Power Resistor for Mounting Onto a Heatsink Thick Film Technology



LINKS TO ADDITIONAL RESOURCES

3D Models

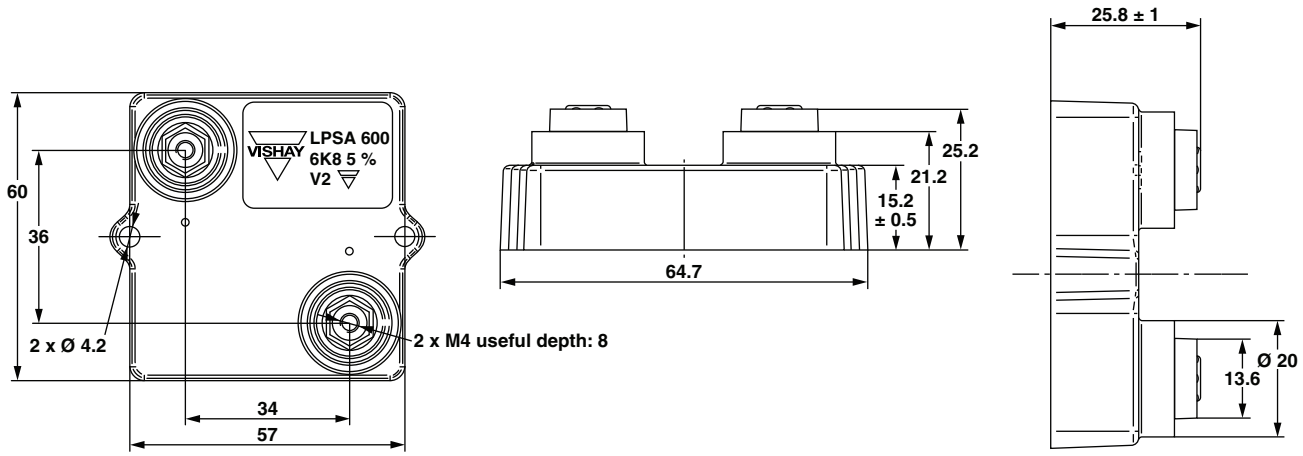
LPSA is a fully AEC-Q200 qualified high power resistor. Its high power / energy capability makes it a perfect fit for automotive precharge and discharge applications requiring high levels of performance.

FEATURES

- **AEC-Q200 qualified**
- Compliant with requirement #26 of NF-EN45545-2
- High power 600 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

RoHS COMPLIANT

DIMENSIONS in millimeters



Note

- Tolerances unless stated: ± 0.2 mm

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	RESISTANCE RANGE Ω	RATED POWER $P_{85\,°C}$ W	LIMITING ELEMENT VOLTAGE U_L V	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C	CRITICAL RESISTANCE (Ω)
LPSA 600	0.3 to 900K	600	5K	1, 2, 5, 10	150, 300, 500	41.66K

For technical questions, contact: sferfixedresistors@vishay.com

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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 ± 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 $R_{TH\ (j\ -\ c)}$: 0.112 °C/W
Temperature Coefficient **-55 °C / +155 °C** **IEC 60115-1** **Standard**	$R \leq 1\ \Omega$: ± 500 ppm/°C $1\ \Omega < R \leq 10\ \Omega$: ± 300 ppm/°C $10\ \Omega < R$: ± 150 ppm/°C
Dielectric Strength **IEC 60115-1, 1 min,** **10 mA max.**	7 kV_{RMS} or 12 kV_{RMS}
Lightning test 1.2/50 µs **IEC 61000-4-5**	Until 12 kV
Insulation Resistance	≥ 10^4 MΩ
Inductance	≤ 0.1 µH
Partial Discharge **(for LPSA 600 D only)**	≤ 100 pC/7 kV ≤ 10 pC/5 kV Other cases: Consult us

