Agilent Technologies
Innovating the HP Way

Up to 6 GHz Low Noise Silicon Bipolar Transistor

Technical Data

AT-41485

Features

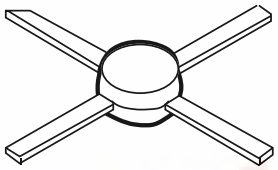
- **Low Noise Figure:**
  1.4 dB Typical at 1.0 GHz
  1.7 dB Typical at 2.0 GHz
- **High Associated Gain:**
  18.5 dB Typical at 1.0 GHz
  13.5 dB Typical at 2.0 GHz
- **High Gain-Bandwidth Product:** 8.0 GHz Typical f_T

Description

Agilent's AT-41485 is a general purpose NPN bipolar transistor that offers excellent high frequency performance. The AT-41485 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 14 emitter finger interdigitated geometry yields an intermediate sized transistor with impedances that are easy to match for low noise and moderate power applications. Applications include use in wireless systems as an LNA, gain stage, buffer, oscillator, and mixer. An optimum noise match near 50 Ω at 900 MHz, makes this device easy to use as a low noise amplifier.

The AT-41485 bipolar transistor is fabricated using Agilent'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



AT-41485 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	60
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} = 155°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 6.5 mW/°C for T_C > 73°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 = 25 mA	f = 1.0 GHz f = 2.0 GHz	dB		17.5 11.5	
$P_{1\ dB}$	Power Output @ 1 dB Gain Compression V_{CE} = 8 V, I_C = 25 mA	f = 2.0 GHz	dBm		18.5	
$G_{1\ dB}$	1 dB Compressed Gain; V_{CE} = 8 V, I_C = 25 mA	f = 2.0 GHz	dB		14.0	
NF_O	Optimum Noise Figure: V_{CE} = 8 V, I_C = 10 mA	f = 1.0 GHz f = 2.0 GHz f = 4.0 GHz	dB		1.4 1.7 3.0	1.8
G_A	Gain @ NF_O; V_{CE} = 8 V, I_C = 10 mA	f = 1.0 GHz f = 2.0 GHz f = 4.0 GHz	dB	17.5	18.5 13.5 9.5	
f_T	Gain Bandwidth Product: V_{CE} = 8 V, I_C = 25 mA		GHz		8.0	
h_{FE}	Forward Current Transfer Ratio; V_{CE} = 8 V, I_C = 10 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			1.0
C_{CB}	Collector Base Capacitance[1]: V_{CB} = 8 V, f = 1 MHz		pF		0.25	

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

AT-41485 Typical Performance, T_A = 25°C

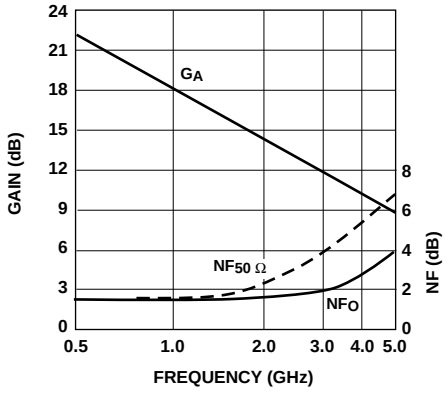


Figure 1. Noise Figure and Associated Gain vs. Frequency. V_{CE} = 8 V, I_C = 10 mA.

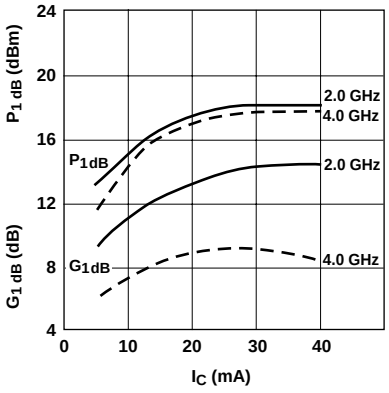


Figure 2. Output Power and 1 dB Compressed Gain vs. Collector Current and Frequency. V_{CE} = 8 V.

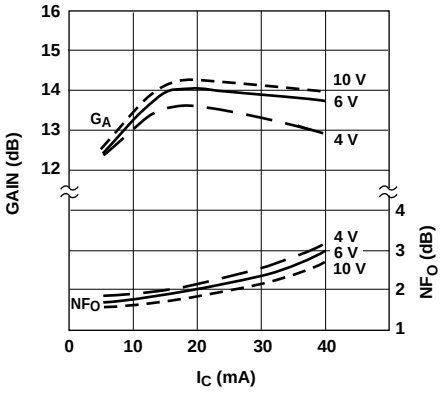


Figure 3. Optimum Noise Figure and Associated Gain vs. Collector Current and Collector Voltage. f = 2.0 GHz.

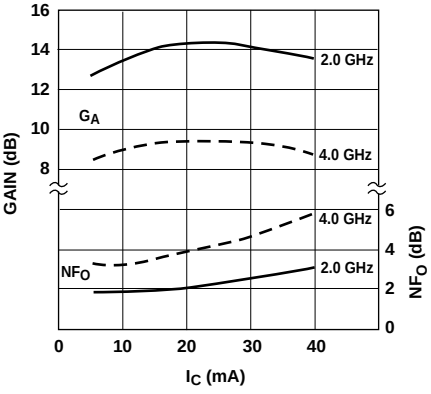


Figure 4. Optimum Noise Figure and Associated Gain vs. Collector Current and Frequency. V_{CE} = 8 V.

