

# NE3516S02

R09DS0038EJ0100

Rev.1.00

N-Channel GaAs HJ-FET, X to Ku Band Low Noise and High-Gain

Apr 18, 2012

## FEATURES

- Low noise figure and high associated gain  
 $NF = 0.35 \text{ dB TYP.}, G_a = 14 \text{ dB TYP. @ } f = 12 \text{ GHz}, V_{DS} = 2 \text{ V}, I_D = 10 \text{ mA}$   
 $NF = 0.35 \text{ dB TYP.}, G_a = 13.5 \text{ dB TYP. @ } f = 12 \text{ GHz}, V_{DS} = 2 \text{ V}, I_D = 6 \text{ mA (Reference Value)}$
- 4-pin Micro-X plastic (S02) package

## APPLICATIONS

- X to Ku band DBS LNB
- Other Ku band communication system

## ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Marking	Supplying Form
NE3516S02-T1C	NE3516S02-T1C-A	S02 package (Pb-Free)	2 kpcs/reel	P	<ul style="list-style-type: none"> <li>• 8 mm wide embossed taping</li> <li>• Pin 4 (Gate) faces the perforation side of the tape</li> </ul>
NE3516S02-T1D	NE3516S02-T1D-A		10 kpcs/reel		

**Remark** To order evaluation samples, please contact your nearby sales office.  
 Part number for sample order: NE3516S02

## ABSOLUTE MAXIMUM RATINGS ( $T_A = +25^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	Ratings	Unit
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	$\mu\text{A}$
Total Power Dissipation <sup>Note</sup>	$P_{tot}$	165	mW
Channel Temperature	$T_{ch}$	+125	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +125	$^\circ\text{C}$

Note: Mounted on  $1.08 \text{ cm}^2 \times 1.0 \text{ mm (t)}$  glass epoxy PWB

## RECOMMENDED OPERATING RANGE ( $T_A = +25^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	$V_{DS}$	+1	+2	+3	V
Drain Current	$I_D$	5	10	15	mA
Input Power	$P_{in}$	-	-	0	dBm

### CAUTION

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

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, unless otherwise specified)**

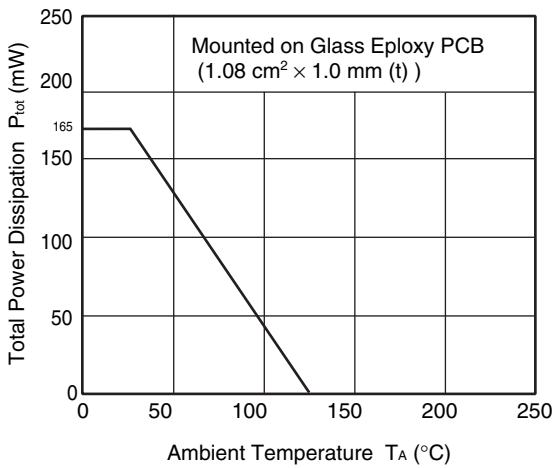
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	I <sub>GSO</sub>	V <sub>GS</sub> = -3.0 V	-	0.5	10	μA
Saturated Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 2 V, V <sub>GS</sub> = 0 V	15	30	60	mA
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 2V, I <sub>D</sub> = 100 μA	-0.2	-0.5	-1.3	V
Transconductance	gm	V <sub>DS</sub> = 2 V, I <sub>D</sub> = 10 mA	55	65	-	mS
Noise Figure	NF	V <sub>DS</sub> = 2 V, I <sub>D</sub> = 10 mA, f = 12 GHz	-	0.35	0.50	dB
Associated Gain	G <sub>a</sub>		13	14	-	dB

**STANDARD CHARACTERISTICS FOR REFERENCE  
(T<sub>A</sub> = +25°C, unless otherwise specified)**

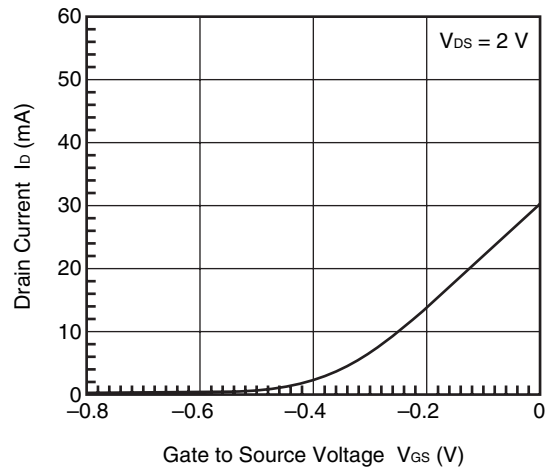
Parameter	Symbol	Test Conditions	Reference Value	Unit
Noise Figure	NF	V <sub>DS</sub> = 2 V, I <sub>D</sub> = 6 mA, f = 12 GHz	0.35	dB
Associated Gain	G <sub>a</sub>		13.5	dB

**TYPICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise specified)**

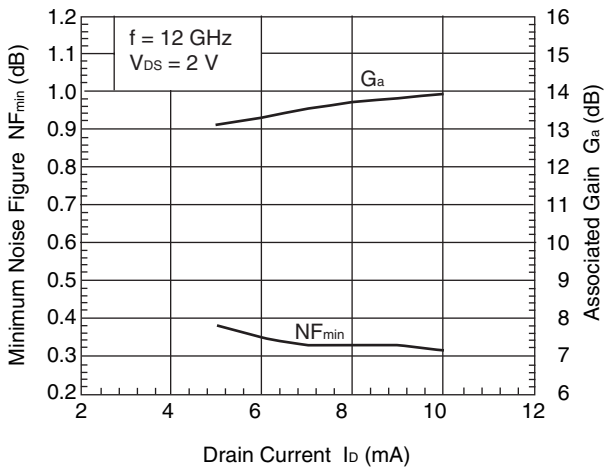
**TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE**



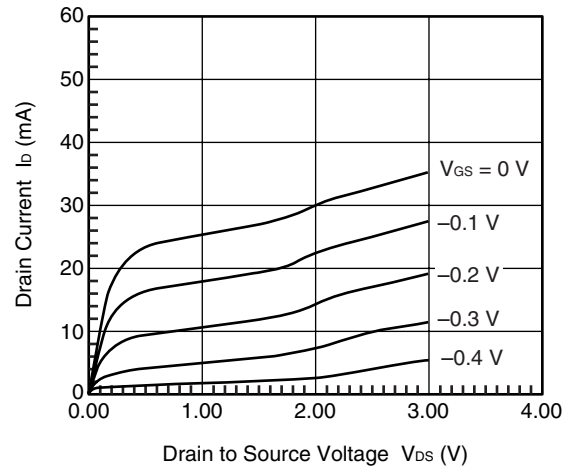
**DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE**



**MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT**



**DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE**



**Remark** The graph indicates nominal characteristics.

## S-PARAMETERS

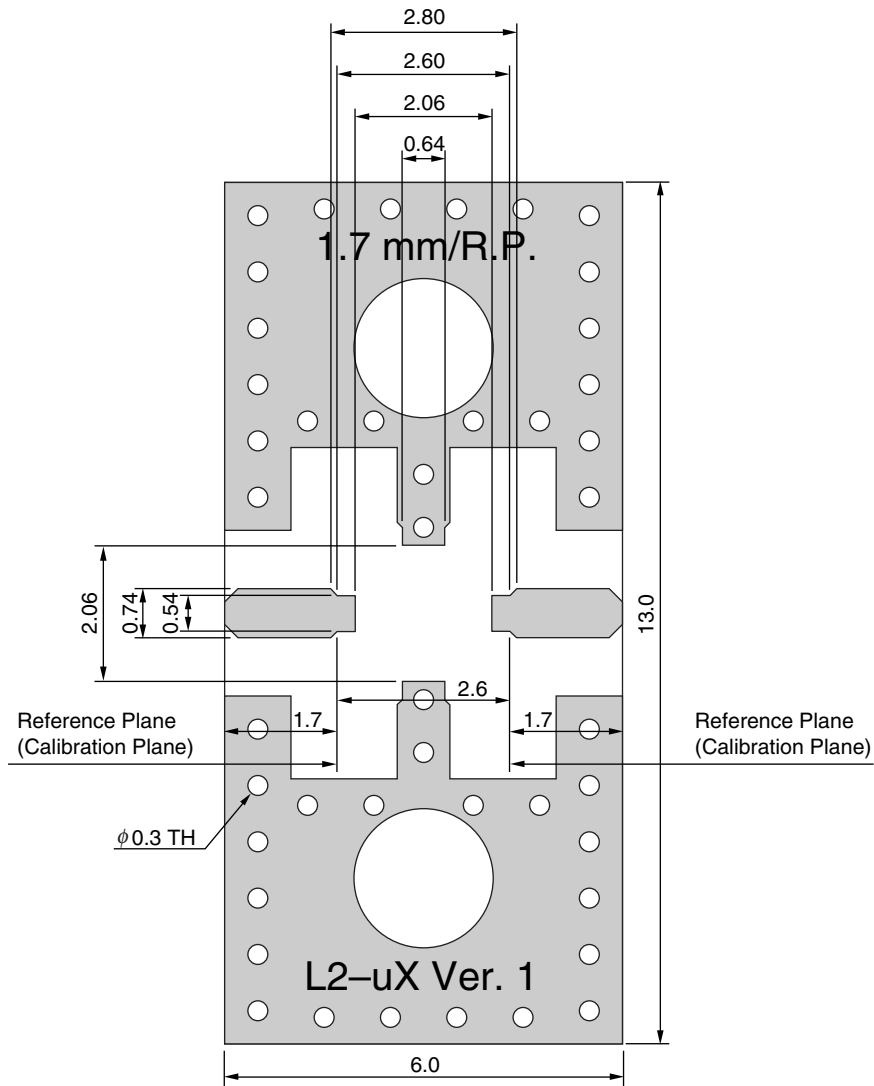
S-parameters and noise parameters are provided on our web site in a form (S2P) that enables direct import to microwave circuit simulators without keyboard inputs.

