

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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

April 1st, 2010
Renesas Electronics Corporation

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

Send any inquiries to <http://www.renesas.com/inquiry>.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
 - “Standard”: Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.
 - “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.
 - “Specific”: Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

SILICON MMIC 1st FREQUENCY DOWN-CONVERTER FOR CELLULAR/CORDLESS TELEPHONE

DESCRIPTION

The μPC8112TB is a silicon monolithic integrated circuit designed as 1st frequency down-converter for cellular/cordless telephone receiver stage. This IC consists of mixer and local amplifier. The μPC8112TB features high impedance output of open collector. Similar ICs of the μPC2757TB and μPC2758TB feature low impedance output of emitter follower. These TB suffix ICs which are smaller package than conventional T suffix ICs contribute to reduce your system size.

The μPC8112TB is manufactured using NEC's 20 GHz f_T NESAT™III silicon bipolar process. This process uses silicon nitride passivation film and gold electrodes. These materials can protect chip surface from external pollution and prevent corrosion/migration. Thus, this IC has excellent performance, uniformity and reliability.

FEATURES

- Excellent RF performance : IIP₃ = -7 dBm@f_{RFIn} = 1.9 GHz (reference)
IM₃ = -88 dBm@P_{RFIn} = -38 dBm, 1.9 GHz (reference)
- Similar conversion gain to μPC2757 and lower noise figure than μPC2758
- Minimized carrier leakage : RF_{LO} = -80 dB@f_{RFIn} = 900 MHz (reference)
RF_{LO} = -55 dB@f_{RFIn} = 1.9 GHz (reference)
- High linearity : P_{O(sat)} = -2.5 dBm TYP. @f_{RFIn} = 900 MHz
P_{O(sat)} = -3 dBm TYP. @f_{RFIn} = 1.9 GHz
- Low current consumption : I_{CC} = 8.5 mA TYP.
- Supply voltage : V_{CC} = 2.7 to 3.3 V
- High-density surface mounting : 6-pin super minimold package

APPLICATIONS

- 1.5 to 1.9 GHz cellular/cordless telephone (PHS, DECT, PDC1.5G and so on)
- 800 to 900 MHz cellular telephone (PDC800M and so on)

ORDER INFORMATION

Part Number	Package	Markings	Supplying Form
μPC8112TB-E3	6-pin super minimold	C2K	Embossed tape 8 mm wide. Pin 1, 2, 3 face the tape perforation side. Qty 3kpcs/reel.

Remark To order evaluation samples, please contact your local NEC sales office (Part number for sample order: μPC8112TB).

Caution Electro-static sensitive devices

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

CONTENTS

1. PIN CONNECTIONS..... 3

2. PRODUCT LINE-UP..... 3

3. INTERNAL BLOCK DIAGRAM..... 4

4. SYSTEM APPLICATION EXAMPLE..... 4

5. PIN EXPLANATION 5

6. ABSOLUTE MAXIMUM RATINGS..... 6

7. RECOMMENDED OPERATING RANGE 6

8. ELECTRICAL CHARACTERISTICS 6

9. STANDARD CHARACTERISTICS FOR REFERENCE 7

10. TEST CIRCUIT 7

11. ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD..... 8

12. TYPICAL CHARACTERISTICS..... 9

 12.1 Without Signals..... 9

 12.2 IF 100 MHz Matching ($f_{RFIn} = 900$ MHz)..... 10

 12.3 IF 100 MHz Matching ($f_{RFIn} = 1.5$ GHz) 12

 12.4 IF 240 MHz Matching 14

13. S-PARAMETERS 16

 13.1 Calibrated on pin of DUT..... 16

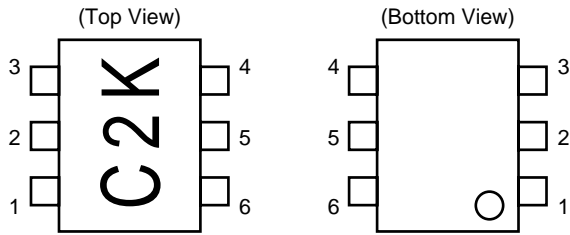
 13.2 IF Output Matching..... 17

14. PACKAGE DIMENSIONS..... 18

15. NOTE ON CORRECT USE..... 19

16. RECOMMENDED SOLDERING CONDITIONS..... 19

1. PIN CONNECTIONS



Pin No.	Pin Name
1	RFinput
2	GND
3	LOinput
4	PS
5	Vcc
6	IFoutput

2. PRODUCT LINE-UP (TA = +25°C, VCC = VPS = 3.0 V, Zs = ZL = 50 Ω)

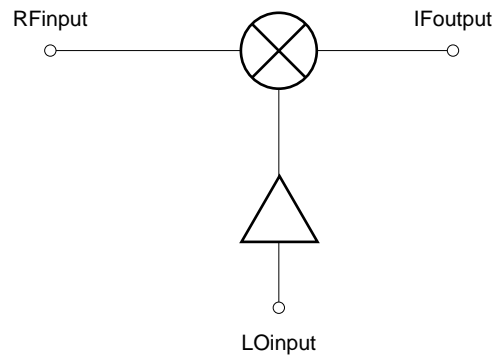
Part Number	Items	No RF Icc (mA)	900 MHz SSB · NF (dB)	1.5 GHz SSB · NF (dB)	1.9 GHz SSB · NF (dB)	900 MHz CG (dB)	1.5 GHz CG (dB)	1.9 GHz CG (dB)	900 MHz IIP ₃ (dBm)	1.5 GHz IIP ₃ (dBm)	1.9 GHz IIP ₃ (dBm)
μPC2757T		5.6	10	10	13	15	15	13	-14	-14	-12
μPC2757TB											
μPC2758T		11	9	10	13	19	18	17	-13	-12	-11
μPC2758TB											
μPC8112T		8.5	9	11	11	15	13	13	-10	-9	-7
μPC8112TB											

Part Number	Items	900 MHz P _{O(sat)} (dBm)	1.5 GHz P _{O(sat)} (dBm)	1.9 GHz P _{O(sat)} (dBm)	900 MHz RF _{Lo} (dB)	1.5 GHz RF _{Lo} (dB)	1.9 GHz RF _{Lo} (dB)	IF Output Configuration	Package
μPC2757T		-3	-	-8	-	-	-	Emitter follower	6-pin minimold
μPC2757TB									6-pin super minimold
μPC2758T	+1	-	-4	-	-	-	6-pin minimold		
μPC2758TB							6-pin super minimold		
μPC8112T		-2.5	-3	-3	-80	-57	-55	Open collector	6-pin minimold
μPC8112TB									6-pin super minimold

Remark Typical performance. Please refer to ELECTRICAL CHARACTERISTICS in detail.

