THE DATASHEET OF

1SMB5940BT3G

1SMB59xxBT3G 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
- These are Pb−Free Devices*

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°C Measured at Zero Lead Length Derate Above 75°C Thermal Resistance from Junction−to−Lead	P_D $R_{\theta JL}$	3.0 40 25	W mW/°C °C/W
Maximum Steady State Power Dissipation @ T_A = 25°C (Note 1) Derate Above 25°C Thermal Resistance from Junction−to−Ambient	P_D $R_{\theta JA}$	550 4.4 226	mW mW/°C °C/W
Operating and Storage Temperature Range	T_J, T_{stg}	−65 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR−4 board, using recommended 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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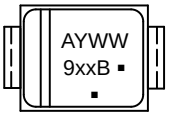
PLASTIC SURFACE MOUNT ZENER VOLTAGE REGULATOR DIODES 3.3−200 V, 3 W DC POWER

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†
1SMB59xxBT3G	SMB (Pb−Free)	2,500 / Tape & Reel
SZ1SMB59xxBT3G	SMB (Pb−Free)	2,500 / 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.

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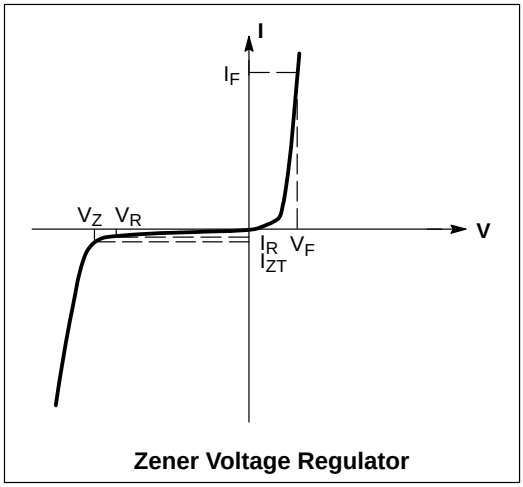
ELECTRICAL CHARACTERISTICS

(T_L = 30°C unless otherwise noted,
V_F = 1.5 V Max. @ I_F = 200 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



Zener Voltage Regulator

ELECTRICAL CHARACTERISTICS (T_L = 30°C unless otherwise noted, V_F = 1.5 V Max. @ I_F = 200 mA(dc) for all types)
(Devices listed in ***bold, italic*** are ON Semiconductor Preferred devices.)

