



AT-00510

Up to 4 GHz General Purpose
Silicon Bipolar Transistor

Features

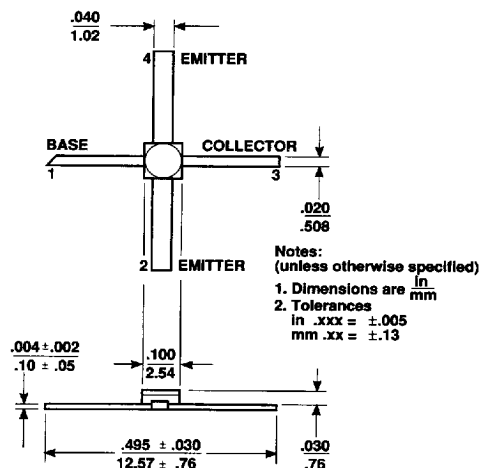
- 16.0 dBm typical $P_{1\text{ dB}}$ at 2.0 GHz
- 10.5 dB typical $G_{1\text{ dB}}$ at 2.0 GHz
- 2.5 dB typical NF_0 at 2.0 GHz
- High Gain-Bandwidth Product: 8.0 GHz typical f_T
- Hermetic Gold-ceramic Microstrip Package

Description

The AT-00510 is a high performance NPN silicon bipolar transistor housed in a hermetic, high reliability package. This device is designed for use in wide band amplifier and oscillator applications operating over VHF, UHF and microwave frequencies.

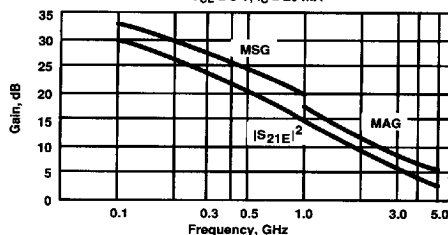
Excellent device uniformity, performance and reliability are produced by the use of ion-implantation, self-alignment techniques, and gold metallization in the fabrication of these devices.

100 mil Package



Outline 10A

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	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	13.0	15.0 9.0	
$P_{1\text{ dB}}$	Power Output @ 1 dB Gain Compression: $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$ $f = 2.0\text{ GHz}$	dBm		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		10.5	
NF_0	Optimum Noise Figure: $V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$ $f = 2.0\text{ GHz}$	dB		2.5	
G_A	Gain @ NF_0 : $V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$ $f = 2.0\text{ GHz}$	dB		10.5	
f_T	Gain Bandwidth Product: $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$	GHz		8.0	
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
C_{CB}	Collector Base Capacitance ¹ : $V_{CB} = 8\text{ V}$, $f = 1\text{ MHz}$	pF		0.5	

Note. 1. 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	50 mA
Power Dissipation ^{2,3}	PT	500 mW
Junction Temperature	TJ	200°C
Storage Temperature	TSTG	-65°C to 200°C

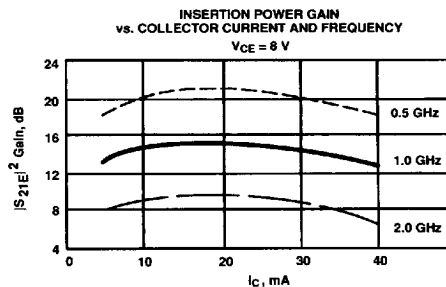
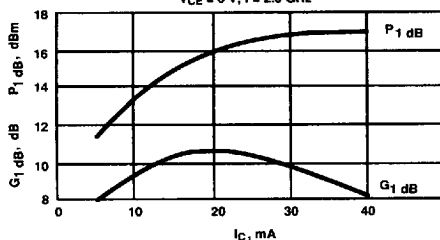
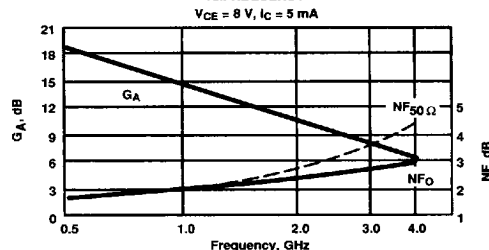
Thermal Resistance^{2,4}: $\theta_{JC} = 150^\circ\text{C/W}$

Notes:

- Operation of this device above any one of these parameters may cause permanent damage.
- TCASE = 25°C.
- Derate at 6.7 mW/°C for $T_C > 125^\circ\text{C}$.
- 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.

Typical Performance, $T_A = 25^\circ\text{C}$

(unless otherwise noted)

OUTPUT POWER AND 1 dB COMPRESSED GAIN
vs. COLLECTOR CURRENT
 $V_{CE} = 8\text{ V}, f = 2.0\text{ GHz}$ NOISE FIGURE AND ASSOCIATED GAIN
vs. FREQUENCY
 $V_{CE} = 8\text{ V}, I_C = 5\text{ mA}$ 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	S11		S21			S12			S22	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.75	-31	23.3	14.61	160	-31.7	.026	81	.95	-16
0.5	.60	-112	18.3	8.22	111	-23.0	.071	42	.58	-51
1.0	.54	-152	13.4	4.65	85	-21.4	.085	33	.41	-63
1.5	.52	-173	10.2	3.24	69	-20.1	.099	33	.36	-70
2.0	.52	171	7.9	2.49	55	-19.2	.109	33	.35	-77
2.5	.53	163	6.3	2.07	47	-17.8	.128	35	.33	-81
3.0	.55	153	4.9	1.75	36	-17.1	.139	36	.34	-90
3.5	.55	143	3.8	1.54	24	-16.1	.157	32	.36	-101
4.0	.55	134	2.7	1.37	13	-15.4	.170	30	.38	-111
4.5	.55	123	1.9	1.24	3	-14.4	.190	25	.40	-121
5.0	.55	111	1.1	1.14	8	-13.7	.206	20	.42	-131

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

Freq. GHz	S11 Mag	S11 Ang	S21 dB	S21 Mag	S21 Ang	S12 dB	S12 Mag	S12 Ang	S22 Mag	S22 Ang
0.1	.47	-71	29.7	30.66	145	-34.4	.019	63	.83	-30
0.5	.52	-156	20.8	10.90	97	-27.7	.041	51	.34	-66
1.0	.53	-179	15.1	5.68	78	-24.7	.058	52	.24	-72
1.5	.52	167	11.8	3.87	65	-21.4	.085	55	.22	-76
2.0	.53	156	9.4	2.94	53	-19.6	.105	51	.22	-84
2.5	.54	151	7.7	2.42	46	-17.8	.128	51	.22	-88
3.0	.56	143	6.2	2.04	37	-16.7	.146	50	.23	-98
3.5	.56	135	5.0	1.78	26	-15.6	.165	44	.25	-107
4.0	.55	126	4.0	1.59	16	-14.6	.186	39	.27	-117
4.5	.55	117	3.2	1.44	6	-13.7	.206	32	.30	-126
5.0	.56	105	2.4	1.32	-4	-13.0	.223	26	.31	-135

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