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# NE3513M04

**Data Sheet**  
R09DS0028EJ0100  
Rev.1.00  
Oct 18, 2011

N-Channel GaAs HJ-FET, X to Ku Band Low Noise and High-Gain

## FEATURES

- Low noise figure and high associated gain:  
NF = 0.45 dB TYP.,  $G_a = 13$  dB TYP. @  $V_{DS} = 2$  V,  $I_D = 10$  mA,  $f = 12$  GHz  
NF = 0.5 dB TYP.,  $G_a = 12$  dB TYP. @  $V_{DS} = 2$  V,  $I_D = 6$  mA,  $f = 12$  GHz (Reference Value)
- Flat-lead 4-pin thin-type super minimold (M04) package

## APPLICATIONS

- DBS LNB gain-stage, Mix-stage
- Low noise amplifier for microwave communication system

## ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Marking	Supplying Form
NE3513M04-T2	NE3513M04-T2-A	Flat-lead 4-pin thin-type super minimold (M04) (Pb-Free)	3 kpcs/reel	V84	<ul style="list-style-type: none"> <li>• Embossed tape 8 mm wide</li> <li>• Pin 1 (Source), Pin 2 (Drain) face the perforation side of the tape</li> </ul>
NE3513M04-T2B	NE3513M04-T2B-A		15 kpcs/reel		

**Remark** To order evaluation samples, please contact your nearby sales office.  
Part number for sample order: NE3513M04-A

## ABSOLUTE MAXIMUM RATINGS ( $T_A = +25^\circ\text{C}$ , unless otherwise specified)

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	$I_G$	80	$\mu\text{A}$
Total Power Dissipation <sup>Note</sup>	$P_{tot}$	125	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 PWB

### CAUTION

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

**RECOMMENDED OPERATING RANGE ( $T_A = +25^\circ\text{C}$ , unless otherwise specified)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	$V_{DS}$	+1	+2	+3	V
Drain Current	$I_D$	3	10	15	mA
Input Power	$P_{in}$	–	–	0	dBm

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

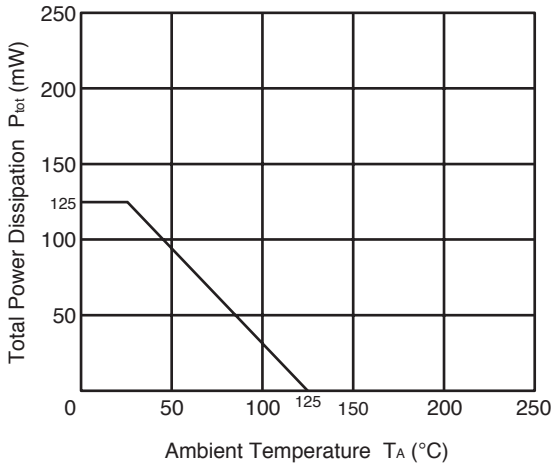
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	$I_{GSO}$	$V_{GS} = -3.0\text{ V}$	–	0.5	10	$\mu\text{A}$
Saturated Drain Current	$I_{DSS}$	$V_{DS} = 2\text{ V}, V_{GS} = 0\text{ V}$	15	30	60	mA
Gate to Source Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 2\text{ V}, I_D = 100\ \mu\text{A}$	-0.2	-0.5	-1.3	V
Transconductance	gm	$V_{DS} = 2\text{ V}, I_D = 10\text{ mA}$	50	65	–	mS
Noise Figure	NF	$V_{DS} = 2\text{ V}, I_D = 10\text{ mA}, f = 12\text{ GHz}$	–	0.45	0.65	dB
Associated Gain	$G_a$		11.5	13	–	dB

**STANDARD CHARACTERISTICS FOR REFERENCE  
( $T_A = +25^\circ\text{C}$ , unless otherwise specified)**

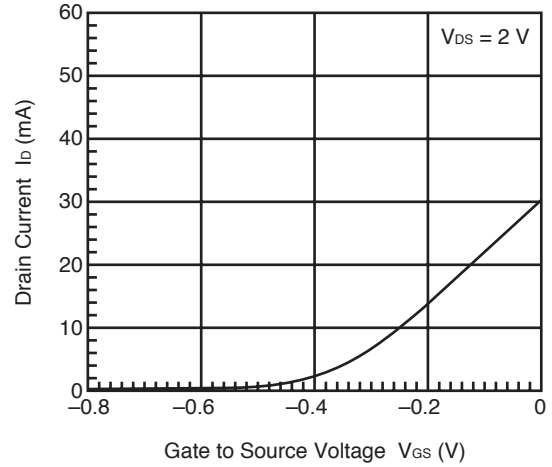
Parameter	Symbol	Test Conditions	Reference Value	Unit
Noise Figure	NF	$V_{DS} = 2\text{ V}, I_D = 6\text{ mA}, f = 12\text{ GHz}$	0.5	dB
Associated Gain	$G_a$		12	dB

