

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

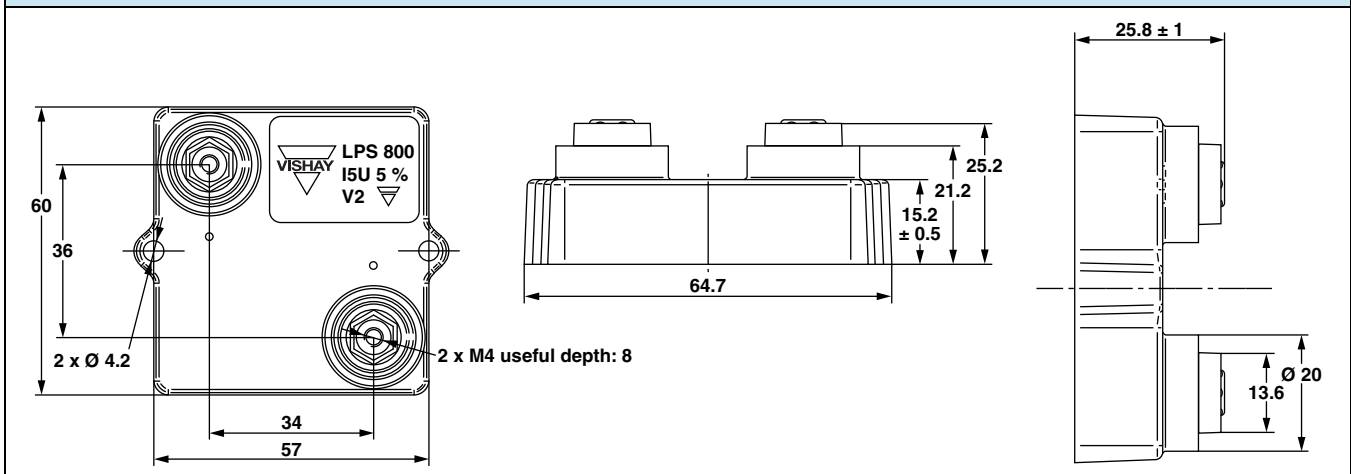


### FEATURES

- 800 W at 85 °C bottom case temperature
- Wide resistance range: 0.3 Ω to 900 kΩ E24 series
- Non inductive
- Easy 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

### DIMENSIONS in millimeters



#### Note

- Tolerances unless stated: ± 0.2 mm

### STANDARD ELECTRICAL SPECIFICATIONS

| MODEL   | RESISTANCE RANGE<br>Ω | RATED POWER<br>$P_{85^{\circ}\text{C}}$<br>W | LIMITING ELEMENT VOLTAGE $U_L$<br>V | TOLERANCE<br>± % | TEMPERATURE COEFFICIENT<br>± ppm/°C | CRITICAL RESISTANCE (Ω) |
|---------|-----------------------|----------------------------------------------|-------------------------------------|------------------|-------------------------------------|-------------------------|
| LPS 800 | 0.3 to 900K           | 800                                          | 5K                                  | 1, 2, 5, 10      | 150, 300, 500                       | 31.25K                  |

### MECHANICAL SPECIFICATIONS

|                               |                          |
|-------------------------------|--------------------------|
| Mechanical Protection         | Insulated case UL 94 V-0 |
| Resistive Element             | Thick film               |
| Substrate                     | Alumina                  |
| End Connections               | Screws M4                |
| Tightening Torque Connections | 2 Nm                     |
| Tightening Torque Heatsink    | 2 Nm                     |
| Maximum Torque                | 2.5 Nm                   |
| Weight                        | 83 g ± 10 %              |

### ENVIRONMENTAL SPECIFICATIONS

|                   |                  |
|-------------------|------------------|
| Temperature Range | -55 °C to 175 °C |
| Climatic Category | 55/175/56        |

