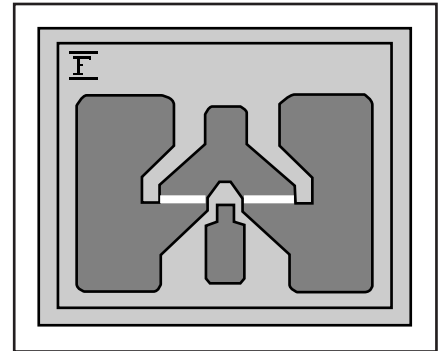


### FEATURES

- Low Noise Figure: 0.75dB (Typ.)@f=18GHz
- High Associated Gain: 10.0dB (Typ.)@f=18GHz
- $L_g \leq 0.15\mu\text{m}$ ,  $W_g = 100\mu\text{m}$
- Gold Gate Metallization for High Reliability

### DESCRIPTION

The FHR20X is a Super High Electron Mobility Transistor (SuperHEMT™) intended for general purpose, ultra-low noise and high gain amplifiers in the 2-30GHz frequency range. The device is well suited for telecommunication and low noise millimeter wave applications.



Fujitsu's stringent Quality Assurance Program assures the highest reliability and consistent performance.

### ABSOLUTE MAXIMUM RATING (Ambient Temperature $T_a=25^\circ\text{C}$ )

Item	Symbol	Condition	Rating	Unit
Drain-Source Voltage	$V_{DS}$		3.5	V
Gate-Source Voltage	$V_{GS}$		-3.0	V
Total Power Dissipation	$P_{tot}$	Note	100	mW
Storage Temperature	$T_{stg}$		-65 to +175	$^\circ\text{C}$
Channel Temperature	$T_{ch}$		175	$^\circ\text{C}$

Note: Mounted on  $\text{Al}_2\text{O}_3$  board (30 x 30 x 0.65mm)

Fujitsu recommends the following conditions for the reliable operation of GaAs FETs:

1. The drain-source operating voltage ( $V_{DS}$ ) should not exceed 2 volts.
2. The forward and reverse gate currents should not exceed 0.1 and -0.025 mA respectively with gate resistance of 4000 $\Omega$ .
3. The operating channel temperature ( $T_{ch}$ ) should not exceed 80 $^\circ\text{C}$ .

### ELECTRICAL CHARACTERISTICS (Ambient Temperature $T_a=25^\circ\text{C}$ )

Item	Symbol	Test Conditions	Limit			Unit
			Min.	Typ.	Max.	
Saturated Drain Current	$I_{DSS}$	$V_{DS} = 2\text{V}$ , $V_{GS} = 0\text{V}$	5	15	30	mA
Transconductance	$g_m$	$V_{DS} = 2\text{V}$ , $I_{DS} = 5\text{mA}$	20	30	-	mS
Pinch-off Voltage	$V_p$	$V_{DS} = 2\text{V}$ , $I_{DS} = 0.5\text{mA}$	-0.1	-0.7	-1.5	V
Gate Source Breakdown Voltage	$V_{GSO}$	$I_{GS} = -5\mu\text{A}$	-3.0	-	-	V
Noise Figure	NF	$V_{DS} = 2\text{V}$ $I_{DS} = 5\text{mA}$ $f = 18\text{GHz}$	-	0.75	0.90	dB
Associated Gain	$G_{as}$		8.5	10.0	-	dB
Thermal Resistance	$R_{th}$	Channel to Case	-	450	600	$^\circ\text{C/W}$

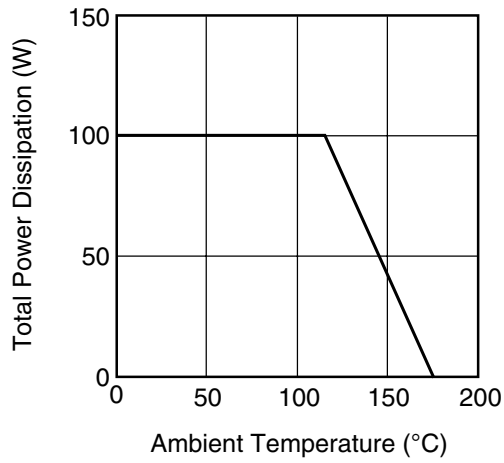
Note: RF parameter sample size 10pcs. criteria (accept/reject)=(2/3)

The chip must be enclosed in a hermetically sealed environment for optimum performance and reliability.

