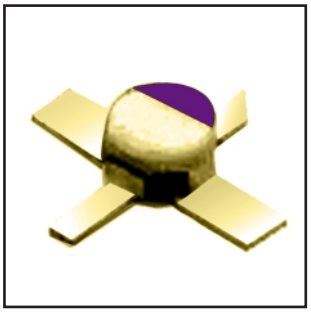
# FHX13LG, FHX14LG

## Super Low Noise HEMT

## FEATURES



- Low Noise Figure: 0.45dB (Typ.)@f=12GHz (FHX13)
- High Associated Gain: 13.0dB (Typ.)@f=12GHz
- Lg ≤ 0.15µm, Wg = 200µm
- 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 Ta=25°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 | °C |
| **Channel Temperature** | $T_{ch}$ | 175 | °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 -0.05 mA respectively with gate resistance of 4000Ω.
3. The operating channel temperature ($T_{ch}$) should not exceed 80°C.

### ELECTRICAL CHARACTERISTICS (Ambient Temperature Ta=25°C)

| Item | | Symbol | Condition | Limit | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| **Saturated Drain Current** | | $I_{DSS}$ | $V_{DS}$ = 2V, $V_{GS}$ =0V | 10 | 30 | 60 | mA |
| **Transconductance** | | $g_m$ | $V_{DS}$ = 2V, $I_{DS}$ =10mA | 35 | 50 | - | mS |
| **Pinch-off Voltage** | | $V_p$ | $V_{DS}$ = 2V, $I_{DS}$ =1mA | -0.1 | -0.7 | -1.5 | V |
| **Gate Source Breakdown Voltage** | | $V_{GSO}$ | $I_{GS}$ = -10µA | -3.0 | - | - | V |
| **Noise Figure** | FHX13LG | NF | $V_{DS}$ = 2V, $I_{DS}$ = 10mA, f = 12GHz | - | 0.45 | 0.50 | dB |
| **Associated Gain** | FHX13LG | $G_{as}$ | | 11.0 | 13.0 | - | dB |
| **Noise Figure** | FHX14LG | NF | | - | 0.55 | 0.60 | dB |
| **Associated Gain** | FHX14LG | $G_{as}$ | | 11.0 | 13.0 | - | dB |
| **Thermal Resistance** | | $R_{th}$ | Channel to Case | - | 300 | 400 | °C/W |

**AVAILABLE CASE STYLES:** LG

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

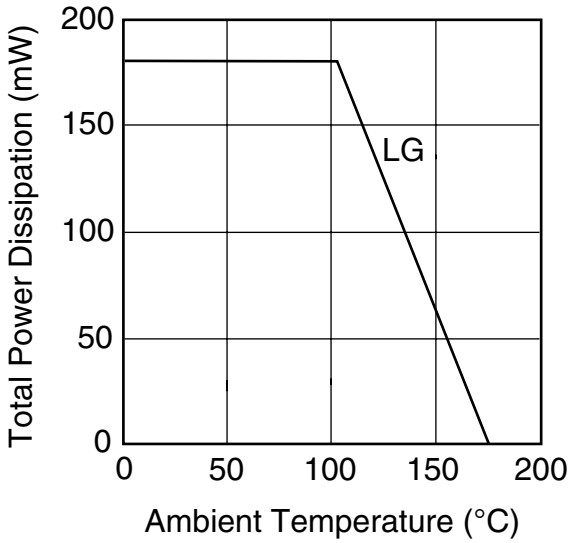
| Lot qty. | | | Sample qty. | Accept/Reject |
|---|---|---|---|---|
| 1200 | or | less | 125 | (0,1) |
| 1201 | to | 3200 | 200 | (0,1) |
| 3201 | to | 10000 | 315 | (1,2) |
| 10001 | or | over | 500 | (1,2) |

