

# 1SMB2EZ6.8~1SMB2EZ51

## GLASS PASSIVATED JUNCTION SILICON ZENER DIODES

**VOLTAGE** 6.8 to 51 Volt **POWER** 2 Watt

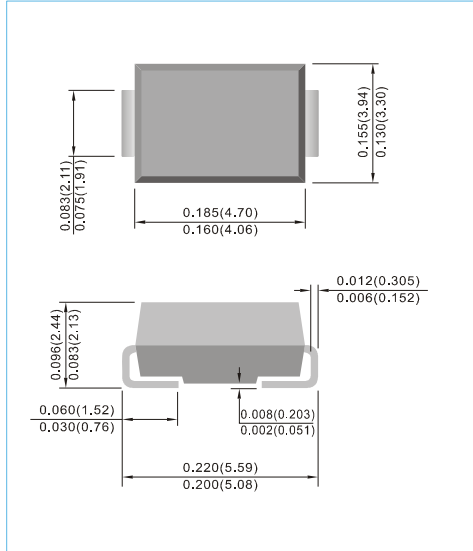
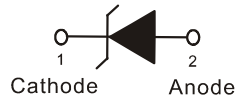
**SMB / DO-214AA** Unit : inch(mm)

### FEATURES

- Glass passivated junction
- Low inductance
- Typical  $I_D$  less than 1.0 $\mu$ A above 11V
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- High temperature soldering : 260°C /10 seconds at terminals
- Lead free in compliance with EU RoHS 2.0
- Green molding compound as per IEC 61249 standard

### MECHANICAL DATA

- Case: JEDEC DO-214AA, Molded plastic over passivated junction
- Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denotes cathode end
- Standard packing: 12mm tape (E1A-481)
- Weight: 0.0032 ounce, 0.092 gram



## MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

| Parameter                                                                             | Symbol         | Value        | Units |
|---------------------------------------------------------------------------------------|----------------|--------------|-------|
| Peak Pulse Power Dissipation on $T_L=50^\circ\text{C}$ (Notes A)<br>Derate above 50°C | $P_D$          | 2            | Watts |
| Peak Forward Surge Current 8.3ms single half sine-wave<br>superimposed on rated load  | $I_{FSM}$      | 15           | Amps  |
| Operating Junction and Storage Temperature Range                                      | $T_J, T_{STG}$ | -55 to + 150 | °C    |

### NOTES :

A.Mounted on 5mm<sup>2</sup> (0.013mm thick) land areas.

B.Measured on 8.3ms, and single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum



## 1SMB2EZ6.8~1SMB2EZ51

| Part Number           | Nominal Zener Voltage            |        |        | Maximum Zener Impedance           |                 |                                   |                 | Max. Reverse Leakage Current    |      | Marking Code |
|-----------------------|----------------------------------|--------|--------|-----------------------------------|-----------------|-----------------------------------|-----------------|---------------------------------|------|--------------|
|                       | V <sub>Z</sub> @ I <sub>ZT</sub> |        |        | Z <sub>zT</sub> @ I <sub>ZT</sub> | I <sub>zT</sub> | Z <sub>zK</sub> @ I <sub>zK</sub> | I <sub>zK</sub> | I <sub>R</sub> @ V <sub>R</sub> |      |              |
|                       | Nom. V                           | Min. V | Max. V | Ω                                 | mA              | Ω                                 | mA              | μA                              | V    |              |
| 2.0 watt Zener Diodes |                                  |        |        |                                   |                 |                                   |                 |                                 |      |              |
| 1SMB2EZ6.8            | 6.8                              | 6.46   | 7.14   | 2                                 | 73.5            | 700                               | 1               | 5                               | 4    | 2006         |
| 1SMB2EZ7.5            | 7.5                              | 7.13   | 7.88   | 2                                 | 66.5            | 700                               | 0.5             | 5                               | 5    | 2007         |
| 1SMB2EZ8.2            | 8.2                              | 7.79   | 8.61   | 2                                 | 61              | 700                               | 0.5             | 5                               | 6    | 2008         |
| 1SMB2EZ8.7            | 8.7                              | 8.27   | 9.14   | 2                                 | 58              | 700                               | 0.5             | 4                               | 6.6  | 20A8         |
| 1SMB2EZ9.1            | 9.1                              | 8.65   | 9.56   | 3                                 | 55              | 700                               | 0.5             | 3                               | 7    | 2009         |
| 1SMB2EZ10             | 10                               | 9.5    | 10.5   | 4                                 | 50              | 700                               | 0.25            | 3                               | 7.6  | 2010         |
| 1SMB2EZ11             | 11                               | 10.45  | 11.55  | 4                                 | 45.5            | 700                               | 0.25            | 1                               | 8.4  | 2011         |
| 1SMB2EZ12             | 12                               | 11.4   | 12.6   | 5                                 | 41.5            | 700                               | 0.25            | 1                               | 9.1  | 2012         |
| 1SMB2EZ13             | 13                               | 12.35  | 13.65  | 5                                 | 38.5            | 700                               | 0.25            | 0.5                             | 9.9  | 2013         |
| 1SMB2EZ14             | 14                               | 13.3   | 14.7   | 6                                 | 35.7            | 700                               | 0.25            | 0.5                             | 10.6 | 2014         |
| 1SMB2EZ15             | 15                               | 14.25  | 15.75  | 7                                 | 33.4            | 700                               | 0.25            | 0.5                             | 11.4 | 2015         |
| 1SMB2EZ16             | 16                               | 15.2   | 16.8   | 8                                 | 31.2            | 700                               | 0.25            | 0.5                             | 12.2 | 2016         |
| 1SMB2EZ17             | 17                               | 16.15  | 17.85  | 9                                 | 29.4            | 750                               | 0.25            | 0.5                             | 13   | 2017         |
| 1SMB2EZ18             | 18                               | 17.1   | 18.9   | 10                                | 27.8            | 750                               | 0.25            | 0.5                             | 13.7 | 2018         |
| 1SMB2EZ19             | 19                               | 18.05  | 19.95  | 11                                | 26.3            | 750                               | 0.25            | 0.5                             | 14.4 | 2019         |
| 1SMB2EZ20             | 20                               | 19     | 21     | 11                                | 25              | 750                               | 0.25            | 0.5                             | 15.2 | 2020         |
| 1SMB2EZ22             | 22                               | 20.9   | 23.1   | 12                                | 22.8            | 750                               | 0.25            | 0.5                             | 16.7 | 2022         |
| 1SMB2EZ24             | 24                               | 22.8   | 25.2   | 13                                | 20.8            | 750                               | 0.25            | 0.5                             | 18.2 | 2024         |
| 1SMB2EZ25             | 25                               | 23.75  | 26.25  | 14                                | 20              | 750                               | 0.25            | 0.5                             | 19   | 2025         |
| 1SMB2EZ27             | 27                               | 25.65  | 28.35  | 18                                | 18.5            | 750                               | 0.25            | 0.5                             | 20.6 | 2027         |
| 1SMB2EZ28             | 28                               | 26.6   | 29.4   | 18                                | 17              | 750                               | 0.25            | 0.5                             | 21.3 | 2028         |
| 1SMB2EZ30             | 30                               | 28.5   | 31.5   | 20                                | 16.6            | 1000                              | 0.25            | 0.5                             | 22.5 | 2030         |
| 1SMB2EZ33             | 33                               | 31.35  | 34.65  | 23                                | 15.1            | 1000                              | 0.25            | 0.5                             | 25.1 | 2033         |
| 1SMB2EZ36             | 36                               | 34.2   | 37.8   | 25                                | 13.9            | 1000                              | 0.25            | 0.5                             | 27.4 | 2036         |
| 1SMB2EZ39             | 39                               | 37.05  | 40.95  | 30                                | 12.8            | 1000                              | 0.25            | 0.5                             | 29.7 | 2039         |
| 1SMB2EZ43             | 43                               | 40.85  | 45.15  | 35                                | 11.6            | 1500                              | 0.25            | 0.5                             | 32.7 | 2043         |
| 1SMB2EZ47             | 47                               | 44.65  | 49.35  | 40                                | 10.6            | 1500                              | 0.25            | 0.5                             | 35.8 | 2047         |
| 1SMB2EZ51             | 51                               | 48.45  | 53.55  | 48                                | 9.8             | 1500                              | 0.25            | 0.5                             | 38.8 | 2051         |

