

# Product Standards

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Package Code No.	SSMINI-5DC

Semiconductor Company  
Panasonic Corporation

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# AN26011A

## LNA-IC for 800MHz / 450MHz Band Applications

### ■ Overview

- AN26011A is LNA-IC for 800MHz / 450MHz Band Applications.
- Realizing high performance by using 0.18  $\mu\text{m}$  SiGeC Bi-CMOS process( $f_T = 90 \text{ GHz}$ ,  $f_{\text{max}} = 140 \text{ GHz}$ ).
- Sleep mode is available, controlled by integrated CMOS logic circuit.
- Achieving miniaturization by using small size package.

### ■ Features

- Low voltage operation      +2.80 V typ.
- High gain                      15.0 dB typ.  $f_{\text{RX}} = 881.5 \text{ MHz}$   
16.0 dB typ.  $f_{\text{RX}}=450 \text{ MHz}$
- Low noise figure            1.50 dB typ.  $f_{\text{RX}} = 881.5 \text{ MHz}$   
1.40 dB typ.  $f_{\text{RX}}=450 \text{ MHz}$
- Low distortion                +10.0 dBm typ.  $f_{\text{RX}} = 881.5 \text{ MHz}$   
+10.0 dBm typ.  $f_{\text{RX}}=450 \text{ MHz}$   
(IIP3 +10 MHz offset)
- Small package

### ■ Applications

- 800MHz Band Applications
- 450MHz Band Applications

### ■ Package

- 5 pin Plastic Small Surface Mount Package (SMINI Type)

### ■ Type

- Bi-CMOS IC

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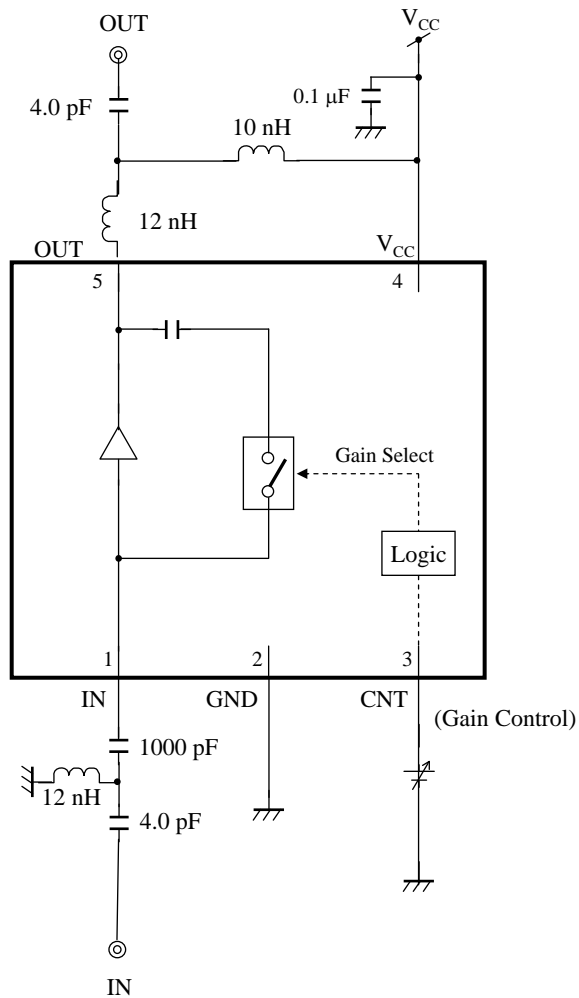
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## Application Circuit Example

- 800MHz Band Applications



Notes) • This application circuit is shown as an example but does not guarantee the design for mass production set.

