@vishay.com

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PERFORMANCE		
TESTS	**CONDITIONS**	**TYPICAL DRIFTS**
Short Time Overload	NF EN 140000 CEI 115_1 4 Pn/5 seconds	< ± (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 140000 Pn at 25 °C 1000 hours	< ± (0.5 % + 0.05 Ω)
Humidity (steady state)	MIL STD 202 Method 103 B Test D 56 days 95 % R.H.	< ± (0.5 % + 0.05 Ω)

RESISTANCE VALUE IN RELATION TO TOLERANCE AND TCR		
Ohmic Value	< 1Ω	> 1 Ω
Standard Tolerance	± 5 %	± 5 %
Standard T.C.R.	± 300 ppm/°C	± 150 ppm/°C
Tolerances On Request	± 1 % - ± 2 %	

CHOICE OF THE HEATSINK

The user must choose 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 ratios:

$$P = \frac{\Delta T}{[R^{TH}(j\text{-}c) + R^{TH}(c\text{-}a)]} \quad (1)$$

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-a): thermal resistance value measured between outer side of the resistor and room temperature. It is the thermal resistance of the heatsink itself (type, shape) and the quality of the fastening device.

Example:

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

Thermal resistance R_{TH} (j-c): 0.55 °C/W

Considering equation (1) we have:

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

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

$RTH\ (c\text{-}a) \leq 1.06\ °C/W - 0.55\ °C/W \leq 0.51\ °C/W$

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 four screws (not supplied).

Tightening torque: 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).

OVERLOADS

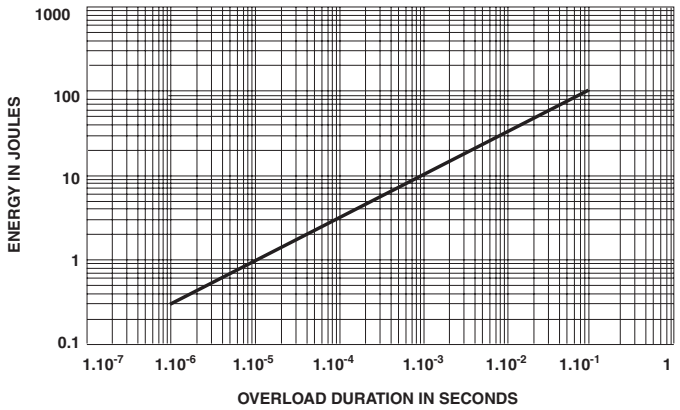
In any case the applied voltage must be lower than 2 Un.

U maxi < 2 Un < 3800 V.

Short time overload: 4 Pn/5 seconds.

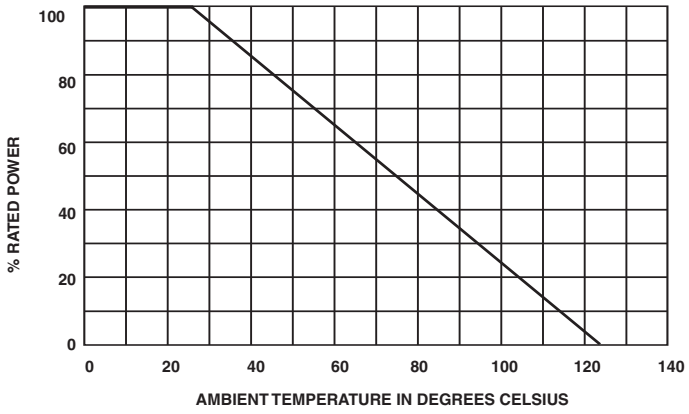
Accidental overload: The values indicated on the graph below are applicable to resistors in air or mounted onto a heatsink.

ENERGY CURVE



POWER RATING CHART

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



MARKING

Series, style, ohmic value (in Ω), tolerance (in %), manufacturing date, SFERNICE trade mark.

ORDERING INFORMATION

RPH	100	3.3 kΩ	± 5 %	V	
MODEL	**STYLE**	**RESISTANCE VALUE**	**TOLERANCE**	**CONNECTIONS**	**CUSTOM DESIGN**
			Optional ± 1 % ± 2 % ± 5 %	V: screw M4	Options on request T.C.R., shape, etc.

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