

## Power Resistor for Mounting onto a Heatsink Thick Film Technology



### FEATURES

- High power rating: 500 W
- High overload capability up to 2 times rated power (see energy curve)
- Heatsink mounting
- Low thermal radiation of the case
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

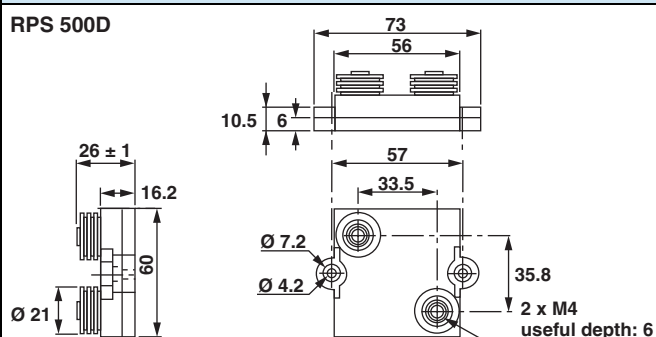
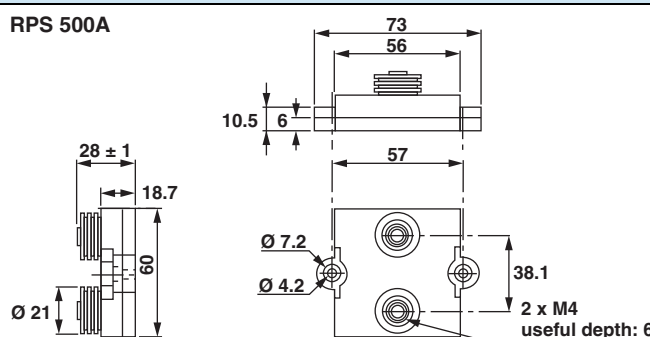

**RoHS**  
COMPLIANT

### DESIGN SUPPORT TOOLS

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**3D**  
Models  
Available

This range has been developed specifically for electrical traction applications and is capable of dissipating 500 W at +70 °C. The remarkable performance characteristics are evident when used in severe pulse conditions. The copper base allows easy mounting on the heatsink and provides optimal dissipation conditions.

### DIMENSIONS in millimeters

**RPS 500D**

**RPS 500A**


#### Note

- Tolerances unless stated: ± 0.2 mm

### STANDARD ELECTRICAL SPECIFICATIONS

| MODEL   | SIZE | RESISTANCE RANGE<br>$\Omega$ | RATED POWER<br>$P_{25^\circ\text{C}}$<br>W | LIMITING ELEMENT<br>VOLTAGE $U_L$<br>V | TOLERANCE<br>$\pm \%$ | TEMPERATURE<br>COEFFICIENT<br>$\pm \text{ppm}/^\circ\text{C}$ |
|---------|------|------------------------------|--|--|-----------------------|---|
| RPS 500 | 500  | 0.24 to 1M <sup>(1)</sup>    | 500  | 5000                                   | 1, 2, 5, 10           | 150   |

#### Note

- <sup>(1)</sup> E24 series

### MECHANICAL SPECIFICATIONS

|                                  |  |
|----------------------------------|--|
| Mechanical Protection            | Insulated case and resin for potting UL 94 V-0 |
| Resistive Element                | Cermet   |
| Substrate                        | Alumina onto base of nickel coated copper      |
| End Connections                  | Screws M4 (M5 on request)                      |
| Weight                           | 250 g ± 10 %                                   |
| Tightening Torque on Connections | 2 Nm   |
| Tightening Torque on Heatsink    | 4 Nm   |

### ENVIRONMENTAL SPECIFICATIONS

|                   |  |
|-------------------|--|
| Temperature Range | -55 °C to +125 °C  |
| Flammability      | IEC 60695-11-5<br>2 applications 30 s<br>separated by 60 s |

