Power Resistors for Mounting onto a Heatsink Thick Film Technology



FEATURES

- 1 % tolerance available
- High power rating = 200 W
- Wide ohmic value range = 0.046 Ω to 1 MΩ
- Non inductive
- Easy mounting
- Low thermal radiation of the case
- Standard isotop case (SOT-227 B)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

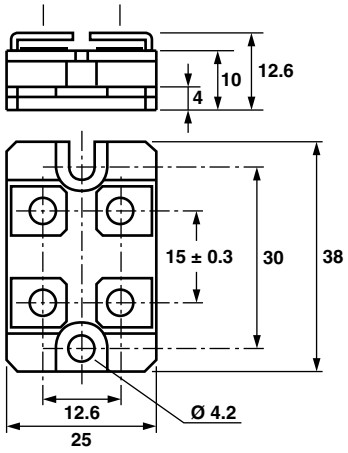
RoHS COMPLIANT

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



Note

- Tolerances unless otherwise specified: ± 0.3 mm

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	RESISTANCE RANGE Ω	RATED POWER $P_{25\,°C}$ W	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C
DRTOP50 RTOP100 DRTOP100 RTOP200	SOT-227B	0.091 to 1M	50	1, 2, 5, 10	150, 300
		0.046 to 1M	100	1, 2, 5, 10	150, 300
		0.046 to 1M	200	1, 2, 5, 10	150, 300

MECHANICAL SPECIFICATIONS

Mechanical Protection	Insulated case
Resistive Element	Cermet
Substrate	Alumina on insulated base
End Connections	V connections: screw M4 x 6
Tightening Torque Connections	1 Nm
Tightening Torque Heatsink	2 Nm
Weight	30 g max.

ENVIRONMENTAL SPECIFICATIONS

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

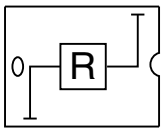
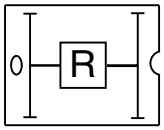
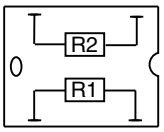
TECHNICAL SPECIFICATIONS

Temperature Coefficient (-55 °C to +125 °C)	**Standard**	± 300 ppm/°C (R < 1) ± 150 ppm/°C (R > 1)
Insulation Resistance		> 10^6 MΩ

For technical questions, contact: sferfixedresistors@vishay.com

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PERFORMANCE		
TESTS	**CONDITIONS**	**REQUIREMENTS**
Momentary Overload	IEC 60115-1 2.5 Pr/5 s U_S < 2 U_L	< ± (0.25 % + 0.05 Ω)
Rapid Temperature Change	IEC 60115-1 5 cycles -55 °C +125 °C	< ± (0.25 % + 0.05 Ω)
Load Life	IEC 60115-1 Pr at 25 °C 1000 h	< ± (0.5 % + 0.05 Ω)
Humidity (Steady State)	IEC 60115-1/IEC 60068-2-3 Test Ca 56 days 95 % RH/40 °C	< ± (0.5 % + 0.05 Ω)

SPECIAL FEATURES				
MODEL	**RTOP 200**	**RTOP 100**	**DRTOP 100**	**DRTOP 50**
Power Rating at +25 °C **Chassis Mounted Resistors** **Unmounted Resistors**	 200 W 5 W	 100 W 5 W	 100 W 3.5 W	 50 W 3.5 W
Thermal Resistance (per Resistor)	0.5 °C/W	1 °C/W	0.5 °C/W	1 °C/W
Limiting Voltage U_L	1500 V	1500 V	500 V	500 V
Dielectric Strength (1) **Connections/Chassis**	2500 V, 1 min 10 mA max.	2500 V, 1 min 10 mA max.	2500 V, 1 min 10 mA max.	2500 V, 1 min 10 mA max.
Dielectric Strength (1) **Connections/Resistors**	-	-	2500 V, 1 min 10 mA max.	2500 V, 1 min 10 mA max.
Ohmic Value Range	0.046 Ω to 1 MΩ		0.091 Ω to 1 MΩ	
Tolerance	± 1 % to ± 10 %		± 1 % to ± 10 %	
Electrical Diagrams	  Shunt version			

Note

(1) MIL-STD-202 Method 301

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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 SI 340 from Rhône-Poulenc or Dow 340 from Dow Corning).

Tightening Torque on Heatsink	RTOP
	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.

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 125 °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 table Special Features).

