MGF1303B

LOW NOISE GaAs FET

DESCRIPTION

The MGF1303B 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} = 2.0 dB (MAX.) @ f = 12 GHz
- High associated gain G_S = 8 dB (MIN.) @ f = 12 GHz
- High reliability and stability

APPLICATION

S to Ku band low-noise amplifiers.

QUALITY GRADE

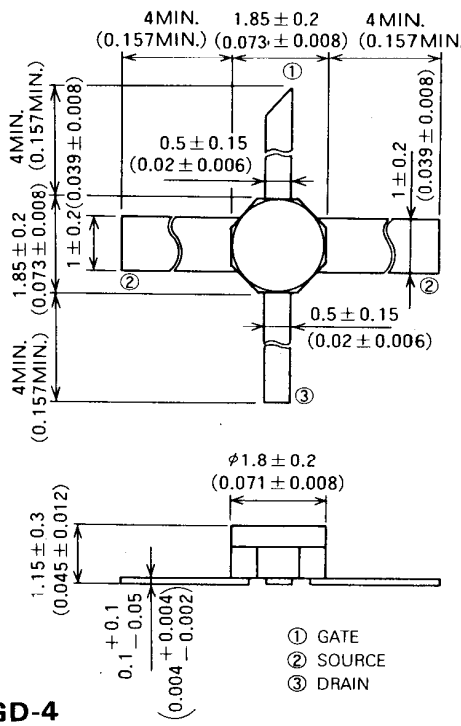
- GG

RECOMMENDED BIAS CONDITIONS

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

OUTLINE DRAWING

Unit: millimeters (inches)



GD-4

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	80	mA
P_T	Total power dissipation *1	240	mW
Tch	Channel temperature	175	°C
Tstg	Storage temperature	−55~+175	°C

*1 : Tc=25°C

ELECTRICAL CHARACTERISTICS (Ta=25°C)

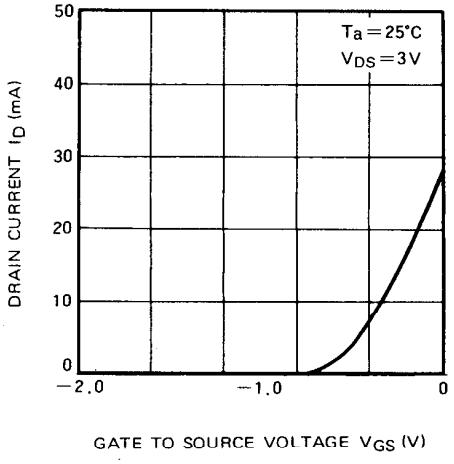
Symbol	Parameter	Test conditions		Limits			Unit
				Min	Typ	Max	
$V_{(BR)GDO}$	Gate to drain breakdown voltage	I_G=−100μA		−6	—	—	V
$V_{(BR)GSO}$	Gate to source breakdown voltage	I_G=−100μA		−6	—	—	V
I_{GSS}	Gate to source leakage current	V_{GS}=−3V, V_{DS}=0V		—	—	10	μA
I_{DSS}	Saturated drain current	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
gm	Transconductance	V_{DS}=3V, I_D=10mA		20	40	—	mS
Gs	Associated gain	V_{DS}=3V, I_D=10mA	f=4GHz	12	—	—	dB
			f=12GHz	8	—	—	
NFmin	Minimum noise figure	V_{DS}=3V, I_D=10mA	f=4GHz	—	—	1.0	dB
			f=12GHz	—	—	2.0	
Rth(ch-a)	Thermal resistance *1	ΔVf method		—	—	625	°C/W

