MGF1305

FOR MICROWAVE LOW-NOISE AMPLIFIERS N-CHANNEL SCHOTTKY BARRIER GATE TYPE

DESCRIPTIONS

The MGF1305 is a super low-noise GaAs FET with an N-channel Schottky gate, which 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 microstip circuit.

FEATURES

- Low noise figure NF = 1.6 (MAX.) @f = 12 GHz
- High associated gain G_S = 8.5 dB (MIN.) @f = 12 GHz
- High reliability and stability

APPLICATION

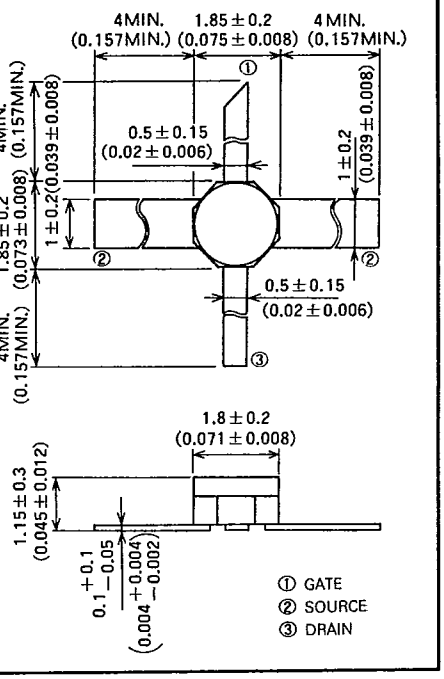
S- to Ku-band super low noise amplifiers

QUALITY GRADE

- GG

OUTLINE DRAWING

Unit. millimeters (inches)



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	70	mA
P_T	Total power dissipation	200	mW
Tch	Channel temperature	150	°C
Tstg	Storage temperature	−55~+150	°C
Rth(ch-a)	Thermal resistance	625	°C/W

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		13	30	70	mA
$V_{GS(off)}$	Gate to source cut-off voltage	V_{DS}=3V, I_D=100μA		−0.3		−3.5	V
gm	Transconductance	V_{DS}=3V, I_D=10mA		25	45		mS
Gs	Associated gain	V_{DS}=3V, I_D=10mA	f=4 GHz	13.0			dB
			f=12GHz	8.5			
NFmin	Minimum noise figure	V_{DS}=3V, I_D=10mA	f=4 GHz			0.6	dB
			f=12GHz			1.6	

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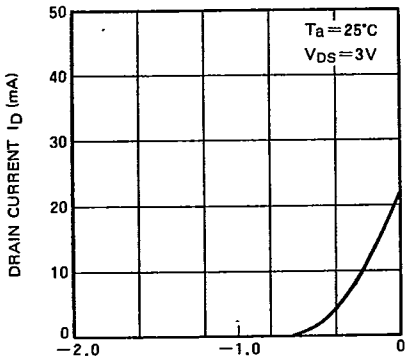
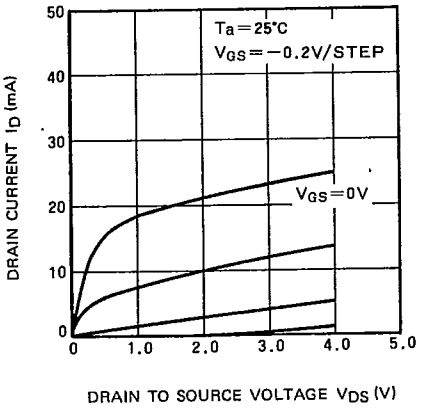
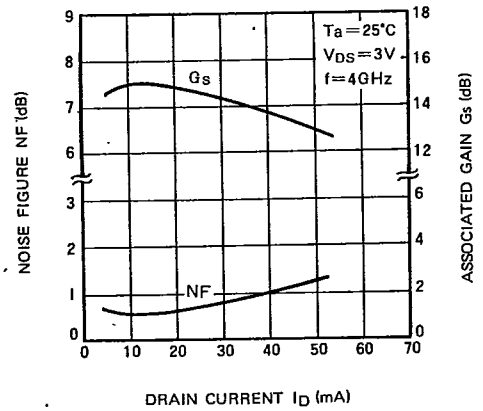
I_D vs. V_{GIS}



