

FHX13X, FHX14X

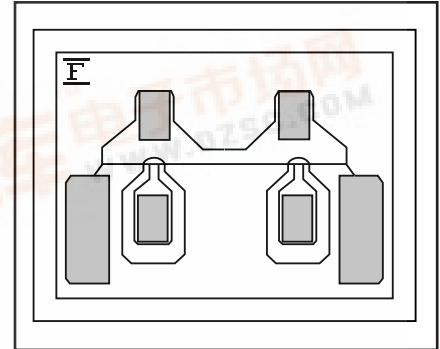
GaAs FET & HEMT Chips

FEATURES

- Low Noise Figure: 0.45dB (Typ.)@f=12GHz (FHX13)
- High Associated Gain: 13.0dB (Typ.)@f=12GHz
- $L_g \leq 0.15\mu\text{m}$, $W_g = 200\mu\text{m}$
- Gold Gate Metallization for High Reliability

DESCRIPTION

The FHX13X, FHX14X are Super High Electron Mobility Transistor (SuperHEMT™) intended for general purpose, ultra-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 Al_2O_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 -0.05mA respectively with gate resistance of 4000 Ω .
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}	$V_{DS} = 2\text{V}$, $V_{GS} = 0\text{V}$	10	30	60	mA
Transconductance	g_m	$V_{DS} = 2\text{V}$, $I_{DS} = 10\text{mA}$	35	50	-	mS
Pinch-off Voltage	V_p	$V_{DS} = 2\text{V}$, $I_{DS} = 1\text{mA}$	-0.1	-0.7	-1.5	V
Gate Source Breakdown Voltage	V_{GSO}	$I_{GS} = -10\mu\text{A}$	-3.0	-	-	V
Noise Figure	FHX13X	NF	-	0.45	0.50	dB
Associated Gain		G_{as}	$V_{DS} = 2\text{V}$ $I_{DS} = 10\text{mA}$ $f = 12\text{GHz}$	11.0	13.0	-
Noise Figure	FHX14X	NF	-	0.55	0.60	dB
Associated Gain		G_{as}		11.0	13.0	-
Thermal Resistance	R_{th}	Channel to Case	-	220	300	$^\circ\text{C}/\text{W}$

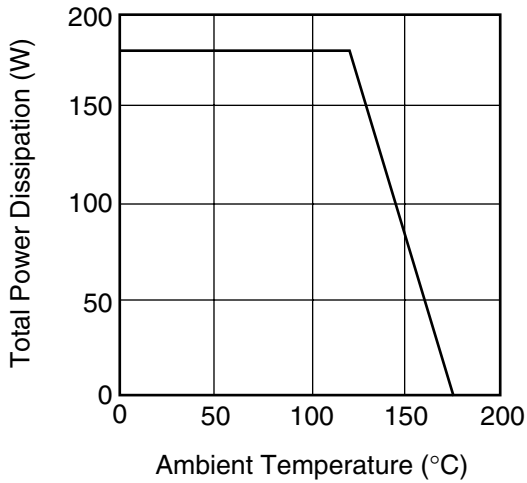
Note: RF parameter sample size 10pcs. criteria (accept/reject)=(2/3)

