Up to 6 GHz Medium Power Silicon Bipolar Transistor

Technical Data

AT-42085

Features

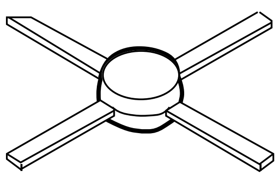
- **High Output Power:** 20.5 dBm Typical $P_{1\,dB}$ at 2.0 GHz
- **High Gain at 1 dB Compression:** 14.0 dB Typical $G_{1\,dB}$ at 2.0 GHz
- **Low Noise Figure:** 2.0 dB Typical NF_O at 2.0 GHz
- **High Gain-Bandwidth Product:** 8.0 GHz Typical f_T
- **Low Cost Plastic Package**

Description

Hewlett-Packard's AT-42085 is a general purpose NPN bipolar transistor that offers excellent high frequency performance. The AT-42085 is housed in a low cost .085" diameter plastic package. The 4 micron emitter-to-emitter pitch enables this transistor to be used in many different functions. The 20 emitter finger interdigitated geometry yields a medium sized transistor with impedances that are easy to match for low noise and medium power applications. Applications include use in wireless systems as an LNA, gain stage, buffer, oscillator, and mixer. An optimum noise match near 50 Ω up to 1 GHz, makes this device easy to use as a low noise amplifier.

The AT-42085 bipolar transistor is fabricated using Hewlett-Packard's 10 GHz f_T Self-Aligned-Transistor (SAT) process. The die is nitride passivated for surface protection. Excellent device uniformity, performance and reliability are produced by the use of ion-implantation, self-alignment techniques, and gold metalization in the fabrication of this device.

85 Plastic Package



5965-8913E

AT-42085 Absolute Maximum Ratings

Symbol	Parameter	Units	Absolute Maximum[1]
V_{EBO}	Emitter-Base Voltage	V	1.5
V_{CBO}	Collector-Base Voltage	V	20
V_{CEO}	Collector-Emitter Voltage	V	12
I_C	Collector Current	mA	80
P_T	Power Dissipation [2,3]	mW	500
T_j	Junction Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to 150

Thermal Resistance [2,4]:
θ_{jc} = 130°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 7.7 mW/°C for T_C > 85°C.
4. See MEASUREMENTS section "Thermal Resistance" for more information.

Electrical Specifications, T_A = 25°C

Symbol	Parameters and Test Conditions		Units	Min.	Typ.	Max.
$\|S_{21E}\|^2$	Insertion Power Gain; V_{CE} = 8 V, I_C = 35 mA	f = 1.0 GHz f = 2.0 GHz f = 4.0 GHz	dB	15.5	17.0 11.0 5.0	
$P_{1\,dB}$	Power Output @ 1 dB Gain Compression V_{CE} = 8 V, I_C = 35 mA	f = 2.0 GHz f= 4.0 GHz	dBm		20.5 20.0	
$G_{1\,dB}$	1 dB Compressed Gain; V_{CE} = 8 V, I_C = 35 mA	f = 2.0 GHz f = 4.0 GHz	dB		14.0 9.5	
NF_O	Optimum Noise Figure: V_{CE} = 8 V, I_C = 10 mA	f = 2.0 GHz f = 4.0 GHz	dB		2.0 3.5	
G_A	Gain @ NF_O; V_{CE} = 8 V, I_C = 10 mA	f = 2.0 GHz f = 4.0 GHz	dB		13.5 9.5	
f_T	Gain Bandwidth Product: V_{CE} = 8 V, I_C = 35 mA		GHz		8.0	
h_{FE}	Forward Current Transfer Ratio; V_{CE} = 8 V, I_C = 35 mA		—	30	150	270
I_{CBO}	Collector Cutoff Current; V_{CB} = 8 V		µA			0.2
I_{EBO}	Emitter Cutoff Current; V_{EB} = 1 V		µA			2.0
C_{CB}	Collector Base Capacitance[1]: V_{CB} = 8 V, f = 1 MHz		pF		0.32	

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

AT-42085 Typical Performance, T_A = 25°C

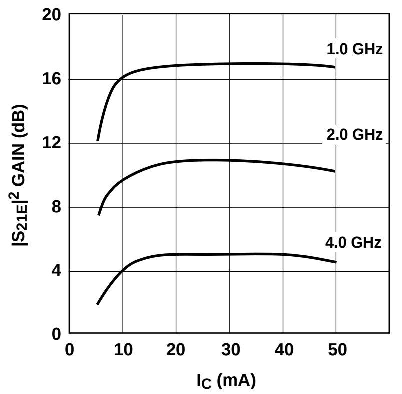


Figure 1. Insertion Power Gain vs. Collector Current and Frequency. V_{CE} = 8 V.

