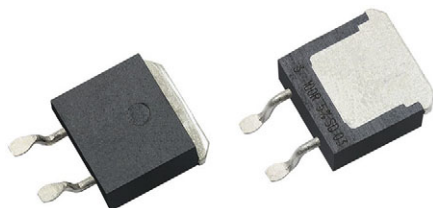


Surface Mount Power Resistor, Thick Film Technology, TO-263 Top Side Cooling


RoHS
COMPLIANT

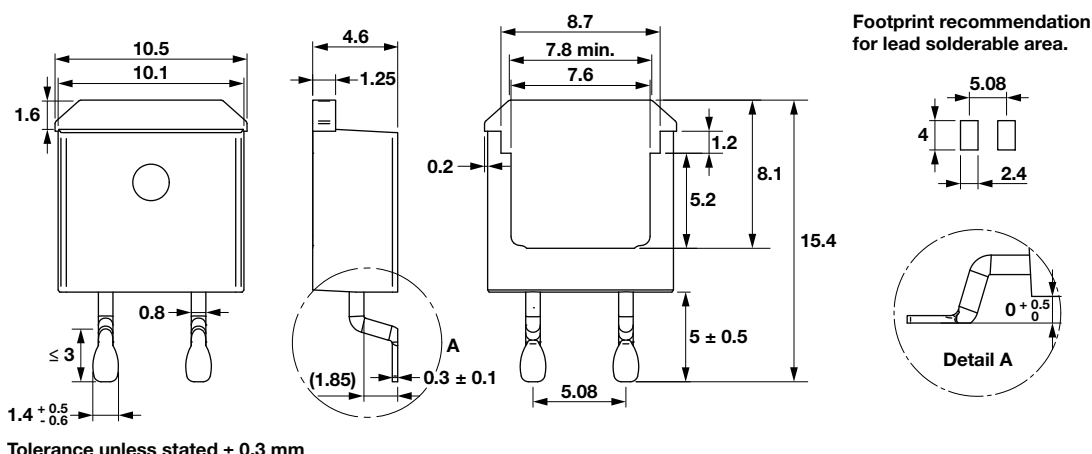
FEATURES

- AEC-Q200 qualified
- 35 W at 25 °C top side temperature
- Surface mounted resistor - TO-263 (D²PAK) style package
- Top side cooling mount
- Wide resistance range from 4.7 Ω to 550 kΩ
- Non inductive
- Resistor isolated from metal tab
- Solder reflow secure at 270 °C/10 s
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

LINKS TO ADDITIONAL RESOURCES



DIMENSIONS in millimeters



Notes

- For the assembly on board, we recommend the lead (Pb)-free thermal profile as per J-STD-020C
- Planarity measurement according to JEDEC® TO-263D
- The resistive element is electrically isolated from the metal tab, allowing flexible grounding without electrical interference

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
D2TO35S	TO-263	4.7 to 550K	35	500	1, 2, 5, 10	150	7.14K

MECHANICAL SPECIFICATIONS

Mechanical Protection	Molded
Resistive Element	Thick film
Substrate	Alumina
Connections	Tinned copper
Weight	2.2 g max.

ENVIRONMENTAL SPECIFICATIONS

Temperature Range	-55 °C to +175 °C
Flammability	IEC 60695-11-5 Application time: $t_a = 10$ s Burning duration: $t_b < 30$ s

TECHNICAL SPECIFICATIONS

Power Rating and Thermal Resistance of the Component	35 W at 25 °C (top side temperature) $R_{TH(j-c)}$: 4.28 °C/W
Temperature Coefficient Standard	See Special Feature table ± 150 ppm/°C
Dielectric Strength IEC 60115-1	2000 V _{RMS} - 1 min - 10 mA max. (between terminals and board)
Insulation Resistance	≥ 10 ⁴ MΩ
Inductance	≤ 0.1 μH