Edition 1.1
July 1999

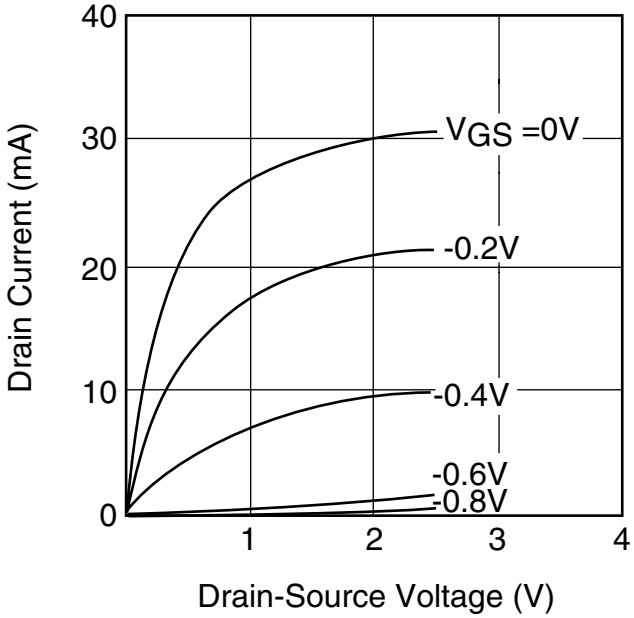


FUJITSU

**POWER DERATING CURVE**

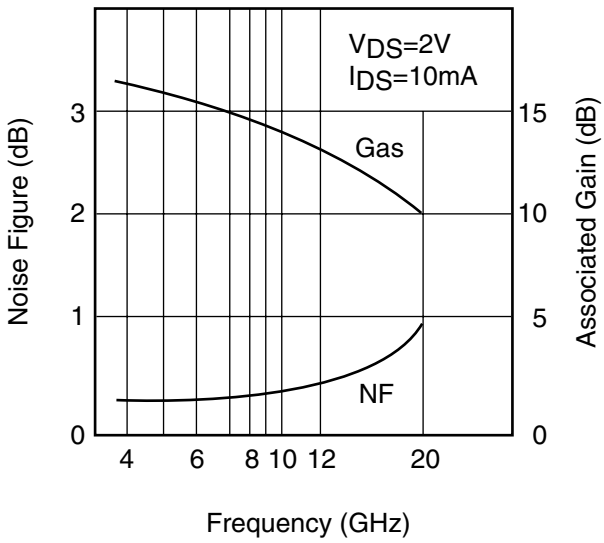



**DRAIN CURRENT vs. DRAIN-SOURCE VOLTAGE**



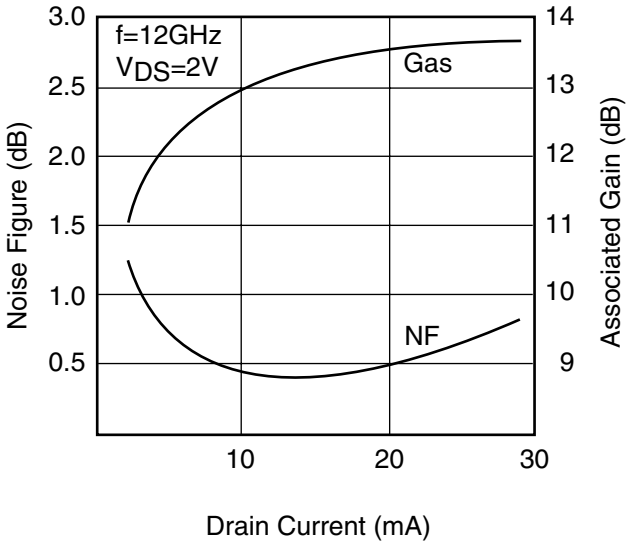
**NF & Gas vs. FREQUENCY**

FHX13LG



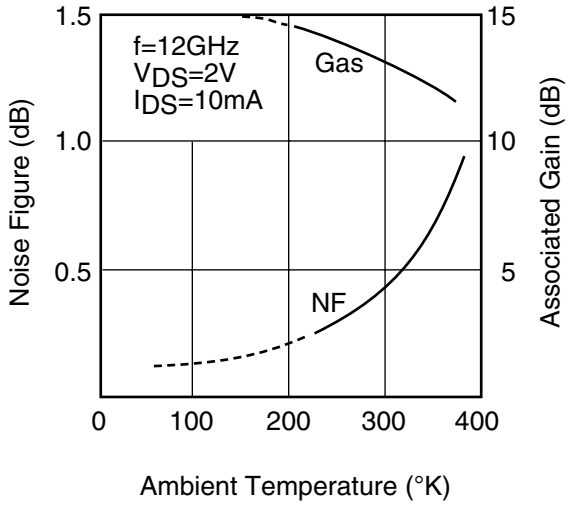

**NF & Gas vs. $I_{DS}$**

FHX13LG



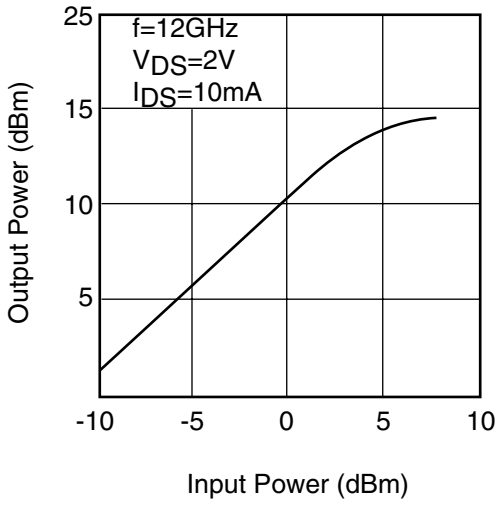

**NF & Gas vs. TEMPERATURE**

FHX13LG



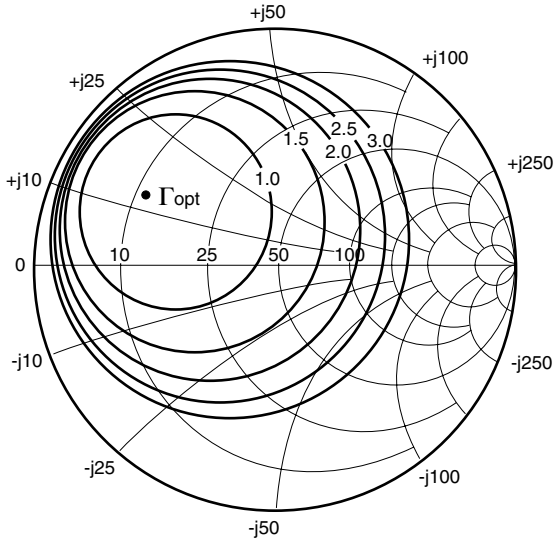

**OUTPUT POWER vs. INPUT POWER**

FHX13LG