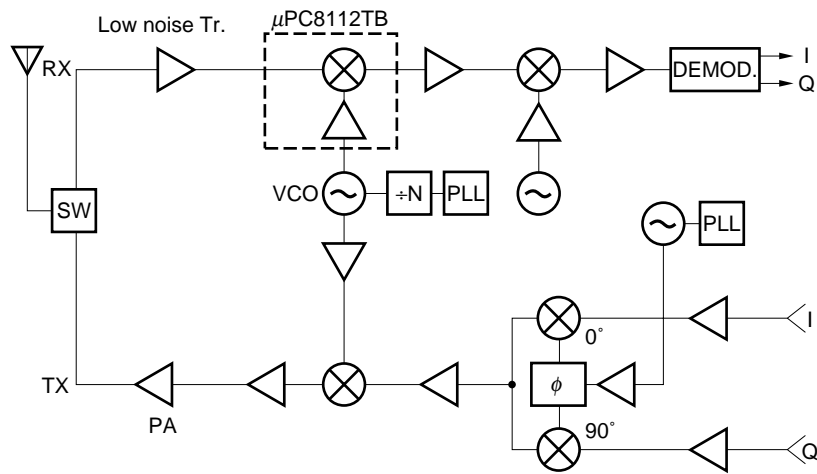
- Cautions**
- The μPC2757 and μPC2758's IIP₃ are calculated with ΔIM₃ = 3 which is the same IM₃ inclination as μPC8112. On the other hand, OIP₃ of Standard characteristics in page 7 is cross point IP.
 - This document is to be specified for μPC8112TB. The other part number mentioned in this document should be referred to the data sheet of each part number.

3. INTERNAL BLOCK DIAGRAM



4. SYSTEM APPLICATION EXAMPLE

Digital cordless phone



5. PIN EXPLANATION

Pin No.	Pin Name	Applied Voltage (V)	Pin Voltage (V)	Function and Application	Internal Equivalent Circuit									
1	RFinput	–	1.2	RF input pin of mixer. This mixer is designed as double balanced type. This pin should be externally coupled to front stage with DC cut capacitor.										
2	GND	GND	–	Ground pin. This pin must be connected to the system ground. Form the ground pattern as wide as possible and the track length as short as possible to minimize ground impedance.										
5	Vcc	2.7 to 3.3	–	Supply voltage pin. This pin should be connected with bypass capacitor (example: 1 000 pf) to minimize ground impedance.										
6	IFoutput	as same as Vcc voltage through external inductor	–	IF output pin. This output is configured with open collector of high impedance. This pin should be externally equipped with matching circuit of inductor should be selected as small resistance and high frequency use.										
3	LOinput	–	1.4	Input pin of local amplifier. This amplifier is designed as differential type. This pin should be externally coupled to local signal source with DC cut capacitor. Recommendable input level is –15 to 0 dBm.										
4	PS	Vcc or GND	–	Power save control pin. This pin can control ON/OFF operation with bias as follows; <table border="1" style="margin: 10px auto;"> <thead> <tr> <th></th> <th>Bias: V</th> <th>Operation</th> </tr> </thead> <tbody> <tr> <td>V_{PS}</td> <td>≥ 2.5</td> <td>ON</td> </tr> <tr> <td></td> <td>0 to 0.5</td> <td>OFF</td> </tr> </tbody> </table>		Bias: V	Operation	V _{PS}	≥ 2.5	ON		0 to 0.5	OFF	
	Bias: V	Operation												
V _{PS}	≥ 2.5	ON												
	0 to 0.5	OFF												

6. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions	Ratings	Unit
Supply Voltage	V _{CC}	T _A = +25°C, 5 pin and 6 pin	3.6	V
Total Circuit Current	I _{CC}	T _A = +25°C	77.7	mA
★ Total Power Dissipation	P _D	Mounted on double sided copper clad 50 × 50 × 1.6 mm epoxy glass PWB (T _A = +85°C)	270	mW
Operating Ambient Temperature	T _A		-40 to +85	°C
Storage Temperature	T _{stg}		-55 to +150	°C

7. RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
Supply Voltage	V _{CC}	2.7	3.0	3.3	V	5 pin and 6 pin should be applied to same voltage.
Operating Ambient Temperature	T _A	-40	+25	+85	°C	
LO Input Power	P _{LOin}	-15	-10	0	dBm	Z _s = 50 Ω
RF Input Frequency	f _{RFIn}	0.8	1.9	2.0	GHz	
IF Output Frequency	f _{IFout}	100	250	300	MHz	With external matching

8. ELECTRICAL CHARACTERISTICS (Unless otherwise specified, T_A = +25°C, V_{CC} = V_{PS} = V_{IFout} = 3.0 V, P_{LOin} = -10 dBm, Z_s = Z_L = 50 Ω)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I _{CC}	No input signal	4.9	8.5	11.7	mA
Circuit Current at Power Save Mode	I _{CC(PS)}	V _{CC} = 3.0 V, V _{PS} = 0.5 V	-	-	0.1	μA
Conversion Gain	CG	f _{RFIn} = 900 MHz, f _{LOin} = 1 000 MHz f _{RFIn} = 1.9 GHz, f _{LOin} = 1.66 GHz	11.5 9.5	15 13	17.5 15.5	dB
SSB Noise Figure	SSB·NF	f _{RFIn} = 900 MHz, f _{LOin} = 1 000 MHz f _{RFIn} = 1.9 GHz, f _{LOin} = 1.66 GHz	- -	9.0 11.2	11 13.2	dB
Saturated Output Power	P _{O(sat)}	f _{RFIn} = 900 MHz, f _{LOin} = 1 000 MHz f _{RFIn} = 1.9 GHz, f _{LOin} = 1.66 GHz (P _{RFIn} = -10 dBm each)	-6.5 -7	-2.5 -3	- -	dBm

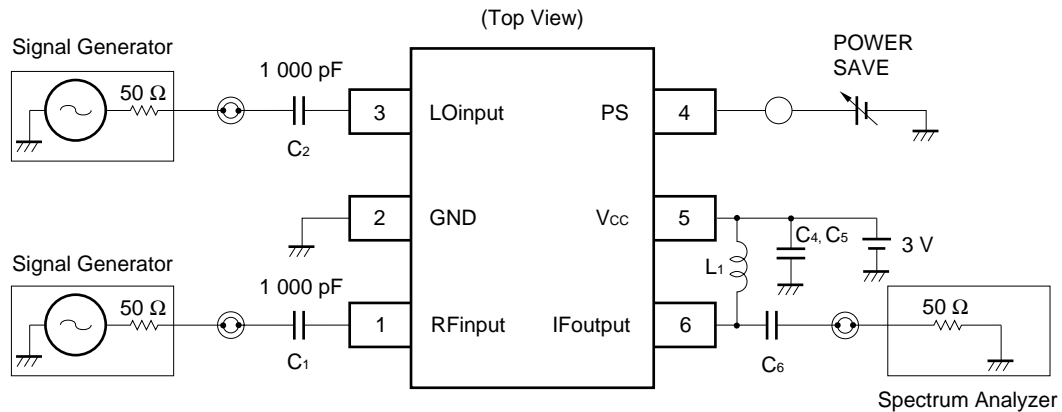
9. STANDARD CHARACTERISTICS FOR REFERENCE

($T_A = +25^{\circ}\text{C}$, $V_{CC} = V_{PS} = V_{IFout} = 3.0\text{ V}$, $P_{LOin} = -10\text{ dBm}$, $Z_s = Z_L = 50\ \Omega$)

