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.

DATA SHEET

RENESAS

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC8187TB

SILICON MMIC HI-IP3 FREQUENCY UP-CONVERTER FOR WIRELESS TRANSCEIVER

DESCRIPTION

The μPC8187TB is a silicon monolithic integrated circuit designed as frequency up-converter for wireless transceiver. This IC is higher operating frequency, lower distortion and higher conversion gain than conventional μPC8163TB.

This IC is manufactured using NEC's 30 GHz f_{max} UHS0 (Ultra High Speed Process) silicon bipolar process.

FEATURES

- High output frequency : f_{RFout} = 0.8 to 2.5 GHz
- High-density surface mounting : 6-pin super minimold package
- Supply voltage : V_{CC} = 2.7 to 3.3 V
- Higher IP_3 : OIP_3 = +10 dBm @ f_{RFout} = 1.9 GHz

APPLICATION

- TDMA, PCS, CDMA etc.

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPC8187TB-E3	6-pin super minimold	C3G	• Embossed tape 8 mm wide. • Pin 1, 2, 3 face the tape perforation side. • Qty 3 kpcs/reel.

Remark To order evaluation samples, please contact your local NEC sales office.
(Part number for sample order: μPC8187TB)

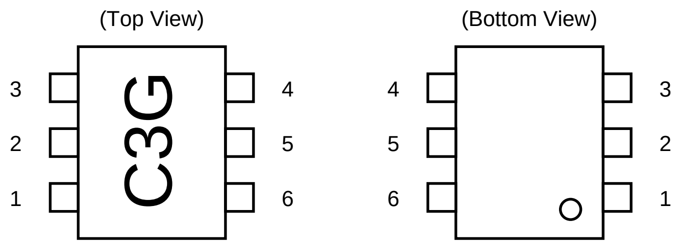
Caution Electro-static sensitive devices

Document No. P15106EJ2V0DS00 (2nd edition)
Date Published January 2001 N CP(K)
Printed in Japan

The mark ★ shows major revised points.

CONTENTS

1. PIN CONNECTIONS



Pin No.	Pin Name
1	IFinput
2	GND
3	LOinput
4	GND
5	V_{CC}
6	RFoutput

2. SERIES PRODUCTS (T_A = +25°C, V_{CC} = V_{PS} = V_{RFout} = 3.0 V, Z_S = Z_L = 50 Ω)

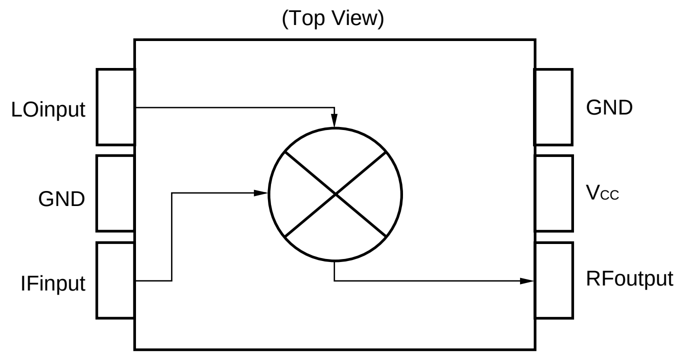
Part Number	I_{CC} (mA)	f_{RFout} (GHz)	CG (dB)		
			@RF 0.9 GHz Note	@RF 1.9 GHz	@RF 2.4 GHz
μPC8187TB	15	0.8 to 2.5	11	11	10
μPC8106TB	9	0.4 to 2.0	9	7	–
μPC8172TB	9	0.8 to 2.5	9.5	8.5	8.0
μPC8109TB	5	0.4 to.2.0	6	4	–
μPC8163TB	16.5	0.8 to 2.0	9	5.5	–

Part Number	$P_{O(sat)}$ (dBm)			OIP_3 (dBm)		
	@RF 0.9 GHz Note	@RF 1.9 GHz	@RF 2.4 GHz	@RF 0.9 GHz Note	@RF 1.9 GHz	@RF 2.4 GHz
μPC8187TB	+4	+2.5	+1	+10	+10	+8.5
μPC8106TB	–2	–4	–	+5.5	+2.0	–
μPC8172TB	+0.5	0	–0.5	+7.5	+6.0	+4.0
μPC8109TB	–5.5	–7.5	–	+1.5	–1.0	–
μPC8163TB	+0.5	–2	–	+9.5	+6.0	–

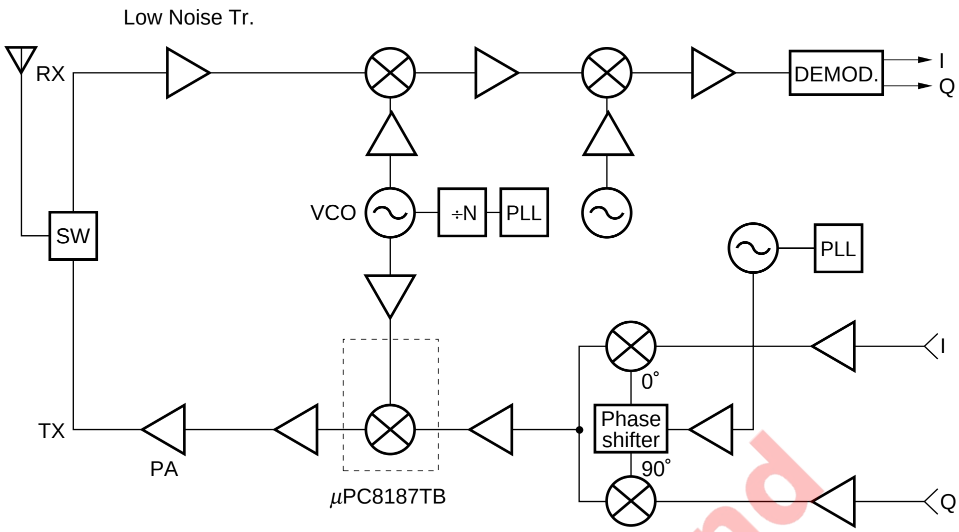
Note f_{RFout} = 0.83 GHz @ μPC8163TB and μPC8187TB

Remark Typical performance. Please refer to **8. ELECTRICAL CHARACTERISTICS** in detail.
To know the associated product, please refer to each latest data sheet.

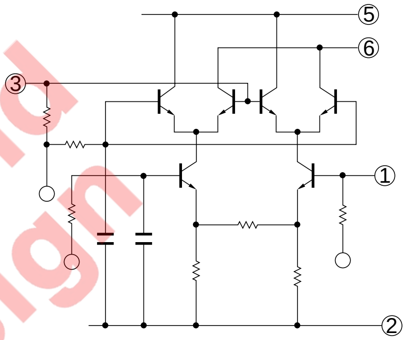
3. BLOCK DIAGRAM



4. SYSTEM APPLICATION EXAMPLES (SCHEMATICS OF IC LOCATION IN THE SYSTEM)



5. PIN EXPLANATION

Pin No.	Pin Name	Applied Voltage (V)	Pin Voltage (V)[Note]	Function and Explanation	Equivalent Circuit
1	IFinput	–	1.2	This pin is IF input to double balanced mixer (DBM). The input is designed as high impedance. The circuit contributes to suppress spurious signal. Also this symmetrical circuit can keep specified performance insensitive to process-condition distribution. For above reason, double balanced mixer is adopted.	
2 4	GND	GND	–	GND pin. Ground pattern on the board should be formed as wide as possible. Track Length should be kept as short as possible to minimize ground impedance.	
3	LOinput	–	2.1	Local input pin. Recommendable input level is –10 to 0 dBm.	
5	Vcc	2.7 to 3.3	–	Supply voltage pin.	
6	RFoutput	Same bias as Vcc through external inductor	–	This pin is RF output from DBM. This pin is designed as open collector. Due to the high impedance output, this pin should be equipped with LC matching circuit to next stage.	

Note Each pin voltage is measured at $V_{CC} = V_{RFout} = 2.8$ V.

6. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Rating	Unit
Supply Voltage	V_{CC}	T_A = +25°C	3.6	V
Power Dissipation	P_D	Mounted on double-side copperclad 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
Maximum Input Power	P_{in}		+10	dBm

7. RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
Supply Voltage	V_{CC}	2.7	2.8	3.3	V	The same voltage should be applied to pin 5 and 6
Operating Ambient Temperature	T_A	–40	+25	+85	°C	
Local Input Power	P_{LOin}	–10	–5	0	dBm	Z_S = 50 Ω (without matching)
RF Output Frequency	f_{RFout}	0.8	–	2.5	GHz	With external matching circuit
IF Input Frequency	f_{IFin}	50	–	400	MHz	

8. ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{CC} = V_{RFout} = 2.8 V, f_{IFin} = 150 MHz, P_{LOin} = –5 dBm)

Parameter	Symbol	Test Conditions[Note]	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	No signal	11	15	19	mA
Conversion Gain	CG1	f_{RFout} = 0.83 GHz, P_{IFin} = –20 dBm	8	11	14	dB
	CG2	f_{RFout} = 1.9 GHz, P_{IFin} = –20 dBm	8	11	14	dB
	CG3	f_{RFout} = 2.4 GHz, P_{IFin} = –20 dBm	7	10	13	dB
Saturated Output Power	$P_{O(sat)}1$	f_{RFout} = 0.83 GHz, P_{IFin} = 0 dBm	+1.5	+4	–	dBm
	$P_{O(sat)}2$	f_{RFout} = 1.9 GHz, P_{IFin} = 0 dBm	0	+2.5	–	dBm
	$P_{O(sat)}3$	f_{RFout} = 2.4 GHz, P_{IFin} = 0 dBm	–1.5	+1	–	dBm

Note $f_{RFout} < f_{LOin}$ @ f_{RFout} = 0.83 GHz
$f_{LOin} < f_{RFout}$ @ f_{RFout} = 1.9 GHz/2.4 GHz

9. OTHER CHARACTERISTICS, FOR REFERENCE PURPOSES ONLY

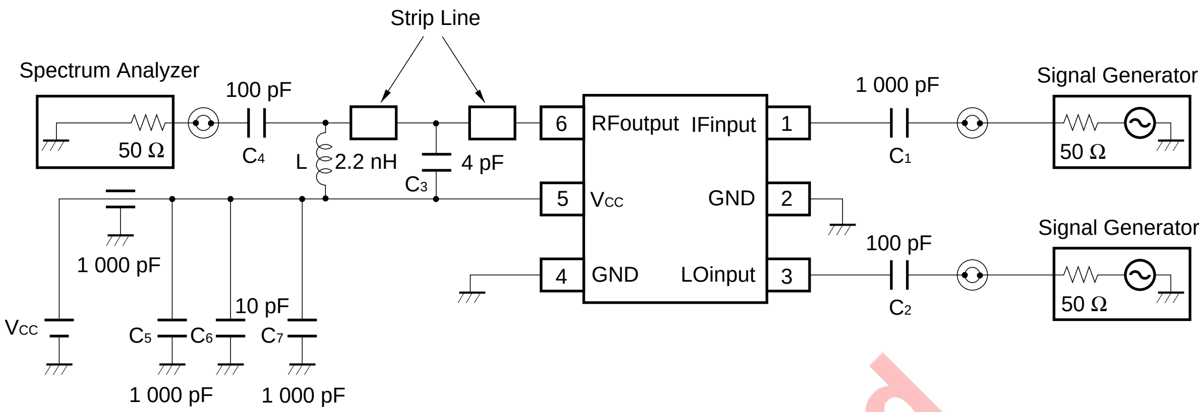
(T_A = +25°C, V_{CC} = V_{RFout} = 2.8 V, P_{LOin} = –5 dBm)

