



AT-42070
Up to 6 GHz Medium Power
Silicon Bipolar Transistor

T-31-21

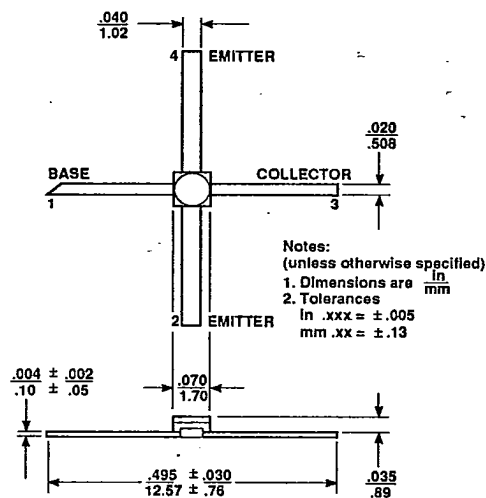
Features

- **High Output Power:**
21.0 dBm typical $P_{1\text{ dB}}$ at 2.0 GHz
20.5 dBm typical $P_{1\text{ dB}}$ at 4.0 GHz
- **High Gain at 1 dB Compression:**
15.0 dB typical $G_{1\text{ dB}}$ at 2.0 GHz
10.0 dB typical $G_{1\text{ dB}}$ at 4.0 GHz
- **Low Noise Figure:**
1.9 dB typical NF_0 at 2.0 GHz
- **High Gain-Bandwidth Product:**
8.0 GHz typical f_T
- **Hermetic Gold-ceramic Microstrip Package**

Description

Avantek's AT-42070 is a high performance NPN silicon bipolar transistor housed in a hermetic high reliability package. This device is designed for use in medium power, 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 70 mil Package**Noise Parameters: $V_{CE} = 8\text{ V}$, $I_C = 10\text{ mA}$**

Freq. GHz	NF_0 dB	Gamma Mag	Opt Ang	$R_N/50$
0.1	1.0	.05	15	0.13
0.5	1.1	.06	75	0.13
1.0	1.5	.10	126	0.12
2.0	1.9	.23	172	0.11
4.0	3.0	.45	-145	0.17

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

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.
$ S_{21E} ^2$	Insertion Power Gain: $V_{CE} = 8\text{ V}$, $I_C = 35\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$	dB	10.5	11.5 5.5	
$P_{1\text{ dB}}$	Power Output @ 1 dB Gain Compression: $V_{CE} = 8\text{ V}$, $I_C = 35\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$	dBm		21.0 20.5	
$G_{1\text{ dB}}$	1 dB Compressed Gain: $V_{CE} = 8\text{ V}$, $I_C = 35\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$	dB		15.0 10.0	
NF_0	Optimum Noise Figure: $V_{CE} = 8\text{ V}$, $I_C = 10\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$	dB		1.9 3.0	
G_A	Gain @ NF_0 : $V_{CE} = 8\text{ V}$, $I_C = 10\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$	dB		14.0 10.5	
f_T	Gain Bandwidth Product: $V_{CE} = 8\text{ V}$, $I_C = 35\text{ mA}$	GHz		8.0	
h_{FE}	Forward Current Transfer Ratio: $V_{CE} = 8\text{ V}$, $I_C = 35\text{ mA}$		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			2.0
CCB	Collector Base Capacitance*: $V_{CB} = 8\text{ V}$, $f = 1\text{ MHz}$	pF		0.28	

Note: 1. For this test the emitter is grounded.

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Absolute Maximum Ratings

Parameter	Symbol	Absolute Maximum
Emitter-Base Voltage	VEBO	1.5 V
Collector-Base Voltage	VCBO	20 V
Collector-Emitter Voltage	VCEO	12 V
Collector Current	IC	80 mA
Power Dissipation ^{2,3}	PT	600 mW
Junction Temperature	Tj	200°C
Storage Temperature	TSTG	-65°C to 200°C