DIMENSIONS

Standard Package	TO-263 style (D ² PAK)
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**SPECIAL FEATURES**

Resistance Values	$\geq 4.7 \Omega$
Tolerances	$\pm 1 \% \text{ to } \pm 10 \%$
Requirement Temperature Coefficient (TCR) (-55 °C +150 °C) IEC 60115-1	$\pm 150 \text{ ppm}/^{\circ}\text{C}$

PERFORMANCE

TESTS	CONDITIONS	REQUIREMENTS
Momentary Overload	IEC 60115-1 §4.13 1.4 Pr 5 s for $R \geq 100 \Omega$ $US < 1.5 UL$	$\pm (0.25 \% + 0.05 \Omega)$
Load Life	IEC 60115-1 1000 h, 90/30 Pr at +25 °C	$\pm (0.5 \% + 0.05 \Omega)$
High Temperature Exposure	AEC-Q200 rev. E conditions: MIL-STD-202 method 108 1000 h, +175 °C, unpowered	$\pm (0.25 \% + 0.05 \Omega)$
Temperature Cycling	AEC-Q200 rev. E conditions: pre-conditioning 3 reflows according JESD020D JESD22 method JA-104 1000 cycles, (-55 °C to +155 °C) dwell time 15 min	$\pm (0.5 \% + 0.05 \Omega)$
Humidity Bias	AEC-Q200 rev. E conditions: MIL-STD-202 method 103 1000 h, 85 °C, 85 % RH	$\pm (0.5 \% + 0.05 \Omega)$
High Temperature Operating Life	AEC-Q200 rev. E conditions: pre-conditioning 3 reflows according JESD020D MIL-STD-202 method 108 1000 h, 90/30, powered, +25 °C	$\pm (0.5 \% + 0.05 \Omega)$
ESD Human Body Model	AEC-Q200 rev. E conditions: AEC-Q200-002 25 kV _{AD}	$\pm (0.5 \% + 0.05 \Omega)$
Vibration	AEC-Q200 rev. E conditions: MIL-STD-202 method 204 5 g's for 20 min, 12 cycles test from 10 Hz to 2000 Hz	$\pm (0.2 \% + 0.05 \Omega)$
Mechanical Shock	AEC-Q200 rev. E conditions: MIL-STD-202 method 213 100 g's, 6 ms, 3.75 m/s 3 shocks/direction	$\pm (0.2 \% + 0.05 \Omega)$
Board Flex	AEC-Q200 rev. E conditions: AEC-Q200-005 bending 2 mm, 60 s	$\pm (0.25 \% + 0.01 \Omega)$
Terminal Strength	AEC-Q200 rev. E conditions: AEC-Q200-006 1.8 kgf, 60 s	$\pm (0.25 \% + 0.01 \Omega)$

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	$\pm (0.5 \% + 0.05 \Omega)$
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

**CHOICE OF THE HEATSINK**

The user must choose the heatsink according to the working conditions of the component (power, room temperature). Maximum working temperature must not exceed 175 °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

ΔT : difference between maximum working temperature and room temperature or fluid cooling 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: 4.28 °C/W.

$R_{TH(c-h)}$: thermal resistance value measured between outer side of the resistor and upper side of the heatsink. This is the thermal resistance of the interface (solder layer, thermal grease).

$R_{TH(h-a)}$: thermal resistance of the heatsink.

Example:

$R_{TH(c-h)} + R_{TH(h-a)}$ for D2TO35S power rating 10 W at ambient temperature +25 °C.

