



# HETERO JUNCTION FIELD EFFECT TRANSISTOR

## NE3511S02

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

#### FEATURES

- Super low noise figure and high associated gain  
NF = 0.30 dB TYP.,  $G_a$  = 13.5 dB TYP. @  $f$  = 12 GHz
- Micro-X plastic (S02) package

#### APPLICATIONS

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

#### ORDERING INFORMATION

| Part Number   | Order Number    | Package       | Quantity     | Marking | Supplying Form                                                                       |
|---------------|-----------------|---------------|--------------|---------|--------------------------------------------------------------------------------------|
| NE3511S02-T1C | NE3511S02-T1C-A | S02 (Pb-Free) | 2 kpcs/reel  | B       | • 8 mm wide embossed taping<br>• Pin 4 (Gate) faces the perforation side of the tape |
| NE3511S02-T1D | NE3511S02-T1D-A |               | 10 kpcs/reel |         |                                                                                      |

**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order: NE3511S02-A

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

| 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         | $\mu\text{A}$      |
| Total Power Dissipation | $P_{tot}$ <sup>Note</sup> | 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 PCB

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

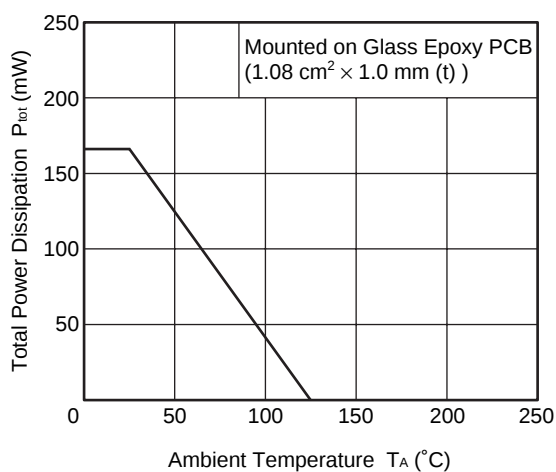
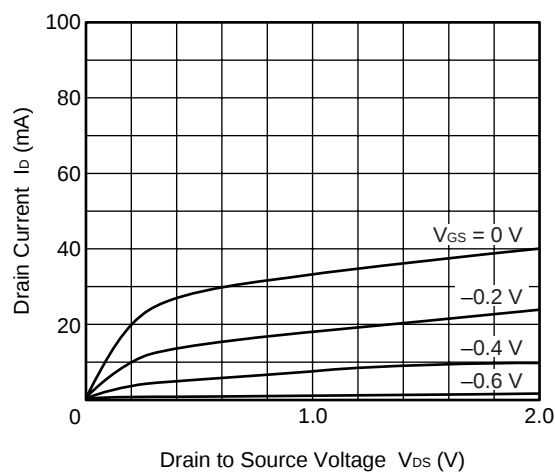
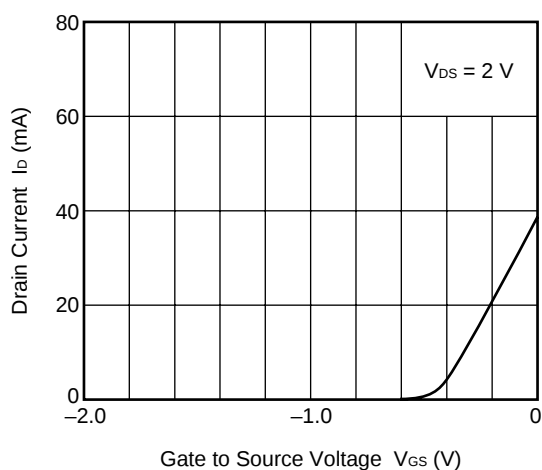
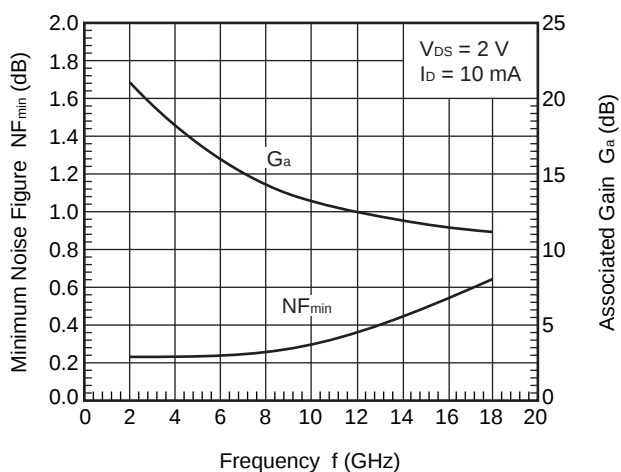
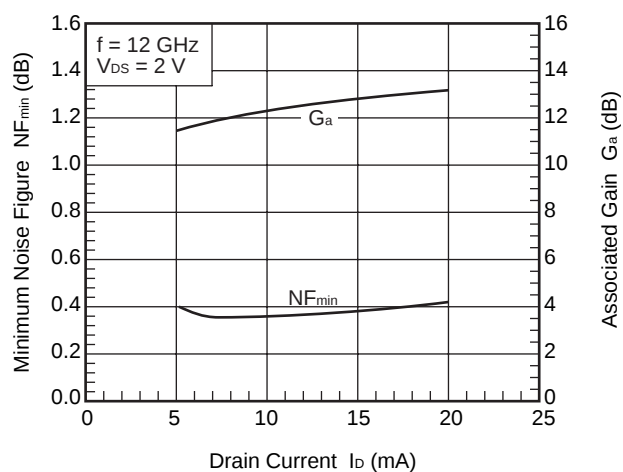
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**RECOMMENDED OPERATING CONDITIONS ( $T_A = +25^\circ\text{C}$ )**

