



# HETERO JUNCTION FIELD EFFECT TRANSISTOR

# NE3517S03

## K-BAND SUPER LOW NOISE AMPLIFIER

### N-CHANNEL GaAs HJ-FET

#### FEATURES

- Super low noise figure, high associated gain  
NF = 0.7 dB TYP.,  $G_a = 13.5$  dB TYP. @  $f = 20$  GHz
- K-band Micro-X plastic (S03) package

#### APPLICATIONS

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

#### ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Marking	Supplying Form
NE3517S03-T1C	NE3517S03-T1C-A	S03 (Pb-Free)	2 kpcs/reel	E	• 8 mm wide embossed taping • Pin 4 (Gate) faces the perforation side of the tape
NE3517S03-T1D	NE3517S03-T1D-A		10 kpcs/reel		

**Remark** To order evaluation samples, please contact your nearby sales office.  
Part number for sample order: NE3517S03-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.

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<sub>A</sub> = +25°C)**

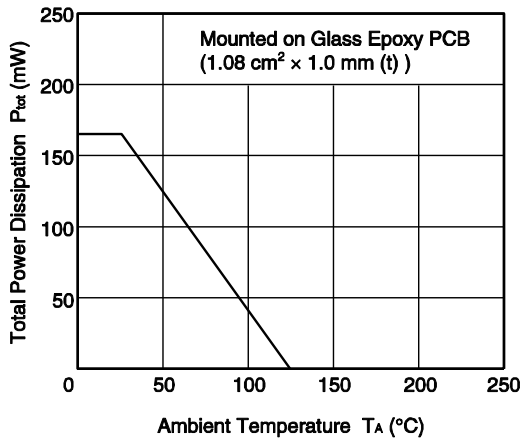
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V <sub>DS</sub>	1	2	3	V
Drain Current	I <sub>D</sub>	5	10	15	mA
Input Power	P <sub>in</sub>	–	–	0	dBm

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

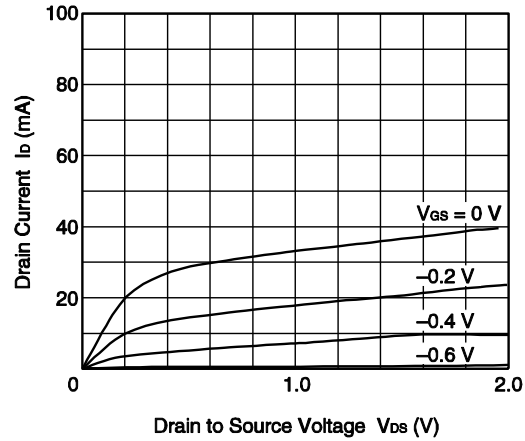
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	I <sub>GSO</sub>	V <sub>GS</sub> = –3 V	–	0.5	10	μA
Saturated Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 2 V, V <sub>GS</sub> = 0 V	25	40	70	mA
Gate to Source Cutoff Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 2 V, I <sub>D</sub> = 100 μA	–0.2	–0.7	–1.5	V
Transconductance	g <sub>m</sub>	V <sub>DS</sub> = 2 V, I <sub>D</sub> = 10 mA	40	55	–	mS
Noise Figure	NF	V <sub>DS</sub> = 2 V, I <sub>D</sub> = 10 mA, f = 20 GHz	–	0.7	1.0	dB
Associated Gain	G <sub>a</sub>		11.0	13.5	–	dB

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

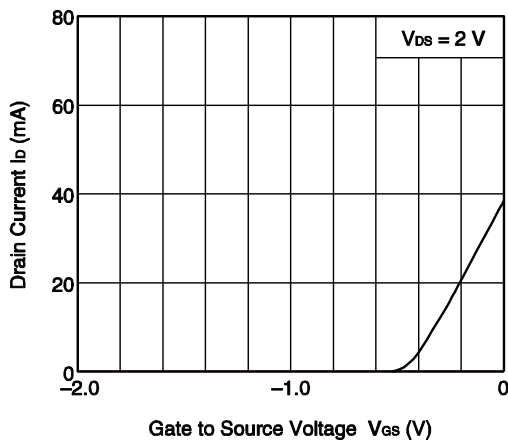
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



