SONY. # 2SK676H5

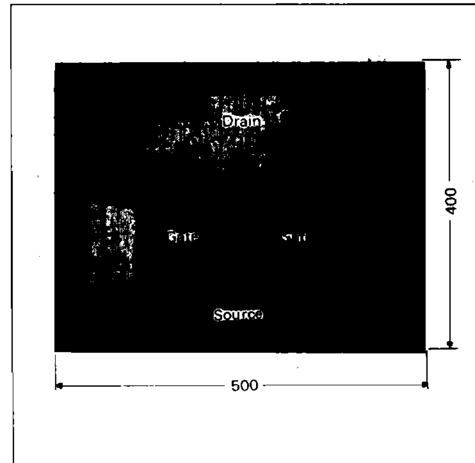
AlGaAs/GaAs Low Noise Microwave HEMT CHIP

Description

The 2SK676H5 is an AlGaAs/GaAs HEMT chip fabricated by MOCVD (Metal Organic Chemical Vapor Deposition). This 0.5 micron gate FET features very low noise figure and high gain, and is suitable for a wide range of front-end amplifier applications including satellite reception and other communications systems up to K-band.

Chip outline

Unit: μm



Features

- Low noise figure
- Excellent device uniformity
- High gain
- Wide band

Structure

AlGaAs/GaAs N-channel HEMT chip
Twin gate-pad π geometry

Absolute Maximum Ratings (Ta=25°C)

• Drain to source voltage	V_{DS}	5	V
• Gate to source voltage	V_{GSO}	−3.5	V
• Drain current	I_D	70	mA

Electrical Characteristics

Ta=25°C

Item	Symbol	Condition		Min.	Typ.	Max.	Unit
Gate to source cutoff current	I_{GSS}	V_{DS}=0V, V_{GS}=−3V				−100	μA
Drain current	I_{DSS}	V_{DS}=2V, V_{GS}=0V		10	40	70	mA
Gate to source cutoff voltage	$V_{GS(OFF)}$	V_{DS}=2V, I_D=500μA		−0.2	−1.5	−3.0	V
Forward transfer admittance	Y_{fs}	V_{DS}=2V, I_D=10mA		25	40		ms
Noise figure	NF	V_{DS}=2V, I_D=10mA	f=12GHz			1.4	dB
Associated gain at NF min.	Ga	V_{DS}=2V I_D=10mA	f=12GHz	9	11		dB

Noise figure ranks determined on a sampling basis by measuring ceramic-mounted devices.

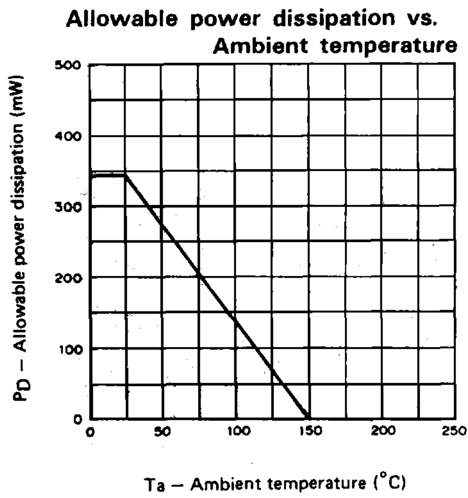
Noise Figure Classification (f=12 GHz)

