

Features

- **Low Bias Current Operation**
- **Low Noise Figure: 1.9 dB typical at 2.0 GHz**
3.0 dB typical at 4.0 GHz
- **High Associated Gain: 10.0 dB typical at 2.0 GHz**
6.5 dB typical at 4.0 GHz
- **High Gain-Bandwidth Product: 9.0 GHz typical f_T**

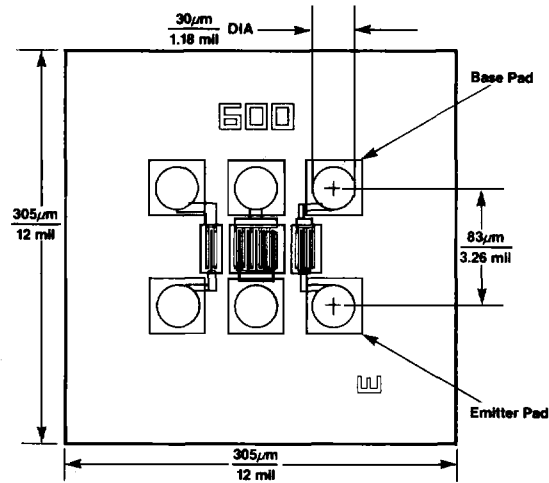
Description

The AT-60200 is a high performance NPN silicon bipolar transistor chip designed for use in low noise, wide band amplifier and oscillator applications operating over VHF, UHF and microwave frequencies.

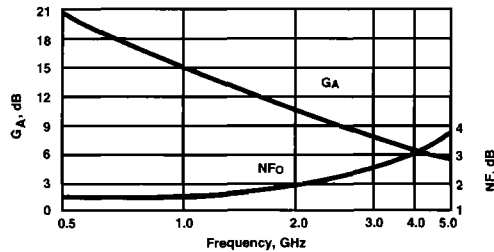
The die are nitride-passivated for surface protection. Excellent device uniformity, performance and reliability are produced by the use of ion-implantation, self alignment techniques, and gold metallization in the fabrication of these devices.

The recommended assembly procedure is gold-eutectic die attach at 400°C and either wedge or ball bonding using 0.7 mil gold wire. See also "Chip Use" in the APPLICATIONS section.

Chip Outline¹



NOISE FIGURE AND ASSOCIATED GAIN vs. FREQUENCY
 $V_{CE} = 8V, I_C = 1mA$



Electrical Specifications, $T_A = 25^\circ C$

Symbol	Parameter and Test Conditions ^{1,2}	Units	Min.	Typ.	Max.
NFO	Optimum Noise Figure: $V_{CE} = 8V, I_C = 1mA$ $f = 1.0 GHz$ $f = 2.0 GHz$ $f = 4.0 GHz$	dB		1.4 1.9 3.0	
GA	Gain @ NFO: $V_{CE} = 8V, I_C = 1mA$ $f = 1.0 GHz$ $f = 2.0 GHz$ $f = 4.0 GHz$	dB		15.0 10.0 6.5	
IS_{21E}^2	Insertion Power Gain: $V_{CE} = 8V, I_C = 5mA$ $f = 2.0 GHz$ $f = 4.0 GHz$	dB		11.0 5.5	
P_1 dB	Power Output @ 1 dB Gain Compression: $V_{CE} = 8V, I_C = 5mA$ $f = 2.0 GHz$	dBm		6.5	
G_1 dB	1 dB Compressed Gain: $V_{CE} = 8V, I_C = 5mA$ $f = 2.0 GHz$	dB		13.5	
f_T	Gain Bandwidth Product: $V_{CE} = 8V, I_C = 5mA$	GHz		9.0	
h_{FE}	Forward Current Transfer Ratio: $V_{CE} = 8V, I_C = 5mA$		30	150	300
I_{CBO}	Collector Cutoff Current: $V_{CB} = 8V$	μA			0.2
I_{EBO}	Emitter Cutoff Current: $V_{EB} = 1V$	μA			1.0
CCB	Collector Base Capacitance ³ : $V_{CB} = 8V, f = 1MHz$	pF		0.08	

Notes: 1. This chip contains 3 active devices. The performance specified applies only to the device whose base and emitter pads are indicated on the chip outline.
2. RF performance is determined by packaging and testing 10 devices per wafer.
3. For this test, the emitter is grounded.

