



**THE DATASHEET OF
1SMB5933BT3**



1SMB59xxBT3 Series, SZ1SMB59xxT3G Series

3 Watt Plastic Surface Mount Zener Voltage Regulators

This complete new line of 3 W Zener diodes offers the following advantages.

Features

- Zener Voltage Range – 3.3 V to 200 V
- ESD Rating of Class 3 (>16 kV) per Human Body Model
- Flat Handling Surface for Accurate Placement
- Package Design for Top Side or Bottom Circuit Board Mounting
- AEC-Q101 Qualified and PPAP Capable – SZ1SMB59xxT3G
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- Pb-Free Packages are Available

Mechanical Characteristics:

CASE: Void-free, transfer-molded plastic

FINISH: All external surfaces are corrosion resistant and leads are readily solderable

MAXIMUM LEAD TEMPERATURE FOR SOLDERING PURPOSES:
260°C for 10 Seconds

LEADS: Modified L-Bend providing more contact area to bond pads

POLARITY: Cathode indicated by polarity band

FLAMMABILITY RATING: UL 94 V-0

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Maximum Steady State Power Dissipation @ $T_L = 75^\circ\text{C}$ Measured at Zero Lead Length Derate Above 75°C	P_D	3.0	W
Thermal Resistance from Junction-to-Lead	$R_{\theta JL}$	40 25	$\text{mW}/^\circ\text{C}$ $^\circ\text{C}/\text{W}$
Maximum Steady State Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note) Derate Above 25°C	P_D	550	mW
Thermal Resistance from Junction-to-Ambient	$R_{\theta JA}$	4.4 226	$\text{mW}/^\circ\text{C}$ $^\circ\text{C}/\text{W}$
Operating and Storage Temperature Range	T_J, T_{stg}	-65 to +150	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

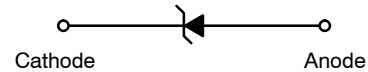
1. FR-4 board, using recommended footprint.



ON Semiconductor®

<http://onsemi.com>

**PLASTIC SURFACE MOUNT
ZENER VOLTAGE
REGULATOR DIODES
3.3–200 V, 3 W DC POWER**



**SMB
CASE 403A
PLASTIC**

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
9xxB = Device Code (Refer to page 3)
▪ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
1SMB59xxBT3	SMB	2500 / Tape & Reel
1SMB59xxBT3G	SMB (Pb-Free)	2500 / Tape & Reel
SZ1SMB59xxBT3G	SMB (Pb-Free)	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

DEVICE MARKING INFORMATION

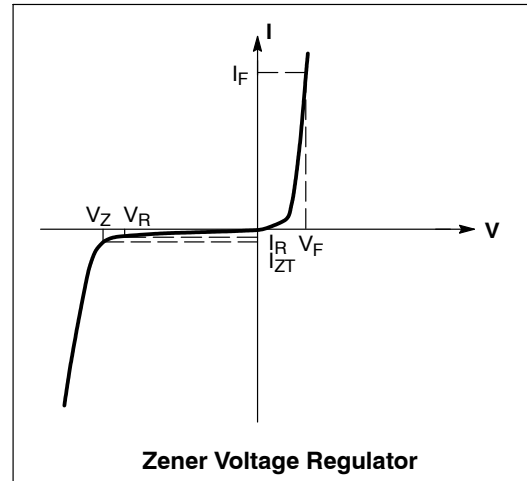
See specific marking information in the device marking column of the Electrical Characteristics table on page 3 of this data sheet.

1SMB59xxBT3 Series, SZ1SMB59xxT3G Series

ELECTRICAL CHARACTERISTICS

($T_L = 30^\circ\text{C}$ unless otherwise noted,
 $V_F = 1.5\text{ V Max. @ } I_F = 200\text{ mA(dc)}$ for all types)

Symbol	Parameter
V_Z	Reverse Zener Voltage @ I_{ZT}
I_{ZT}	Reverse Current
Z_{ZT}	Maximum Zener Impedance @ I_{ZT}
I_{ZK}	Reverse Current
Z_{ZK}	Maximum Zener Impedance @ I_{ZK}
I_R	Reverse Leakage Current @ V_R
V_R	Reverse Voltage
I_F	Forward Current
V_F	Forward Voltage @ I_F
I_{ZM}	Maximum DC Zener Current



1SMB59xxBT3 Series, SZ1SMB59xxT3G Series

ELECTRICAL CHARACTERISTICS (Devices listed in **bold, italic** are ON Semiconductor Preferred devices.)

