

## Small Signal Zener Diodes



### FEATURES

- Very sharp reverse characteristic
- Low reverse current level
- Very high stability
- Low noise
- AEC-Q101 qualified
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

- Voltage stabilization

### PRIMARY CHARACTERISTICS

| PARAMETER                    | VALUE         | UNIT |
|------------------------------|---------------|------|
| V <sub>Z</sub> range nom.    | 2.4 to 36     | V    |
| Test current I <sub>ZT</sub> | 2; 5          | mA   |
| V <sub>Z</sub> specification | Pulse current |      |
| Int. construction            | Single        |      |

### ORDERING INFORMATION

| DEVICE NAME | ORDERING CODE  | TAPED UNITS PER REEL                | MINIMUM ORDER QUANTITY |
|-------------|----------------|-------------------------------------|------------------------|
| TZX-series  | TZX-series-TAP | 10 000 per ammpack<br>(52 mm tape)  | 30 000/box             |
| TZX-series  | TZX-series-TR  | 10 000 per 14" reel<br>(52 mm tape) | 30 000/box             |

### PACKAGE

| PACKAGE NAME | WEIGHT | MOLDING COMPOUND<br>FLAMMABILITY RATING | MOISTURE SENSITIVITY<br>LEVEL        | SOLDERING CONDITIONS     |
|--------------|--------|---|--------------------------------------|--------------------------|
| DO-35        | 125 mg | UL 94 V-0                               | MSL level 1<br>(according J-STD-020) | 260 °C/10 s at terminals |

### ABSOLUTE MAXIMUM RATINGS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

| PARAMETER                                  | TEST CONDITION                      | SYMBOL            | VALUE                            | UNIT |
|--|-------------------------------------|-------------------|----------------------------------|------|
| Power dissipation                          | I = 4 mm, T <sub>L</sub> = 25 °C    | P <sub>tot</sub>  | 500                              | mW   |
| Zener current                              |                                     | I <sub>Z</sub>    | P <sub>tot</sub> /V <sub>Z</sub> | mA   |
| Thermal resistance junction to ambient air | I = 4 mm, T <sub>L</sub> = constant | R <sub>thJA</sub> | 300                              | K/W  |
| Junction temperature                       |                                     | T <sub>j</sub>    | 175                              | °C   |
| Storage temperature range                  |                                     | T <sub>stg</sub>  | - 65 to + 175                    | °C   |
| Forward voltage (max.)                     | I <sub>F</sub> = 200 mA             | V <sub>F</sub>    | 1.5                              | V    |

**ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PART NUMBER | ZENER VOLTAGE RANGE |      | TEST CURRENT | REVERSE LEAKAGE CURRENT |     |                      |   | DYNAMIC RESISTANCE |
|-------------|---------------------|------|--------------|-------------------------|-----|----------------------|---|--------------------|
|             | $V_Z$ at $I_{ZT1}$  |      | $I_{ZT1}$    | $I_R$ at $V_R$          |     | $I_R$ at $V_R^{(1)}$ |   | $Z_Z$ at $I_{ZT1}$ |
|             | V                   |      | mA           | $\mu\text{A}$           | V   | $\mu\text{A}$        | V | $\Omega$           |
|             | MIN.                | MAX. |              | MAX.                    |     | MAX.                 |   | MAX.               |
| TZX2V4A     | 2.3                 | 2.5  | 5            | 5                       | 0.5 | 50                   | 1 | 100                |
| TZX2V4B     | 2.4                 | 2.6  | 5            | 5                       | 0.5 | 50                   | 1 | 100                |
| TZX2V7A     | 2.5                 | 2.7  | 5            | 5                       | 0.5 | 10                   | 1 | 100                |
| TZX2V7B     | 2.6                 | 2.8  | 5            | 5                       | 0.5 | 10                   | 1 | 100                |
| TZX2V7C     | 2.7                 | 2.9  | 5            | 5                       | 0.5 | 10                   | 1 | 100                |
| TZX3V0A     | 2.8                 | 3    | 5            | 5                       | 0.5 | 6                    | 1 | 100                |
| TZX3V0B     | 2.9                 | 3.1  | 5            | 5                       | 0.5 | 6                    | 1 | 100                |
| TZX3V0C     | 3                   | 3.2  | 5            | 5                       | 0.5 | 6                    | 1 | 100                |
| TZX3V3A     | 3.1                 | 3.3  | 5            | 5                       | 1   | 2                    | 1 | 100                |
| TZX3V3B     | 3.2                 | 3.4  | 5            | 5                       | 1   | 2                    | 1 | 100                |
| TZX3V3C     | 3.3                 | 3.5  | 5            | 5                       | 1   | 2                    | 1 | 100                |
| TZX3V6A     | 3.4                 | 3.6  | 5            | 5                       | 1   | 2                    | 1 | 100                |
| TZX3V6B     | 3.5                 | 3.7  | 5            | 5                       | 1   | 2                    | 1 | 100                |
| TZX3V6C     | 3.6                 | 3.8  | 5            | 5                       | 1   | 2                    | 1 | 100                |
| TZX3V9A     | 3.7                 | 3.9  | 5            | 5                       | 1   | 2                    | 1 | 100                |
| TZX3V9B     | 3.8                 | 4    | 5            | 5                       | 1   | 2                    | 1 | 100                |
| TZX3V9C     | 3.9                 | 4.1  | 5            | 5                       | 1   | 2                    | 1 | 100                |
| TZX4V3A     | 4                   | 4.2  | 5            | 5                       | 1.5 | 1                    | 1 | 100                |
| TZX4V3B     | 4.1                 | 4.3  | 5            | 5                       | 1.5 | 1                    | 1 | 100                |
| TZX4V3C     | 4.2                 | 4.4  | 5            | 5                       | 1.5 | 1                    | 1 | 100                |
| TZX4V3D     | 4.3                 | 4.5  | 5            | 5                       | 1.5 | 1                    | 1 | 100                |
| TZX4V7A     | 4.4                 | 4.6  | 5            | 5                       | 2   | 6                    | 2 | 100                |
| TZX4V7B     | 4.5                 | 4.7  | 5            | 5                       | 2   | 5                    | 2 | 100                |
| TZX4V7C     | 4.6                 | 4.8  | 5            | 5                       | 2   | 4                    | 2 | 100                |
| TZX4V7D     | 4.7                 | 4.9  | 5            | 5                       | 2   | 3                    | 2 | 100                |
| TZX5V1A     | 4.8                 | 5    | 5            | 5                       | 2   | 2                    | 2 | 100                |
| TZX5V1B     | 4.9                 | 5.1  | 5            | 5                       | 2   | 2                    | 2 | 100                |
| TZX5V1C     | 5                   | 5.2  | 5            | 5                       | 2   | 2                    | 2 | 100                |
| TZX5V1D     | 5.1                 | 5.3  | 5            | 5                       | 2   | 2                    | 2 | 100                |
| TZX5V6A     | 5.2                 | 5.5  | 5            | 5                       | 2   | 1                    | 2 | 40                 |
| TZX5V6B     | 5.3                 | 5.6  | 5            | 5                       | 2   | 1                    | 2 | 40                 |
| TZX5V6C     | 5.4                 | 5.7  | 5            | 5                       | 2   | 1                    | 2 | 40                 |
| TZX5V6D     | 5.5                 | 5.8  | 5            | 5                       | 2   | 1                    | 2 | 40                 |
| TZX5V6E     | 5.6                 | 5.9  | 5            | 5                       | 2   | 1                    | 2 | 40                 |
| TZX6V2A     | 5.7                 | 6    | 5            | 1                       | 3   | 3                    | 4 | 15                 |
| TZX6V2B     | 5.8                 | 6.1  | 5            | 1                       | 3   | 3                    | 4 | 15                 |
| TZX6V2C     | 6                   | 6.3  | 5            | 1                       | 3   | 3                    | 4 | 15                 |
| TZX6V2D     | 6.1                 | 6.4  | 5            | 1                       | 3   | 3                    | 4 | 15                 |
| TZX6V2E     | 6.3                 | 6.6  | 5            | 1                       | 3   | 3                    | 4 | 15                 |
| TZX6V8A     | 6.4                 | 6.7  | 5            | 1                       | 3.5 | 2                    | 4 | 15                 |
| TZX6V8B     | 6.6                 | 6.9  | 5            | 1                       | 3.5 | 2                    | 4 | 15                 |
| TZX6V8C     | 6.7                 | 7    | 5            | 1                       | 3.5 | 2                    | 4 | 15                 |
| TZX6V8D     | 6.9                 | 7.2  | 5            | 1                       | 3.5 | 2                    | 4 | 15                 |



