

# BZX84CxxxET1 Series, SZBZX84CxxxET1G Series

## Zener Voltage Regulators

### 225 mW SOT-23 Surface Mount

This series of Zener diodes is offered in the convenient, surface mount plastic SOT-23 package. These devices are designed to provide voltage regulation with minimum space requirement. They are well suited for applications such as cellular phones, hand held portables, and high density PC boards.

#### Specification Features

- 225 mW Rating on FR-4 or FR-5 Board
- Zener Breakdown Voltage Range – 2.4 V to 75 V
- Package Designed for Optimal Automated Board Assembly
- Small Package Size for High Density Applications
- ESD Rating of Class 3 (>16 kV) per Human Body Model
- Peak Power – 225 W (8 X 20  $\mu$ s)
- AEC-Q101 Qualified and PPAP Capable
- 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, thermosetting plastic case

**FINISH:** Corrosion resistant finish, easily solderable

**MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:**

260°C for 10 Seconds

**POLARITY:** Cathode indicated by polarity band

**FLAMMABILITY RATING:** UL 94 V-0

#### MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Peak Power Dissipation @ 20 $\mu$ s (Note 1) @ $T_L \leq 25^\circ\text{C}$	$P_{pk}$	225	W
Total Power Dissipation on FR-5 Board, (Note 2) @ $T_A = 25^\circ\text{C}$ Derated above 25°C	$P_D$	225 1.8	mW mW/°C
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	556	°C/W
Total Power Dissipation on Alumina Substrate, (Note 3) @ $T_A = 25^\circ\text{C}$ Derated above 25°C	$P_D$	300 2.4	mW mW/°C
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature Range	$T_J, T_{stg}$	-65 to +150	°C

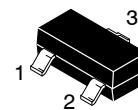
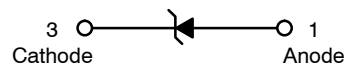
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Nonrepetitive current pulse per Figure 9.
2. FR-5 = 1.0 X 0.75 X 0.62 in.
3. Alumina = 0.4 X 0.3 X 0.024 in, 99.5% alumina.



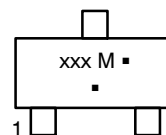
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**SOT-23  
CASE 318  
STYLE 8**

#### MARKING DIAGRAM



xxx = Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

#### ORDERING INFORMATION

Device	Package	Shipping†
BZX84CxxxET1	SOT-23	3000 / Tape & Reel
BZX84CxxxET1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
SZBZX84CxxxET1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
BZX84CxxxET3	SOT-23	10,000 / Tape & Reel
BZX84CxxxET3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel
SZBZX84CxxxET3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel

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

#### DEVICE MARKING INFORMATION

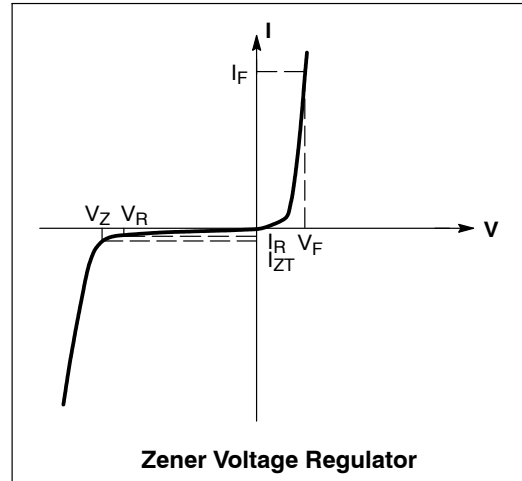
See specific marking information in the device marking column of the Electrical Characteristics table on page 3 of this data sheet.