Thermal resistance $R_{TH(j-c)}$: 4.28 °C/W

Considering equation (1) we have:

$$\Delta T = 175\text{ °C} - 25\text{ °C} = 150\text{ °C}$$

$$R_{TH(j-c)} + R_{TH(c-h)} + R_{TH(h-a)} = \Delta T/P = 150/10 = 15\text{ °C/W}$$

$$R_{TH(c-h)} + R_{TH(h-a)} = 15\text{ °C/W} - 4.28\text{ °C/W} = 10.72\text{ °C/W}$$

	CONFIGURATION 1	CONFIGURATION 2	CONFIGURATION 3
Power dissipation (W)	12	15	32
T° resistive element (°C)	175	175	175
$R_{TH(j-c)}$ max. (°C/W)	4.28	4.28	4.28
$R_{TH(c-h)} + R_{TH(h-a)}$ (°C/W)	8.22	5.72	0.72
Fluid T° (°C)	25 (air)	25 (air)	15 (water)

Configuration 1: part is glued on FR4 HTG and mounted on an air cooling heatsink (45 mm x 30 mm x 50 mm) utilizing thermal grease Bluesil Past 340 from BlueStar silicones.

Configuration 2: part is glued on FR4 HTG and mounted on an air cooling heatsink (80 mm x 48 mm x 73 mm) utilizing thermal grease Bluesil Past 340 from BlueStar silicones.

Configuration 3: part is glued on FR4 HTG and mounted on a water cooling heatsink (304 mm x 95.3 mm x 8 mm) utilizing thermal grease Bluesil Past 340 from BlueStar silicones.

Mounting Recommendation

To prevent PCB deformation and excessive stress on solder joints, the overall system - including PCB, component, and heatsink - shall be designed with particular care.

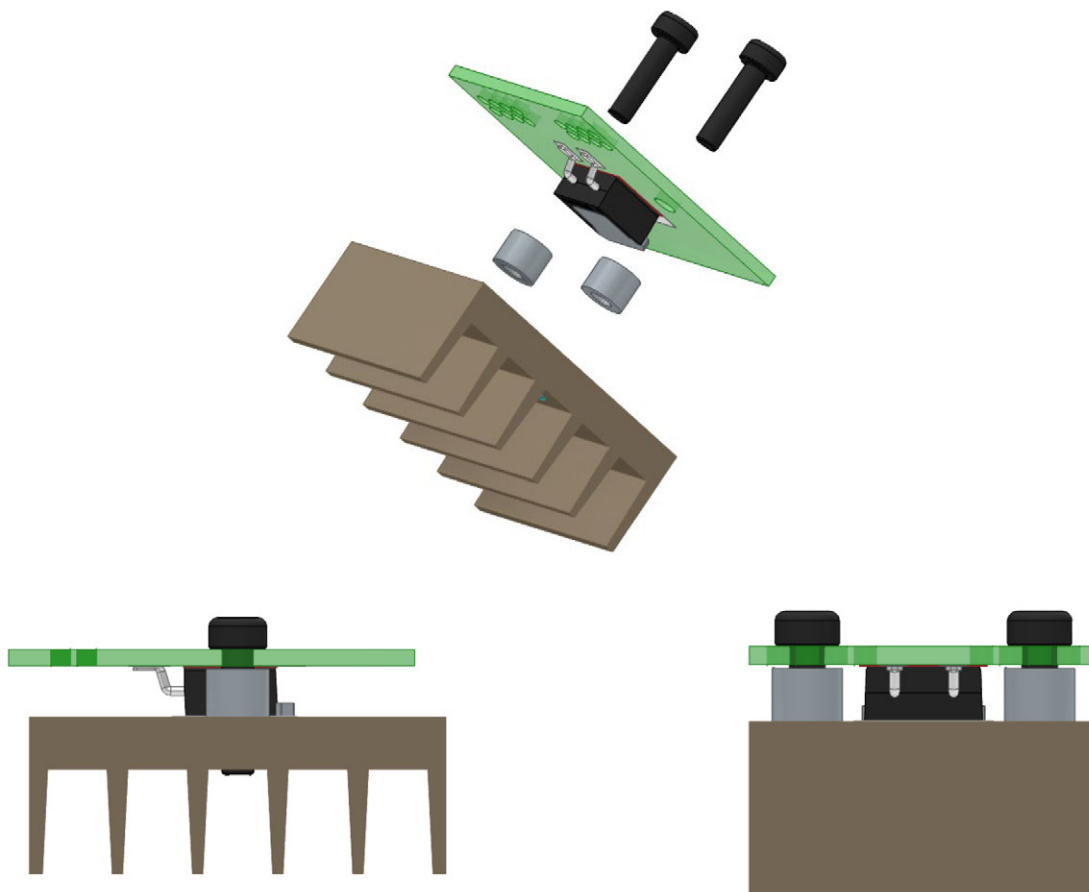
The clamping force shall be uniformly distributed over the component surface to avoid localized stress concentrations and to ensure consistent thermal contact with the heatsink. Sufficient force shall be applied to achieve low thermal resistance, while excessive loading shall be avoided to prevent damage to the component, solder joints, or PCB. As a guideline, a uniform force of approximately 110 N is recommended; this value shall be verified and validated within the final application.