PERFORMANCE		
TESTS	**CONDITIONS**	**REQUIREMENTS**
Momentary Overload	IEC 60115-1 2 x P_r/10 s $U_{max.} \leq U_L$ = 5000 V	± (0.5 % + 0.005 Ω)
Load Life	IEC 60115-1 1000 h (90/30) P_r at 85 °C	± (0.5 % + 0.05 Ω)
High Temperature Exposure	AEC-Q200 rev. D conditions: MIL-STD-202 method 108 1000 h, +125 °C, unpowered	± (0.5 % + 0.005 Ω)
Temperature Cycling	AEC-Q200 rev. D conditions: JESD22 method JA-104 1000 cycles, -55 °C to +125 °C dwell time -15 min	± (1 % + 0.005 Ω)
Biased Humidity	AEC-Q200 rev. D conditions: MIL-STD-202 method 103 1000 h, +85 °C, 85 % RH	± (0.5 % + 0.005 Ω)
Operational Life	AEC-Q200 rev. D conditions: MIL-STD-202 method 108 1000 h, 90/30, powered, +25 °C	± (1 % + 0.005 Ω)
ESD Human Body Model	AEC-Q200 rev. D conditions: AEC-Q200-002 25 kV_{AD}	± (0.5 % + 0.005 Ω)
Vibration	AEC-Q200 rev. D conditions: MIL-STD-202 method 204 5 *g* for 20 min, 12 cycles test from 10 Hz to 2000 Hz	± (0.5 % + 0.005 Ω)
Mechanical Shock	AEC-Q200 rev. D conditions: MIL-STD-202 method 213 100 *g*; 6 ms, 3.75 m/s 3 shocks/direction	± (0.5 % + 0.005 Ω)
Terminal Strength	AEC-Q200 rev. D conditions: AEC-Q200-006 2.27 kg, 60 s	± (0.25 % + 0.01 Ω)

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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	LPSA 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

$R_{TH\ (j\ -\ c)}$: 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).

$R_{TH\ (c\ -\ h)}$: 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.

Example:

$R_{TH\ (c\ -\ a)}$ for LPSA 600 power dissipation 180 W at +50 °C room temperature.

