

## Power Resistor 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)

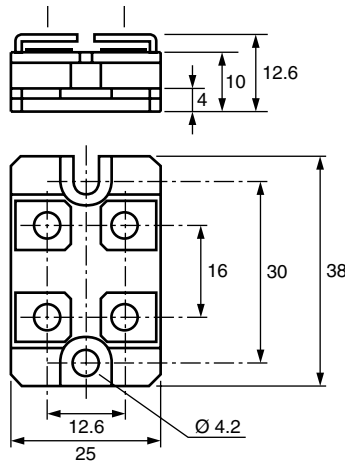


This series of thick film power resistors include modules which can incorporate up to 2 different resistor values in the same SOT 227B package. Two types of terminations are available along with a 4 terminal device for measurement applications in the case of the single resistor version. This product 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: ± 0.3 mm

**MECHANICAL SPECIFICATIONS**

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

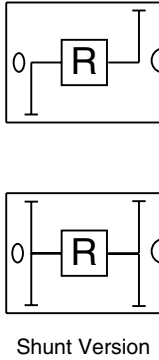
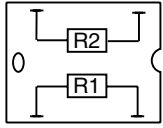
**ENVIRONMENTAL SPECIFICATIONS**

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

**ELECTRICAL SPECIFICATIONS**

ELECTRICAL SPECIFICATIONS	
<b>Resistance Range</b>	0.046 to 1 MΩ
<b>Standard Tolerance</b>	± 1 % to ± 10 %
<b>Power Rating</b>	50 W to 200 W at + 25 °C
<b>Temperature Coefficient</b> (- 55 °C to + 125 °C)	<b>Standard</b> ± 300 ppm/°C (R < 1) ± 150 ppm/°C (R > 1)
<b>Insulation Resistance</b>	> 10 <sup>6</sup> MΩ

PERFORMANCE		
TESTS	CONDITIONS	REQUIREMENTS
Momentary Overload	IEC 60115-1 2.5 Pn/5 s $U_S < 2 U_L$	$< \pm (0.25 \% + 0.05 \Omega)$
Rapid Temperature Change	IEC 60115-1 5 cycles - 55 °C + 125 °C	$< \pm (0.25 \% + 0.05 \Omega)$
Load Life	IEC 60115-1 Pn at 25 °C 1000 h	$< \pm (0.5 \% + 0.05 \Omega)$
Humidity (Steady State)	IEC 60115-1/IEC 60068-2-3 Test Ca 56 days 95 % R.H./40 °C	$< \pm (0.5 \% + 0.05 \Omega)$

SPECIAL FEATURES				
MODEL	RTOP 200	RTOP 100	DRTOP 100	DRTOP 50
Power Rating at + 25 °C Chassis Mounted Resistors Unmounted Resistors	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 <sup>(1)</sup> 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 <sup>(1)</sup> Connections/Resistors	-	-	2500 V, 1 min 10 mA max.	2500 V, 1 min 10 mA max.
Ohmic Value Range	0.046 $\Omega$ to 1 M $\Omega$		0.092 $\Omega$ to 1 M $\Omega$	
Tolerance	$\pm 1 \%$ to $\pm 10 \%$		$\pm 1 \%$ to $\pm 10 \%$	
Electrical Diagrams	 <p style="text-align: center;">Shunt Version</p>			

**Note**
<sup>(1)</sup> MIL STD 202 Method 301

**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:

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

- P: Expressed in W
- $\Delta T$ : 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 130 W at ambient temperature + 30 °C.

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

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

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

$$R_{TH(j-c)} \leq 0.5 \text{ °C/W}$$

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

**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.

**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.

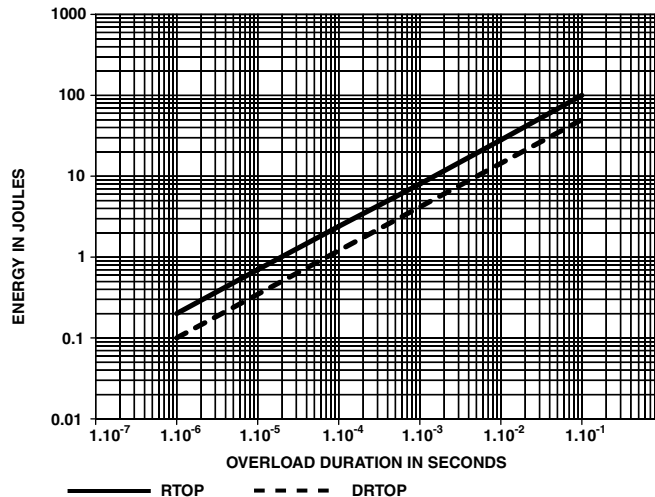
Roughness of the heater must be around 6.3 μm.

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.

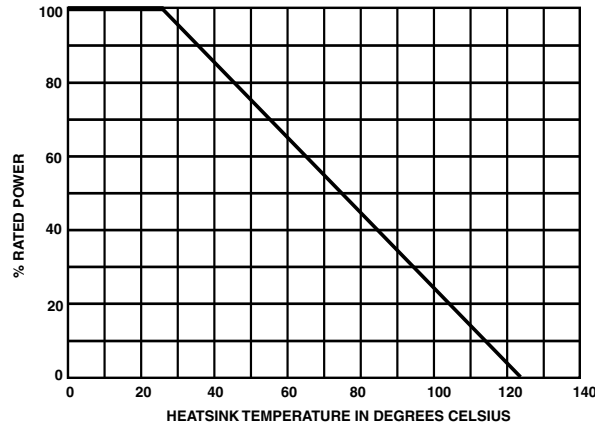
**ENERGY CURVE**





**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.

**PACKAGING**

Box of 10 units

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	100		Optional	To be precise	V: Screw	Optional			
DRTOP	50		± 1 %	for each	VS: RTOP Shunt				
			± 2 %	resistor					
			± 5 %						
			± 10 %						

GLOBAL PART NUMBER INFORMATION														
R	T	O	P	1	0	0	V	5	R	0	0	K	B	
GLOBAL MODEL	SIZE	LEADS	OHMIC VALUE			TOL.	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 2700 = 2.7 kΩ			F = 1 % G = 2 % J = 5 % K = 10 %	B = Box 10 pieces	As applicable Ex = UA1						



## Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А