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

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

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

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

$R_{TH\ (j\ -\ c)} = 0.112\ °C/W$

$R_{TH\ (c\ -\ h)} + R_{TH\ (h\ -\ a)} = 0.73\ °C/W - 0.5\ °C/W \leq 0.23\ °C/W$

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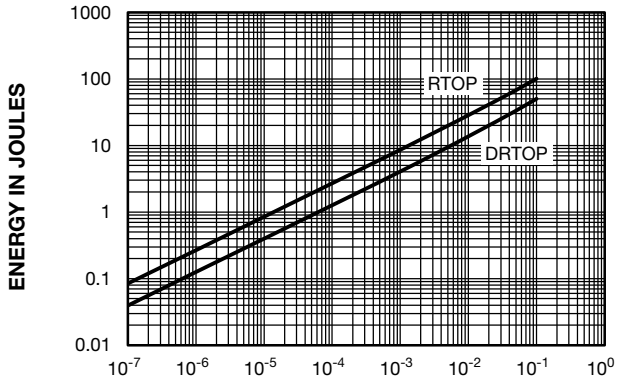
OVERLOADS

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

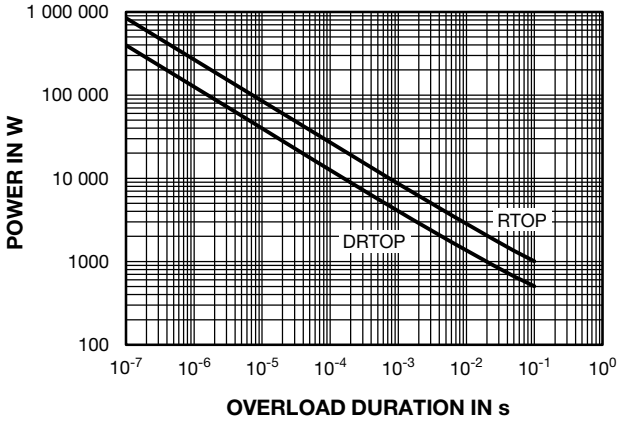
Accidental overload: The values indicated in the graph below are applicable to resistors in air or mounted onto a heatsink.

In case of multi-resistor devices, (DRTOP, TROP and QROP) the results apply to each resistor value in the device.

ENERGY CURVE



POWER CURVE

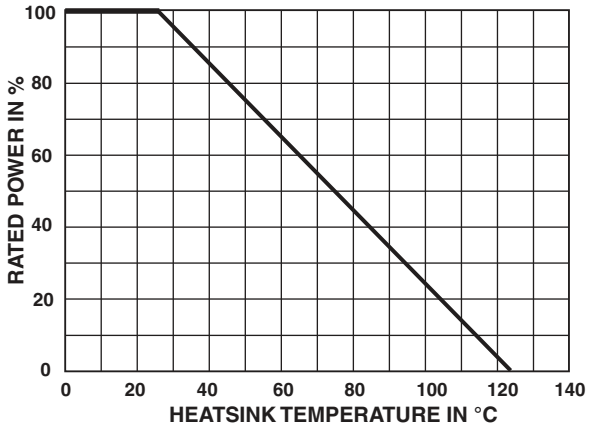


MARKING

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

POWER RATING

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.



PACKAGING

Box of 10 units

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ORDERING INFORMATION

RTOP	**200**	**5U**	**± 1 %**		**± %**		**V**			
DRTOP	**50**	**150U**	**5 %**	**15U**		**5 %**	**V**	**XXX**	**BO10**	**e**
				R1	T1	R2				
MODEL	STYLE	OHMIC VALUE	ABSOLUTE TOLERANCE PER RESISTOR				CONNECTIONS	CUSTOM DESIGN	PACKAGING	LEAD (Pb)-FREE
RTOP DRTOP	100 50		Optional ± 1 % ± 2 % ± 5 % ± 10 %	To be precise for each resistor			V: screw VS: RTOP shunt	Optional		

GLOBAL PART NUMBER INFORMATION

R	T	O	P	1	0	0	V	5	R	0	0	K	B	

GLOBAL MODEL	SIZE	LEADS	OHMIC VALUE	TOLERANCE	PACKAGING	SPECIAL
RTOP	**100** **200**	**V** = screw **VS** = RTOP shunt	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 **4871** = 4870 Ω **1002** = 10 000 Ω **R010** = 0.01 Ω **R680** = 0.68 Ω **2701** = 2.7 kΩ	**F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**B** = box 10 pieces	As applicable **Ex** = UA1

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