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# Small Signal Zener Diodes



## FEATURES

- Silicon planar Zener diodes
- The Zener voltages are graded according to the international E24 standard
- AEC-Q101 qualified
- ESD capability according to AEC-Q101:
  Human body model > 8 kV
  Machine model > 800 V
- Base P/N-E3 - RoHS-compliant, commercial grade
- Base P/N-HE3 - RoHS-compliant, AEC-Q101 qualified
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

## 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 | |
| Int. construction | Single | |

## ORDERING INFORMATION

| DEVICE NAME | ORDERING CODE | TAPED UNITS PER REEL | MINIMUM ORDER QUANTITY |
|---|---|---|---|
| BZT52-series | BZT52C2V4-E3-08 to BZT52C75-E3-08 | 3000 (8 mm tape on 7" reel) | 15 000/box |
| | BZT52B2V4-E3-08 to BZT52B75-E3-08 | | |
| | BZT52C2V4-HE3-08 to BZT52C75-HE3-08 | | |
| | BZT52B2V4-HE3-08 to BZT52B75-HE3-08 | | |
| | BZT52C2V4-E3-18 to BZT52C75-E3-18 | 10 000 (8 mm tape on 13" reel) | 10 000/box |
| | BZT52B2V4-E3-18 to BZT52B75-E3-18 | | |
| | BZT52C2V4-HE3-18 to BZT52C75-HE3-18 | | |
| | BZT52B2V4-HE3-18 to BZT52B75-HE3-18 | | |

## PACKAGE

| PACKAGE NAME | WEIGHT | MOLDING COMPOUND FLAMMABILITY RATING | MOISTURE SENSITIVITY LEVEL | SOLDERING CONDITIONS |
|---|---|---|---|---|
| SOD-123 | 10.3 mg | UL 94 V-0 | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |

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

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| Power dissipation | Diode on ceramic substrate 0.7 mm; 5 mm² pad areas | $P_{tot}$ | 500 | mW |
| | Diode on ceramic substrate 0.7 mm; 2.5 mm² pad areas | $P_{tot}$ | 410 | mW |
| Zener current | See table “Electrical Characteristics “ | | | |
| Thermal resistance junction to ambient air | Valid provided that electrodes are kept at ambient temperature | $R_{thJA}$ | 300 | K/W |
| Junction temperature | | $T_j$ | 150 | °C |
| Storage temperature range | | $T_{stg}$ | - 65 to + 150 | °C |
| Operating temperature range | | $T_{op}$ | - 55 to + 150 | °C |



