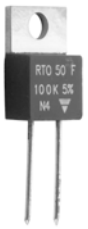
50 W Power Resistor, Thick Film Technology, TO-220



FEATURES

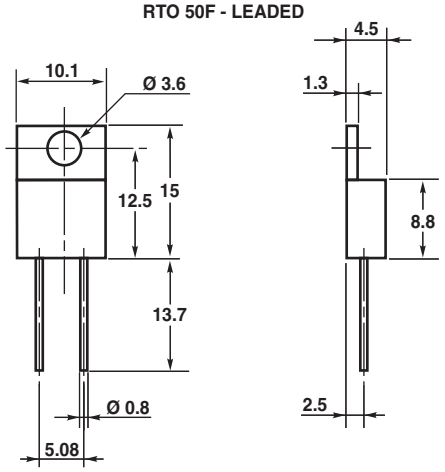
- 50 W at 25 °C heatsink mounted
- Adjusted by sand trimming
- Leaded or surface mount versions
- High power to size ratio
- Non inductive element
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

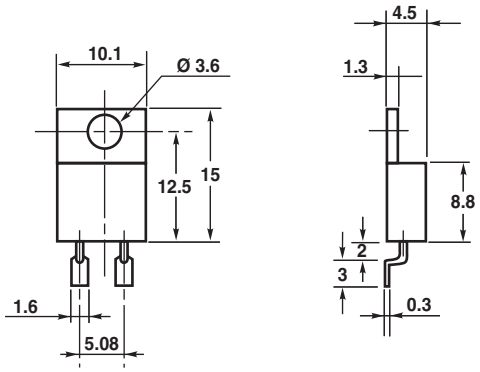
Because of the knowledge and experience in Thick Film technology, Vishay Sfernice has been able to develop a high power resistor in a TO-220 package called RTO 50. The special design of this component allows the dissipation of 50 W when mounted on a heatsink. The ohmic value is adjusted by sand trimming. This process does not generate hot spots as in laser trimming, which could lead to microcracks on each side of the curve. This process improves the reliability and the stability of the resistor and at the same time gives a good overload capability.

DIMENSIONS in millimeters

RTO 50F - LEADED



RTO 50C - FOR SURFACE MOUNTING



• Only for RTO 50 version C = during surface mount soldering, the soldering temperature profile must not cause the metal tab of this device to exceed 220 °C.

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	RESISTANCE RANGE Ω	RATED POWER $P_{25\,°C}$ W	LIMITING ELEMENT VOLTAGE U_L V	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C	CRITICAL RESISTANCE Ω
RTO 50	TO-220	0.010 to 550K (1)	50	500	1, 2, 5, 10	150	5K

Note

(1) E24 series

MECHANICAL SPECIFICATIONS

Mechanical Protection	Molded
Resistive Element	Thick film
Connections	Tinned copper alloy
Weight	2.2 g max.

ENVIRONMENTAL SPECIFICATIONS

Temperature Range	-55 °C to 155 °C
Climatic Category	55/155/156
Sealing	Sealed container, solder immersion
Flammability	IEC 60695-11-5, 2 applications 30 s separated by 60 s

Note

- Not compatible with RoHS reflow profile.

TECHNICAL SPECIFICATIONS

Dissipation and Associated	Onto a heatsink
Thermal Resistance and Nominal Power	50 W at +25 °C $R_{TH\,(j-c)}$: 2.6 °C/W Free air: 2.25 W at +25 °C
Dielectric Strength MIL STD 202 (301)	2000 V_{RMS} - 1 min 10 mA max.
Insulation Resistance	≥ 10^6 MΩ
Inductance	≤ 0.1 µH

DIMENSIONS

Standard Package	TO-220 insulated case

PERFORMANCE		
TESTS	**CONDITIONS**	**REQUIREMENTS**
Momentary Overload	EN 60115-1 2 Pr 5 s for R < 2 Ω 1.6 Pr 5 s for R ≥ 2 Ω $U_S < 1.5\ U_L$	± (0.25 % + 0.05 Ω)
Rapid Temperature Change	EN 60115-1 60 068-2-14 5 cycles -55 °C to +155 °C	± (0.5 % + 0.05 Ω)
Load Life	EN 60115-1 Pr at +25 °C, 1000 h CEI 115_1	± (1 % + 0.05 Ω)
Humidity (Steady State)	EN 60115-1 56 days RH 95 %	± (0.5 % + 0.05 Ω)
Vibration	MIL STD 202 method 204 C test D	± (0.2 % + 0.05 Ω)
Terminal Strength	MIL STD 202 method 211 test A1	± (0.2 % + 0.05 Ω)

RESISTANCE VALUE IN RELATION TO TOLERANCE AND TCR					
Resistance Values		≥ 0.01 Ω	≥ 0.015 Ω	≥ 0.1 Ω	≥ 0.5 Ω
Tolerances		± 1 % at ± 10 %			
Temperature Coefficient (-55 °C to +155 °C)	**Standard**	± 900 ppm/°C	± 700 ppm/°C	± 250 ppm/°C	± 150 ppm/°C

CHOICE OF THE HEATSINK

The user must choose according to the working conditions of the component (power, room temperature).
Maximum working temperature must not exceed 155 °C. The dissipated power is simply calculated by the following ratio:

