

Power Resistors for Mounting onto a Heatsink Thick Film Technology



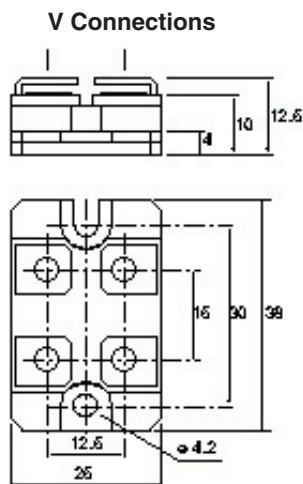
FEATURES

- 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



• Tolerances unless otherwise specified: $\pm 0.3\text{mm}$

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 |

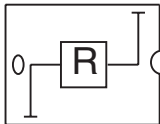
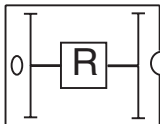
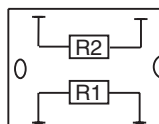
ENVIRONMENTAL SPECIFICATIONS

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

ELECTRICAL SPECIFICATIONS

| | |
|-------------------------|--|
| Resistance Range | 0.046 to 1M Ω |
| Standard Tolerance | $\pm 1\%$ to $\pm 10\%$ |
| Power Rating | 50W to 200W at + 25°C |
| Temperature Coefficient | |
| Standard | $\pm 300 \text{ ppm}/^\circ\text{C}$ (R < 1) $\pm 150 \text{ ppm}/^\circ\text{C}$ (R > 1) |
| Insulation Resistance | > 10 ⁶ M Ω |

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

| 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 1M Ω | | 0.092 to 1M Ω | |
| Tolerance | $\pm 1\%$ to $\pm 10\%$ | | $\pm 1\%$ to $\pm 10\%$ | |
| 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:

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

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

$$\Delta T \leq 125^\circ\text{C} - 30^\circ\text{C} = 95^\circ\text{C}$$

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

$$R_{TH(j-c)} \leq 0.5^\circ\text{C/W}$$

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

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

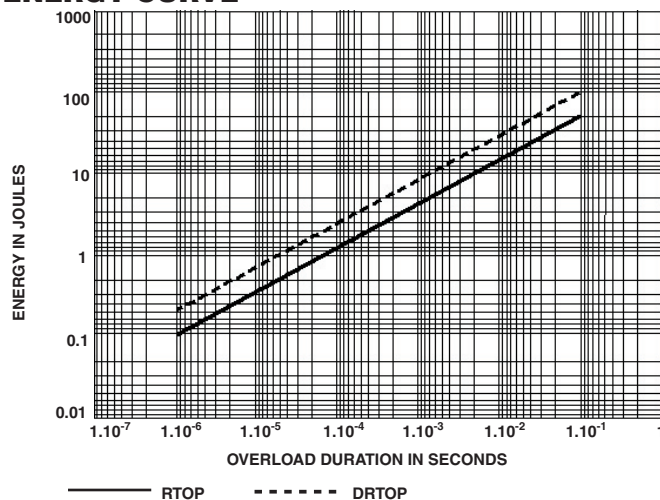
For the electrical connections, it is recommended to use M4 x 6 screws and if necessary a washer of 1mm thickness. The recommended screw tightening torque is 1 Nm.

OVERLOADS

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

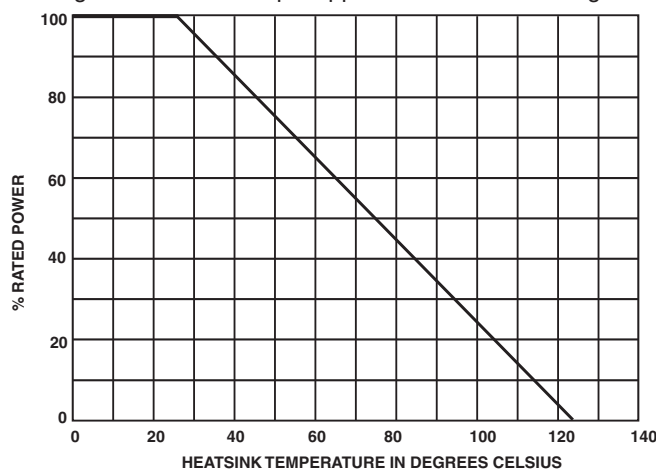
Accidental overload: The values indicated in the graph below are applicable to resistors in air or mounted onto a heatsink. In case of multi-resistor devices, (DRTOP, TROP and QROP) the results apply to each resistor value in the device.

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 Ω), tolerance (in %), manufacturing date, VISHAY trade mark.

ORDERING INFORMATION

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