## BZX84CxxxET1 Series, SZBZX84CxxxET1G Series

### ELECTRICAL CHARACTERISTICS

(Pinout: 1-Anode, 2-No Connection, 3-Cathode) ( $T_A = 25^\circ\text{C}$  unless otherwise noted,  $V_F = 0.90\text{ V Max. @ } I_F = 10\text{ mA}$ )

Symbol	Parameter
$V_Z$	Reverse Zener Voltage @ $I_{ZT}$
$I_{ZT}$	Reverse Current
$Z_{ZT}$	Maximum Zener Impedance @ $I_{ZT}$
$I_R$	Reverse Leakage Current @ $V_R$
$V_R$	Reverse Voltage
$I_F$	Forward Current
$V_F$	Forward Voltage @ $I_F$
$\Theta V_Z$	Maximum Temperature Coefficient of $V_Z$
C	Max. Capacitance @ $V_R = 0$ and $f = 1\text{ MHz}$



## BZX84CxxxET1 Series, SZBZX84CxxxET1G Series

### ELECTRICAL CHARACTERISTICS

(Pinout: 1-Anode, 2-No Connection, 3-Cathode) ( $T_A = 25^\circ\text{C}$  unless otherwise noted,  $V_F = 0.90\text{ V Max. @ } I_F = 10\text{ mA}$ )