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

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: (Special Features Table)

$R_{TH\ (c\ -\ h)}$: 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 RTO 50 power rating 13 W at ambient temperature +30 °C

Thermal resistance $R_{TH\ (j\ -\ c)}$: 2.6 °C/W

Considering equation (1) we have:

$\Delta T \leq 155\ °C - 30\ °C = 125\ °C$

$R_{TH\ (j\ -\ c)} + R_{TH\ (c\ -\ h)} + R_{TH\ (h\ -\ a)} = \frac{\Delta T}{P} = \frac{125}{13} = 9.6\ °C/W$

$R_{TH\ (c\ -\ a)} + R_{TH\ (h\ -\ a)} \leq 9.6\ °C/W - 2.6\ °C/W \leq 7\ °C/W$

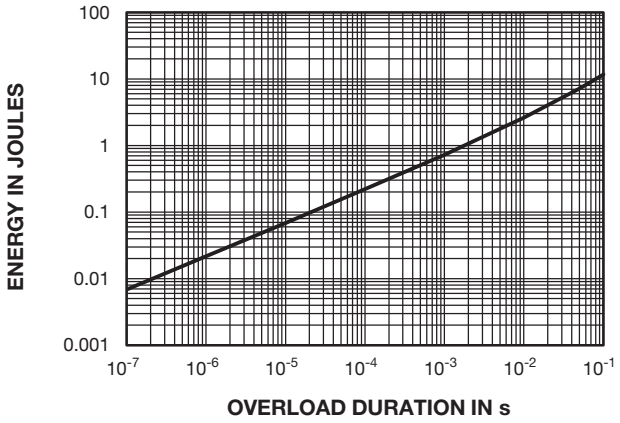
OVERLOADS

The applied voltage must always be lower than the maximum overload voltage of 750 V.
The values indicated on the graph below are applicable to resistors in air or mounted onto a heatsink.

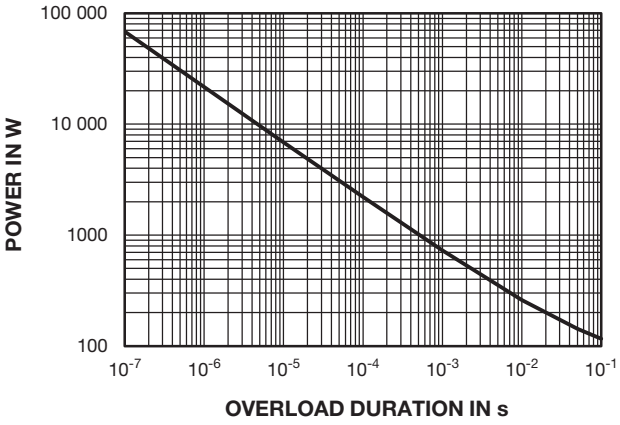
MARKING

Model, style, resistance value (in Ω), tolerance (in %), manufacturing date, Vishay Sfernice trademark.

ENERGY CURVE

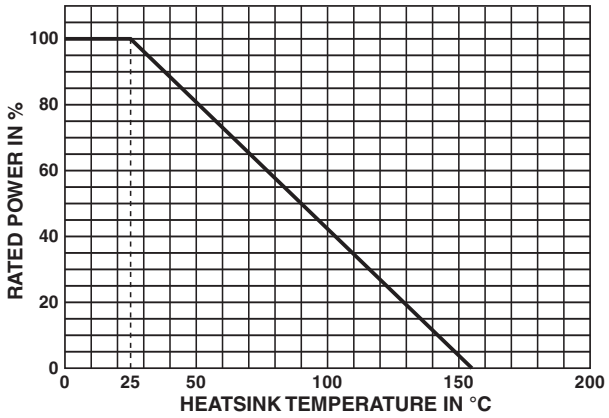


POWER CURVE



POWER RATING

The temperature of the heatsink should be maintained within the limits specified.
To improve the thermal conductivity, surfaces in contact should be coated with a silicone grease and the torque applied on the screw for tightening should be around 1 Nm.



PACKAGING

Tube of 50 units

ORDERING INFORMATION

RTO	50	F	100K	± 1%	XXX	TU50	e1
MODEL	STYLE	CONNECTIONS	RESISTANCE VALUE	TOLERANCE	CUSTOM DESIGN	PACKAGING	LEAD (Pb)-FREE
		F: Radial leads C: Surface mount		± 1% ± 2% ± 5% ± 10%	Optional on request: Special TCR, shape, etc.		

GLOBAL PART NUMBER INFORMATION

R	T	O	0	5	0	F	R	6	8	0	0	J	T	E	1

GLOBAL MODEL	SIZE	LEADS	OHMIC VALUE	TOLERANCE	PACKAGING
RTO	**050**	**F** = Radial leads **C** = Surface mount	The first four digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point. **48R70** = 48.7 Ω **48701** = 48 700 Ω **10002** = 100 000 Ω **R0100** = 0.01 Ω **R6800** = 0.68 Ω **27000** = 2700 Ω = 2.7 kΩ	**F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**T** = Tube Size 30 and 50: Tube 50 pieces

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.

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.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.