DATA SHEET

CEL

HETERO JUNCTION FIELD EFFECT TRANSISTOR

NE3510M04

L TO S BAND LOW NOISE AMPLIFIER
N-CHANNEL HJ-FET

FEATURES

- Low noise figure and high associated gain
  NF = 0.45 dB TYP., G_a = 16 dB TYP. @ f = 4 GHz, V_{DS} = 2 V, I_D = 15 mA
  NF = 0.35 dB TYP., G_a = 19 dB TYP. @ f = 2 GHz, V_{DS} = 2 V, I_D = 10 mA (Reference only)
- Flat-lead 4-pin thin-type super minimold (M04) package

APPLICATIONS

- Satellite radio (SDARS, DMB, etc.) antenna LNA
- Low noise amplifier for microwave communication system

ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Marking	Supplying Form
NE3510M04	NE3510M04-A	Flat-lead 4-pin thin-type super minimold (M04) (Pb-Free)	50 pcs (Non reel)	V81	• 8 mm wide embossed taping • Pin 1 (Source), Pin 2 (Drain) face the perforation side of the tape
NE3510M04-T2	NE3510M04-T2-A		3 kpcs/reel		

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: NE3510M04-A

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V_{DS}	4.0	V
Gate to Source Voltage	V_{GS}	–3.0	V
Drain Current	I_D	I_{DSS}	mA
Gate Current	I_G	140	μA
Total Power Dissipation	P_{tot} Note	125	mW
Channel Temperature	T_{ch}	+150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

Note Mounted on 1.08 cm^2 × 1.0 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.

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RECOMMENDED OPERATING CONDITIONS (T_A = +25°C)

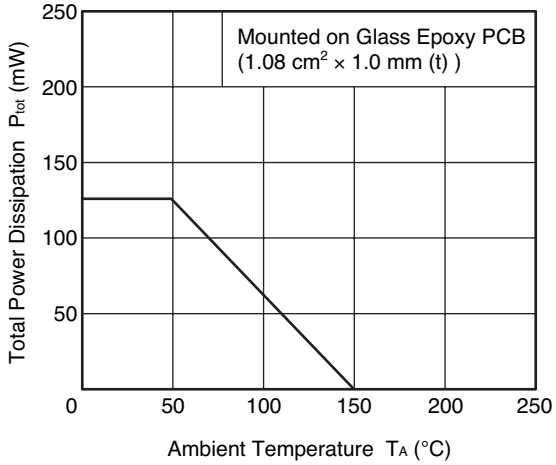
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}	–	2	3	V
Drain Current	I_D	–	15	30	mA
Input Power	P_{in}	–	–	0	dBm

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

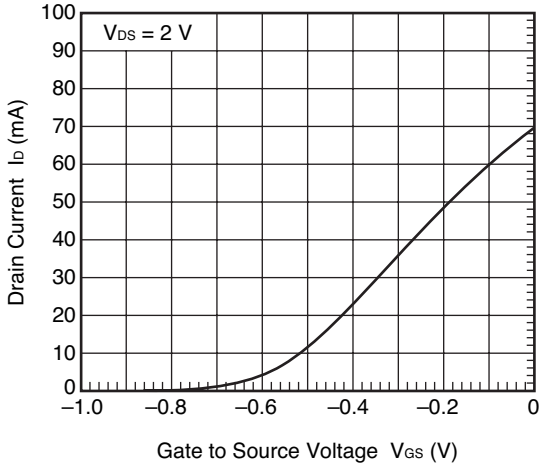
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	I_{GSO}	V_{GS} = –3 V	–	0.5	10	μA
Saturated Drain Current	I_{DSS}	V_{DS} = 2 V, V_{GS} = 0 V	42	70	97	mA
Gate to Source Cutoff Voltage	$V_{GS (off)}$	V_{DS} = 2 V, I_D = 100 μA	–0.35	–0.7	–1.10	V
Transconductance	g_m	V_{DS} = 2 V, I_D = 15 mA	70	–	–	mS
Noise Figure	NF	V_{DS} = 2 V, I_D = 15 mA, f = 4 GHz	–	0.45	0.65	dB
Associated Gain	G_a		14.5	16	–	dB
Gain 1 dB Compression Output Power	$P_{O (1 dB)}$	V_{DS} = 2 V, I_D = 15 mA (Non-RF), f = 4 GHz	–	+11	–	dBm

