

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



### FEATURES

- Compliant with requirement #26 of NF-EN45545-2
- High power 600 W at 85 °C bottom case temperature
- Wide resistance range: 0.3  $\Omega$  to 900 k $\Omega$  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)

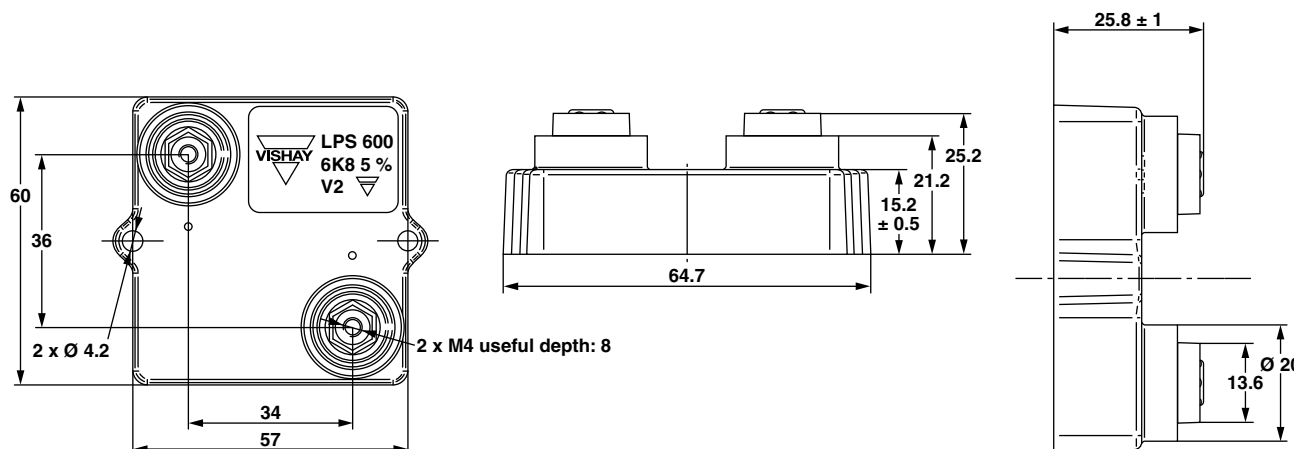

**RoHS**  
COMPLIANT

### LINKS TO ADDITIONAL RESOURCES



3D Models

### DIMENSIONS in millimeters



#### Note

- Tolerances unless stated:  $\pm 0.2$  mm

### STANDARD ELECTRICAL SPECIFICATIONS

| MODEL   | RESISTANCE RANGE<br>$\Omega$ | RATED POWER<br>$P_{85^\circ\text{C}}$<br>W | LIMITING ELEMENT VOLTAGE $U_L$<br>V | TOLERANCE<br>$\pm \%$ | TEMPERATURE COEFFICIENT<br>$\pm \text{ppm}/^\circ\text{C}$ | CRITICAL RESISTANCE<br>( $\Omega$ ) |
|---------|------------------------------|--------------------------------------------|-------------------------------------|-----------------------|------------------------------------------------------------|-------------------------------------|
| LPS 600 | 0.3 to 900K                  | 600                                        | 5K                                  | 1, 2, 5, 10           | 150, 300, 500                                              | 41.66K                              |

### MECHANICAL SPECIFICATIONS

|                               |                          |
|-------------------------------|--------------------------|
| Flammability                  | 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 $\pm 10 \%$         |

### ENVIRONMENTAL SPECIFICATIONS

|                   |                   |
|-------------------|-------------------|
| Temperature Range | -55 °C to +155 °C |
| Climatic Category | 55 / 155 / 56     |

### TECHNICAL SPECIFICATIONS

|                                                                        |                                                                                                                                                                                            |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power Rating and Thermal Resistance                                    | 600 W at + 85 °C bottom case temperature<br>$R_{TH(j-c)}$ : 0.112 °C/W                                                                                                                     |
| Temperature Coefficient<br>-55 °C / +155 °C<br>IEC 60115-1<br>Standard | $R \leq 1 \Omega$ : $\pm 500 \text{ ppm}/^\circ\text{C}$<br>$1 \Omega < R \leq 10 \Omega$ : $\pm 300 \text{ ppm}/^\circ\text{C}$<br>$10 \Omega < R$ : $\pm 150 \text{ ppm}/^\circ\text{C}$ |
| 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 $\mu\text{s}$<br>IEC 61000-4-5                   | Until 12 kV                                                                                                                                                                                |
| Insulation Resistance                                                  | $\geq 10^4 \text{ M}\Omega$                                                                                                                                                                |
| Inductance                                                             | $\leq 0.1 \mu\text{H}$                                                                                                                                                                     |
| Partial Discharge<br>(for LPS 600 D only)                              | $\leq 100 \text{ pC}/7 \text{ kV}$<br>$\leq 10 \text{ pC}/5 \text{ kV}$<br>Other cases: Consult us                                                                                         |

| PERFORMANCE              |                                                                                  |                               |
|--------------------------|----------------------------------------------------------------------------------|-------------------------------|
| TESTS                    | CONDITIONS                                                                       | REQUIREMENTS                  |
| Momentary Overload       | IEC 60115-1<br>2 x P <sub>r</sub> / 10 s<br>$U_{max.} \leq U_L = 5000 \text{ V}$ | $\pm (0.25 \% + 0.05 \Omega)$ |
| Rapid Temperature Change | IEC 60115-1/IEC 60068-2-14 Test Na<br>50 cycles<br>-55 °C to +155 °C             | $\pm (0.5 \% + 0.05 \Omega)$  |
| Load Life                | IEC 60115-1<br>1000 h (90/30) P <sub>r</sub> at 85 °C                            | $\pm (0.5 \% + 0.05 \Omega)$  |
| Humidity (Steady State)  | IEC 60115-1<br>56 days RH 95 % / 40 °C                                           | $\pm (0.5 \% + 0.05 \Omega)$  |
| Vibration                | MIL STD 202 method 204 cond. D<br>(10 g; 5/500 Hz)                               | $\pm (0.25 \% + 0.05 \Omega)$ |
| Climatic Sequence        | IEC 60115-1<br>(55 / 155 / 56)                                                   | $\pm (1 \% + 0.05 \Omega)$    |

## 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 600 |
|                               | 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 155 °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 600 power dissipation 180 W at + 50 °C room temperature.