Device* (Note 2)	Device Marking	Zener Voltage (Note 3)				Zener Impedance (Note 4)			Leakage Current		I_{ZM}
		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	mA(dc)
1SMB5913BT3G	913B	3.13	3.3	3.47	113.6	10	500	1	100	1	454
1SMB5914BT3G	914B	3.42	3.6	3.78	104.2	9	500	1	75	1	416
1SMB5915BT3G	***915B***	***3.70***	***3.9***	***4.10***	***96.1***	***7.5***	***500***	***1***	***25***	***1***	***384***
1SMB5916BT3G	***916B***	***4.08***	***4.3***	***4.52***	***87.2***	***6***	***500***	***1***	***5***	***1***	***348***
1SMB5917BT3G	***917B***	***4.46***	***4.7***	***4.94***	***79.8***	***5***	***500***	***1***	***5***	***1.5***	***319***
1SMB5918BT3G	***918B***	***4.84***	***5.1***	***5.36***	***73.5***	***4***	***350***	***1***	***5***	***2***	***294***
1SMB5919BT3G	***919B***	***5.32***	***5.6***	***5.88***	***66.9***	***2***	***250***	***1***	***5***	***3***	***267***
1SMB5920BT3G	***920B***	***5.89***	***6.2***	***6.51***	***60.5***	***2***	***200***	***1***	***5***	***4***	***241***
1SMB5921BT3G	921B	6.46	6.8	7.14	55.1	2.5	200	1	5	5.2	220
1SMB5922BT3G	922B	7.12	7.5	7.88	50	3	400	0.5	5	6	200
1SMB5923BT3G	***923B***	***7.79***	***8.2***	***8.61***	***45.7***	***3.5***	***400***	***0.5***	***5***	***6.5***	***182***
1SMB5924BT3G	924B	8.64	9.1	9.56	41.2	4	500	0.5	5	7	164
1SMB5925BT3G	***925B***	***9.5***	***10***	***10.5***	***37.5***	***4.5***	***500***	***0.25***	***5***	***8***	***150***
1SMB5926BT3G	***926B***	***10.45***	***11***	***11.55***	***34.1***	***5.5***	***550***	***0.25***	***1***	***8.4***	***136***
1SMB5927BT3G	***927B***	***11.4***	***12***	***12.6***	***31.2***	***6.5***	***550***	***0.25***	***1***	***9.1***	***125***
1SMB5928BT3G	928B	12.35	13	13.65	28.8	7	550	0.25	1	9.9	115
1SMB5929BT3G	***929B***	***14.25***	***15***	***15.75***	***25***	***9***	***600***	***0.25***	***1***	***11.4***	***100***
1SMB5930BT3G	930B	15.2	16	16.8	23.4	10	600	0.25	1	12.2	93
1SMB5931BT3G	***931B***	***17.1***	***18***	***18.9***	***20.8***	***12***	***650***	***0.25***	***1***	***13.7***	***83***
1SMB5932BT3G	932B	19	20	21	18.7	14	650	0.25	1	15.2	75
1SMB5933BT3G	933B	20.9	22	23.1	17	17.5	650	0.25	1	16.7	68
1SMB5934BT3G	***934B***	***22.8***	***24***	***25.2***	***15.6***	***19***	***700***	***0.25***	***1***	***18.2***	***62***
1SMB5935BT3G	***935B***	***25.65***	***27***	***28.35***	***13.9***	***23***	***700***	***0.25***	***1***	***20.6***	***55***
1SMB5936BT3G	***936B***	***28.5***	***30***	***31.5***	***12.5***	***28***	***750***	***0.25***	***1***	***22.8***	***50***
1SMB5937BT3G	937B	31.35	33	34.65	11.4	33	800	0.25	1	25.1	45
1SMB5938BT3G	***938B***	***34.2***	***36***	***37.8***	***10.4***	***38***	***850***	***0.25***	***1***	***27.4***	***41***
1SMB5939BT3G	939B	37.05	39	40.95	9.6	45	900	0.25	1	29.7	38
1SMB5940BT3G	940B	40.85	43	45.15	8.7	53	950	0.25	1	32.7	34
1SMB5941BT3G	941B	44.65	47	49.35	8	67	1000	0.25	1	35.8	31
1SMB5942BT3G	942B	48.45	51	53.55	7.3	70	1100	0.25	1	38.8	29
1SMB5943BT3G	943B	53.2	56	58.8	6.7	86	1300	0.25	1	42.6	26
1SMB5944BT3G	944B	58.9	62	65.1	6	100	1500	0.25	1	47.1	24
1SMB5945BT3G	945B	64.6	68	71.4	5.5	120	1700	0.25	1	51.7	22
1SMB5946BT3G	946B	71.25	75	78.75	5	140	2000	0.25	1	56	20
1SMB5947BT3G	947B	77.9	82	86.1	4.6	160	2500	0.25	1	62.2	18
1SMB5948BT3G	948B	86.45	91	95.55	4.1	200	3000	0.25	1	69.2	16
1SMB5949BT3G	***949B***	***95***	***100***	***105***	***3.7***	***250***	***3100***	***0.25***	***1***	***76***	***15***
1SMB5951BT3G	951B	114	120	126	3.1	380	4500	0.25	1	91.2	12
1SMB5952BT3G	952B	123.5	130	136.5	2.9	450	5000	0.25	1	98.8	11
1SMB5953BT3G	953B	142.5	150	157.5	2.5	600	6000	0.25	1	114	10
1SMB5954BT3G	954B	152	160	168	2.3	700	6500	0.25	1	121.6	9
1SMB5955BT3G	955B	171	180	189	2.1	900	7000	0.25	1	136.8	8
1SMB5956BT3G	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 ±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.

