HEWLETT® PACKARD

2–16 GHz Low Noise Gallium Arsenide FET

Technical Data

ATF-13736

Features

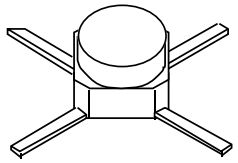
- **Low Noise Figure:** 1.8 dB Typical at 12 GHz
- **High Associated Gain:** 9.0 dB Typical at 12 GHz
- **High Output Power:** 17.5 dB Typical at 12 GHz
- **Cost Effective Ceramic Microstrip Package**
- **Tape-and-Reel Packaging Option Available[1]**

Description

The ATF-13736 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor housed in a cost effective microstrip package. Its noise figure makes this device appropriate for use in the gain stages of low noise amplifiers operating in the 2-16 GHz frequency range.

This GaAs FET device has a nominal 0.3 micron gate length with a total gate periphery of 250 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} = 2.5 V, I_{DS} = 20 mA	f = 8.0 GHz	dB		1.5	
		f = 12.0 GHz	dB		1.8	2.2
		f = 14.0 GHz	dB		2.1	
G_A	Gain @ NF_O: V_{DS} = 2.5 V, I_{DS} = 20 mA	f = 8.0 GHz	dB		11.5	
		f = 12.0 GHz	dB	8.0	9.0	
		f = 14.0 GHz	dB		7.0	
$P_{1\,dB}$	Power Output @ 1 dB Gain Compression: V_{DS} = 4 V, I_{DS} = 40 mA	f = 12.0 GHz	dBm		17.5	
$G_{1\,dB}$	1 dB Compressed Gain: V_{DS} = 4 V, I_{DS} = 40 mA	f = 12.0 GHz	dB		8.5	
g_m	Transconductance: V_{DS} = 2.5 V, V_{GS} = 0 V		mmho	25	55	
I_{DSS}	Saturated Drain Current: V_{DS} = 2.5 V, V_{GS} = 0 V		mA	40	50	90
V_P	Pinch-off Voltage: V_{DS} = 2.5 V, I_{DS} = 1 mA		V	-4.0	-1.5	-0.5

Note:

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

ATF-13736 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	-6
I_{DS}	Drain Current	mA	I_{DSS}
P_T	Power Dissipation [2,3]	mW	225
T_{CH}	Channel Temperature	°C	175
T_{STG}	Storage Temperature[4]	°C	-65 to +175

Thermal Resistance:	$\theta_{jc} = 400°C/W; T_{CH} = 150°C$
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 2.5 mW/°C for $T_{CASE} > 85°C$.
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 MEASUREMENTS section for more information.

Part Number Ordering Information

Part Number	Devices Per Reel	Reel Size
ATF-13736-TR1	1000	7"
ATF-13736-STR	10	strip

ATF-13736 Noise Parameters: $V_{DS} = 2.5$ V, $I_{DS} = 20$ mA

Freq. GHz	NF_O dB	Γ_{opt}		$R_N/50$
		Mag	Ang	
4.0	1.1	.71	102	.10
6.0	1.3	.55	147	.07
8.0	1.5	.46	-144	.19
12.0	1.8	.50	-40	.88
14.0	2.1	.52	-2	1.17

ATF-13736 Typical Performance, $T_A = 25°C$

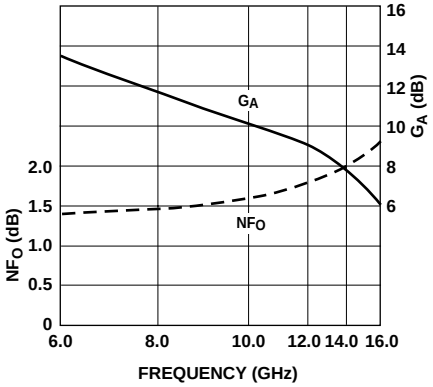


Figure 1. Optimum Noise Figure and Associated Gain vs. Frequency. V_{DS} = 2.5V, I_{DS} = 20 mA, T_A = 25°C.

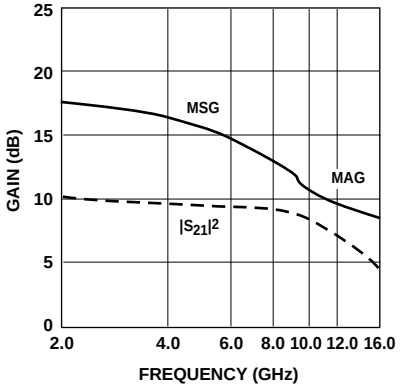


Figure 2. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency. V_{DS} = 2.5 V, I_{DS} = 20 mA.

