

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 $NF_{min} = 1.8 \text{ dB (TYP.) @ } f = 12 \text{ GHz}$
- High associated gain $G_s = 10.5 \text{ dB (TYP.) @ } f = 12 \text{ GHz}$
- High reliability and stability

APPLICATION

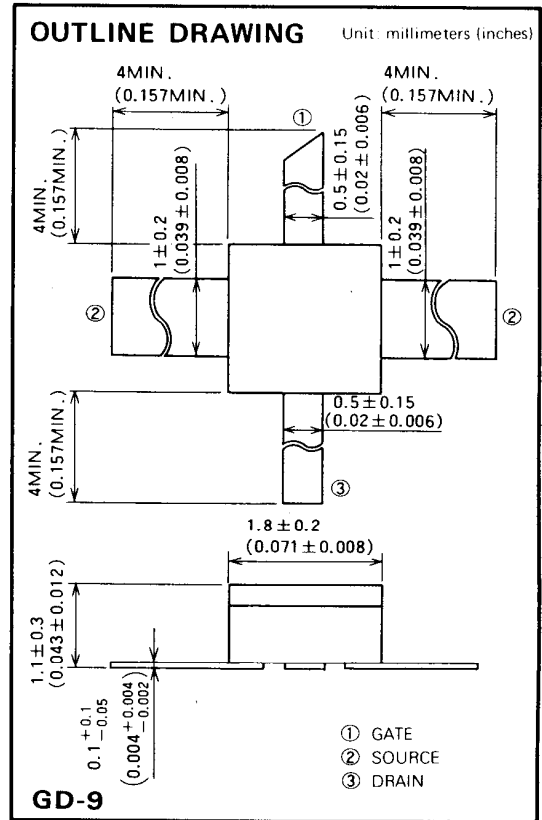
S to Ku band low-noise amplifiers.

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	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
T_{ch}	Channel temperature	175	$^\circ\text{C}$
T_{stg}	Storage temperature	-55 ~ +175	$^\circ\text{C}$

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

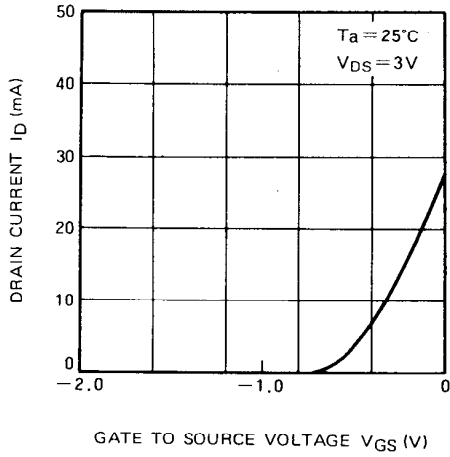
ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

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	$V_{GS} = 0\text{V}, V_{DS} = 3\text{V}$	15	40	80	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	$V_{DS} = 3\text{V}, I_D = 10\text{mA}$	20	40	—	mS
G_s	Associated gain	$V_{DS} = 3\text{V}, I_D = 10\text{mA}, f = 12\text{GHz}$	8	10.5	—	dB
NF_{min}	Minimum noise figure	$V_{DS} = 3\text{V}, I_D = 10\text{mA}, f = 12\text{GHz}$	—	1.8	2.3	dB
$R_{th(ch-a)}$	Thermal resistance *1	ΔV_f method	—	—	625	$^\circ\text{C/W}$