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

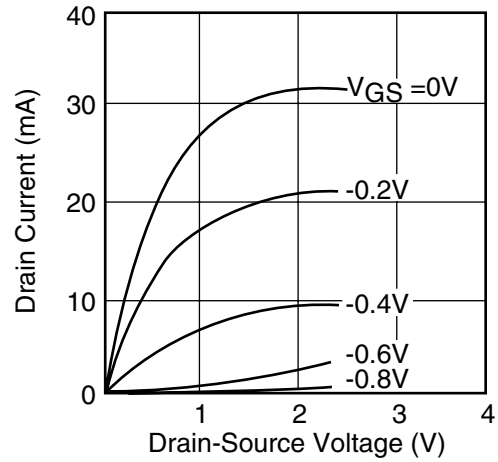
FHX13X, FHX14X

GaAs FET & HEMT Chips

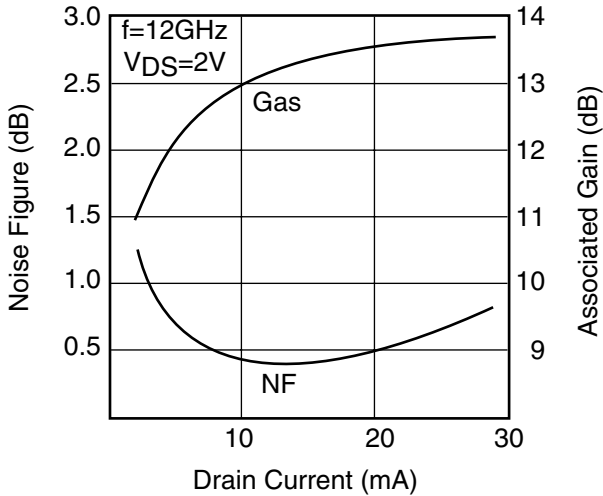
POWER DERATING CURVE



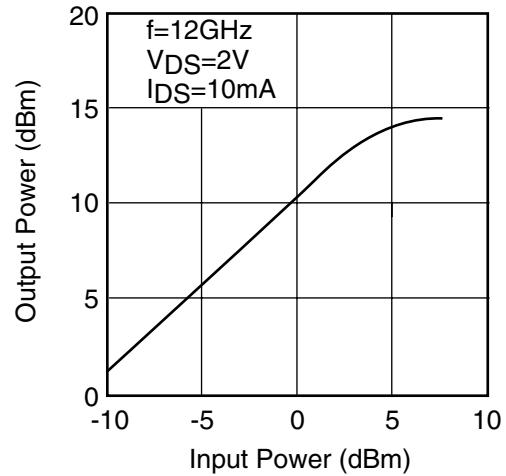
DRAIN CURRENT vs. DRAIN-SOURCE VOLTAGE



NF & Gas vs. I_{DS}



OUTPUT POWER vs. INPUT POWER

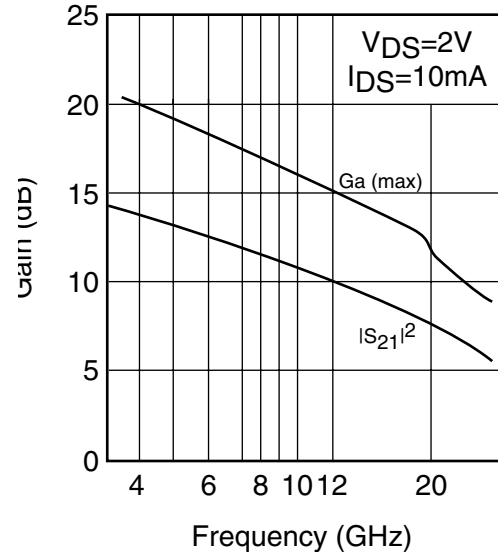


NOISE PARAMETERS

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

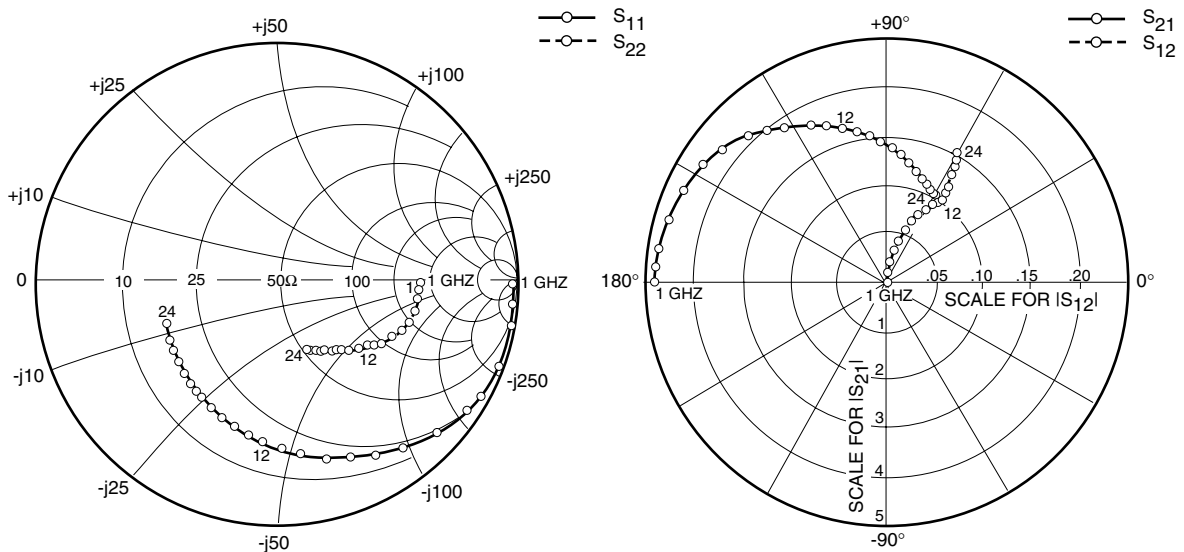
Freq. (GHz)	Γ _{opt}		NF _{min} (dB)	R _n /50
	(MAG)	(ANG)		
2	0.92	13	0.28	0.65
4	0.84	25	0.30	0.54
6	0.77	38	0.32	0.41
8	0.71	51	0.34	0.31
10	0.66	65	0.39	0.23
12	0.61	79	0.45	0.17
14	0.58	93	0.56	0.12
16	0.56	108	0.68	0.09
18	0.54	122	0.86	0.07
20	0.52	136	1.03	0.07
22	0.50	150	1.22	0.07
24	0.46	162	1.43	0.07