## TYPICAL NOISE FIGURE CIRCLE

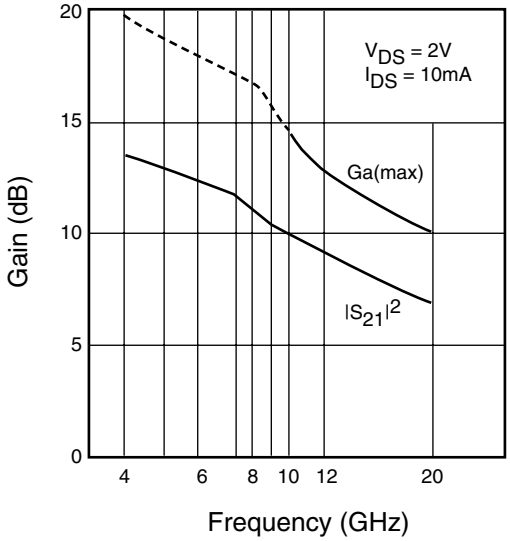
FHX13LG




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

Γopt = 0.61∠150°
Rn/50 = 0.04
NFmin = 0.45dB

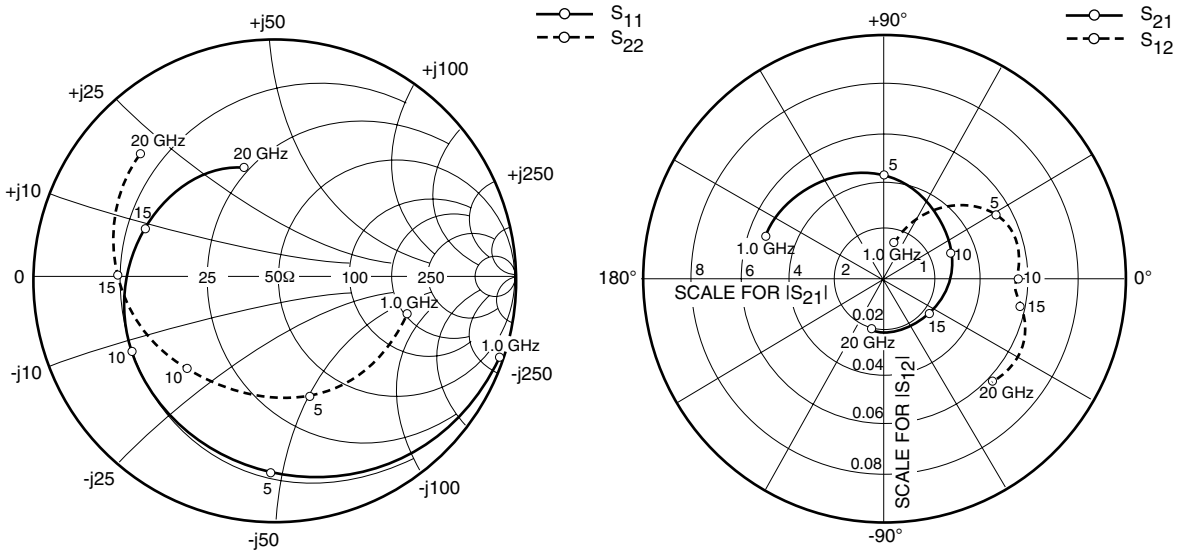
## Ga(max) & $|S_{21}|^2$ vs. FREQUENCY




## NOISE PARAMETERS

FHX13LG
$V_{DS}$=2V, $I_{DS}$=10mA

| Freq. (GHz) | Γopt (MAG) | Γopt (ANG) | NFmin (dB) | Rn/50 |
|---|---|---|---|---|
| 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 |