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

| PART NUMBER | MARKING CODE | ZENER VOLTAGE RANGE (1) | | | TEST CURRENT | | REVERSE VOLTAGE | | DYNAMIC RESISTANCE | | TEMP. COEFFICIENT | ADMISSABLE ZENER CURRENT (4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_Z$ at $I_{ZT1}$ | | | $I_{ZT1}$ | $I_{ZT2}$ | $V_R$ at $I_R$ | | $Z_Z$ at $I_{ZT1}$ | $Z_{ZK}$ at $I_{ZT2}$ | $\alpha_{VZ}$ | $I_Z$ at $T_{amb}$ = 45 °C | $I_Z$ at $T_{amb}$ = 25 °C |
| | | V | | | mA | | V | nA | Ω | | $10^{-4}$/°C | mA | |
| | | MIN. | NOM. | MAX. | | | | | | | | | |
| BZT52C2V4 | W1 | 2.2 | 2.4 | 2.6 | 5 | 1 | - | - | 85 | 600 | - 9 to - 4 | - | - |
| BZT52C2V7 | W2 | 2.5 | 2.7 | 2.9 | 5 | 1 | - | - | 75 (< 83) | < 500 | - 9 to - 4 | 113 | 134 |
| BZT52C3V0 | W3 | 2.8 | 3.0 | 3.2 | 5 | 1 | - | - | 80 (< 95) | < 500 | - 9 to - 3 | 98 | 118 |
| BZT52C3V3 | W4 | 3.1 | 3.3 | 3.5 | 5 | 1 | - | - | 80 (< 95) | < 500 | - 8 to - 3 | 92 | 109 |
| BZT52C3V6 | W5 | 3.4 | 3.6 | 3.8 | 5 | 1 | - | - | 80 (< 95) | < 500 | - 8 to - 3 | 85 | 100 |
| BZT52C3V9 | W6 | 3.7 | 3.9 | 4.1 | 5 | 1 | - | - | 80 (< 95) | < 500 | - 7 to - 3 | 77 | 92 |
| BZT52C4V3 | W7 | 4 | 4.3 | 4.6 | 5 | 1 | - | - | 80 (< 95) | < 500 | - 6 to - 1 | 71 | 84 |
| BZT52C4V7 | W8 | 4.4 | 4.7 | 5 | 5 | 1 | - | - | 70 (< 78) | < 500 | - 5 to + 2 | 64 | 76 |
| BZT52C5V1 | W9 | 4.8 | 5.1 | 5.4 | 5 | 1 | > 0.8 | 100 | 30 (< 60) | < 480 | - 3 to + 4 | 56 | 67 |
| BZT52C5V6 | WA | 5.2 | 5.6 | 6 | 5 | 1 | > 1 | 100 | 10 (< 40) | < 400 | - 2 to + 6 | 50 | 59 |
| BZT52C6V2 | WB | 5.8 | 6.2 | 6.6 | 5 | 1 | > 2 | 100 | 4.8 (< 10) | < 200 | - 1 to + 7 | 45 | 54 |
| BZT52C6V8 | WC | 6.4 | 6.8 | 7.2 | 5 | 1 | > 3 | 100 | 4.5 (< 8) | < 150 | + 2 to + 7 | 41 | 49 |
| BZT52C7V5 | WD | 7 | 7.5 | 7.9 | 5 | 1 | > 5 | 100 | 4 (< 7) | < 50 | + 3 to + 7 | 37 | 44 |
| BZT52C8V2 | WE | 7.7 | 8.2 | 8.7 | 5 | 1 | > 6 | 100 | 4.5 (< 7) | < 50 | + 4 to + 7 | 34 | 40 |
| BZT52C9V1 | WF | 8.5 | 9.1 | 9.6 | 5 | 1 | > 7 | 100 | 4.8 (< 10) | < 50 | + 5 to + 8 | 30 | 36 |
| BZT52C10 | WG | 9.4 | 10 | 10.6 | 5 | 1 | > 7.5 | 100 | 5.2 (< 15) | < 70 | + 5 to + 8 | 28 | 33 |
