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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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Evaluation Board Information

EC-NE3508M04

2.4 GHz LNA Evaluation Board

for Satellite Radio Application (NF optimized)

- **Evaluation Board Pattern Layout**
- **Circuit Description**
- **Evaluation Board Test Results**
- **Gain and Isolation**
- **Input and Output Return Loss**
- **1 dB Gain Compression Output Power**
- **P_{in}-P_{out} & IM₃ Performance**

Reference Design Data

- **Frequency Feature of NF**
- **Relations of C1 with NF, Input and Output Return Loss**

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This document outlines general applications for this product. The application circuits and circuit constants provided in this document are simply examples and should not be used for mass production design. Be aware also that there is no intention to standardize the restrictions and characteristics of these application circuits.

The characteristics of high-frequency devices in particular vary depending on the external components and mounting pattern used.

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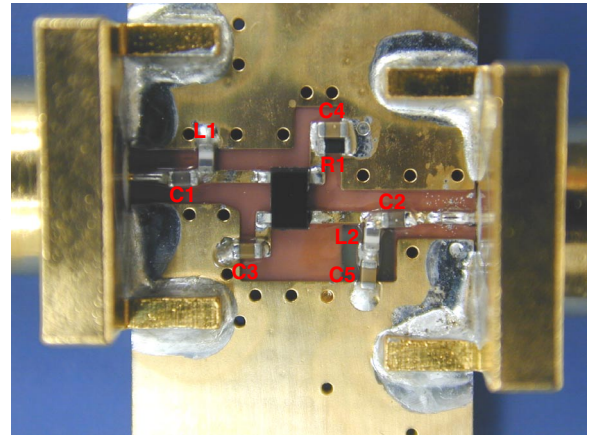
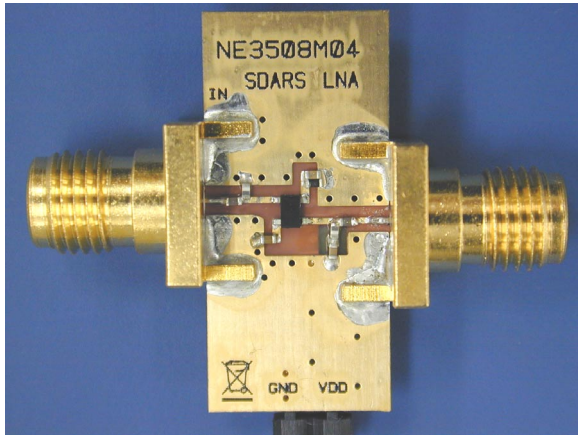
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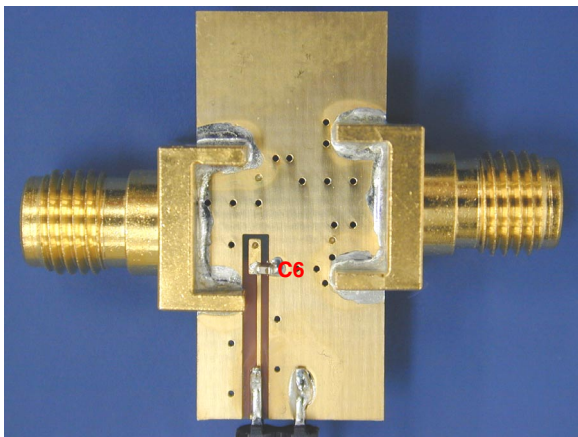
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Evaluation Board Pattern Layout

