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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RENESAS

DATA SHEET

HETERO JUNCTION FIELD EFFECT TRANSISTOR
NE3515S02

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

FEATURES

- Super low noise figure, high associated gain and middle output power
  NF = 0.3 dB TYP., G_a = 12.5 dB TYP. @ f = 12 GHz, V_{DS} = 2 V, I_D = 10 mA
  $P_{O\ (1dB)}$ = +14 dBm TYP. @ f = 12 GHz, V_{DS} = 3 V, I_D = 25 mA set (Non-RF)
- Micro-X plastic (S02) package

APPLICATIONS

- X to Ku-band local buffer amplifier, PA driver amplifier, low noise amplifier, mixer
- DBS LNB, VSAT
- Other X to Ku-band communication systems

ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Marking	Supplying Form
NE3515S02-T1C	NE3515S02-T1C-A	S02 (Pb-Free)	2 kpcs/reel	G	• 8 mm wide embossed taping • Pin 4 (Gate) faces the perforation side of the tape
NE3515S02-T1D	NE3515S02-T1D-A		10 kpcs/reel		

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: NE3515S02

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V_{DS}	4	V
Gate to Source Voltage	V_{GS}	−3	V
Drain Current	I_D	I_{DSS}	mA
Gate Current	I_G	100	μA
Total Power Dissipation	P_{tot} Note	165	mW
Channel Temperature	T_{ch}	+125	°C
Storage Temperature	T_{stg}	−65 to +125	°C

Note Mounted on 1.08 $cm^2 \times$ 1.0 mm (t) glass epoxy PCB

Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

Document No. PG10708EJ01V0DS (1st edition)
Date Published February 2008 NS
Printed in Japan

RECOMMENDED OPERATING CONDITIONS (T_A = +25°C)

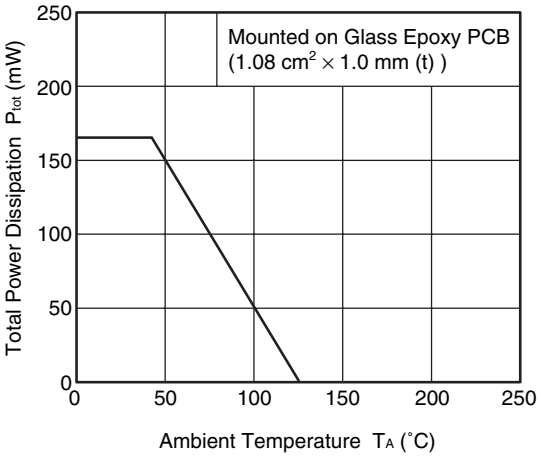
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}	1	2	3	V
Drain Current	I_D	5	10	25	mA
Input Power	P_{in}	–	–	0	dBm

ELECTRICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

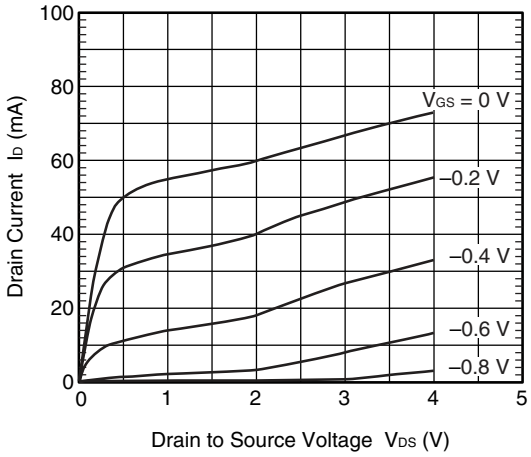
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	I_{GSO}	V_{GS} = –3 V	–	0.5	10	μA
Saturated Drain Current	I_{DSS}	V_{DS} = 2 V, V_{GS} = 0 V	32	60	88	mA
Gate to Source Cutoff Voltage	$V_{GS (off)}$	V_{DS} = 2 V, I_D = 100 μA	–0.2	–0.8	–1.4	V
Transconductance	g_m	V_{DS} = 2 V, I_D = 10 mA	45	70	–	mS
Noise Figure	NF	V_{DS} = 2 V, I_D = 10 mA, f = 12 GHz	–	0.3	0.5	dB
Associated Gain	G_a		11	12.5	–	dB
Gain 1 dB Compression Output Power	$P_{O (1 dB)}$	V_{DS} = 3 V, I_D = 25 mA set (Non-RF), f = 12 GHz	–	+14	–	dBm

TYPICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

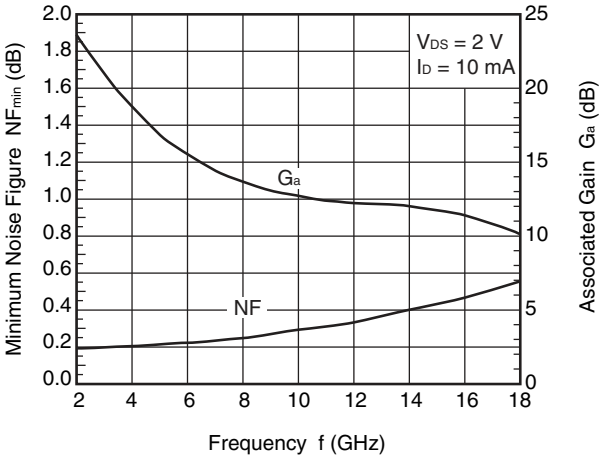
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



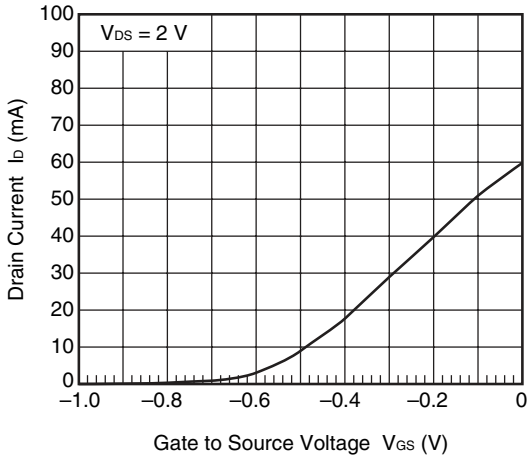
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



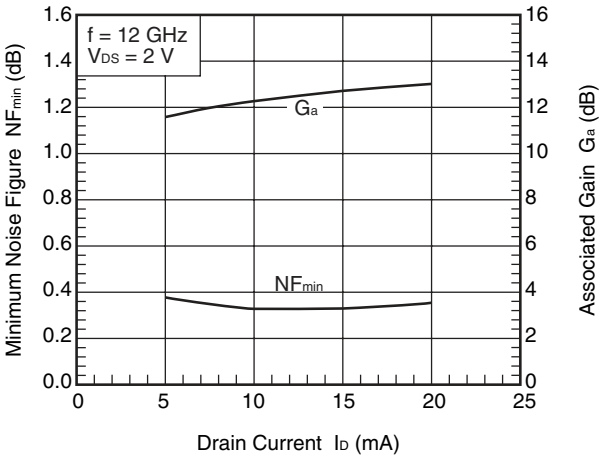
MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY



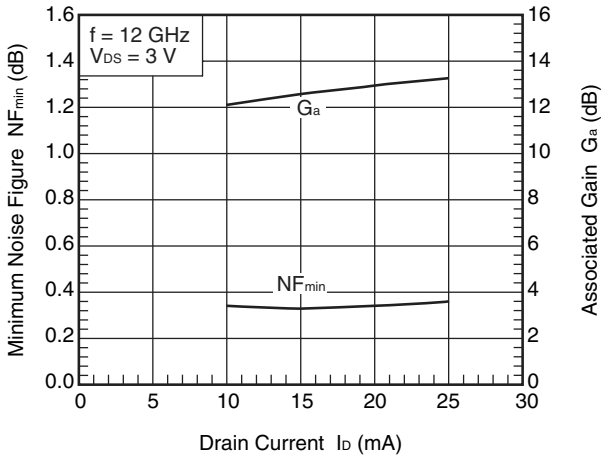
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT

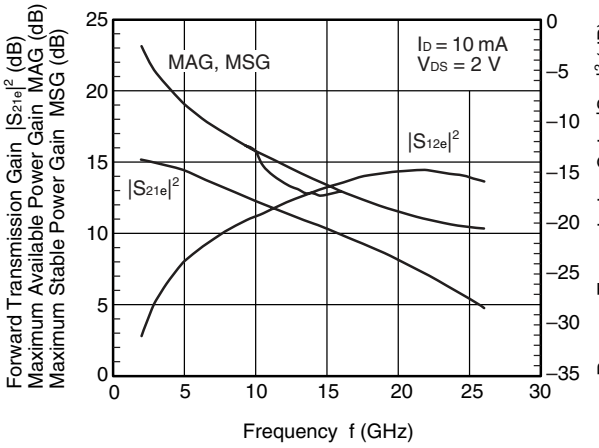


MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT

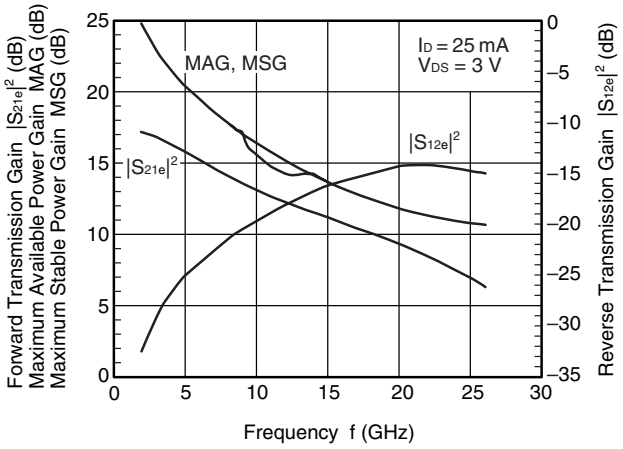


Remark The graphs indicate nominal characteristics.

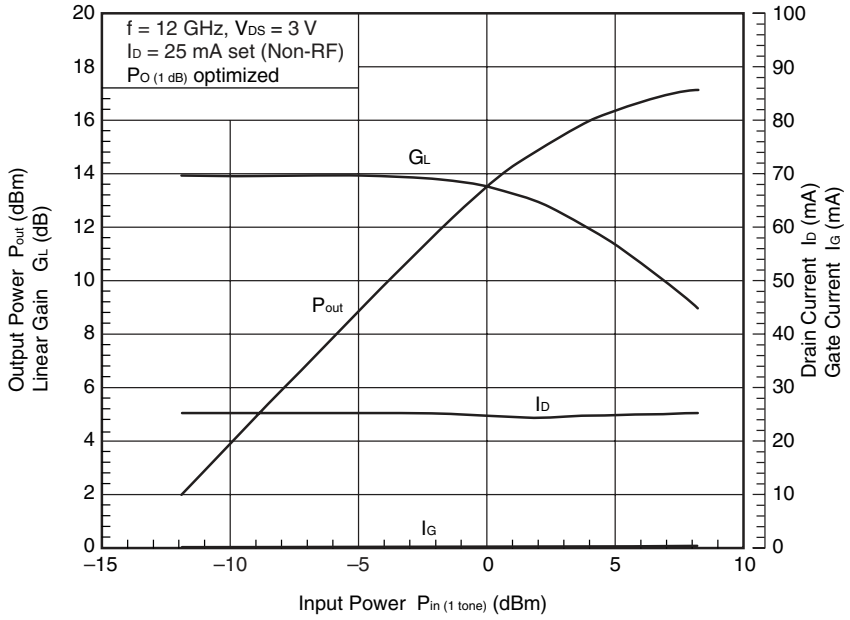
$|S_{21e}|^2$, MAG, MSG, $|S_{12e}|^2$ vs. FREQUENCY



