Power Resistor for Mounting onto a Heatsink
Thick Film Technology

FEATURES
• Compliant with requirement #26 of NF-EN45545-2
• 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

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

<table>
<thead>
<tr>
<th>MODEL</th>
<th>SIZE</th>
<th>RESISTANCE RANGE ( \Omega )</th>
<th>RATED POWER ( P_{25 \degree C} ) W</th>
<th>LIMITING ELEMENT VOLTAGE ( U_L ) V</th>
<th>TOLERANCE ± %</th>
<th>TEMPERATURE COEFFICIENT ± ppm/°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPS 500</td>
<td>500</td>
<td>0.24 to 1M (1)</td>
<td>500</td>
<td>5000</td>
<td>1, 2, 5, 10</td>
<td>150</td>
</tr>
</tbody>
</table>

Note
• Tolerances unless stated: ± 0.2 mm

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 2 applications 30 s separated by 60 s

TECHNICAL SPECIFICATIONS
Rated Power \( (P_{70}) \) Chassis Mounted at 70 °C (Case Temperature): 500 W continuous load
Thermal Resistance of the Component: \( R_{th(j-c)}: 0.11 \degree C/W \)
Temperature Coefficient ± 300 ppm/°C < 1 \( \Omega \)
± 150 ppm/°C > 1 \( \Omega \)
Dielectric Strength: L: 7 kV RMS - H: 12 kV RMS
MIL STD 202 Method 301: 1 min/10 mA max.
Insulation Resistance: > 10\(^8\) M\(\Omega\) under \( U_{ins} = 500 \) V\(_{DC} \)
IEC 60115-1
Inductance: < 50 nH

Revision: 05-Jun-2019
For technical questions, contact: sferfixedresistors@vishay.com
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Note
(1) Resistors are not tested and guaranteed in cycling conditions

### PERFORMANCE

<table>
<thead>
<tr>
<th>TESTS</th>
<th>CONDITIONS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Momentary Overload</td>
<td>EN 60115-1&lt;br&gt;2 Pr / 10 s&lt;br&gt;(U_L = 5000) V</td>
<td>&lt; ± (0.25 % + 0.05 (\Omega))</td>
</tr>
<tr>
<td>Rapid Temperature Change</td>
<td>IEC 60068-2-14 Test Na&lt;br&gt;5 cycles, -55 °C to +125 °C</td>
<td>&lt; ± (0.25 % + 0.05 (\Omega))</td>
</tr>
<tr>
<td>Load Life</td>
<td>IEC 60115-1&lt;br&gt;Pr (i.e. 500 W) / 1000 h / 70 °C</td>
<td>&lt; ± (0.5 % + 0.05 (\Omega))</td>
</tr>
<tr>
<td>Humidity (Steady State)</td>
<td>MIL STD 202 Method 103 B and D&lt;br&gt;56 days, 95 % RH / 40 °C</td>
<td>&lt; ± (0.5 % + 0.05 (\Omega))</td>
</tr>
</tbody>
</table>

### RESISTANCE VALUE IN RELATION TO TOLERANCE AND TCR

<table>
<thead>
<tr>
<th>Resistance Values</th>
<th>&lt; 1 (\Omega)</th>
<th>&gt; 1 (\Omega)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Tolerances</td>
<td>± 5 %</td>
<td></td>
</tr>
<tr>
<td>Standard TCR (-55 °C to +125 °C)</td>
<td>± 300 ppm/°C</td>
<td>± 150 ppm/°C</td>
</tr>
<tr>
<td>Tolerance on Request</td>
<td>± 1 %, ± 2 %, 10 %</td>
<td></td>
</tr>
</tbody>
</table>

### 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) are coated with a silicone grease (type Sl 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.

### 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 Ω), tolerance (in %), manufacturing date, Vishay Sfernice trademark.

ENERGY CURVE

POWER CURVE

OVERLOAD DURATION IN s

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**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>STYLE</th>
<th>CONNECTIONS</th>
<th>RESISTANCE VALUE</th>
<th>TOLERANCE</th>
<th>CUSTOM DESIGN</th>
<th>PACKAGING</th>
<th>LEAD (Pb)-FREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPS</td>
<td>500</td>
<td>DH</td>
<td>100 kΩ</td>
<td>± 10 %</td>
<td>xxx</td>
<td>BO15</td>
<td>e</td>
</tr>
</tbody>
</table>

**GLOBAL PART NUMBER INFORMATION**

<table>
<thead>
<tr>
<th>GLOBAL MODEL</th>
<th>MODEL</th>
<th>STYLE</th>
<th>DIELECTRIC</th>
<th>OHMIC VALUE</th>
<th>TOLERANCE</th>
<th>PACKAGING</th>
<th>SPECIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPS500</td>
<td>D</td>
<td>diagonal connections</td>
<td>H: dielectric strength 12 kV</td>
<td>48R70 = 48.7 Ω</td>
<td>F = 1 %</td>
<td>B = box 15 pieces</td>
<td>As applicable ZAx.</td>
</tr>
</tbody>
</table>

**RELATED DOCUMENTS**

**APPLICATION NOTES**

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