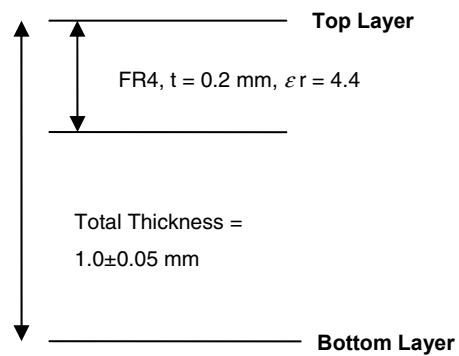
<Top View>



<Bottom View>



<PCB Cross Section>

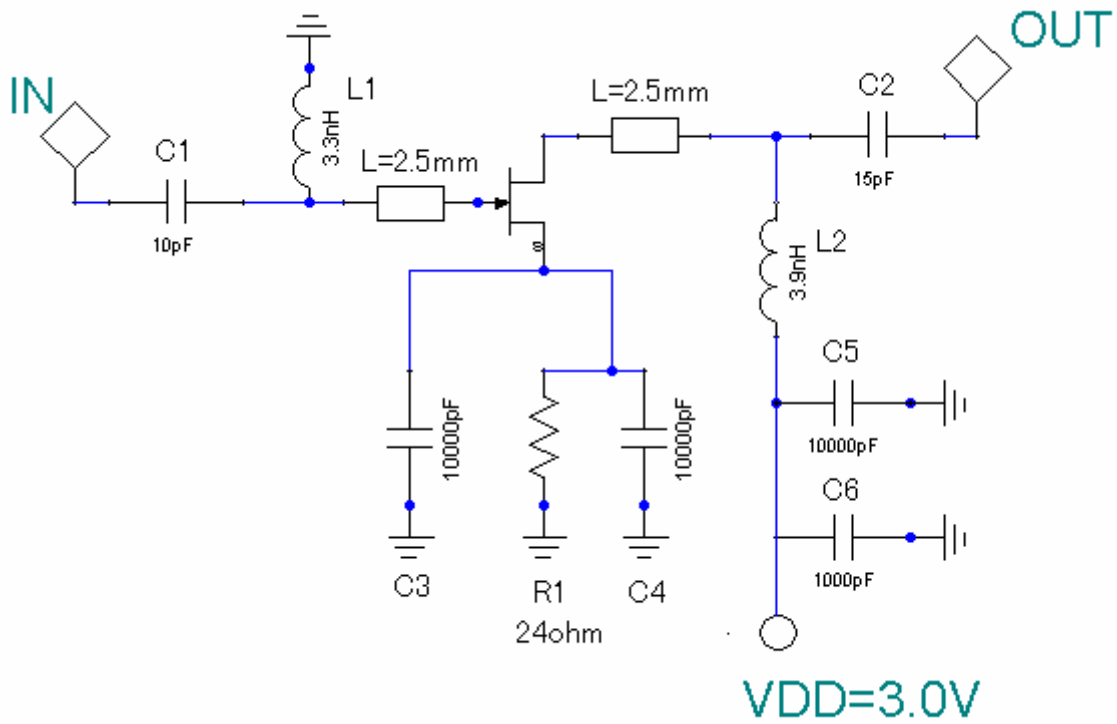


size 11.0 mm × 24.0 mm

material FR4 (ELC4756/Sumitomo)
 $t = 0.2 \text{ mm}$, $\epsilon_r = 4.4$

Circuit Description

($V_{DD} = 3.0\text{ V}$, $I_D = 11.7\text{ mA}$, $f = 2.4\text{ GHz}$ (NF optimized))



COMPONENTS OF TEST CIRCUIT

Parts	Part Number	Maker	Symbol	Value	Unit
Chip Capacitor	GRM1552C1H100JZ01	Murata	C1	10	pF
Chip Capacitor	GRM1552C1H150JZ01	Murata	C2	15	pF
Chip Capacitor	GRP155B11E103KA01	Murata	C3, C4, C5	10 000	pF
Chip Capacitor	GRM155B11H102KA01	Murata	C6	1 000	pF
Chip Inductor	AML1005H3N3ST	FDK	L1	3.3	nH
Chip Inductor	AML1005H3N9ST	FDK	L2	3.9	nH
Chip Resistor	MCR01MZPJ240	ROHM	R1	24	Ω
Transistor	NE3508M04	NEC	TR		
DC Connector	A2-2PA-2.54DSA (71)	Hirose			
RF Connector	01K2266-00	WAKA			
Substrate	FR4 (t = 0.2 mm)	Sumitomo			