	Min.	Typ.	Max.	
2SK676H5-1	—	—	1.0	dB
2SK676H5-2	—	—	1.2	
2SK676H5-3	—	—	1.4	

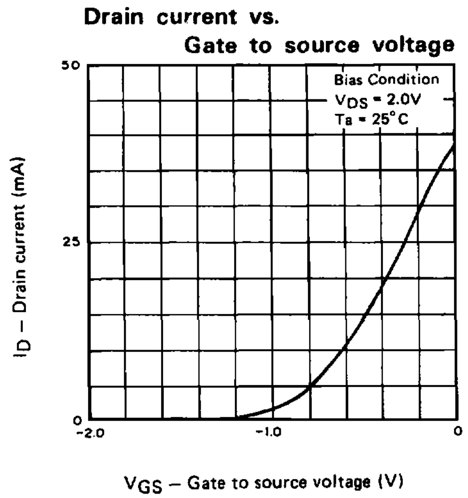
V_{DS}=2V
I_D=10mA

E90180 – ST

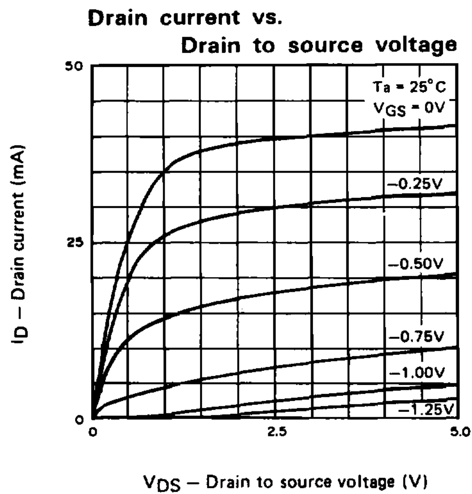
Allowable power dissipation vs. Ambient temperature



Drain current vs. Gate to source voltage



Drain current vs. Drain to source voltage

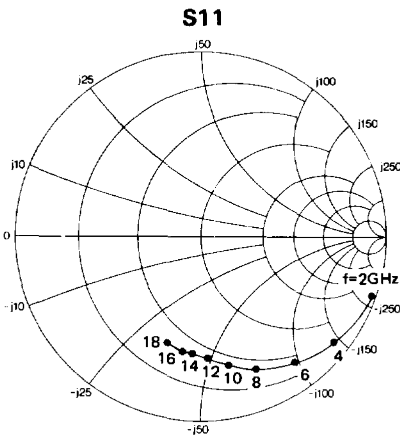


S-Parameters vs. Frequency Characteristics

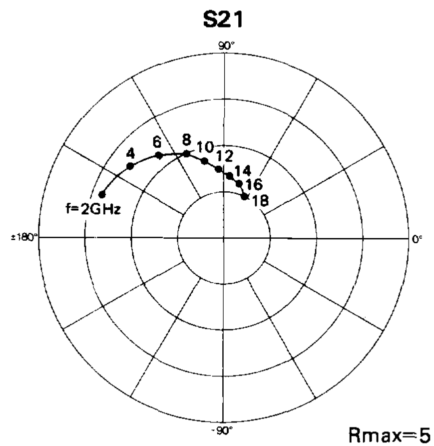
V_{DS}=2V, I_D=10 mA

f (GHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
2	0.976	−20.0	3.415	161.1	0.030	79.2	0.744	−10.1
4	0.916	−38.6	3.164	143.8	0.057	69.8	0.723	−19.0
6	0.852	−54.2	2.819	129.4	0.076	62.2	0.700	−27.2
8	0.775	−67.7	2.482	115.3	0.089	55.9	0.671	−32.6
10	0.717	−78.3	2.154	105.0	0.096	52.8	0.657	−37.2
12	0.667	−87.2	1.897	94.4	0.103	52.6	0.644	−41.4
14	0.631	−93.7	1.666	85.4	0.103	55.0	0.648	−45.1
16	0.625	−99.4	1.542	75.4	0.105	58.8	0.627	−47.8
18	0.605	−106.8	1.237	63.6	0.123	62.6	0.645	−46.7

