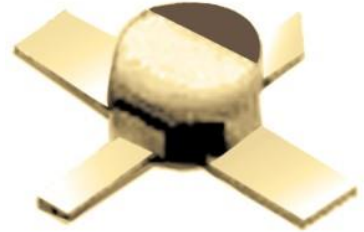


### FEATURES

- Low Noise Figure: 1.2dB (Typ.)@f=12GHz
- High Associated Gain: 10.0dB (Typ.)@f=12GHz
- $L_g \leq 0.25\mu\text{m}$ ,  $W_g = 280\mu\text{m}$
- Gold Gate Metallization for High Reliability
- Cost Effective Ceramic Microstrip (SMT) Package
- Tape and Reel Packaging Available



### DESCRIPTION

The FHX35LG & FHX35LP are a High Electron Mobility Transistor(HEMT) intended for general purpose, low noise and high gain amplifiers in the 2 to 18GHz frequency range. This device is packaged in cost effective, low parasitic, hermetically sealed(LG) or epoxy-sealed(LP) metal-ceramic packages for high volume telecommunication, DBS, TVRO, VSAT or other low noise applications.

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

### ABSOLUTE MAXIMUM RATING (Ambient Temperature Ta=25deg.C)

Item	Symbol	Rating	Unit	
Drain-Source Voltage	$V_{DS}$	4.0	V	
Gate-Source Voltage	$V_{GS}$	-3.0	V	
Total Power Dissipation	$P_T$	290	mW	
Storage Temperature	FHX35LG	$T_{stg}$	-65 to +175	deg.C
			FHX35LP	-65 to +150
Channel Temperature	FHX35LG	$T_{ch}$	175	deg.C
			FHX35LP	150

\*Note: Mounted on  $Al_2O_3$  board (30 x 30 x 0.65mm)

Sumitomo Electric recommends the following conditions for the reliable operation of GaAs FETs:

1. The drain-source operating voltage ( $V_{DS}$ ) should not exceed 3 volts.
2. The forward and reverse gate currents should not exceed 0.2 and -0.075 mA respectively with gate resistance of 4000ohm.
3. The operating channel temperature ( $T_{ch}$ ) should not exceed 80deg.C.

### ELECTRICAL CHARACTERISTICS (Ambient Temperature Ta=25deg.C)

Item	Symbol	Test Conditions	Limit			Unit
			Min.	Typ.	Max.	
Saturated Drain Current	$I_{DSS}$	$V_{DS} = 2V, V_{GS} = 0V$	15	40	85	mA
Transconductance	gm	$V_{DS} = 2V, I_{DS} = 10mA$	40	60	-	mS
Pinch-off Voltage	$V_p$	$V_{DS} = 2V, I_{DS} = 1mA$	-0.2	-1.0	-2.0	V
Gate Source Breakdown Voltage	$V_{GSO}$	$I_{GS} = -10\mu A$	-3.0	-	-	V
Noise Figure	NF	$V_{DS} = 3V, I_{DS} = 10mA$ f = 12GHz	-	1.2	1.6	dB
Associated Gain	$G_{as}$		8.5	10.0	-	dB
Thermal Resistance	$R_{th}$	Channel to Case	-	220	300	deg.C/W

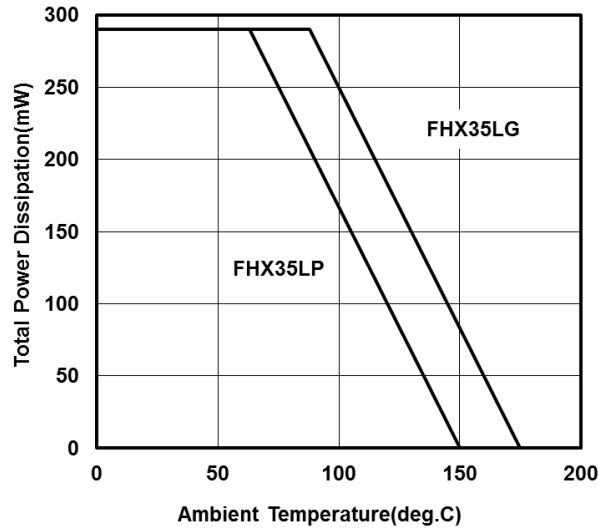
AVAILABLE CASE STYLES:	FHX35LG	FHX35LP
	LG	LP

Note: RF parameters are measured on a sample basis as follow s:

