Power Resistor for Mounting onto a Heatsink Thick Film Technology

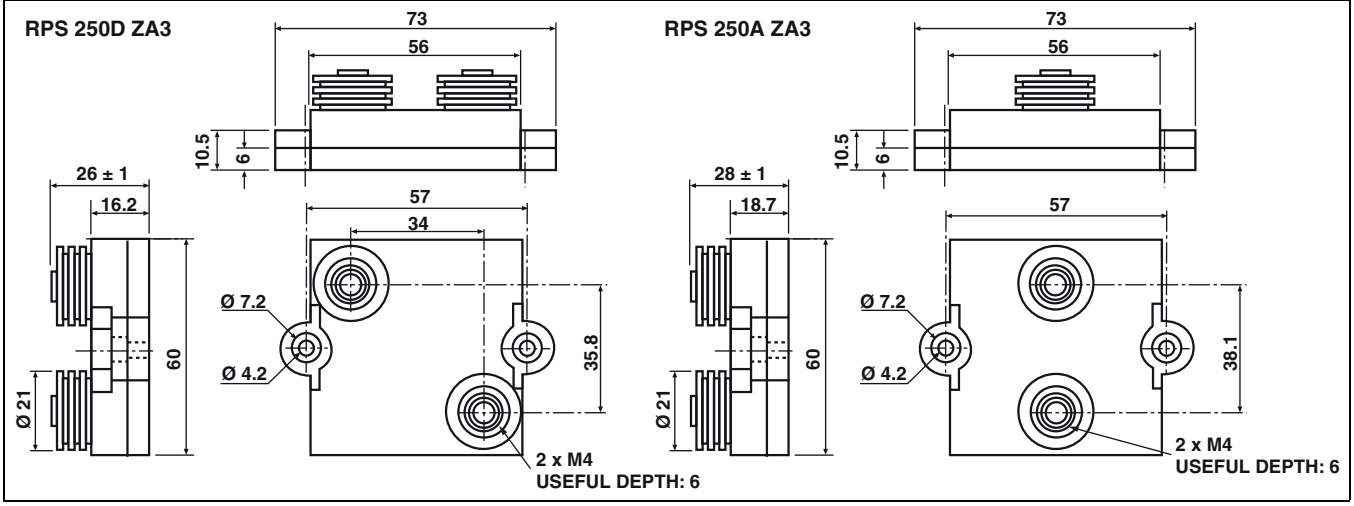
FEATURES

- High power rating: 250 W
- High overload capability up to 4 times nominal power (see energy curve)
- Easy mounting
- Low thermal radiation of the case
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

Developed for specific applications such as railroad electrical traction, this series can bear short overloads as high as fifteen times the nominal power. Designed to be mounted onto a heatsink, these power resistors exhibit remarkable characteristics.

DIMENSIONS in millimeters



Note

- Tolerance 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
RPS 250	250	0.24 to 1M (1)	250	5000	1, 2, 5, 10	150

Note

(1) E24 series

MECHANICAL SPECIFICATIONS

Mechanical Protection	Insulated case and resin for potting UL 94 V-0
Resistive Element	Cermet
Substrate	Alumina onto aluminum base
End Connections	Screws M4 (M5 on request)
Tightening Torque Connections	2 Nm
Weight	170 g ± 10 %

ENVIRONMENTAL SPECIFICATIONS

Thermal Resistance	$R_{th\,(j-c)}$ 0.22 °C/W
Temperature Range	-55 °C to 125 °C
Climatic Category	55 / 125 / 56

TECHNICAL SPECIFICATIONS

Power Rating Chassis Mounted	250 W at 50 °C continuous 1000 W at 25 °C for 10 s
Temperature Coefficient Standard	± 250 ppm/°C < 1 Ω ± 150 ppm/°C > 1 Ω
Dielectric Strength MIL STD 202 (301), min, 10 mA max.	L connections 7 kV_{RMS} H connections 12 kV_{RMS}
Insulation Resistance	> 10^6 MΩ
Inductance	< 50 nH
Capacitance Resistor/ Ground	< 40 pF < 120 pF

PERFORMANCE		
TESTS	**CONDITIONS**	**REQUIREMENTS**
Momentary Overload	NF EN 140000 CEI 115_1 4 Pr / 10 s / U_L = 5000 V	< ± (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	NF EN 140000 CEI 115_1 1000 h Pr at 70 °C	< ± (0.5 % + 0.05 Ω)
Humidity (Steady State)	MIL STD 202 Method 103 B and D 56 days RH 95 %	< ± (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 (-55 °C to +125 °C)	± 250 ppm/°C	± 150 ppm/°C
Tolerance on Request	± 1 %/± 2 %/± 10 %	

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 on Heatsink	RPS 250
	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).
- In any case the hot spot temperature, measured locally on the case must not exceed 125 °C.
- Test should be performed by the user.

