

## Power Resistor Thick Film Technology



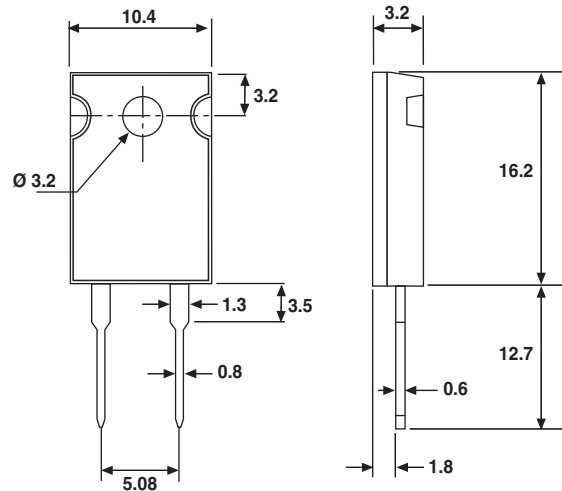
LTO series are the extension of RTO types. We used the direct ceramic mounting design (no metal tab) of our RCH power resistors applied to semiconductor packages.

### FEATURE

- 50 W at 25 °C case temperature heatsink mounted
- Direct mounting ceramic on heatsink
- Broad resistance range: 0.010 Ω to 550 kΩ
- Non inductive
- TO-220 package: Compact and easy to mount
- Isolated case
- Compliant to RoHS directive 2002/95/EC



### DIMENSIONS in millimeters



#### Note

- Tolerance unless otherwise specified: ± 0.3 mm

### MECHANICAL SPECIFICATIONS

<b>Mechanical Protection</b>	Molded
<b>Resistive Element</b>	Thick film
<b>Substrate</b>	Alumina
<b>Connections</b>	Tinned copper
<b>Weight</b>	2 g max.
<b>Mounting Torque</b>	1 Nm

### DIMENSIONS

<b>Standard Package</b>	TO220 package
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### ENVIRONMENTAL SPECIFICATIONS

<b>Temperature Range</b>	- 55 °C to + 155 °C
<b>Climatic Category</b>	55/155/56
<b>Flammability</b>	IEC 60695-11-5 2 applications 30 s separated by 60 s

### ELECTRICAL SPECIFICATIONS

<b>Resistance Range</b>	0.010 Ω to 550 kΩ
<b>Tolerances (Standard)</b>	± 1 % to ± 10 %
<b>Dissipation and Associated</b>	Onto a heatsink
<b>Power Rating and Thermal Resistance of the Component</b>	50 W at + 25 °C (case temp.) $R_{TH(j-c)}$ : 2.5 °C/W Free air: 2.5 W at + 25 °C
<b>Temperature Coefficient Standard</b>	See Performance table ± 150 ppm/°C
<b>Limiting Element Voltage <math>U_L</math></b>	250 V
<b>Dielectric Strength MIL-STD-202</b>	1500 $V_{RMS}$ - 1 min 10 mA max.
<b>Insulation Resistance</b>	≥ 10 <sup>4</sup> MΩ
<b>Inductance</b>	≤ 0.1 μH
<b>Critical Resistance</b>	1.25 kΩ

PERFORMANCE		
TESTS	CONDITIONS	REQUIREMENTS
Momentary Overload	EN 60115-1 1.5 $P_T/5$ s $U_S < 1.5 U_L$	$\pm (0.5 \% + 0.005 \Omega)$
Rapid Temperature Change	EN 60115-1 IEC 60068-2-14 Test Na 5 cycles - 55 °C to + 155 °C	$\pm (0.5 \% + 0.005 \Omega)$
Load Life	EN 60115-1 1000 h $P_T$ at + 25 °C	$\pm (1 \% + 0.005 \Omega)$
Humidity (Steady State)	MIL-STD-202 Method 103 B Cond. D	$\pm (0.5 \% + 0.005 \Omega)$
Vibration	MIL-STD-202 Method 204 Cond. D	$\pm (0.2 \% + 0.005 \Omega)$
Terminal Strength	MIL-STD-202 Method 211 Cond. A1	$\pm (0.2 \% + 0.005 \Omega)$
Shock	100G, MIL-STD-202 Method 213 Cond. I	$\pm (0.5 \% + 0.005 \Omega)$

SPECIAL FEATURES				
Resistance Values	$\geq 0.010$	$\geq 0.015$	$\geq 0.1$	$\geq 0.5$
Tolerances	$\pm 1 \%$ at $\pm 10 \%$			
Typical Temperature Coefficient (- 55 ° to + 155 °C)	$\pm 900$ ppm/°C	$\pm 700$ ppm/°C	$\pm 250$ ppm/°C	$\pm 150$ 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 150 °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.  
 $R_{TH(c-a)}$ : Thermal resistance value measured between outer side of the resistor and room temperature. It is the thermal resistance of the heatsink itself (type, shape) and the quality of the fastening device, and the thermal resistance of the thermal compound.