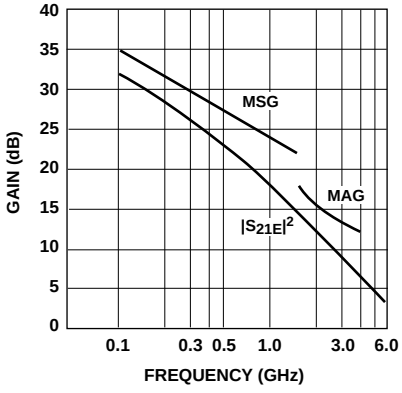


Figure 5. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency. V_{CE} = 8 V, I_C = 25 mA.

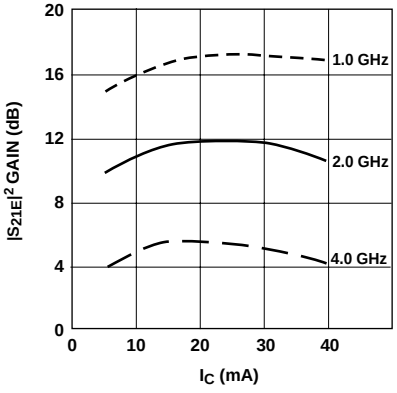


Figure 6. Insertion Power Gain vs. Collector Current and Frequency. V_{CE} = 8 V.

AT-41485 Typical Scattering Parameters, Common Emitter,
Z_O = 50 Ω, T_A = 25°C, V_{CE} = 8 V, I_C = 10 mA

Freq.	S_{11}		S_{21}			S_{12}			S_{22}	
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.
0.1	.74	-40	28.2	25.80	156	-35.6	.017	81	.93	-14
0.5	.61	-126	21.9	12.46	108	-29.2	.035	44	.57	-31
1.0	.57	-161	16.6	6.80	87	-27.9	.040	38	.46	-33
1.5	.57	-180	13.4	4.67	75	-25.7	.052	47	.43	-34
2.0	.58	166	11.0	3.55	64	-24.5	.060	54	.41	-38
2.5	.59	160	9.3	2.92	59	-23.3	.068	58	.40	-39
3.0	.61	150	7.7	2.42	50	-21.9	.080	63	.39	-46
3.5	.62	142	6.4	2.09	41	-20.8	.091	61	.41	-54
4.0	.62	134	5.3	1.84	32	-19.5	.106	59	.42	-62
4.5	.62	125	4.3	1.65	24	-18.4	.120	57	.43	-67
5.0	.63	115	3.5	1.50	15	-17.2	.138	54	.44	-73
5.5	.65	103	2.7	1.37	6	-16.1	.157	49	.43	-78
6.0	.69	92	1.8	1.24	-4	-15.3	.172	46	.40	-86

AT-41485 Typical Scattering Parameters, Common Emitter,
Z_O = 50 Ω, T_A = 25°C, V_{CE} = 8 V, I_C = 25 mA

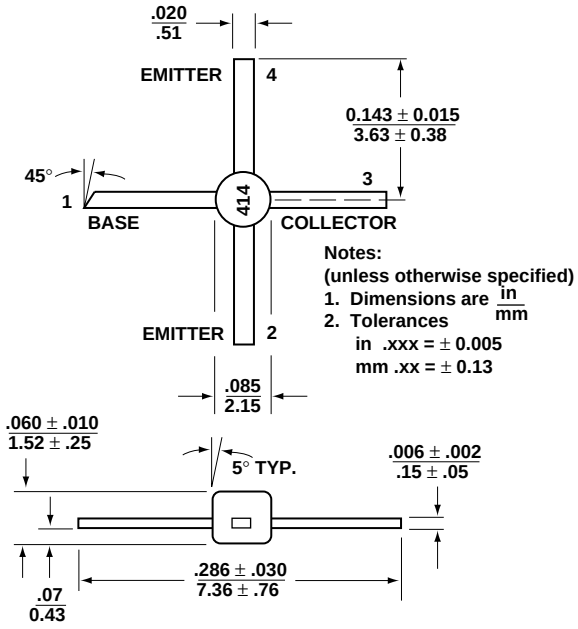
Freq.	S_{11}		S_{21}			S_{12}			S_{22}	
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.
0.1	.55	-68	32.0	40.01	146	-40.9	.009	57	.85	-19
0.5	.58	-153	23.1	14.20	99	-32.7	.023	52	.47	-29
1.0	.58	-177	17.4	7.39	82	-29.8	.032	63	.41	-28
1.5	.58	169	14.0	5.01	71	-27.3	.043	60	.39	-30
2.0	.60	158	11.6	3.78	61	-24.6	.059	64	.38	-36
2.5	.60	153	9.8	3.09	58	-23.7	.065	71	.36	-39
3.0	.63	147	8.1	2.55	48	-21.7	.082	68	.35	-47
3.5	.64	140	6.9	2.21	39	-20.7	.092	67	.37	-56
4.0	.64	133	5.8	1.94	31	-19.4	.107	65	.39	-64
4.5	.64	125	4.8	1.74	23	-18.1	.125	63	.40	-71
5.0	.64	115	4.0	1.58	14	-17.1	.140	56	.41	-78
5.5	.66	105	3.2	1.45	5	-15.9	.160	50	.40	-82
6.0	.70	94	2.4	1.32	-5	-15.1	.175	47	.37	-91

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

AT-41485 Noise Parameters: V_{CE} = 8 V, I_C = 10 mA

Freq.	NF_O	Γ_{opt}		$R_N/50$
GHz	dB	Mag	Ang	
0.1	1.3	.12	5	0.17
0.5	1.3	.10	25	0.17
1.0	1.4	.06	50	0.16
2.0	1.7	.25	172	0.16
4.0	3.0	.48	-131	0.24

85 Plastic Package Dimensions



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