



**AT-41472**  
Up to 1 GHz Low Noise  
Silicon Bipolar Transistor

T-31-21

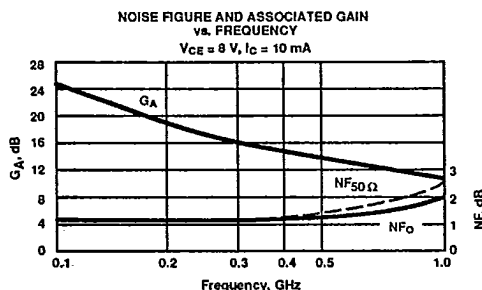
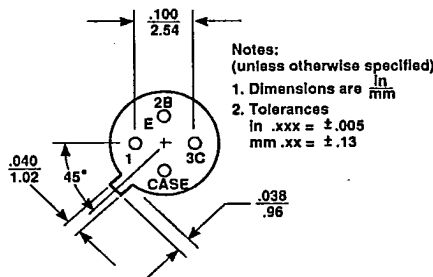
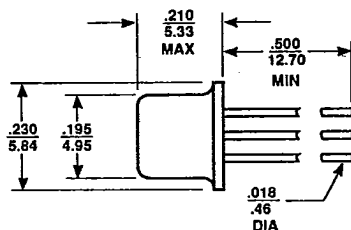
**Features**

- Low Noise Figure: 1.3 dB typical at 0.5 GHz  
2.0 dB typical at 1.0 GHz
- High Associated Gain: 14.0 dB typical at 0.5 GHz  
10.0 dB typical at 1.0 GHz
- High Gain-Bandwidth Product: 6.5 GHz typical  $f_T$
- Hermetic, Metal Package

**Description**

Avantek's AT-41472 is a high performance NPN silicon bipolar transistor housed in a hermetic, high reliability metal package. This device is designed for use in low noise, 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.

**Avantek TO-72 Package****Electrical Specifications,  $T_A = 25^\circ\text{C}$** 

| Symbol            | Parameters and Test Conditions                                                       | Units         | Min. | Typ. | Max. |
|-------------------|--------------------------------------------------------------------------------------|---------------|------|------|------|
| NF <sub>0</sub>   | Optimum Noise Figure: $V_{CE} = 8\text{ V}$ , $I_C = 10\text{ mA}$                   | dB            |      | 1.3  | 1.6  |
| GA                | Gain @ NF <sub>0</sub> : $V_{CE} = 8\text{ V}$ , $I_C = 10\text{ mA}$                | dB            |      | 14.0 |      |
|                   | $f = 0.5\text{ GHz}$                                                                 |               |      | 10.0 |      |
|                   | $f = 1.0\text{ GHz}$                                                                 |               |      |      |      |
| $ S_{21} ^2$      | Insertion Power Gain: $V_{CE} = 8\text{ V}$ , $I_C = 25\text{ mA}$                   | dB            |      | 16.5 |      |
|                   | $f = 0.5\text{ GHz}$                                                                 |               |      | 11.5 |      |
|                   | $f = 1.0\text{ GHz}$                                                                 |               |      |      |      |
| P <sub>1</sub> dB | Power Output @ 1 dB Gain Compression: $V_{CE} = 8\text{ V}$ , $I_C = 25\text{ mA}$   | dBm           |      | 20.5 |      |
| G <sub>1</sub> dB | 1 dB Compressed Gain: $V_{CE} = 8\text{ V}$ , $I_C = 25\text{ mA}$                   | dB            |      | 7.0  |      |
| $f_T$             | Gain Bandwidth Product: $V_{CE} = 8\text{ V}$ , $I_C = 25\text{ mA}$                 | GHz           |      | 6.5  |      |
| hFE               | Forward Current Transfer Ratio: $V_{CE} = 8\text{ V}$ , $I_C = 10\text{ mA}$         |               | 30   | 150  | 300  |
| ICBO              | Collector Cutoff Current: $V_{CB} = 8\text{ V}$                                      | $\mu\text{A}$ |      |      | 0.2  |
| IEBO              | Emitter Cutoff Current: $V_{EB} = 1\text{ V}$                                        | $\mu\text{A}$ |      |      | 1.0  |
| CCB               | Collector Base Capacitance <sup>1</sup> : $V_{CB} = 8\text{ V}$ , $f = 1\text{ MHz}$ | pF            |      | 0.35 |      |