*Include SZ-prefix devices where applicable.

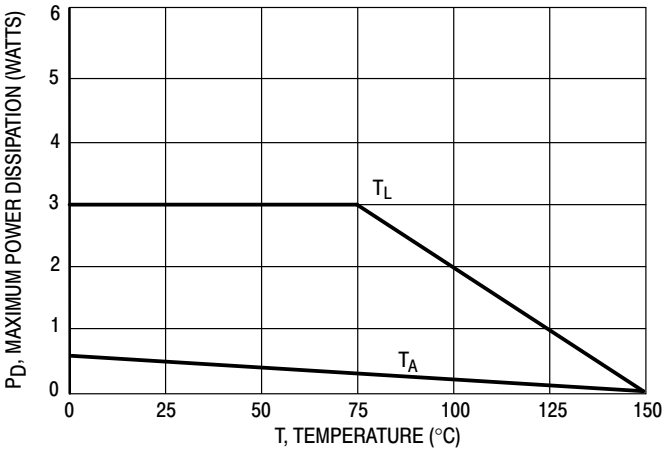


Figure 1. Steady State Power Derating

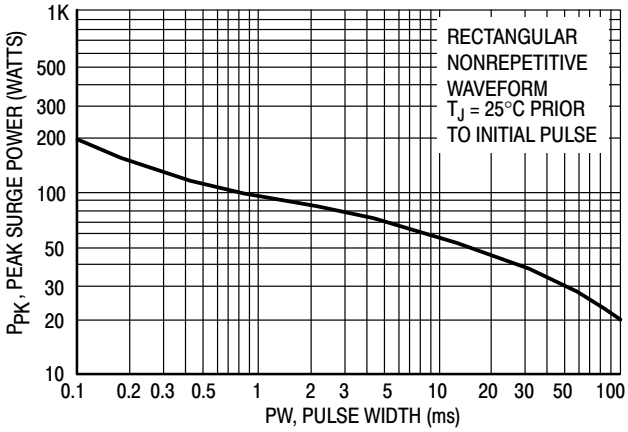


Figure 2. Maximum Surge Power

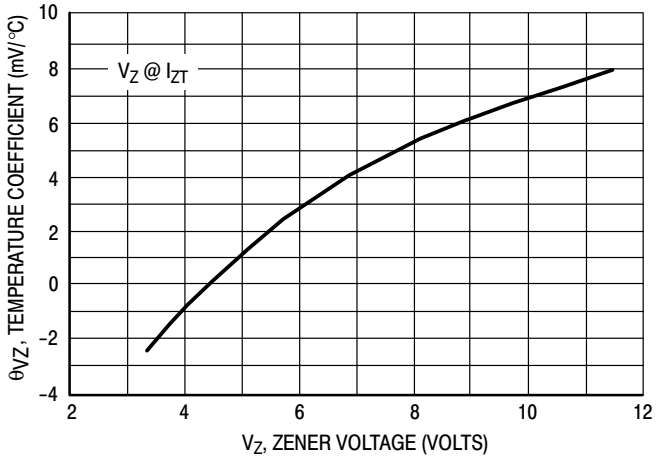


Figure 3. Zener Voltage − To 12 Volts

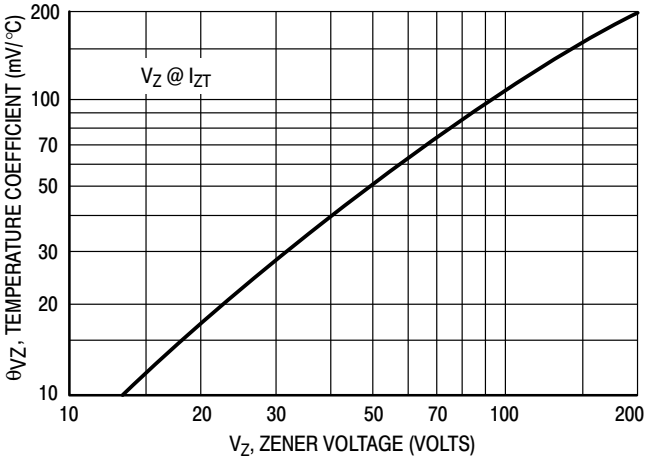


Figure 4. Zener Voltage − 14 To 200 Volts

