Power Resistor for Mounting onto a Heatsink Thick Film Technology

DESIGN SUPPORT TOOLS AVAILABLE

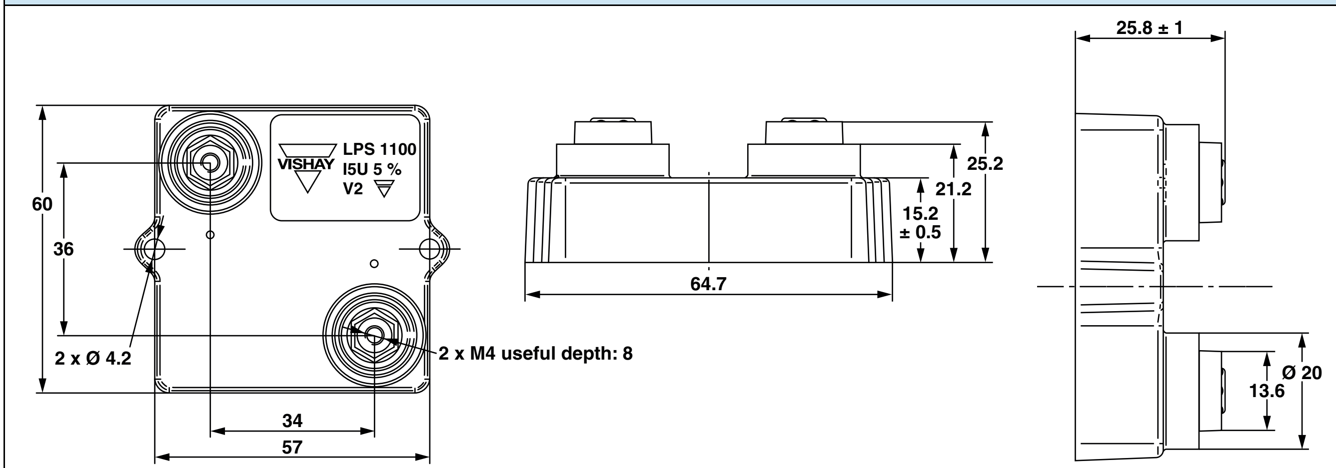
3D Models

FEATURES

RoHS COMPLIANT

- Compliant with requirement #26 of NF-EN45545-2
- LPS high power: 1100 W
- Wide resistance range: 1 Ω to 1.3 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

DIMENSIONS in millimeters



Notes

- Tolerances unless stated: ± 0.2 mm
- Power dissipation is 1100 W by using a water cooled heatsink at T_{water} = 15 °C of R_{th} = 0.059 °C/W (25 °C to the nearest point of the resistor onto heatsink) and R_{th} contact estimated at 0.07 °C/W

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	RESISTANCE RANGE Ω	RATED POWER $P_{25\ °C}$ W	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C
LPS 1100	1 to 1.3K	1100	1, 2, 5, 10	150

MECHANICAL SPECIFICATIONS

Mechanical Protection	Insulated case and resin for potting UL 94 V-0
Resistive Element	Thick film
End Connections	Screws M4
Tightening Torque Connections	2 Nm
Tightening Torque Heatsink	2 Nm
Maximum Torque	2.5 Nm
Weight	79 g ± 10 %

ENVIRONMENTAL SPECIFICATIONS

Temperature Range	-55 °C to +200 °C
Climatic Category	55 / 200 / 56

TECHNICAL SPECIFICATIONS

Power Rating and Thermal Resistance	1100 W at +25 °C On heatsink $R_{th(j-c)}$: 0.039 °C/W
Temperature Coefficient (-55 °C to +200 °C), IEC 60115-1	$R \leq 1\ \Omega$: ± 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	$\geq 10^4$ MΩ
Inductance	≤ 0.1 µH
Partial Discharge (for LPS 1100 D only)	≤ 100 pC/7 kV ≤ 10 pC/5 kV Other cases: Consult us

For technical questions, contact: sferfixedresistors@vishay.com

PERFORMANCE		
TESTS	**CONDITIONS**	**REQUIREMENTS**
Momentary Overload	IEC 60115-1: 2 x P_r / 10 s for heatsink with $R_{th(h-a)} \geq 0.26$ °C/W (maximum power: 700 W) 1.6 x P_r / 1 s for heatsink with 0.26 °C/W > $R_{th(h-a)} \geq 0.059$ °C/W (maximum power: 1800 W)	± (0.25 % + 0.05 Ω)
Rapid Temperature Change	AEC-Q200 conditions: IEC 60115-1/IEC 60068-2-14, Test Na 50 cycles (-55 °C to +200 °C)	± (0.5 % + 0.05 Ω) for all the ohmic values
	1000 cycles (-55 °C to +200 °C)	± (5 % + 0.05 Ω) for R < 38 Ω ± (0.5 % + 0.05 Ω) for $R \geq 38$ Ω
Load Life	AEC-Q200 conditions: IEC 60115-1 2000 h (90/30) P_r	± (5 % + 0.05 Ω) for R < 38 Ω ± (0.5 % + 0.05 Ω) for $R \geq 38$ Ω
Humidity (Steady State)	AEC-Q200 conditions: IEC 60115-1, 1000 h RH 85 % / 85 °C	± (0.5 % + 0.05 Ω)
Mechanical Shock	AEC-Q200 conditions: MIL-STD-202 method 213 condition D (100 *g*'s / 6 ms 3.75 m/s)	± (1 % + 0.05 Ω)
Vibration	AEC-Q200 conditions: MIL-STD-202 method 204 condition D (5 *g*, 20 min 10/2000 Hz)	± (1 % + 0.05 Ω)
Climatic Sequence	AEC-Q200 conditions: IEC 60115-1 (55 / 200 / 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 (ceramic, heatsink) should be coated with a silicone grease (type Bluesil Past 340 from Blue Star Silicones). Thermal film (type Q-pad II from Berquist) is also possible, easier and faster to install than grease but with a lower efficiency for the power dissipation
- 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 1100
	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 AND THE THERMAL INTERFACE

