

# 0.5–12 GHz Low Noise Gallium Arsenide FET

## Technical Data

### ATF-10136

#### Features

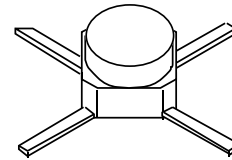
- **Low Noise Figure:**  
0.5 dB Typical at 4 GHz
- **Low Bias:**  
 $V_{DS} = 2V, I_{DS} = 20mA$
- **High Associated Gain:**  
13.0 dB Typical at 4 GHz
- **High Output Power:**  
20.0 dBm Typical  $P_{1dB}$  at 4 GHz
- **Cost Effective Ceramic Microstrip Package**
- **Tape-and Reel Packaging Option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

#### Description

The ATF-10136 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor housed in a cost effective microstrip package. Its premium noise figure makes this device appropriate for use in the first stage 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, $T_A = 25^\circ C$

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.
NF <sub>O</sub>	Optimum Noise Figure: $V_{DS} = 2V, I_{DS} = 25mA$	f = 2.0 GHz	dB	0.4	0.6
		f = 4.0 GHz	dB	0.5	
		f = 6.0 GHz	dB	0.8	
G <sub>A</sub>	Gain @ NF <sub>O</sub> ; $V_{DS} = 2V, I_{DS} = 25mA$	f = 2.0 GHz	dB	12.0	16.5
		f = 4.0 GHz	dB		13.0
		f = 6.0 GHz	dB		11.0
P <sub>1dB</sub>	Power Output @ 1 dB Gain Compression $V_{DS} = 4V, I_{DS} = 70mA$	f = 4.0 GHz	dBm	20.0	
G <sub>1dB</sub>	1 dB Compressed Gain: $V_{DS} = 4V, I_{DS} = 70mA$	f = 4.0 GHz	dB	12.0	
g <sub>m</sub>	Transconductance: $V_{DS} = 2V, V_{GS} = 0V$		mmho	70	140
I <sub>DSS</sub>	Saturated Drain Current: $V_{DS} = 2V, V_{GS} = 0V$		mA	70	130
V <sub>P</sub>	Pinchoff Voltage: $V_{DS} = 2V, I_{DS} = 1mA$		V	-4.0	-1.3

#### Note:

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

## ATF-10136 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	-65 to +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>

### 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 APPLICATIONS PRIMER IIIA for more information.

## Part Number Ordering Information

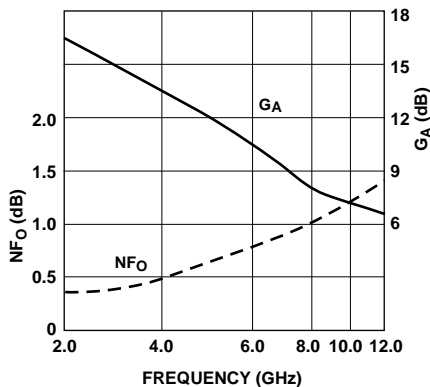
Part Number	Devices Per Reel	Reel Size
ATF-10136-TR1	1000	7"
ATF-10136-STR	10	STRIP

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

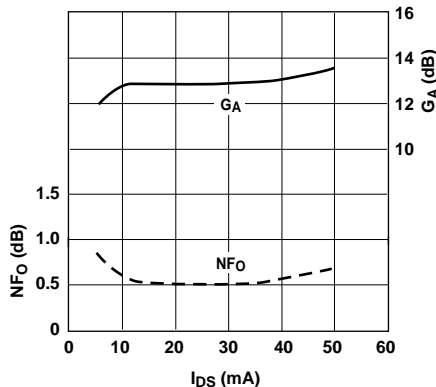
## ATF-10136 Noise Parameters: V<sub>DS</sub> = 2 V, I<sub>DS</sub> = 25 mA

Freq. GHz	NF <sub>O</sub> dB	$\Gamma_{opt}$		R <sub>N</sub> /50
		Mag	Ang	
0.5	0.35	0.93	12	0.80
1.0	0.4	0.85	24	0.70
2.0	0.4	0.70	47	0.46
4.0	0.5	0.39	126	0.36
6.0	0.8	0.36	-170	0.12
8.0	1.1	0.45	-100	0.38

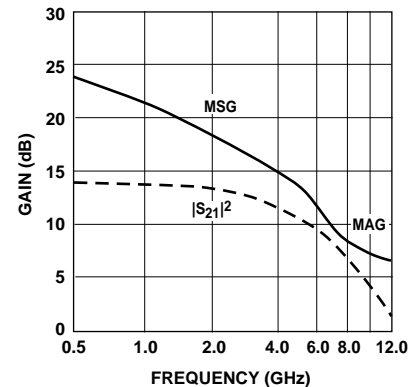
## ATF-10136 Typical Performance, T<sub>A</sub> = 25°C



**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.

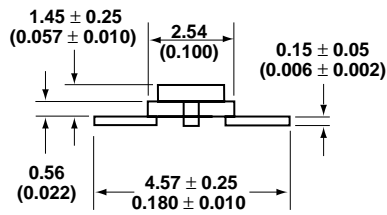
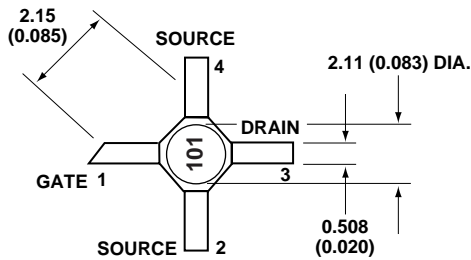


**Figure 3. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency.**  
V<sub>DS</sub> = 2 V, I<sub>DS</sub> = 25 mA.

**Typical Scattering Parameters, Common Source,  $Z_0 = 50 \Omega$ ,  $T_A = 25^\circ\text{C}$ ,  $V_{DS} = 2\text{V}$ ,  $I_{DS} = 25\text{mA}$**

Freq. MHz	$S_{11}$		$S_{21}$			$S_{12}$			$S_{22}$	
	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.
0.5	.98	-18	14.5	5.32	163	-34.0	.020	78	.35	-9
1.0	.93	-33	14.3	5.19	147	-28.4	.038	67	.36	-19
2.0	.79	-66	13.3	4.64	113	-22.6	.074	59	.30	-31
3.0	.64	-94	12.2	4.07	87	-19.2	.110	44	.27	-42
4.0	.54	-120	11.1	3.60	61	-17.3	.137	31	.22	-49
5.0	.47	-155	10.1	3.20	37	-15.5	.167	13	.16	-54
6.0	.45	162	9.2	2.88	13	-14.3	.193	-2	.08	-17
7.0	.50	120	8.0	2.51	-10	-13.9	.203	-19	.16	45
8.0	.60	87	6.4	2.09	-32	-13.6	.210	-36	.32	48
9.0	.68	61	4.9	1.75	-51	-13.6	.209	-46	.44	38
10.0	.73	42	3.6	1.52	-66	-13.7	.207	-58	.51	34
11.0	.77	26	2.0	1.26	-82	-13.8	.205	-73	.54	27
12.0	.80	14	1.0	1.12	-97	-14.0	.200	-82	.54	15

**36 micro-X Package Dimensions**



**Notes:**

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