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

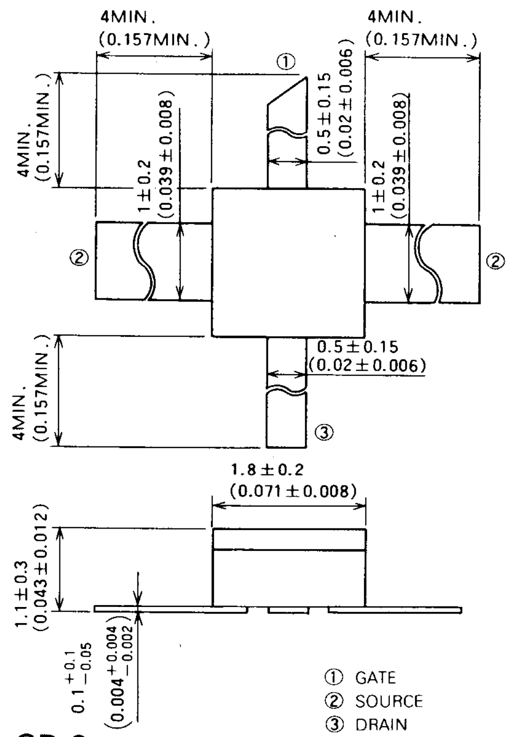
- IG, IGX, IGV

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℃

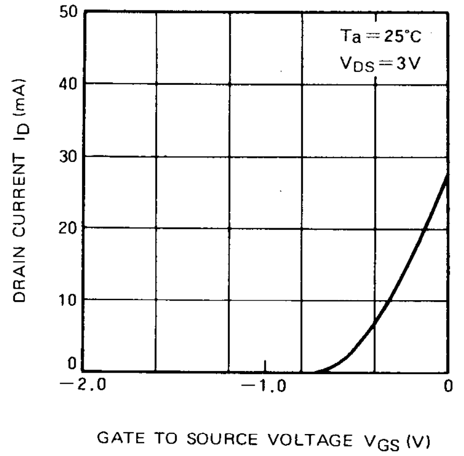
ELECTRICAL CHARACTERISTICS (Ta=25°C)

Symbol	Parameter	Test conditions	Limits Min	Limits Typ	Limits Max	Unit
$V_{(BR)GDO}$	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
Gs	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
Rth(ch-a)	Thermal resistance ∗1	ΔVf method	—	—	625	℃/W

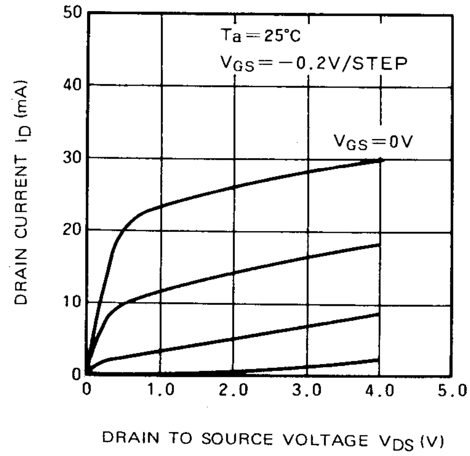
∗1: Channel to ambient

TYPICAL CHARACTERISTICS

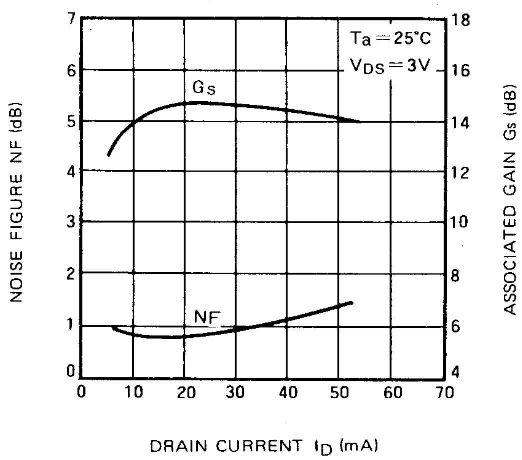
I_D vs. V_{GS}



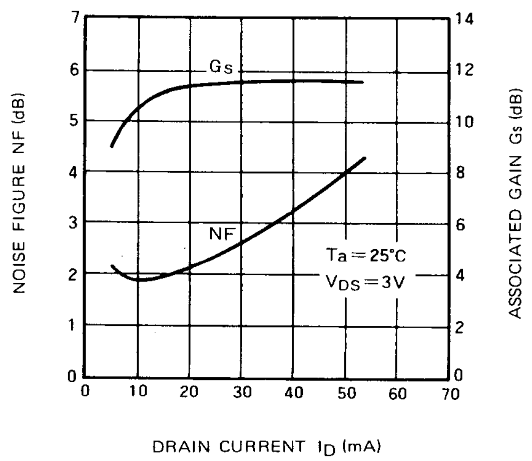
I_D vs. V_{DS}



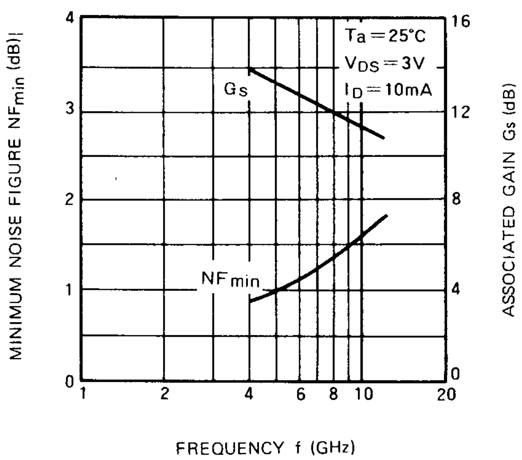
NF & G_S vs. I_D
(f = 4 GHz)



