NE3509M14

N-Channel GaAs HJ-FET, L to C Band Low Noise Amplifier

R09DS0011EJ0100
Rev.1.00
Jan 21, 2011

FEATURES

- Super low noise figure and high associated gain high isolation
  NF = 0.4 dB TYP., G_a = 18.5 dB TYP. @ V_{DS} = 2 V, I_D = 10 mA, f = 2 GHz
- 4-pin lead-less minimold (M14, 1208 PKG) package

APPLICATIONS

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

ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Marking	Supplying Form
NE3509M14-T3	NE3509M14-T3-A	4-pin lead-less minimold (M14, 1208 PKG) (Pb-Free)	10 kpcs/reel	zR	• Embossed tape 8 mm wide • Pin 1 (Drain), Pin 4 (Source) face the perforation side of the tape

Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: NE3509M14

ABSOLUTE MAXIMUM RATINGS (T_A = +25°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	200	μA
Total Power Dissipation Note	P_{tot}	150	mW
Channel Temperature	T_{ch}	+150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

Note: Mounted on 1.08 $cm^2 \times 1.0$ mm (t) glass epoxy PWB

CAUTION

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

RECOMMENDED OPERATING RANGE (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}	–	2	3	V
Drain Current	I_D	–	10	20	mA
Input Power	P_{in}	–	–	0	dBm

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

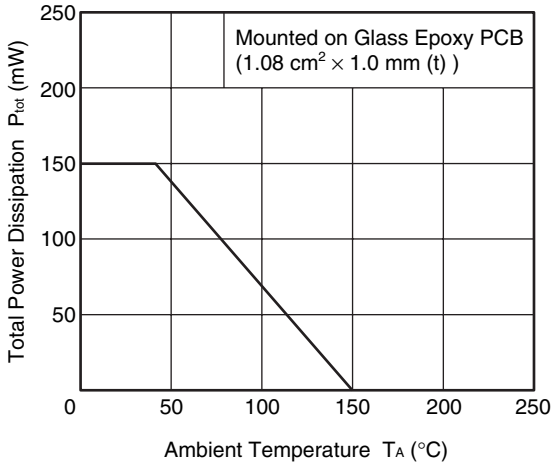
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	I_{GSO}	V_{GS} = –3.0 V	–	0.5	10	μA
Saturated Drain Current	I_{DSS}	V_{DS} = 2 V, V_{GS} = 0 V	30	45	60	mA
Gate to Source Cutoff Voltage	$V_{GS (off)}$	V_{DS} = 2 V, I_D = 50 μA	–0.25	–0.50	–0.75	V
Trans conductance	g_m	V_{DS} = 2 V, I_D = 10 mA	80	–	–	mS
Noise Figure	NF	V_{DS} = 2 V, I_D = 10 mA, f = 2 GHz	–	0.4	0.7	dB
Associated Gain	G_a		16.5	18.5	–	dB

STANDARD CHARACTERISTICS FOR REFERENCE (T_A = +25°C, unless otherwise specified)

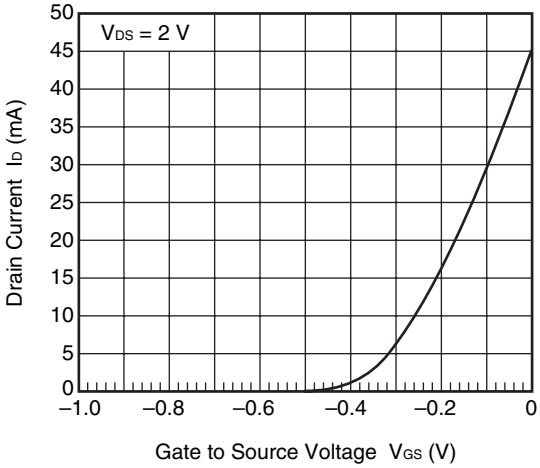
Parameter	Symbol	Test Conditions	Reference Value	Unit
Gain 1 dB Compression Output Power	$P_{O (1 dB)}$	f = 2 GHz, V_{DS} = 2 V, I_D = 10 mA set (non-RF)	+11	dBm

