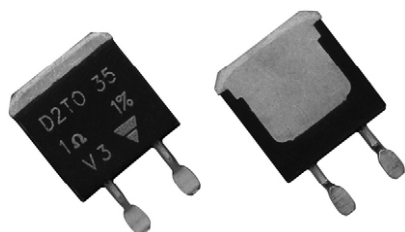


Surface Mount Power Resistor Thick Film Technology



FEATURES

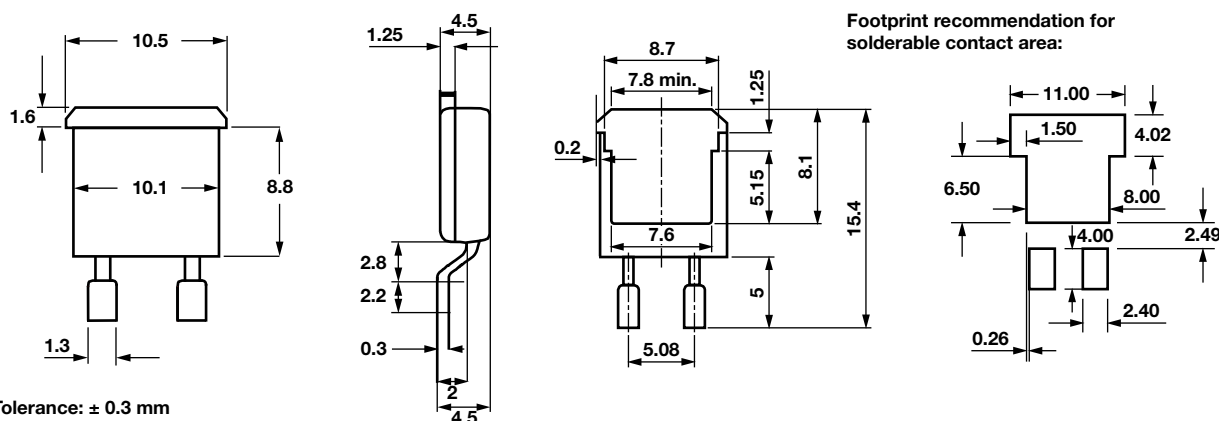
- AEC-Q200 qualified
- 35 W at 25 °C case temperature
- Surface mounted resistor - TO-263 (D²PAK) style package
- Wide resistance range from 0.01 Ω to 550 kΩ
- Non inductive
- Resistor isolated from metal tab
- Solder reflow secure at 270 °C/10 s
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


**RoHS
COMPLIANT**

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
- Power dissipation is 3.5 W at an ambient temperature of 25 °C when mounted on a double sided copper board using FR4 HTG, 70 μm of copper, 39 mm x 30 mm x 1.6 mm, with thermal vias

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	RESISTANCE RANGE Ω	RATED POWER $P_{25\text{ °C}}$ W	LIMITING ELEMENT VOLTAGE U_L V	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C	CRITICAL RESISTANCE Ω
D2TO35	TO-263	0.01 to 550K	35	500	1, 2, 5, 10	150, 250, 700, 1100	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 (case 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)
------------------	-----------------------------------

**SPECIAL FEATURES**

Resistance Values	≥ 0.010	≥ 0.045	≥ 0.1	≥ 0.5
Tolerances	± 1 % at ± 10 %			
Requirement Temperature Coefficient (TCR) (-55 °C +150 °C) IEC 60115-1	± 1100 ppm/°C	± 700 ppm/°C	± 250 ppm/°C	± 150 ppm/°C

