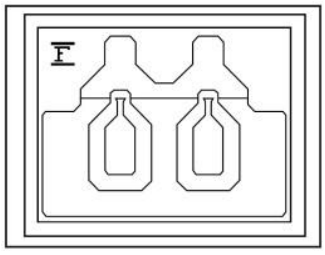
FHX04X, FHX05X, FHX06X

GaAs HEMT Chips

FEATURES

- Low Noise Figure: 0.75dB (Typ.)@f=12GHz (FHX04)
- High Associated Gain: 10.5dB (Typ.)@f=12GHz
- Lg ≤ 0.25um, Wg = 200um
- 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 to 18GHz frequency range. The devices are well suited for 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}	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	deg.C
Channel Temperature	T_{ch}	175	deg.C

*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 2 volts.
2. The forward and reverse gate currents should not exceed 0.2 and -0.05 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)

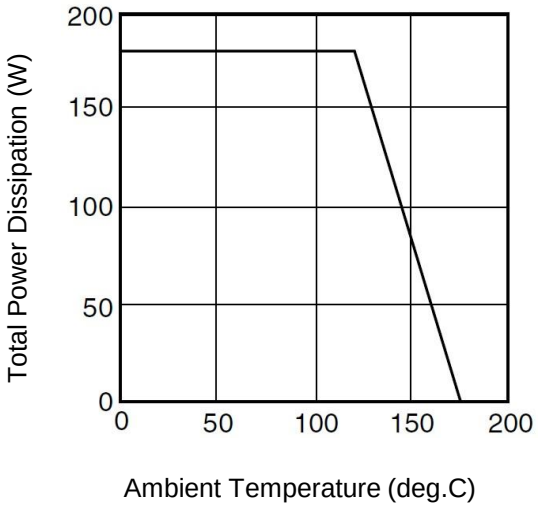
Item		Symbol	Test Conditions	Limit			Unit
				Min.	Typ.	Max.	
Saturated Drain Current		I_{DSS}	V_{DS} = 2V, V_{GS} = 0V	15	30	60	mA
Transconductance		gm	V_{DS} = 2V, I_{DS} = 10mA	35	45	-	mS
Pinch-off Voltage		Vp	V_{DS} = 2V, I_{DS} = 1mA	-0.2	-0.7	-1.5	V
Gate Source Breakdown Voltage		V_{GSO}	I_{GS} = -10uA	-3.0	-	-	V
Noise Figure	FHX04X	NF	V_{DS} = 2V I_{DS} = 10mA f = 12GHz	-	0.75	0.85	dB
Associated Gain	FHX04X	G_{as}		9.5	10.5	-	dB
Noise Figure	FHX05X	NF		-	0.9	1.1	dB
Associated Gain	FHX05X	G_{as}		9.5	10.5	-	dB
Noise Figure	FHX06X	NF		-	1.1	1.35	dB
Associated Gain	FHX06X	G_{as}		9.5	10.5	-	dB
Maximum Abailable Gain		G_a(max)	Same as above, Gain matched	11.0	12.0	-	dB
Thermal Resistance		R_{th}	Channel to Case	-	220	300	deg.C/W

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

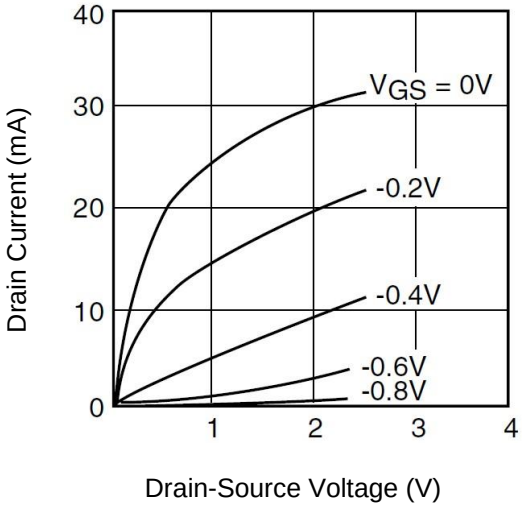
The chip must be enclosed in a hermetically sealed environment for optimum performance and reliability.