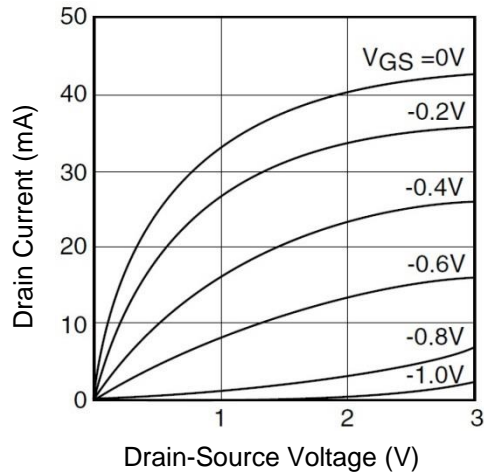
Lot qty.	Sample qty.	Accept/Reject
1200 or less	125	(0, 1)
1201 to 3200	200	(0, 1)
3201 to 10000	315	(1, 2)
10001 or over	500	(1, 2)

RoHS Compliance	Yes
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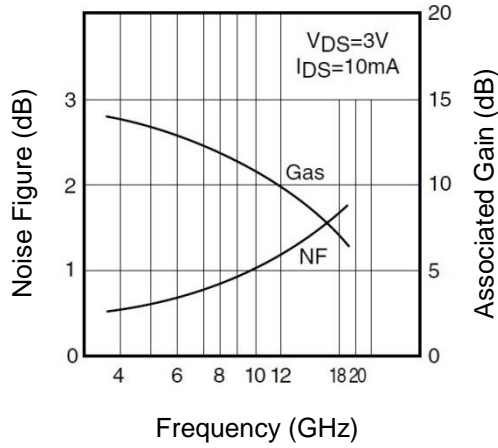
### POWER DERATING CURVE



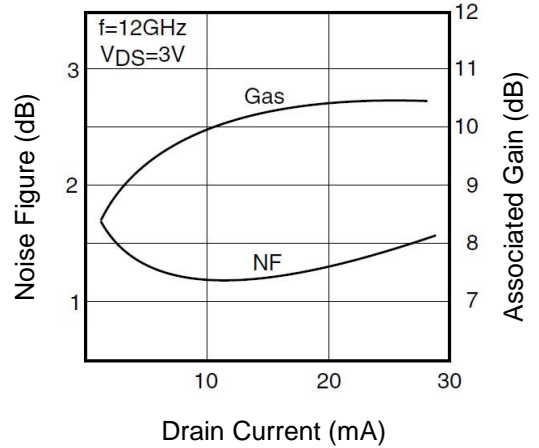
### DRAIN CURRENT vs. DRAIN-SOURCE VOLTAGE



