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HEWLETT
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AT-00500

Up to 4 GHz General Purpose
Silicon Bipolar Transistor
Chip

Features

- 16.0 dBm typical $P_{1\text{ dB}}$ at 2.0 GHz
- 11.5 dB typical $G_{1\text{ dB}}$ at 2.0 GHz
- 2.5 dB typical N_{F0} at 2.0 GHz
- High Gain-Bandwidth Product: 9.0 GHz typical f_T

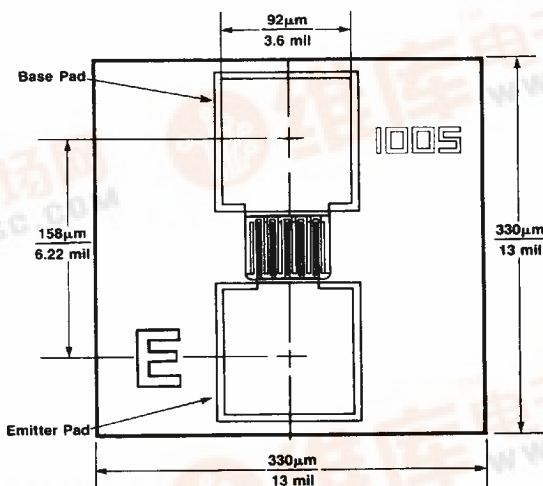
Description

The AT-00500 is a high performance NPN silicon bipolar transistor chip designed for use in 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.

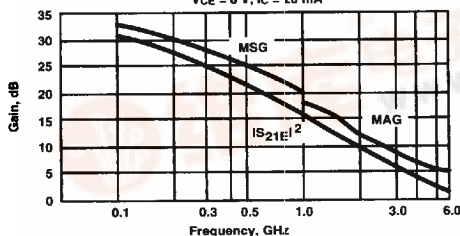
The recommended assembly procedure is gold-eutectic die attach at 400°C and either wedge or ball bonding using 0.7 mil gold wire. See also "Chip Use" in the APPLICATIONS section.

Chip Outline



INSERTION POWER GAIN, MAXIMUM AVAILABLE
GAIN AND MAXIMUM STABLE GAIN
vs. FREQUENCY

$V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$

Electrical Specifications, $T_A = 25^\circ\text{C}$

Symbol	Parameters and Test Conditions ¹	Units	Min.	Typ.	Max.
$ S_{21E} ^2$	Insertion Power Gain: $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$ $f = 1.0\text{ GHz}$ $f = 2.0\text{ GHz}$	dB		15.5 9.5	
$P_{1\text{ dB}}$	Power Output @ 1 dB Gain Compression: $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$ $f = 2.0\text{ GHz}$	dB		16.0	
$G_{1\text{ dB}}$	1 dB Compressed Gain: $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$ $f = 2.0\text{ GHz}$	dB		11.5	
N_{F0}	Optimum Noise Figure: $V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$ $f = 2.0\text{ GHz}$	dB		2.5	
GA	Gain @ N_{F0} : $V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$ $f = 2.0\text{ GHz}$	dB		10.5	
f_T	Gain Bandwidth Product: $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$	GHz		9.0	
h_{FE}	Forward Current Transfer Ratio: $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$		30	150	300
I_{CBO}	Collector Cutoff Current: $V_{CB} = 8\text{ V}$	μA			0.2
I_{EBO}	Emitter Cutoff Current: $V_{EB} = 1\text{ V}$	μA			1.0
CCB	Collector Base Capacitance ² : $V_{CB} = 8\text{ V}$, $f = 1\text{ MHz}$	pF		0.45	

Notes: 1. RF performance is determined by packaging and testing 10 devices per wafer.
2. For this test, the emitter is grounded.



AT-00500
General Purpose Silicon Bipolar Transistor

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	50 mA
Power Dissipation ^{2,3}	PT	500 mW
Junction Temperature	TJ	200°C
Storage Temperature	TSTG	-65°C to 200°C

