

SiGe 1800 MHz DCS Low-Noise Amplifier with Gain Control

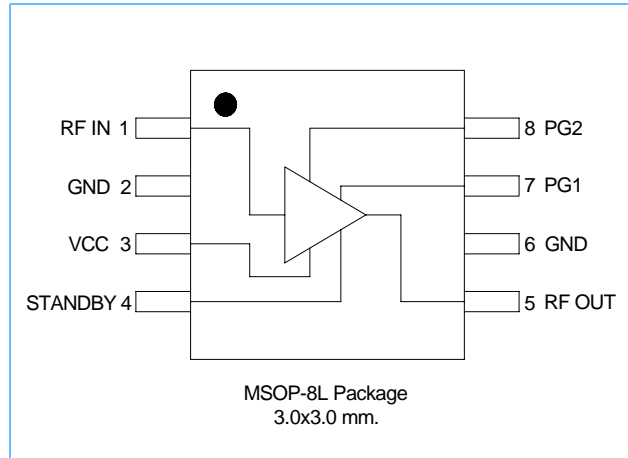
Features

- 1805-1880 MHz operation for DCS applications
- Single 2.8 V, low current power requirement
- Selectable gain: 0dB, 19dB, or 25dB
- 40dB reverse isolation at all gain settings
- Less than 20 μ A current drain in standby mode
- Compact MSOP-8L exposed paddle package
- High IIP3 and low noise to meet demanding system requirements

Applications

- DCS portable transceivers

Figure 1. IBM43RCLNA1116 Low Noise Amplifier



Description

The IBM43RCLNA1116 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 DCS applications that require amplifiers with very high reverse isolation such as direct conversion where the LNA is more susceptible to local oscillator leakage.

The IBM43RCLNA1116 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

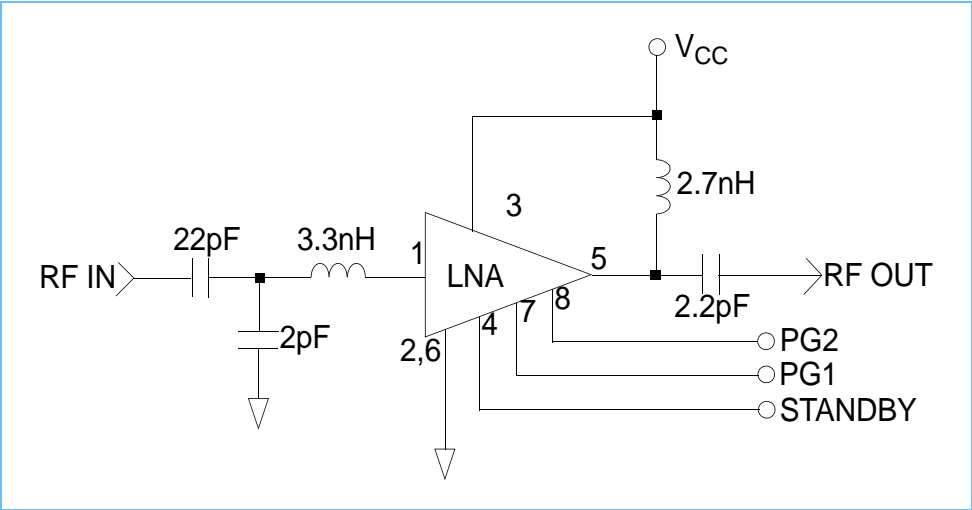
To order samples of the LNA or an evaluation board, contact an IBM sales representative or distributor. Regional contact information is located on the IBM Microelectronics Division web site at:

www.ibm.com/chips/support/howtobuy.html

Part Number	Product
IBM43RCLNA1116	SiGe 1800 MHz DCS Low-Noise Amplifier with Gain Control
IBM43RCLNA1116EVBA	1800 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 1800 MHz DCS 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
			8.8	10	mA	low gain mode
			19.6	22		mid gain mode
			12.8	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 Functions¹

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: ¹Control lines PG1, PG2, and STANDBY require CMOS logic levels.

Table 3. AC Characteristics ($V_{CC} = 2.8V_{dc}$, $T_A = 25\text{ }^{\circ}C$)

Parameter	Symbol	Min	Typ	Max	Units	Gain Mode
Frequency	F0	1805 TO 1880			MHz	--
Insertion power gain	$ S_{21} ^2$	24.0	25.0	28.0	dB	High
		15.5	19.0	22.0	dB	Mid
		-3.0	0.0	3.0	dB	Low
Over Supply/ Temperature	$ S_{21} ^2$ Variation	--	+0.3/-1.2	--	dB	High
		--	+0.5/-0.9	--	dB	Mid
		--	+0.4/-0.9	--	dB	Low
Over Frequency	$ S_{21} ^2$ Variation	--	± 0.2	--	dB	High
		--	± 0.1	--	dB	Mid
		--	+0.5/-0.3	--	dB	Low
Noise Figure	NF	--	2.2	3.0	dB	High
		--	2.8	3.3	dB	Mid
		--	5.2	6.0	dB	Low
Reverse Isolation	$ S_{12} ^2$	-40	--	--	dB	All
Input SWR	ISWR	--	--	3:1	--	High
		--	--	3:1	--	Mid
		--	--	3:1	--	Low
Output SWR	OSWR	--	--	2:1	--	--
		--	--	2:1	--	--
		--	--	2:1	--	--
Input Third Order Intercept	IIP3	-20.0	-16.0	--	dBm	High
		-12.0	-6.7	--	dBm	Mid
		-12.0	-4.7	--	dBm	Low
Input 1dB Compression Point	P1dB	-30.0	-24.0	--	dBm	High
		-20.0	-16.7	--	dBm	Mid
		-20.0	-13.8	--	dBm	Low
Stability	--	Unconditional			--	--

