To our customers,

Old Company Name in Catalogs and Other Documents

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April 1st, 2010
Renesas Electronics Corporation

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RENESAS

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RENESAS

DATA SHEET

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC8240T6N

SiGe:C LOW NOISE AMPLIFIER FOR GPS

DESCRIPTION

The μPC8240T6N is a silicon germanium carbon (SiGe:C) monolithic integrated circuit designed as low noise amplifier for GPS. This device exhibits low noise figure and high power gain characteristics, so this IC can improve the sensitivity of GPS receiver. In addition, the μPC8240T6N which is included output matching circuit contributes to reduce external components and system size.

The package is a 6-pin plastic TSON (Thin Small Out-line Non-leaded) (T6N) suitable for surface mount.

This IC is manufactured using our UHS4 (Ultra High Speed Process) SiGe:C bipolar process.

FEATURES

- Supply voltage : V_{CC} = 1.6 to 3.3 V (2.7 V TYP.)
- Low noise : NF = 1.0 dB TYP. @ V_{CC} = 2.7 V, f_{in} = 1 575 MHz
  : NF = 1.0 dB TYP. @ V_{CC} = 1.8 V, f_{in} = 1 575 MHz
- High gain : G_P = 28 dB TYP. @ V_{CC} = 2.7 V, f_{in} = 1 575 MHz
  : G_P = 27 dB TYP. @ V_{CC} = 1.8 V, f_{in} = 1 575 MHz
- Low current consumption : I_{CC} = 6.5 mA TYP. @ V_{CC} = 2.7 V
- Built-in power-saving function : V_{PSon} = 1.0 V to V_{CC}, V_{PSoff} = 0 to 0.4 V
- High-density surface mounting : 6-pin plastic TSON (T6N) package (1.5 × 1.5 × 0.37 mm)
- Included output matching circuit
- Included very robust bandgap regulator (Small V_{CC} and T_A dependence)
- Included protection circuits for ESD

APPLICATION

- Low noise amplifier for GPS

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPC8240T6N-E2	μPC8240T6N-E2-A	6-pin plastic TSON (T6N) (Pb-Free)	C3T	• 8 mm wide embossed taping • Pin 1, 6 face the perforation side of the tape • Qty 3 kpcs/reel

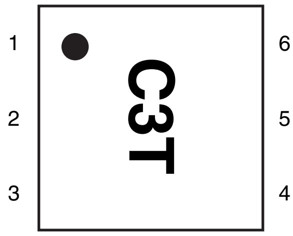
Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPC8240T6N

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

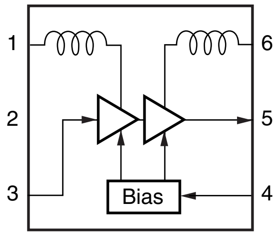
Document No. PU10735EJ01V0DS (1st edition)
Date Published October 2008 NS
Printed in Japan

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

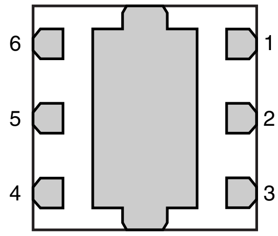
(Top View)



(Top View)



(Bottom View)



Pin No.	Pin Name
1	V_{CC}
2	GND
3	INPUT
4	Power Save
5	OUTPUT
6	V_{CC}

Remark Exposed pad : GND

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Ratings	Unit
Supply Voltage	V_{CC}	T_A = +25°C	4.0	V
Power-Saving Voltage	V_{PS}	T_A = +25°C	4.0	V
Total Power Dissipation	P_{tot}		150	mW
Operating Ambient Temperature	T_A		–40 to +85	°C
Storage Temperature	T_{stg}		–55 to +150	°C
Input Power	P_{in}		+10	dBm

RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	1.6	2.7	3.3	V
Operating Ambient Temperature	T_A	–40	+25	+85	°C
Power Save Turn-on Voltage	V_{PSon}	1.0	–	V_{CC}	V
Power Save Turn-off Voltage	V_{PSoff}	0	–	0.4	V

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{CC} = V_{PS} = 2.7 V, f_{in} = 1 575 MHz, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	No Signal (V_{PS} = 2.7 V)	4.5	6.5	9.0	mA
		At Power-Saving Mode (V_{PS} = 0 V)	–	–	1	μA
Power Gain	G_P	P_{in} = –35 dBm	24.5	28	31	dB
Noise Figure	NF		–	1.0	1.3	dB
Input Return Loss	RL_{in}		6.5	8.5	–	dB
Output Return Loss	RL_{out}		10	17	–	dB

STANDARD CHARACTERISTICS FOR REFERENCE 1

(T_A = +25°C, V_{CC} = V_{PS} = 2.7 V, f_{in} = 1 575 MHz, unless otherwise specified)

