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Avago Technologies US, Inc. AT-64000-GP4

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AT-64000

Up to 4 GHz Linear Power Silicon Bipolar Transistor Chip



Data Sheet

Description

The AT-64000 of Avago Technologies is a high performance NPN silicon bipolar transistor. This device is designed for use in medium power, wideband 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 golf metallization in the fabrication of these devices. The use of ion-implanted ballast resistors ensures uniform current distribution through the multiple emitter fingers.

Chip Outline



Features

Performance in 230 mil BeO package:

- High Output Power: 27.5 dBm typical P1dB at 2.0 GHz 26.5 dBm typical P1dB at 4.0 GHz
- High Gain at 1 dB Compression: 12.5 dB typical G1dB at 2.0 GHz
 9.5 dB typical G1dB at 4.0 GHz
- 35% Total Efficiency
- Emitter Ballast Resistors



Table 1. Absolute Maximum Ratings at $Tc = +25^{\circ}C$

| Symbol | Parameter | Unit | Max Rating | | |
|------------------|----------------------------------|------|------------|--|--|
| V _{EBO} | Emitter-Base Voltage | V | 2.2 | | |
| V _{CBO} | Collector-Base Voltage | V | 40 | | |
| V _{CEO} | Collector-Emitter Voltage | V | 20 | | |
| Ic | Collector Current | mA | 200 | | |
| PT | Power Dissipation ^[3] | W | 3 | | |
| Tj | Junction Temperature | 0C | 200 | | |
| T _{stg} | Storage Temperature | 0C | -65 to 200 | | |
| θ _{jc} | Thermal Resistance | 0C/W | 40 | | |

Notes:

1. Operation in excess of any one of these conditions may result in permanent damage to the device.

2. Maximum ratings are tested in 230 mil BeO packages.

3. T—CASE = 25 °C. Derate at 25 mW/°C for Tc > 80 °C

Table 2. Electrical Specifications $^{[1,2]}$ at Tc = +25°C

| Symbol | Parameter and Test Condition | | Units | Min. | Тур. | Max. |
|---|---|----------------------------|---------------|------|--------------|-------------------|
| S _{21E} ² | Insertion Power Gain; Vce = 16V, Ic = 110 mA | f = 2.0 GHz f = 4.0 GHz | dB | | 6.5 2.0 | |
| P1dB | Power Output @1dB Gain Compression Vce = 16V, lc = 110 mA | f = 2.0 GHz f = 4.0 GHz | dBm | 25.5 | 27.5 26.5 | |
| G1dB | 1 dB Compressed Gain Vce = 16V, lc = 110 mA | f = 2.0 GHz f = 4.0 GHz | dB | 7.0 | 12.5 9.5 | |
| ητ | Total Efficiency ^[3] at 1 dB Gain Compression Vce = 16V, lc = 110 mA | f = 4.0 GHz | % | | 35.0 | |
| h _{FE} I _{CBO} I _{EBO} | Forward Current Transfer Ratio; Vce = 8V, Ic = 110 mA Collector Cutoff Current; V_{CB} = 16 V Emitter Cutoff Current; V_{EB} = 1V | | - uA uA | 20 | 50 | 200 100 5.0 |

Notes:

1. RF performance is determined by packaging and testing 10 devices per wafer.

2. RF performance is measured in 230 mil BeO packages.

3. $\eta T = (RF Output Power)/(RF Input Power + VCE x IC)$



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Typical Performance Curves at $Tc = +25^{\circ}C$



Figure 1. Power Output @ 1 dB Gain Compression vs. Frequency and Collector Current. VCE = 16 V.



Figure 3. Output Power and Efficiency vs. Input Power. VCE = 16 V, IC = 110 mA, f = 4.0 GHz.

Typical Scattering Parameters at $Tc = +25^{\circ}C$

 $V_{CE} = 16 \text{ V}, \text{ I}_{C} = 110 \text{ mA}, \text{ Z}_{O} = 50 \text{ Ohm}, \text{ Common Emitter}$



Figure 2. 1 dB Compressed Gain vs. Frequency and Collector Current. VCE = 16 V.