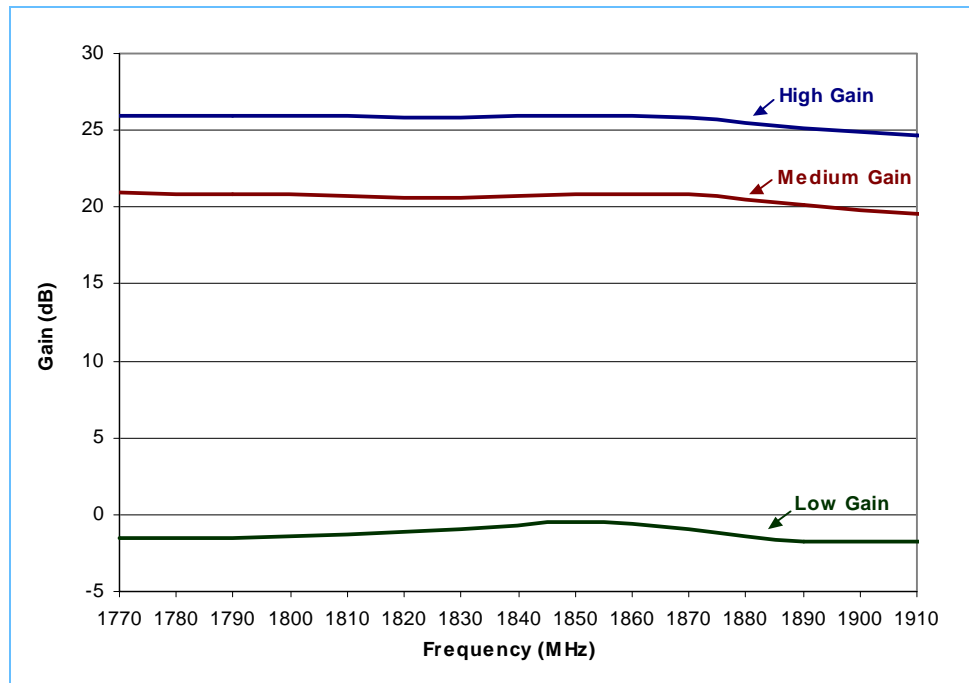
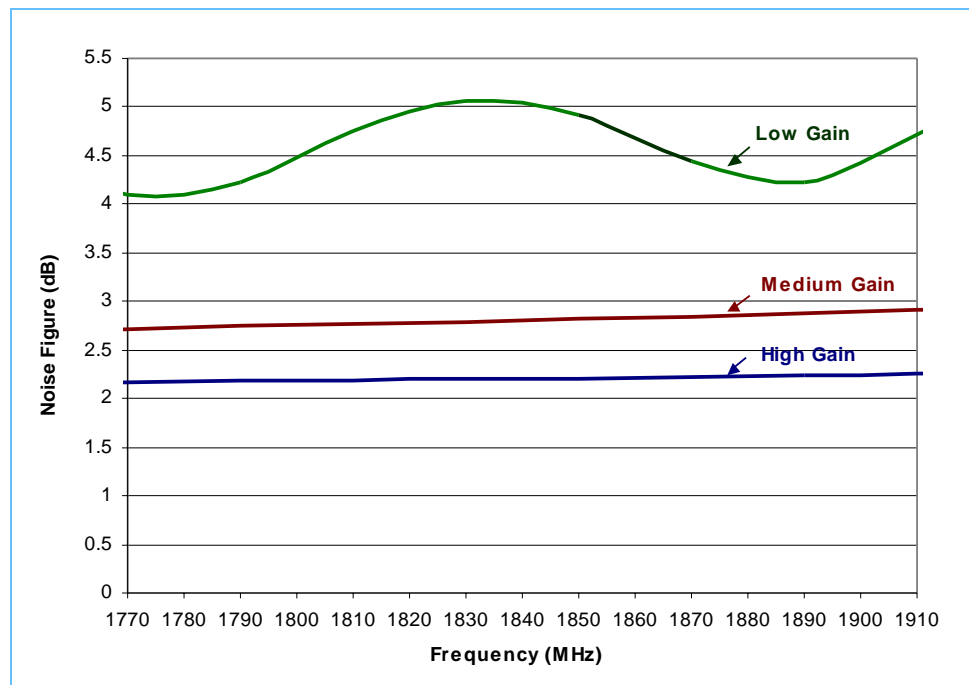
Figure 3. Low Noise Amplifier Gain Plot (typical)**Figure 4. Low Noise Amplifier Noise Figure Plot (typical)**