($T_L = 30^\circ\text{C}$ unless otherwise noted, $V_F = 1.5\text{ V Max.}$ @ $I_F = 200\text{ mA(dc)}$ for all types)

Device* (Note 2)	Device Marking	Zener Voltage (Note 3)				Zener Impedance (Note 4)			Leakage Current		I_{ZM} mA(dc)
		V_Z (Volts)			@ I_{ZT}	Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}		I_R @ V_R		
		Min	Nom	Max	mA	Ω	Ω	mA	μA	Volts	
SZ/1SMB5913BT3, G	913B	3.13	3.3	3.47	113.6	10	500	1	100	1	454
SZ/1SMB5914BT3, G	914B	3.42	3.6	3.78	104.2	9	500	1	75	1	416
SZ/1SMB5915BT3, G	915B	3.70	3.9	4.10	96.1	7.5	500	1	25	1	384
1SMB5916BT3, G	916B	4.08	4.3	4.52	87.2	6	500	1	5	1	348
SZ/1SMB5917BT3, G	917B	4.46	4.7	4.94	79.8	5	500	1	5	1.5	319
SZ/1SMB5918BT3, G	918B	4.84	5.1	5.36	73.5	4	350	1	5	2	294
SZ/1SMB5919BT3, G	919B	5.32	5.6	5.88	66.9	2	250	1	5	3	267
SZ/1SMB5920BT3, G	920B	5.89	6.2	6.51	60.5	2	200	1	5	4	241
SZ/1SMB5921BT3, G	921B	6.46	6.8	7.14	55.1	2.5	200	1	5	5.2	220
SZ/1SMB5922BT3, G	922B	7.12	7.5	7.88	50	3	400	0.5	5	6	200
SZ/1SMB5923BT3, G	923B	7.79	8.2	8.61	45.7	3.5	400	0.5	5	6.5	182
SZ/1SMB5924BT3, G	924B	8.64	9.1	9.56	41.2	4	500	0.5	5	7	164
SZ/1SMB5925BT3, G	925B	9.5	10	10.5	37.5	4.5	500	0.25	5	8	150
SZ/1SMB5926BT3, G	926B	10.45	11	11.55	34.1	5.5	550	0.25	1	8.4	136
SZ/1SMB5927BT3, G	927B	11.4	12	12.6	31.2	6.5	550	0.25	1	9.1	125
SZ/1SMB5928BT3, G	928B	12.35	13	13.65	28.8	7	550	0.25	1	9.9	115
SZ/1SMB5929BT3, G	929B	14.25	15	15.75	25	9	600	0.25	1	11.4	100
SZ/1SMB5930BT3, G	930B	15.2	16	16.8	23.4	10	600	0.25	1	12.2	93
SZ/1SMB5931BT3, G	931B	17.1	18	18.9	20.8	12	650	0.25	1	13.7	83
SZ/1SMB5932BT3, G	932B	19	20	21	18.7	14	650	0.25	1	15.2	75
SZ/1SMB5933BT3, G	933B	20.9	22	23.1	17	17.5	650	0.25	1	16.7	68
SZ/1SMB5934BT3, G	934B	22.8	24	25.2	15.6	19	700	0.25	1	18.2	62
SZ/1SMB5935BT3, G	935B	25.65	27	28.35	13.9	23	700	0.25	1	20.6	55
SZ/1SMB5936BT3, G	936B	28.5	30	31.5	12.5	28	750	0.25	1	22.8	50
SZ/1SMB5937BT3, G	937B	31.35	33	34.65	11.4	33	800	0.25	1	25.1	45
SZ/1SMB5938BT3, G	938B	34.2	36	37.8	10.4	38	850	0.25	1	27.4	41
SZ/1SMB5939BT3, G	939B	37.05	39	40.95	9.6	45	900	0.25	1	29.7	38
SZ/1SMB5940BT3, G	940B	40.85	43	45.15	8.7	53	950	0.25	1	32.7	34
SZ/1SMB5941BT3, G	941B	44.65	47	49.35	8	67	1000	0.25	1	35.8	31
1SMB5942BT3, G	942B	48.45	51	53.55	7.3	70	1100	0.25	1	38.8	29
1SMB5943BT3, G	943B	53.2	56	58.8	6.7	86	1300	0.25	1	42.6	26
SZ/1SMB5944BT3, G	944B	58.9	62	65.1	6	100	1500	0.25	1	47.1	24
SZ/1SMB5945BT3, G	945B	64.6	68	71.4	5.5	120	1700	0.25	1	51.7	22
SZ/1SMB5946BT3, G	946B	71.25	75	78.75	5	140	2000	0.25	1	56	20
SZ/1SMB5947BT3, G	947B	77.9	82	86.1	4.6	160	2500	0.25	1	62.2	18
1SMB5948BT3, G	948B	86.45	91	95.55	4.1	200	3000	0.25	1	69.2	16
1SMB5949BT3, G	949B	95	100	105	3.7	250	3100	0.25	1	76	15
1SMB5950BT3, G	950B	104.5	110	115.5	3.4	300	4000	0.25	1	83.6	13
1SMB5951BT3, G	951B	114	120	126	3.1	380	4500	0.25	1	91.2	12
1SMB5952BT3, G	952B	123.5	130	136.5	2.9	450	5000	0.25	1	98.8	11
1SMB5953BT3, G	953B	142.5	150	157.5	2.5	600	6000	0.25	1	114	10
1SMB5954BT3, G	954B	152	160	168	2.3	700	6500	0.25	1	121.6	9
1SMB5955BT3, G	955B	171	180	189	2.1	900	7000	0.25	1	136.8	8
SZ/1SMB5956BT3, G	956B	190	200	210	1.9	1200	8000	0.25	1	152	7

