NEC

N-CHANNEL GaAs MES FET
NE960R5 SERIES

0.5 W X, Ku-BAND POWER GaAs MES FET

DESCRIPTION

The NE960R5 Series are 0.5 W GaAs MES FETs designed for middle power transmitter applications for X, Ku-band microwave communication systems. It is capable of delivering 0.5 watt of output power (CW) with high linear gain, high efficiency and low distortion and are suitable as driver amplifiers for our X, Ku-band amplifiers etc. The NE960R500 is available in chip form. The NE960R500 has a via hole source grounding and PHS (Plated Heat Sink) for superior RF performance. The NE960R575 is available in a hermetically sealed ceramic package. Reliability and performance uniformity are assured by NEC's stringent quality and control procedures.

FEATURES

- High Output Power : $P_{o\ (1\ dB)}$ = +27.5 dBm TYP.
- High Linear Gain : 9.0 dB TYP.
- High Power Added Efficiency : 30 % TYP. @V_{DS} = 9 V, I_{Dset} = 180 mA, f = 14.5 GHz

ORDERING INFORMATION

Part Number	Package	Supplying Form
NE960R500	00 (CHIP)	ESD protective envelope
NE960R575	75	

Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: NE960R500, NE960R575

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

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The mark ★ shows major revised points.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Operation in excess of any one of these parameters may result in permanent damage.

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V_{DS}	15	V
★ Gate to Source Voltage	V_{GSO}	–7	V
Drain Current	I_D	0.7	A
Gate Forward Current	I_{GF}	+5.0	mA
Gate Reverse Current	I_{GR}	–5.0	mA
★ Total Power Dissipation	P_T	5.0	W
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	–65 to +175	°C

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Test Condition	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}		–	9.0	9.0	V
Gain Compression	Gcomp		–	–	3.0	dB
Channel Temperature	T_{ch}		–	–	+130	°C

ELECTRICAL CHARACTERISTICS

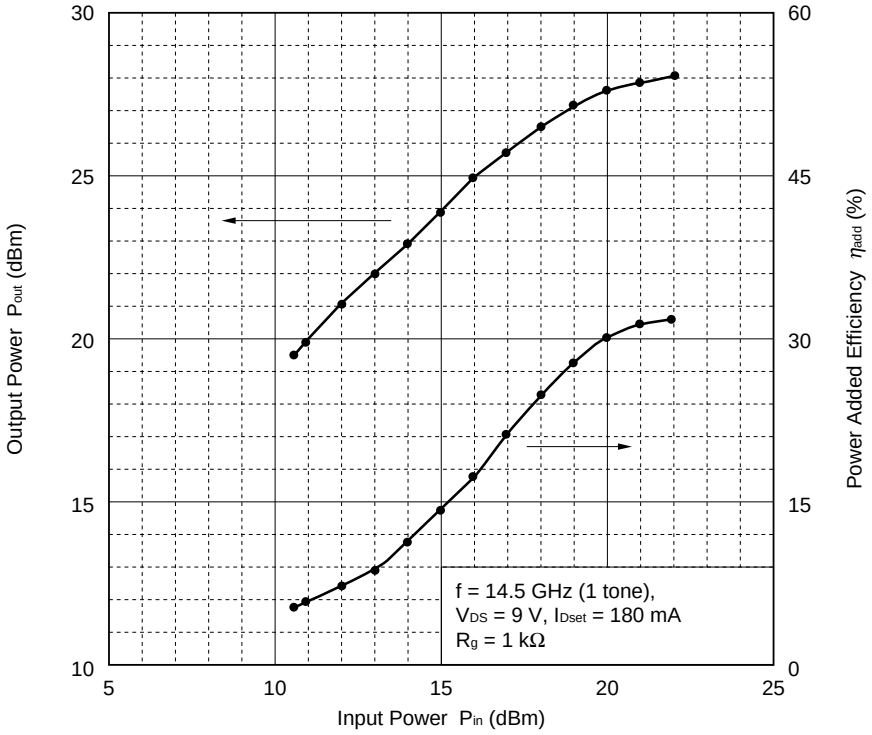
(T_A = +25°C, unless otherwise specified, using NEC standard test fixture.)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Saturated Drain Current	I_{DSS}	V_{DS} = 1.5 V, V_{GS} = 0 V	0.18	0.4	0.7	A
Pinch-off Voltage	V_p	V_{DS} = 2.5 V, I_D = 2 mA	–2.5	–1.8	–0.5	V
Gate to Drain Break Down Voltage	BV_{gd}	I_{gd} = 2 mA	15	–	–	V
★ Thermal Resistance	R_{th}	Channel to Case	–	–	30	°C/W
Output Power at P_{in} = +19 dBm	P_{out}	f = 14.5 GHz, V_{DS} = 9.0 V R_g = 1 kΩ I_{Dset} = 180 mA (RF OFF)	25.5	26.5	–	dBm
Output Power at 1 dB Gain Compression Point	$P_{o\ (1\ dB)}$		–	27.5	–	dBm
Power Added Efficiency at $P_{o\ (1dB)}$	η_{add}		–	30	–	%
Linear Gain	G_L		8.0	9.0	–	dB

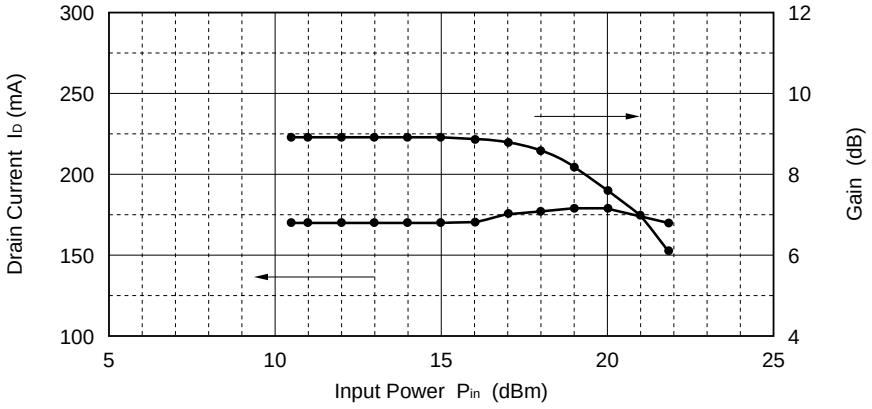
Remark DC and RF performance is 100 % testing.

