



**THE DATASHEET OF  
AT-64020**



# AT-64020

## Up to 4 GHz Linear Power Silicon Bipolar Transistor



## Data Sheet

### Description

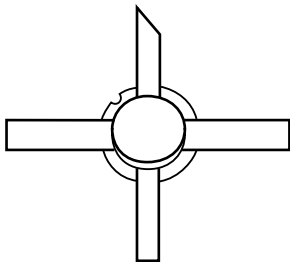
The AT-64020 is a high performance NPN silicon bipolar transistor housed in a hermetic BeO disk package for good thermal characteristics. This device is designed for use in medium power, wide band amplifier and oscillator applications operating over VHF, UHF and microwave frequencies.

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.

### Features

- High Output Power:  
27.5 dBm Typical P1 dB at 2.0 GHz  
26.5 dBm Typical P1 dB at 4.0 GHz
- High Gain at 1 dB Compression:  
10.0 dB Typical G1 dB at 2.0 GHz  
6.5 dB Typical G1 dB at 4.0 GHz
- 35% Total Efficiency
- Emitter Ballast Resistors
- Hermetic, Metal/Beryllia Package

### 200 mil BeO Package



## AT-64020 Absolute Maximum Ratings

| Symbol           | Parameter                          | Units | Absolute Maximum <sup>[1]</sup> |
|------------------|------------------------------------|-------|---------------------------------|
| V <sub>EBO</sub> | Emitter-Base Voltage               | V     | 2                               |
| V <sub>CBO</sub> | Collector-Base Voltage             | V     | 40                              |
| V <sub>CEO</sub> | Collector-Emitter Voltage          | V     | 20                              |
| I <sub>C</sub>   | Collector Current                  | mA    | 200                             |
| P <sub>T</sub>   | Power Dissipation <sup>[2,3]</sup> | W     | 3                               |
| T <sub>j</sub>   | Junction Temperature               | °C    | 200                             |
| T <sub>STG</sub> | Storage Temperature                | °C    | -65 to 200                      |

### Thermal Resistance<sup>[2,4]</sup>:

$$\theta_{jc} = 40^{\circ}\text{C}/\text{W}$$

#### Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2. T<sub>case</sub> = 25°C.
3. Derate at 25 mW/°C for T<sub>c</sub> > 80°C.
4. The small spot size of this technique results in a higher, though more accurate determination of  $\theta_{jc}$  than do alternate methods. See MEASUREMENTS section "Thermal Resistance" for more information.

## Electrical Specifications, T<sub>A</sub> = 25°C

| Symbol                          | Parameters and Test Conditions <sup>[1]</sup>  | Units                      | Min. | Typ.         | Max. |
|---------------------------------|--|----------------------------|------|--------------|------|
| S <sub>21E</sub>   <sup>2</sup> | Insertion Power Gain; V <sub>CE</sub> = 16 V, I <sub>C</sub> = 110 mA                    | f = 2.0 GHz<br>f = 4.0 GHz |      | 7.0<br>2.0   |      |
| P <sub>1 dB</sub>               | Power Output @ 1 dB Gain Compression<br>V <sub>CE</sub> = 16 V, I <sub>C</sub> = 110 mA  | f = 2.0 GHz<br>f = 4.0 GHz | 26.5 | 27.5<br>26.5 |      |
| G <sub>1 dB</sub>               | 1 dB Compressed Gain; V <sub>CE</sub> = 16 V, I <sub>C</sub> = 110 mA                    | f = 2.0 GHz<br>f = 4.0 GHz | 8.5  | 10.0<br>6.5  |      |
| η <sub>T</sub>                  | Total Efficiency at 1 dB Compression:<br>V <sub>CE</sub> = 16 V, I <sub>C</sub> = 110 mA | f = 4.0 GHz                |      | 35.0         |      |
| h <sub>FE</sub>                 | Forward Current Transfer Ratio; V <sub>CE</sub> = 8 V, I <sub>C</sub> = 110 mA           |                            | 20   | 50           | 200  |
| I <sub>CBO</sub>                | Collector Cutoff Current; V <sub>CB</sub> = 16 V   |                            |      |              | 100  |
| I <sub>EBO</sub>                | Emitter Cutoff Current; V <sub>EB</sub> = 1 V  |                            |      |              | 5.0  |

#### Note:

1.  $\eta_T = (\text{RF Output Power}) / (\text{RF Input Power} + \text{VCEIC})$ .

