

MGF1423B

SMALL SIGNAL GaAs FET

DESCRIPTION

The MGF1423B, low-noise GaAs FET with an N-channel Schottky gate, is designed for use in S to Ku band amplifiers.

FEATURES

- High linear power gain
 $G_{LP} = 11 \text{ dB (TYP.) @ } f = 12 \text{ GHz}$
- High output power at 1 dB gain compression
 $P_{1dB} = 13 \text{ dBm (TYP.) @ } f = 12 \text{ GHz}$
- High reliability and stability

APPLICATION

S to Ku band amplifiers

QUALITY GRADE

- IG, IGX, IGV

RECOMMENDED BIAS CONDITIONS

- $V_{DS} = 3 \text{ V}$
- $I_D = 10 \text{ mA}$ for Low Noise Amplifiers
- $I_D = 30 \text{ mA}$ for Small Signal Amplifiers
- Refer to Bias Procedure

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

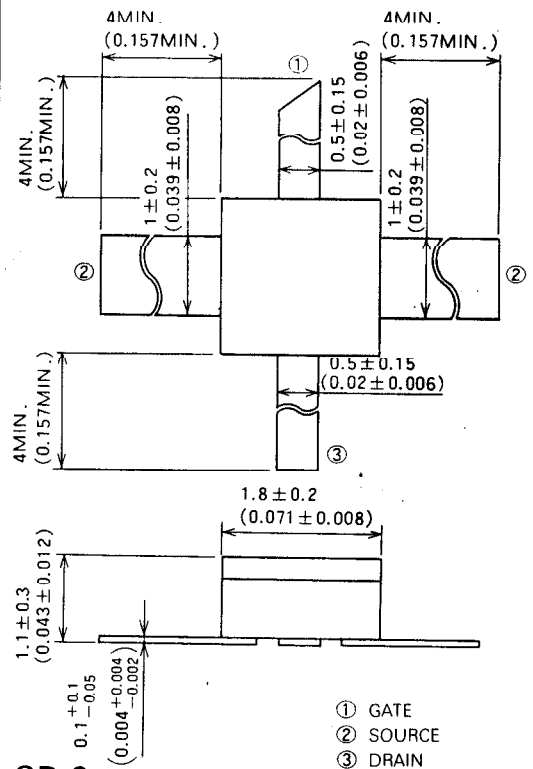
ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$V_{(BR)GDO}$	Gate to drain breakdown voltage	$I_G = -100 \mu\text{A}$	-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	$V_{GS} = 0 \text{ V}, V_{DS} = 3 \text{ V}$	40	60	80	mA
$V_{GS(off)}$	Gate to source cut-off voltage	$V_{DS} = 3 \text{ V}, I_D = 100 \mu\text{A}$	-0.5	—	-3.5	V
g_m	Transconductance	$V_{DS} = 3 \text{ V}, I_D = 10 \text{ mA}$	20	35	—	mS
G_{LP}	Linear power gain	$V_{DS} = 3 \text{ V}, I_D = 30 \text{ mA}, f = 12 \text{ GHz}$	9	11	—	dB
P_{1dB}	Output power at 1 dB gain compression	$V_{DS} = 3 \text{ V}, I_D = 30 \text{ mA}, f = 12 \text{ GHz}$	10	13	—	dBm
G_s	Associated gain	$V_{DS} = 3 \text{ V}, I_D = 10 \text{ mA}, f = 12 \text{ GHz}$	8	—	—	dB
NF_{min}	Minimum noise figure	$V_{DS} = 3 \text{ V}, I_D = 10 \text{ mA}, f = 12 \text{ GHz}$	—	—	2.3	dB
$R_{th(ch-a)}$	Thermal resistance *1	ΔV_f method	—	—	625	$^\circ\text{C/W}$

