

Small Signal Zener Diodes

Features

- Very sharp reverse characteristic
- Low reverse current level
- Very high stability
- Low noise
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



94 9367

Applications

- Voltage stabilization

Mechanical Data

Case: DO35 Glass case

Weight: approx. 125 mg

Cathode Band Color: black

Packaging codes/options:

TAP/10 k per Ammopack (52 mm tape), 30 k/box

Absolute Maximum Ratings

$T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

| Parameter | Test condition | Symbol | Value | Unit |
|---------------------------|--|-----------|---------------|--------------------|
| Power dissipation | $I = 4\text{ mm}$, $T_L = 25\text{ }^{\circ}\text{C}$ | P_{tot} | 500 | mW |
| Z-current | | I_Z | P_{tot}/V_Z | mA |
| Junction temperature | | T_j | 175 | $^{\circ}\text{C}$ |
| Storage temperature range | | T_{stg} | - 65 to + 175 | $^{\circ}\text{C}$ |

Thermal Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

| Parameter | Test condition | Symbol | Value | Unit |
|--|---|------------|-------|------|
| Thermal resistance junction to ambient air | $I = 4\text{ mm}$, $T_L = \text{constant}$ | R_{thJA} | 300 | K/W |

Electrical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

| Parameter | Test condition | Symbol | Min | Typ. | Max | Unit |
|-----------------|-----------------------|--------|-----|------|-----|------|
| Forward voltage | $I_F = 200\text{ mA}$ | V_F | | | 1.5 | V |



