HETERO JUNCTION FIELD EFFECT TRANSISTOR

NE3514S02

K BAND SUPER LOW NOISE AMPLIFIER
N-CHANNEL HJ-FET

FEATURES
- Super low noise figure and high associated gain
  \( NF = 0.75 \) dB TYP., \( G_a = 10 \) dB TYP. @ \( f = 20 \) GHz
- Micro-X plastic (S02) package

APPLICATIONS
- 20 GHz-band DBS LNB
- Other K-band communication systems

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Order Number</th>
<th>Package</th>
<th>Quantity</th>
<th>Marking</th>
<th>Supplying Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE3514S02-T1C</td>
<td>NE3514S02-T1C-A</td>
<td>S02 (Pb-Free)</td>
<td>2 kpcs/reel</td>
<td>D</td>
<td>• 8 mm wide embossed taping</td>
</tr>
<tr>
<td>NE3514S02-T1D</td>
<td>NE3514S02-T1D-A</td>
<td>S02 (Pb-Free)</td>
<td>10 kpcs/reel</td>
<td></td>
<td>• Pin 4 (Gate) faces the perforation side of the tape</td>
</tr>
</tbody>
</table>

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: NE3514S02

ABSOLUTE MAXIMUM RATINGS (\( T_a = +25^\circ \text{C} \))

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Ratings</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain to Source Voltage</td>
<td>( V_{DS} )</td>
<td>4</td>
<td>V</td>
</tr>
<tr>
<td>Gate to Source Voltage</td>
<td>( V_{SS} )</td>
<td>-3</td>
<td>V</td>
</tr>
<tr>
<td>Drain Current</td>
<td>( I_D )</td>
<td>( I_{DS} )</td>
<td>mA</td>
</tr>
<tr>
<td>Gate Current</td>
<td>( I_G )</td>
<td>100</td>
<td>( \mu )A</td>
</tr>
<tr>
<td>Total Power Dissipation</td>
<td>( P_{tot} )</td>
<td>165</td>
<td>mW</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>( T_{ch} )</td>
<td>+125</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>( T_{stg} )</td>
<td>-65 to +125</td>
<td>°C</td>
</tr>
</tbody>
</table>

Note Mounted on 1.08 cm\(^2\) x 1.0 mm (l) glass epoxy PCB

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

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Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.
### RECOMMENDED OPERATING CONDITIONS (TA = +25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain to Source Voltage</td>
<td>$V_{DS}$</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>V</td>
</tr>
<tr>
<td>Drain Current</td>
<td>$I_D$</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>mA</td>
</tr>
<tr>
<td>Input Power</td>
<td>$P_{in}$</td>
<td>–</td>
<td>–</td>
<td>0</td>
<td>dBm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate to Source Leak Current</td>
<td>$I_{GS}$</td>
<td>$V_{GS} = -3$ V</td>
<td>–</td>
<td>0.5</td>
<td>10</td>
<td>µA</td>
</tr>
<tr>
<td>Saturated Drain Current</td>
<td>$I_{DS}$</td>
<td>$V_{DS} = 2$ V, $V_{GS} = 0$ V</td>
<td>15</td>
<td>40</td>
<td>70</td>
<td>mA</td>
</tr>
<tr>
<td>Gate to Source Cutoff Voltage</td>
<td>$V_{GS}$ (off)</td>
<td>$V_{DS} = 2$ V, $I_D = 100$ µA</td>
<td>–0.2</td>
<td>–0.7</td>
<td>–2.0</td>
<td>V</td>
</tr>
<tr>
<td>Transconductance</td>
<td>$g_m$</td>
<td>$V_{DS} = 2$ V, $I_D = 10$ mA</td>
<td>40</td>
<td>55</td>
<td>–</td>
<td>mS</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>NF</td>
<td>$V_{DS} = 2$ V, $I_O = 10$ mA, $f = 20$ GHz</td>
<td>–</td>
<td>0.75</td>
<td>1.0</td>
<td>dB</td>
</tr>
<tr>
<td>Associated Gain</td>
<td>$G_a$</td>
<td></td>
<td>8</td>
<td>10</td>
<td>–</td>
<td>dB</td>
</tr>
</tbody>
</table>
TYPICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE

Mounted on Glass Epoxy PCB (1.08 cm² x 1.0 mm (t))

DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE

DRAIN TO SOURCE VOLTAGE

MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY

Remark The graphs indicate nominal characteristics.
S-PARAMETERS

S-parameters/Noise parameters are provided on the NEC Compound Semiconductor Devices 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/
RF MEASURING LAYOUT PATTERN (REFERENCE ONLY) (UNIT: mm)

- Reference Plane (Calibration Plane)
- RT/duroid 5880/ROGERS
  - $t = 0.254 \text{ mm}$
  - $\varepsilon_r = 2.20$
  - $\tan \delta = 0.0009 \text{ @} 10 \text{ GHz}$
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.

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

**Caution** Do not use different soldering methods together (except for partial heating).
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  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

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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.

For further information, please contact

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