*1: Channel to ambient

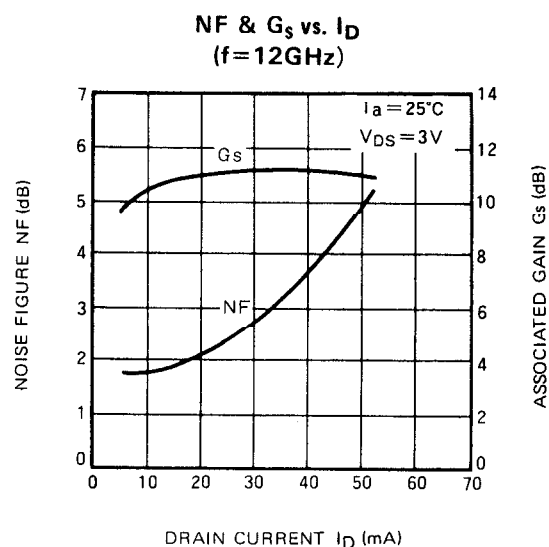
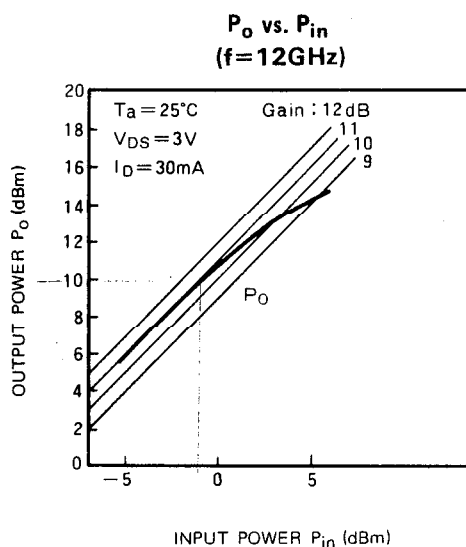
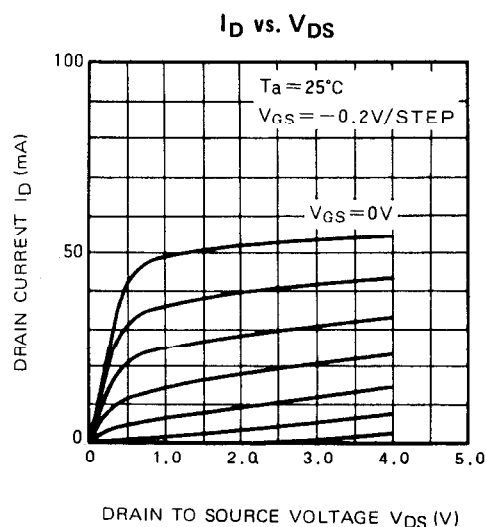
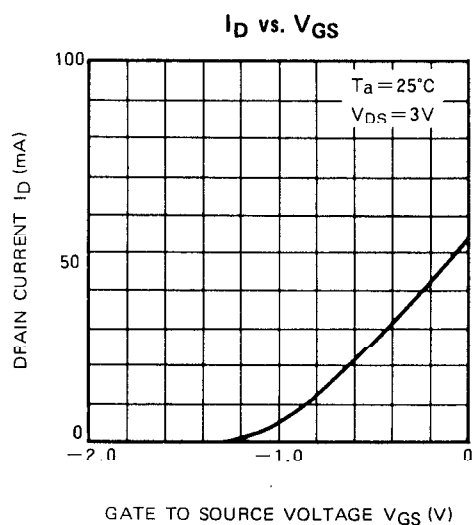
OUTLINE DRAWING

Unit: millimeters (inches)

