MGF1403B

LOW NOISE GaAs FET

DESCRIPTION

The MGF1403B low-noise GaAs FET with an N-channel Schottky gate is designed for use in S to Ku 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} = 1.8 dB (TYP.) @ f = 12 GHz
- High associated gain G_S = 10.5 dB (TYP.) @ f = 12 GHz
- High reliability and stability

APPLICATION

S to Ku band low-noise amplifiers.

QUALITY GRADE

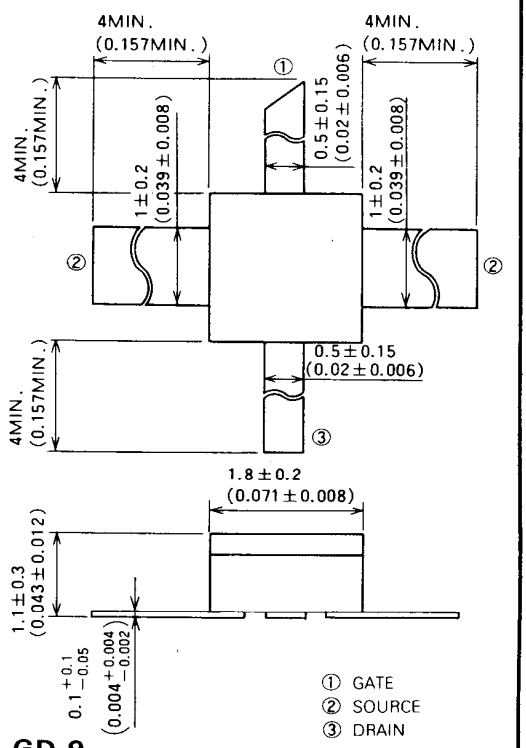
- IG, IGX, IGV

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	Rating	Unit
V_{GDO}	Gate to drain voltage	−6	V
V_{GSO}	Gate to source voltage	−6	V
I_D	Drain current	80	mA
P_T	Total power dissipation *1	240	mW
Tch	Channel temperature	175	℃
Tstg	Storage temperature	−55 ~ +175	℃

*1 : Tc=25℃

ELECTRICAL CHARACTERISTICS (Ta=25°C)

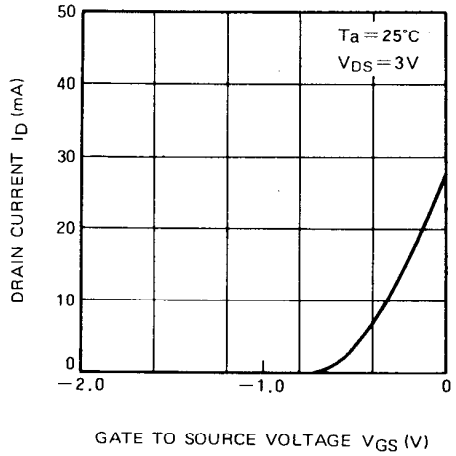
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$V_{(BR)GDO}$	Gate to drain breakdown voltage	I_G=−100μA	−6	—	—	V
$V_{(BR)GSO}$	Gate to source breakdown voltage	I_G=−100μA	−6	—	—	V
I_{GSS}	Gate to source leakage current	V_{GS}=−3V, V_{DS}=0V	—	—	10	μA
I_{DSS}	Saturated drain current	V_{GS}=0V, V_{DS}=3V	15	40	80	mA
$V_{GS(off)}$	Gate to source cut-off voltage	V_{DS}=3V, I_D=100μA	−0.3	—	−3.5	V
g_m	Transconductance	V_{DS}=3V, I_D=10mA	20	40	—	mS
G_S	Associated gain	V_{DS}=3V, I_D=10mA, f=12GHz	8	10.5	—	dB
NF_{min}	Minimum noise figure	V_{DS}=3V, I_D=10mA, f=12GHz	—	1.8	2.3	dB
$R_{th(ch-a)}$	Thermal resistance *1	ΔVf method	—	—	625	℃/W

