DATA SHEET

Part No.	AN26011A
Package Code No.	SSMINI-5DC

Contents

AN26011A

LNA-IC for 800 MHz / 450 MHz Band Applications

■ Overview

- AN26011A is LNA-IC for 800 MHz / 450 MHz Band Applications.
- Realizing high performance by using 0.18 µm SiGeC Bi-CMOS process (f_T = 90 GHz, f_{max} = 140 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. fRX = 881.5 MHz
  16.0 dB typ. fRX= 450 MHz
- Low noise figure 1.50 dB typ. fRX = 881.5 MHz
  1.40 dB typ. fRX= 450 MHz
- Low distortion +10.0 dBm typ.fRX = 881.5 MHz
  +10.0 dBm typ. fRX= 450 MHz
  (IIP3 +10 MHz offset)
- Small package

■ Applications

- 800MHz Band Applications
- 450MHz Band Applications

■ Package

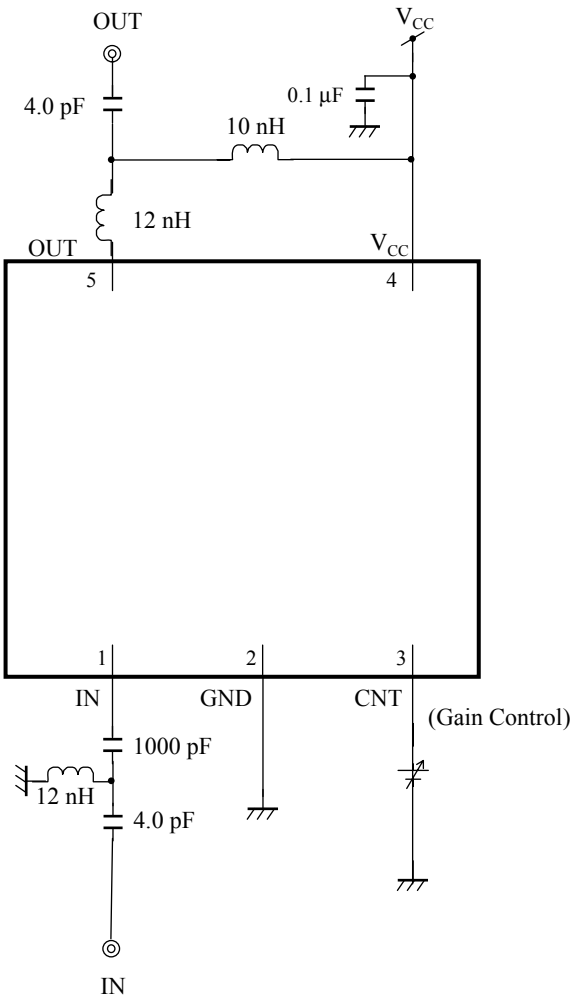
- 5 pin Plastic Small Surface Mount Package (SMINI Type)