2. **TOLERANCE AND TYPE NUMBER DESIGNATION** The type numbers listed indicate a tolerance of $\pm 5\%$.

3. **ZENER VOLTAGE (V_Z) MEASUREMENT**

Nominal Zener voltage is measured with the device junction in thermal equilibrium with ambient temperature at 25°C .

4. **ZENER IMPEDANCE (Z_Z) DERIVATION** Z_{ZT} and Z_{ZK} are measured by dividing the ac voltage drop across the device by the ac current applied. The specified limits are for $I_{Z(ac)} = 0.1 I_{Z(dc)}$ with the ac frequency = 60 Hz.

*The "G" suffix indicates Pb-Free package available.

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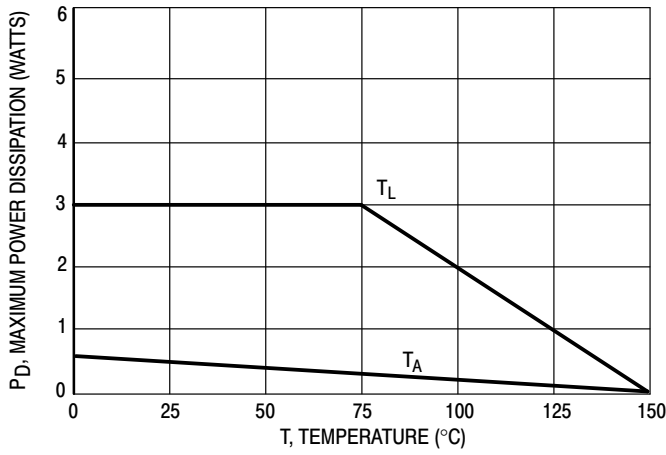


