NEC

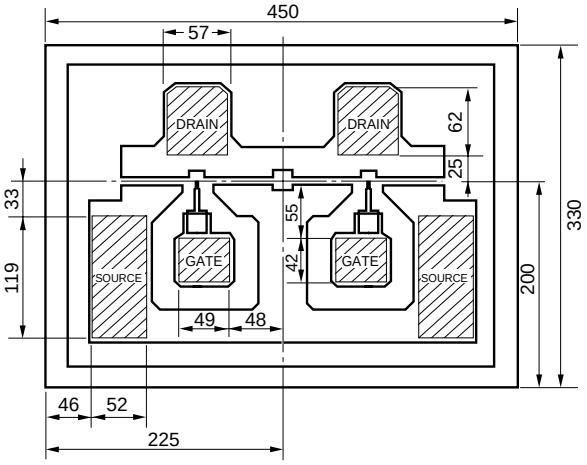
GaAs MES FET
NE76000

C to Ku BAND LOW NOISE AMPLIFIER
N-CHANNEL GaAs MES FET

FEATURES

- Low noise figure
  NF = 1.6 dB TYP. at f = 12 GHz
- High associated gain
  Ga = 9.0 dB TYP. at f = 12 GHz
- Gate length: L_g = 0.3 μm
- Gate width: W_g = 280 μm

CHIP DIMENSIONS (Unit: μm)



Thickness = 140 μm

▨ : BONDING AREA

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Drain to Source Voltage	V_{DS}	5.0	V
Gate to Source Voltage	V_{GS}	–3.0	V
Gate to Drain Voltage	V_{GD}	–5.0	V
Drain Current	I_D	I_{DSS}	mA
Total Power Dissipation	P_{tot}	500*1	mW
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	–65 to +175	°C
Thermal Resistance	$R_{th(c-a)}$	190	°C/W

***1** : T_A = 100 °C
P_{tot} for chip mounted on a copper heat sink.

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Gate to Source Leak Current	I_{GSO}			10	μA	V_{GS} = –4 V
Saturated Drain Current	I_{DSS}	15	30	50	mA	V_{DS} = 3 V, V_{GS} = 0 V
Gate to Source Cutoff Voltage	$V_{GS(off)}$	–0.5	–0.8	–3.0	V	V_{DS} = 3 V, I_D = 100 μA
Transconductance	gm	30	40	70	mS	V_{DS} = 3 V, I_D = 10 mA
Noise Figure	NF		1.6	1.8	dB	V_{DS} = 3 V, I_D = 10 mA
Associated Gain	Ga	8.0	9.0		dB	f = 12 GHz

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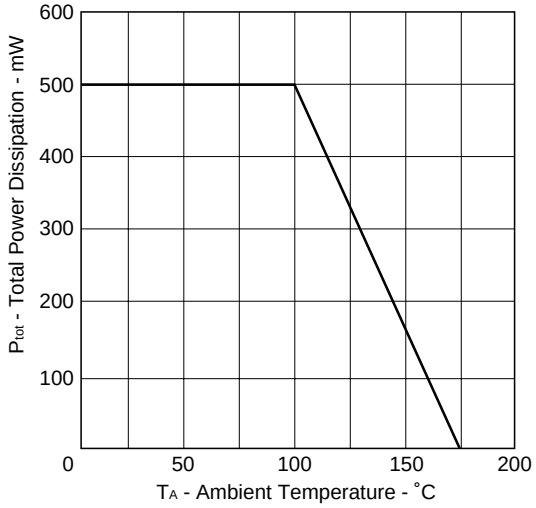
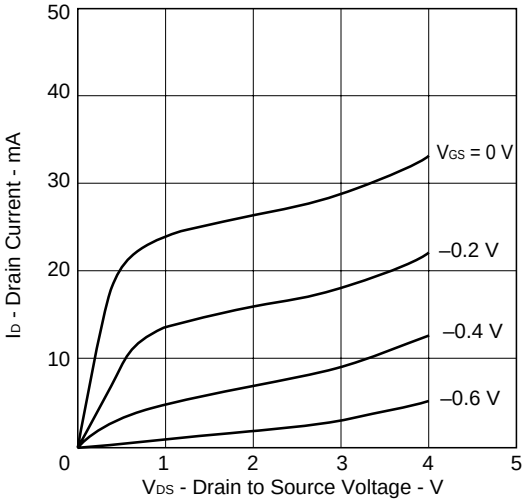
TYPICAL CHARACTERISTICS (T_A = 25 °C)