$|S_{21e}|^2$, MAG, MSG, $|S_{12e}|^2$ vs. FREQUENCY



OUTPUT POWER, LINEAR GAIN, DRAIN CURRENT GATE CURRENT vs. INPUT POWER



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

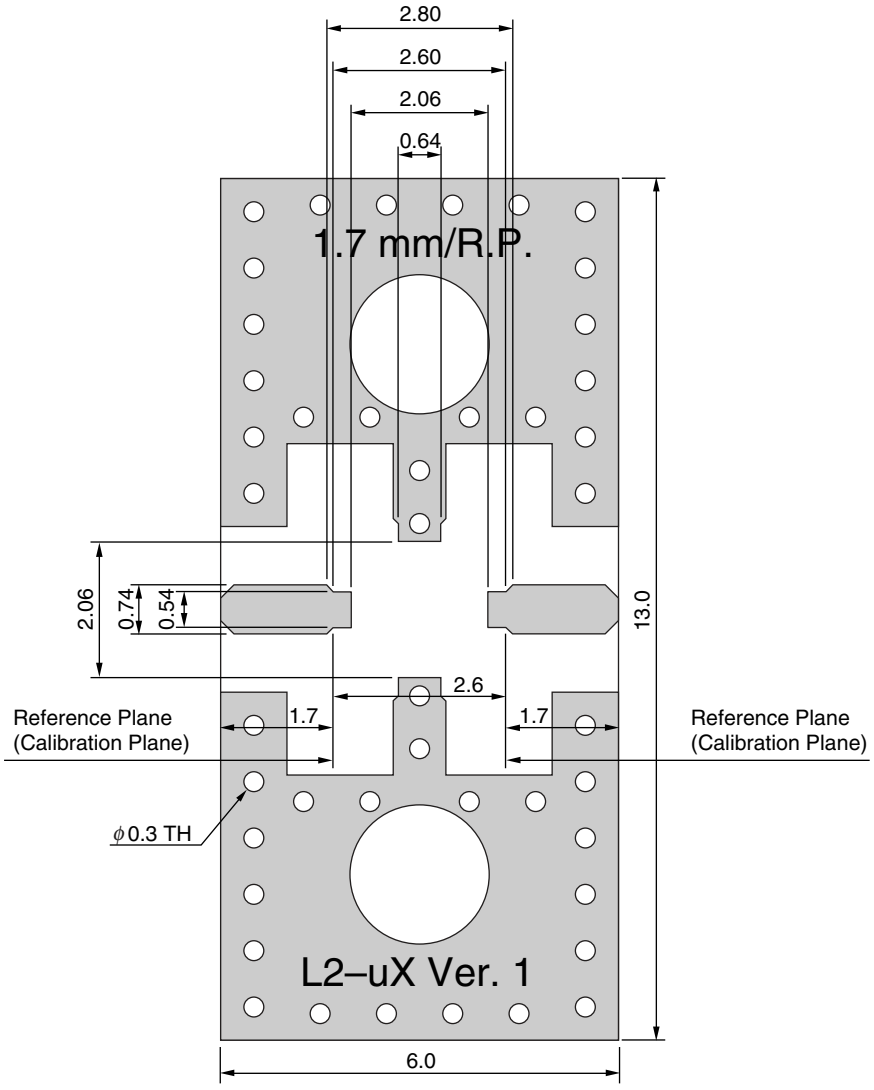
S-parameters and noise parameters are provided on our Web site in a format (S2P) that enables the direct import of the parameters to microwave circuit simulators without the need for keyboard inputs.

Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL http://www.necel.com/microwave/en/

RF MEASURING LAYOUT PATTERN (REFERENCE ONLY) (UNIT: mm)



RT/duroid 5880/ROGERS

t = 0.254 mm

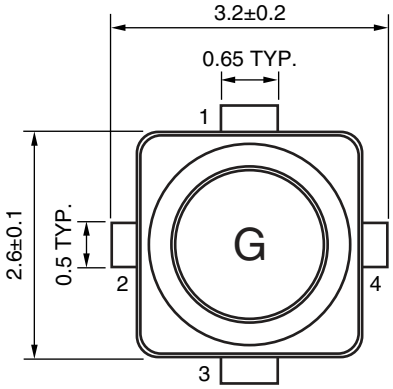
εr = 2.20

tan delta = 0.0009 @10 GHz

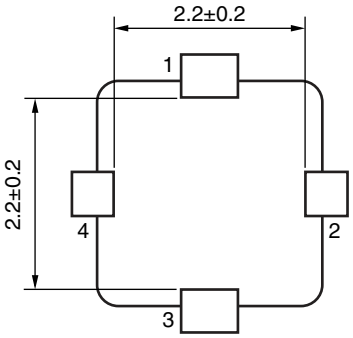
PACKAGE DIMENSIONS

S02 (UNIT: mm)

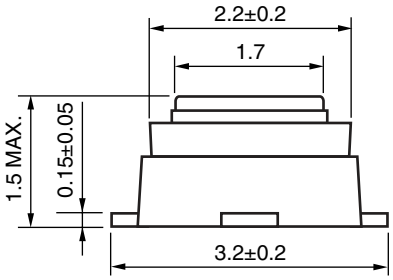
(Top View)



(Bottom View)



(Side View)



PIN CONNECTIONS

1. Source
2. Drain
3. Source
4. Gate

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

Soldering Method	Soldering Conditions		Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
Partial Heating	Peak temperature (terminal temperature) Soldering time (per side of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350

Caution Do not use different soldering methods together (except for partial heating).

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M8E 02. 11-1

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