# 1SMB2EZ6.8~1SMB2EZ51

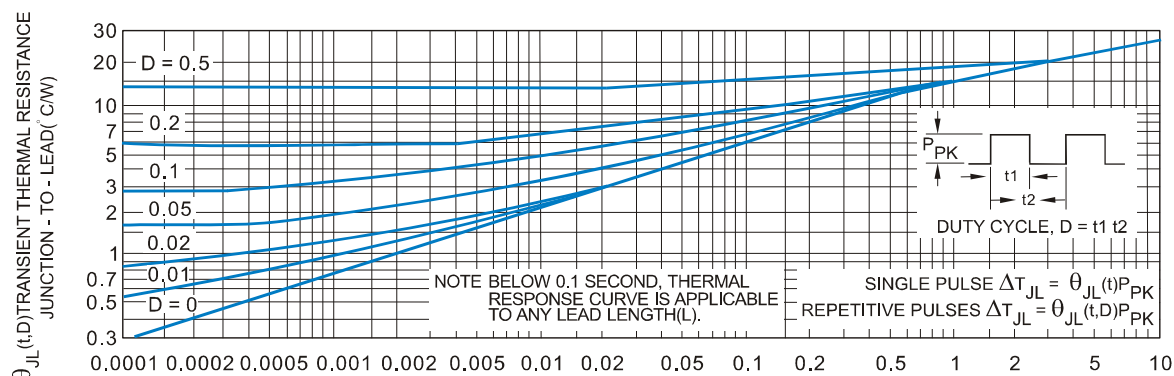


FIGURE 1. TYPICAL THERMAL RESPONSE L,

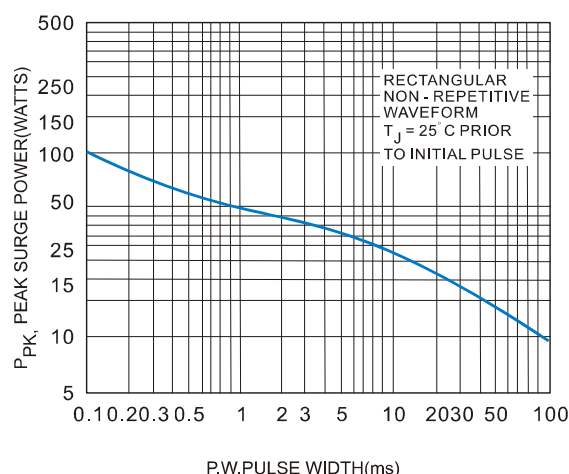


FIGURE 2. MAXIMUM SURGE POWER

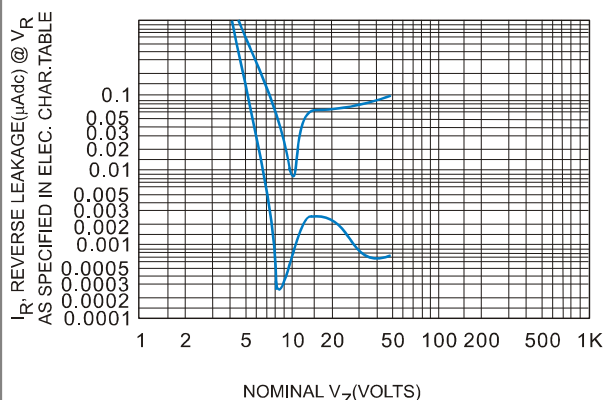


FIGURE 3. TYPICAL REVERSE LEAKAGE

## APPLICATION NOTE:

Since the actual voltage available from a given zener diode is temperature dependent, it is necessary to determine junction temperature under any set of operating conditions in order to calculate its value. The following procedure is recommended:

Lead Temperature,  $T_L$ , should be determined from:

$$T_L = \theta_{LA} P_D + T_A$$

$\theta_{LA}$  is the lead-to-ambient thermal resistance ( $^{\circ}\text{C}/\text{W}$ ) and  $P_D$  is the power dissipation. The value for  $\theta_{LA}$  will vary and depends on the device mounting method.  $\theta_{LA}$  is generally  $30\text{--}40\text{ }^{\circ}\text{C}/\text{W}$  for the various clips and tie points in common use and for printed circuit board wiring.

The temperature of the lead can also be measured using a thermocouple placed on the lead as close as possible to the tie point.