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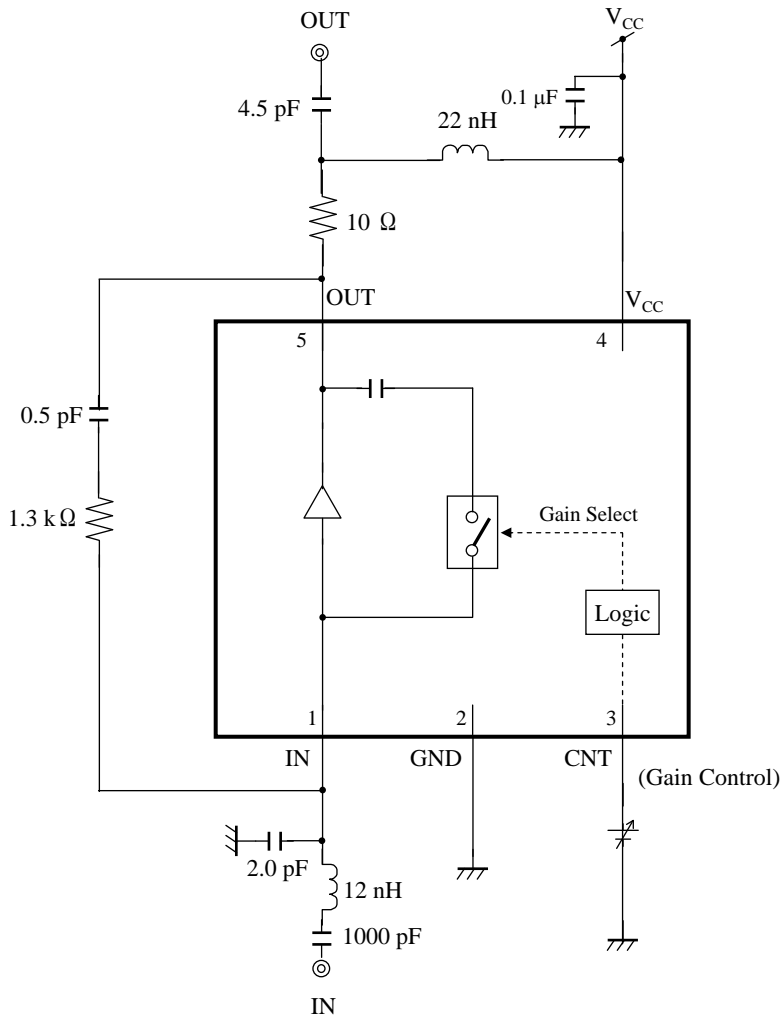
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## ■ Application Circuit Example (continued)

- 450MHz Band Applications



Notes) • This application circuit is shown as an example but does not guarantee the design for mass production set.

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■ Pin Descriptions

Pin No.	Pin name	Type	Description
1	IN	Input	RF Input
2	GND	Ground	GND
3	CNT	Input	High-Gain / Low-Gain SW
4	VCC	Power supply	V <sub>CC</sub>
5	OUT	Output	RF Output

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### ■ Absolute Maximum Ratings

Note) Absolute maximum ratings are limit values which are not destructed, and are not the values to which operation is guaranteed.

A No.	Parameter	Symbol	Rating	Unit	Notes
1	Supply voltage	$V_{CC}$	3.6	V	*1
2	Supply current	$I_{CC}$	18	mA	—
3	Power dissipation	$P_D$	64.8	mW	*2
4	Operating ambient temperature	$T_{opr}$	-20 to +70	°C	*3
5	Storage temperature	$T_{stg}$	-55 to +125	°C	*3

Notes) \*1 : The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

\*2 : The power dissipation shown is the value at  $T_a = 70^\circ\text{C}$  for the independent (unmounted) IC package without a heat sink.

When using this IC, refer to the  $P_D$ - $T_a$  diagram of the package standard and design the heat radiation with sufficient margin so that the allowable value might not be exceeded based on the conditions of power supply voltage, load, and ambient temperature.

\*3 : Except for the power dissipation, operating ambient temperature, and storage temperature, all ratings are for  $T_a = 25^\circ\text{C}$ .

### ■ Operating supply voltage range

Parameter	Symbol	Range	Unit	Notes
Supply voltage range	$V_{CC}$	2.65 to 2.95	V	*

Notes) \* : The values under the condition not exceeding the above absolute maximum ratings and the power dissipation

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## ■ Allowable Current and Voltage Range

- Notes)
- Allowable current and voltage ranges are limit ranges which are not destructed, and are not the ranges to which operation is guaranteed.
  - Voltage values, unless otherwise specified, are with respect to GND.
  - Do not apply external currents or voltages to any pin not specifically mentioned.
  - For the circuit currents, "+" denotes current flowing into the IC, and "-" denotes current flowing out of the IC.

Pin No.	Pin name	Rating	Unit	Notes
1	IN	—	V	*1
3	CNT	-0.3 to ( $V_{CC}+0.3$ )	V	*2
5	OUT	-0.3 to ( $V_{CC}+0.3$ )	V	*2

- Note)
- \*1 Do not apply more than 0 dBm to RF input  
RF signal input pin. Do not apply DC current.
  - \*2 ( $V_{CC} + 0.3$ ) V must not be exceeded 3.6 V

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## ■ Electrical Characteristics at $V_{CC} = 2.80\text{ V}$

Notes) All parameters are specified under  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$  unless otherwise specified.