TYPICAL CHARACTERISTICS (T_A = +25°C)

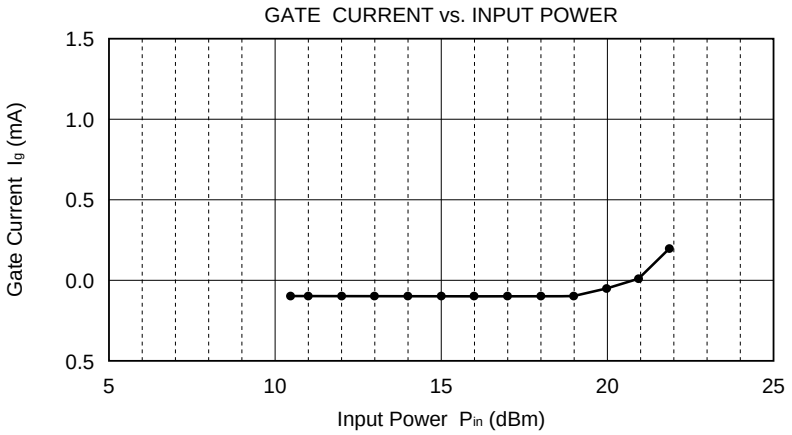
OUTPUT POWER AND POWER ADDED EFFICIENCY vs. INPUT POWER



DRAIN CURRENT AND GAIN vs. INPUT POWER



GATE CURRENT vs. INPUT POWER



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.

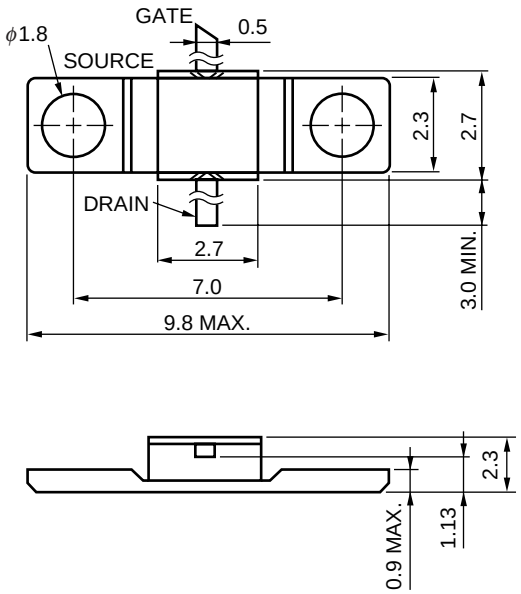
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL http://www.ncsd.necel.com/

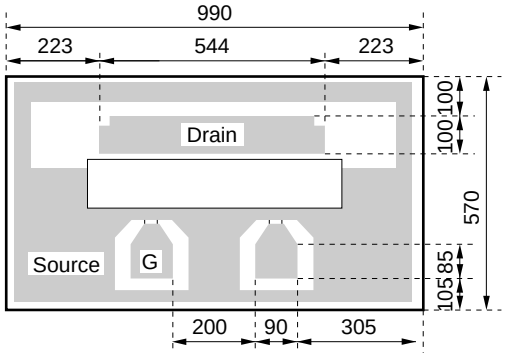
PACKAGE DIMENSIONS

PACKAGE CODE-75 (Unit: mm)



★ PHYSICAL DIMENSIONS

NE960R500 (CHIP) (Unit: μm)



Remark Chip thickness: 100 μm
G : Gate

★ RECOMMENDED SOLDERING CONDITIONS

This product should be soldered 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
Partial Heating	Peak temperature (pin temperature) : 350°C or below Soldering time (per pin of device) : 3 seconds or less Maximum chlorine content of rosin flux (% mass) : 0.2 % (Wt.) or below	HS350-P3

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

CHIP HANDLING

DIE ATTACHMENT

Die attach can be accomplished with a Au-Sn (300 ±10°C) performs in a forming gas environment. Epoxy die attach is not recommended.

BONDING

Gate and drain bonding wires should be minimum length, semi-hard gold wire (3 to 8 % elongation) 30 microns or less in diameter.

Bonding should be performed with a wedge tip that has a taper of approximately 15 %.

Die attach and bonding time should be kept to a minimum. As a general rule, the bonding operation should be kept within a 280°C_5 minute curve. If longer periods are required, the temperature should be lowered.

PRECAUTIONS

The user must operate in a clean, dry environment.

The chip channel is glassivated for mechanical protection only and does not preclude the necessity of a clean environment.

The bonding equipment should be periodically checked for sources of surge voltage and should be properly grounded at all times. In fact, all test and handling equipment should be grounded to minimize the possibilities of static discharge.

- **The information in this document is current as of August, 2003. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
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  "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.

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  (Note)

  (1) "NEC" as used in this statement means NEC Corporation, NEC Compound Semiconductor Devices, Ltd. and also includes its majority-owned subsidiaries.

  (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4-0110

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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