| S11 | | | | | | | | | |
|------|--|--|---|--|--|---|--|--|--|
| | | S21 | | | S12 | | | S22 | |
| Mag. | Ang. | dB | Mag. | Ang. | dB | Mag. | Ang. | Mag. | Ang. |
| .54 | -124 | 28.2 | 25.71 | 135 | -33.3 | .022 | 42 | .72 | -51 |
| .80 | -178 | 17.6 | 7.57 | 78 | -29.5 | .034 | 18 | .33 | -119 |
| .80 | 162 | 11.9 | 3.92 | 47 | -28.6 | .037 | 10 | .33 | -142 |
| .80 | 147 | 8.6 | 2.70 | 21 | -27.9 | .040 | 12 | .40 | -156 |
| .78 | 133 | 6.3 | 2.07 | -4 | -27.6 | .042 | 1 | .48 | -169 |
| .77 | 127 | 5.1 | 1.80 | -24 | -25.5 | .053 | -5 | .58 | -178 |
| .73 | 116 | 3.8 | 1.56 | -51 | -25.0 | .056 | -20 | .67 | 170 |
| .66 | 106 | 2.9 | 1.40 | -79 | -25.8 | .051 | -28 | .78 | 156 |
| .60 | 99 | 2.2 | 1.28 | -109 | -27.2 | .044 | -49 | .86 | 142 |
| .55 | 98 | 1.4 | 1.18 | -141 | -31.2 | .028 | -70 | .93 | 127 |
| .54 | 99 | 0.6 | 1.07 | -175 | -40.9 | .009 | -144 | .93 | 112 |
| | Mag. .54 .80 .80 .78 .77 .73 .66 .60 .55 .54 | Mag. Ang. .54 -124 .80 -178 .80 162 .80 147 .78 133 .77 127 .73 116 .66 106 .60 99 .55 98 .54 99 | Mag.Ang.dB.54-12428.2.80-17817.6.8016211.9.801478.6.781336.3.771275.1.731163.8.661062.9.60992.2.55981.4.54990.6 | Mag.Ang.dBMag54-12428.225.71.80-17817.67.57.8016211.93.92.801478.62.70.781336.32.07.771275.11.80.731163.81.56.661062.91.40.60992.21.28.55981.41.18 | Mag.Ang.dBMag.Ang54-12428.225.71135.80-17817.67.5778.8016211.93.9247.801478.62.7021.781336.32.07-4.771275.11.80-24.731163.81.56-51.60992.21.28-109.54990.61.07-175 | Mag.Ang.dBMag.Ang.dB.54-12428.225.71135-33.3.80-17817.67.5778-29.5.8016211.93.9247-28.6.801478.62.7021-27.9.781336.32.07-4-27.6.771275.11.80-24-25.5.731163.81.56-51-25.0.661062.91.40-79-25.8.60992.21.28-109-27.2.55981.41.18-141-31.2.54990.61.07-175-40.9 | Mag.Ang.dBMag.Ang.dBMag54-12428.225.71135-33.3.022.80-17817.67.5778-29.5.034.8016211.93.9247-28.6.037.801478.62.7021-27.9.040.781336.32.07-4-27.6.042.771275.11.80-24-25.5.053.731163.81.56-51-25.0.056.661062.91.40-79-25.8.051.60992.21.28-109-27.2.044.55981.41.18-141-31.2.028 | Mag.Ang.dBMag.Ang.dBMag.Ang54-12428.225.71135-33.3.02242.80-17817.67.5778-29.5.03418.8016211.93.9247-28.6.03710.801478.62.7021-27.9.04012.781336.32.07-4-27.6.0421.771275.11.80-24-25.5.053-5.731163.81.56-51-25.0.056-20.661062.91.40-79-25.8.051-28.60992.21.28-109-27.2.044-49.55981.41.18-141-31.2.028-70.54990.61.07-175-40.9.009-144 | Mag.Ang.dBMag.Ang.dBMag.Ang.Mag54.12428.225.71135.33.3.02242.72.80.17817.67.5778.29.5.03418.33.8016211.93.9247.28.6.03710.33.801478.62.7021.27.9.04012.40.781336.32.07-4.27.6.0421.48.771275.11.80.24.25.5.053.5.58.731163.81.56.51.25.0.056.20.67.661062.91.40.79.25.8.051.28.78.639.92.21.28.109.27.2.044.49.86.55981.41.18.141.31.2.028.70.93.54990.61.07.175.40.9.009.144.93 |

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



AT-64000 Chip Dimensions



Notes : 1) The bottom of the die is Collector. 2) Die thickness is 5 to 6 mils.

Part Number Ordering Information

| Part number | Devices Per Tray | | | |
|--------------|------------------|--|--|--|
| AT-64000-GP4 | 100 | | | |

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