B No.	Parameter	Symbol	Test Circuit	Conditions	Limits			Unit	Notes
					Min	Typ	Max		
DC electrical characteristics									
DC-1	Supply current (High Gain mode)	IccHS	1	$V_{CC}$ current at Active mode No input signal	—	11.5	14.5	mA	—
DC-2	Supply current (Low Gain mode)	IccLS	1	$V_{CC}$ current at Sleep mode No input signal	—	0	10	$\mu\text{A}$	—
DC-3	CNT current (High Gain mode)	IcntHS	1	CNT current at Active mode No input signal	—	5	35	$\mu\text{A}$	—
DC-4	CNT current (Low Gain mode)	IcntLS	1	CNT current at Sleep mode No input signal	—	0	10	$\mu\text{A}$	—
DC-5	CNT voltage (High Gain mode)	VIHS	1		2.52	—	3.1	V	—
DC-6	CNT voltage (Low Gain mode)	VILS	1		—	0	0.3	V	—

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## ■ Electrical Characteristics (continued) at $V_{CC} = 2.80\text{ V}$

Note) All parameters are specified under  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ ,  $f_{RXa} = 881.5\text{ MHz}$ ,  $PRXa = -30\text{ dBm}$ , CW unless otherwise specified.

B No.	Parameter	Symbol	Test Circuit	Conditions	Limits			Unit	Notes
					Min	Typ	Max		
LNA AC electrical characteristics ( High Gain Mode )									
A-1	Power Gain HG	GHS	1		13.0	15.0	17.0	dB	—
A-2	IIP3 +10 MHz offset	IIP3S	1	f1 = fRXa + 10 MHz f2 = fRXa + 20 MHz Input 2 signals (f1, f2)	6.0	10.0	—	dBm	—
LNA AC electrical characteristics ( Low Gain Mode )									
A-3	Power Gain LG	GLS	1	PRX a= - 20 dBm	-5.0	-3.0	-1.5	dB	—

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■ Electrical Characteristics (Reference values for design) at  $V_{CC} = 2.8\text{ V}$

Note) •All characteristics are specified under  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ ,  $f_{RXa} = 869\text{ MHz}$ ,  $881.5\text{ MHz}$ ,  $894\text{ MHz}$ ,  $PRXa = -30\text{ dBm}$ , CW

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection.

If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
LNA AC electrical characteristics ( High Gain Mode )									
B-1	Power Gain HG	GHa	1		13.0	15.0	17.0	dB	—
B-2	Noise Figure HG	NFHa	1		—	1.5	2.1	dB	※1
B-3	IIP3 +10 MHz offset HG	IIP3H1a	1	$f_1 = f_{RXa} + 10\text{ MHz}$ $f_2 = f_{RXa} + 20\text{ MHz}$ Input 2 signals ( $f_1, f_2$ )	6.0	10.0	—	dBm	—
B-4	IIP3 -10 MHz offset HG	IIP3H2a	1	$f_1 = f_{RXa} - 10\text{ MHz}$ $f_2 = f_{RXa} - 20\text{ MHz}$ Input 2 signals ( $f_1, f_2$ )	6.0	10.0	—	dBm	—
B-5	Input P1dB	IP1dBHa	1		-10.0	-6.0	—	dBm	—
B-6	Reverse Isolation HG	ISOHa	1		—	-22.0	-18	dB	—
B-7	Input Return Loss HG	S11Ha	1		5.5	7.5	—	dB	—
B-8	Output Return Loss HG	S22Ha	1		7.0	9.0	—	dB	—
LNA AC electrical characteristics ( Low Gain Mode )									
B-9	Power Gain LG	GLa	1	$PRXa = -20\text{ dBm}$	-5.0	-3.0	-1.5	dB	—
B-10	Noise Figure LG	NFLa	1		—	3.0	5.5	dB	—
B-11	IIP3 +10 MHz offset LG	IIP3L1a	1	$f_1 = f_{RXa} + 10\text{ MHz}$ $f_2 = f_{RXa} + 20\text{ MHz}$ $PRXa = -15\text{ dBm}$ Input 2 signals ( $f_1, f_2$ )	17.0	20.0	—	dBm	—
B-12	Reverse Isolation LG	ISOLa	1		-5.0	-3.0	-1.5	dB	—
B-13	Input Return Loss LG	S11La	1		7.0	9.0	—	dB	—
B-14	Output Return Loss LG	S22La	1		5.5	7.5	—	dB	—

Note) \*1 : Connector & substrate loss (0.1 dB) included.

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### ■ Electrical Characteristics (Reference values for design ; continued) at $V_{CC} = 2.8\text{ V}$

Note) •All characteristics are specified under  $T_a = -25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ,  $f_{RXa} = 869\text{ MHz}$ ,  $881.5\text{ MHz}$ ,  $894\text{ MHz}$ ,  $PRXa = -30\text{ dBm}$ , CW

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection.

