



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

| 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 | μA |
| Total Power Dissipation | P_{tot} ^{Note} | 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.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

RECOMMENDED OPERATING CONDITIONS (T_A = +25°C)

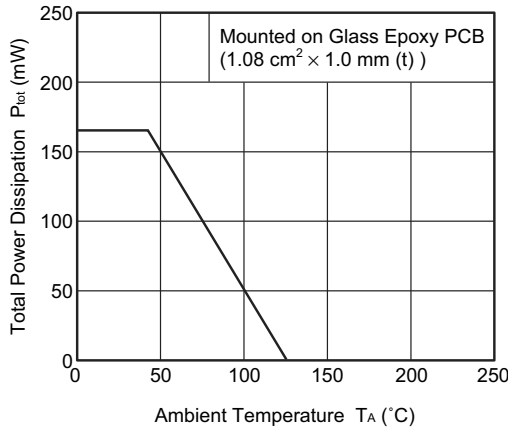
| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|-------------------------|-----------------|------|------|------|------|
| Drain to Source Voltage | V _{DS} | 1 | 2 | 3 | V |
| Drain Current | I _D | 5 | 10 | 25 | mA |
| Input Power | P _{in} | – | – | 0 | dBm |

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

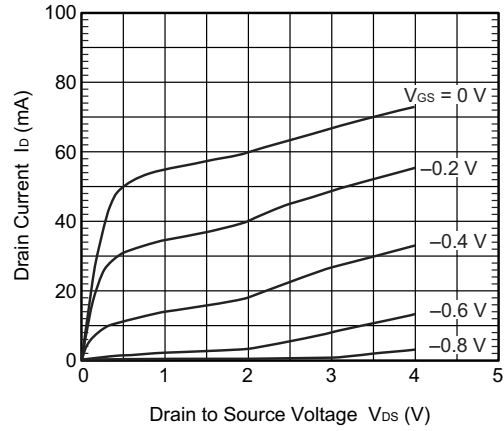
| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|---------------------------------------|----------------------|---|------|------|------|------|
| Gate to Source Leak Current | I _{GSO} | V _{GS} = –3 V | – | 0.5 | 10 | μA |
| Saturated Drain Current | I _{DSS} | V _{DS} = 2 V, V _{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)

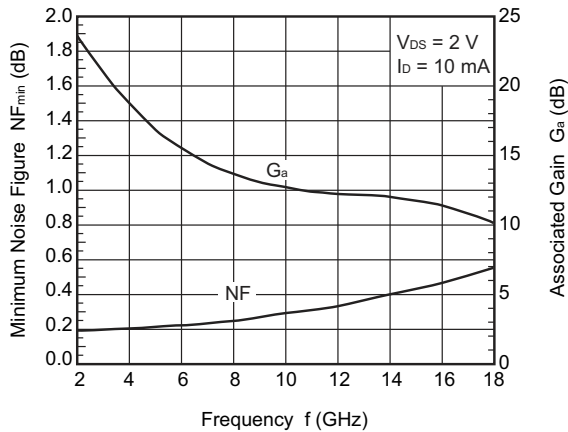
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



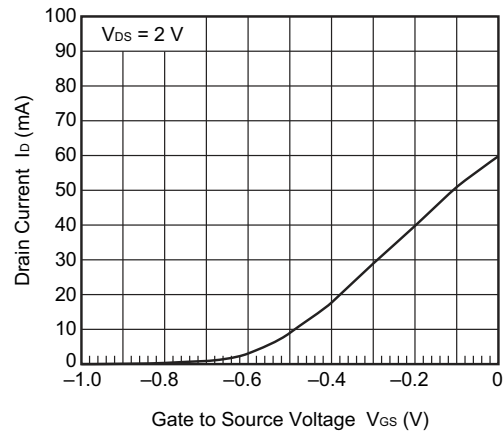
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



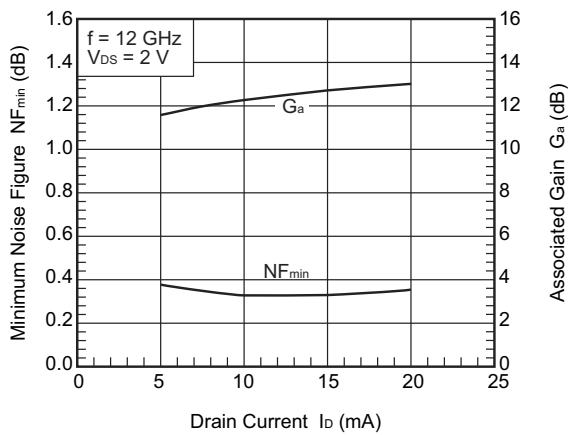
MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY



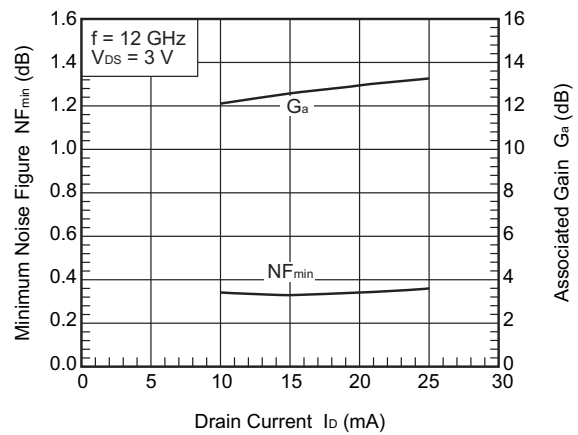
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



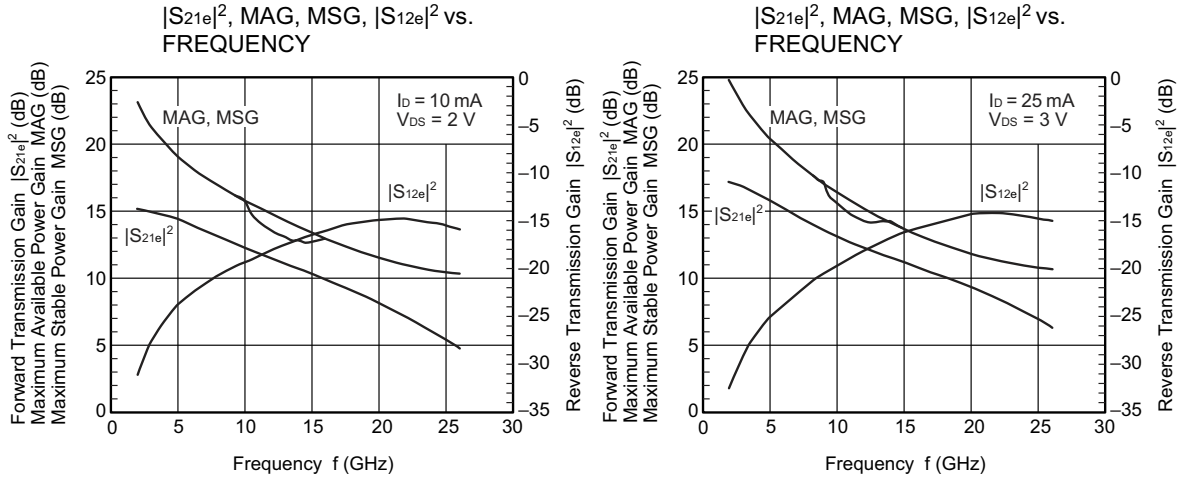
MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT



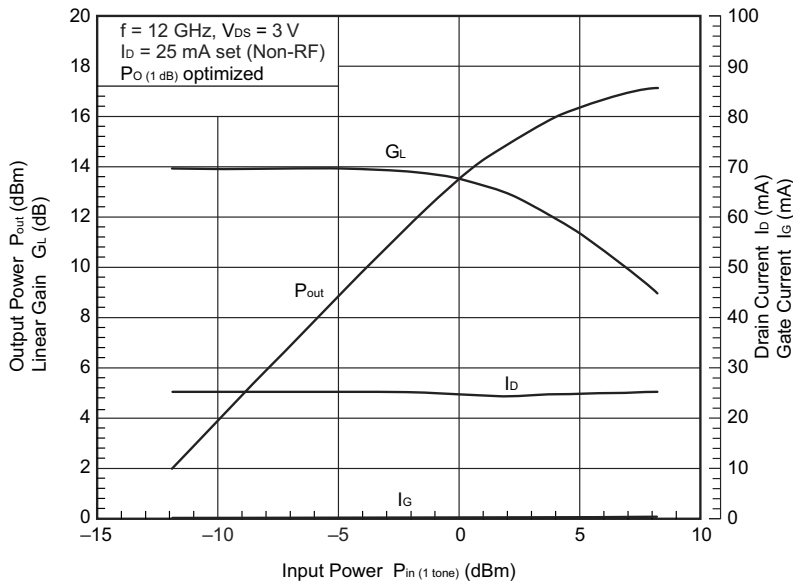
MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT



Remark The graphs indicate nominal characteristics.