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

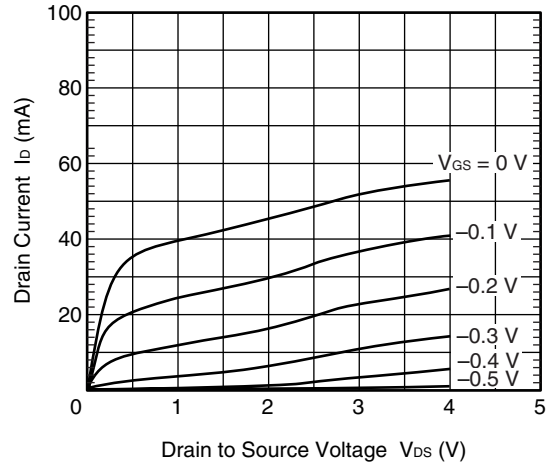
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



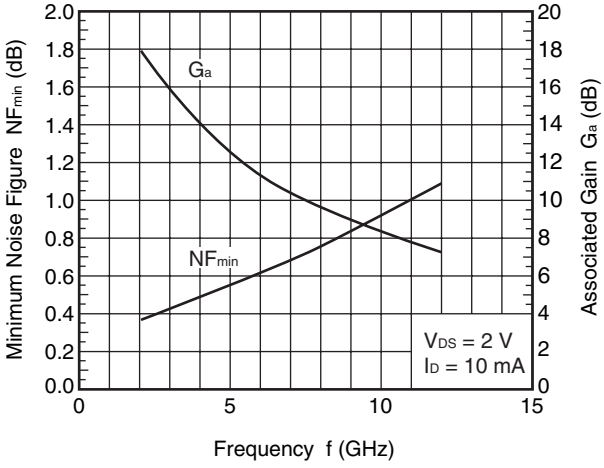
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



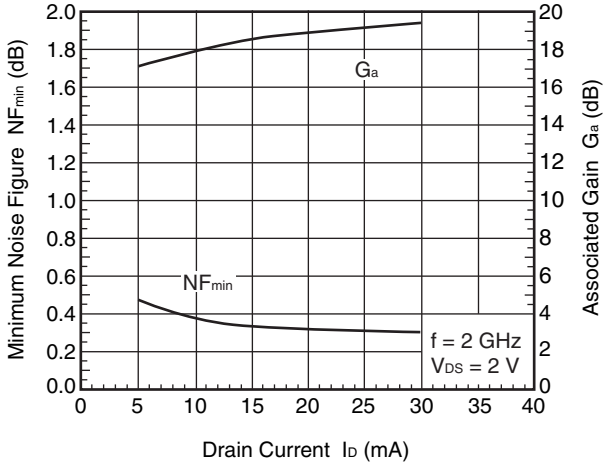
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



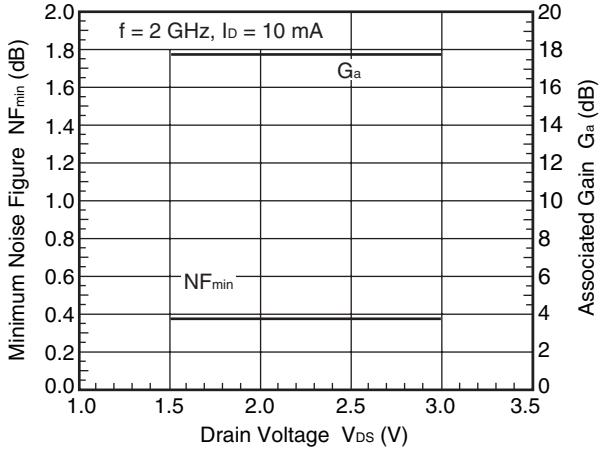
MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY



MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT

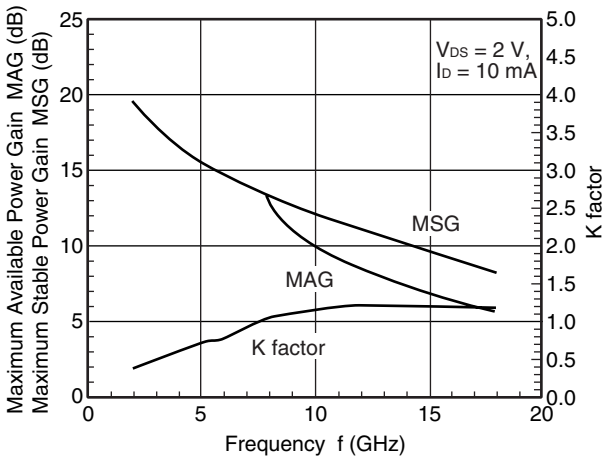


MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN VOLTAGE

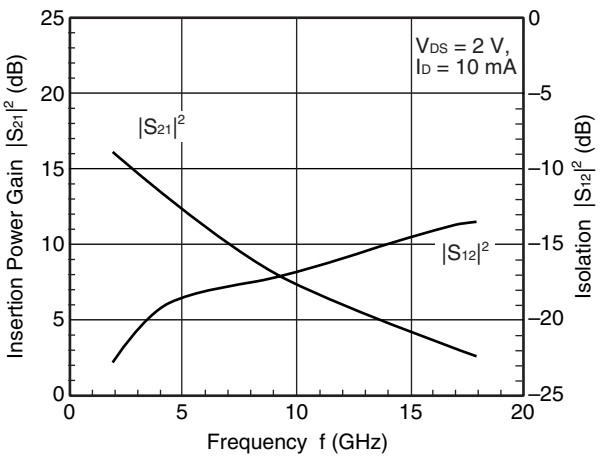


Remark The graphs indicate nominal characteristics.

