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 dB (TYP.) @ f = 12 GHz
- High output power at 1 dB gain compression
  P_{1dB} = 13dBm (TYP.) @ f = 12 GHz
- High reliability and stability

APPLICATION

S to Ku band amplifiers

QUALITY GRADE

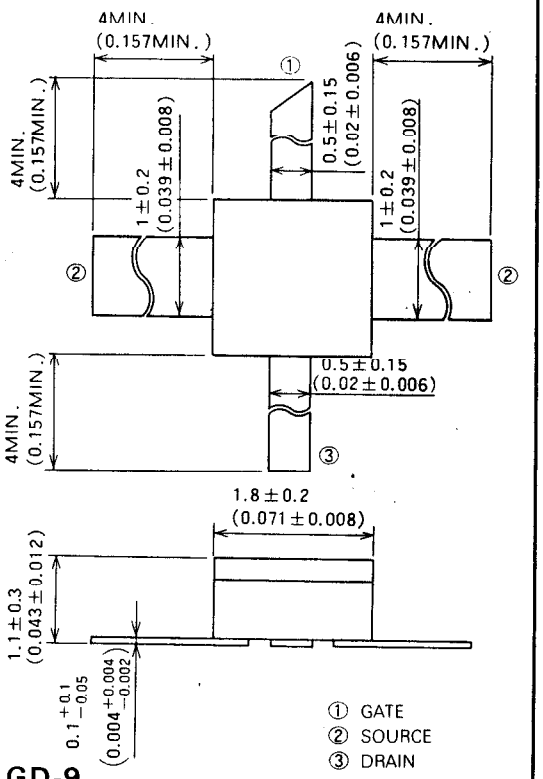
- IG, IGX, IGV

RECOMMENDED BIAS CONDITIONS

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

OUTLINE DRAWING

Unit: millimeters (inches)



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
T_{ch}	Channel temperature	175	°C
T_{stg}	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 = −100 μA	−6	—	—	V
$V_{(BR)GSO}$	Gate to source breakdown voltage	I_G = −100 μA	−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	40	60	80	mA
$V_{GS(off)}$	Gate to source cut-off voltage	V_{DS} = 3V, I_D = 100 μA	−0.5	—	−3.5	V
g_m	Transconductance	V_{DS} = 3V, I_D = 10mA	20	35	—	mS
G_{LP}	Linear power gain	V_{DS} = 3V, I_D = 30mA, f = 12GHz	9	11	—	dB
P_{1dB}	Output power at 1 dB gain compression	V_{DS} = 3V, I_D = 30mA, f = 12GHz	10	13	—	dBm
G_S	Associated gain	V_{DS} = 3V, I_D = 10mA, f = 12GHz	8	—	—	dB
NFmin	Minimum noise figure	V_{DS} = 3V, I_D = 10mA, f = 12GHz	—	—	2.3	dB
$R_{th(ch-a)}$	Thermal resistance *1	ΔVf method	—	—	625	°C/W

*1: Channel to ambient

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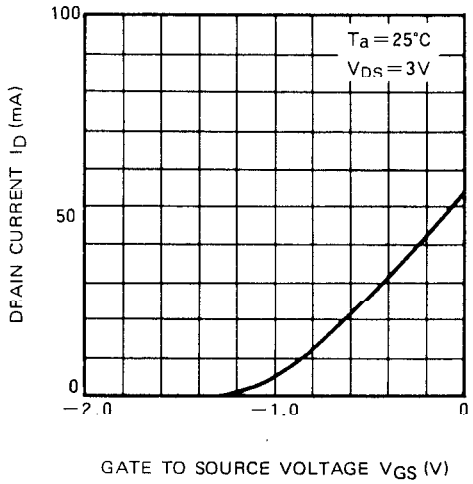
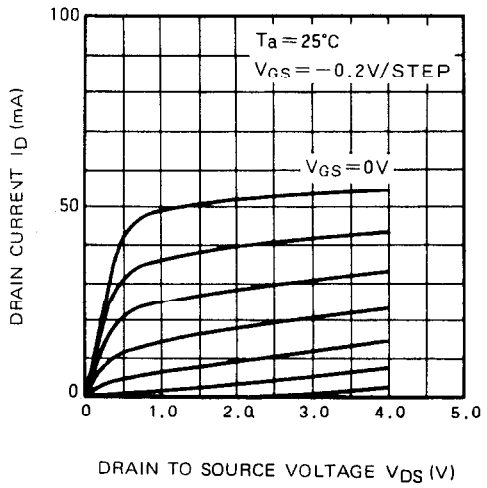
TYPICAL CHARACTERISTICS

