

# 1SMB2EZ6.8~1SMB2EZ51

## GLASS PASSIVATED JUNCTION SILICON ZENER DIODES

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

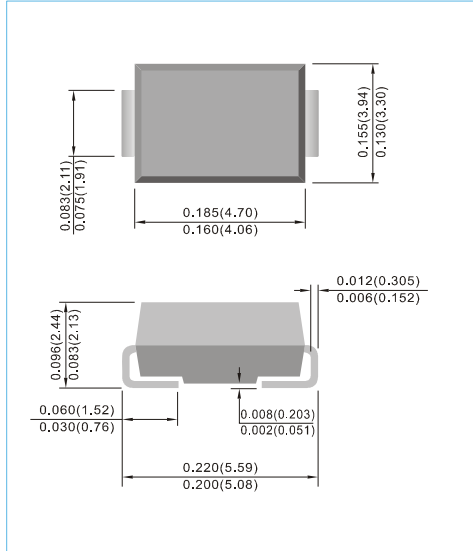
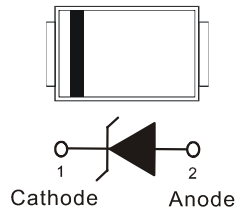
**SMB / DO-214AA** Unit : inch(mm)

### 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) Derate above 50°C	$P_D$	2	Watts
Peak Forward Surge Current 8.3ms single half sine-wave 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

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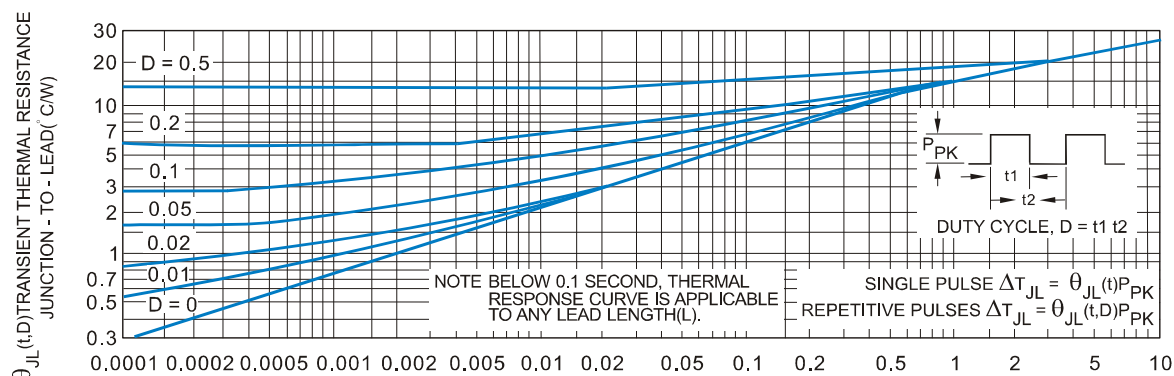


