AVANTEK

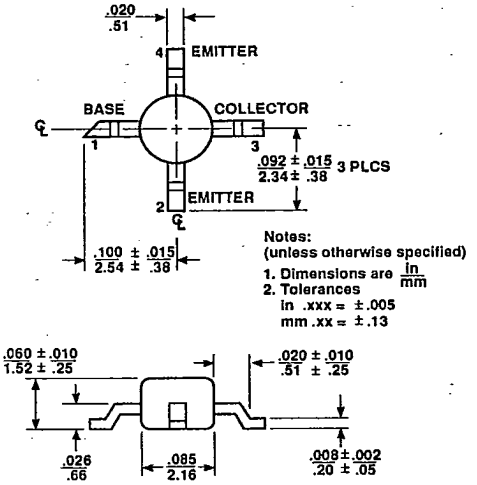
AT-42086
Up to 6 GHz Medium Power Silicon Bipolar Transistor

T-31-21

Features

- **High Output Power:**
  20.5 dBm typical $P_{1\,dB}$ at 2.0 GHz
- **High Gain at 1 dB Compression:**
  13.5 dB typical $G_{1\,dB}$ at 2.0 GHz
- **Low Noise Figure:**
  1.9 dB typical NF_O at 2.0 GHz
- **High Gain-Bandwidth Product:**
  8.0 GHz typical f_T
- **Surface Mount Plastic Package**
- **Tape-and-Reel Packaging Option Available[1]**

Avantek 86 Plastic Package



Description

Avantek's AT-42086 is a high performance NPN silicon bipolar transistor housed in a low cost, surface mount plastic 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 metalization in the fabrication of these devices.

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

Freq. GHz	NF_O dB	Gamma Opt Mag	Gamma Opt Ang	$R_N/50$
0.1	1.0	.04	8	0.13
0.5	1.1	.03	62	0.12
1.0	1.5	.06	168	0.12
2.0	1.9	.25	−146	0.12
4.0	3.5	.58	−100	0.52

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	15.0	16.5 10.5 4.5	
$P_{1\,dB}$	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		13.5 9.0	
NF_O	Optimum Noise Figure: V_{CE} = 8 V, I_C = 10 mA	f = 2.0 GHz f = 4.0 GHz	dB		1.9 3.5	
G_A	Gain @ NF_O: V_{CE} = 8 V, I_C = 10 mA	f = 2.0 GHz f = 4.0 GHz	dB		13.0 9.0	
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	300
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[2]: V_{CB} = 8 V, f = 1 MHz		pF		0.32	

Notes: 1. Refer to PACKAGING section "Tape-and-Reel Packaging for Surface Mount Semiconductors".
2. For this test, the emitter is grounded.

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Absolute Maximum Ratings

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

Thermal Resistance[2,4]: θ_{jc} = 140°C/W

Notes:
1. Operation of this device above any one of these parameters may cause permanent damage.
2. T_{CASE} = 25°C.
3. Derate at 7.1 mW/°C for T_C > 80°C.
4. See MEASUREMENTS section "Thermal Resistance" for more information.

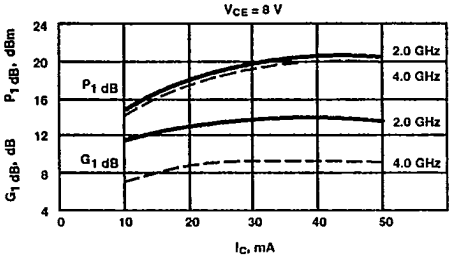
Part Number Ordering Information

Part Number	Devices Per Reel	Reel Size
AT-42086-TR1	1000	7"
AT-42086-TR2	4000	13"

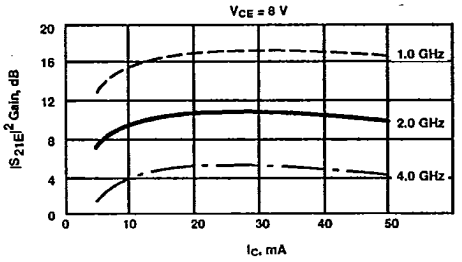
Typical Performance, T_A = 25°C

(unless otherwise noted)