Evaluation Board Test Results

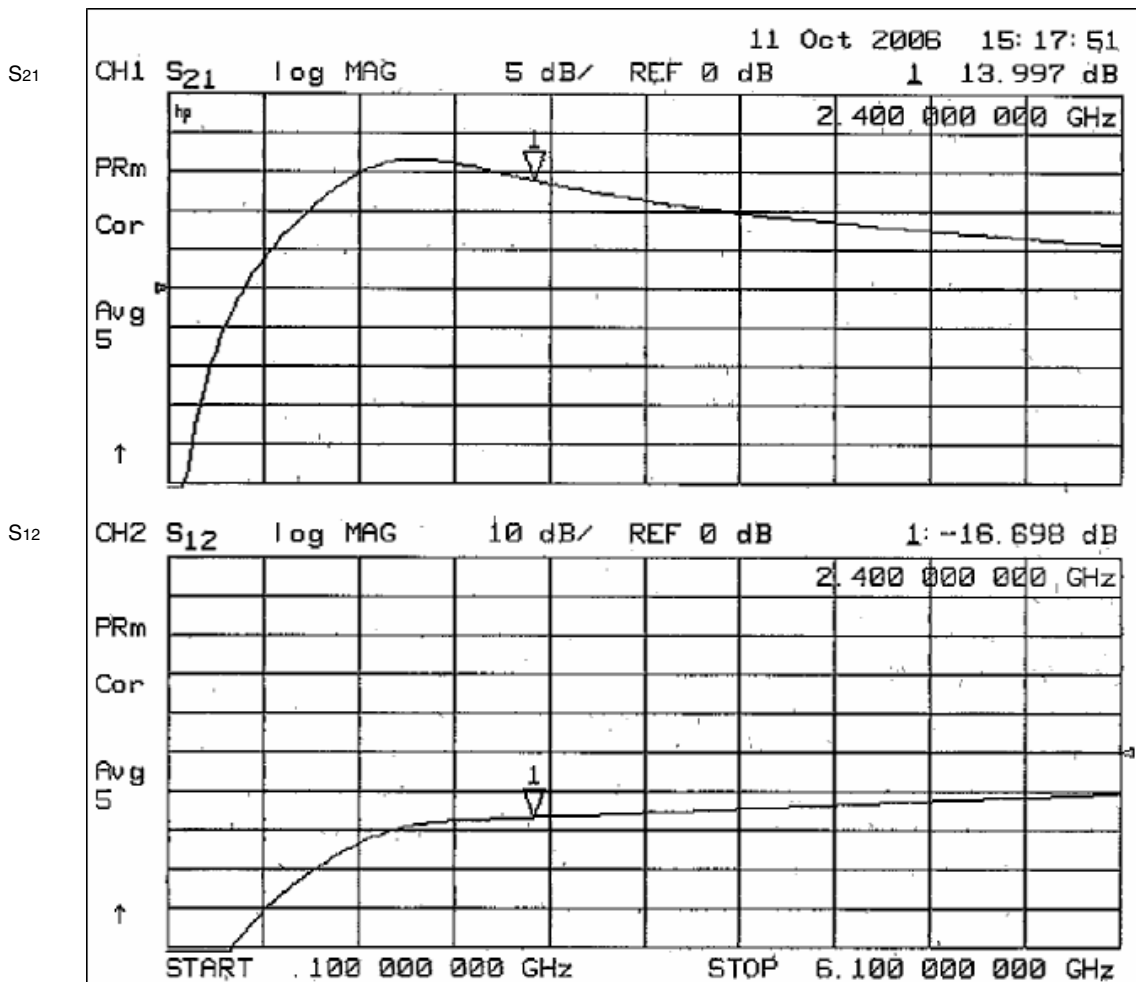
(V_{DD} = 3.0 V, I_D = 11.7 mA, f = 2.4 GHz)

Item	Symbol	Data	Unit
Noise Figure	NF ^{Note}	0.61	dB
Associated Gain	G _a	14.1	dB
Input Return Loss	RL _{in}	10.4	dB
Output Return Loss	RL _{out}	18.9	dB
Output Power at 1 dB Compression Point	P _O (1 dB)	10.4	dBm

Note A substrate loss 0.1 dB is including in value of NF.