*1: Channel to ambient

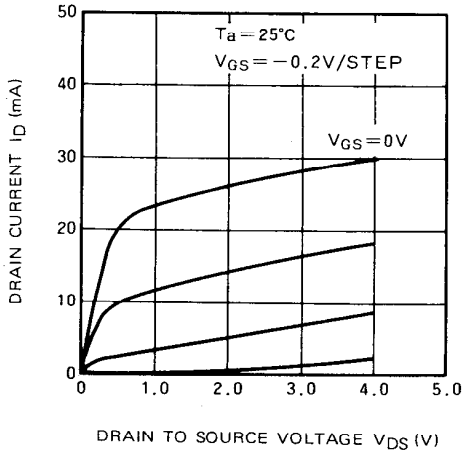
MITSUBISHI ELECTRIC

TYPICAL CHARACTERISTICS

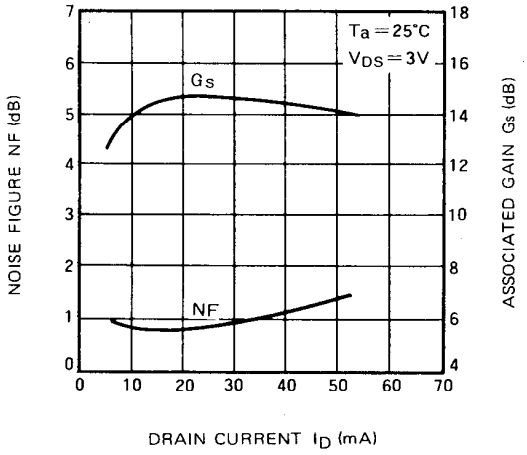
I_D vs. V_{GS}



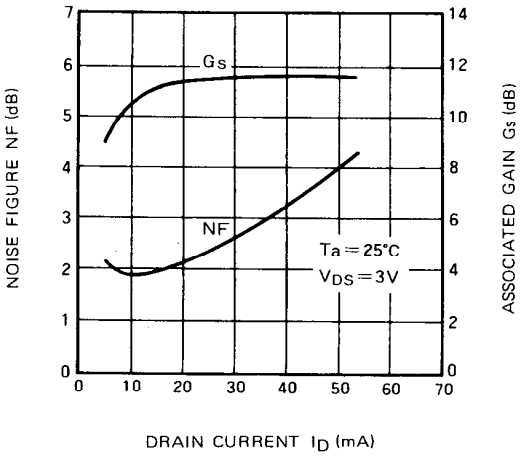
I_D vs. V_{DS}



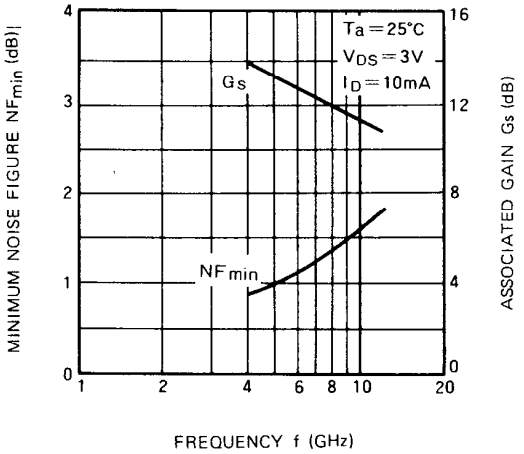
NF & G_S vs. I_D (f = 4 GHz)



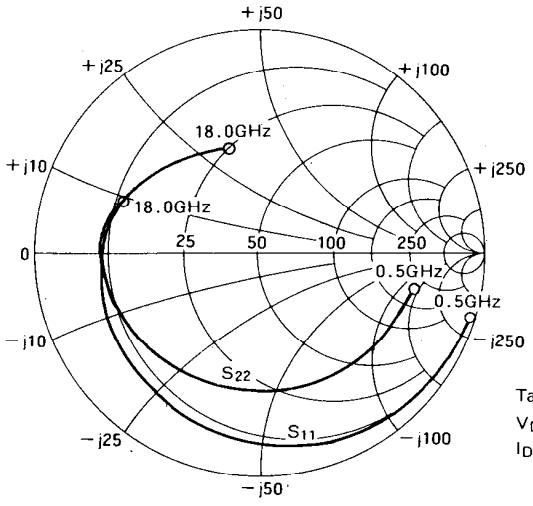
NF & G_S vs. I_D (f = 12 GHz)