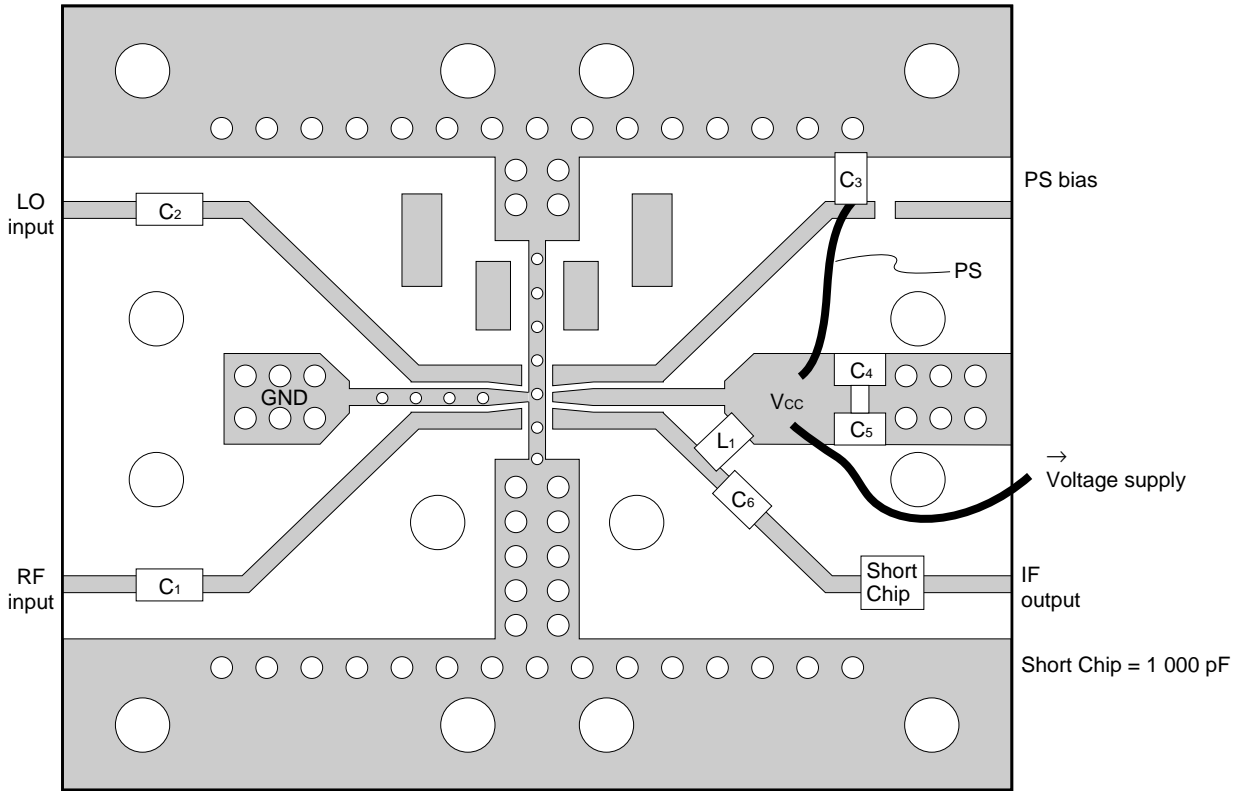
Parameter	Symbol	Test Conditions	Reference	Unit
Conversion Gain	CG	$f_{RFin} = 1.5\text{ GHz}$, $f_{LOin} = 1.6\text{ GHz}$	13	dB
SSB Noise Figure	SSB·NF	$f_{RFin} = 1.5\text{ GHz}$, $f_{LOin} = 1.6\text{ GHz}$	11	dB
LO Leakage at RF pin	LO _{RF}	$f_{RFin} = 900\text{ MHz}$, $f_{LOin} = 1\ 000\text{ MHz}$ $f_{RFin} = 1.5\text{ GHz}$, $f_{LOin} = 1.6\text{ GHz}$ $f_{RFin} = 1.9\text{ GHz}$, $f_{LOin} = 1.66\text{ GHz}$	-45 -46 -45	dB
RF Leakage at LO pin	RF _{LO}	$f_{RFin} = 900\text{ MHz}$, $f_{LOin} = 1\ 000\text{ MHz}$ $f_{RFin} = 1.5\text{ GHz}$, $f_{LOin} = 1.6\text{ GHz}$ $f_{RFin} = 1.9\text{ GHz}$, $f_{LOin} = 1.66\text{ GHz}$	-80 -57 -55	dB
LO Leakage at IF pin	LO _{if}	$f_{RFin} = 900\text{ MHz}$, $f_{LOin} = 1\ 000\text{ MHz}$ $f_{RFin} = 1.5\text{ GHz}$, $f_{LOin} = 1.6\text{ GHz}$ $f_{RFin} = 1.9\text{ GHz}$, $f_{LOin} = 1.66\text{ GHz}$	-32 -33 -30	dB
3rd Order Distortion Input Intercept Point ^{Note}	IIP ₃	$f_{RFin} = 900\text{ MHz}$, $f_{LOin} = 1\ 000\text{ MHz}$ $f_{RFin} = 1.5\text{ GHz}$, $f_{LOin} = 1.6\text{ GHz}$ $f_{RFin} = 1.9\text{ GHz}$, $f_{LOin} = 1.66\text{ GHz}$	-10 -9 -7	dBm

Note IIP₃ is determined by comparing two method; theoretical calculation and cross point of IM₃ curve.
 $IIP_3 = (\Delta IM_3 \times P_{in} + CG - IM_3) \div (\Delta IM_3 - 1)$ (dBm) [ΔIM_3 : IM₃ curve inclination in linear range]
 μPC8112's ΔIM_3 is closer to 3 (theoretical inclination) than μPC2757 and μPC2758 of conventional ICs.

10. TEST CIRCUIT



★ 11. ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



Component Number	IF 100 MHz Matching	IF 240 MHz Matching	Remarks
C1 to C5	1 000 pF	1 000 pF	CHIP C
C6	5 pF	2 pF	CHIP C
L1	330 nH	84 nH	CHIP L

EVALUATION BOARD CHARACTERS AND NOTE

- (1) 35 μm thick double-sided copper clad 35 × 42 × 0.4 mm polyimide board
- (2) Back side: GND pattern
- (3) Solder plated patterns
- (4) ○O: Through holes
- (5) To mount C6, pattern should be cut.

Caution Test circuit or print pattern in this sheet is for testing IC characteristics. They are not an application circuit or recommended system circuit.