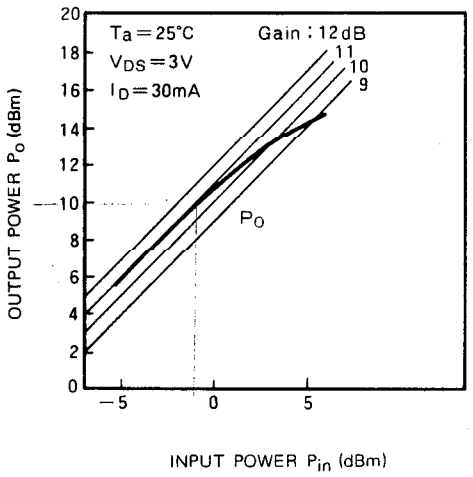
I_D vs. V_{GS}



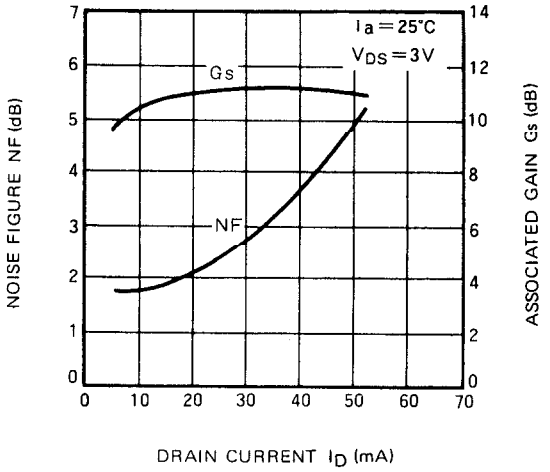
I_D vs. V_{DS}



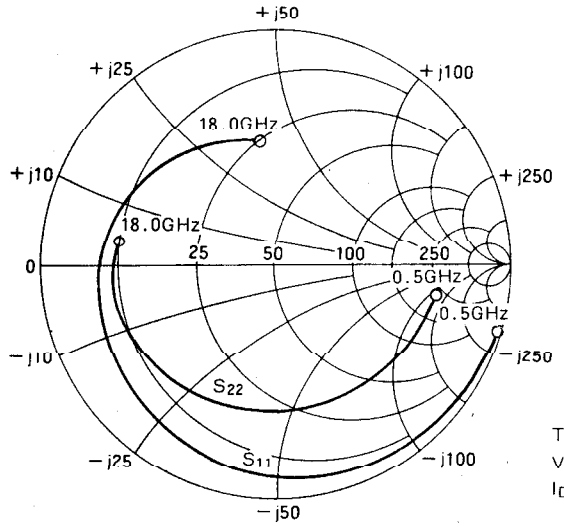
P_o vs. P_{in} (f=12GHz)



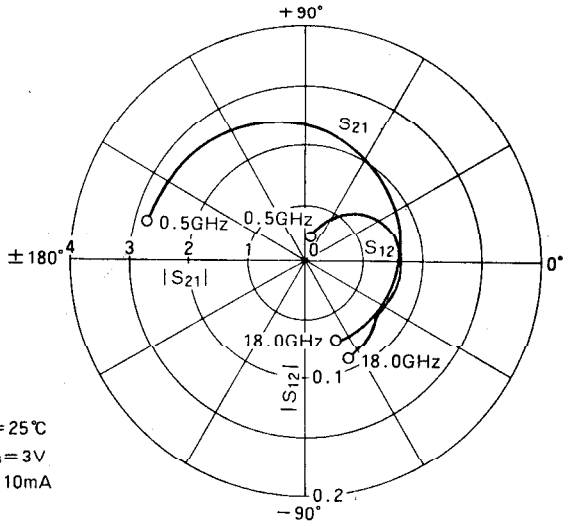
NF & G_S vs. I_D (f=12GHz)



