



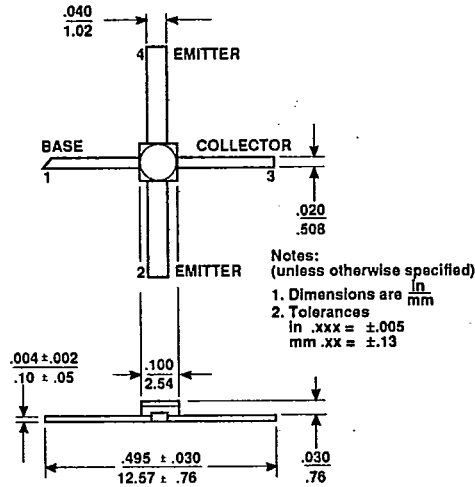
AT-42010
Up to 6 GHz Medium Power
Silicon Bipolar Transistor

T-31-21

Features

- **High Output Power:**
12.0 dBm typical $P_{1\text{ dB}}$ at 2.0 GHz
20.5 dBm typical $P_{1\text{ dB}}$ at 4.0 GHz
- **High Gain at 1 dB Compression:**
14.0 dB typical $G_{1\text{ dB}}$ at 2.0 GHz
9.5 dB typical $G_{1\text{ dB}}$ at 4.0 GHz
- **Low Noise Figure:**
1.9 dB typical N_{F0} at 2.0 GHz
- **High Gain-Bandwidth Product:**
8.0 GHz typical f_T
- **Hermetic Gold-ceramic Microstrip Package**

Avantek 100 mil Package



Description

Avantek's AT-42010 is a high performance NPN silicon bipolar transistor housed in a hermetic, high reliability 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 metallization in the fabrication of these devices.

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

| Freq. GHz | N_{F0} dB | Gamma Mag | Opt Ang | $R_N/50$ |
|-----------|-------------|-----------|---------|----------|
| 0.1 | 1.0 | .04 | 15 | 0.13 |
| 0.5 | 1.1 | .05 | 76 | 0.12 |
| 1.0 | 1.5 | .10 | 132 | 0.12 |
| 2.0 | 1.9 | .23 | -177 | 0.11 |
| 4.0 | 3.0 | .45 | -125 | 0.26 |

Electrical Specifications, $T_A = 25^\circ\text{C}$

| Symbol | Parameters and Test Conditions | Units | Min. | Typ. | Max. |
|-------------------|---|---------------|------|--------------|------|
| $ S_{21E} ^2$ | Insertion Power Gain: $V_{CE} = 8\text{ V}$, $I_C = 35\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$ | dB | 10.5 | 11.5 5.5 | |
| $P_{1\text{ dB}}$ | Power Output @ 1 dB Gain Compression: $V_{CE} = 8\text{ V}$, $I_C = 35\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$ | dBm | | 21.0 20.5 | |
| $G_{1\text{ dB}}$ | 1 dB Compressed Gain: $V_{CE} = 8\text{ V}$, $I_C = 35\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$ | dB | | 14.0 9.5 | |
| N_{F0} | Optimum Noise Figure: $V_{CE} = 8\text{ V}$, $I_C = 10\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$ | dB | | 1.9 3.0 | |
| G_A | Gain @ N_{F0} : $V_{CE} = 8\text{ V}$, $I_C = 10\text{ mA}$ $f = 2.0\text{ GHz}$ $f = 4.0\text{ GHz}$ | dB | | 13.5 10.0 | |
| f_T | Gain Bandwidth Product: $V_{CE} = 8\text{ V}$, $I_C = 35\text{ mA}$ | GHz | | 8.0 | |
| h_{FE} | Forward Current Transfer Ratio: $V_{CE} = 8\text{ V}$, $I_C = 35\text{ mA}$ | | 30 | 150 | 300 |
| I_{CBO} | Collector Cutoff Current: $V_{CB} = 8\text{ V}$ | μA | | | 0.2 |
| I_{EBO} | Emitter Cutoff Current: $V_{EB} = 1\text{ V}$ | μA | | | 2.0 |
| C_{CB} | Collector Base Capacitance ¹ : $V_{CB} = 8\text{ V}$, $f = 1\text{ MHz}$ | pF | | 0.28 | |

Note: 1. For this test the emitter is grounded.