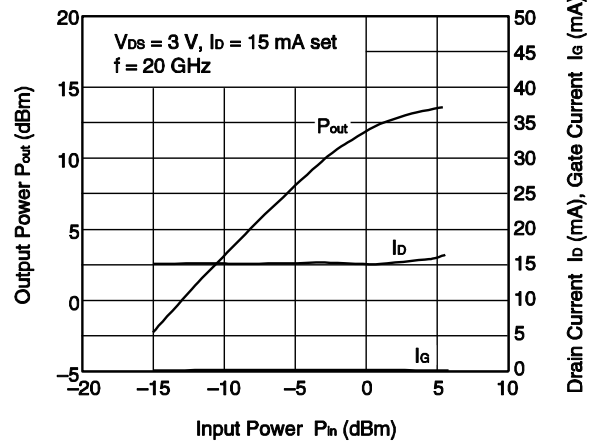
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



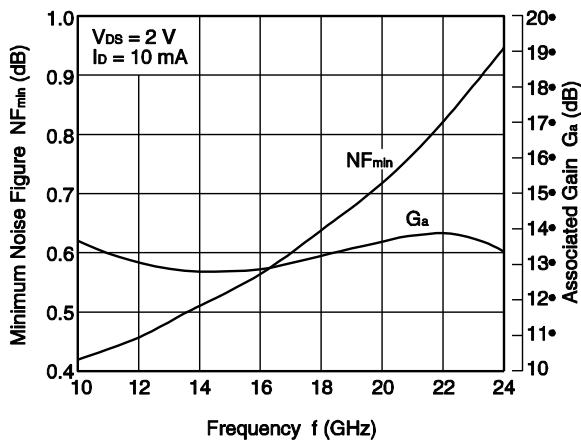
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