PERFORMANCE

TESTS	CONDITIONS	REQUIREMENTS
Momentary Overload	IEC 60115-1 §4.13 1.7 Pr 5 s for $R < 2 \Omega$ 1.4 Pr 5 s for $R \geq 2 \Omega$ US < 1.5 UL	± (0.25 % + 0.005 Ω)
Load Life	IEC 60115-1 1000 h, 90/30 Pr at +25 °C	± (0.5 % + 0.005 Ω)
High Temperature Exposure	AEC-Q200 rev. D conditions: MIL-STD-202 method 108 1000 h, +175 °C, unpowered	± (0.25 % + 0.005 Ω)
Temperature Cycling	Pre-conditioning 3 reflows according JESTD020D IEC 60068-2-14 test Na 1000 cycles, -55 °C, +175 °C Dwell time - 15 min	± (0.5 % + 0.005 Ω)
Moisture Resistance	AEC-Q200 rev. D conditions: MIL-STD-202 method 106 10 cycles, 24 h, unpowered	± (0.5 % + 0.005 Ω)
Biased Humidity	AEC-Q200 rev. D conditions: MIL-STD-202 method 103 1000 h, 85 °C, 85% RH	± (0.5 % + 0.005 Ω)
Operational Life	AEC-Q200 rev. D conditions: Pre-conditioning 3 reflows according JESTD020D MIL-STD-202 method 108 2000 h, 90/30, powered, +125 °C	± (0.5 % + 0.005 Ω)
ESD Human Body Model	AEC-Q200 rev. D conditions: AEC-Q200-002 25 kV _{AD}	± (0.5 % + 0.005 Ω)
Vibration	AEC-Q200 rev. D conditions: MIL-STD-202 method 204 5 g's for 20 min, 12 cycles test from 10 Hz to 2000 Hz	± (0.2 % + 0.005 Ω)
Mechanical Shock	AEC-Q200 rev. D conditions: MIL-STD-202 method 213 100 g's, 6 ms, 3.75 m/s 3 shocks/direction	± (0.2 % + 0.005 Ω)
Board Flex	AEC-Q200 rev. D conditions: AEC-Q200-005 bending 2 mm, 60 s	± (0.25 % + 0.01 Ω)
Terminal Strength	AEC-Q200 rev. D conditions: AEC-Q200-006 1.8 kgf, 60 s	± (0.25 % + 0.01 Ω)

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

**CHOICE 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 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 board. This is the thermal resistance of the solder layer.

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

Example:

$R_{TH(c-h)} + R_{TH(h-a)}$ for D2TO35 power rating 3.5 W at ambient temperature +25 °C.

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

Considering equation (1) we have:

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

$$R_{TH(j-c)} + R_{TH(c-h)} + R_{TH(h-a)} = \Delta T / P = 150 / 3.5 = 42.8\text{ °C/W}$$

$$R_{TH(c-h)} + R_{TH(h-a)} = 42.8\text{ °C/W} - 4.28\text{ °C/W} = 38.52\text{ °C/W}$$