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                     |       |              |                         |      |                               |      |                    |
|--|---------------------|-------|--------------|-------------------------|------|-------------------------------|------|--------------------|
| PART NUMBER  | ZENER VOLTAGE RANGE |       | TEST CURRENT | REVERSE LEAKAGE CURRENT |      |                               |      | DYNAMIC RESISTANCE |
|  | $V_Z$ at $I_{ZT1}$  |       | $I_{ZT1}$    | $I_R$ at $V_R$          |      | $I_R$ at $V_R$ <sup>(1)</sup> |      | $Z_Z$ at $I_{ZT1}$ |
|  | V                   |       | mA           | $\mu\text{A}$           | V    | $\mu\text{A}$                 | V    | $\Omega$           |
|  | MIN.                | MAX.  |              | MAX.                    |      | MAX.                          |      | MAX.               |
| TZX7V5A  | 7                   | 7.3   | 5            | 1                       | 5    | 30                            | 6.65 | 15                 |
| TZX7V5B  | 7.2                 | 7.6   | 5            | 1                       | 5    | 30                            | 6.84 | 15                 |
| TZX7V5C  | 7.3                 | 7.7   | 5            | 1                       | 5    | 30                            | 6.94 | 15                 |
| TZX7V5D  | 7.5                 | 7.9   | 5            | 1                       | 5    | 30                            | 7.13 | 15                 |
| TZX7V5X  | 7.07                | 7.45  | 5            | 1                       | 5    | 30                            | 6.72 | 15                 |
| TZX8V2A  | 7.7                 | 8.1   | 5            | 1                       | 6.2  | 0.1                           | 7.32 | 20                 |
| TZX8V2B  | 7.9                 | 8.3   | 5            | 1                       | 6.2  | 0.1                           | 7.5  | 20                 |
| TZX8V2C  | 8.1                 | 8.5   | 5            | 1                       | 6.2  | 0.1                           | 7.7  | 20                 |
| TZX8V2D  | 8.3                 | 8.7   | 5            | 1                       | 6.2  | 0.1                           | 7.98 | 20                 |
| TZX9V1A  | 8.5                 | 8.9   | 5            | 1                       | 6.8  | 0.04                          | 8.08 | 20                 |
| TZX9V1B  | 8.7                 | 9.1   | 5            | 1                       | 6.8  | 0.04                          | 8.27 | 20                 |
| TZX9V1C  | 8.9                 | 9.3   | 5            | 1                       | 6.8  | 0.04                          | 8.46 | 20                 |
| TZX9V1D  | 9.1                 | 9.5   | 5            | 1                       | 6.8  | 0.04                          | 8.65 | 20                 |
| TZX9V1E  | 9.3                 | 9.7   | 5            | 1                       | 6.8  | 0.04                          | 8.84 | 20                 |
| TZX10A   | 9.5                 | 9.9   | 5            | 1                       | 7.5  | 0.04                          | 9.03 | 25                 |
| TZX10B   | 9.7                 | 10.1  | 5            | 1                       | 7.5  | 0.04                          | 9.22 | 25                 |
| TZX10C   | 9.9                 | 10.3  | 5            | 1                       | 7.5  | 0.04                          | 9.41 | 25                 |
| TZX10D   | 10.2                | 10.6  | 5            | 1                       | 7.5  | 0.04                          | 9.69 | 25                 |
| TZX11A   | 10.4                | 10.8  | 5            | 1                       | 8.2  | 0.04                          | 9.88 | 25                 |
| TZX11B   | 10.7                | 11.1  | 5            | 1                       | 8.2  | 0.04                          | 10.2 | 25                 |
| TZX11C   | 10.9                | 11.3  | 5            | 1                       | 8.2  | 0.04                          | 10.4 | 25                 |
| TZX11D   | 11.1                | 11.6  | 5            | 1                       | 8.2  | 0.04                          | 10.5 | 25                 |
| TZX12A   | 11.4                | 11.9  | 5            | 1                       | 9.5  | 0.04                          | 10.8 | 35                 |
| TZX12B   | 11.6                | 12.1  | 5            | 1                       | 9.5  | 0.04                          | 11   | 35                 |
| TZX12C   | 11.9                | 12.4  | 5            | 1                       | 9.5  | 0.04                          | 11.3 | 35                 |
| TZX12D   | 12.2                | 12.7  | 5            | 1                       | 9.5  | 0.04                          | 11.6 | 35                 |
| TZX12X   | 11.44               | 12.03 | 5            | 1                       | 9.5  | 0.04                          | 10.9 | 35                 |
| TZX13A   | 12.4                | 12.9  | 5            | 1                       | 10   | 0.04                          | 11.8 | 35                 |
| TZX13B   | 12.6                | 13.1  | 5            | 1                       | 10   | 0.04                          | 12   | 35                 |
| TZX13C   | 12.9                | 13.4  | 5            | 1                       | 10   | 0.04                          | 12.3 | 35                 |
| TZX14A   | 13.2                | 13.7  | 5            | 1                       | 11   | 0.04                          | 12.5 | 35                 |
| TZX14B   | 13.5                | 14    | 5            | 1                       | 11   | 0.04                          | 12.8 | 35                 |
| TZX14C   | 13.8                | 14.3  | 5            | 1                       | 11   | 0.04                          | 13.1 | 35                 |
| TZX15A   | 14.1                | 14.7  | 5            | 1                       | 11.5 | 0.04                          | 13.4 | 40                 |
| TZX15B   | 14.5                | 15.1  | 5            | 1                       | 11.5 | 0.04                          | 13.8 | 40                 |
| TZX15C   | 14.9                | 15.5  | 5            | 1                       | 11.5 | 0.04                          | 14.2 | 40                 |
| TZX15X   | 14.35               | 15.09 | 5            | 1                       | 11.5 | 0.04                          | 13.6 | 40                 |
| TZX16A   | 15.3                | 15.9  | 5            | 1                       | 12   | 0.04                          | 14.5 | 45                 |
| TZX16B   | 15.7                | 16.5  | 5            | 1                       | 12   | 0.04                          | 14.9 | 45                 |
| TZX16C   | 16.3                | 17.1  | 5            | 1                       | 12   | 0.04                          | 15.5 | 45                 |
| TZX18A   | 16.9                | 17.7  | 5            | 1                       | 13   | 0.04                          | 16.1 | 55                 |
| TZX18B   | 17.5                | 18.3  | 5            | 1                       | 13   | 0.04                          | 16.6 | 55                 |
| TZX18C   | 18.1                | 19    | 5            | 1                       | 13   | 0.04                          | 17.2 | 55                 |
| TZX20A   | 18.8                | 19.7  | 2            | 1                       | 15   | 0.04                          | 17.9 | 60                 |
| TZX20B   | 19.5                | 20.4  | 2            | 1                       | 15   | 0.04                          | 18.5 | 60                 |
| TZX20C   | 20.2                | 21.2  | 2            | 1                       | 15   | 0.04                          | 19.2 | 60                 |
| TZX22A   | 20.9                | 21.9  | 2            | 1                       | 17   | 0.04                          | 19.9 | 65                 |

| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                     |       |              |                         |    |                      |      |                    |
|--|---------------------|-------|--------------|-------------------------|----|----------------------|------|--------------------|
| PART NUMBER  | ZENER VOLTAGE RANGE |       | TEST CURRENT | REVERSE LEAKAGE CURRENT |    |                      |      | DYNAMIC RESISTANCE |
|  | $V_Z$ at $I_{ZT1}$  |       | $I_{ZT1}$    | $I_R$ at $V_R$          |    | $I_R$ at $V_R^{(1)}$ |      | $Z_Z$ at $I_{ZT1}$ |
|  | V                   |       | mA           | $\mu\text{A}$           | V  | $\mu\text{A}$        | V    | $\Omega$           |
|  | MIN.                | MAX.  |              | MAX.                    |    | MAX.                 |      | MAX.               |
| TZX22B   | 21.6                | 22.6  | 2            | 1                       | 17 | 0.04                 | 20.5 | 65                 |
| TZX22C   | 22.3                | 23.3  | 2            | 1                       | 17 | 0.04                 | 21.2 | 65                 |
| TZX24A   | 22.9                | 24    | 2            | 1                       | 19 | 0.04                 | 21.8 | 70                 |
| TZX24B   | 23.6                | 24.7  | 2            | 1                       | 19 | 0.04                 | 22.4 | 70                 |
| TZX24C   | 24.3                | 25.5  | 2            | 1                       | 19 | 0.04                 | 23.1 | 70                 |
| TZX24X   | 22.61               | 23.77 | 2            | 1                       | 19 | 0.04                 | 21.5 | 70                 |
| TZX27A   | 25.2                | 26.6  | 2            | 1                       | 21 | 0.04                 | 23.9 | 80                 |
| TZX27B   | 26.2                | 27.6  | 2            | 1                       | 21 | 0.04                 | 24.9 | 80                 |
| TZX27C   | 27.2                | 28.6  | 2            | 1                       | 21 | 0.04                 | 25.8 | 80                 |
| TZX27X   | 26.99               | 28.39 | 2            | 1                       | 21 | 0.04                 | 25.6 | 80                 |
| TZX30A   | 28.2                | 29.6  | 2            | 1                       | 23 | 0.04                 | 26.8 | 100                |
| TZX30B   | 29.2                | 30.6  | 2            | 1                       | 23 | 0.04                 | 27.7 | 100                |
| TZX30C   | 30.2                | 31.6  | 2            | 1                       | 23 | 0.04                 | 28.7 | 100                |
| TZX30X   | 29.02               | 30.51 | 2            | 1                       | 23 | 0.04                 | 27.6 | 100                |
| TZX33A   | 31.2                | 32.6  | 2            | 1                       | 25 | 0.04                 | 29.6 | 120                |
| TZX33B   | 32.2                | 33.6  | 2            | 1                       | 25 | 0.04                 | 30.6 | 120                |
| TZX33C   | 33.2                | 34.5  | 2            | 1                       | 25 | 0.04                 | 31.5 | 120                |
| TZX36A   | 34.2                | 35.7  | 2            | 1                       | 27 | 0.04                 | 32.5 | 140                |
| TZX36B   | 35.3                | 36.8  | 2            | 1                       | 27 | 0.04                 | 33.5 | 140                |
| TZX36C   | 36.4                | 38    | 2            | 1                       | 27 | 0.04                 | 34.6 | 140                |
| TZX36X   | 35.36               | 37.19 | 2            | 1                       | 27 | 0.04                 | 33.6 | 140                |

