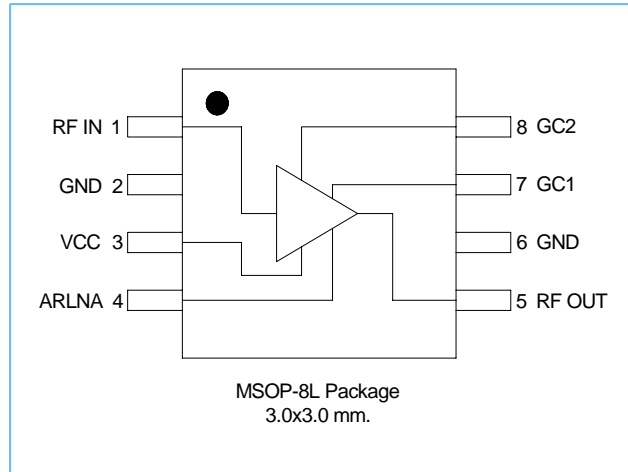## Features

- 925-960 MHz operation for GSM applications

- Low power, single 2.8 volt supply

- Gain control feature with 0, 17, and 25 dB gain settings

- 40 dB of reverse isolation at all gain settings

- Standby Mode with less than 20 μA current consumption

- Compact MSOP-8L package

- High IIP3 and low noise meet demanding system requirements

Applications

- GSM portable transceivers

Figure 1. IBM43RCLNA1115 Low Noise Amplifier

MSOP-8L Package
3.0x3.0 mm.

Description

The IBM43RCLNA1115 is a gain-controlled low-noise amplifier (LNA) implemented using IBM Microelectronics Silicon Germanium (SiGe) technology.

The LNA is designed for low power consumption and uses a 2.8 volt power supply. It is optimized for GSM applications that require amplifiers with very high reverse isolation such as direct conversion where the LNA is more susceptible to local oscillator leakage.

The IBM43RCLNA1115 is programmable for three levels of gain, and it has a very low power standby mode.

The inputs for gain control and standby mode are 3V CMOS compatible.

External capacitors in series with the input and output are required for DC blocking and as part of the impedance matching networks. A series inductor on the input and a shunt inductor on the output are also part of the matching network. Proper selection of these components ensures optimized LNA performance in the desired band.

Specifications in this data sheet were obtained using the circuit in the IBM evaluation board for this product.

Ordering Information

To order samples of the LNA or an evaluation board, contact an IBM sales representative or distributor. Regional contact information is located on the IBM Microelectronics Division web site at:
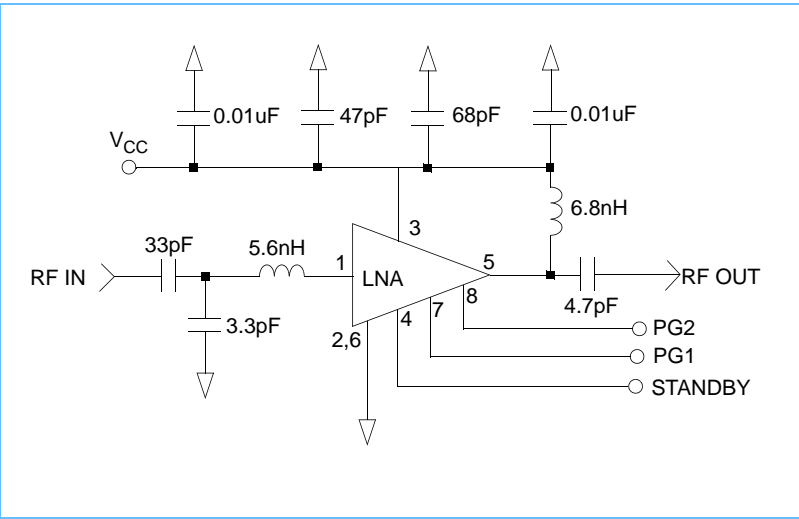
www.ibm.com/chips/support/howtobuy.html

Part Number	Product
IBM43RCLNA1115	SiGe 900 MHz GSM Low-Noise Amplifier with Gain Control
IBM43RCLNA1115EVBA	900 MHz LNA Evaluation Board

Note: The low noise amplifier is susceptible to damage from electrostatic discharge (ESD). Observe normal ESD precautions at all times.