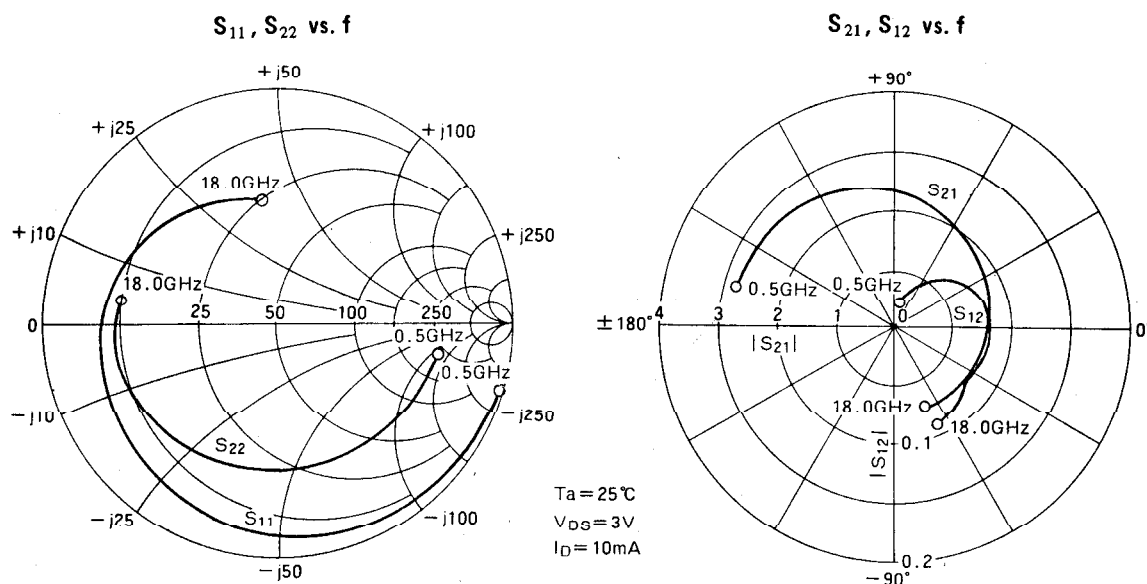


GD-9

- ① GATE
- ② SOURCE
- ③ DRAIN

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TYPICAL CHARACTERISTICS


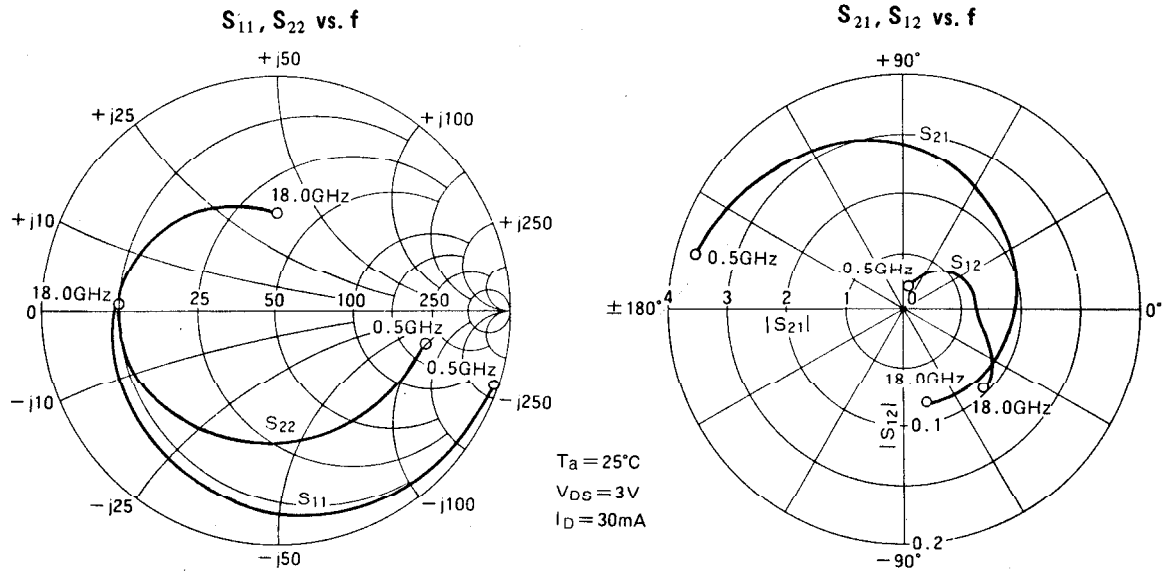
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S PARAMETERS ($T_a = 25^\circ\text{C}$, $V_{DS} = 3\text{V}$, $I_D = 10\text{mA}$)