**Notes**

- Additional measurement of voltage group TZX9V1 to TZX36,  $I_R$  at 95 %  $V_{Zmin.} \leq 40\text{ nA}$  at  $T_j = 25\text{ }^{\circ}\text{C}$

<sup>(1)</sup> Additional measurement

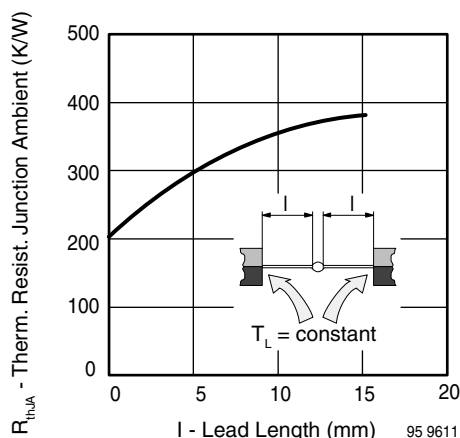
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Thermal Resistance vs. Lead Length

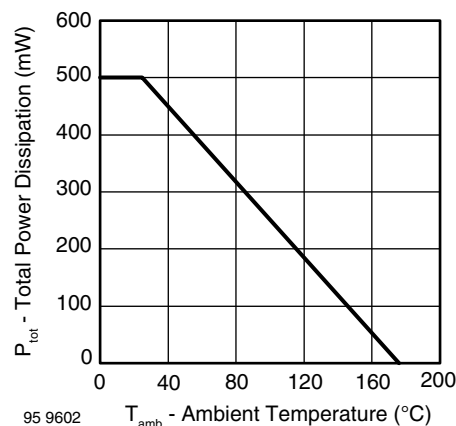


Fig. 2 - Total Power Dissipation vs. Ambient Temperature

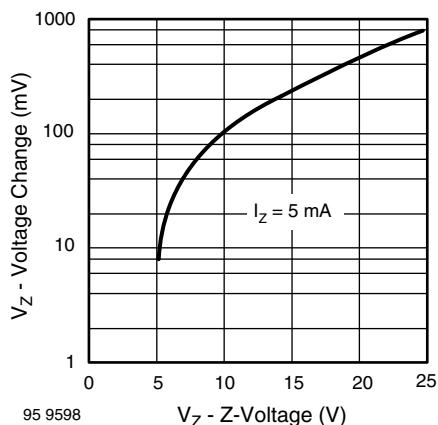


Fig. 3 - Typical Change of Working Voltage under Operating Conditions at  $T_{\text{amb}} = 25^\circ\text{C}$

