

MGF1402B

LOW NOISE GaAs FET

DESCRIPTION

The MGF1402B low-noise GaAs FET with an N-channel Schottky gate is designed for use in S to X band amplifiers and oscillators. The hermetically sealed metalceramic package assures minimum parasitic losses, and has a configuration suitable for microstrip circuits.

FEATURES

- Low noise figure $NF_{min} = 3.0\text{dB}$ (TYP.) @ $f = 12\text{GHz}$
- High associated gain $G_s = 8\text{dB}$ (TYP.) @ $f = 12\text{GHz}$
- High reliability and stability

APPLICATION

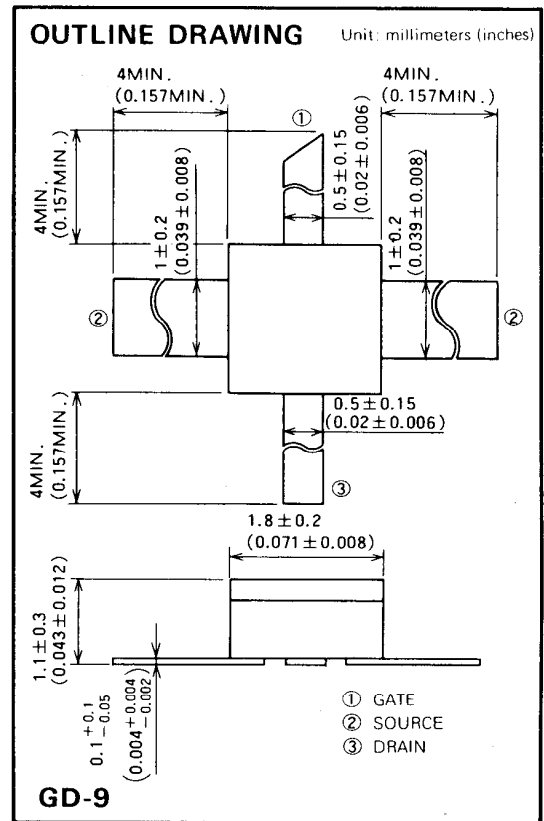
S to X band low-noise amplifiers and oscillators.