| BZT52C11 | WH | 10.4 | 11 | 11.6 | 5 | 1 | > 8.5 | 100 | 6 (< 20) | < 70 | + 5 to + 9 | 25 | 30 |
| BZT52C12 | WI | 11.4 | 12 | 12.7 | 5 | 1 | > 9 | 100 | 7 (< 20) | < 90 | + 6 to + 9 | 23 | 28 |
| BZT52C13 | WK | 12.4 | 13 | 14.1 | 5 | 1 | > 10 | 100 | 9 (< 25) | < 110 | + 7 to + 9 | 21 | 25 |
| BZT52C15 | WL | 13.8 | 15 | 15.6 | 5 | 1 | > 11 | 100 | 11 (< 30) | < 110 | + 7 to + 9 | 19 | 23 |
| BZT52C16 | WM | 15.3 | 16 | 17.1 | 5 | 1 | > 12 | 100 | 13 (< 40) | < 170 | + 8 to + 9.5 | 17 | 20 |
| BZT52C18 | WN | 16.8 | 18 | 19.1 | 5 | 1 | > 14 | 100 | 18 (< 50) | < 170 | + 8 to + 9.5 | 15 | 18 |
| BZT52C20 | WO | 18.8 | 20 | 21.2 | 5 | 1 | > 15 | 100 | 20 (< 50) | < 220 | + 8 to + 10 | 14 | 17 |
| BZT52C22 | WP | 20.8 | 22 | 23.3 | 5 | 1 | > 17 | 100 | 25 (< 55) | < 220 | + 8 to + 10 | 13 | 16 |
| BZT52C24 | WR | 22.8 | 24 | 25.6 | 5 | 1 | > 18 | 100 | 28 (< 80) | < 220 | + 8 to + 10 | 11 | 13 |
| BZT52C27 | WS | 25.1 | 27 | 28.9 | 5 | 1 | > 20 | 100 | 30 (< 80) | < 250 | + 8 to + 10 | 10 | 12 |
| BZT52C30 | WT | 28 | 30 | 32 | 5 | 1 | > 22.5 | 100 | 35 (< 80) | < 250 | + 8 to + 10 | 9 | 10 |
| BZT52C33 | WU | 31 | 33 | 35 | 5 | 1 | > 25 | 100 | 40 (< 80) | < 250 | + 8 to + 10 | 8 | 9 |
| BZT52C36 | WW | 34 | 36 | 38 | 5 | 1 | > 27 | 100 | 40 (< 90) | < 250 | + 8 to + 10 | 8 | 9 |
| BZT52C39 | WX | 37 | 39 | 41 | 5 | 1 | > 29 | 100 | 50 (< 90) | < 300 | + 10 to + 12 | 7 | 8 |
| BZT52C43 | WY | 40 | 43 | 46 | 5 | 1 | > 32 | 100 | 60 (< 100) | < 700 | + 10 to + 12 | 6 | 7 |
| BZT52C47 | WZ | 44 | 47 | 50 | 5 | 1 | > 35 | 100 | 70 (< 100) | < 750 | + 10 to + 12 | 5 | 6 |
| BZT52C51 | X1 | 48 | 51 | 54 | 5 | 1 | > 38 | 100 | 70 (< 100) | < 750 | + 10 to + 12 | 5 | 6 |
| BZT52C56 | X2 | 52 | 56 | 60 | 2.5 | 0.5 | - | - | < 135 (2) | < 1000 (3) | typ. +10 (2) | - | - |
| BZT52C62 | X3 | 58 | 62 | 66 | 2.5 | 0.5 | - | - | < 150 (2) | < 1000 (3) | typ. +10 (2) | - | - |
| BZT52C68 | X4 | 64 | 68 | 72 | 2.5 | 0.5 | - | - | < 200 (2) | < 1000 (3) | typ. +10 (2) | - | - |
| BZT52C75 | X5 | 70 | 75 | 79 | 2.5 | 0.5 | - | - | < 250 (2) | < 1500 (3) | typ. +10 (2) | - | - |