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

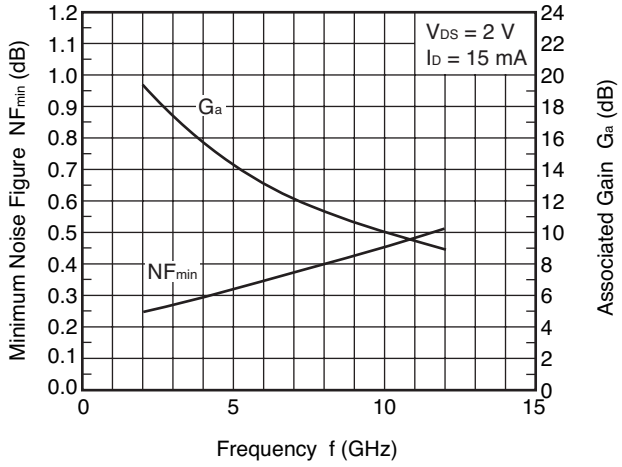
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



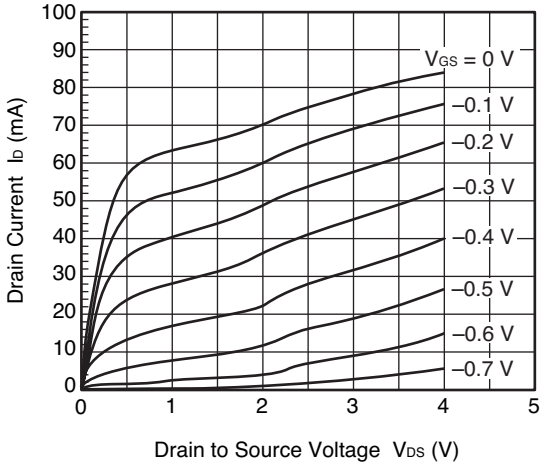
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



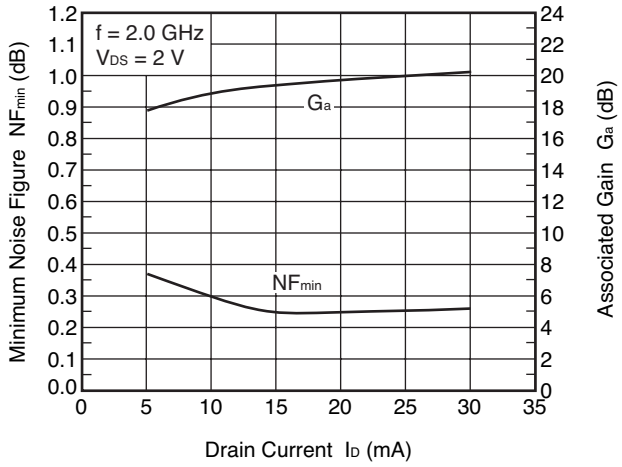
MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY



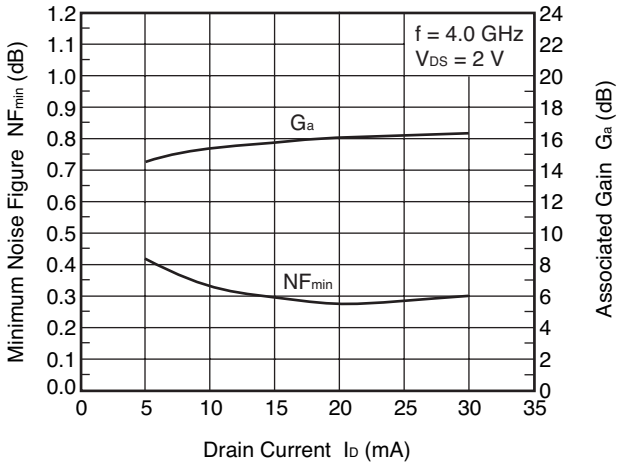
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT

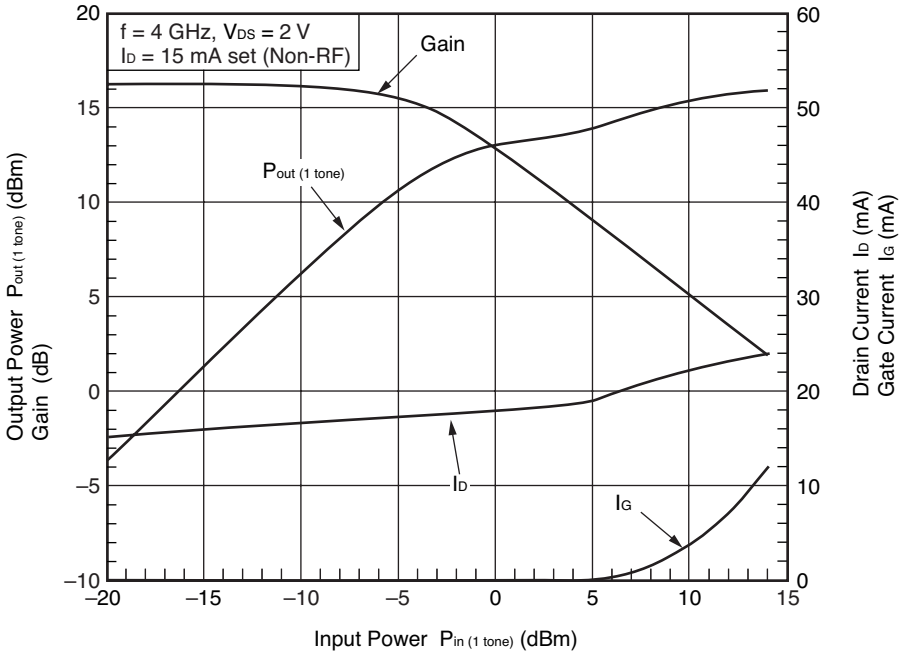


MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT

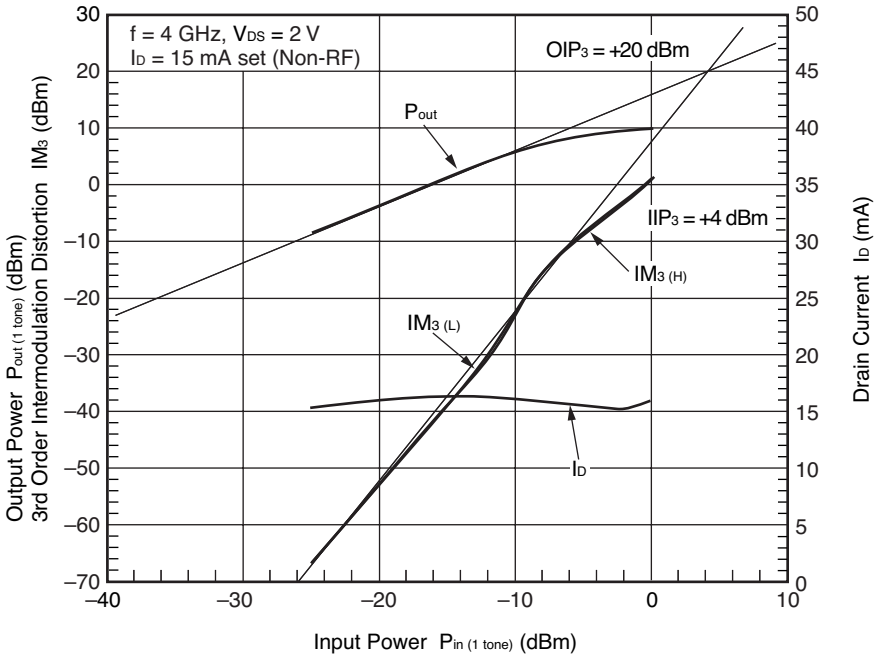


Remark The graphs indicate nominal characteristics.