Electrical Characteristics

| Partnumber group | Partnumber | Zener Voltage | | Dynamic Resistance | Test Current | Reverse Leakage Current | | | |
|------------------|------------|----------------|-----|--------------------|--------------|-------------------------|----------|-------------|----------------|
| | | V_Z at I_Z | | r_z at I_Z | I_Z | I_R | at V_R | $I_R^{(1)}$ | at $V_R^{(1)}$ |
| | | V | V | Ω | mA | μA | V | μA | V |
| | | min | max | max | | max | | max | |
| TZX2V4 | TZX2V4A | 2.3 | 2.5 | 100 | 5 | 5 | 0.5 | 50 | 1 |
| | TZX2V4B | 2.4 | 2.6 | 100 | 5 | 5 | 0.5 | 50 | 1 |
| TZX2V7 | TZX2V7A | 2.5 | 2.7 | 100 | 5 | 5 | 0.5 | 10 | 1 |
| | TZX2V7B | 2.6 | 2.8 | 100 | 5 | 5 | 0.5 | 10 | 1 |
| | TZX2V7C | 2.7 | 2.9 | 100 | 5 | 5 | 0.5 | 10 | 1 |
| TZX3V0 | TZX3V0A | 2.8 | 3 | 100 | 5 | 5 | 0.5 | 6 | 1 |
| | TZX3V0B | 2.9 | 3.1 | 100 | 5 | 5 | 0.5 | 6 | 1 |
| | TZX3V0C | 3 | 3.2 | 100 | 5 | 5 | 0.5 | 6 | 1 |
| TZX3V3 | TZX3V3A | 3.1 | 3.3 | 100 | 5 | 5 | 1 | 2 | 1 |
| | TZX3V3B | 3.2 | 3.4 | 100 | 5 | 5 | 1 | 2 | 1 |
| | TZX3V3C | 3.3 | 3.5 | 100 | 5 | 5 | 1 | 2 | 1 |
| TZX3V6 | TZX3V6A | 3.4 | 3.6 | 100 | 5 | 5 | 1 | 2 | 1 |
| | TZX3V6B | 3.5 | 3.7 | 100 | 5 | 5 | 1 | 2 | 1 |
| | TZX3V6C | 3.6 | 3.8 | 100 | 5 | 5 | 1 | 2 | 1 |
| TZX3V9 | TZX3V9A | 3.7 | 3.9 | 100 | 5 | 5 | 1 | 2 | 1 |
| | TZX3V9B | 3.8 | 4 | 100 | 5 | 5 | 1 | 2 | 1 |
| | TZX3V9C | 3.9 | 4.1 | 100 | 5 | 5 | 1 | 2 | 1 |
| TZX4V3 | TZX4V3A | 4 | 4.2 | 100 | 5 | 5 | 1.5 | 1 | 1 |
| | TZX4V3B | 4.1 | 4.3 | 100 | 5 | 5 | 1.5 | 1 | 1 |
| | TZX4V3C | 4.2 | 4.4 | 100 | 5 | 5 | 1.5 | 1 | 1 |
| | TZX4V3D | 4.3 | 4.5 | 100 | 5 | 5 | 1.5 | 1 | 1 |
| TZX4V7 | TZX4V7A | 4.4 | 4.6 | 100 | 5 | 5 | 2 | 6 | 2 |
| | TZX4V7B | 4.5 | 4.7 | 100 | 5 | 5 | 2 | 5 | 2 |
| | TZX4V7C | 4.6 | 4.8 | 100 | 5 | 5 | 2 | 4 | 2 |
| | TZX4V7D | 4.7 | 4.9 | 100 | 5 | 5 | 2 | 3 | 2 |
| TZX5V1 | TZX5V1A | 4.8 | 5 | 100 | 5 | 5 | 2 | 2 | 2 |
| | TZX5V1B | 4.9 | 5.1 | 100 | 5 | 5 | 2 | 2 | 2 |
| | TZX5V1C | 5 | 5.2 | 100 | 5 | 5 | 2 | 2 | 2 |
| | TZX5V1D | 5.1 | 5.3 | 100 | 5 | 5 | 2 | 2 | 2 |
| TZX5V6 | TZX5V6A | 5.2 | 5.5 | 40 | 5 | 5 | 2 | 1 | 2 |
| | TZX5V6B | 5.3 | 5.6 | 40 | 5 | 5 | 2 | 1 | 2 |
| | TZX5V6C | 5.4 | 5.7 | 40 | 5 | 5 | 2 | 1 | 2 |
| | TZX5V6D | 5.5 | 5.8 | 40 | 5 | 5 | 2 | 1 | 2 |
| | TZX5V6E | 5.6 | 5.9 | 40 | 5 | 5 | 2 | 1 | 2 |
| TZX6V2 | TZX6V2A | 5.7 | 6 | 15 | 5 | 1 | 3 | 3 | 4 |
| | TZX6V2B | 5.8 | 6.1 | 15 | 5 | 1 | 3 | 3 | 4 |
| | TZX6V2C | 6 | 6.3 | 15 | 5 | 1 | 3 | 3 | 4 |
| | TZX6V2D | 6.1 | 6.4 | 15 | 5 | 1 | 3 | 3 | 4 |
| | TZX6V2E | 6.3 | 6.6 | 15 | 5 | 1 | 3 | 3 | 4 |
| TZX6V8 | TZX6V8A | 6.4 | 6.7 | 15 | 5 | 1 | 3.5 | 2 | 4 |
| | TZX6V8B | 6.6 | 6.9 | 15 | 5 | 1 | 3.5 | 2 | 4 |
| | TZX6V8C | 6.7 | 7 | 15 | 5 | 1 | 3.5 | 2 | 4 |
| | TZX6V8D | 6.9 | 7.2 | 15 | 5 | 1 | 3.5 | 2 | 4 |



