

## Small Signal Zener Diodes



### FEATURES

- Very sharp reverse characteristic
- Low reverse current level
- Very high stability
- Low noise
- TZMC -  $V_Z$ -tolerance  $\pm 5\%$
- TZMB -  $V_Z$ -tolerance  $\pm 2\%$
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### LINKS TO ADDITIONAL RESOURCES



### APPLICATIONS

- Voltage stabilization

### PRIMARY CHARACTERISTICS

| PARAMETER             | VALUE         | UNIT |
|-----------------------|---------------|------|
| $V_Z$ range nom.      | 2.4 to 75     | V    |
| Test current $I_{ZT}$ | 2.5; 5        | mA   |
| $V_Z$ specification   | Pulse current |      |
| Circuit configuration | Single        |      |

### ORDERING INFORMATION

| DEVICE NAME | ORDERING CODE   | TAPED UNITS PER REEL           | MINIMUM ORDER QUANTITY |
|-------------|-----------------|--------------------------------|------------------------|
| TZM-series  | TZM-series-GS18 | 10 000 (8 mm tape on 13" reel) | 10 000/box             |
| TZM-series  | TZM-series-GS08 | 2500 (8 mm tape on 7" reel)    | 12 500/box             |

### PACKAGE

| PACKAGE NAME      | WEIGHT | MOLDING COMPOUND FLAMMABILITY RATING | MOISTURE SENSITIVITY LEVEL           | SOLDERING CONDITIONS         |
|-------------------|--------|--------------------------------------|--------------------------------------|------------------------------|
| MiniMELF (SOD-80) | 31 mg  | UL 94 V-0                            | MSL level 1<br>(according J-STD-020) | Peak temperature max. 260 °C |

### ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)

| PARAMETER                 | TEST CONDITION                     | SYMBOL     | VALUE         | UNIT |
|---------------------------|------------------------------------|------------|---------------|------|
| Power dissipation         | $R_{thJA} \leq 300\text{ K/W}$     | $P_{tot}$  | 500           | mW   |
| Zener current             |                                    | $I_Z$      | $P_{tot}/V_Z$ | mA   |
| Junction to ambient air   | On PC board 50 mm x 50 mm x 1.6 mm | $R_{thJA}$ | 500           | K/W  |
| Junction temperature      |                                    | $T_j$      | 175           | °C   |
| Storage temperature range |                                    | $T_{stg}$  | -65 to +175   | °C   |
| Forward voltage (max.)    | $I_F = 200\text{ mA}$              | $V_F$      | 1.5           | V    |



