To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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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HETERO JUNCTION FIELD EFFECT TRANSISTOR

NE329S01

X to Ku BAND SUPER LOW NOISE AMPLIFIER
N-CHANNEL HJ-FET

DESCRIPTION

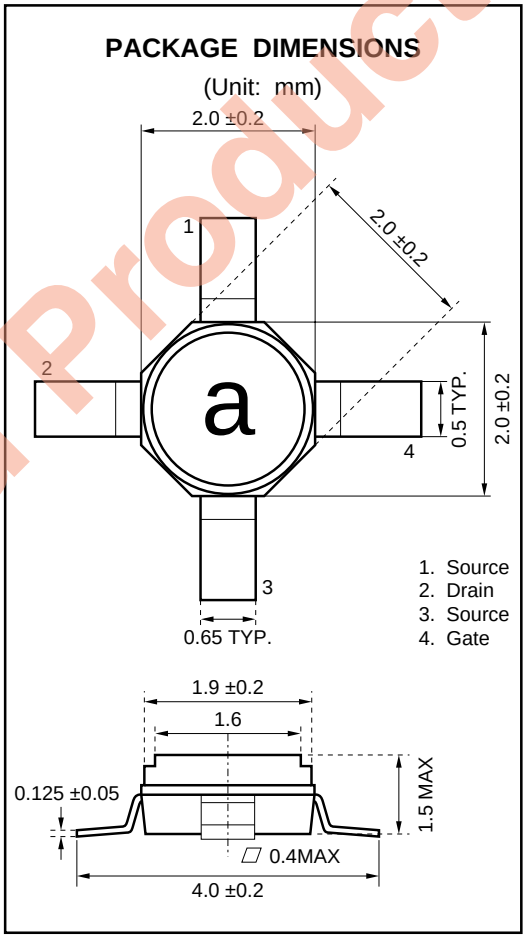
The NE329S01 is a Hetero Junction FET that utilizes the hetero junction to create high mobility electrons. Its excellent low noise and high associated gain make it suitable for DBS and another commercial systems.

FEATURES

- Super Low Noise Figure & High Associated Gain
  NF = 0.35 dB TYP., G_a = 13.0 dB TYP. at f = 12 GHz
- Gate Length : $L_g \leq 0.20$ μm
- Gate Width : W_g = 200 μm

PACKAGE DIMENSIONS

(Unit: mm)



ORDERING INFORMATION

PART NUMBER	SUPPLYING FORM	MARKING
NE329S01-T1	Tape & reel 1000 pcs./reel	a
NE329S01-T1B	Tape & reel 4000 pcs./reel	

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Drain to Source Voltage	V_{DS}	4.0	V
Gate to Source Voltage	V_{GS}	–3.0	V
Drain Current	I_D	I_{DSS}	mA
Gate Current	I_G	100	μA
Total Power Dissipation	P_{tot}	165	mW
Channel Temperature	T_{ch}	125	°C
Storage Temperature	T_{stg}	–65 to +125	°C

RECOMMENDED OPERATING CONDITION (T_A = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}		2	3	V
Drain Current	I_D		10	20	mA
Input Power	P_{in}			0	dBm

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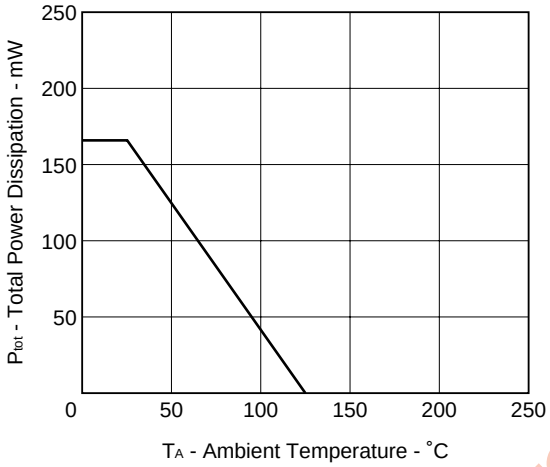
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