### TECHNICAL SPECIFICATIONS

|                                                                      |                                                                                                                    |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Power Rating and Thermal Resistance                                  | 800 W at +85 °C bottom case temperature<br>$R_{TH(j-c)}$ : 0.112 °C/W                                              |
| Temperature Coefficient<br>- 55 °C/175 °C<br>IEC 60115-1<br>Standard | $R \leq 1 \Omega$ : ± 500 ppm/°C<br>$1 \Omega < R \leq 10 \Omega$ : ± 300 ppm/°C<br>$10 \Omega < R$ : ± 150 ppm/°C |
| Dielectric Strength<br>IEC 60115-1, 1 min,<br>10 mA max.             | 7 kV <sub>RMS</sub> or 12 kV <sub>RMS</sub>                                                                        |
| Lightning test 1.2/50 μs<br>IEC 61000-4-5                            | Until 12 kV                                                                                                        |
| Insulation Resistance                                                | ≥ 10 <sup>4</sup> MΩ                                                                                               |
| Inductance                                                           | ≤ 0.1 μH                                                                                                           |
| Partial Discharge<br>(for LPS 800 D only)                            | ≤ 100 pC/7 kV<br>≤ 10 pC/5 kV<br>Other cases: Consult us                                                           |



| PERFORMANCE              |                                                                                          |                     |
|--------------------------|------------------------------------------------------------------------------------------|---------------------|
| TESTS                    | CONDITIONS                                                                               | REQUIREMENTS        |
| Momentary Overload       | IEC 60115-1<br>1.5 x P <sub>r</sub> /10 s<br>U <sub>max.</sub> ≤ U <sub>L</sub> = 5000 V | ± (0.25 % + 0.05 Ω) |
| Rapid Temperature Change | IEC 60115-1/IEC 30068-2-14 Test Na<br>50 cycles<br>-55 °C to +175 °C                     | ± (0.5 % + 0.05 Ω)  |
| Load Life                | IEC 60115-1<br>1000 h (90/30) P <sub>r</sub> at 85 °C                                    | ± (0.5 % + 0.05 Ω)  |
| Humidity (Steady State)  | IEC 60115-1<br>56 days RH 95 %/40 °C                                                     | ± (0.5 % + 0.05 Ω)  |
| Vibration                | MIL STD 202 method 204 cond. D<br>(10 g; 5/500 Hz)                                       | ± (0.25 % + 0.05 Ω) |
| Climatic Sequence        | IEC 60115-1<br>(55/175/56)                                                               | ± (1 % + 0.05 Ω)    |

**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 Bluesil Past 340 from BlueStar Silicones) or a thermal film (type Q Pad II) easier and faster to install than the grease.
- The fastening of the resistor to the heatsink is under pressure control of two screws tightened at 2 Nm for full power availability.

|                               |         |
|-------------------------------|---------|
| Tightening Torque on Heatsink | LPS 800 |
|                               | 2 Nm    |

- The following accessories are supplied with each product:
  - 2 screws CHC M4 x 25 class 8.8 and 2 M4 contact lock washers for heatsink mounting
  - 2 screws TH M4 x 6/6 and 2 M4 contact lock washers for connections.

**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 175 °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<sub>TH(j-c)</sub>: Thermal resistance value measured between resistive layer and outer side of the resistor. It is the thermal resistance of the component: (see specifications environmental paragraph).
- R<sub>TH(c-h)</sub>: 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<sub>TH(h-a)</sub>: Thermal resistance of the heatsink.

**Example:**

R<sub>TH(c-a)</sub> for LPS 800 power dissipation 180 W at +50 °C room temperature.

$$\Delta T \leq 175 \text{ °C} - 50 \text{ °C} = 125 \text{ °C}$$

$$R_{TH(j-c)} + R_{TH(c-h)} + R_{TH(h-a)} = \frac{\Delta T}{P} = \frac{125}{180} = 0.69 \text{ °C/W}$$

$$R_{TH(j-c)} = 0.112 \text{ °C/W}$$

$$R_{TH(c-h)} + R_{TH(h-a)} = 0.69 \text{ °C/W} - 0.112 \text{ °C/W} = 0.578 \text{ °C/W}$$