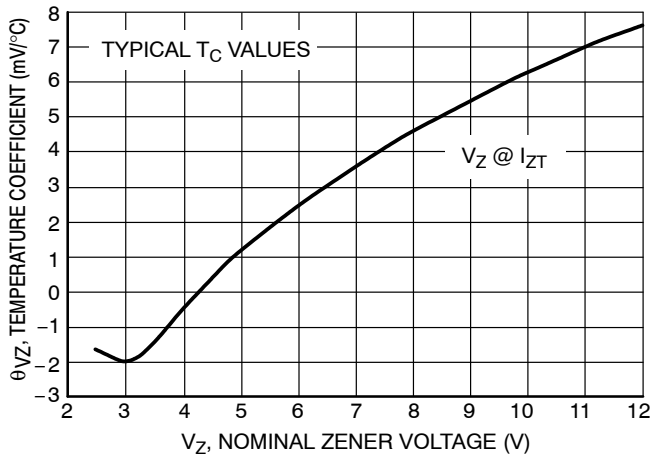
Device*	Device Marking	$V_{Z1}$ (V) @ $I_{ZT1} = 5\text{ mA}$ (Note 4)			$Z_{ZT1}$ ( $\Omega$ ) @ $I_{ZT1} = 5\text{ mA}$	$V_{Z2}$ (V) @ $I_{ZT2} = 1\text{ mA}$ (Note 4)		$Z_{ZT2}$ ( $\Omega$ ) @ $I_{ZT2} = 1\text{ mA}$	$V_{Z3}$ (V) @ $I_{ZT3} = 20\text{ mA}$ (Note 4)		$Z_{ZT3}$ ( $\Omega$ ) @ $I_{ZT3} = 20\text{ mA}$	Max Reverse Leakage Current		$\theta_{VZ}$ (mV/k) @ $I_{ZT1} = 5\text{ mA}$		C (pF) @ $V_R = 0\text{ V}$ f = 1 MHz
		Min	Nom	Max		Min	Max		Min	Max		$I_R$ ( $\mu\text{A}$ )	$V_R$ (V)	Min	Max	
BZX84C2V4ET1, G	BA1	2.2	2.4	2.6	100	1.7	2.1	600	2.6	3.2	50	50	1.0	-3.5	0	450
SZ/BZX84C2V7ET1, G	BA2	2.5	2.7	2.9	100	1.9	2.4	600	3.0	3.6	50	20	1.0	-3.5	0	450
BZX84C3V0ET1, G	BA3	2.8	3.0	3.2	95	2.1	2.7	600	3.3	3.9	50	10	1.0	-3.5	0	450
BZX84C3V3ET1, G	BA4	3.1	3.3	3.5	95	2.3	2.9	600	3.6	4.2	40	5.0	1.0	-3.5	0	450
BZX84C3V6ET1, G	BA5	3.4	3.6	3.8	90	2.7	3.3	600	3.9	4.5	40	5.0	1.0	-3.5	0	450
BZX84C3V9ET1, G	BA6	3.7	3.9	4.1	90	2.9	3.5	600	4.1	4.7	30	3.0	1.0	-3.5	-2.5	450
BZX84C4V3ET1, G	BA7	4.0	4.3	4.6	90	3.3	4.0	600	4.4	5.1	30	3.0	1.0	-3.5	0	450
BZX84C4V7ET1, G	BA9	4.4	4.7	5.0	80	3.7	4.7	500	4.5	5.4	15	3.0	2.0	-3.5	0.2	260
BZX84C5V1ET1, G	BB1	4.8	5.1	5.4	60	4.2	5.3	480	5.0	5.9	15	2.0	2.0	-2.7	1.2	225
BZX84C5V6ET1, G SZBZX84C5V6ET3, G	BB2	5.2	5.6	6.0	40	4.8	6.0	400	5.2	6.3	10	1.0	2.0	-2	2.5	200
SZ/BZX84C6V2ET1, G	BB3	5.8	6.2	6.6	10	5.6	6.6	150	5.8	6.8	6	3.0	4.0	0.4	3.7	185
BZX84C6V8ET1, G	BB4	6.4	6.8	7.2	15	6.3	7.2	80	6.4	7.4	6	2.0	4.0	1.2	4.5	155
BZX84C7V5ET1, G	BB5	7.0	7.5	7.9	15	6.9	7.9	80	7.0	8.0	6	1.0	5.0	2.5	5.3	140
BZX84C8V2ET1, G	BB6	7.7	8.2	8.7	15	7.6	8.7	80	7.7	8.8	6	0.7	5.0	3.2	6.2	135
BZX84C9V1ET1, G	BB7	8.5	9.1	9.6	15	8.4	9.6	100	8.5	9.7	8	0.5	6.0	3.8	7.0	130
BZX84C10ET1, G	BB8	9.4	10	10.6	20	9.3	10.6	150	9.4	10.7	10	0.2	7.0	4.5	8.0	130
BZX84C11ET1, G	BB9	10.4	11	11.6	20	10.2	11.6	150	10.4	11.8	10	0.1	8.0	5.4	9.0	130
BZX84C12ET1, G	BC1	11.4	12	12.7	25	11.2	12.7	150	11.4	12.9	10	0.1	8.0	6.0	10	130