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



OUTPUT POWER, IM3, DRAIN CURRENT
vs. INPUT POWER



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.

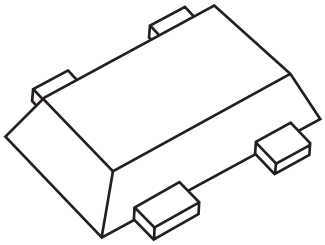
Click here to download S-parameters.

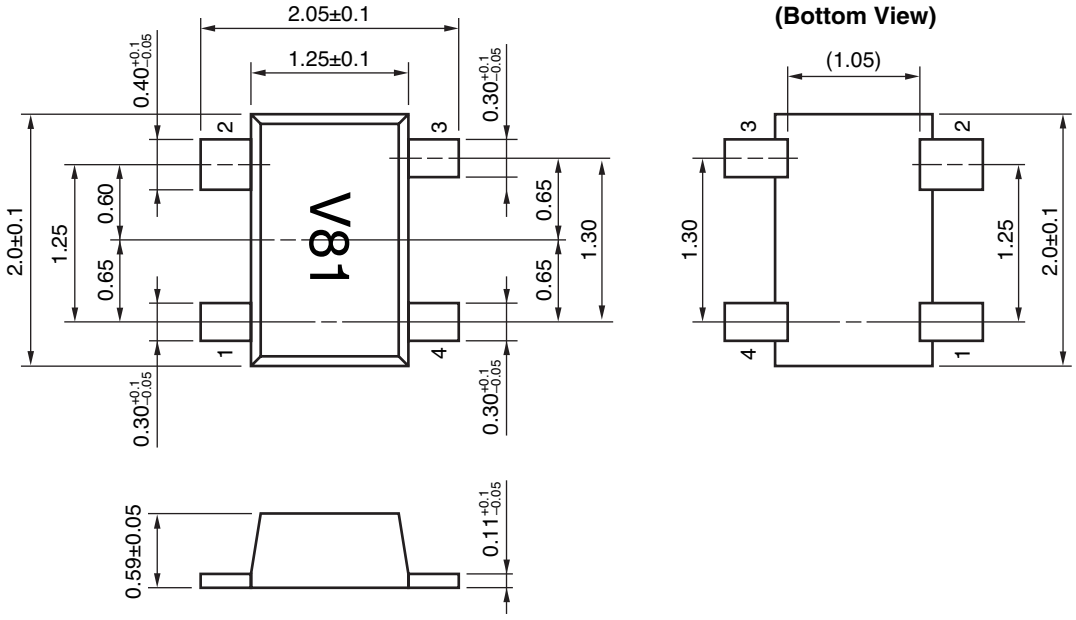
[RF and Microwave] → [Device Parameters]

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

PACKAGE DIMENSIONS

FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M04) (UNIT: mm)



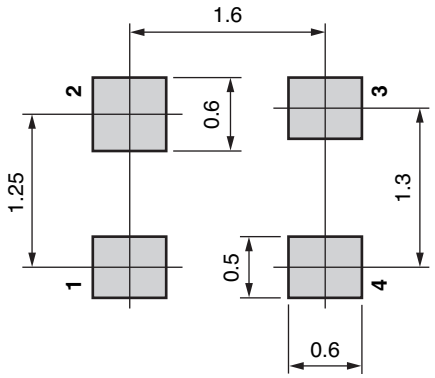


PIN CONNECTIONS

1. Source
2. Drain
3. Source
4. Gate

MOUNTING PAD DIMENSIONS (REFERENCE ONLY)

FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M04) PACKAGE (UNIT: mm)



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	IR260
	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	HS350
	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 July, 2007. 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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  "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 Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.

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M8E 02. 11-1

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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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	
Lead (Pb)	< 1000 PPM	-A	-AZ
		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.