

To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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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: $L_g = 0.3 \mu\text{m}$
- Gate width: $W_g = 280 \mu\text{m}$

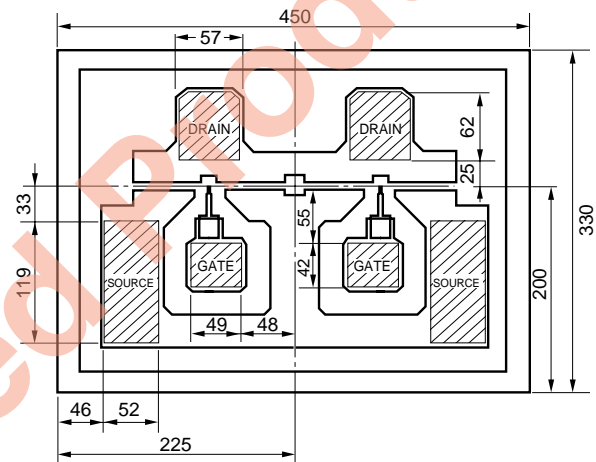
ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

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	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +175	$^\circ\text{C}$
Thermal Resistance	$R_{th(c-a)}$	190	$^\circ\text{C/W}$

*1 : $T_A = 100^\circ\text{C}$

P_{tot} for chip mounted on a copper heat sink.

CHIP DIMENSIONS (Unit: μm)



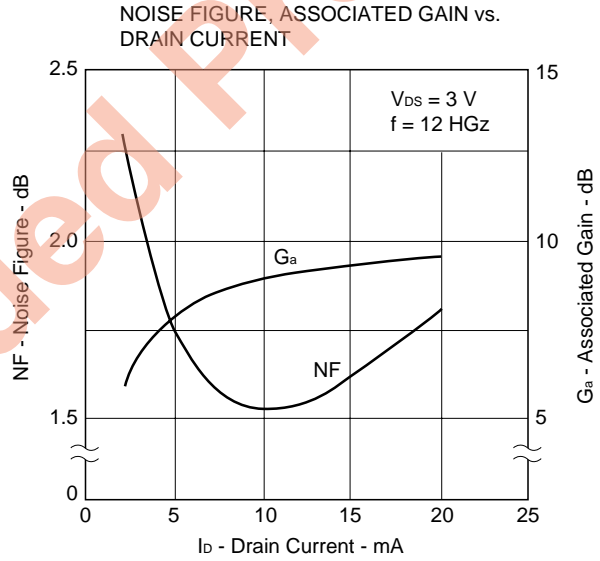
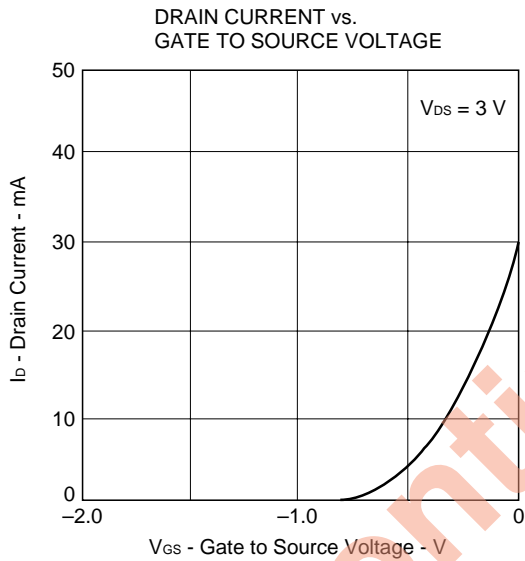
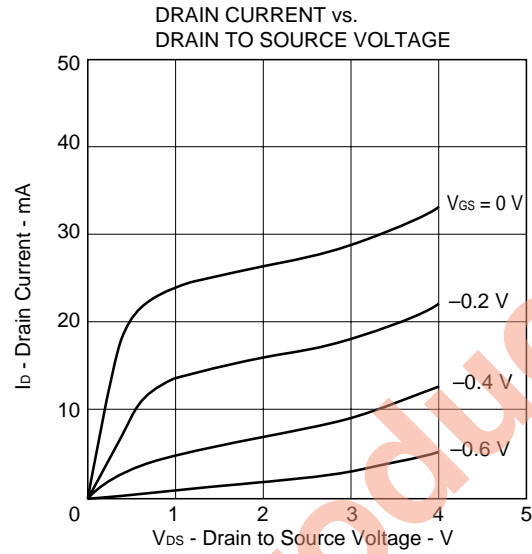
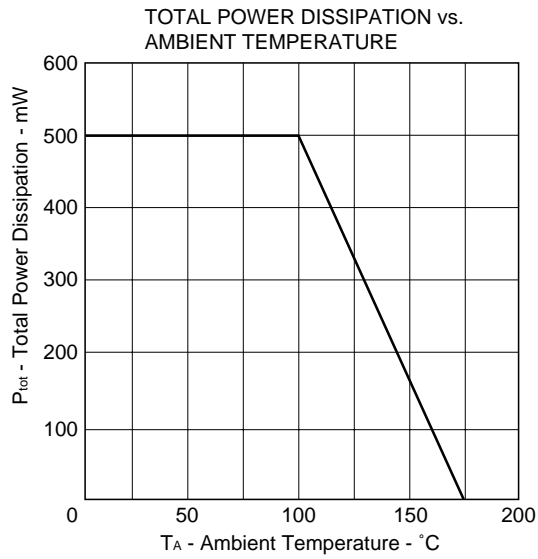
Thickness = $140 \mu\text{m}$