Figure 1. Steady State Power Derating

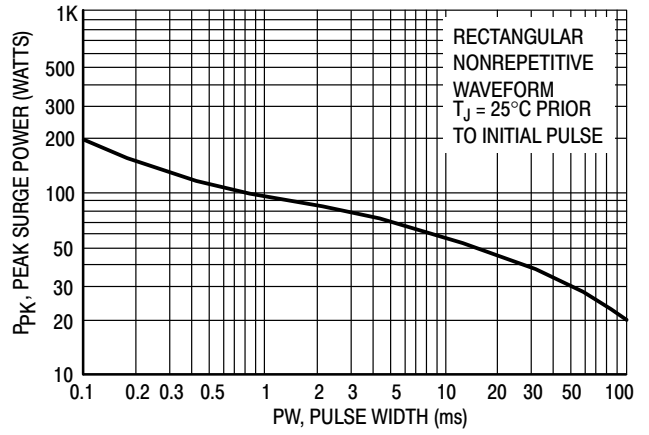


Figure 2. Maximum Surge Power

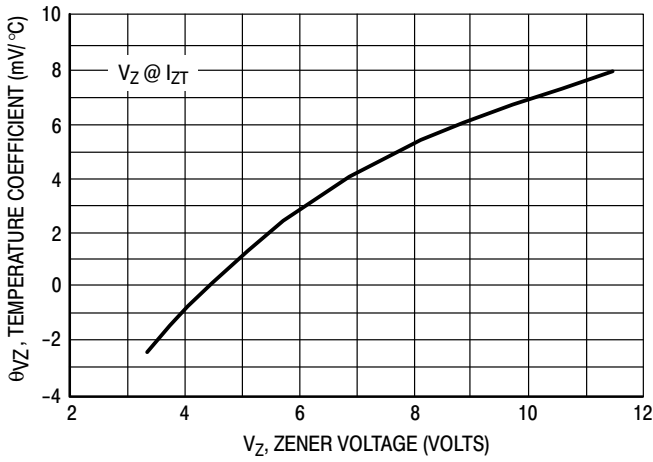


Figure 3. Zener Voltage - To 12 Volts

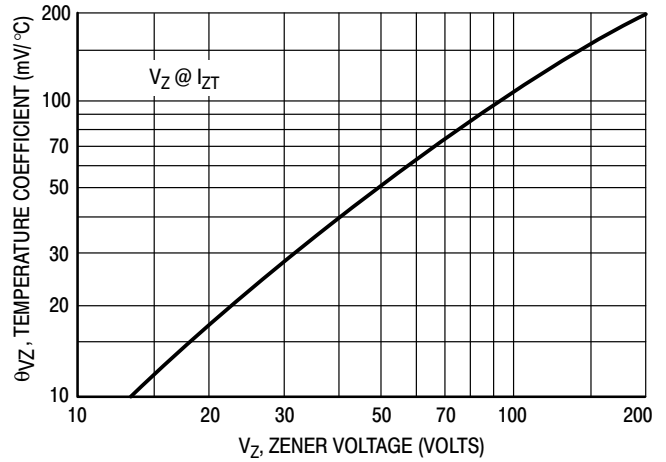


Figure 4. Zener Voltage - 14 To 200 Volts

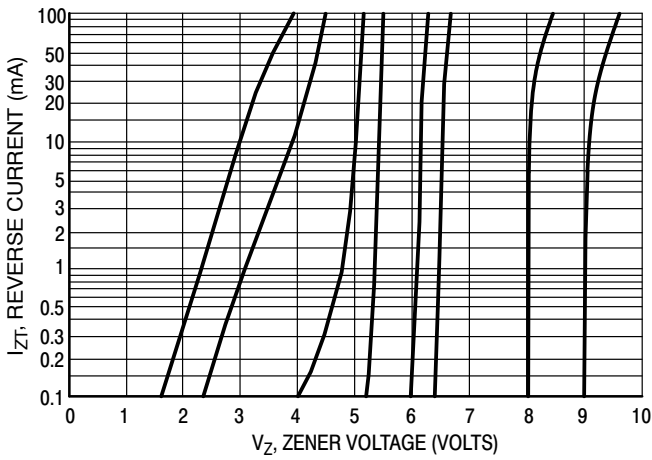


Figure 5. $V_Z = 3.3$ thru 10 Volts