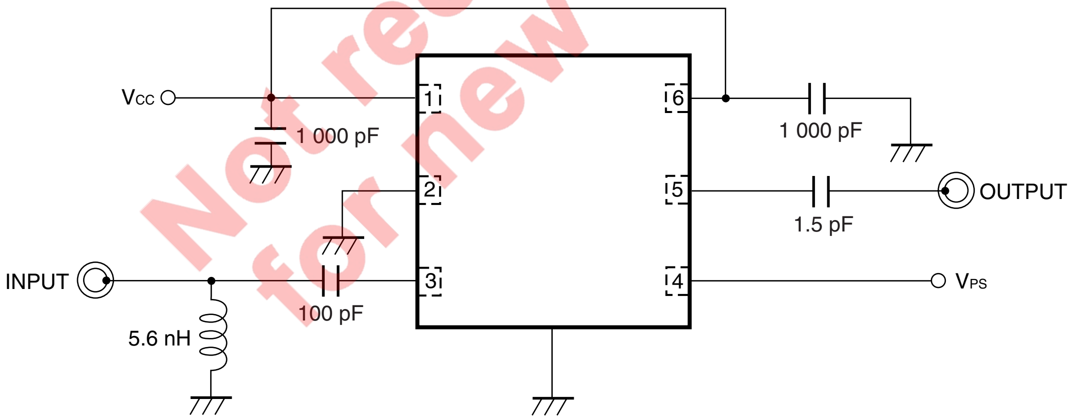
Parameter	Symbol	Test Conditions	Reference	Unit
Input 3rd Order Intercept Point	IIP_3	$f_{in}1$ = 1 575 MHz, $f_{in}2$ = 1 574 MHz	–21.5	dBm
Isolation	ISL		55	dB
Gain 1 dB Compression Input Power	$P_{in\ (1\ dB)}$		–22.5	dBm

STANDARD CHARACTERISTICS FOR REFERENCE 2

(T_A = +25°C, V_{CC} = V_{PS} = 1.8 V, f_{in} = 1 575 MHz, unless otherwise specified)

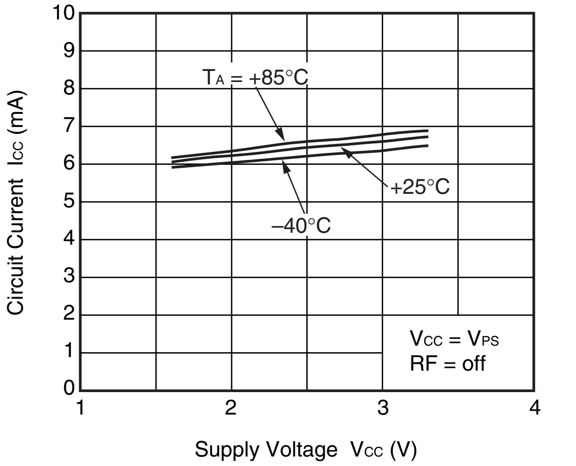
Parameter	Symbol	Test Conditions	Reference	Unit
Circuit Current	I_{CC}	No Signal (V_{PS} = 1.8 V)	6.2	mA
Power Gain	G_P	P_{in} = –35 dBm	27	dB
Noise Figure	NF		1.0	dB
Input Return Loss	RL_{in}		8.5	dB
Output Return Loss	RL_{out}		16.5	dB
Input 3rd Order Intercept Point	IIP_3	$f_{in}1$ = 1 575 MHz, $f_{in}2$ = 1 574 MHz	–21.5	dBm
Isolation	ISL		55	dB
Gain 1 dB Compression Input Power	$P_{in\ (1\ dB)}$		–26.5	dBm

TEST CIRCUIT

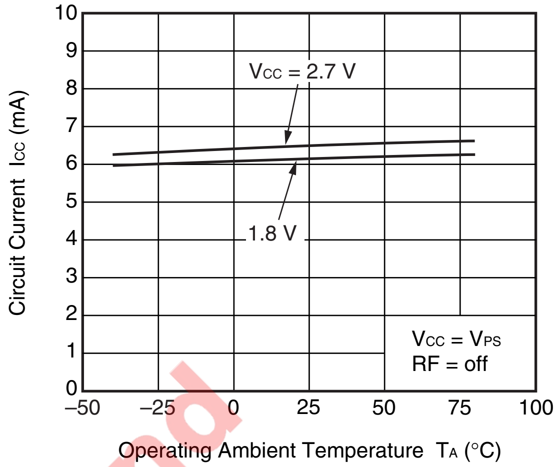


TYPICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

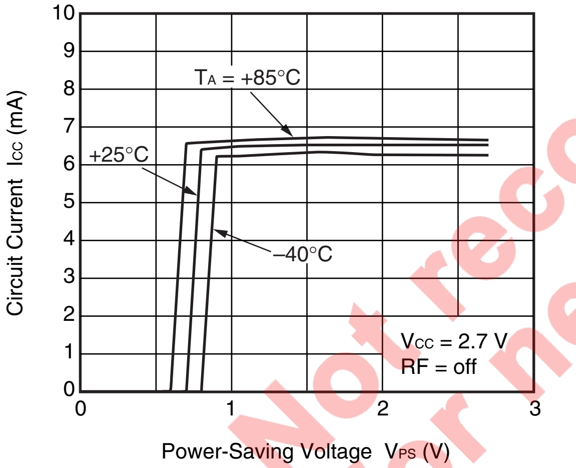
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



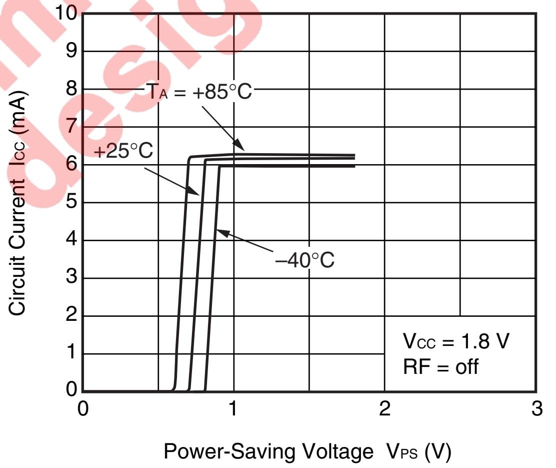
CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE



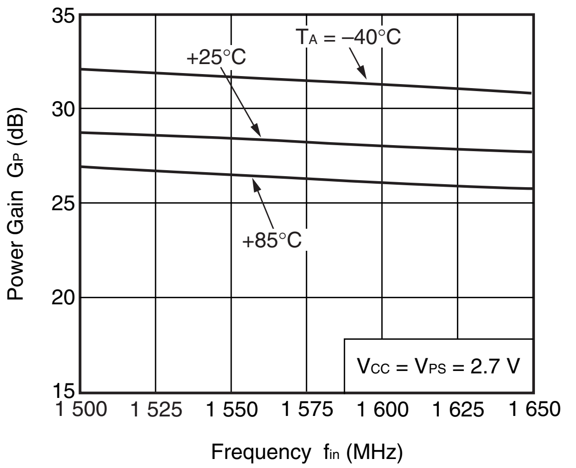
CIRCUIT CURRENT vs. POWER-SAVING VOLTAGE



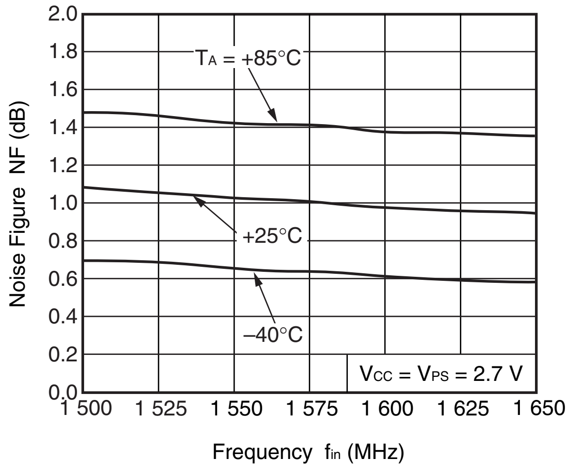
CIRCUIT CURRENT vs. POWER-SAVING VOLTAGE



POWER GAIN vs. FREQUENCY

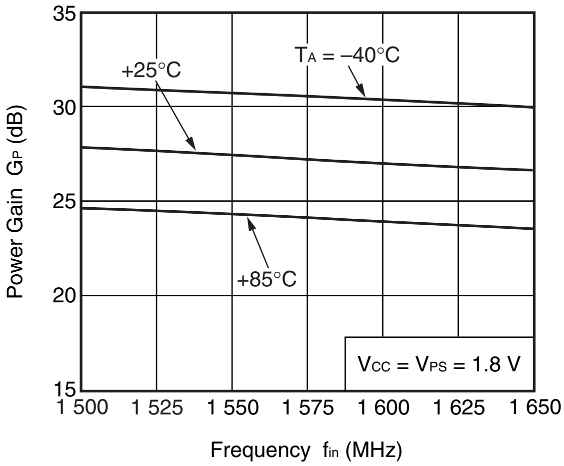


NOISE FIGURE vs. FREQUENCY

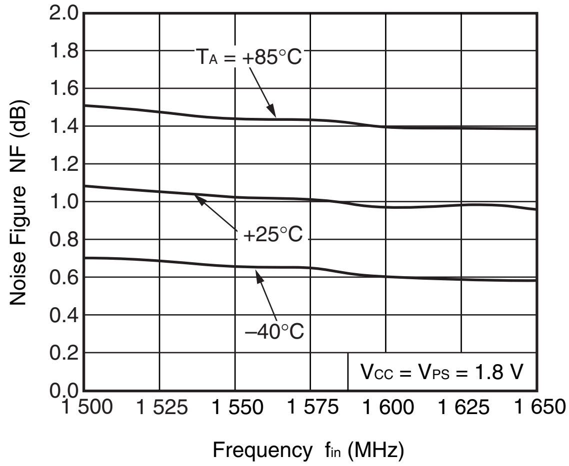


Remark The graphs indicate nominal characteristics.