| <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 |                       | TEMPERATURE COEFFICIENT OF ZENER VOLTAGE |       |
|  | $V_Z$ at $I_{ZT1}$  |      |      | $I_{ZT1}$    | $I_{ZT2}$ | $I_R$ at $V_R$          |     | $I_R^{(1)}$ at $V_R$ |     | $Z_Z$ at $I_{ZT1}$ | $Z_{ZK}$ at $I_{ZT2}$ | $TK_{VZ}$                                |       |
|  | V                   |      |      | mA           |           | $\mu\text{A}$           | V   | $\mu\text{A}$        | V   | $\Omega$           |                       | %/K                                      |       |
|  | MIN.                | NOM. | MAX. |              |           |                         |     |                      |     | TYP.               | TYP.                  | MIN.                                     | MAX.  |
| TZMC2V4  | 2.28                | 2.4  | 2.56 | 5            | 1         | < 50                    | 1   | < 100                | 1   | < 85               | < 600                 | -0.09                                    | -0.06 |
| TZMC2V7  | 2.5                 | 2.7  | 2.9  | 5            | 1         | < 10                    | 1   | < 50                 | 1   | < 85               | < 600                 | -0.09                                    | -0.06 |
| TZMC3V0  | 2.8                 | 3.0  | 3.2  | 5            | 1         | < 4                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMC3V3  | 3.1                 | 3.3  | 3.5  | 5            | 1         | < 2                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMC3V6  | 3.4                 | 3.6  | 3.8  | 5            | 1         | < 2                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMC3V9  | 3.7                 | 3.9  | 4.1  | 5            | 1         | < 2                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMC4V3  | 4                   | 4.3  | 4.6  | 5            | 1         | < 1                     | 1   | < 20                 | 1   | < 90               | < 600                 | -0.06                                    | -0.03 |
| TZMC4V7  | 4.4                 | 4.7  | 5    | 5            | 1         | < 0.5                   | 1   | < 10                 | 1   | < 80               | < 600                 | -0.05                                    | 0.02  |
| TZMC5V1  | 4.8                 | 5.1  | 5.4  | 5            | 1         | < 0.1                   | 1   | < 2                  | 1   | < 60               | < 550                 | -0.02                                    | 0.02  |
| TZMC5V6  | 5.2                 | 5.6  | 6    | 5            | 1         | < 0.1                   | 1   | < 2                  | 1   | < 40               | < 450                 | -0.05                                    | 0.05  |
| TZMC6V2  | 5.8                 | 6.2  | 6.6  | 5            | 1         | < 0.1                   | 2   | < 2                  | 2   | < 10               | < 200                 | 0.03                                     | 0.06  |
| TZMC6V8  | 6.4                 | 6.8  | 7.2  | 5            | 1         | < 0.1                   | 3   | < 2                  | 3   | < 8                | < 150                 | 0.03                                     | 0.07  |
| TZMC7V5  | 7                   | 7.5  | 7.9  | 5            | 1         | < 0.1                   | 5   | < 2                  | 5   | < 7                | < 50                  | 0.03                                     | 0.07  |
| TZMC8V2  | 7.7                 | 8.2  | 8.7  | 5            | 1         | < 0.1                   | 6.2 | < 2                  | 6.2 | < 7                | < 50                  | 0.03                                     | 0.08  |
| TZMC9V1  | 8.5                 | 9.1  | 9.6  | 5            | 1         | < 0.1                   | 6.8 | < 2                  | 6.8 | < 10               | < 50                  | 0.03                                     | 0.09  |
| TZMC10   | 9.4                 | 10   | 10.6 | 5            | 1         | < 0.1                   | 7.5 | < 2                  | 7.5 | < 15               | < 70                  | 0.03                                     | 0.1   |
| TZMC11   | 10.4                | 11   | 11.6 | 5            | 1         | < 0.1                   | 8.2 | < 2                  | 8.2 | < 20               | < 70                  | 0.03                                     | 0.11  |
