

# MGF1303B

## LOW NOISE GaAs FET

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### 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  $NF_{min} = 2.0 \text{ dB (MAX.) @ } f = 12 \text{ GHz}$
- High associated gain  $G_s = 8 \text{ dB (MIN.) @ } f = 12 \text{ GHz}$
- High reliability and stability

### APPLICATION

S to Ku band low-noise amplifiers.

### QUALITY GRADE

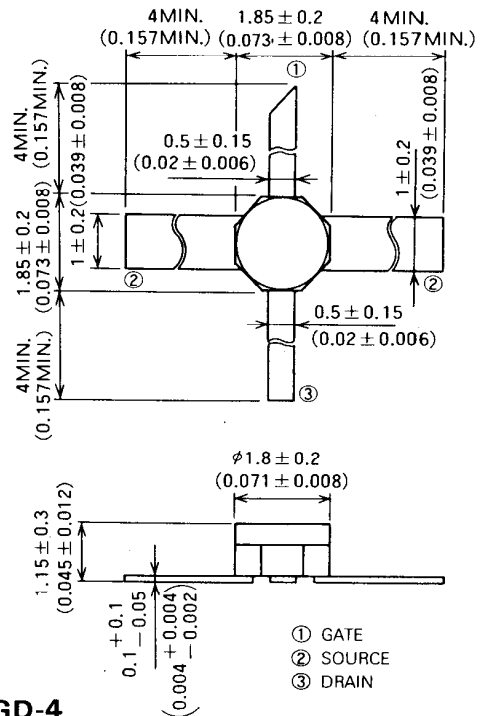
- GG

### RECOMMENDED BIAS CONDITIONS

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

### OUTLINE DRAWING

Unit: millimeters (inches)



### ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

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

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

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

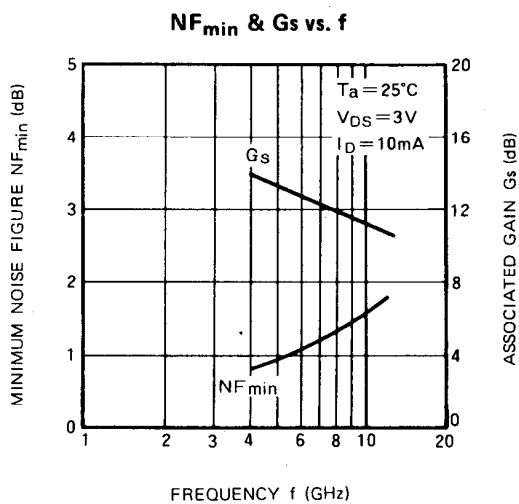
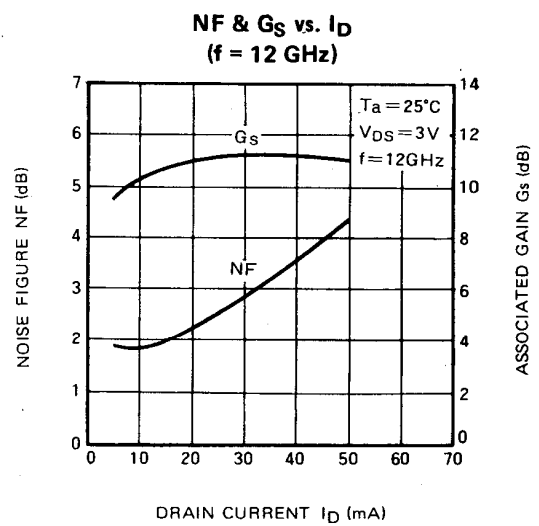
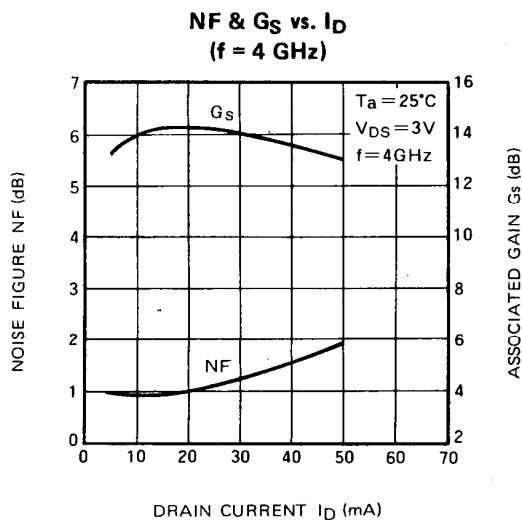
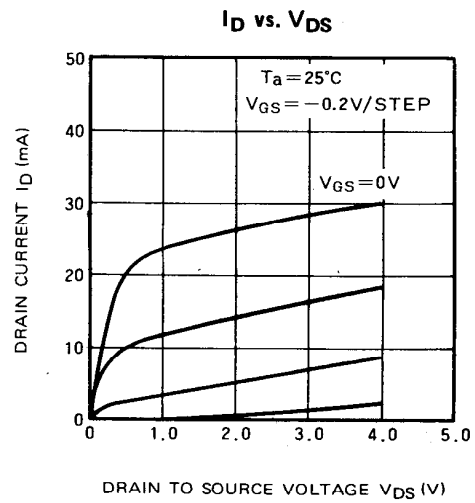
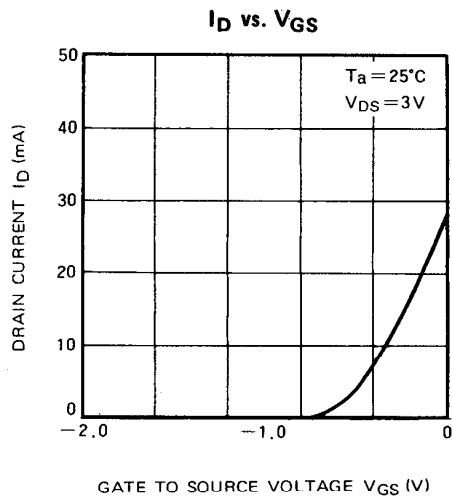
Symbol	Parameter	Test conditions		Limits			Unit
				Min	Typ	Max	
V(BR)GDO	Gate to drain breakdown voltage	I <sub>G</sub> = −100μA		−6	—	—	V
V(BR)GSO	Gate to source breakdown voltage	I <sub>G</sub> = −100μA		−6	—	—	V
I <sub>GSS</sub>	Gate to source leakage current	V <sub>GS</sub> = −3V, V <sub>DS</sub> = 0V		—	—	10	μA
I <sub>DSS</sub>	Saturated drain current	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 3V		15	40	80	mA
V <sub>GS(off)</sub>	Gate to source cut-off voltage	V <sub>DS</sub> = 3V, I <sub>D</sub> = 100μA		−0.3	—	−3.5	V
g <sub>m</sub>	Transconductance	V <sub>DS</sub> = 3V, I <sub>D</sub> = 10 mA		20	40	—	mS
G <sub>s</sub>	Associated gain	V <sub>DS</sub> = 3V, I <sub>D</sub> = 10mA	f = 4 GHz	12	—	—	dB
			f = 12GHz	8	—	—	
NF <sub>min</sub>	Minimum noise figure	V <sub>DS</sub> = 3V, I <sub>D</sub> = 10mA	f = 4 GHz	—	—	1.0	dB
			f = 12GHz	—	—	2.0	
R <sub>th(ch-a)</sub>	Thermal resistance * 1	ΔV <sub>f</sub> method		—	—	625	℃/W