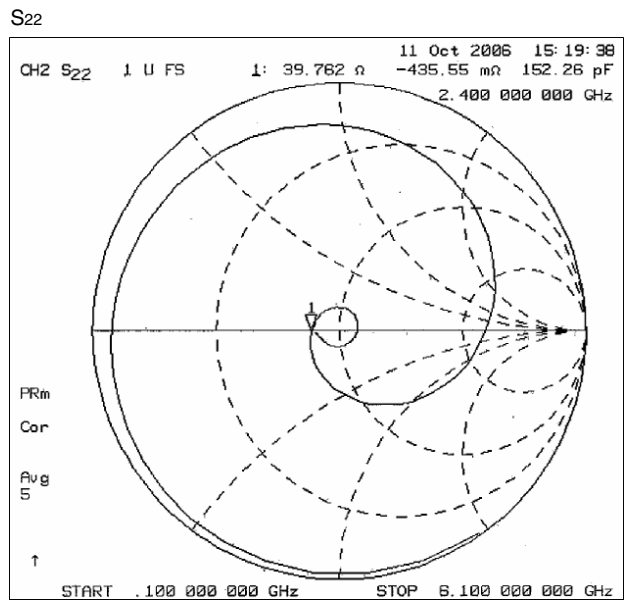
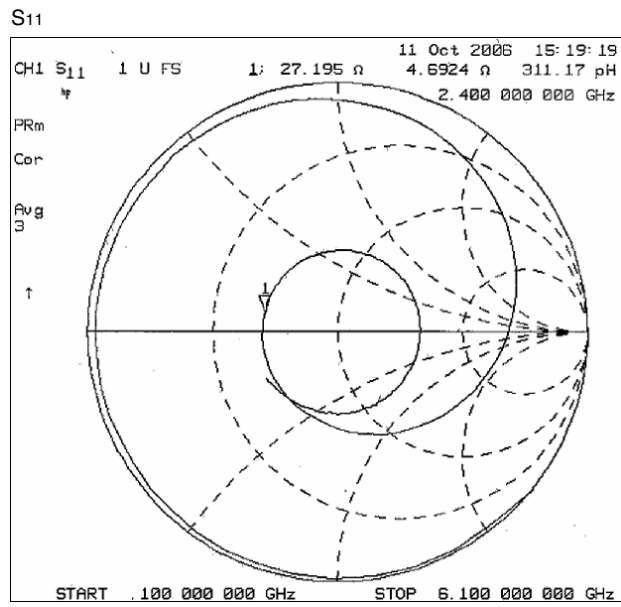
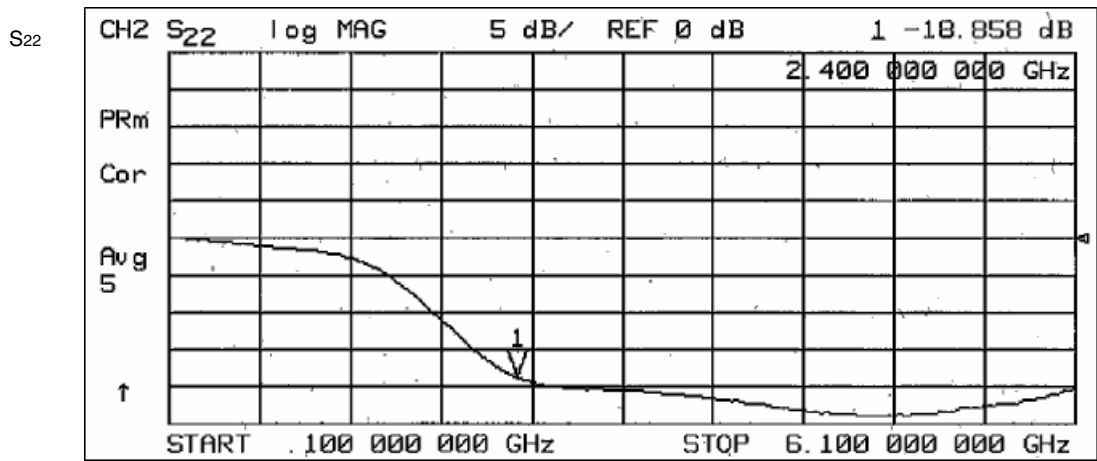
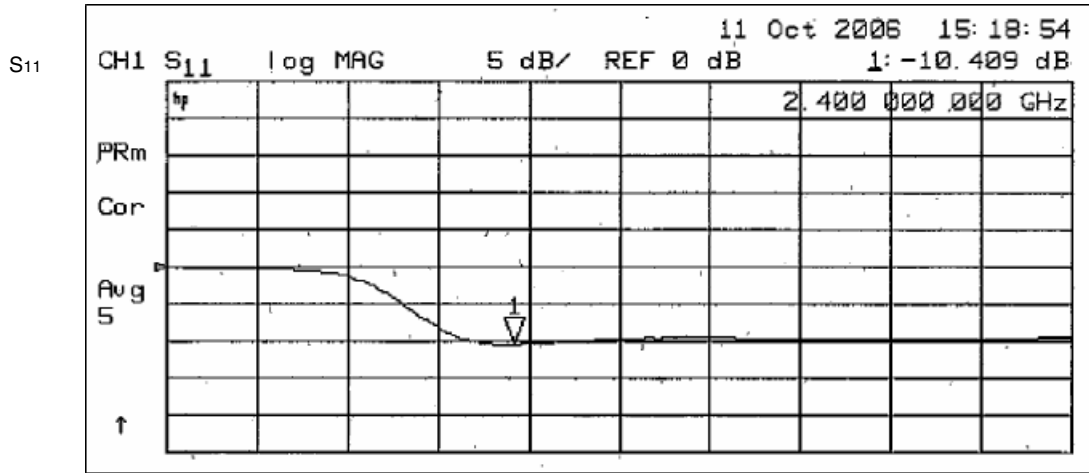
Gain and Isolation

