



AT-00535
Up to 4 GHz General Purpose
Silicon Bipolar Transistor

T-31-21

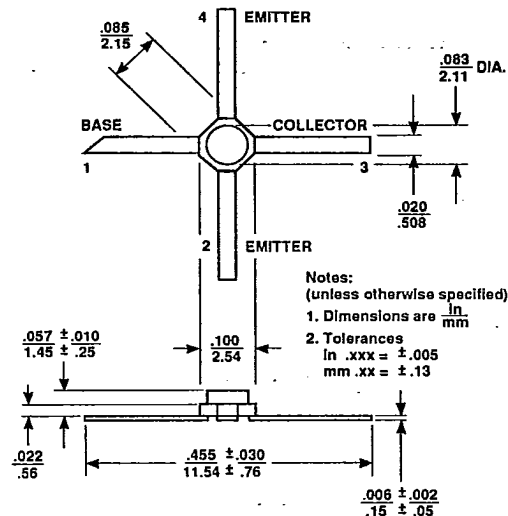
Features

- 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
- Cost Effective Ceramic Microstrip Package

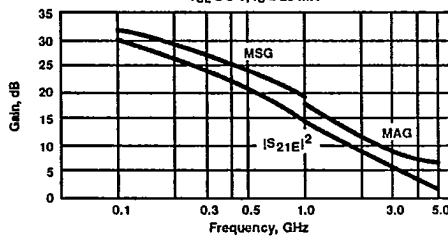
Description

Avantek's AT-00535 is a high performance NPN silicon bipolar transistor housed in a cost effective, microstrip 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.

Avantek 35 micro-X Package

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	VCBQ	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 ⁴	TSTG	-65°C to 200°C

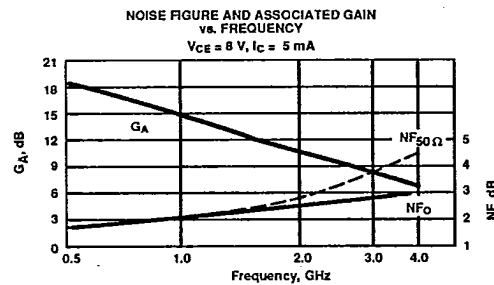
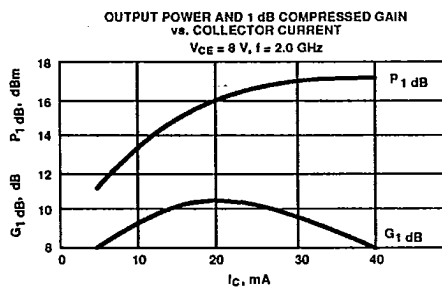
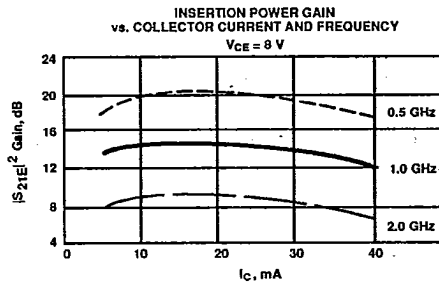
Thermal Resistance^{2,5}: $\theta_{JC} = 180^\circ\text{C/W}$

Notes:

- Operation of this device above any one of these parameters may cause permanent damage.
- TCASE = 25°C.
- Derate at 5.6 mW/°C for TCASE > 110°C.
- Storage above 150°C may tarnish the leads of this package making it difficult to solder into a circuit. After a device has been soldered into a circuit, it may be safely stored up to 200°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)

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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	dB	Mag	Ang
0.1	.82	-29	23.4	14.90	159	-33.1	.022	69	.95	-16	
0.5	.58	-106	18.3	8.20	110	-23.4	.068	44	.58	-47	
1.0	.49	-149	13.4	4.67	83	-20.9	.090	37	.41	-37	
1.5	.48	-175	10.3	3.28	66	-19.6	.105	39	.35	-64	
2.0	.49	167	8.1	2.53	52	-18.1	.125	37	.32	-74	
2.5	.50	156	6.4	2.10	43	-17.0	.141	41	.31	-82	
3.0	.53	144	5.0	1.78	31	-15.9	.160	39	.30	-97	
3.5	.54	134	3.9	1.56	19	-15.0	.178	36	.34	-110	
4.0	.54	124	2.8	1.38	8	-13.9	.202	34	.37	-120	
4.5	.55	112	2.0	1.25	-3	-12.8	.229	29	.39	-129	
5.0	.56	98	1.2	1.15	-15	-11.9	.253	23	.40	-139	

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

Freq. GHz	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang
0.1	.56	-63	29.6	30.24	143	-34.4	.019	62	.81	-28	
0.5	.47	-150	20.3	10.37	96	-27.3	.043	54	.36	-52	
1.0	.47	-178	14.7	5.43	76	-23.4	.068	56	.27	-54	
1.5	.48	165	11.4	3.71	62	-20.4	.095	57	.24	-61	
2.0	.50	152	9.1	2.84	49	-18.3	.121	53	.23	-72	
2.5	.51	145	7.3	2.33	41	-16.7	.146	53	.21	-82	
3.0	.54	135	5.9	1.96	31	-15.5	.167	50	.23	-98	
3.5	.56	126	4.7	1.72	-20	-14.2	.194	44	.26	-113	
4.0	.56	116	3.7	1.53	9	-13.2	.219	40	.29	-123	
4.5	.55	106	2.8	1.38	-2	-12.2	.244	32	.32	-131	
5.0	.57	93	2.1	1.27	-13	-11.3	.273	25	.33	-141	

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