| TZMC12   | 11.4                | 12   | 12.7 | 5            | 1         | < 0.1                   | 9.1 | < 2                  | 9.1 | < 20               | < 90                  | 0.03                                     | 0.11  |
| TZMC13   | 12.4                | 13   | 14.1 | 5            | 1         | < 0.1                   | 10  | < 2                  | 10  | < 26               | < 110                 | 0.03                                     | 0.11  |
| TZMC15   | 13.8                | 15   | 15.6 | 5            | 1         | < 0.1                   | 11  | < 2                  | 11  | < 30               | < 110                 | 0.03                                     | 0.11  |
| TZMC16   | 15.3                | 16   | 17.1 | 5            | 1         | < 0.1                   | 12  | < 2                  | 12  | < 40               | < 170                 | 0.03                                     | 0.11  |
| TZMC18   | 16.8                | 18   | 19.1 | 5            | 1         | < 0.1                   | 13  | < 2                  | 13  | < 50               | < 170                 | 0.03                                     | 0.11  |
| TZMC20   | 18.8                | 20   | 21.2 | 5            | 1         | < 0.1                   | 15  | < 2                  | 15  | < 55               | < 220                 | 0.03                                     | 0.11  |
| TZMC22   | 20.8                | 22   | 23.3 | 5            | 1         | < 0.1                   | 16  | < 2                  | 16  | < 55               | < 220                 | 0.04                                     | 0.12  |
| TZMC24   | 22.8                | 24   | 25.6 | 5            | 1         | < 0.1                   | 18  | < 2                  | 18  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMC27   | 25.1                | 27   | 28.9 | 5            | 1         | < 0.1                   | 20  | < 2                  | 20  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMC30   | 28                  | 30   | 32   | 5            | 1         | < 0.1                   | 22  | < 2                  | 22  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMC33   | 31                  | 33   | 35   | 5            | 1         | < 0.1                   | 24  | < 2                  | 24  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMC36   | 34                  | 36   | 38   | 5            | 1         | < 0.1                   | 27  | < 2                  | 27  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMC39   | 37                  | 39   | 41   | 2.5          | 0.5       | < 0.1                   | 30  | < 5                  | 30  | < 90               | < 500                 | 0.04                                     | 0.12  |
| TZMC43   | 40                  | 43   | 46   | 2.5          | 0.5       | < 0.1                   | 33  | < 5                  | 33  | < 90               | < 600                 | 0.04                                     | 0.12  |
| TZMC47   | 44                  | 47   | 50   | 2.5          | 0.5       | < 0.1                   | 36  | < 5                  | 36  | < 110              | < 700                 | 0.04                                     | 0.12  |
| TZMC51   | 48                  | 51   | 54   | 2.5          | 0.5       | < 0.1                   | 39  | < 10                 | 39  | < 125              | < 700                 | 0.04                                     | 0.12  |
| TZMC56   | 52                  | 56   | 60   | 2.5          | 0.5       | < 0.1                   | 43  | < 10                 | 43  | < 135              | < 1000                | 0.04                                     | 0.12  |
| TZMC62   | 58                  | 62   | 66   | 2.5          | 0.5       | < 0.1                   | 47  | < 10                 | 47  | < 150              | < 1000                | 0.04                                     | 0.12  |
| TZMC68   | 64                  | 68   | 72   | 2.5          | 0.5       | < 0.1                   | 51  | < 10                 | 51  | < 200              | < 1000                | 0.04                                     | 0.12  |
| TZMC75   | 70                  | 75   | 79   | 2.5          | 0.5       | < 0.1                   | 56  | < 10                 | 56  | < 250              | < 1500                | 0.04                                     | 0.12  |

