

130 to 930 MHz Low-noise amplifier

SPECIFICATION

1 FEATURES

- iHP SiGe BiCMOS 0.25 um
- Frequency range from 130 to 930 MHz
- Subband amplifier selection
- Low noise figure
- Feedback circuit for linearity improving
- Amplifier current consumption control
- Gain temperature compensation mode
- Portable to other technologies (upon request)

2 APPLICATION

- Input RF preamplification in receiver

3 OVERVIEW

Low noise amplifier (LNA) is usually used as the first stage of receivers and is characterized by low noise figure and high linearity. The structure is based on two matched cascodes. The first one is a common-emitter bipolar transistor and the second is common-gate FET. Commutable feedback is used to improve the linearity in the lower range of operating frequencies (130...435 MHz).

The block is fabricated on iHP SiGe BiCMOS 0.25 um technology.

4 STRUCTURE

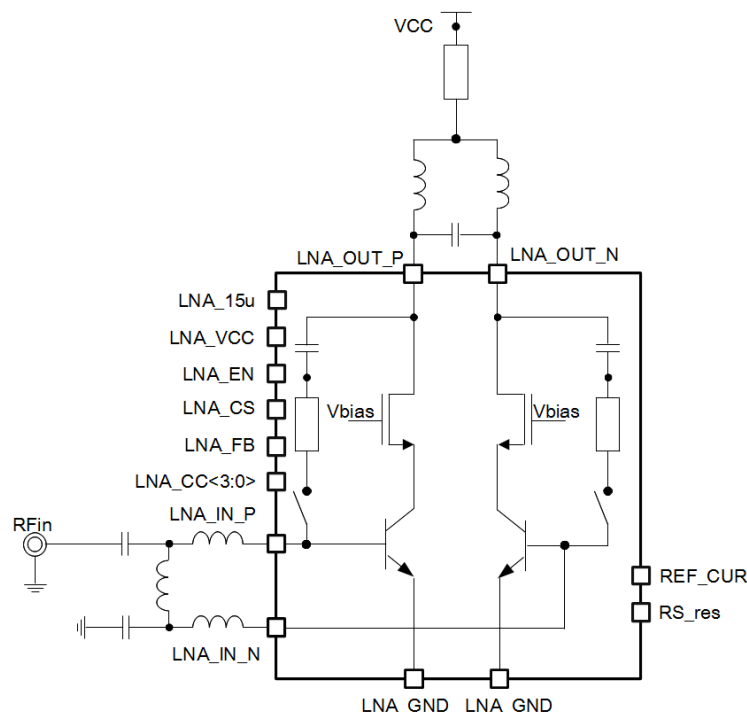


Figure 1: Low-noise amplifier structure.

5 PIN DESCRIPTION

Name	Direction	Description
LNA_15u	I	Reference current (15 uA)
LNA_IN_P	I	LNA differential input
LNA_IN_N	I	
LNA_EN	I	LNA enable/disable
LNA_CS	I	Termocompensation mode enable
LNA_FB	I	Feedback circuit enable
LNA_OUT_P	O	LNA differential output
LNA_OUT_N	O	
LNA_CC<3:0>	I	Amplifier stage current control
REF_CUR	IO	Reference frequency
RS_res	IO	External resistor of reference current source
LNA_VCC	IO	Supply voltage
LNA_GND	IO	Ground

6 LAYOUT DESCRIPTION

The block dimensions are given in the table 1.

Table 1: Block dimensions.