The thermal mass connected to the tie point is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady-state conditions are achieved. Using the measured value of  $T_L$ , the junction temperature may be determined by:

$$T_J = T_L + \Delta T_{JL}$$

$\Delta T_{JL}$  is the increase in junction temperature above the lead temperature and may be found from Figure 2 for a train of power pulses.

$$\Delta T_{JL} = \theta_{JL} P_D$$

For worst-case design, using expected limits of  $I_Z$ , limits of  $P_D$  and the extremes of  $T_J(\Delta T_J)$  may be estimated. Changes in voltage,  $V_Z$ , can then be found from:

$$\Delta V = \theta_{VZ} \Delta T_J$$

$\theta_{VZ}$ , the zener voltage temperature coefficient, is found from Figures 5 and 6.

Under high power-pulse operation, the zener voltage will vary with time and may also be affected significantly by the zener resistance. For best regulation, keep current excursions as low as possible.

Data of Figure 2 should not be used to compute surge capability. Surge limitations are given in Figure 3. They are lower than would be expected by considering only junction temperature, as current crowding effects cause temperatures to be extremely high in small spots resulting in device degradation should the limits of Figure 3 be exceeded.

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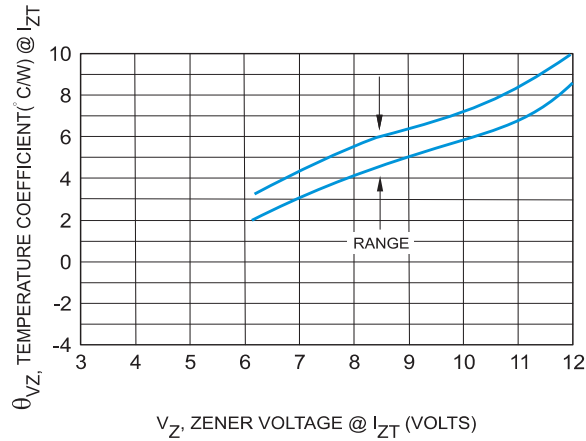