■ Type

- Bi-CMOS IC

■ Application Circuit Example

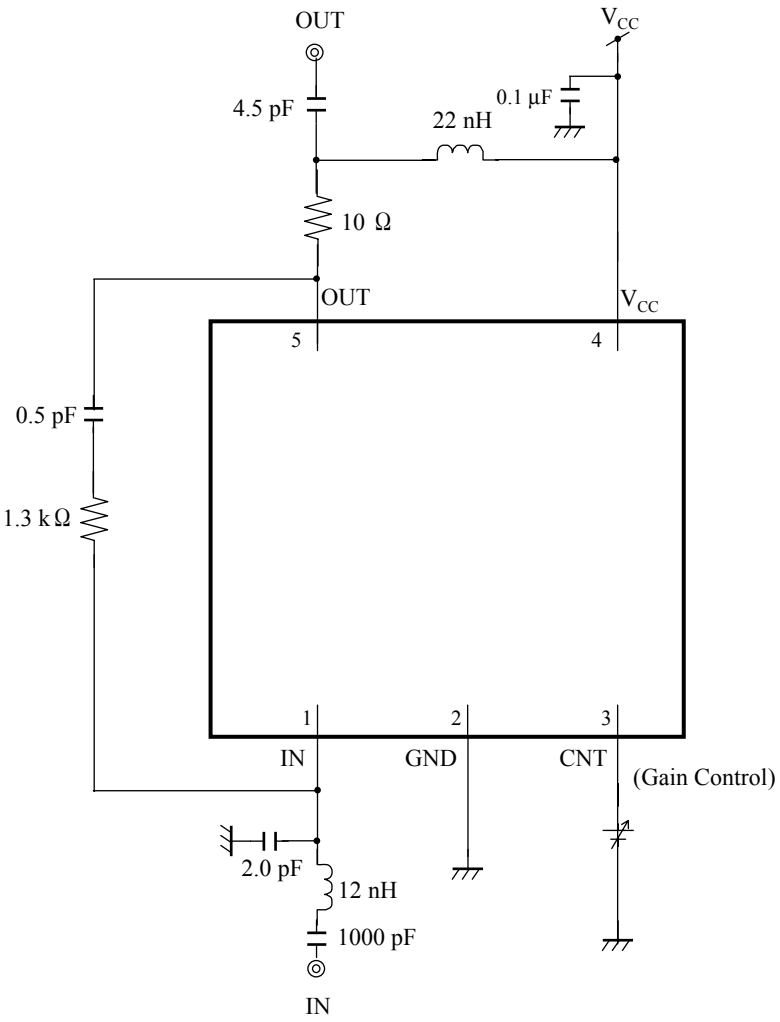
- 800 MHz Band Applications



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

■ Application Circuit Example (continued)

• 450 MHz Band Applications



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

■ 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_{CC}
5	OUT	Output	RF Output

■ 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°C for the independent (unmounted) IC package without a heat sink. When using this IC, refer to • P_D-T_a diagram in the ■ Technical Data 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°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

■ 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

■ Electrical Characteristics at V_{CC} = 2.80 V

Notes) All parameters are specified under T_a = 25°C±2°C unless otherwise specified.

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

■ Electrical Characteristics (continued) at V_{CC} = 2.80 V

Note) All parameters are specified under T_a = 25°C±2°C, fRXa = 881.5 MHz, PRXa = –30 dBm, CW unless otherwise specified.

B No.	Parameter	Symbol	Conditions	Limits			Unit	Notes
				Min	Typ	Max		
LNA AC electrical characteristics (High Gain Mode)								
A-1	Power Gain HG	GHS		13.0	15.0	17.0	dB	—
A-2	IIP3 +10 MHz offset	IIP3S	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	PRX a= –20 dBm	–5.0	–3.0	–1.5	dB	—

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

Note) • All characteristics are specified under T_a = 25°C±2°C, fRXa = 869 MHz, 881.5 MHz, 894 MHz, PRXa = –30 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	Conditions	Reference values			Unit	Notes
				Min	Typ	Max		
LNA AC electrical characteristics (High Gain Mode)								
B-1	Power Gain HG	GHa		13.0	15.0	17.0	dB	—
B-2	Noise Figure HG	NFHa		—	1.5	2.1	dB	*1
B-3	IIP3 +10 MHz offset HG	IIP3H1a	f1 = fRXa + 10 MHz f2 = fRXa + 20 MHz Input 2 signals (f1, f2)	6.0	10.0	—	dBm	—
B-4	IIP3 –10 MHz offset HG	IIP3H2a	f1 = fRXa – 10 MHz f2 = fRXa – 20 MHz Input 2 signals (f1, f2)	6.0	10.0	—	dBm	—
B-5	Input P1dB	IP1dBHa		–10.0	–6.0	—	dBm	—
B-6	Reverse Isolation HG	ISOHa		—	–22.0	–18	dB	—
B-7	Input Return Loss HG	S11Ha		5.5	7.5	—	dB	—
B-8	Output Return Loss HG	S22Ha		7.0	9.0	—	dB	—
LNA AC electrical characteristics (Low Gain Mode)								
B-9	Power Gain LG	GLa	PRXa = –20 dBm	–5.0	–3.0	–1.5	dB	—
B-10	Noise Figure LG	NFLa		—	3.0	5.5	dB	—
B-11	IIP3 +10 MHz offset LG	IIP3L1a	f1 = fRXa + 10 MHz f2 = fRXa + 20 MHz PRXa = –15 dBm Input 2 signals (f1, f2)	17.0	20.0	—	dBm	—
B-12	Reverse Isolation LG	ISOLa		–5.0	–3.0	–1.5	dB	—
B-13	Input Return Loss LG	S11La		7.0	9.0	—	dB	—
B-14	Output Return Loss LG	S22La		5.5	7.5	—	dB	—