|                           | <b>CONFIG. 1:<br/>WATER COOLING<br/>HEATSINK CP15<br/>AND THERMAL GREASE<br/>BLUESIL PAST 340</b> | <b>CONFIG. 2:<br/>AIR COOLING<br/>HEATSINK P207/250<br/>AND THERMAL GREASE<br/>BLUESIL PAST 340</b> | <b>CONFIG. 3:<br/>WATER COOLING<br/>HEATSINK CP15 AND<br/>THERMAL<br/>PAD Q-PAD II</b> | <b>CONFIG. 4:<br/>AIR COOLING<br/>HEATSINK P207/250<br/>AND THERMAL<br/>PAD Q-PAD II</b> |
|---------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Power dissipation (W)     | 710                                                                                               | 282                                                                                                 | 307                                                                                    | 180                                                                                      |
| T° resistive element (°C) | 175                                                                                               | 175                                                                                                 | 175                                                                                    | 175                                                                                      |
| $R_{TH(j-c)}$ max. (°C/W) | 0.112                                                                                             | 0.112                                                                                               | 0.112                                                                                  | 0.112                                                                                    |
| $R_{TH(c-h)}$ typ. (°C/W) | 0.05                                                                                              | 0.13                                                                                                | 0.34                                                                                   | 0.43                                                                                     |
| $R_{TH(h-a)}$ max. (°C/W) | 0.059                                                                                             | 0.29                                                                                                | 0.059                                                                                  | 0.29                                                                                     |
| Fluid T° (°C)             | 18                                                                                                | 25                                                                                                  | 18                                                                                     | 25                                                                                       |

**Notes**

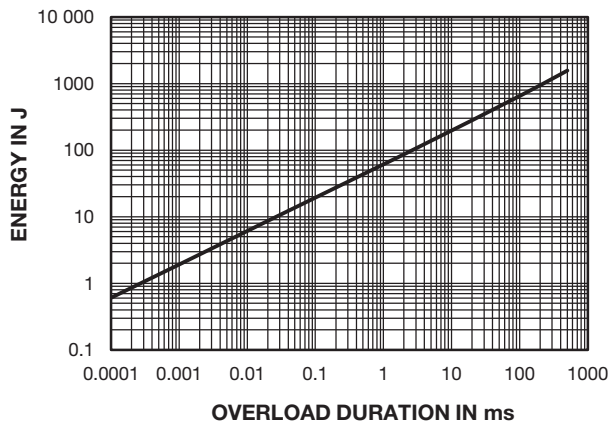
- **Configuration 1:** Water cooling heatsink CP15 from Lytron (304 mm x 95.3 mm x 8 mm) with water flow rate 4 LPM and thermal grease Bluesil Past 340 from BlueStar silicones.
- **Configuration 2:** Air cooling heatsink P207/250 from Semikron (250 mm x 200 mm x 72 mm) and thermal grease Bluesil Past 340 from BlueStar silicones.
- **Configuration 3:** Water cooling heatsink CP15 from Lytron (304 mm x 95.3 mm x 8 mm) with water flow rate 4 LPM and thermal pad Q-Pad II from Berquist.
- **Configuration 4:** Air cooling heatsink P207/250 from Semikron (250 mm x 200 mm x 72 mm) and thermal pad Q-Pad II from Berquist.

**OVERLOADS**

In any case the applied voltage must be lower than  $U_L = 5000$  V.

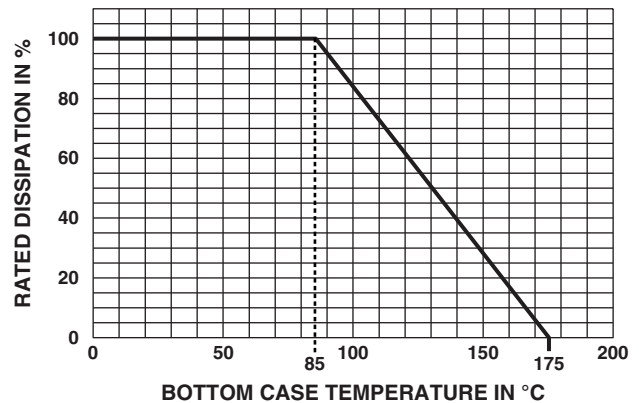
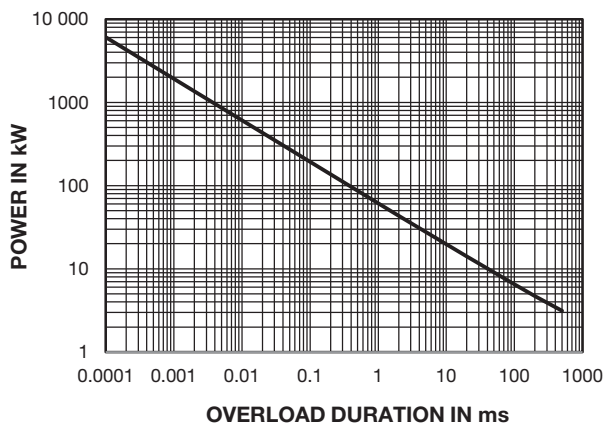
**Short time overload:**  $1.5 \times P_r/10$  s

