

## 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  $\pm 2\%$
- 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**

### DESIGN SUPPORT TOOLS

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**3D**  
Models  
Available

### APPLICATION

- 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-M-series | TZM-M-series-18 | 10 000 (8 mm tape on 13" reel) | 10 000/box             |
| TZM-M-series | TZM-M-series-08 | 2500 (8 mm tape on 7" reel)    | 12 500/box             |

### PACKAGE

| PACKAGE NAME    | WEIGHT | MOLDING COMPOUND<br>FLAMMABILITY RATING | MOISTURE SENSITIVITY<br>LEVEL        | SOLDERING CONDITIONS     |
|-----------------|--------|-----------------------------------------|--------------------------------------|--------------------------|
| MiniMELF SOD-80 | 31 mg  | UL 94 V-0                               | MSL level 1<br>(according J-STD-020) | 260 °C/10 s at terminals |

### 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    |

**ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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-M   | 2.28                | 2.4  | 2.56 | 5            | 1         | < 50                    | 1   | < 100                | 1   | < 85               | < 600                 | -0.09                                    | -0.06 |
| TZMC2V7-M   | 2.5                 | 2.7  | 2.9  | 5            | 1         | < 10                    | 1   | < 50                 | 1   | < 85               | < 600                 | -0.09                                    | -0.06 |
| TZMC3V0-M   | 2.8                 | 3.0  | 3.2  | 5            | 1         | < 4                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMC3V3-M   | 3.1                 | 3.3  | 3.5  | 5            | 1         | < 2                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMC3V6-M   | 3.4                 | 3.6  | 3.8  | 5            | 1         | < 2                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMC3V9-M   | 3.7                 | 3.9  | 4.1  | 5            | 1         | < 2                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMC4V3-M   | 4                   | 4.3  | 4.6  | 5            | 1         | < 1                     | 1   | < 20                 | 1   | < 90               | < 600                 | -0.06                                    | -0.03 |
| TZMC4V7-M   | 4.4                 | 4.7  | 5    | 5            | 1         | < 0.5                   | 1   | < 10                 | 1   | < 80               | < 600                 | -0.05                                    | 0.02  |
| TZMC5V1-M   | 4.8                 | 5.1  | 5.4  | 5            | 1         | < 0.1                   | 1   | < 2                  | 1   | < 60               | < 550                 | -0.02                                    | 0.02  |
| TZMC5V6-M   | 5.2                 | 5.6  | 6    | 5            | 1         | < 0.1                   | 1   | < 2                  | 1   | < 40               | < 450                 | -0.05                                    | 0.05  |
| TZMC6V2-M   | 5.8                 | 6.2  | 6.6  | 5            | 1         | < 0.1                   | 2   | < 2                  | 2   | < 10               | < 200                 | 0.03                                     | 0.06  |
| TZMC6V8-M   | 6.4                 | 6.8  | 7.2  | 5            | 1         | < 0.1                   | 3   | < 2                  | 3   | < 8                | < 150                 | 0.03                                     | 0.07  |
| TZMC7V5-M   | 7                   | 7.5  | 7.9  | 5            | 1         | < 0.1                   | 5   | < 2                  | 5   | < 7                | < 50                  | 0.03                                     | 0.07  |
| TZMC8V2-M   | 7.7                 | 8.2  | 8.7  | 5            | 1         | < 0.1                   | 6.2 | < 2                  | 6.2 | < 7                | < 50                  | 0.03                                     | 0.08  |
| TZMC9V1-M   | 8.5                 | 9.1  | 9.6  | 5            | 1         | < 0.1                   | 6.8 | < 2                  | 6.8 | < 10               | < 50                  | 0.03                                     | 0.09  |