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

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

Note) •All characteristics are specified under T_a = 25°C±2°C, fRXb = 440 MHz, 450 MHz, 460 MHz, PRXb = –30 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	Conditions	Reference values			Unit	Notes
				Min	Typ	Max		
LNA AC electrical characteristics (High Gain Mode)								
D-1	Power Gain HG	GHc		14.0	16.0	18.0	dB	—
D-2	Noise Figure HG	NFHc		—	1.4	2.1	dB	*1
D-3	IIP3 +10 MHz offset HG	IIP3H1c	f1 = fRXb + 10 MHz f2 = fRXb + 20 MHz Input 2 signals (f1, f2)	6.5	10.0	—	dBm	—
D-4	IIP3 –10 MHz offset HG	IIP3H2c	f1 = fRXb – 10 MHz f2 = fRXb – 20 MHz Input 2 signals (f1, f2)	6.5	10.0	—	dBm	—
D-5	Input P1dB	IP1dBHc		–11.0	–7.0	—	dBm	—
D-6	Reverse Isolation HG	ISOHc		—	–24.0	–20.0	dB	—
D-7	Input Return Loss HG	S11Hc		5.5	7.5	—	dB	—
D-8	Output Return Loss HG	S22Hc		5.0	7.5	—	dB	—
LNA AC electrical characteristics (Low Gain Mode)								
D-9	Power Gain LG	GLc	PRXb = –20 dBm	–4.5	–3.0	–1.5	dB	—
D-10	Noise Figure LG	NFLc		—	3.0	5.0	dB	—
D-11	IIP3 +10 MHz offset LG	IIP3L1c	f1 = fRXa + 10 MHz f2 = fRXa + 20 MHz PRXa = –10 dBm Input 2 signals (f1, f2)	22.0	25.0	—	dBm	—
D-12	Reverse Isolation LG	ISOLc		–4.5	–3.0	–1.5	dB	—
D-13	Input Return Loss LG	S11Lc		8.5	10.0	—	dB	—
D-14	Output Return Loss LG	S22Lc		12.0	15.0	—	dB	—

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

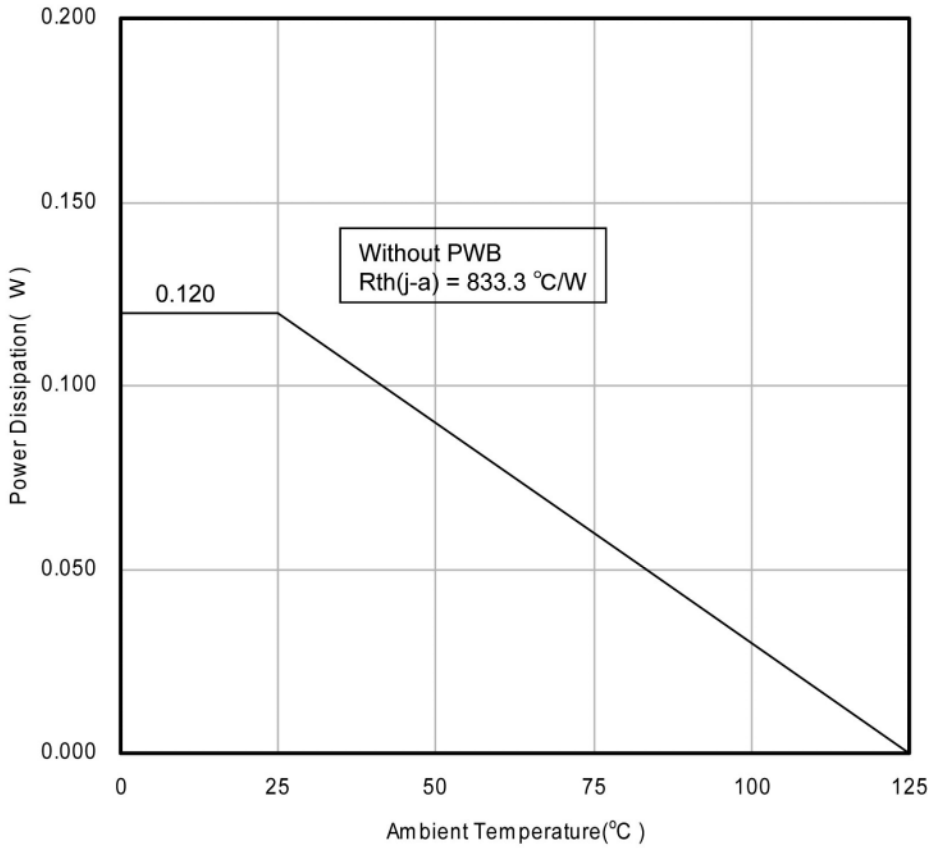
■ Control Pins Mode Table

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	—

■ Technical Data

• P_D — T_a diagram



■ 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.

Request for your special attention and precautions in using the technical information and semiconductors described in this book

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