**Notes**

- Additional measurement of voltage group TZMC9V1 to TZMC75,  $I_R$  at 95 %  $V_{Zmin.} \leq 35\text{ nA}$  at  $T_j = 25\text{ }^{\circ}\text{C}$
- (1) at  $T_j = 150\text{ }^{\circ}\text{C}$



| ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified) |                                    |      |       |                  |                  |                                  |     |   |     |                                    |                                     |  |       |
|---|------------------------------------|------|-------|------------------|------------------|----------------------------------|-----|---|-----|------------------------------------|-------------------------------------|--|-------|
| PART NUMBER   | ZENER VOLTAGE RANGE                |      |       | TEST CURRENT     |                  | REVERSE LEAKAGE CURRENT          |     |   |     | DYNAMIC RESISTANCE                 |                                     | TEMPERATURE COEFFICIENT OF ZENER VOLTAGE |       |
|   | V <sub>Z</sub> at I <sub>ZT1</sub> |      |       | I <sub>ZT1</sub> | I <sub>ZT2</sub> | I <sub>R</sub> at V <sub>R</sub> |     | I <sub>R</sub> <sup>(1)</sup> at V <sub>R</sub> |     | Z <sub>Z</sub> at I <sub>ZT1</sub> | Z <sub>ZK</sub> at I <sub>ZT2</sub> | TK <sub>VZ</sub>                         |       |
|   | V                                  |      |       | mA               |                  | μA                               | V   | μA  | V   | Ω                                  |                                     | % / K                                    |       |
|   | MIN.                               | NOM. | MAX.  |                  |                  |                                  |     |   |     | TYP.                               | TYP.                                | MIN.                                     | MAX.  |
| TZMB2V4   | 2.35                               | 2.4  | 2.45  | 5                | 1                | < 50                             | 1   | < 100   | 1   | < 85                               | < 600                               | -0.09                                    | -0.06 |
| TZMB2V7   | 2.64                               | 2.7  | 2.76  | 5                | 1                | < 10                             | 1   | < 50  | 1   | < 85                               | < 600                               | -0.09                                    | -0.06 |
| TZMB3V0   | 2.94                               | 3.0  | 3.06  | 5                | 1                | < 4                              | 1   | < 40  | 1   | < 90                               | < 600                               | -0.08                                    | -0.05 |
| TZMB3V3   | 3.24                               | 3.3  | 3.36  | 5                | 1                | < 2                              | 1   | < 40  | 1   | < 90                               | < 600                               | -0.08                                    | -0.05 |
| TZMB3V6   | 3.52                               | 3.6  | 3.68  | 5                | 1                | < 2                              | 1   | < 40  | 1   | < 90                               | < 600                               | -0.08                                    | -0.05 |
| TZMB3V9   | 3.82                               | 3.9  | 3.98  | 5                | 1                | < 2                              | 1   | < 40  | 1   | < 90                               | < 600                               | -0.08                                    | -0.05 |
| TZMB4V3   | 4.22                               | 4.3  | 4.38  | 5                | 1                | < 1                              | 1   | < 20  | 1   | < 90                               | < 600                               | -0.06                                    | -0.03 |
| TZMB4V7   | 4.6                                | 4.7  | 4.8   | 5                | 1                | < 0.5                            | 1   | < 10  | 1   | < 80                               | < 600                               | -0.05                                    | 0.02  |
| TZMB5V1   | 5                                  | 5.1  | 5.2   | 5                | 1                | < 0.1                            | 1   | < 2   | 1   | < 60                               | < 550                               | -0.02                                    | 0.02  |
| TZMB5V6   | 5.48                               | 5.6  | 5.72  | 5                | 1                | < 0.1                            | 1   | < 2   | 1   | < 40                               | < 450                               | -0.05                                    | 0.05  |
| TZMB6V2   | 6.08                               | 6.2  | 6.32  | 5                | 1                | < 0.1                            | 2   | < 2   | 2   | < 10                               | < 200                               | 0.03                                     | 0.06  |
| TZMB6V8   | 6.66                               | 6.8  | 6.94  | 5                | 1                | < 0.1                            | 3   | < 2   | 3   | < 8                                | < 150                               | 0.03                                     | 0.07  |
| TZMB7V5   | 7.35                               | 7.5  | 7.65  | 5                | 1                | < 0.1                            | 5   | < 2   | 5   | < 7                                | < 50                                | 0.03                                     | 0.07  |
| TZMB8V2   | 8.04                               | 8.2  | 8.36  | 5                | 1                | < 0.1                            | 6.2 | < 2   | 6.2 | < 7                                | < 50                                | 0.03                                     | 0.08  |
| TZMB9V1   | 8.92                               | 9.1  | 9.28  | 5                | 1                | < 0.1                            | 6.8 | < 2   | 6.8 | < 10                               | < 50                                | 0.03                                     | 0.09  |