For optimal thermal and mechanical performance, the heatsink assembly shall be designed such that the spacer height closely matches the component thickness. This approach ensures reliable thermal coupling while minimizing mechanical stress transmitted to the PCB.

The component shall be properly soldered to the PCB in accordance with applicable assembly standards. Additional mechanical fixation may be implemented using a suitable adhesive to enhance robustness against vibration and mechanical loading. Epoxy adhesives qualified for electronic assemblies (e.g., Loctite® 3609 or equivalent) have demonstrated good performance in terms of adhesion strength, vibration resistance, and long-term mechanical stability.

The internal heatsink of the resistor shall establish intimate and uniform contact with an air or water-cooled heatsink, using thermal grease to improve thermal conductivity. The complete mounting solution shall be validated by the end user to ensure adequate thermal performance and long-term reliability under the intended operating conditions.

Example of Heatsink Assembly With Spacer



For optimal thermal and mechanical performance, the heat sink assembly shall be designed such that the spacer height closely matches the component thickness. To minimize PCB bending during assembly, a controlled initial gap of approximately 0.1 mm to 0.2 mm is recommended between the spacer and the component. Any remaining stack-up tolerances should be accommodated by a compliant thermal interface material (TIM). This approach promotes uniform load distribution, reliable thermal contact, and reduced mechanical stress on the component, solder joints, and PCB.

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:

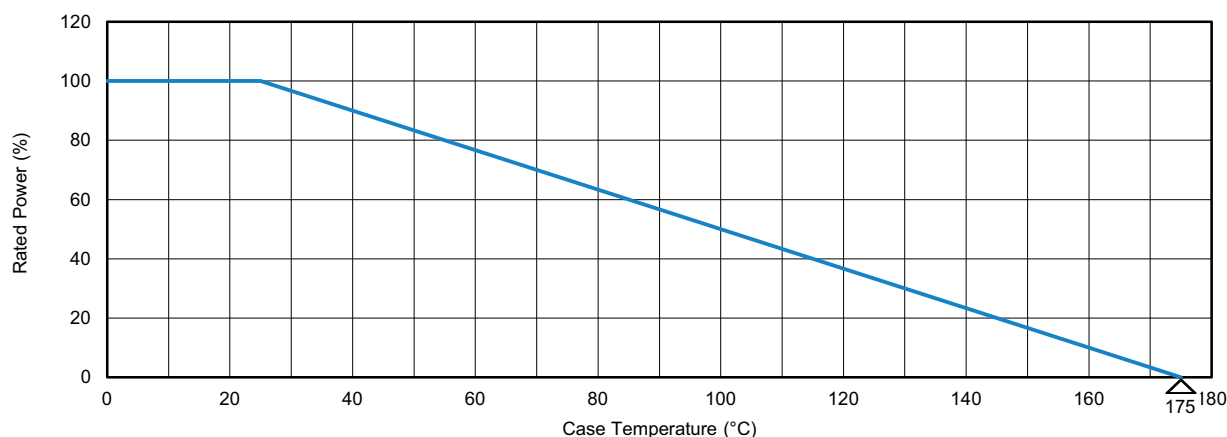
- E (J): pulse energy
- P (W): pulse power
- t (s): pulse duration
- U (V): pulse voltage
- R (Ω): resistor

