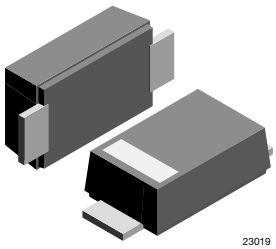
# Zener Diodes with Surge Current Specification

**eSMP® Series**



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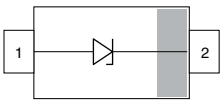



23018

**SMF (DO-219AB)**

## LINKS TO ADDITIONAL RESOURCES

3D Models

## FEATURES

AUTOMOTIVE GRADE Available

RoHS COMPLIANT

HALOGEN FREE

- Sillicon planar Zener diodes
- Voltage range includes 43 breakdown voltages from 3.6 V to 200 V with ± 2 % for BZD27B-M Series
- Low profile surface-mount package
- Zener and surge current specification
- Low leakage current
- Excellent stability
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Meets JESD 201 class 2 whisker test
- ESD capability according to AEC-Q101:
  human body model: > 8 kV
  machine model: > 800 V
- Wave and reflow solderable
- AEC-Q101 qualified available
- Base P/N-M3 - halogen-free, RoHS-compliant, and commercial grade
- Base P/N-HM3 - halogen-free, RoHS-compliant, and AEC-Q101 qualified (available on request)
- Compatible to SOD-123W package case outline or SOD-123F and SOD-123FL
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

## PRIMARY CHARACTERISTICS

| PARAMETER | VALUE | UNIT |
|---|---|---|
| $V_Z$ range nom. | 3.6 to 200 | V |
| Test current $I_{ZT}$ | 5 to 100 | mA |
| $V_{BR}$ | 7.35 to 196 | V |
| $V_{WM}$ | 6.2 to 160 | V |
| $P_{PPM}$ | 150 | W |
| $T_J$ max. | 175 | °C |
| $V_Z$ specification | Pulse current | |
| Int. construction | Single | |
| Polarity | Uni-directional | |

## ORDERING INFORMATION

| DEVICE NAME | ORDERING CODE | TAPED UNITS PER REEL | MINIMUM ORDER QUANTITY |
|---|---|---|---|
| BZD27B-M Series | BZD27B3V6P-M3-08 to BZD27B200P-M3-08 | 3000 per 7" reel (8mm tape) | MOQ = 30K |
| | BZD27B3V6P-M3-18 to BZD27B200P-M3-18 | 10 000 per 13" reel (8 mm tape) | MOQ = 50K |

## PACKAGE

| PACKAGE NAME | WEIGHT | MOLDING COMPOUND FLAMMABILITY RATING | MOISTURE SENSITIVITY LEVEL | WHISKER TEST ACC. JESD 201 | SOLDERING CONDITIONS |
|---|---|---|---|---|---|
| SMF (DO-219AB) | 15 mg | UL 94 V-0 | MSL level 1 (according J-STD-020) | Class 2 | Peak temperature max. 260 °C |

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

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| Power dissipation | $T_L$ = 105 °C | $P_{tot}$ | 2300 | mW |
| | $T_A$ = 30 °C (1) | $P_{tot}$ | 800 | mW |
| Non repetitive peak surge power dissipation (2) | 100 µs square pulse | $P_{ZSM}$ | 300 | W |
| | 10/1000 µs waveform | $P_{RSM}$ | 150 | W |
| Junction to lead | | $R_{thJL}$ | 30 | K/W |
| Junction to ambient air | Mounted on epoxy-glass PCB with 3 mm x 3 mm Cu pads (≥ 40 µm thick) | $R_{thJA}$ | 180 | K/W |
| Junction temperature | | $T_j$ | 175 | °C |
| Storage temperature range | | $T_{stg}$ | -65 to +175 | °C |
| Operating temperature range | | $T_{op}$ | -65 to +175 | °C |

**Notes**

(1) Mounted on epoxy-glass PCB with 3 mm x 3 mm Cu pads (≥ 40 µm thick)

