

# PZT222AT1

Preferred Device

## NPN Silicon Planar Epitaxial Transistor

This NPN Silicon Epitaxial transistor is designed for use in linear and switching applications. The device is housed in the SOT-223 package which is designed for medium power surface mount applications.

### Features

- PNP Complement is PZT2907AT1
- The SOT-223 package can be soldered using wave or reflow
- SOT-223 package ensures level mounting, resulting in improved thermal conduction, and allows visual inspection of soldered joints
- The formed leads absorb thermal stress during soldering, eliminating the possibility of damage to the die
- Available in 12 mm tape and reel
- Pb-Free Packages are Available

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	40	Vdc
Collector-Base Voltage	$V_{CBO}$	75	Vdc
Emitter-Base Voltage (Open Collector)	$V_{EBO}$	6.0	Vdc
Collector Current	$I_C$	600	mAdc
Total Power Dissipation up to $T_A = 25^\circ\text{C}$ (Note 1)	$P_D$	1.5	W
Storage Temperature Range	$T_{stg}$	- 65 to +150	$^\circ\text{C}$
Junction Temperature	$T_J$	150	$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Device mounted on an epoxy printed circuit board 1.575 inches x 1.575 inches x 0.059 inches; mounting pad for the collector lead min. 0.93 inches<sup>2</sup>.

### THERMAL CHARACTERISTICS

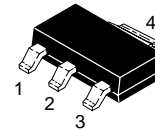
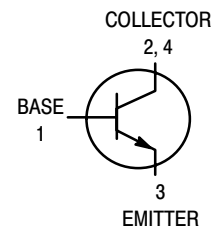
Rating	Symbol	Value	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	83.3	$^\circ\text{C/W}$
Lead Temperature for Soldering, 0.0625" from case Time in Solder Bath	$T_L$	260 10	$^\circ\text{C}$ Sec



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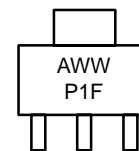
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### SOT-223 PACKAGE NPN SILICON TRANSISTOR SURFACE MOUNT



SOT-223 (TO-261)  
CASE 318E-04  
STYLE 1

### MARKING DIAGRAM



A = Assembly Location  
WW = Work Week

### ORDERING INFORMATION

Device	Package	Shipping†
PZT222AT1	SOT-223	3000 Tape & Reel
PZT222AT1G	SOT-223 (Pb-Free)	3000 Tape & Reel
PZT222AT3	SOT-223	10,000 Tape & Reel
PZT222AT3G	SOT-223 (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 Specifications Brochure, BRD8011/D.

Preferred devices are recommended choices for future use and best overall value.

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## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage ( $I_C = 10\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	40	–	Vdc
Collector-Base Breakdown Voltage ( $I_C = 10\text{ }\mu\text{Adc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	75	–	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10\text{ }\mu\text{Adc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	6.0	–	Vdc
Base-Emitter Cutoff Current ( $V_{CE} = 60\text{ Vdc}$ , $V_{BE} = -3.0\text{ Vdc}$ )	$I_{BEX}$	–	20	nAdc
Collector-Emitter Cutoff Current ( $V_{CE} = 60\text{ Vdc}$ , $V_{BE} = -3.0\text{ Vdc}$ )	$I_{CEX}$	–	10	nAdc
Emitter-Base Cutoff Current ( $V_{EB} = 3.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	100	nAdc
Collector-Base Cutoff Current ( $V_{CB} = 60\text{ Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 60\text{ Vdc}$ , $I_E = 0$ , $T_A = 125^\circ\text{C}$ )	$I_{CBO}$	– –	10 10	nAdc $\mu\text{Adc}$