[Click here to download S-parameters.](#)

[Products] → [RF Devices] → [Device Parameters]

URL <http://www.renesas.com/products/microwave/download/parameter/>

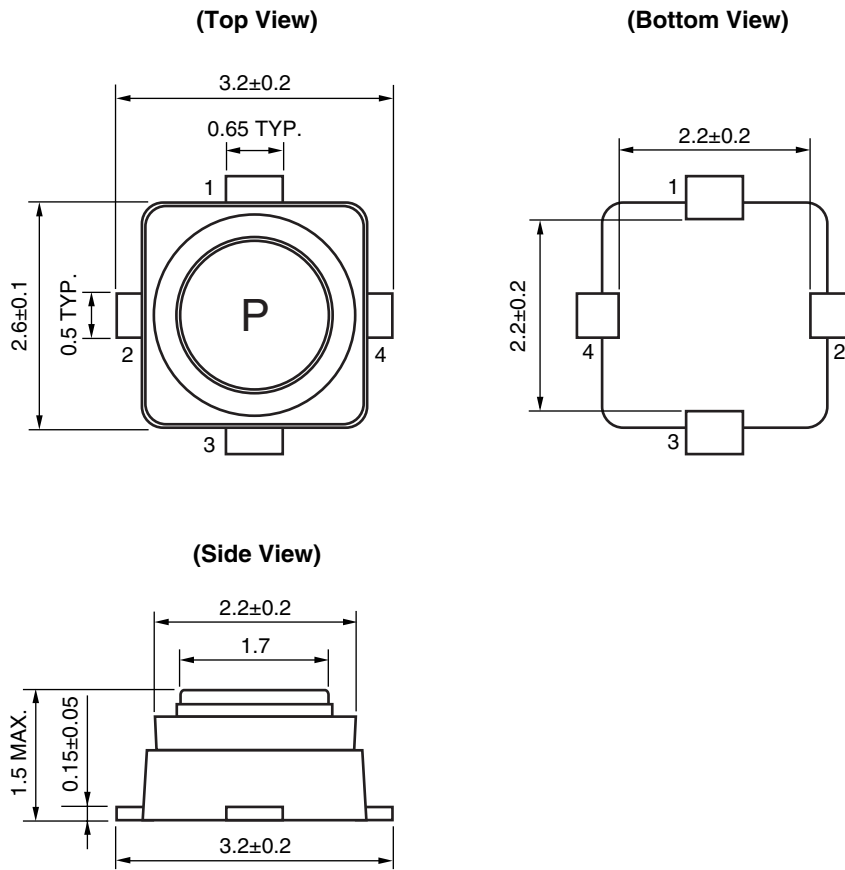
RF MEASURING LAYOUT PATTERN (REFERENCE ONLY) (UNIT: mm)



RT/duroid 5880/ROGERS  
 t = 0.254 mm  
 εr = 2.20  
 tan delta = 0.0009 @10 GHz

**PACKAGE DIMENSIONS**

S02 (UNIT: mm)



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

**CAUTION**

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

<b>Caution</b>	GaAs Products	<p>This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.</p> <ul style="list-style-type: none"><li>• Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below.<ol style="list-style-type: none"><li>1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials.</li><li>2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal.</li></ol></li><li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li><li>• Do not lick the product or in any way allow it to enter the mouth.</li></ul>
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<b>Revision History</b>	<b>NE3516S02 Data Sheet</b>
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Rev.	Date	Description	
		Page	Summary
1.00	Apr 18, 2012	–	First edition issued

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2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.  
Tel: +1-408-586-6000, Fax: +1-408-586-6130

**Renesas Electronics Canada Limited**  
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada  
Tel: +1-905-898-5441, Fax: +1-905-898-3220

**Renesas Electronics Europe Limited**  
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.  
Tel: +44-1628-585-100, Fax: +44-1628-585-900

**Renesas Electronics Europe GmbH**  
Arcadiastrasse 10, 40472 Düsseldorf, Germany  
Tel: +49-211-65030, Fax: +49-211-6503-1327

**Renesas Electronics (China) Co., Ltd.**  
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China  
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

**Renesas Electronics (Shanghai) Co., Ltd.**  
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China  
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

**Renesas Electronics Hong Kong Limited**  
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong  
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

**Renesas Electronics Taiwan Co., Ltd.**  
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Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

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Tel: +65-6213-0200, Fax: +65-6276-8001

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Tel: +82-2-558-3737, Fax: +82-2-558-5141