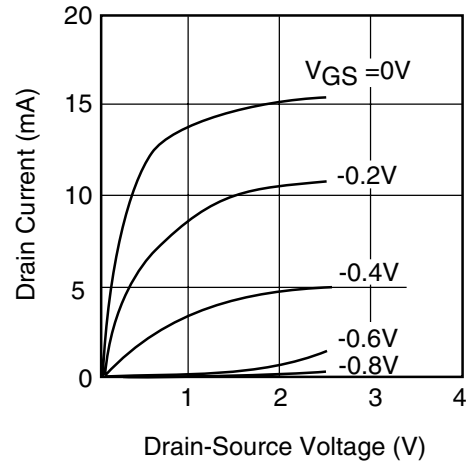
# FHR20X

## GaAs FET & HEMT Chips

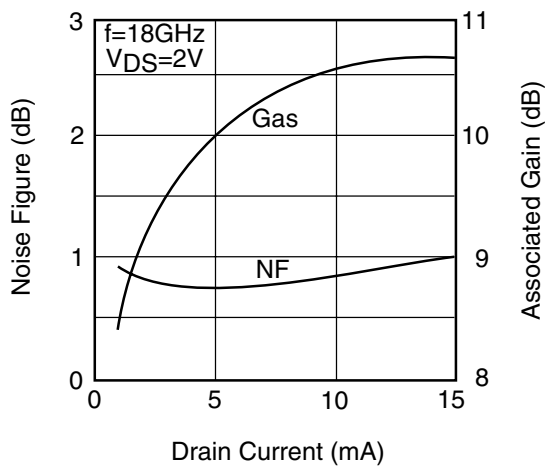
**POWER DERATING CURVE**



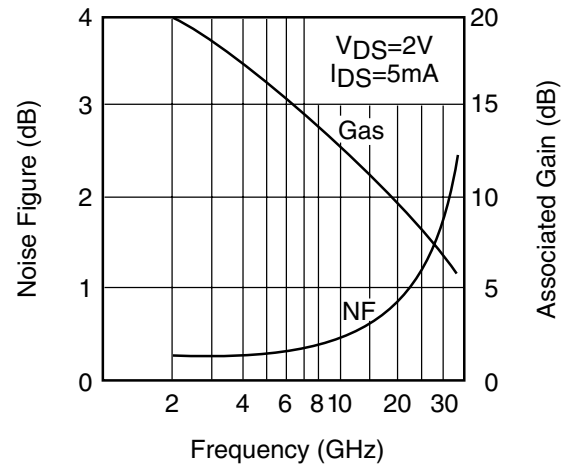
**DRAIN CURRENT vs. DRAIN-SOURCE VOLTAGE**