### TECHNICAL SPECIFICATIONS

|  |  |
|--|--|
| Rated Power ( $P_{70}$ )<br>Chassis Mounted at 70 °C<br>(Case Temperature) | 500 W continuous load  |
| Thermal Resistance of the Component  | $R_{th(j-c)}$ : 0.11 °C/W  |
| Temperature Coefficient  | $\pm 300 \text{ ppm}/^\circ\text{C} < 1 \Omega$<br>$\pm 150 \text{ ppm}/^\circ\text{C} > 1 \Omega$ |
| Dielectric Strength  | L: 7 kV <sub>RMS</sub> - H: 12 kV <sub>RMS</sub><br>MIL STD 202 Method 301:<br>1 min/10 mA max.    |
| Insulation Resistance  | $> 10^6 \text{ M}\Omega$ under $U_{ins} = 500 \text{ V}_{DC}$<br>IEC 60115-1                       |
| Inductance   | $< 50 \text{ nH}$  |

| <b>PERFORMANCE</b>       |   |                                 |
|--------------------------|---|---------------------------------|
| TESTS                    | CONDITIONS  | REQUIREMENTS                    |
| Momentary Overload       | EN 60115-1<br>2 Pr / 10 s<br>$U_L = 5000 \text{ V}$                         | $< \pm (0.25 \% + 0.05 \Omega)$ |
| Rapid Temperature Change | IEC 60115-1 / IEC60068-2-14 Test Na<br>5 cycles, -55 °C to +125 °C          | $< \pm (0.25 \% + 0.05 \Omega)$ |
| Load Life                | IEC 60115-1<br>Pr (i.e. 500 W) / 1000 h / 70 °C (no cycling) <sup>(1)</sup> | $< \pm (0.5 \% + 0.05 \Omega)$  |
| Humidity (Steady State)  | MIL STD 202 Method 103 B and D<br>56 days, 95 % RH / 40 °C                  | $< \pm (0.5 \% + 0.05 \Omega)$  |

**Note**

<sup>(1)</sup> Resistors are not tested and guaranteed in cycling conditions

| <b>RESISTANCE VALUE IN RELATION TO TOLERANCE AND TCR</b> |                                      |                                      |
|--|--------------------------------------|--------------------------------------|
| Resistance Values  | $< 1 \Omega$                         | $> 1 \Omega$                         |
| Standard Tolerances                                      | $\pm 5 \%$                           |                                      |
| Standard TCR (-55 °C to +125 °C)                         | $\pm 300 \text{ ppm/}^\circ\text{C}$ | $\pm 150 \text{ ppm/}^\circ\text{C}$ |
| Tolerance on Request                                     | $\pm 1 \%, \pm 2 \%, 10 \%$          |                                      |

**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  $\mu\text{m}$ . In order to improve thermal conductivity, surfaces in contact (alumina, heatsink) are 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 tightened at 4 Nm for full power availability.

| Tightening Torque on Heatsink | RPS 500 |
|-------------------------------|---------|
|                               | 4 Nm    |

- The following accessories are supplied with each product: 2 off CHC M4 x 16/16 class 8.8 for heatsink mounting, 2 off TH M4 x 6/6 and 2 M4 contact lock washers for connections.

**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 ratio:

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

P: Expressed in W

$\Delta T$ : 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: 0.11 °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.



## OVERLOADS

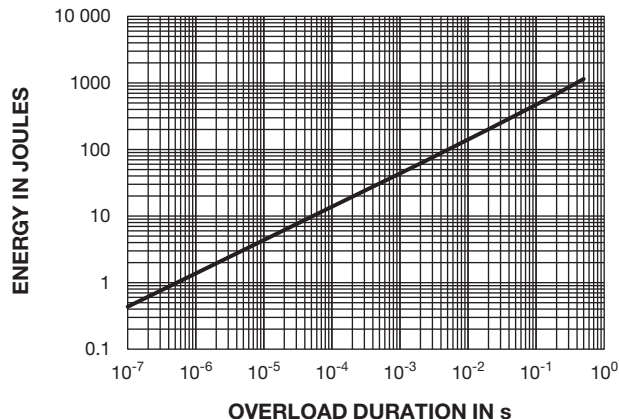
Short time overload: 2 Pr/10 s

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

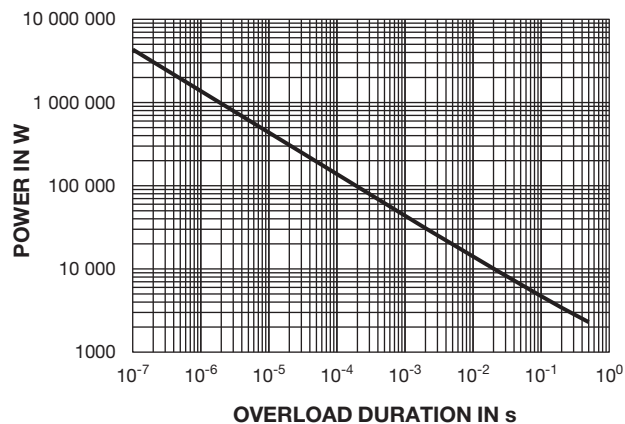
## MARKING

Model, style, resistance value (in  $\Omega$ ), tolerance (in %), manufacturing date, Vishay Sfernice trademark.