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



POWER RATING

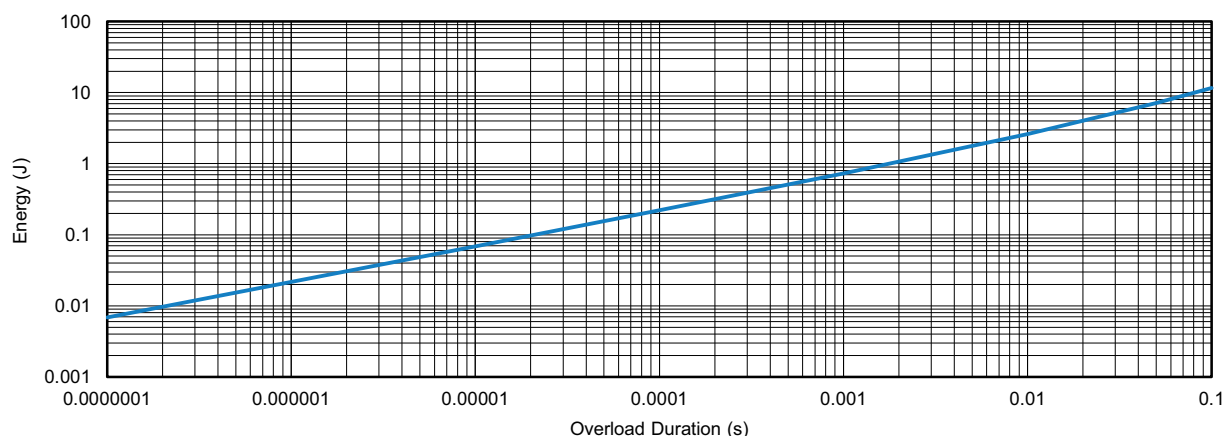
The temperature of the case should be maintained within the limits specified.