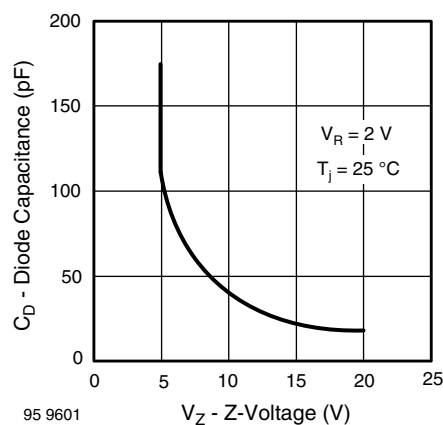


Fig. 6 - Diode Capacitance vs. Z-Voltage

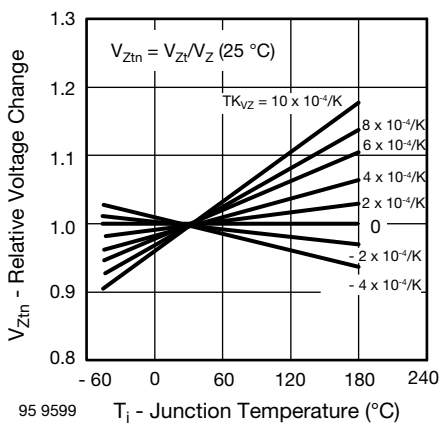


Fig. 4 - Typical Change of Working Voltage vs. Junction Temperature

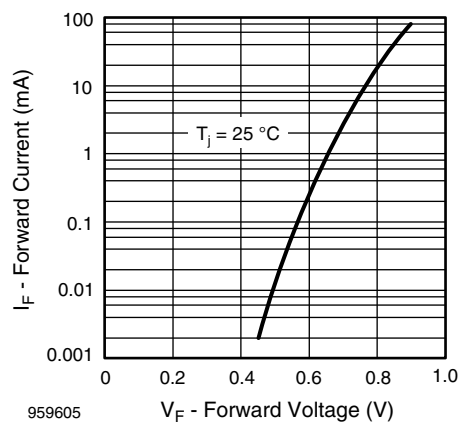


Fig. 7 - Forward Current vs. Forward Voltage

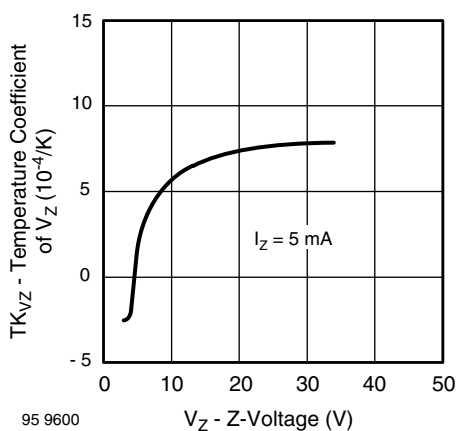


Fig. 5 - Temperature Coefficient of  $V_Z$  vs. Z-Voltage

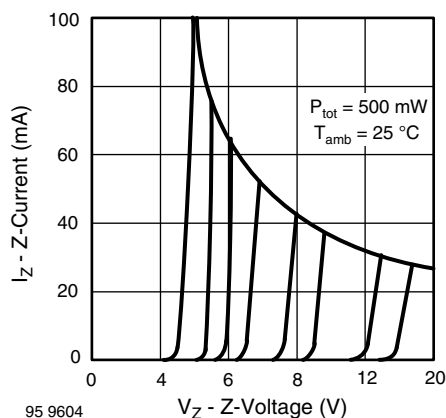


Fig. 8 - Z-Current vs. Z-Voltage

