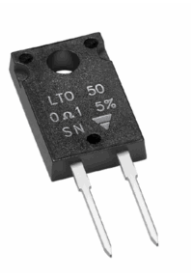
# LTO 50

Vishay Sfernice

## Power Resistor Thick Film Technology



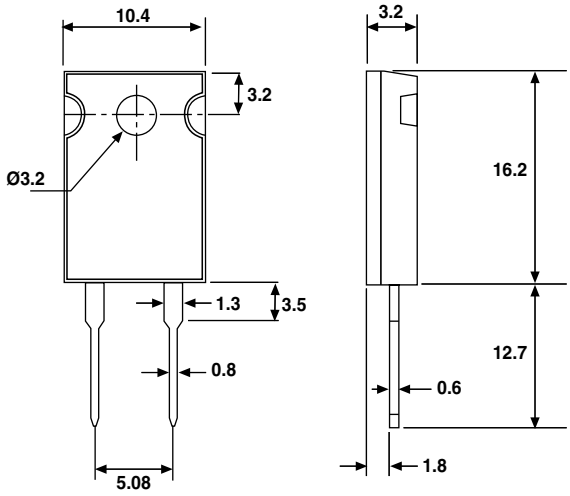

LTO series are the extension of RTO types. We used the direct ceramic mounting design (no metal tab) of our RCH power resistors applied to semiconductor packages.

### FEATURES

- 50 Watt at 25 °C Case Temperature Heatsink Mounted
- Direct mounting ceramic on heatsink
- Broad Resistance Range: R010 to 550K
- Non Inductive
- TO-220 package: Compact and easy to mount
- RoHS compliant
- Isolated case

RoHS COMPLIANT

### DIMENSIONS in millimeters




• Tolerance unless otherwise specified: ± 0.3 mm

### MECHANICAL SPECIFICATIONS

| | |
|---|---|
| **Mechanical Protection** | Molded |
| **Resistive Element** | Thick Film |
| **Substrate** | Alumina |
| **Connections** | Tinned Copper |
| **Weight** | 2 g max. |
| **Mounting Torque** | 1 N-m |

### DIMENSIONS

| | |
|---|---|
| **Standard Package** | TO-220<br>Isolated case |

### ENVIRONMENTAL SPECIFICATIONS

| | |
|---|---|
| **Temperature Range** | - 55 °C to + 150 °C |
| **Climatic Category** | 55/155/56 |

### ELECTRICAL SPECIFICATIONS

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

| PERFORMANCE | | |
|---|---|---|
| **TESTS** | **CONDITIONS** | **TYPICAL DRIFTS** |
| **Momentary Overload** | EN60115-1<br>1.5 Pr/5 s<br>Us < 1.5 UL | ± (0.5 % + 0.005 Ω) |
| **Rapid Temperature Change** | EN60115-1<br>IEC 60068-2-14 Tests Na<br>5 cycles<br>- 55 °C to + 155 °C | ± (0.5 % + 0.005 Ω) |
| **Load Life** | EN60115-1<br>1000 h Pr at + 25 °C | ± (1 % + 0.005 Ω) |
| **Humidity (Steady State)** | MIL STD 202<br>Method 103 B Cond. D | ± (0.5 % + 0.005 Ω) |
| **Vibration** | MIL STD 202<br>Method 204 Cond. D | ± (0.2 % + 0.005 Ω) |
| **Terminal Strength** | MIL STD 202<br>Method 211 Cond. A1 | ± (0.2 % + 0.005 Ω) |
| **Shock** | 100G, MIL STD 202<br>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 °C/+ 150 °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:

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

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.

$R_{TH}$: (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), the quality of the fastening device, and the thermal resistance of the thermal compound.

Example:

$R_{TH}$: (c-a) for LTO50 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 °C - 25 °C = 125 °C

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

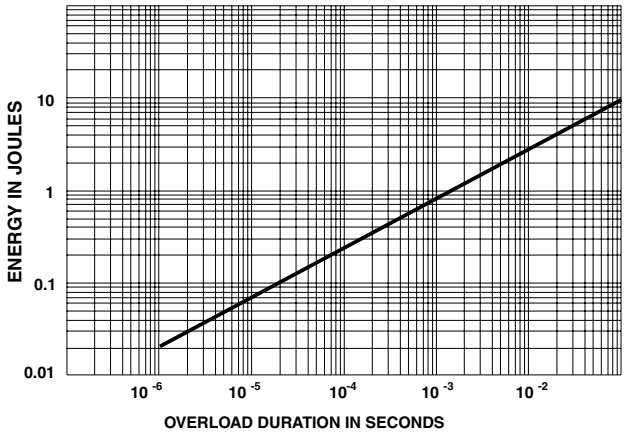
$R_{TH}$ (c-a) = 12.5 °C/W - 2.5 °C/W = 10 °C/W

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

## OVERLOADS

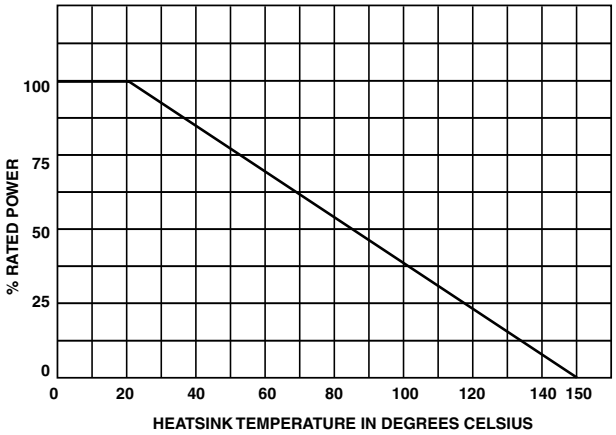
In any case the applied voltage must be lower than the maximum overload voltage of 375V.
The values indicated on the graph below are applicable to resistors in air or mounted onto a heatsink.

### ENERGY CURVE




## POWER RATING CHART

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.




## MARKING

Model, Style, Resistance Value (in Ω), Tolerance (in %), Manufacturing Date, VISHAY trademark

## PACKAGING

Tube of 50 units

## ORDERING INFORMATION

| LTO | 50 | F | 100 kΩ | ± 1 % | xxx | TU50 | e3 |
|---|---|---|---|---|---|---|---|
| MODEL | STYLE | CONNECTIONS | RESISTANCE VALUE | TOLERANCE | CUSTOM DESIGN | PACKAGING | LEAD (Pb)-FREE |
| | | | | ± 1 %<br>± 2 %<br>± 5 %<br>± 10 % | Optional<br>on request:<br>special TCR,<br>shape etc. | | |

## SAP PART NUMBERING GUIDELINES

| L | T | O | 0 | 5 | 0 | F | 1 | 0 | 0 | 0 | 2 | F | T | E | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | | | STYLE | | CONNECTIONS | | RESISTANCE VALUE | | | | | TOL | PACK | LEAD (Pb)-FREE | |

SAP Part Number LTO050F10002FTE3

# Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.