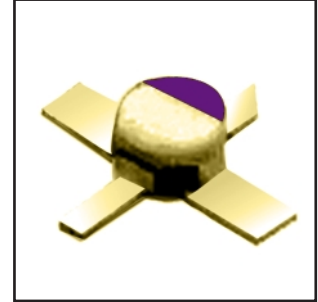


# FHX13LG, FHX14LG

Super Low Noise HEMT

## 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
- Cost Effective Ceramic Microstrip (SMT) Package
- Tape and Reel Packaging Available



## DESCRIPTION

The FHX13LG, FHX14LG is a 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 packaged in cost effective, low parasitic, hermetically sealed metal-ceramic package for high volume telecommunication, 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	Condition	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	NF	$V_{DS} = 2\text{V}$ , $I_{DS} = 10\text{mA}$ , $f = 12\text{GHz}$	-	0.45	0.50	dB
Associated Gain			$G_{as}$	11.0	13.0	-
Noise Figure	NF	$f = 12\text{GHz}$	-	0.55	0.60	dB
Associated Gain			$G_{as}$	11.0	13.0	-
Thermal Resistance	$R_{th}$	Channel to Case	-	300	400	$^\circ\text{C/W}$

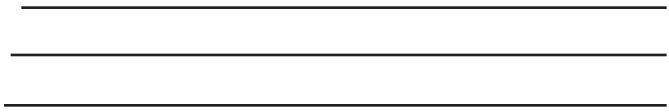
## AVAILABLE CASE STYLES: LG

Note: RF parameters for LG devices are measured on a sample basis as follows:

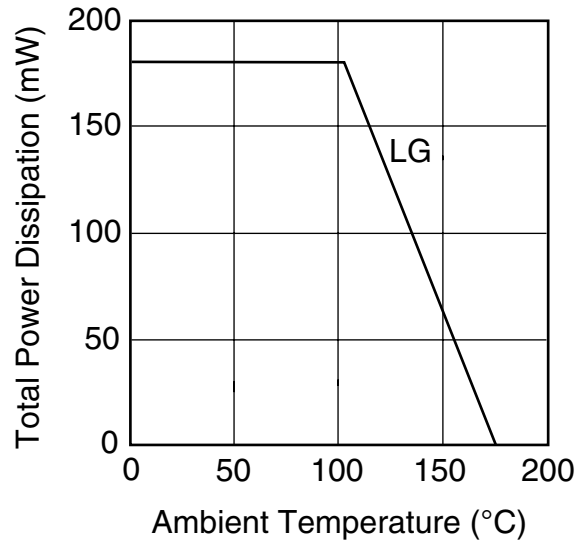
Lot qty.	Sample qty.	Accept/Reject
1200 or less	125	(0,1)
1201 to 3200	200	(0,1)
3201 to 10000	315	(1,2)
10001 or over	500	(1,2)

