

DESCRIPTION

The MGFC4419G low-noise HEMT (High Electron Mobility Transistor) is designed for use in X to K band amplifiers.

FEATURES

- Low noise figure
 $NF_{min.} = 0.50dB (MAX.)$ @ $f=12GHz$
- High associated gain
 $G_s=12.0dB (MIN.)$ @ $f=12GHz$

APPLICATION

X to K band low noise amplifiers.

OUTLINE DRAWING

Unit: millimeters

Fig.1

RECOMMENDED BIAS CONDITIONS

$V_{DS}=2V, I_D=10mA$
 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 ($T_a=25^{\circ}C$)

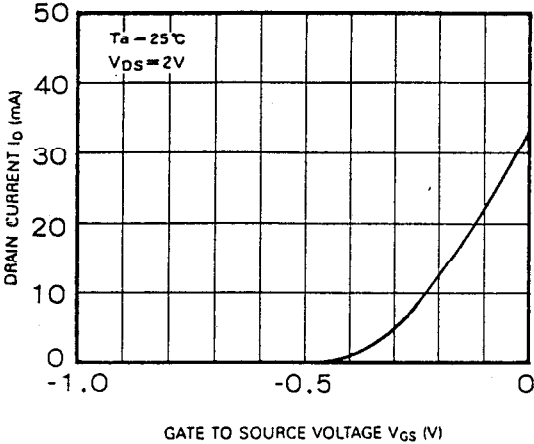
Symbol	Parameter	Ratings	Unit
V_{GDO}	Gate to drain voltage	-4	V
V_{GSO}	Gate to source voltage	-4	V
I_D	Drain current	60	mA
PT	Total power dissipation	50	mW
T_{ch}	Channel temperature	125	$^{\circ}C$
T_{stg}	Storage temperature	-65~+125	$^{\circ}C$

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

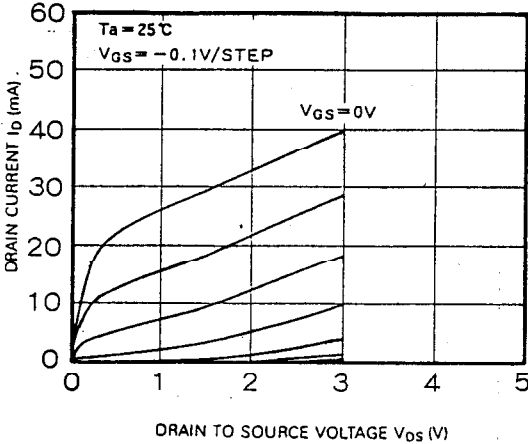
Symbol	Parameter	Test conditions	Limits			Unit
			MIN.	TYP.	MAX.	
$V_{(BR)GDO}$	Gate to drain breakdown voltage	$I_G=-10\mu A$	-3	--	--	V
I_{GSS}	Gate to source leakage current	$V_{GS}=-2V, V_{DS}=0V$	--	--	50	μA
I_{DSS}	Saturated drain current	$V_{GS}=0V, V_{DS}=2V$	15	--	60	mA
$V_{GS(off)}$	Gate to source cut-off voltage	$V_{DS}=2V, I_D=500\mu A$	-0.1	--	-1.5	V
gm	Transconductance	$V_{DS}=2V, I_D=10mA$	--	75	--	mS
G_s	Associated gain	$V_{DS}=2V, I_D=10mA$	12.0	13.5	--	dB
$NF_{min.}$	Minimum noise figure	$f=12GHz$	--	--	0.50	dB

TYPICAL CHARACTERISTICS

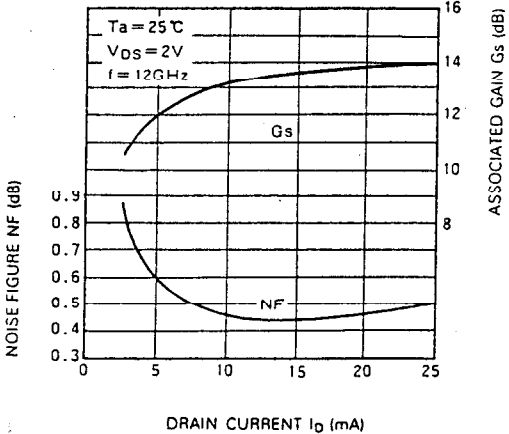
ID vs. VGS



ID vs. VDS



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



TYPICAL CHARACTERISTICS

S PARAMETERS (Ta=25°C, VDS=2V, ID=10mA)

