

# FHX04X, FHX05X, FHX06X

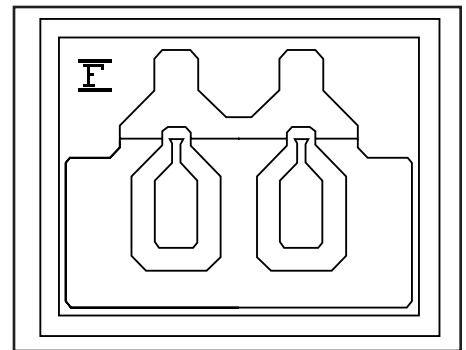
GaAs FET & HEMT Chips

## FEATURES

- Low Noise Figure: 0.75dB (Typ.)@f=12GHz (FHX04)
- High Associated Gain: 10.5dB (Typ.)@f=12GHz
- $L_g \leq 0.25\mu\text{m}$ ,  $W_g = 200\mu\text{m}$
- Gold Gate Metallization for High Reliability

## DESCRIPTION

The FHX04X, FHX05X, FHX06X are High Electron Mobility Transistors (HEMT) intended for general purpose, low noise and high gain amplifiers in the 2-18GHz frequency range. The devices are well suited for telecommunication, DBS, TVRO, VSAT or other low noise 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	Rating	Unit
Drain-Source Voltage	$V_{DS}$	3.5	V
Gate-Source Voltage	$V_{GS}$	-3.0	V
Total Power Dissipation	$P_{t^*}$	180	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 0.2 and -0.05 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 $T_a=25^\circ\text{C}$ )