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Medium Power Silicon Bipolar Transistor

Absolute Maximum Ratings

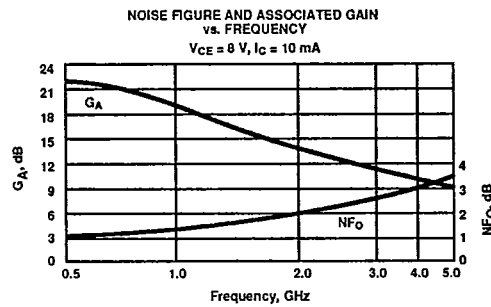
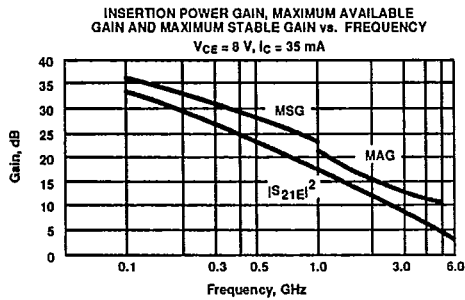
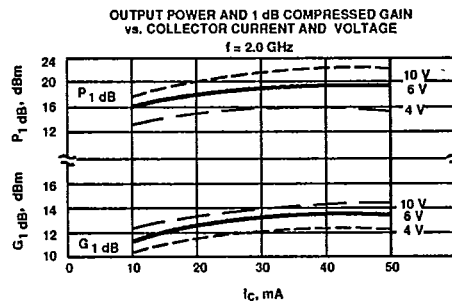
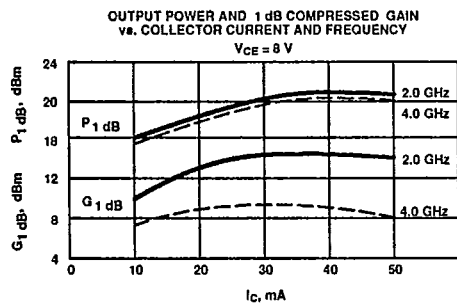
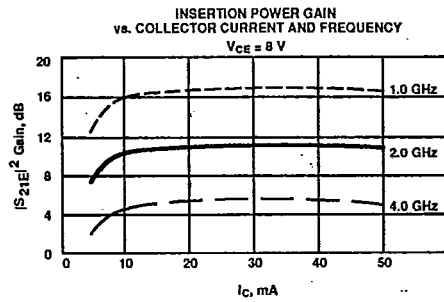
| Parameter | Symbol | Absolute Maximum ¹ |
|----------------------------------|--------|-------------------------------|
| Emitter-Base Voltage | VEBO | 1.5 V |
| Collector-Base Voltage | VCBO | 20 V |
| Collector-Emitter Voltage | VCEO | 12 V |
| Collector Current | IC | 80 mA |
| Power Dissipation ^{2,3} | PT | 600 mW |
| Junction Temperature | Tj | 200°C |
| Storage Temperature | TSTG | -65°C to 200°C |

Thermal Resistance^{2,4}: $\theta_{jc} = 150^\circ\text{C/W}$

- Notes:
1. Operation of this device above any one of these parameters may cause permanent damage.
 2. TCASE = 25°C.
 3. Derate at 6.7 mW/°C for TC > 110°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.