# FHX13LG, FHX14LG

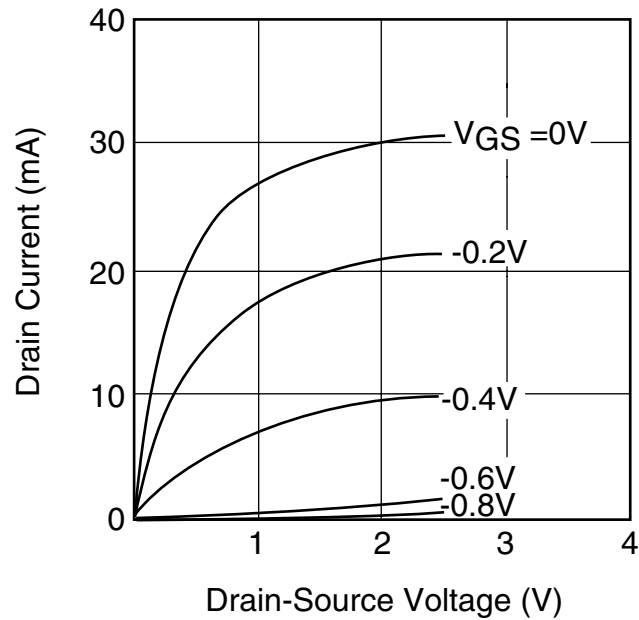
Super Low Noise HEMT



## POWER DERATING CURVE



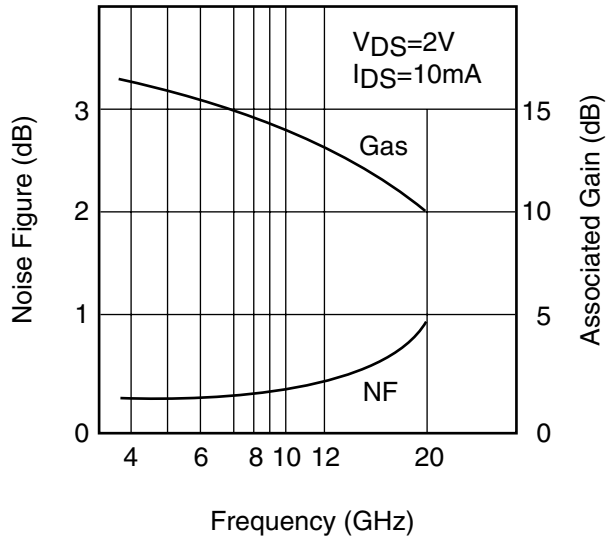
## DRAIN CURRENT vs. DRAIN-SOURCE VOLTAGE