(2) $T_J$ = 25 °C prior to surge

**ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified)

| PART NUMBER | MARKING CODE | ZENER VOLTAGE RANGE (1) | | | TEST CURRENT | REVERSE CURRENT | | DYNAMIC RESISTANCE | | TEMPERATURE COEFFICIENT | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_Z$ at $I_{ZT1}$ | | | $I_{ZT1}$ | $I_R$ at $V_R$ | | $Z_Z$ at $I_{ZT1}$ | | $\alpha_{VZ}$ at $I_{ZT1}$ | |
| | | V | | | mA | µA | V | Ω | | %/°C | |
| | | MIN. | NOM. | MAX. | | MAX. | | TYP. | MAX. | MIN. | MAX. |
| BZD27B3V6P-M | 0N | 3.53 | 3.6 | 3.67 | 100 | 100 | 1 | 4 | 8 | -0.14 | -0.04 |
| BZD27B3V9P-M | 1N | 3.82 | 3.9 | 3.98 | 100 | 50 | 1 | 4 | 8 | -0.14 | -0.04 |
| BZD27B4V3P-M | 2N | 4.21 | 4.3 | 4.39 | 100 | 25 | 1 | 4 | 7 | -0.12 | -0.02 |
| BZD27B4V7P-M | 3N | 4.61 | 4.7 | 4.79 | 100 | 10 | 1 | 3 | 7 | -0.1 | 0 |
| BZD27B5V1P-M | 4N | 5.00 | 5.1 | 5.20 | 100 | 5 | 1 | 3 | 6 | -0.08 | 0.02 |
| BZD27B5V6P-M | 5N | 5.49 | 5.6 | 5.71 | 100 | 10 | 2 | 2 | 4 | -0.04 | 0.04 |
| BZD27B6V2P-M | 6N | 6.08 | 6.2 | 6.32 | 100 | 5 | 2 | 2 | 3 | -0.01 | 0.06 |
| BZD27B6V8P-M | 7N | 6.66 | 6.8 | 6.94 | 100 | 10 | 3 | 1 | 3 | 0 | 0.07 |
| BZD27B7V5P-M | 8N | 7.35 | 7.5 | 7.65 | 100 | 50 | 3 | 1 | 2 | 0 | 0.07 |
| BZD27B8V2P-M | 9N | 8.04 | 8.2 | 8.36 | 100 | 10 | 3 | 1 | 2 | 0.03 | 0.08 |
| BZD27B9V1P-M | 0O | 8.92 | 9.1 | 9.28 | 50 | 10 | 5 | 2 | 4 | 0.03 | 0.08 |
| BZD27B10P-M | 1O | 9.80 | 10 | 10.20 | 50 | 7 | 7.5 | 2 | 4 | 0.05 | 0.09 |
| BZD27B11P-M | 2O | 10.78 | 11 | 11.22 | 50 | 4 | 8.2 | 4 | 7 | 0.05 | 0.1 |
| BZD27B12P-M | 3O | 11.76 | 12 | 12.24 | 50 | 3 | 9.1 | 4 | 7 | 0.05 | 0.1 |
| BZD27B13P-M | 4O | 12.74 | 13 | 13.26 | 50 | 2 | 10 | 5 | 10 | 0.05 | 0.1 |
| BZD27B15P-M | 5O | 14.70 | 15 | 15.30 | 50 | 1 | 11 | 5 | 10 | 0.05 | 0.1 |
| BZD27B16P-M | 6O | 15.68 | 16 | 16.32 | 25 | 1 | 12 | 6 | 15 | 0.06 | 0.11 |
| BZD27B18P-M | 7O | 17.64 | 18 | 18.36 | 25 | 1 | 13 | 6 | 15 | 0.06 | 0.11 |
| BZD27B20P-M | 8O | 19.60 | 20 | 20.40 | 25 | 1 | 15 | 6 | 15 | 0.06 | 0.11 |