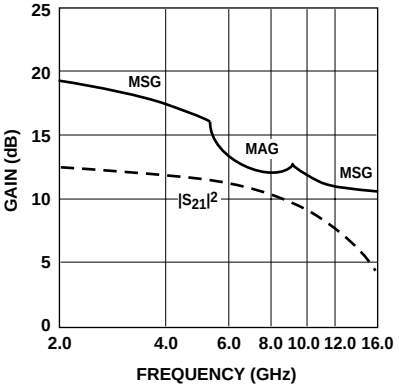


Figure 3. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency. V_{DS} = 2.5 V, I_{DS} = 20 mA.

Typical Scattering Parameters, Common Emitter, $Z_O = 50\ \Omega, T_A = 25°C, V_{DS} = 2.5\ V, I_{DS} = 20\ mA$

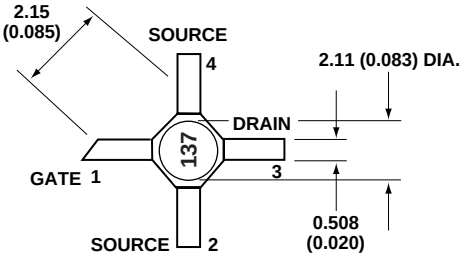
Freq.	S_{11}		S_{21}			S_{12}			S_{22}	
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.
2.0	.94	-46	11.0	3.56	128	-26.4	.048	55	.59	-36
3.0	.86	-70	10.2	3.23	109	-25.2	.055	40	.57	-47
4.0	.84	-90	9.8	3.08	91	-23.1	.070	31	.56	-55
5.0	.77	-110	9.6	3.02	69	-20.9	.090	18	.52	-63
6.0	.68	-135	9.9	3.14	51	-19.3	.109	7	.47	-75
7.0	.59	-170	9.9	3.13	24	-18.0	.126	-12	.39	-92
8.0	.54	149	9.5	2.99	-1	-17.6	.132	-27	.30	-112
9.0	.56	112	8.8	2.75	-22	-16.9	.143	-43	.19	-121
10.0	.58	86	8.1	2.53	-43	-16.4	.152	-58	.11	-140
11.0	.60	63	7.6	2.41	-66	-16.5	.149	-73	.09	92
12.0	.64	39	7.0	2.24	-90	-17.1	.140	-81	.15	47
13.0	.68	20	6.4	2.08	-106	-17.6	.132	-90	.19	21
14.0	.70	9	6.0	1.99	-130	-18.0	.126	-97	.19	-3
15.0	.72	-1	5.2	1.83	-145	-18.2	.123	-111	.15	-26
16.0	.74	-17	4.6	1.70	-177	-18.4	.120	-129	.11	-34

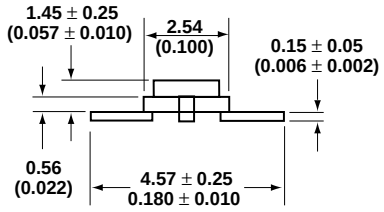
Typical Scattering Parameters, Common Emitter, $Z_O = 50\ \Omega, T_A = 25°C, V_{DS} = 4\ V, I_{DS} = 40\ mA$

Freq.	S_{11}		S_{21}			S_{12}			S_{22}	
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.
2.0	.88	-44	13.5	4.73	130	-26.4	.048	64	.67	-28
3.0	.76	-68	13.0	4.47	107	-24.9	.057	52	.61	-39
4.0	.68	-90	12.4	4.19	86	-22.5	.075	39	.57	-46
5.0	.56	-113	12.0	4.00	66	-21.0	.089	32	.52	-52
6.0	.42	-145	11.8	3.90	44	-19.8	.102	21	.44	-61
7.0	.37	161	11.5	3.74	20	-18.6	.117	9	.31	-75
8.0	.47	116	10.5	3.36	-3	-17.9	.128	-5	.17	-95
9.0	.57	90	9.4	2.96	-23	-17.2	.138	-19	.05	-143
10.0	.63	70	8.9	2.77	-41	-17.4	.135	-28	.06	128
11.0	.69	51	7.9	2.47	-63	-17.7	.131	-39	.17	100
12.0	.77	33	7.1	2.26	-82	-18.0	.126	-52	.26	75
13.0	.82	21	6.0	2.00	-101	-18.6	.118	-65	.35	62
14.0	.85	13	5.4	1.86	-117	-19.2	.110	-75	.39	54
15.0	.83	1	4.8	1.73	-134	-19.7	.104	-83	.41	49
16.0	.81	-17	4.4	1.65	-154	-19.8	.102	-103	.42	41

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