Parameter	Symbol	Test Conditions[Note]		Value	Unit
Output 3rd Order Distortion Intercept Point	OIP31	f_{RFout} = 0.83 GHz	$f_{IFin}1$ = 150 MHz, $f_{IFin}2$ = 151 MHz	+10	dBm
	OIP32	f_{RFout} = 1.9 GHz		+10	dBm
	OIP33	f_{RFout} = 2.4 GHz		+8.5	dBm
Input 3rd Order Distortion Intercept Point	IIP31	f_{RFout} = 0.83 GHz	$f_{IFin}1$ = 150 MHz, $f_{IFin}2$ = 151 MHz	–1.0	dBm
	IIP32	f_{RFout} = 1.9 GHz		–1.0	dBm
	IIP33	f_{RFout} = 2.4 GHz		–1.5	dBm
SSB Noise Figure	SSB•NF1	f_{RFout} = 0.83 GHz	f_{IFin} = 150 MHz	11	dB
	SSB•NF2	f_{RFout} = 1.9 GHz		12	dB
	SSB•NF3	f_{RFout} = 2.4 GHz		12.5	dB

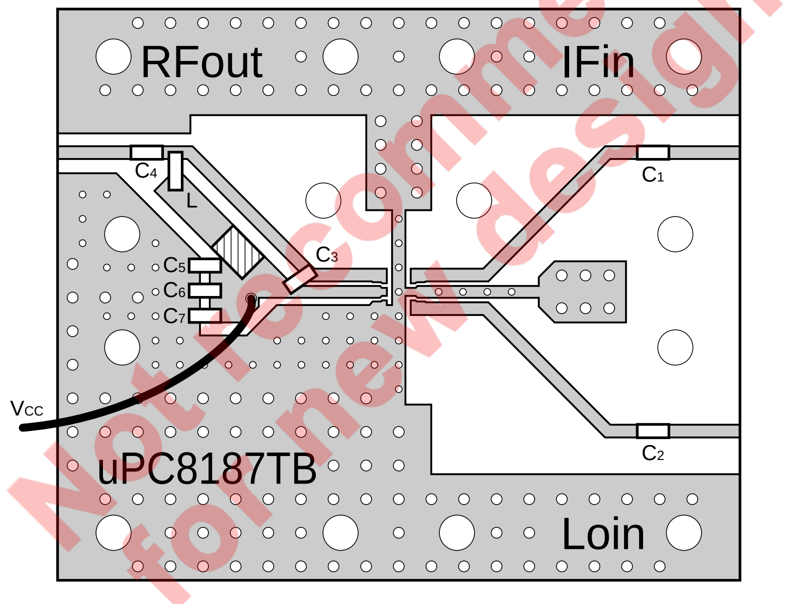
Note $f_{RFout} < f_{LOin}$ @ f_{RFout} = 0.83 GHz
$f_{LOin} < f_{RFout}$ @ f_{RFout} = 1.9 GHz/2.4 GHz

★ 10. TEST CIRCUITS

10.1 TEST CIRCUIT 1 (f_{RFout} = 0.83 GHz)



EXAMPLE OF TEST CIRCUIT 1 ASSEMBLED ON EVALUATION BOARD



COMPONENT LIST

Form	Symbol	Value
Chip capacitor	C1, C5, C7	1 000 pF
	C2, C4	100 pF
	C6	10 pF
	C3	4 pF
Chip inductor	L	2.2 nH[Note]

(∗1) 35 × 42 × 0.4 mm polyimide board, double-sided copper clad

(∗2) Ground pattern on rear of the board

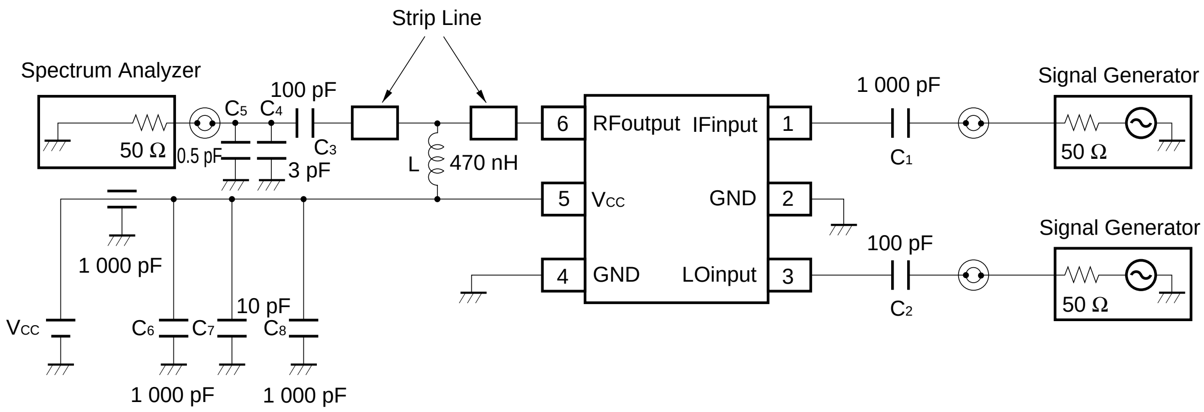
(∗3) Solder plated patterns

(∗4) ○○◯ : Through holes

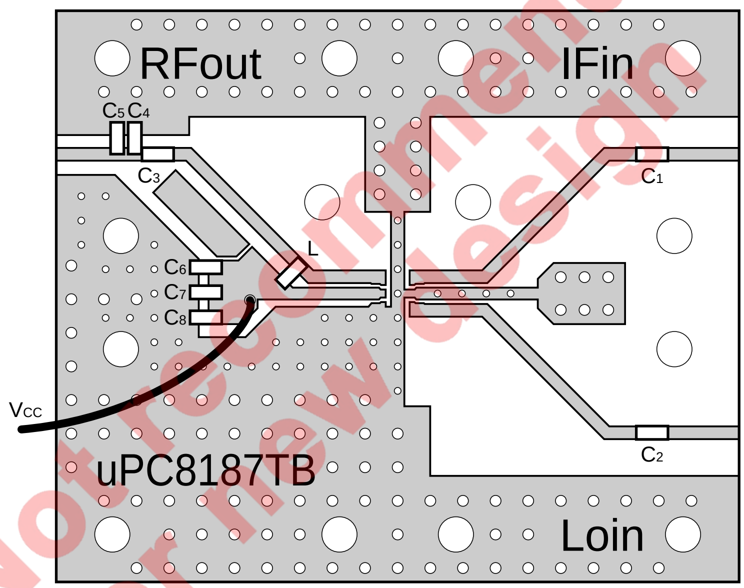
(∗5) ▨ : Join patterns with electrical tape

Note 2.2 nH: LL1608-FH2N25 (TOKO Co., Ltd.)

10.2 TEST CIRCUIT 2 (f_{RFout} = 1.9 GHz)



EXAMPLE OF TEST CIRCUIT 2 ASSEMBLED ON EVALUATION BOARD



COMPONENT LIST

Form	Symbol	Value
Chip capacitor	C_1, C_6, C_8	1 000 pF
	C_2, C_3	100 pF
	C_7	10 pF
	C_4	3 pF
	C_5	0.5 pF
Chip inductor	L	470 nH[Note]

(∗1) 35 × 42 × 0.4 mm polyimide board, double-sided copper clad

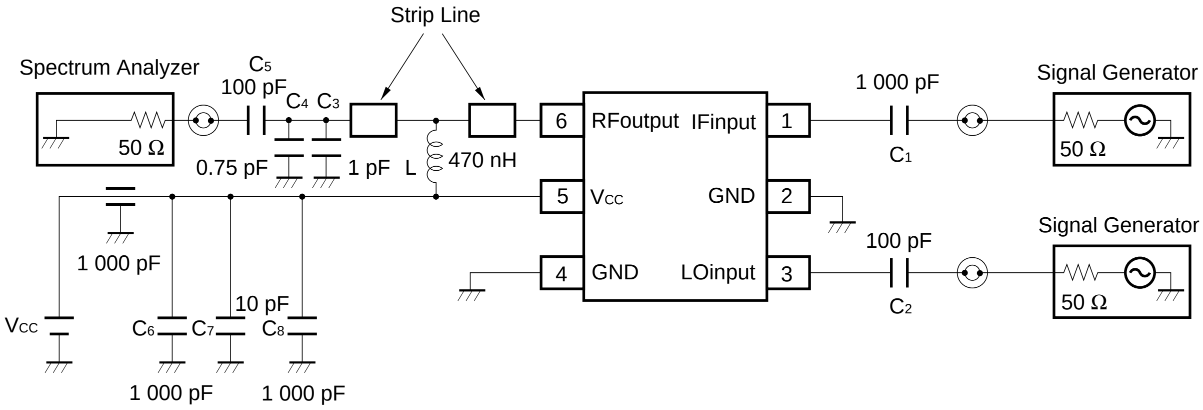
(∗2) Ground pattern on rear of the board

(∗3) Solder plated patterns

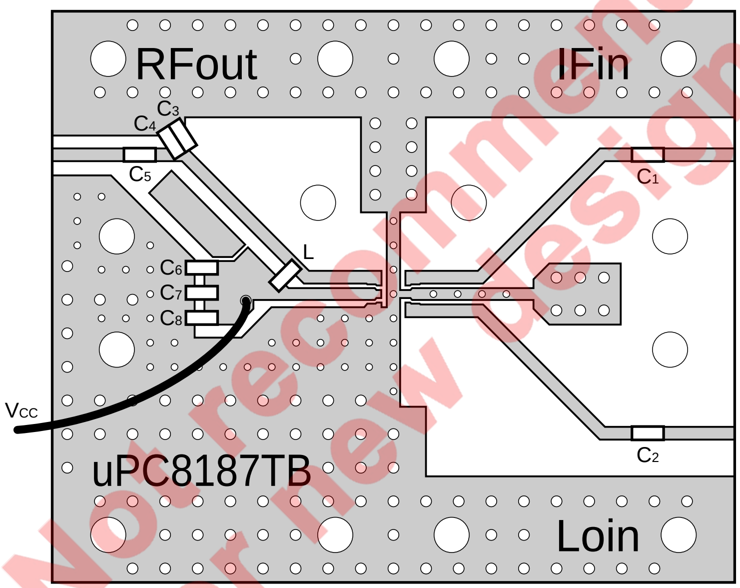
(∗4) ○○◯ : Through holes

Note 470 nH: LL2012-FR47 (TOKO Co., Ltd.)