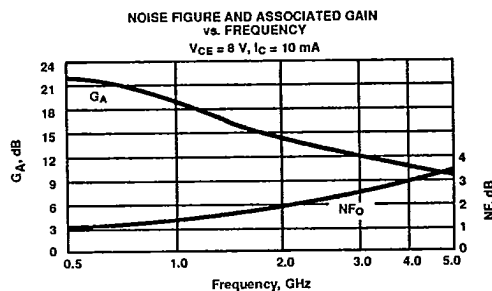
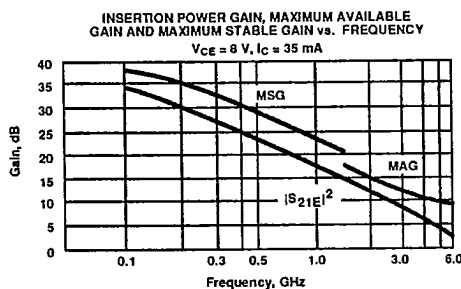
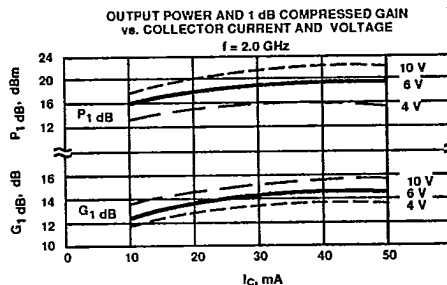
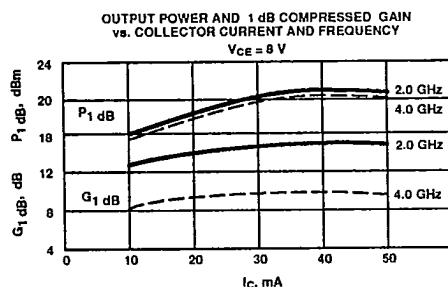
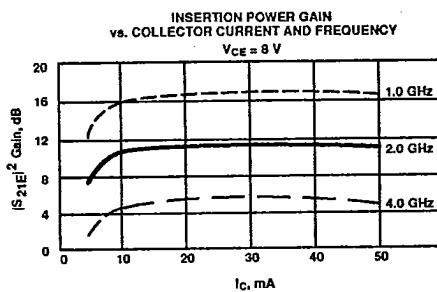
Thermal Resistance^{2,4}: $\theta_{jc} = 150^\circ\text{C/W}$

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 $T_c > 110^\circ\text{C}$.
- 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)

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Typical Scattering Parameters: Common Emitter, $Z_0 = 50 \Omega$ $T_A = 25^\circ\text{C}$, $V_{CE} = 8 \text{ V}$, $I_C = 10 \text{ mA}$

Freq. GHz	S_{11}		dB	S_{21}		dB	S_{12}		dB	S_{22}	
	Mag	Ang		Mag	Ang		Mag	Ang		Mag	Ang
0.1	.70	-49	28.5	26.56	154	-36.0	.016	77	.91	-18	
0.5	.69	-137	21.5	11.85	105	-29.6	.033	34	.50	-41	
1.0	.69	-165	16.0	6.34	85	-27.2	.044	29	.40	-44	
1.5	.68	-179	12.7	4.33	72	-27.4	.043	37	.38	-48	
2.0	.69	169	10.3	3.26	62	-25.6	.052	42	.37	-54	
2.5	.69	164	8.5	2.64	56	-25.4	.054	46	.37	-55	
3.0	.70	157	6.9	2.22	48	-23.8	.065	52	.39	-63	
3.5	.70	151	5.6	1.91	39	-22.4	.076	51	.41	-71	
4.0	.69	144	4.5	1.68	30	-21.4	.085	55	.43	-77	
4.5	.68	137	3.5	1.50	22	-20.4	.096	49	.46	-83	
5.0	.68	128	2.7	1.37	14	-19.4	.107	50	.48	-87	
5.5	.68	117	2.0	1.26	5	-18.3	.121	45	.48	-91	
6.0	.70	107	1.2	1.15	-3	-17.6	.132	44	.48	-98	

 $T_A = 25^\circ\text{C}$, $V_{CE} = 8 \text{ V}$, $I_C = 35 \text{ mA}$

Freq. GHz	S_{11}		dB	S_{21}		dB	S_{12}		dB	S_{22}	
	Mag	Ang		Mag	Ang		Mag	Ang		Mag	Ang
0.1	.52	-95	33.4	46.52	139	-40.0	.010	50	.77	-29	
0.5	.66	-163	23.1	14.33	95	-34.4	.019	46	.34	-42	
1.0	.67	179	17.3	7.36	80	-29.6	.033	51	.28	-41	
1.5	.67	169	13.9	4.97	69	-28.0	.040	59	.27	-44	
2.0	.68	160	11.4	3.74	60	-27.3	.053	59	.27	-51	
2.5	.69	157	9.6	3.04	55	-23.8	.065	65	.28	-53	
3.0	.69	151	8.1	2.55	47	-22.8	.072	65	.28	-62	
3.5	.69	145	6.8	2.20	39	-21.4	.086	59	.30	-72	
4.0	.68	139	5.7	1.93	20	-20.2	.097	60	.33	-80	
4.5	.67	132	4.7	1.74	22	-19.3	.109	54	.36	-85	
5.0	.67	123	4.0	1.59	13	-18.0	.126	50	.38	-90	
5.5	.67	113	3.2	1.46	5	-17.2	.138	46	.39	-94	
6.0	.69	103	2.5	1.34	-4	-16.4	.152	40	.38	-102	

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