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

MAXIMUM RATINGS

- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant*

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	Ι _C	600	mAdc
Total Power Dissipation up to $T_A = 25^{\circ}C$ (Note 1)	P _D	1.5	W
Storage Temperature Range	T _{stg}	– 65 to +150	°C
Junction Temperature Range	TJ	– 55 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.

 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 inches².

THERMAL CHARACTERISTICS

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

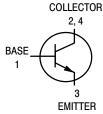


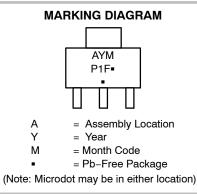
ON Semiconductor®

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SOT-223 PACKAGE NPN SILICON TRANSISTOR SURFACE MOUNT







ORDERING INFORMATION

Device	Package	Shipping [†]
PZT2222AT1G	SOT-223 (Pb-Free)	1,000 Tape & Reel
SPZT2222AT1G	SOT-223 (Pb-Free)	1,000 Tape & Reel
PZT2222AT3G	SOT-223 (Pb-Free)	4,000 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.

*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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ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage ($I_C = 10 \text{ mAdc}, I_B = 0$)	V _{(BR)CEO}	40	-	Vdc
Collector-Base Breakdown Voltage ($I_C = 10 \ \mu Adc$, $I_E = 0$)	V _{(BR)CBO}	75	-	Vdc
Emitter-Base Breakdown Voltage (I _E = 10 μ Adc, I _C = 0)	V _{(BR)EBO}	6.0	-	Vdc
Base-Emitter Cutoff Current (V_{CE} = 60 Vdc, V_{BE} = - 3.0 Vdc)	I _{BEX}	- 1	20	nAdc
Collector-Emitter Cutoff Current (V_{CE} = 60 Vdc, V_{BE} = - 3.0 Vdc)	I _{CEX}	-	10	nAdc
Emitter-Base Cutoff Current (V_{EB} = 3.0 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 μAdc
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 Vdc, I _C = 1.0 mAdc, f = 1.0 kHz) (V _{CE} = 10 Vdc, I _C = 10 mAdc, f = 1.0 kHz)	h _{ie}	2.0 0.25	8.0 1.25	kΩ
Voltage Feedback Ratio ($V_{CE} = 10$ Vdc, $I_C = 1.0$ mAdc, $f = 1.0$ kHz) ($V_{CE} = 10$ Vdc, $I_C = 10$ mAdc, $f = 1.0$ kHz)	h _{re}		8.0x10 ⁻⁴ 4.0x10 ⁻⁴	_
$ Small-Signal Current Gain \\ (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz) \\ (V_{CE} = 10 Vdc, I_C = 10 mAdc, f = 1.0 kHz) $	h _{fe}	50 75	300 375	_
Output Admittance (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz) (V_{CE} = 10 Vdc, I_C = 10 mAdc, f = 1.0 kHz)	h _{oe}	5.0 25	35 200	μmhos
Noise Figure (V _{CE} = 10 Vdc, I_C = 100 μ Adc, f = 1.0 kHz)	F	-	4.0	dB
DYNAMIC CHARACTERISTICS				
Current–Gain – Bandwidth Product (I _C = 20 mAdc, V _{CE} = 20 Vdc, f = 100 MHz)	f _T	300	_	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)	C _c	-	8.0	pF
Input Capacitance (V _{EB} = 0.5 Vdc, I _C = 0, f = 1.0 MHz)	C _e	-	25	pF
SWITCHING TIMES (T _A = 25°C)				
Delay Time $(V_{CC} = 30 \text{ Vdc}, I_C = 150 \text{ mAdc},$	t _d	-	10	ns
Rise TimeI _{B(on)} = 15 mAdc, V _{EB(off)} = 0.5 Vdc)Figure 1	t _r	-	25	
Storage Time $(V_{CC} = 30 \text{ Vdc}, I_C = 150 \text{ mAdc},$	t _s	_	225	ns
IB(on) = IB(off) = 15 mAdc) Fall Time Figure 2	t _f	_	60	