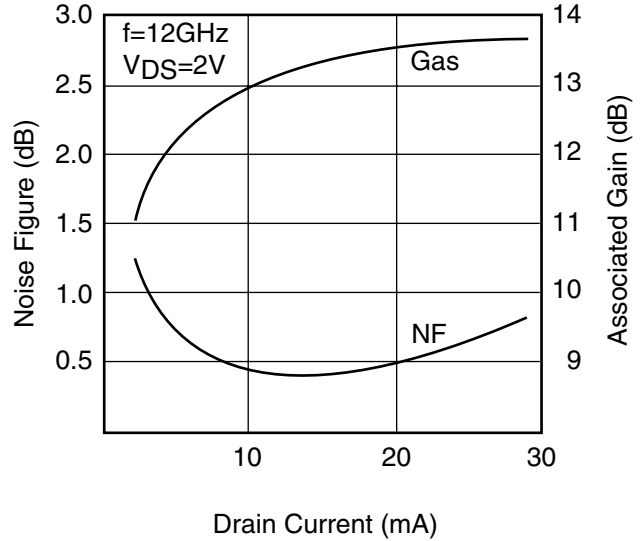
# FHX13LG, FHX14LG

Super Low Noise HEMT

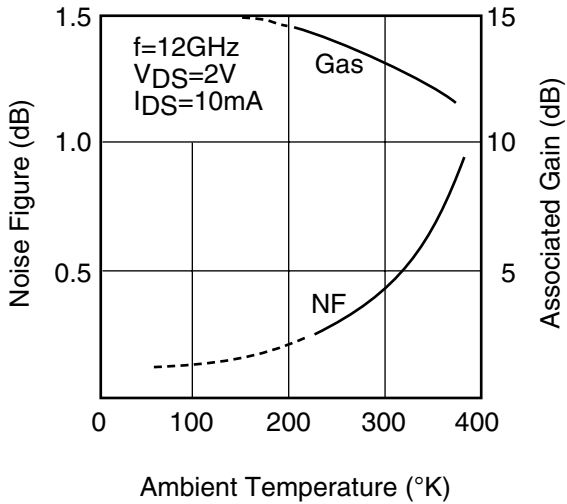
**NF & Gas vs. FREQUENCY**  
FHX13LG



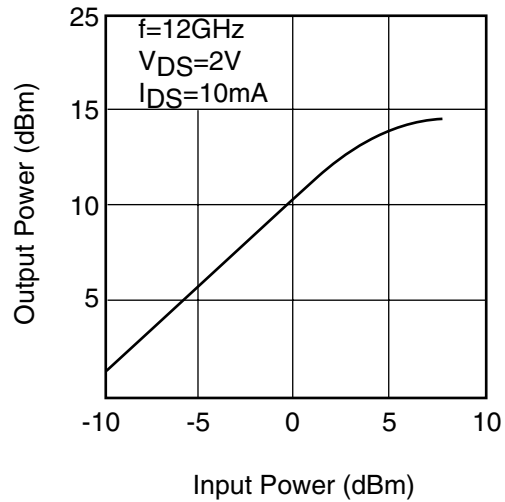
**NF & Gas vs.  $I_{DS}$**   
FHX13LG



**NF & Gas vs. TEMPERATURE**  
FHX13LG



**OUTPUT POWER vs. INPUT POWER**  
FHX13LG

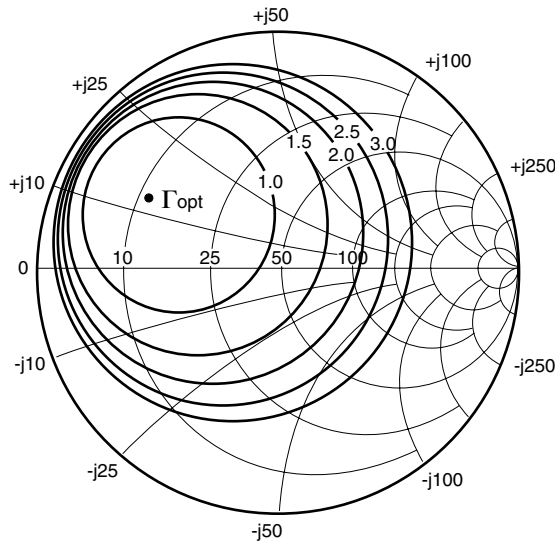


# FHX13LG, FHX14LG

Super Low Noise HEMT

## TYPICAL NOISE FIGURE CIRCLE

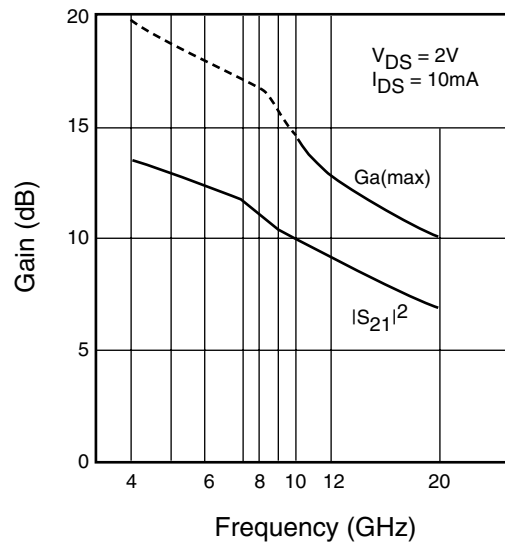
FHX13LG



f = 12 GHz  
 $V_{DS} = 2V$   
 $I_{DS} = 10mA$

$\Gamma_{opt} = 0.61 \angle 150^\circ$   
 $Rn/50 = 0.04$   
 $NF_{min} = 0.45dB$