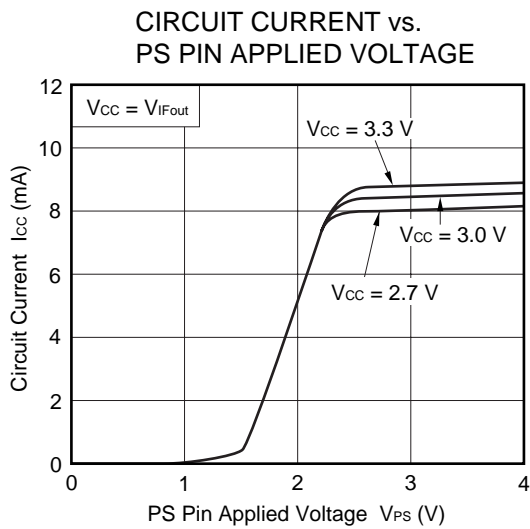
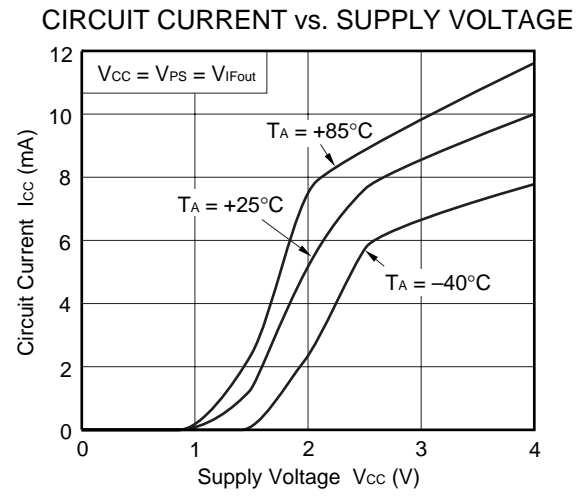
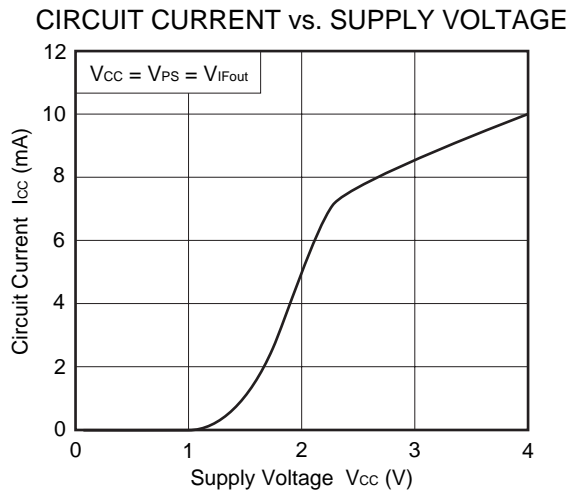
In the case of actual system application, external circuits including print pattern and matching circuit constant of output port should be designed in accordance with IC's S-parameters and environmental components.

Remark External circuits of the IC can be referred to following application notes.

- USAGE AND APPLICATION CHARACTERISTICS OF μPC2757, μPC2758, AND μPC8112, 3-V POWER SUPPLY, 1.9-GHz FREQUENCY DOWN-CONVERTER ICS FOR MOBILE COMMUNICATION (Document No. P11997E)

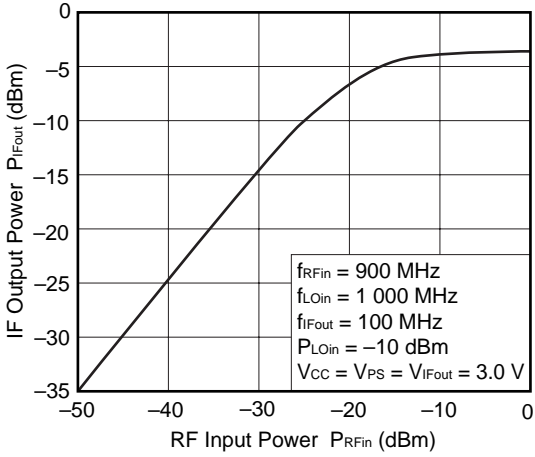
12. TYPICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise specified, measured on test circuits)

12.1 Without Signals

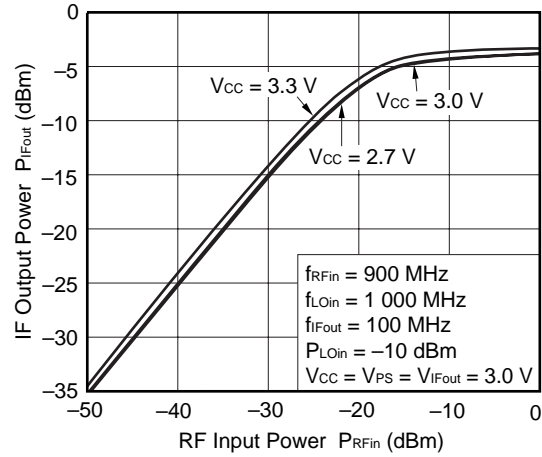


12.2 IF 100 MHz Matching ($f_{RFin} = 900$ MHz)

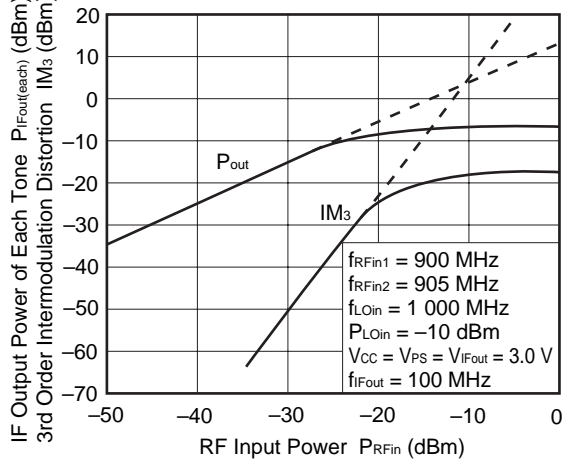
IF OUTPUT POWER vs. RF INPUT POWER



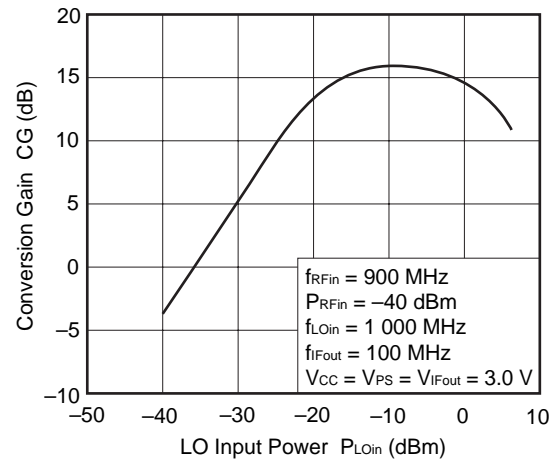
IF OUTPUT POWER vs. RF INPUT POWER



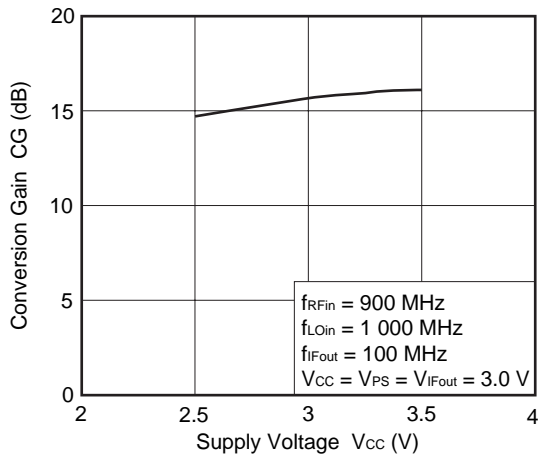
IF OUTPUT POWER OF EACH TONE, IM_3 vs. RF INPUT POWER