BZX84C13ET1, G	BC2	12.4	13	14.1	30	12.3	14	170	12.5	14.2	15	0.1	8.0	7.0	11	120
BZX84C15ET1, G	BC3	13.8	15	15.6	30	13.7	15.5	200	13.9	15.7	20	0.05	10.5	9.2	13	110
BZX84C16ET1, G	BC4	15.3	16	17.1	40	15.2	17	200	15.4	17.2	20	0.05	11.2	10.4	14	105
BZX84C18ET1, G	BC5	16.8	18	19.1	45	16.7	19	225	16.9	19.2	20	0.05	12.6	12.4	16	100
BZX84C20ET1, G	BC6	18.8	20	21.2	55	18.7	21.1	225	18.9	21.4	20	0.05	14	14.4	18	85
BZX84C22ET1, G	BC7	20.8	22	23.3	55	20.7	23.2	250	20.9	23.4	25	0.05	15.4	16.4	20	85
BZX84C24ET1, G	BC8	22.8	24	25.6	70	22.7	25.5	250	22.9	25.7	25	0.05	16.8	18.4	22	80
Device	Device Marking	$V_{Z1}$ Below @ $I_{ZT1} = 2\text{ mA}$			$Z_{ZT1}$ Below @ $I_{ZT1} = 2\text{ mA}$	$V_{Z2}$ Below @ $I_{ZT2} = 0.1\text{ mA}$		$Z_{ZT2}$ Below @ $I_{ZT2} = 0.5\text{ mA}$	$V_{Z3}$ Below @ $I_{ZT3} = 10\text{ mA}$		$Z_{ZT3}$ Below @ $I_{ZT3} = 10\text{ mA}$	Max Reverse Leakage Current		$\theta_{VZ}$ (mV/k) Below @ $I_{ZT1} = 2\text{ mA}$		C (pF) @ $V_R = 0\text{ V}$ f = 1 MHz
		Min	Nom	Max		Min	Max		Min	Max		$I_R$ ( $\mu\text{A}$ )	$V_R$ (V)	Min	Max	
BZX84C27ET1, G	BC9	25.1	27	28.9	80	25	28.9	300	25.2	29.3	45	0.05	18.9	21.4	25.3	70
BZX84C30ET1	BD1	28	30	32	80	27.8	32	300	28.1	32.4	50	0.05	21	24.4	29.4	70
BZX84C33ET1, G	BD2	31	33	35	80	30.8	35	325	31.1	35.4	55	0.05	23.1	27.4	33.4	70
BZX84C36ET1, G	BD3	34	36	38	90	33.8	38	350	34.1	38.4	60	0.05	25.2	30.4	37.4	70
BZX84C39ET1, G	BD4	37	39	41	130	36.7	41	350	37.1	41.5	70	0.05	27.3	33.4	41.2	45
BZX84C43ET1, G	BK6	40	43	46	150	39.7	46	375	40.1	46.5	80	0.05	30.1	37.6	46.6	40
BZX84C47ET1, G	BD5	44	47	50	170	43.7	50	375	44.1	50.5	90	0.05	32.9	42	51.8	40
BZX84C51ET1, G	BD6	48	51	54	180	47.6	54	400	48.1	54.6	100	0.05	35.7	46.6	57.2	40
BZX84C56ET1, G	BD7	52	56	60	200	51.5	60	425	52.1	60.8	110	0.05	39.2	52.2	63.8	40
BZX84C62ET1, G	BD8	58	62	66	215	57.4	66	450	58.2	67	120	0.05	43.4	58.8	71.6	35
BZX84C68ET1, G	BD9	64	68	72	240	63.4	72	475	64.2	73.2	130	0.05	47.6	65.6	79.8	35
BZX84C75ET1, G	BE1	70	75	79	255	69.4	79	500	70.3	80.2	140	0.05	52.5	73.4	88.6	35

