HEWLETT® PACKARD

# 0.5 – 12 GHz Low Noise Gallium Arsenide FET

## Technical Data

**ATF-10236**

### Features

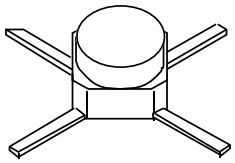
- **Low Noise Figure:** 0.8 dB Typical at 4 GHz
- **Low Bias:** $V_{DS}$ = 2 V, $I_{DS}$ = 20 mA
- **High Associated Gain:** 13.0 dB Typical at 4 GHz
- **High Output Power:** 20.0 dBm Typical $P_{1dB}$ at 4 GHz
- **Cost Effective Ceramic Microstrip Package**
- **Tape-And-Reel Packaging Option Available** [1]

### Description

The ATF-10236 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor housed in a cost effective microstrip package. Its low noise figure makes this device appropriate for use in the first and second stages of low noise amplifiers operating in the 0.5-12 GHz frequency range.

This GaAs FET device has a nominal 0.3 micron gate length using airbridge interconnects between drain fingers. Total gate periphery is 500 microns. Proven gold based metallization systems and nitride passivation assure a rugged, reliable device.

### 36 micro-X Package



### Electrical Specifications, $T_A$ = 25°C

| Symbol | Parameters and Test Conditions | | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|---|
| $NF_O$ | Optimum Noise Figure: $V_{DS}$ = 2 V, $I_{DS}$ = 25 mA | f = 2.0 GHz<br>f = 4.0 GHz<br>f = 6.0 GHz | dB<br>dB<br>dB | | 0.6<br>0.8<br>1.0 | <br>1.0<br> |
| $G_A$ | Gain @ $NF_O$; $V_{DS}$ = 2 V, $I_{DS}$ = 25 mA | f = 2.0 GHz<br>f = 4.0 GHz<br>f = 6.0 GHz | dB<br>dB<br>dB | <br>12.0<br> | 16.5<br>13.0<br>10.5 | <br><br> |
| $P_{1\,dB}$ | Power Output @ 1 dB Gain Compression<br>$V_{DS}$ = 4 V, $I_{DS}$ = 70 mA | f = 4.0 GHz | dBm | | 20.0 | |
| $G_{1\,dB}$ | 1 dB Compressed Gain: $V_{DS}$ = 4 V, $I_{DS}$ = 70 mA | f = 4.0 GHz | dB | | 12.0 | |
| $g_m$ | Transconductance: $V_{DS}$ = 2 V, $V_{GS}$ = 0 V | | mmho | 80 | 140 | |
| $I_{DSS}$ | Saturated Drain Current: $V_{DS}$ = 2 V, $V_{GS}$ = 0 V | | mA | 70 | 130 | 180 |
| $V_P$ | Pinchoff Voltage: $V_{DS}$ = 2 V, $I_{DS}$ = 1 mA | | V | -3.0 | -1.3 | -0.8 |

**Note:**

1. Refer to PACKAGING section, "Tape-and-Reel Packaging for Surface Mount Semiconductors."

## ATF-10236 Absolute Maximum Ratings

| Symbol | Parameter | Units | Absolute Maximum[1] |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | V | +5 |
| $V_{GS}$ | Gate-Source Voltage | V | -4 |
| $V_{GD}$ | Gate-Drain Voltage | V | -7 |
| $I_{DS}$ | Drain Current | mA | $I_{DSS}$ |
| $P_T$ | Power Dissipation [2,3] | mW | 430 |
| $T_{CH}$ | Channel Temperature | °C | 175 |
| $T_{STG}$ | Storage Temperature[4] | °C | 175 |

| | |
|---|---|
| **Thermal Resistance:** | $\theta_{jc} = 350°C/W; T_{CH} = 150°C$ |
| **Liquid Crystal Measurement:** | 1µm Spot Size[5] |

**Notes:**

1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{CASE\ TEMPERATURE} = 25°C$.
3. Derate at 2.9 mW/°C for $T_{CASE} > 25°C$.
4. Storage above +150°C may tarnish the leads of this package making it difficult to solder into a circuit. After a device has been soldered into a circuit, it may be safely stored up to 175°C.
5. 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 for more information.

## Part Number Ordering Information

| Part Number | Devices Per Reel | Reel Size |
|---|---|---|
| ATF-10236-TR1 | 1000 | 7" |
| ATF-10236-STR | 10 | STRIP |

For more information, see "Tape and Reel Packaging for Semiconductor Devices."