ΔT ≤ 155 °C - 50 °C = 105 °C

$R_{TH(j-c)} + R_{TH(c-h)} + R_{TH(h-a)} = \frac{\Delta T}{P} = \frac{105}{180} = 0.58 \text{ °C/W}$

R<sub>TH(j-c)</sub> = 0.112 °C/W

R<sub>TH(c-h)</sub> + R<sub>TH(h-a)</sub> = 0.58 °C/W - 0.112 °C/W = 0.468 °C/W



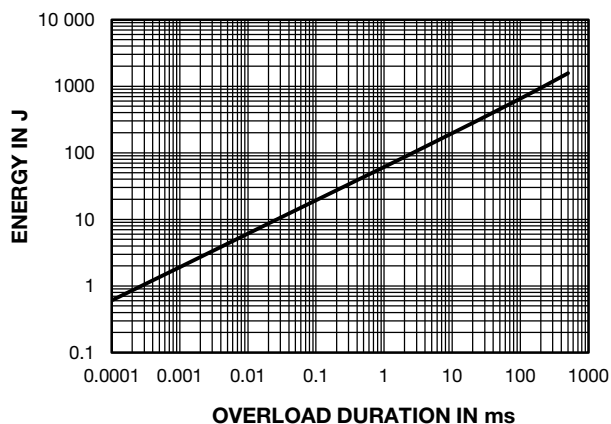
## OVERLOADS

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

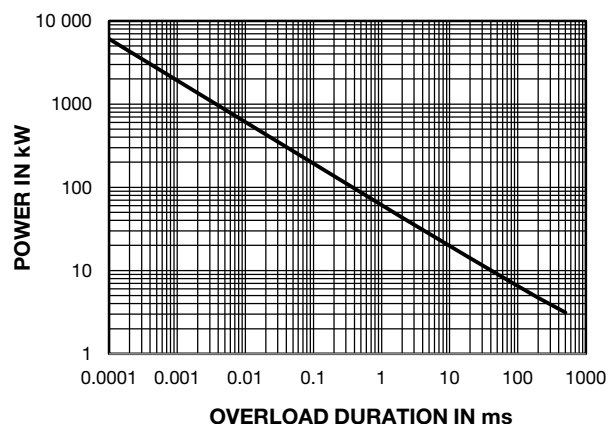
**Short time overload:**  $2 \times P_r/10$  s

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

## ENERGY CURVE



## POWER CURVE



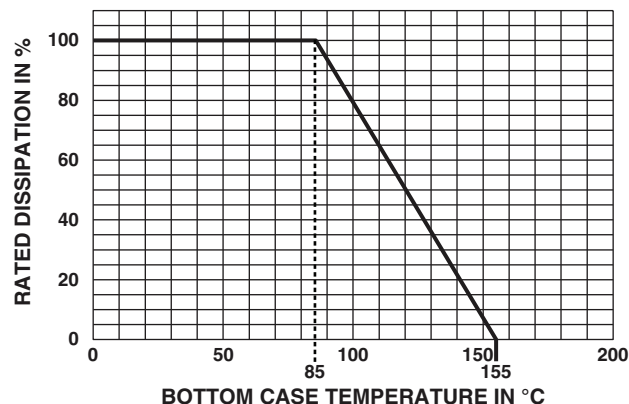
## MARKING

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

## 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.



## PACKAGING

Box of 15 units

**ORDERING INFORMATION**

| LPS   | 600   | 100 k $\Omega$      | $\pm 1\%$                                         | xxx                                                   | BO15      | e              |
|-------|-------|---------------------|---------------------------------------------------|-------------------------------------------------------|-----------|----------------|
| MODEL | STYLE | RESISTANCE<br>VALUE | TOLERANCE                                         | CUSTOM DESIGN                                         | PACKAGING | LEAD (Pb)-FREE |
|       |       |                     | $\pm 1\%$<br>$\pm 2\%$<br>$\pm 5\%$<br>$\pm 10\%$ | Optional<br>on request:<br>special TCR,<br>shape etc. |           |                |

**GLOBAL PART NUMBER INFORMATION**

|                 |                                                                                                                                 |   |                                                                                                                                                                                                                                                            |   |   |                                           |   |                   |   |                   |   |   |   |  |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|-------------------------------------------|---|-------------------|---|-------------------|---|---|---|--|
| L               | P                                                                                                                               | S | 0                                                                                                                                                                                                                                                          | 6 | 0 | 0                                         | H | 4                 | 7 | R                 | 0 | J | B |  |
| GLOBAL<br>MODEL | DIELECTRIC                                                                                                                      |   | OHMIC VALUE                                                                                                                                                                                                                                                |   |   | TOLERANCE                                 |   | PACKAGING         |   | SPECIAL           |   |   |   |  |
| LPS 600         | L = dielectric strength 7 kV<br>H = dielectric strength 12 kV<br>D = partial discharge $\leq 100$ pC/7 kV and $\leq 10$ pC/5 kV |   | The first three digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point.<br>48R7 = 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 |   | As applicable ZAx |   |   |   |  |



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