

DATA SHEET

Part No.	AN26027A
Package Code No.	ALGA005-W-0609ANA

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AN26027A

Single band LNA-IC for 600 MHz band applications

■ Overview

AN26027A is single band LNA-IC for 600 MHz band applications. It realizes high performance by using 0.18 μm SiGeC Bi-CMOS process ($f_T = 90 \text{ GHz}$, $f_{\text{max}} = 140 \text{ GHz}$). High/Low gain-mode is changeable, controlled by integrated CMOS logic circuit. A WLCSP package (wafer level chip sized package) achieves miniaturization.

■ Features

- Low voltage operation +2.85 V typ.
- Low current consumption 3 mA typ. (High-gain mode)
1 μA typ. (Low-gain mode)
- High gain (gain) 15.0 dB typ. fRX = 620 MHz (High-gain mode)
- Low noise figure (NF) 1.30 dB typ. fRX = 620 MHz (High-gain mode)
- Low distortion (IIP3 +10 MHz offset) -4.0 dBm typ. fRX = 620 MHz (High-gain mode)
- Small and thin package (WLCSP)

■ Applications

- 600 MHz band single band LNA

■ Package

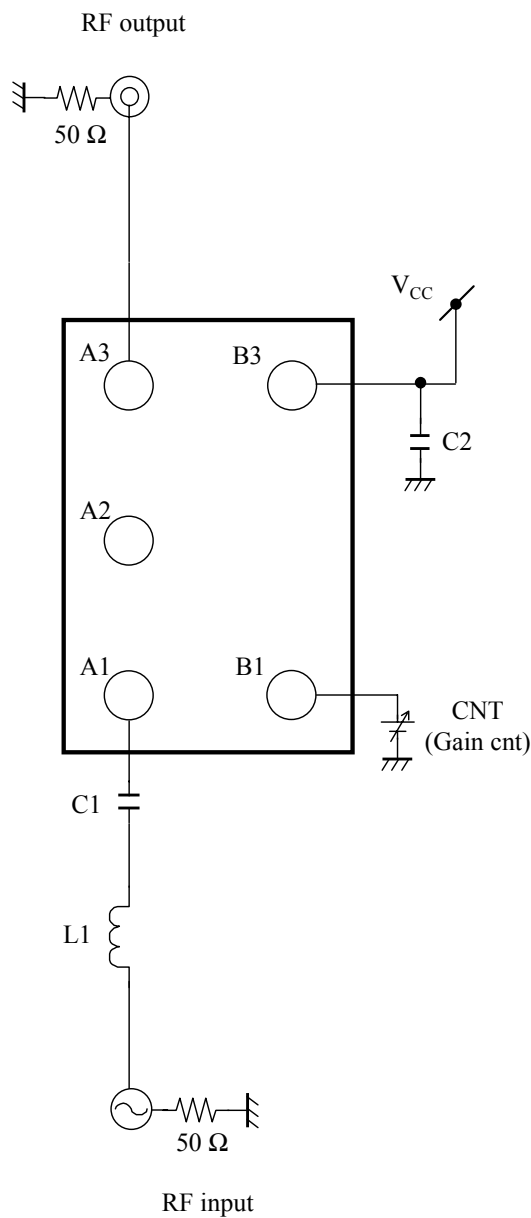
- 5 pin wafer level chip size package (WLCSP)
Size: $0.86 \times 0.56 \text{ mm}^2$ (0.3 mm pitch)

■ Type

- Bi-CMOS IC

■ Application Circuit Example (Block Diagram)

(Top View)



- Note) 1. This circuit and these circuit constants show an example and do not guarantee the design as a mass-production set.
 2. This block diagram is for explaining functions. The part of the block diagram may be omitted, or it may be simplified.

■ Pin Descriptions

Pin No.	Pin name	Type	Description
A1	IN	Input	RF input
A2	GND	Ground	GND
A3	OUT	Output	RF output
B1	CNT	input	High-gain / Low-gain switch
B3	V _{CC}	Power Supply	V _{CC}

■ Absolute Maximum Ratings

A No.	Parameter	Symbol	Rating	Unit	Note
1	Supply voltage	V_{CC}	3.6	V	*1
2	Supply current	I_{CC}	18	mA	—
3	Power dissipation	P_D	36	mW	*2
4	Operating ambient temperature	T_{opr}	-25 to +75	°C	*3
5	Storage temperature	T_{stg}	-40 to +125	°C	*3

Note) *1: The range under absolute maximum ratings, power dissipation.