| TZMC10-M    | 9.4                 | 10   | 10.6 | 5            | 1         | < 0.1                   | 7.5 | < 2                  | 7.5 | < 15               | < 70                  | 0.03                                     | 0.1   |
| TZMC11-M    | 10.4                | 11   | 11.6 | 5            | 1         | < 0.1                   | 8.2 | < 2                  | 8.2 | < 20               | < 70                  | 0.03                                     | 0.11  |
| TZMC12-M    | 11.4                | 12   | 12.7 | 5            | 1         | < 0.1                   | 9.1 | < 2                  | 9.1 | < 20               | < 90                  | 0.03                                     | 0.11  |
| TZMC13-M    | 12.4                | 13   | 14.1 | 5            | 1         | < 0.1                   | 10  | < 2                  | 10  | < 26               | < 110                 | 0.03                                     | 0.11  |
| TZMC15-M    | 13.8                | 15   | 15.6 | 5            | 1         | < 0.1                   | 11  | < 2                  | 11  | < 30               | < 110                 | 0.03                                     | 0.11  |
| TZMC16-M    | 15.3                | 16   | 17.1 | 5            | 1         | < 0.1                   | 12  | < 2                  | 12  | < 40               | < 170                 | 0.03                                     | 0.11  |
| TZMC18-M    | 16.8                | 18   | 19.1 | 5            | 1         | < 0.1                   | 13  | < 2                  | 13  | < 50               | < 170                 | 0.03                                     | 0.11  |
| TZMC20-M    | 18.8                | 20   | 21.2 | 5            | 1         | < 0.1                   | 15  | < 2                  | 15  | < 55               | < 220                 | 0.03                                     | 0.11  |
| TZMC22-M    | 20.8                | 22   | 23.3 | 5            | 1         | < 0.1                   | 16  | < 2                  | 16  | < 55               | < 220                 | 0.04                                     | 0.12  |
| TZMC24-M    | 22.8                | 24   | 25.6 | 5            | 1         | < 0.1                   | 18  | < 2                  | 18  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMC27-M    | 25.1                | 27   | 28.9 | 5            | 1         | < 0.1                   | 20  | < 2                  | 20  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMC30-M    | 28                  | 30   | 32   | 5            | 1         | < 0.1                   | 22  | < 2                  | 22  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMC33-M    | 31                  | 33   | 35   | 5            | 1         | < 0.1                   | 24  | < 2                  | 24  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMC36-M    | 34                  | 36   | 38   | 5            | 1         | < 0.1                   | 27  | < 2                  | 27  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMC39-M    | 37                  | 39   | 41   | 2.5          | 0.5       | < 0.1                   | 30  | < 5                  | 30  | < 90               | < 500                 | 0.04                                     | 0.12  |
| TZMC43-M    | 40                  | 43   | 46   | 2.5          | 0.5       | < 0.1                   | 33  | < 5                  | 33  | < 90               | < 600                 | 0.04                                     | 0.12  |
| TZMC47-M    | 44                  | 47   | 50   | 2.5          | 0.5       | < 0.1                   | 36  | < 5                  | 36  | < 110              | < 700                 | 0.04                                     | 0.12  |
| TZMC51-M    | 48                  | 51   | 54   | 2.5          | 0.5       | < 0.1                   | 39  | < 10                 | 39  | < 125              | < 700                 | 0.04                                     | 0.12  |
| TZMC56-M    | 52                  | 56   | 60   | 2.5          | 0.5       | < 0.1                   | 43  | < 10                 | 43  | < 135              | < 1000                | 0.04                                     | 0.12  |
| TZMC62-M    | 58                  | 62   | 66   | 2.5          | 0.5       | < 0.1                   | 47  | < 10                 | 47  | < 150              | < 1000                | 0.04                                     | 0.12  |