$\Delta T \leq 155\ °C - 50\ °C = 105\ °C$

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

$R_{TH\ (j\ -\ c)} = 0.112\ °C/W$

$R_{TH\ (c\ -\ h)} + R_{TH\ (h\ -\ a)} = 0.58\ °C/W - 0.112\ °C/W = 0.468\ °C/W$

OVERLOADS

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

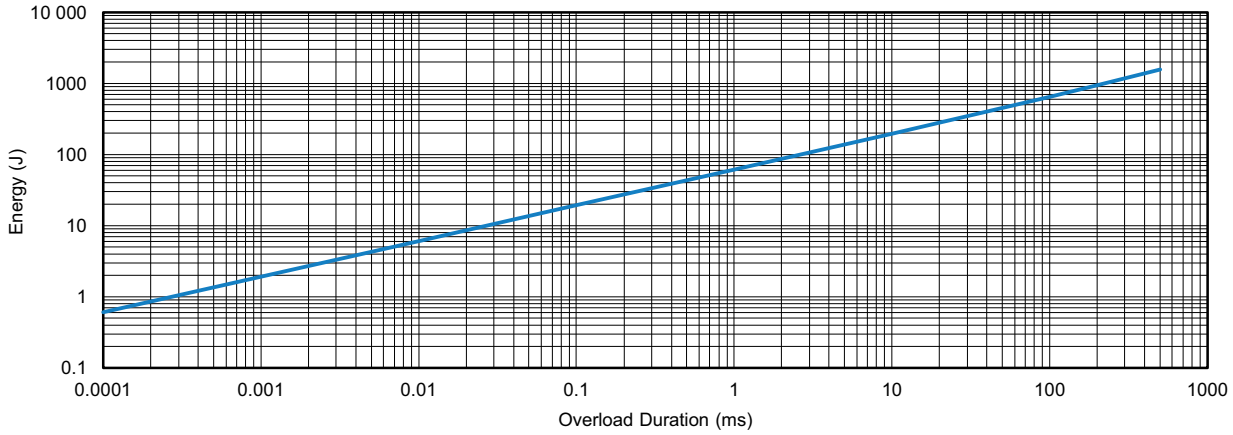
Short time overload: 2 x P_r/10 s

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

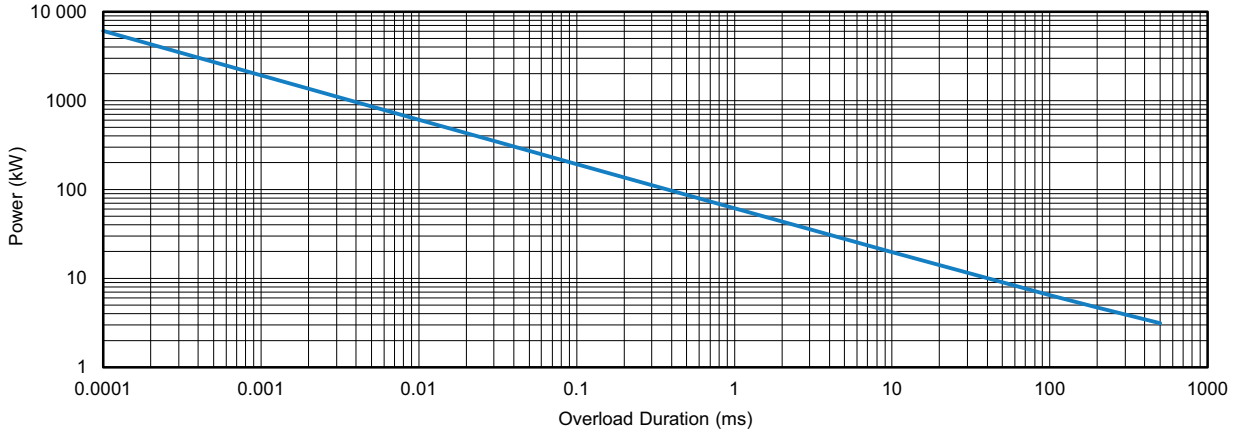
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ENERGY CURVE

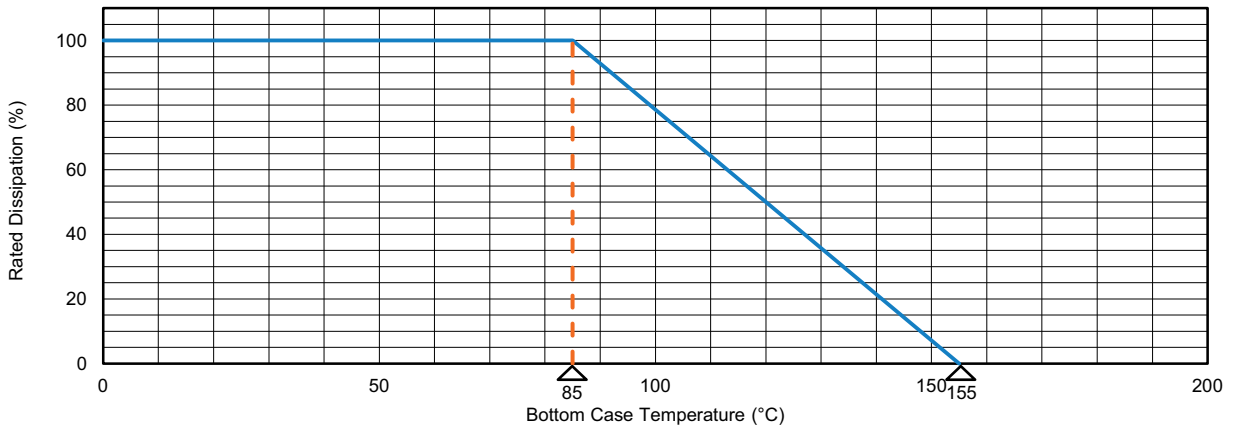


POWER CURVE



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.



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MARKING

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

PACKAGING

Box of 15 units

ORDERING INFORMATION

LPSA	600	100 kΩ	± 1 %	xxx	BO15	e
MODEL	STYLE	RESISTANCE VALUE	TOLERANCE	CUSTOM DESIGN	PACKAGING	LEAD (Pb)-FREE
			± 1 % ± 2 % ± 5 % ± 10 %	Optional on request: special TCR, shape etc.		

GLOBAL PART NUMBER INFORMATION

L	P	S	A	6	0	0	H	4	7	R	0	J	B	

GLOBAL MODEL	DIELECTRIC	OHMIC VALUE	TOLERANCE	PACKAGING	SPECIAL
LPSA 600	**L** = dielectric strength 7 kV **H** = dielectric strength 12 kV **D** = partial discharge ≤ 100 pC/7 kV and ≤ 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. **48R7** = 48.7 Ω **47R0** = 47 Ω **1001** = 1 kΩ **4R70** = 4.7 Ω **R240** = 0.24 Ω	**F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**B** = box 15 pieces	As applicable ZAx

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