**Notes**

- $I_{ZT1}$ = 5 mA, $I_{ZT2}$ = 1 mA

(1) Measured with pulses $t_p$ = 5 ms
(2) $I_{ZT1}$ = 2.5 mA
(3) $I_{ZT2}$ = 0.5 mA
(4) Valid provided that electrodes are kept at ambient temperature


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

| PART NUMBER | MARKING CODE | ZENER VOLTAGE RANGE (1) | | | TEST CURRENT | | REVERSE VOLTAGE | | DYNAMIC RESISTANCE | | TEMP. COEFFICIENT | ADMISSABLE ZENER CURRENT (4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_Z$ at $I_{ZT1}$ | | | $I_{ZT1}$ | $I_{ZT2}$ | $V_R$ at $I_R$ | | $Z_Z$ at $I_{ZT1}$ | $Z_{ZK}$ at $I_{ZT2}$ | $\alpha_{VZ}$ | $I_Z$ at $T_{amb}$ = 45 °C | $I_Z$ at $T_{amb}$ = 25 °C |
| | | V | | | mA | | V | nA | Ω | | $10^{-4}$/°C | mA | |
| | | MIN. | NOM. | MAX. | | | | | | | | | |
| BZT52B2V4 | W1 | 2.35 | 2.4 | 2.45 | 5 | 1 | - | - | 85 | 600 | - 9 to - 4 | - | - |
| BZT52B2V7 | W2 | 2.65 | 2.7 | 2.75 | 5 | 1 | - | - | 75 (< 83) | < 500 | - 9 to - 4 | 113 | 134 |
| BZT52B3V0 | W3 | 2.94 | 3.0 | 3.06 | 5 | 1 | - | - | 80 (< 95) | < 500 | - 9 to - 3 | 98 | 118 |
| BZT52B3V3 | W4 | 3.23 | 3.3 | 3.37 | 5 | 1 | - | - | 80 (< 95) | < 500 | - 8 to - 3 | 92 | 109 |
| BZT52B3V6 | W5 | 3.53 | 3.6 | 3.67 | 5 | 1 | - | - | 80 (< 95) | < 500 | - 8 to - 3 | 85 | 100 |
| BZT52B3V9 | W6 | 3.82 | 3.9 | 3.98 | 5 | 1 | - | - | 80 (< 95) | < 500 | - 7 to - 3 | 77 | 92 |
| BZT52B4V3 | W7 | 4.21 | 4.3 | 4.39 | 5 | 1 | - | - | 80 (< 95) | < 500 | - 6 to - 1 | 71 | 84 |
| BZT52B4V7 | W8 | 4.61 | 4.7 | 4.79 | 5 | 1 | - | - | 70 (< 78) | < 500 | - 5 to + 2 | 64 | 76 |
| BZT52B5V1 | W9 | 5 | 5.1 | 5.2 | 5 | 1 | > 0.8 | 100 | 30 (< 60) | < 480 | - 3 to + 4 | 56 | 67 |
| BZT52B5V6 | WA | 5.49 | 5.6 | 5.71 | 5 | 1 | > 1 | 100 | 10 (< 40) | < 400 | - 2 to + 6 | 50 | 59 |
| BZT52B6V2 | WB | 6.08 | 6.2 | 6.32 | 5 | 1 | > 2 | 100 | 4.8 (< 10) | < 200 | - 1 to + 7 | 45 | 54 |
| BZT52B6V8 | WC | 6.66 | 6.8 | 6.94 | 5 | 1 | > 3 | 100 | 4.5 (< 8) | < 150 | + 2 to + 7 | 41 | 49 |
| BZT52B7V5 | WD | 7.35 | 7.5 | 7.65 | 5 | 1 | > 5 | 100 | 4 (< 7) | < 50 | + 3 to + 7 | 37 | 44 |
| BZT52B8V2 | WE | 8.04 | 8.2 | 8.36 | 5 | 1 | > 6 | 100 | 4.5 (< 7) | < 50 | + 4 to + 7 | 34 | 40 |
| BZT52B9V1 | WF | 8.92 | 9.1 | 9.28 | 5 | 1 | > 7 | 100 | 4.8 (< 10) | < 50 | + 5 to + 8 | 30 | 36 |
