MGFC1403

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

DESCRIPTION

The MGFC1403 low-noise GaAs FET with an N-channel Schottky gate is designed for use in S to Ku band amplifiers.

FEATURES

- Low noise figure
  NFmin. = 2.3dB (MAX.) @ f=12GHz
- High associated gain
  Gs=8dB (MIN.) @ f=12GHz

OUTLINE DRAWING

Unit:millimeters

Fig.1

APPLICATION

S to Ku band low noise amplifiers.

RECOMMENDED BIAS CONDITIONS

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

Keep safety first in your circuit designs!

Mitsubishi Electric Corporation puts the maximum effort into making semiconductor products better and more reliable , but there is always the possibility that trouble may occur with them . Trouble with semiconductors may lead to personal injury , fire or property damage . Remember to give due consideration to safety when making your circuit designs , with appropriate measure such as (i) placement of substitutive , auxiliary circuits , (ii) use of non-flammable material or (iii) prevention against any malfunction or mishap.

ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

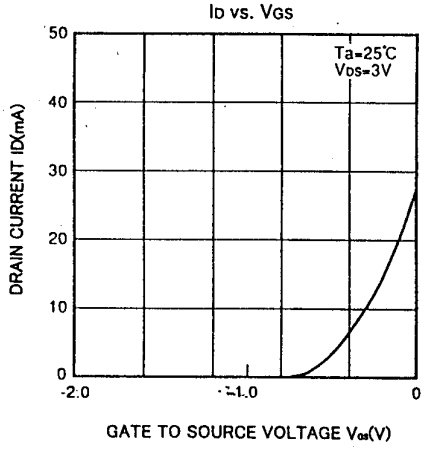
Symbol	Parameter	Ratings	Unit
V_{GDO}	Gate to drain voltage	-6	V
V_{GSO}	Gate to source voltage	-6	V
I_D	Drain current	80	mA
PT	Total power dissipation	240	mW
T_{ch}	Channel temperature	175	°C
T_{stg}	Storage temperature	-55~+175	°C

ELECTRICAL CHARACTERISTICS (Ta=25°C)

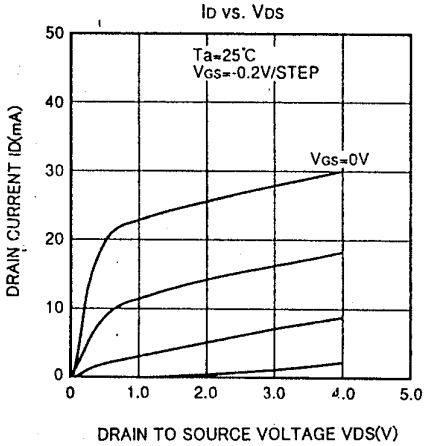
Symbol	Parameter	Test conditions	Limits			Unit
			MIN.	TYP.	MAX.	
$V_{(BR)GDO}$	Gate to drain breakdown voltage	I_G=-100μA	-6	--	--	V
$V_{(BR)GSO}$	Gate to source breakdown voltage	I_G=-100μA	-6	--	--	V
I_{GSS}	Gate to source leakage current	V_{GS}=-3V,V_{DS}=0V	--	--	10	μA
I_{DSS}	Saturated drain current	V_{GS}=0V,V_{DS}=3V	15	40	80	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	20	40	--	mS
Gs	Associated gain	V_{DS}=3V, I_D=10mA,f=12 GHz	8			dB
NFmin.	Minimum noise figure	V_{DS}=3V, I_D=10mA,f=12 GHz	--	--	2.3	dB

TYPICAL CHARACTERISTICS (Ta=25°C)