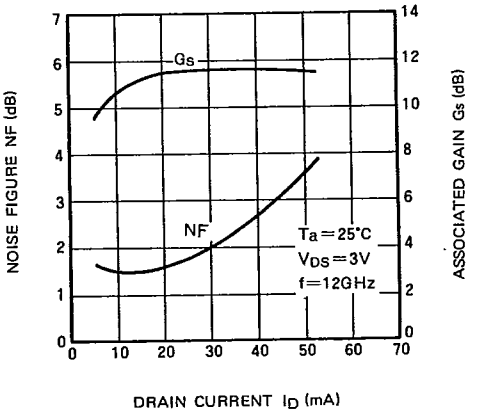
I_D vs. V_{DS}



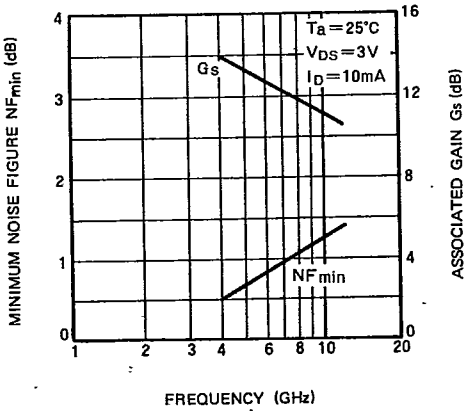
NF & Gs vs. I_D (f = 4GHz)



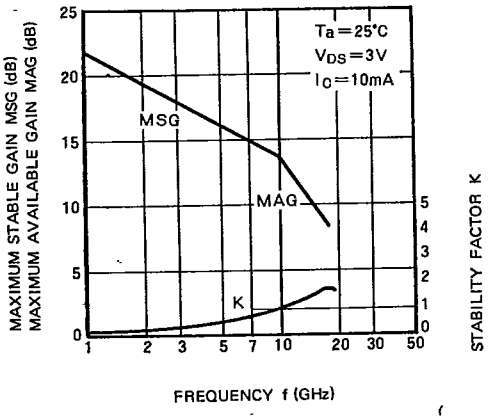
NF & Gs vs. I_D (f = 12GHz)



NF_{min} & Gs vs. f



MSG, MAG & K vs. f



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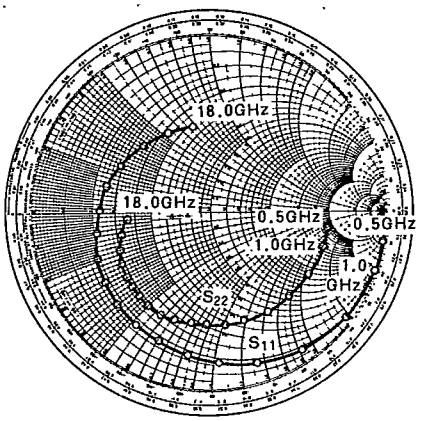
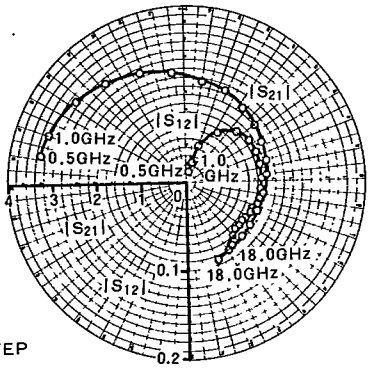
S_{11}, S_{22} vs. f



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



Ta=25°C
V_{DS}=3V
I_D=10mA
f=1GHz/STEP

S PARAMETERS (T_a=25°C, V_{DS}=3V, I_D=10mA)