| Partnumber group | Partnumber | Zener Voltage | | Dynamic Resistance | Test Current | Reverse Leakage Current | | | |
|------------------|------------|----------------------------------|-------|----------------------------------|----------------|-------------------------|-------------------|------------------------------|---------------------------------|
| | | V _Z at I _Z | | r _Z at I _Z | I _Z | I _R | at V _R | I _R ¹⁾ | at V _R ¹⁾ |
| | | V | V | Ω | mA | μA | V | μA | V |
| | | min | max | max | | max | | max | |
| TZX7V5 | TZX7V5A | 7 | 7.3 | 15 | 5 | 1 | 5 | 30 | 6.65 |
| | TZX7V5B | 7.2 | 7.6 | 15 | 5 | 1 | 5 | 30 | 6.84 |
| | TZX7V5C | 7.3 | 7.7 | 15 | 5 | 1 | 5 | 30 | 6.94 |
| | TZX7V5D | 7.5 | 7.9 | 15 | 5 | 1 | 5 | 30 | 7.13 |
| | TZX7V5X | 7.07 | 7.45 | 15 | 5 | 1 | 5 | 30 | 6.72 |
| TZX8V2 | TZX8V2A | 7.7 | 8.1 | 20 | 5 | 1 | 6.2 | 0.1 | 7.32 |
| | TZX8V2B | 7.9 | 8.3 | 20 | 5 | 1 | 6.2 | 0.1 | 7.5 |
| | TZX8V2C | 8.1 | 8.5 | 20 | 5 | 1 | 6.2 | 0.1 | 7.7 |
| | TZX8V2D | 8.3 | 8.7 | 20 | 5 | 1 | 6.2 | 0.1 | 7.98 |
| TZX9V1 | TZX9V1A | 8.5 | 8.9 | 20 | 5 | 1 | 6.8 | 0.04 | 8.08 |
| | TZX9V1B | 8.7 | 9.1 | 20 | 5 | 1 | 6.8 | 0.04 | 8.27 |
| | TZX9V1C | 8.9 | 9.3 | 20 | 5 | 1 | 6.8 | 0.04 | 8.46 |
| | TZX9V1D | 9.1 | 9.5 | 20 | 5 | 1 | 6.8 | 0.04 | 8.65 |
| | TZX9V1E | 9.3 | 9.7 | 20 | 5 | 1 | 6.8 | 0.04 | 8.84 |
| TZX10 | TZX10A | 9.5 | 9.9 | 25 | 5 | 1 | 7.5 | 0.04 | 9.03 |
| | TZX10B | 9.7 | 10.1 | 25 | 5 | 1 | 7.5 | 0.04 | 9.22 |
| | TZX10C | 9.9 | 10.3 | 25 | 5 | 1 | 7.5 | 0.04 | 9.41 |
| | TZX10D | 10.2 | 10.6 | 25 | 5 | 1 | 7.5 | 0.04 | 9.69 |
| TZX11 | TZX11A | 10.4 | 10.8 | 25 | 5 | 1 | 8.2 | 0.04 | 9.88 |
| | TZX11B | 10.7 | 11.1 | 25 | 5 | 1 | 8.2 | 0.04 | 10.2 |
| | TZX11C | 10.9 | 11.3 | 25 | 5 | 1 | 8.2 | 0.04 | 10.4 |
| | TZX11D | 11.1 | 11.6 | 25 | 5 | 1 | 8.2 | 0.04 | 10.5 |
| TZX12 | TZX12A | 11.4 | 11.9 | 35 | 5 | 1 | 9.5 | 0.04 | 10.8 |
| | TZX12B | 11.6 | 12.1 | 35 | 5 | 1 | 9.5 | 0.04 | 11 |
| | TZX12C | 11.9 | 12.4 | 35 | 5 | 1 | 9.5 | 0.04 | 11.3 |
| | TZX12D | 12.2 | 12.7 | 35 | 5 | 1 | 9.5 | 0.04 | 11.6 |
| | TZX12X | 11.44 | 12.03 | 35 | 5 | 1 | 9.5 | 0.04 | 10.9 |
| TZX13 | TZX13A | 12.4 | 12.9 | 35 | 5 | 1 | 10 | 0.04 | 11.8 |
| | TZX13B | 12.6 | 13.1 | 35 | 5 | 1 | 10 | 0.04 | 12 |
| | TZX13C | 12.9 | 13.4 | 35 | 5 | 1 | 10 | 0.04 | 12.3 |
| TZX14 | TZX14A | 13.2 | 13.7 | 35 | 5 | 1 | 11 | 0.04 | 12.5 |
| | TZX14B | 13.5 | 14 | 35 | 5 | 1 | 11 | 0.04 | 12.8 |
| | TZX14C | 13.8 | 14.3 | 35 | 5 | 1 | 11 | 0.04 | 13.1 |
| TZX15 | TZX15A | 14.1 | 14.7 | 40 | 5 | 1 | 11.5 | 0.04 | 13.4 |
| | TZX15B | 14.5 | 15.1 | 40 | 5 | 1 | 11.5 | 0.04 | 13.8 |
| | TZX15C | 14.9 | 15.5 | 40 | 5 | 1 | 11.5 | 0.04 | 14.2 |
| | TZX15X | 14.35 | 15.09 | 40 | 5 | 1 | 11.5 | 0.04 | 13.6 |
| TZX16 | TZX16A | 15.3 | 15.9 | 45 | 5 | 1 | 12 | 0.04 | 14.5 |
| | TZX16B | 15.7 | 16.5 | 45 | 5 | 1 | 12 | 0.04 | 14.9 |
| | TZX16C | 16.3 | 17.1 | 45 | 5 | 1 | 12 | 0.04 | 15.5 |
| TZX18A | TZX18A | 16.9 | 17.7 | 55 | 5 | 1 | 13 | 0.04 | 16.1 |
| | TZX18B | 17.5 | 18.3 | 55 | 5 | 1 | 13 | 0.04 | 16.6 |
| | TZX18C | 18.1 | 19 | 55 | 5 | 1 | 13 | 0.04 | 17.2 |
| TZX20A | TZX20A | 18.8 | 19.7 | 60 | 2 | 1 | 15 | 0.04 | 17.9 |
| | TZX20B | 19.5 | 20.4 | 60 | 2 | 1 | 15 | 0.04 | 18.5 |
| | TZX20C | 20.2 | 21.2 | 60 | 2 | 1 | 15 | 0.04 | 19.2 |

