

## GaAs MMIC LOW NOISE AMPLIFIER FOR GPS

## DESCRIPTION

The  $\mu$ PG2311T5F is a GaAs MMIC LNA for Car Navigation Systems and Handy GPS. This IC consists of two stage amplifiers and has high gain performance.

## FEATURES

- High gain :  $G_P = 37$  dB TYP.
- Low noise :  $NF = 1.2$  dB TYP.
- 12-pin plastic QFN package ( $3.0 \times 3.0 \times 0.75$  mm)

## APPLICATION

- Car Navigation System
- Handy GPS

## ORDERING INFORMATION

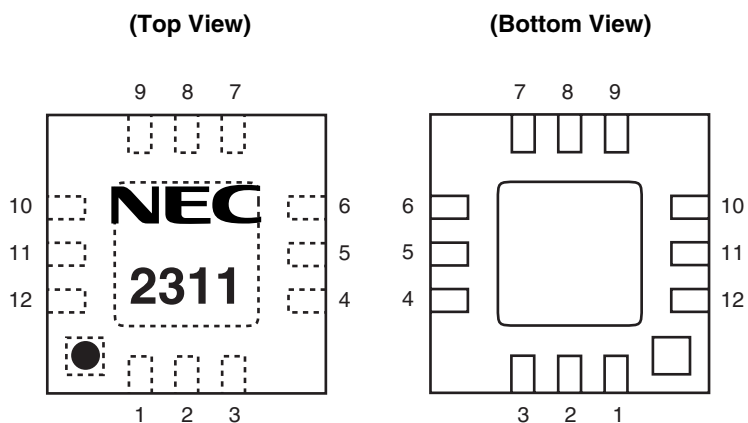
Part Number	Order Number	Package	Marking	Supplying Form
$\mu$ PG2311T5F-E2	$\mu$ PG2311T5F-E2-A	12-pin plastic QFN (Pb-Free)	2311	<ul style="list-style-type: none"><li>• Embossed tape 8 mm wide</li><li>• Pin 1 indicates roll-in direction of tape</li><li>• Qty 3 kpcs/reel</li></ul>

**Remark** To order evaluation samples, contact your nearby sales office.  
Part number for sample order:  $\mu$ PG2311T5F

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

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# PIN CONNECTIONS



Pin No.	Pin Name
1	OUT2
2	GND
3	V <sub>cc</sub> 2
4	V <sub>cc</sub> 1
5	GND
6	IN1
7	GND
8	OUT1
9	GND
10	IN2
11	GND
12	GND
EXPOSED PAD	GND

## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V <sub>cc</sub> 1, V <sub>cc</sub> 2	+5.0	V
Input Power	P <sub>in</sub>	+10	dBm
Total Power Dissipation	P <sub>tot</sub>	0.25 <sup>Note</sup>	W
Operating Ambient Temperature	T <sub>A</sub>	−45 to +85	°C
Storage Temperature	T <sub>stg</sub>	−55 to +150	°C

**Note** Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T<sub>A</sub> = +85°C

## RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f <sub>opt</sub>	–	1.575	–	GHz
Supply Voltage	V <sub>cc</sub> 1, V <sub>cc</sub> 2	+2.7	+3.0	+3.3	V

**ELECTRICAL CHARACTERISTICS** ( $T_A = +25^\circ\text{C}$ ,  $V_{CC1} = V_{CC2} = +3.0\text{ V}$ ,  $Z_o = 50\ \Omega$ , unless otherwise specified)

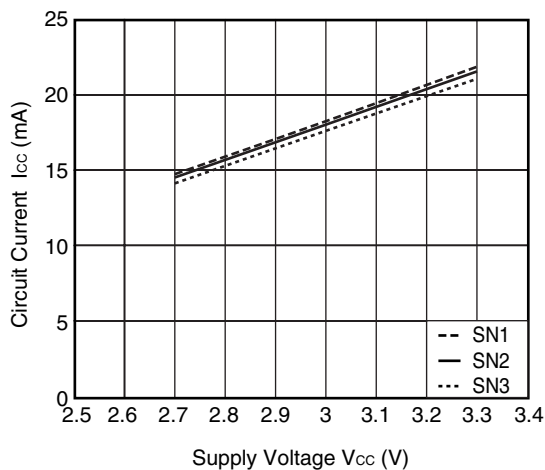
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Power Gain <sup>Note 1</sup>	$G_P$	$f = 1.575\text{ GHz}$	34	37	—	dB
Noise Figure <sup>Note 2</sup>	NF	$f = 1.575\text{ GHz}$	—	1.2	1.5	dB
Input Return Loss	$RL_{in}$	$f = 1.575\text{ GHz}$	—	5	—	dB
Output Return Loss	$RL_{out}$	$f = 1.575\text{ GHz}$	—	20	—	dB
1 dB Gain Compression Output Power	$P_O (1\text{ dB})$	$f = 1.575\text{ GHz}$	—	+5	—	dBm
Circuit Current <sup>Note 3</sup>	$I_{CC}$	$f = 1.575\text{ GHz}$ , Non-RF	—	17	20	mA

