Up to 4 GHz Linear Power Silicon Bipolar Transistor

Technical Data

AT-64020

Features

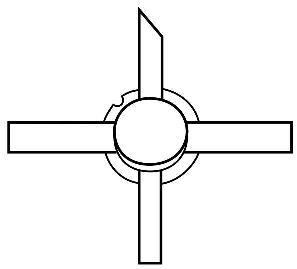
- **High Output Power:**
  27.5 dBm Typical $P_{1\,dB}$ at 2.0 GHz
  26.5 dBm Typical $P_{1\,dB}$ at 4.0 GHz
- **High Gain at 1 dB Compression:**
  10.0 dB Typical $G_{1\,dB}$ at 2.0 GHz
  6.5 dB Typical $G_{1\,dB}$ at 4.0 GHz
- **35% Total Efficiency**
- **Emitter Ballast Resistors**
- **Hermetic, Metal/Beryllia Package**

Description

The AT-64020 is a high performance NPN silicon bipolar transistor housed in a hermetic BeO disk package for good thermal characteristics. 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. The use of ion-implanted ballast resistors ensures uniform current distribution through the multiple emitter fingers.

200 mil BeO Package



5965-8915E

AT-64020 Absolute Maximum Ratings

Symbol	Parameter	Units	Absolute Maximum[1]
V_{EBO}	Emitter-Base Voltage	V	2
V_{CBO}	Collector-Base Voltage	V	40
V_{CEO}	Collector-Emitter Voltage	V	20
I_C	Collector Current	mA	200
P_T	Power Dissipation [2,3]	W	3
T_j	Junction Temperature	°C	200
T_{STG}	Storage Temperature	°C	-65 to 200

Thermal Resistance [2,4]:
$\theta_{jc} = 40°C/W$

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{CASE} = 25°C$.
3. Derate at 25 mW/°C for $T_C > 80°C$.
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.

Electrical Specifications, $T_A = 25°C$

Symbol	Parameters and Test Conditions[1]		Units	Min.	Typ.	Max.
$\|S_{21E}\|^2$	Insertion Power Gain; $V_{CE} = 16$ V, $I_C = 110$ mA	f = 2.0 GHz f = 4.0 GHz	dB		7.0 2.0	
$P_{1\,dB}$	Power Output @ 1 dB Gain Compression $V_{CE} = 16$ V, $I_C = 110$ mA	f = 2.0 GHz f = 4.0 GHz	dBm	26.5	27.5 26.5	
$G_{1\,dB}$	1 dB Compressed Gain; $V_{CE} = 16$ V, $I_C = 110$ mA	f = 2.0 GHz f = 4.0 GHz	dB	8.5	10.0 6.5	
η_T	Total Efficiency at 1 dB Compression: $V_{CE} = 16$ V, $I_C = 110$ mA	f = 4.0 GHz	%		35.0	
h_{FE}	Forward Current Transfer Ratio; $V_{CE} = 8$ V, $I_C = 110$ mA		—	20	50	200
I_{CBO}	Collector Cutoff Current; $V_{CB} = 16$ V		μA			100
I_{EBO}	Emitter Cutoff Current; $V_{EB} = 1$ V		μA			5.0

Note:
1. η_T = (RF Output Power)/(RF Input Power + $V_{CE} I_C$).

AT-64020 Typical Performance, $T_A = 25°C$

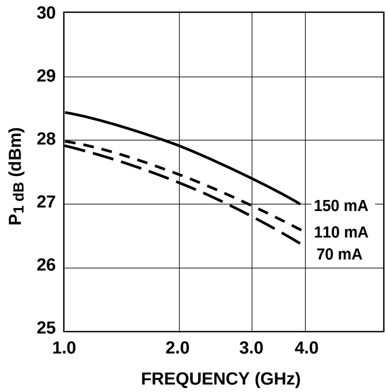


Figure 1. Power Output @ 1 dB Gain Compression vs. Frequency and Collector Current. V_{CE} = 16 V.