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	$^\circ\text{C}$

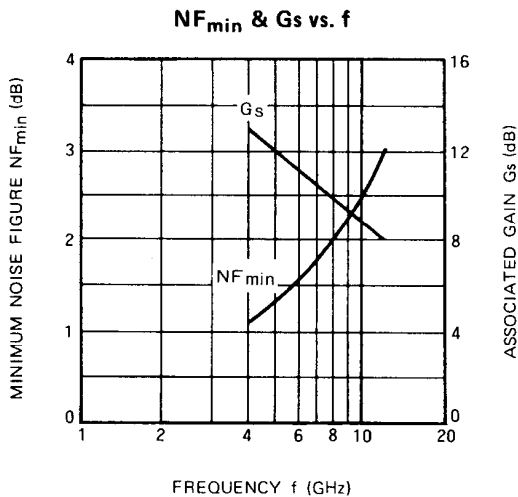
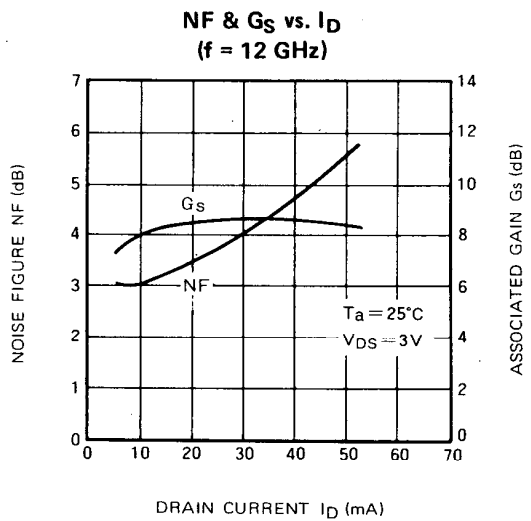
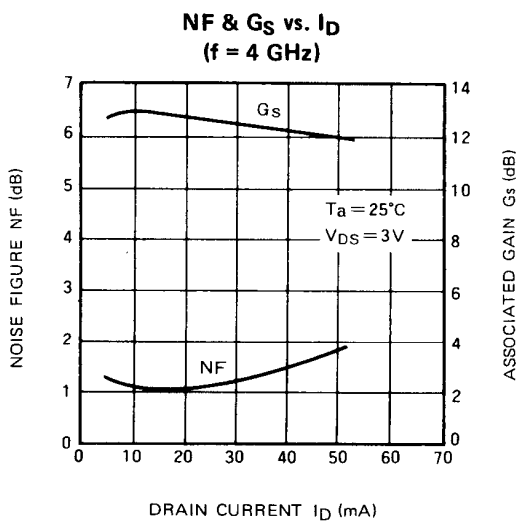
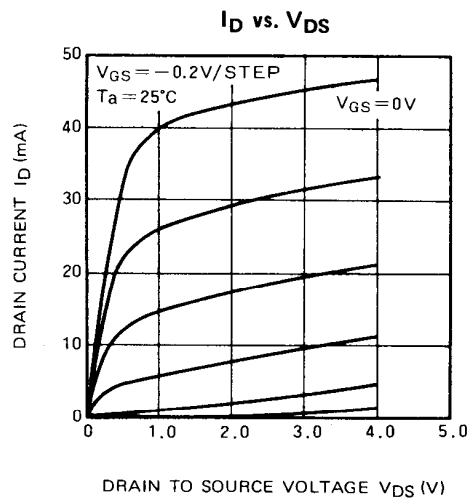
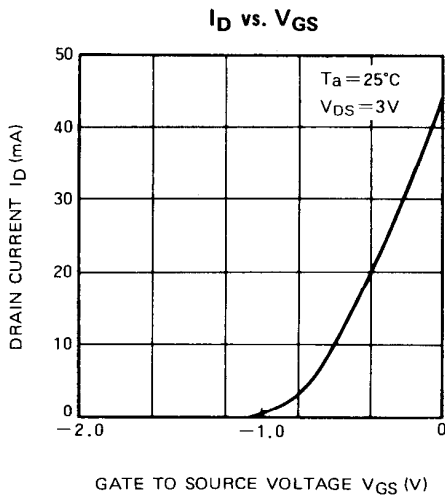
*1 : $T_c = 25^\circ\text{C}$

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	μA
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	$V_{DS} = 3\text{V}, I_D = 10\text{mA}, f = 12\text{GHz}$	—	3.0	4.0	dB
$R_{th(ch-a)}$	Thermal resistance *1	ΔV_f method	—	—	416	$^\circ\text{C/W}$

