

MITSUBISHI SEMICONDUCTOR <GaAs FET>

MGF1923

TAPE CARRIER SMALL SIGNAL GaAs FET

DESCRIPTION

The MGF1923, low noise GaAs FET with an N-channel Schottky gate, is designed for use in S to Ku band amplifiers. The MGF1923 is mounted in the super 12 tape.

FEATURES

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

APPLICATION

S to Ku band amplifiers

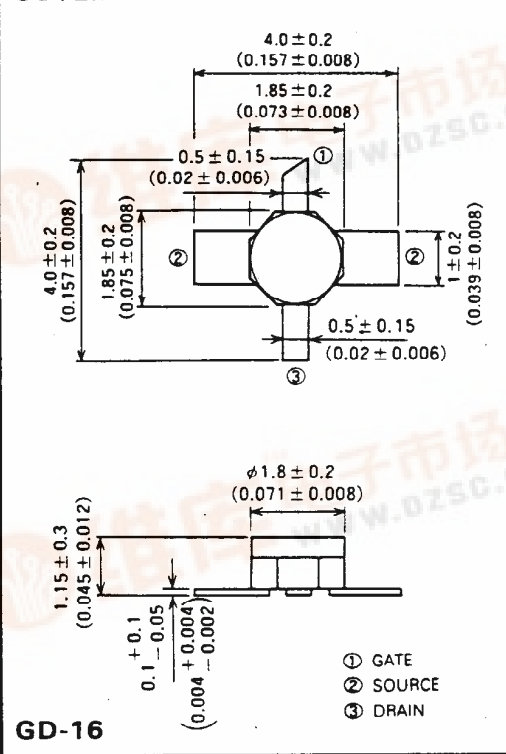
QUALITY GRADE

- GG

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

OUTLINE DRAWING



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	240	mW
T_{ch}	Channel temperature	175	°C
T_{stg}	Storage temperature	-55 ~ +175	°C