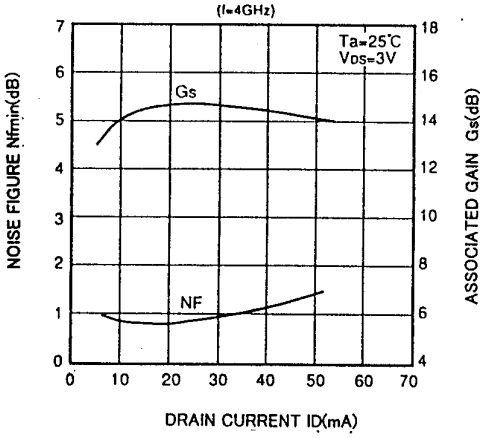
ID vs. VGS



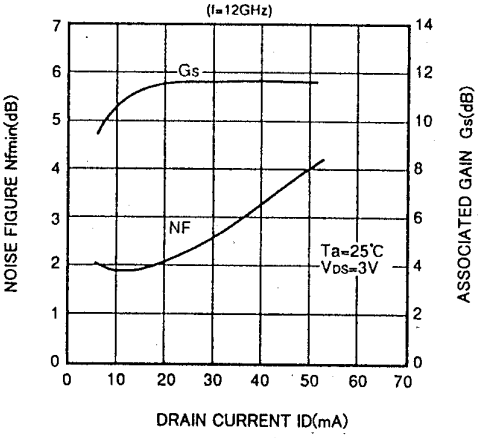
ID vs. VDS



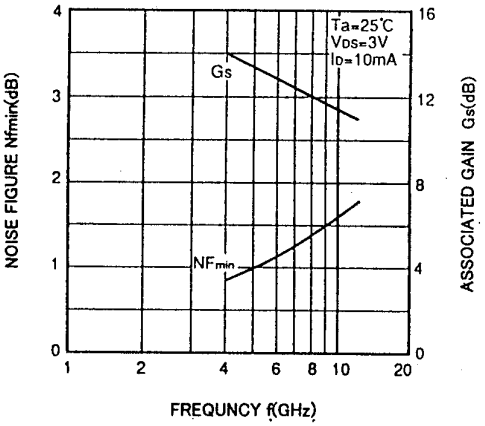
NF & Gs vs. ID (f=4GHz)



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



NFmin & Gs vs.f



TYPICAL CHARACTERISTICS

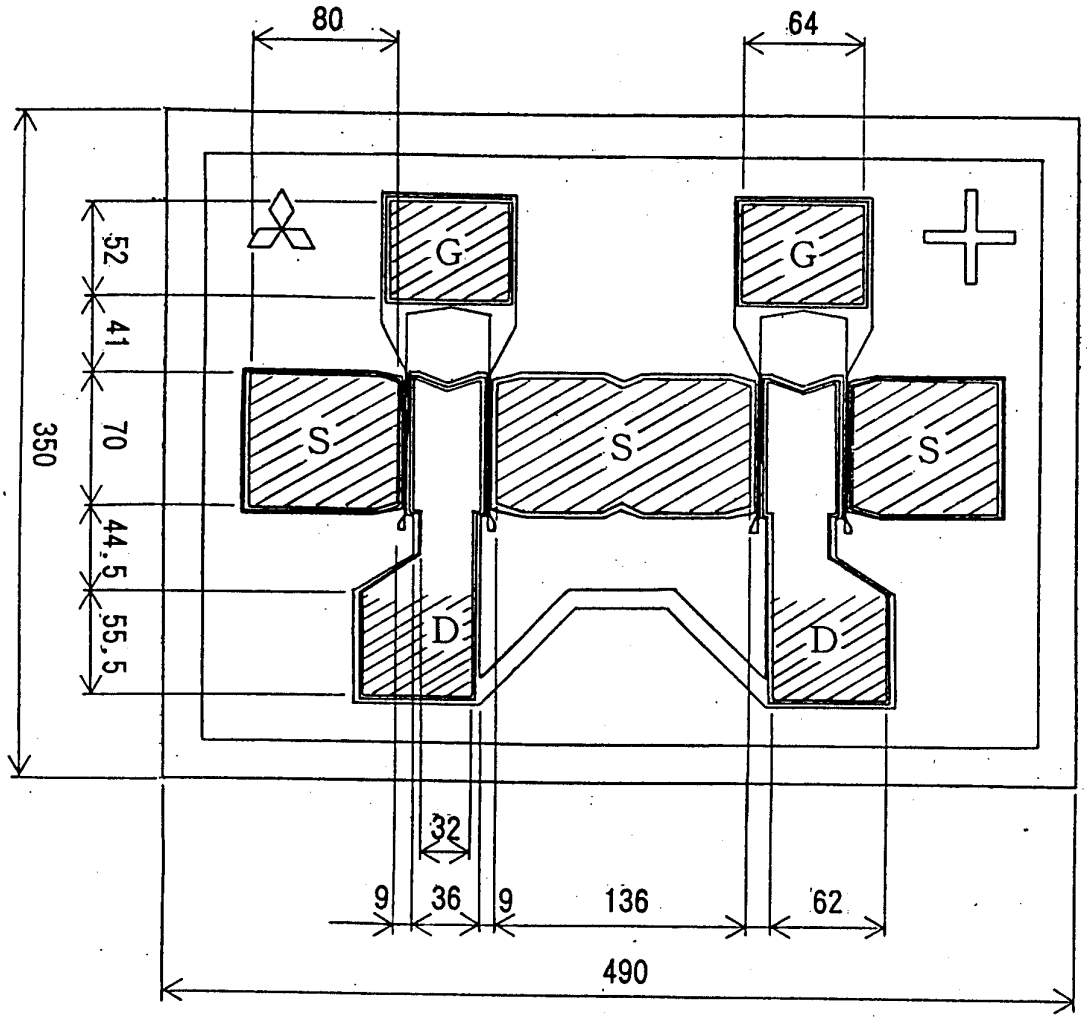
S PARAMETERS (Ta=25°C,VDS=3V,ID=10mA)