### Example:

$R_{TH(c-a)}$  for LTO 50 power rating 10 W at ambient temperature + 25 °C

Thermal resistance  $R_{TH(j-c)}$ : 2.5 °C/W

Considering equation (1) we have:

$$\Delta T = 150 \text{ °C} - 25 \text{ °C} = 125 \text{ °C}$$

$$R_{TH(j-c)} + R_{TH(c-a)} = \frac{\Delta T}{P} = \frac{125}{10} = 12.5 \text{ °C/W}$$

$$R_{TH(c-a)} = 12.5 \text{ °C/W} - 2.5 \text{ °C/W} = 10 \text{ °C/W}$$

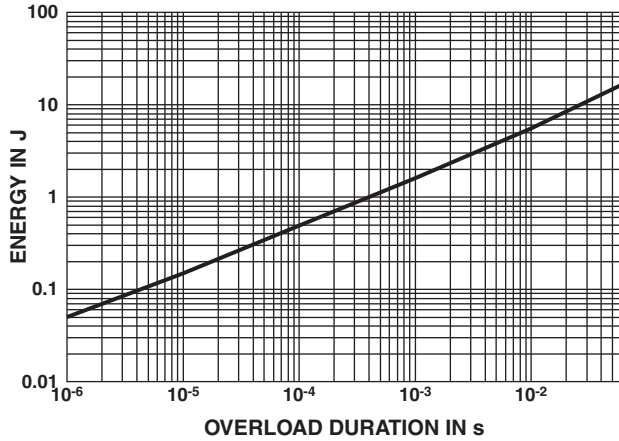
with a thermal grease  $R_{TH(c-h)} = 1 \text{ °C/W}$ , we need a heatsink with  $R_{TH(h-a)} = 9 \text{ °C/W}$ .



**OVERLOADS**

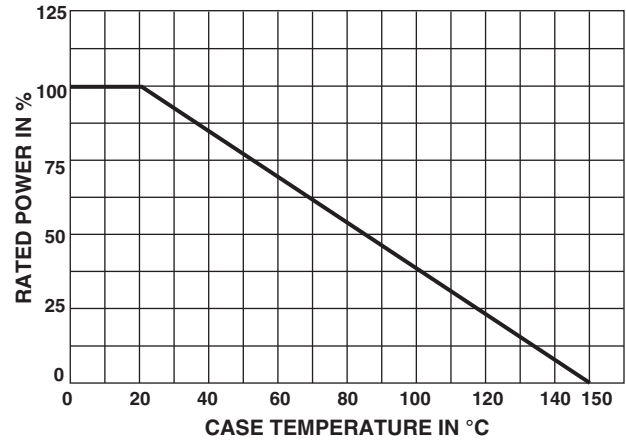
In any case the applied voltage must be lower than the maximum overload voltage of 375 V. The values indicated on the graph below are applicable to resistors in air or mounted onto a heatsink.

**ENERGY CURVE**



**POWER RATING**

The temperature of the case 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.



**MARKING**

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

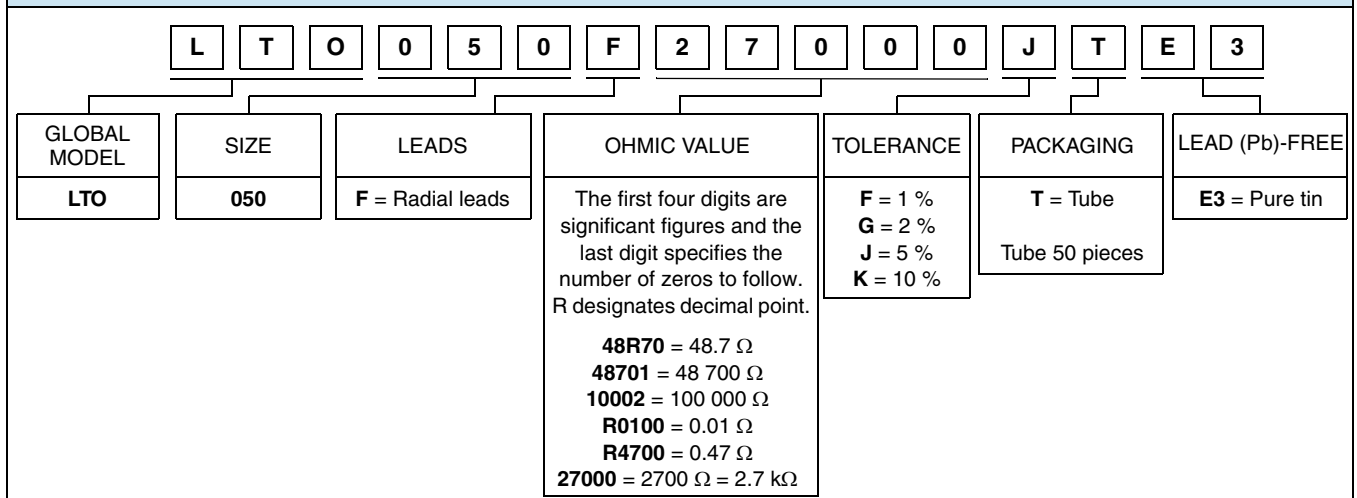
**PACKAGING**

Tube of 50 units

**ORDERING INFORMATION**

LTO	50	F	2.7 kΩ	± 1 %	xxx	TU50	e3
MODEL	STYLE	CONNECTIONS	RESISTANCE VALUE	TOLERANCE	CUSTOM DESIGN	PACKAGING	LEAD (Pb)-FREE
				± 1 % ± 2 % ± 5 % ± 10 %	Optional on request: Special TCR, shape etc.		

**GLOBAL PART NUMBER INFORMATION**





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