

# MGF1412B

## LOW NOISE GaAs FET

### DESCRIPTION

The MGF1412B low-noise GaAs FET with an N-channel Schottky gate is designed for use in S to X band amplifiers. The hermetically sealed metal-ceramic package assures minimum parasitic losses, and has a configuration suitable for microstrip circuits.

### FEATURES

- Low noise figure  $NF_{min} = 2.5\text{dB}$  (TYP) @  $f = 12\text{GHz}$
- High associated gain  $G_s = 8\text{dB}$  (TYP) @  $f = 12\text{GHz}$
- High reliability and stability

### APPLICATION

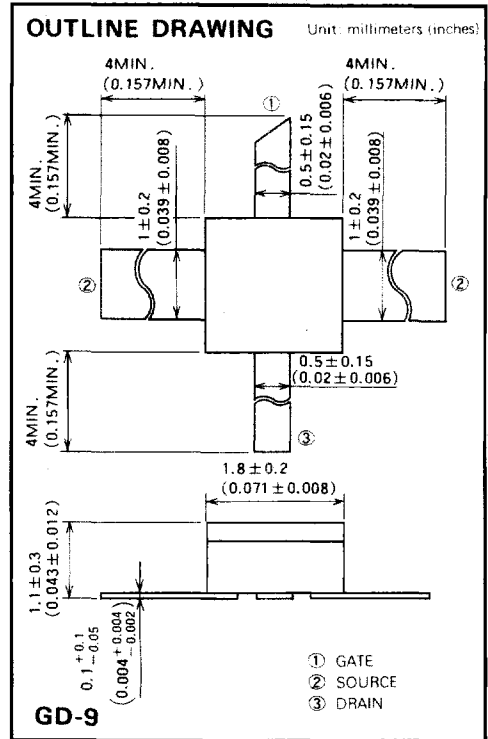
S to X band low-noise amplifiers.

### QUALITY GRADE

- IG, IGX, IGV

### RECOMMENDED BIAS CONDITIONS

- $V_{DS} = 3\text{V}$
- $I_D = 10\text{mA}$
- Refer to Bias Procedure



### ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

Symbol	Parameter	Ratings	Unit
$V_{GDO}$	Gate to drain voltage	-6	V
$V_{GSO}$	Gate to source voltage	-6	V
$I_D$	Drain current	100	mA
$P_T$	Total power dissipation *1	360	mW
$T_{ch}$	Channel temperature	175	$^\circ\text{C}$
$T_{stg}$	Storage temperature	-55 ~ +175	$^\circ\text{C}$

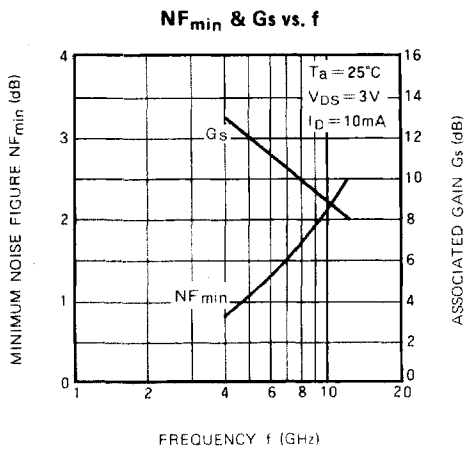
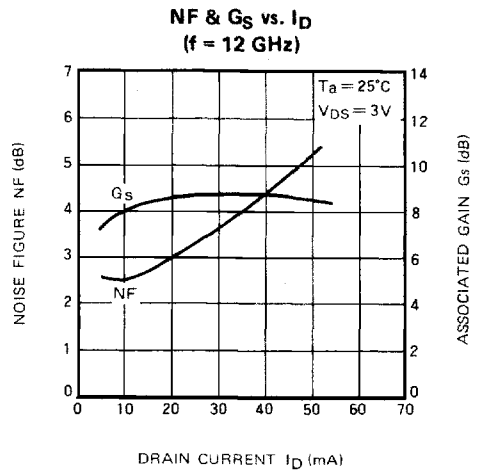
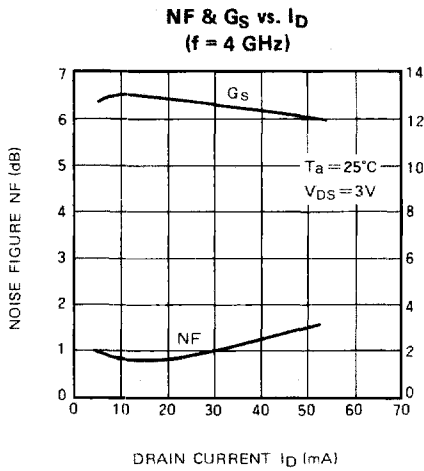
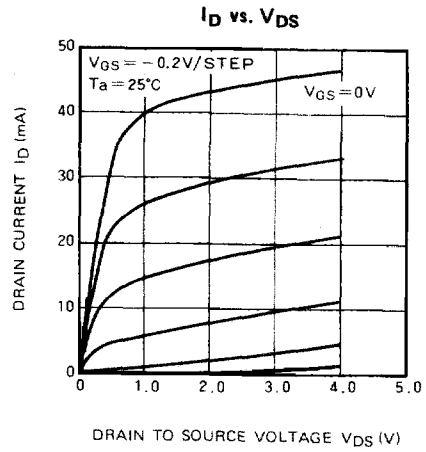
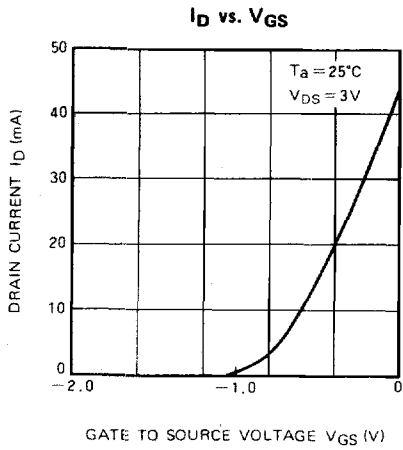
\*1:  $T_c = 25^\circ\text{C}$

### ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$V_{(BR)GDO}$	Gate to drain breakdown voltage	$I_G = -100\mu\text{A}$	-6	—	—	V
$V_{(BR)GSO}$	Gate to source breakdown voltage	$I_G = -100\mu\text{A}$	-6	—	—	V
$I_{GSS}$	Gate to source leakage current	$V_{GS} = -3\text{V}, V_{DS} = 0\text{V}$	—	—	10	$\mu\text{A}$
$I_{DSS}$	Saturated drain current	$V_{GS} = 0\text{V}, V_{DS} = 3\text{V}$	30	60	100	mA
$V_{GS(off)}$	Gate to source cut-off voltage	$V_{DS} = 3\text{V}, I_D = 100\mu\text{A}$	-0.3	—	-3.5	V
$g_m$	Transconductance	$V_{DS} = 3\text{V}, I_D = 10\text{mA}$	25	45	—	mS
$G_s$	Associated gain	$V_{DS} = 3\text{V}, I_D = 10\text{mA}, f = 12\text{GHz}$	5	8	—	dB
$NF_{min}$	Minimum noise figure	$V_{DS} = 3\text{V}, I_D = 10\text{mA}, f = 12\text{GHz}$	—	2.5	3.5	dB
$R_{th(ch-a)}$	Thermal resistance *1	$\Delta V_f$ method	—	—	416	$^\circ\text{C}/\text{W}$

\*1: Channel to ambient

**TYPICAL CHARACTERISTICS**



**LOW NOISE GaAs FET**

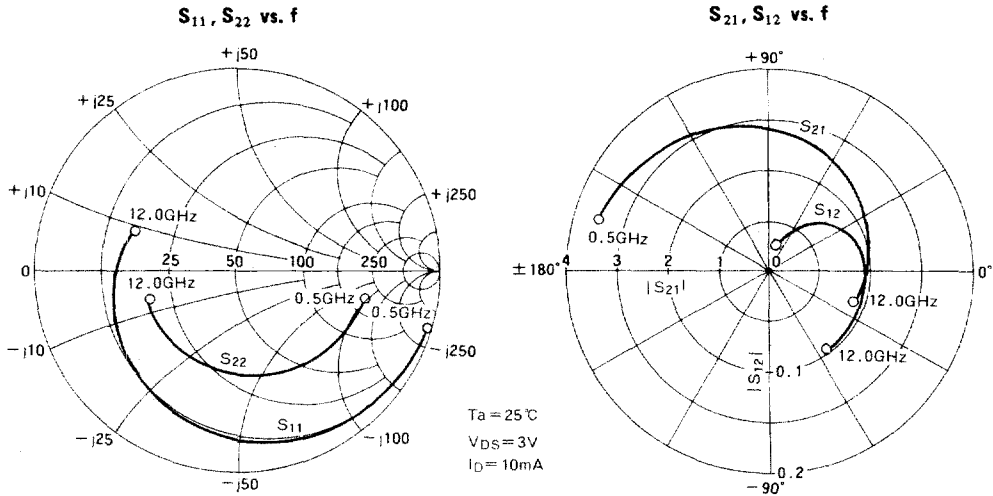
**NOISE PARAMETERS** ( $V_{DS}=3V, I_D=10mA$ )