MAG, MSG, K FACTOR vs. FREQUENCY

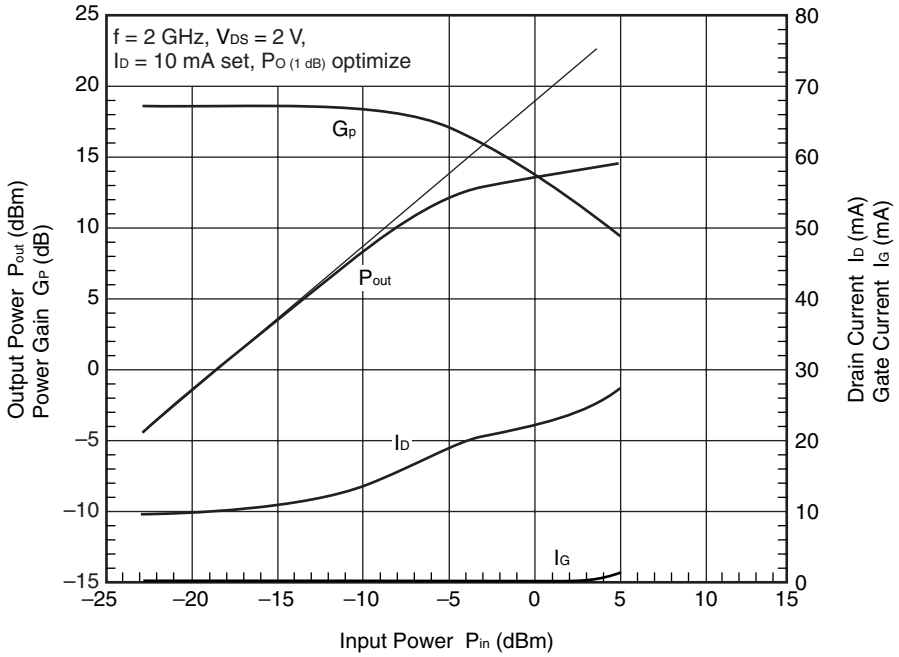


INSERTION POWER GAIN, ISOLATION vs. FREQUENCY

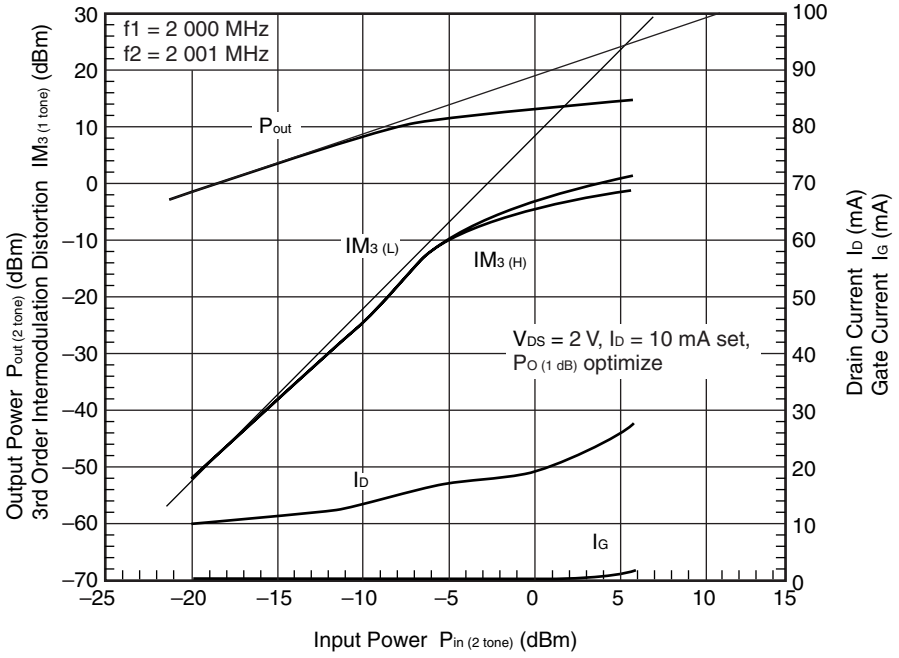


Remark The graphs indicate nominal characteristics.

OUTPUT POWER, G_p, I_D, I_G vs. INPUT POWER



OUTPUT POWER, IM_3, I_D, I_G vs. INPUT POWER



Remark The graphs indicate nominal characteristics.

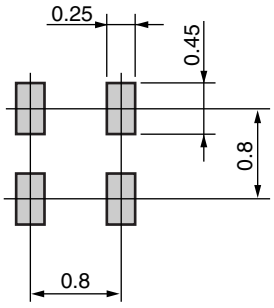
S-PARAMETERS

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://www2.renesas.com/microwave/en/download.html

MOUNTING PAD LAYOUT DIMENSIONS

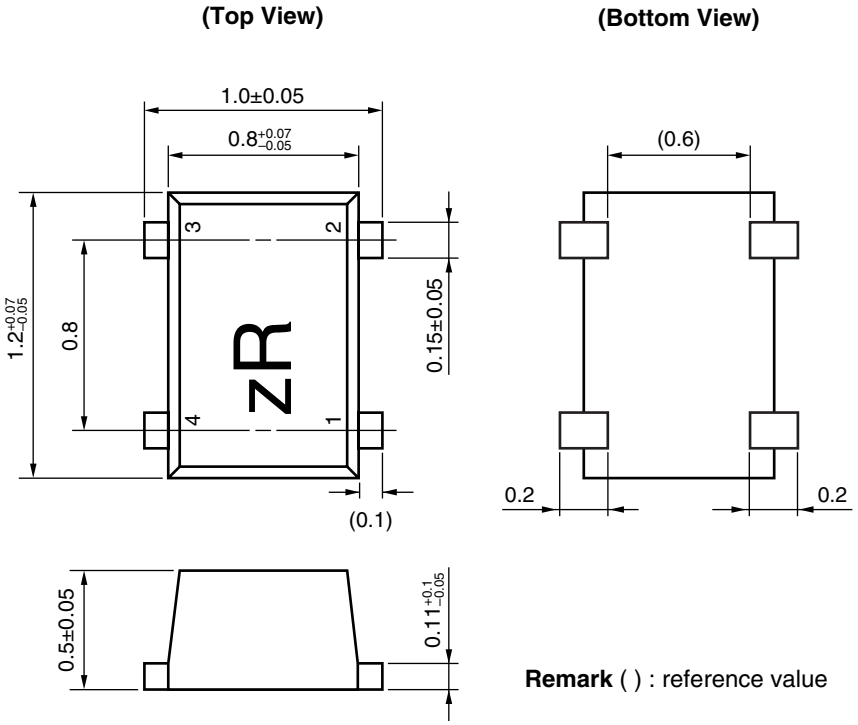
4-PIN LEAD-LESS MINI-MOLD (M14, 1208 PKG) (UNIT: mm)



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

PACKAGE DIMENSIONS

4-PIN LEAD-LESS MINI-MOLD (M14, 1208 PKG) (UNIT: mm)



Remark ( ) : reference value

PIN CONNECTIONS

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

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	IR260
Partial Heating	Peak temperature (package surface 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).

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.

Revision History	NE3509M14 Data Sheet

Rev.	Date	Description	
		Page	Summary
1.00	Jan 21, 2011	—	First edition issued

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