Typical Performance, TA = 25°C
(unless otherwise noted)

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AT-42010
Medium Power Silicon Bipolar Transistor

AVANTEK INC

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Typical Scattering Parameters: Common Emitter, $Z_0 = 50 \Omega$

$T_A = 25^\circ\text{C}$, $V_{CE} = 8 \text{ V}$, $I_C = 10 \text{ mA}$

| Freq. GHz | S ₁₁ | | dB | S ₂₁ | | dB | S ₁₂ | | S ₂₂ | |
|-----------|-----------------|------|------|-----------------|-----|-------|-----------------|-----|-----------------|------|
| | Mag | Ang | | Mag | Ang | | Mag | Ang | Mag | Ang |
| 0.1 | .74 | -47 | 28.5 | 26.65 | 153 | -36.4 | .015 | 72 | .91 | -18 |
| 0.5 | .65 | -136 | 21.4 | 11.71 | 103 | -29.4 | .034 | 38 | .51 | -39 |
| 1.0 | .63 | -168 | 15.9 | 6.24 | 82 | -27.2 | .044 | 36 | .40 | -42 |
| 1.5 | .63 | 174 | 12.6 | 4.26 | 69 | -26.0 | .050 | 42 | .38 | -45 |
| 2.0 | .63 | 161 | 10.1 | 3.23 | 57 | -24.6 | .059 | 43 | .38 | -49 |
| 2.5 | .64 | 154 | 8.4 | 2.64 | 51 | -23.0 | .070 | 52 | .38 | -51 |
| 3.0 | .65 | 145 | 6.9 | 2.22 | 41 | -22.0 | .080 | 54 | .37 | -56 |
| 3.5 | .66 | 136 | 5.8 | 1.94 | 31 | -21.0 | .090 | 51 | .38 | -65 |
| 4.0 | .66 | 126 | 4.7 | 1.72 | 21 | -19.7 | .104 | 50 | .39 | -74 |
| 4.5 | .66 | 115 | 3.8 | 1.55 | 11 | -18.0 | .126 | 45 | .40 | -82 |
| 5.0 | .66 | 103 | 3.0 | 1.41 | 1 | -17.3 | .136 | 41 | .40 | -89 |
| 5.5 | .68 | 90 | 2.1 | 1.28 | -9 | -16.1 | .156 | 36 | .40 | -98 |
| 6.0 | .72 | 81 | 1.3 | 1.16 | -19 | -15.4 | .170 | 31 | .37 | -110 |

$T_A = 25^\circ\text{C}$, $V_{CE} = 8 \text{ V}$, $I_C = 35 \text{ mA}$

| | | | | | | | | | | |
|-----|-----|------|------|-------|-----|-------|------|----|-----|------|
| 0.1 | .54 | -90 | 33.3 | 45.97 | 138 | -39.2 | .011 | 54 | .76 | -29 |
| 0.5 | .62 | -163 | 22.8 | 13.83 | 94 | -33.2 | .022 | 52 | .34 | -40 |
| 1.0 | .62 | 177 | 17.0 | 7.10 | 78 | -28.8 | .036 | 59 | .30 | -40 |
| 1.5 | .62 | 166 | 13.6 | 4.82 | 67 | -26.2 | .049 | 61 | .29 | -42 |
| 2.0 | .62 | 155 | 11.3 | 3.65 | 56 | -23.8 | .065 | 57 | .29 | -47 |
| 2.5 | .63 | 150 | 9.5 | 2.99 | 51 | -21.8 | .081 | 62 | .29 | -50 |
| 3.0 | .64 | 142 | 8.0 | 2.52 | 42 | -21.0 | .090 | 63 | .30 | -57 |
| 3.5 | .65 | 133 | 6.8 | 2.19 | 32 | -19.7 | .103 | 59 | .30 | -67 |
| 4.0 | .65 | 124 | 5.7 | 1.93 | 22 | -18.4 | .120 | 54 | .31 | -76 |
| 4.5 | .65 | 113 | 4.7 | 1.72 | 13 | -17.2 | .138 | 49 | .33 | -85 |
| 5.0 | .66 | 102 | 3.9 | 1.56 | 3 | -16.6 | .148 | 45 | .34 | -92 |
| 5.5 | .69 | 91 | 3.0 | 1.41 | -6 | -15.6 | .166 | 39 | .33 | -100 |
| 6.0 | .73 | 83 | 2.1 | 1.27 | -16 | -14.9 | .180 | 32 | .30 | -110 |

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