| TZMC68-M    | 64                  | 68   | 72   | 2.5          | 0.5       | < 0.1                   | 51  | < 10                 | 51  | < 200              | < 1000                | 0.04                                     | 0.12  |
| TZMC75-M    | 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-M to TZMC75-M,  $I_R$  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** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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.  |
| TZMB2V4-M   | 2.35                | 2.4  | 2.45  | 5            | 1         | < 50                    | 1   | < 100                | 1   | < 85               | < 600                 | -0.09                                    | -0.06 |
| TZMB2V7-M   | 2.64                | 2.7  | 2.76  | 5            | 1         | < 10                    | 1   | < 50                 | 1   | < 85               | < 600                 | -0.09                                    | -0.06 |
| TZMB3V0-M   | 2.94                | 3.0  | 3.06  | 5            | 1         | < 4                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMB3V3-M   | 3.24                | 3.3  | 3.36  | 5            | 1         | < 2                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMB3V6-M   | 3.52                | 3.6  | 3.68  | 5            | 1         | < 2                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMB3V9-M   | 3.82                | 3.9  | 3.98  | 5            | 1         | < 2                     | 1   | < 40                 | 1   | < 90               | < 600                 | -0.08                                    | -0.05 |
| TZMB4V3-M   | 4.22                | 4.3  | 4.38  | 5            | 1         | < 1                     | 1   | < 20                 | 1   | < 90               | < 600                 | -0.06                                    | -0.03 |
| TZMB4V7-M   | 4.6                 | 4.7  | 4.8   | 5            | 1         | < 0.5                   | 1   | < 10                 | 1   | < 80               | < 600                 | -0.05                                    | 0.02  |
| TZMB5V1-M   | 5                   | 5.1  | 5.2   | 5            | 1         | < 0.1                   | 1   | < 2                  | 1   | < 60               | < 550                 | -0.02                                    | 0.02  |
| TZMB5V6-M   | 5.48                | 5.6  | 5.72  | 5            | 1         | < 0.1                   | 1   | < 2                  | 1   | < 40               | < 450                 | -0.05                                    | 0.05  |
| TZMB6V2-M   | 6.08                | 6.2  | 6.32  | 5            | 1         | < 0.1                   | 2   | < 2                  | 2   | < 10               | < 200                 | 0.03                                     | 0.06  |
| TZMB6V8-M   | 6.66                | 6.8  | 6.94  | 5            | 1         | < 0.1                   | 3   | < 2                  | 3   | < 8                | < 150                 | 0.03                                     | 0.07  |
| TZMB7V5-M   | 7.35                | 7.5  | 7.65  | 5            | 1         | < 0.1                   | 5   | < 2                  | 5   | < 7                | < 50                  | 0.03                                     | 0.07  |
| TZMB8V2-M   | 8.04                | 8.2  | 8.36  | 5            | 1         | < 0.1                   | 6.2 | < 2                  | 6.2 | < 7                | < 50                  | 0.03                                     | 0.08  |
| TZMB9V1-M   | 8.92                | 9.1  | 9.28  | 5            | 1         | < 0.1                   | 6.8 | < 2                  | 6.8 | < 10               | < 50                  | 0.03                                     | 0.09  |
| TZMB10-M    | 9.8                 | 10   | 10.2  | 5            | 1         | < 0.1                   | 7.5 | < 2                  | 7.5 | < 15               | < 70                  | 0.03                                     | 0.1   |
| TZMB11-M    | 10.78               | 11   | 11.22 | 5            | 1         | < 0.1                   | 8.2 | < 2                  | 8.2 | < 20               | < 70                  | 0.03                                     | 0.11  |
| TZMB12-M    | 11.76               | 12   | 12.24 | 5            | 1         | < 0.1                   | 9.1 | < 2                  | 9.1 | < 20               | < 90                  | 0.03                                     | 0.11  |