**NF & Gas vs. IDS**



**NF & Gas vs. Frequency**



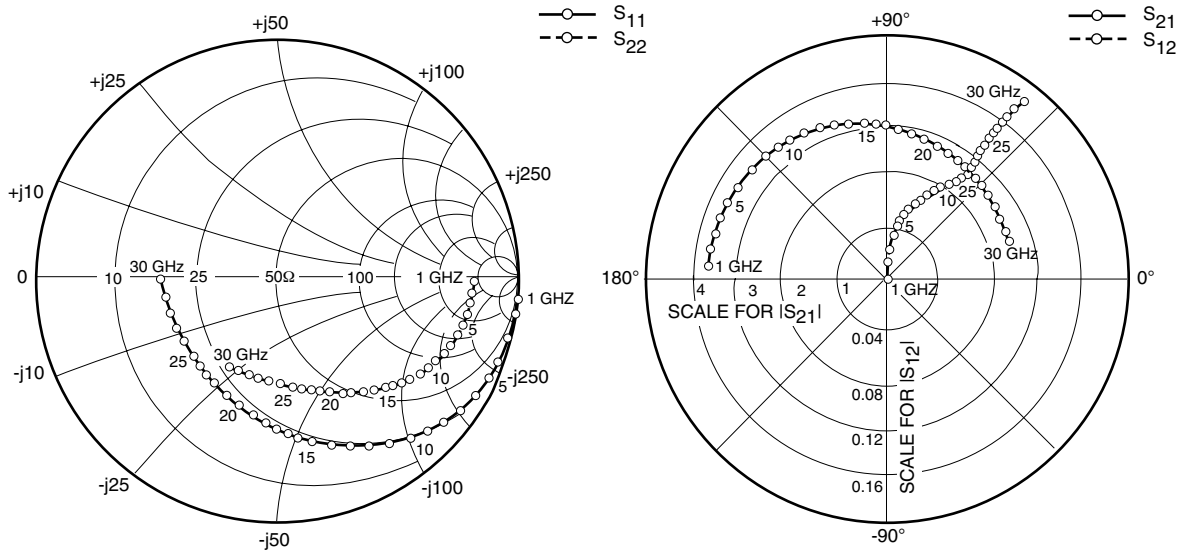
**NOISE PARAMETERS**

V<sub>DS</sub>=2V, I<sub>DS</sub>=5mA

Freq. (GHz)	Γ <sub>opt</sub>		NF <sub>min</sub> (dB)	R <sub>n</sub> /50
	(MAG)	(ANG)		
2	0.93	3.3	0.28	0.42
4	0.88	14.7	0.30	0.39
6	0.83	25.3	0.32	0.35
8	0.79	35.1	0.35	0.33
10	0.75	44.1	0.39	0.30
12	0.72	52.3	0.45	0.27
14	0.70	59.7	0.53	0.24
16	0.67	66.2	0.62	0.22
18	0.65	72.0	0.75	0.19
20	0.63	76.9	0.86	0.17
22	0.61	81.0	1.00	0.15
24	0.59	84.3	1.15	0.13
26	0.57	86.7	1.32	0.11
28	0.55	88.4	1.51	0.09
30	0.53	89.2	1.71	0.07