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



## NOISE PARAMETERS

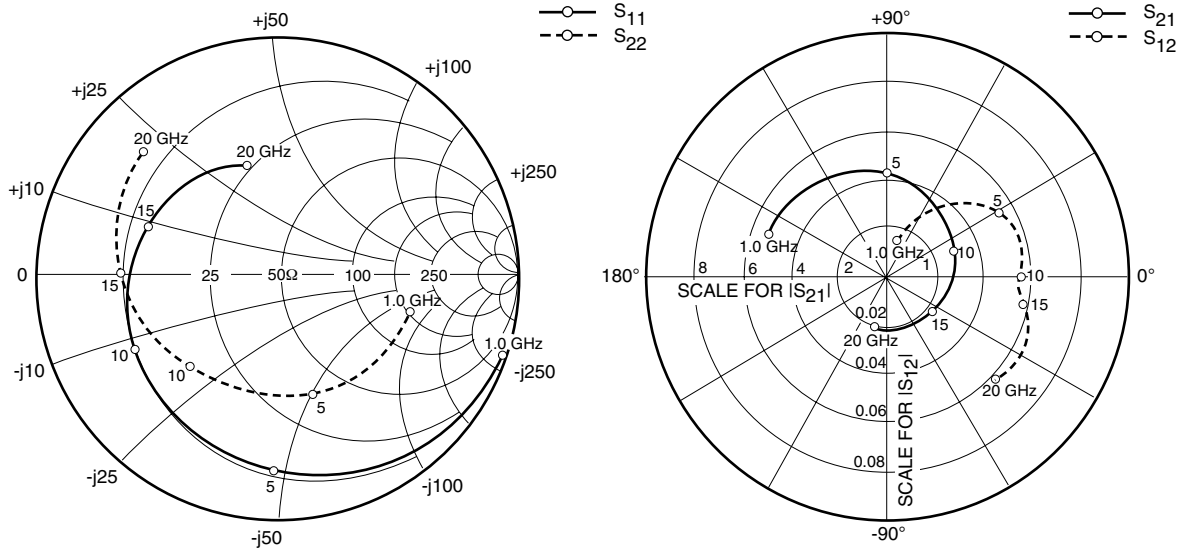
FHX13LG

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

Freq. (GHz)	$\Gamma_{opt}$		NFmin (dB)	Rn/50
	(MAG)	(ANG)		
2	0.96	29	0.33	0.22
4	0.92	57	0.34	0.20
6	0.86	83	0.35	0.15
8	0.79	107	0.37	0.11
10	0.71	129	0.40	0.07
12	0.61	150	0.45	0.04
14	0.50	168	0.53	0.04
16	0.38	-175	0.63	0.06
18	0.24	-161	0.83	0.10

# FHX13LG, FHX14LG

Super Low Noise HEMT



## S-PARAMETERS

FHX13/14LG

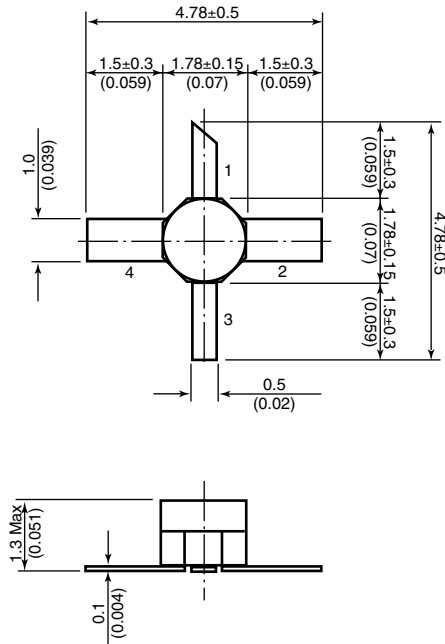
$V_{DS} = 2V, I_{DS} = 10mA$

FREQUENCY (MHZ)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1000	0.988	-20.0	5.327	160.1	0.015	75.7	0.574	-16.3
2000	0.956	-39.5	5.133	141.0	0.028	63.3	0.560	-32.1
3000	0.908	-58.1	4.851	123.0	0.039	50.1	0.539	-47.3
4000	0.862	-75.5	4.534	105.9	0.048	39.0	0.522	-62.0
5000	0.811	-91.6	4.213	89.7	0.053	29.3	0.502	-75.6
6000	0.763	-107.1	3.886	74.4	0.056	21.0	0.488	-89.6
7000	0.727	-121.1	3.582	60.0	0.057	13.2	0.487	-103.0
8000	0.701	-133.3	3.300	46.4	0.056	7.9	0.498	-114.9
9000	0.682	-144.1	3.078	33.8	0.055	3.5	0.515	-125.0
10000	0.659	-154.2	2.899	21.4	0.055	-0.0	0.531	-134.4
11000	0.636	-164.4	2.748	9.3	0.054	-2.6	0.544	-144.0
12000	0.618	-175.4	2.593	-3.3	0.054	-5.2	0.561	-155.1
13000	0.608	175.5	2.466	-14.8	0.054	-5.7	0.590	-164.0
14000	0.596	166.6	2.366	-26.6	0.055	-7.8	0.619	-172.4
15000	0.585	158.3	2.279	-38.3	0.056	-9.7	0.654	-179.7
16000	0.564	148.8	2.244	-50.7	0.058	-12.8	0.677	172.6
17000	0.543	138.2	2.217	-63.6	0.061	-17.6	0.701	163.4
18000	0.525	127.3	2.185	-77.1	0.063	-24.7	0.727	154.1
19000	0.506	116.2	2.143	-91.4	0.063	-33.1	0.748	143.6
20000	0.470	106.5	2.089	-105.4	0.061	-43.7	0.763	137.2

# FHX13LG, FHX14LG

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## Case Style "LG" Metal-Ceramic Hermetic Package



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