f (GHz)	S_{11}		S_{12}		S_{21}		S_{22}	
	Magn.	Angle (deg.)	Magn.	Angle (deg.)	Magn.	Angle (deg.)	Magn.	Angle (deg.)
0.5	0.992	− 10.0	0.011	83.0	3.330	169.0	0.668	− 8.0
1.0	0.989	− 20.0	0.022	75.1	3.255	160.0	0.665	− 17.0
1.5	0.977	− 29.1	0.032	67.6	3.162	150.9	0.658	− 25.1
2.0	0.958	− 38.1	0.043	60.8	3.072	142.5	0.653	− 32.6
2.5	0.939	− 47.9	0.055	54.2	2.985	132.5	0.649	− 40.5
3.0	0.917	− 56.8	0.067	47.7	2.884	127.0	0.643	− 46.3
3.5	0.894	− 66.0	0.073	41.3	2.786	119.1	0.638	− 53.7
4.0	0.871	− 73.5	0.079	35.3	2.691	111.0	0.634	− 60.0
4.5	0.851	− 80.0	0.081	29.1	2.600	103.8	0.632	− 66.2
5.0	0.832	− 87.3	0.083	23.7	2.521	95.4	0.629	− 72.4
5.5	0.817	− 93.4	0.084	17.6	2.441	87.6	0.628	− 78.0
6.0	0.802	− 99.3	0.084	12.0	2.371	80.0	0.629	− 83.1
6.5	0.788	−106.0	0.084	6.1	2.307	72.3	0.630	− 87.5
7.0	0.776	−112.1	0.084	1.2	2.239	65.6	0.631	− 92.0
7.5	0.763	−118.0	0.084	− 3.9	2.163	59.0	0.632	− 96.3
8.0	0.753	−124.1	0.084	− 7.8	2.101	52.7	0.635	−100.5
8.5	0.744	−129.5	0.083	−10.8	2.049	46.2	0.635	−104.8
9.0	0.733	−135.6	0.083	−13.8	1.995	40.4	0.633	−108.7
9.5	0.722	−140.8	0.083	−16.1	1.950	34.4	0.631	−112.5
10.0	0.712	−146.1	0.082	−18.4	1.916	28.5	0.629	−116.7
10.5	0.701	−151.7	0.081	−20.7	1.872	22.0	0.626	−120.0
11.0	0.690	−157.0	0.080	−22.8	1.841	15.5	0.624	−123.5
11.5	0.678	−163.0	0.079	−25.2	1.820	9.0	0.618	−126.6
12.0	0.666	−169.2	0.079	−27.5	1.793	3.2	0.617	−130.0
12.5	0.653	−175.3	0.078	−29.8	1.772	− 3.8	0.614	−133.7
13.0	0.640	179.0	0.077	−32.1	1.748	− 9.7	0.611	−136.8
13.5	0.624	172.6	0.077	−33.5	1.738	−16.0	0.605	−140.0
14.0	0.607	166.0	0.076	−35.0	1.732	−22.0	0.599	−142.7
14.5	0.591	159.0	0.076	−36.9	1.728	−27.9	0.589	−146.3
15.0	0.573	151.5	0.075	−39.6	1.728	−34.2	0.579	−150.3
15.5	0.555	143.3	0.075	−41.0	1.734	−40.1	0.569	−154.0
16.0	0.542	134.5	0.076	−44.4	1.738	−46.2	0.556	−157.6
16.5	0.525	126.0	0.077	−47.2	1.764	−52.3	0.542	−161.8
17.0	0.513	118.0	0.079	−50.2	1.786	−58.2	0.525	−166.0
17.5	0.500	109.7	0.083	−54.5	1.816	−64.2	0.504	−170.0
18.0	0.487	101.5	0.089	−60.0	1.841	−69.3	0.479	−174.4

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

Freq. (GHz)	Γopt		Rn (Ω)	NFmin (dB)
	Mag.	Angle (deg)		
4	0.633	52.0	18.5	0.55
8	0.598	105.1	10.0	1.13
12	0.503	159.2	9.5	1.55
14	0.464	−168.0	11.5	1.67
18	0.411	− 97.0	20.0	1.92

HANDLING PRECAUTIONS FOR GaAs FETs

1. Check of Electrical Characteristics

(1) Measurement of DC Characteristics by Curve Tracer
Many curve tracers, if not properly grounded, exhibit a high leakage current from the high-voltage transformer, which can be a prime cause of failure or degradation of the FET. Measurement of the DC characteristics using a curve tracer is therefore not recommended. However, when tests using a curve tracer are required, first of all, check that the curve tracer is grounded to earth.
(2) Measurement of RF Characteristics
Before measurement, check that the measuring instruments are grounded to earth. Many instruments to measure RF characteristics such as RF power meters, network analyzers and so on, if not properly grounded to earth, sometimes allow a high AC leakage of up to several tens volts, which can be a cause of failure or degradation of the FET.

2. Installation of GaAs FET

When GaAs FET is soldered on a microstrip circuit, the following should be attended to,
(1) Properly ground the soldering iron to earth.
Leakage current from the soldering iron could cause failure or degradation of the FET.
(2) Solder the FET as promptly as possible at a low temperature. For a criterion, soldering in less than 8 seconds at a temperature of less than 250°C is recommended for each soldering process.

3. Bias Procedure and Conditions

When GaAs FET is biased, the following procedure is recommended.
(1) Slowly adjust the gate to source voltage, V_{GS}, to about −1V.
(2) Gradually increase the drain to source voltage, V_{DS}, from zero to a desired value.
(3) Adjust the drain current, I_D, to a desired value by controlling the gate to source voltage, V_{GS}.
When bias is released, the reverse procedure is recommended.
Be careful that the FET is not operated under conditions exceeding absolute maximum ratings.

4. Guaranteed Characteristics

All the graphic characteristics illustrated in this catalog are typical examples. The characteristics of individual devices as specified in the tables of absolute maximum ratings and electrical characteristics are guaranteed under the specified conditions.