**Notes 1.** Total gain of 1st stage and 2nd stage amplifiers (not include filter loss).

**2.** NF of 1st stage amplifier.

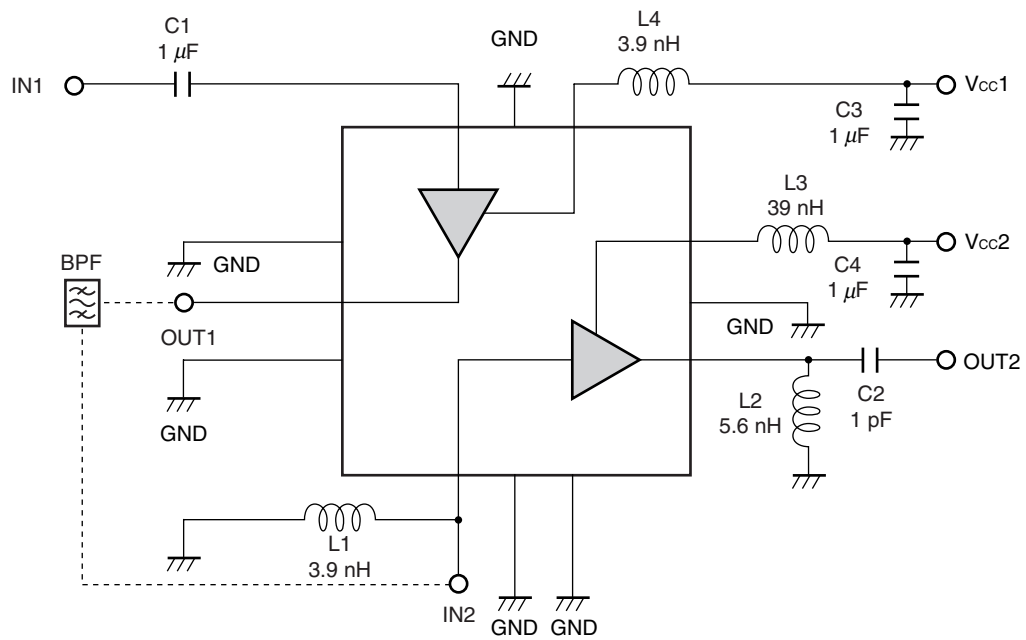
**3.** Please refer to following chart.

CIRCUIT CURRENT vs. SUPPLY VOLTAGE



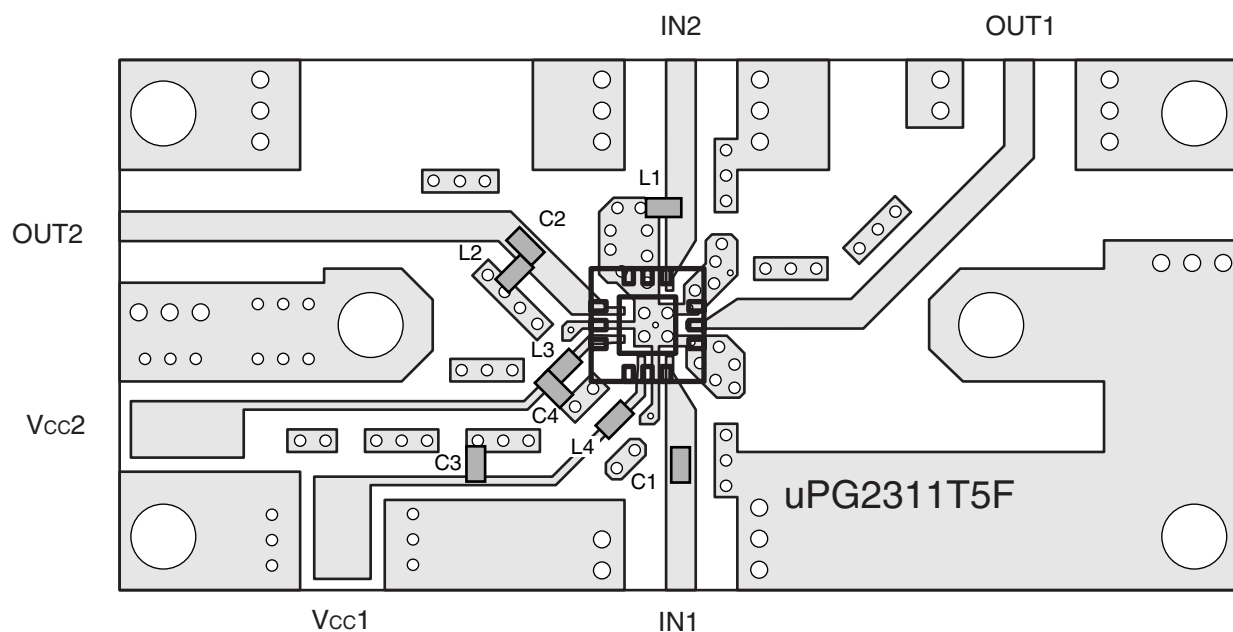
**Remark** The graph indicates nominal characteristics.