Figure 2. SiGe 900 MHz GSM LNA Schematic

Technical Description

Table 1. Operating Conditions

Symbol	Parameter	Min.	Typical	Max	Units	Notes
V_{CC1} and V_{CC2}	Supply voltage	2.7	2.8	2.9	Vdc	
I_{CC}	Supply current		6	20	µA	standby mode
			8	10	mA	low gain mode
			17	22		mid gain mode
			12	15		high gain mode
I_{GC1}	Gain Control 1 Current		7	10	µA	
I_{GC2}	Gain Control 2 Current		8	10	µA	
T_{OPR}	Operating Temperature	-20	+25	+70	°C	
T_{STO}	Storage Temperature	-40	+25	+85		

Table 2. Control Functions[1]

MODE	STANDBY (pin 4)	Programmable Gain 1 (pin 7)	Programmable Gain 2 (pin 8)
High	1	1	1
Mid	1	0	1
Low	1	0	0
Standby	0	0	0

Note: [1]Control lines PG1, PG2, and STANDBY require CMOS logic levels

Table 3. AC Characteristics *(V_{CC} = 2.8Vdc, T_A = 25 °C)*

Symbol	Parameter	Rating			Units	Notes
		Minimum	**Typical**	**Maximum**		
F0	Frequency		925 to 960		MHz	
$|S_{21}|^2$	Insertion power gain	24	25	28	dB	high gain mode
		15.5	17	20		mid gain mode
		-3	0	3		low gain mode
$|S_{21}|^2$ Variation	Over Supply/Temperature		+/-1.7		dB	high gain mode
			+/-1.5		dB	mid gain mode
			+/-0.8		dB	low gain mode
$|S_{21}|^2$ Variation	Over Frequency		+/-0.1		dB	high gain mode
			+/-0.1		dB	mid gain mode
			+/-0.1		dB	low gain mode
$|S_{21}|^2$ Variation	Over Process		+/-0.8		dB	high gain mode
			+/-0.8		dB	mid gain mode
			+/-0.8		dB	low gain mode
NF	Noise Figure		1.6	3.0	dB	high gain mode
			2.4	3.3		mid gain mode
			3.8	5.0		low gain mode
$|S_{12}|^2$	Reverse Isolation		-40	-35	dB	in all gain modes
ISWR	Input SWR		1.7:1	3:1		high gain mode
			2.1:1	3:1		mid gain mode
			2.3:1	3:1		low gain mode
OSWR	Output SWR		1.6:1	2:1		high gain mode
			1.2:1	2:1		mid gain mode
			1.3:1	2:1		low gain mode
IIP3	Input Third Order Intercept	-20	-17.0		dBm	high gain mode
		-9.5	-6.0			mid gain mode
		-9.5	-6.3			low gain mode
P1dB	Input 1 dB Compression Point	-30	-26.0		dBm	high gain mode
		-20	-16			mid gain mode
		-20	-16			low gain mode
	Stability		Unconditional			

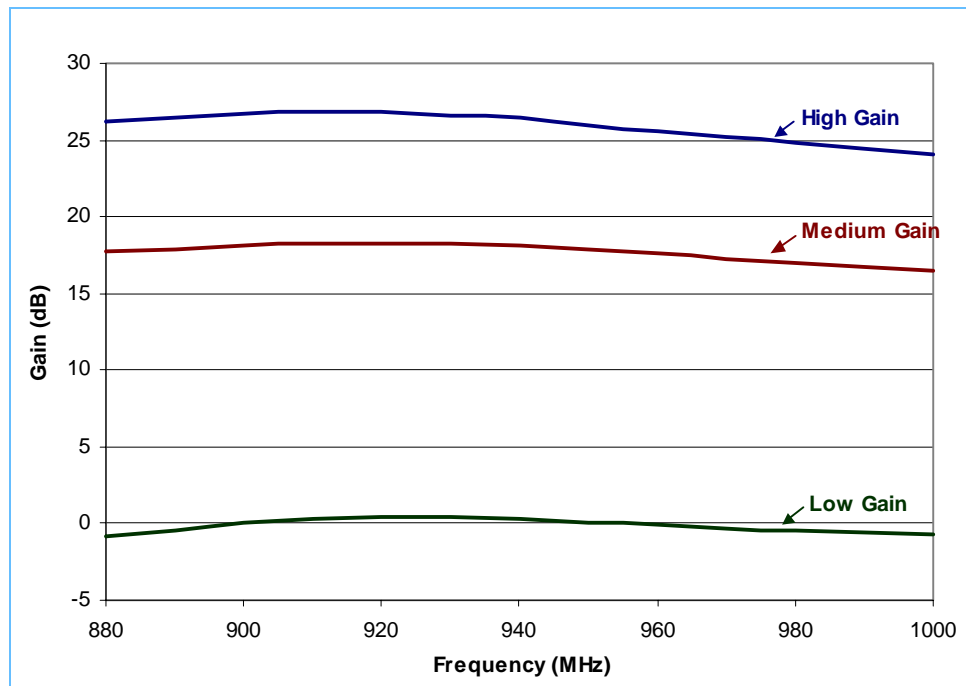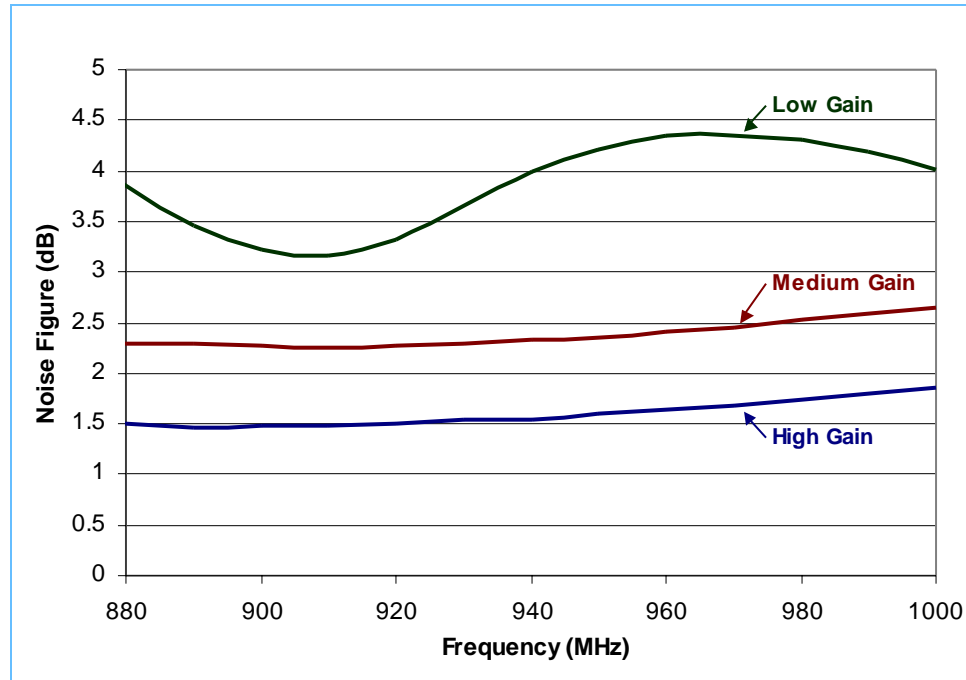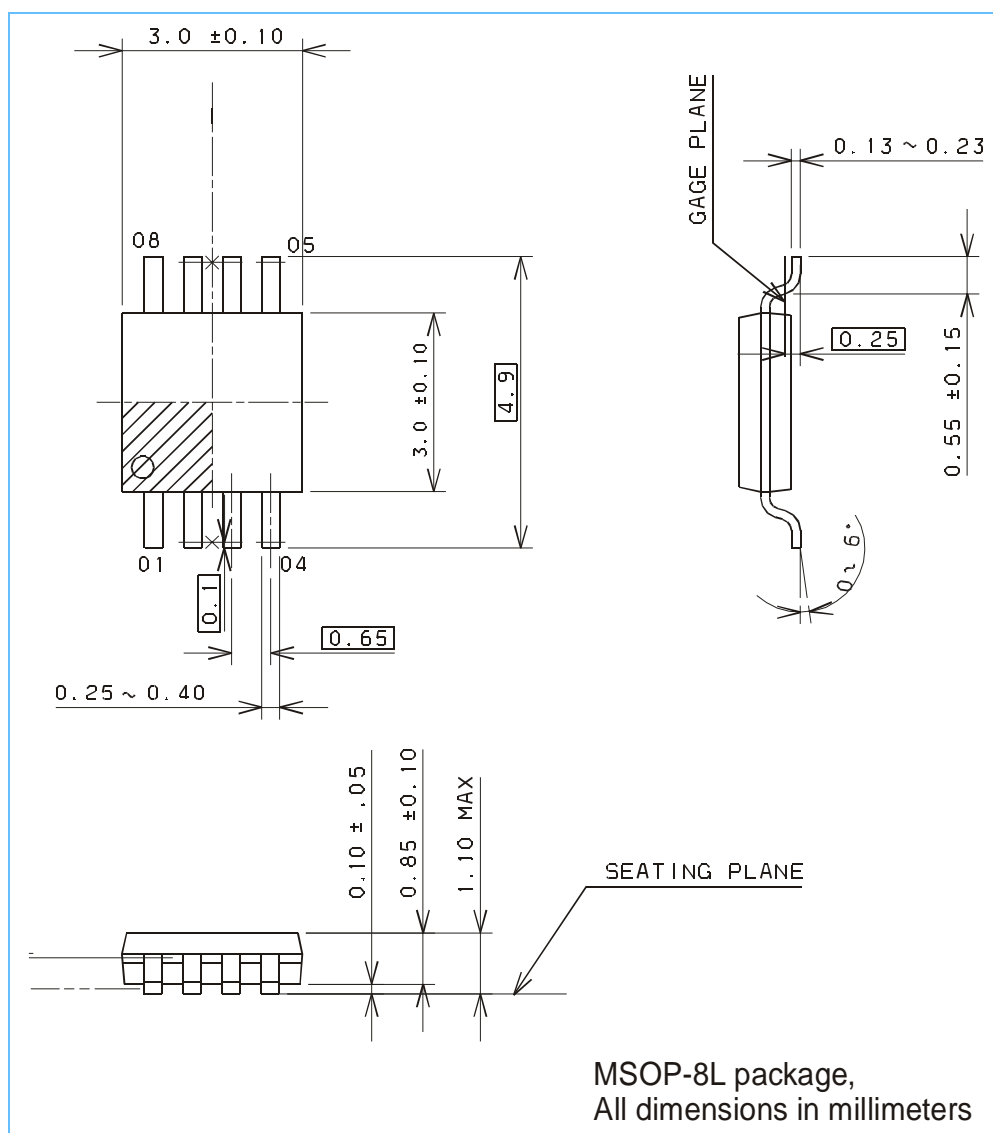*Figure 3.   Low Noise Amplifier Gain Plot (typical)*

Figure 4.   Low Noise Amplifier Noise Figure Plot (typical)

Table 4. Pin Descriptions

Pin	Name	Description	Package Type
1	RF IN	RF input	
2	GND	Ground	
3	V_{CC}	DC supply	
4	STANDBY	Mode control (see *Table 2*)	
5	RF OUT	RF output	
6	GND	Ground	
7	PG1	Mode control (see *Table 2*)	
8	PG2	Mode control (see *Table 2*)	

Package diagram (right column):

RF IN 1, GND 2, VCC 3, ARLNA 4 (left side); 8 GC2, 7 GC1, 6 GND, 5 RF OUT (right side)

MSOP-8L Package
3.0x3.0 mm.

Figure 5. 900 MHz GSM LNA Package Dimensions

MSOP-8L package,
All dimensions in millimeters

Document Revision Log

Rev.	Contents of Modification
July 19, 1999	Initial release (00)
November 21, 2001	Overall revision (01)
April 03, 2002	Removed preliminary from document for general release (02)

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