Table 4. Pin Descriptions

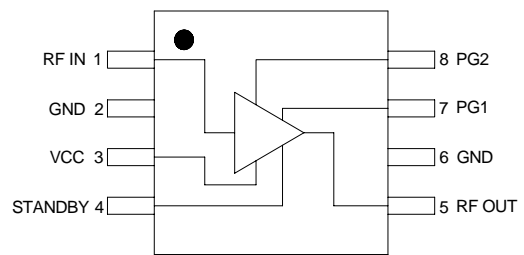
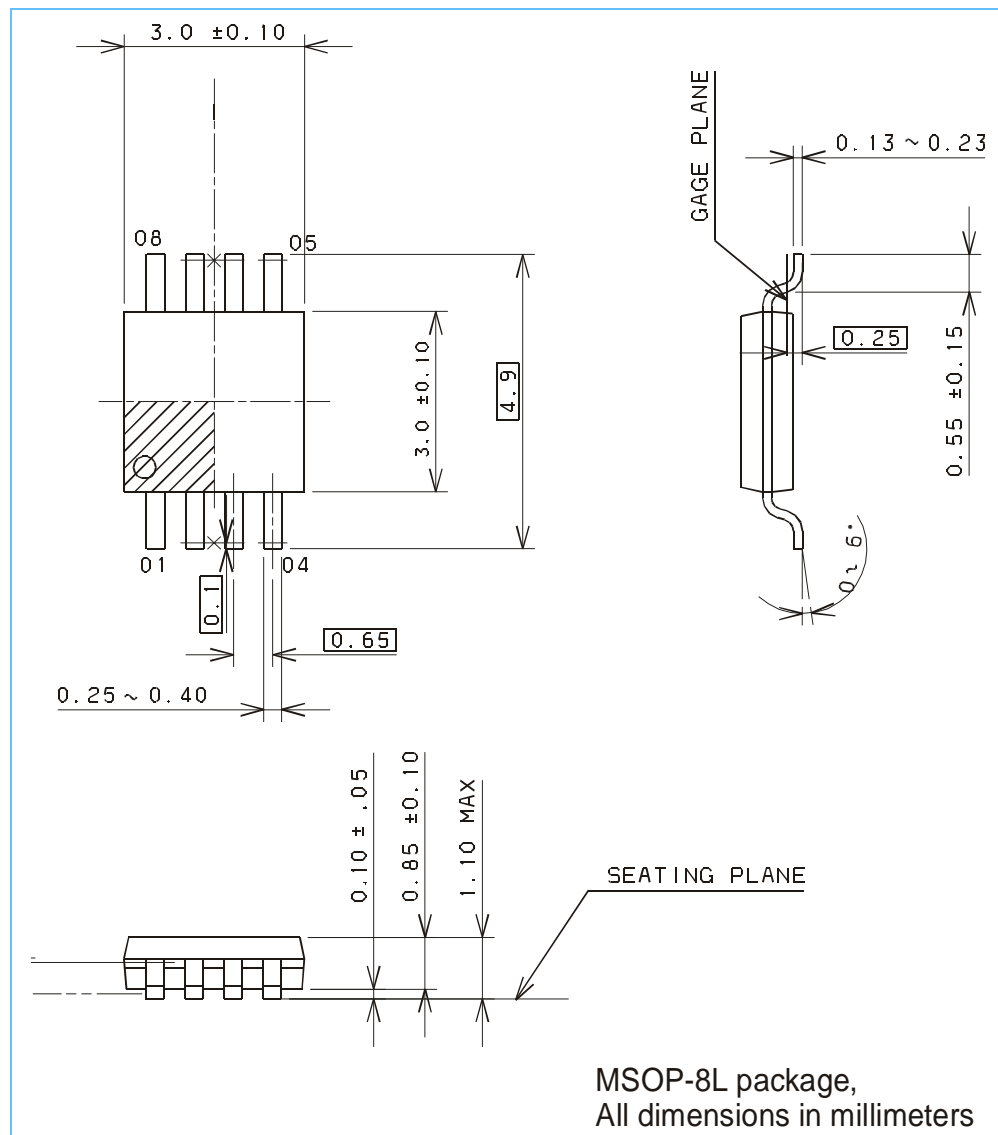
Pin	Name	Description	Package Type
1	RF IN	RF input	 <p>MSOP-8L Package 3.0x3.0 mm.</p>
2	GND	Ground	
3	V _{CC}	DC supply	
4	STANDBY	Mode control (see Table 2)	
5	RF OUT	RF output	
6	GND	Ground	
7	PG1	Mode control (see Table 2)	
8	PG2	Mode control (see Table 2)	

Figure 5. 1800 MHz DCS LNA Package Dimensions


Document Revision Log

Rev.	Contents of Modification
January 3, 2001	Initial release (00)
November 21, 2001	Overall revision (01)
April 03, 2002	Removed 'preliminary' for general release

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