10.3 TEST CIRCUIT 3 (f_{RFout} = 2.4 GHz)



EXAMPLE OF TEST CIRCUIT 3 ASSEMBLED ON EVALUATION BOARD



COMPONENT LIST

Form	Symbol	Value
Chip capacitor	C1, C6, C8	1 000 pF
	C2, C5	100 pF
	C7	10 pF
	C3	1 pF
	C4	0.75 pF
Chip inductor	L	470 nH Note

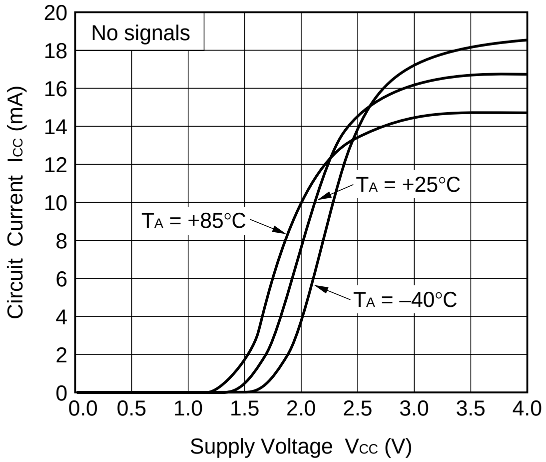
(∗1) 35 × 42 × 0.4 mm polyimide board, double-sided copper clad
(∗2) Ground pattern on rear of the board
(∗3) Solder plated patterns
(∗4) ○○◯ : Through holes

Note 470 nH: LL2012-FR47 (TOKO Co., Ltd.)

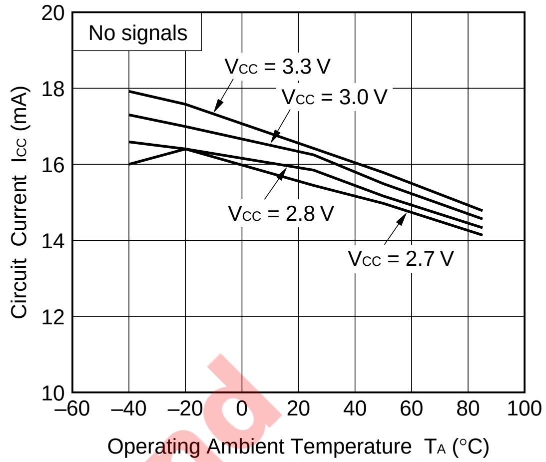
Caution The test circuits and board pattern on data sheet are for performance evaluation use only (They are not recommended circuits). In the case of actual design-in, matching circuit should be determined using S-parameter of desired frequency in accordance to actual mounting pattern.

★ 11. TYPICAL CHARACTERISTICS (Unless otherwise specified, T_A = +25°C, V_{CC} = V_{RFout})

CIRCUIT CURRENT vs. SUPPLY VOLTAGE

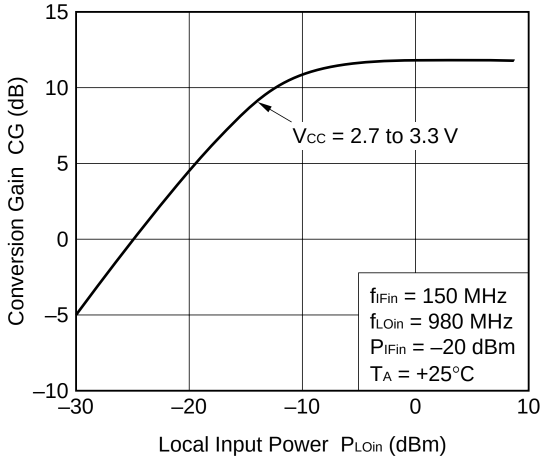


CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE

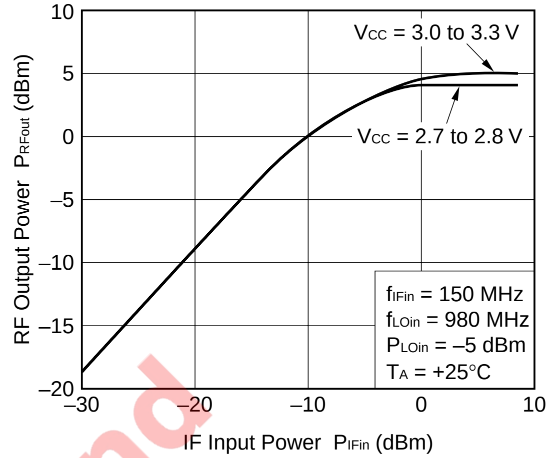


11.1 f_{RFout} = 0.83 GHz

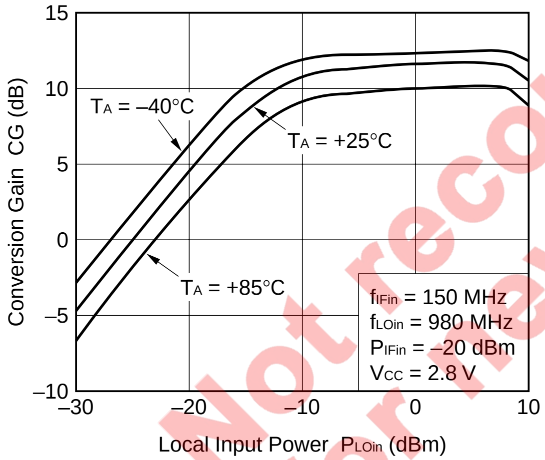
CONVERSION GAIN vs.
LOCAL INPUT POWER



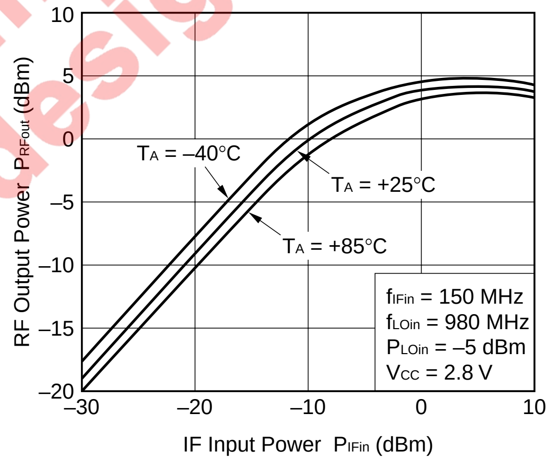
RF OUTPUT POWER vs.
IF INPUT POWER



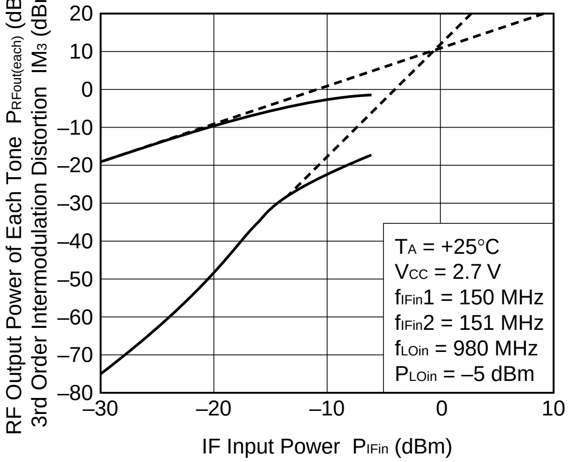
CONVERSION GAIN vs.
LOCAL INPUT POWER



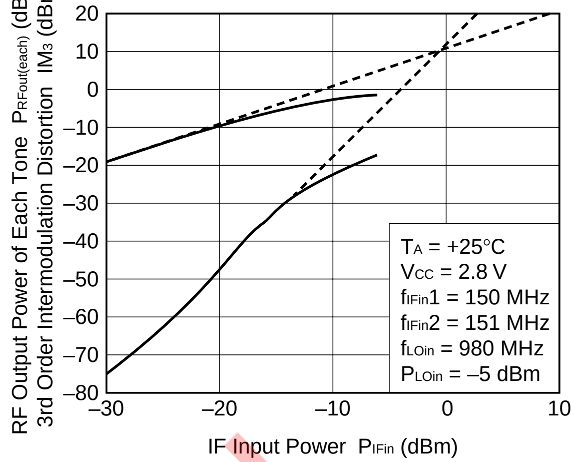
RF OUTPUT POWER vs.
IF INPUT POWER



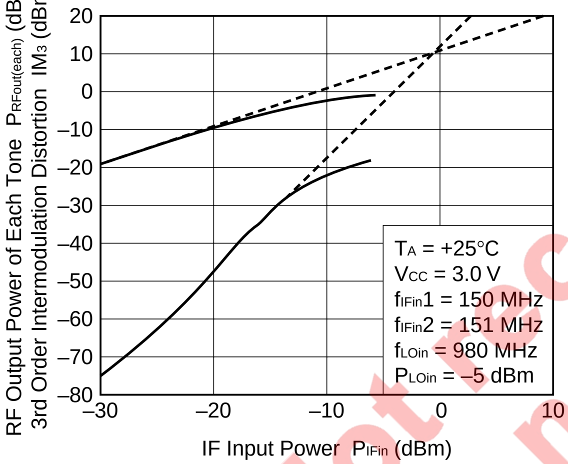
RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER



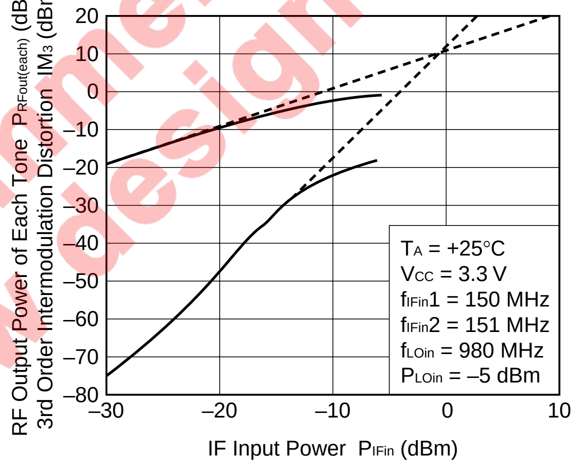
RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER



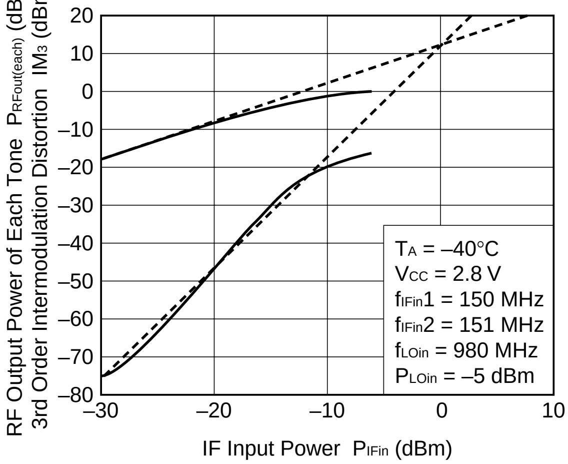
RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER



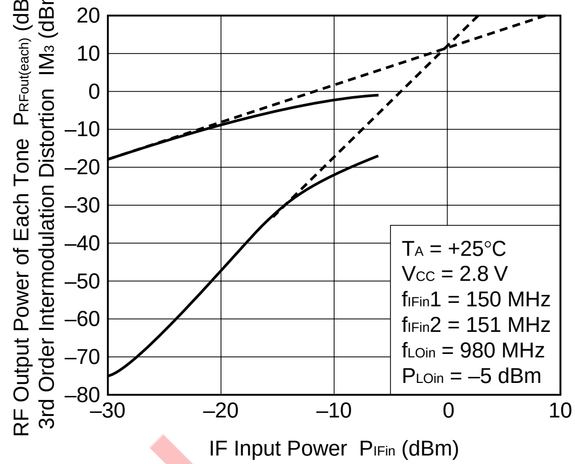
RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER



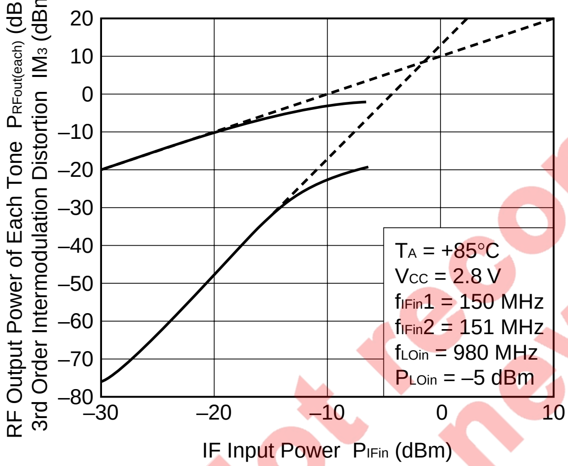
RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER



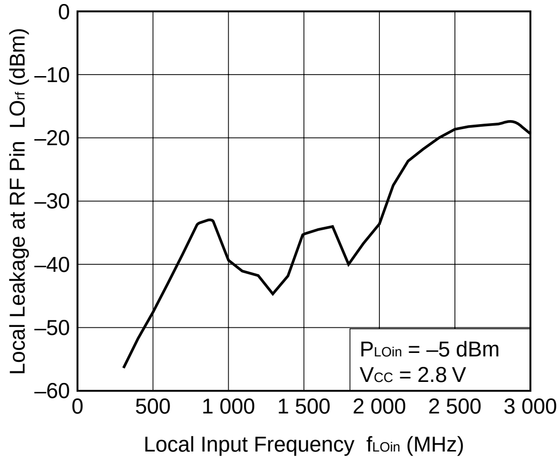
RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER



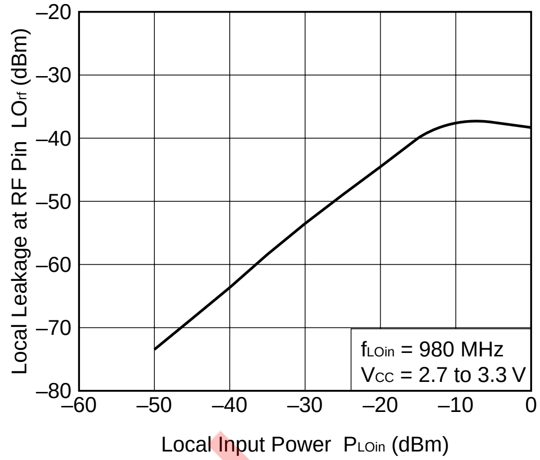
RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER



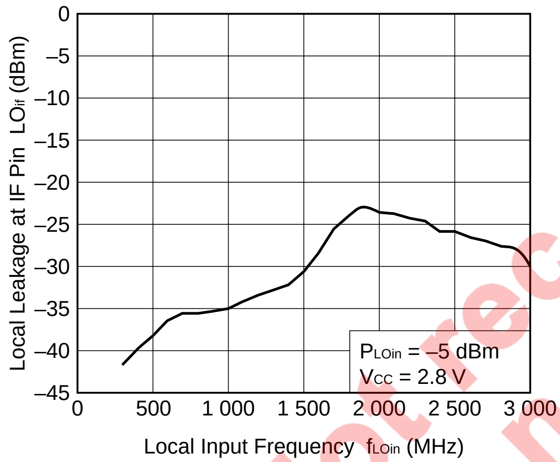
LOCAL LEAKAGE AT RF PIN vs.
LOCAL INPUT FREQUENCY



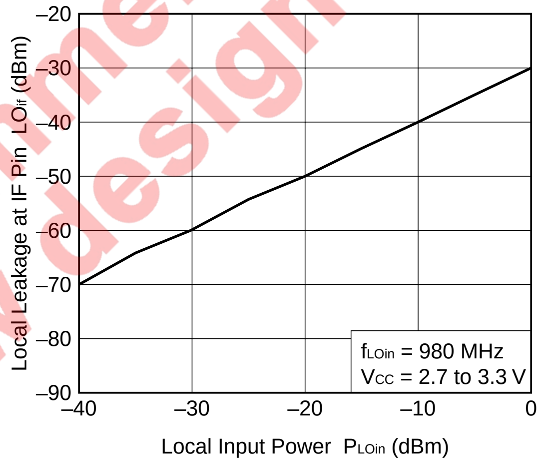
LOCAL LEAKAGE AT RF PIN vs.
LOCAL INPUT POWER



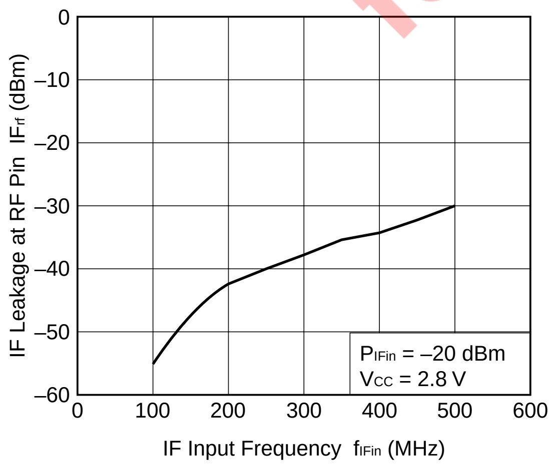
LOCAL LEAKAGE AT IF PIN vs.
LOCAL INPUT FREQUENCY



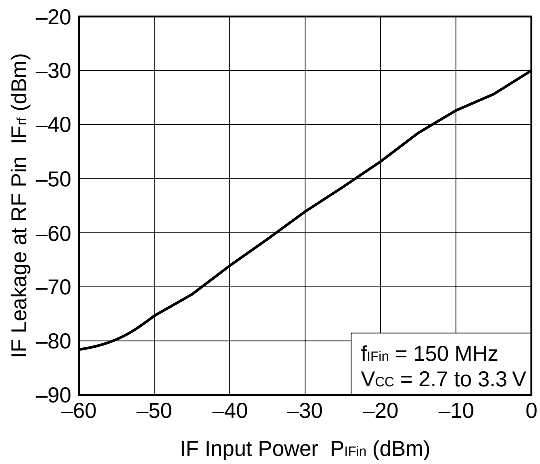
LOCAL LEAKAGE AT IF PIN vs.
LOCAL INPUT POWER