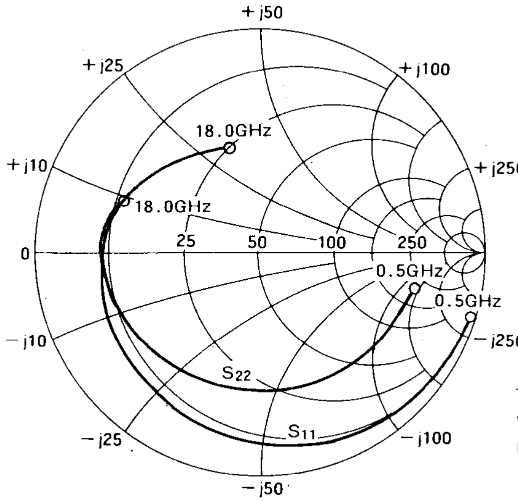
NF & G_S vs. I_D
(f = 12 GHz)



NF_{min} & Gs vs. f

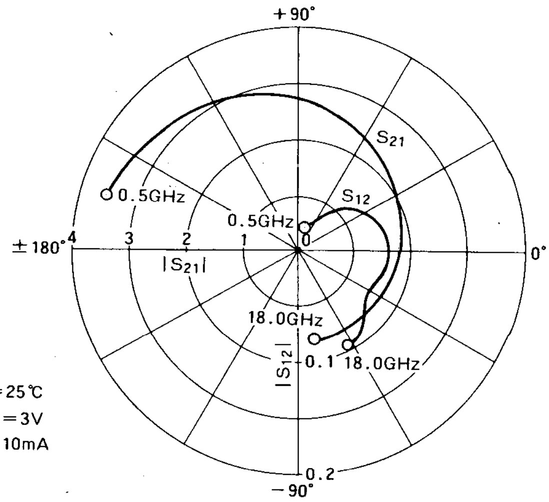


S_{11}, S_{22} vs. f.



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)	S11		S21		S12		S22		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

Requests Regarding Safety Designs

Mitsubishi Electric constantly strives to raise the level of its quality and reliability. Despite these concerted efforts, however, there will be occasions when our semiconductor products suffer breakdowns, malfunctions or other problems. In view of this reality, it is requested that every feasible precaution be taken in the pursuit of redundancy design, malfunction prevention design and other safety-related designs, to prevent breakdowns or malfunctions in our products from resulting in accidents involving people, fires, social losses or other problems, thereby upholding the highest levels of safety in the products when in use by customers.

Matters of Importance when Using these Materials

1. These materials are designed as reference materials to ensure that all customers purchase Mitsubishi Electric semiconductors best suited to their specific use applications. Please be aware, however, that the technical information contained in these materials does not comprise consent for the execution or use of intellectual property rights or other rights owned by Mitsubishi Electric Corporation.
2. Mitsubishi Electric does not assume responsibility for damages resulting from the use of product data, graphs, charts, programs, algorithms or other applied circuit examples described in these materials, or for the infringement of the rights of third-party owners resulting from such use.
3. The data, graphs, charts, programs, algorithms and all other information described in these materials were current at the issue of these materials, with Mitsubishi Electric reserving the right to make any necessary updates or changes in the products or specifications in these materials without prior notice. Before purchasing Mitsubishi Electric semiconductor products, therefore, please obtain the latest available information from Mitsubishi Electric directly or an authorized dealer.
4. Every possible effort has been made to ensure that the information described in these materials is fully accurate. However, Mitsubishi Electric assumes no responsibility for damages resulting from inaccuracies occurring within these materials.
5. When using the product data, technical contents indicated on the graphs, charts, programs or algorithms described in these materials, assessments should not be limited to only the technical contents, programs and algorithm units. Rather, it is requested that ample evaluations be made of each individual system as a whole, with the customer assuming full responsibility for decisions on the propriety of application. Mitsubishi Electric does not accept responsibility for the propriety of application.
6. The products described in these materials, with the exception of special mention concerning use and reliability, have been designed and manufactured with the purpose of use in general electronic machinery. Accordingly these products have not been designed and manufactured with the purpose of application in machinery or systems that will be used under conditions that can affect human life, or in machinery or systems used in social infrastructure that demand a particularly high degree of reliability. When considering the use of the products described in these materials in transportation machinery (automobiles, trains, vessels), for objectives related to medical treatment, aerospace, nuclear power control, submarine repeaters or systems or other specialized applications, please consult with Mitsubishi Electric directly or an authorized dealer.
7. When considering use of products for purposes other than the specific applications described in these materials, please inquire at Mitsubishi Electric or an authorized dealer.
8. The prior consent of Mitsubishi Electric in writing is required for any reprinting or reproduction of these materials.
9. Please direct any inquiries regarding further details of these materials, or any other comments or matters of attention, to Mitsubishi Electric or an authorized dealer.