

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

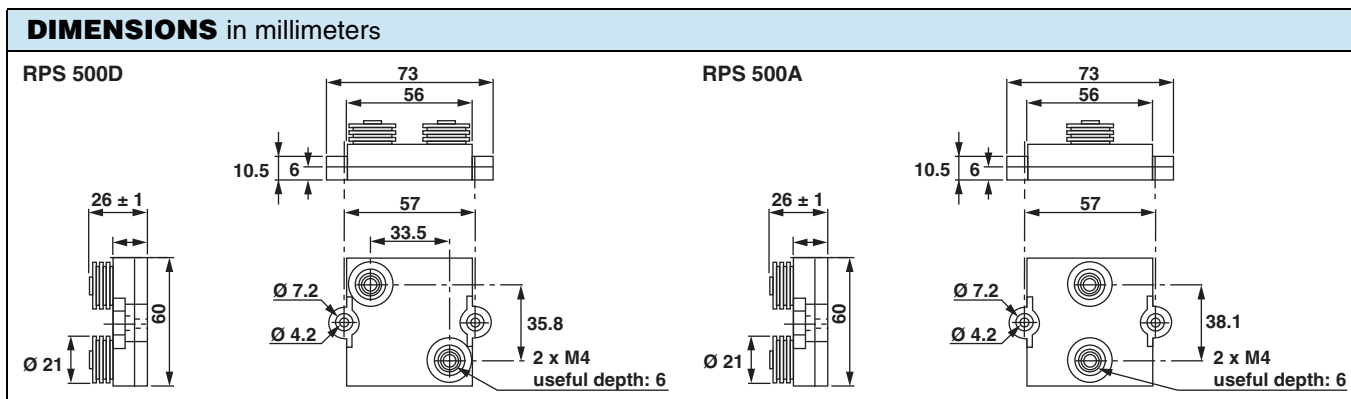


### FEATURES

- 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
- Compliant to RoHS directive 2002/95/EC



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.



**Note**  
• Tolerances unless stated: ± 0.2 mm

### MECHANICAL SPECIFICATIONS

|   |   |
|---|---|
| <b>Mechanical Protection</b>            | Insulated case                            |
| <b>Substrate</b>                        | Alumina onto base of nickel coated copper |
| <b>Resistive Element</b>                | Cermet                                    |
| <b>End Connections</b>                  | Screws M4 (M5 on request)                 |
| <b>Tightening Torque on Connections</b> | 2 Nm                                      |
| <b>Tightening Torque on Heatsink</b>    | 4 Nm                                      |
| <b>Weight</b>                           | 250 g ± 10 %                              |

### ENVIRONMENTAL SPECIFICATIONS

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

### ELECTRICAL SPECIFICATIONS

|  |   |
|--|---|
| <b>Resistance Range</b>  | 0.24 Ω to 1 MΩ E24 series   |
| <b>Tolerances</b>  | ± 1 % to ± 10 %   |
| <b>Rated Power (<math>P_{r,70}</math>)<br/>Chassis Mounted at 70 °C<br/>(Case Temperature)</b> | 500 W continuous load   |
| <b>Thermal Resistance of the Component</b>   | $R_{TH(j-c)}$ : 0.11 °C/W   |
| <b>Temperature Coefficient</b>   | ± 300 ppm/°C < 1 Ω<br>± 150 ppm/°C > 1 Ω  |
| <b>Limiting Element Voltage <math>U_L</math></b>   | 5 kV <sub>RMS</sub>   |
| <b>Dielectric Strength</b>   | L: 7 kV <sub>RMS</sub> - H: 12 kV <sub>RMS</sub><br>MIL STD 202 Method 301:<br>1 min/10 mA max. |
| <b>Insulation Resistance</b>   | > 10 <sup>6</sup> MΩ under $U_{ins} = 500 V_{DC}$<br>IEC 60115-1                                |
| <b>Inductance</b>  | < 50 nH   |

| <b>PERFORMANCE</b>                 |  |                                 |
|------------------------------------|--|---------------------------------|
| <b>TESTS</b>                       | <b>CONDITIONS</b>  | <b>REQUIREMENTS</b>             |
| <b>Momentary Overload</b>          | IEC 60115-1<br>2 $P_r/10$ s $U_L = 5000$ V                                 | $< \pm (0.25 \% + 0.05 \Omega)$ |
| <b>Rapid Temperature Change</b>    | IEC 60115-1/IEC60068-2-14 Test Na<br>5 cycles - 55 °C to + 125 °C          | $< \pm (0.25 \% + 0.05 \Omega)$ |
| <b>Load Life (Chassis Mounted)</b> | IEC 60115-1<br>$P_r$ (i.e. 500 W)/1000 h/70 °C (no cycling) <sup>(1)</sup> | $< \pm (0.5 \% + 0.05 \Omega)$  |
| <b>Humidity (Steady State)</b>     | 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> |                                 |                  |
|--|---------------------------------|------------------|
| <b>Ohmic</b>   | $< 1 \Omega$                    | $> 1 \Omega$     |
| <b>Standard Tolerance</b>                                | $\pm 5 \%$                      | $\pm 5 \%$       |
| <b>Standard TCR (- 55 °C to + 125 °C)</b>                | $\pm 300$ ppm/°C                | $\pm 150$ ppm/°C |
| <b>Tolerance on Request</b>                              | $\pm 1 \%, \pm 2 \%, \pm 10 \%$ |                  |

**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  $\mu$ m. 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 tightened at 4 Nm for full power availability.

|                                      |         |
|--------------------------------------|---------|
| <b>Tightening Torque on Heatsink</b> | 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:

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

P: Expressed in W

$\Delta T$ : Difference between maximum working temperature and room temperature.