If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
LNA AC electrical characteristics ( High Gain Mode )									
C-1	Power Gain HG	GHb	2		12.0	14.0	16.0	dB	—
C-2	Noise Figure HG	NFHb	2		—	1.4	2.0	dB	※1
C-3	IIP3 +10 MHz offset HG	IIP3H1b	2	$f_1 = f_{RXa} + 10\text{ MHz}$ $f_2 = f_{RXa} + 20\text{ MHz}$ Input 2 signals ( $f_1, f_2$ )	7.5	11.5	—	dBm	—
C-4	IIP3 -10 MHz offset HG	IIP3H2b	2	$f_1 = f_{RXa} - 10\text{ MHz}$ $f_2 = f_{RXa} - 20\text{ MHz}$ Input 2 signals ( $f_1, f_2$ )	7.5	11.5	—	dBm	—
C-5	Input P1dB	IP1dBHb	2		-9.0	-5.0	—	dBm	—
C-6	Reverse Isolation HG	ISOHb	2		—	-22.0	-18.0	dB	—
C-7	Input Return Loss HG	S11Hb	2		2.5	4.0	—	dB	—
C-8	Output Return Loss HG	S22Hb	2		5.5	7.5	—	dB	—
LNA AC electrical characteristics ( Low Gain Mode )									
C-9	Power Gain LG	GLb	2	$PRXa = -20\text{ dBm}$	-6.0	-4.0	-2.5	dB	—
C-10	Noise Figure LG	NFLb	2		—	4.0	6.5	dB	—
C-11	IIP3 +10 MHz offset LG	IIP3L1b	2	$f_1 = f_{RXa} + 10\text{ MHz}$ $f_2 = f_{RXa} + 20\text{ MHz}$ $PRXa = -15\text{ dBm}$ Input 2 signals ( $f_1, f_2$ )	17.0	20.0	—	dBm	—
C-12	Reverse Isolation LG	ISOLb	2		-6.0	-4.0	-2.5	dB	—
C-13	Input Return Loss LG	S11Lb	2		2.5	5.0	—	dB	—
C-14	Output Return Loss LG	S22Lb	2		2.5	5.0	—	dB	—

Note) \*1 : Connector & substrate loss (0.1 dB) included.

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■ Electrical Characteristics (Reference values for design ; continued) at  $V_{CC} = 2.8\text{ V}$

Note) •All characteristics are specified under  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ ,  $f_{RXb} = 440\text{ MHz}$ ,  $450\text{ MHz}$ ,  $460\text{ MHz}$ ,  $PRXb = -30\text{ dBm}$ , CW

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection.

If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
LNA AC electrical characteristics ( High Gain Mode )									
D-1	Power Gain HG	GHc	3		14.0	16.0	18.0	dB	—
D-2	Noise Figure HG	NFHc	3		—	1.4	2.1	dB	※1
D-3	IIP3 +10 MHz offset HG	IIP3H1c	3	$f_1 = f_{RXb} + 10\text{ MHz}$ $f_2 = f_{RXb} + 20\text{ MHz}$ Input 2 signals ( $f_1, f_2$ )	6.5	10.0	—	dBm	—
D-4	IIP3 -10 MHz offset HG	IIP3H2c	3	$f_1 = f_{RXb} - 10\text{ MHz}$ $f_2 = f_{RXb} - 20\text{ MHz}$ Input 2 signals ( $f_1, f_2$ )	6.5	10.0	—	dBm	—
D-5	Input P1dB	IP1dBHc	3		-11.0	-7.0	—	dBm	—
D-6	Reverse Isolation HG	ISOHc	3		—	-24.0	-20.0	dB	—
D-7	Input Return Loss HG	S11Hc	3		5.5	7.5	—	dB	—
D-8	Output Return Loss HG	S22Hc	3		5.0	7.5	—	dB	—
LNA AC electrical characteristics ( Low Gain Mode )									
D-9	Power Gain LG	GLc	3	$PRXb = -20\text{ dBm}$	-4.5	-3.0	-1.5	dB	—
D-10	Noise Figure LG	NFLc	3		—	3.0	5.0	dB	—
D-11	IIP3 +10 MHz offset LG	IIP3L1c	3	$f_1 = f_{RXa} + 10\text{ MHz}$ $f_2 = f_{RXa} + 20\text{ MHz}$ $PRXa = -10\text{ dBm}$ Input 2 signals ( $f_1, f_2$ )	22.0	25.0	—	dBm	—
D-12	Reverse Isolation LG	ISOLc	3		-4.5	-3.0	-1.5	dB	—
D-13	Input Return Loss LG	S11Lc	3		8.5	10.0	—	dB	—
D-14	Output Return Loss LG	S22Lc	3		12.0	15.0	—	dB	—

Note) \*1 : Connector & substrate loss (0.1 dB) included.