| Parameter               | Symbol   | MIN. | TYP. | MAX. | Unit |
|-------------------------|----------|------|------|------|------|
| Drain to Source Voltage | $V_{DS}$ | 1    | 2    | 3    | V    |
| Drain Current           | $I_D$    | 5    | 10   | 20   | mA   |
| Input Power             | $P_{in}$ | —    | —    | 0    | dBm  |

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

| Parameter                     | Symbol        | Test Conditions                                              | MIN. | TYP. | MAX. | Unit          |
|-------------------------------|---------------|--------------------------------------------------------------|------|------|------|---------------|
| Gate to Source Leak Current   | $I_{GSO}$     | $V_{GS} = -3\text{ V}$                                       | —    | 0.5  | 10   | $\mu\text{A}$ |
| Saturated Drain Current       | $I_{DSS}$     | $V_{DS} = 2\text{ V}, V_{GS} = 0\text{ V}$                   | 20   | 40   | 70   | mA            |
| Gate to Source Cutoff Voltage | $V_{GS(off)}$ | $V_{DS} = 2\text{ V}, I_D = 100\text{ }\mu\text{A}$          | -0.2 | -0.7 | -1.7 | V             |
| Transconductance              | $g_m$         | $V_{DS} = 2\text{ V}, I_D = 10\text{ mA}$                    | 50   | 65   | —    | mS            |
| Noise Figure                  | NF            | $V_{DS} = 2\text{ V}, I_D = 10\text{ mA}, f = 12\text{ GHz}$ | —    | 0.30 | 0.45 | dB            |
| Associated Gain               | $G_a$         |                                                              | 12.5 | 13.5 | —    | dB            |

TYPICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise specified)TOTAL POWER DISSIPATION  
vs. AMBIENT TEMPERATUREDRAIN CURRENT vs.  
DRAIN TO SOURCE VOLTAGEDRAIN CURRENT vs.  
GATE TO SOURCE VOLTAGEMINIMUM NOISE FIGURE,  
ASSOCIATED GAIN vs. FREQUENCYMINIMUM NOISE FIGURE,  
ASSOCIATED GAIN vs. DRAIN CURRENT