| TZMB10  | 9.8                                | 10   | 10.2  | 5                | 1                | < 0.1                            | 7.5 | < 2   | 7.5 | < 15                               | < 70                                | 0.03                                     | 0.1   |
| TZMB11  | 10.78                              | 11   | 11.22 | 5                | 1                | < 0.1                            | 8.2 | < 2   | 8.2 | < 20                               | < 70                                | 0.03                                     | 0.11  |
| TZMB12  | 11.76                              | 12   | 12.24 | 5                | 1                | < 0.1                            | 9.1 | < 2   | 9.1 | < 20                               | < 90                                | 0.03                                     | 0.11  |
| TZMB13  | 12.74                              | 13   | 13.26 | 5                | 1                | < 0.1                            | 10  | < 2   | 10  | < 26                               | < 110                               | 0.03                                     | 0.11  |
| TZMB15  | 14.7                               | 15   | 15.3  | 5                | 1                | < 0.1                            | 11  | < 2   | 11  | < 30                               | < 110                               | 0.03                                     | 0.11  |
| TZMB16  | 15.7                               | 16   | 16.3  | 5                | 1                | < 0.1                            | 12  | < 2   | 12  | < 40                               | < 170                               | 0.03                                     | 0.11  |
| TZMB18  | 17.64                              | 18   | 18.36 | 5                | 1                | < 0.1                            | 13  | < 2   | 13  | < 50                               | < 170                               | 0.03                                     | 0.11  |
| TZMB20  | 19.6                               | 20   | 20.4  | 5                | 1                | < 0.1                            | 15  | < 2   | 15  | < 55                               | < 220                               | 0.03                                     | 0.11  |
| TZMB22  | 21.55                              | 22   | 22.45 | 5                | 1                | < 0.1                            | 16  | < 2   | 16  | < 55                               | < 220                               | 0.04                                     | 0.12  |
| TZMB24  | 23.5                               | 24   | 24.5  | 5                | 1                | < 0.1                            | 18  | < 2   | 18  | < 80                               | < 220                               | 0.04                                     | 0.12  |
| TZMB27  | 26.4                               | 27   | 27.6  | 5                | 1                | < 0.1                            | 20  | < 2   | 20  | < 80                               | < 220                               | 0.04                                     | 0.12  |
| TZMB30  | 29.4                               | 30   | 30.6  | 5                | 1                | < 0.1                            | 22  | < 2   | 22  | < 80                               | < 220                               | 0.04                                     | 0.12  |
| TZMB33  | 32.4                               | 33   | 33.6  | 5                | 1                | < 0.1                            | 24  | < 2   | 24  | < 80                               | < 220                               | 0.04                                     | 0.12  |
| TZMB36  | 35.3                               | 36   | 36.7  | 5                | 1                | < 0.1                            | 27  | < 2   | 27  | < 80                               | < 220                               | 0.04                                     | 0.12  |
| TZMB39  | 38.2                               | 39   | 39.8  | 2.5              | 0.5              | < 0.1                            | 30  | < 5   | 30  | < 90                               | < 500                               | 0.04                                     | 0.12  |
| TZMB43  | 42.1                               | 43   | 43.9  | 2.5              | 0.5              | < 0.1                            | 33  | < 5   | 33  | < 90                               | < 600                               | 0.04                                     | 0.12  |
| TZMB47  | 46.1                               | 47   | 47.9  | 2.5              | 0.5              | < 0.1                            | 36  | < 5   | 36  | < 110                              | < 700                               | 0.04                                     | 0.12  |
| TZMB51  | 50                                 | 51   | 52    | 2.5              | 0.5              | < 0.1                            | 39  | < 10  | 39  | < 125                              | < 700                               | 0.04                                     | 0.12  |
| TZMB56  | 54.9                               | 56   | 57.1  | 2.5              | 0.5              | < 0.1                            | 43  | < 10  | 43  | < 135                              | < 1000                              | 0.04                                     | 0.12  |
| TZMB62  | 60.8                               | 62   | 63.2  | 2.5              | 0.5              | < 0.1                            | 47  | < 10  | 47  | < 150                              | < 1000                              | 0.04                                     | 0.12  |
| TZMB68  | 66.6                               | 68   | 69.4  | 2.5              | 0.5              | < 0.1                            | 51  | < 10  | 51  | < 200                              | < 1000                              | 0.04                                     | 0.12  |
| TZMB75  | 73.5                               | 75   | 76.5  | 2.5              | 0.5              | < 0.1                            | 56  | < 10  | 56  | < 250                              | < 1500                              | 0.04                                     | 0.12  |