## ON CHARACTERISTICS

DC Current Gain ( $I_C = 0.1\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ ) ( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ ) ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ ) ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $T_A = -55^\circ\text{C}$ ) ( $I_C = 150\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ ) ( $I_C = 150\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ ) ( $I_C = 500\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ )	$h_{FE}$	35 50 70 35 100 50 40	– – – – 300 – –	–
Collector-Emitter Saturation Voltages ( $I_C = 150\text{ mAdc}$ , $I_B = 15\text{ mAdc}$ ) ( $I_C = 500\text{ mAdc}$ , $I_B = 50\text{ mAdc}$ )	$V_{CE(sat)}$	– –	0.3 1.0	Vdc
Base-Emitter Saturation Voltages ( $I_C = 150\text{ mAdc}$ , $I_B = 15\text{ mAdc}$ ) ( $I_C = 500\text{ mAdc}$ , $I_B = 50\text{ mAdc}$ )	$V_{BE(sat)}$	0.6 –	1.2 2.0	Vdc
Input Impedance ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 1.0\text{ mAdc}$ , $f = 1.0\text{ kHz}$ ) ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 10\text{ mAdc}$ , $f = 1.0\text{ kHz}$ )	$h_{ie}$	2.0 0.25	8.0 1.25	$k\Omega$
Voltage Feedback Ratio ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 1.0\text{ mAdc}$ , $f = 1.0\text{ kHz}$ ) ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 10\text{ mAdc}$ , $f = 1.0\text{ kHz}$ )	$h_{re}$	– –	$8.0 \times 10^{-4}$ $4.0 \times 10^{-4}$	–
Small-Signal Current Gain ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 1.0\text{ mAdc}$ , $f = 1.0\text{ kHz}$ ) ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 10\text{ mAdc}$ , $f = 1.0\text{ kHz}$ )	$ h_{fe} $	50 75	300 375	–
Output Admittance ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 1.0\text{ mAdc}$ , $f = 1.0\text{ kHz}$ ) ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 10\text{ mAdc}$ , $f = 1.0\text{ kHz}$ )	$h_{oe}$	5.0 25	35 200	$\mu\text{mhos}$
Noise Figure ( $V_{CE} = 10\text{ Vdc}$ , $I_C = 100\text{ }\mu\text{Adc}$ , $f = 1.0\text{ kHz}$ )	F	–	4.0	dB

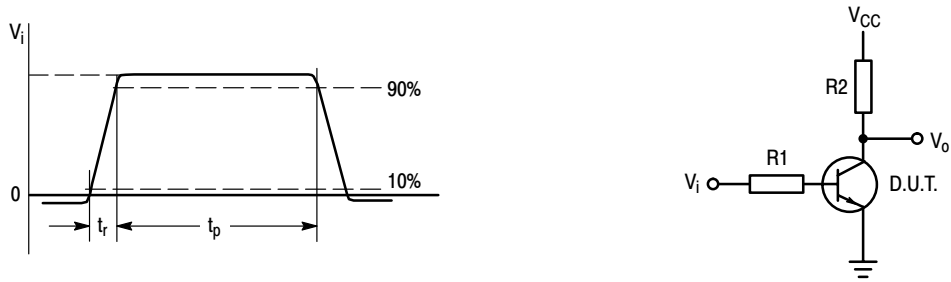
## DYNAMIC CHARACTERISTICS

Current-Gain – Bandwidth Product ( $I_C = 20\text{ mAdc}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	300	–	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_c$	–	8.0	pF
Input Capacitance ( $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )	$C_e$	–	25	pF

## SWITCHING TIMES ( $T_A = 25^\circ\text{C}$ )

Delay Time	$(V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mAdc}$ , $I_{B(on)} = 15\text{ mAdc}$ , $V_{EB(off)} = 0.5\text{ Vdc}$ ) Figure 1	$t_d$	–	10	ns
Rise Time		$t_r$	–	25	
Storage Time	$(V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mAdc}$ , $I_{B(on)} = I_{B(off)} = 15\text{ mAdc}$ ) Figure 2	$t_s$	–	225	ns
Fall Time		$t_f$	–	60	