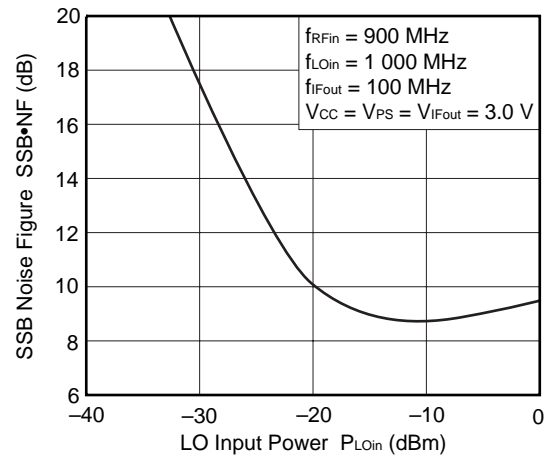
CONVERSION GAIN vs. LO INPUT POWER



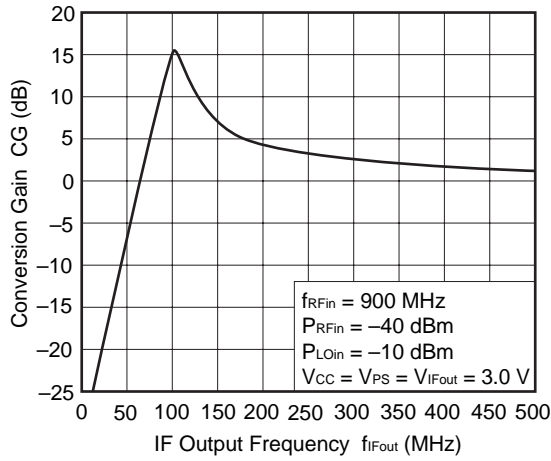
CONVERSION GAIN vs. SUPPLY VOLTAGE



SSB NOISE FIGURE vs. LO INPUT POWER

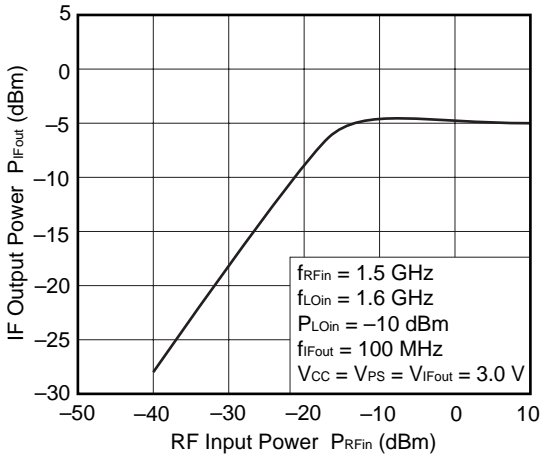


CONVERSION GAIN vs. IF OUTPUT FREQUENCY

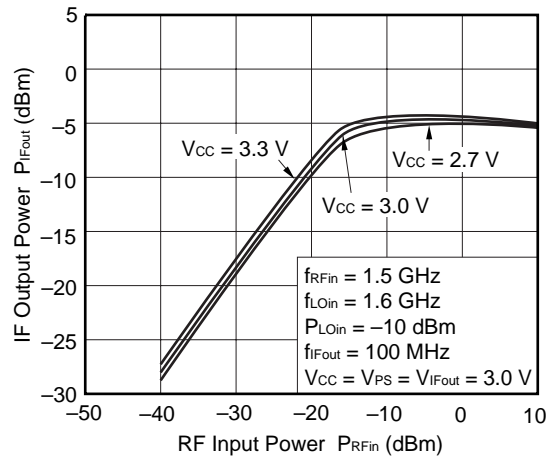


12.3 IF 100 MHz Matching ($f_{RFin} = 1.5$ GHz)

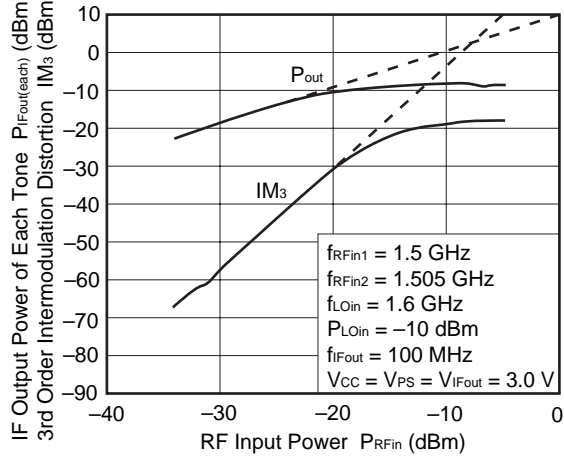
IF OUTPUT POWER vs. RF INPUT POWER



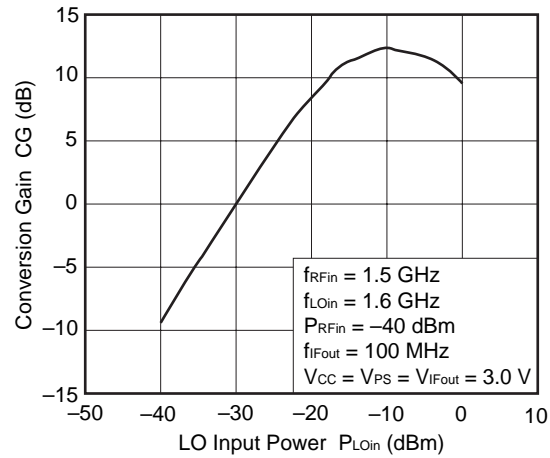
IF OUTPUT POWER vs. RF INPUT POWER



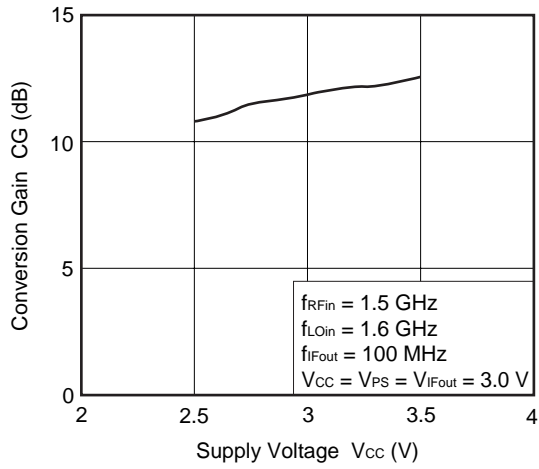
IF OUTPUT POWER OF EACH TONE, IM_3 vs. RF OUTPUT POWER