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

**ENERGY CURVE**

**POWER RATING**

The temperature of the case should be maintained within the limits specified in the following figure.

To optimize the thermal conduction, contacting surfaces should be coated with silicone grease or thermal film, and heatsink mounting screws tightened to 2 Nm.


**POWER CURVE**

**MARKING**

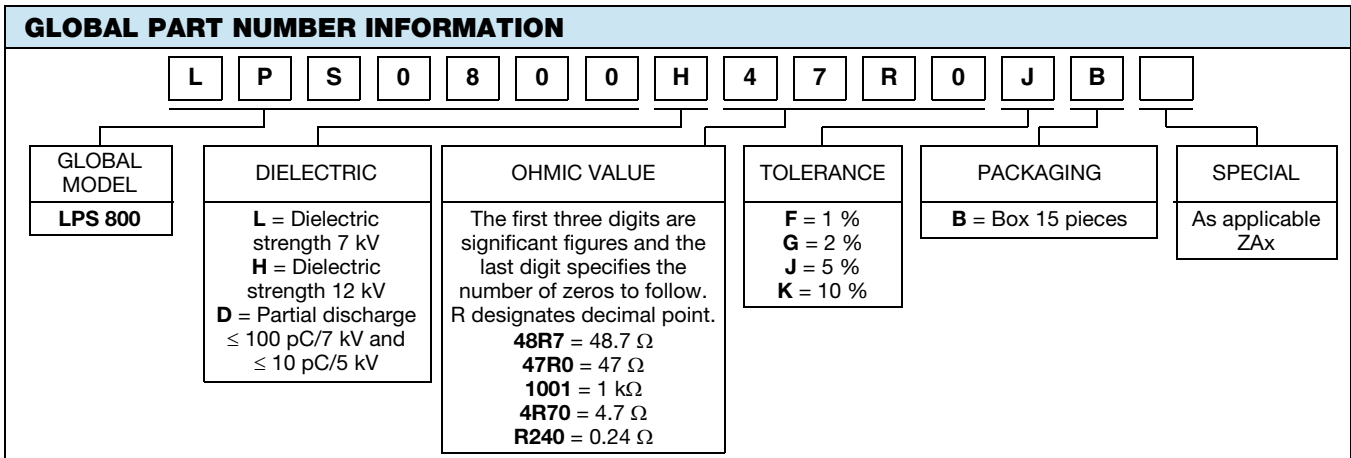
Series, style, ohmic value (in  $\Omega$ ), tolerance (in %), manufacturing date, Vishay Sfernice trademark.

**PACKAGING**

Box of 15 units



| ORDERING INFORMATION |       |                  |                                   |                                                       |           |                |
|----------------------|-------|------------------|-----------------------------------|-------------------------------------------------------|-----------|----------------|
| LPS                  | 800   | 100 kΩ           | ± 1 %                             | xxx                                                   | BO15      | e              |
| MODEL                | STYLE | RESISTANCE VALUE | TOLERANCE                         | CUSTOM DESIGN                                         | PACKAGING | LEAD (Pb)-FREE |
|                      |       |                  | ± 1 %<br>± 2 %<br>± 5 %<br>± 10 % | Optional<br>on request:<br>Special TCR,<br>shape etc. |           |                |





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