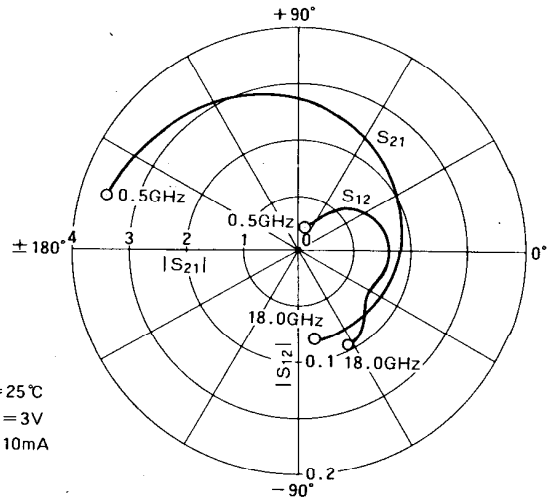
NF_{min} & Gs vs. f



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



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



Ta=25℃
V_{DS}=3V
I_D=10mA

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	− 17.1	3.457	164.2	0.021	75.7	0.716	− 13.5	0.062	22.2
1.0	0.978	− 26.0	3.369	155.4	0.027	69.4	0.706	− 20.7	0.145	20.9
1.5	0.962	− 34.8	3.282	146.7	0.034	63.0	0.696	− 27.8	0.202	19.8
2.0	0.945	− 43.6	3.195	137.9	0.041	56.7	0.686	− 34.9	0.247	18.9
2.5	0.928	− 52.4	3.108	129.2	0.048	50.4	0.676	− 42.0	0.284	18.1
3.0	0.912	− 61.3	3.020	120.4	0.055	44.1	0.666	− 49.2	0.317	17.4
3.5	0.895	− 70.1	2.933	111.7	0.061	37.7	0.656	− 56.3	0.347	16.8
4.0	0.878	− 78.9	2.846	102.9	0.068	31.4	0.646	− 63.4	0.376	16.2
4.5	0.859	− 87.3	2.747	94.8	0.071	25.8	0.639	− 70.3	0.422	15.9
5.0	0.839	− 95.6	2.648	86.7	0.073	20.3	0.631	− 77.2	0.469	15.6
5.5	0.820	−104.0	2.549	78.5	0.076	14.7	0.624	− 84.0	0.519	15.3
6.0	0.800	−112.3	2.450	70.4	0.078	9.1	0.616	− 90.9	0.572	15.0
6.5	0.788	−118.5	2.361	63.6	0.078	5.2	0.617	− 96.6	0.614	14.8
7.0	0.776	−124.6	2.271	56.9	0.078	1.4	0.618	−102.3	0.661	14.7
7.5	0.764	−130.8	2.182	50.1	0.077	− 2.5	0.620	−107.9	0.713	14.5
8.0	0.752	−136.9	2.092	43.3	0.077	− 6.4	0.621	−113.6	0.769	14.3
8.5	0.742	−142.4	2.036	37.1	0.076	− 9.1	0.625	−118.6	0.808	14.3
9.0	0.732	−148.0	1.980	30.9	0.076	−11.9	0.630	−123.3	0.850	14.2
9.5	0.723	−153.5	1.924	24.6	0.075	−14.6	0.634	−128.1	0.895	14.1
10.0	0.713	−159.0	1.868	18.4	0.074	−17.3	0.639	−132.9	0.943	14.0
10.5	0.704	−164.7	1.833	12.1	0.073	−19.4	0.642	−137.4	0.983	14.0
11.0	0.695	−170.4	1.798	5.7	0.073	−21.5	0.645	−141.8	1.025	13.0
11.5	0.686	−176.0	1.762	− 0.7	0.072	−23.6	0.648	−146.3	1.069	12.3
12.0	0.677	178.3	1.727	− 7.0	0.071	−25.7	0.651	−150.7	1.116	11.8
12.5	0.671	173.4	1.701	−12.2	0.071	−27.5	0.653	−154.7	1.131	11.6
13.0	0.665	168.4	1.674	−17.4	0.071	−29.2	0.656	−158.7	1.147	11.4
13.5	0.659	163.5	1.648	−22.5	0.072	−31.0	0.658	−162.7	1.163	11.2
14.0	0.653	158.5	1.621	−27.7	0.072	−32.7	0.660	−166.7	1.181	10.9
14.5	0.631	152.6	1.616	−34.2	0.074	−35.3	0.667	−170.9	1.188	10.8
15.0	0.609	146.7	1.611	−40.7	0.076	−37.9	0.675	−175.1	1.191	10.6
15.5	0.586	140.7	1.606	−47.1	0.079	−40.5	0.682	−179.2	1.190	10.5
16.0	0.564	134.8	1.601	−53.6	0.081	−43.1	0.689	176.6	1.186	10.3
16.5	0.544	127.3	1.605	−60.2	0.085	−47.8	0.682	172.2	1.199	10.1
17.0	0.525	119.8	1.609	−66.9	0.089	−52.5	0.674	167.7	1.210	9.8
17.5	0.505	112.2	1.614	−73.5	0.093	−57.2	0.666	163.3	1.222	9.6
18.0	0.485	104.7	1.618	−80.1	0.097	−61.9	0.659	158.8	1.233	9.3

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

Freq. (GHz)	Γopt		Rn (Ω)	NFmin (dB)
	Magn.	Angle (deg.)		
4	0.723	57.3	18.0	0.77
8	0.582	97.6	20.0	1.38
12	0.515	145.6	13.0	1.78
14	0.478	179.0	15.0	2.02
18	0.393	−103.3	19.0	2.19

Glp and P1dB (Ta=25℃, V_D=3V, I_D=10mA)

	f=4GHz	f=12GHz
Glp (dB)	15.5	11.1
P_{1dB} (dBm)	11.6	9.8