IF LEAKAGE AT RF PIN vs.
IF INPUT FREQUENCY

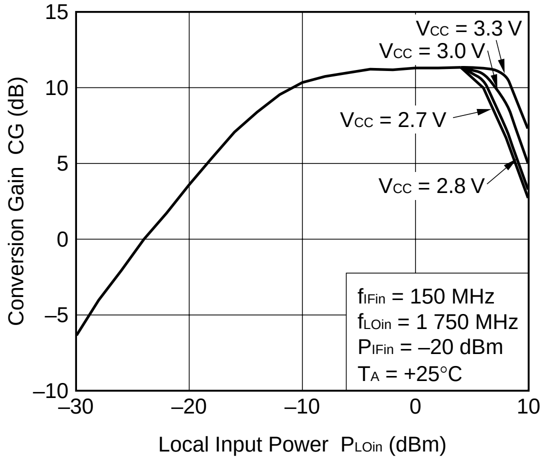


IF LEAKAGE AT RF PIN vs.
IF INPUT POWER

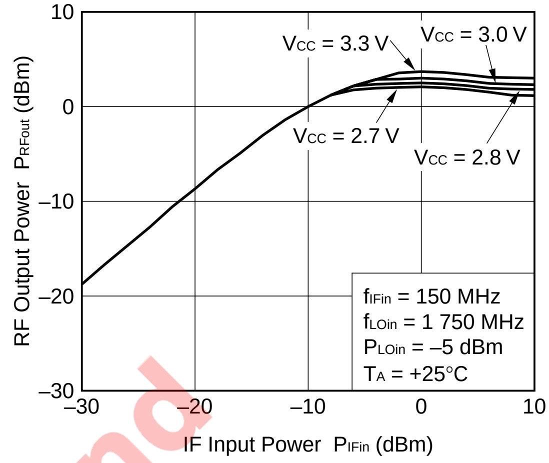


11.2 f_{RFout} = 1.9 GHz

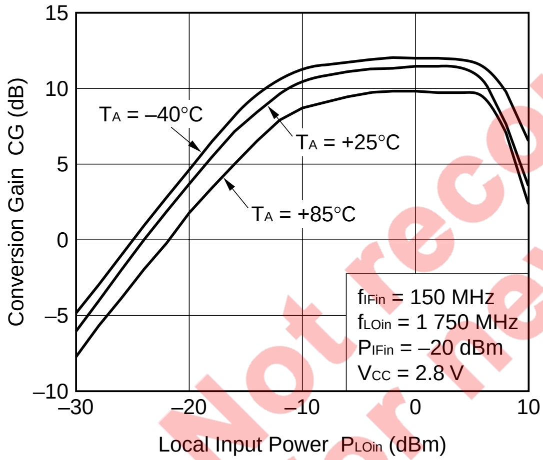
CONVERSION GAIN vs.
LOCAL INPUT POWER



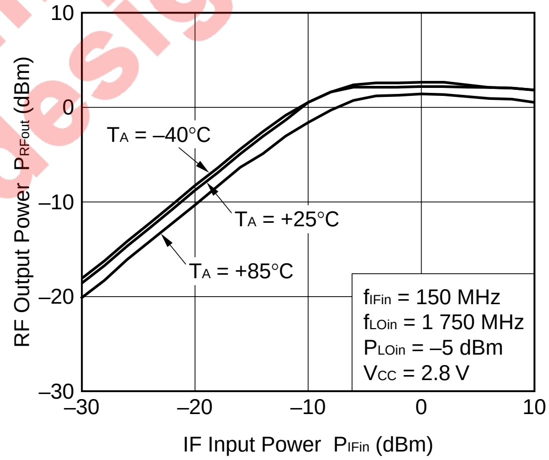
RF OUTPUT POWER vs.
IF INPUT POWER



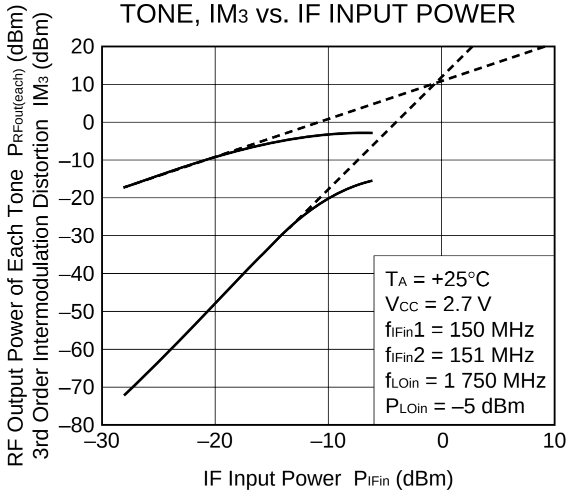
CONVERSION GAIN vs.
LOCAL INPUT POWER



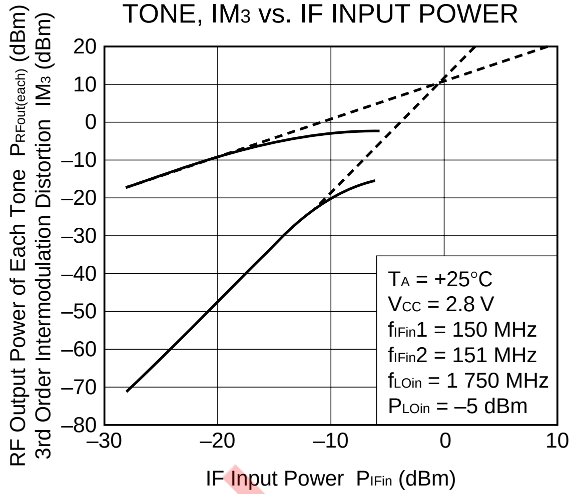
RF OUTPUT POWER vs.
IF INPUT POWER



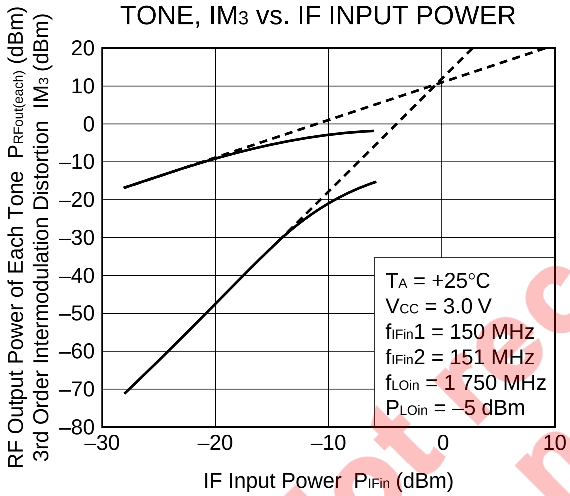
RF OUTPUT POWER OF EACH TONE, IM3 vs. IF INPUT POWER



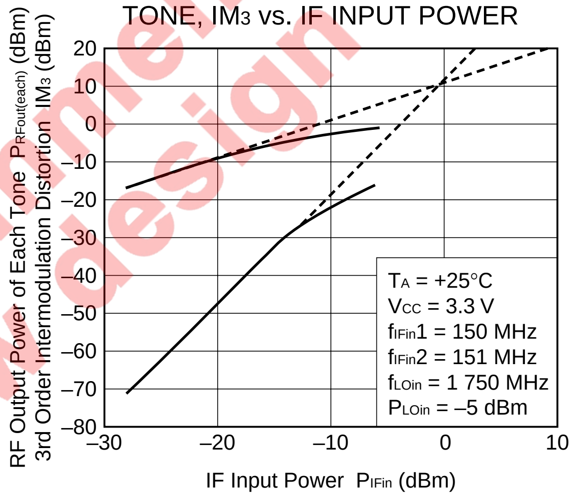
RF OUTPUT POWER OF EACH TONE, IM3 vs. IF INPUT POWER

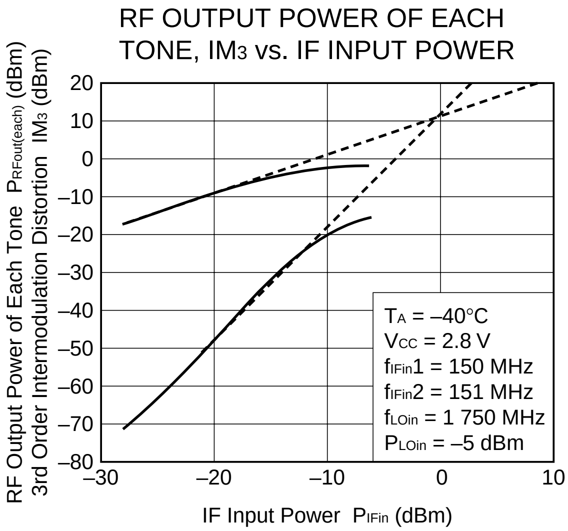


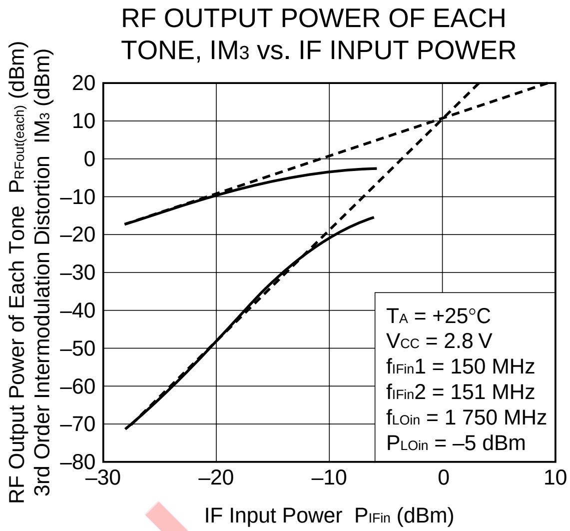
RF OUTPUT POWER OF EACH TONE, IM3 vs. IF INPUT POWER

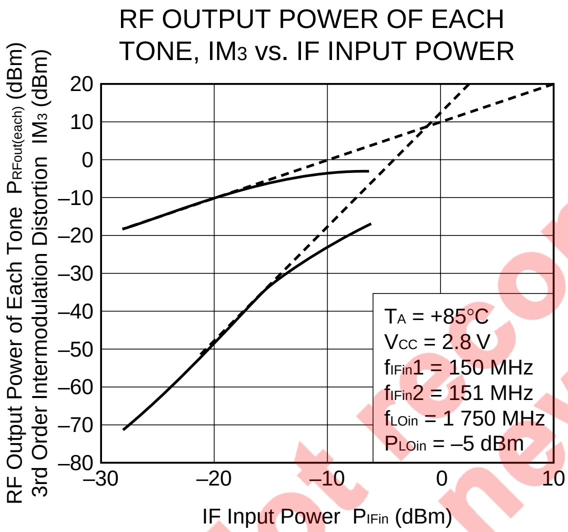


RF OUTPUT POWER OF EACH TONE, IM3 vs. IF INPUT POWER

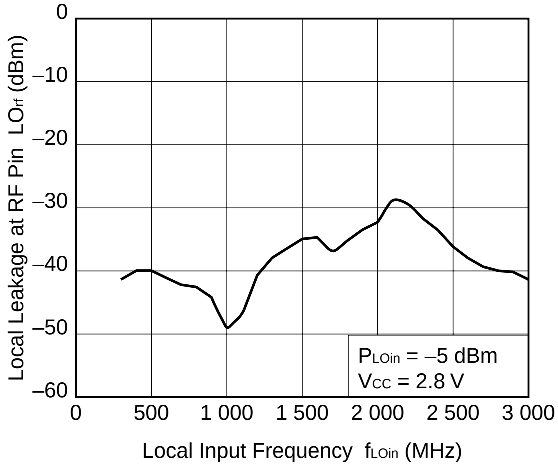



RF OUTPUT POWER OF EACH
TONE, IM3 vs. IF INPUT POWER
RF Output Power of Each Tone PRFout(each) (dBm)
3rd Order Intermodulation Distortion IM3 (dBm)
IF Input Power PIFin (dBm)
TA = –40°C
VCC = 2.8 V
fIFin1 = 150 MHz
fIFin2 = 151 MHz
fLOin = 1 750 MHz
PLOin = –5 dBm

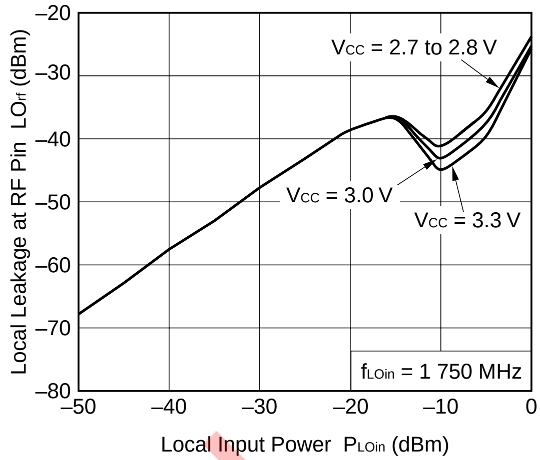

RF OUTPUT POWER OF EACH
TONE, IM3 vs. IF INPUT POWER
RF Output Power of Each Tone PRFout(each) (dBm)
3rd Order Intermodulation Distortion IM3 (dBm)
IF Input Power PIFin (dBm)
TA = +25°C
VCC = 2.8 V
fIFin1 = 150 MHz
fIFin2 = 151 MHz
fLOin = 1 750 MHz
PLOin = –5 dBm


RF OUTPUT POWER OF EACH
TONE, IM3 vs. IF INPUT POWER
RF Output Power of Each Tone PRFout(each) (dBm)
3rd Order Intermodulation Distortion IM3 (dBm)
IF Input Power PIFin (dBm)
TA = +85°C
VCC = 2.8 V
fIFin1 = 150 MHz
fIFin2 = 151 MHz
fLOin = 1 750 MHz
PLOin = –5 dBm

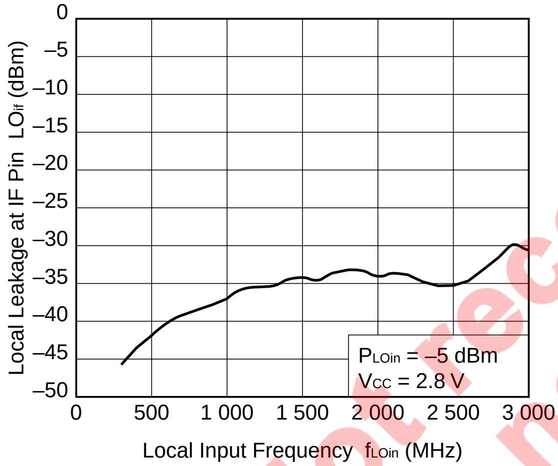
LOCAL LEAKAGE AT RF PIN vs.
LOCAL INPUT FREQUENCY