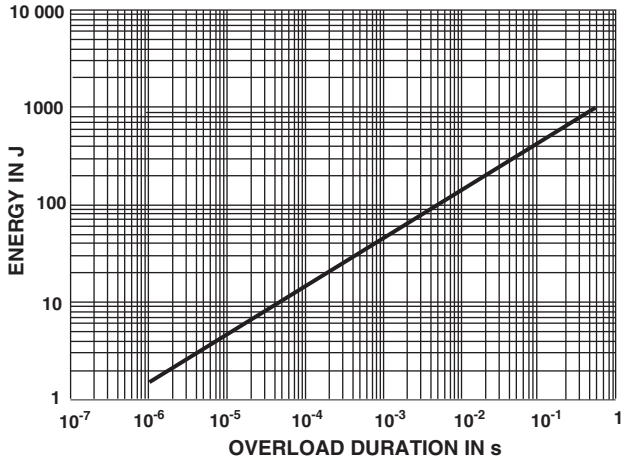
$R_{TH(j-c)}$ : Thermal resistance value measured between resistive layer and outer side of the resistor. It is the thermal resistance of the component: 0.11 °C/W.

$R_{TH(c-a)}$ : Thermal resistance value measured between outer side of the resistor and room temperature. It is the thermal resistance of the heatsink, depending on the heatsink itself (type, shape) and the quality of the fastening device.

**OVERLOADS**

Short time overload:  $2 P_r/10$  s

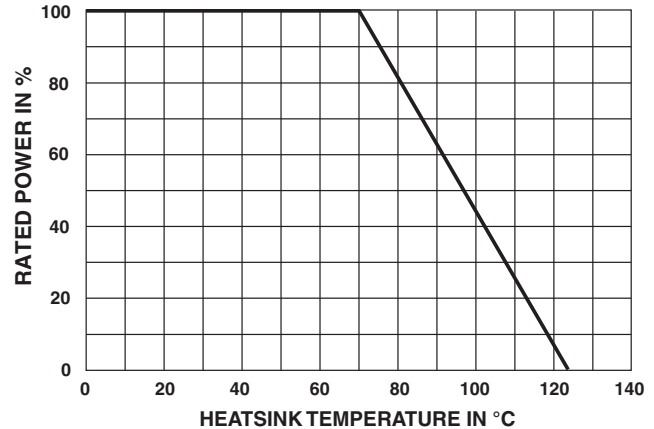
Accidental overload: The values indicated in the graph below are applicable to resistors in air or mounted onto a heatsink.



**POWER RATING**

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

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



**MARKING**

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

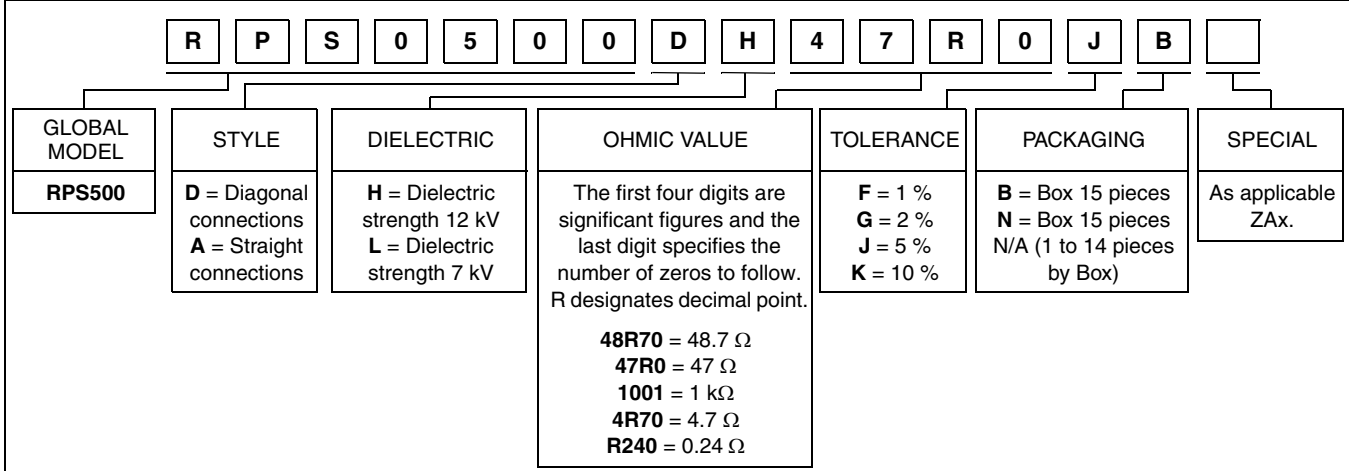
**PACKAGING**

Box of 15 units

**ORDERING INFORMATION**

|       |       |                              |                  |            |                  |           |                |
|-------|-------|------------------------------|------------------|------------|------------------|-----------|----------------|
| RPS   | 500   | DH                           | 100 $\Omega$     | 10 %       | XXX              | BO15      | e              |
| MODEL | STYLE | CONNECTIONS                  | RESISTANCE VALUE | TOLERANCE  | CUSTOM DESIGN    | PACKAGING | LEAD (Pb)-FREE |
|       |       | Optional                     |                  | $\pm 1$ %  | Options          |           |                |
|       |       | H: Dielectric strength 12 kV |                  | $\pm 2$ %  | on request       |           |                |
|       |       | L: Dielectric strength 7 kV  |                  | $\pm 5$ %  | TCR, shape, etc. |           |                |
|       |       |                              |                  | $\pm 10$ % |                  |           |                |

**SAP PART NUMBERING GUIDELINES**





## 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 and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. 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.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**