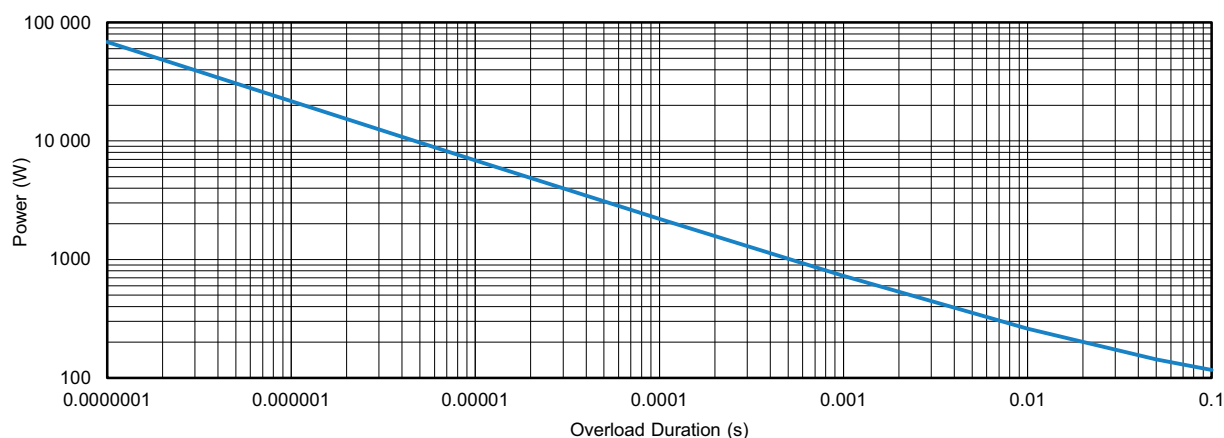
OVERLOADS

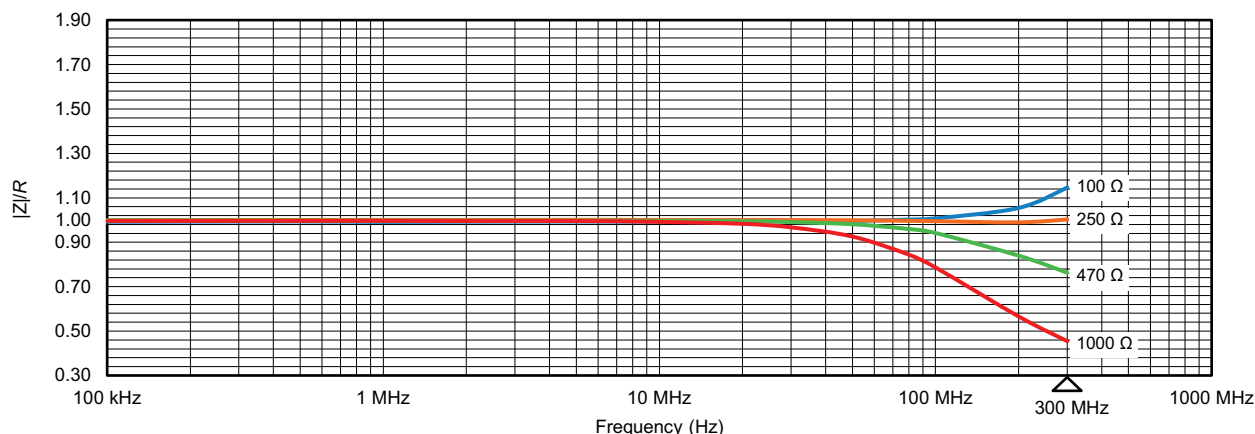
In any case the applied voltage must be lower than the maximum overload voltage of 750 V. The values indicated on the graph below are applicable to resistors in air or mounted onto a board.

ENERGY CURVE

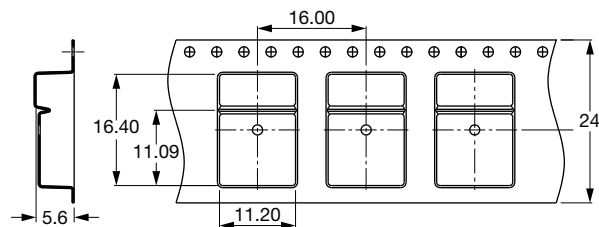


POWER CURVE



IMPEDANCE CURVE 100 Ω to 1 k Ω from 100 kHz to 300 MHz

PACKAGING

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


MARKING

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

ORDERING INFORMATION

D2TO	35	S	100 k Ω	$\pm 1\%$	XXX	e3
MODEL	STYLE	CONNECTIONS	RESISTANCE VALUE	TOLERANCE	CUSTOM DESIGN	LEAD (Pb)-FREE
				F = $\pm 1\%$ G = $\pm 2\%$ J = $\pm 5\%$ K = $\pm 10\%$	Optional on request: shape, etc.	

SAP PART NUMBERING GUIDELINES

SAP PART NUMBERING GUIDELINES																
D	2	T	O	0	3	5	S	1	0	0	0	2	K	R	E	3
GLOBAL MODEL	SIZE	LEADS		OHMIC VALUE				TOLERANCE		PACKAGING		LEAD (Pb)-FREE				
D2TO	035	S = top side cooling		The first four digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point. 48701 = 48 700 Ω 10002 = 100 000 Ω 27000 = 2700 Ω = 2.7 kΩ				F = 1 % G = 2 % J = 5 % K = 10 %		R = reel 500 pieces T = tube 50 pieces		E3 = pure tin				



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