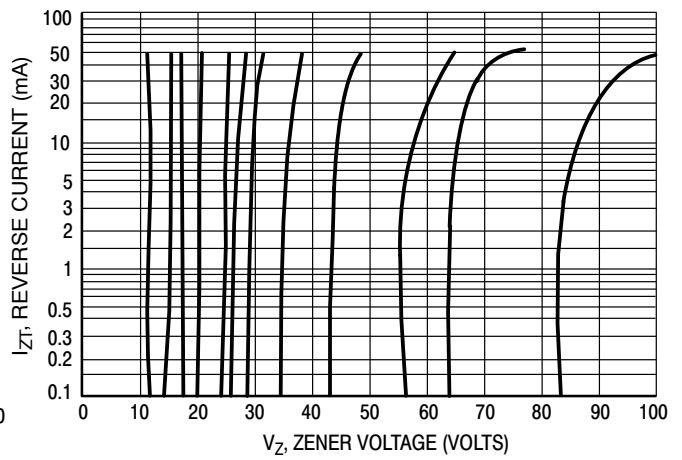


Figure 6. $V_Z = 12$ thru 82 Volts

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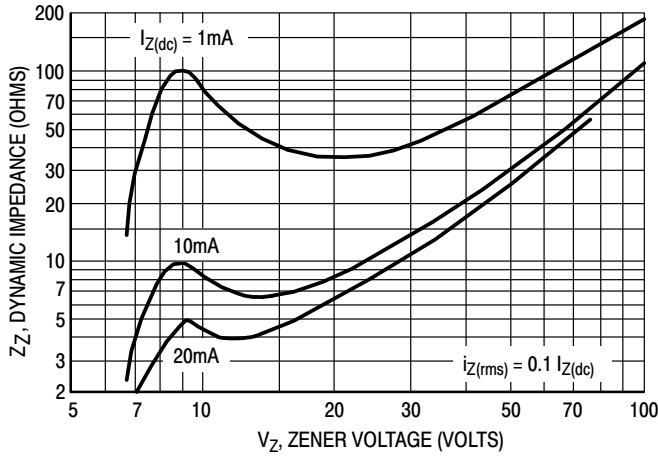


Figure 7. Effect of Zener Voltage

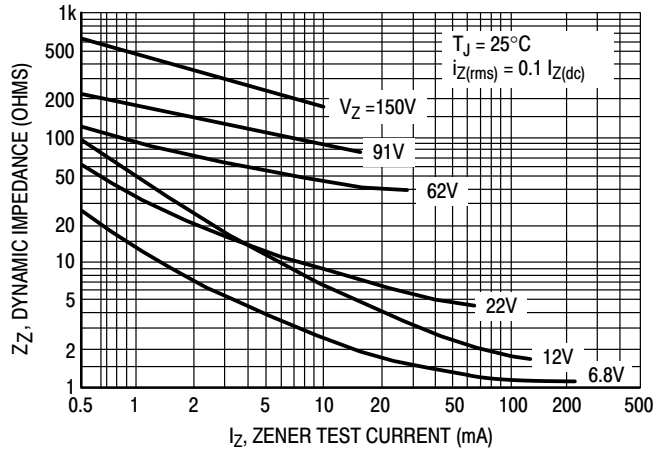


Figure 8. Effect of Zener Current

Rating and Typical Characteristic Curves ($T_A = 25^\circ\text{C}$)