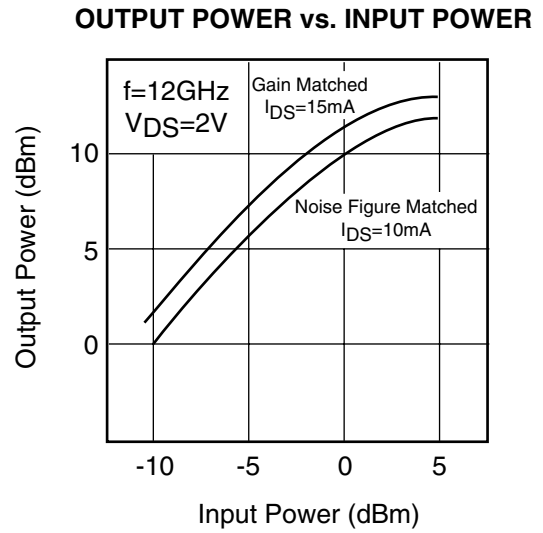
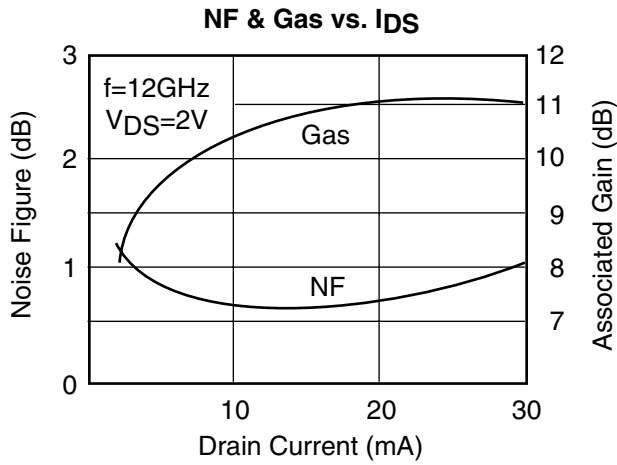
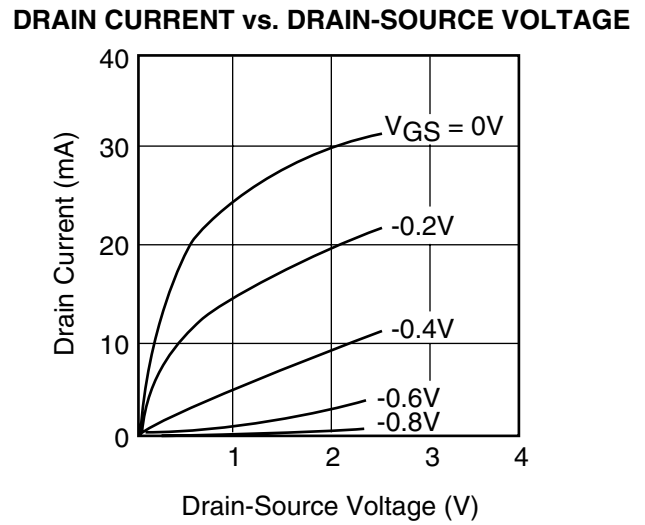
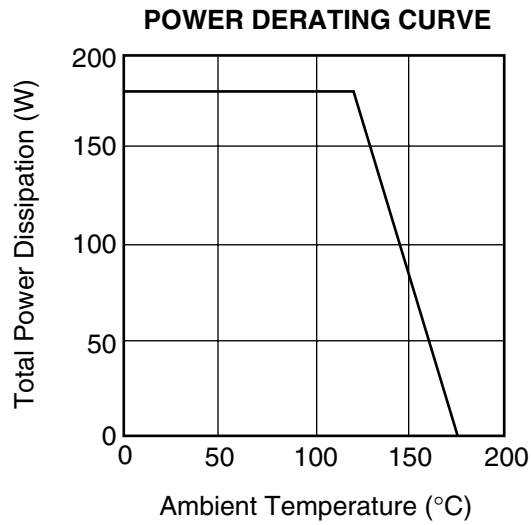
Item	Symbol	Test Conditions	Limit			Unit
			Min.	Typ.	Max.	
Saturated Drain Current	$I_{DSS}$	$V_{DS} = 2\text{V}$ , $V_{GS} = 0\text{V}$	15	30	60	mA
Transconductance	$g_m$	$V_{DS} = 2\text{V}$ , $I_{DS} = 10\text{mA}$	35	45	-	mS
Pinch-off Voltage	$V_p$	$V_{DS} = 2\text{V}$ , $I_{DS} = 1\text{mA}$	-0.2	-0.7	-1.5	V
Gate Source Breakdown Voltage	$V_{GSO}$	$I_{GS} = -10\mu\text{A}$	-3.0	-	-	V
Noise Figure	FHX04X	NF	-	0.75	0.85	dB
Associated Gain			$G_{as}$	9.5	10.5	-
Noise Figure	FHX05X	NF	-	0.9	1.1	dB
Associated Gain			$G_{as}$	9.5	10.5	-
Noise Figure	FHX06X	NF	-	1.1	1.35	dB
Associated Gain			$G_{as}$	9.5	10.5	-
Maximum Available Gain	$G_a(\text{max})$	Same as above, Gain matched	11.0	12.0	-	dB
Thermal Resistance	$R_{th}$	Channel to Case	-	220	300	$^\circ\text{C}/\text{W}$

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.

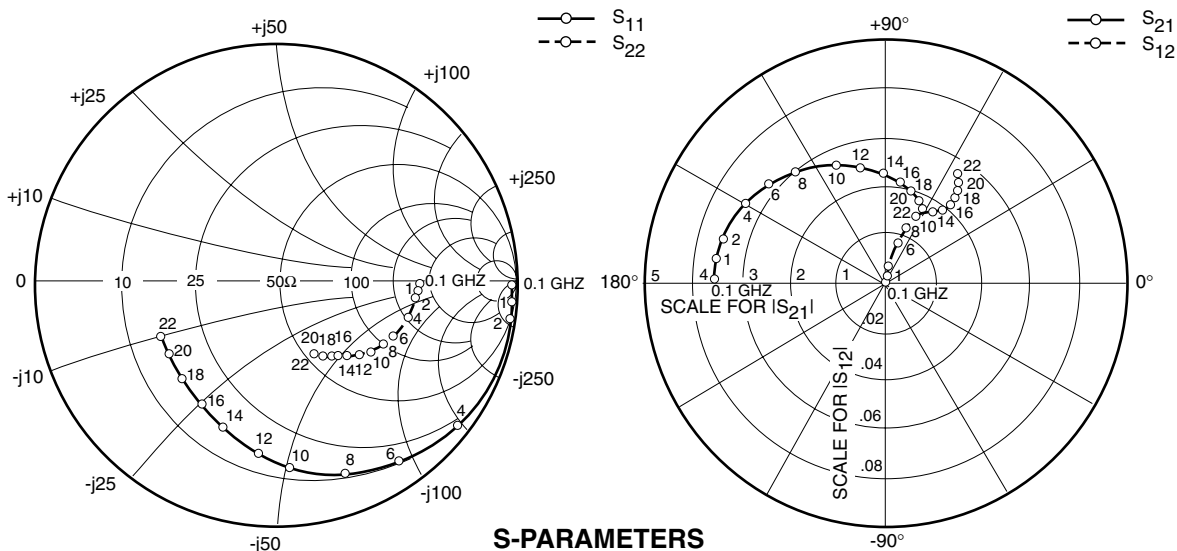
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### S-PARAMETERS