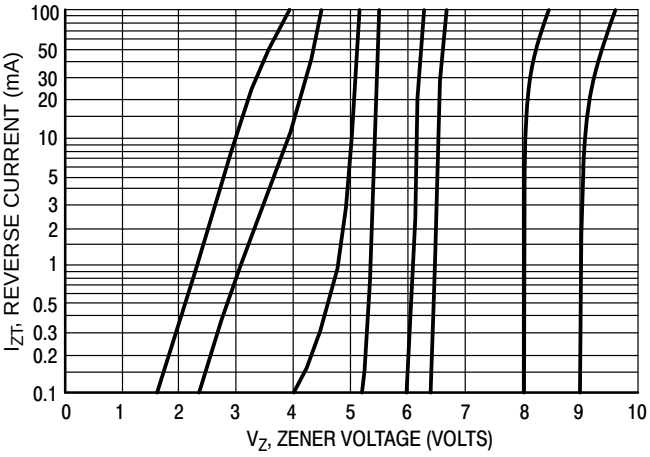


Figure 5. V_Z = 3.3 thru 10 Volts

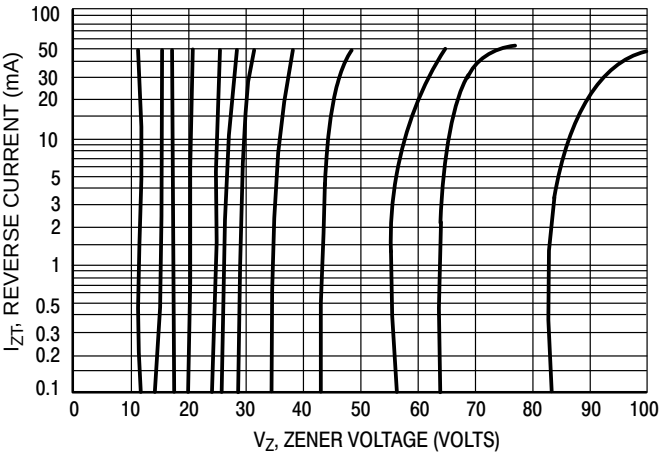


Figure 6. V_Z = 12 thru 82 Volts

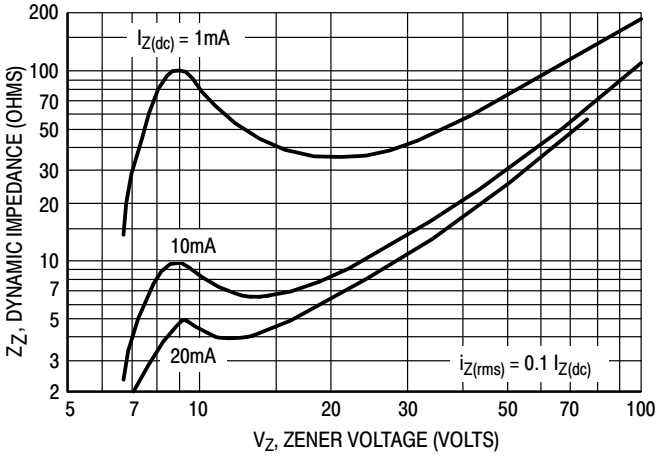


Figure 7. Effect of Zener Voltage

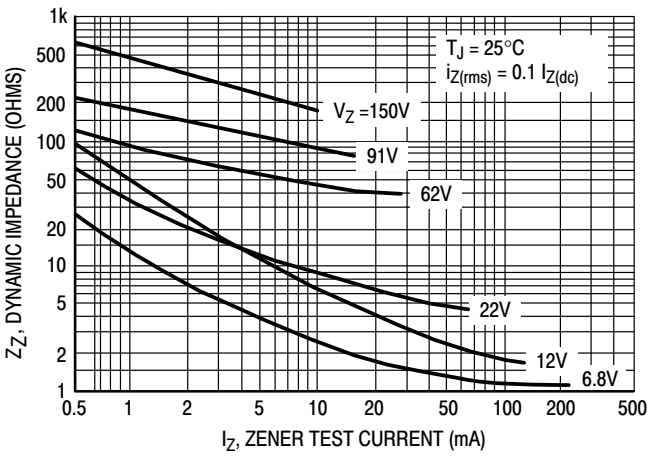


Figure 8. Effect of Zener Current

Rating and Typical Characteristic Curves (T_A = 25°C)

