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

APPLICATION

S to X band low-noise amplifiers and oscillators.

QUALITY GRADE

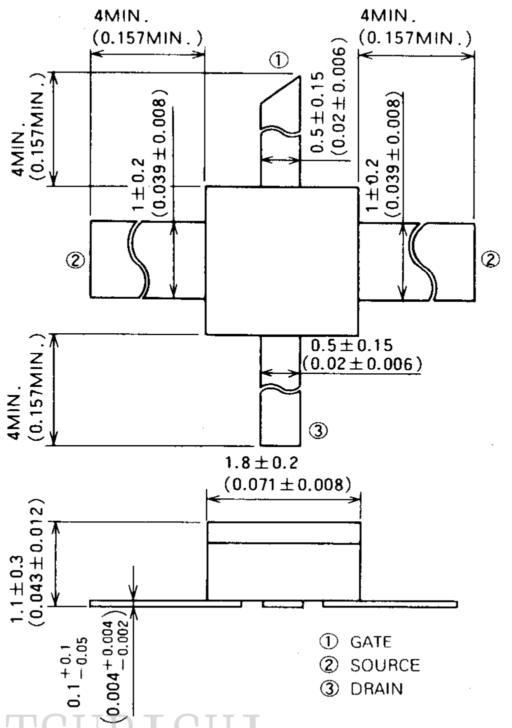
- IG, IGX, IGV

RECOMMENDED BIAS CONDITIONS

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

OUTLINE DRAWING

Unit: millimeters (inches)



GD-9

ABSOLUTE MAXIMUM RATINGS (Ta = 25°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
Tch	Channel temperature	175	°C
Tstg	Storage temperature	−55 ~ +175	°C

*1 : Tc = 25°C

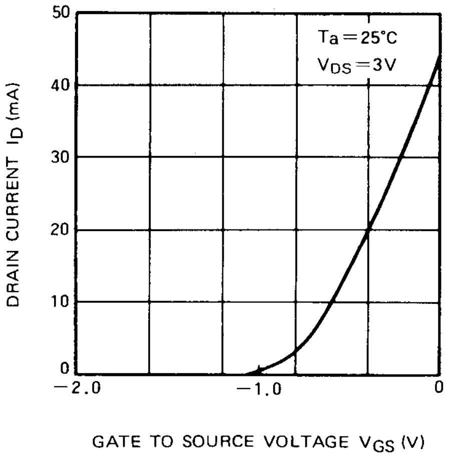
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$V_{(BR)GDO}$	Gate to drain breakdown voltage	$I_G = -100\mu A$	−6	—	—	V
$V_{(BR)GSO}$	Gate to source breakdown voltage	$I_G = -100\mu A$	−6	—	—	V
I_{GSS}	Gate to source leakage current	$V_{GS} = -3V$, $V_{DS} = 0V$	—	—	10	μA
I_{DSS}	Saturated drain current	$V_{GS} = 0V$, $V_{DS} = 3V$	30	60	100	mA
$V_{GS(off)}$	Gate to source cut-off voltage	$V_{DS} = 3V$, $I_D = 100\mu A$	−0.3	—	−3.5	V
g_m	Transconductance	$V_{DS} = 3V$, $I_D = 10mA$	25	45	—	mS
G_s	Associated gain	$V_{DS} = 3V$, $I_D = 10mA$, f = 12GHz	5	8	—	dB
NF_{min}	Minimum noise figure	$V_{DS} = 3V$, $I_D = 10mA$, f = 12GHz	—	3.0	4.0	dB
Rth(ch-a)	Thermal resistance *1	ΔVf method	—	—	416	°C/W