| BZD27B22P-M | 9O | 21.56 | 22 | 22.44 | 25 | 1 | 16 | 6 | 15 | 0.06 | 0.11 |
| BZD27B24P-M | 0P | 23.52 | 24 | 24.48 | 25 | 1 | 18 | 7 | 15 | 0.06 | 0.11 |
| BZD27B27P-M | 1P | 26.46 | 27 | 27.54 | 25 | 1 | 20 | 7 | 15 | 0.06 | 0.11 |
| BZD27B30P-M | 2P | 29.40 | 30 | 30.60 | 25 | 1 | 22 | 8 | 15 | 0.06 | 0.11 |
| BZD27B33P-M | 3P | 32.34 | 33 | 33.66 | 25 | 1 | 24 | 8 | 15 | 0.06 | 0.11 |
| BZD27B36P-M | 4P | 35.28 | 36 | 36.72 | 10 | 1 | 27 | 21 | 40 | 0.06 | 0.11 |
| BZD27B39P-M | 5P | 38.22 | 39 | 39.78 | 10 | 1 | 30 | 21 | 40 | 0.06 | 0.11 |
| BZD27B43P-M | 6P | 42.14 | 43 | 43.86 | 10 | 1 | 33 | 24 | 45 | 0.07 | 0.12 |
| BZD27B47P-M | 7P | 46.06 | 47 | 47.94 | 10 | 1 | 36 | 24 | 45 | 0.07 | 0.12 |
| BZD27B51P-M | 8P | 49.98 | 51 | 52.02 | 10 | 1 | 39 | 25 | 60 | 0.07 | 0.12 |
| BZD27B56P-M | 9P | 54.88 | 56 | 57.12 | 10 | 1 | 43 | 25 | 60 | 0.07 | 0.12 |
| BZD27B62P-M | 0Q | 60.76 | 62 | 63.24 | 10 | 1 | 47 | 25 | 80 | 0.08 | 0.13 |
| BZD27B68P-M | 1Q | 66.64 | 68 | 69.36 | 10 | 1 | 51 | 25 | 80 | 0.08 | 0.13 |
| BZD27B75P-M | 2Q | 73.50 | 75 | 76.50 | 10 | 1 | 56 | 30 | 100 | 0.08 | 0.13 |
| BZD27B82P-M | 3Q | 80.36 | 82 | 83.64 | 10 | 1 | 62 | 30 | 100 | 0.08 | 0.13 |
| BZD27B91P-M | 4Q | 89.18 | 91 | 92.82 | 5 | 1 | 68 | 60 | 200 | 0.08 | 0.13 |
| BZD27B100P-M | 5Q | 98.00 | 100 | 102.00 | 5 | 1 | 75 | 60 | 200 | 0.09 | 0.13 |
| BZD27B110P-M | 6Q | 107.80 | 110 | 112.20 | 5 | 1 | 82 | 80 | 250 | 0.09 | 0.13 |
| BZD27B120P-M | 7Q | 117.60 | 120 | 122.40 | 5 | 1 | 91 | 80 | 250 | 0.09 | 0.13 |
| BZD27B130P-M | 8Q | 127.40 | 130 | 132.60 | 5 | 1 | 100 | 110 | 300 | 0.09 | 0.13 |
| BZD27B150P-M | 9Q | 147.00 | 150 | 153.00 | 5 | 1 | 110 | 130 | 300 | 0.09 | 0.13 |
| BZD27B160P-M | 0R | 156.80 | 160 | 163.20 | 5 | 1 | 120 | 150 | 350 | 0.09 | 0.13 |
| BZD27B180P-M | 1R | 176.40 | 180 | 183.60 | 5 | 1 | 130 | 180 | 400 | 0.09 | 0.13 |
| BZD27B200P-M | 2R | 196.00 | 200 | 204.00 | 5 | 1 | 150 | 200 | 500 | 0.09 | 0.13 |

