

AT-32011, AT-32033

Low Current, High Performance NPN

Silicon Bipolar Transistor



Data Sheet

Description

Avago's AT-32011 and AT-32033 are high performance NPN bipolar transistors that have been optimized for maximum f_t at low voltage operation, making them ideal for use in battery powered applications in wireless markets. The AT-32033 uses the 3 lead SOT-23, while the AT-32011 places the same die in the higher performance 4 lead SOT-143. Both packages are industry standard, and compatible with high volume surface mount assembly techniques.

The 3.2 micron emitter-to-emitter pitch and reduced parasitic design of these transistors yields extremely high performance products that can perform a multiplicity of tasks. The 20 emitter finger interdigitated geometry yields an easy to match to and extremely fast transistor with moderate power, low noise resistance, and low operating currents.

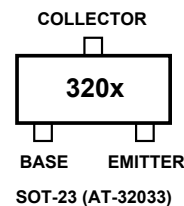
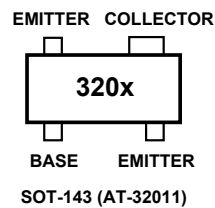
Optimized performance at 2.7 V makes these devices ideal for use in 900 MHz, 1.8 GHz, and 2.4 GHz battery operated systems as an LNA, gain stage, buffer, oscillator, or active mixer. Typical amplifier designs at 900 MHz yield 1.2 dB noise figures with 12 dB or more associated gain at a 2.7 V, 2 mA bias, with noise performance being relatively insensitive to input match. High gain capability at 1 V, 1 mA makes these devices a good fit for 900 MHz pager applications. Voltage breakdowns are high enough for use at 5 volts.

The AT-3 series bipolar transistors are fabricated using an optimized version of Avago's 10 GHz f_t , 30 GHz f_{MAX} Self-Aligned-Transistor (SAT) process. The die are nitride passivated for surface protection. Excellent device uniformity, performance and reliability are produced by the use of ion-implantation, self-alignment techniques, and gold metalization in the fabrication of these devices.

Features

- High Performance Bipolar Transistor Optimized for Low Current, Low Voltage Operation
- 900 MHz Performance:
AT-32011: 1 dB NF, 14 dB G_A
AT-32033: 1 dB NF, 12.5 dB G_A
- Characterized for End-Of-Life Battery Use (2.7 V)
- SOT-23 and SOT-143 SMT Plastic Packages
- Tape-And-Reel Packaging Option Available
- Lead-free Option Available

Pin Connections and Package Marking



Notes:

Top View. Package Marking provides orientation and identification. "x" is the date code.

AT-32011, AT-32033 Absolute Maximum Ratings

Symbol	Parameter	Units	Absolute Maximum ^[1]
V _{EBO}	Emitter-Base Voltage	V	1.5
V _{CBO}	Collector-Base Voltage	V	11
V _{CEO}	Collector-Emitter Voltage	V	5.5
I _C	Collector Current	mA	32
P _T	Power Dissipation ^[2, 3]	mW	200
T _j	Junction Temperature	°C	150
T _{STG}	Storage Temperature	°C	-65 to 150

Thermal Resistance^[2]:

$$\theta_{jc} = 550 \text{ }^{\circ}\text{C/W}$$

Notes:

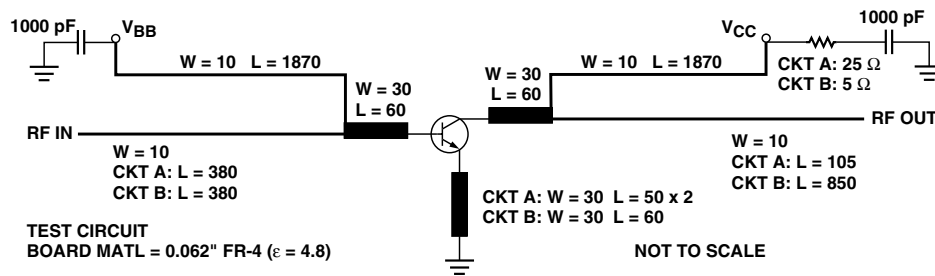
1. Operation of this device above any one of these parameters may cause permanent damage.
2. T_{Mounting Surface} = 25°C.
3. Derate at 1.82 mW/°C for T_C > 40°C.

