

# 0.5–12 GHz Low Noise Gallium Arsenide FET

## Technical Data

### ATF-10236

#### Features

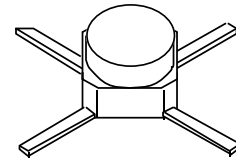
- **Low Noise Figure:**  
0.8 dB Typical at 4 GHz
- **Low Bias:**  
 $V_{DS} = 2\text{ V}$ ,  $I_{DS} = 20\text{ mA}$
- **High Associated Gain:**  
13.0 dB Typical at 4 GHz
- **High Output Power:** 20.0 dBm  
Typical  $P_{1\text{dB}}$  at 4 GHz
- **Cost Effective Ceramic Microstrip Package**
- **Tape-And-Reel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

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

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.
NF <sub>O</sub>	Optimum Noise Figure: $V_{DS} = 2\text{ V}$ , $I_{DS} = 25\text{ mA}$	$f = 2.0\text{ GHz}$	dB	0.6	1.0
		$f = 4.0\text{ GHz}$	dB	0.8	
		$f = 6.0\text{ GHz}$	dB	1.0	
G <sub>A</sub>	Gain @ NF <sub>O</sub> ; $V_{DS} = 2\text{ V}$ , $I_{DS} = 25\text{ mA}$	$f = 2.0\text{ GHz}$	dB	12.0	16.5
		$f = 4.0\text{ GHz}$	dB		13.0
		$f = 6.0\text{ GHz}$	dB		10.5
P <sub>1dB</sub>	Power Output @ 1 dB Gain Compression $V_{DS} = 4\text{ V}$ , $I_{DS} = 70\text{ mA}$	$f = 4.0\text{ GHz}$	dBm	20.0	
G <sub>1dB</sub>	1 dB Compressed Gain: $V_{DS} = 4\text{ V}$ , $I_{DS} = 70\text{ mA}$	$f = 4.0\text{ GHz}$	dB	12.0	
g <sub>m</sub>	Transconductance: $V_{DS} = 2\text{ V}$ , $V_{GS} = 0\text{ V}$		mmho	80	140
I <sub>DSS</sub>	Saturated Drain Current: $V_{DS} = 2\text{ V}$ , $V_{GS} = 0\text{ V}$		mA	70	130
V <sub>P</sub>	Pinchoff Voltage: $V_{DS} = 2\text{ V}$ , $I_{DS} = 1\text{ mA}$		V	-3.0	-1.3

#### Note:

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

## ATF-10236 Absolute Maximum Ratings

Symbol	Parameter	Units	Absolute Maximum <sup>[1]</sup>
V <sub>DS</sub>	Drain-Source Voltage	V	+5
V <sub>GS</sub>	Gate-Source Voltage	V	-4
V <sub>GD</sub>	Gate-Drain Voltage	V	-7
I <sub>DS</sub>	Drain Current	mA	I <sub>DSS</sub>
P <sub>T</sub>	Power Dissipation <sup>[2,3]</sup>	mW	430
T <sub>CH</sub>	Channel Temperature	°C	175
T <sub>STG</sub>	Storage Temperature <sup>[4]</sup>	°C	175

**Thermal Resistance:**  $\theta_{jc} = 350^{\circ}\text{C}/\text{W}; T_{CH} = 150^{\circ}\text{C}$   
**Liquid Crystal Measurement:**  $1\mu\text{m}$  Spot Size<sup>[5]</sup>

## Part Number Ordering Information

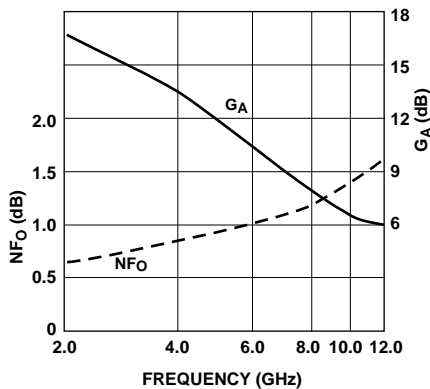
Part Number	Devices Per Reel	Reel Size
ATF-10236-TR1	1000	7"
ATF-10236-STR	10	STRIP

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

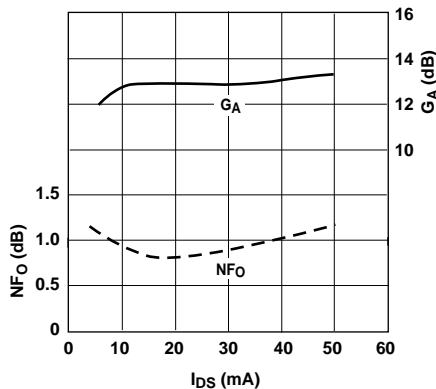
## ATF-10236 Noise Parameters: V<sub>DS</sub> = 2 V, I<sub>DS</sub> = 25 mA

Freq. GHz	NF <sub>O</sub> dB	$\Gamma_{opt}$		R <sub>N</sub> /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<sub>A</sub> = 25°C



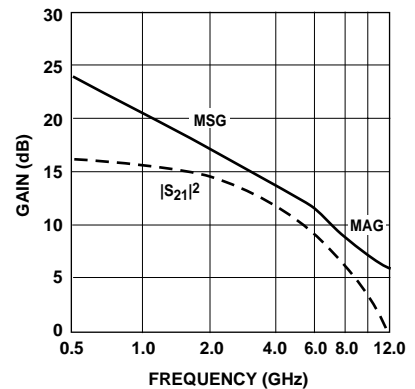
**Figure 1. Optimum Noise Figure and Associated Gain vs. Frequency.**  
V<sub>DS</sub> = 2V, I<sub>DS</sub> = 25 mA, T<sub>A</sub> = 25°C.



**Figure 2. Optimum Noise Figure and Associated Gain vs. I<sub>DS</sub>.**  
V<sub>DS</sub> = 2V, f = 4.0 GHz.

### Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2. T<sub>CASE TEMPERATURE</sub> = 25°C.
3. Derate at 2.9 mW/°C for T<sub>CASE</sub> > 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.



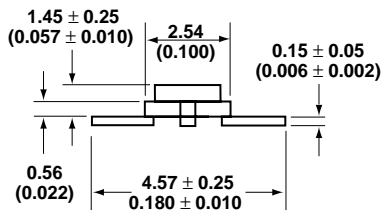
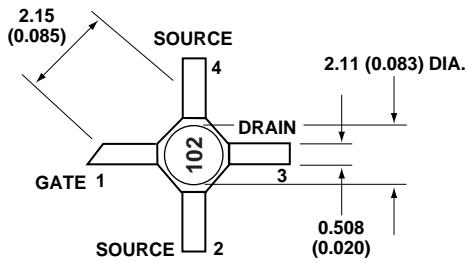
**Figure 3. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency.**  
V<sub>DS</sub> = 2 V, I<sub>DS</sub> = 25 mA.

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

Freq. GHz	$S_{11}$		$S_{21}$			$S_{12}$			$S_{22}$	
	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