(V_{DD} = 3.0 V, I_D = 11.7 mA, f = 2.4 GHz)



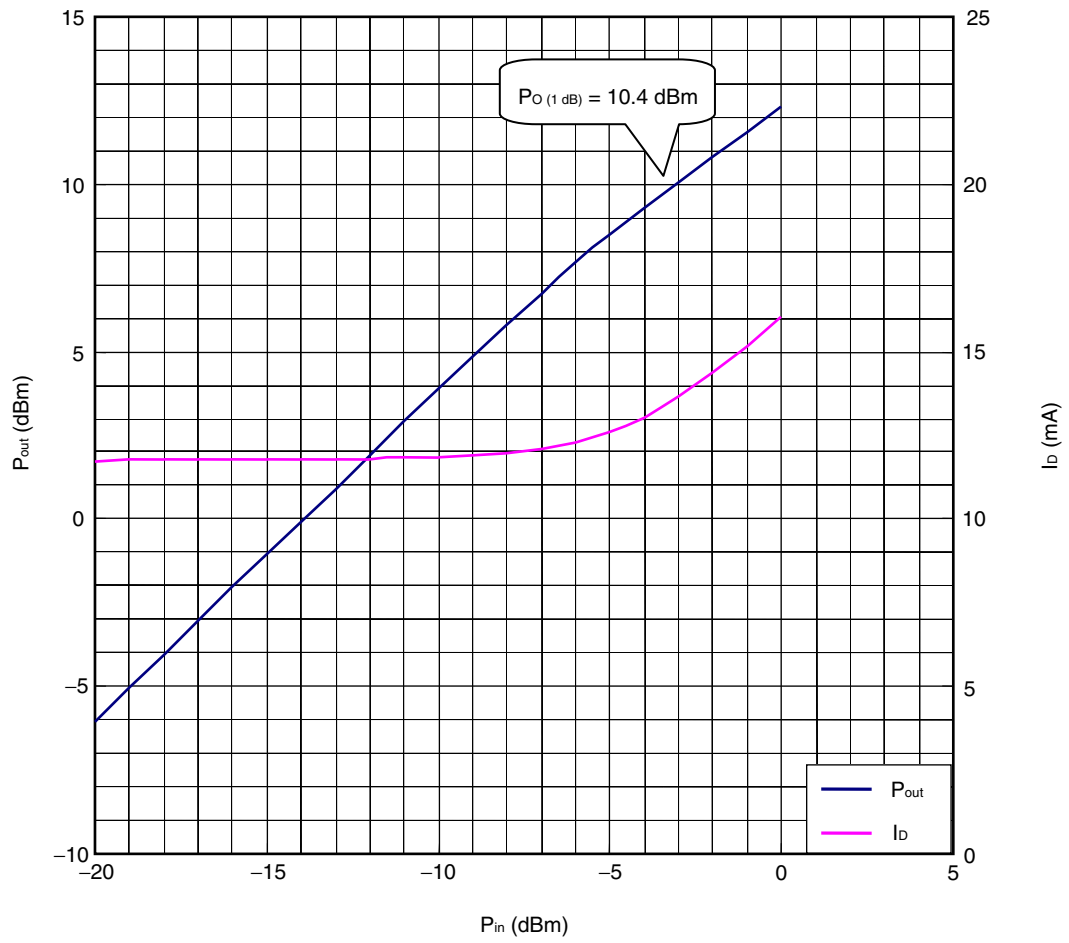
Input and Output Return Loss

(V_{DD} = 3.0 V, I_D = 11.7 mA, f = 2.4 GHz)