# FHR20X

## GaAs FET & HEMT Chips



### S-PARAMETERS

$V_{DS} = 2V, I_{DS} = 5mA$

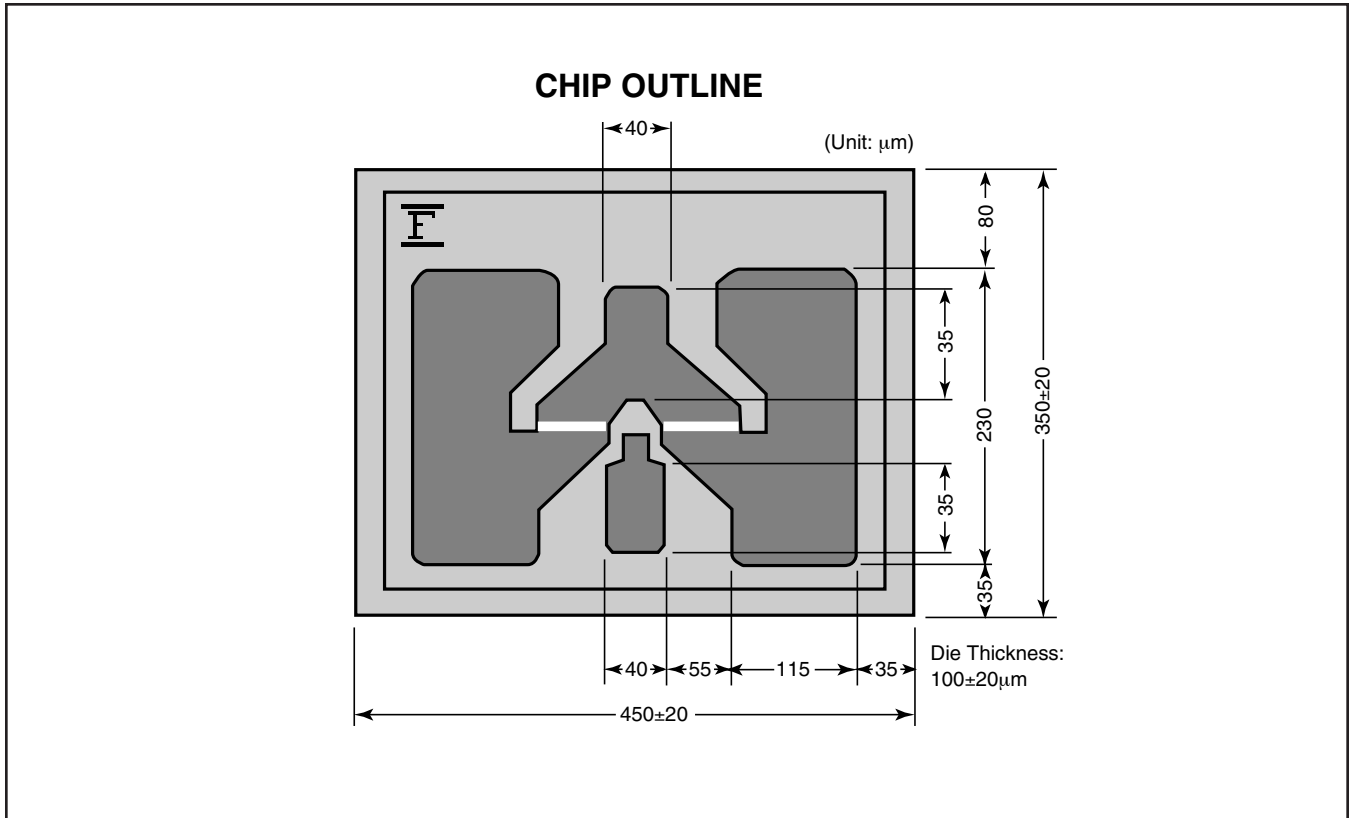
FREQUENCY (MHZ)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	1.000	-0.5	3.554	179.4	0.001	89.7	0.804	-0.3
500	1.000	-2.5	3.554	177.2	0.004	88.5	0.803	-1.7
1000	0.998	-5.1	3.552	174.3	0.009	87.0	0.802	-3.3
2000	0.993	-10.2	3.545	168.7	0.018	83.9	0.799	-6.7
3000	0.984	-15.3	3.533	163.1	0.026	80.9	0.793	-10.0
4000	0.972	-20.3	3.517	157.4	0.035	78.0	0.785	-13.3
5000	0.956	-25.4	3.496	151.8	0.043	75.1	0.776	-16.5
6000	0.938	-30.6	3.471	146.3	0.050	72.3	0.764	-19.8
7000	0.917	-35.7	3.442	140.7	0.058	69.7	0.750	-23.0
8000	0.893	-40.8	3.409	135.2	0.064	67.1	0.735	-26.2
9000	0.867	-46.0	3.372	129.8	0.071	64.8	0.719	-29.4
10000	0.840	-51.2	3.332	124.4	0.076	62.5	0.701	-32.5
11000	0.811	-56.4	3.289	119.0	0.081	60.5	0.683	-35.6
12000	0.781	-61.7	3.244	113.7	0.086	58.7	0.663	-38.7
13000	0.751	-67.1	3.197	108.5	0.091	57.1	0.644	-41.8
14000	0.720	-72.6	3.147	103.3	0.094	55.7	0.624	-44.9
15000	0.689	-78.1	3.096	98.2	0.098	54.6	0.604	-48.0
16000	0.659	-83.8	3.044	93.1	0.101	53.8	0.583	-51.2
17000	0.630	-89.6	2.991	88.1	0.105	53.2	0.563	-54.4
18000	0.602	-95.5	2.937	83.2	0.108	52.9	0.544	-57.7
19000	0.576	-101.6	2.884	78.3	0.111	52.8	0.525	-61.1
20000	0.553	-108.0	2.829	73.5	0.115	52.9	0.506	-64.7
21000	0.531	-114.5	2.775	68.7	0.119	53.1	0.488	-68.5
22000	0.513	-121.2	2.722	64.0	0.123	53.5	0.470	-72.5
23000	0.497	-128.1	2.668	59.3	0.129	53.8	0.454	-76.8
24000	0.485	-135.1	2.614	54.7	0.134	54.2	0.438	-81.4
25000	0.477	-142.3	2.561	50.0	0.141	54.4	0.424	-86.4
26000	0.473	-149.5	2.507	45.4	0.149	54.5	0.410	-91.8
27000	0.472	-156.7	2.453	40.8	0.157	54.4	0.399	-97.7
28000	0.475	-163.9	2.399	36.3	0.166	54.0	0.389	-104.1
29000	0.481	-170.9	2.344	31.7	0.176	53.4	0.381	-111.0
30000	0.491	-177.8	2.228	27.1	0.187	52.5	0.375	-118.5

NOTE:\* The data includes bonding wires.

n: number of wires    Gate n=1 (0.3mm length, 25µm Dia Au wire)  
 Drain n=1 (0.3mm length, 25µm Dia Au wire)  
 Source n=4 (0.3mm length, 25µm Dia Au wire)

# FHR20X

## GaAs FET & HEMT Chips



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