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■ Electrical Characteristics (Reference values for design ; continued) at  $V_{CC} = 2.65 \text{ V}$  to  $2.95 \text{ V}$

Note) •All characteristics are specified under  $T_a = -20^\circ\text{C}$  to  $70^\circ\text{C}$

- The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection.
- If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
DC electrical characteristics									
DCT-1	Supply current (High Gain mode)	IccHT	1	$V_{CC}$ current at Active mode No input signal	—	11.5	15.5	mA	—
DCT-2	Supply current (Low Gain mode)	IccLT	1	$V_{CC}$ current at Sleep mode No input signal	—	0	20	$\mu\text{A}$	—
DCT-3	CNT current (High Gain mode)	IcntHT	1	CNT current at Active mode No input signal	—	5	45	$\mu\text{A}$	—
DCT-4	CNT current (Low Gain mode)	IcntLT	1	CNT current at Sleep mode No input signal	—	0	20	$\mu\text{A}$	—

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■ Electrical Characteristics (Reference values for design ; continued) at  $V_{CC} = 2.65\text{ V to }2.95\text{ V}$

Note) •All characteristics are specified under  $T_a = -20^\circ\text{C to }70^\circ\text{C}$ ,  $f_{RXa} = 869\text{ MHz, }881.5\text{ MHz, }894\text{ MHz}$ ,  $PRXa = -30\text{ dBm, CW}$

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection.

If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
LNA AC electrical characteristics ( High Gain Mode )									
E-1	Power Gain HG	GHTa	1		12.0	15.0	18.0	dB	—
E-2	Noise Figure HG	NFHTa	1		—	1.5	2.4	dB	※1
E-3	IIP3 +10 MHz offset HG	IIP3H1Ta	1	$f1 = f_{RXa} + 10\text{ MHz}$ $f2 = f_{RXa} + 20\text{ MHz}$ Input 2 signals (f1, f2)	5.0	10.0	—	dBm	—
E-4	IIP3 -10 MHz offset HG	IIP3H2Ta	1	$f1 = f_{RXa} - 10\text{ MHz}$ $f2 = f_{RXa} - 20\text{ MHz}$ Input 2 signals (f1, f2)	5.0	10.0	—	dBm	—
E-5	Input P1dB	IP1dBHTa	1		-15.0	-6.0	—	dBm	—
LNA AC electrical characteristics ( Low Gain Mode )									
E-6	Power Gain LG	GLTa	1	$PRXa = -20\text{ dBm}$	-5.5	-3.0	-1.0	dB	—
E-7	Noise Figure LG	NFLTa	1		—	3.0	7.0	dB	—
E-8	IIP3 +10 MHz offset LG	IIP3LT1a	1	$f1 = f_{RXa} + 10\text{ MHz}$ $f2 = f_{RXa} + 20\text{ MHz}$ $PRXa = -15\text{ dBm}$ Input 2 signals (f1, f2)	15.0	20.0	—	dBm	—

Note) \*1 : Connector & substrate loss (0.1 dB) included.

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■ Electrical Characteristics (Reference values for design ; continued) at  $V_{CC} = 2.65\text{ V to }2.95\text{ V}$

Note) •All characteristics are specified under  $T_a = -20^\circ\text{C to }70^\circ\text{C}$ ,  $f_{RXa} = 869\text{ MHz, }881.5\text{ MHz, }894\text{ MHz}$ ,  $PRXa = -30\text{ dBm, CW}$

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection.

If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
LNA AC electrical characteristics ( High Gain Mode )									
F-1	Power Gain HG	GHTb	2		11.0	14.0	17.0	dB	—
F-2	Noise Figure HG	NFHTb	2		—	1.4	2.3	dB	※1
F-3	IIP3 +10 MHz offset HG	IIP3H1Tb	2	High-Gain mode $f_1 = f_{RXa} + 10\text{ MHz}$ $f_2 = f_{RXa} + 20\text{ MHz}$ Input 2 signals ( $f_1, f_2$ )	6.5	11.5	—	dBm	—
F-4	IIP3 -10 MHz offset HG	IIP3H2Tb	2	High-Gain mode $f_1 = f_{RXa} - 10\text{ MHz}$ $f_2 = f_{RXa} - 20\text{ MHz}$ Input 2 signals ( $f_1, f_2$ )	6.5	11.5	—	dBm	—
F-5	Input P1dB	IP1dBHTb	2		-14.0	-5.0	—	dBm	—
LNA AC electrical characteristics ( Low Gain Mode )									
F-6	Power Gain LG	GLTb	2	$PRXa = -20\text{ dBm}$	-6.5	-4.0	-2.0	dB	—
F-7	Noise Figure LG	NFLTb	2		—	4.0	8.0	dB	—
F-8	IIP3 +10 MHz offset LG	IIP3LT1b	2	$f_1 = f_{RXa} + 10\text{ MHz}$ $f_2 = f_{RXa} + 20\text{ MHz}$ $PRXa = -15\text{ dBm}$ Input 2 signals ( $f_1, f_2$ )	15.0	20.0	—	dBm	—

Note) \*1 : Connector & substrate loss (0.1 dB) included.