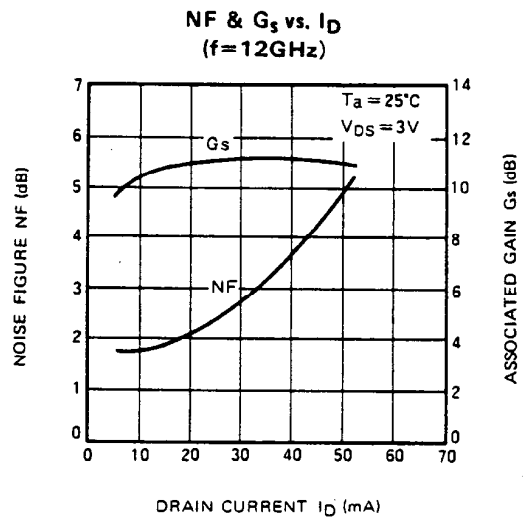
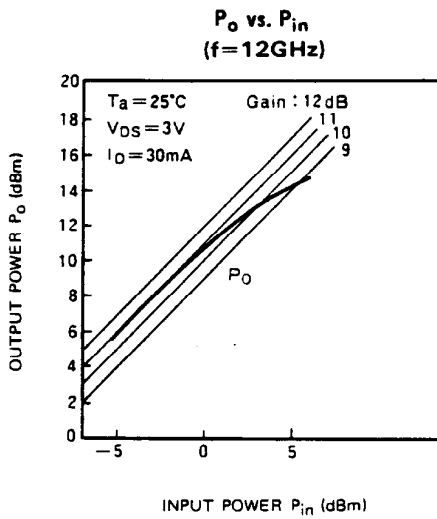
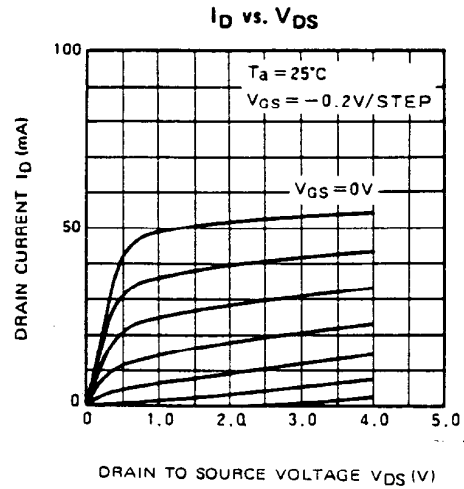
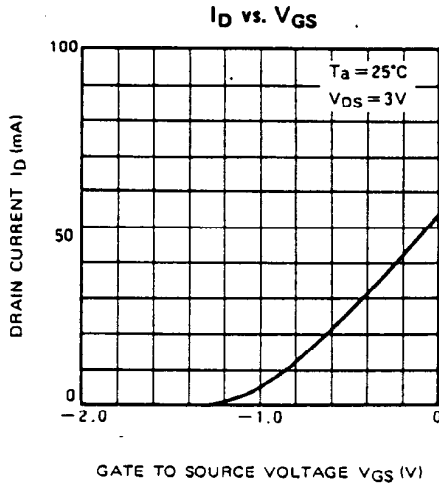
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$V_{(BR)GDO}$	Gate to drain breakdown voltage	$I_G = -100\mu\text{A}$	-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	$V_{DS} = 3\text{V}, I_D = 30\text{mA}, f = 12\text{GHz}$	9.0	11.0	—	dB
P_{1dB}	Output power at 1dB gain compression		10.0	13.0	—	dBm
G_s	Associated gain	$V_{DS} = 3\text{V}, I_D = 10\text{mA}, f = 12\text{GHz}$	8.0	—	—	dB
NFmin	Minimum noise figure		—	—	2.3	dB
$\theta_{th(ch-a)}$	Thermal resistance * 1	ΔV_I method	—	—	625	°C/W