Absolute Maximum Ratings

Parameter	Symbol	Absolute Maximum ¹
Emitter-Base Voltage	VEBO	1.5 V
Collector-Base Voltage	VCBO	20 V
Collector-Emitter Voltage	VCEO	12 V
Collector Current	IC	16 mA
Power Dissipation ^{2,3}	PT	160 mW
Junction Temperature	TJ	200°C
Storage Temperature	TSTG	-65°C to 200°C

Thermal Resistance^{2,4}: $\theta_{jc} = 155^\circ\text{C/W}$

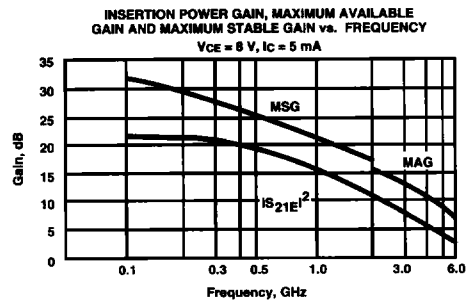
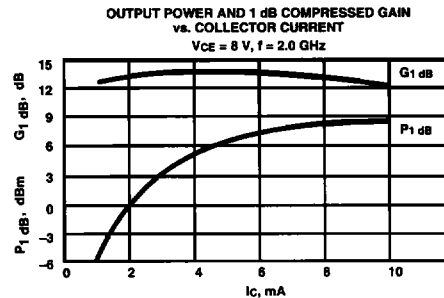
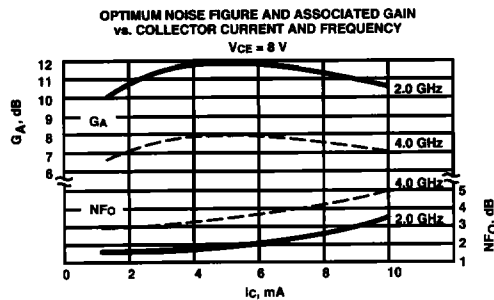
Notes:

1. Operation of this device above any one of these parameters may cause permanent damage.
2. TMOUNTING SURFACE = 25°C.
3. Derate at 6.5 mW/°C for TMOUNTING SURFACE > 175°C.
4. The small spot size of this technique results in a higher, though more accurate determination of θ_{jc} than do alternate methods. See MEASUREMENTS section "Thermal Resistance" for more information.

Part Number Ordering Information

Part Number	Devices Per Tray
AT-60200-GP2	10
AT-60200-GP4	100
AT-60200-GP6	up to 300

Typical Performance, $T_A = 25^\circ\text{C}$
(unless otherwise noted)



AT-60200
Low Noise Silicon Bipolar Transistor

Typical Scattering Parameters: Common Emitter, $Z_0 = 50 \Omega$

$T_A = 25^\circ\text{C}$, $V_{CE} = 8 \text{ V}$, $I_C = 1 \text{ mA}$

Freq. GHz	S_{11}		dB	S_{21}		dB	S_{12}		S_{22}	
	Mag	Ang		Mag	Ang		Mag	Ang	Mag	Ang
0.1	.97	-8	16.9	7.00	172	-43.1	.007	87	.99	-3
0.5	.85	-32	15.8	6.13	147	-29.9	.032	73	.94	-11
1.0	.66	-57	13.6	4.78	126	-25.2	.055	64	.87	-13
1.5	.52	-74	11.7	3.86	108	-23.4	.068	59	.79	-14
2.0	.41	-89	9.9	3.12	99	-22.2	.078	58	.75	-17
2.5	.34	-101	8.7	2.71	90	-20.8	.091	59	.74	-17
3.0	.29	-114	7.3	2.31	82	-20.0	.100	61	.72	-18
3.5	.25	-126	6.2	2.03	74	-19.3	.108	60	.71	-20
4.0	.23	-137	5.3	1.83	69	-18.4	.120	61	.71	-23
5.0	.20	-163	3.4	1.47	57	-17.5	.133	61	.72	-26

$T_A = 25^\circ\text{C}$, $V_{CE} = 8 \text{ V}$, $I_C = 5 \text{ mA}$

0.1	.87	-8	22.0	12.51	169	-50.5	.003	88	.92	-6
0.5	.70	-44	19.0	8.94	138	-31.4	.027	72	.90	-12
1.0	.48	-74	15.7	6.12	113	-27.7	.041	65	.81	-11
1.5	.32	-97	13.1	4.54	100	-26.0	.050	66	.76	-11
2.0	.24	-114	10.9	3.50	90	-24.4	.060	67	.73	-13
2.5	.19	-134	9.3	2.90	83	-23.0	.071	71	.73	-14
3.0	.15	-161	7.7	2.42	76	-21.7	.082	74	.73	-15
3.5	.11	-160	6.4	2.08	74	-20.5	.095	75	.73	-18
4.0	.15	178	5.4	1.87	70	-19.5	.106	80	.73	-18
5.0	.14	168	4.0	1.59	61	-17.4	.135	74	.72	-24

A model for this device is available in the DEVICE MODELS section.