The user must choose the heatsink according to the working conditions of the component (power, room temperature). Maximum working temperature must not exceed 200 °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 or fluid cooling 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: 0.039 °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

Example:

$R_{th\ (c-h)} + R_{th\ (h-a)}$ for LPS 1100 power dissipation 850 W at + 18 °C fluid temperature

$$\Delta T \leq 200\ °C - 18\ °C = 182\ °C$$

$$R_{th\ (j-c)} + R_{TH\ (c-h)} + R_{TH\ (h-a)} = \frac{\Delta T}{P} = \frac{182}{850} = 0.214\ °C/W$$

$$R_{th\ (j-c)} = 0.039\ °C/W$$

$$R_{th\ (c-h)} + R_{th\ (h-a)} = 0.214\ °C/W - 0.039\ °C/W = 0.175\ °C/W$$

	CONFIG. 1: WATER COOLING HEATSINK CP15 AND THERMAL GREASE BLUESIL PAST 340	CONFIG. 2: AIR COOLING HEATSINK P207/250 AND THERMAL GREASE BLUESIL PAST 340	CONFIG. 3: WATER COOLING HEATSINK CP15 AND THERMAL PAD Q-PAD II	CONFIG. 4: AIR COOLING HEATSINK P207/250 AND THERMAL PAD Q-PAD II
Power Dissipation (W)	1100	350	650	285
T° Resistive Element (°C)	200	200	200	200
$R_{th(j-c)}$ max. (°C/W)	0.039	0.039	0.039	0.039
$R_{th(c-h)}$ typ. (°C/W)	0.070	0.201	0.187	0.315
$R_{th(h-a)}$ max. (°C/W)	0.059	0.260	0.059	0.260
Fluid T° (°C)	15 (water)	25 (air)	15 (water)	25 (air)

Note

- Configuration 1: Water cooling heatsink (CP15 from Lytron (304 mm x 95.3 mm x 8 mm) with water flow rate 4LPM 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 4LPM 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

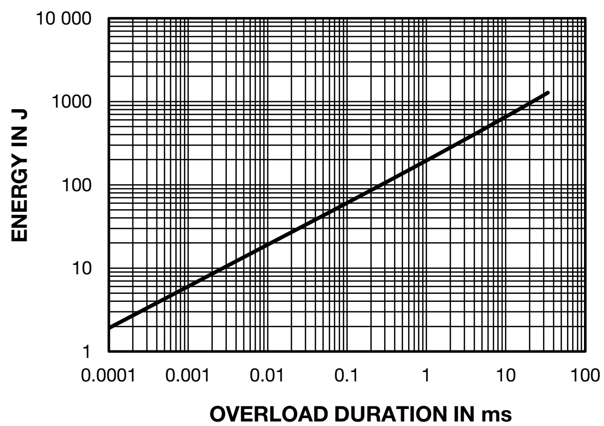
OVERLOAD

In any case the applied voltage must be lower than U_l = 6600 V.

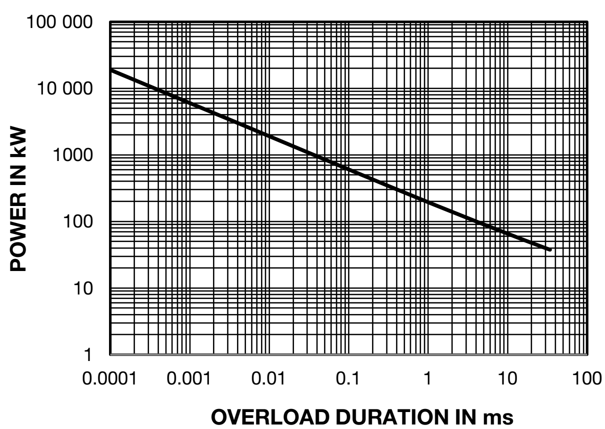
Short time overload: 2 x Pr/10 s for heatsink with $R_{th(h-a)} \geq 0.26$ °C/W (maximum power: 700 W) and 1.6 x Pr/1 s for heatsink with 0.26 °C/W > $R_{th(h-a)} \geq 0.059$ °C/W (maximum power: 1800 W).

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

ENERGY CURVE



POWER CURVE

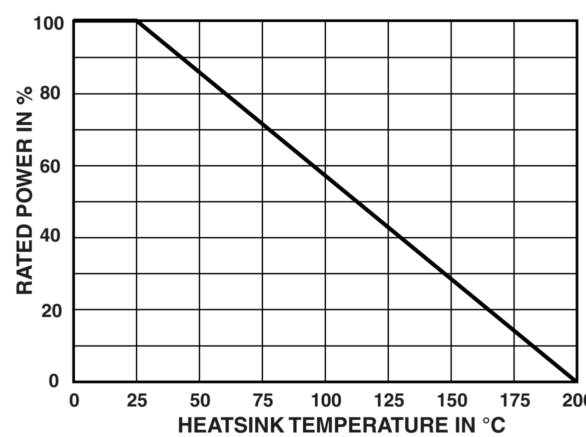


MARKING

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

POWER RATING

The temperature of the case should be maintained within the limit 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	1100	1 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	1	1	0	0	H	4	7	R	0	J	B	

GLOBAL MODEL	DIELECTRIC	OHMIC VALUE	TOLERANCE	PACKAGING	SPECIAL
LPS 1100	**L** = dielectric strengh 7 kV **H** = dielectric strengh 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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