$V_{DS} = 2V, I_{DS} = 10mA$

FREQUENCY (MHZ)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	1.000	-0.9	3.721	179.2	.001	89.5	.606	-0.4
500	.999	-4.7	3.717	176.0	.007	87.7	.605	-2.1
1000	.996	-9.5	3.705	172.0	.013	86.4	.604	-4.2
2000	.983	-18.8	3.658	164.1	.026	81.0	.598	-8.3
4000	.928	-37.0	3.489	149.0	.049	72.3	.576	-16.0
6000	.877	-54.0	3.255	135.1	.068	66.0	.547	-22.9
8000	.811	-59.3	2.999	122.5	.082	60.3	.516	-28.9
10000	.748	-84.5	2.750	111.2	.093	57.3	.485	-34.2
12000	.694	-98.2	2.521	101.1	.101	55.2	.457	-39.1
14000	.649	-111.1	2.319	92.0	.108	54.6	.432	-43.7
16000	.614	-123.2	2.142	83.5	.114	55.0	.410	-48.4
18000	.588	-134.6	1.988	75.9	.121	56.2	.391	-53.2
20000	.570	-145.4	1.853	68.8	.130	57.8	.373	-58.4

NOTE:\* The data includes bonding wires.

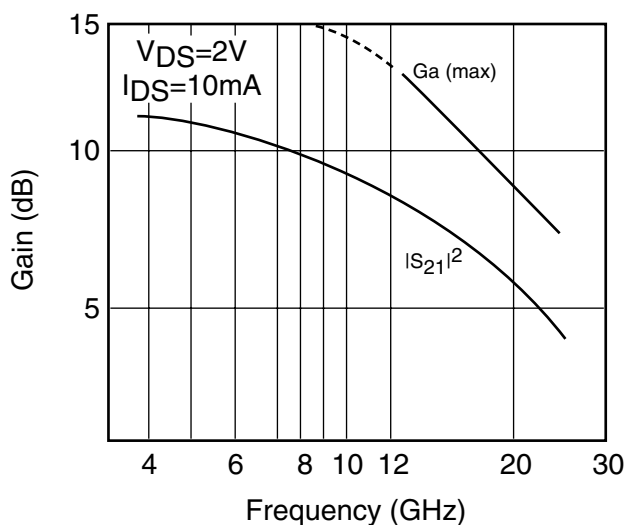
n: number of wires

Gate n=2 (0.3mm length, 20um Dia Au wire)

Drain n=2 (0.3mm length, 20um Dia Au wire)

Source n=4 (0.3mm length, 20um Dia Au wire)