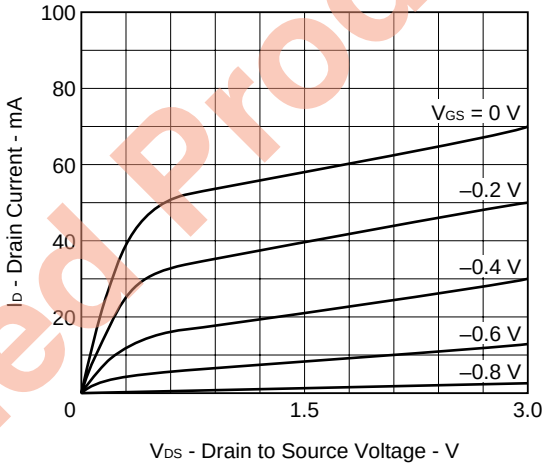
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Gate to Source Leak Current	I_{GSO}		0.5	10	mA	V_{GS} = –3 V
Saturated Drain Current	I_{DSS}	20	60	90	mA	V_{DS} = 2 V, V_{GS} = 0 V
Gate to Source Cutoff Voltage	$V_{GS(off)}$	–0.2	–0.7	–2.0	V	V_{DS} = 2 V, I_D = 100 μA
Transconductance	g_m	45	60		mS	V_{DS} = 2 V, I_D = 10 mA
Noise Figure	NF		0.35	0.45	dB	V_{DS} = 2 V, I_D = 10 mA, f = 12 GHz
Associated Gain	G_a	11.5	13.0		dB	

TYPICAL CHARACTERISTICS (T_A = 25 °C)

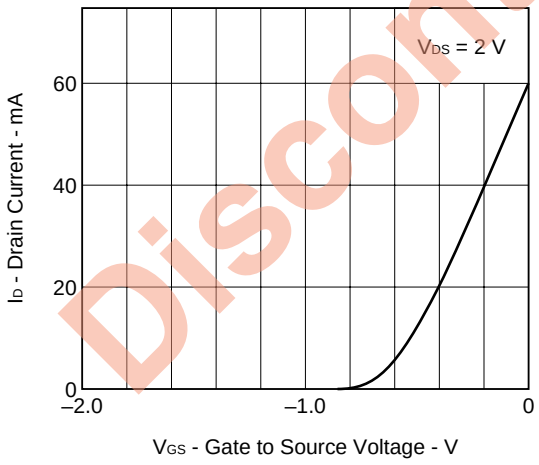
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



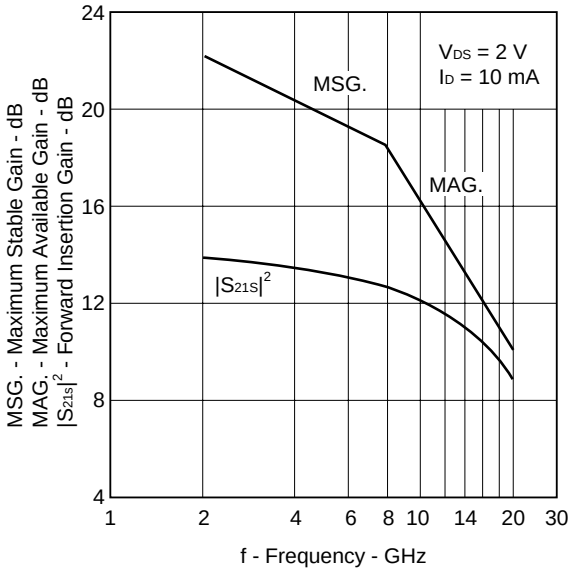
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