Ga (max) & |S₂₁|² vs. FREQUENCY



FHX13X, FHX14X

GaAs FET & HEMT Chips



S-PARAMETERS

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

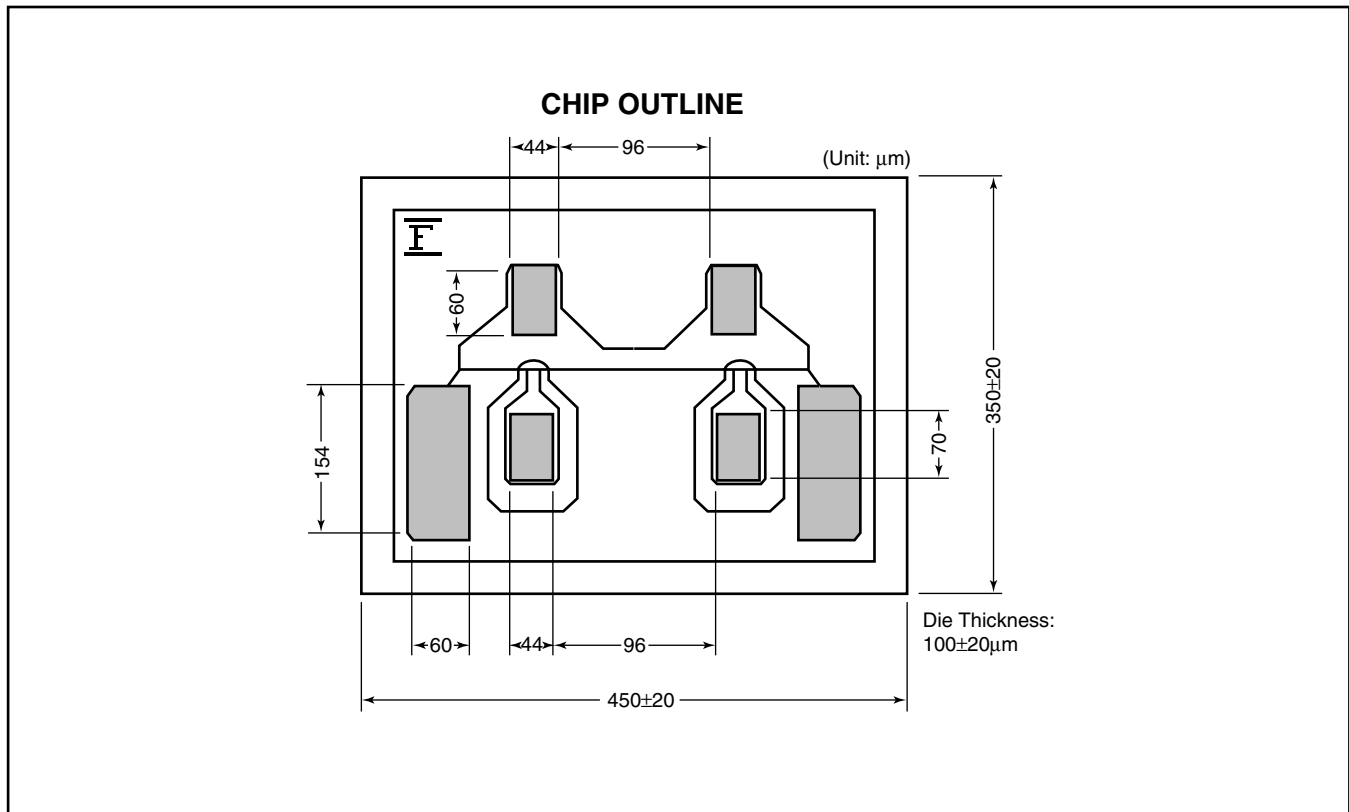
FREQUENCY (MHZ)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	1.000	-0.9	4.899	179.2	0.001	89.5	0.601	-0.5
500	0.999	-4.7	4.894	175.9	0.006	87.7	0.601	-2.3
1000	0.995	-9.4	4.876	171.9	0.013	85.5	0.599	-4.6
2000	0.981	-18.6	4.806	163.9	0.025	81.1	0.591	-9.2
3000	0.958	-27.7	4.696	156.1	0.037	77.0	0.580	-13.5
4000	0.929	-36.4	4.555	148.6	0.048	73.2	0.565	-17.7
5000	0.895	-44.9	4.392	141.5	0.057	69.8	0.548	-21.5
6000	0.860	-53.0	4.215	134.8	0.066	66.8	0.530	-25.0
7000	0.823	-60.7	4.034	128.4	0.074	64.2	0.512	-28.3
8000	0.786	-68.1	3.852	122.4	0.080	62.0	0.493	-31.3
9000	0.751	-75.3	3.675	116.8	0.086	60.2	0.475	-34.0
10000	0.718	-82.1	3.506	111.5	0.092	58.9	0.458	-36.6
11000	0.687	-88.7	3.345	106.5	0.096	57.8	0.442	-39.0
12000	0.659	-95.0	3.194	101.8	0.101	57.1	0.426	-41.3
13000	0.633	-101.2	3.054	97.3	0.105	56.6	0.412	-43.6
14000	0.610	-107.2	2.923	93.0	0.108	56.4	0.399	-45.8
15000	0.590	-113.0	2.801	88.9	0.112	56.4	0.386	-47.9
16000	0.572	-118.7	2.688	85.0	0.116	56.6	0.375	-50.1
17000	0.556	-124.2	2.584	81.3	0.120	56.9	0.364	-52.3
18000	0.543	-129.6	2.487	77.7	0.124	57.3	0.353	-54.6
19000	0.532	-134.9	2.397	74.2	0.129	57.8	0.344	-56.9
20000	0.523	-140.0	2.314	70.8	0.133	58.4	0.335	-59.4
21000	0.516	-145.0	2.236	67.5	0.138	58.9	0.326	-62.0
22000	0.511	-149.8	2.164	64.4	0.144	59.5	0.318	-64.7
23000	0.507	-154.6	2.096	61.3	0.150	60.0	0.310	-67.5
24000	0.505	-159.2	2.033	58.3	0.156	60.5	0.303	-70.5