*2: Power dissipation shows the value of only package at $T_a = 70^\circ\text{C}$.

When using this IC, refer to the • $P_D - T_a$ diagram in the ■ Technical Data and use under the condition not exceeding the allowable value.

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

■ Operating Supply Voltage Range

Parameter	Symbol	Range	Unit	Note
Supply voltage range	V_{CC}	2.5 to 3.0	V	—

Note) The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

■ Electrical Characteristics $V_{CC} = 28.5 \text{ V}$

Note) Unless otherwise specified, $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$

B No.	Parameter	Symbol	Conditions	Limits			Unit	Note
				Min	Typ	Max		
DC electrical characteristics								
DC-1	Supply current HG	I_{CCH}	V_{CC} current at High-gain mode No input signal	—	3.0	4.4	mA	—
DC-2	Supply current LG	I_{CCL}	V_{CC} current at Low-gain mode No input signal	—	1.0	10	μA	—
DC-3	Switching voltage (High gain mode)	V_{IH}	$V_{IH} = V_{CC} \times 0.90$	2.57	2.85	—	V	—
DC-4	Switching voltage (Low gain mode)	V_{IL}	$V_{IL} = V_{CC} \times 0.14$	—	0.0	0.4	V	—
DC-5	Switching current (High)	I_{IH}	Current at CNT pin $V_{IH} = V_{CC}$	—	4.6	20	μA	—

Note) Unless otherwise specified, $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$, $f_{RXa} = 620 \text{ MHz}$, $PRX = -30 \text{ dBm}$, CW

B No.	Parameter	Symbol	Conditions	Limits			Unit	Note
				Min	Typ	Max		
LNA AC electrical characteristics								
A-1	Power gain HG	GHS	High-gain mode	13.0	15.0	17.0	dB	—
A-2	Power gain LG	GLS	Low-gain mode $PRX = -20 \text{ dBm}$	-7.5	-4.0	-1.0	dB	—
A-3	IIP3 +10 MHz offset HG	IIP3H1	High-gain mode $f1 = f_{RXa} + 10 \text{ MHz}$ $f2 = f_{RXa} + 20 \text{ MHz}$ Input 2 signals ($f1, f2$)	-12	-4.0	—	dBm	—

■ Electrical Characteristics (Reference values for design) $V_{CC} = 2.85\text{ V}$

Note) Unless otherwise specified, $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$, $f_{RX} = 470\text{ MHz}, 620\text{ MHz}, 770\text{ MHz}$, $PRX = -30\text{ dBm}$, CW.

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

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

B No.	Parameter	Symbol	Conditions	Limits			Unit	Note
				Min	Typ	Max		
LNA AC electrical characteristics								
C-1	Power gain HG	GH	High-gain mode $f = f_{RX}$	11.5	15.0	17.5	dB	—
C-2	Power gain LG	GL	Low-gain mode $f = f_{RX}$, $PRX = -20\text{ dBm}$	-8.0	-4.0	-1.0	dB	—
C-3	Noise Figure HG	NFH	High-gain mode $f = f_{RX}$	—	1.3	2.3	dB	*
C-4	Noise Figure LG	NFL	Low-gain mode $f = f_{RX}$	—	6.5	8.5	dB	—
C-5	IIP3 +10 MHz offset HG	IIP3H1	High-gain mode $f1 = f_{RX} + 10\text{ MHz}$ $f2 = f_{RX} + 20\text{ MHz}$ Input 2 signals ($f1, f2$)	-13	-4.0	—	dBm	—
C-6	IIP3 -10 MHz offset HG	IIP3H2	High-gain mode $f1 = f_{RXa} - 10\text{ MHz}$ $f2 = f_{RXa} - 20\text{ MHz}$ Input 2 signals ($f1, f2$)	-13	-4.0	—	dBm	—
C-7	Input P1dB HG	IP1dBH	High-gain mode $f1 = f_{RX}$	-10	-6	—	dBm	—
C-8	Reverse Isolation HG	ISOH	High-gain mode $f1 = f_{RX}$	—	-24	—	dB	—
C-9	Reverse Isolation LG	ISOL	High-gain mode $f1 = f_{RX}$	—	-3.5	—	dB	—