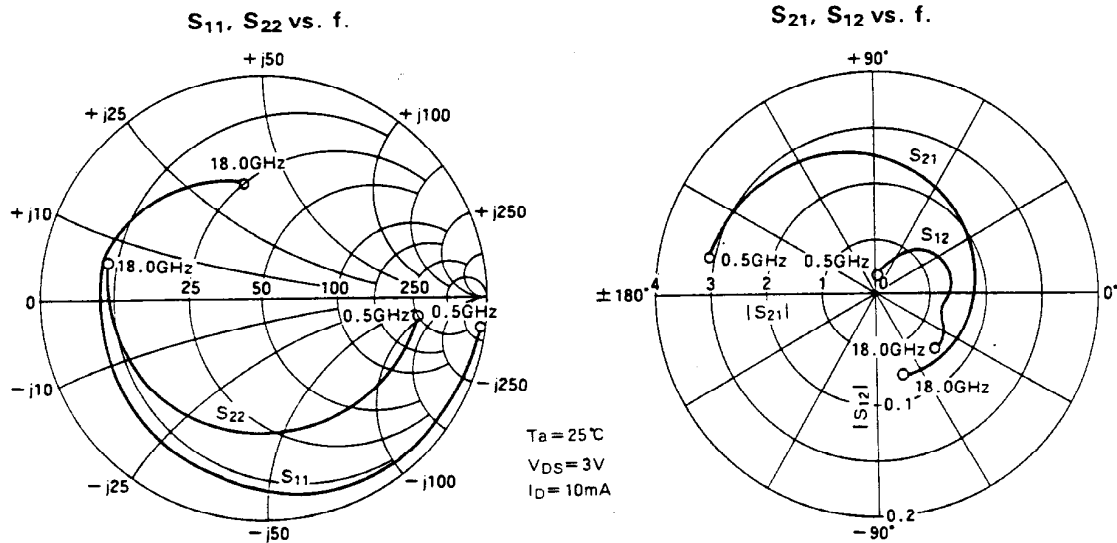


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TYPICAL CHARACTERISTICS



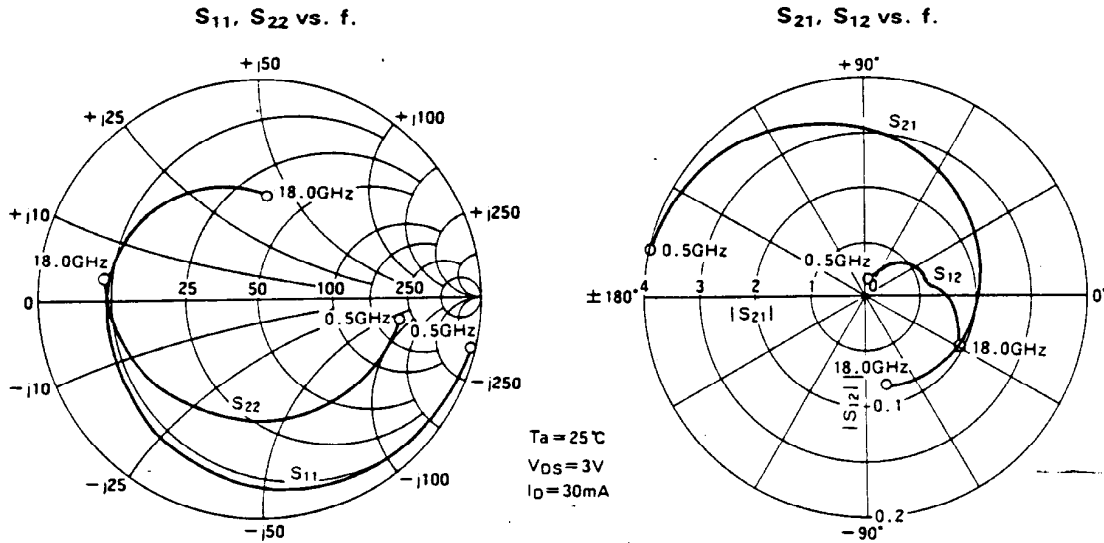
TAPE CARRIER SMALL SIGNAL GaAs FET



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	0.996	- 11.5	3.084	168.7	0.016	81.0	0.704	- 7.4	0.081	22.8
1.0	0.982	- 20.8	3.028	160.3	0.023	74.8	0.696	- 13.7	0.171	21.3
1.5	0.969	- 30.0	2.973	151.8	0.029	68.7	0.687	- 20.0	0.227	20.1
2.0	0.955	- 39.3	2.918	143.4	0.035	62.5	0.679	- 26.3	0.266	19.2
2.5	0.941	- 48.6	2.863	135.0	0.041	56.4	0.671	- 32.6	0.297	18.4
3.0	0.927	- 57.9	2.808	126.6	0.047	50.2	0.663	- 38.9	0.323	17.7
3.5	0.914	- 67.1	2.752	118.1	0.054	44.1	0.654	- 45.2	0.346	17.1
4.0	0.900	- 76.4	2.697	109.7	0.060	37.9	0.646	- 51.5	0.367	16.5
4.5	0.882	- 84.9	2.621	101.7	0.062	32.6	0.637	- 57.9	0.417	16.2
5.0	0.864	- 93.4	2.545	93.8	0.064	27.4	0.627	- 64.2	0.469	16.0
5.5	0.846	- 101.8	2.469	85.8	0.067	22.1	0.617	- 70.6	0.523	15.7
6.0	0.828	- 110.3	2.393	77.8	0.069	16.8	0.608	- 76.9	0.580	15.4
6.5	0.816	- 117.5	2.312	70.8	0.069	12.8	0.607	- 82.8	0.626	15.3
7.0	0.803	- 124.7	2.232	63.8	0.069	8.8	0.606	- 88.7	0.678	15.1
7.5	0.791	- 131.8	2.152	56.7	0.068	4.8	0.605	- 94.6	0.736	15.0
8.0	0.778	- 139.0	2.071	49.7	0.068	0.8	0.604	- 100.5	0.800	14.8
8.5	0.770	- 145.0	2.022	43.6	0.067	- 1.2	0.603	- 105.3	0.849	14.8
9.0	0.762	- 151.0	1.973	37.4	0.066	- 3.2	0.603	- 110.1	0.903	14.8