| Partnumber group | Partnumber | Zener Voltage | | Dynamic Resistance | Test Current | Reverse Leakage Current | | | |
|------------------|------------|----------------|-------|--------------------|--------------|-------------------------|----------|-------------|----------------|
| | | V_Z at I_Z | | r_Z at I_Z | I_Z | I_R | at V_R | $I_R^{(1)}$ | at $V_R^{(1)}$ |
| | | V | V | Ω | mA | μA | V | μA | V |
| | | min | max | max | | max | | max | |
| TZX22 | TZX22A | 20.9 | 21.9 | 65 | 2 | 1 | 17 | 0.04 | 19.9 |
| | TZX22B | 21.6 | 22.6 | 65 | 2 | 1 | 17 | 0.04 | 20.5 |
| | TZX22C | 22.3 | 23.3 | 65 | 2 | 1 | 17 | 0.04 | 21.2 |
| TZX24 | TZX24A | 22.9 | 24 | 70 | 2 | 1 | 19 | 0.04 | 21.8 |
| | TZX24B | 23.6 | 24.7 | 70 | 2 | 1 | 19 | 0.04 | 22.4 |
| | TZX24C | 24.3 | 25.5 | 70 | 2 | 1 | 19 | 0.04 | 23.1 |
| | TZX24X | 22.61 | 23.77 | 70 | 2 | 1 | 19 | 0.04 | 21.5 |
| TZX27 | TZX27A | 25.2 | 26.6 | 80 | 2 | 1 | 21 | 0.04 | 23.9 |
| | TZX27B | 26.2 | 27.6 | 80 | 2 | 1 | 21 | 0.04 | 24.9 |
| | TZX27C | 27.2 | 28.6 | 80 | 2 | 1 | 21 | 0.04 | 25.8 |
| | TZX27X | 26.99 | 28.39 | 80 | 2 | 1 | 21 | 0.04 | 25.6 |
| TZX30 | TZX30A | 28.2 | 29.6 | 100 | 2 | 1 | 23 | 0.04 | 26.8 |
| | TZX30B | 29.2 | 30.6 | 100 | 2 | 1 | 23 | 0.04 | 27.7 |
| | TZX30C | 30.2 | 31.6 | 100 | 2 | 1 | 23 | 0.04 | 28.7 |
| | TZX30X | 29.02 | 30.51 | 100 | 2 | 1 | 23 | 0.04 | 27.6 |
| TZX33 | TZX33A | 31.2 | 32.6 | 120 | 2 | 1 | 25 | 0.04 | 29.6 |
| | TZX33B | 32.2 | 33.6 | 120 | 2 | 1 | 25 | 0.04 | 30.6 |
| | TZX33C | 33.2 | 34.5 | 120 | 2 | 1 | 25 | 0.04 | 31.5 |
| TZX36 | TZX36A | 34.2 | 35.7 | 140 | 2 | 1 | 27 | 0.04 | 32.5 |
| | TZX36B | 35.3 | 36.8 | 140 | 2 | 1 | 27 | 0.04 | 33.5 |
| | TZX36C | 36.4 | 38 | 140 | 2 | 1 | 27 | 0.04 | 34.6 |
| | TZX36X | 35.36 | 37.19 | 140 | 2 | 1 | 27 | 0.04 | 33.6 |

¹⁾ Additional measurement

NOTE: Additional measurement of voltage group TZX9V1 to TZX36, I_R at 95 % $V_{Zmin} \leq 40$ nA at $T_j = 25$ °C