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

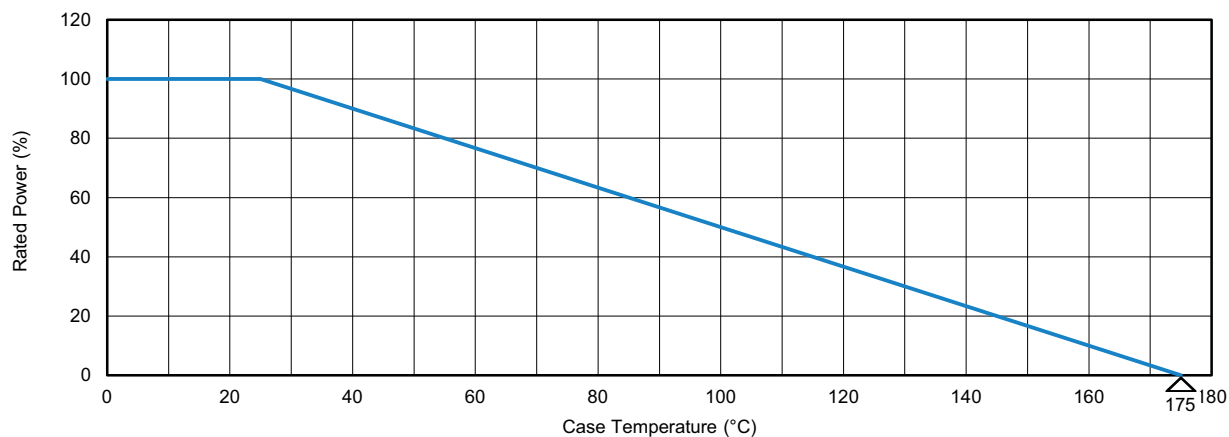
R (Ω): resistor

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



POWER RATING

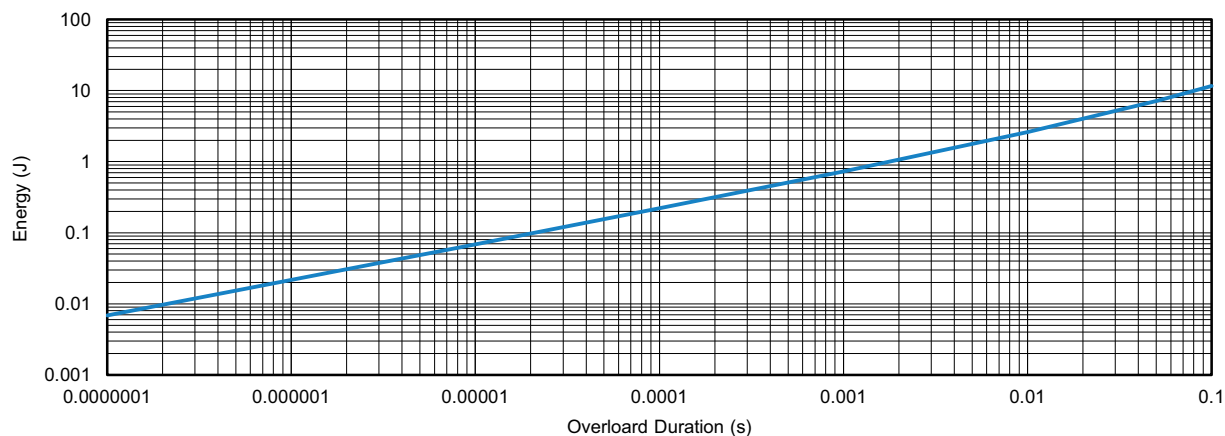
The temperature of the case should be maintained within the limits specified.



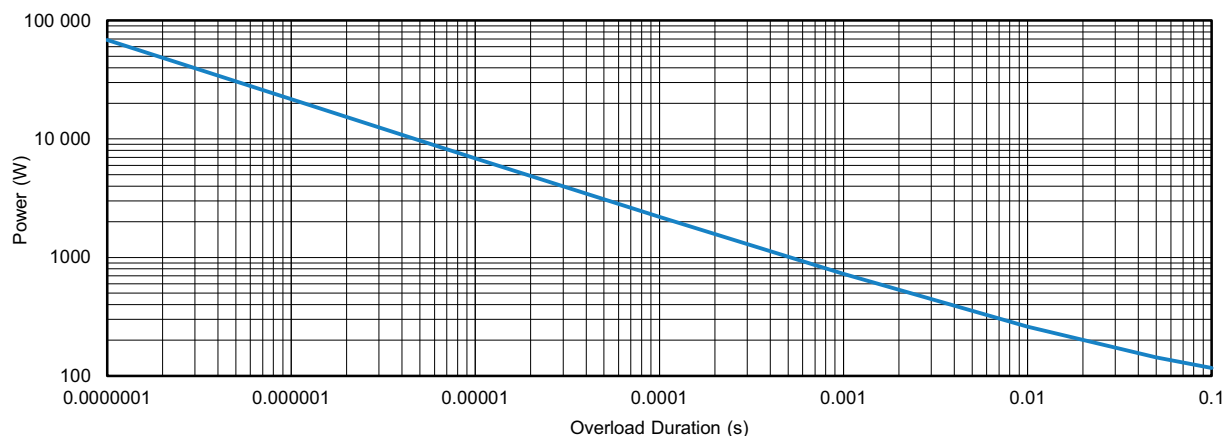
OVERLOADS

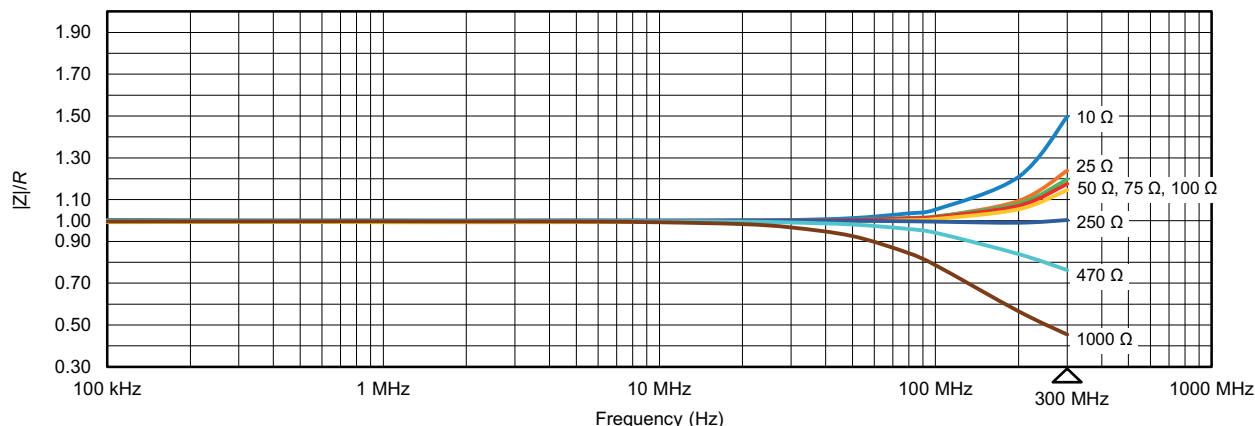
In any case the applied voltage must be lower than the maximum overload voltage of 750 V. The values indicated on the graph below are applicable to resistors in air or mounted onto a board.

