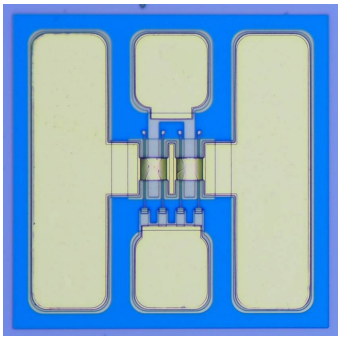
Super Low Noise GaAs PHEMT FETs

FEATURES

- Low Noise Figure: NF = 0.35 dB Typical at 12 GHz
- High Associated Gain: Ga = 14.5 dB Typical at 12 GHz
- Lg = 0.15 µm, Wg = 160 µm
- All-Gold Metallization for High Reliability
- Tight Vp ranges control
- High RF input power handling capability
- 100 % DC Tested

PHOTO ENLARGEMENT



DESCRIPTION

The TC1106 is a GaAs Pseudomorphic High Electron Mobility Transistor (PHEMT) chip, which has very low noise figure and high associated gain. The device can be used in circuits up to 50 GHz and suitable for low noise application including a wide range of commercial and military applications. All devices are 100% DC tested to assure consistent quality. All bond pads are gold plated for either thermo-compression or thermo-sonic wire bonding.

ELECTRICAL SPECIFICATIONS (T_A=25 °C)

Symbol	Conditions	MIN	TYP	MAX	UNIT
NF	Noise Figure at V_{DS} = 2 V, I_{DS} = 10 mA,, *f* = 12GHz		0.35	0.45	dB
G_a	Associated Gain at V_{DS} = 2 V, I_{DS} = 10 mA, *f* = 12GHz	12.5	14.5		dB
I_{DSS}	Saturated Drain-Source Current at V_{DS} = 2 V, V_{GS} = 0 V		54		mA
g_m	Transconductance at V_{DS} = 2 V, V_{GS} = 0 V		96		mS
V_P	Pinch-off Voltage at V_{DS} = 2 V, I_D = 0.32 mA		-0.6		Volts
BV_{DGO}	Drain-Gate Breakdown Voltage at I_{DGO} =0.08 mA	5	7		Volts
R_{th}	Thermal Resistance		225		°C/W

ABSOLUTE MAXIMUM RATINGS (T_A=25 °C)

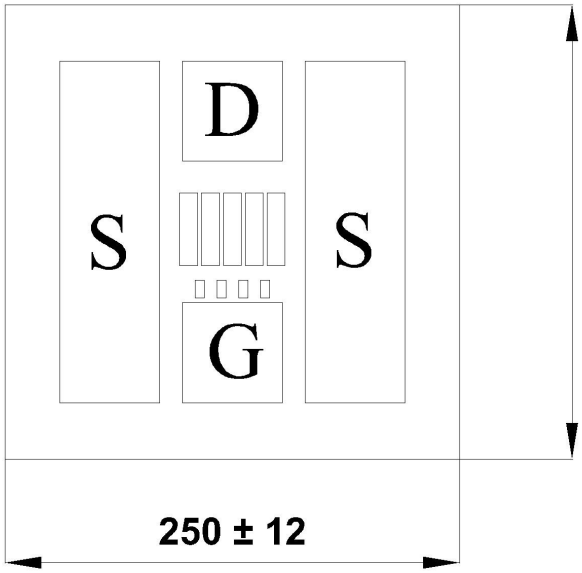
Symbol	Parameter	Rating
V_{DS}	Drain-Source Voltage	4 V
V_{GS}	Gate-Source Voltage	-3.0 V
I_{DS}	Drain Current	I_{DSS}
I_{GS}	Gate Current	160 µA
P_{in}	RF Input Power, CW	10 dBm
P_T	Continuous Dissipation	150 mW
T_{CH}	Channel Temperature	175 °C
T_{STG}	Storage Temperature	- 65 °C to +175 °C

TYPICAL NOISE PARAMETERS (T_A=25 °C)

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

Frequency (GHz)	NF_{opt} (dB)	G_A (dB)	Γ_{opt}		Rn/50
			MAG	ANG	
2	0.24	22.3	0.96	13	0.39
4	0.26	20.6	0.82	28	0.34
6	0.28	19.3	0.67	47	0.26
8	0.30	17.3	0.51	72	0.19
10	0.32	15.8	0.38	100	0.11
12	0.34	14.5	0.29	139	0.09
14	0.40	13.8	0.26	185	0.08
16	0.54	13.1	0.33	-128	0.10
18	0.70	12.3	0.40	-81	0.22