**Notes**

- Electrical characteristics when used as regulator diodes
- Maximum $V_F$ = 1.2 V, at $I_F$ = 0.2 A

(1) Pulse test: $t_p \leq 5$ ms

**ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified)

| PART NUMBER | MARKING CODE | ZENER VOLTAGE RANGE | | | TEST CURRENT | REVERSE CURRENT | | CLAMPING VOLTAGE | | TEMPERATURE COEFFICIENT | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_Z$ at $I_{ZT1}$ | | | $I_{ZT1}$ | $I_R$ at $V_R$ | | $V_C$ at $I_{RSM}$ (1) | | $\alpha_{VZ}$ at $I_{ZT1}$ | |
| | | V | | | mA | µA | V | V | A | %/C | |
| | | MIN. | NOM. | MAX. | | MAX. | | MAX. | | MIN. | MAX. |
| BZD27B7V5P-M | 8N | 7.35 | 7.5 | 7.65 | 100 | 1500 | 6.2 | 10.9 | 13.3 | 0 | 0.07 |
| BZD27B8V2P-M | 9N | 8.04 | 8.2 | 8.36 | 100 | 1200 | 6.8 | 11.8 | 12.2 | 0.03 | 0.08 |
| BZD27B9V1P-M | 0O | 8.92 | 9.1 | 9.28 | 50 | 100 | 7.5 | 12.9 | 11.3 | 0.03 | 0.08 |
| BZD27B10P-M | 1O | 9.80 | 10 | 10.20 | 50 | 20 | 8.2 | 14.2 | 10.1 | 0.05 | 0.09 |
| BZD27B11P-M | 2O | 10.78 | 11 | 11.22 | 50 | 5 | 9.1 | 15.2 | 9.6 | 0.05 | 0.1 |
| BZD27B12P-M | 3O | 11.76 | 12 | 12.24 | 50 | 5 | 10 | 16 | 8.8 | 0.05 | 0.1 |
| BZD27B13P-M | 4O | 12.74 | 13 | 13.26 | 50 | 5 | 11 | 17.8 | 7.9 | 0.05 | 0.1 |
| BZD27B15P-M | 5O | 14.70 | 15 | 15.30 | 50 | 5 | 12 | 20.5 | 7.2 | 0.05 | 0.1 |
| BZD27B16P-M | 6O | 15.68 | 16 | 16.32 | 25 | 5 | 13 | 21.9 | 6.6 | 0.06 | 0.11 |
| BZD27B18P-M | 7O | 17.64 | 18 | 18.36 | 25 | 5 | 15 | 24.6 | 5.9 | 0.06 | 0.11 |
| BZD27B20P-M | 8O | 19.60 | 20 | 20.40 | 25 | 5 | 16 | 27.3 | 5.3 | 0.06 | 0.11 |
| BZD27B22P-M | 9O | 21.56 | 22 | 22.44 | 25 | 5 | 18 | 30 | 4.8 | 0.06 | 0.11 |
| BZD27B24P-M | 0P | 23.52 | 24 | 24.48 | 25 | 5 | 20 | 32.3 | 4.4 | 0.06 | 0.11 |
| BZD27B27P-M | 1P | 26.46 | 27 | 27.54 | 25 | 5 | 22 | 36.3 | 3.9 | 0.06 | 0.11 |