**Remark** The graphs indicate nominal characteristics.

**S-PARAMETERS**

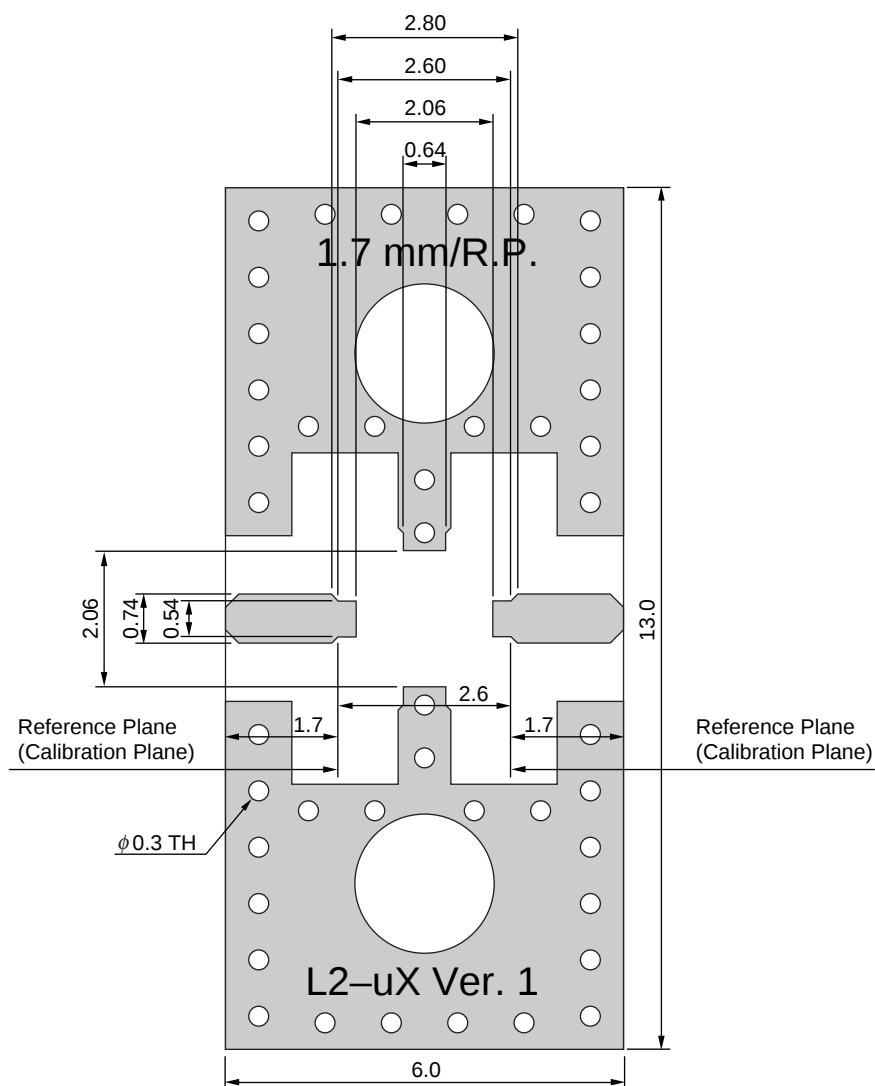
S-parameters/Noise parameters are provided on our web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL <http://www.ncsd.necel.com/microwave/index.html>