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

AT-41472

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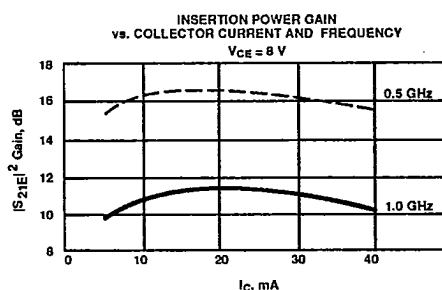
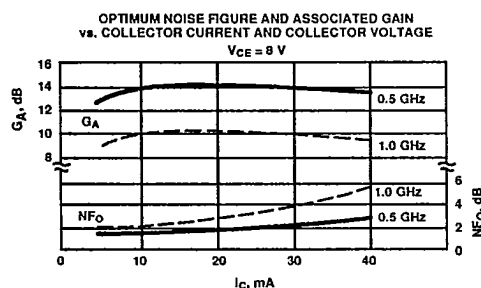
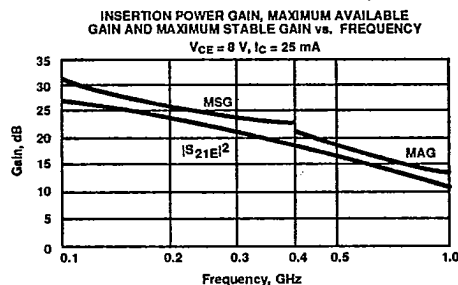
## Absolute Maximum Ratings

| Parameter                        | Symbol | Absolute Maximum <sup>1</sup> |
|----------------------------------|--------|-------------------------------|
| Emitter-Base Voltage             | VEBO   | 1.5 V                         |
| Collector-Base Voltage           | VCBO   | 20 V                          |
| Collector-Emitter Voltage        | VCEO   | 12 V                          |
| Collector Current                | IC     | 60 mA                         |
| Power Dissipation <sup>2,3</sup> | PT     | 500 mW                        |
| Junction Temperature             | Tj     | 200°C                         |
| Storage Temperature              | TSTG   | -65°C to 200°C                |

Thermal Resistance<sup>2,4</sup>:  $\theta_{JC} = 260^\circ\text{C/W}$ 

## Notes:

1. Operation of this device above any one of these parameters may cause permanent damage.
2. TCASE = 25°C.
3. Derate at 3.8 mW/°C for TC > 70°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.

Typical Performance,  $T_A = 25^\circ\text{C}$   
(unless otherwise noted)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.<br>GHz | $S_{11}$ |     | $S_{21}$ |       | $S_{12}$ |      | $S_{22}$ |     |
|--------------|----------|-----|----------|-------|----------|------|----------|-----|
|              | Mag      | Ang | dB       | Mag   | dB       | Mag  | Mag      | Ang |
| 0.1          | .67      | -24 | 25.1     | 18.00 | -35.6    | .017 | .71      | .89 |
| 0.2          | .51      | -37 | 22.3     | 12.98 | -30.5    | .030 | .71      | .78 |
| 0.3          | .41      | -42 | 19.9     | 9.84  | -28.5    | .038 | .72      | .71 |
| 0.4          | .34      | -45 | 17.9     | 7.87  | -26.4    | .048 | .71      | .67 |
| 0.5          | .29      | -48 | 16.4     | 6.60  | -24.5    | .060 | .71      | .65 |
| 0.6          | .25      | -49 | 15.0     | 5.64  | -22.9    | .072 | .71      | .62 |
| 0.7          | .22      | -47 | 13.8     | 4.92  | -21.7    | .082 | .69      | .61 |
| 0.8          | .21      | -45 | 12.7     | 4.32  | -21.1    | .088 | .67      | .61 |
| 0.9          | .20      | -45 | 11.6     | 3.81  | -20.1    | .099 | .64      | .61 |
| 1.0          | .19      | -45 | 10.8     | 3.46  | -19.8    | .103 | .64      | .62 |

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

| Freq.<br>GHz | $S_{11}$ |     | $S_{21}$ |       | $S_{12}$ |      | $S_{22}$ |     |
|--------------|----------|-----|----------|-------|----------|------|----------|-----|
|              | Mag      | Ang | dB       | Mag   | dB       | Mag  | Mag      | Ang |
| 0.1          | .58      | -30 | 26.9     | 22.02 | -35.4    | .017 | .78      | .15 |
| 0.2          | .40      | -38 | 23.4     | 14.70 | -30.8    | .029 | .80      | .68 |
| 0.3          | .32      | -41 | 20.7     | 10.79 | -27.5    | .042 | .79      | .64 |
| 0.4          | .27      | -37 | 18.4     | 8.26  | -25.7    | .052 | .76      | .61 |
| 0.5          | .24      | -37 | 16.5     | 6.71  | -23.9    | .064 | .73      | .57 |
| 0.6          | .22      | -38 | 15.3     | 5.82  | -22.0    | .079 | .74      | .56 |
| 0.7          | .20      | -36 | 14.2     | 5.15  | -20.8    | .091 | .72      | .54 |
| 0.8          | .19      | -35 | 13.2     | 4.56  | -19.8    | .102 | .71      | .53 |
| 0.9          | .19      | -38 | 12.1     | 4.01  | -18.8    | .115 | .72      | .56 |
| 1.0          | .18      | -37 | 11.4     | 3.71  | -18.2    | .123 | .69      | .56 |

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