| BZD27B30P-M | 2P | 29.40 | 30 | 30.60 | 25 | 5 | 24 | 40.4 | 3.6 | 0.06 | 0.11 |
| BZD27B33P-M | 3P | 32.34 | 33 | 33.66 | 25 | 5 | 27 | 44.4 | 3.2 | 0.06 | 0.11 |
| BZD27B36P-M | 4P | 35.28 | 36 | 36.72 | 10 | 5 | 30 | 48.4 | 3 | 0.06 | 0.11 |
| BZD27B39P-M | 5P | 38.22 | 39 | 39.78 | 10 | 5 | 33 | 52.5 | 2.8 | 0.06 | 0.11 |
| BZD27B43P-M | 6P | 42.14 | 43 | 43.86 | 10 | 5 | 36 | 57.9 | 2.5 | 0.07 | 0.12 |
| BZD27B47P-M | 7P | 46.06 | 47 | 47.94 | 10 | 5 | 39 | 62.8 | 2.3 | 0.07 | 0.12 |
| BZD27B51P-M | 8P | 49.98 | 51 | 52.02 | 10 | 5 | 43 | 68.2 | 2.1 | 0.07 | 0.12 |
| BZD27B56P-M | 9P | 54.88 | 56 | 57.12 | 10 | 5 | 47 | 74.8 | 1.9 | 0.07 | 0.12 |
| BZD27B62P-M | 0Q | 60.76 | 62 | 63.24 | 10 | 5 | 51 | 82.9 | 1.7 | 0.08 | 0.13 |
| BZD27B68P-M | 1Q | 66.64 | 68 | 69.36 | 10 | 5 | 56 | 90.9 | 1.6 | 0.08 | 0.13 |
| BZD27B75P-M | 2Q | 73.50 | 75 | 76.50 | 10 | 5 | 62 | 100.2 | 1.5 | 0.08 | 0.13 |
| BZD27B82P-M | 3Q | 80.36 | 82 | 83.64 | 10 | 5 | 68 | 110 | 1.3 | 0.08 | 0.13 |
| BZD27B91P-M | 4Q | 89.18 | 91 | 92.82 | 5 | 5 | 75 | 122 | 1.2 | 0.09 | 0.13 |
| BZD27B100P-M | 5Q | 98.00 | 100 | 102.00 | 5 | 5 | 82 | 134 | 1.1 | 0.09 | 0.13 |
| BZD27B110P-M | 6Q | 107.80 | 110 | 112.20 | 5 | 5 | 91 | 145 | 1 | 0.09 | 0.13 |
| BZD27B120P-M | 7Q | 117.60 | 120 | 122.40 | 5 | 5 | 100 | 161 | 0.9 | 0.09 | 0.13 |
| BZD27B130P-M | 8Q | 127.40 | 130 | 132.60 | 5 | 5 | 110 | 174 | 0.81 | 0.09 | 0.13 |
| BZD27B150P-M | 9Q | 147.00 | 150 | 153.00 | 5 | 5 | 120 | 201 | 0.73 | 0.09 | 0.13 |
| BZD27B160P-M | 0R | 156.80 | 160 | 163.20 | 5 | 5 | 130 | 214 | 0.67 | 0.09 | 0.13 |
| BZD27B180P-M | 1R | 176.40 | 180 | 183.60 | 5 | 5 | 150 | 242 | 0.6 | 0.09 | 0.13 |
| BZD27B200P-M | 2R | 196.00 | 200 | 204.00 | 5 | 5 | 160 | 268 | 0.54 | 0.09 | 0.13 |