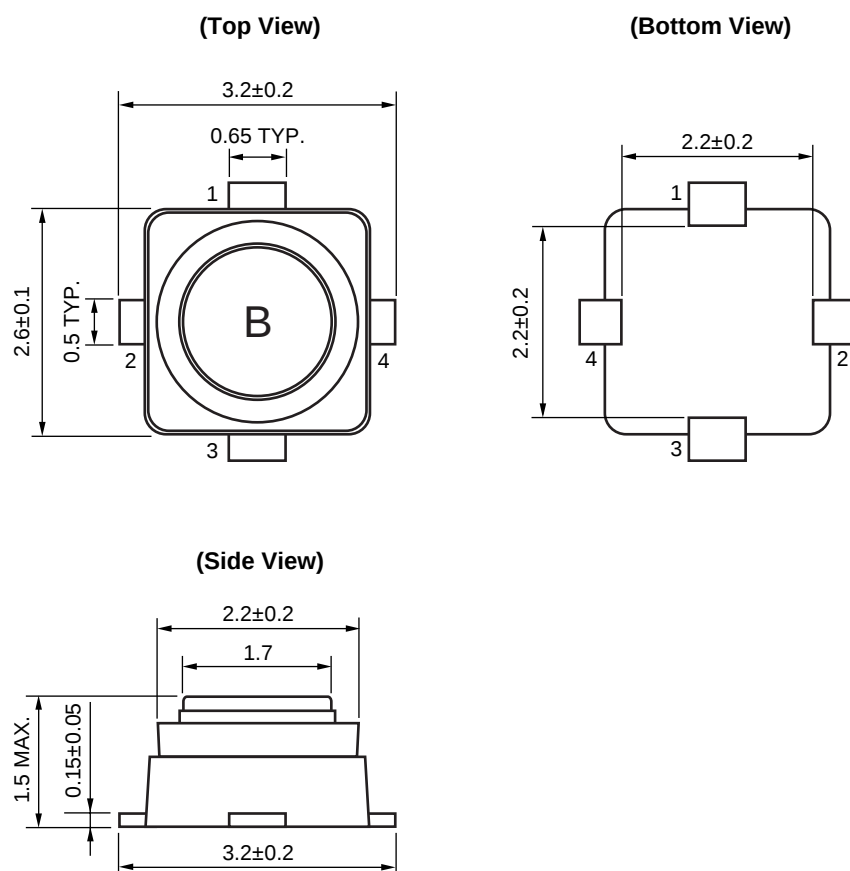
## RF MEASURING LAYOUT PATTERN (REFERENCE ONLY) (UNIT: mm)



RT/duroid 5880/ROGERS  
t = 0.254 mm  
 $\epsilon_r = 2.20$   
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<br>Time at peak temperature : 10 seconds or less<br>Time at temperature of 220°C or higher : 60 seconds or less<br>Preheating time at 120 to 180°C : 120±30 seconds<br>Maximum number of reflow processes : 3 times<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below | IR260            |
| Partial Heating  | Peak temperature (terminal temperature) : 350°C or below<br>Soldering time (per side of device) : 3 seconds or less<br>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).

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**Caution**

GaAs Products

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.

- 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.
  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.
  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.
- Do not burn, destroy, cut, crush, or chemically dissolve the product.
- Do not lick the product or in any way allow it to enter the mouth.

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► For further information, please contact

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Subject: Compliance with EU Directives

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CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

| Restricted Substance per RoHS | Concentration Limit per RoHS (values are not yet fixed) | Concentration contained in CEL devices |     |
|-------------------------------|---------------------------------------------------------|----------------------------------------|-----|
|                               |                                                         | -A                                     | -AZ |
| Lead (Pb)                     | < 1000 PPM                                              | Not Detected                           | (*) |
| Mercury                       | < 1000 PPM                                              | Not Detected                           |     |
| Cadmium                       | < 100 PPM                                               | Not Detected                           |     |
| Hexavalent Chromium           | < 1000 PPM                                              | Not Detected                           |     |
| PBB                           | < 1000 PPM                                              | Not Detected                           |     |
| PBDE                          | < 1000 PPM                                              | Not Detected                           |     |

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