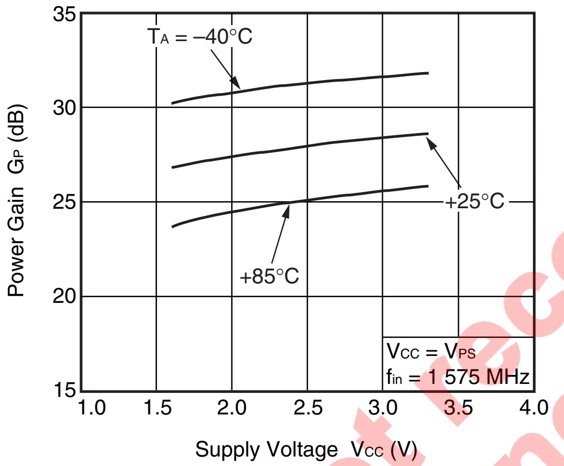
POWER GAIN vs. FREQUENCY



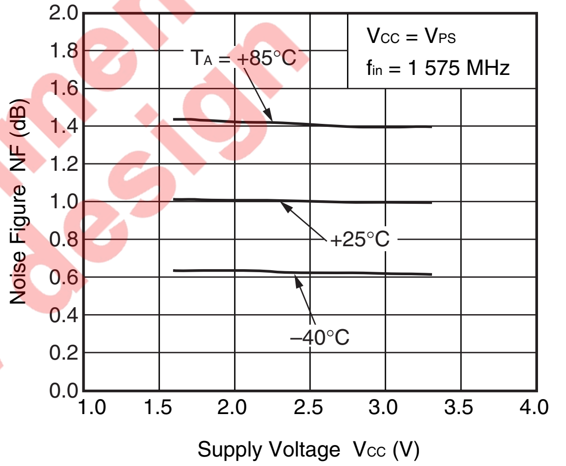
NOISE FIGURE vs. FREQUENCY



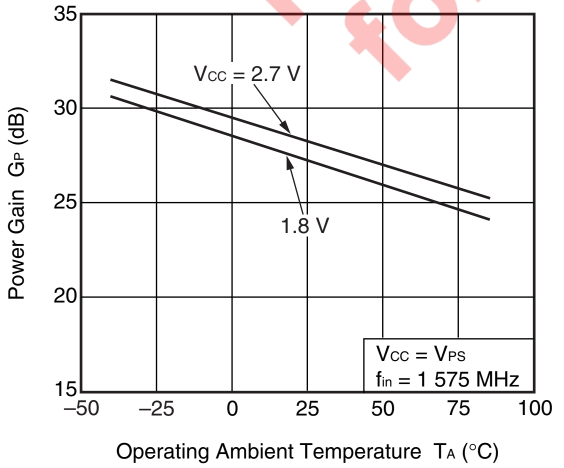
POWER GAIN vs. SUPPLY VOLTAGE



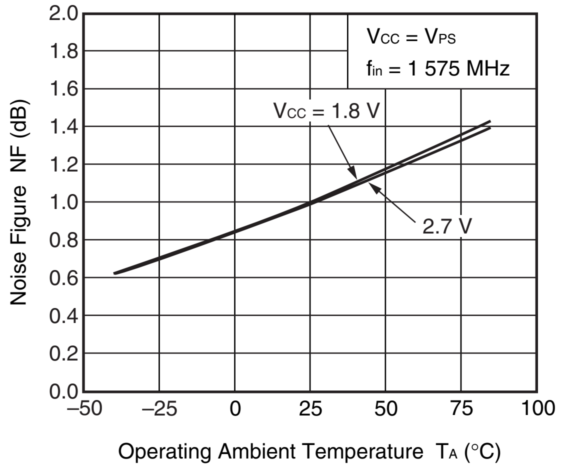
NOISE FIGURE vs. SUPPLY VOLTAGE



POWER GAIN vs. OPERATING AMBIENT TEMPERATURE

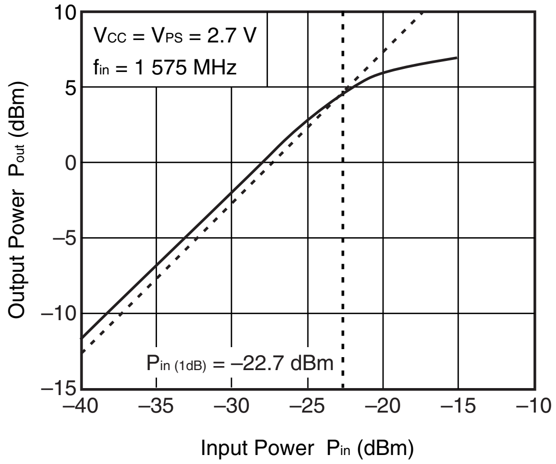


NOISE FIGURE vs. OPERATING AMBIENT TEMPERATURE

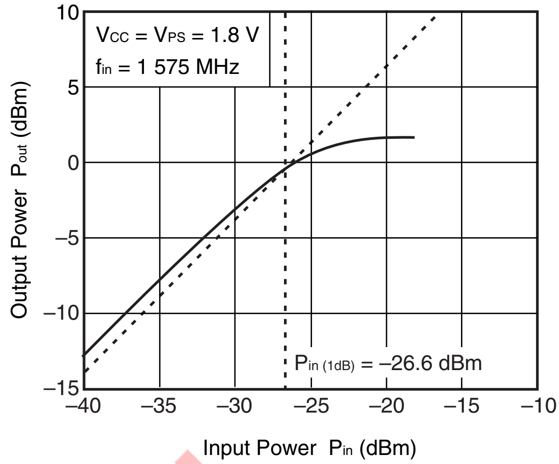


Remark The graphs indicate nominal characteristics.