9.5	0.753	- 156.9	1.924	31.3	0.064	- 5.1	0.602	- 114.8	0.964	14.8
10.0	0.745	- 162.9	1.875	25.1	0.063	- 7.1	0.602	- 119.6	1.032	13.6
10.5	0.736	- 169.1	1.840	18.9	0.063	- 8.5	0.614	- 124.2	1.038	13.5
11.0	0.727	- 175.4	1.805	12.7	0.063	- 9.8	0.627	- 128.9	1.044	13.3
11.5	0.717	- 178.4	1.771	6.4	0.063	- 11.2	0.639	- 133.5	1.048	13.2
12.0	0.708	- 172.2	1.736	0.2	0.063	- 12.5	0.651	- 138.1	1.051	13.0
12.5	0.700	166.8	1.701	- 5.5	0.063	- 13.1	0.655	- 143.1	1.084	12.6
13.0	0.692	161.4	1.667	- 11.1	0.062	- 13.7	0.658	- 148.0	1.121	12.2
13.5	0.685	155.9	1.633	- 16.8	0.062	- 14.3	0.662	- 153.0	1.162	11.8
14.0	0.677	150.5	1.598	- 22.4	0.061	- 14.9	0.665	- 157.9	1.208	11.4
14.5	0.665	144.8	1.590	- 28.6	0.063	- 17.5	0.672	- 162.3	1.194	11.4
15.0	0.653	139.0	1.583	- 34.8	0.064	- 20.1	0.680	- 166.6	1.178	11.4
15.5	0.642	133.3	1.575	- 40.9	0.066	- 22.7	0.687	- 171.0	1.162	11.4
16.0	0.630	127.5	1.567	- 47.1	0.067	- 25.3	0.694	- 175.3	1.144	11.4
16.5	0.603	120.1	1.555	- 53.3	0.068	- 29.7	0.699	- 179.6	1.202	10.9
17.0	0.576	112.7	1.542	- 59.4	0.069	- 34.0	0.703	- 176.2	1.256	10.4
17.5	0.549	105.2	1.529	- 65.6	0.071	- 38.4	0.708	- 172.0	1.304	10.0
18.0	0.522	97.8	1.517	- 71.7	0.072	- 42.7	0.712	- 167.7	1.347	9.7

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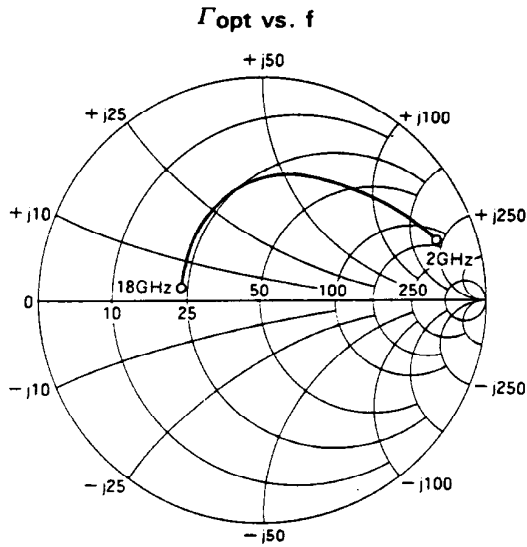


S PARAMETERS ($T_a = 25^\circ\text{C}$, $V_{DS} = 3\text{V}$, $I_D = 30\text{mA}$)