f (GHz)	S11		S21		S12		S22		MSG/MAG (dB)	K
	Magn.	Angle	Magn.	Angle	Magn.	Angle	Magn.	Angle		
1	0.994	-12.2	5.908	169.6	0.019	82.3	0.660	-8.9	24.9	0.017
2	0.976	-24.3	5.790	159.4	0.037	74.9	0.645	-17.6	21.9	0.038
3	0.950	-36.0	5.608	149.5	0.054	67.7	0.623	-26.0	20.1	0.065
4	0.917	-47.3	5.380	140.0	0.069	61.1	0.595	-34.0	18.9	0.100
5	0.880	-58.1	5.123	131.1	0.083	54.9	0.564	-41.6	17.9	0.143
6	0.842	-68.4	4.854	122.7	0.094	49.3	0.531	-48.7	17.1	0.192
7	0.805	-78.2	4.585	114.8	0.103	44.2	0.498	-55.5	16.5	0.246
8	0.771	-87.6	4.324	107.3	0.111	39.6	0.466	-61.9	15.9	0.304
9	0.739	-96.5	4.076	100.3	0.117	35.4	0.436	-68.1	15.4	0.364
10	0.711	-104.9	3.843	93.7	0.122	31.7	0.407	-74.1	15.0	0.425
11	0.687	-113.1	3.626	87.4	0.127	28.3	0.381	-79.9	14.6	0.486
12	0.666	-120.9	3.426	81.4	0.130	25.3	0.357	-85.6	14.2	0.546
13	0.648	-128.3	3.241	75.7	0.133	22.5	0.335	-91.4	13.9	0.604
14	0.634	-135.5	3.071	70.2	0.136	20.0	0.316	-97.2	13.6	0.660
15	0.622	-142.3	2.914	64.9	0.138	17.7	0.298	-103.0	13.3	0.713
16	0.613	-148.9	2.770	59.8	0.139	15.6	0.283	-109.0	13.0	0.763
17	0.607	-155.2	2.636	54.8	0.141	13.8	0.270	-115.1	12.7	0.810
18	0.603	-161.3	2.513	50.0	0.143	12.0	0.259	-121.4	12.5	0.853
19	0.600	-167.0	2.398	45.3	0.144	10.5	0.250	-127.8	12.2	0.892
20	0.600	-172.6	2.292	40.7	0.145	9.0	0.243	-134.3	12.0	0.927
21	0.601	-177.9	2.193	36.3	0.146	7.7	0.238	-140.9	11.8	0.958
22	0.603	177.0	2.100	31.9	0.148	6.4	0.235	-147.5	11.5	0.984
23	0.606	172.2	2.013	27.7	0.149	5.3	0.234	-154.1	10.8	1.006
24	0.610	167.5	1.931	23.5	0.151	4.2	0.235	-160.6	10.1	1.024
25	0.616	163.0	1.855	19.4	0.152	3.1	0.238	-166.9	9.7	1.037
26	0.621	158.7	1.782	15.4	0.154	2.1	0.242	-173.0	9.3	1.045

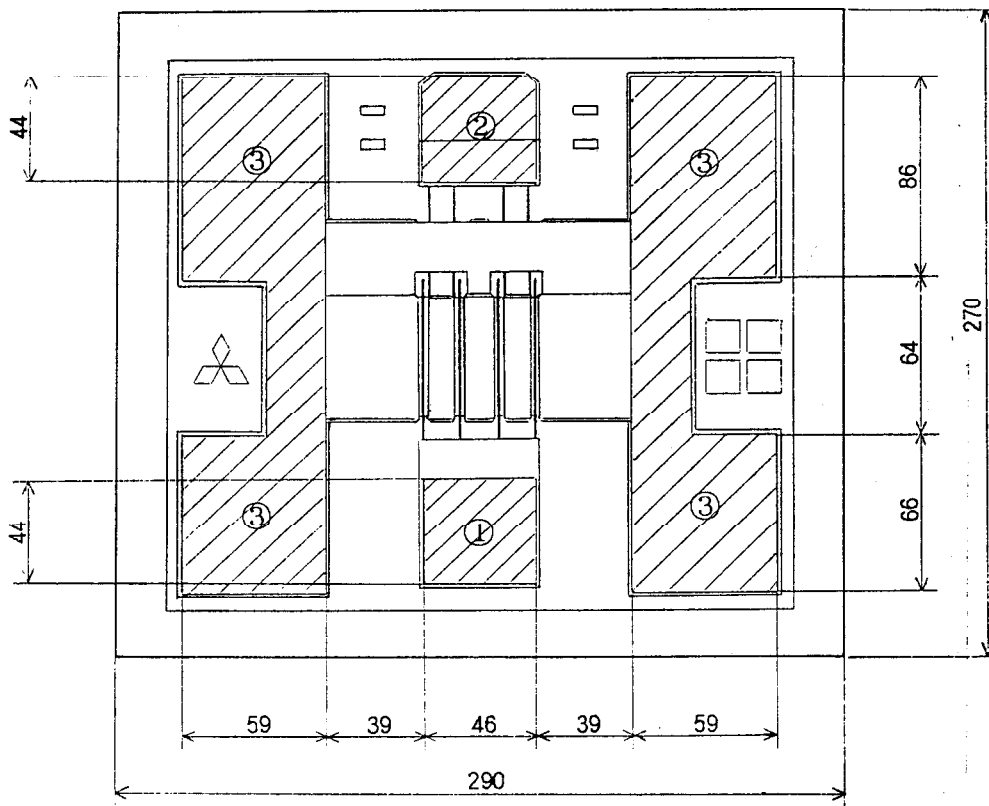
NOISE PARAMETERS (Ta=25°C, VDS=2V, ID=10mA)

f (GHz)	Fopt.		Rn (Ω)	NFmin. (dB)	Gs (dB)
	Magn.	Angle			
4	0.71	33.0	18.0	0.24	18.3
8	0.62	61.1	14.6	0.35	15.9
12	0.55	97.0	12.2	0.45	13.5
18	0.48	123.8	10.3	0.63	9.9
22	0.45	148.1	11.0	0.78	7.5
26	0.45	173.2	12.4	0.98	5.1

OUTLINE DRAWING

Fig. 1

Unit : μm



Chip Thickness : $105^{+35}_{-30} \mu\text{m}$

- ①: Gate
- ②: Drain
- ③: Source

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% of 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:

$$T_a = 25 \pm 3^\circ\text{C}$$

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 environment, 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 custom ordered. In this case, we may prepare special spec. No. for each customer. (ex. -A21,-A22 ...)

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	