

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


RoHS
COMPLIANT

DESIGN SUPPORT TOOLS AVAILABLE



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 (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 |



| 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 | | μA | V | μA | V | Ω | | % / 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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, 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 | | 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_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)

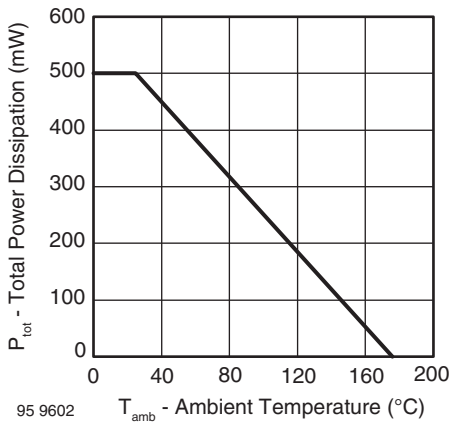


Fig. 1 - Total Power Dissipation vs. Ambient Temperature

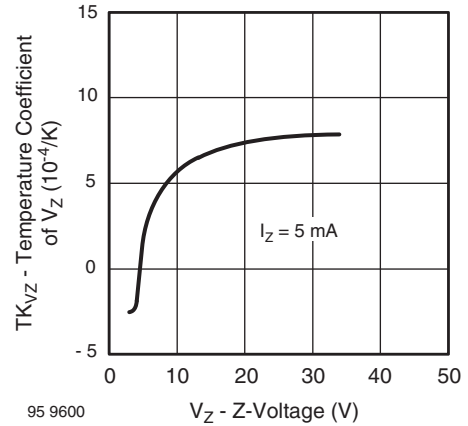


Fig. 4 - Temperature Coefficient of V_Z vs. Z-Voltage

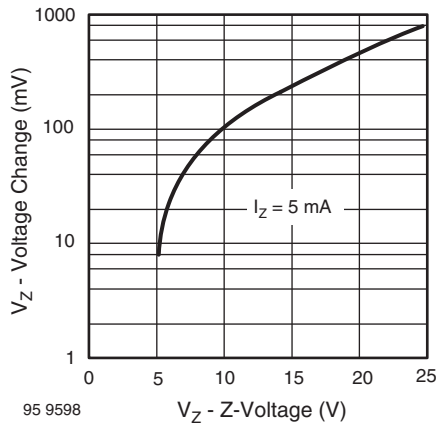


Fig. 2 - Typical Change of Working Voltage under Operating Conditions at $T_{amb} = 25\text{ }^{\circ}\text{C}$