| BZT52B10 | WG | 9.8 | 10 | 10.2 | 5 | 1 | > 7.5 | 100 | 5.2 (< 15) | < 70 | + 5 to + 8 | 28 | 33 |
| BZT52B11 | WH | 10.8 | 11 | 11.2 | 5 | 1 | > 8.5 | 100 | 6 (< 20) | < 70 | + 5 to + 9 | 25 | 30 |
| BZT52B12 | WI | 11.8 | 12 | 12.2 | 5 | 1 | > 9 | 100 | 7 (< 20) | < 90 | + 6 to + 9 | 23 | 28 |
| BZT52B13 | WK | 12.7 | 13 | 13.3 | 5 | 1 | > 10 | 100 | 9 (< 25) | < 110 | + 7 to + 9 | 21 | 25 |
| BZT52B15 | WL | 14.7 | 15 | 15.3 | 5 | 1 | > 11 | 100 | 11 (< 30) | < 110 | + 7 to + 9 | 19 | 23 |
| BZT52B16 | WM | 15.7 | 16 | 16.3 | 5 | 1 | > 12 | 100 | 13 (< 40) | < 170 | + 8 to + 9.5 | 17 | 20 |
| BZT52B18 | WN | 17.6 | 18 | 18.4 | 5 | 1 | > 14 | 100 | 18 (< 50) | < 170 | + 8 to + 9.5 | 15 | 18 |
| BZT52B20 | WO | 19.6 | 20 | 20.4 | 5 | 1 | > 15 | 100 | 20 (< 50) | < 220 | + 8 to + 10 | 14 | 17 |
| BZT52B22 | WP | 21.6 | 22 | 22.4 | 5 | 1 | > 17 | 100 | 25 (< 55) | < 220 | + 8 to + 10 | 13 | 16 |
| BZT52B24 | WR | 23.5 | 24 | 24.5 | 5 | 1 | > 18 | 100 | 28 (< 80) | < 220 | + 8 to + 10 | 11 | 13 |
| BZT52B27 | WS | 26.5 | 27 | 27.5 | 5 | 1 | > 20 | 100 | 30 (< 80) | < 250 | + 8 to + 10 | 10 | 12 |
| BZT52B30 | WT | 29.4 | 30 | 30.6 | 5 | 1 | > 22.5 | 100 | 35 (< 80) | < 250 | + 8 to + 10 | 9 | 10 |
| BZT52B33 | WU | 32.3 | 33 | 33.7 | 5 | 1 | > 25 | 100 | 40 (< 80) | < 250 | + 8 to + 10 | 8 | 9 |
| BZT52B36 | WW | 35.3 | 36 | 36.7 | 5 | 1 | > 27 | 100 | 40 (< 90) | < 250 | + 8 to + 10 | 8 | 9 |
| BZT52B39 | WX | 38.2 | 39 | 39.8 | 5 | 1 | > 29 | 100 | 50 (< 90) | < 300 | + 10 to + 12 | 7 | 8 |
| BZT52B43 | WY | 42.1 | 43 | 43.9 | 5 | 1 | > 32 | 100 | 60 (< 100) | < 700 | + 10 to + 12 | 6 | 7 |
| BZT52B47 | WZ | 46.1 | 47 | 47.9 | 5 | 1 | > 35 | 100 | 70 (< 100) | < 750 | + 10 to + 12 | 5 | 6 |
| BZT52B51 | X1 | 50 | 51 | 52 | 5 | 1 | > 38 | 100 | 70 (< 100) | < 750 | + 10 to + 12 | 5 | 6 |
| BZT52B56 | X2 | 54.9 | 56 | 57.1 | 2.5 | 0.5 | - | - | < 135 (2) | < 1000 (3) | typ. + 10 (2) | - | - |
| BZT52B62 | X3 | 60.8 | 62 | 63.2 | 2.5 | 0.5 | - | - | < 150 (2) | < 1000 (3) | typ. + 10 (2) | - | - |
| BZT52B68 | X4 | 66.6 | 68 | 69.4 | 2.5 | 0.5 | - | - | < 200 (2) | < 1000 (3) | typ. + 10 (2) | - | - |
| BZT52B75 | X5 | 73.5 | 75 | 76.5 | 2.5 | 0.5 | - | - | < 250 (2) | < 1500 (3) | typ. + 10 (2) | - | - |

