

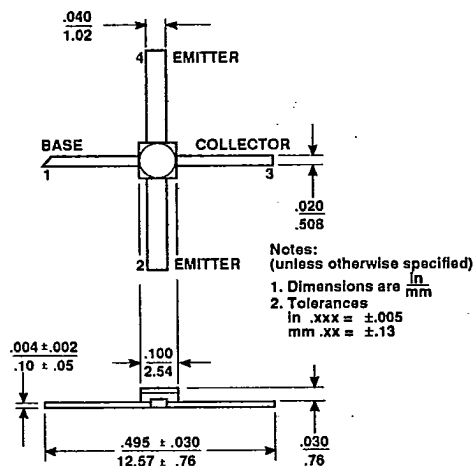


AT-42010
Up to 6 GHz Medium Power
Silicon Bipolar Transistor

T-31-21

Features

- **High Output Power:**
12.0 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:**
14.0 dB typical $G_{1\text{ dB}}$ at 2.0 GHz
9.5 dB typical $G_{1\text{ dB}}$ at 4.0 GHz
- **Low Noise Figure:**
1.9 dB typical N_{F0} at 2.0 GHz
- **High Gain-Bandwidth Product:**
8.0 GHz typical f_T
- **Hermetic Gold-ceramic Microstrip Package**

Avantek 100 mil Package**Description**

Avantek's AT-42010 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.

Noise Parameters: $V_{CE} = 8\text{ V}$, $I_C = 10\text{ mA}$

Freq. GHz	N_{F0} dB	Gamma Mag	Opt Ang	$R_{N/50}$
0.1	1.0	.04	15	0.13
0.5	1.1	.05	76	0.12
1.0	1.5	.10	132	0.12
2.0	1.9	.23	-177	0.11
4.0	3.0	.45	-125	0.26

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		14.0 9.5	
N_{F0}	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 @ N_{F0} : $V_{CE} = 8\text{ V}$, $I_C = 10\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$	dB		13.5 10.0	
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
C_{CB}	Collector Base Capacitance ¹ : $V_{CB} = 8\text{ V}$, $f = 1\text{ MHz}$	pF		0.28	

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

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Medium Power 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	80 mA
Power Dissipation ^{2,3}	PT	600 mW
Junction Temperature	TJ	200°C
Storage Temperature	TSTG	-65°C to 200°C

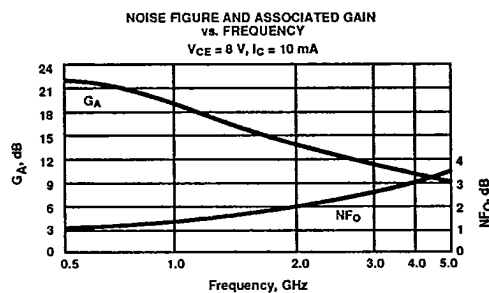
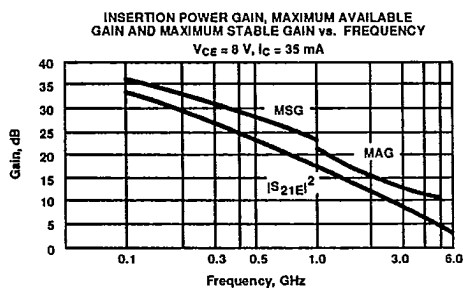
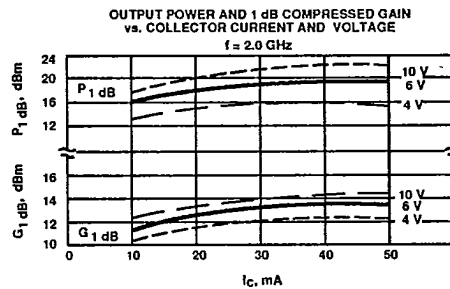
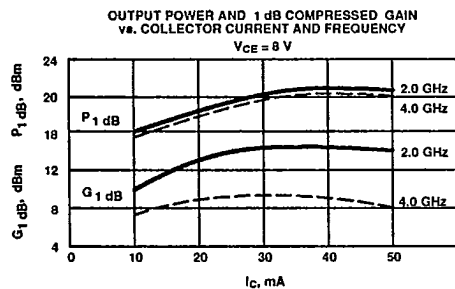
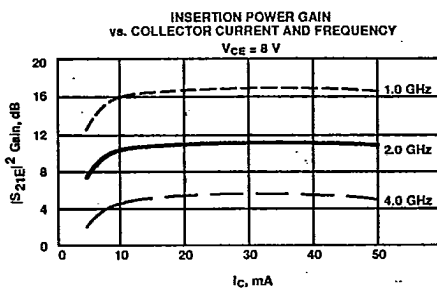
Thermal Resistance^{2,4}: $\theta_{JC} = 150^\circ\text{C/W}$

Notes:

1. Operation of this device above any one of these parameters may cause permanent damage.
2. TCASE = 25°C.
3. Derate at 6.7 mW/°C for $T_C > 110^\circ\text{C}$.
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.

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}		S_{21}			S_{12}			S_{22}	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.74	-47	28.5	26.65	153	-36.4	.015	72	.91	-18
0.5	.65	-136	21.4	11.71	103	-29.4	.034	38	.51	-39
1.0	.63	-168	15.9	6.24	82	-27.2	.044	36	.40	-42
1.5	.63	174	12.6	4.26	69	-26.0	.050	42	.38	-45
2.0	.63	161	10.1	3.23	57	-24.6	.059	43	.38	-49
2.5	.64	154	8.4	2.64	51	-23.0	.070	52	.38	-51
3.0	.65	145	6.9	2.22	41	-22.0	.080	54	.37	-55
3.5	.66	136	5.8	1.94	31	-21.0	.090	51	.38	-65
4.0	.66	126	4.7	1.72	21	-19.7	.104	50	.39	-74
4.5	.66	115	3.8	1.55	11	-18.0	.126	45	.40	-82
5.0	.66	103	3.0	1.41	1	-17.3	.136	41	.40	-89
5.5	.68	90	2.1	1.28	-9	-16.1	.156	36	.40	-98
6.0	.72	81	1.3	1.16	-19	-15.4	.170	31	.37	-110

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

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.54	-90	33.3	45.97	138	-39.2	.011	54	.76	-29
0.5	.62	-163	22.8	13.83	94	-33.2	.022	52	.34	-40
1.0	.62	177	17.0	7.10	78	-28.8	.036	59	.30	-40
1.5	.62	166	13.6	4.82	67	-26.2	.049	61	.29	-42
2.0	.62	155	11.3	3.65	56	-23.8	.065	57	.29	-47
2.5	.63	150	9.5	2.99	51	-21.8	.081	62	.29	-50
3.0	.64	142	8.0	2.52	42	-21.0	.090	63	.30	-57
3.5	.65	133	6.8	2.19	32	-19.7	.103	59	.30	-67
4.0	.65	124	5.7	1.93	22	-18.4	.120	54	.31	-76
4.5	.65	113	4.7	1.72	13	-17.2	.138	49	.33	-85
5.0	.66	102	3.9	1.56	3	-16.6	.148	45	.34	-92
5.5	.69	91	3.0	1.41	-6	-15.6	.166	39	.33	-100
6.0	.73	83	2.1	1.27	-16	-14.9	.180	32	.30	-110

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