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■ Electrical Characteristics (Reference values for design ; continued) at  $V_{CC} = 2.65\text{ V to }2.95\text{ V}$

Note) •All characteristics are specified under  $T_a = -20^\circ\text{C to }70^\circ\text{C}$ ,  $f_{RXb} = 440\text{ MHz, }450\text{ MHz, }460\text{ MHz}$ ,  $PRXc = -30\text{ dBm}$ , CW

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection.

If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
LNA AC electrical characteristics ( High Gain Mode )									
G-1	Power Gain HG	GHTc	3		13.0	16.0	19.0	dB	—
G-2	Noise Figure HG	NFHTc	3		—	1.4	2.4	dB	※1
G-3	IIP3 +10 MHz offset HG	IIP3H1Tc	3	$f1 = f_{RXb} + 10\text{ MHz}$ $f2 = f_{RXb} + 20\text{ MHz}$ Input 2 signals (f1, f2)	5.0	10.0	—	dBm	—
G-4	IIP3 -10 MHz offset HG	IIP3H2Tc	3	$f1 = f_{RXb} - 10\text{ MHz}$ $f2 = f_{RXb} - 20\text{ MHz}$ Input 2 signals (f1, f2)	5.0	10.0	—	dBm	—
G-5	Input P1dB	IP1dBHTc	3		-16.0	-7.0	—	dBm	—
LNA AC electrical characteristics ( Low Gain Mode )									
G-6	Power Gain LG	GLTc	3	$PRXb = -20\text{ dBm}$	-5.0	-3.0	-1.0	dB	—
G-7	Noise Figure LG	NFLTc	3		—	3.0	6.5	dB	—
G-8	IIP3 +10 MHz offset LG	IIP3LT1c	3	$f1 = f_{RXa} + 10\text{ MHz}$ $f2 = f_{RXa} + 20\text{ MHz}$ $PRXa = -10\text{ dBm}$ Input 2 signals (f1, f2)	20.0	25.0	—	dBm	—

Note) \*1 : Connector & substrate loss (0.1 dB) included.

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■ Control Pins Mode Table

Note) Control voltage range : See B No. DC-5 / B No. DC-6 at page 9

Pin No.	Description	Pin voltage		Remarks
		Low	High	
3	Gain control	Low gain	High gain	—

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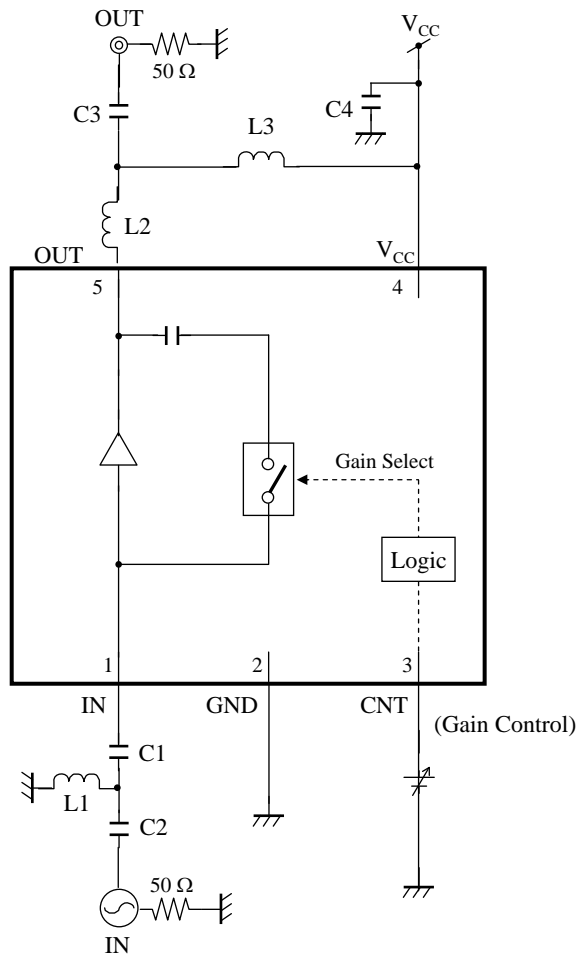
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## ■ Test Circuit Diagram