Electrical Specifications, T_A = 25°C

Symbol	Parameters and Test Conditions	Units	AT-32011			AT-32033		
			Min.	Typ.	Max.	Min.	Typ.	Max.
NF	Noise Figure V _{CE} = 2.7 V, I _C = 2 mA f = 0.9 GHz	dB		1.0 ^[1]	1.3 ^[1]		1.0 ^[2]	1.3 ^[2]
G _A	Associated Gain V _{CE} = 2.7 V, I _C = 2 mA f = 0.9 GHz	dB	12.5 ^[1]	14 ^[1]		11 ^[2]	12.5 ^[2]	
h _{FE}	Forward Current Transfer Ratio V _{CE} = 2.7 V, I _C = 2 mA	–	70		300	70		300
I _{CBO}	Collector Cutoff Current V _{CB} = 3 V	μA			0.2			0.2
I _{EBO}	Emitter Cutoff Current V _{EB} = 1 V	μA			1.5			1.5

Notes:

1. Test circuit A, Figure 1. Numbers reflect device performance de-embedded from circuit losses. Input loss = 0.3 dB; output loss = 0.3 dB.
2. Test circuit B, Figure 1. Numbers reflect device performance de-embedded from circuit losses. Input loss = 0.3 dB; output loss = 0.3 dB.



DIMENSIONS IN MILS

Figure 1. Test Circuit for Noise Figure and Associated Gain.

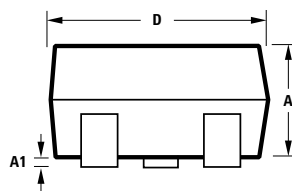
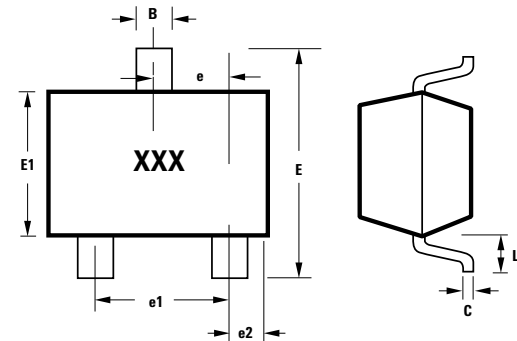
This circuit is a compromise match between best noise figure, best gain, stability, and a practical synthesizable match.

Ordering Information

Part Numbers	No. of Devices	Comments	
AT-32011-BLKG	AT-32033-BLKG	100	Bulk
AT-32011-TR1G	AT-32033-TR1G	3000	7" Reel
AT-32011-TR2G	AT-32033-TR2G	10000	13" Reel

Package Dimensions

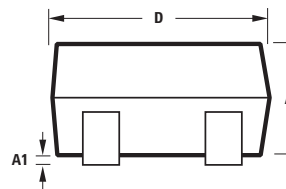
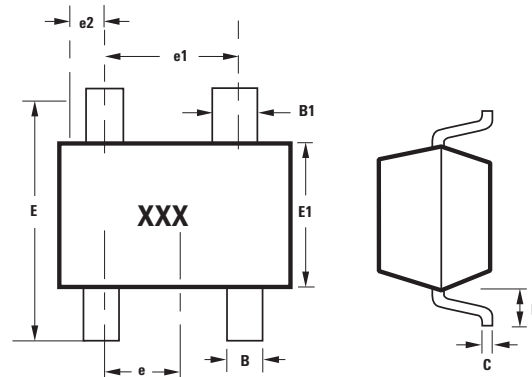
SOT-23 Plastic Package



Notes:
XXX-package marking
Drawings are not to scale

SYMBOL	DIMENSIONS (mm)	
	MIN.	MAX.
A	0.79	1.20
A1	0.000	0.100
B	0.37	0.54
C	0.086	0.152
D	2.73	3.13
E1	1.15	1.50
e	0.89	1.02
e1	1.78	2.04
e2	0.45	0.60
E	2.10	2.70
L	0.45	0.69

SOT-143 Plastic Package



Notes:
XXX-package marking
Drawings are not to scale

SYMBOL	DIMENSIONS (mm)	
	MIN.	MAX.
A	0.79	1.097
A1	0.013	0.10
B	0.36	0.54
B1	0.76	0.92
C	0.086	0.152
D	2.80	3.06
E1	1.20	1.40
e	0.89	1.02
e1	1.78	2.04
e2	0.45	0.60
E	2.10	2.65
L	0.45	0.69