**Notes**

- Electrical characteristics when used as protection diodes

(1) Non-repetitive peak reverse current in accordance with “IEC 60-1, section 8” (10/1000 µs pulse); see fig. 4

**TYPICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified)

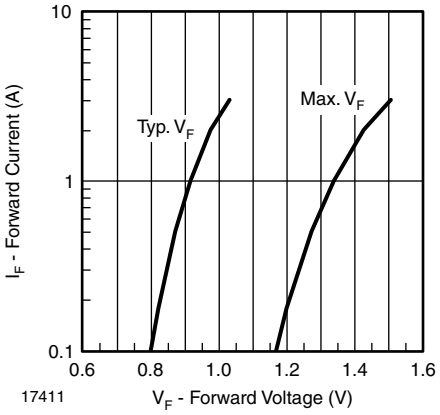



Fig. 1 - Forward Current vs. Forward Voltage

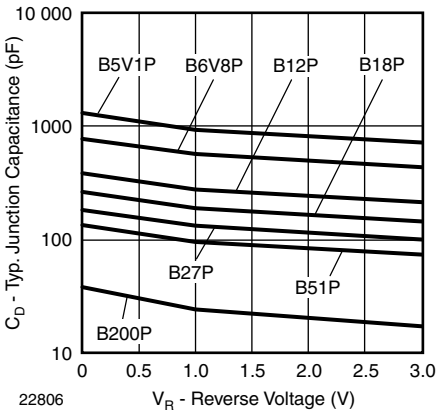



Fig. 2 - Typ. Diode Capacitance vs. Reverse Voltage

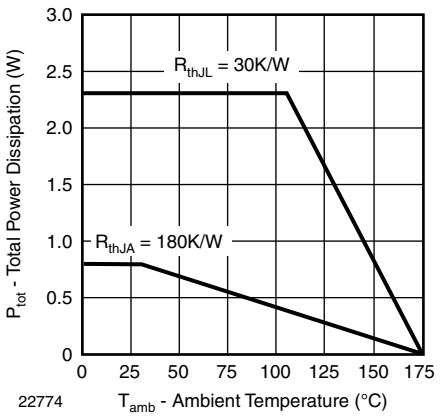



Fig. 3 - Power Dissipation vs. Ambient Temperature

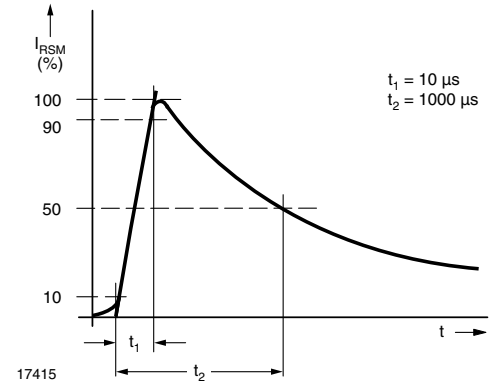