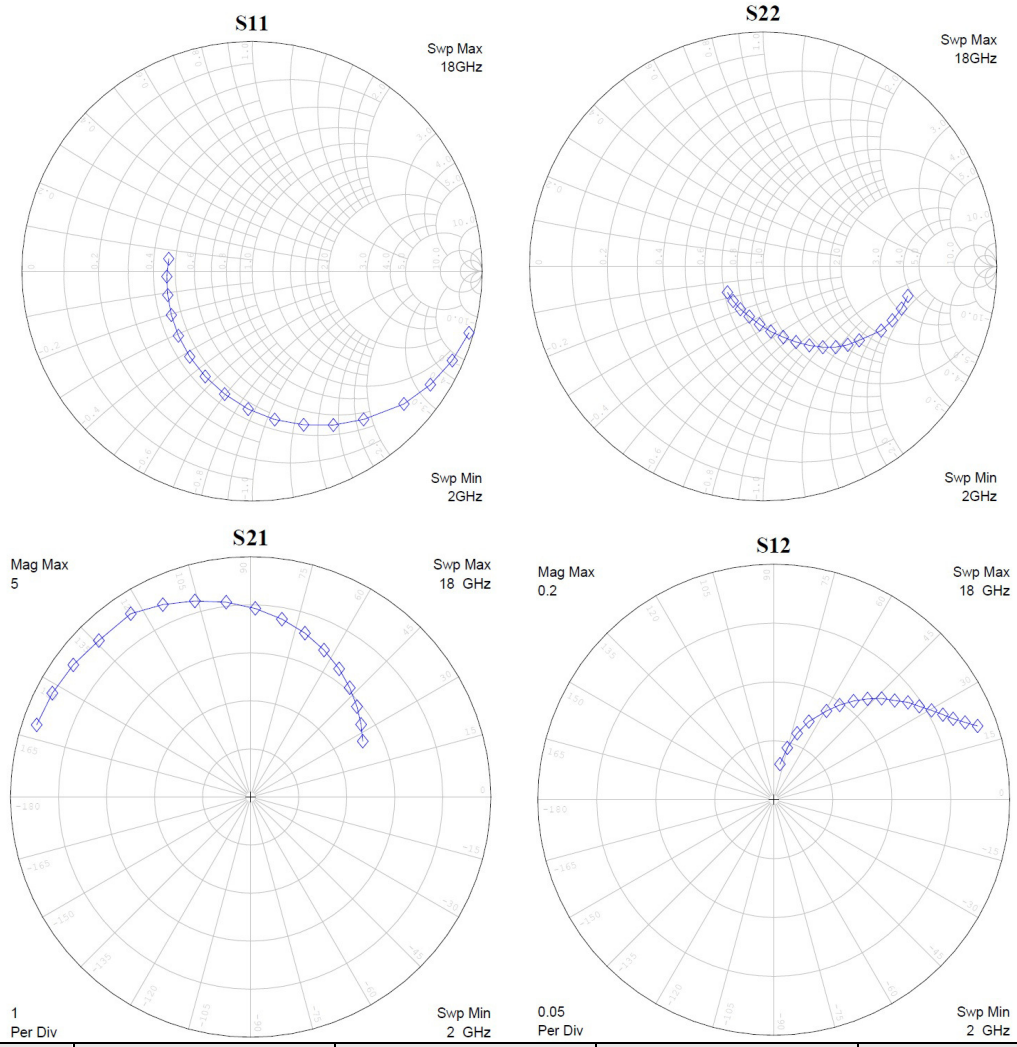
CHIP DIMENSIONS



Units : Micrometers
Chip Thickness : 100

Gate Pad : 45*50
Drain Pad : 45*50
Source Pad : 185*50

TYPICAL SCATTERING PARAMETERS (T_A=25 °C) V_{DS} = 2 V, I_{DS} = 10 mA



FREQUENCY	S11		S21		S12		S22	
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
2	0.9798	-15.87	4.7006	161.39	0.0307	80.11	0.6315	-11.46
3	0.9527	-24.05	4.6587	152.37	0.0455	75.45	0.6186	-16.88
4	0.9186	-32.48	4.6026	143.32	0.0598	70.72	0.5985	-22.56
5	0.8768	-41.17	4.5365	134.14	0.0727	65.91	0.5744	-28.44
6	0.8065	-53.06	4.5578	123.18	0.0876	59.38	0.5177	-37.48
7	0.7567	-62.15	4.4006	114.53	0.0979	55.23	0.4926	-42.72
8	0.7048	-71.42	4.2415	105.88	0.1077	51.15	0.4635	-47.94
9	0.6529	-81.34	4.0864	97.17	0.1168	47.16	0.4285	-53.45
10	0.5997	-91.61	3.9256	88.58	0.1255	43.27	0.3903	-59.61
11	0.5476	-102.53	3.7577	80.02	0.1327	39.43	0.3516	-66.38
12	0.5008	-113.96	3.5918	71.66	0.1406	36.02	0.3134	-74.05
13	0.4597	-126.07	3.4186	63.44	0.1466	32.76	0.2795	-83.23
14	0.4255	-138.73	3.2414	55.37	0.1537	29.58	0.2477	-93.61
15	0.3988	-151.45	3.0695	47.79	0.1605	26.76	0.2216	-105.61
16	0.3806	-164.22	2.9046	40.35	0.1668	24.34	0.2065	-118.24
17	0.3707	-176.45	2.7507	33.26	0.1749	22.06	0.1953	-131.12
18	0.3658	-171.43	2.6065	26.42	0.1837	19.94	0.1884	-144.13

CHIP HANDLING

DIE ATTACHMENT: Conductive epoxy or eutectic die attach is recommended. Eutectic die attach can be accomplished with Au-Sn (80%Au-20%Sn) perform at stage temperature: 290°C ± 5°C; Handling Tool: Tweezers; Time: less than 1min.

WIRE BONDING: The recommended wire bond method is thermocompression bonding with 0.7 to 1.0 mil (0.018 to 0.025 mm) gold wires. Stage temperature: 220°C to 250°C; Bond Tip Temperature: 150°C; Bond Force: 20 to 30 gms depending on size of wire and Bond Tip Temperature.

HANDLING PRECAUTIONS: The user must operate in a clean and dry environment. Care should be exercised during handling avoid damage to the devices. Electrostatic Discharge (ESD) precautions should be observed at all stages of storage, handling, assembly, and testing. The static discharge must be less than 300V.