# PZT2222AT1



**Figure 1. Input Waveform and Test Circuit for Determining Delay Time and Rise Time**

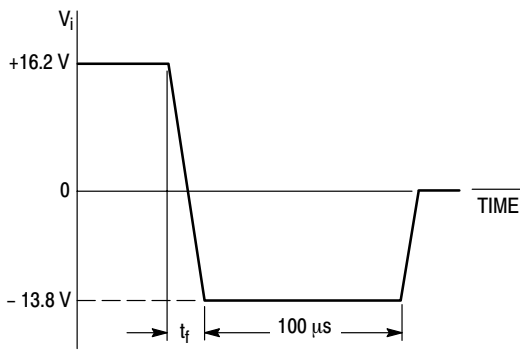
$V_i = -0.5 \text{ V to } +9.9 \text{ V}$ ,  $V_{CC} = +30 \text{ V}$ ,  $R_1 = 619 \Omega$ ,  $R_2 = 200 \Omega$ .

**PULSE GENERATOR:**

**PULSE DURATION**  $t_p$  3 200 ns  
**RISE TIME**  $t_r$  3 2 ns  
**DUTY FACTOR**  $\delta$  = 0.02

**OSCILLOSCOPE:**

**INPUT IMPEDANCE**  $Z_i > 100 \text{ k}\Omega$   
**INPUT CAPACITANCE**  $C_i < 12 \text{ pF}$   
**RISE TIME**  $t_r < 5 \text{ ns}$

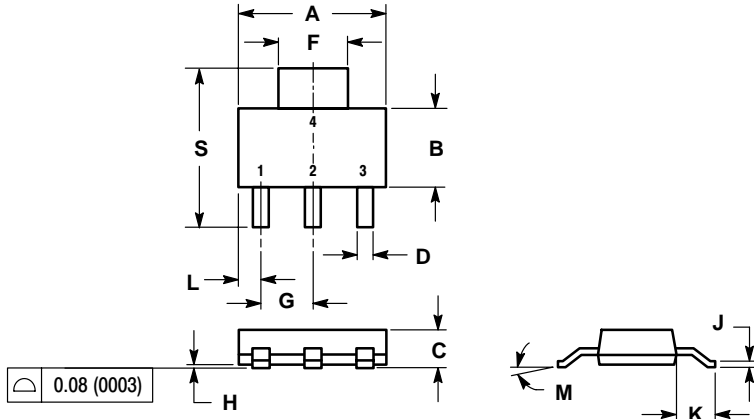


**Figure 2. Input Waveform and Test Circuit for Determining Storage Time and Fall Time**

# PZT222AT1

## PACKAGE DIMENSIONS

SOT-223 (TO-261)  
CASE 318E-04  
ISSUE K

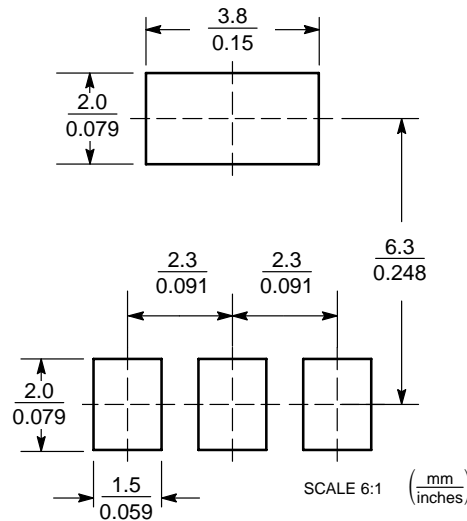


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.249	0.263	6.30	6.70
B	0.130	0.145	3.30	3.70
C	0.060	0.068	1.50	1.75
D	0.024	0.035	0.60	0.89
F	0.115	0.126	2.90	3.20
G	0.087	0.094	2.20	2.40
H	0.0008	0.0040	0.020	0.100
J	0.009	0.014	0.24	0.35
K	0.060	0.078	1.50	2.00
L	0.033	0.041	0.85	1.05
M	0°	10°	0°	10°
S	0.264	0.287	6.70	7.30

- STYLE 1:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

### 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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