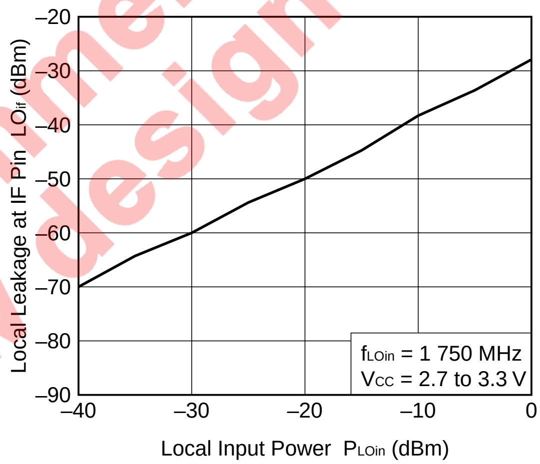
LOCAL LEAKAGE AT RF PIN vs.
LOCAL INPUT POWER



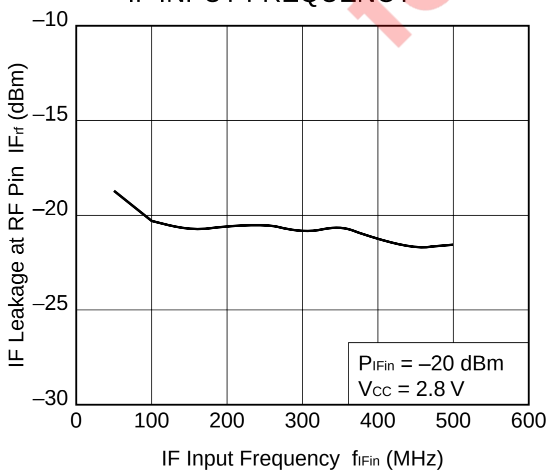
LOCAL LEAKAGE AT IF PIN vs.
LOCAL INPUT FREQUENCY



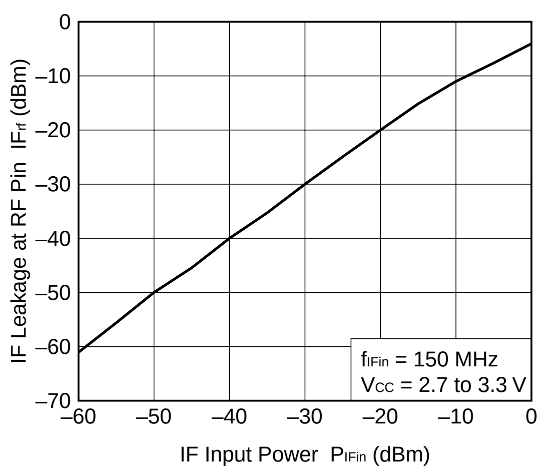
LOCAL LEAKAGE AT IF PIN vs.
LOCAL INPUT POWER



IF LEAKAGE AT RF PIN vs.
IF INPUT FREQUENCY

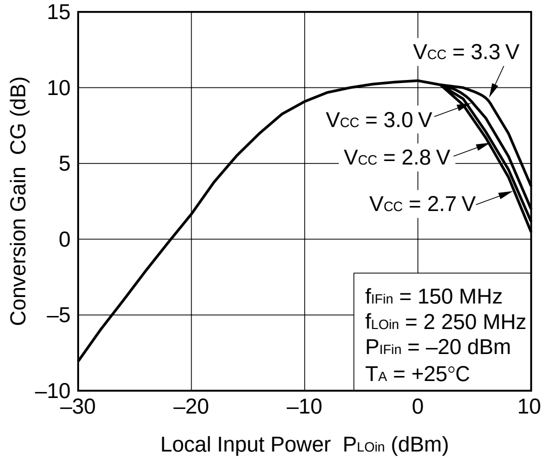


IF LEAKAGE AT RF PIN vs.
IF INPUT POWER

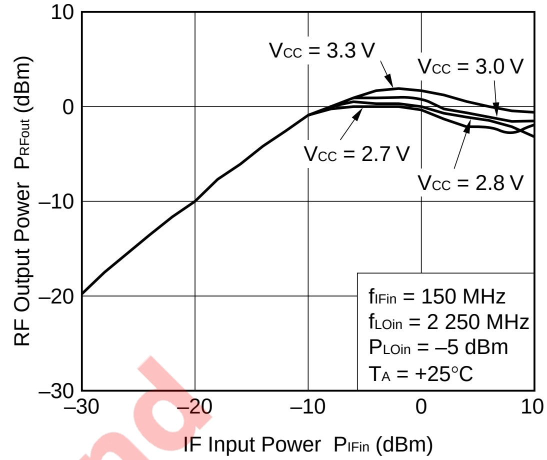


11.3 f_{RFout} = 2.4 GHz

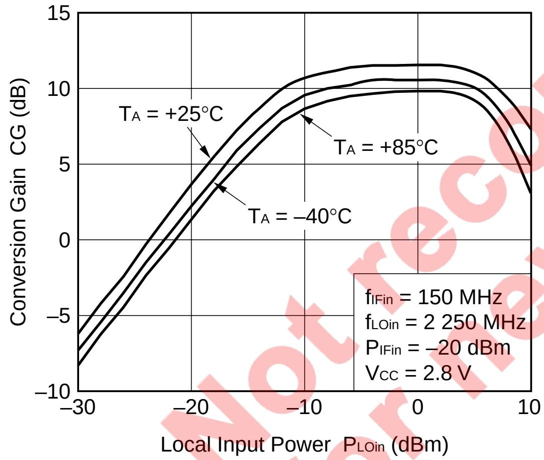
CONVERSION GAIN vs.
LOCAL INPUT POWER



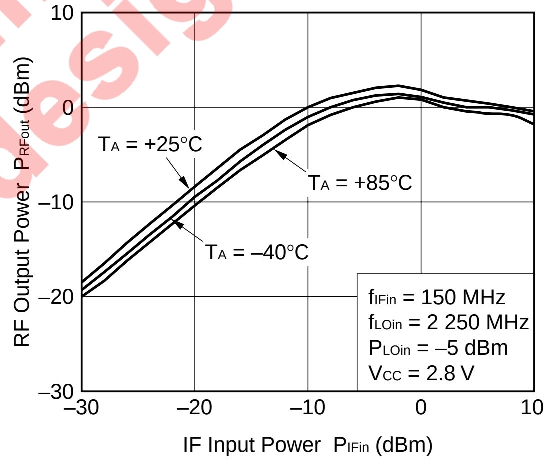
RF OUTPUT POWER vs.
IF INPUT POWER



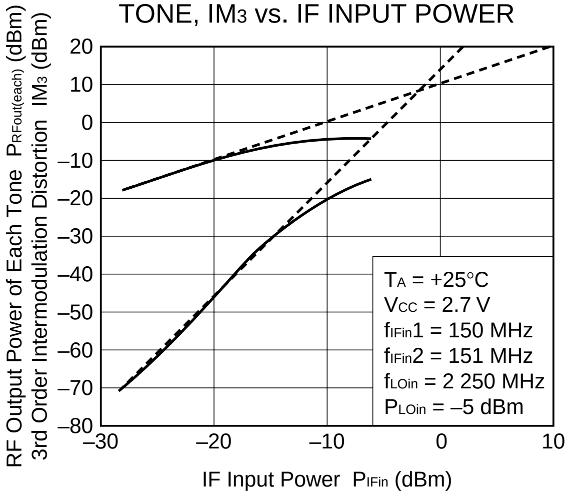
CONVERSION GAIN vs.
LOCAL INPUT POWER



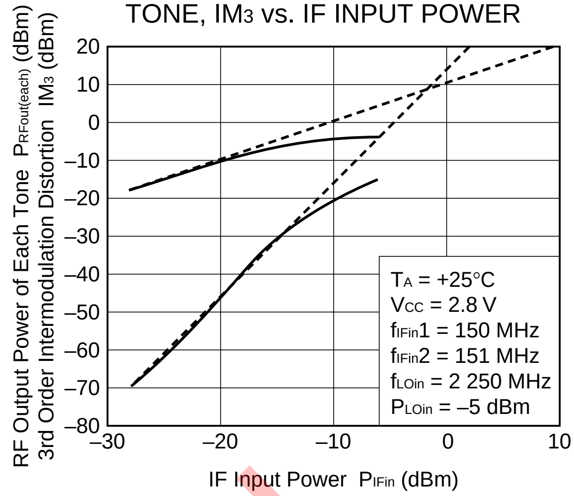
RF OUTPUT POWER vs.
IF INPUT POWER



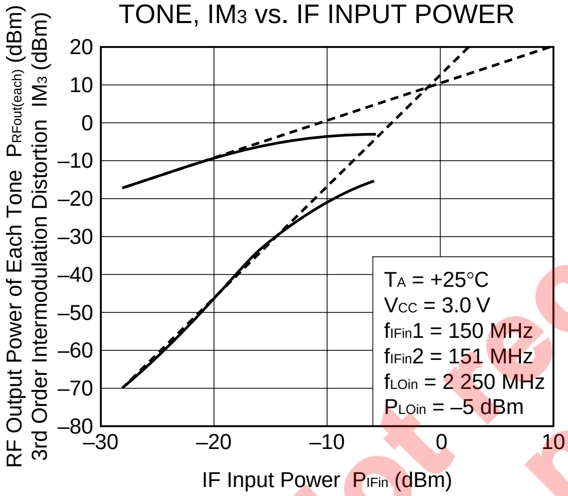
RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER



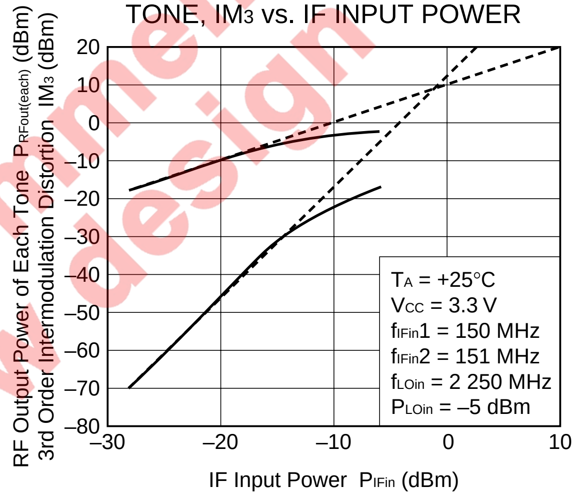
RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER

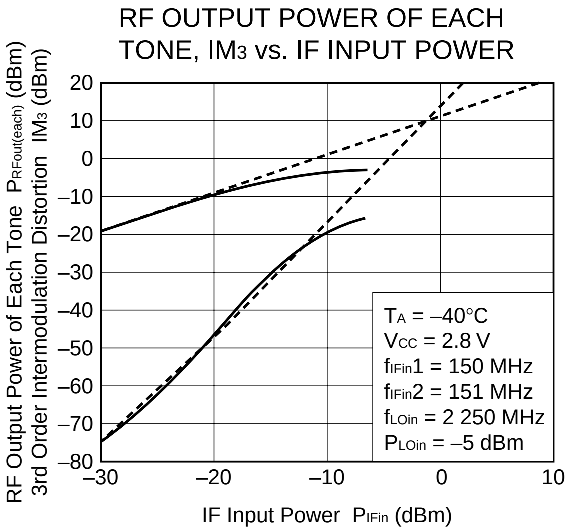


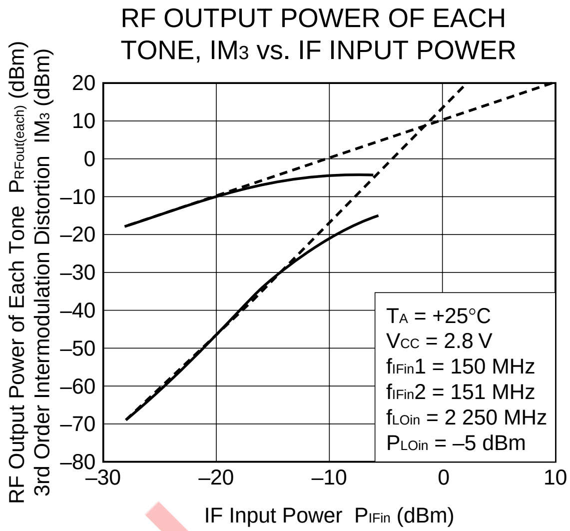
RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER

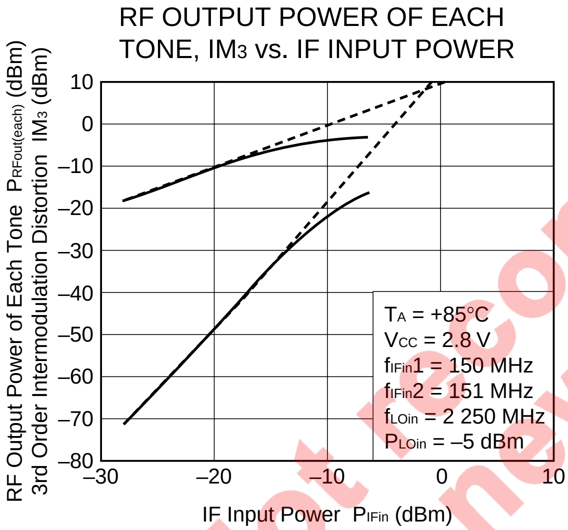


RF OUTPUT POWER OF EACH TONE, IM_3 vs. IF INPUT POWER

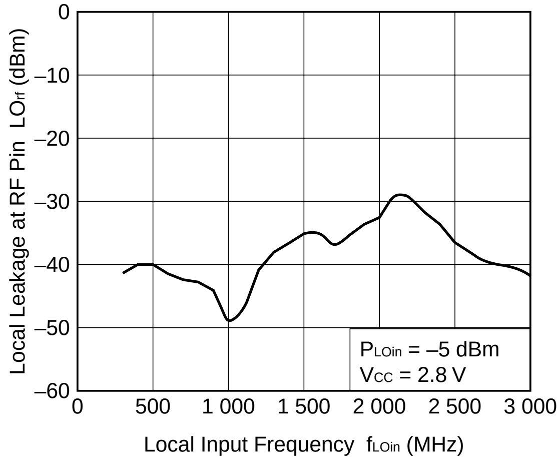



RF OUTPUT POWER OF EACH TONE, IM3 vs. IF INPUT POWER
RF Output Power of Each Tone PRFout(each) (dBm)
3rd Order Intermodulation Distortion IM3 (dBm)
IF Input Power PIFin (dBm)
TA = –40°C
VCC = 2.8 V
fIFin1 = 150 MHz
fIFin2 = 151 MHz
fLOin = 2 250 MHz
PLOin = –5 dBm

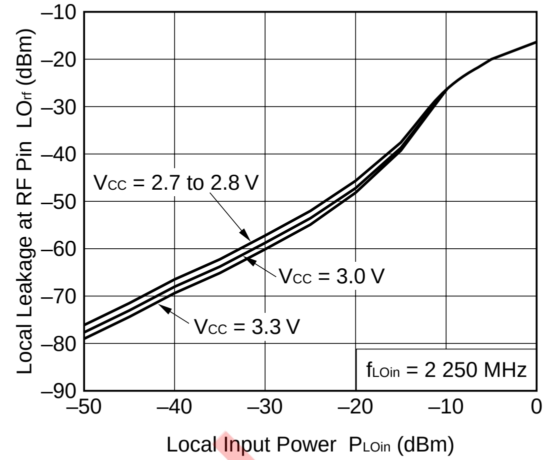

RF OUTPUT POWER OF EACH TONE, IM3 vs. IF INPUT POWER
RF Output Power of Each Tone PRFout(each) (dBm)
3rd Order Intermodulation Distortion IM3 (dBm)
IF Input Power PIFin (dBm)
TA = +25°C
VCC = 2.8 V
fIFin1 = 150 MHz
fIFin2 = 151 MHz
fLOin = 2 250 MHz
PLOin = –5 dBm


RF OUTPUT POWER OF EACH TONE, IM3 vs. IF INPUT POWER
RF Output Power of Each Tone PRFout(each) (dBm)
3rd Order Intermodulation Distortion IM3 (dBm)
IF Input Power PIFin (dBm)
TA = +85°C
VCC = 2.8 V
fIFin1 = 150 MHz
fIFin2 = 151 MHz
fLOin = 2 250 MHz
PLOin = –5 dBm

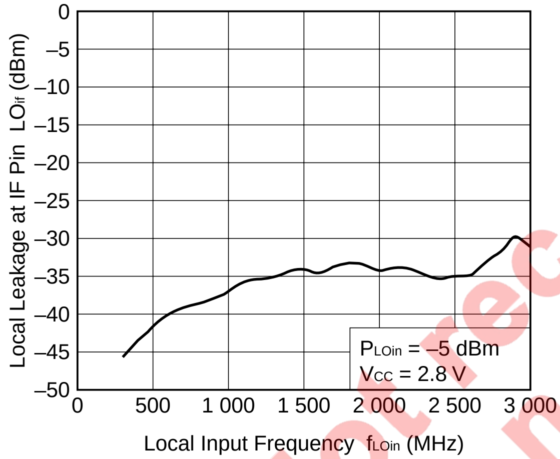
LOCAL LEAKAGE AT RF PIN vs.
LOCAL INPUT FREQUENCY



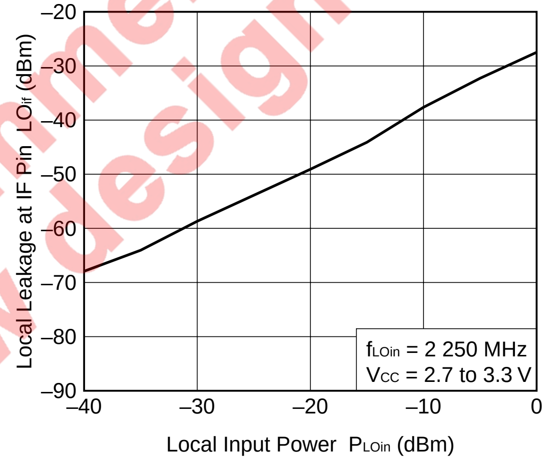
LOCAL LEAKAGE AT RF PIN vs.
LOCAL INPUT POWER



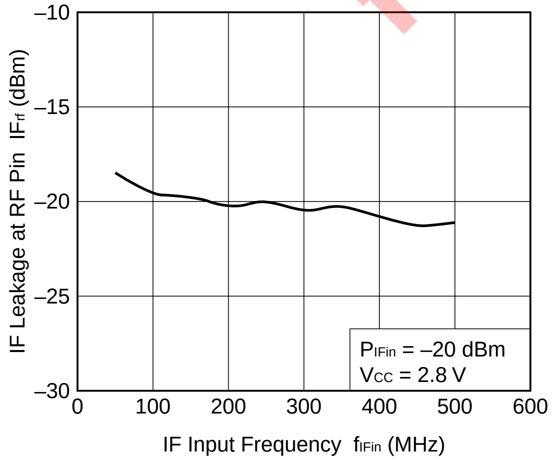
LOCAL LEAKAGE AT IF PIN vs.
LOCAL INPUT FREQUENCY



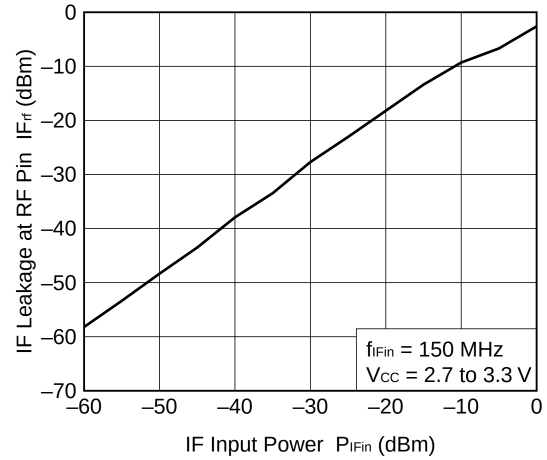
LOCAL LEAKAGE AT IF PIN vs.
LOCAL INPUT POWER



IF LEAKAGE AT RF PIN vs.
IF INPUT FREQUENCY

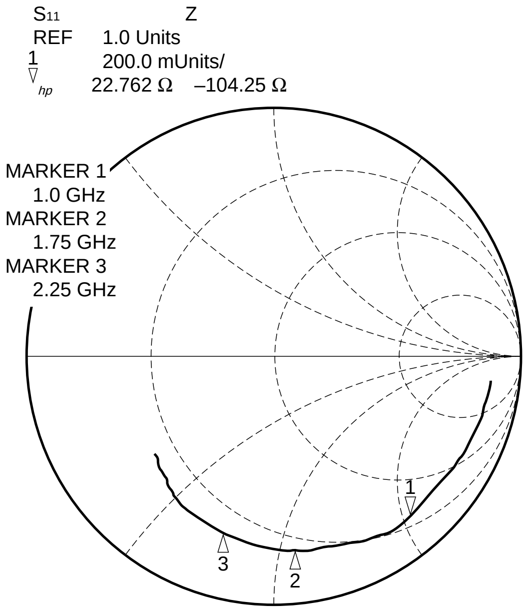


IF LEAKAGE AT RF PIN vs.
IF INPUT POWER



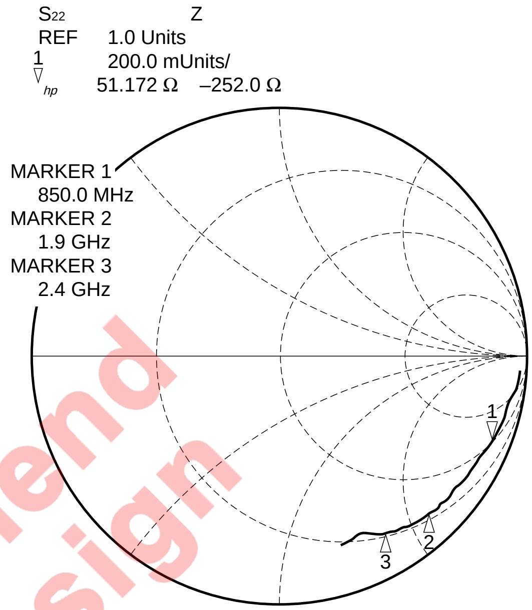
★ **12. S-PARAMETERS FOR EACH PORT (V_{CC} = V_{RFout} = 2.8 V)**
(The parameters are monitored at DUT pins)