S11

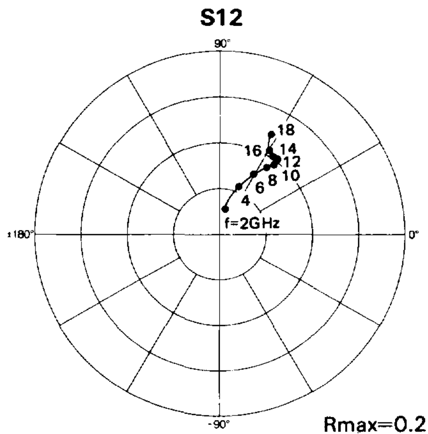


S21



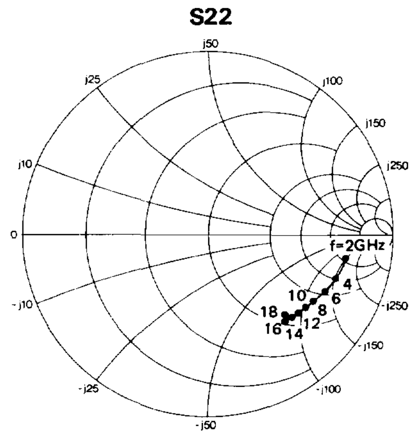
Rmax=5

S12

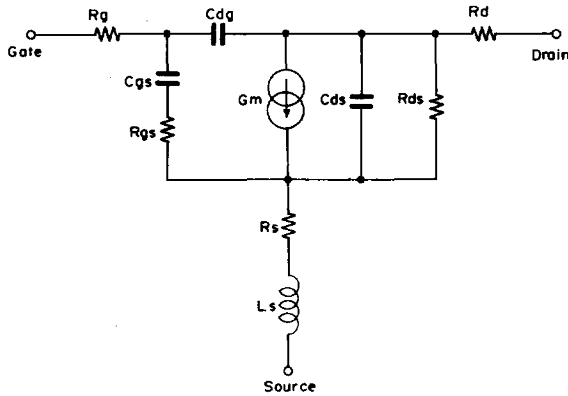


Rmax=0.2

S22



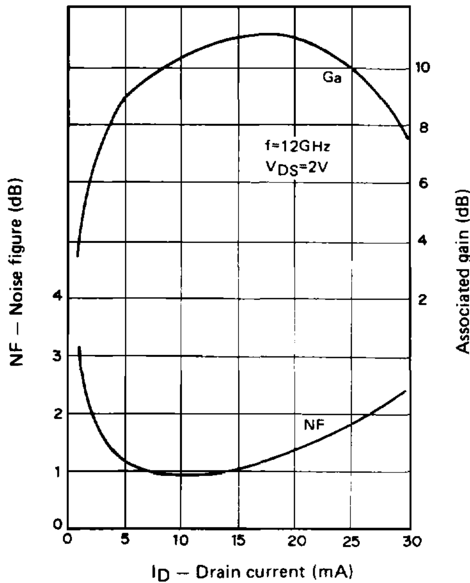
Equivalent Circuit



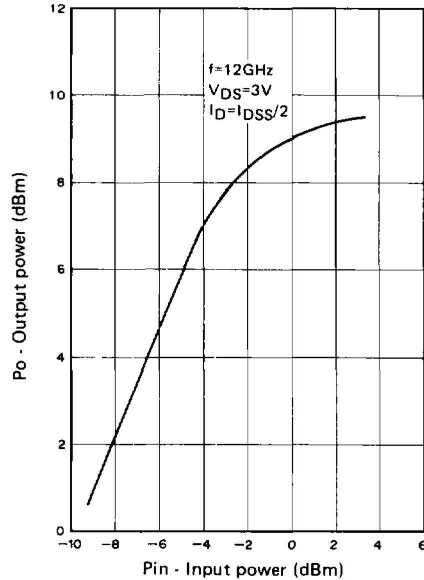
VDS=2V, ID=10 mA

Parameter	Value
Rg	1Ω
Cgs	0.23 pF
Rgs	3.5Ω
Gm	50 mS
Cds	0.06 pF
Rds	300Ω
Rd	1Ω
Rs	3.5Ω
Ls	0.08 nH
Cdg	28 fF

