



# 0.5 – 12 GHz Low Noise Gallium Arsenide FET

## Technical Data

### ATF-10136

#### Features

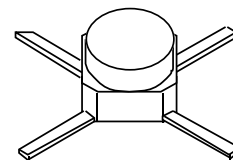
- **Low Noise Figure:**  
0.5 dB Typical at 4 GHz
- **Low Bias:**  
 $V_{DS} = 2\text{ V}$ ,  $I_{DS} = 20\text{ mA}$
- **High Associated Gain:**  
13.0 dB Typical at 4 GHz
- **High Output Power:**  
20.0 dBm Typical  $P_{1\text{ dB}}$  at 4 GHz
- **Cost Effective Ceramic Microstrip Package**
- **Tape-and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

#### Description

The ATF-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, $T_A = 25^\circ\text{C}$

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	0.4	0.6	
		$f = 4.0\text{ GHz}$	dB	0.5		
		$f = 6.0\text{ GHz}$	dB	0.8		
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		11.0	
P <sub>1 dB</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>1 dB</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	70	140	
I <sub>DSS</sub>	Saturated Drain Current: $V_{DS} = 2\text{ V}$ , $V_{GS} = 0\text{ V}$		mA	70	130	180
V <sub>P</sub>	Pinchoff Voltage: $V_{DS} = 2\text{ V}$ , $I_{DS} = 1\text{ mA}$		V	-4.0	-1.3	-0.5

#### 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>
$V_{DS}$	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 <sup>[2,3]</sup>	mW	430
$T_{CH}$	Channel Temperature	°C	175
$T_{STG}$	Storage Temperature <sup>[4]</sup>	°C	-65 to +175

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

## Part Number Ordering Information

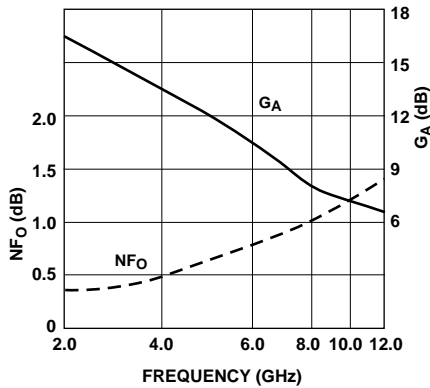
Part Number	Devices Per Reel	Reel Size
ATF-10136-TR1	1000	7"
ATF-10136-STR	10	STRIP

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

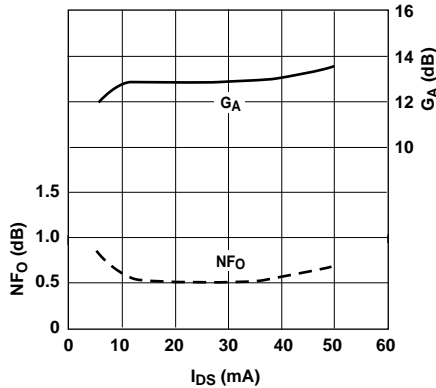
## ATF-10136 Noise Parameters: $V_{DS} = 2\ \text{V}$ , $I_{DS} = 25\ \text{mA}$

Freq. GHz	$NF_O$ dB	$\Gamma_{opt}$		$R_N/50$
		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

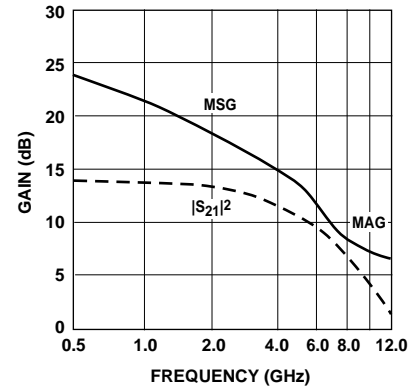
## ATF-10136 Typical Performance, $T_A = 25^\circ\text{C}$



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



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



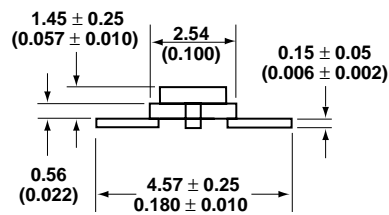
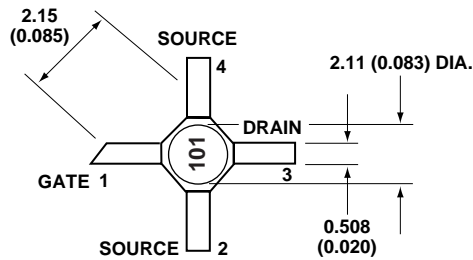
**Figure 3. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency.**  
 $V_{DS} = 2\ \text{V}$ ,  $I_{DS} = 25\ \text{mA}$ .

### Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2.  $T_{CASE\ TEMPERATURE} = 25^\circ\text{C}$ .
3. Derate at  $2.9\ \text{mW}/^\circ\text{C}$  for  $T_{CASE} > 25^\circ\text{C}$ .
4. Storage above  $+150^\circ\text{C}$  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  $175^\circ\text{C}$ .
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.

**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:**

- Dimensions are in millimeters (inches)
- Tolerances: in .xxx =  $\pm 0.005$   
mm .xx =  $\pm 0.13$



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