Freq. (GHz)	$\Gamma_{opt}$		$R_n$ ( $\Omega$ )	NF min (dB)
	Magn.	Angle (deg.)		
4	0.649	61.5	28.0	0.81
8	0.437	138.1	32.0	1.73
12	0.414	-168.1	15.0	2.52

**G<sub>lp</sub> and P<sub>1dB</sub>** ( $T_a=25^\circ C, V_D=3V$ )

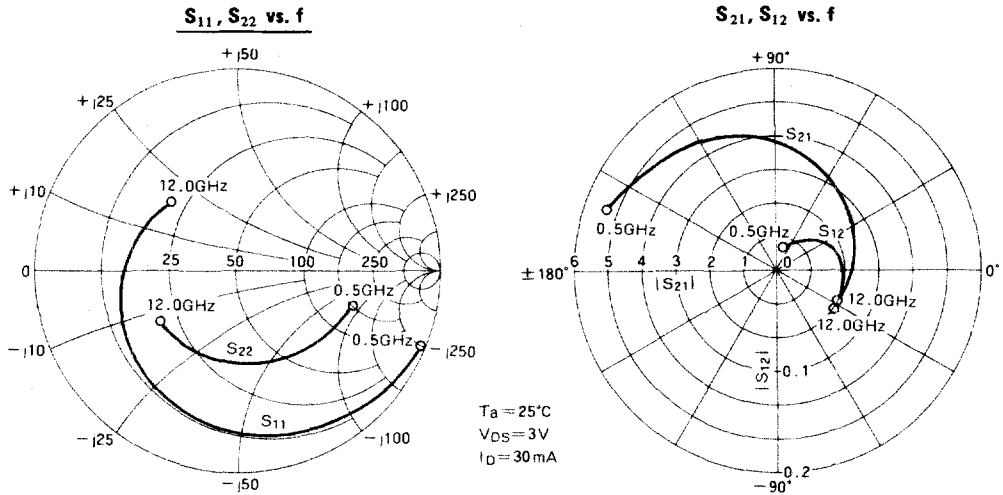
	f=4GHz		f=12GHz	
	$I_D=10mA$	$I_D=30mA$	$I_D=10mA$	$I_D=30mA$
G <sub>lp</sub> (dB)	15.5	16.8	9.6	10.5
P <sub>1dB</sub> (dBm)	12.6	14.5	10.5	12.7

**LOW NOISE GaAs FET**



**S PARAMETERS** (Ta=25°C, V<sub>DS</sub>=3V, I<sub>D</sub>=10mA)

Freq. (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MSG/MAG (dB)
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.		
0.5	0.995	-17.7	3.463	163.8	0.024	76.2	0.649	-13.6	0.067	21.6
1.0	0.974	-27.0	3.378	154.7	0.032	69.2	0.634	-20.8	0.178	20.2
1.5	0.954	-36.4	3.293	145.6	0.040	62.3	0.620	-28.1	0.255	19.2
2.0	0.933	-45.7	3.208	136.5	0.048	55.3	0.606	-35.3	0.315	18.3
2.5	0.913	-55.1	3.123	127.4	0.056	48.4	0.592	-42.6	0.367	17.5
3.0	0.892	-64.4	3.038	118.3	0.064	41.4	0.578	-49.8	0.412	16.8
3.5	0.872	-73.8	2.953	109.2	0.072	34.5	0.563	-57.1	0.454	16.1
4.0	0.851	-83.1	2.868	100.1	0.080	27.5	0.549	-64.3	0.494	15.5
4.5	0.827	-92.2	2.772	91.4	0.083	21.1	0.536	-71.6	0.554	15.2
5.0	0.802	-101.4	2.676	82.8	0.087	14.7	0.524	-78.9	0.617	14.9
5.5	0.778	-110.5	2.579	74.1	0.090	8.3	0.511	-86.2	0.680	14.5
6.0	0.753	-119.6	2.483	65.4	0.094	1.9	0.498	-93.5	0.747	14.2
6.5	0.736	-126.4	2.401	58.2	0.095	-3.1	0.495	-99.6	0.803	14.0
7.0	0.719	-133.2	2.319	51.1	0.095	-8.0	0.493	-105.8	0.862	13.9
7.5	0.702	-140.0	2.238	43.9	0.096	-13.0	0.491	-111.9	0.926	13.7
8.0	0.685	-146.8	2.156	36.7	0.097	-17.9	0.488	-118.0	0.993	13.5
8.5	0.669	-153.3	2.109	29.8	0.097	-22.5	0.488	-123.1	1.053	12.0
9.0	0.652	-159.8	2.061	23.0	0.098	-27.2	0.487	-128.3	1.115	11.2
9.5	0.636	-166.2	2.014	16.1	0.098	-31.8	0.487	-133.4	1.179	10.6
10.0	0.619	-172.7	1.967	9.2	0.098	-36.4	0.487	-138.5	1.244	10.1
10.5	0.603	-179.9	1.931	-2.0	0.098	-41.1	0.484	-143.9	1.313	9.6
11.0	0.586	172.9	1.895	-5.3	0.098	-45.8	0.481	-149.2	1.384	9.2
11.5	0.569	165.7	1.858	-12.6	0.097	-50.4	0.478	-154.6	1.458	8.8
12.0	0.553	158.5	1.822	-19.8	0.097	-55.1	0.475	-159.9	1.535	8.4



**S PARAMETERS** ( $T_a = 25^\circ\text{C}$ ,  $V_{DS} = 3\text{V}$ ,  $I_D = 30\text{mA}$ )

Freq. (GHz)	$S_{11}$		$S_{21}$		$S_{12}$		$S_{22}$		K	MSG/MAG (dB)
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.		
0.5	0.997	- 22.7	5.280	159.8	0.023	73.1	0.592	- 16.3	0.055	23.7
1.0	0.966	- 33.5	5.084	150.2	0.028	66.5	0.576	- 23.2	0.198	22.6
1.5	0.934	- 44.2	4.889	140.7	0.034	59.8	0.559	- 30.2	0.307	21.6
2.0	0.902	- 54.9	4.694	131.1	0.039	53.1	0.543	- 37.1	0.398	20.8
2.5	0.870	- 65.6	4.499	121.6	0.045	46.4	0.526	- 44.1	0.477	20.0
3.0	0.838	- 76.4	4.303	112.0	0.050	39.8	0.510	- 51.0	0.550	19.3
3.5	0.807	- 87.1	4.108	102.5	0.056	33.1	0.493	- 58.0	0.620	18.7
4.0	0.775	- 97.8	3.913	92.9	0.061	26.4	0.477	- 64.9	0.689	18.1
4.5	0.748	- 107.6	3.730	84.3	0.063	21.4	0.467	- 71.6	0.764	17.7
5.0	0.720	- 117.5	3.546	75.7	0.065	16.3	0.457	- 78.3	0.846	17.4
5.5	0.693	- 127.3	3.362	67.1	0.066	11.3	0.447	- 85.0	0.935	17.1
6.0	0.666	- 137.1	3.179	58.5	0.068	6.2	0.437	- 91.7	1.033	15.6
6.5	0.648	- 144.5	3.050	51.5	0.068	2.7	0.437	- 96.8	1.108	14.5
7.0	0.631	- 152.0	2.922	44.6	0.069	- 0.8	0.437	- 101.9	1.189	13.7
7.5	0.613	- 159.4	2.793	37.6	0.069	- 4.2	0.438	- 106.9	1.278	12.9
8.0	0.595	- 166.8	2.665	30.6	0.069	- 7.7	0.438	- 112.0	1.374	12.2
8.5	0.579	- 174.3	2.586	23.7	0.069	- 11.0	0.440	- 116.7	1.451	11.8
9.0	0.563	178.2	2.507	16.9	0.069	- 14.3	0.441	- 121.4	1.531	11.3
9.5	0.547	170.7	2.427	10.0	0.069	- 17.6	0.443	- 126.0	1.617	10.9
10.0	0.531	163.2	2.348	3.1	0.069	- 20.9	0.445	- 130.7	1.707	10.4
10.5	0.516	155.9	2.293	- 4.0	0.070	- 24.6	0.445	- 135.1	1.770	10.1
11.0	0.502	148.5	2.238	- 11.0	0.070	- 28.2	0.444	- 139.5	1.834	9.7
11.5	0.487	141.2	2.183	- 18.1	0.071	- 31.9	0.444	- 143.8	1.900	9.4
12.0	0.472	133.8	2.128	- 25.1	0.072	- 35.5	0.444	- 148.2	1.968	9.1