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: (see Environmental Specifications).

$R_{th\ (c\ -\ h)}$: 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 RPS 250 power dissipation 180 W at +50 °C room temperature.

$\Delta T \leq 125\ °C - 50\ °C \leq 75\ °C$

$R_{th\ (j\ -\ c)} + R_{th\ (c\ -\ h)} + R_{th\ (h\ -\ a)} = \frac{\Delta T}{P} = \frac{75}{180} = 0.42\ °C/W$

$R_{th\ (j\ -\ c)} = 0.22\ °C/W$

$R_{th\ (c\ -\ h)} + R_{th\ (h\ -\ a)} \leq 0.42\ °C/W - 0.22\ °C/W \leq 0.20\ °C/W$

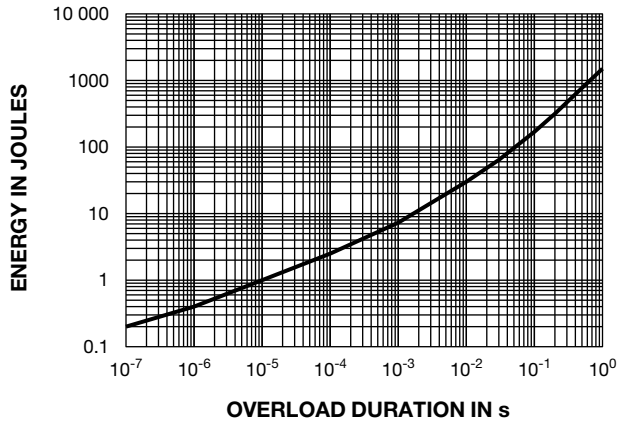
OVERLOADS

In any case the applied voltage must be lower than 2.5 U_n.
$U_{max.} < 2.5\ U_n < 12\ 500$ V.

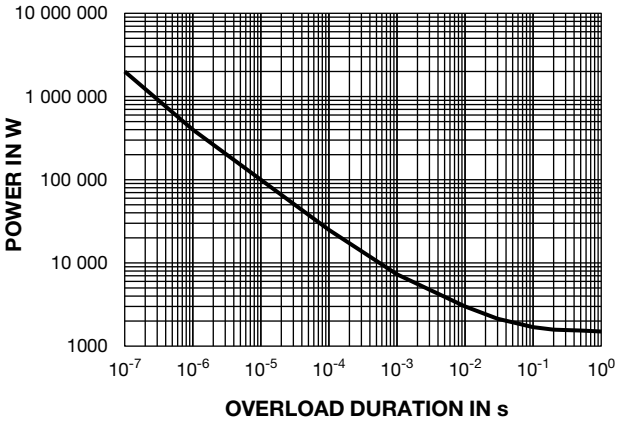
Short time overload: 4 Pr/10 s

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

ENERGY CURVE



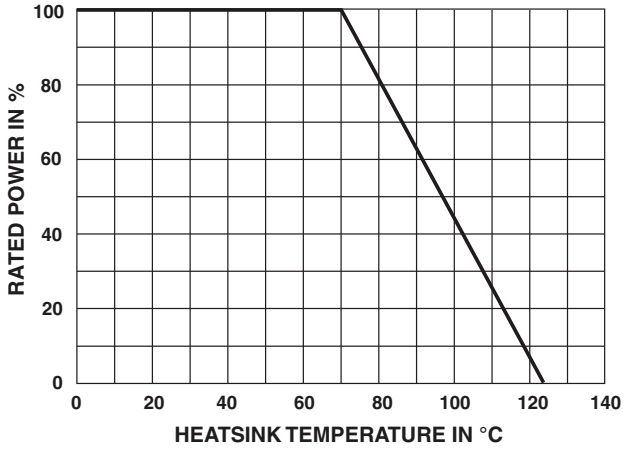
POWER CURVE



POWER RATING

The temperature of the heatsink should be maintained in the limit specified.

To improve the thermal conductivity, surfaces in contact should be coated with a silicone grease.



PACKAGING

Box of 15 units

MARKING

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

GLOBAL PART NUMBER INFORMATION

R	P	S	0	2	5	0	D	L	2	R	2	0	J	B	Z	A	3

GLOBAL MODEL	STYLE	DIELECTRIC	OHMIC VALUE	TOLERANCE	PACKAGING	TYPE
RPS250	**D** = diagonal connections **A** = straight connections	**H** = dielectric strength 12 kV **L** = dielectric strength 7 kV	The first three digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point. **2R20** = 2.20 Ω **48R7** = 48.7 Ω **47R0** = 47 Ω **1001** = 1 kΩ **4R70** = 4.7 Ω **R240** = 0.24 Ω	**F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**B** = box, 15 pcs **N** = box, 15 pcs N/A (1 to 14 pcs by box)	Square sole = **blank** Cropped sole = **ZA3** As applicable = **ZAx**

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