### AT-64020 Typical Performance, $T_A = 25^\circ\text{C}$

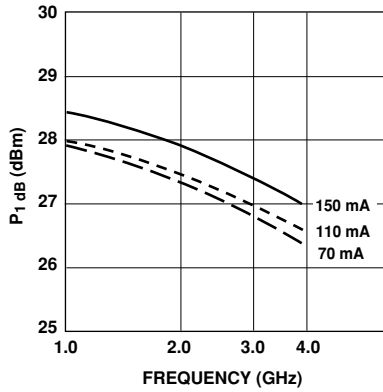


Figure 1. Power Output @ 1 dB Gain Compression vs. Frequency and Collector Current.  $V_{CE} = 16\text{ V}$ .

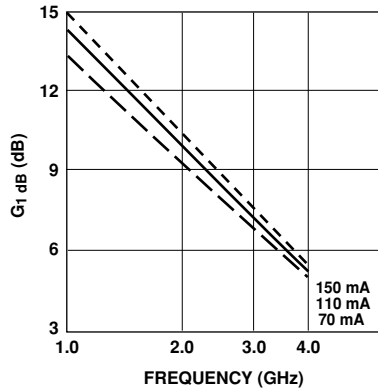


Figure 2. 1 dB Compressed Gain vs. Frequency and Collector Current.  $V_{CE} = 16\text{ V}$ .

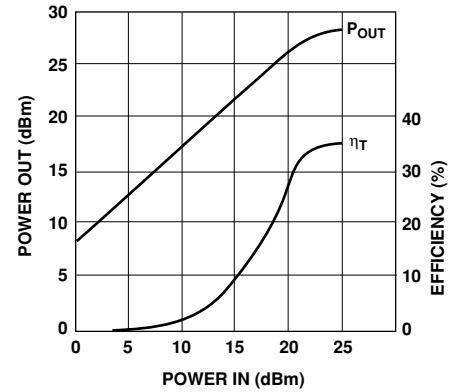


Figure 3. Output Power and Efficiency vs. Input Power.  $V_{CE} = 16\text{ V}$ ,  $I_C = 110\text{ mA}$ ,  $f = 4.0\text{ GHz}$ .

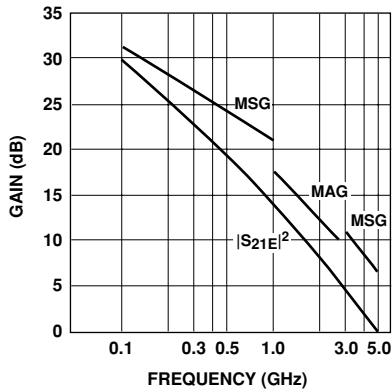


Figure 4. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency.  $V_{CE} = 16\text{ V}$ ,  $I_C = 110\text{ mA}$ .

### Typical Scattering Parameters, Common Emitter, $Z_0 = 50\ \Omega$ , $T_A = 25^\circ\text{C}$ , $V_{CE} = 16\text{ V}$ , $I_C = 110\text{ mA}$

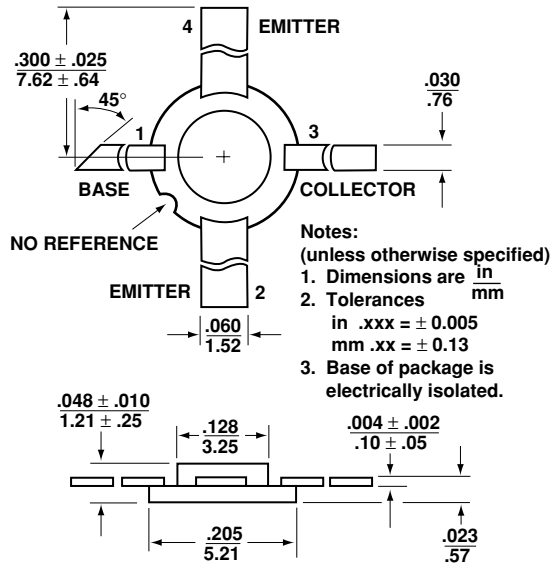
| Freq. GHz | $S_{11}$ |      | dB   | $S_{21}$ |      | dB    | $S_{12}$ |      | $S_{22}$ |      |
|-----------|----------|------|------|----------|------|-------|----------|------|----------|------|
|           | Mag.     | Ang. |      | Mag.     | Ang. |       | Mag.     | Ang. | Mag.     | Ang. |
| 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.

## Ordering Information

| Part Number | No. of Devices |
|-------------|----------------|
| AT-64020    | 100            |

## 200 mil BeO Package Dimensions



For product information and a complete list of distributors, please go to our web site: [www.avagotech.com](http://www.avagotech.com)

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