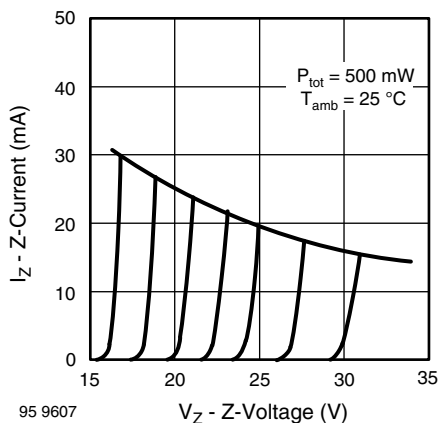


Fig. 9 - Z-Current vs. Z-Voltage

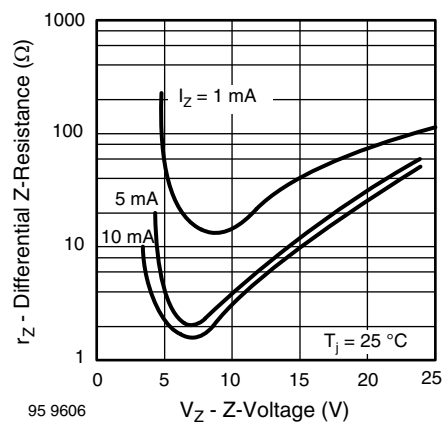


Fig. 10 - Differential Z-Resistance vs. Z-Voltage

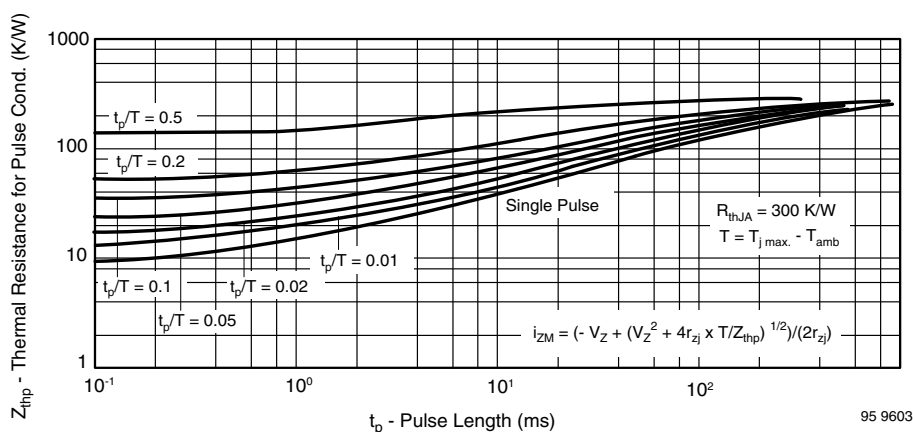
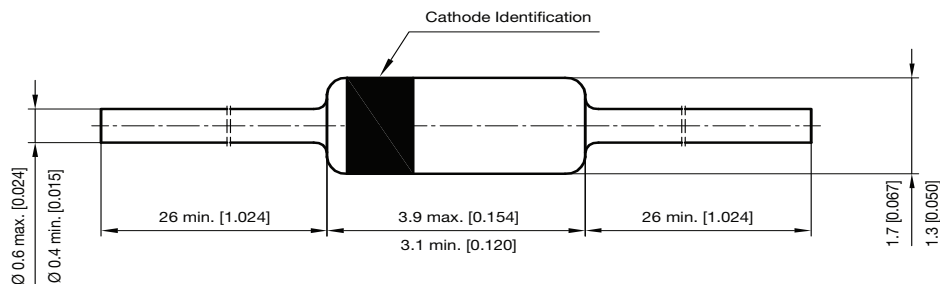


Fig. 11 - Thermal Response

## PACKAGE DIMENSIONS in millimeters (inches): DO-35



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94 9366



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