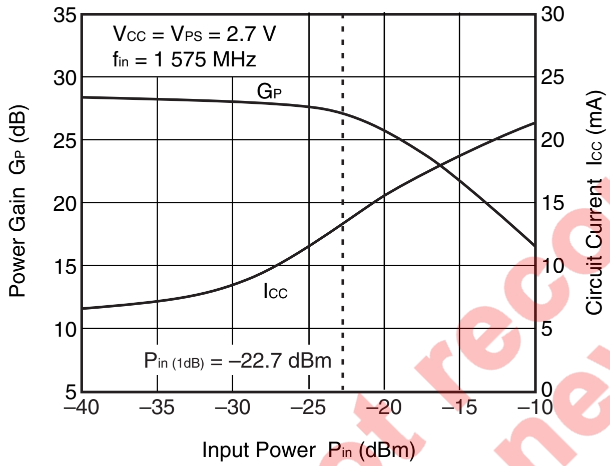
OUTPUT POWER vs. INPUT POWER



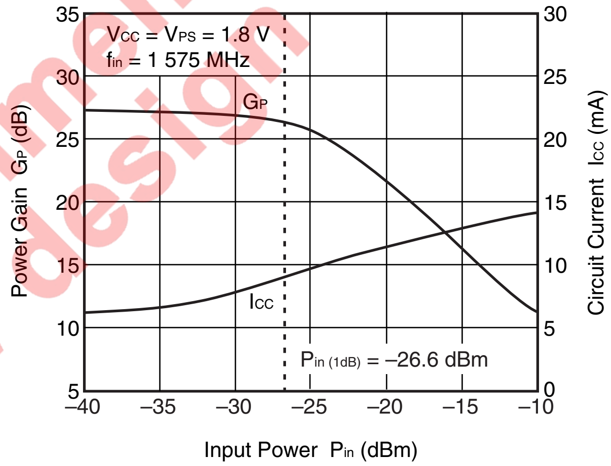
OUTPUT POWER vs. INPUT POWER



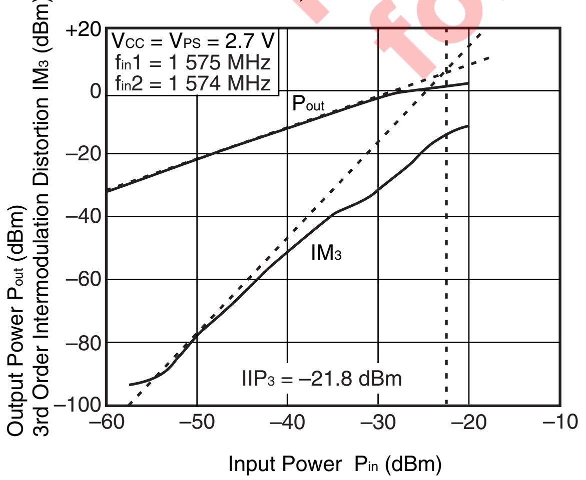
POWER GAIN, CIRCUIT CURRENT vs. INPUT POWER



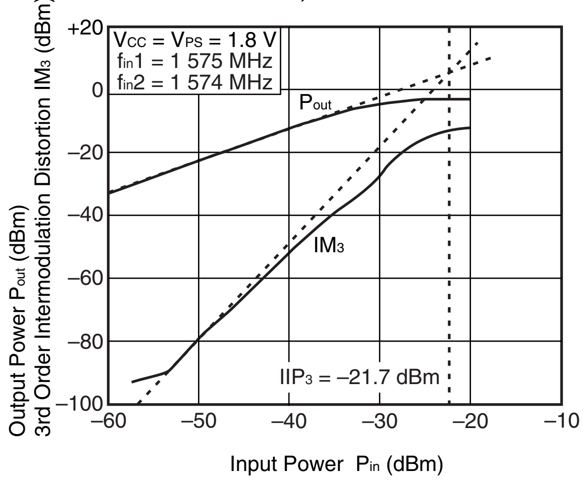
POWER GAIN, CIRCUIT CURRENT vs. INPUT POWER



OUTPUT POWER, IM3 vs. INPUT POWER

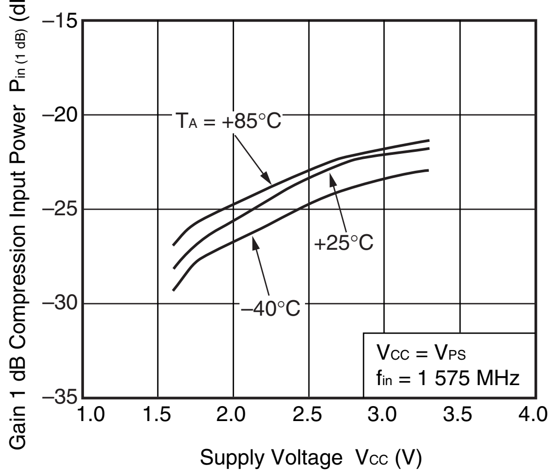


OUTPUT POWER, IM3 vs. INPUT POWER

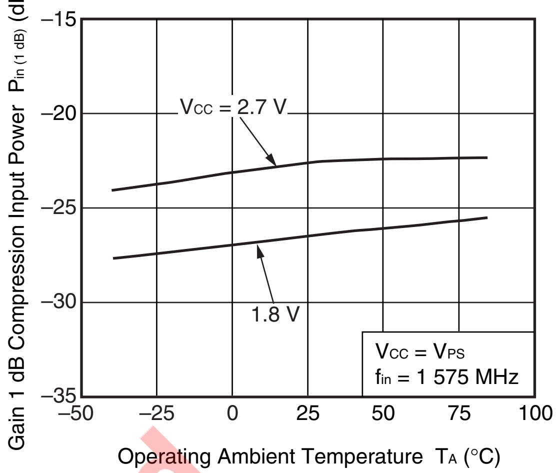


Remark The graphs indicate nominal characteristics.

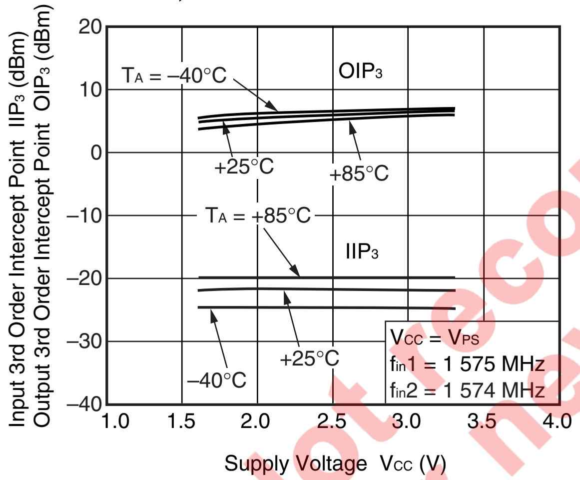
GAIN 1 dB COMPRESSION INPUT POWER vs. SUPPLY VOLTAGE