ENERGY CURVE

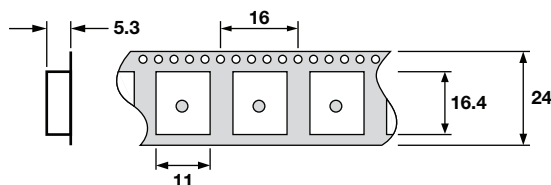


POWER CURVE



IMPEDANCE CURVE 10 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	C	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

D	2	T	O	0	3	5	C	R	2	0	0	0	K	R	E	3
GLOBAL MODEL	SIZE	LEADS	OHMIC VALUE				TOLERANCE	PACKAGING		LEAD (Pb)-FREE						
D2TO	035	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 = 2.7 kΩ				F = 1 % G = 2 % J = 5 % K = 10 %		R = reel 500 pieces T = tube 50 pieces		E3 = pure tin					



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Vishay:](#)

D2TO035C5R000FTE3	D2TO035CR0500FTE3	D2TO035C10000FTE3	D2TO035C100R0FTE3
D2TO035C10R00FTE3	D2TO035C15R00FTE3	D2TO035C1R000FTE3	D2TO035C22R00FTE3
D2TO035C2R200FTE3	D2TO035C47R00FTE3	D2TO035CR0100FTE3	D2TO035CR0150FTE3
D2TO035CR0220FTE3	D2TO035CR0680FTE3	D2TO035CR1000FTE3	D2TO035CR4700FTE3
D2TO035C150R0JTE3	D2TO035C33000JTE3	D2TO035CR0100GTE3	D2TO035C47R00KTE3
D2TO035CR0150JRE3	D2TO035C2R700KRE3	D2TO035CR0150FRE3	D2TO035C1R000GRE3
D2TO035C200R0KTE3	D2TO035C33000FTE3	D2TO035C3R300FRE3	D2TO035C44000JTE3
D2TO035C11000KTE3	D2TO035C10001FRE3	D2TO035C12000JTE3	D2TO035C499R0FTE3
D2TO035C1R700FRE3	D2TO035CR4700FRE3	D2TO035C150R0FTE3	D2TO035C47R00FRE3
D2TO035C100R0GRE3	D2TO035C1R000FRE3	D2TO035C47R00JRE3	D2TO035C150R0FRE3
D2TO035C44R20FRE3	D2TO035C20R00JRE3	D2TO035C33000JRE3	D2TO035C75R00FRE3
D2TO035C10R00JRE3	D2TO035C250R0JRE3	D2TO035C20R00FRE3	D2TO035C15R00JRE3
D2TO035C27R00FRE3	D2TO035C100R0JRE3	D2TO035C12000FTE3	D2TO035C200R0FRE3
D2TO035C220R0FRE3	D2TO035C220R0FTE3	D2TO035C2R000FRE3	D2TO035C4R700FTE3
D2TO035C7R500FTE3	D2TO035CR0470FTE3	D2TO035C10R00JTE3	D2TO035C15R00JTE3
D2TO035C18R00JTE3	D2TO035C200R0JTE3	D2TO035C220R0JTE3	D2TO035C47R00JTE3
D2TO035C10000KTE3	D2TO035C1R000JTE3	D2TO035C200R0FTE3	D2TO035C20R00FTE3
D2TO035C30R00JTE3	D2TO035C50R00FTE3	D2TO035CR1500FTE3	D2TO035CR3000FTE3
D2TO035C50R00JRE3	D2TO035C20001JRE3	D2TO035CR2000FTE3	D2TO035C10R00FRE3
D2TO035C43000JRE3	D2TO035CR2000FRE3	D2TO035CR1000FRE3	D2TO035C2R200FRE3
D2TO035C4R700FRE3	D2TO035C30R00JRE3	D2TO035C3R000FTE3	D2TO035C47000FTE3
D2TO035C5R000FRE3	D2TO035CR2200FTE3	D2TO035CR5000FRE3	D2TO035CR5000FTE3
D2TO035C1R600FTE3	D2TO035C270R0JRE3	D2TO035C50R00KRE3	D2TO035C100R0FRE3
D2TO035C130R0JRE3	D2TO035C1R600FRE3	D2TO035C250R0FRE3	D2TO035C250R0FTE3
D2TO035C330R0JTE3	D2TO035C3R300JTE3	D2TO035CR0680FRE3	D2TO035C30R00FTE3