FIGURE 1. TYPICAL THERMAL RESPONSE L,

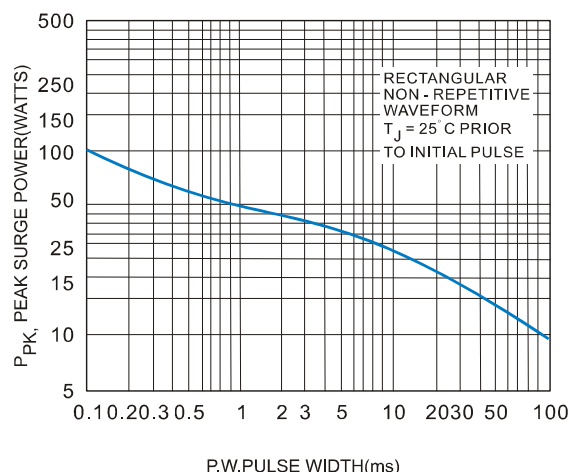


FIGURE 2. MAXIMUM SURGE POWER

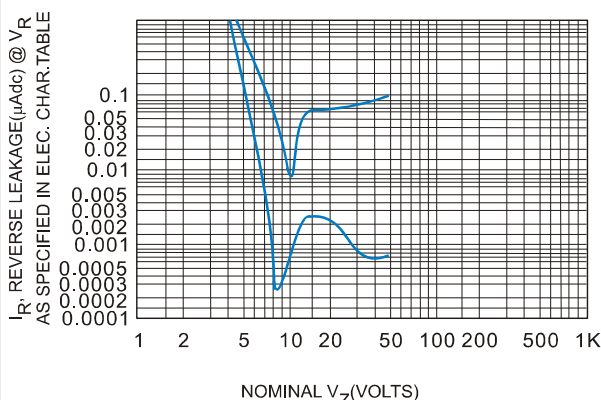


FIGURE 3. TYPICAL REVERSE LEAKAGE

## 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  $30\text{--}40^{\circ}\text{C}/\text{W}$  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:

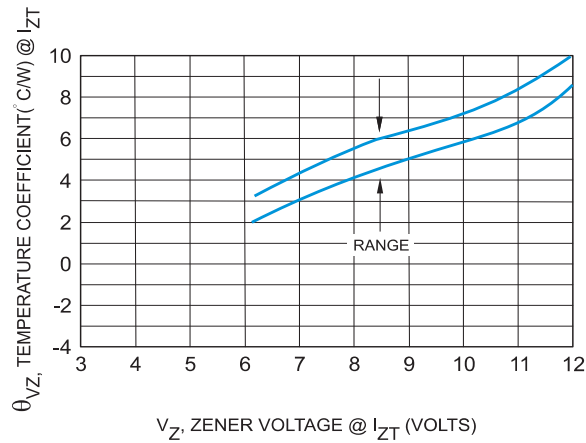
$$\Delta V = \theta_{VZ} \Delta T_J$$

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

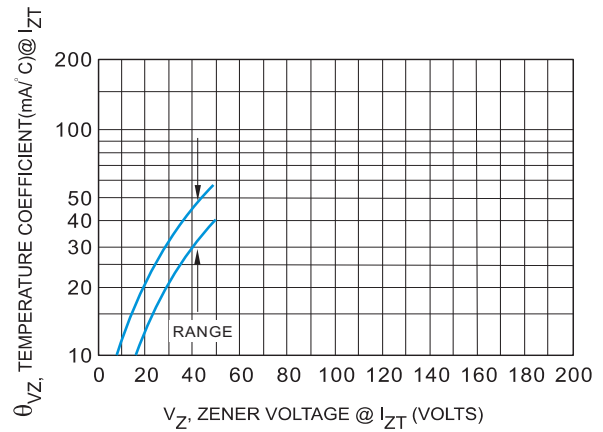
Under high power-pulse operation, the zener voltage will vary with time and may also be affected significantly by the zener resistance. For best regulation, keep current excursions as low as possible.

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.

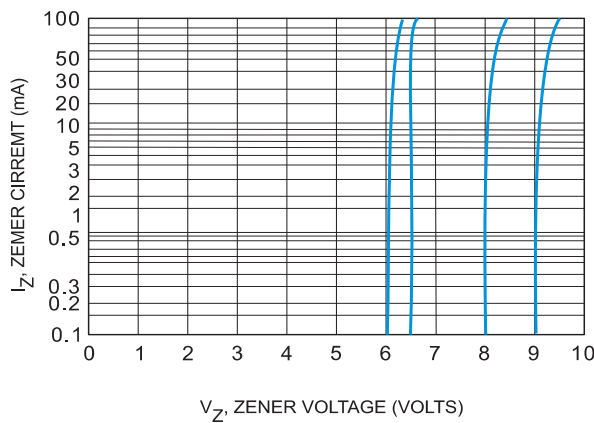
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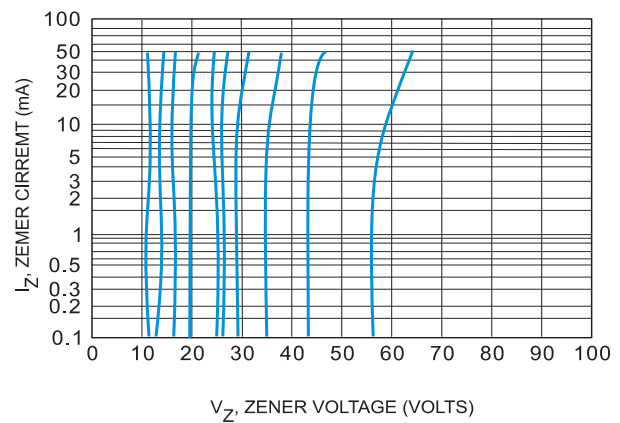
**FIGURE 4 . UNITS TO 12 VOLTS**



