Power Resistors for Mounting onto a Heatsink Thick Film Technology

FEATURES

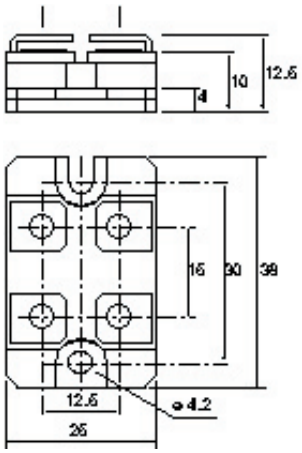
- 1% tolerance available
- High power rating
- Wide ohmic value range
- Non inductive
- Easy mounting
- Low thermal radiation of the case
- Standard Isotop case (SOT 227 B)

This series of thick film power resistors include modules which can incorporate up to 2 different resistor values in the same SOT 227B package. Two types of terminations are available along with a 4 terminal device for measurement applications in the case of the single resistor version. This product range benefits from Vishay Sfernice's experience in thick film power resistor technology i.e high power: volume ratio, low tolerance or individual resistors and excellent overload capabilities (due to the trimming technique).

DIMENSIONS in millimeters

RTOP

V Connections



• Tolerances unless otherwise specified: ± 0.3mm

MECHANICAL SPECIFICATIONS

Mechanical Protection	Insulated case
Substrate	Alumina on insulated base
Resistive Element	Cermet
End Connection	V connections: screw M4 x 6
Tightening Torque Connections	1 Nm
Tightening Torque Heatsink	2 Nm

ENVIRONMENTAL SPECIFICATIONS

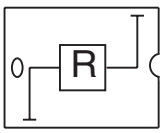
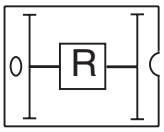
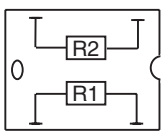
Temperature Range	- 55°C to + 125°C
Climatic Category	55/125/56

ELECTRICAL SPECIFICATIONS	
Resistance Range	0.046 to 1MΩ
Standard Tolerance	± 1% to ± 10%
Power Rating	50W to 200W at + 25°C
Temperature Coefficient	
Standard	± 300 ppm/°C (R < 1) ± 150 ppm/°C (R > 1)
Insulation Resistance	> 10^6MΩ

PERFORMANCE

TESTS	CONDITIONS	TYPICAL DRIFTS
Momentary Overload	NF EN 140000 CEI 115_1 2.5Pn/5 seconds	< ± (0.25% + 0.05Ω)
Rapid Temperature Change	NF EN 140000 CEI 68214 Test Na 5 cycles - 55°C +125°C	< ± (0.25% + 0.05Ω)
Load Life	NF EN 140000 CEI 115_1 Pn at 25°C 1000 hours	< ± (0.5% + 0.05Ω)
Humidity (steady state)	MIL STD 202 Method 103 B Test D 56 days 95% R.H.	< ± (0.5% + 0.05Ω)

SPECIAL FEATURES

MODEL	RTOP 200	RTOP 100	DRTOP 100	DRTOP 50
Power Rating at + 25°C **chassis mounted resistors** **unmounted resistors**	 200W 5W	 100W 5W	 100W 3.5W	 50W 3.5W
Thermal Resistance (per resistor)	0.5°C/W	1°C/W	0.5°C/W	1°C/W
Limiting Voltage	1500V	1500V	500V	500V
Dielectric Strength* **connections/chassis**	2500V, 1 Minute 10mA Max	2500V, 1 Minute 10mA Max	2500V, 1 Minute 10mA Max	2500V, 1 Minute 10mA Max
Dielectric Strength* **connections/resistors**	-	-	2500V, 1 Minute 10mA Max	2500V, 1 Minute 10mA Max
Ohmic Value Range	0.046 to 1MΩ		0.092 to 1MΩ	
Tolerance	± 1% to ± 10%		± 1% to ± 10%	
Electrical Diagrams	  Shunt Version			

*MIL STD 202 Method 301

CHOICE OF HEATSINK

The user must choose the heatsink 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:

$$P = \frac{\Delta T}{[R_{TH}\,(j\text{-}c) + R_{TH}\,(c\text{-}a)]} \quad (1)$$

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 Table Special Features).

R_{TH}: (c-a): thermal resistance value measured between outer side of the resistor and room temperature. It is the thermal resistance of the heatsink depending on the heatsink itself (type, shape) and the quality of the fastening device.