*1: Channel to ambient

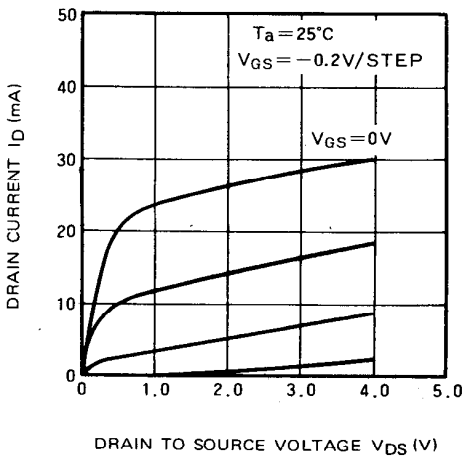
MITSUBISHI ELECTRIC

TYPICAL CHARACTERISTICS

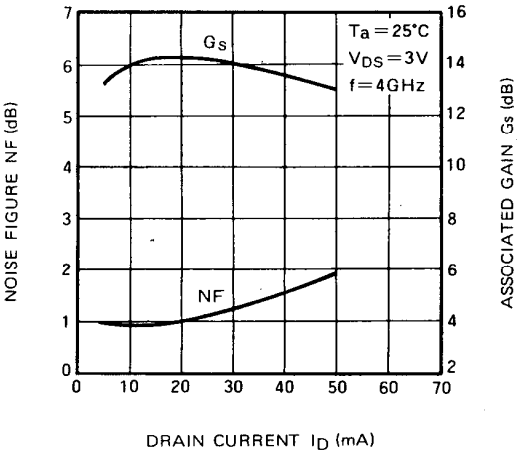
I_D vs. V_{GS}



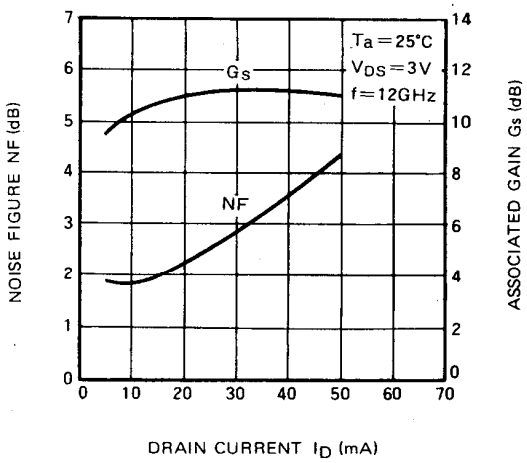
I_D vs. V_{DS}



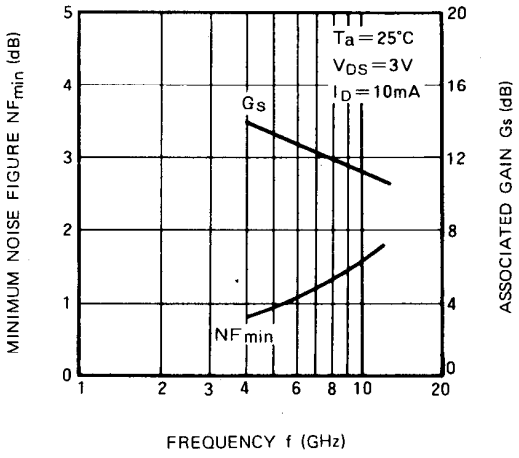
NF & G_S vs. I_D (f = 4 GHz)