DRAIN CURRENT vs.
GATE TO SOURCE VOLTAGE



MAXIMUM AVAILABLE GAIN, FORWARD
INSERTION GAIN vs. FREQUENCY

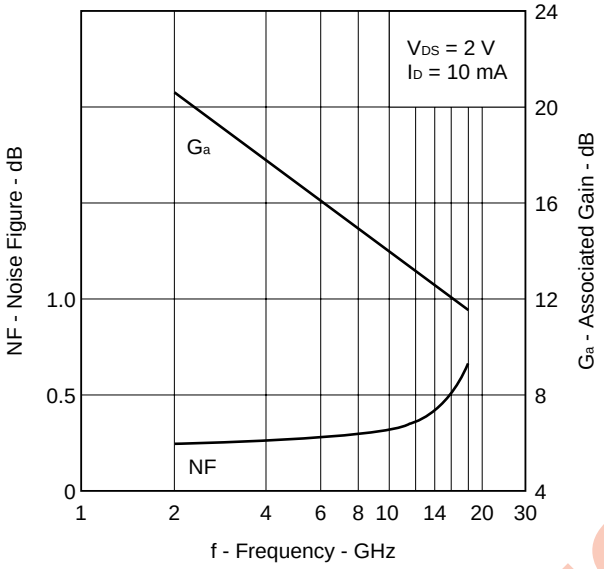


Gain Calculations

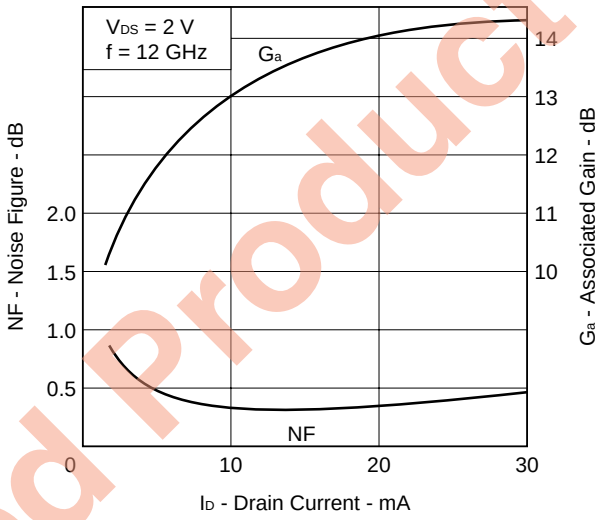
$$MSG. = \frac{|S_{21}|}{|S_{12}|} \qquad K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2\,|S_{12}|\,|S_{21}|}$$

$$MAG. = \frac{|S_{21}|}{|S_{12}|}\,(K \pm \sqrt{K^2 - 1}) \qquad \Delta = S_{11} \cdot S_{22} - S_{21} \cdot S_{12}$$

NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY



NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT



S-PARAMETERS

MAG. AND ANG.

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

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
2000	.955	–25.3	5.347	150.0	.027	73.3	.546	–21.3
2500	.933	–32.2	5.282	142.9	.035	67.8	.537	–26.6
3000	.910	–38.5	5.210	135.7	.039	64.8	.526	–32.0
3500	.881	–45.0	5.118	128.6	.044	60.0	.510	–36.7
4000	.853	–51.3	5.015	121.7	.049	55.4	.498	–41.2
4500	.820	–57.4	4.912	115.2	.053	51.3	.488	–45.4
5000	.791	–63.5	4.817	108.7	.056	47.4	.476	–49.0
5500	.761	–69.0	4.745	102.5	.059	44.3	.463	–52.5
6000	.741	–74.6	4.688	96.6	.061	42.0	.453	–54.9
6500	.702	–79.9	4.652	90.1	.067	38.0	.441	–60.1
7000	.657	–85.8	4.608	83.2	.071	34.5	.422	–66.4
7500	.604	–92.8	4.536	76.2	.073	30.9	.392	–71.7
8000	.558	–101.3	4.484	69.5	.076	29.0	.368	–76.0
8500	.525	–111.7	4.417	62.6	.079	25.1	.342	–81.3
9000	.497	–122.7	4.349	55.7	.084	21.5	.309	–87.3
9500	.477	–133.2	4.266	48.7	.088	18.5	.275	–95.2
10000	.464	–142.7	4.183	42.1	.092	14.9	.248	–104.1
10500	.456	–152.9	4.107	35.4	.096	11.2	.222	–113.6
11000	.443	–163.1	4.025	28.7	.100	6.2	.198	–123.0
11500	.431	–174.8	3.937	21.8	.101	3.6	.174	–131.5
12000	.426	172.3	3.848	15.0	.106	–.5	.154	–140.5
12500	.424	160.2	3.738	7.8	.107	–4.8	.136	–154.2
13000	.433	148.4	3.627	1.1	.109	–8.3	.123	–170.8
13500	.448	137.8	3.505	–5.7	.110	–12.4	.118	168.5
14000	.468	127.4	3.396	–12.6	.111	–15.0	.129	145.9
14500	.496	116.8	3.273	–19.2	.113	–18.7	.153	128.1
15000	.525	106.8	3.149	–25.7	.112	–22.7	.190	116.0
15500	.547	98.7	3.021	–32.0	.113	–25.4	.229	105.6
16000	.577	93.0	2.895	–38.4	.112	–28.1	.274	97.8
16500	.612	87.7	2.773	–45.0	.111	–30.9	.318	90.5
17000	.631	82.5	2.618	–51.5	.110	–35.0	.360	82.6
17500	.661	76.5	2.490	–57.4	.111	–37.6	.388	77.4
18000	.685	71.0	2.364	–63.6	.110	–38.9	.414	72.4