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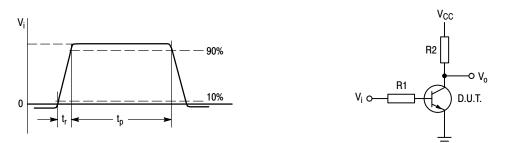


Figure 1. Input Waveform and Test Circuit for Determining Delay Time and Rise Time

$V_i = -0.5 V \text{ to } +9.9 V,$	V_{CC} = +30 V, R1 = 619 Ω , R2 = 20	00 Ω.	
PULSE GENERATOR: PULSE DURATION RISE TIME DUTY FACTOR	$t_p 3 200 \text{ ns}$ $t_r 3 2 \text{ ns}$ $\delta = 0.02$	OSCILLOSCOPE: INPUT IMPEDANCE INPUT CAPACITANCE RISE TIME	Z _i > 100 kΩ C _i < 12 pF t _r < 5 ns

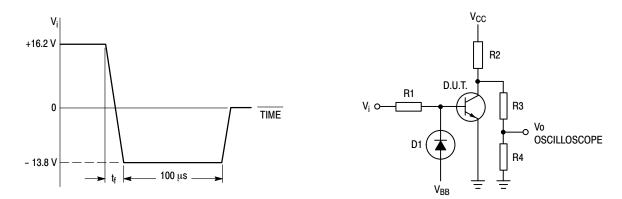
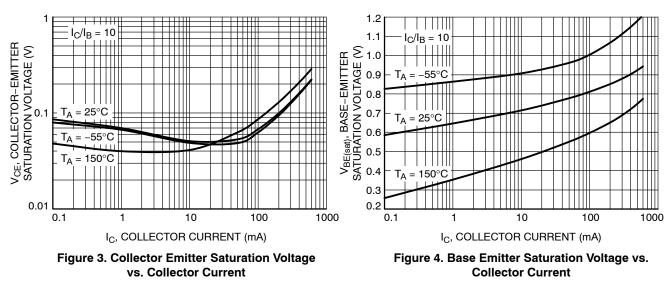


Figure 2. Input Waveform and Test Circuit for Determining Storage Time and Fall Time

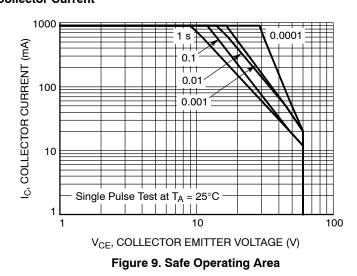


TYPICAL CHARACTERISTICS

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1000 2.0 T_A = 25°C V_{CE} = 6 V_{CE(sat)}, COLLECTOR-EMITTER SATURATION VOLTAGE (V) 1.8 +++++ T_A = 150°C 1.6 h_{FE}, DC CURRENT GAIN ٩ 100 mA 600 mA 1.4 10 mA 300 mA $T_A = 25^{\circ}C$ ī 1.2 100 1.0 T_A -55°C 0.8 ++++0.6 0.4 0.2 10 0 0.1 1 10 100 1000 0.001 0.01 0.1 1 10 100 IC, COLLECTOR CURRENT (mA) IB, BASE CURRENT (mA) Figure 5. DC Current Gain vs. Collector Figure 6. Saturation Region Current V_{BE(ON)}, BASE-EMITTER ON VOLTAGE (V) 100 1.1 $V_{CE} = 2 V$ 1.0 0.9 TA 55°C C, CAPACITANCE (pF) Cibo 0.8 Cobo 0.7 TA = 25°C 10 0.6 0.5 0.4 T_A = 150°C 0.3 0.2 1 10 100 1000 0.1 100 0.1 10 1 1 I_C, COLLECTOR CURRENT (mA) V_R, REVERSE VOLTAGE (V) Figure 7. Base-Emitter Turn-On Voltage vs. Figure 8. Capacitance **Collector Current**

TYPICAL CHARACTERISTICS



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