Freq. (GHz)	S_{11}		S_{21}		S_{12}		S_{22}		K	MSG/MAG (dB)
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.		
0.5	0.997	-16.6	2.783	165.5	0.018	76.4	0.697	-10.3	0.073	22.0
1.0	0.984	-25.2	2.726	157.2	0.024	70.5	0.688	-16.9	0.159	20.5
1.5	0.972	-33.8	2.669	148.8	0.031	64.5	0.680	-23.4	0.212	19.3
2.0	0.960	-42.4	2.612	140.5	0.038	58.6	0.672	-29.9	0.250	18.4
2.5	0.948	-51.0	2.555	132.2	0.045	52.7	0.664	-36.4	0.281	17.6
3.0	0.935	-59.6	2.498	123.9	0.051	46.8	0.655	-43.0	0.307	16.9
3.5	0.923	-68.2	2.441	115.5	0.058	40.8	0.647	-49.5	0.331	16.2
4.0	0.911	-76.8	2.384	107.2	0.065	34.9	0.639	-56.0	0.352	15.6
4.5	0.896	-85.3	2.315	99.3	0.068	29.0	0.632	-62.6	0.396	15.3
5.0	0.880	-93.8	2.246	91.3	0.071	23.2	0.625	-69.2	0.441	15.0
5.5	0.864	-102.2	2.176	83.4	0.074	17.3	0.617	-75.7	0.486	14.7
6.0	0.849	-110.7	2.107	75.4	0.077	11.4	0.610	-82.3	0.533	14.4
6.5	0.838	-116.9	2.040	68.9	0.077	7.4	0.611	-87.8	0.572	14.2
7.0	0.828	-123.1	1.973	62.3	0.078	3.4	0.612	-93.3	0.613	14.1
7.5	0.817	-129.3	1.905	55.8	0.078	-0.6	0.613	-98.8	0.658	13.9
8.0	0.807	-135.5	1.838	49.2	0.078	-4.6	0.614	-104.3	0.706	13.7
8.5	0.797	-141.1	1.797	43.0	0.078	-7.7	0.619	-109.2	0.746	13.7
9.0	0.787	-146.7	1.756	36.7	0.077	-10.9	0.623	-114.2	0.787	13.6
9.5	0.778	-152.2	1.714	30.5	0.076	-14.0	0.628	-119.1	0.830	13.5
10.0	0.768	-157.8	1.673	24.2	0.076	-17.1	0.632	-124.0	0.875	13.4
10.5	0.759	-163.7	1.647	17.7	0.075	-19.8	0.636	-128.7	0.908	13.4
11.0	0.750	-169.6	1.622	11.2	0.075	-22.4	0.640	-133.4	0.943	13.3
11.5	0.742	-175.5	1.596	4.7	0.075	-25.1	0.644	-138.0	0.979	13.3
12.0	0.733	-178.6	1.570	-1.8	0.074	-27.7	0.648	-142.7	1.016	12.5
12.5	0.726	-173.5	1.549	-6.8	0.074	-29.8	0.651	-146.6	1.037	12.1
13.0	0.720	-168.3	1.529	-11.9	0.073	-32.0	0.654	-150.6	1.058	11.7
13.5	0.714	-163.2	1.508	-16.9	0.073	-34.1	0.657	-154.5	1.081	11.4
14.0	0.707	-158.0	1.487	-21.9	0.073	-36.2	0.660	-158.4	1.105	11.1
14.5	0.684	-151.4	1.484	-28.6	0.075	-39.1	0.670	-162.4	1.122	10.8
15.0	0.661	-144.7	1.481	-35.2	0.077	-41.9	0.680	-166.5	1.132	10.6
15.5	0.637	-138.1	1.479	-41.9	0.079	-44.8	0.689	-170.5	1.136	10.5
16.0	0.614	-131.4	1.479	-48.5	0.081	-47.6	0.699	-174.5	1.134	10.4
16.5	0.593	-122.7	1.481	-55.1	0.084	-52.3	0.694	-178.5	1.160	10.1
17.0	0.573	-114.0	1.487	-61.7	0.087	-57.0	0.689	-177.6	1.185	9.8
17.5	0.552	-105.2	1.493	-68.3	0.089	-61.7	0.684	-173.7	1.208	9.5
18.0	0.531	-96.5	1.498	-74.9	0.092	-66.4	0.679	-169.7	1.229	9.2

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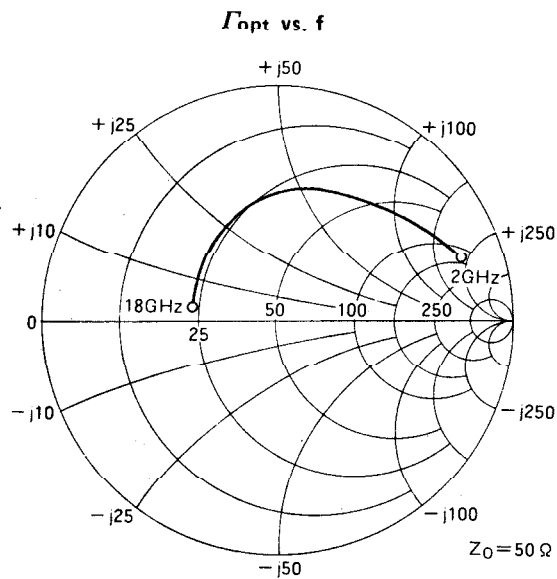


S PARAMETERS (Ta = 25°C, V_{DS} = 3V, I_D = 30mA)