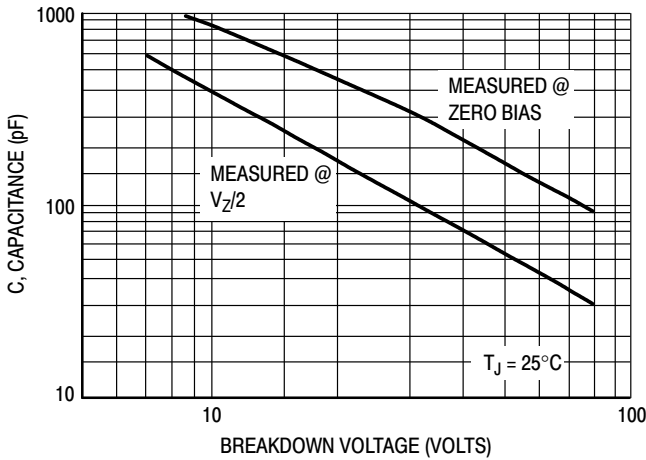


Figure 9. Capacitance Curve

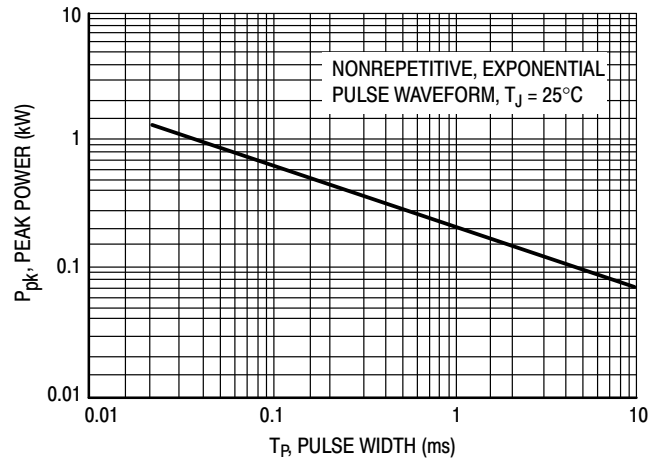


Figure 10. Typical Pulse Rating Curve

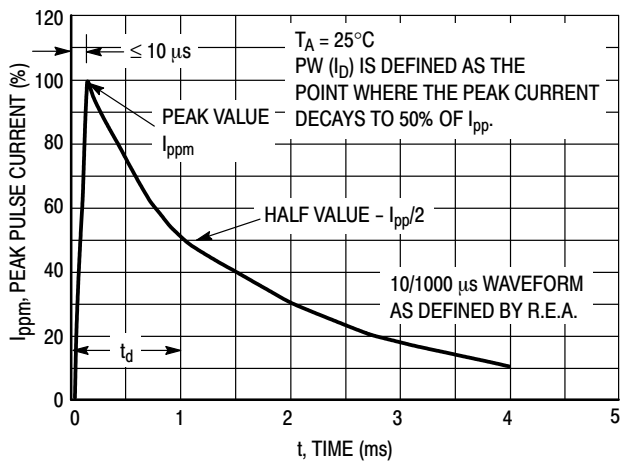


Figure 11. Pulse Waveform

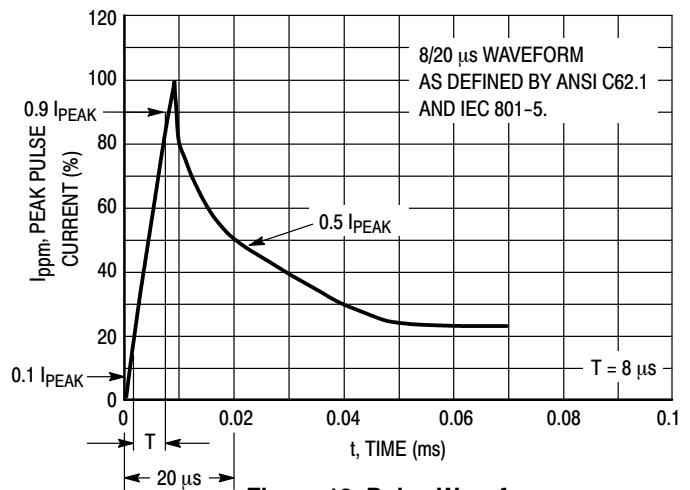
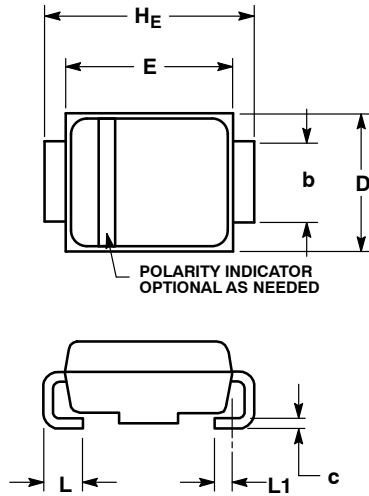


Figure 12. Pulse Waveform

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PACKAGE DIMENSIONS

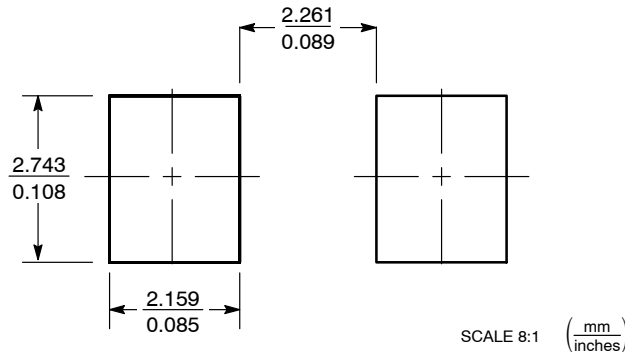
SMB CASE 403A-03 ISSUE H



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. D DIMENSION SHALL BE MEASURED WITHIN DIMENSION P.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.90	2.20	2.28	0.075	0.087	0.090
A1	0.05	0.10	0.19	0.002	0.004	0.007
b	1.96	2.03	2.20	0.077	0.080	0.087
c	0.15	0.23	0.31	0.006	0.009	0.012
D	3.30	3.56	3.95	0.130	0.140	0.156
E	4.06	4.32	4.60	0.160	0.170	0.181
HE	5.21	5.44	5.60	0.205	0.214	0.220
L	0.76	1.02	1.60	0.030	0.040	0.063
L1	0.51 REF			0.020 REF		

SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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