AMP. PARAMETERS

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

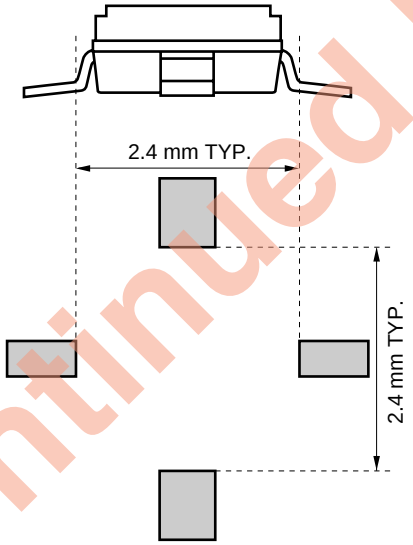
FREQUENCY MHz	GUmax dB	GAmax dB	$\|S_{21}\|^2$ dB	$\|S_{12}\|^2$ dB	K	Delay ns	Mason's U dB	G1 dB	G2 dB
2000	26.69		14.56	–31.28	.28	.040	32.544	10.59	1.54
2500	24.78		14.46	–29.22	.35	.040	29.157	8.85	1.48
3000	23.41		14.34	–28.17	.40	.040	29.707	7.67	1.41
3500	21.99		14.18	–27.06	.48	.040	27.146	6.50	1.31
4000	20.89		14.01	–26.22	.54	.038	25.526	5.64	1.24
4500	19.85		13.82	–25.58	.62	.037	24.162	4.85	1.18
5000	19.03		13.66	–25.04	.68	.036	23.230	4.26	1.12
5500	18.33		13.52	–24.62	.74	.034	22.632	3.76	1.05
6000	17.88		13.42	–24.28	.78	.033	22.758	3.46	1.00
6500	17.24		13.35	–23.53	.82	.036	22.142	2.95	.94
7000	16.58		13.27	–23.01	.88	.038	21.629	2.46	.85
7500	15.83		13.13	–22.78	.97	.039	20.513	1.97	.73
8000	15.28	16.80	13.03	–22.36	1.02	.037	20.408	1.62	.63
8500	14.84	16.01	12.90	–22.03	1.06	.038	20.127	1.40	.54
9000	14.43	15.53	12.77	–21.51	1.07	.038	20.138	1.23	.44
9500	14.06	15.12	12.60	–21.08	1.08	.039	20.334	1.12	.34
10000	13.76	14.78	12.43	–20.75	1.09	.037	20.417	1.05	.28
10500	13.51	14.58	12.27	–20.32	1.08	.037	20.863	1.01	.22
11000	13.22	14.19	12.09	–20.01	1.09	.037	20.558	.95	.17
11500	12.93	13.76	11.90	–19.88	1.12	.038	20.298	.89	.13
12000	12.68	13.49	11.70	–19.49	1.12	.038	20.428	.87	.10
12500	12.40	13.09	11.45	–19.44	1.15	.040	19.772	.86	.08
13000	12.16	12.81	11.19	–19.21	1.16	.038	19.654	.90	.07
13500	11.93	12.52	10.89	–19.17	1.17	.038	19.231	.97	.06
14000	11.77	12.31	10.62	–19.10	1.18	.038	19.066	1.07	.07
14500	11.63	12.16	10.30	–18.95	1.16	.037	19.138	1.22	.10
15000	11.52	12.04	9.96	–18.99	1.16	.036	19.024	1.40	.16
15500	11.38	11.84	9.60	–18.95	1.16	.035	18.672	1.55	.23
16000	11.33	11.79	9.23	–19.05	1.15	.036	18.573	1.76	.34
16500	11.36	11.86	8.86	–19.09	1.12	.037	18.847	2.03	.46
17000	11.17	11.62	8.36	–19.14	1.12	.036	18.243	2.20	.60
17500	11.13	11.64	7.92	–19.06	1.09	.033	18.300	2.50	.71
18000	11.04	11.48	7.47	–19.19	1.09	.035	17.311	2.76	.81

NOISE PARAMETER

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

Freq. (GHz)	$NF_{min.}$ (dB)	G_a (dB)	$\Gamma_{opt.}$		$R_n/50$
			MAG.	ANG. (deg.)	
2.0	0.26	20.7	0.93	14	0.38
4.0	0.27	19.0	0.80	29	0.33
6.0	0.29	17.3	0.65	48	0.25
8.0	0.31	15.7	0.49	72	0.18
10.0	0.33	14.2	0.36	102	0.11
12.0	0.35	13.0	0.27	139	0.08
14.0	0.43	12.4	0.24	–176	0.07
16.0	0.57	12.1	0.30	–122	0.10
18.0	0.73	11.8	0.47	–58	0.22

TYPICAL MOUNT PAD LAYOUT



RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

<TYPES OF SURFACE MOUNT DEVICE>

For more details, refer to our document “SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL” (C10535E).

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package’s surface temperature: 235 °C or below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: 3, Exposure limit[Note]: None	IR35-00-3
Partial heating method	Terminal temperature: 230 °C or below, Flow time: 10 seconds or below, Exposure limit[Note]: None	

Note Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

Caution Do not apply more than a single process at once, except for “Partial heating method”.

PRECAUTION Avoid high static voltage and electric fields, because this device is Hetero Junction 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.

M4 96.5