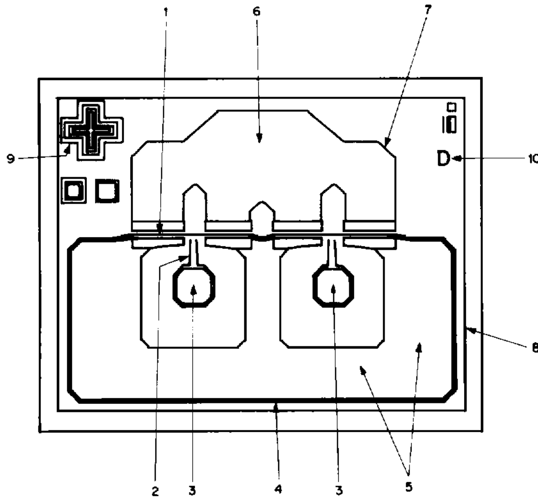
Minimum noise figure vs. Drain current



Output power at 1 dB gain compression

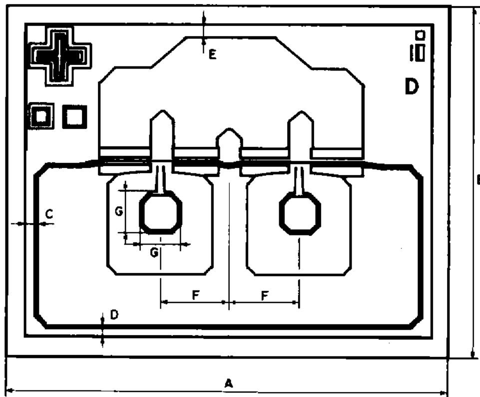


Chip Outline



1. Gate area
2. Gate metal
3. Gate bonding pad
4. Source metal
5. Source bonding pad
6. Drain bonding pad
7. Drain metal
8. Scribe line
9. Alignment mark
10. D: 2SK676H5

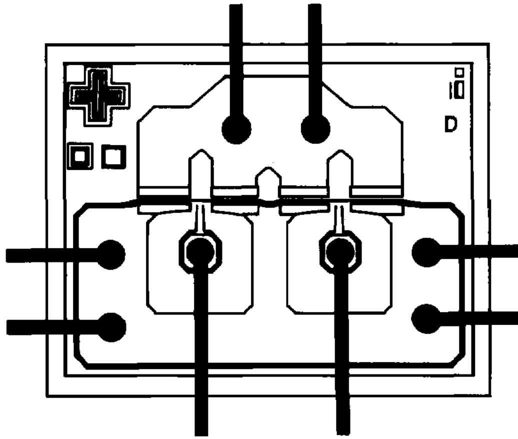
Chip Pattern Dimension



Symbol	Dimension (μm)
A	500 ±50
B	400 ±50
C	15 ± 3
D	10 ± 3
E	15 ± 3
F	75 ± 5
G	44 ± 5

Chip thickness 150 ± 30 μm
Pad metal Au 1 ± 0.15 μm
Back metal Ti/Au 0.45 ± 0.05 μm

Recommended Bonding Position



HEMT Chip Handling Precautions

1) All handling and assembly operations should be done in a clean and dry environment.

2) Chips should be stored in a dry nitnogen environment at room temperature.

3) Care must be exercised when handling GaAs chips, since they break easily under pressure.

4) All equipment used for handling, die attachment, and wire bonding must be properly grounded to avoid electrostatic damage to the chips.

5) Die attachment: Use AuSn alloy in nitrogen atmosphere. The temperature should be 280 to 300°C, and the operation time should be kept as short as possible. When using Ag paste, cure for one hour at 160°C in a nitrogen atmosphere.

6) Wire bonding: Thermal compression wedge bonding is recommended.
The temperature should be under 290°C, and the operation time should be kept under a minute. Bonding wire diameter should be 0.7 to 1.0 mils (18 to 25 microns) diameter gold. Wire lengths should, in general, be kept as short as possible.

Packaging

The chip is placed on the film carrier and numbered as shown in the figure, starting in the top left corner.

	1	2	3	4	5	6	7	8	9	10
A	1									10
B	11									20
C	21									30
D	31									40
E	41									50
F	51									60
G	61									70
H	71									80
I	81									90
J	91									100