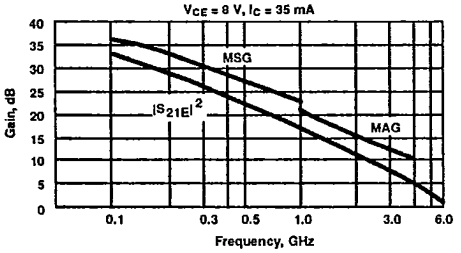
OUTPUT POWER AND 1 dB COMPRESSED GAIN vs. COLLECTOR CURRENT AND FREQUENCY
V_{CE} = 8 V



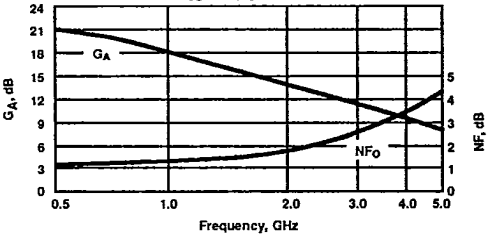
INSERTION POWER GAIN vs. COLLECTOR CURRENT AND FREQUENCY
V_{CE} = 8 V



INSERTION POWER GAIN, MAXIMUM AVAILABLE GAIN AND MAXIMUM STABLE GAIN vs. FREQUENCY
V_{CE} = 8 V, I_C = 35 mA



NOISE FIGURE AND ASSOCIATED GAIN vs. FREQUENCY
V_{CE} = 8 V, I_C = 10 mA



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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}		S_{21}			S_{12}			S_{22}	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.68	–48	28.0	25.12	153	–36.0	.016	65	.91	–15
0.5	.63	–141	20.9	11.07	102	–29.9	.032	42	.54	–30
1.0	.63	–176	15.4	5.87	80	–27.4	.043	43	.43	–30
1.5	.65	164	12.0	3.98	65	–26.0	.050	46	.40	–34
2.0	.66	151	9.5	2.99	53	–23.9	.064	52	.38	–40
2.5	.69	142	7.8	2.44	45	–23.1	.070	53	.36	–46
3.0	.71	132	6.2	2.04	34	–21.6	.084	54	.34	–54
3.5	.73	123	4.8	1.74	24	–19.7	.104	53	.33	–67
4.0	.75	115	3.6	1.51	14	–18.3	.122	51	.30	–80
4.5	.78	108	2.6	1.34	5	–17.2	.138	50	.31	–94
5.0	.80	101	1.6	1.20	–4	–16.0	.159	46	.31	–110
5.5	.82	95	0.6	1.08	–12	–14.8	.182	40	.32	–129
6.0	.85	89	–0.2	0.97	–21	–14.0	.200	35	.34	–148
									$T_A = 25°C$, $V_{CE} = 8$ V, $I_C = 35$ mA	
0.1	.48	–94	32.8	43.62	137	–37.7	.013	65	.77	–25
0.5	.57	–168	22.4	13.21	92	–32.6	.023	57	.39	–28
1.0	.59	168	16.5	6.69	75	–28.7	.037	62	.33	–27
1.5	.61	154	13.0	4.48	62	–24.8	.057	64	.31	–31
2.0	.63	143	10.5	3.36	51	–23.0	.071	61	.29	–37
2.5	.68	137	8.7	2.72	43	–21.0	.089	56	.26	–45
3.0	.68	127	7.0	2.25	33	–19.7	.104	58	.25	–53
3.5	.71	118	5.7	1.92	24	–18.4	.121	55	.24	–65
4.0	.73	111	4.5	1.69	14	–17.3	.136	49	.20	–80
4.5	.76	104	3.5	1.49	5	–15.9	.161	46	.21	–95
5.0	.78	98	2.4	1.32	–3	–15.2	.174	43	.21	–115
5.5	.81	91	1.6	1.20	–12	–14.3	.193	36	.22	–136
6.0	.84	85	0.7	1.08	–20	–13.4	.213	31	.25	–156

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