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



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

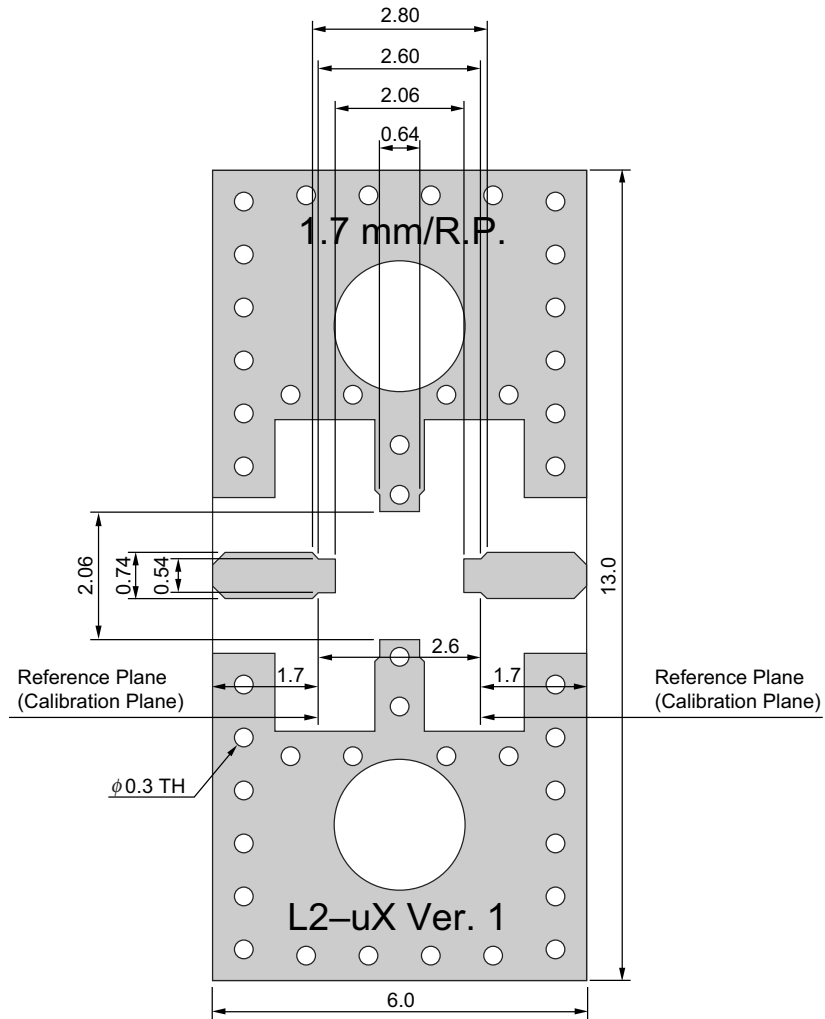
S-parameters and noise parameters are provided on our Web site in a format (S2P) that enables the direct import of the parameters to microwave circuit simulators without the need for keyboard inputs.

Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

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

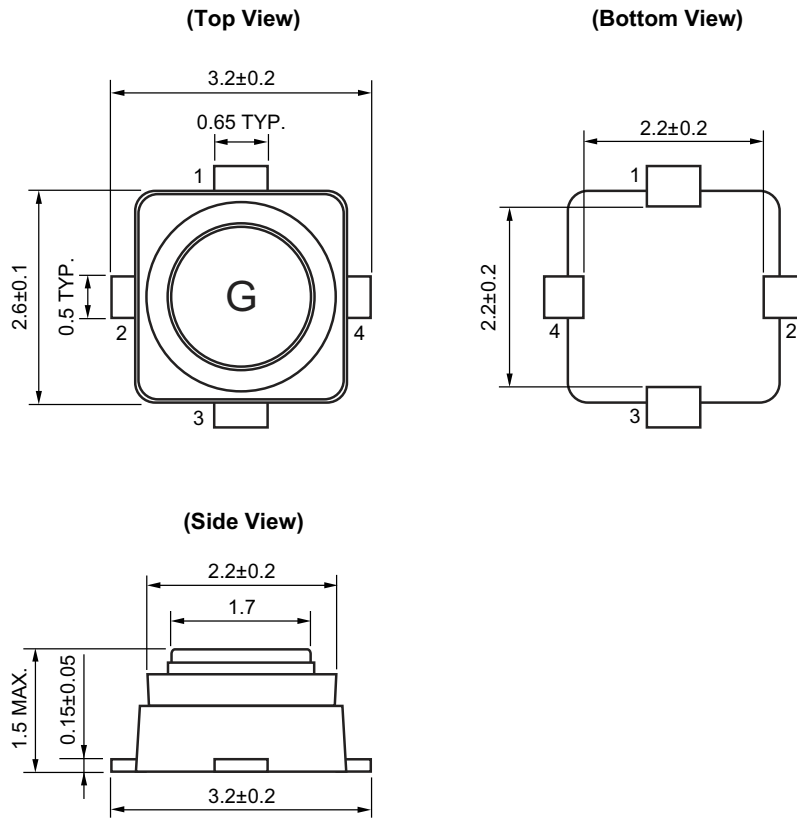
RF MEASURING LAYOUT PATTERN (REFERENCE ONLY) (UNIT: mm)



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

PACKAGE DIMENSIONS

S02 (UNIT: mm)



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 |
| 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 |

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

- **The information in this document is current as of February, 2008. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**
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M8E 02.11-1

| | | |
|----------------|---------------|--|
| Caution | 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">• 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">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. |
|----------------|---------------|--|

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

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 | |

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

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