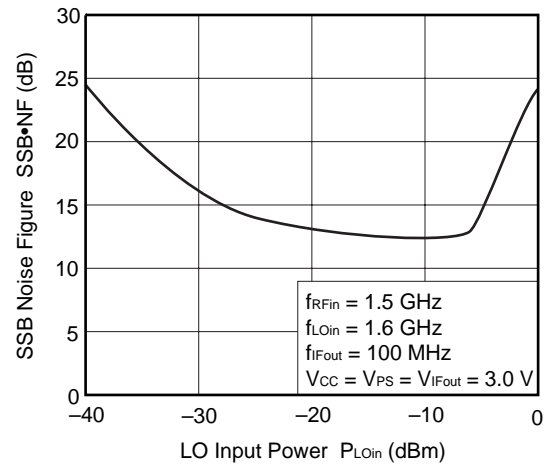
CONVERSION GAIN vs. LO INPUT POWER



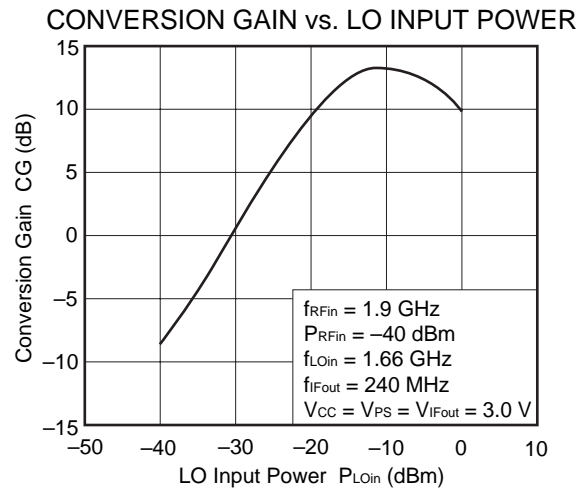
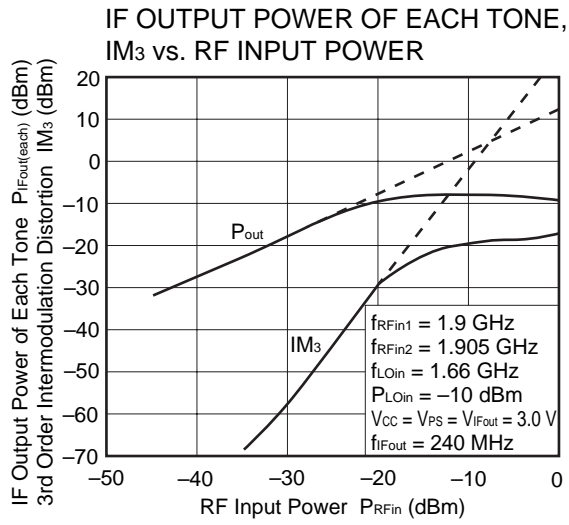
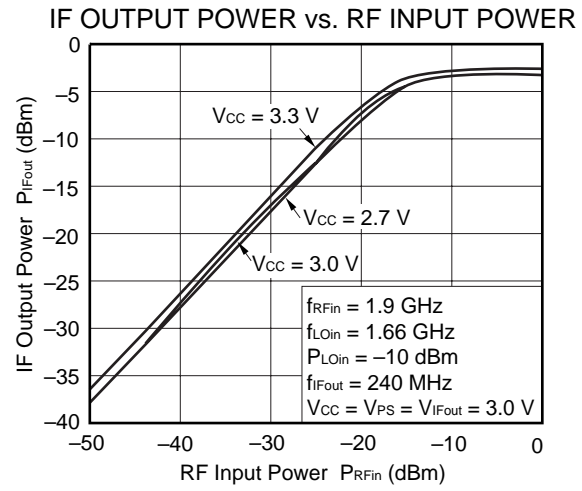
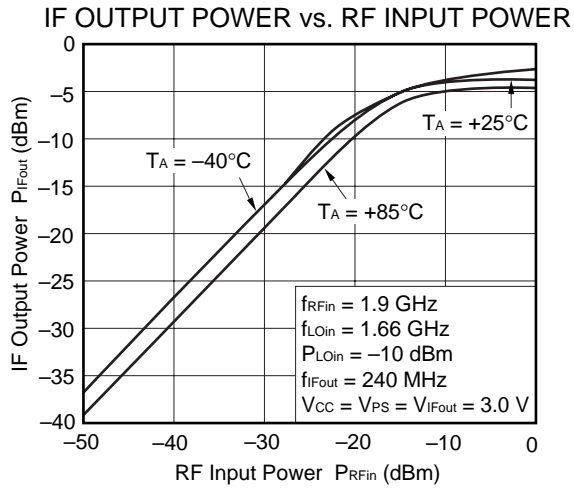
CONVERSION GAIN vs. SUPPLY VOLTAGE

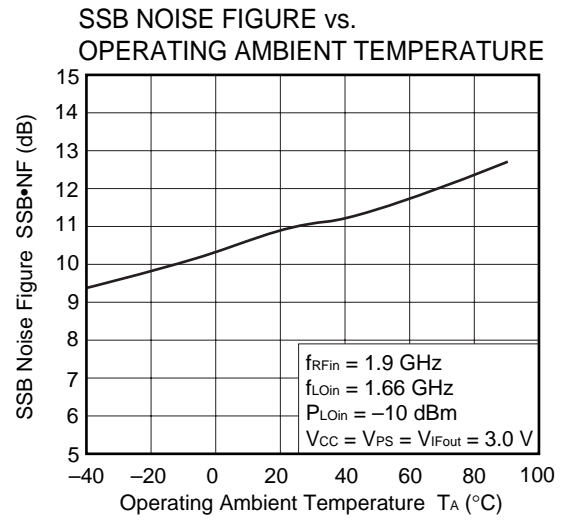
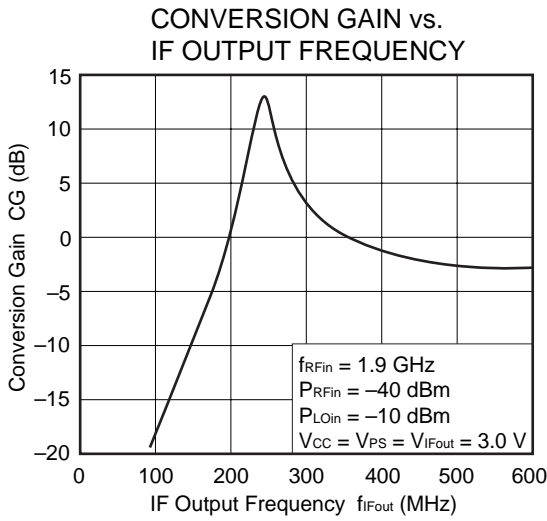
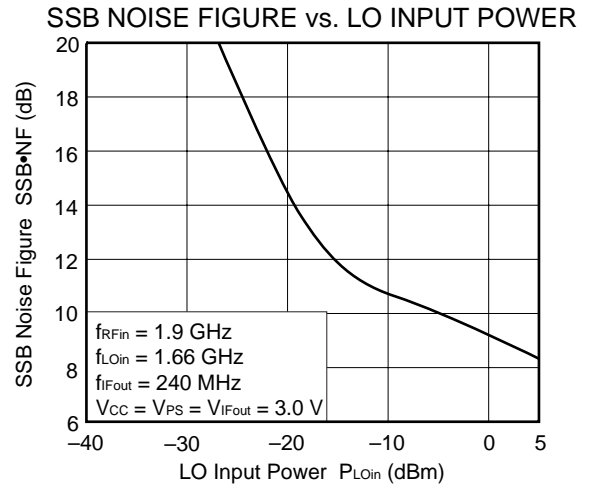
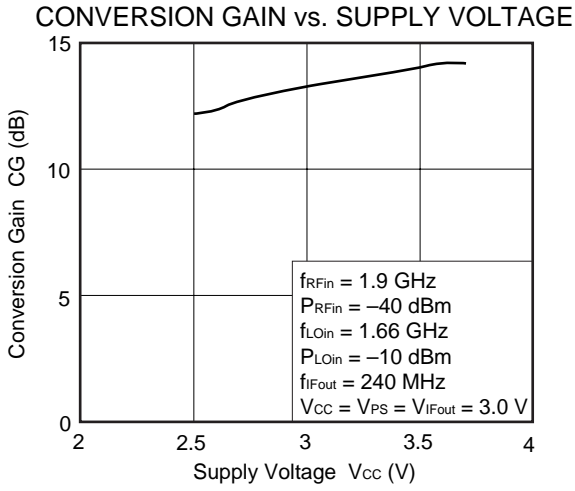