LO port



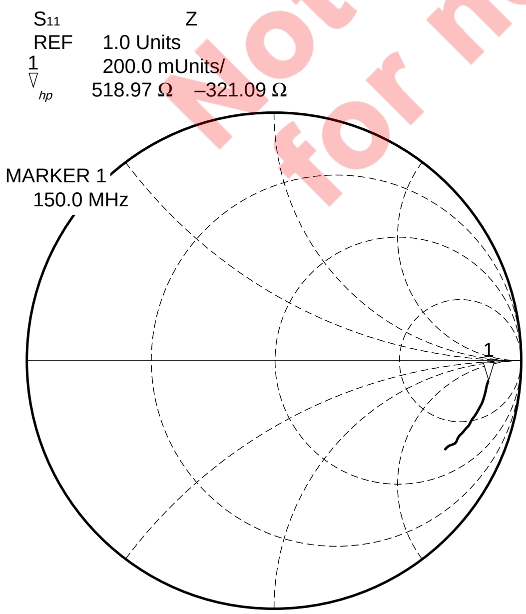
START 0.100000000 GHz
STOP 3.100000000 GHz

RF port (without matching)



START 0.100000000 GHz
STOP 3.100000000 GHz

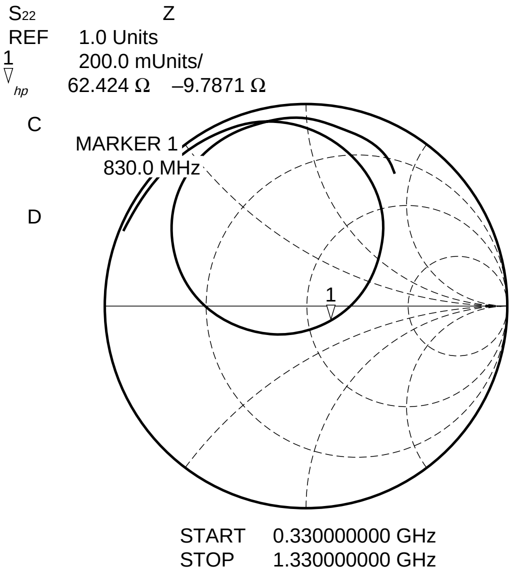
IF port



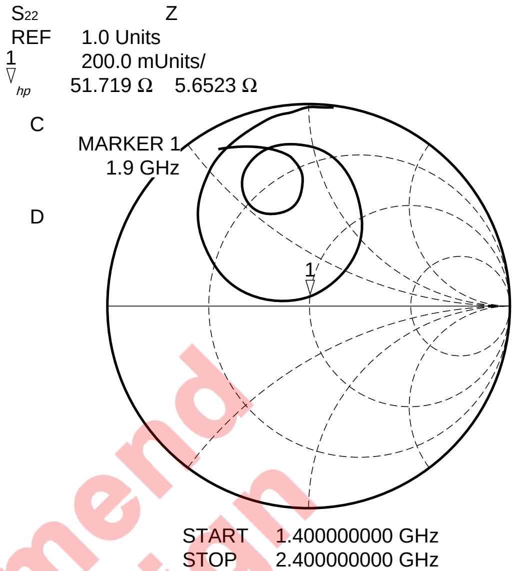
START 0.100000000 GHz
STOP 1.000000000 GHz

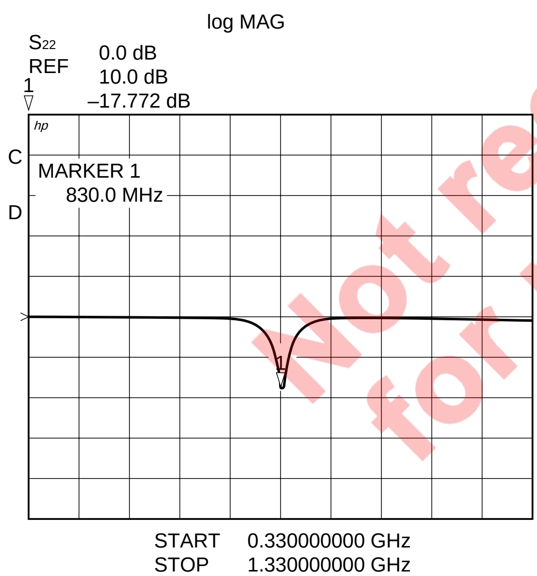
★ 13. S-PARAMETERS FOR MATCHED RF OUTPUT ($V_{CC} = V_{RFout} = 2.8$ V)
– ON EVALUATION BOARD – (S_{22} data are monitored at RF connector on board)

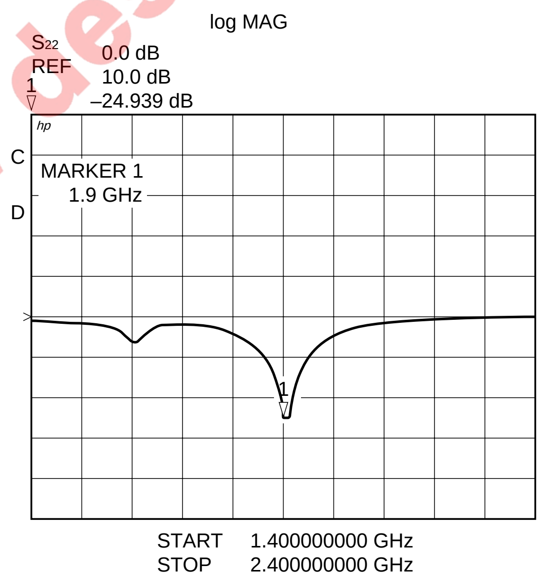
0.83 GHz (matched in test circuit 1)



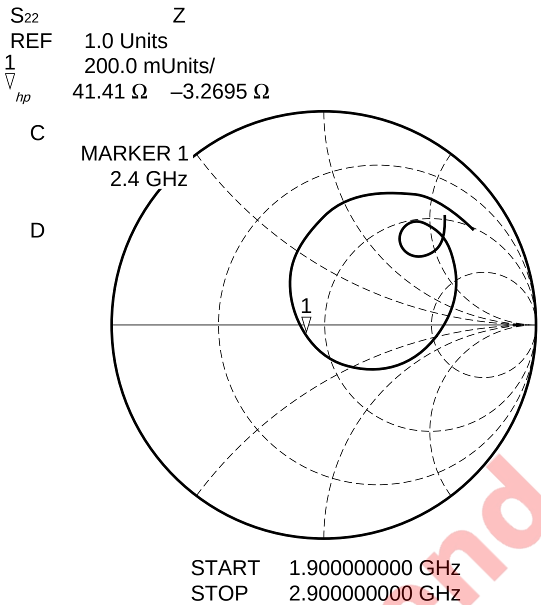
1.9 GHz (matched in test circuit 2)

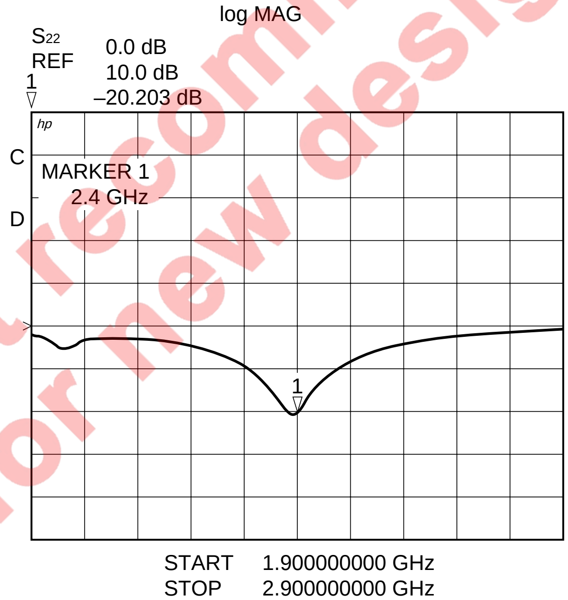






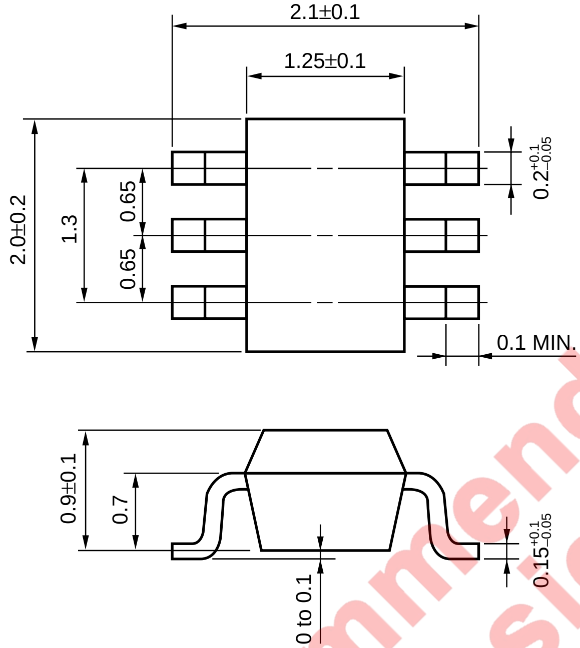
2.4 GHz (matched in test circuit 3)





14. PACKAGE DIMENSIONS

6-PIN SUPER MINIMOLD (UNIT: mm)



15. NOTE ON CORRECT USE

(1) Observe precautions for handling because of electrostatic sensitive devices.

(2) Form a ground pattern as wide as possible to minimize ground impedance (to prevent undesired oscillation).

(3) Connect a bypass capacitor to the V_{CC} pin.

(4) Connect a matching circuit to the RF 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 Conditions	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]	–

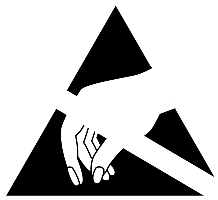
Note After opening the dry pack, keep it in a place below 25°C and 65% RH for the allowable storage period.

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)**.

[MEMO]

[MEMO]



ATTENTION

OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES