

# 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](http://www.vishay.com/doc?99912)

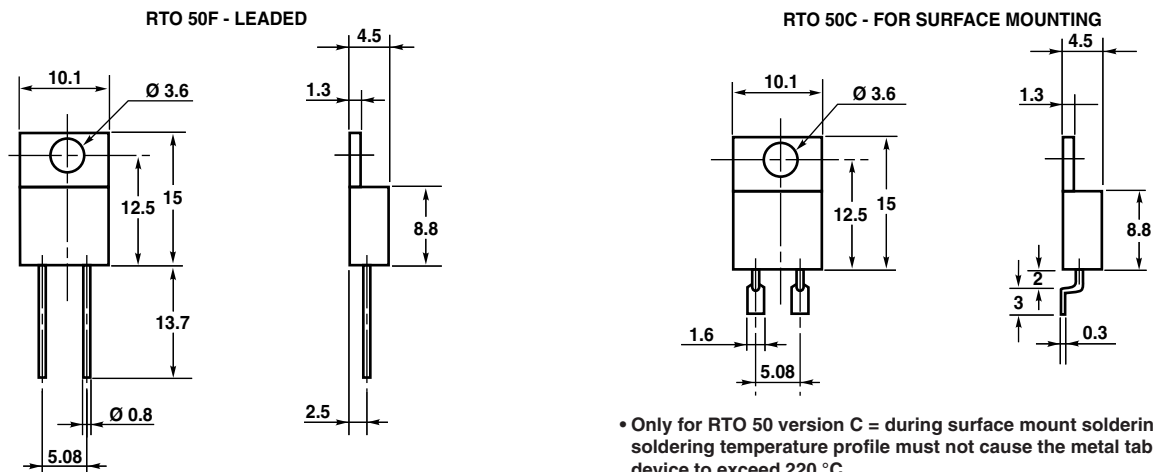

**RoHS**  
COMPLIANT

## DESIGN SUPPORT TOOLS

[click logo to get started](#)
**3D**  
Models  
Available

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.

## DIMENSIONS in millimeters



## STANDARD ELECTRICAL SPECIFICATIONS

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

**Note**
<sup>(1)</sup> 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 <sup>6</sup> MΩ
Inductance	≤ 0.1 μH

## DIMENSIONS

Standard Package	TO-220 insulated case
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PERFORMANCE		
TESTS	CONDITIONS	REQUIREMENTS
Momentary Overload	EN 60115-1 2 Pr 5 s for $R < 2 \Omega$ 1.6 Pr 5 s for $R \geq 2 \Omega$ $U_S < 1.5 U_L$	$\pm (0.25 \% + 0.05 \Omega)$
Rapid Temperature Change	EN 60115-1 60 068-2-14 5 cycles $-55 \text{ }^\circ\text{C}$ to $+155 \text{ }^\circ\text{C}$	$\pm (0.5 \% + 0.05 \Omega)$
Load Life	EN 60115-1 Pr at $+25 \text{ }^\circ\text{C}$ , 1000 h CEI 115_1	$\pm (1 \% + 0.05 \Omega)$
Humidity (Steady State)	EN 60115-1 56 days RH 95 %	$\pm (0.5 \% + 0.05 \Omega)$
Vibration	MIL STD 202 method 204 C test D	$\pm (0.2 \% + 0.05 \Omega)$
Terminal Strength	MIL STD 202 method 211 test A1	$\pm (0.2 \% + 0.05 \Omega)$

RESISTANCE VALUE IN RELATION TO TOLERANCE AND TCR				
Resistance Values	$\geq 0.01 \Omega$	$\geq 0.015 \Omega$	$\geq 0.1 \Omega$	$\geq 0.5 \Omega$
Tolerances	$\pm 1 \%$ at $\pm 10 \%$			
Temperature Coefficient ( $-55 \text{ }^\circ\text{C}$ to $+155 \text{ }^\circ\text{C}$ )	Standard	$\pm 900 \text{ ppm}/^\circ\text{C}$	$\pm 700 \text{ ppm}/^\circ\text{C}$	$\pm 250 \text{ ppm}/^\circ\text{C}$ $\pm 150 \text{ ppm}/^\circ\text{C}$

### 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  $155 \text{ }^\circ\text{C}$ . 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
$\Delta T$ :	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: (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  $+30 \text{ }^\circ\text{C}$

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

Considering equation (1) we have:

$$\Delta T \leq 155 \text{ }^\circ\text{C} - 30 \text{ }^\circ\text{C} = 125 \text{ }^\circ\text{C}$$

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

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



**OVERLOADS**

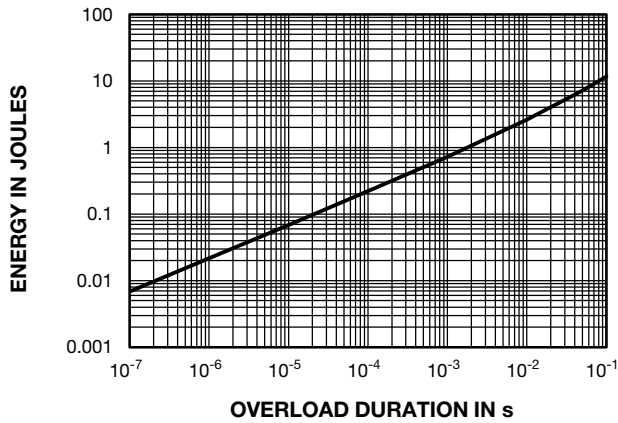
The applied voltage must always be lower than the maximum overload voltage of 750 V.

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

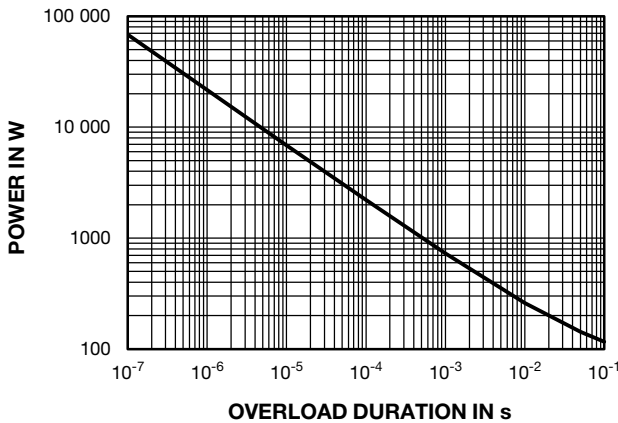
**MARKING**

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

**ENERGY CURVE**



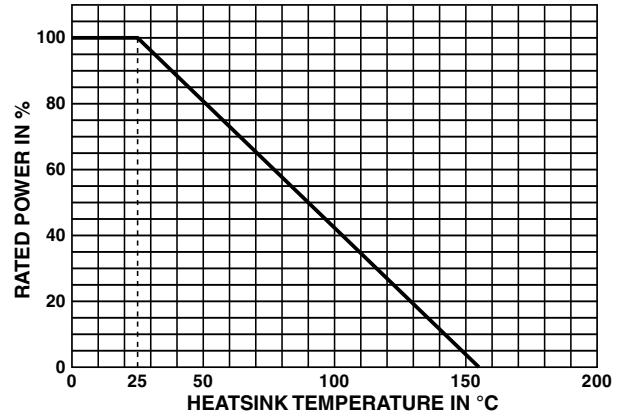
**POWER CURVE**



**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.

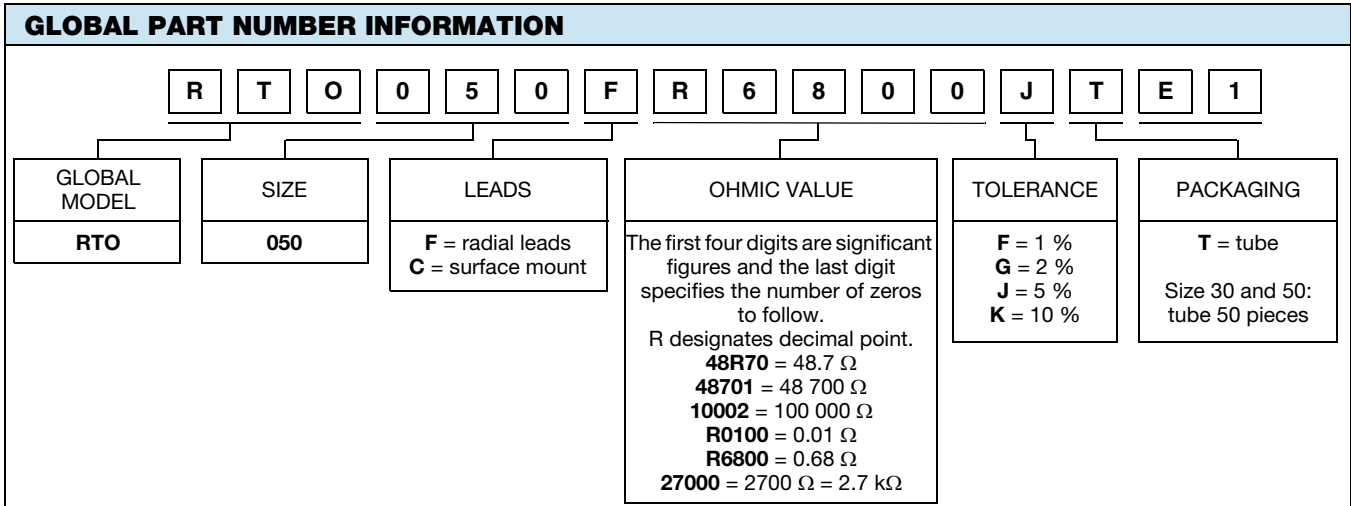


**PACKAGING**

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.		



RELATED DOCUMENTS	
APPLICATION NOTES	
Potentiometers and Trimmers	<a href="http://www.vishay.com/doc?51001">www.vishay.com/doc?51001</a>
Guidelines for Vishay Sfernice Resistive and Inductive Components	<a href="http://www.vishay.com/doc?52029">www.vishay.com/doc?52029</a>



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