| TZMB13-M    | 12.74               | 13   | 13.26 | 5            | 1         | < 0.1                   | 10  | < 2                  | 10  | < 26               | < 110                 | 0.03                                     | 0.11  |
| TZMB15-M    | 14.7                | 15   | 15.3  | 5            | 1         | < 0.1                   | 11  | < 2                  | 11  | < 30               | < 110                 | 0.03                                     | 0.11  |
| TZMB16-M    | 15.7                | 16   | 16.3  | 5            | 1         | < 0.1                   | 12  | < 2                  | 12  | < 40               | < 170                 | 0.03                                     | 0.11  |
| TZMB18-M    | 17.64               | 18   | 18.36 | 5            | 1         | < 0.1                   | 13  | < 2                  | 13  | < 50               | < 170                 | 0.03                                     | 0.11  |
| TZMB20-M    | 19.6                | 20   | 20.4  | 5            | 1         | < 0.1                   | 15  | < 2                  | 15  | < 55               | < 220                 | 0.03                                     | 0.11  |
| TZMB22-M    | 21.55               | 22   | 22.45 | 5            | 1         | < 0.1                   | 16  | < 2                  | 16  | < 55               | < 220                 | 0.04                                     | 0.12  |
| TZMB24-M    | 23.5                | 24   | 24.5  | 5            | 1         | < 0.1                   | 18  | < 2                  | 18  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMB27-M    | 26.4                | 27   | 27.6  | 5            | 1         | < 0.1                   | 20  | < 2                  | 20  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMB30-M    | 29.4                | 30   | 30.6  | 5            | 1         | < 0.1                   | 22  | < 2                  | 22  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMB33-M    | 32.4                | 33   | 33.6  | 5            | 1         | < 0.1                   | 24  | < 2                  | 24  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMB36-M    | 35.3                | 36   | 36.7  | 5            | 1         | < 0.1                   | 27  | < 2                  | 27  | < 80               | < 220                 | 0.04                                     | 0.12  |
| TZMB39-M    | 38.2                | 39   | 39.8  | 2.5          | 0.5       | < 0.1                   | 30  | < 5                  | 30  | < 90               | < 500                 | 0.04                                     | 0.12  |
| TZMB43-M    | 42.1                | 43   | 43.9  | 2.5          | 0.5       | < 0.1                   | 33  | < 5                  | 33  | < 90               | < 600                 | 0.04                                     | 0.12  |
| TZMB47-M    | 46.1                | 47   | 47.9  | 2.5          | 0.5       | < 0.1                   | 36  | < 5                  | 36  | < 110              | < 700                 | 0.04                                     | 0.12  |
| TZMB51-M    | 50                  | 51   | 52    | 2.5          | 0.5       | < 0.1                   | 39  | < 10                 | 39  | < 125              | < 700                 | 0.04                                     | 0.12  |
| TZMB56-M    | 54.9                | 56   | 57.1  | 2.5          | 0.5       | < 0.1                   | 43  | < 10                 | 43  | < 135              | < 1000                | 0.04                                     | 0.12  |
| TZMB62-M    | 60.8                | 62   | 63.2  | 2.5          | 0.5       | < 0.1                   | 47  | < 10                 | 47  | < 150              | < 1000                | 0.04                                     | 0.12  |
| TZMB68-M    | 66.6                | 68   | 69.4  | 2.5          | 0.5       | < 0.1                   | 51  | < 10                 | 51  | < 200              | < 1000                | 0.04                                     | 0.12  |
| TZMB75-M    | 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-M to TZMB75-M,  $I_R$  at 95 %  $V_{Zmin.} \leq 35\text{ nA}$  at  $T_j = 25\text{ }^{\circ}\text{C}$
- (1) at  $T_j = 150\text{ }^{\circ}\text{C}$