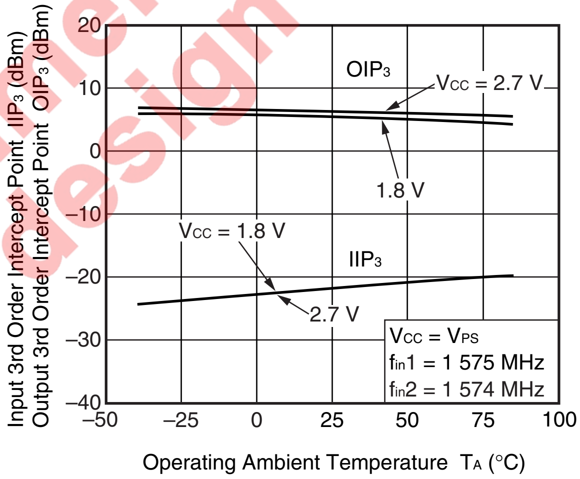
GAIN 1 dB COMPRESSION INPUT POWER vs. OPERATING AMBIENT TEMPERATURE



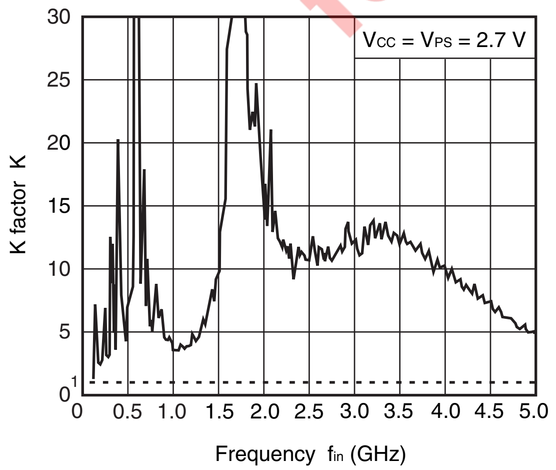
IIP3, OIP3 vs. SUPPLY VOLTAGE



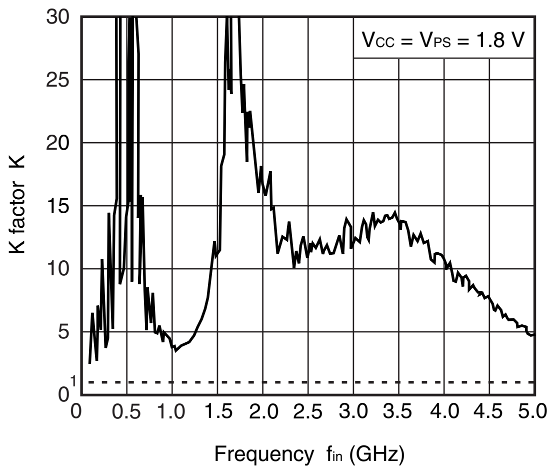
IIP3, OIP3 vs. OPERATING AMBIENT TEMPERATURE



K FACTOR vs. FREQUENCY



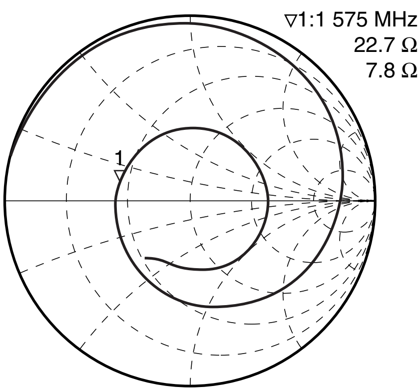
K FACTOR vs. FREQUENCY



Remark The graphs indicate nominal characteristics.

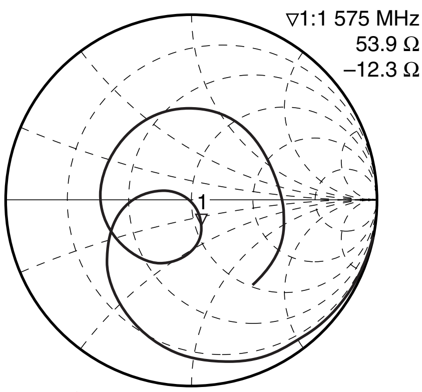
S-PARAMETERS (T_A = +25°C, V_{CC} = V_{PS} = 2.7 V, monitored at connector on board)

S_{11}–FREQUENCY



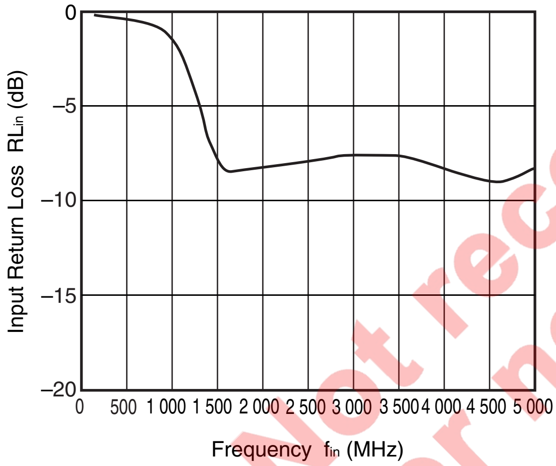
START 100.000 000 MHz STOP 5 000.000 000 MHz