*1: Channel to ambient

TYPICAL CHARACTERISTICS

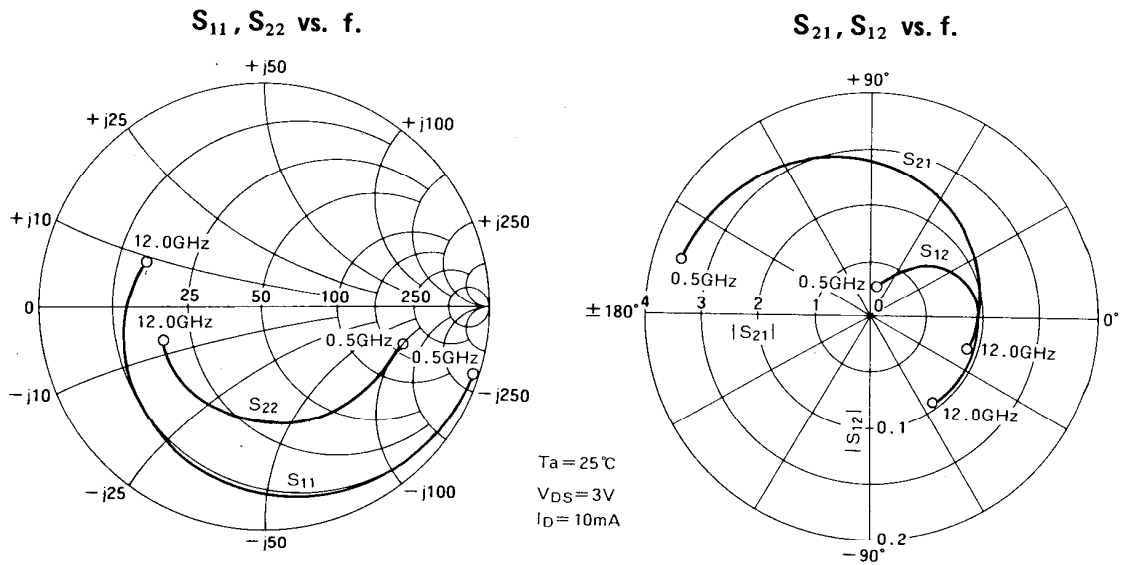


LOW NOISE GaAs FET**NOISE PARAMETERS** ($V_{DS}=3V$, $I_D=10mA$)

Freq. (GHz)	Γ_{opt}		Rn (Ω)	NF min (dB)
	Magn.	Angle (deg.)		
4	0.649	61.5	28.0	0.96
8	0.437	138.1	32.0	1.85
12	0.414	-168.1	15.0	2.76

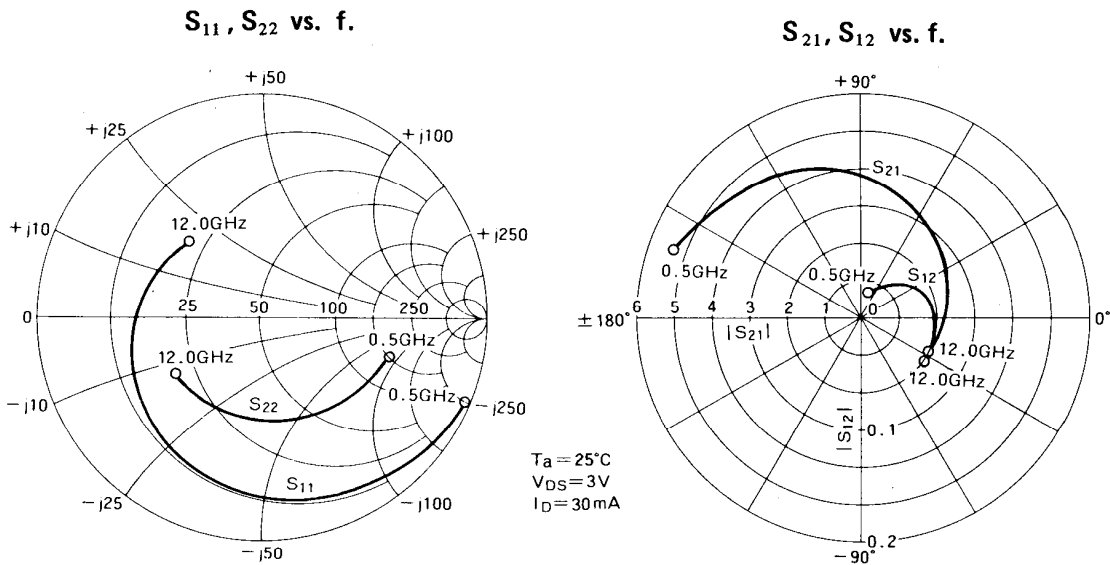
G_{lp} and P_{1dB} ($T_a=25^\circ C$, $V_D=3V$)

	f = 4GHz		f = 12GHz	
	$I_D=10mA$	$I_D=30mA$	$I_D=10mA$	$I_D=30mA$
G _{lp} (dB)	15.5	16.8	9.6	10.5
P _{1dB} (dBm)	12.6	14.5	10.5	12.7



S PARAMETERS ($T_a = 25^\circ\text{C}$, $V_{DS} = 3\text{V}$, $I_D = 10\text{mA}$)

Freq. (GHz)	S_{11}		S_{21}		S_{12}		S_{22}		K	MSG/MAG (dB)
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.		
0.5	0.995	-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 (Ta = 25°C, V_{DS} = 3V, I_D = 30mA)

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

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