f	S11		S21		S12		S22		MSG/MAG	
(GHz)	Magn.	Angle	Magn.	Angle	Magn.	Angle	Magn.	Angle	(dB)	K
1	0.994	−11.5	3.482	169.0	0.019	82.8	0.736	−7.3	22.6	0.07
2	0.976	−22.8	3.409	158.2	0.038	75.8	0.727	−14.5	19.6	0.14
3	0.948	−33.7	3.297	147.7	0.054	69.2	0.712	−21.4	17.8	0.20
4	0.914	−44.1	3.158	137.8	0.069	63.2	0.694	−27.9	16.6	0.27
5	0.877	−53.8	3.004	128.5	0.082	57.7	0.674	−33.9	15.7	0.34
6	0.839	−63.0	2.846	119.8	0.092	52.8	0.655	−39.6	14.9	0.40
7	0.803	−71.5	2.689	111.6	0.101	48.6	0.637	−44.8	14.3	1.00
8	0.769	−79.6	2.539	103.9	0.108	44.8	0.621	−49.8	13.7	0.53
9	0.737	−87.1	2.398	96.8	0.114	41.6	0.607	−54.4	13.2	0.59
10	0.709	−94.2	2.268	90.0	0.119	38.8	0.595	−58.9	12.8	0.65
11	0.684	−100.9	2.148	83.6	0.122	36.4	0.585	−63.2	12.4	0.70
12	0.662	−107.2	2.038	77.6	0.125	34.3	0.577	−67.3	12.1	0.75
13	0.643	−113.1	1.937	71.8	0.128	32.6	0.571	−71.4	11.8	0.80
14	0.626	−118.9	1.845	66.3	0.130	31.2	0.566	−75.4	11.3	0.85
15	0.612	−124.3	1.761	61.0	0.132	30.1	0.563	−79.3	11.3	0.89
16	0.600	−129.5	1.683	55.9	0.133	29.2	0.562	−83.1	11.0	0.93
17	0.590	−134.4	1.612	51.0	0.135	28.5	0.561	−87.0	10.8	0.97
18	0.582	−139.2	1.546	46.3	0.136	28.0	0.562	−90.8	10.6	1.00
19	0.575	−143.8	1.485	41.7	0.137	27.7	0.564	−94.6	9.4	1.02
20	0.570	−148.3	1.428	37.2	0.139	27.5	0.566	−98.3	8.9	1.04
21	0.565	−152.6	1.375	32.9	0.141	27.5	0.569	−102.1	8.4	1.06
22	0.562	−156.7	1.325	28.7	0.143	27.6	0.574	−105.8	8.1	1.07
23	0.560	−160.8	1.278	24.6	0.145	27.8	0.578	−109.5	7.8	1.07
24	0.559	−164.7	1.233	20.7	0.147	28.0	0.583	−113.1	7.6	1.07
25	0.558	−168.5	1.190	16.8	0.150	28.3	0.589	−116.8	4.5	1.06
26	0.559	−172.2	1.150	13.0	0.153	28.6	0.595	−120.4	7.4	1.05

OUTLINE DRAWING

Unit : μ m

Fig. 1



Chip Thickness : 130±20 μ m

TECHNICAL NOTE

1. Characteristics and quality assurance

1.1 Electrical characteristics

a. DC characteristics on spec. sheet show the test conditions and values using wafer-prober. DC characteristics are tested 100% devices.

b. RF characteristics are tested using the corresponding packaged FET. When more than 80% 0f the samples satisfy the value of RF characteristics on spec. sheet , that wafer is accepted for shipment.

1.2 Quality assurance and reliability

a. Mechanical characteristics are tested using corresponding package with sampling test.

b. Visual inspection is complied with MITSUBISHI's technical note.

c. The electrical characteristics and the quality assurance test are sampling test. And so the shipped chips are contained some sub-standard articles.

d. After opening the packing , the quality of chips are influenced with storage conditions. Our recommended storage conditions and period is as follows:

Ta=25±3°C

MITSUBISHI's packing + Desiccator	6 months
Opened packing + Desiccator	2 months

In the desiccator , leave the chips in the pack keeping up-side-up and store in a clean and dry enviroment , preferable dry N2.

e. Packing quantity

Standard : 100 pcs. or 25 pcs. / each waffle pack

Custom order : 25~100 pcs. / each waffle pack by 25 pcs. step

In case of long storage exceeding 2 months at customer after opening the packing , total quantity of order shall be separated and small unit quantity of each orders shall be custome ordered. In this case , we may prepare special spec. No. for each cuatomer. (ex . -21,-22 ...)

1.3 Others

The device shall not be returned in the following case.

a. Inadequate storage

b. Mishandling

c. Incorrect die/wire bonding

d. RF characteristics failure rate less than 30%.

2. Ordering information

Spec. No.	Visual Grade	Unit quantity for each waffle pack
-A01	A	100 pcs.
-A02	B	
-A03	C	
-A11	A	25 pcs.
-A12	B	
-A13	C	