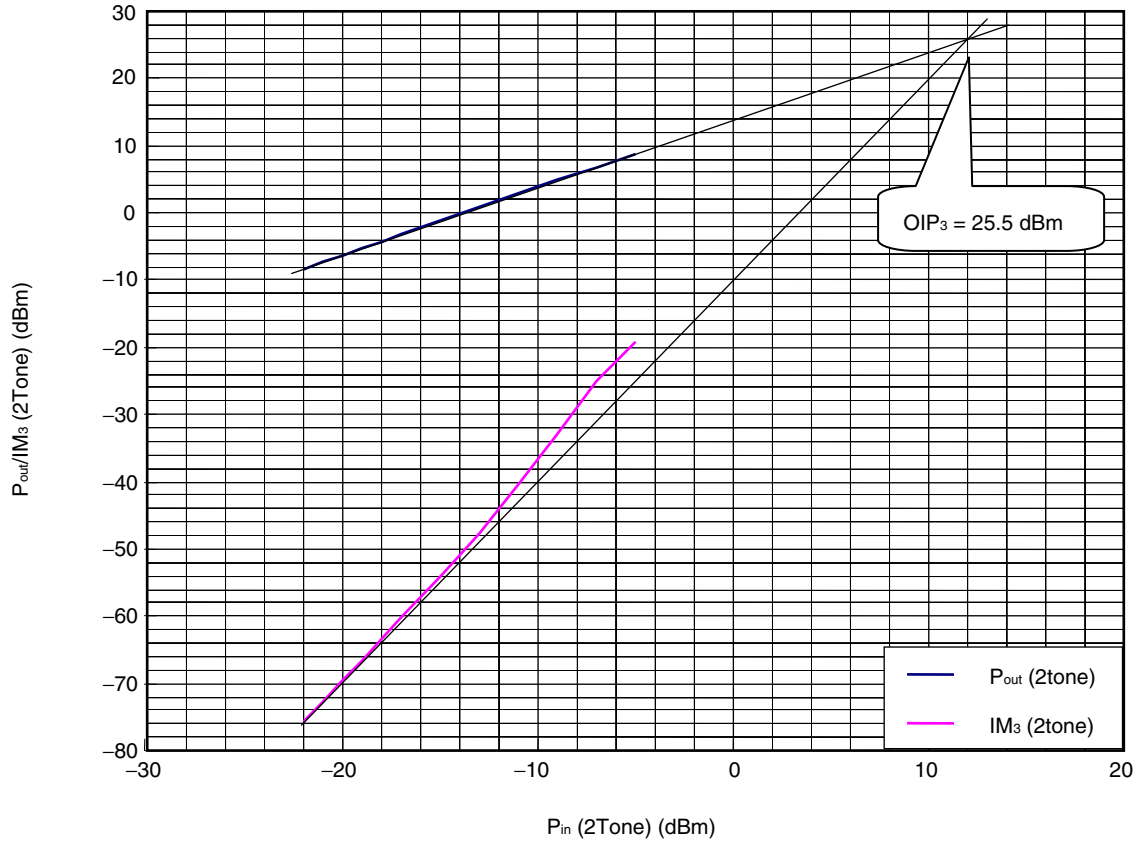
1 dB Gain Compression Output Power

($V_{DD} = 3.0\text{ V}$, $I_D = 11.7\text{ mA}$, $f = 2.4\text{ GHz}$)