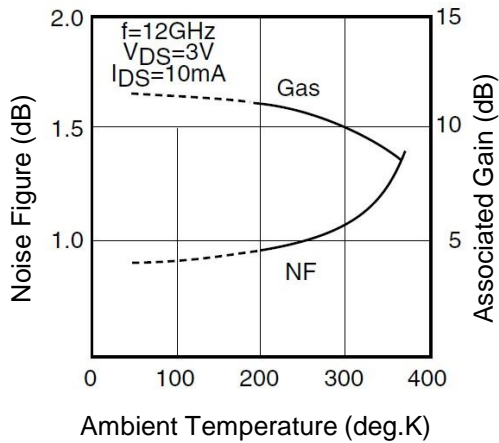
**NF &  $G_{as}$  vs. FREQUENCY**



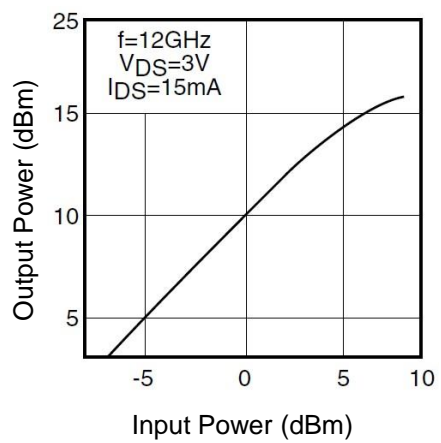
**NF &  $G_{as}$  vs.  $I_{DS}$**



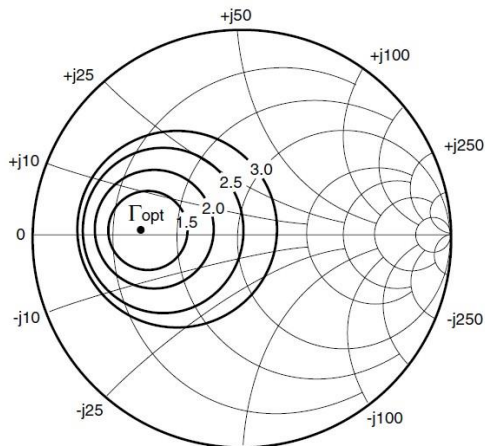
**NF &  $G_{as}$  vs. TEMPERATURE**



**OUTPUT POWER vs. INPUT POWER**



### TYPICAL NOISE FIGURE CIRCLE



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

$\Gamma_{opt}=0.56 \angle 175deg.$   
 $Rn/50=0.08$   
 $NFmin=1.2dB$

### NOISE PARAMETERS

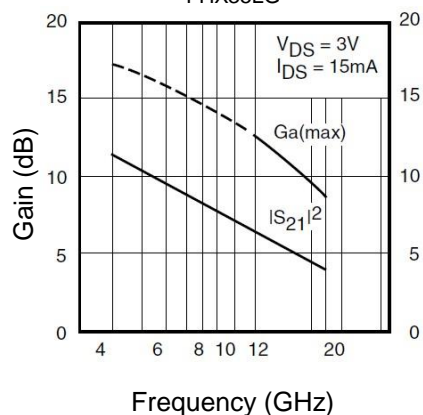
FHX35LG

$V_{DS} = 3V, I_{DS} = 10mA$

Freq. (GHz)	$\Gamma_{opt}$		NFmin (dB)	Rn/50
	(MAG)	(ANG)		
2	0.81	32	0.40	0.58
4	0.74	63	0.50	0.42
6	0.69	93	0.68	0.30
8	0.64	127	0.86	0.20
10	0.60	148	1.03	0.12
12	0.56	175	1.20	0.08
14	0.53	-162	1.38	0.08
16	0.50	-139	1.54	0.10
18	0.48	-117	1.70	0.14