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	-13.5	3.989	167.7	0.014	80.4	0.649	-8.4	0.064	24.6
1.0	0.979	-23.3	3.896	159.0	0.019	74.7	0.641	-14.5	0.186	23.2
1.5	0.962	-33.2	3.803	150.4	0.023	69.1	0.632	-20.5	0.263	22.1
2.0	0.945	-43.0	3.710	141.7	0.028	63.4	0.624	-26.6	0.318	21.2
2.5	0.928	-52.9	3.617	133.1	0.033	57.8	0.616	-32.7	0.361	20.4
3.0	0.910	-62.7	3.524	124.4	0.037	52.1	0.608	-38.8	0.398	19.7
3.5	0.893	-72.6	3.431	115.8	0.042	46.5	0.599	-44.8	0.430	19.1
4.0	0.876	-82.4	3.338	107.1	0.047	40.8	0.591	-50.9	0.460	18.5
4.5	0.856	-91.4	3.223	99.0	0.049	36.5	0.582	-57.0	0.520	18.2
5.0	0.837	-100.4	3.109	91.0	0.050	32.1	0.574	-63.1	0.582	17.9
5.5	0.817	-109.4	2.994	82.9	0.052	27.8	0.565	-69.1	0.649	17.6
6.0	0.798	-118.4	2.879	74.8	0.054	23.4	0.556	-75.2	0.720	17.3
6.5	0.785	-125.7	2.774	67.9	0.054	21.0	0.557	-80.9	0.772	17.1
7.0	0.771	-132.9	2.668	61.0	0.054	18.7	0.558	-86.6	0.831	16.9
7.5	0.758	-140.2	2.563	54.1	0.054	16.3	0.558	-92.3	0.897	16.7
8.0	0.745	-147.4	2.458	47.2	0.054	13.9	0.559	-98.0	0.971	16.6
8.5	0.736	-153.3	2.393	41.2	0.054	13.5	0.561	-102.7	1.012	15.8
9.0	0.727	-159.3	2.329	35.1	0.054	13.1	0.562	-107.5	1.057	14.9
9.5	0.718	-165.2	2.265	29.1	0.054	12.7	0.564	-112.2	1.107	14.2
10.0	0.709	-171.1	2.200	23.0	0.054	12.3	0.565	-116.9	1.163	13.7
10.5	0.700	-177.4	2.155	16.8	0.056	11.9	0.579	-121.5	1.123	13.7
11.0	0.692	176.3	2.110	10.6	0.058	11.6	0.593	-126.0	1.084	13.8
11.5	0.683	170.0	2.064	4.3	0.060	11.2	0.606	-130.6	1.047	14.0
12.0	0.674	163.7	2.019	-1.9	0.062	10.8	0.620	-135.1	1.011	14.5
12.5	0.665	158.1	1.979	-7.6	0.064	9.5	0.626	-140.0	1.010	14.3
13.0	0.656	152.5	1.939	-13.3	0.065	8.3	0.632	-144.8	1.010	14.1
13.5	0.646	146.9	1.898	-19.0	0.067	7.0	0.637	-149.7	1.012	13.8
14.0	0.637	141.3	1.858	-24.7	0.069	5.7	0.643	-154.5	1.016	13.5
14.5	0.623	135.2	1.846	-30.9	0.072	2.1	0.653	-158.8	0.981	14.1
15.0	0.610	129.0	1.833	-37.2	0.075	-1.6	0.663	-163.2	0.947	13.9
15.5	0.596	122.9	1.820	-43.4	0.078	-5.3	0.673	-167.5	0.914	13.7
16.0	0.582	116.7	1.808	-49.6	0.081	-8.9	0.683	-171.8	0.881	13.5
16.5	0.555	108.9	1.785	-56.5	0.084	-13.8	0.690	-176.1	0.901	13.3
17.0	0.528	101.2	1.762	-63.5	0.087	-18.7	0.697	179.6	0.919	13.1
17.5	0.501	93.4	1.739	-70.4	0.090	-23.5	0.704	175.3	0.933	12.9
18.0	0.474	85.6	1.716	-77.3	0.093	-28.4	0.711	171.0	0.944	12.7

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



Frequency (GHz)	Γ_{OPT}		R_n (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

G_{ip} 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 _{ip} (dB)	15.9	16.9	11.7	12.0
P _{1dB} (dBm)	12.4	14.2	10.9	12.8