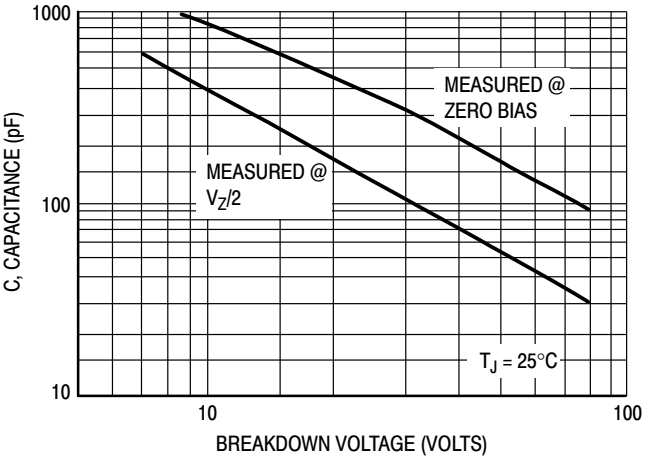


Figure 9. Capacitance Curve

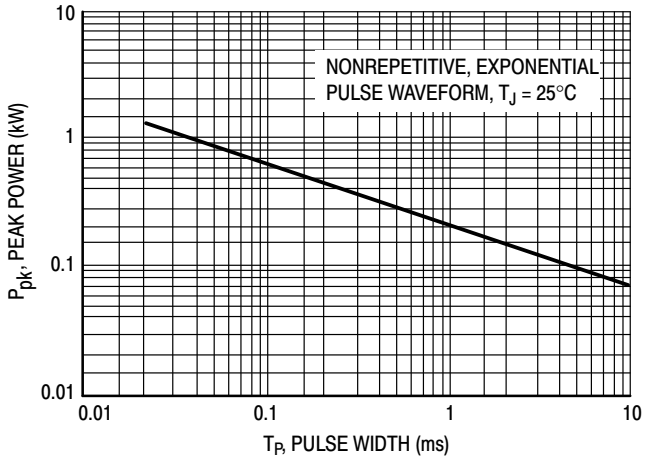


Figure 10. Typical Pulse Rating Curve

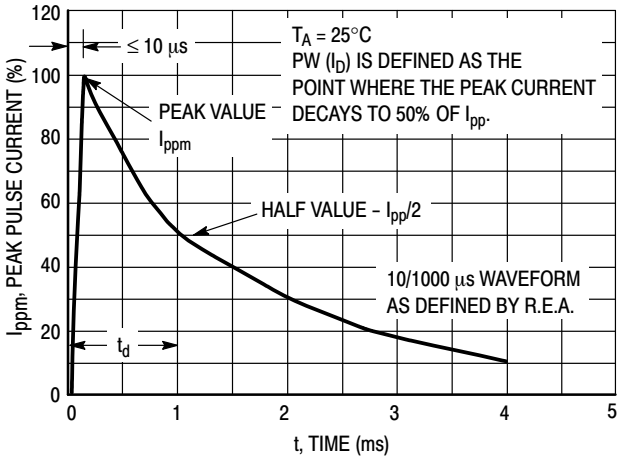


Figure 11. Pulse Waveform

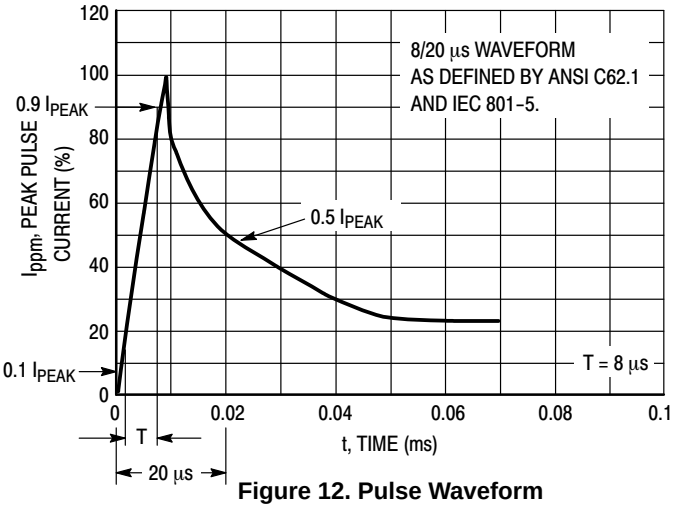
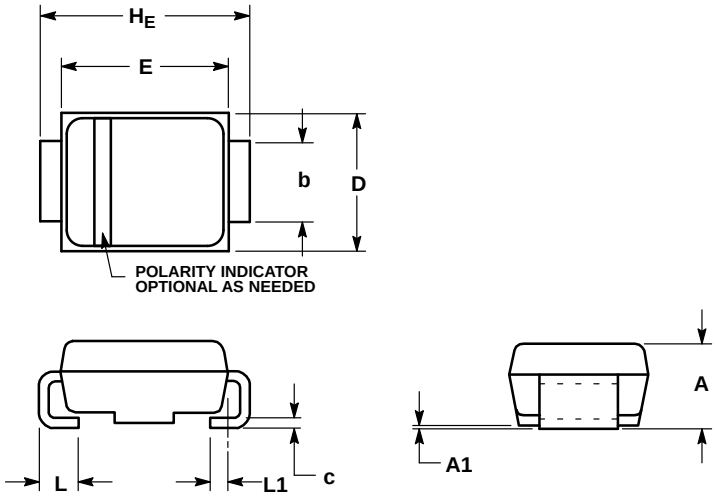


Figure 12. Pulse Waveform

PACKAGE DIMENSIONS

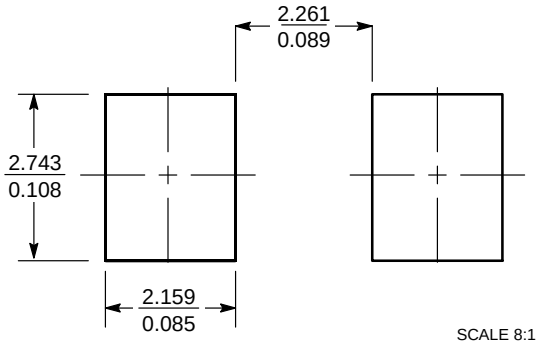
SMB
CASE 403A−03
ISSUE J



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION b SHALL BE MEASURED WITHIN DIMENSION L1.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	1.95	2.30	2.47	0.077	0.091	0.097
A1	0.05	0.10	0.20	0.002	0.004	0.008
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
H_E	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*



SCALE 8:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*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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