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

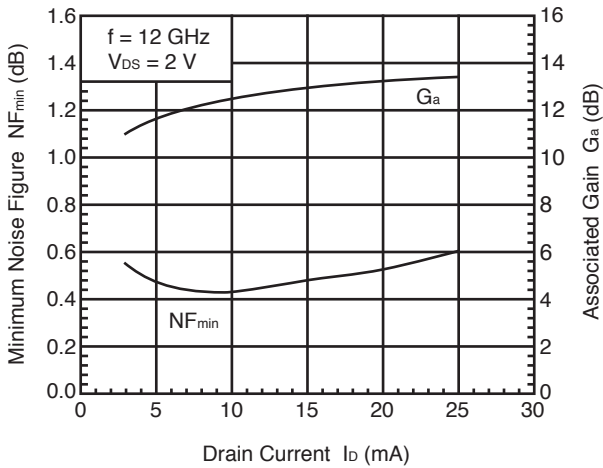
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



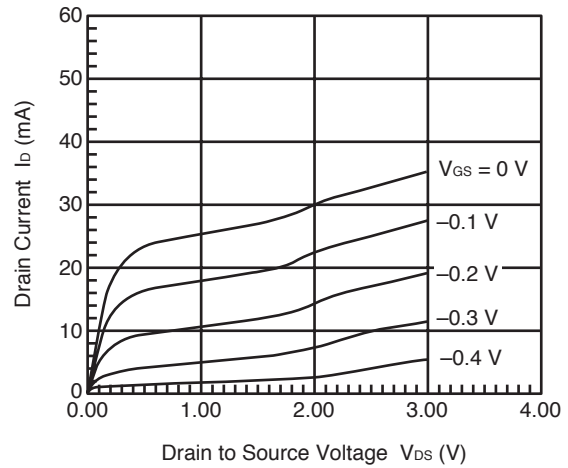
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



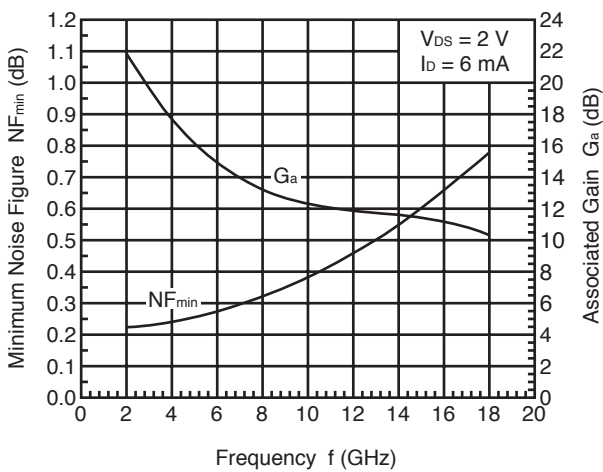
MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT



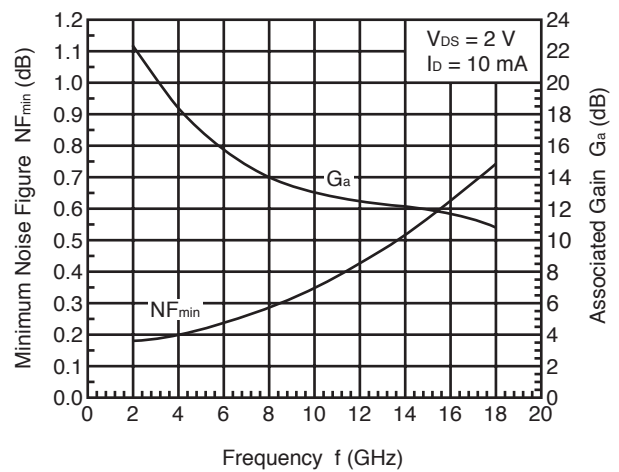
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY



MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY



**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.

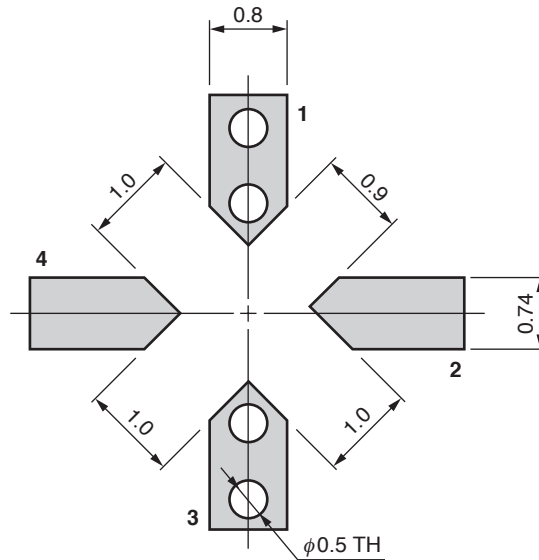
[RF and Microwave]  [Device Parameters]

URL <http://www2.renesas.com/microwave/>

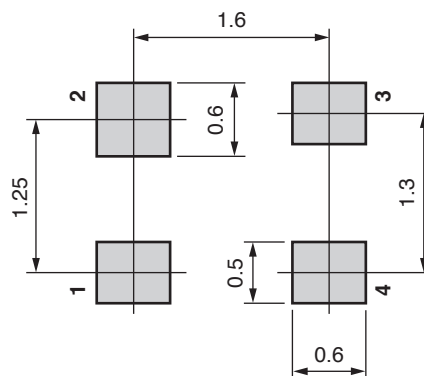
## MOUNTING PAD DIMENSIONS

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

-Reference 1-



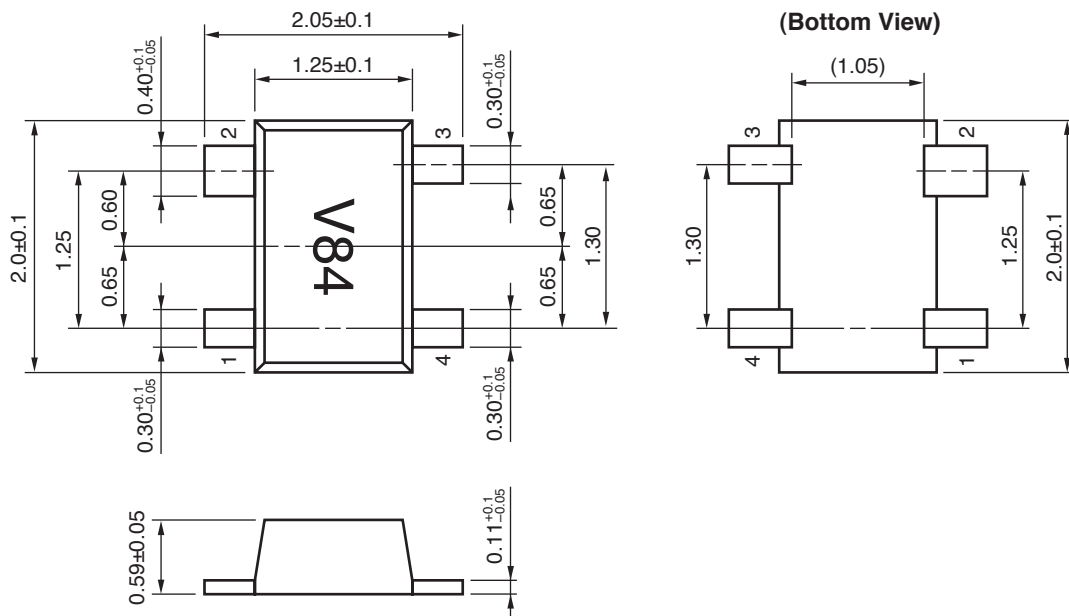
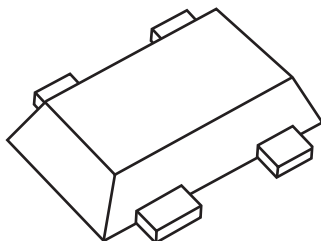
-Reference 2-



**Remark** The mounting pad layout in this document is for reference only.

**PACKAGE DIMENSIONS**

FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M04) (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.

<b>Soldering Method</b>	<b>Soldering Conditions</b>	<b>Condition Symbol</b>
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	IR260
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	HS350

**CAUTION**

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



<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>
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<b>Revision History</b>	<b>NE3513M04 Data Sheet</b>
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<b>Rev.</b>	<b>Date</b>	<b>Description</b>	
		<b>Page</b>	<b>Summary</b>
1.00	Oct 18, 2011	-	First edition issued

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