Thermal Resistance^{2,4}: $\theta_{jc} = 75^\circ\text{C/W}$

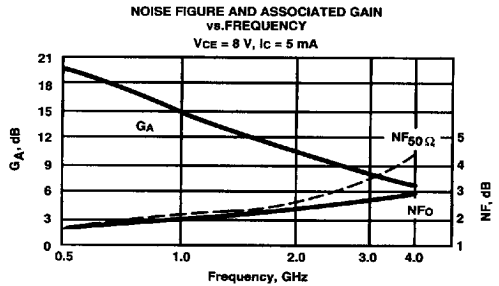
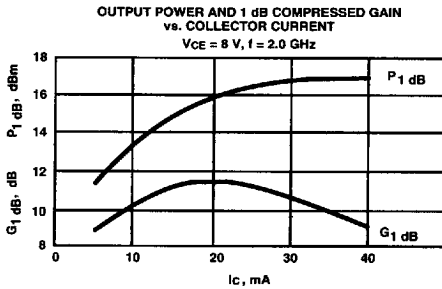
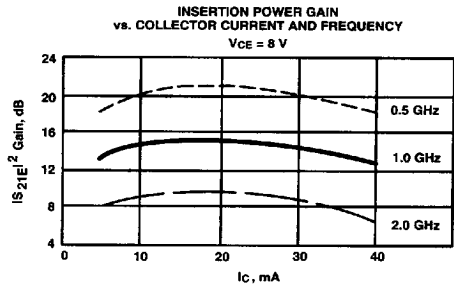
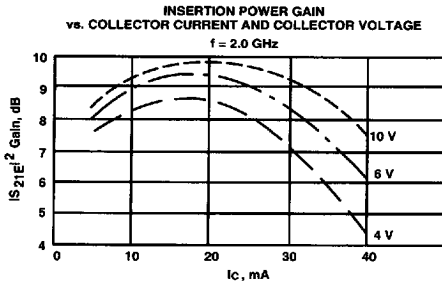
Notes:

1. Operation of this device above any one of these parameters may cause permanent damage.
2. TCASE = 25°C.
3. Derate at 13.3 mW/°C for TC > 163°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-00500-GP2	10
AT-00500-GP4	100
AT-00500-GP6	up to 300

Typical Performance, TA = 25°C
 (unless otherwise noted)



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

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

Freq. GHz	S ₁₁		S ₂₁			S ₁₂			S ₂₂	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.87	-29	23.2	14.43	161	-32.4	.024	76	.96	-14
0.5	.66	-103	18.2	8.17	116	-23.2	.069	45	.61	-42
1.0	.57	-142	13.6	4.78	94	-21.4	.085	40	.44	-47
1.5	.54	-162	10.2	3.24	81	-20.4	.096	44	.39	-50
2.0	.54	-176	8.0	2.51	72	-19.4	.107	49	.38	-53
2.5	.54	178	6.1	2.02	64	-18.6	.118	52	.38	-55
3.0	.56	171	4.8	1.73	55	-17.5	.134	53	.39	-59
3.5	.56	163	3.6	1.52	51	-16.5	.149	58	.40	-63
4.0	.58	158	2.5	1.33	44	-15.9	.160	59	.43	-66
4.5	.59	153	1.6	1.20	39	-15.1	.176	60	.46	-71
5.0	.59	149	0.6	1.07	33	-14.2	.194	61	.48	-76
5.5	.60	144	-0.1	0.99	29	-13.8	.204	62	.50	-83
6.0	.62	141	-1.1	0.88	23	-13.4	.215	63	.54	-88

$T_A = 25^\circ\text{C}$, $V_{CE} = 8 \text{ V}$, $I_C = 20 \text{ mA}$

0.1	.64	-66	30.4	33.05	145	-35.4	.017	65	.82	-29
0.5	.56	-149	21.1	11.31	99	-28.4	.038	52	.34	-53
1.0	.55	-172	15.5	5.96	86	-24.9	.057	61	.25	-52
1.5	.55	178	11.9	3.95	77	-22.3	.077	66	.24	-54
2.0	.56	169	9.6	3.03	70	-20.3	.097	68	.25	-56
2.5	.55	165	7.6	2.41	64	-18.8	.115	69	.26	-59
3.0	.57	160	6.3	2.06	57	-17.3	.136	69	.27	-63
3.5	.57	155	5.1	1.81	53	-16.2	.155	70	.28	-67
4.0	.59	150	3.9	1.57	47	-15.4	.170	69	.32	-70
4.5	.60	146	3.1	1.42	43	-14.3	.192	69	.35	-75
5.0	.60	144	2.1	1.27	38	-13.7	.207	62	.37	-79
5.5	.62	139	1.4	1.18	33	-13.1	.221	68	.39	-85
6.0	.62	136	0.4	1.05	29	-12.5	.237	68	.43	-90

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