Typical Characteristics

$T_{amb} = 25$ °C, unless otherwise specified

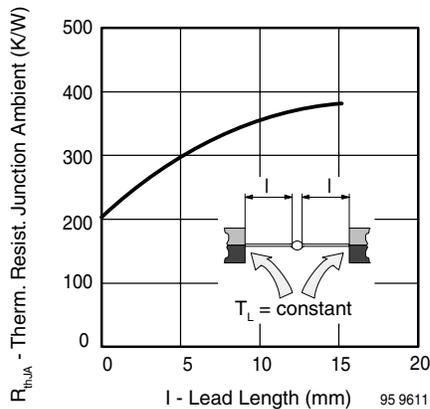


Figure 1. Thermal Resistance vs. Lead Length

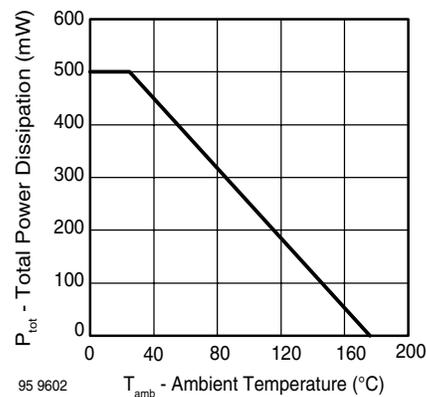


Figure 2. Total Power Dissipation vs. Ambient Temperature

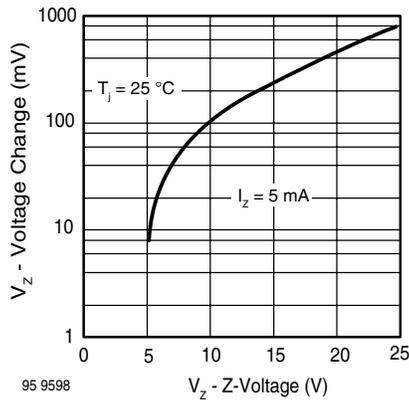


Figure 3. Typical Change of Working Voltage under Operating Conditions at $T_{amb} = 25\text{ °C}$