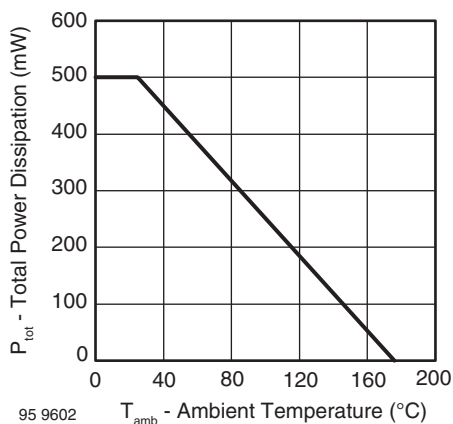
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

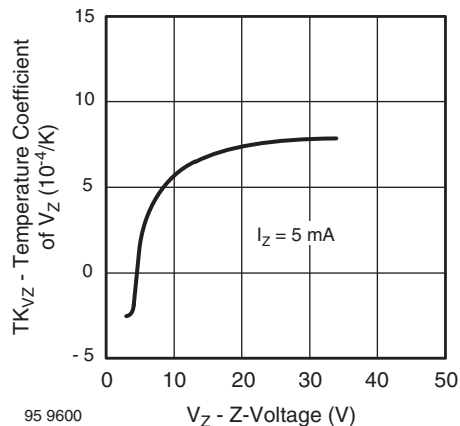
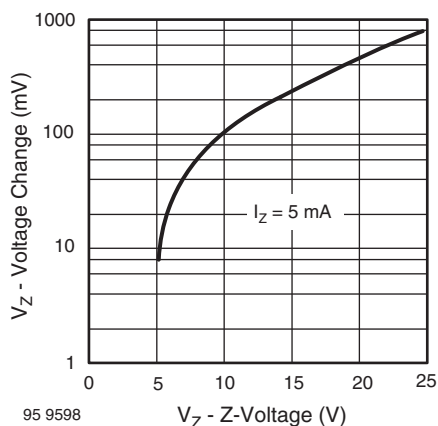
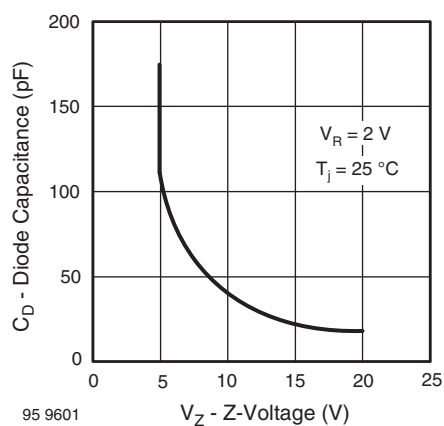