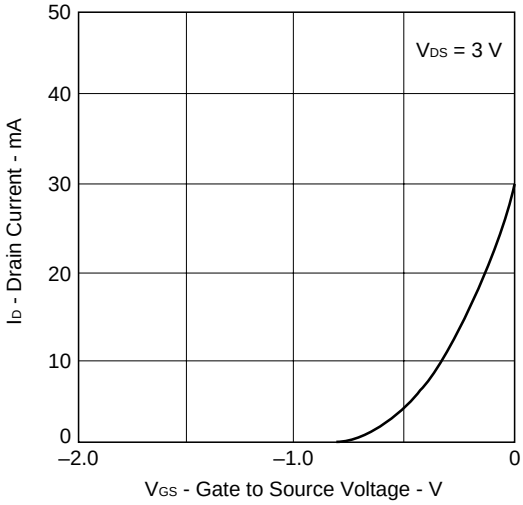
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



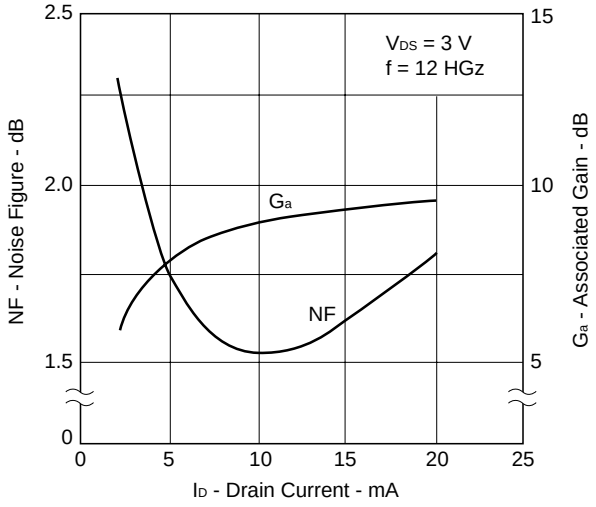
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



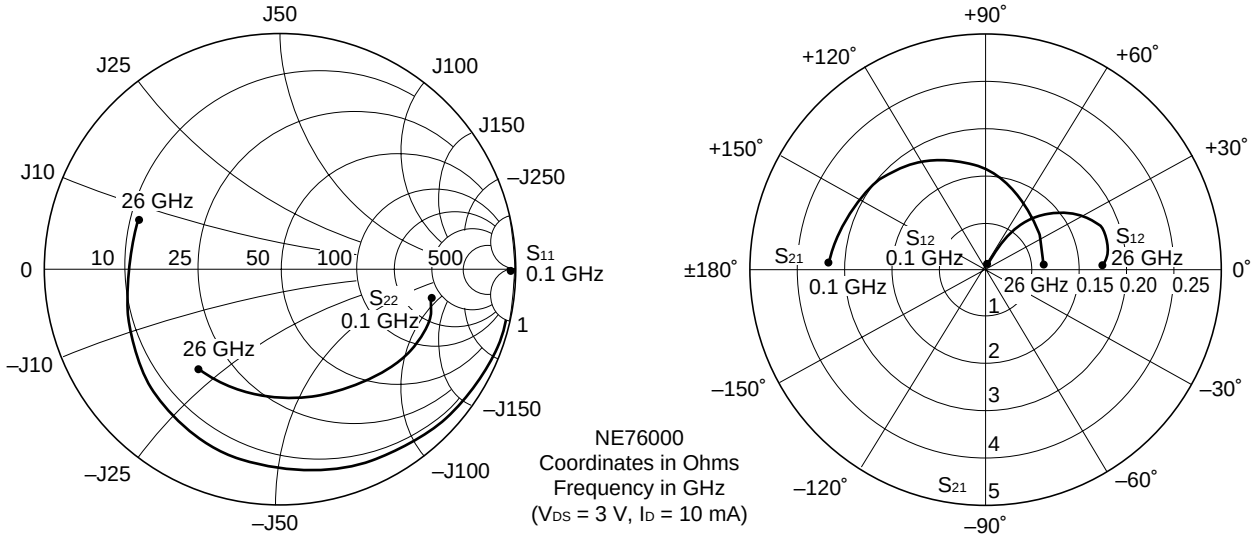
DRAIN CURRENT vs.
GATE TO SOURCE VOLTAGE



NOISE FIGURE, ASSOCIATED GAIN vs.
DRAIN CURRENT



S-Parameters



Note: S-parameters include bond wires.

Gate : Total 2 wire(s), 1 per bond pad, 0.0139" (354 μm) long each wire.

Drain : Total 2 wire(s), 1 per bond pad, 0.0115" (291 μm) long each wire.

Source : Total 4 wire(s), 2 per side, 0.0066" (168 μm) long each wire.

Wire : 0.0007" (17.8 μm) Diameter, Gold.

MAG AND ANG

V_{DS} = 3 V, I_D = 10 mA

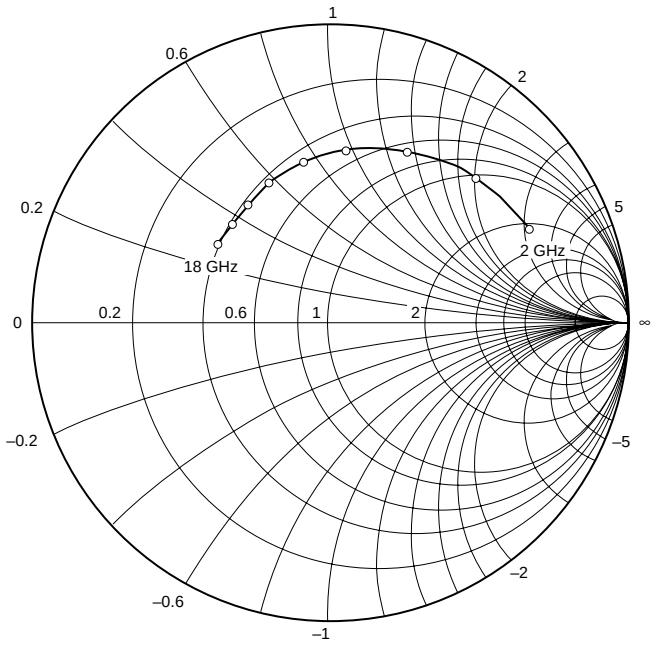
FREQUENCY(GHz)	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG
0.05	0.99	–1	3.32	180	0.001	89	0.68	–1	.15	35.2
0.10	0.99	–2	3.30	179	0.002	87	0.68	–1	.10	32.2
0.20	0.99	–3	3.29	178	0.004	86	0.68	–2	.10	29.2
0.50	0.99	–7	3.28	175	0.009	85	0.68	–3	.05	25.6
1.0	0.99	–14	3.27	169	0.02	81	0.67	–8	.05	21.9
2.0	0.99	–27	3.19	158	0.04	74	0.67	–16	.08	19.1
3.0	0.97	–39	3.08	148	0.06	66	0.66	–23	.13	17.3
4.0	0.95	–50	2.95	138	0.07	59	0.64	–30	.18	16.1
5.0	0.92	–61	2.81	129	0.09	51	0.62	–36	.24	15.2
6.0	0.89	–70	2.67	120	0.09	47	0.60	–42	.30	14.5
7.0	0.87	–78	2.55	113	0.10	41	0.59	–47	.34	13.9
8.0	0.86	–87	2.45	104	0.11	36	0.58	–53	.38	13.5
9.0	0.83	–96	2.33	97	0.11	30	0.57	–58	.45	13.1
10.0	0.81	–104	2.24	90	0.12	29	0.57	–63	.45	12.7
11.0	0.80	–112	2.16	83	0.13	23	0.56	–68	.48	12.3
12.0	0.77	–120	2.08	76	0.13	19	0.56	–73	.52	12.0
13.0	0.75	–128	2.00	70	0.13	16	0.55	–77	.56	11.9
14.0	0.74	–135	1.93	63	0.13	12	0.55	–81	.59	11.6
15.0	0.73	–141	1.85	58	0.13	9	0.55	–85	.62	11.4
16.0	0.72	–147	1.80	53	0.13	6	0.55	–88	.65	11.3
17.0	0.71	–152	1.73	47	0.13	5	0.55	–91	.72	11.3
18.0	0.70	–155	1.65	43	0.13	3	0.55	–94	.80	11.0
19.0	0.69	–159	1.57	38	0.12	2	0.55	–96	.97	11.1
20.0	0.68	–162	1.53	35	0.12	4	0.55	–99	.99	11.0
21.0	0.67	–166	1.49	30	0.12	5	0.55	–102	1.02	10.0
22.0	0.67	–171	1.46	26	0.12	4	0.55	–107	1.09	9.3
23.0	0.65	–176	1.41	21	0.12	5	0.55	–111	1.13	8.7
24.0	0.64	178	1.39	16	0.12	5	0.55	–116	1.08	8.9
25.0	0.63	171	1.32	11	0.12	5	0.55	–120	1.17	7.9
26.0	0.62	164	1.29	7	0.12	4	0.55	–123	1.18	7.6

NOISE PARAMETERS

V_{DS} = 3.0 V

I_D = 10 mA

<Γ_{opt}. vs. frequency>



START 2 GHz, STOP 18 GHz, STEP 2 GHz

<Noise Parameter>

Freq. (GHz)	$NF_{min.}$ (dB)	Gain (dB)	$\Gamma_{opt.}$		$R_n/50$
			MAG.	ANG.(deg.)	
2.0	0.65	18.0	0.76	25	0.63
4.0	0.70	14.5	0.70	45	0.49
6.0	0.85	12.5	0.64	65	0.41
8.0	1.10	11.0	0.60	83	0.36
10.0	1.30	9.9	0.56	99	0.32
12.0	1.60	9.0	0.52	114	0.27
14.0	1.90	8.2	0.49	125	0.23
16.0	2.20	7.5	0.48	135	0.20
18.0	2.50	7.0	0.47	145	0.18

Γ_{opt}. includes bond wired.

Bond wires used during testing. Wire: 0.0007” (17.8 μm) Diameter, Gold.

Gate: 2 wires total, 1 per bond pad, 0.0139” long each wire.

Drain: 2 wires total, 1 per bond pad, 0.0115” long each wire.

Source: 4 wires total, 2 per side, 0.0066” long each wire.

CHIP HANDLING

DIE ATTACHMENT

Die attach operation can be accomplished with Au-Sn (within a 300 °C –10 s) performs in a forming gas environment.

Epoxy die attach is not recommend.

BONDING

Bonding wires should be minimum length, semi hard gold wire (3-8 % elongation) 20 microns in diameter.

Bonding should be performed with a wedge tip that has a taper of approximately 15 %. Bonding time should be kept to minimum.

As a general rule, the bonding operation should be kept within a 280 °C, 2 minutes for all bonding wires.

If longer periods are required, the temperature should be lowered.

PRECAUTIONS

The user must operate in a clean, dry environment. The chip channel is glassivated for mechanical protection only and does not preclude the necessity of a clean environment.

The bonding equipment should be periodically checked for sources of surge voltage and should be properly grounded at all times. In fact, all test and handling equipment should be grounded to minimize the possibilities of static discharge.

Avoid high static voltage and electric fields, because this device is GaAs field effect transistor with shottky barrier gate.

Caution

The Great Care must be taken in dealing with the devices in this guide.
The reason is that the material of the devices is GaAs (Gallium Arsenide), which is designated as harmful substance according to the law concerned.
Keep the law concerned and so on, especially in case of removal.

[MEMO]

[MEMO]

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