4. Zener voltage is measured with a pulse test current  $I_Z$  at an ambient temperature of  $25^\circ\text{C}$

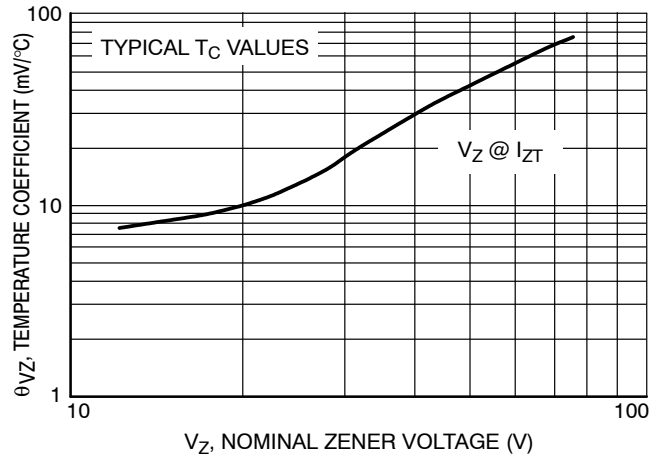
\* The "G" suffix indicates Pb-Free package available.

# BZX84CxxxET1 Series, SZBZX84CxxxET1G Series

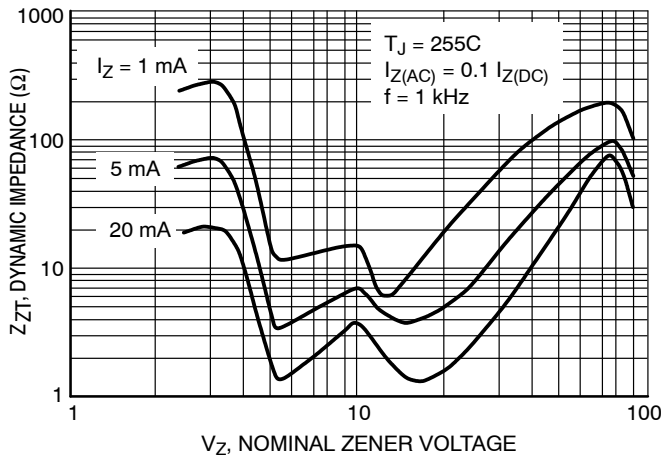
## TYPICAL CHARACTERISTICS



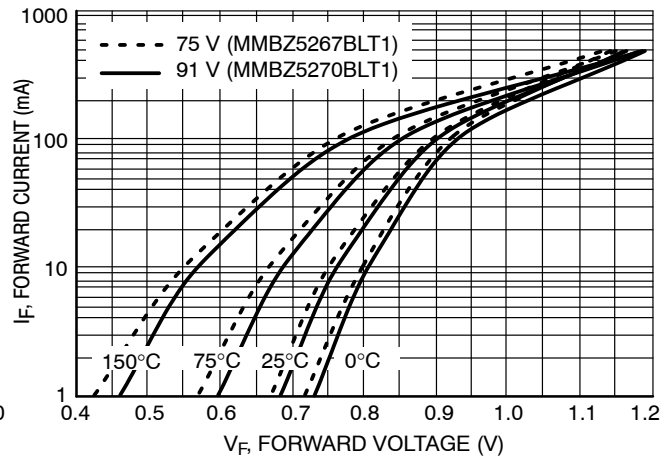
**Figure 1. Temperature Coefficients**  
(Temperature Range -55°C to +150°C)



**Figure 2. Temperature Coefficients**  
(Temperature Range -55°C to +150°C)



**Figure 3. Effect of Zener Voltage on Zener Impedance**



**Figure 4. Typical Forward Voltage**

TYPICAL CHARACTERISTICS

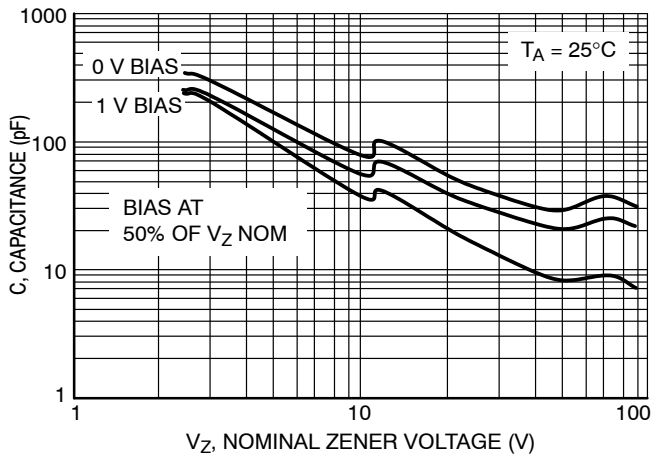


Figure 5. Typical Capacitance

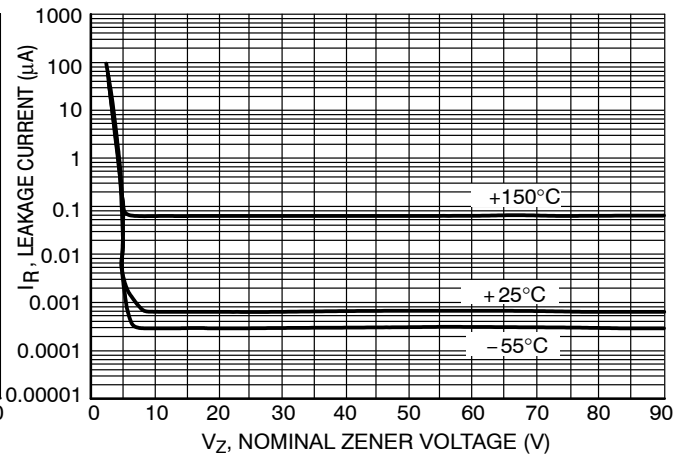


Figure 6. Typical Leakage Current

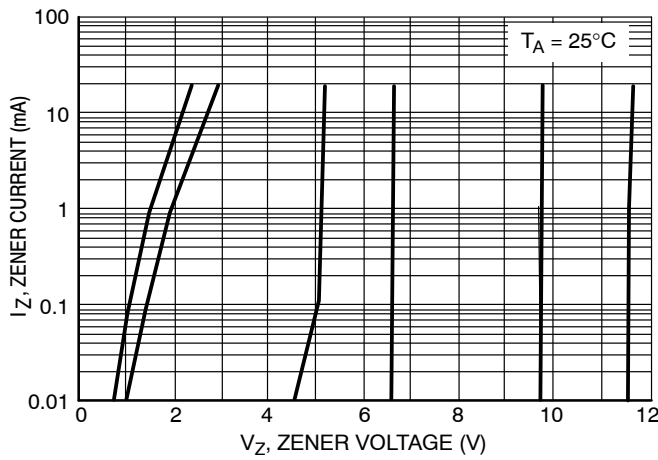


Figure 7. Zener Voltage versus Zener Current (V<sub>Z</sub> Up to 12 V)

