HEWLETT® PACKARD

0.5 – 10 GHz Low Noise Gallium Arsenide FET

Technical Data

ATF-25170

Features

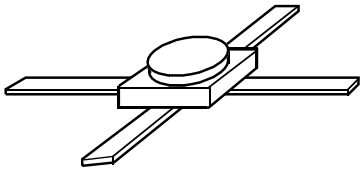
- **Low Noise Figure:** 0.8 dB Typical at 4 GHz
- **High Associated Gain:** 14.0 dB Typical at 4 GHz
- **High Output Power:** 21.0 dBm Typical $P_{1\,dB}$ at 4 GHz
- **Hermetic Gold-Ceramic Microstrip Package**

Description

The ATF-25170 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor housed in a hermetic, high reliability package. Its noise figure makes this device appropriate for use in low noise amplifiers operating in the 0.5-10 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.

70 mil Package



Electrical Specifications, T_A = 25°C

Symbol	Parameters and Test Conditions		Units	Min.	Typ.	Max.
NF_O	Optimum Noise Figure: V_{DS} = 3 V, I_{DS} = 20 mA	f = 4.0 GHz	dB		0.8	1.0
		f = 6 0 GHz	dB		1.0	
		f = 8.0 GHz	dB		1.2	
G_A	Gain @ NF_O: V_{DS} = 3 V, I_{DS} = 20 mA	f = 4.0 GHz	dB	13.0	14.0	
		f = 6.0 GHz	dB		11.5	
		f = 8.0 GHz	dB		9.0	
$P_{1\,dB}$	Power Output @ 1 dB Gain Compression: V_{DS} = 5 V, I_{DS} = 50 mA	f = 4.0 GHz	dBm		21.0	
$G_{1\,dB}$	1 dB Compressed Gain: V_{DS} = 5 V, I_{DS} = 50 mA	f = 4.0 GHz	dB		15.0	
g_m	Transconductance: V_{DS} = 3 V, V_{GS} = 0 V		mmho	50	80	
I_{DSS}	Saturated Drain Current: V_{DS} = 3 V, V_{GS} = 0 V		mA	50	100	150
V_P	Pinch-off Voltage: V_{DS} = 3 V, I_{DS} = 1 mA		V	-3.0	-2.0	-0.8

ATF-25170 Absolute Maximum Ratings

Symbol	Parameter	Units	Absolute Maximum[1]
V_{DS}	Drain-Source Voltage	V	+7
V_{GS}	Gate-Source Voltage	V	-4
V_{GD}	Gate-Drain Voltage	V	-8
I_{DS}	Drain Current	mA	I_{DSS}
P_T	Power Dissipation [2,3]	mW	450
T_{CH}	Channel Temperature	°C	175
T_{STG}	Storage Temperature	°C	-65 to +175

Thermal Resistance:	$\theta_{jc} = 300°C/W; T_{CH} = 150°C$
Liquid Crystal Measurement:	1 μm Spot Size[4]

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{MOUNTING\ SURFACE} = 25°C$.
3. Derate at 3.3 mW/°C for $T_{MOUNTING\ SURFACE} > 40°C$.
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.

ATF-25170 Noise Parameters: $V_{DS} = 3\ V, I_{DS} = 20\ mA$

Freq. GHz	NF_O dB	Γ_{opt}		$R_N/50$
		Mag	Ang	
1.0	0.6	.89	24	.78
2.0	0.7	.77	50	.53
4.0	0.8	.63	105	.33
6.0	1.0	.66	147	.06
8.0	1.2	.62	-159	.11

ATF-25170 Typical Performance, $T_A = 25°C$

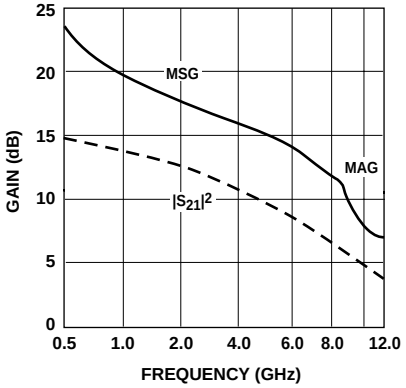


Figure 1. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency. V_{DS} = 3 V, I_{DS} = 20 mA.

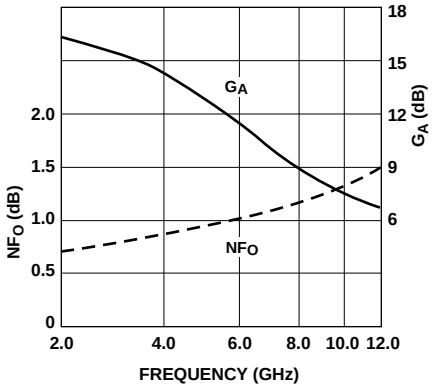


Figure 2. Optimum Noise Figure and Associated Gain vs. Frequency. V_{DS} = 3V, I_{DS} = 20 mA.

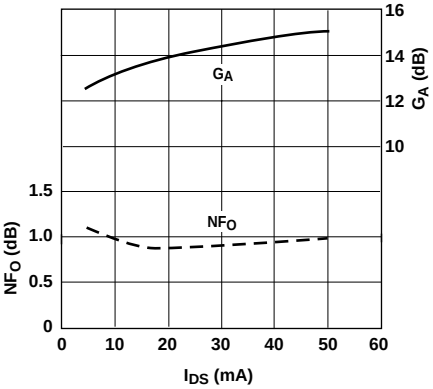


Figure 3. Optimum Noise Figure and Associated Gain vs. I_{DS}. V_{DS} = 3V, f = 4.0 GHz.

Typical Scattering Parameters, Common Emitter, $Z_O = 50\ \Omega$, $T_A = 25°C$, $V_{DS} = 3\,V$, $I_{DS} = 20\,mA$

Freq.	S_{11}		S_{21}			S_{12}			S_{22}	
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.
0.5	.98	-23	13.6	4.80	160	-32.8	.023	76	.50	-23
1.0	.96	-38	13.0	4.46	147	-23.6	.037	67	.48	-30
2.0	.88	-66	11.5	3.75	121	-23.6	.066	50	.44	-45
3.0	.80	-86	10.2	3.23	102	-21.8	.081	41	.41	-55
4.0	.77	-106	9.3	2.93	82	-19.7	.103	28	.38	-65
5.0	.71	-127	8.5	2.66	62	-18.6	.118	17	.35	-78
6.0	.65	-149	7.9	2.47	42	-17.7	.130	6	.30	-93
7.0	.60	-173	7.3	2.33	24	-16.5	.149	-4	.26	-111
8.0	.56	161	6.8	2.20	5	-15.8	.162	-16	.22	-134
9.0	.56	136	6.2	2.05	-14	-15.1	.175	-26	.21	-166
10.0	.55	118	5.4	1.87	-31	-15.0	.178	-35	.21	173
11.0	.53	108	4.9	1.76	-46	-14.9	.180	-42	.22	164
12.0	.53	95	4.7	1.71	-62	-14.8	.183	-52	.23	159

A model for this device is available in the DEVICE MODELS section.

70 mil Package Dimensions