**Notes**

- $I_{ZT1}$ = 5 mA, $I_{ZT2}$ = 1 mA

(1) Measured with pulses $t_p$ = 5 ms
(2) $I_{ZT1}$ = 2.5 mA
(3) $I_{ZT2}$ = 0.5 mA
(4) Valid provided that electrodes are kept at ambient temperature


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

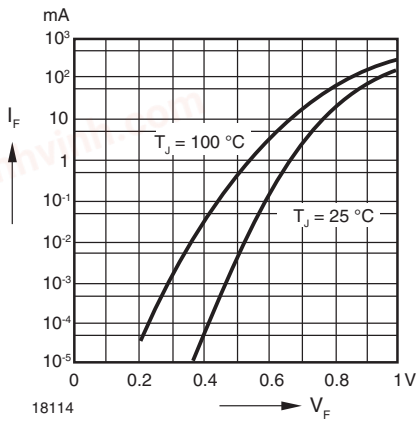



Fig. 1 - Forward characteristics

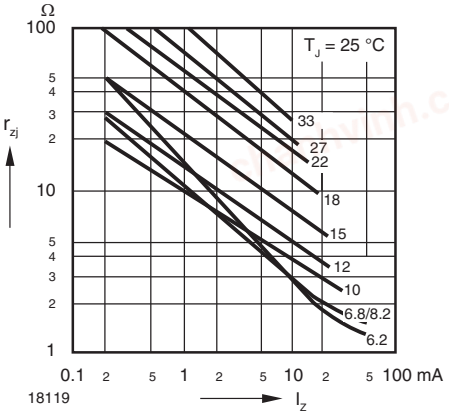



Fig. 4 - Dynamic Resistance vs. Zener Current

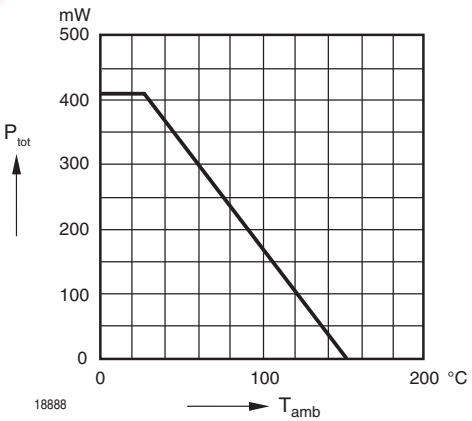



Fig. 2 - Admissible Power Dissipation vs. Ambient Temperature

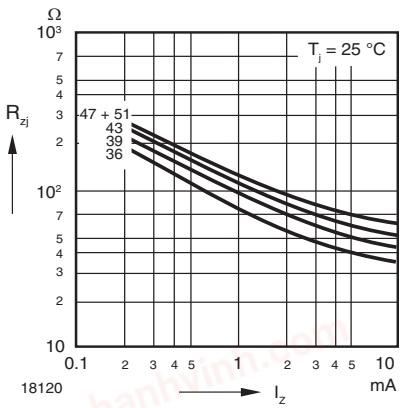



Fig. 5 - Dynamic Resistance vs. Zener Current

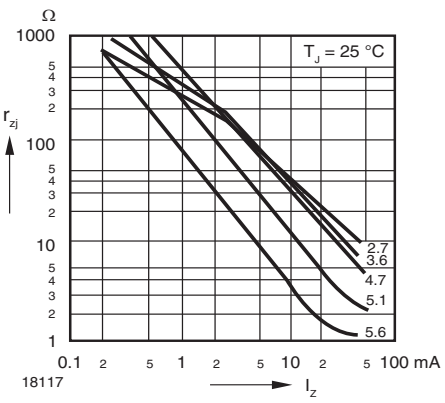



Fig. 3 - Dynamic Resistance vs. Zener Current

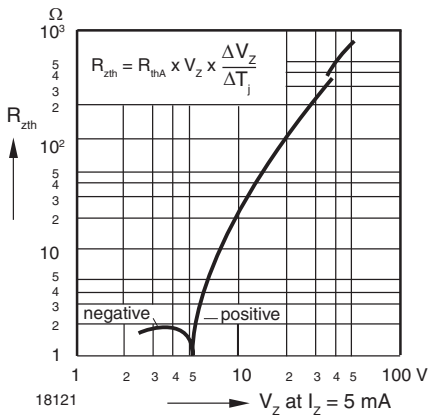



Fig. 6 - Thermal Differential Resistance vs. Zener Voltage


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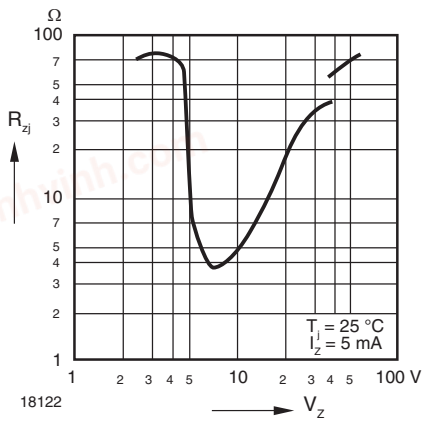