Dimension	Value	Unit
Height	542.07	um
Width	430.35	um

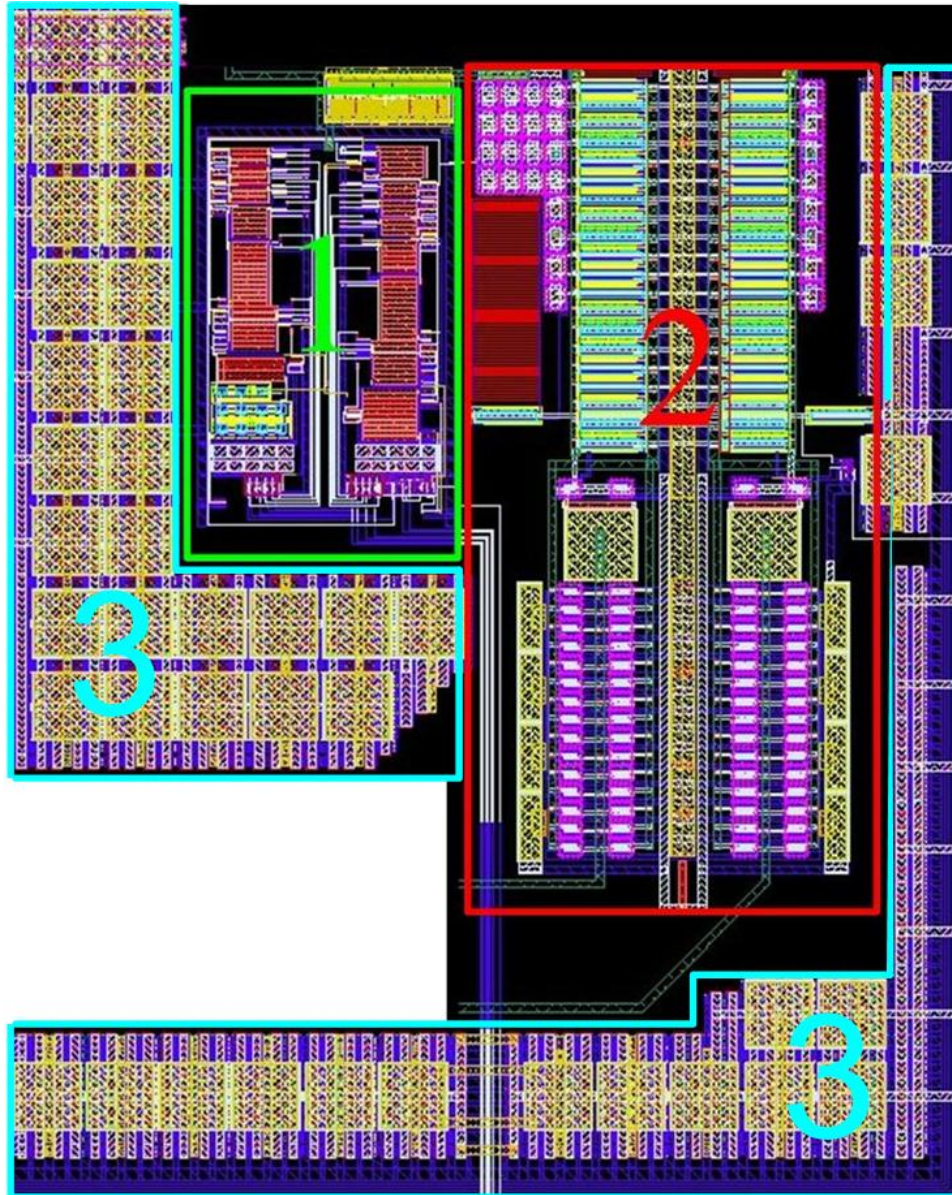


Figure 2: Low-noise amplifier layout view.

1. LNA reference current source
2. LNA amplifying stage
3. Filtering capacitors

7 OPERATING CHARACTERISTICS

7.1 TECHNICAL CHARACTERISTICS

Technology _____ iHP SiGe BiCMOS 0.25 μm
 Status _____ silicon proven
 Area _____ 0.2 mm^2

7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for $V_{cc} = 1.8 \div 2.3 \text{ V}$ and $T_a = -45 \div +85 \text{ }^\circ\text{C}$. Typical values are at $V_{cc} = 2.2 \text{ V}$, $T_a = +27 \text{ }^\circ\text{C}$, unless otherwise specified.

Parameter	Symbol	Condition	Value			Unit
			min	typ	max	
Supply voltage	V_{cc}	-	1.8	2.2	2.3	V
Operating temperature range	T_a	-	-45	27	85	$^\circ\text{C}$
Frequency range	F_{LNA}	-	130	-	935	MHz
Gain	G_{LNA}	$F_{LNA} = 140 \text{ MHz}$	12.6	14.9	17.1	dB
		$F_{LNA} = 435 \text{ MHz}$	11.8	14.8	17.4	
		$F_{LNA} = 930 \text{ MHz}$	10.4	15.6	19.5	
Noise figure	NF_{LNA}	$F_{LNA} = 140 \text{ MHz}$	1.1	1.5	2.1	dB
		$F_{LNA} = 435 \text{ MHz}$	1.0	1.5	2.2	
		$F_{LNA} = 930 \text{ MHz}$	1.1	1.7	2.6	
Input VSWR (50Ω)*	$VSWR_{LNA}$	$F_{LNA} = 140 \text{ MHz}$	1.1	1.2	1.5	-
		$F_{LNA} = 435 \text{ MHz}$	1.1	1.2	1.5	
		$F_{LNA} = 930 \text{ MHz}$	1.3	1.8	2.9	
Output impedance*	R_{out}	-	-	150	-	Ω
Intermodulation immunity	IM3	$F_{LNA} = 140 \text{ MHz}$	-	76	-	dB
		$F_{LNA} = 435 \text{ MHz}$	-	69	-	
		$F_{LNA} = 930 \text{ MHz}$	-	69.5	-	
Current consumption in an active mode	I_{cc}	$F_{LNA} = 140 \text{ MHz}$	1.1	1.2	1.3	mA
		$F_{LNA} = 435 \text{ MHz}$	1.5	1.6	1.7	
		$F_{LNA} = 930 \text{ MHz}$	1.5	1.6	1.7	
Current consumption in a standby mode	I_{stb}	-	-	-	50	nA
Input logic-high level	V_{IH}	For digital inputs	$0.7V_{cc}$	-	$V_{cc}+0.25$	V
Input logic-low level	V_{IL}		-0.25	-	0.3	V

* Measured with external components.

8 DELIVERABLES

IP contents:

- Schematic or NetList
- Layout or blackbox
- Extracted view (optional)
- GDSII
- DRC, LVS, antenna report
- Test bench with saved configurations (optional)
- Documentation

REVISION HISTORY

From version 1.1:

- Section 4 update.