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



MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY

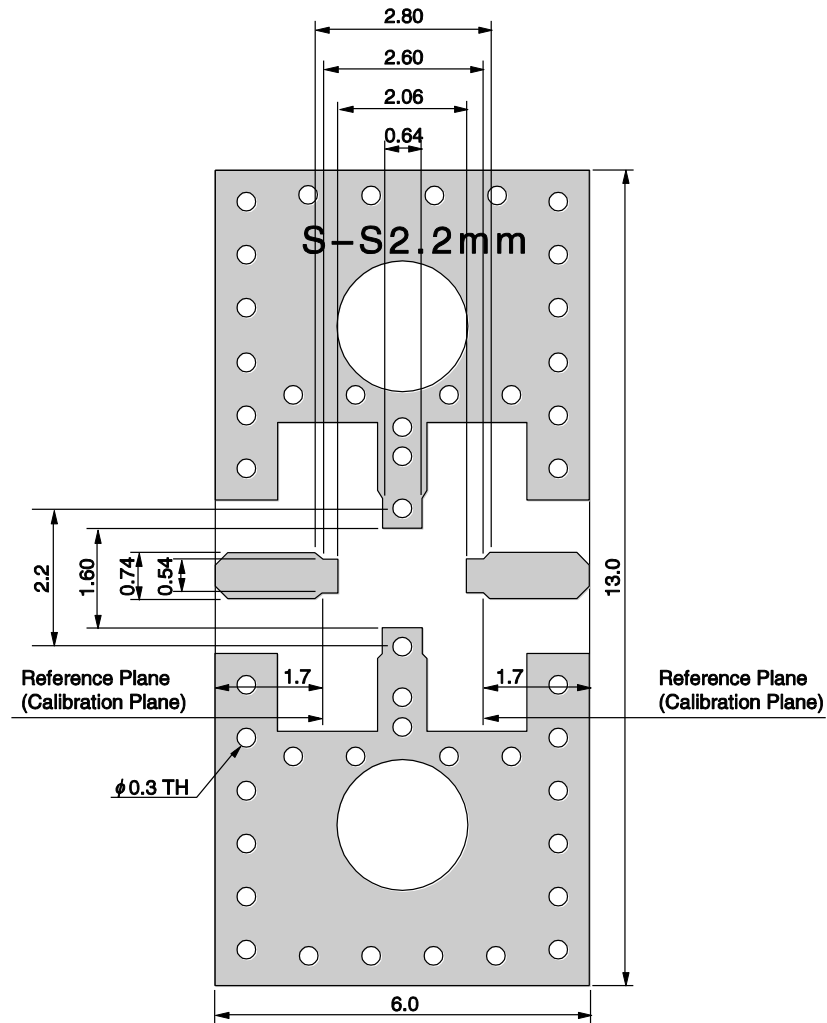


Remark The graphs indicate nominal characteristics.

**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/>

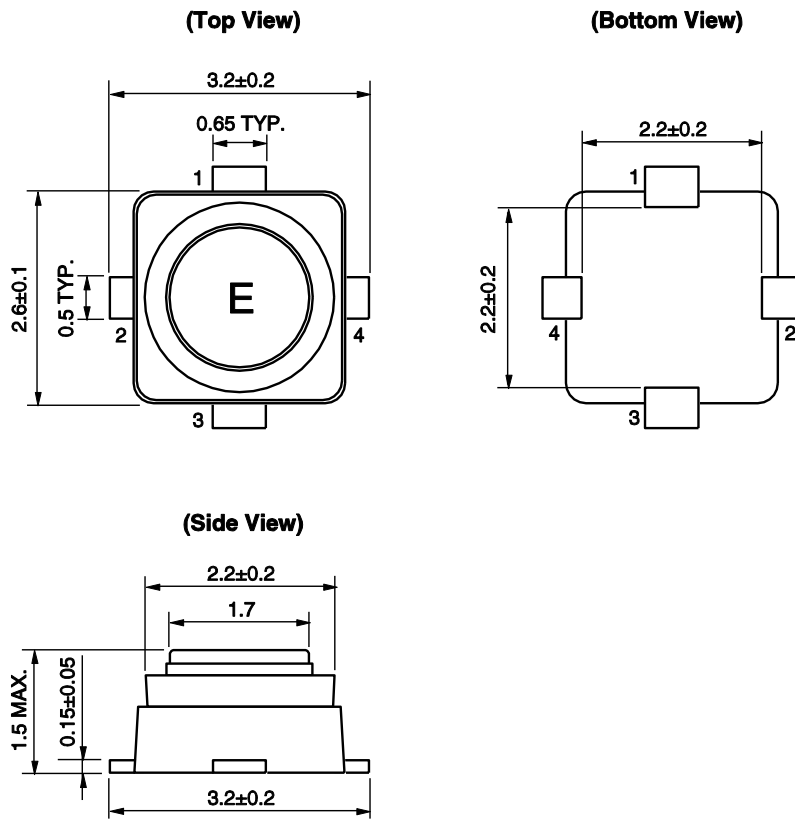
RF MEASURING LAYOUT PATTERN (REFERENCE ONLY) (UNIT: mm)



RT/duroid 5880/ROGERS  
 t = 0.254 mm  
 $\epsilon_r = 2.20$   
 tan delta = 0.0009 @10 GHz  
 Au-flash plate

**PACKAGE DIMENSIONS**

**S03 (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 November, 2009. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets, 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.**
- No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Electronics. NEC Electronics assumes no responsibility for any errors that may appear in this document.
- NEC Electronics does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC Electronics products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Electronics or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of a customer's equipment shall be done under the full responsibility of the customer. NEC Electronics assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC Electronics endeavors to enhance the quality and safety of NEC Electronics products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. In addition, NEC Electronics products are not taken measures to prevent radioactive rays in the product design. When customers use NEC Electronics products with their products, customers shall, on their own responsibility, incorporate sufficient safety measures such as redundancy, fire-containment and anti-failure features to their products in order to avoid risks of the damages to property (including public or social property) or injury (including death) to persons, as the result of defects of NEC Electronics products.
- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".

The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics product before using it in a particular application.

"Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots.

"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).

"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)

- (1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.
- (2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).

M8E0904E



<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>
----------------	---------------	--