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

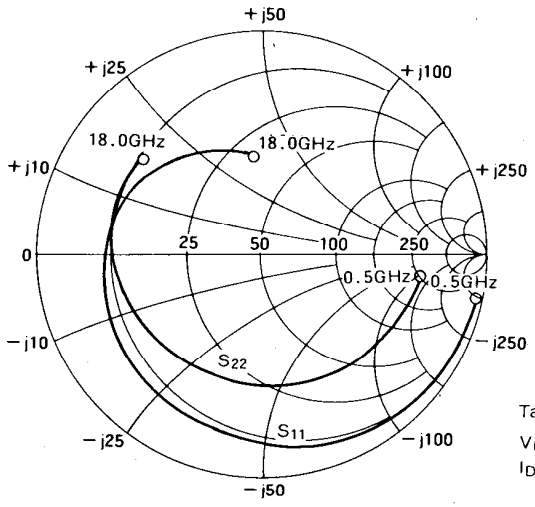


NF_{min} & Gs vs. f

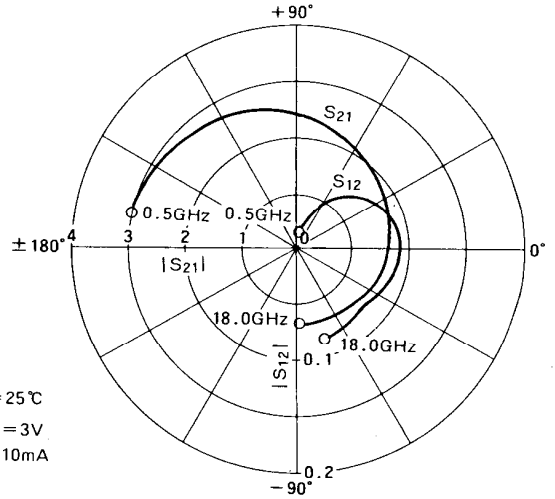


LOW NOISE GaAs FET

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	− 12.1	2.991	167.7	0.016	77.1	0.728	− 9.0	0.125	22.7
1.0	0.984	− 21.8	2.937	158.6	0.026	71.3	0.708	− 16.6	0.163	20.5
1.5	0.973	− 31.5	2.883	149.5	0.036	65.5	0.688	− 24.2	0.179	19.0
2.0	0.962	− 41.2	2.829	140.4	0.046	59.7	0.668	− 31.8	0.189	17.9
2.5	0.942	− 50.5	2.762	131.5	0.054	52.9	0.657	− 39.1	0.249	17.1
3.0	0.921	− 59.9	2.696	122.6	0.061	46.0	0.646	− 46.4	0.299	16.4
3.5	0.900	− 69.2	2.629	113.6	0.069	39.2	0.636	− 53.7	0.344	15.8
4.0	0.880	− 78.5	2.563	104.7	0.077	32.3	0.625	− 61.0	0.385	15.2
4.5	0.860	− 87.1	2.479	96.4	0.080	26.3	0.614	− 68.2	0.432	14.9
5.0	0.840	− 95.7	2.395	88.1	0.084	20.4	0.604	− 75.5	0.482	14.6
5.5	0.821	−104.3	2.311	79.8	0.087	14.4	0.593	− 82.7	0.534	14.3
6.0	0.801	−112.9	2.227	71.5	0.090	8.4	0.582	− 89.9	0.589	13.9
6.5	0.787	−119.8	2.146	64.2	0.089	3.9	0.581	− 96.7	0.639	13.8
7.0	0.773	−126.7	2.066	57.0	0.089	− 0.6	0.581	−103.4	0.694	13.7
7.5	0.759	−133.5	1.985	49.7	0.088	− 5.1	0.580	−110.2	0.757	13.5
8.0	0.745	−140.4	1.905	42.4	0.087	− 9.6	0.579	−116.9	0.827	13.4
8.5	0.735	−146.1	1.857	36.1	0.086	−12.2	0.580	−122.2	0.877	13.4
9.0	0.725	−151.8	1.808	29.8	0.084	−14.9	0.581	−127.6	0.933	13.3
9.5	0.714	−157.4	1.760	23.4	0.083	−17.5	0.583	−132.9	0.993	13.3
10.0	0.704	−163.1	1.712	17.1	0.082	−20.1	0.584	−138.2	1.059	11.7
10.5	0.694	−169.2	1.675	10.6	0.081	−23.3	0.596	−143.7	1.088	11.3
11.0	0.685	−175.4	1.637	4.2	0.081	−26.5	0.607	−149.2	1.116	11.0
11.5	0.675	178.5	1.600	− 2.3	0.080	−29.7	0.619	−154.7	1.145	10.7
12.0	0.665	172.4	1.563	− 8.8	0.079	−32.9	0.631	−160.2	1.174	10.4
12.5	0.653	167.0	1.531	−14.7	0.078	−34.4	0.636	−165.5	1.229	10.1
13.0	0.641	161.5	1.498	−20.7	0.077	−35.9	0.642	−170.9	1.288	9.7
13.5	0.629	156.1	1.466	−26.6	0.075	−37.3	0.647	−176.2	1.352	9.4
14.0	0.617	150.6	1.434	−32.5	0.074	−38.3	0.653	178.5	1.420	9.0
14.5	0.601	144.4	1.426	−38.9	0.075	−42.4	0.659	173.9	1.444	8.9
15.0	0.586	138.3	1.418	−45.2	0.076	−46.1	0.664	169.3	1.465	8.7
15.5	0.571	132.1	1.409	−51.6	0.076	−49.7	0.670	164.6	1.484	8.5
16.0	0.555	125.9	1.401	−57.9	0.077	−53.3	0.675	160.0	1.501	8.4
16.5	0.526	117.9	1.386	−65.3	0.079	−58.1	0.674	155.0	1.576	8.0
17.0	0.497	110.0	1.371	−72.6	0.080	−62.9	0.674	150.0	1.646	7.6
17.5	0.468	102.0	1.356	−80.0	0.082	−67.6	0.673	144.9	1.713	7.3
18.0	0.439	94.0	1.341	−87.3	0.084	−72.4	0.672	139.9	1.776	6.9

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

Freq. (GHz)	Γopt.		Rn (Ω)	NFmin. (dB)
	Magn.	Angle (deg.)		
1	0.768	12.1	19.3	0.67
2	0.732	21.0	18.9	0.72
3	0.714	37.2	18.4	0.78
4	0.688	52.0	18.0	0.83
5	0.665	66.3	17.3	0.98
6	0.650	79.1	16.7	1.13
7	0.633	90.6	16.1	1.27
8	0.617	102.2	15.5	1.42
9	0.597	112.4	14.9	1.52
10	0.575	123.5	14.2	1.62
11	0.550	134.8	13.6	1.73
12	0.523	146.3	13.0	1.83
13	0.503	160.0	14.2	1.94
14	1.475	174.2	15.5	2.05
15	0.441	−171.9	16.6	2.12
16	0.420	−155.0	17.8	2.20
17	0.394	−138.1	18.9	2.28
18	0.372	−112.2	20.0	2.35

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

	f=4GHz	f=12GHz
Glp (dB)	15.5	11.1
P1dB (dBm)	11.6	9.8