SSB NOISE FIGURE vs. LO INPUT POWER



12.4 IF 240 MHz Matching





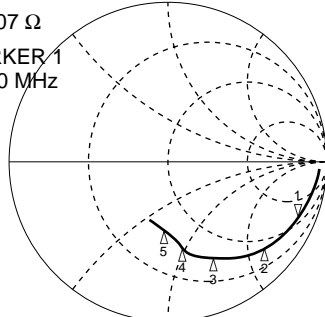
Remark The graphs indicate nominal characteristics.

13. S-PARAMETERS

13.1 Calibrated on pin of DUT

S₁₁ Z
 REF 1.0 Units
 $\frac{1}{V}$ 200.0 mUnits/
 hp 62.711 Ω -224.07 Ω

MARKER 1
 500.0 MHz



RF PORT

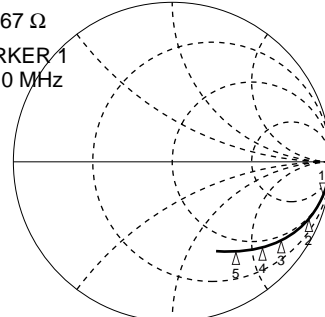
V_{CC} = V_{PS} = 3.0V

1:500 MHz 62.711 Ω -j224.07 Ω
 2:900 MHz 48.977 Ω -j219.18 Ω
 3:1 500 MHz 40.641 Ω -j129.94 Ω
 4:1 900 MHz 37.422 Ω -j101.51 Ω
 5:2 500 MHz 34.801 Ω -j74.141 Ω

START 0.050000000 GHz
 STOP 3.000000000 GHz

S₁₁ Z
 REF 1.0 Units
 $\frac{1}{V}$ 200.0 mUnits/
 hp 76.656 Ω -421.67 Ω

MARKER 1
 500.0 MHz



RF PORT

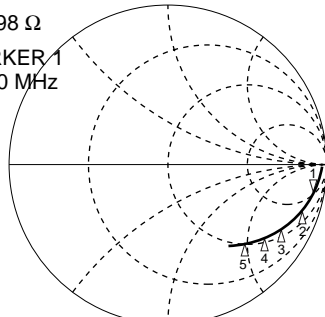
V_{CC} = 3.0V V_{PS} = GND

1:500 MHz 76.656 Ω -j421.67 Ω
 2:900 MHz 53.102 Ω -j234.55 Ω
 3:1 500 MHz 44.844 Ω -j140.82 Ω
 4:1 900 MHz 40.898 Ω -j109.73 Ω
 5:2 500 MHz 38.063 Ω -j80.547 Ω

START 0.050000000 GHz
 STOP 3.000000000 GHz

S₁₁ Z
 REF 1.0 Units
 $\frac{1}{V}$ 200.0 mUnits/
 hp 169.11 Ω -429.98 Ω

MARKER 1
 500.0 MHz



LO PORT

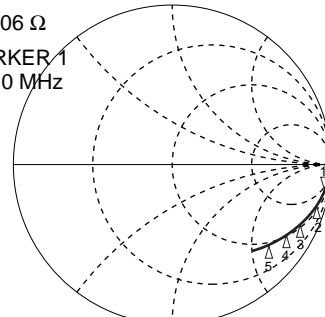
V_{CC} = V_{PS} = 3.0V

1:500 MHz 169.11 Ω -j429.98 Ω
 2:900 MHz 91.875 Ω -j263.7 Ω
 3:1 500 MHz 60.781 Ω -j162.56 Ω
 4:1 900 MHz 56.789 Ω -j125.66 Ω
 5:2 500 MHz 49.652 Ω -j97.602 Ω

START 0.050000000 GHz
 STOP 3.000000000 GHz

S₁₁ Z
 REF 1.0 Units
 $\frac{1}{V}$ 200.0 mUnits/
 hp 135.53 Ω -575.06 Ω

MARKER 1
 500.0 MHz



LO PORT

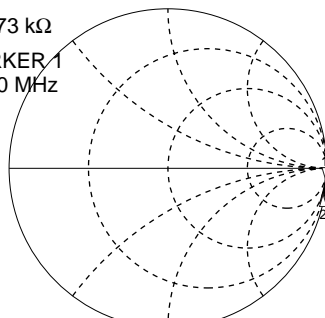
V_{CC} = 3.0V V_{PS} = GND

1:500 MHz 135.53 Ω -j575.06 Ω
 2:900 MHz 78.266 Ω -j337.66 Ω
 3:1 500 MHz 55.883 Ω -j201.43 Ω
 4:1 900 MHz 52.734 Ω -j159.63 Ω
 5:2 500 MHz 44.262 Ω -j122.66 Ω

START 0.050000000 GHz
 STOP 3.000000000 GHz

S₂₂ Z
 REF 1.0 Units
 $\frac{1}{V}$ 200.0 mUnits/
 hp 201.00 Ω -1.7173 k Ω

MARKER 1
 100.0 MHz



IF PORT

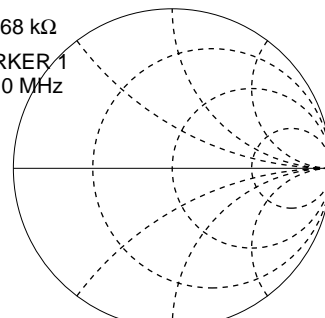
V_{CC} = V_{PS} = 3.0V

1:100 MHz 201.88 Ω -j1.7173 k Ω
 2:240 MHz 92.094 Ω -j715.72 Ω

START 0.050000000 GHz
 STOP 3.000000000 GHz

S₂₂ Z
 REF 1.0 Units
 $\frac{1}{V}$ 200.0 mUnits/
 hp 056.56 Ω -1.7468 k Ω

MARKER 1
 100.0 MHz



IF PORT

V_{CC} = 3.0V V_{PS} = GND

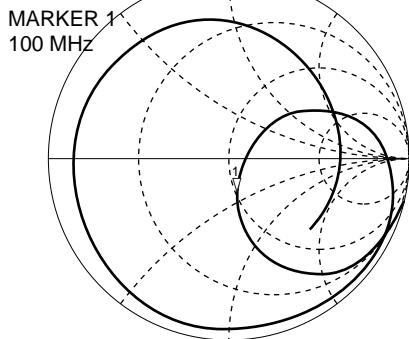
1:100 MHz 56.56 Ω -j1.7468 k Ω
 2:240 MHz 85.5 Ω -j722.22 Ω

