2 – 16 GHz Low Noise Gallium Arsenide FET

Technical Data

ATF-13336

Features

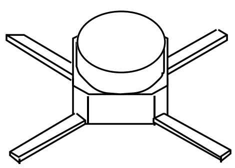
- **Low Noise Figure:** 1.4 dB Typical at 12 GHz
- **High Associated Gain:** 9.0 dB Typical at 12 GHz
- **High Output Power:** 17.5 dBm Typical $P_{1\,dB}$ at 12 GHz
- **Cost Effective Ceramic Microstrip Package**
- **Tape-and-Reel Packaging Option Available**[1]

Description

The ATF-13336 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 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		1.2	
		f = 12.0 GHz	dB		1.4	1.6
		f = 14.0 GHz			1.6	
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		7.5	
$P_{1\,dB}$	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-13336 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	°C	-65 to +175

Thermal Resistance:	θ_{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 2.5mW/°C for T_{CASE} > 85°C.
4. Storage above +150°C may tarnish the leads of this package difficult to solder into a circuit. After a device has been soldered into a circuit, it may be safely stored up to 175°C.
4. 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-13336-TR1	1000	7"
ATF-13336-STR	10	strip

ATF-13336 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	0.8	.63	93	.27
6.0	1.1	.47	138	.10
8.0	1.2	.40	-153	.20
12.0	1.4	.52	-45	.88
14.0	1.6	.57	-2	1.3

ATF-13336 Typical Performance, T_A = 25°C

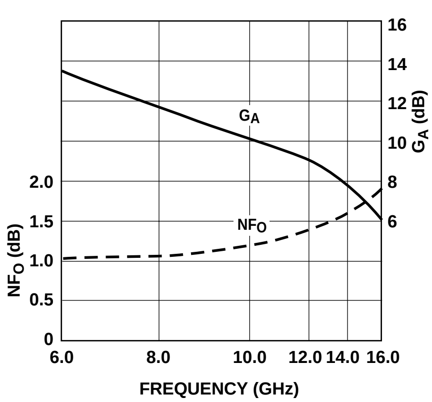


Figure 1. Optimum Noise Figure and Associated Gain vs. Frequency. V_{DS} = 2.5V, I_{DS} = 20 mA, T_A = 25°C.

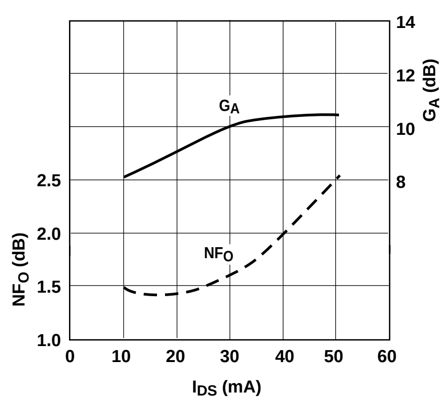


Figure 2. Optimum Noise Figure and Associated Gain vs. I_{DS}. V_{DS} = 2.5V, f = 12.0 GHz.

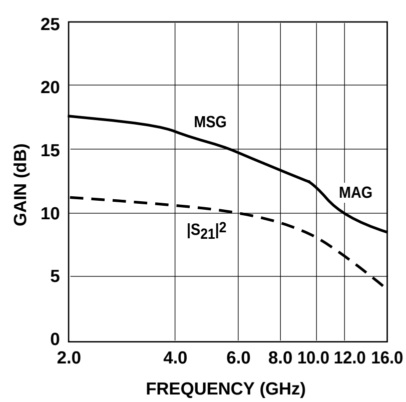


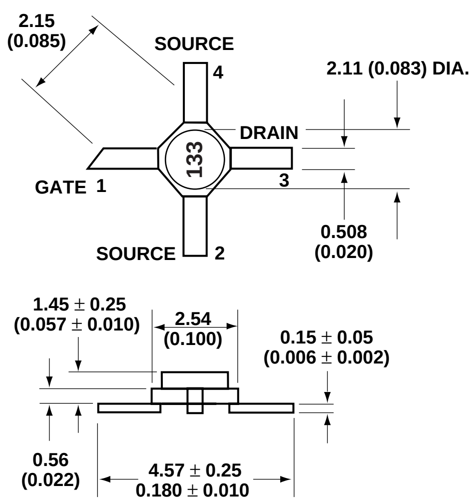
Figure 3. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency. V_{DS} = 2.5 V, I_{DS} = 20 mA.

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

Freq. GHz	S_{11} Mag.	S_{11} Ang.	S_{21} dB	S_{21} Mag.	S_{21} Ang.	S_{12} dB	S_{12} Mag.	S_{12} Ang.	S_{22} Mag.	S_{22} Ang.
2.0	.96	-51	10.6	3.39	127	-27.1	.044	57	.61	-41
3.0	.88	-75	10.3	3.28	106	-23.4	.060	33	.58	-51
4.0	.86	-96	10.1	3.19	86	-22.6	.074	25	.57	-57
5.0	.79	-117	9.9	3.13	66	-20.6	.093	12	.54	-65
6.0	.69	-142	10.2	3.22	46	-18.9	.114	1	.49	-79
7.0	.60	-178	10.1	3.21	21	-17.6	.132	-18	.42	-97
8.0	.54	141	9.8	3.10	-4	-17.3	.137	-33	.31	-112
9.0	.56	103	8.9	2.80	-26	-16.7	.147	-48	.21	-121
10.0	.56	74	8.3	2.60	-48	-16.5	.150	-63	.09	-145
11.0	.58	44	7.6	2.39	-68	-16.8	.145	-78	.07	89
12.0	.63	20	6.7	2.17	-90	-17.5	.133	-95	.16	43
13.0	.65	3	6.0	2.00	-108	-18.3	.121	-107	.19	21
14.0	.66	-7	5.5	1.89	-126	-18.9	.114	-121	.19	-4
15.0	.70	-19	4.9	1.76	-144	-19.0	.112	-129	.16	-28
16.0	.72	-34	4.4	1.66	-175	-19.2	.110	-142	.14	-32

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