6121 Baker Road,
Suite 108
Minnetonka, MN 55345

www.chtechnology.com

Phone (952) 933-6190
Fax (952) 933-6223

1-800-274-4284

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Phone – 1-800-274-4284

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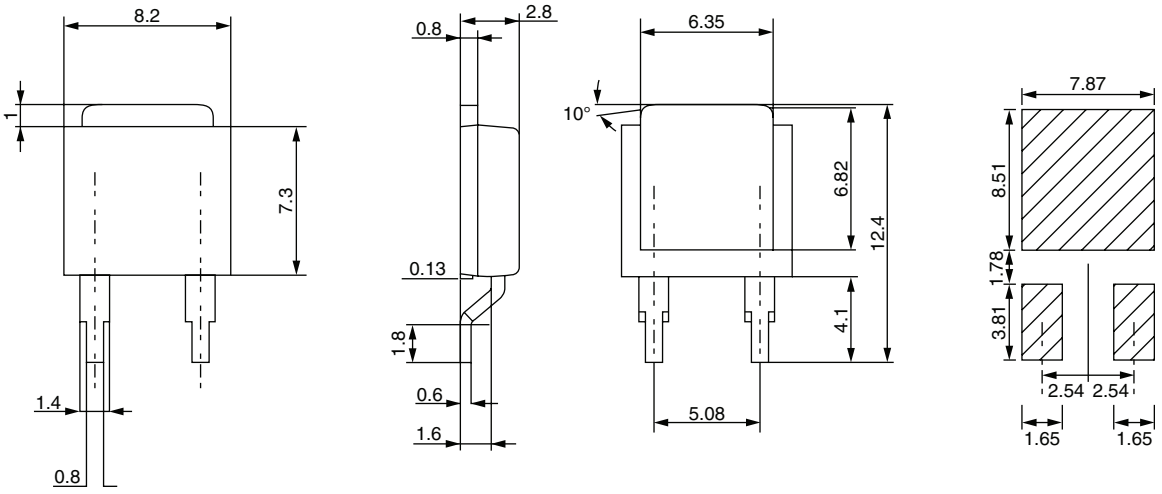
Surface Mounted Power Resistor Thick Film Technology

FEATURES

- 25 W at 25 °C case temperature
- Surface mounted resistor - TO-252 (D-PAK) style package
- Wide resistance range: 0.016 Ω to 700 kΩ
- Non inductive
- RoHS compliant
- Resistor isolated from metal tab
- Solder reflow secure at 270 °C/10 s, MSL = 1

RoHS COMPLIANT

DIMENSIONS in millimeters



MECHANICAL SPECIFICATIONS

Mechanical Protection	Molded
Resistive Element	Thick film
Substrate	Alumina
Connections	Tinned copper
Weight	2 g max.

DIMENSIONS

Standard Package	TO-252 style (D-PAK)

ENVIRONMENTAL SPECIFICATIONS

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

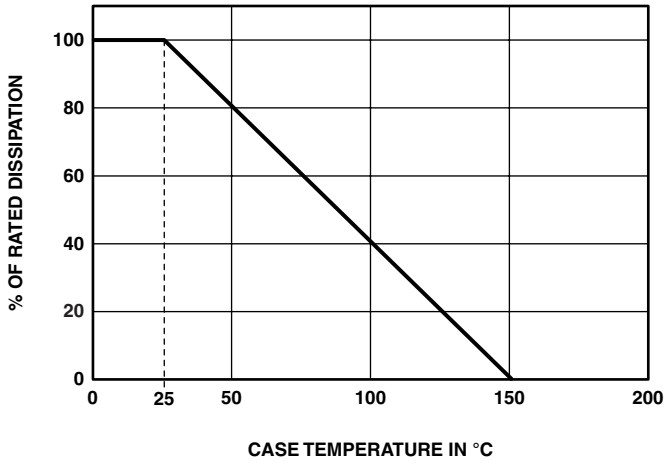
ELECTRICAL SPECIFICATIONS	
Resistance Range	0.016 Ω to 700 kΩ
Tolerances	± 1 % to ± 10 % from 0.016 Ω to 0.049 Ω only ± 5 % and ± 10 % available
Power Rating and Thermal Resistance	25 W at + 25 °C case temperature $R_{TH\ (j\ -\ c)}$: 5 °C/W
Temperature Coefficient **Standard**	See Special Features table ± 150 ppm/°C
Limiting Element Voltage U_L	200 V
Dielectric Strength IEC 60115-1	1500 V_{RMS} - 1 min - 15 mA max. (between terminals and board)
Insulation Resistance	≥ 10^4 MΩ
Inductance	≤ 0.1 µH
Critical Resistance	1.6 kΩ

SPECIAL FEATURES			
Resistance Values	≥ 0.016	≥ 0.1	≥ 0.5
Typical Temperature Coefficient (- 55 °C to + 150 °C)	± 800 ppm/°C	± 250 ppm/°C	± 150 ppm/°C

PERFORMANCE		
TESTS	**CONDITIONS**	**REQUIREMENTS**
Momentary Overload	IEC 60115-1 § 4.13 1.5 Pr/5 s $Us \leq 1.5\ U_L$	± (0.25 % + 0.005 Ω)
Rapid Temperature Change	IEC 60115-1 Tests Na 5 cycles - 1 h - 55 °C to + 150 °C	± (0.5 % + 0.005 Ω)
Load Life	IEC 60115-1 1000 h Pr at + 25 °C case temperature	± (1 % + 0.005 Ω)
Humidity (Steady State)	IEC 60115-1 IEC 60068-2-3 Test Ca: 56 days RH 95 % 85 °C	± (0.5 % + 0.005 Ω)
Vibration	IEC 60115-1 IEC 60068-2-6 Test Fc: 10 to 2000 Hz	± (0.2 % + 0.005 Ω)
Shear (Adhesion) Test	IEC 60115-1 IEC 60068-2-21 Test Ue3/Shear: 5 N/10 s	No visible damage
Substrate Bending Test	IEC 60115-1 IEC 60068-2-21 Test Ue1: 2 mm/3 times	± (0.25 % + 0.005 Ω)

POWER RATING CHART

The temperature of the case should be maintained within the limits specified.