RoHS Compliance	Yes

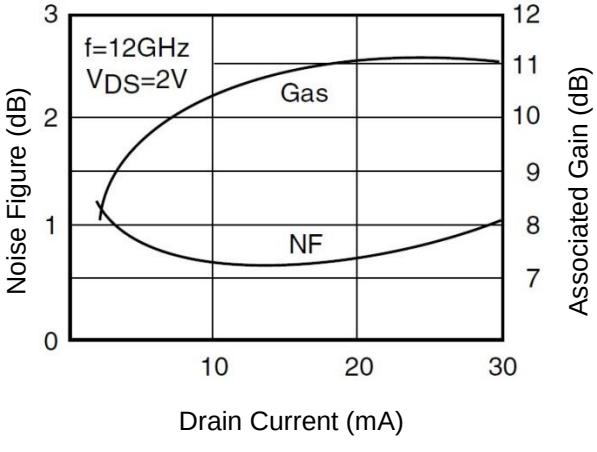
POWER DERATING CURVE



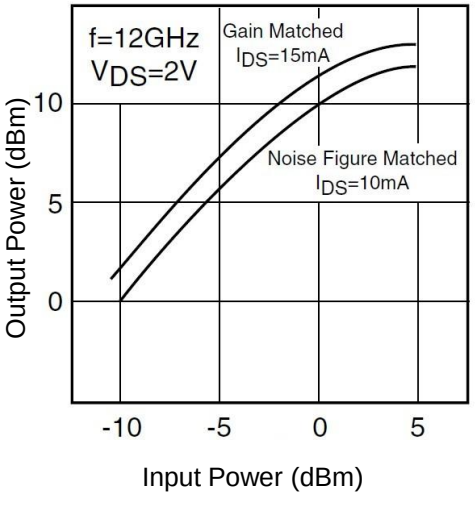
DRAIN CURRENT vs. DRAIN-SOURCE VOLTAGE

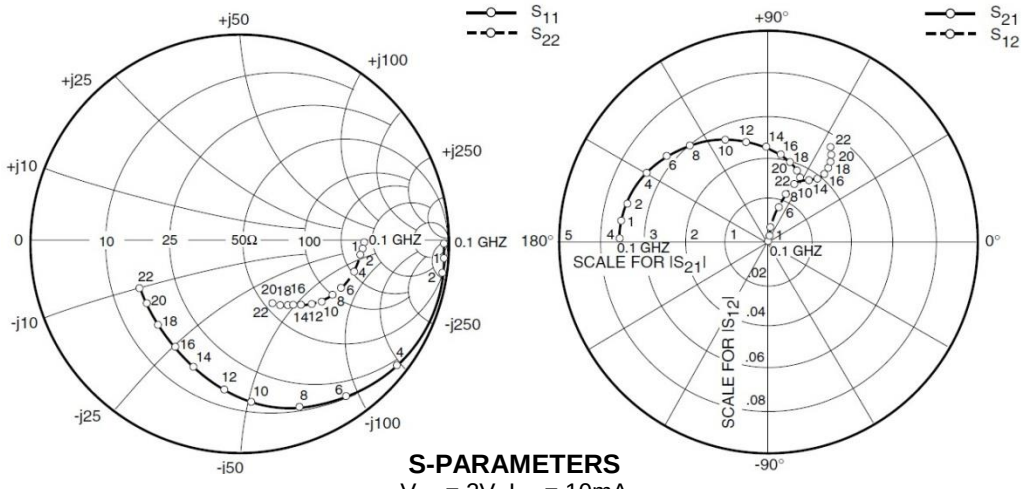


NF & G_{as} vs. I_{DS}



OUTPUT POWER vs. INPUT POWER





S-PARAMETERS

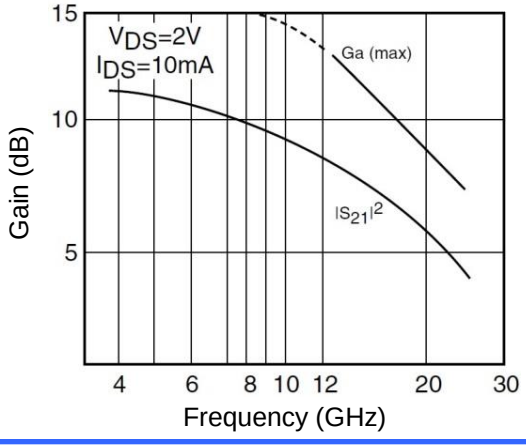
V_{DS} = 2V, I_{DS} = 10mA

Freq	S11		S21		S12		S22	
(MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	1.000	-0.9	3.721	179.2	0.001	89.5	0.606	-0.4
500	0.999	-4.7	3.717	176.0	0.007	87.7	0.605	-2.1
1000	0.996	-9.5	3.705	172.0	0.013	86.4	0.604	-4.2
2000	0.983	-18.8	3.658	164.1	0.026	81.0	0.598	-8.3
4000	0.928	-37.0	3.489	149.0	0.049	72.3	0.576	-16.0
6000	0.877	-54.0	3.255	135.1	0.068	66.0	0.547	-22.9
8000	0.811	-59.3	2.999	122.5	0.082	60.3	0.516	-28.9
10000	0.748	-84.5	2.750	111.2	0.093	57.3	0.485	-34.2
12000	0.694	-98.2	2.521	101.1	0.101	55.2	0.457	-39.1
14000	0.649	-111.1	2.319	92.0	0.108	54.6	0.432	-43.7
16000	0.614	-123.2	2.142	83.5	0.114	55.0	0.410	-48.4
18000	0.588	-134.6	1.988	75.9	0.121	56.2	0.391	-53.2
20000	0.570	-145.4	1.853	68.8	0.130	57.8	0.373	-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)

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

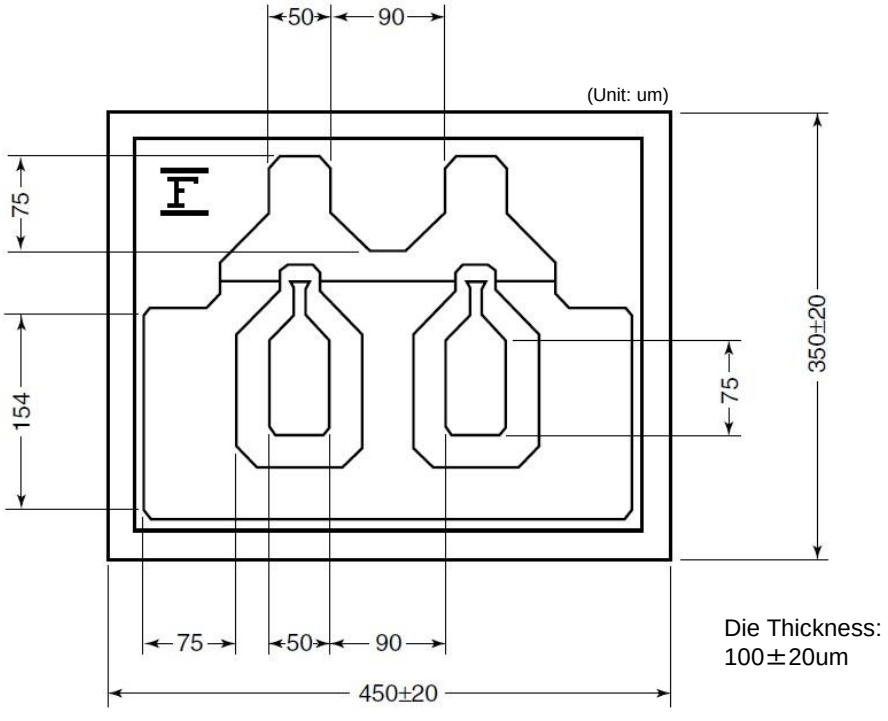


NOISE PARAMETERS

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

Freq. (GHz)	Γ opt (MAG)	Γ opt (ANG)	NFmin (dB)	Rn/50
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

CHIP OUTLINE



Die Thickness:
100±20um

■ BARE DIE INDEMNIFICATION

All devices are DC probed and visually inspected at SEI, and non-compliant devices are removed. The RF electrical characteristics of the bare dice are warranted by the sampling inspection procedures. The standard sampling inspection procedure shall include the number of the sampling dice, position of the sampling dice in the wafer and RF electrical characteristics of the sampling dice measured in the test fixture. Customer shall understand that all the bare dice will not be 100% RF tested by SEI. It is the customer responsibility to verify performance of the devices.

Customer shall comply with the storage and handling requirements for condition and period of storage of the bare dice agreed by customer and SEI. Warranty will not apply when customer disregards the storage and handling requirements.

Warranty will not apply to the electrical characteristics and product quality to the bare dice after assembly by customer.

SEI will indemnify customer for warranty failures, provided however that the indemnification to customer shall be limited to supply of bare dice for substitution.

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.