Fig. 4 - Non-Repetitive Peak Reverse Current Pulse Definition

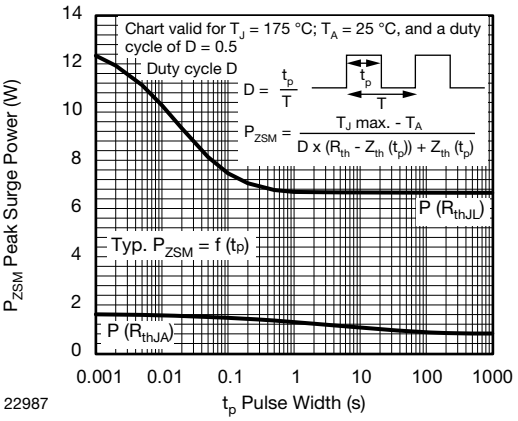



Fig. 5 - Typical Repetitive Peak Surge Power

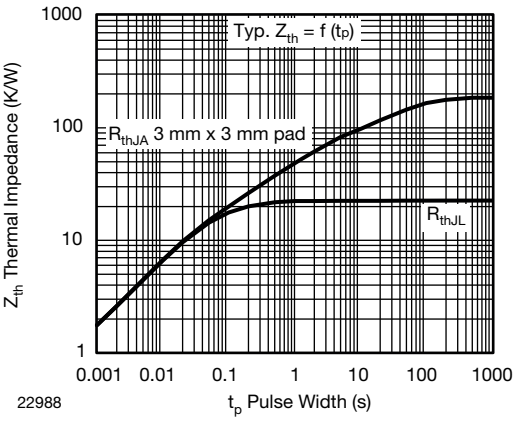
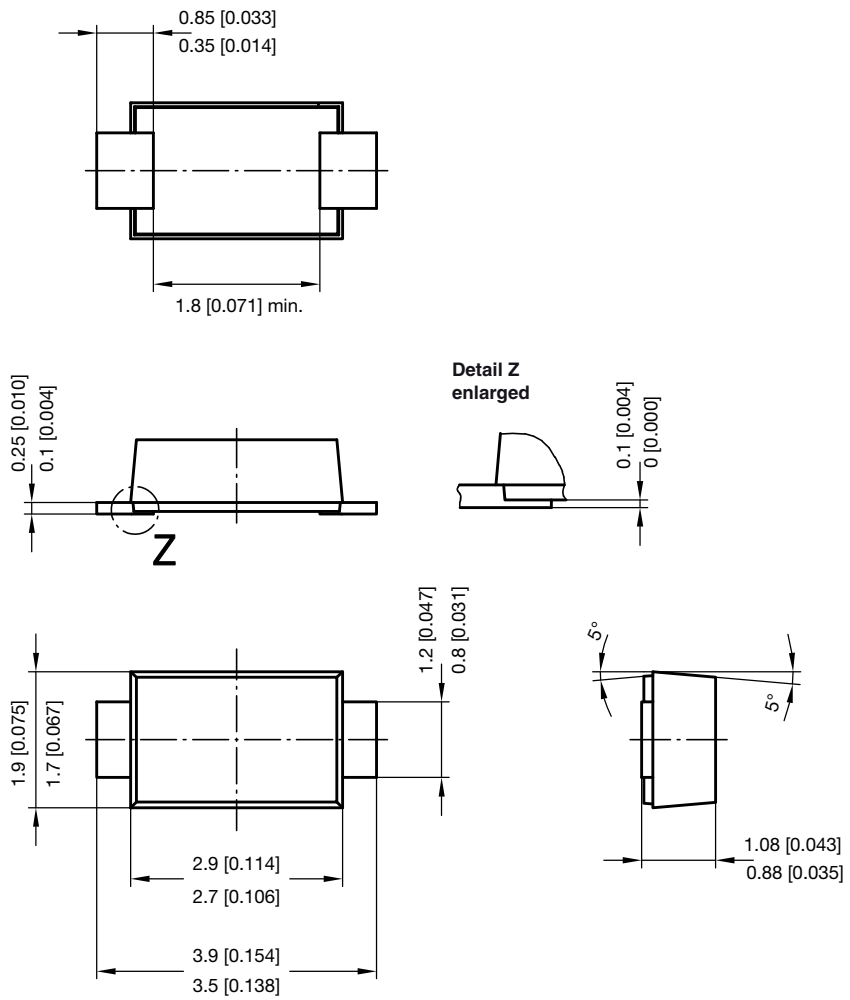


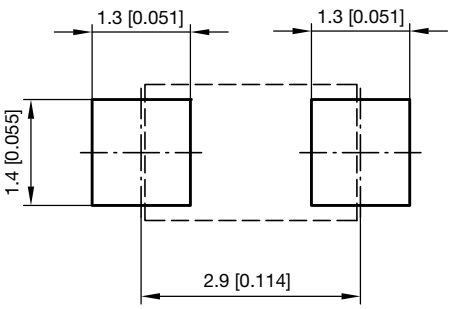

Fig. 6 - Typical Thermal Impedance vs. Time

**PACKAGE DIMENSIONS** in millimeters (inches): **SMF (DO-219AB)**




foot print recommendation:

Reflow soldering

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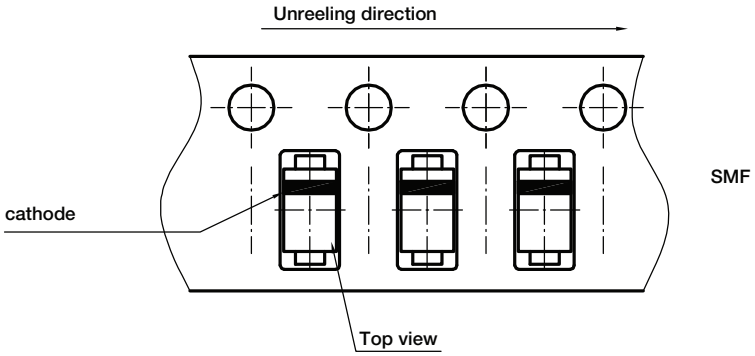
## ORIENTATION IN CARRIER TAPE - SMF (DO-219AB)

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