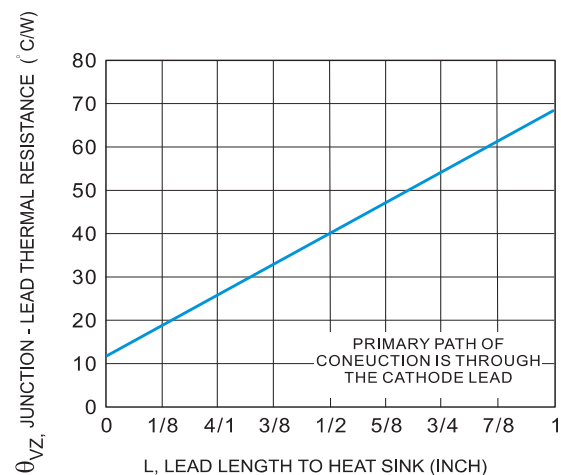
**FIGURE 5 . UNIT 10 TO 200 VOLTS**



**FIGURE 6.  $V_Z = 3.9$  THRU 10 VOLTS**



**FIGURE 7.  $V_Z = 12$  THRU 82 VOLTS**



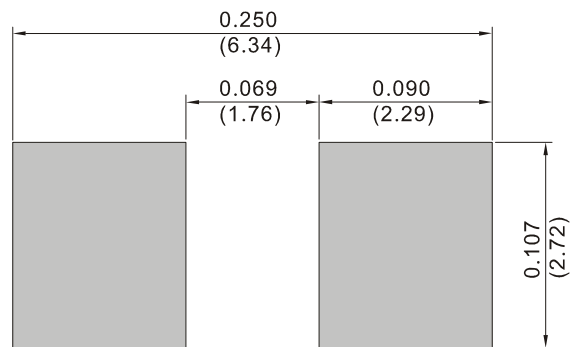
**FIGURE 8 . TYPICAL THERMAL RESISTANCE**

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### 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

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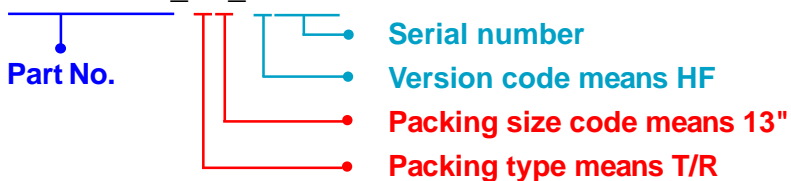
### Part No\_packing code\_Version

1SMB2EZ6.8\_R1\_00001

1SMB2EZ6.8\_R2\_00001

For example :

RB500V-40\_R2\_00001



Packing Code XX				Version Code XXXXX		
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)	A	N/A	0	HF	0	serial number
Tape and Reel (T/R)	R	7"	1	RoHS	1	serial number
Bulk Packing (B/P)	B	13"	2			
Tube Packing (T/P)	T	26mm	X			
Tape and Reel (Right Oriented) (TRR)	S	52mm	Y			
Tape and Reel (Left Oriented) (TRL)	L	PANASERT T/B CATHODE UP (PBCU)	U			
FORMING	F	PANASERT T/B CATHODE DOWN (PBCD)	D			



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