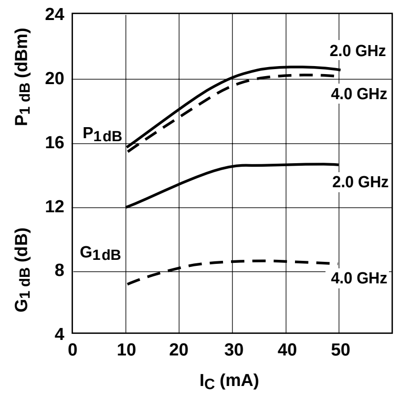


Figure 2. Output Power and 1 dB Compressed Gain vs. Collector Current and Frequency. V_{CE} = 8 V.

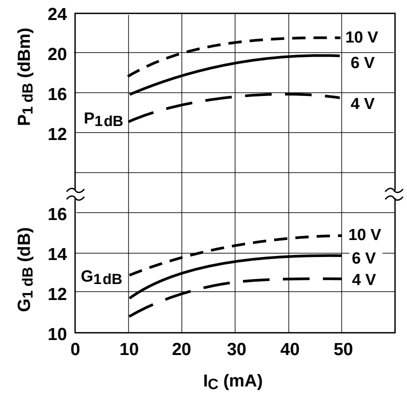


Figure 3. Output Power and 1 dB Compressed Gain vs. Collector Current and Voltage. f = 2.0 GHz.

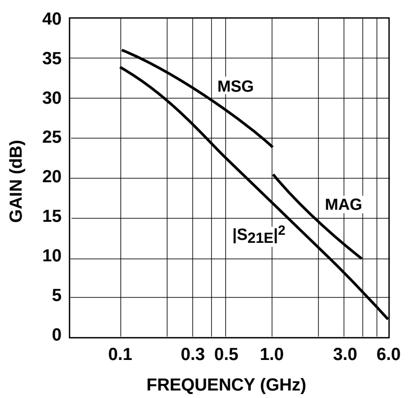


Figure 4. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency. V_{CE} = 8 V, I_C = 35 mA.

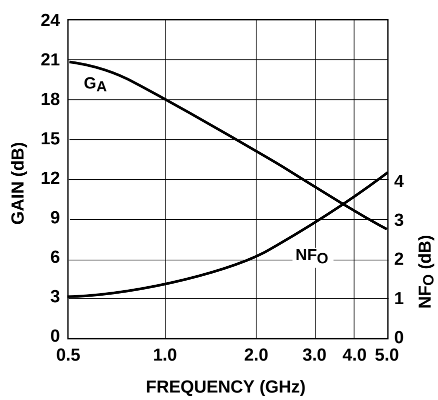


Figure 5. Noise Figure and Associated Gain vs. Frequency. V_{CE} = 8 V, I_C = 10mA.