S_{22}–FREQUENCY

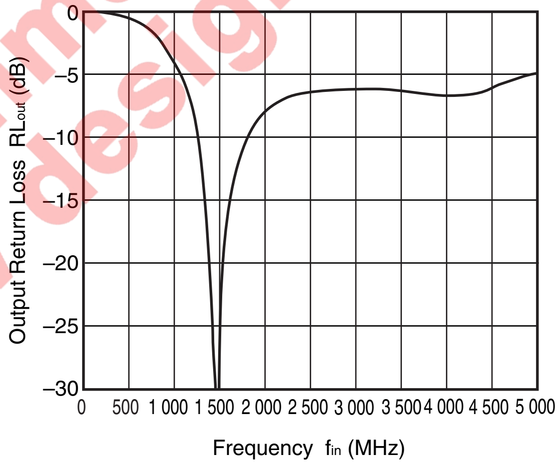


START 100.000 000 MHz STOP 5 000.000 000 MHz

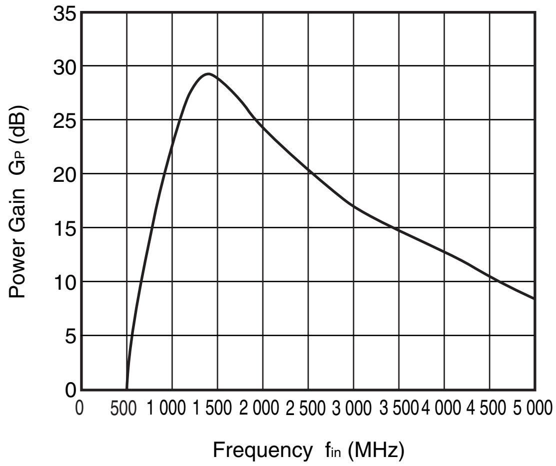
INPUT RETURN LOSS vs. FREQUENCY



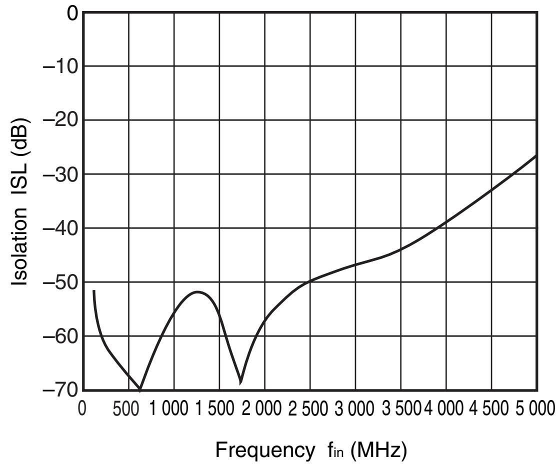
OUTPUT RETURN LOSS vs. FREQUENCY



POWER GAIN vs. FREQUENCY



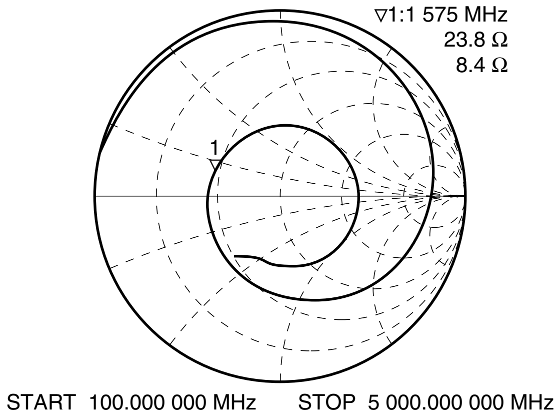
ISOLATION vs. FREQUENCY



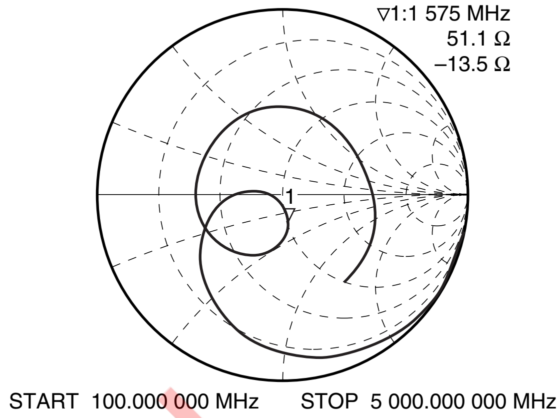
Remark The graphs indicate nominal characteristics.

S-PARAMETERS (T_A = +25°C, V_{CC} = V_{PS} = 1.8 V, monitored at connector on board)

