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
- Supported foundries: TSMC, UMC, Global Foundries, SMIC, iHP, AMS, Vanguard, SilTerra

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

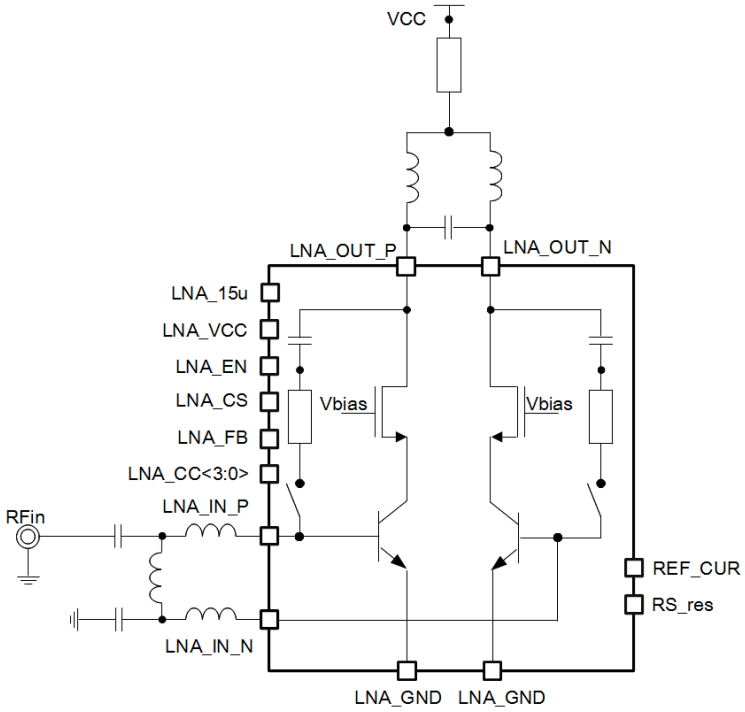

Figure 1: Low-noise amplifier structure.

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

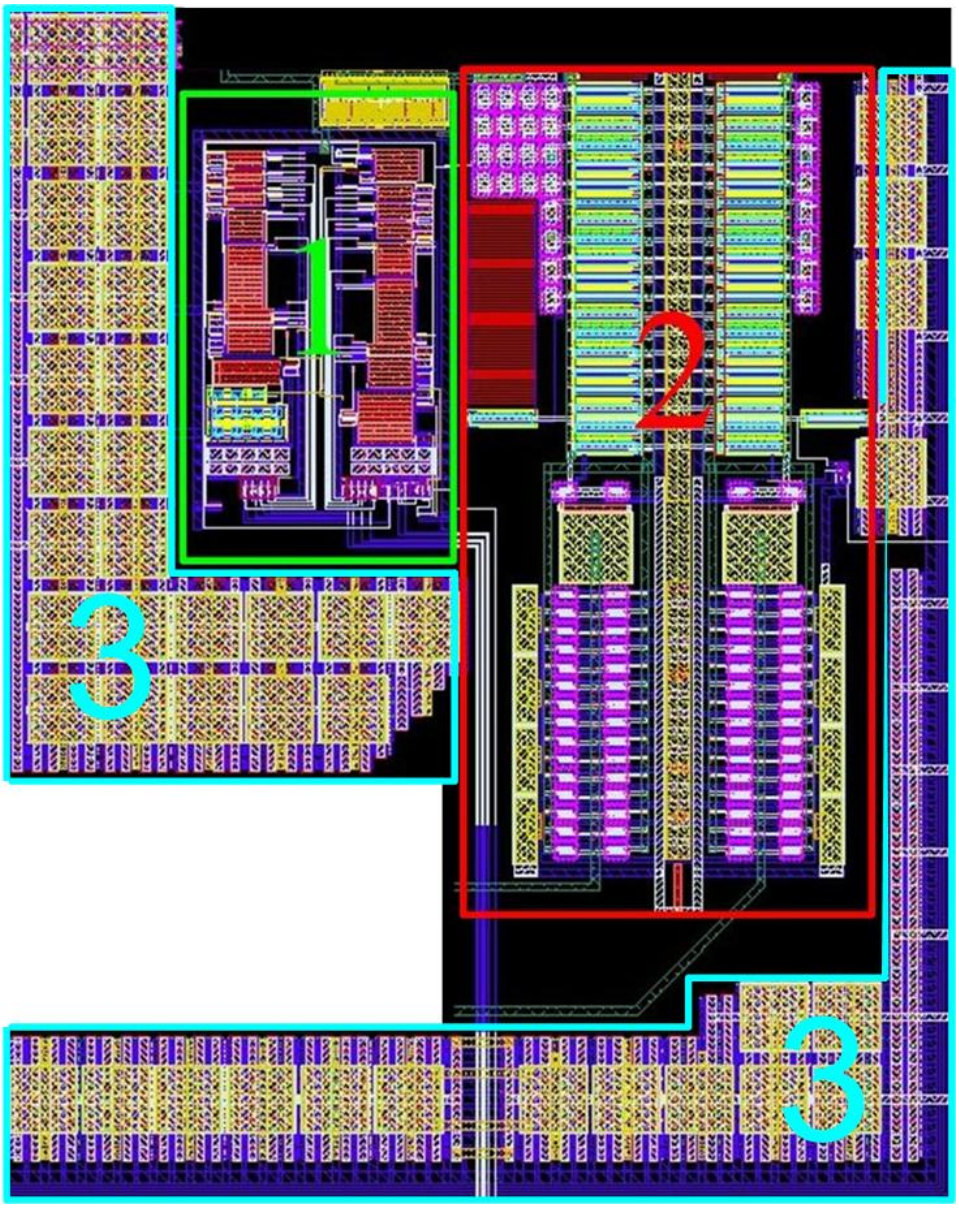

Figure 2: Low-noise amplifier layout view.

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 um
Status silicon proven
Area 0.2 mm^2

7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for V_{cc} = 1.8 ÷ 2.3 V and T_a = -45 ÷ +85 °C. Typical values are at V_{cc} = 2.2 V, T_a = +27 °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	°C
Frequency range	F_{LNA}	-	130	-	935	MHz
Gain	G_{LNA}	F_{LNA} =140 MHz	12.6	14.9	17.1	dB
		F_{LNA} =435 MHz	11.8	14.8	17.4	
		F_{LNA} =930 MHz	10.4	15.6	19.5	
Noise figure	NF_{LNA}	F_{LNA} =140 MHz	1.1	1.5	2.1	dB
		F_{LNA} =435 MHz	1.0	1.5	2.2	
		F_{LNA} =930 MHz	1.1	1.7	2.6	
Input VSWR (50 Ω)*	$VSWR1_{LNA}$	F_{LNA} =140 MHz	1.1	1.2	1.5	-
		F_{LNA} =435 MHz	1.1	1.2	1.5	
		F_{LNA} =930 MHz	1.3	1.8	2.9	
Output impedance*	R_{out}	-	-	150	-	Ω
Intermodulation immunity	IM3	F_{LNA} =140 MHz	-	76	-	dB
		F_{LNA} =435 МГц	-	69	-	
		F_{LNA} =930 МГц	-	69.5	-	
Current consumption in an active mode	I_{cc}	F_{LNA} =140 MHz	1.1	1.2	1.3	mA
		F_{LNA} =435 MHz	1.5	1.6	1.7	
		F_{LNA} =930 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.