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 isotope case (SOT-227 B)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

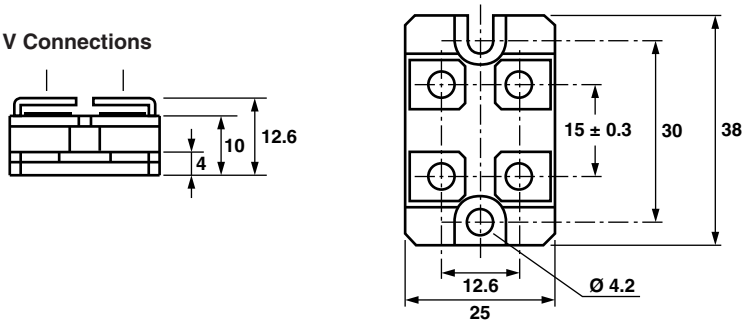
LINKS TO ADDITIONAL RESOURCES

3D Models

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



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

Flammability	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.

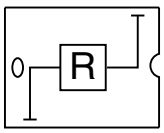
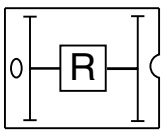
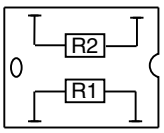
ENVIRONMENTAL SPECIFICATIONS

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

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

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

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

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

$R_{TH\ (j\ -\ c)} = 0.112\ °C/W$

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

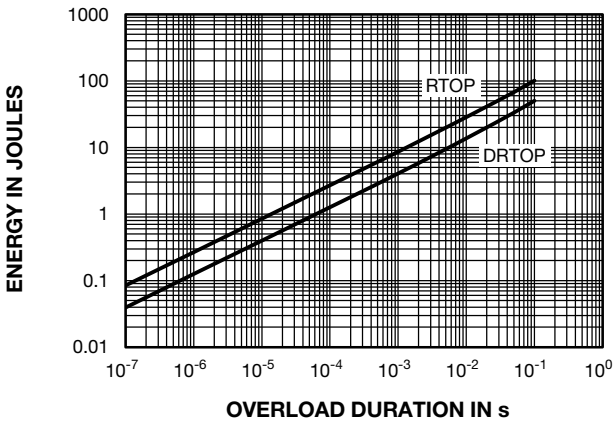
OVERLOADS

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

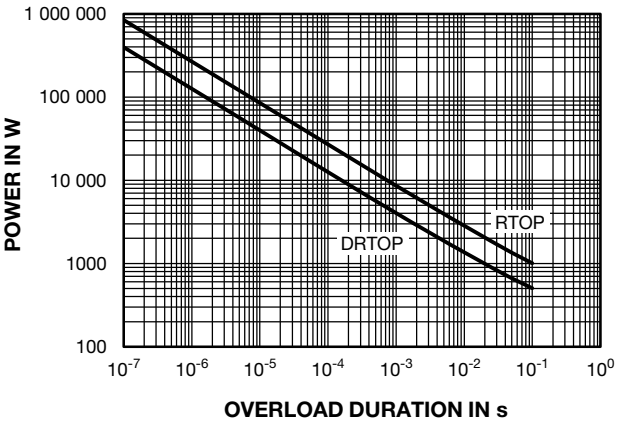
Accidental overload: The values indicated in the graph below are applicable to resistors in air or mounted onto a heatsink.

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

ENERGY CURVE



POWER CURVE

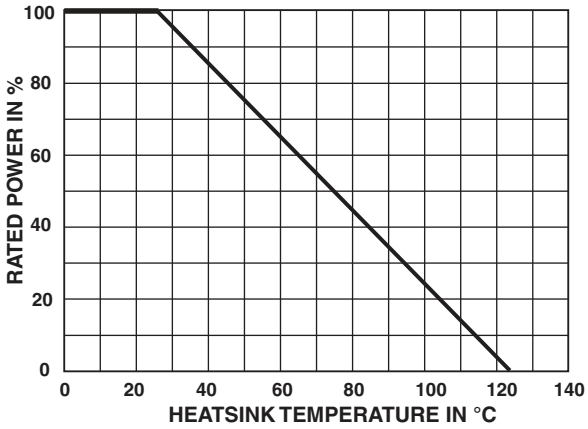


MARKING

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

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	J	B	

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 **2710** = 2.7 kΩ	**F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**B** = box 10 pieces	As applicable **Ex** = UA1

