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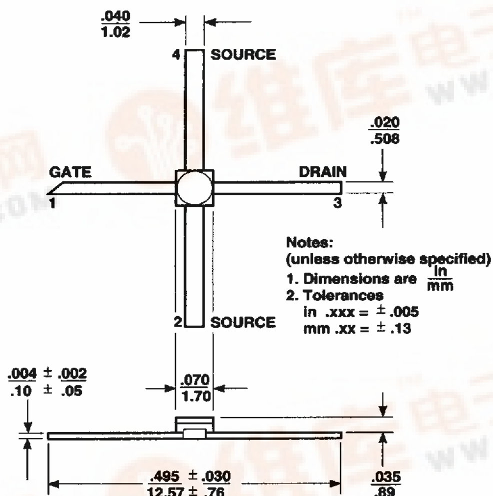
ATF-13170
2-16 GHz Low Noise Gallium Arsenide FET

Features

- Low Noise Figure: 1.0 dB typical at 12 GHz
- High Associated Gain: 10.0 dB typical at 12 GHz
- High Output Power: 17.5 dBm typical $P_{1\,dB}$ at 12 GHz
- Hermetic Gold-Ceramic Microstrip Package

70 mil Package

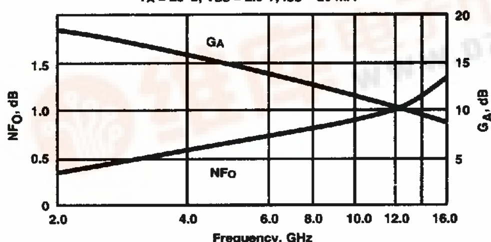


Description

The ATF-13170 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor housed in a hermetic, high reliability 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.

OPTIMUM NOISE FIGURE AND ASSOCIATED GAIN vs. FREQUENCY
T_A = 25°C, V_{DS} = 2.5 V, I_{DS} = 20 mA



Noise Parameters: V_{DS} = 3 V, I_{DS} = 20 mA

Freq. GHz	NF_O dB	Gamma Opt Mag	Gamma Opt Ang	$R_N/50$
4.0	0.5	.62	56	.44
6.0	0.7	.47	81	.34
8.0	0.8	.53	116	.19
12.0	1.0	.44	157	.12
14.0	1.3	.43	179	.07

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		0.8	
		f = 12.0 GHz	dB		1.0	1.1
		f = 14.0 GHz	dB		1.3	
G_A	Gain @ NF_O: V_{DS} = 2.5 V, I_{DS} = 20 mA	f = 8.0 GHz	dB		12.0	
		f = 12.0 GHz	dB	9.0	10.0	
		f = 14.0 GHz	dB		8.5	
$P_{1\,dB}$	Output Power @ 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	30	55	
I_{DSS}	Saturated Drain Current: V_{DS} = 2.5 V, V_{GS} = 0 V		mA	40	50	90
V_P	Pinchoff Voltage: V_{DS} = 2.5 V, I_{DS} = 1 mA		V	–3.0	–1.5	–0.8

ATF-13170, 2-16 GHz
Low Noise Gallium Arsenide FET

Absolute Maximum Ratings

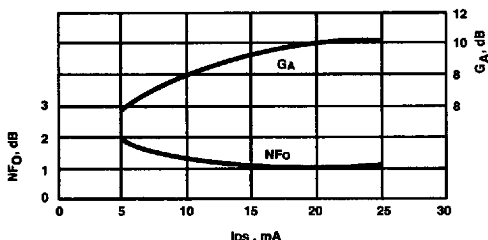
Parameter	Symbol	Absolute Maximum[1]
Drain-Source Voltage	V_{DS}	+5 V
Gate-Source Voltage	V_{GS}	–4 V
Drain Current	I_{DS}	I_{DSS}
Power Dissipation[2,3]	P_T	225 mW
Channel Temperature	T_{CH}	175°C
Storage Temperature	T_{STG}	–65°C to +175°C

Thermal Resistance: θ_{jc} = 350°C/W; T_{CH} = 150°C
Liquid Crystal Measuremen; 1 µm Spot Size[4]

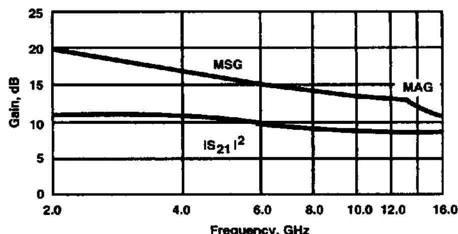
Notes:
1. Operation of this device above any one of these parameters may cause permanent damage.
2. Case Temperature = 25°C.
3. Derate at 2.9 mW/°C for T_{CASE} > 96°C.
4. The small spot size of this technique results in a higher, though more accurate determination of θ_{jc} than do alternate methods. See MEASUREMENTS section for more information.

Typical Performance, T_A = 25°C
(unless otherwise noted)

OPTIMUM NOISE FIGURE AND ASSOCIATED GAIN vs. I_{DS} AND V_{DS}
V_{DS} = 2.5 V, f = 12.0 GHz



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 Source, Z_O = 50 Ω

T_A = 25°C, V_{DS} = 2.5 V, I_{DS} = 20 mA

Freq. GHz	S11 Mag	S11 Ang	S21 dB	S21 Mag	S21 Ang	S12 dB	S12 Mag	S12 Ang	S22 Mag	S22 Ang
2.0	.97	–36	11.4	3.73	143	–28.4	.038	65	.48	–28
3.0	.94	–51	11.2	3.63	128	–25.3	.054	55	.47	–39
4.0	.90	–69	10.9	3.51	111	–23.1	.070	43	.45	–53
5.0	.86	–85	10.5	3.34	94	–21.6	.083	32	.44	–67
6.0	.82	–101	10.1	3.20	78	–20.6	.093	20	.42	–79
7.0	.77	–116	9.7	3.06	63	–19.8	.102	10	.41	–91
8.0	.74	–127	9.3	2.92	50	–19.3	.108	2	.40	–99
9.0	.70	–140	8.9	2.79	37	–18.7	.116	–7	.40	–109
10.0	.67	–153	8.7	2.73	23	–18.2	.123	–17	.41	–120
11.0	.64	–167	8.6	2.69	8	–17.7	.131	–28	.41	–130
12.0	.60	179	8.4	2.64	–7	–17.2	.137	–39	.40	–139
13.0	.57	166	8.3	2.59	–21	–16.8	.144	–50	.39	–148
14.0	.53	153	8.3	2.60	–33	–16.3	.153	–59	.38	–155
15.0	.48	136	8.3	2.61	–49	–15.6	.166	–73	.37	–167
16.0	.41	112	8.4	2.62	–67	–14.9	.180	–88	.34	180
17.0	.36	79	8.3	2.61	–86	–14.4	.191	–105	.26	170
18.0	.35	34	8.2	2.56	–107	–14.0	.200	–124	.17	170

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