



Power Resistor Thick Film Technology



FEATURES

 50 W at 25 °C case temperature heatsink mounted

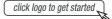


• Direct mounting ceramic on heatsink

• Broad resistance range: 0.010 Ω to 550 k Ω

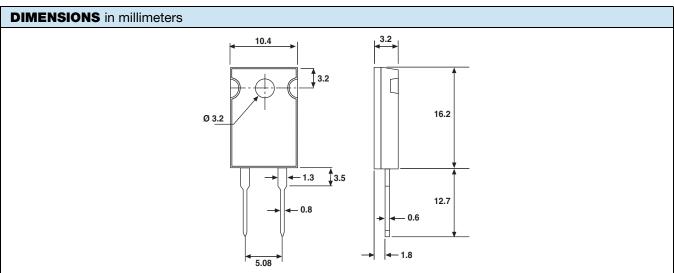
- Non inductive
- TO-220 package: Compact and easy to mount
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

DESIGN SUPPORT TOOLS



3D Models Available

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.



Note

[•] Tolerances unless stated: ± 0.3 mm

STANDA	STANDARD ELECTRICAL SPECIFICATIONS							
MODEL	SIZE	$\begin{array}{c} \textbf{RESISTANCE} \\ \textbf{RANGE} \\ \Omega \end{array}$	RATED POWER P _{25 °C} W	LIMITING ELEMENT VOLTAGE U _L V	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C	$\begin{array}{c} \textbf{CRITICAL} \\ \textbf{RESISTANCE} \\ \Omega \end{array}$	
LTO 50	TO-220	0.010 to 550K	50	500	1, 2, 5, 10	150, 250, 700, 900	5K	

MECHANICAL SPECIFICATIONS			
Mechanical Protection Molded			
Resistive Element	Thick film		
Substrate	Alumina		
Connections	Tinned copper		
Weight	2 g max.		
Mounting Torque	1 Nm		

ENVIRONMENTAL SPECIFICATIONS				
Temperature Range	-55 °C to +150 °C			
Climatic Category	55 / 155 / 56			
Flammability	IEC 60695-11-5 2 applications 30 s separated by 60 s			

TECHNICAL SPECIFICATIONS				
Dissipation and Associated	Onto a heatsink			
Power Rating and Thermal Resistance of the Component	50 W at +25 °C (case temp.) R _{TH (j - c)} : 2.5 °C/W Free air: 2.5 W at +25 °C			
Temperature Coefficient	See Performance table			
Standard	± 150 ppm/°C			
Dielectric Strength MIL STD 202	1500 V _{RMS} - 1 min 10 mA max.			
Insulation Resistance	$\geq 10^4 \ \text{M}\Omega$			
Inductance	≤ 0.1 µH			

Revision: 16-Nov-17 1 Document Number: 50050

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PERFORMANCE					
TESTS	CONDITIONS	REQUIREMENTS			
Momentary Overload	EN 60115-1 1.5 Pr / 5 s <i>U</i> _S < 1.5 <i>U</i> _L	± (0.5 % + 0.005 Ω)			
Rapid Temperature Change	EN 60115-1 IEC 60068-2-14 Test Na 5 cycles -55°C to +155°C	± (0.5 % + 0.005 Ω)			
Load Life	EN 60115-1 1000 h Pr at +25 °C	± (1 % + 0.005 Ω)			
Humidity (Steady State)	MIL-STD-202 method 103 B cond. D	± (0.5 % + 0.005 Ω)			
Vibration	MIL-STD-202 method 204 cond. D	± (0.2 % + 0.005 Ω)			
Terminal Strength	MIL-STD-202 method 211 cond. A1	± (0.2 % + 0.005 Ω)			
Shock	100G, MIL-STD-202 method 213 cond. I	± (0.5 % + 0.005 Ω)			

SPECIAL FEATURES					
Resistance Values	≥ 0.010	≥ 0.015	≥ 0.1	≥ 0.5	
Tolerances	± 1 % at ± 10 %				
Typical Temperature Coefficient (-55 ° to +155 °C)	± 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 150 °C. The dissipated power is simply calculated by the following ratio:

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

P: Expressed in W

 $\Delta T \colon \mbox{Difference}$ 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.

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

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

Considering equation (1) we have:

$$\begin{split} \Delta T &= 150~^{\circ}\text{C} - 25~^{\circ}\text{C} = 125~^{\circ}\text{C} \\ R_{\text{TH (j - c)}} + R_{\text{TH (c - h)}} + R_{\text{TH (h - a)}} &= \frac{\Delta T}{P} = \frac{125}{10} = 12.5~^{\circ}\text{C/W} \\ R_{\text{TH (c - h)}} + R_{\text{TH (h - a)}} &= 12.5~^{\circ}\text{C/W} - 2.5~^{\circ}\text{C/W} = 10~^{\circ}\text{C/W} \end{split}$$

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

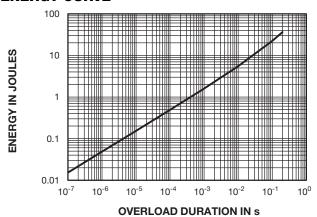


OVERLOADS

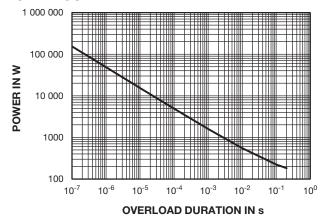
In any case the applied voltage must be lower than the maximum overload voltage of 750 V.

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

ENERGY CURVE



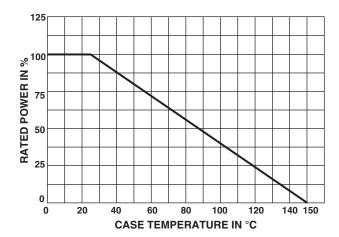
POWER CURVE



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.



PACKAGING

Tube of 50 units

MARKING

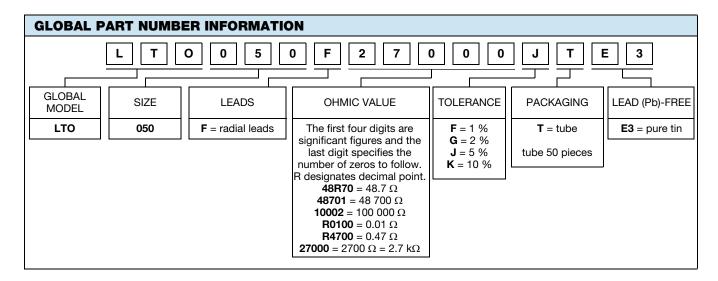
Model, style, resistance value (in Ω), tolerance (in %), manufacturing date, Vishay Sfernice trademark.



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ORDERING INFORMATION							
LTO	50	F	2.7 k Ω	± 1 %	XXX	TU50	e3
MODEL	STYLE	CONNECTIONS	RESISTANCE VALUE	± 1 % ± 2 % ± 5 % ± 10 %	CUSTOM DESIGN optional on request: special TCR, shape etc.	PACKAGING	LEAD (Pb)-FREE



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			



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