AT-42085 Typical Scattering Parameters,

Common Emitter, $Z_O = 50\ \Omega$, $T_A = 25°C$, $V_{CE} = 8$ V, $I_C = 10$ mA

Freq. GHz	S_{11} Mag.	S_{11} Ang.	S_{21} dB	S_{21} Mag.	S_{21} Ang.	S_{12} dB	S_{12} Mag.	S_{12} Ang.	S_{22} Mag.	S_{22} Ang.
0.1	.72	-50	28.5	26.52	152	-37.0	.014	73	.90	-16
0.5	.66	-139	21.0	11.23	103	-29.2	.035	36	.53	-32
1.0	.65	-168	15.5	5.96	84	-28.6	.037	39	.45	-33
1.5	.65	175	12.2	4.06	71	-27.0	.045	46	.43	-36
2.0	.65	163	9.7	3.06	60	-25.3	.054	51	.42	-41
2.5	.66	157	8.0	2.51	55	-24.0	.063	60	.42	-42
3.0	.68	149	6.3	2.07	46	-22.8	.072	65	.41	-48
3.5	.68	141	5.1	1.79	38	-21.4	.085	64	.43	-55
4.0	.69	133	3.9	1.57	29	-19.7	.104	64	.45	-61
4.5	.69	125	3.0	1.41	21	-18.5	.119	63	.46	-66
5.0	.69	114	2.2	1.28	12	-17.1	.139	58	.47	-71
5.5	.71	103	1.4	1.17	3	-15.9	.161	55	.44	-76
6.0	.75	91	0.6	1.07	-6	-15.1	.177	49	.40	-85

AT-42085 Typical Scattering Parameters,

Common Emitter, $Z_O = 50\ \Omega$, $T_A = 25°C$, $V_{CE} = 8$ V, $I_C = 35$ mA

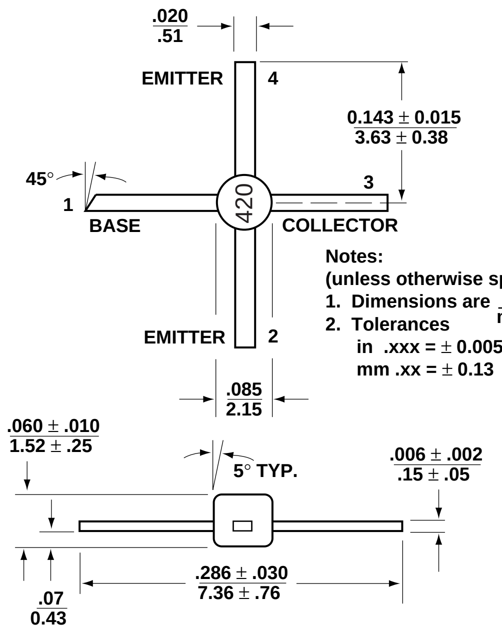
Freq. GHz	S_{11} Mag.	S_{11} Ang.	S_{21} dB	S_{21} Mag.	S_{21} Ang.	S_{12} dB	S_{12} Mag.	S_{12} Ang.	S_{22} Mag.	S_{22} Ang.
0.1	.54	-90	33.1	45.38	137	-40.1	.010	66	.76	-26
0.5	.61	-163	22.6	13.45	95	-32.8	.023	52	.38	-30
1.0	.61	178	16.8	6.90	79	-29.5	.034	61	.34	-28
1.5	.62	167	13.4	4.67	68	-26.4	.048	68	.32	-31
2.0	.63	156	10.9	3.52	59	-23.9	.064	66	.31	-36
2.5	.64	152	9.2	2.89	54	-22.5	.075	68	.31	-40
3.0	.66	146	7.6	2.39	45	-21.2	.088	69	.30	-48
3.5	.67	139	6.3	2.07	37	-19.8	.102	67	.31	-58
4.0	.68	131	5.2	1.81	28	-18.6	.117	65	.33	-67
4.5	.68	123	4.2	1.62	19	-17.2	.138	60	.35	-73
5.0	.68	114	3.4	1.48	10	-16.4	.152	56	.35	-79
5.5	.71	103	2.5	1.34	1	-15.3	.171	50	.34	-85
6.0	.74	93	1.7	1.21	-8	-14.5	.188	46	.31	-96

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

AT-42085 Noise Parameters: $V_{CE} = 8$ V, $I_C = 10$ mA

Freq. GHz	NF_O dB	Γ_{opt} Mag	Γ_{opt} Ang	$R_N/50$
0.1	1.1	.05	16	0.13
0.5	1.2	.06	77	0.13
1.0	1.3	.10	131	0.12
2.0	2.0	.24	-179	0.11
4.0	3.5	.46	-128	0.25

85 Plastic Package Dimensions



Notes:
(unless otherwise specified)
1. Dimensions are $\frac{in}{mm}$
2. Tolerances
in .xxx = ± 0.005
mm .xx = ± 0.13