Fig. 7 - Dynamic Resistance vs. Zener Voltage

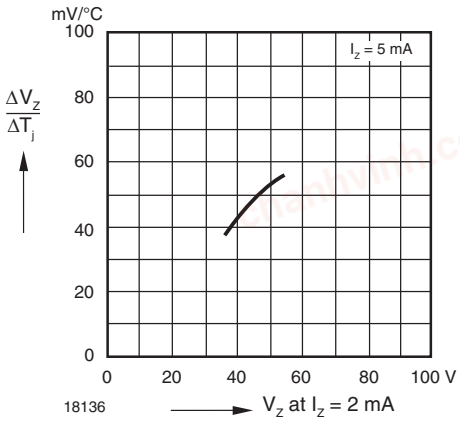



Fig. 10 - Temperature Dependence of Zener Voltage vs. Zener Voltage

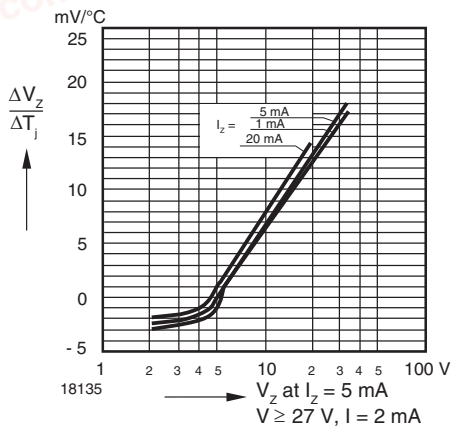



Fig. 8 - Temperature Dependence of Zener Voltage vs. Zener Voltage

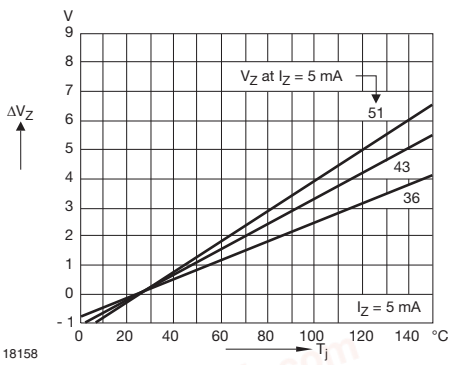



Fig. 11 - Change of Zener Voltage vs. Junction Temperature

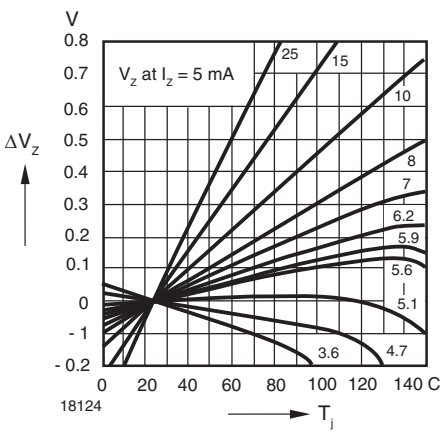



Fig. 9 - Change of Zener Voltage vs. Junction Temperature

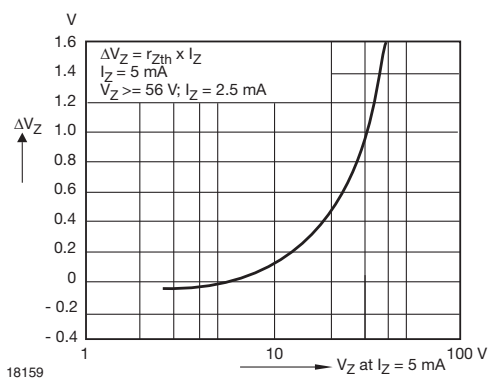



Fig. 12 - Change of Zener Voltage from Turn-on up to the Point of Thermal Equilibrium vs. Zener Voltage


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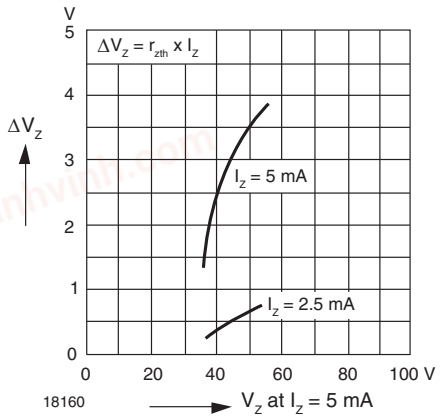



Fig. 13 - Change of Zener Voltage from Turn-on up to the Point of Thermal Equilibrium vs. Zener Voltage