\*1: Channel to ambient

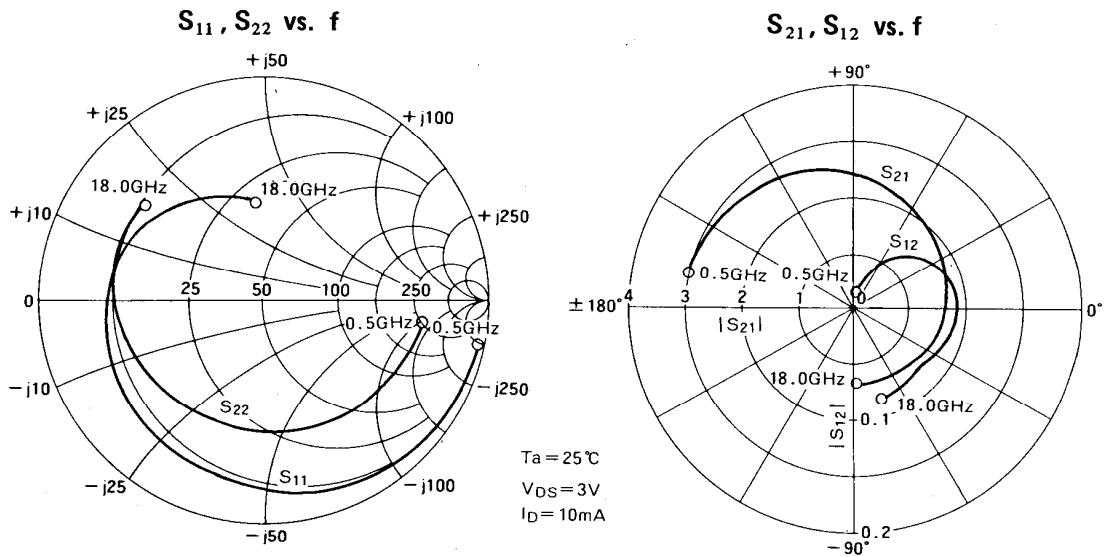
NOV. '97

**LOW NOISE GaAs FET**

**TYPICAL CHARACTERISTICS**



**LOW NOISE GaAs FET**



**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	-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

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

Freq. (GHz)	$\Gamma_{opt.}$		$R_n$ ( $\Omega$ )	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

**G<sub>lp</sub> and P<sub>1dB</sub>** ( $T_a=25^\circ C$ ,  $V_D=3V$ ,  $I_D=10mA$ )

	f=4GHz	f=12GHz
G <sub>lp</sub> (dB)	15.5	11.1
P <sub>1dB</sub> (dBm)	11.6	9.8

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