TEST CIRCUIT



The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

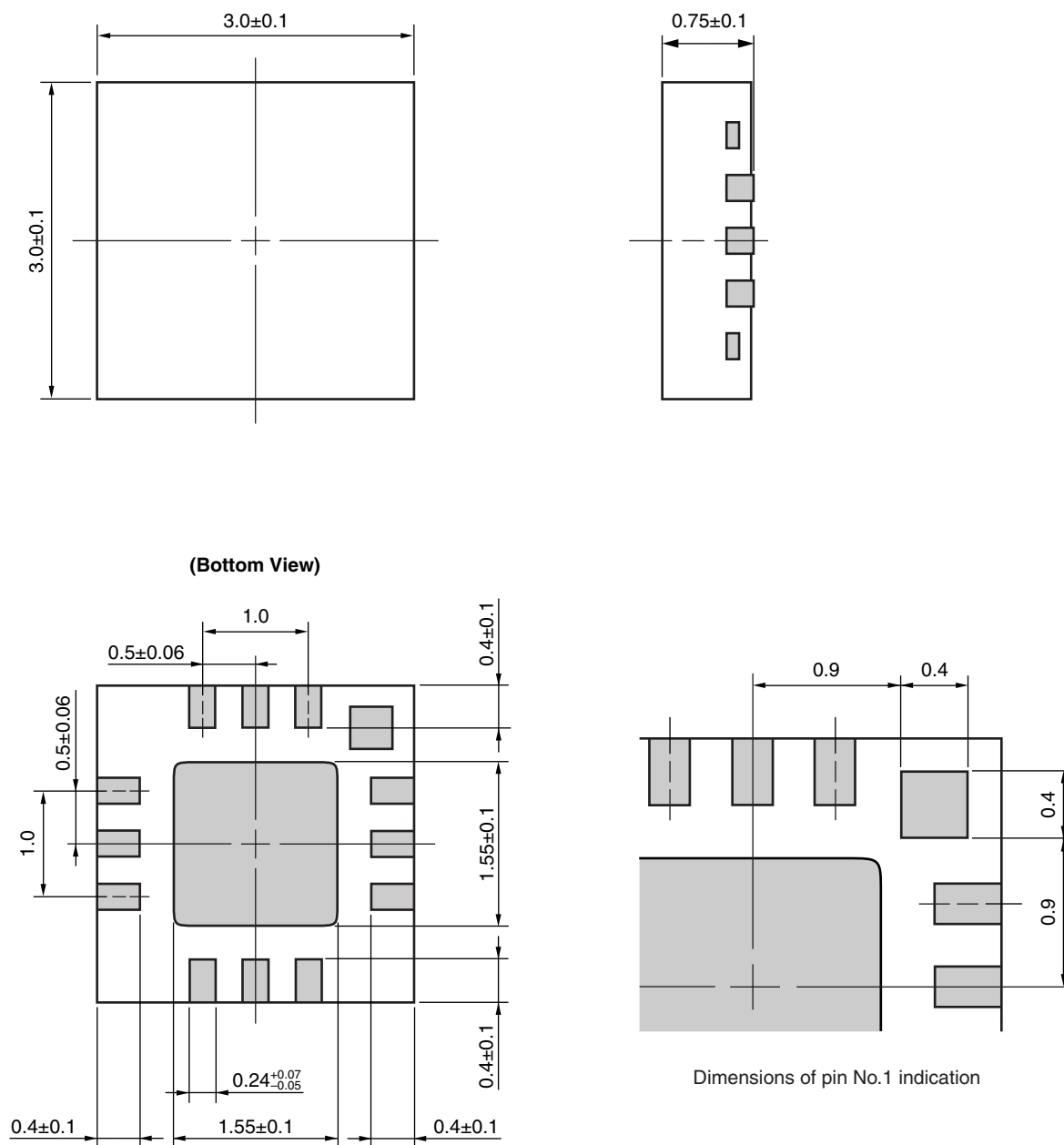


USING THE NEC EVALUATION BOARD

Symbol	Rating	Size	Symbol	Rating	Size
C1	1 $\mu$ F	1608	L1	3.9 nH	1005
C2	1 pF	1005	L2	5.6 nH	1005
C3	1 $\mu$ F	1608	L3	39 nH	1005
C4	1 $\mu$ F	1608	L4	3.9 nH	1005

# PACKAGE DIMENSIONS

## 12-PIN PLASTIC QFN (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 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
Wave Soldering	Peak temperature (molten solder temperature) : 260°C or below Time at peak temperature : 10 seconds or less Preheating temperature (package surface temperature) : 120°C or below Maximum number of flow processes : 1 time Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	WS260
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).

- **The information in this document is current as of June, 2006. 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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<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.</li> </ul> <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> <ul style="list-style-type: none"> <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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► For further information, please contact

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