START 0.050000000 GHz
 STOP 3.000000000 GHz

**13.2 IF Output Matching ($V_{CC} = V_{PS} = V_{IFout} = 3.0\text{ V}$) –on Test Circuit–
(This S_{11} is monitored at IF connector on test circuit fixture)**

IF 100 MHz MATCHING

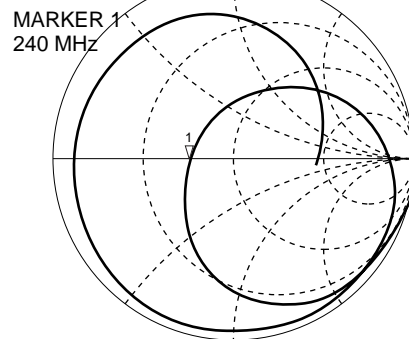
S_{11} 1 U FS 1: 50.277 Ω -22.559 Ω 70.552 pF
hp 100.000 000 MHz



START 50.000 000 MHz STOP 3 000.000 000 MHz

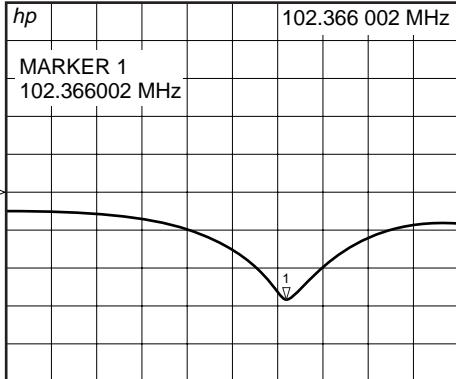
IF 240 MHz MATCHING

S_{11} 1 U FS 1: 31.052 Ω -84.961 m Ω 7.8053 nF
hp 240.000 000 MHz



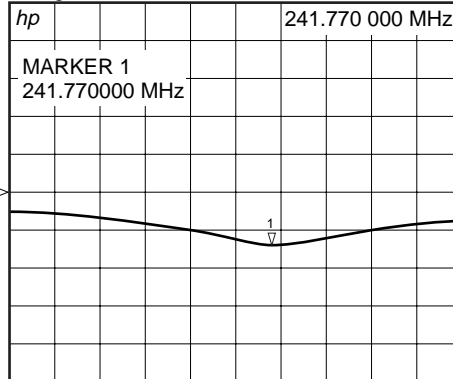
START 50.000 000 MHz STOP 3 000.000 000 MHz

S_{11} log MAG. 10 dB/ REF 0 dB 1: -27.655 dB



START 90.000 000 MHz STOP 110.000 000 MHz

S_{11} log MAG. 10 dB/ REF 0 dB 1: -13.556 dB



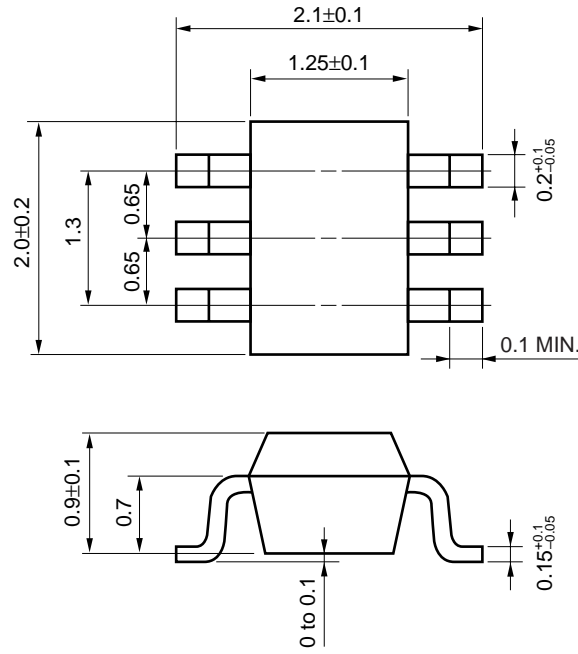
START 230.000 000 MHz STOP 250.000 000 MHz

The data in this page are to make clear the test condition of impedance matched to next stage, not specify the recommended condition. The S_{11} smith charts of the test fixture setting IC are normalized to $Z_0 = 50\ \Omega$, because the IC's load is the measurement equipment of $50\ \Omega$ impedance.

In your use, the output return loss value can be helpful information to adjust your circuit matching to next stage.

14. PACKAGE DIMENSIONS

6-PIN SUPER MINIMOLD (UNIT: mm)



15. NOTE ON CORRECT USE

- (1) Observe precautions for handling because of electro-static sensitive devices.
- (2) Form a ground pattern as widely as possible to minimize ground impedance (to prevent undesired oscillation).
Keep the track length of the ground pins as short as possible.
- (3) The bypass capacitor (example: 1 000 pF) should be attached to the V_{CC} pin.
- (4) The matching circuit should be externally attached to the IF output pin.
- (5) The DC cut capacitor must be each attached to the input and output pins.

16. RECOMMENDED SOLDERING CONDITIONS

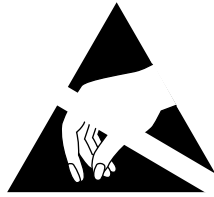
This product should be soldered under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your NEC sales representative.

Soldering Method	Soldering Condition	Recommended Condition Symbol
Infrared Reflow	Package peak temperature: 235°C or below Time: 30 seconds or less (at 210°C) Count: 3, Exposure limit: None ^{Note}	IR35-00-3
VPS	Package peak temperature: 215°C or below Time: 40 seconds or less (at 200°C) Count: 3, Exposure limit: None ^{Note}	VP15-00-3
Wave Soldering	Soldering bath temperature: 260°C or below Time: 10 seconds or less Count: 1, Exposure limit: None ^{Note}	WS60-00-1
Partial Heating	Pin temperature: 300°C Time: 3 seconds or less (per side of device) Exposure limit: None ^{Note}	—

Note After opening the dry pack, keep it in a place below 25°C and 65% RH for the allowable storage period.

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

For details of recommended soldering conditions for surface mounting, refer to information document SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E).



ATTENTION
 OBSERVE PRECAUTIONS
 FOR HANDLING
 ELECTROSTATIC
 SENSITIVE
 DEVICES

NESAT (NEC Silicon Advanced Technology) is a trademark of NEC Corporation.

- **The information in this document is current as of November, 2000. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
 "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.
 "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots
 "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
 "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.

(Note)

- (1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.
- (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).