Notes

- Additional measurement of voltage group TZMB9V1 to TZMB75, I<sub>R</sub> at 95 % V<sub>Zmin</sub>. ≤ 35 nA at T<sub>j</sub> = 25 °C
- (1) at T<sub>j</sub> = 150 °C

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

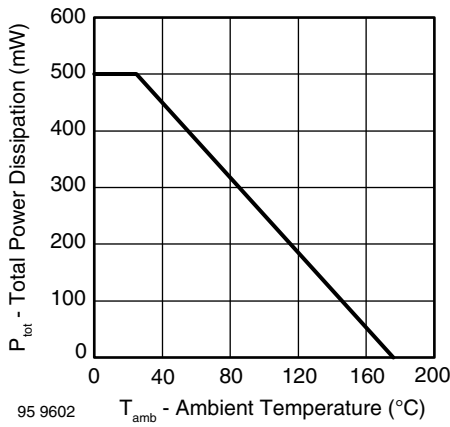


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

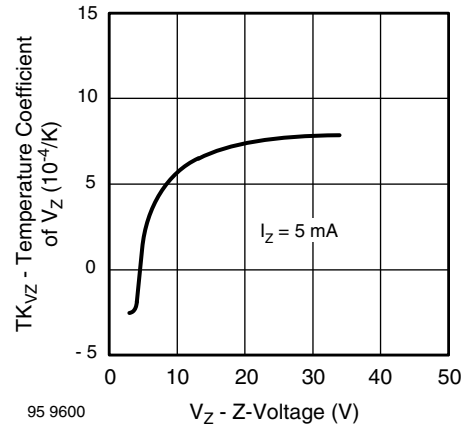


Fig. 4 - Temperature Coefficient of  $V_Z$  vs. Z-Voltage

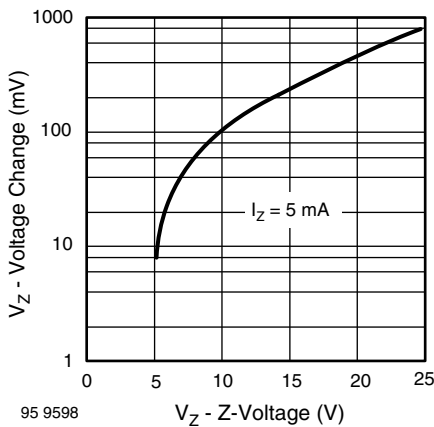


Fig. 2 - Typical Change of Working Voltage under Operating Conditions at  $T_{amb} = 25\text{ }^{\circ}\text{C}$