Note) External components : See page 22

### • Test Circuit 1



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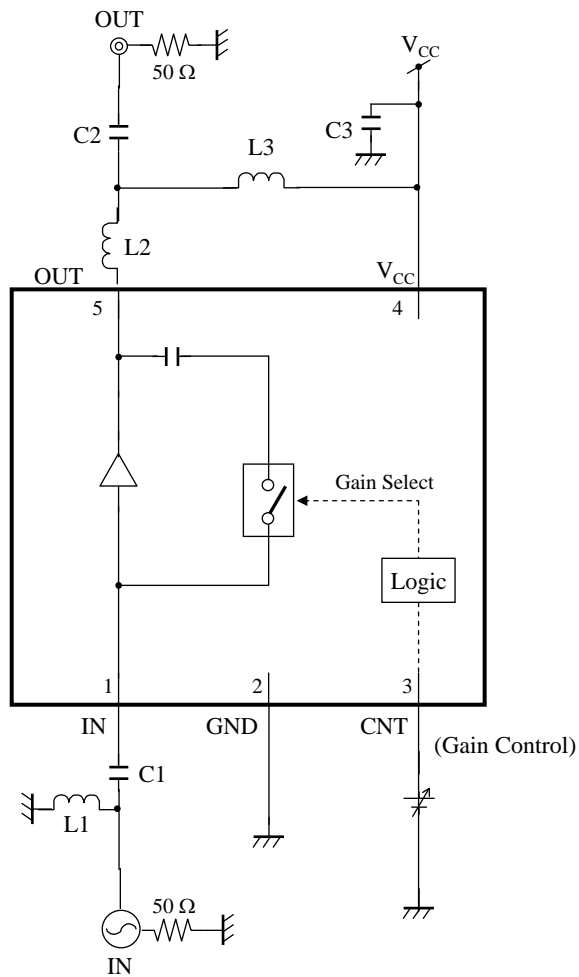
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## ■ Test Circuit Diagram (continued)

Note) External components : See page 22

### • Test Circuit 2



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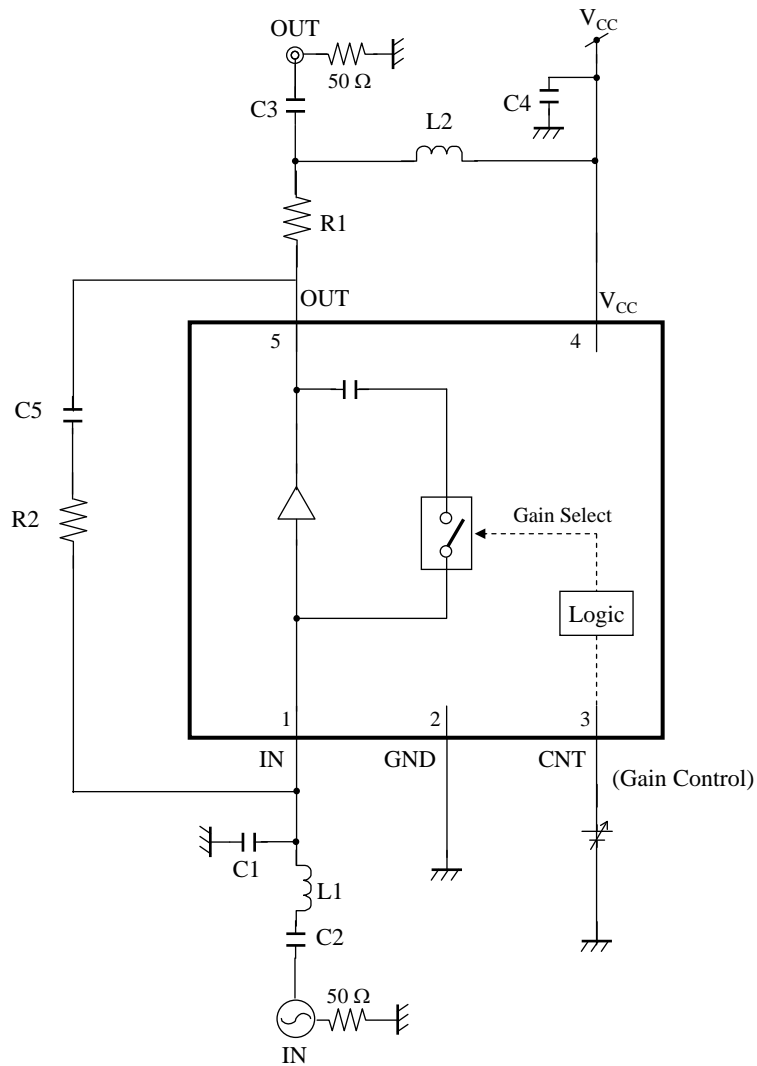
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## ■ Test Circuit Diagram (continued)