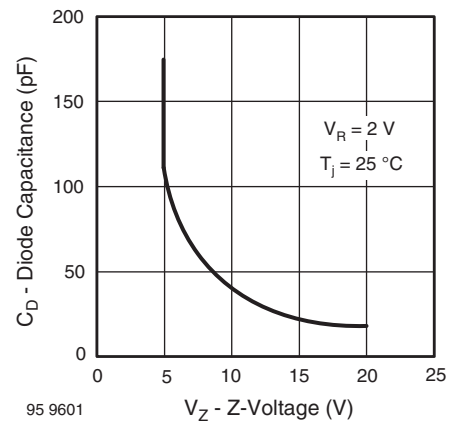


Fig. 5 - Diode Capacitance vs. Z-Voltage

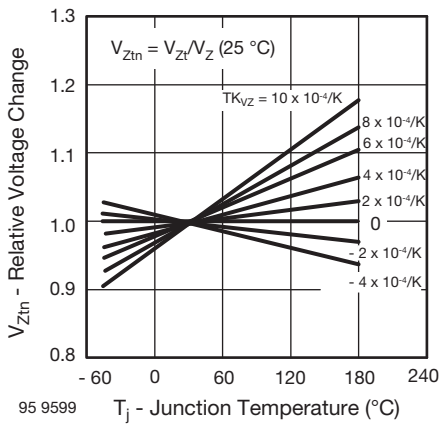


Fig. 3 - Typical Change of Working Voltage vs. Junction Temperature

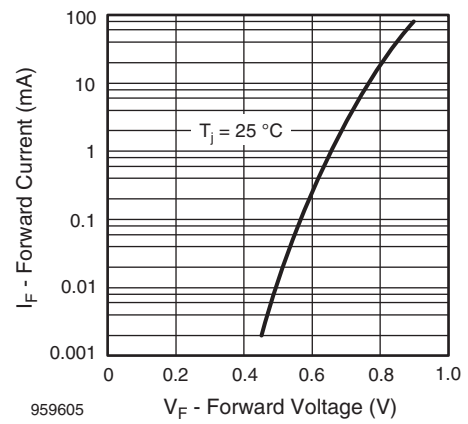


Fig. 6 - Forward Current vs. Forward Voltage



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



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

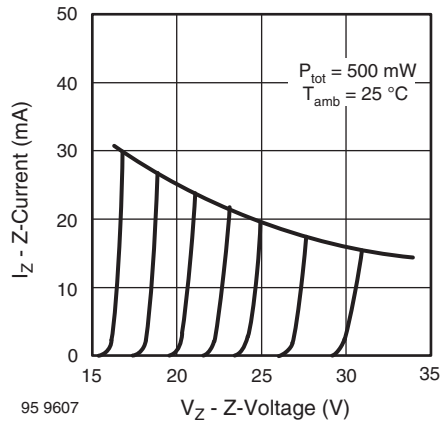


Fig. 8 - Z-Current vs. Z-Voltage

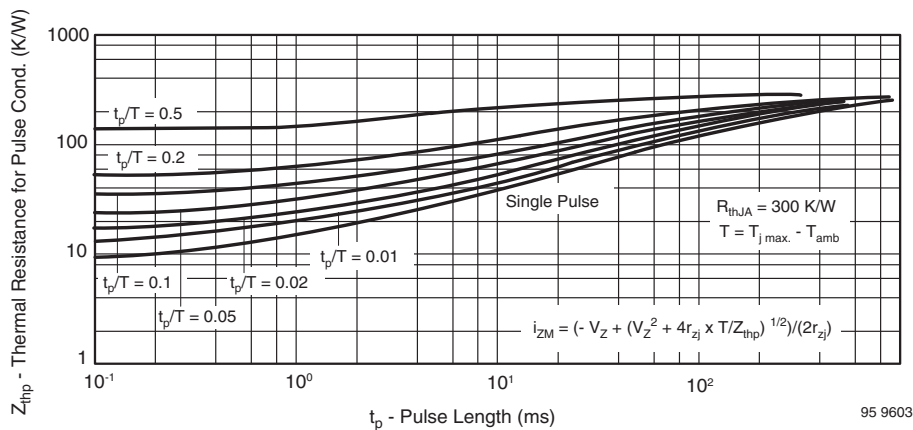
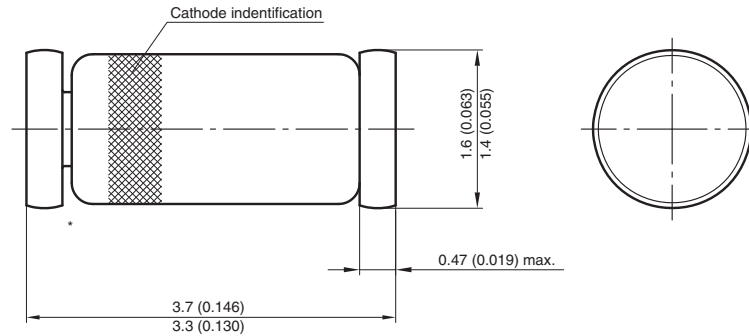


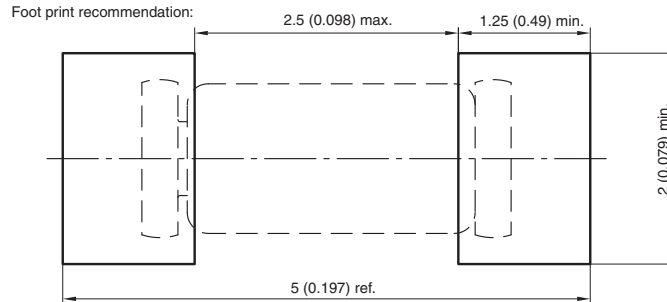
Fig. 10 - Thermal Response



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



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



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



Disclaimer

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

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

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

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

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

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