ASSEMBLY SPECIFICATIONS		
For the assembly on board, we recommend the lead (Pb)-free thermal profile as per J-STD-020C		
TESTS	**CONDITIONS**	**REQUIREMENTS**
Resistance to Soldering Heat	IEC 60115-1 IEC 60068-2-58 Solder Bath method: 270 °C/10 s	± (0.5 % + 0.005 Ω)
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020C 85 °C/85 % RH/168 h	Level: 1 + Pass requirements of TCR Overload and Dielectric Strength after MSL

CHOISE OF THE BOARD

The user must choose the board 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:

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

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: 5 °C/W.

$R_{TH\ (c\ -\ a\ )}$: Thermal resistance value measured between outer side of the resistor and room temperature. It is the thermal resistance of the solder layer (according the quality of the soldering) and the thermal resistance of the board.

$R_{TH\ (c\ -\ a)}$ for DTO25 power rating 3 W at ambient temperature + 25 °C.
Thermal resistance $R_{TH\ (j\ -\ c)}$: 5 °C/W
Considering equation (1) we have:

ΔT = 150 °C - 25 °C = 125 °C

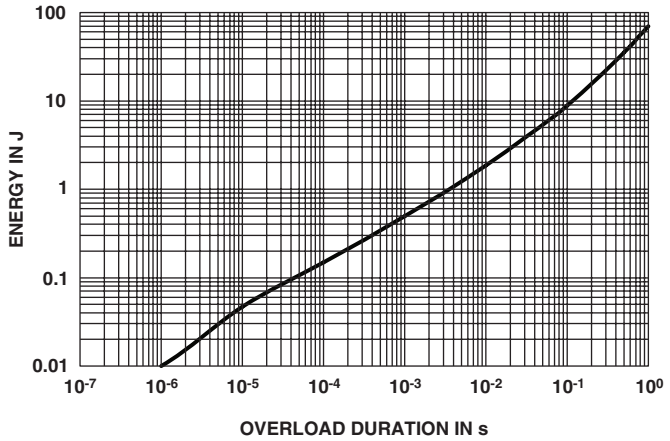
$R_{TH\ (j\ -\ c)} + R_{TH\ (c\ -\ a)} = \Delta T/P = 125/3 = 41.7$ °C/W

$R_{TH\ (c\ -\ a)} = 41.7$ °C/W - 5 °C/W = 36.7 °C/W

ACCIDENTAL OVERLOAD

In any case the applied voltage must be lower than the maximum overload voltage of Us = 375 V. The values indicated on the graph below are applicable to resistors onto a board.

ENERGY CURVE



Single Pulse:

These informations are for a single pulse on a cold resistor at 25 °C (not already used for a dissipation) and for pulses of 100 ms maximum duration.

The formula used to calculate *E* is:

$$E = P \times t = \frac{U^2}{R} \times t$$

with:

E (J): Pulse energy
P (W): Pulse power
t (s): Pulse duration
U (V): Pulse voltage
R (Ω): Resistor

The energy calculated must be less than that allowed by the graph.

Repetitive or Superimposed Pulses:

The following formula is used to calculate the “equivalent“ energy of a repetitive pulse or the “equivalent energy“ of a pulse on a resistor that is already dissipating power.

$$E_c = E \times \left(1 + \frac{P_a}{P_r}\right)$$

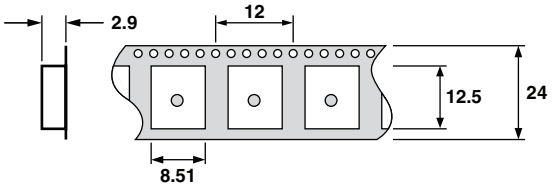
with:

E_c (J): Equivalent pulse energy
E (J): Known pulse energy
P_r: Resistor power rating
P_a: Mean power being dissipated

The energy calculated must be less than that allowed by the graph and the average power dissipated (P_a) must not exceed the continuous power of resistor.

PACKAGING

- Reel
- Tube
- Tape dimensions (mm) for reel:



MARKING

Model, Style, Resistance Value (in Ω), Tolerance (in %), Manufacturing Date, Vishay Trademark

ORDERING INFORMATION

DTO	25	C	100 kΩ	± 1 %	XXX	e3
MODEL	STYLE	CONNECTIONS	RESISTANCE VALUE	TOLERANCE	CUSTOM DESIGN	LEAD (Pb)-FREE
				F = ± 1 % G = ± 2 % J = ± 5 % K = ± 10 %	Optional on request: shape, etc	

GLOBAL PART NUMBER INFORMATION

D	T	O	2	5	C	1	0	0	0	2	F	R	E	3

GLOBAL MODEL	SIZE	LEADS	OHMIC VALUE	TOLERANCE	PACKAGING	LEAD (Pb)-FREE
DTO	**25**	**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 = 2K7 Ω	**F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**R** = Reel 500 pieces **T** = Tube 50 pieces	**E3** = Pure tin

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