## ATF-10236 Noise Parameters: $V_{DS} = 2\ V, I_{DS} = 25\ mA$

| Freq. GHz | $NF_O$ dB | $\Gamma_{opt}$ | | $R_N/50$ |
|---|---|---|---|---|
| | | Mag | Ang | |
| 0.5 | 0.45 | 0.93 | 18 | 0.75 |
| 1.0 | 0.5 | 0.87 | 36 | 0.63 |
| 2.0 | 0.6 | 0.73 | 74 | 0.33 |
| 4.0 | 0.8 | 0.45 | 148 | 0.15 |
| 6.0 | 1.0 | 0.42 | -137 | 0.12 |
| 8.0 | 1.3 | 0.49 | -80 | 0.45 |

## ATF-10236 Typical Performance, $T_A = 25°C$

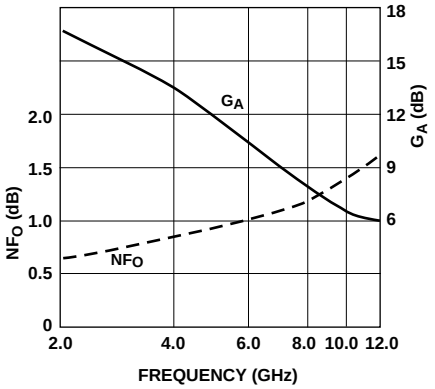



**Figure 1. Optimum Noise Figure and Associated Gain vs. Frequency. $V_{DS}$ = 2V, $I_{DS}$ = 25 mA, $T_A$ = 25°C.**

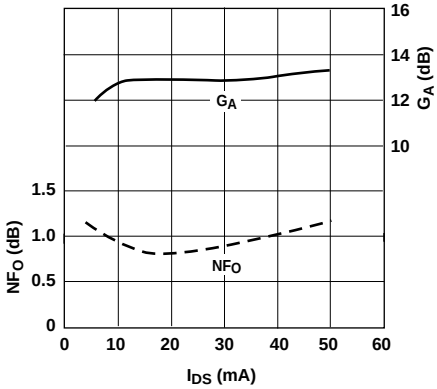



**Figure 2. Optimum Noise Figure and Associated Gain vs. $I_{DS}$. $V_{DS}$ = 2V, f = 4.0 GHz.**

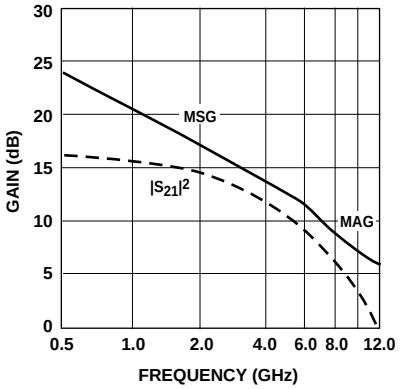


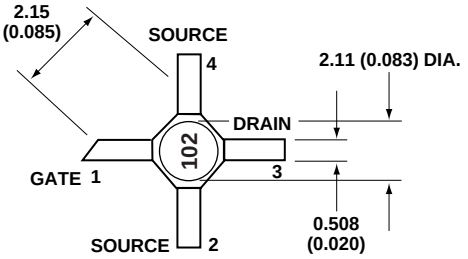

**Figure 3. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency. $V_{DS}$ = 2 V, $I_{DS}$ = 25 mA.**

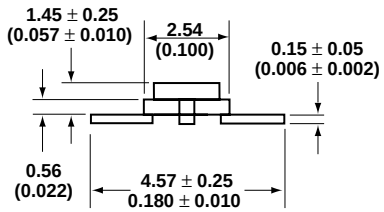
**Typical Scattering Parameters,** Common Source, $Z_O = 50\ \Omega, T_A = 25°C, V_{DS} = 2\,V, I_{DS} = 25\,mA$

| Freq. | $S_{11}$ | | $S_{21}$ | | | $S_{12}$ | | | $S_{22}$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| GHz | Mag. | Ang. | dB | Mag. | Ang. | dB | Mag. | Ang. | Mag. | Ang. |
| 0.5 | .97 | -20 | 15.1 | 5.68 | 162 | -32.8 | .023 | 76 | .47 | -11 |
| 1.0 | .93 | -41 | 14.9 | 5.58 | 143 | -26.0 | .050 | 71 | .45 | -23 |
| 2.0 | .77 | -81 | 13.6 | 4.76 | 107 | -21.3 | .086 | 51 | .36 | -38 |
| 3.0 | .59 | -114 | 12.2 | 4.06 | 80 | -18.4 | .120 | 35 | .30 | -51 |
| 4.0 | .48 | -148 | 10.9 | 3.51 | 52 | -16.5 | .149 | 18 | .23 | -67 |
| 5.0 | .46 | 166 | 9.6 | 3.03 | 26 | -15.3 | .172 | 3 | .10 | -67 |
| 6.0 | .53 | 125 | 8.5 | 2.65 | 1 | -14.5 | .189 | -14 | .09 | 48 |
| 7.0 | .62 | 96 | 6.9 | 2.22 | -20 | -14.4 | .191 | -28 | .24 | 55 |
| 8.0 | .71 | 73 | 4.9 | 1.75 | -39 | -14.5 | .189 | -41 | .37 | 51 |
| 9.0 | .75 | 54 | 3.3 | 1.47 | -55 | -14.7 | .184 | -46 | .46 | 42 |
| 10.0 | .78 | 39 | 2.1 | 1.28 | -72 | -14.9 | .180 | -59 | .51 | 34 |
| 11.0 | .82 | 26 | 0.3 | 1.04 | -86 | -14.9 | .179 | -71 | .54 | 26 |
| 12.0 | .84 | 12 | -0.5 | 0.95 | -101 | -15.0 | .177 | -82 | .54 | 17 |

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

## 36 micro-X Package Dimensions




**Notes:**
1. **Dimensions are in millimeters (inches)**
2. **Tolerances: in .xxx = ± 0.005**
   **mm .xx = ± 0.13**