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	0.997	− 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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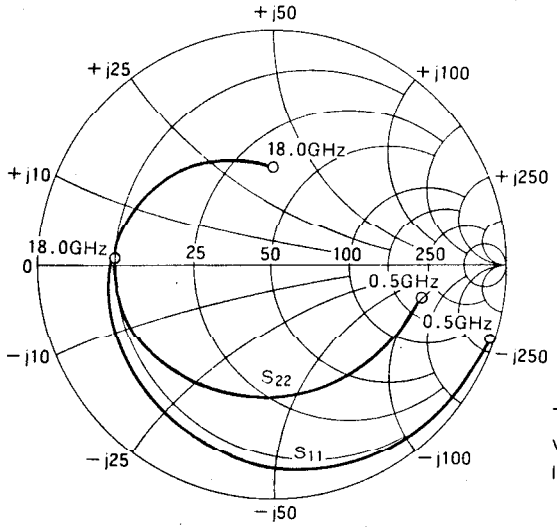
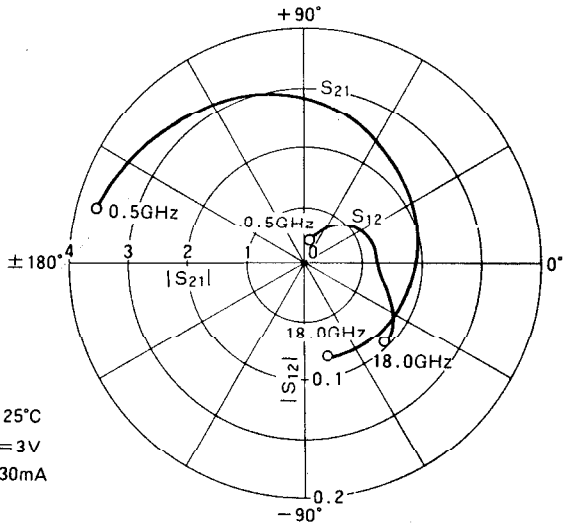
S_{11}, S_{22} vs. f



S_{21}, S_{12} vs. f

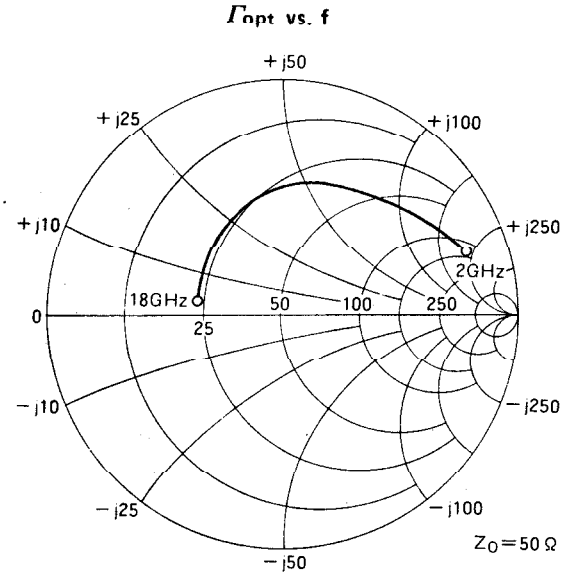


$T_a = 25°C$
$V_{DS} = 3V$
$I_D = 30mA$

S PARAMETERS (T_a=25℃, 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

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



Frequency (GHz)	Γ_{OPT}		Rn (Ω)	NFmin (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

Glp and P1dB (T_a=25°C, V_D=3V)

	f=4GHz		f=12GHz	
	I_D=10mA	I_D=30mA	I_D=10mA	I_D=30mA
Glp (dB)	15.9	16.9	11.7	12.0
P_{1dB} (dBm)	12.4	14.2	10.9	12.8