### $G_a(max)$ AND $|S_{21}|^2$ vs. FREQUENCY

FHX35LG

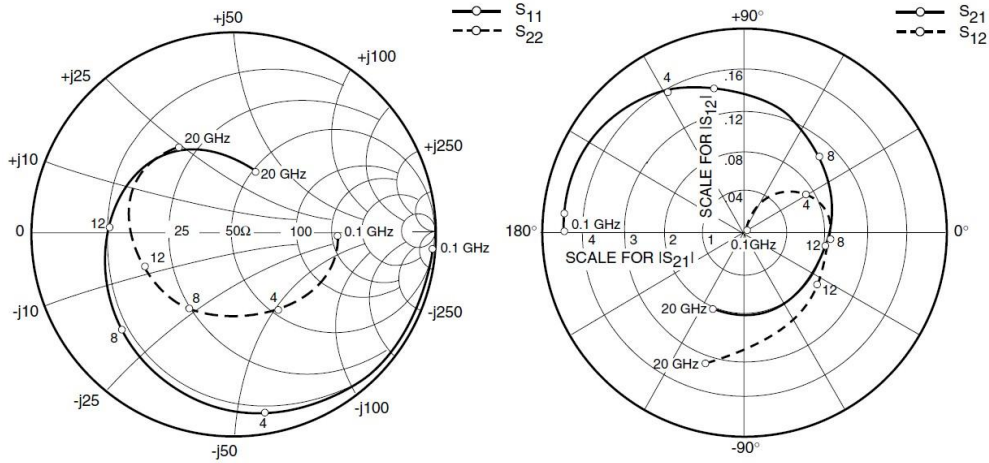


### NOISE PARAMETERS

FHX35LP

$V_{DS} = 3V, I_{DS} = 10mA$

Freq. (GHz)	$\Gamma_{opt}$		NFmin (dB)	Rn/50
	(MAG)	(ANG)		
2	0.85	30	0.40	0.29
4	0.76	55	0.50	0.26
6	0.69	81	0.68	0.19
8	0.62	109	0.86	0.12
10	0.55	138	1.03	0.06
12	0.50	168	1.20	0.04
14	0.45	-160	1.38	0.06
16	0.42	-126	1.54	0.13
18	0.39	-92	1.70	0.22



### S-PARAMETERS FHX35LG

$V_{DS} = 3V, I_{DS} = 10mA$

Freq (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.996	-3.5	4.576	177.2	0.002	81.2	0.516	-2.5
500	0.994	-12.1	4.548	169.0	0.012	79.3	0.517	-10.2
1000	0.982	-23.5	4.471	158.5	0.023	73.1	0.513	-19.9
2000	0.950	-44.7	4.304	139.3	0.043	57.9	0.498	-38.0
3000	0.912	-64.6	4.026	121.0	0.059	44.6	0.483	-54.9
4000	0.867	-84.0	3.742	103.1	0.071	31.8	0.462	-71.9
5000	0.821	-101.6	3.436	86.6	0.079	20.0	0.446	-87.6
6000	0.783	-117.5	3.132	71.6	0.085	9.8	0.439	-102.2
7000	0.757	-130.9	2.881	57.9	0.087	0.9	0.441	-115.3
8000	0.738	-142.8	2.659	45.0	0.088	-7.1	0.452	-126.7
9000	0.726	-153.8	2.497	32.4	0.090	-15.3	0.468	-136.9
10000	0.707	-164.5	2.347	20.2	0.092	-21.7	0.480	-146.1
11000	0.680	-174.1	2.206	8.4	0.090	-27.8	0.494	-156.0
12000	0.654	176.1	2.101	-3.4	0.090	-35.5	0.503	-164.8
13000	0.638	166.0	2.035	-15.1	0.091	-42.6	0.514	-173.8
14000	0.626	157.1	2.003	-26.2	0.093	-49.6	0.537	178.4
15000	0.607	147.8	1.975	-37.6	0.094	-55.8	0.559	171.0
16000	0.565	138.4	1.917	-50.1	0.097	-64.7	0.564	162.7
17000	0.528	127.2	1.924	-62.9	0.102	-73.3	0.567	154.4
18000	0.484	112.8	1.966	-77.1	0.109	-86.2	0.572	142.7
19000	0.421	93.5	1.932	-91.7	0.116	-96.2	0.581	133.1
20000	0.380	74.2	1.991	-107.4	0.127	-110.9	0.547	124.3