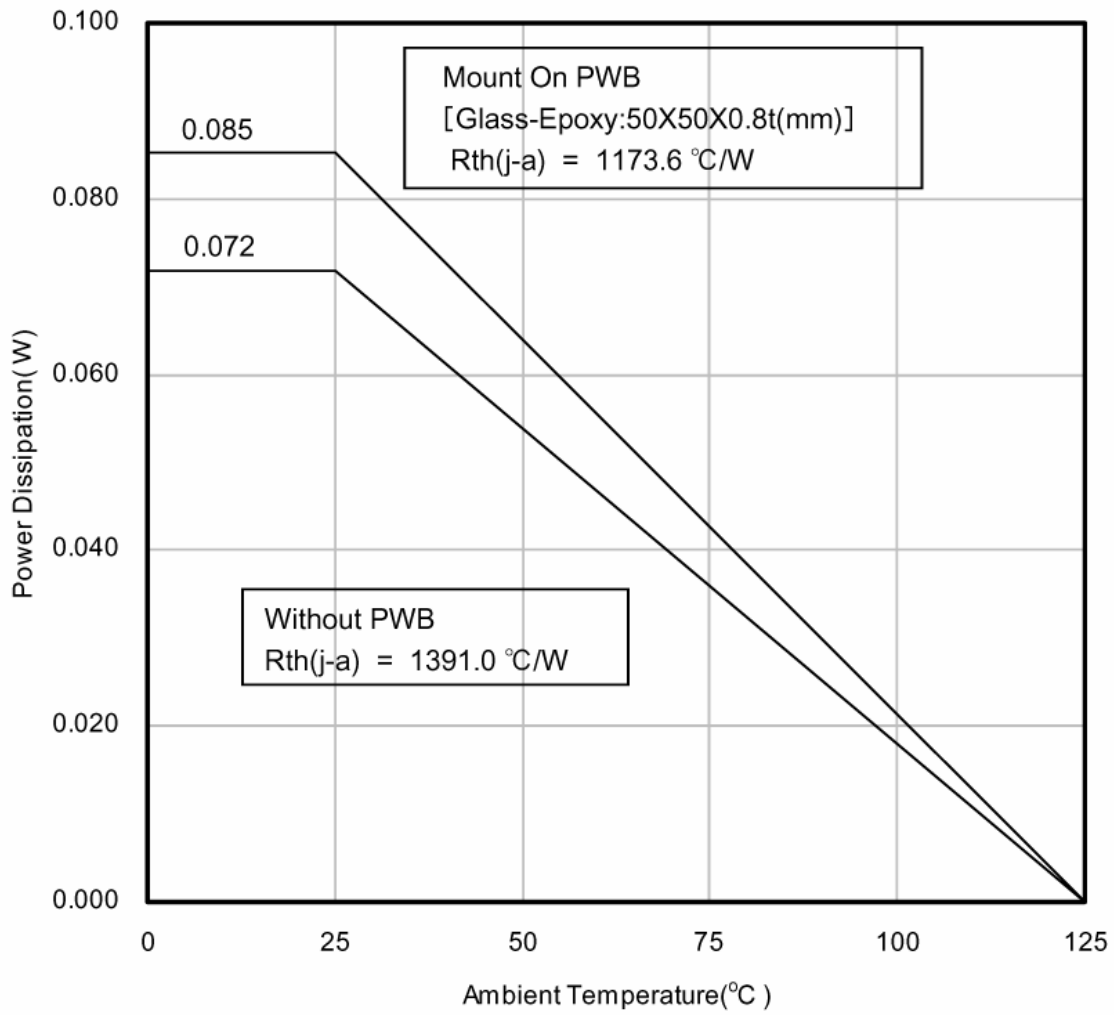
Note) Connector & substrate loss (0.1 dB) included.

■ Switching Logic Table

Note) See parameters B No. DC-3 to B No. DC-4 in the ■ Electrical Characteristics for control voltage retention ranges.

Pin No.	Description	Pin voltage		Remarks
		Low	High	
B1	High-Gain / Low-Gain Switching (Gain Control)	Low-Gain	High-Gain	—

- Technical Data
 - $P_D - T_a$ diagram



■ Usage Notes

1. This IC is intended to be used for general electronic equipment [cellular phones].
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 using the LSI for new models, verify the safety including the long-term reliability for each product.
7. 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.
8. Due to unshielded structure of this IC, under exposure of light, function and characteristic of the product cannot be guaranteed.
During normal operation or even under testing condition, please ensure that IC is not exposed to light.
9. Basically, chip surface is ground potential. Please design to ensure no contact between chip surface and metal shielding.

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

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Consult our sales staff in advance for information on the following applications:
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- (5) 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.
- (6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.
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