GLOBAL PART NUMBER INFORMATION

D	R	T	O	P	0	5	0	V	1	0	3	1	0	3	J	B	

GLOBAL MODEL	SIZE	LEADS	VALUE No. 1	VALUE No. 2	TOLERANCE	PACKAGING	SPECIAL
DRTOP	**050** 100	**V** = screw	The first two digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point. **103** = 10 kΩ **470** = 47.0 Ω **222** = 2.20 kΩ	The first two digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point. **103** = 10 kΩ **470** = 47.0 Ω **222** = 2.20 kΩ	**F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**B** = box 10 pieces	As applicable **Ex** = UA1

GLOBAL PART NUMBER INFORMATION

D	R	T	O	P	1	0	0	V	1	0	1	2	J	B	

MODEL	SIZE	LEADS	VALUE (two values are identical and cannot be coded in three digits) in four digits	TOLERANCE	PACKAGING	SPECIAL
DRTOP	**050** 100	**V** = screw	The first three digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point. **1012** = 10.1 kΩ **48R7** = 48.7 Ω **2241** = 2.24 kΩ	**F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**B** = box 10 pieces	As applicable **Ex** = UA1

RELATED DOCUMENTS

APPLICATION NOTES	
Potentiometers and Trimmers	www.vishay.com/doc?51001
Guidelines for Vishay Sfernice Resistive and Inductive Components	www.vishay.com/doc?52029

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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 in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Vishay:

DRTOP100V101101KB RTOP100VR100JB RTOP200V4R70JB DRTOP100V622622JB DRTOP100V470470FB RTOP200V1001JB RTOP200V3R90JB RTOP200VR100JB DRTOP100V6191FB DRTOP050V100100KB DRTOP100V201201FB DRTOP050V470470JB DRTOP100V132132FB DRTOP100V280280FB DRTOP050V250250JB DRTOP100VR47R47JB DRTOP100V7R50FB DRTOP100V48R7JB DRTOP100VR50R50KB DRTOP100V200200JB DRTOP100V100100KB DRTOP100V133R0FB DRTOP050V471471JB DRTOP050V123123JB DRTOP100V102102KB DRTOP050V1R01R0FB DRTOP050V48R7JB DRTOP100V3R33R3JB RTOP100V56R0FB RTOP200V4702JB RTOP100VS3651FB RTOP200V2R70JB RTOP200V12R0FB RTOP200VR460JB RTOP200V1001FB RTOP200VS1R50FB RTOP100V5000JB RTOP100V1432FB RTOP100V5R60JB RTOP200V3902KB RTOP100V10R0KB RTOP200V2R00JB RTOP100VR050JB RTOP200V2800JB RTOP100V47R0JB RTOP100V6R80JB RTOP100V1R00KB RTOP200VSR200JB RTOP100V4702JB RTOP100V3301FB RTOP100V1002JB RTOP200V39R2FB RTOP200V10R0FB RTOP200V4001JB RTOP200V50R0JB RTOP200V5500JB RTOP100V2001JB RTOP100VR510JB RTOP200V2200JB RTOP100V1000KB RTOP200V1002JB RTOP200VS6202JB RTOP200V1252GB RTOP200V20R0JB RTOP200V2702JB RTOP200VS15R0KB RTOP100VR200KB RTOP200V2490FB RTOP100V15R0FB RTOP200V28R0FB RTOP100VR080KB RTOP100VR470JB RTOP200V7002GB RTOP200VSR300JB RTOP100V47R0KB RTOP100V15R0JB RTOP200VR200JB RTOP200VS2R00FB RTOP200V5002JB RTOP200VS1R00FB RTOP100V3301JB RTOP100V1R00JB RTOP100V4702KB RTOP200V15R0GB RTOP200V1000FB RTOP200V1801JB RTOP200V1200JB RTOP100V1500JB RTOP200V1600JB RTOP200V22R0JB RTOP200V56R0FB RTOP100VR060KB RTOP200V1003FB RTOP100V39R0FB RTOP200VS1501JB RTOP100VR150JB RTOP200V10R0KB RTOP100V50R0FB RTOP100V2322FB RTOP200V47R0FB