FIGURE 4. UNITS TO 12 VOLTS

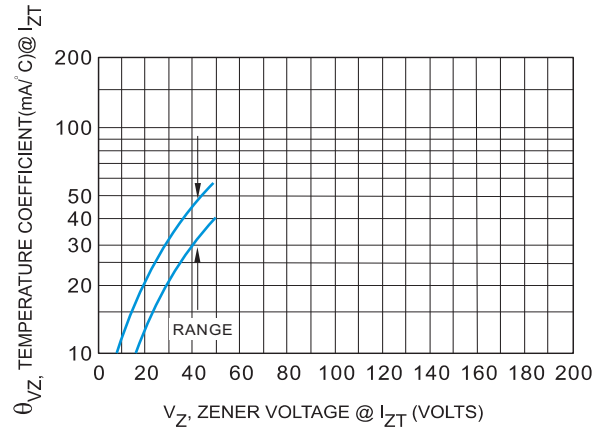


FIGURE 5. UNIT 10 TO 200 VOLTS

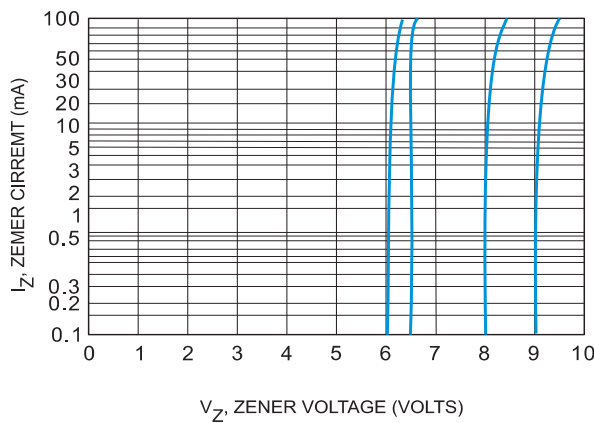


FIGURE 6.  $V_Z = 3.9$  THRU 10 VOLTS

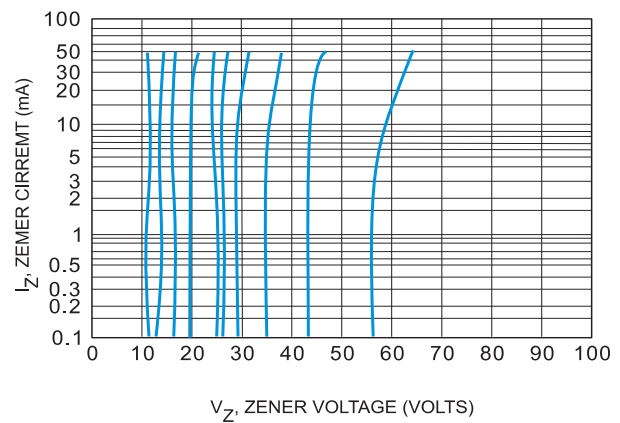


FIGURE 7.  $V_Z = 12$  THRU 82 VOLTS

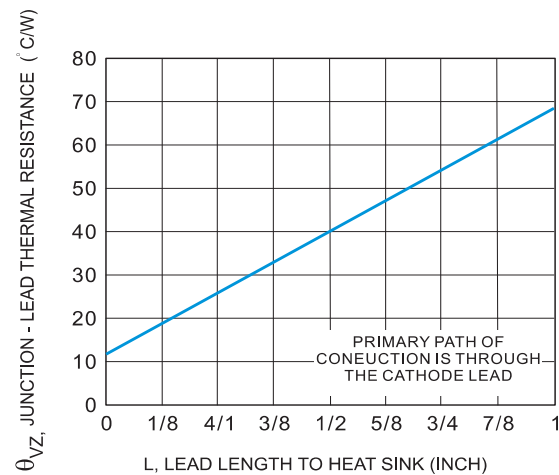


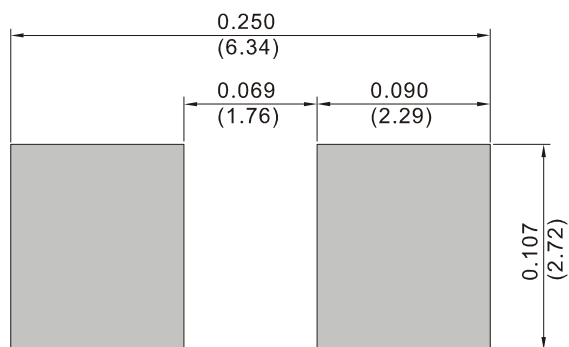
FIGURE 8. TYPICAL THERMAL RESISTANCE

## 1SMB2EZ6.8~1SMB2EZ51

### MOUNTING PAD LAYOUT

**SMB / DO-214AA**

Unit : inch(mm)



### ORDER INFORMATION

- Packing information
  - T/R - 3K per 13" plastic Reel
  - T/R - 0.8K per 7" plastic Reel

## 1SMB2EZ6.8~1SMB2EZ51

### Part No\_packing code\_Version

1SMB2EZ6.8\_R1\_00001

1SMB2EZ6.8\_R2\_00001

For example :

**RB500V-40\_R2\_00001**

Part No.

Serial number

Version code means HF

Packing size code means 13"

Packing type means T/R

| Packing Code <b>XX</b>               |                      |                                  |                      | Version Code <b>XXXXX</b> |                      |                                       |
|--------------------------------------|----------------------|----------------------------------|----------------------|---------------------------|----------------------|---------------------------------------|
| Packing type                         | 1 <sup>st</sup> Code | Packing size code                | 2 <sup>nd</sup> Code | HF or RoHS                | 1 <sup>st</sup> Code | 2 <sup>nd</sup> ~5 <sup>th</sup> Code |
| Tape and Ammunition Box (T/B)        | <b>A</b>             | N/A                              | <b>0</b>             | HF                        | <b>0</b>             | serial number                         |
| Tape and Reel (T/R)                  | <b>R</b>             | 7"                               | <b>1</b>             | RoHS                      | <b>1</b>             | serial number                         |
| Bulk Packing (B/P)                   | <b>B</b>             | 13"                              | <b>2</b>             |                           |                      |                                       |
| Tube Packing (T/P)                   | <b>T</b>             | 26mm                             | <b>X</b>             |                           |                      |                                       |
| Tape and Reel (Right Oriented) (TRR) | <b>S</b>             | 52mm                             | <b>Y</b>             |                           |                      |                                       |
| Tape and Reel (Left Oriented) (TRL)  | <b>L</b>             | PANASERT T/B CATHODE UP (PBCU)   | <b>U</b>             |                           |                      |                                       |
| FORMING                              | <b>F</b>             | PANASERT T/B CATHODE DOWN (PBCD) | <b>D</b>             |                           |                      |                                       |



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