Freq. (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MSG/MAG (dB)
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.		
0.5	0.991	-18.5	3.710	164.2	0.017	79.1	0.649	-12.6	0.060	23.3
1.0	0.976	-27.5	3.620	155.9	0.022	72.9	0.639	-18.7	0.159	22.1
1.5	0.960	-36.6	3.531	147.5	0.028	66.8	0.630	-24.7	0.230	21.0
2.0	0.945	-45.6	3.441	139.1	0.033	60.6	0.621	-30.7	0.285	20.2
2.5	0.929	-54.7	3.351	130.7	0.038	54.5	0.612	-36.7	0.331	19.4
3.0	0.914	-63.7	3.262	122.4	0.044	48.3	0.602	-42.8	0.372	18.7
3.5	0.899	-72.8	3.172	114.0	0.049	42.2	0.593	-48.8	0.410	18.1
4.0	0.883	-81.8	3.082	105.6	0.054	36.0	0.584	-54.8	0.446	17.6
4.5	0.865	-90.5	2.973	97.7	0.056	31.7	0.578	-61.2	0.490	17.3
5.0	0.847	-99.1	2.865	89.7	0.058	27.4	0.572	-67.7	0.537	16.9
5.5	0.830	-107.8	2.756	81.8	0.060	23.0	0.567	-74.1	0.588	16.6
6.0	0.812	-116.4	2.647	73.8	0.062	18.7	0.561	-80.5	0.642	16.3
6.5	0.800	-122.7	2.554	67.4	0.062	15.8	0.563	-85.7	0.689	16.1
7.0	0.787	-129.0	2.461	61.0	0.063	12.8	0.565	-90.9	0.740	16.0
7.5	0.775	-135.2	2.367	54.5	0.063	9.9	0.567	-96.1	0.795	15.8
8.0	0.763	-141.5	2.274	48.1	0.063	6.9	0.569	-101.3	0.855	15.6
8.5	0.752	-147.5	2.217	41.9	0.063	4.9	0.574	-106.0	0.897	15.5
9.0	0.740	-153.4	2.160	35.8	0.063	2.8	0.579	-110.6	0.941	15.4
9.5	0.729	-159.4	2.103	29.6	0.063	0.8	0.585	-115.3	0.988	15.2
10.0	0.717	-165.3	2.046	23.4	0.063	-1.3	0.590	-119.9	1.037	13.9
10.5	0.706	-171.0	2.007	17.3	0.064	-2.9	0.596	-124.5	1.056	13.5
11.0	0.696	-176.7	1.968	11.1	0.065	-4.6	0.603	-129.0	1.076	13.2
11.5	0.685	-177.7	1.929	5.0	0.065	-6.2	0.609	-133.6	1.096	12.8
12.0	0.674	-172.0	1.890	-1.2	0.066	-7.8	0.616	-138.1	1.116	12.5
12.5	0.659	-166.7	1.860	-6.8	0.067	-9.7	0.622	-141.9	1.138	12.1
13.0	0.644	-161.4	1.831	-12.4	0.069	-11.5	0.627	-145.7	1.159	11.8
13.5	0.628	-156.0	1.801	-17.9	0.070	-13.4	0.633	-149.5	1.179	11.5
14.0	0.613	-150.7	1.772	-23.5	0.072	-15.2	0.638	-153.3	1.198	11.2
14.5	0.592	-143.9	1.772	-29.7	0.075	-18.2	0.646	-157.1	1.176	11.2
15.0	0.570	-137.0	1.771	-36.0	0.078	-21.2	0.655	-160.9	1.152	11.2
15.5	0.549	-130.2	1.771	-42.2	0.081	-24.2	0.663	-164.7	1.127	11.2
16.0	0.528	-123.3	1.771	-48.4	0.084	-27.2	0.671	-168.5	1.101	11.3
16.5	0.498	-114.4	1.758	-55.7	0.087	-32.4	0.674	-172.4	1.120	10.9
17.0	0.469	-105.5	1.746	-63.1	0.091	-37.6	0.677	-176.3	1.135	10.6
17.5	0.439	-96.6	1.733	-70.4	0.094	-42.7	0.680	-179.8	1.148	10.3
18.0	0.409	-87.7	1.720	-77.7	0.098	-47.9	0.683	-175.9	1.158	10.0

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NOISE PARAMETERS ($V_{DS}=3.0V$, $I_D=10mA$)



Frequency (GHz)	Γ_{OPT}		R_n (Ω)	NF min (dB)
	MAG	ANG		
2	0.820	18.5	23.5	0.68
4	0.695	36.0	21	0.75
8	0.573	81.2	19	1.30
12	0.489	115.8	17	1.80
18	0.362	173.0	21	2.55

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

	$f=4GHz$		$f=12GHz$	
	$I_D=10mA$	$I_D=30mA$	$I_D=10mA$	$I_D=30mA$
G _{lp} (dB)	15.9	16.9	11.7	12.0
P _{1dB} (dBm)	12.4	14.2	10.9	12.8