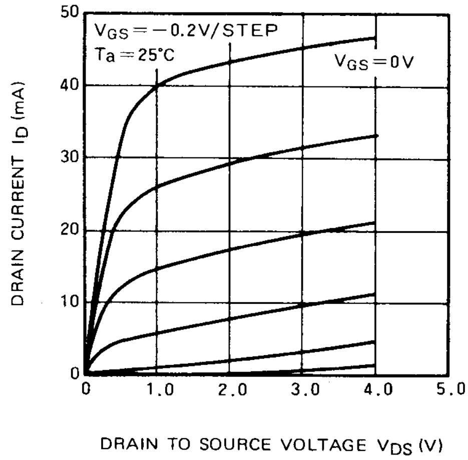
*1: Channel to ambient

TYPICAL CHARACTERISTICS

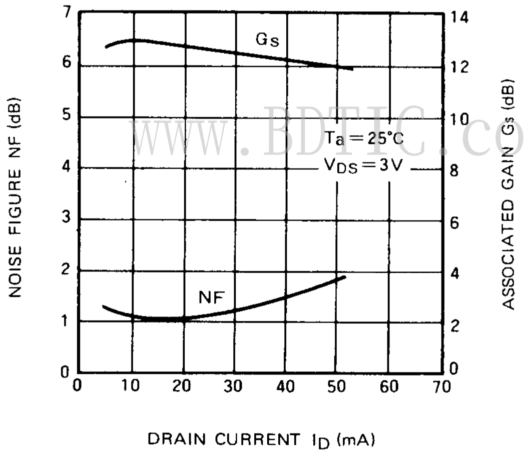
I_D vs. V_{GS}



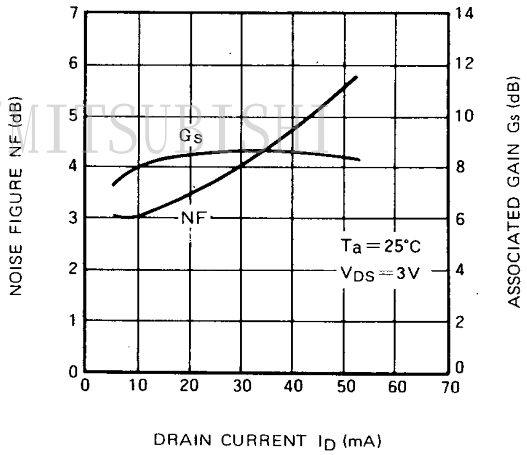
I_D vs. V_{DS}



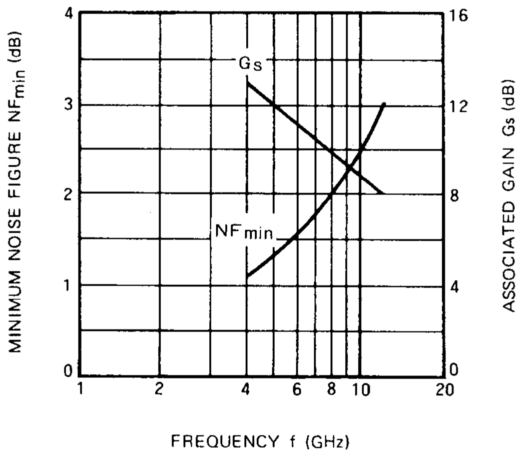
NF & G_S vs. I_D
(f = 4 GHz)



NF & G_S vs. I_D
(f = 12 GHz)



NF_{min} & Gs vs. f



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

Freq. (GHz)	Γopt Magn.	Γopt Angle (deg.)	Rn (Ω)	NFmin (dB)
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

Glp and P1dB (Ta=25℃, V_D=3V)

	f=4GHz		f=12GHz	
	I_D=10mA	I_D=30mA	I_D=10mA	I_D=30mA
Glp (dB)	15.5	16.8	9.6	10.5
P_{1dB} (dBm)	12.6	14.5	10.5	12.7