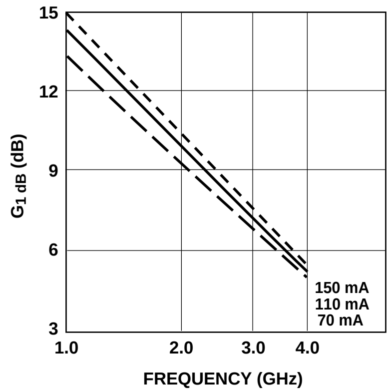


Figure 2. 1 dB Compressed Gain vs. Frequency and Collector Current. V_{CE}= 16 V.

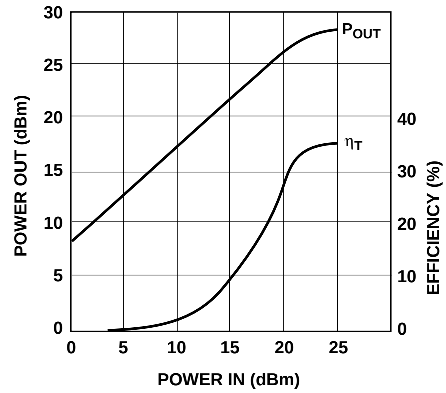


Figure 3. Output Power and Efficiency vs. Input Power. V_{CE} = 16 V, I_C = 110mA, f = 4.0 GHz.

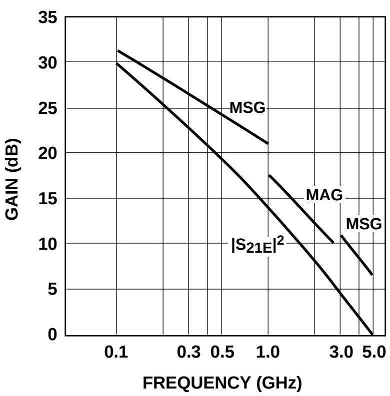


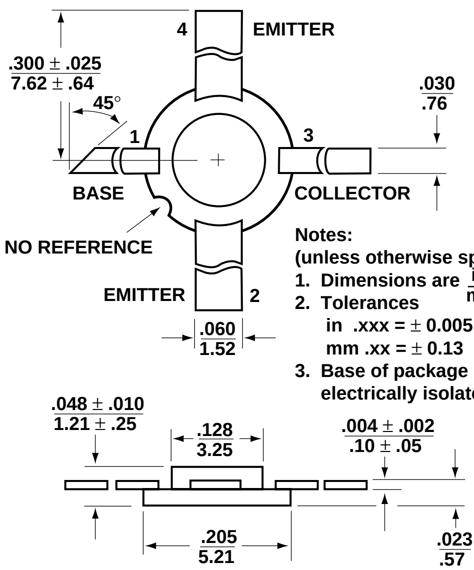
Figure 4. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency. V_{CE} = 16 V, I_C = 110 mA.

Typical Scattering Parameters, Common Emitter, $Z_O = 50\ \Omega$, $T_A = 25°C$, $V_{CE} = 16\ V$, $I_C = 110\ mA$

Freq.	S_{11}		S_{21}			S_{12}			S_{22}	
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.
0.1	.61	-116	30.0	31.51	130	-33.1	.022	57	.67	-48
0.5	.75	-173	18.4	8.27	86	-28.8	.036	41	.23	-88
1.0	.75	171	12.5	4.23	66	-27.4	.043	49	.20	-100
1.5	.74	159	9.2	2.90	50	-23.5	.067	48	.21	-110
2.0	.74	148	7.0	2.23	35	-21.6	.083	46	.25	-120
2.5	.73	141	5.2	1.82	26	-19.8	.103	47	.27	-127
3.0	.73	130	3.8	1.56	12	-17.5	.133	41	.32	-135
3.5	.74	119	2.7	1.37	-2	-16.1	.157	35	.35	-146
4.0	.73	107	1.8	1.23	-16	-14.7	.186	26	.38	-158
4.5	.72	93	0.9	1.11	-30	-13.3	.217	18	.41	-168
5.0	.71	79	0.1	1.01	-43	-11.8	.256	8	.42	179

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

200 mil BeO Package Dimensions



Notes:
(unless otherwise specified)
1. Dimensions are $\frac{\text{in}}{\text{mm}}$
2. Tolerances
   in .xxx = ± 0.005
   mm .xx = ± 0.13
3. Base of package is electrically isolated.