NOTE:* The data includes bonding wires.

n: number of wires Gate n=2 (0.3mm length, 20 μ m Dia Au wire)
 Drain n=2 (0.3mm length, 20 μ m Dia Au wire)
 Source n=4 (0.3mm length, 20 μ m Dia Au wire)

FHX13X, FHX14X

GaAs FET & HEMT Chips



For further information please contact:

FUJITSU COMPOUND SEMICONDUCTOR, INC.

2355 Zanker Rd.

San Jose, CA 95131-1138, U.S.A.

Phone: (408) 232-9500

FAX: (408) 428-9111

www.fcsi.fujitsu.com

FUJITSU MICROELECTRONICS, LTD.

Compound Semiconductor Division

Network House

Norreys Drive

Maidenhead, Berkshire SL6 4FJ

Phone: +44 (0)1628 504800

FAX: +44 (0)1628 504888

CAUTION

Fujitsu Compound Semiconductor Products contain **gallium arsenide (GaAs)** which can be hazardous to the human body and the environment. For safety, observe the following procedures:

- Do not put these products into the mouth.
- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
- Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.

Fujitsu Limited reserves the right to change products and specifications without notice. The information does not convey any license under rights of Fujitsu Limited or others.

© 1998 FUJITSU COMPOUND SEMICONDUCTOR, INC.

Printed in U.S.A. FCSI0598M200

SuperHEMT™ is a trademark of Fujitsu Limited.

FUJITSU