Pin-Pout & IM3 Performance

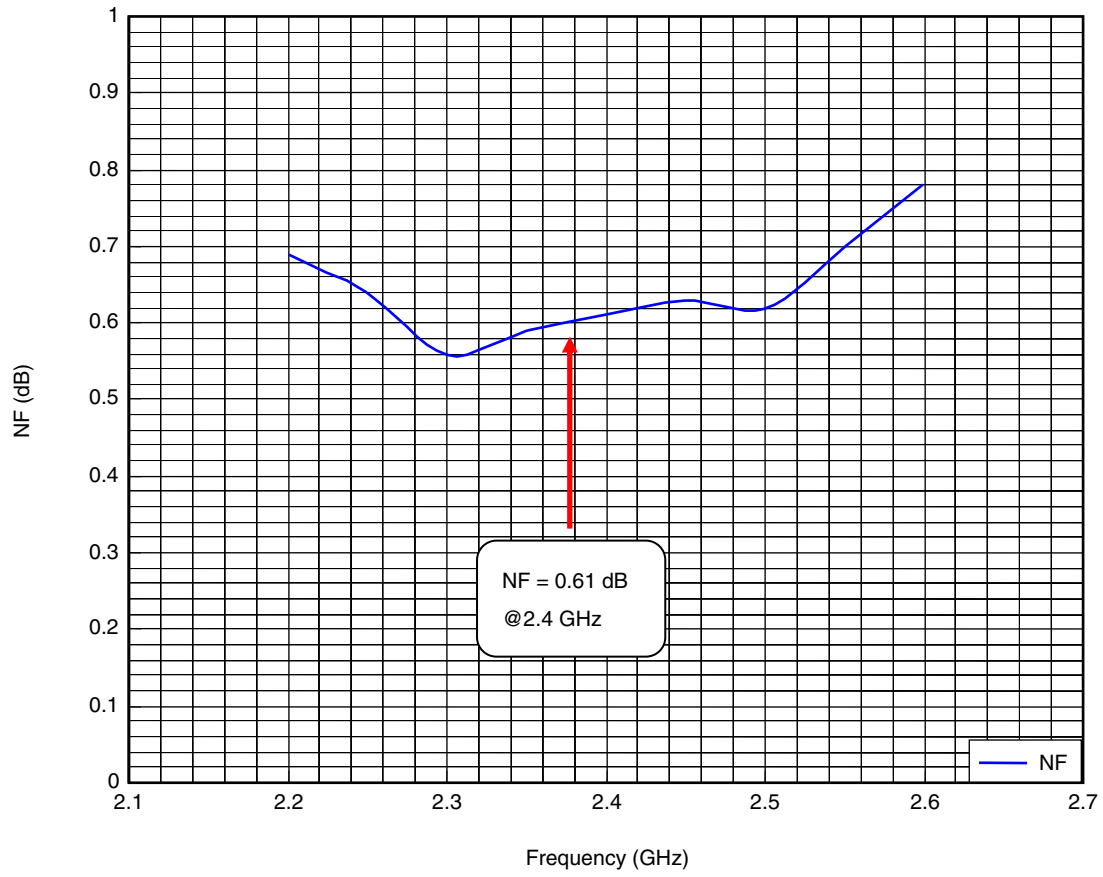
(VDD = 3.0 V, ID = 11.7 mA, f = 2.4 GHz, 1 MHz offset)