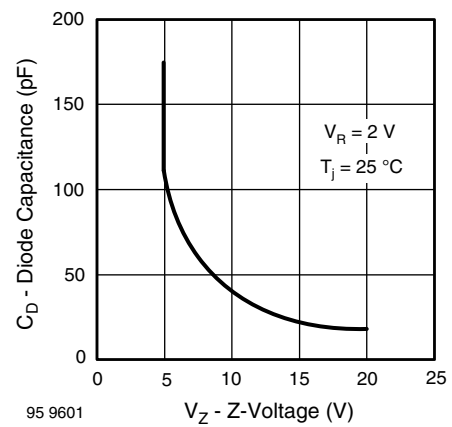


Fig. 5 - Diode Capacitance vs. Z-Voltage

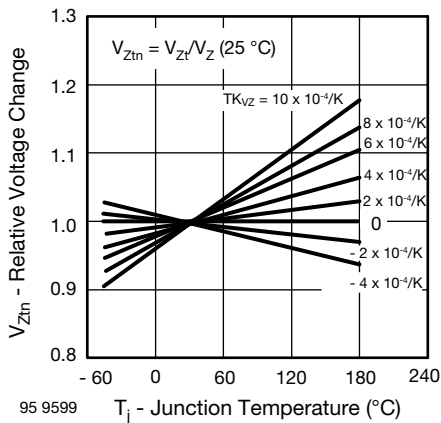


Fig. 3 - Typical Change of Working Voltage vs. Junction Temperature

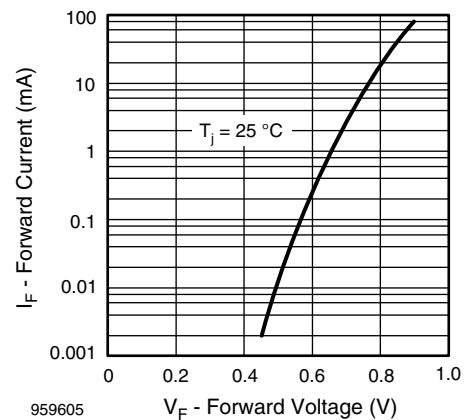


Fig. 6 - Forward Current vs. Forward Voltage

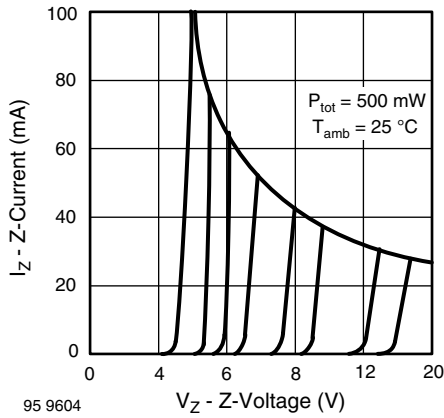


Fig. 7 - Z-Current vs. Z-Voltage

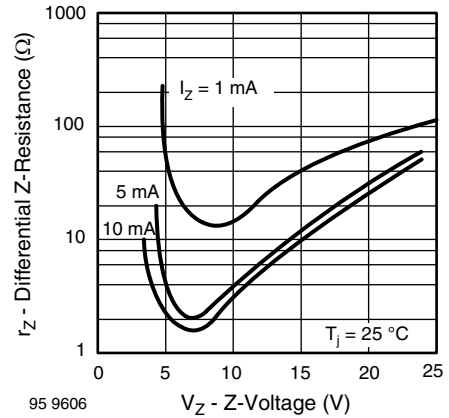


Fig. 9 - Differential Z-Resistance vs. Z-Voltage

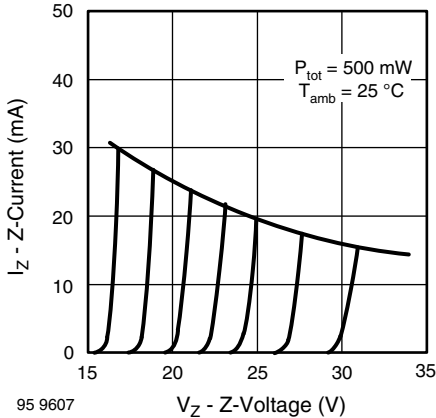


Fig. 8 - Z-Current vs. Z-Voltage

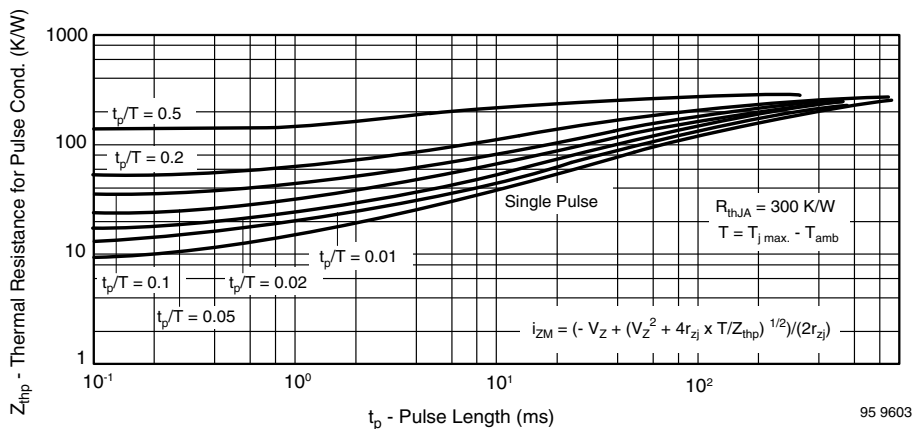
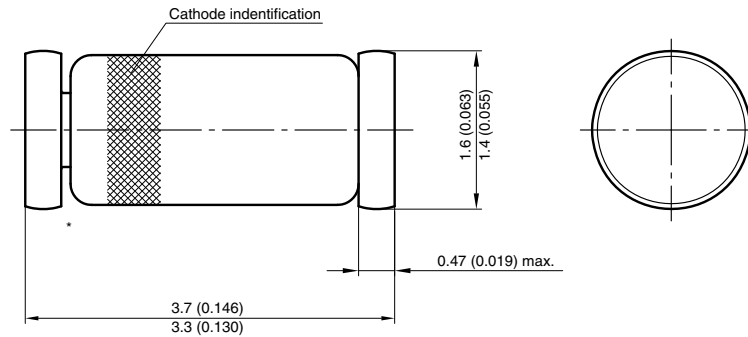


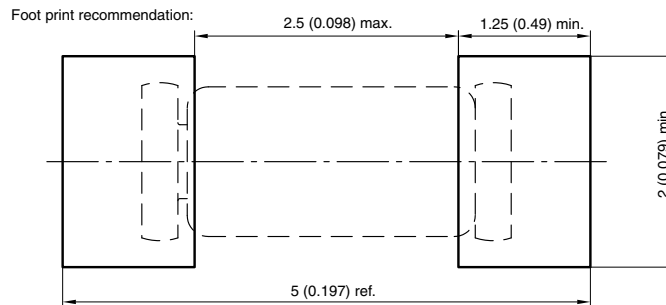
Fig. 10 - Thermal Response



### PACKAGE DIMENSIONS in millimeters (inches): **MiniMELF (SOD-80)**



\* The gap between plug and glass can be either on cathode or anode side



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