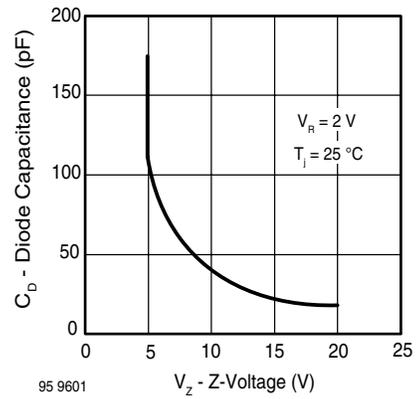


Figure 6. Diode Capacitance vs. Z-Voltage

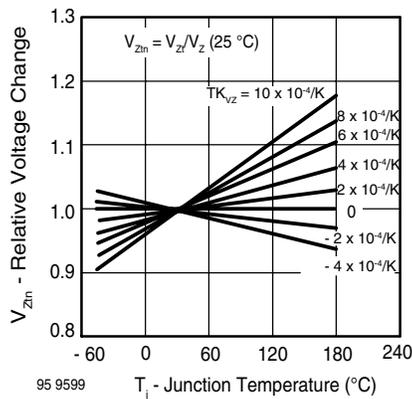


Figure 4. Typical Change of Working Voltage vs. Junction Temperature

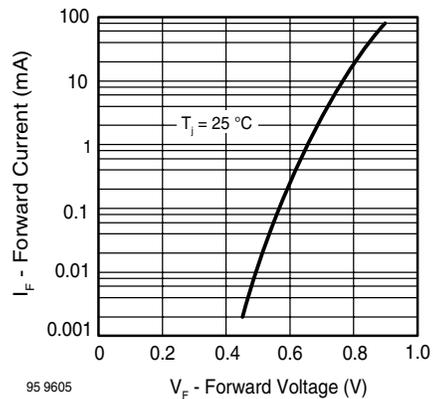


Figure 7. Forward Current vs. Forward Voltage

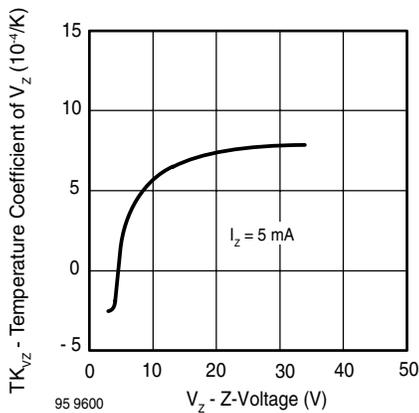


Figure 5. Temperature Coefficient of V_z vs. Z-Voltage

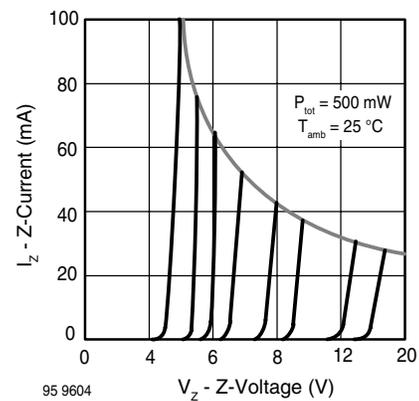


Figure 8. Z-Current vs. Z-Voltage

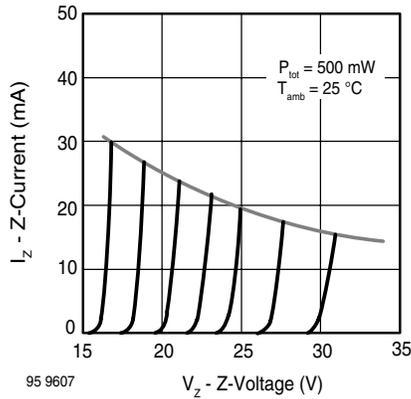


Figure 9. Z-Current vs. Z-Voltage

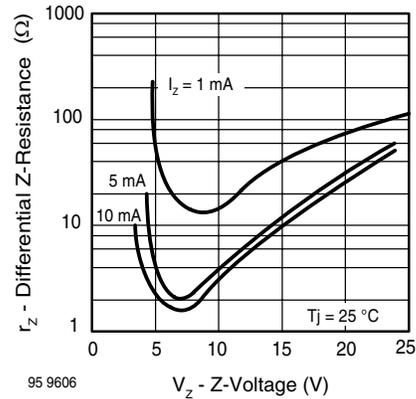


Figure 10. Differential Z-Resistance vs. Z-Voltage

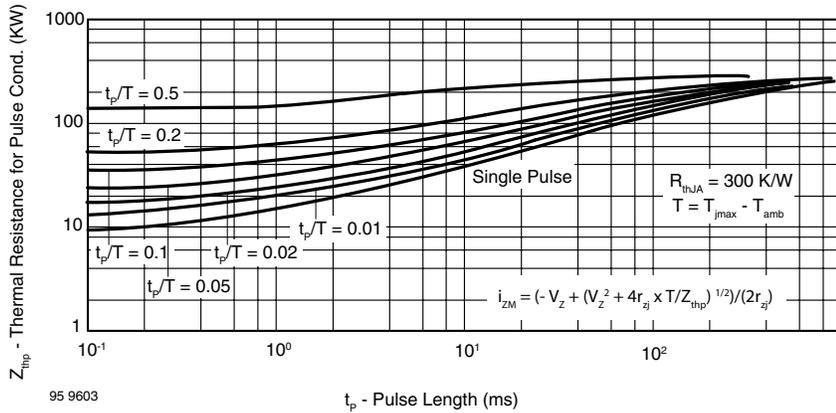
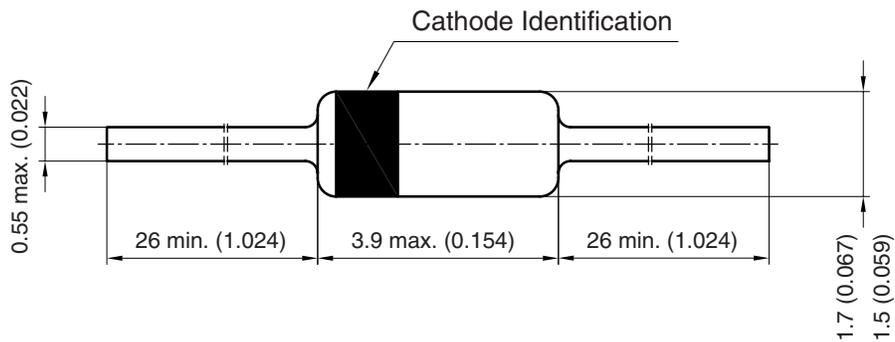


Figure 11. Thermal Response

Package Dimensions in millimeters (inches): DO35



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Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

We reserve the right to make changes to improve technical design
and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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