0.5 – 12 GHz Low Noise Gallium Arsenide FET

Technical Data

ATF-10136

Features

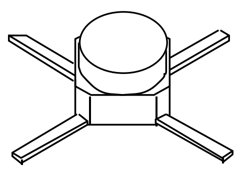
- **Low Noise Figure:**
  0.5 dB Typical at 4 GHz
- **Low Bias:**
  $V_{DS} = 2\,V, I_{DS} = 20\,mA$
- **High Associated Gain:**
  13.0 dB Typical at 4 GHz
- **High Output Power:**
  20.0 dBm Typical $P_{1\,dB}$ at 4 GHz
- **Cost Effective Ceramic Microstrip Package**
- **Tape-and Reel Packaging Option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

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, $T_A = 25°C$

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 f = 4.0 GHz f = 6.0 GHz	dB dB dB		0.4 0.5 0.8	0.6
G_A	Gain @ NF_O; $V_{DS} = 2\,V, I_{DS} = 25\,mA$	f = 2.0 GHz f = 4.0 GHz f = 6.0 GHz	dB dB dB	12.0	16.5 13.0 11.0	
$P_{1\,dB}$	Power Output @ 1 dB Gain Compression $V_{DS} = 4\,V, I_{DS} = 70\,mA$	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	70	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	-4.0	-1.3	-0.5

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

5965-8701E

ATF-10136 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	-65 to +175

Thermal Resistance:	θ_{jc} = 350°C/W; T_{CH} = 150°C
Liquid Crystal Measurement:	1 µm 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 θ_{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_{DS} = 2 V, I_{DS} = 25 mA

Freq. GHz	NF_O dB	Γ_{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°C

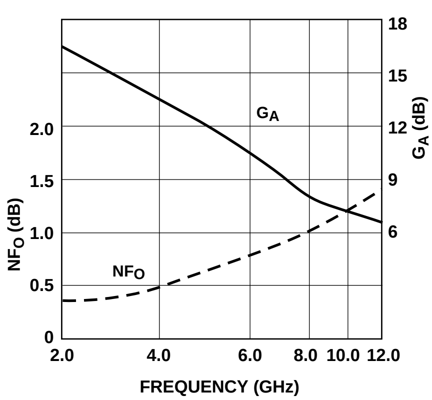


Figure 1. Optimum Noise Figure and Associated Gain vs. Frequency. V_{DS} = 2V, I_{DS} = 25 mA, T_A = 25°C.

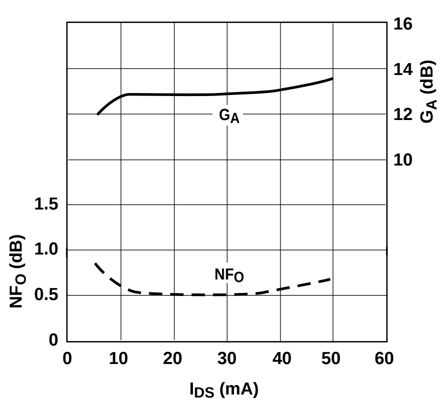


Figure 2. Optimum Noise Figure and Associated Gain vs. I_{DS}. V_{DS} = 2V, f = 4.0 GHz.

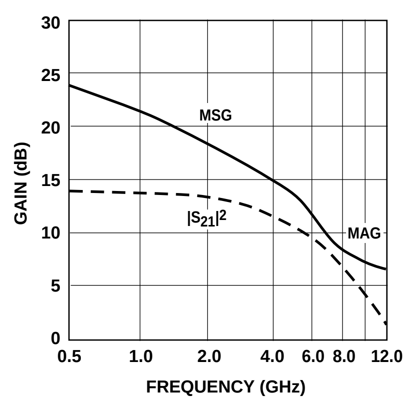
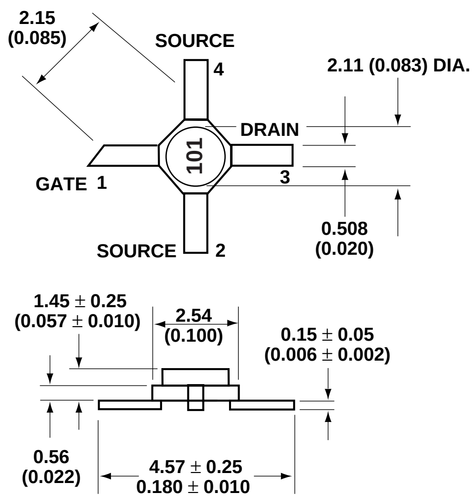


Figure 3. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency. V_{DS} = 2 V, I_{DS} = 25 mA.

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}	
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	-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