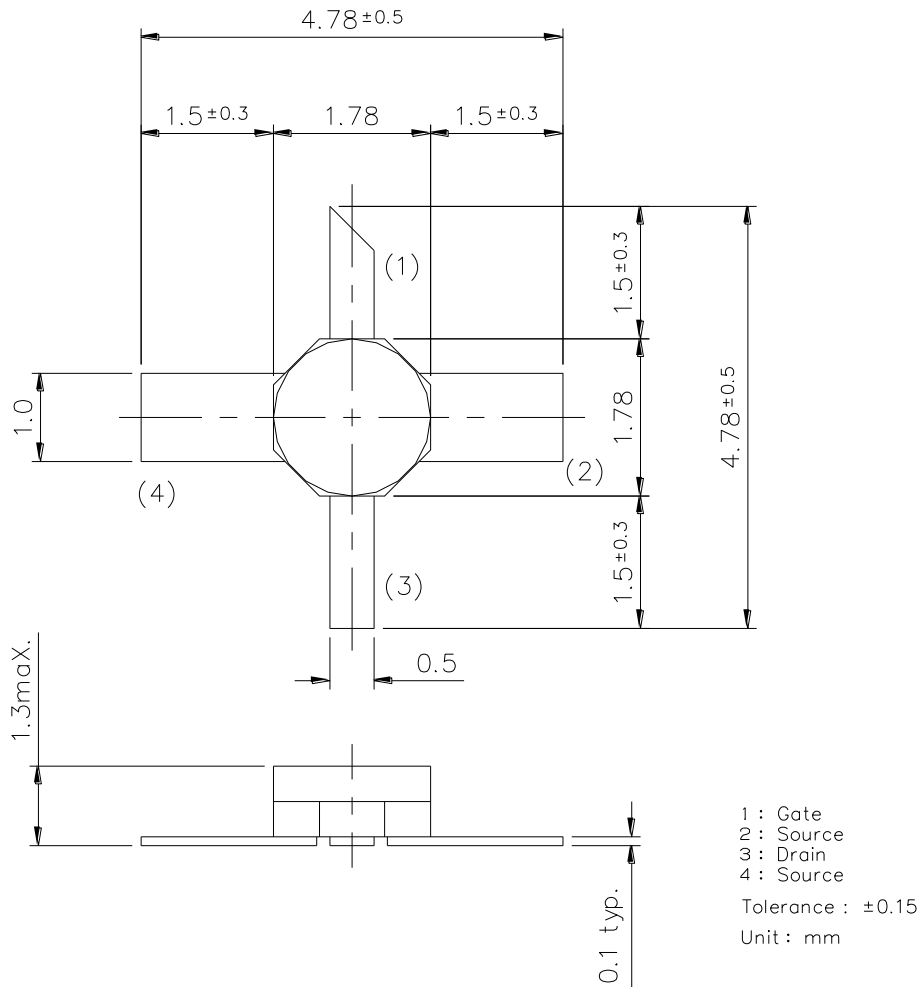
## S-PARAMETERS FHX35LP

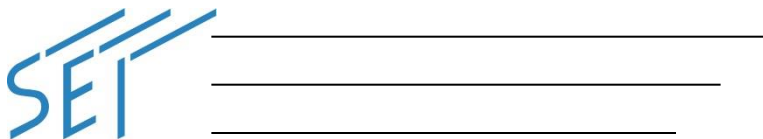
$V_{DS} = 3V, I_{DS} = 10mA$

Freq (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1000	0.987	-20.9	4.008	159.2	0.024	75.4	0.591	-15.5
2000	0.956	-40.5	3.889	141.7	0.045	61.0	0.569	-30.7
3000	0.907	-59.7	3.704	125.0	0.063	47.6	0.536	-45.5
4000	0.855	-78.5	3.504	108.2	0.079	35.5	0.503	-59.6
5000	0.801	-96.6	3.279	91.4	0.091	23.4	0.467	-72.8
6000	0.749	-113.7	3.044	76.0	0.098	13.4	0.434	-87.0
7000	0.707	-129.7	2.822	61.3	0.103	3.8	0.417	-100.7
8000	0.670	-143.9	2.607	48.9	0.107	-4.6	0.411	-113.3
9000	0.639	-156.6	2.422	36.6	0.109	-12.4	0.411	-124.4
10000	0.612	-169.4	2.300	24.2	0.113	-19.5	0.410	-134.5
11000	0.580	178.0	2.168	11.6	0.115	-26.7	0.407	-145.3
12000	0.561	165.0	2.061	-0.3	0.117	-33.9	0.409	-157.7
13000	0.533	153.0	1.949	-12.0	0.119	-40.6	0.424	-167.7
14000	0.519	141.9	1.884	-22.6	0.122	-46.6	0.440	-177.2
15000	0.501	128.9	1.841	-34.1	0.127	-55.3	0.463	174.7
16000	0.486	115.0	1.834	-47.7	0.133	-63.1	0.469	166.1
17000	0.462	98.5	1.765	-60.8	0.139	-73.4	0.478	155.5
18000	0.439	83.6	1.704	-74.4	0.144	-83.3	0.489	145.4

## Case Style "LG" & "LP"

Metal-Ceramic Package





# **FHX35LG/LP**

**Super Low Noise HEMT**

## **CAUTION**

Sumitomo Electric Device Innovations, Inc. 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.