Reference Design Data

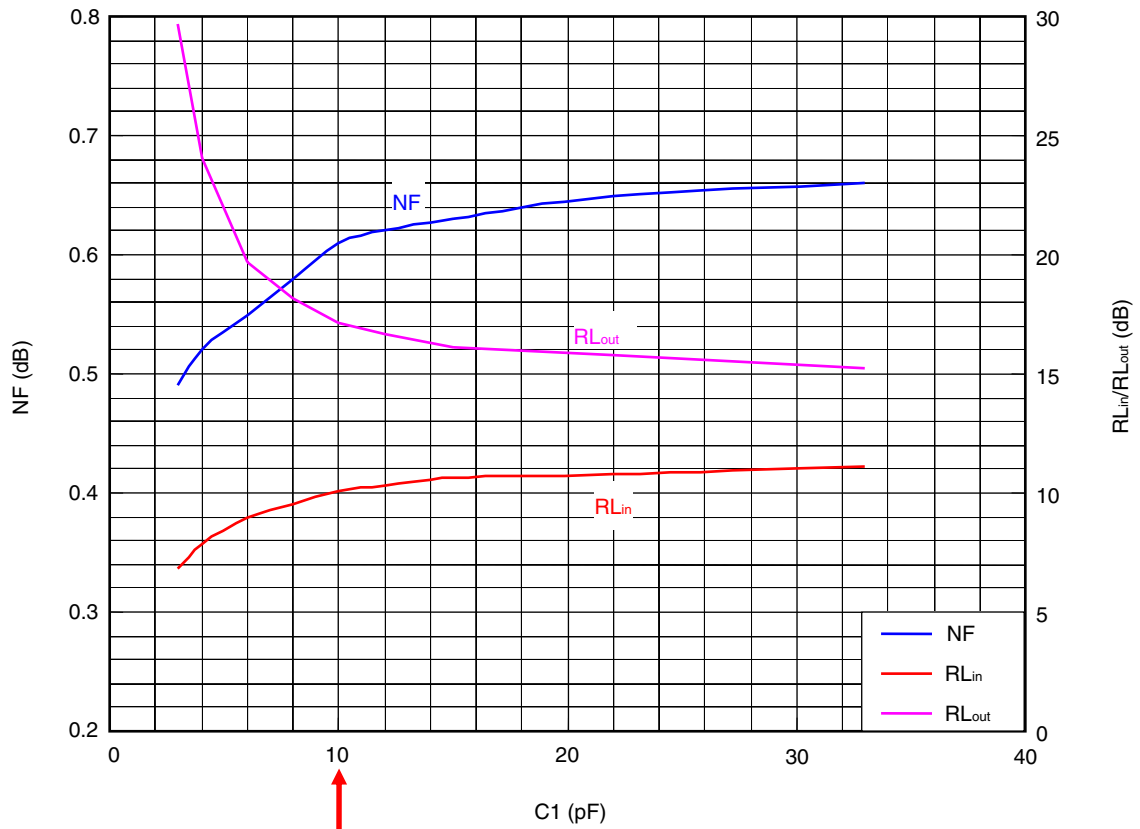
Frequency Feature of NF

($V_{DD} = 3.0\text{ V}$, $I_D = 11.7\text{ mA}$)



Relations of C1 with NF, Input and Output Return Loss

($V_{DD} = 3.0\text{ V}$, $I_D = 11.7\text{ mA}$, $f = 2.4\text{ GHz}$)



Value of this evaluation board

*For further information,
please contact:*

NEC Electronics Corporation

1753, Shimonumabe, Nakahara-ku,
Kawasaki, Kanagawa 211-8668,
Japan
Tel: 044-435-5111
<http://www.necel.com/>

[America]

NEC Electronics America, Inc.

2880 Scott Blvd.
Santa Clara, CA 95050-2554, U.S.A.
Tel: 408-588-6000
800-366-9782
<http://www.am.necel.com/>

[Europe]

NEC Electronics (Europe) GmbH

Arcadiastrasse 10
40472 Düsseldorf, Germany
Tel: 0211-65030
<http://www.eu.necel.com/>

Hanover Office

Podbielskistrasse 166 B
30177 Hannover
Tel: 0 511 33 40 2-0

Munich Office

Werner-Eckert-Strasse 9
81829 München
Tel: 0 89 92 10 03-0

Stuttgart Office

Industriestrasse 3
70565 Stuttgart
Tel: 0 711 99 01 0-0

United Kingdom Branch

Cygnus House, Sunrise Parkway
Linford Wood, Milton Keynes
MK14 6NP, U.K.
Tel: 01908-691-133

Succursale Française

9, rue Paul Dautier, B.P. 52
78142 Velizy-Villacoublay Cédex
France
Tel: 01-3067-5800

Sucursal en España

Juan Esplandiú, 15
28007 Madrid, Spain
Tel: 091-504-2787

Tyskland Filial

Täby Centrum
Entrance S (7th floor)
18322 Täby, Sweden
Tel: 08 638 72 00

Filiale Italiana

Via Fabio Filzi, 25/A
20124 Milano, Italy
Tel: 02-667541

Branch The Netherlands

Steijgerweg 6
5616 HS Eindhoven
The Netherlands
Tel: 040 265 40 10

[Asia & Oceania]

NEC Electronics (China) Co., Ltd

7th Floor, Quantum Plaza, No. 27 ZhiChunLu Haidian
District, Beijing 100083, P.R.China
Tel: 010-8235-1155
<http://www.cn.necel.com/>

NEC Electronics Shanghai Ltd.

Room 2511-2512, Bank of China Tower,
200 Yincheng Road Central,
Pudong New Area, Shanghai P.R. China P.C:200120
Tel: 021-5888-5400
<http://www.cn.necel.com/>

NEC Electronics Hong Kong Ltd.

12/F., Cityplaza 4,
12 Taikoo Wan Road, Hong Kong
Tel: 2886-9318
<http://www.hk.necel.com/>

NEC Electronics Taiwan Ltd.

7F, No. 363 Fu Shing North Road
Taipei, Taiwan, R. O. C.
Tel: 02-8175-9600
<http://www.tw.necel.com/>

NEC Electronics Singapore Pte. Ltd.

238A Thomson Road,
#12-08 Novena Square,
Singapore 307684
Tel: 6253-8311
<http://www.sg.necel.com/>

NEC Electronics Korea Ltd.

11F., Samik Lavied'or Bldg., 720-2,
Yeoksam-Dong, Kangnam-Ku,
Seoul, 135-080, Korea
Tel: 02-558-3737
<http://www.kr.necel.com/>