Note) External components : See page 22

### • Test Circuit 3



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## ■ Test Circuit Diagram (continued)

### •External Components (for Test Circuit 1)

Components	Size	Value	Part Number	Vendor
L1	0603	12 nH	LQPT03TN12NH04	Murata
L2	0603	12 nH	LQPT03TN12NH04	Murata
L3	0603	10 nH	LQPT03TN10NH04	Murata
C1	0603	1000 pF	GRM033B11C102KD01	Murata
C2	0603	4.0 pF	GJM0332C1E4R0BB01D	Murata
C3	0603	4.0 pF	GJM0332C1E4R0BB01D	Murata
C4	0603	0.1 $\mu$ F	GRM033B30J104KE18	Murata

### •External Components (for Test Circuit 2)

Components	Size	Value	Part Number	Vendor
L1	0603	56 nH	LQP03T56NJ04	Murata
L2	0603	12 nH	LQPT03TN12NH04	Murata
L3	0603	10 nH	LQPT03TN10NH04	Murata
C1	0603	1000 pF	GRM033B11C102KD01	Murata
C2	0603	4.0 pF	GJM0332C1E4R0BB01D	Murata
C3	0603	0.1 $\mu$ F	GRM033B30J104KE18	Murata

### •External Components (for Test Circuit 3)

Components	Size	Value	Part Number	Vendor
L1	0603	12 nH	LQPT03TN12NH04	Murata
L2	0603	22 nH	LQP03T22NH04	Murata
R1	1005	10 $\Omega$	ERJ2GEJ100X	Panasonic
R2	1005	1.3 k $\Omega$	ERJ2GEJ132X	Panasonic
C1	0603	2.0 pF	GJM0334C1E2R0BB01	Murata
C2	0603	1000 pF	GRM033B11C102KD01	Murata
C3	0603	4.5 pF	GJM0332C1E4R5BB01D	Murata
C4	0603	0.1 $\mu$ F	GRM033B30J104KE18	Murata
C5	1005	0.5 pF	ECJ0EC1H0R5C	Panasonic

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## ■ Technical Data

- I/O block circuit diagrams and pin function descriptions

Pin No.	Voltage	Internal Circuit	Impedance	Descriptions
1	0.85 V		—	LNA input
2	0.0 V	—	—	GND
3	—		Z : 3600 kΩ	Sleep mode SW input.
4	2.80 V		—	Voltage supply
5	—		—	LNA output

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### ■ Usage Notes

#### • Special attention and precaution in using

1. This IC is intended to be used for general electronic equipment [880 MHz / 450 MHz Band Applications].  
Consult our sales staff in advance for information on the following applications:
  - Special applications in which exceptional quality and reliability are required, or if the failure or malfunction of this IC may directly jeopardize life or harm the human body.
  - Any applications other than the standard applications intended.
    - (1) Space appliance (such as artificial satellite, and rocket)
    - (2) Traffic control equipment (such as for automobile, airplane, train, and ship)
    - (3) Medical equipment for life support
    - (4) Submarine transponder
    - (5) Control equipment for power plant
    - (6) Disaster prevention and security device
    - (7) Weapon
    - (8) Others : Applications of which reliability equivalent to (1) to (7) is required
2. Pay attention to the direction of LSI. When mounting it in the wrong direction onto the PCB (printed-circuit-board), it might smoke or ignite.
3. Pay attention in the PCB (printed-circuit-board) pattern layout in order to prevent damage due to short circuit between pins. In addition, refer to the Pin Description for the pin configuration.
4. Perform a visual inspection on the PCB before applying power, otherwise damage might happen due to problems such as a solder-bridge between the pins of the semiconductor device. Also, perform a full technical verification on the assembly quality, because the same damage possibly can happen due to conductive substances, such as solder ball, that adhere to the LSI during transportation.
5. Take notice in the use of this product that it might break or occasionally smoke when an abnormal state occurs such as output pin- $V_{CC}$  short (Power supply fault), output pin-GND short (Ground fault), or output-to-output-pin short (load short) .  
And, safety measures such as an installation of fuses are recommended because the extent of the above-mentioned damage and smoke emission will depend on the current capability of the power supply.
6. When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.  
Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.
7. When using the LSI for new models, verify the safety including the long-term reliability for each product.
8. When the application system is designed by using this LSI, be sure to confirm notes in this book.  
Be sure to read the notes to descriptions and the usage notes in the book.

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