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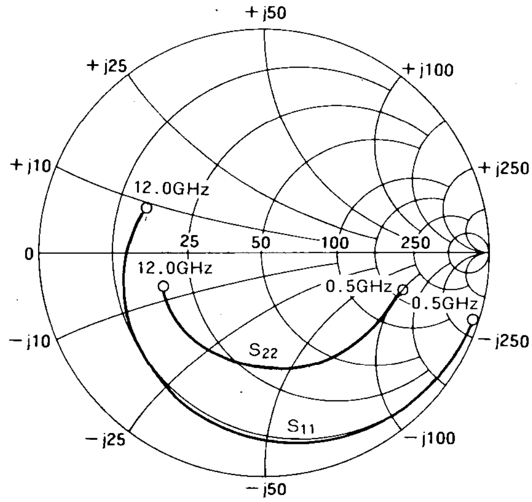
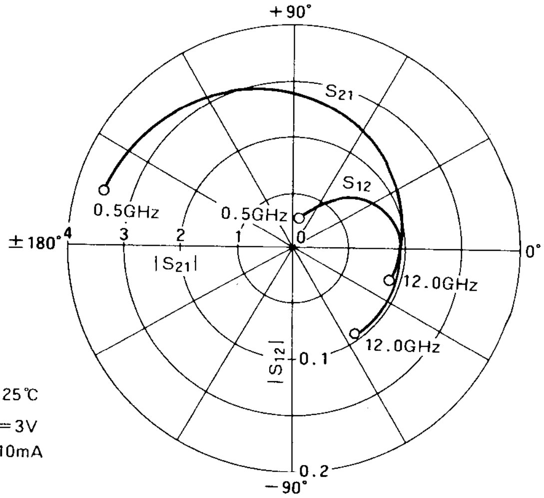
S_{11}, S_{22} vs. f.



Ta = 25℃
V_{DS} = 3V
I_D = 10mA

S_{21}, S_{12} vs. f.

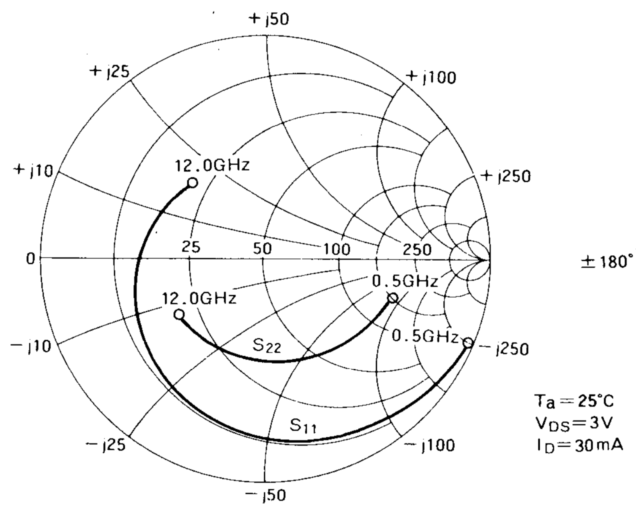


S PARAMETERS (Ta=25℃, V_{DS}=3V, I_D=10mA)

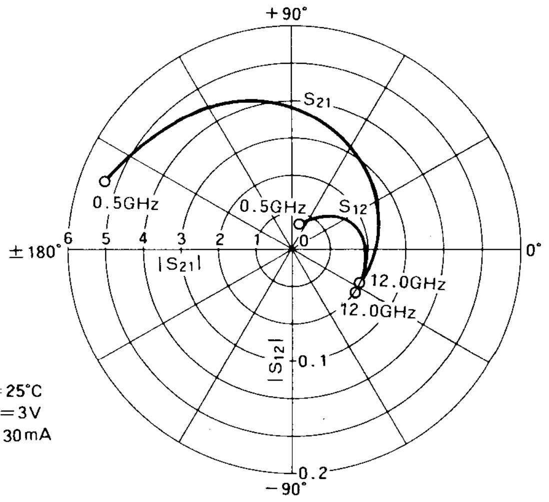
Freq. (GHz)	S_{11}		S_{21}		S_{12}		S_{22}		K	MSG/MAG (dB)
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.		
0.5	0.995	− 17.7	3.463	163.8	0.024	76.2	0.649	− 13.6	0.067	21.6
1.0	0.974	− 27.0	3.378	154.7	0.032	69.2	0.634	− 20.8	0.178	20.2
1.5	0.954	− 36.4	3.293	145.6	0.040	62.3	0.620	− 28.1	0.255	19.2
2.0	0.933	− 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

LOW NOISE GaAs FET

S_{11}, S_{22} vs. f.



S_{21}, S_{12} vs. f.



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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