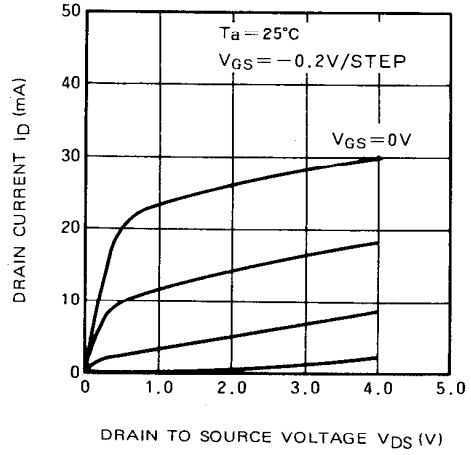
* 1: Channel to ambient

TYPICAL CHARACTERISTICS

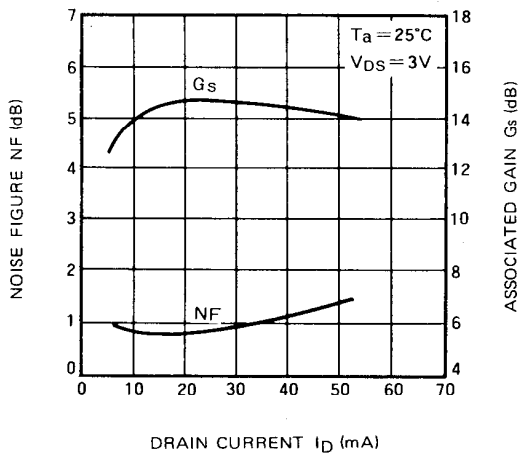
I_D vs. V_{GS}



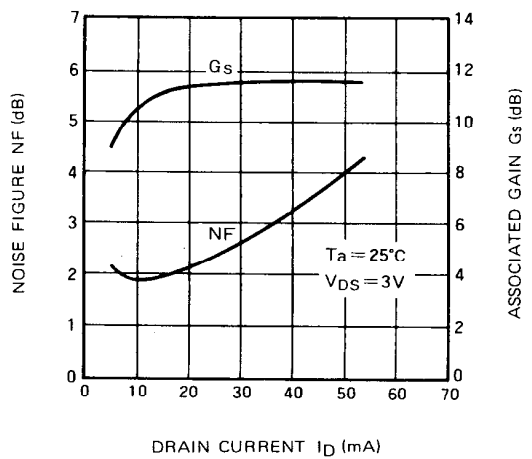
I_D vs. V_{DS}



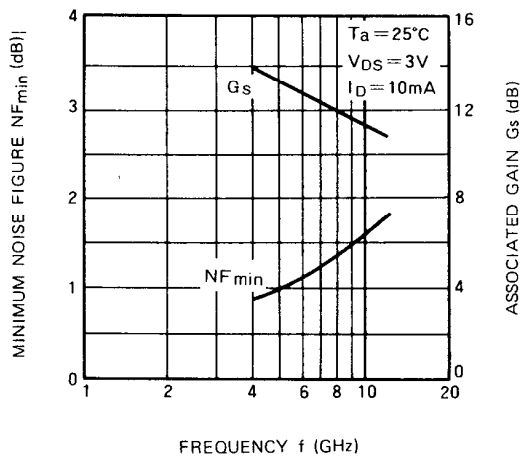
**NF & G_s vs. I_D
($f = 4\text{ GHz}$)**



**NF & G_s vs. I_D
($f = 12\text{ GHz}$)**

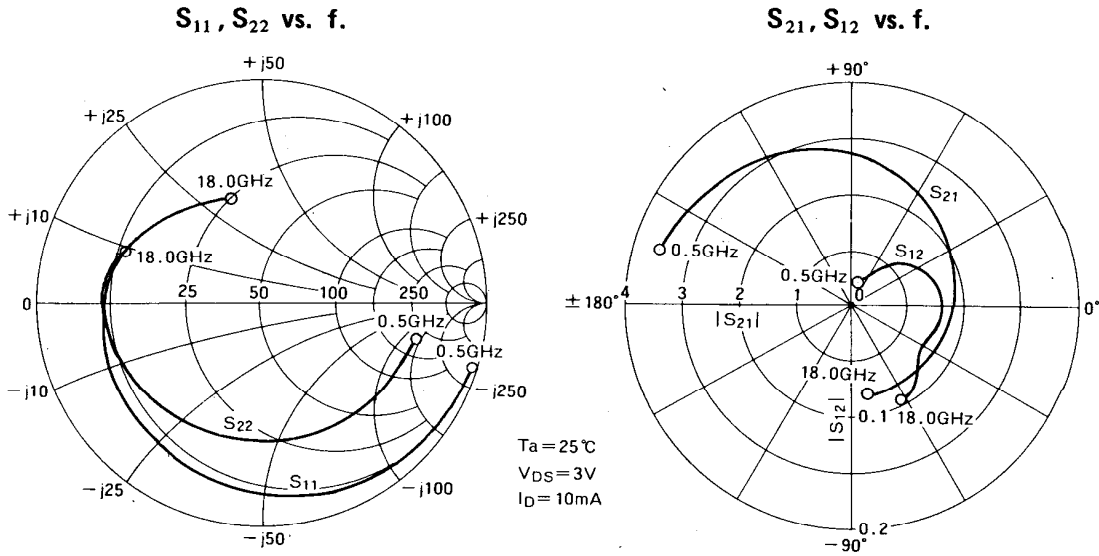


NF_{min} & G_s vs. f



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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	-17.1	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

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

Freq. (GHz)	Γ_{opt}		R_n (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

G_{1p} and P_{1dB} ($T_a=25^\circ C$, $V_D=3V$, $I_D=10mA$)

	f=4GHz	f=12GHz
G _{1p} (dB)	15.5	11.1
P _{1dB} (dBm)	11.6	9.8