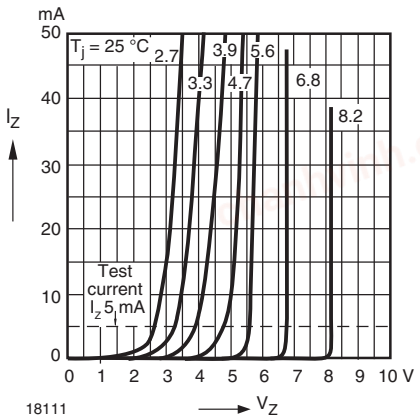



Fig. 14 - Breakdown Characteristics

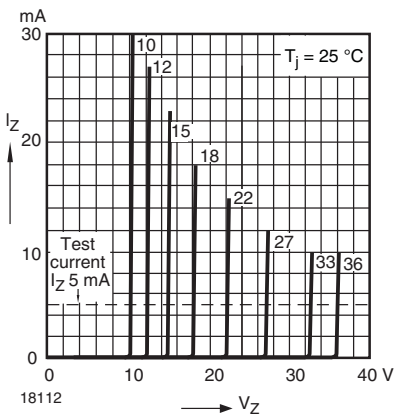



Fig. 15 - Breakdown Characteristics

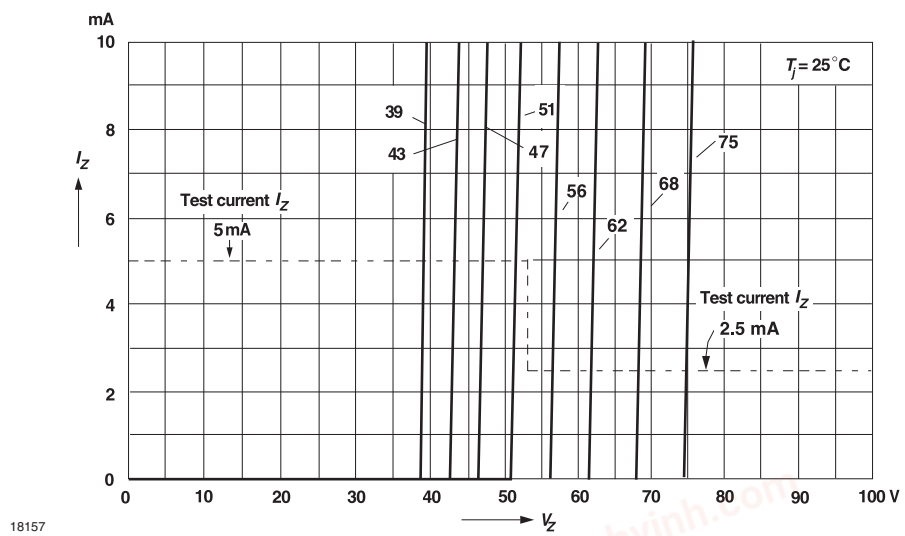


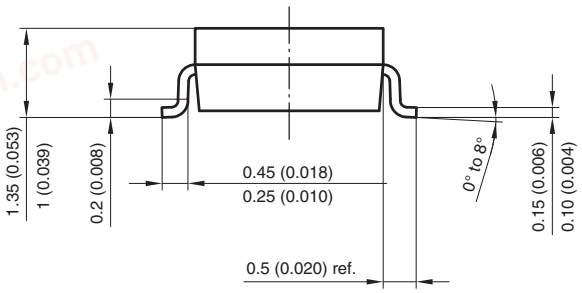

Fig. 16 - Breakdown Characteristics

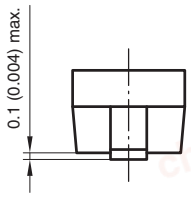

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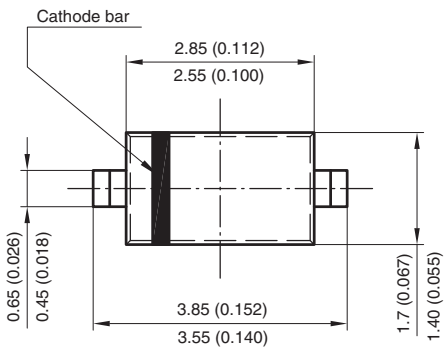
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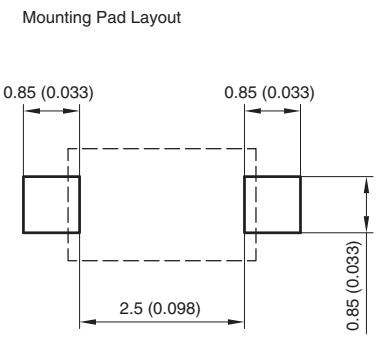


**PACKAGE DIMENSIONS** in millimeters (inches): **SOD-123**




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17432



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