### Ga (max) & $|S_{21}|^2$ vs. FREQUENCY



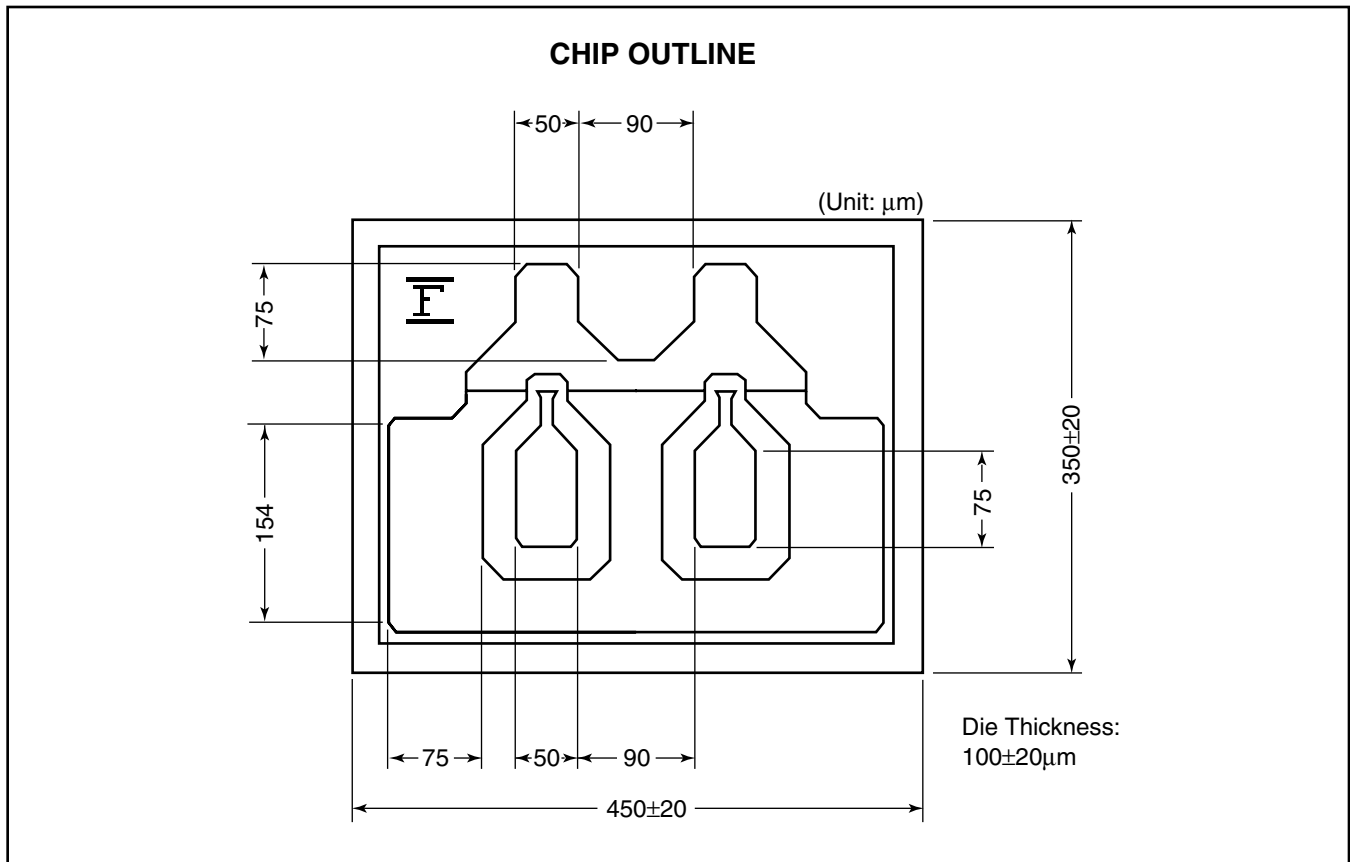
### NOISE PARAMETERS

$V_{DS}=2V, I_{DS}=10mA$

Freq. (GHz)	$\Gamma_{opt}$		NFmin (dB)	Rn/50
	(MAG)	(ANG)		
2	0.80	16	0.33	0.50
4	0.74	31	0.35	0.45
6	0.68	46	0.44	0.40
8	0.63	61	0.53	0.30
10	0.58	75	0.63	0.23
12	0.52	89	0.72	0.18
14	0.47	102	0.84	0.14
16	0.42	114	0.97	0.12
18	0.38	126	1.09	0.10
20	0.33	137	1.22	0.09

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