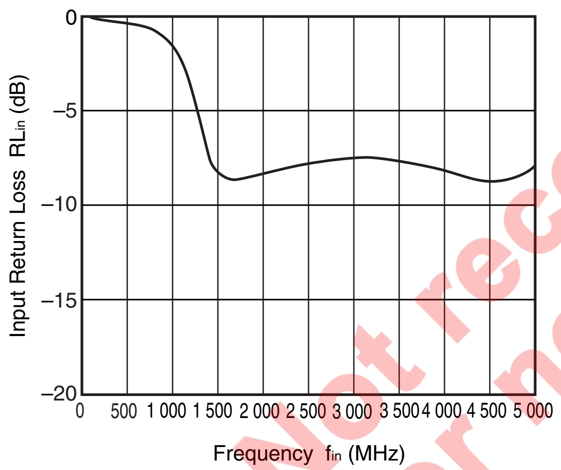
S11–FREQUENCY



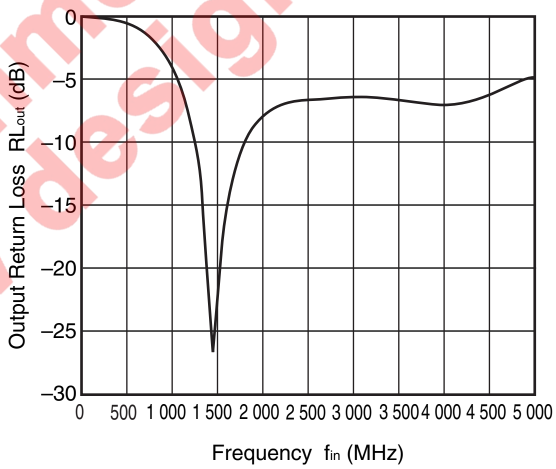
S22–FREQUENCY



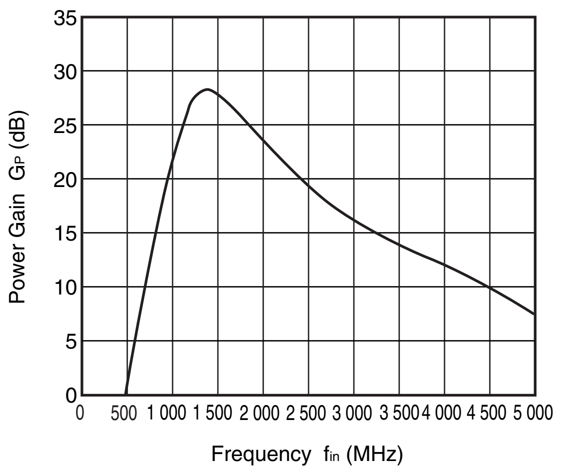
INPUT RETURN LOSS vs. FREQUENCY



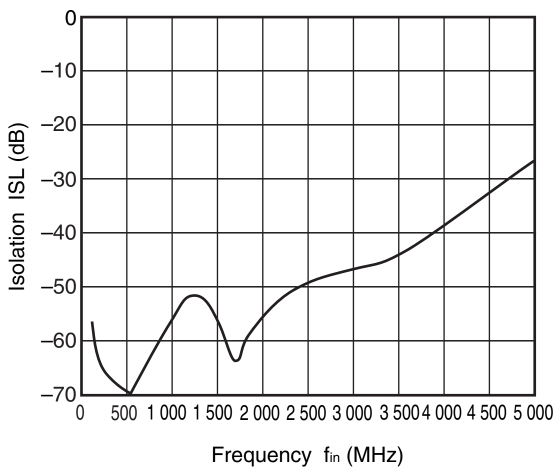
OUTPUT RETURN LOSS vs. FREQUENCY



POWER GAIN vs. FREQUENCY



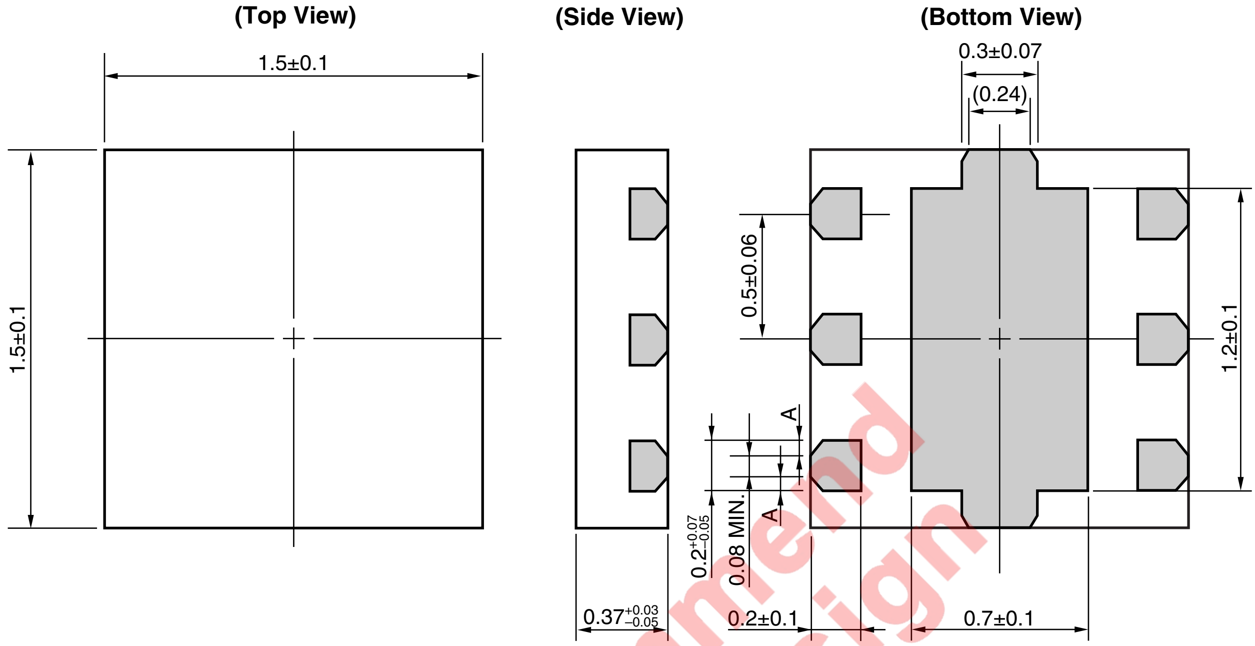
ISOLATION vs. FREQUENCY



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

6-PIN PLASTIC TSON (T6N) (UNIT: mm)



Remark A>0
( ) : Reference value

NOTES 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). All the ground terminals must be connected together with wide ground pattern to decrease impedance difference.
(3) The bypass capacitor should be attached to V_{CC} line.
(4) Do not supply DC voltage to INPUT pin.

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) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
Wave Soldering	Peak temperature (molten solder temperature) Time at peak temperature Preheating temperature (package surface temperature) Maximum number of flow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 120°C or below : 1 time : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (terminal temperature) Soldering time (per side of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350

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