▨ : BONDING AREA

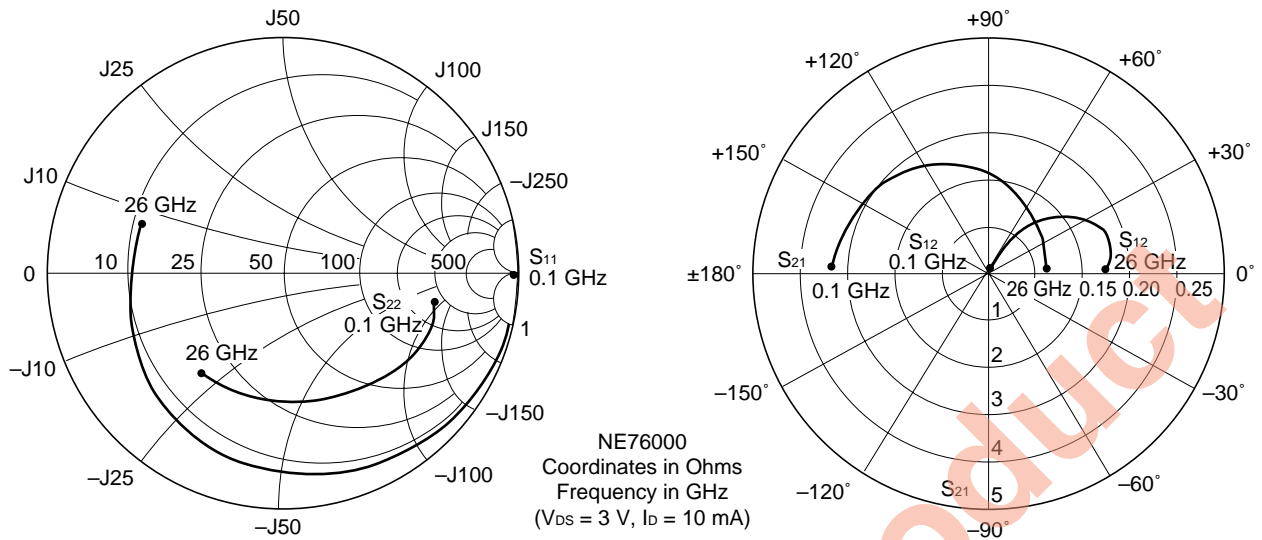
ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

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

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$)



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.

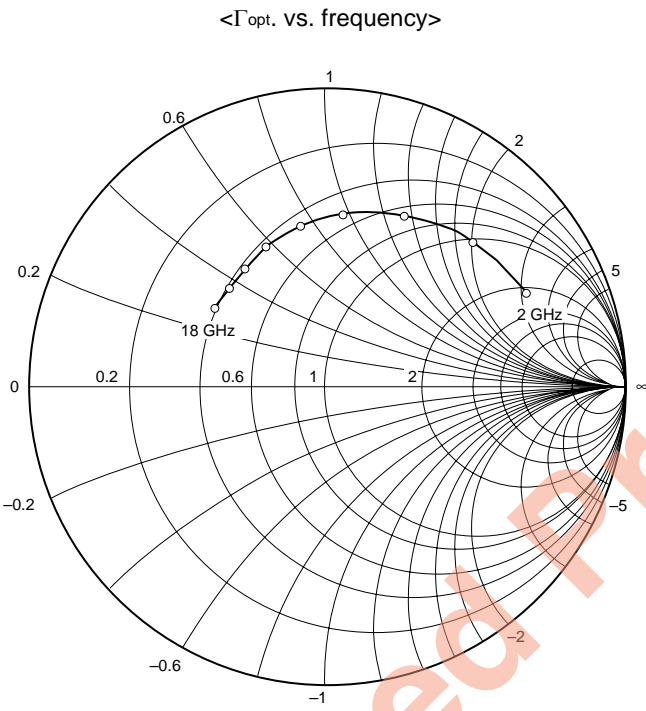
MAG AND ANG

$V_{DS} = 3\text{ V}$, $I_D = 10\text{ mA}$

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

$V_{DS} = 3.0\text{ V}$
 $I_D = 10\text{ mA}$



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

$\Gamma_{opt.}$ 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]

Discontinued Product

[MEMO]

Discontinued Product

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Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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