Fig. 4 - Temperature Coefficient of  $V_Z$  vs. Z-Voltage

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

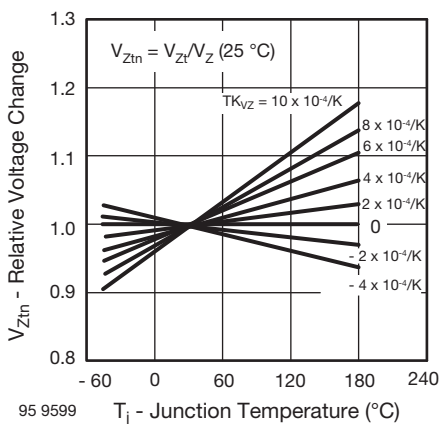


Fig. 3 - Typical Change of Working Voltage vs. Junction Temperature

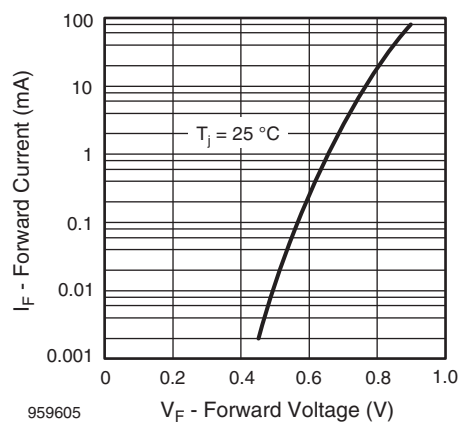


Fig. 6 - Forward Current vs. Forward Voltage

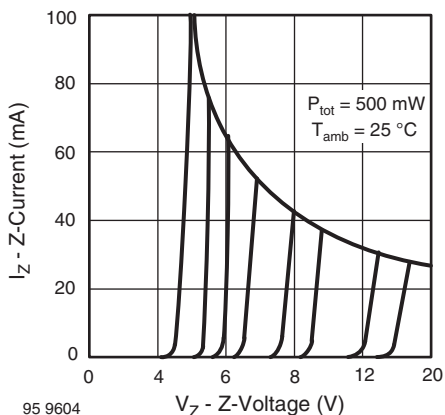


Fig. 7 - Z-Current vs. Z-Voltage

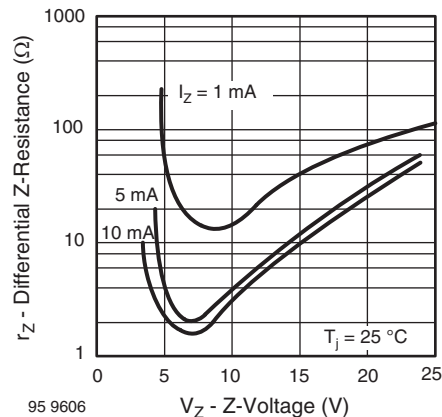


Fig. 9 - Differential Z-Resistance vs. Z-Voltage

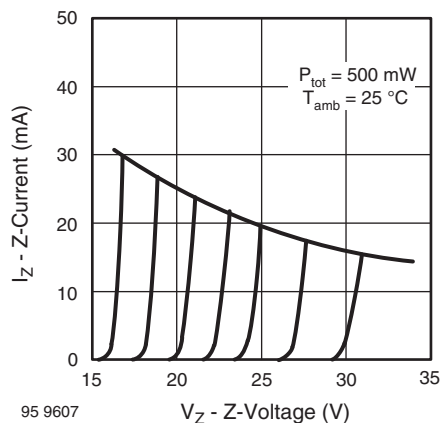


Fig. 8 - Z-Current vs. Z-Voltage

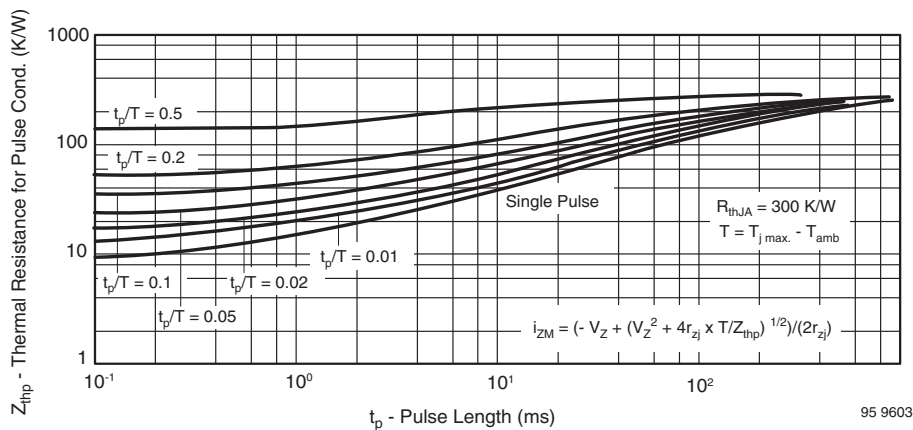
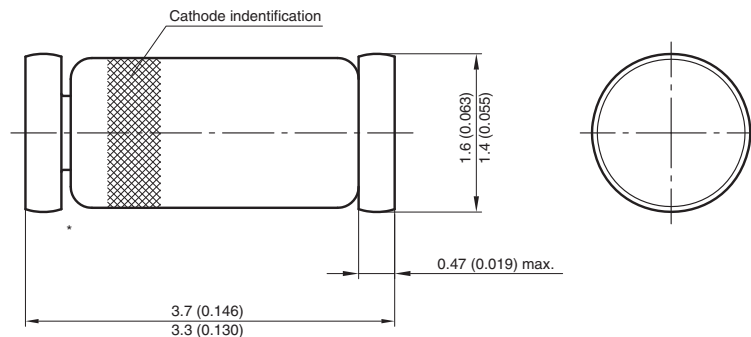


Fig. 10 - Thermal Response

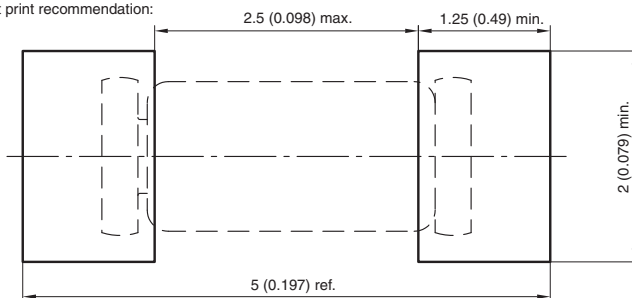


**PACKAGE DIMENSIONS** in millimeters (inches): **MiniMELF SOD-80**



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

Foot print recommendation:



Document no.: 6.560-5005.01-4  
Rev. 8 - Date: 07.June.2006  
96 12070



## Disclaimer

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