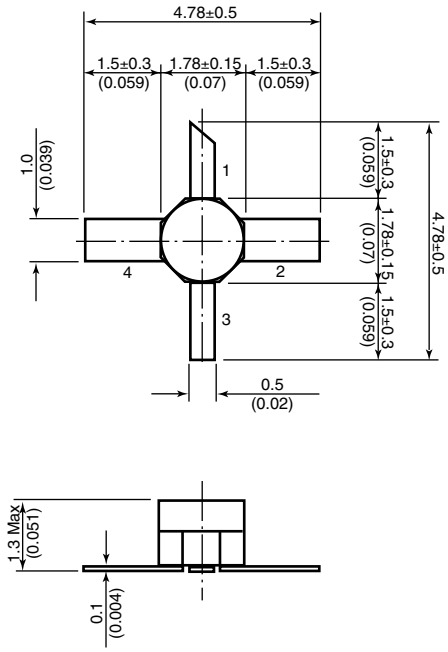

**S-PARAMETERS**
**FHX13/14LG**
$V_{DS}$ = 2V, $I_{DS}$ = 10mA

| FREQUENCY | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| (MHZ) | 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 |

**Download S-Parameters, click here**

**Case Style "LG"**

Metal-Ceramic Hermetic Package




1. **Gate**
2. **Source**
3. **Drain**
4. **Source**

Unit: mm(inches)

**For further information please contact:**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