## ENERGY CURVE



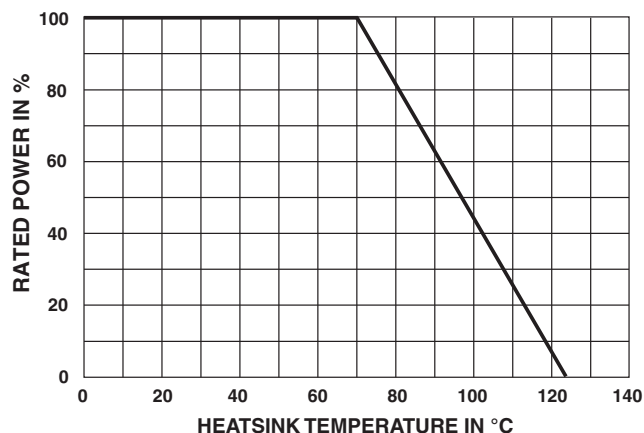
## POWER CURVE



## POWER RATING

The heatsink temperature should be maintained at the values specified in fig. 2.

To optimize the thermal conduction, contacting surfaces should be coated with silicone grease and heatsink mounting screws tightened to 4 Nm.



## PACKAGING

Box of 15 units



## ORDERING INFORMATION

| RPS   | 500   | DH   | 100 k $\Omega$   | $\pm 10\%$   | xxx  | BO15      | e              |
|-------|-------|--|------------------|--|--|-----------|----------------|
| MODEL | STYLE | CONNECTIONS<br>optional<br>H: dielectric<br>strength 12 kV<br>L: dielectric<br>strength 7 kV | RESISTANCE VALUE | TOLERANCE<br><br>$\pm 1\%$<br>$\pm 2\%$<br>$\pm 5\%$<br>$\pm 10\%$ | CUSTOM DESIGN<br>optional<br>on request:<br>special TCR,<br>shape etc. | PACKAGING | LEAD (Pb)-FREE |

## GLOBAL PART NUMBER INFORMATION

|                 |  |   |  |   |   |   |   |  |   |   |   |                       |   |   |  |
|-----------------|--|---|--|---|---|---|---|--|---|---|---|-----------------------|---|---|--|
| R               | P  | S   | 0  | 5 | 0 | 0 | D   | H  | 4 | 7 | R | 0                     | J | B |  |
| GLOBAL<br>MODEL | STYLE  | DIELECTRIC  | OHMIC VALUE  |   |   |   | TOLERANCE                                 | PACKAGING  |   |   |   | SPECIAL               |   |   |  |
| RPS500          | D = diagonal<br>connections<br>A = straight<br>connections | H: dielectric<br>strength 12 kV<br>L: dielectric<br>strength 7 kV | The first four digits are<br>significant figures and the<br>last digit specifies the<br>number of zeros to follow.<br>R designates decimal point.<br>48R70 = 48.7 $\Omega$<br>47R0 = 47 $\Omega$<br>1001 = 1 k $\Omega$<br>4R70 = 4.7 $\Omega$<br>R240 = 0.24 $\Omega$ |   |   |   | F = 1 %<br>G = 2 %<br>J = 5 %<br>K = 10 % | B = box 15 pieces<br>N = box 15 pieces<br>N/A (1 to 14 pieces<br>by box) |   |   |   | As applicable<br>ZAx. |   |   |  |

## RELATED DOCUMENTS

### APPLICATION NOTES

|   |  |
|---|--|
| Potentiometers and Trimmers                                       | <a href="http://www.vishay.com/doc?51001">www.vishay.com/doc?51001</a> |
| Guidelines for Vishay Sfernice Resistive and Inductive Components | <a href="http://www.vishay.com/doc?52029">www.vishay.com/doc?52029</a> |



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