Example:

R_{TH}: (c-a) for RTOP 200 power rating 130W at ambient temperature + 30°C.

Thermal resistance (see table 1) R_{TH} (j-c): 0.5°C/W

$\Delta T \leq 125°C - 30°C - \leq 95°C$

$$R_{TH}(j\text{-}c) + R_{TH}(c\text{-}a) = \frac{\Delta T}{P} = \frac{95}{130} = 0.73°C/W$$

$R_{TH}(j\text{-}c) \leq 0.5°C/W$

$R_{TH}\,(c\text{-}a) \leq 0.73°C/W - 0.5°C/W \leq 0.23°C/W$

RECOMMENDATIONS FOR MOUNTING ONTO A HEATSINK

Surfaces in contact must be carefully cleaned.

The heatsink must have an acceptable flatness: from 0.05mm to 0.1mm/100mm.

Roughness of the heater must be around 6.3µm.

In order to improve thermal conductivity, surfaces in contact (alumina, heatsink) are laid on with a silicone grease (type SI 340 from Rhône-Poulenc or Dow 340 from Dow Corning).

Tightening torque on heater: 2 Nm

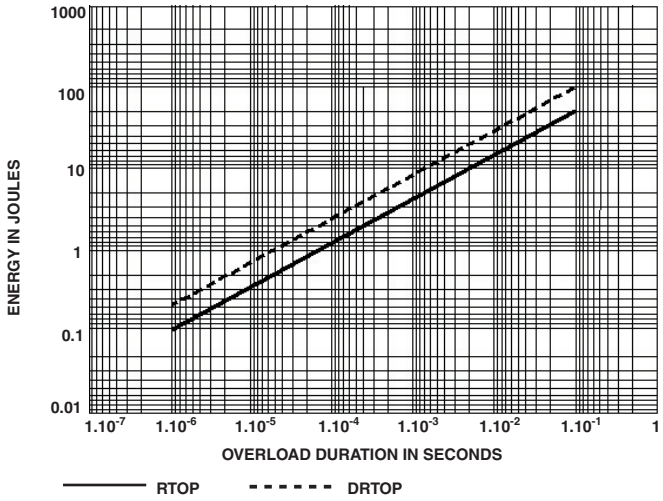
For the electrical connections, it is recommended to use M4 x 6 screws and if necessary a washer of 1mm thickness. The recommended screw tightening torque is 1 Nm.

OVERLOADS

The applied power is 2.5 x rated power for 5 s with a max voltage of 2 x nominal voltage.

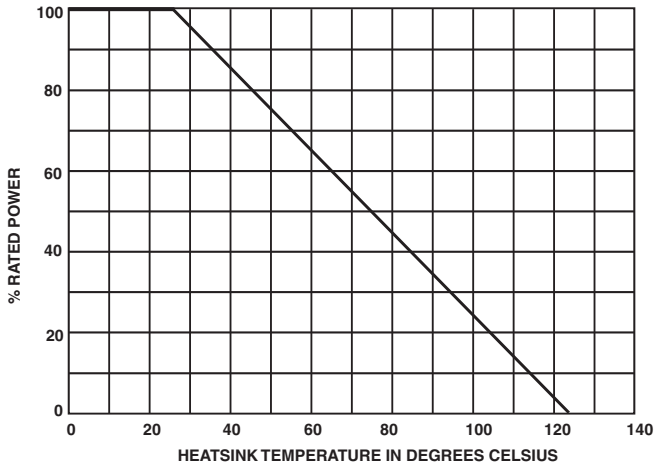
Accidental overload: The values indicated in the graph below are applicable to resistors in air or mounted onto a heatsink. In case of multi-resistor devices, (DRTOP, TROP and QROP) the results apply to each resistor value in the device.

ENERGY CURVE



POWER RATING CHART

The temperature of the heater should be maintained in the limit specified. To improve the thermal conductivity, surfaces in contact should be laid on with a silicon grease and the torque applied on the screw for tightening should be around 2 Nm.



MARKING

Series, style, ohmic value (in), tolerance (in %), manufacturing date, VISHAY trade mark.

ORDERING INFORMATION

RTOP	200	3.2	± 1%		± %	V
				R1 T1	R2	
MODEL	STYLE	OHMIC VALUE	ABSOLUTE TOLERANCE PER RESISTOR			CONNECTIONS	CUSTOM DESIGN
RTOP DRTOP	100 50		Optional ± 1% ± 2% ± 5 % ± 10 %	To be precise for each resistor		V: Screw VS: RTOP Shunt	Optional