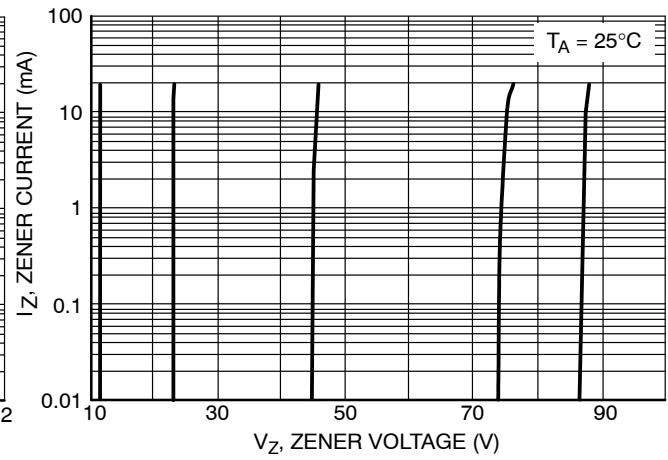


Figure 8. Zener Voltage versus Zener Current (12 V to 91 V)

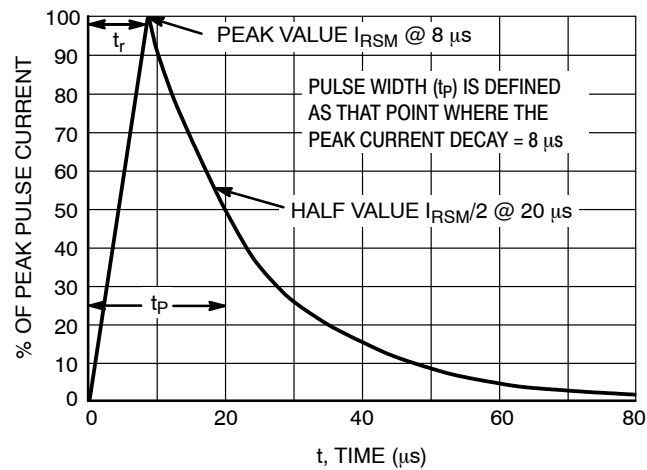
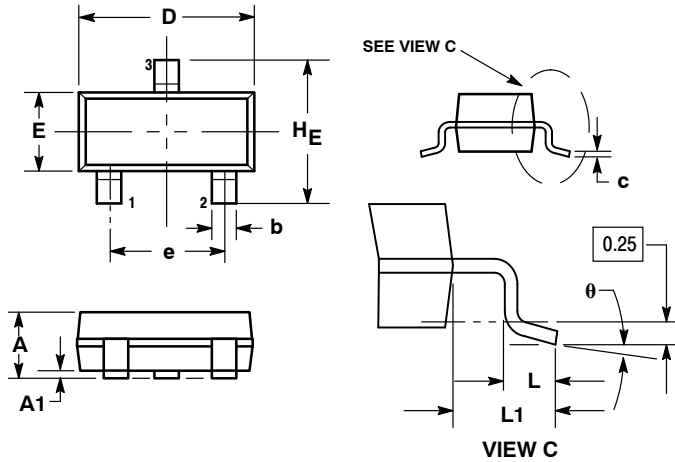


Figure 9. 8 × 20 μs Pulse Waveform

# BZX84CxxxET1 Series, SZBZX84CxxxET1G Series

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AP



NOTES:

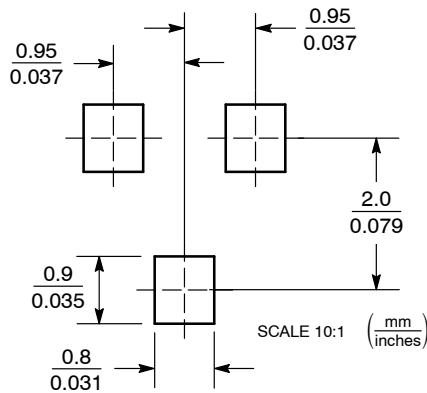
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104
θ	0°	---	10°	0°	---	10°

STYLE 8:

1. ANODE
2. NO CONNECTION
3. CATHODE

### 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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