

# 0.5-12 GHz Low Noise Gallium Arsenide FET

# Technical Data

#### ATF-10136

#### **Features**

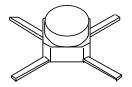
- Low Noise Figure: 0.5 dB Typical at 4 GHz
- **Low Bias:**  $V_{DS} = 2V, I_{DS} = 20 \text{ mA}$
- **High Associated Gain:** 13.0 dB Typical at 4 GHz
- **High Output Power:** 20.0 dBm Typical P<sub>1 dB</sub> at 4 GHz
- Cost Effective Ceramic Microstrip Package
- Tape-and Reel Packaging Option Available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

#### **Description**

The ATF-10136 is a high performance gallium arsenide Schottky-barriergate 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, $T_A = 25$ °C

Symbol	<b>Parameters and Test Conditions</b>		Units	Min.	Тур.	Max.
NF <sub>O</sub>	Optimum Noise Figure: $V_{DS} = 2 \text{ V}, I_{DS} = 25 \text{ mA}$	$\begin{split} &f=2.0\mathrm{GHz}\\ &f=4.0\mathrm{GHz}\\ &f=6.0\mathrm{GHz} \end{split}$	dB dB dB		0.4 0.5 0.8	0.6
$G_{A}$	$Gain @ NF_O; V_{DS} = 2 V, I_{DS} = 25 \text{ mA}$	f = 2.0 GHz f = 4.0 GHz f = 6.0 GHz	dB dB dB	12.0	16.5 13.0 11.0	
P <sub>1 dB</sub>	Power Output @ 1 dB Gain Compression $V_{DS} = 4V, I_{DS} = 70\text{mA}$	f = 4.0  GHz	dBm		20.0	
$G_{1dB}$	$1~\mathrm{dB}$ Compressed Gain: $\mathrm{V_{DS}} = 4~\mathrm{V}, \mathrm{I_{DS}} = 70~\mathrm{mA}$	f = 4.0  GHz	dB		12.0	
$g_{\rm m}$	Transconductance: $V_{DS} = 2 V$ , $V_{GS} = 0 V$		mmho	70	140	
$I_{\mathrm{DSS}}$	Saturated Drain Current: $V_{DS} = 2 V$ , $V_{GS} = 0 V$		mA	70	130	180
$V_{\rm P}$	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."

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ATF-10136 Absolute Maximum Ratings

Symbol	Parameter	Units	Absolute Maximum <sup>[1]</sup>
$V_{\mathrm{DS}}$	Drain-Source Voltage	V	+5
$V_{GS}$	Gate-Source Voltage	V	-4
$V_{ m GD}$	Gate-Drain Voltage	V	-7
$I_{\mathrm{DS}}$	Drain Current	mA	$I_{\mathrm{DSS}}$
$P_{T}$	Power Dissipation [2,3]	mW	430
$T_{\mathrm{CH}}$	Channel Temperature	°C	175
$T_{STG}$	Storage Temperature <sup>[4]</sup>	°C	-65 to +175

Thermal Resistance:	$\theta_{\rm jc} = 350 {\rm ^{\circ}C/W}; T_{\rm CH} = 150 {\rm ^{\circ}C}$
Liquid Crystal Measurement:	$1  \mu m  \mathrm{Spot}  \mathrm{Size}^{\scriptscriptstyle [5]}$

**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.	NFo	Γ	D /50	
GHz	dB	Mag	Ang	$R_N/50$
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, $T_A = 25^{\circ}C$

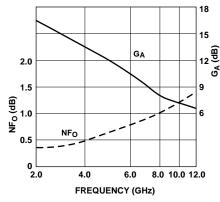


Figure 1. Optimum Noise Figure and Associated Gain vs. Frequency.  $V_{DS}=2V,\,I_{DS}=25$  mA,  $T_A=25^{\circ}C.$ 

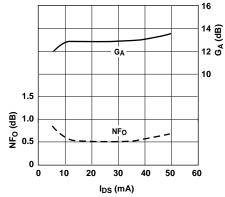


Figure 2. Optimum Noise Figure and Associated Gain vs.  $I_{DS}$ .  $V_{DS} = 2V$ , f = 4.0 GHz.

#### **Notes:**

- 1. Permanent damage may occur if any of these limits are exceeded.
- 2.  $T_{CASE\ TEMPERATURE} = 25^{\circ}C.$
- 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 APPLICATIONS PRIMER IIIA for more information.

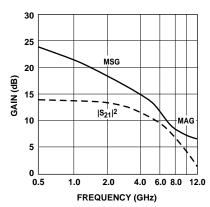
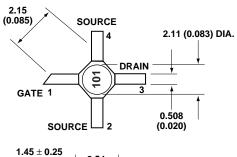


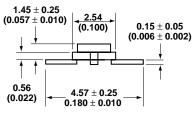
Figure 3. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency.  $V_{DS}=2\ V,\ I_{DS}=25\ mA.$ 

 $\textbf{Typical Scattering Parameters,} \ \ \text{Common Source,} \ \ Z_{O} = 50 \ \Omega, T_{A} = 25 \ \text{°C}, V_{DS} = 2 \ \text{V}, I_{DS} = 25 \ \text{mA}$ 

Freq.	S	11	$S_{21}$		$\mathbf{S}_{12}$			$\mathbf{S_{22}}$		
MHz	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	<b>-</b> 94	12.2	4.07	87	-19.2	.110	44	.27	<b>-</b> 42
4.0	.54	-120	11.1	3.60	61	-17.3	.137	31	.22	<b>-</b> 49
5.0	.47	-155	10.1	3.20	37	-15.5	.167	13	.16	<b>-</b> 54
6.0	.45	162	9.2	2.88	13	-14.3	.193	<b>-</b> 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	<b>-</b> 32	-13.6	.210	-36	.32	48
9.0	.68	61	4.9	1.75	<b>-</b> 51	-13.6	.209	<b>-</b> 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	<b>-</b> 82	-13.8	.205	<b>-7</b> 3	.54	27
12.0	.80	14	1.0	1.12	-97	-14.0	.200	<b>-</b> 82	.54	15

## 36 micro-X Package Dimensions





Notes:

Dimensions are in millimeters (inches)
 Tolerances: in .xxx = ± 0.005

mm .xx =  $\pm$  0.13