

Low noise amplifier

SPECIFICATION

1 FEATURES

- TSMC018 SiGe
- Operating frequency range 1550...1610 MHz
- High gain
- Low noise figure
- Output matching to 50 Ω
- Current source type: temperature dependent or temperature independent
- Portable to other technologies (upon request)

2 APPLICATION

- Front-end HF signal amplification in receivers

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.

LNA consists of two stages. The first one is based on the circuit with common emitter. Two elements are needed to provide the input matching. Cascode MOS-transistor is applied for good isolation between the input and the output of the amplifier. The second stage is an amplifier with common collector (emitter follower) matching the output to 50 Ω in the wide frequency range without using external elements.

The block is fabricated on TSMC018 SiGe technology.

4 STRUCTURE

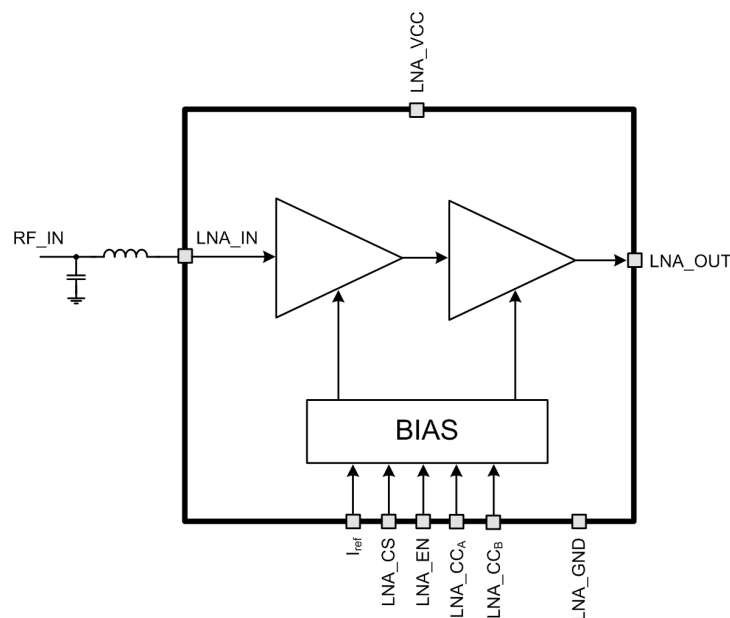


Figure 1: Low noise amplifier structure.

5 PIN DESCRIPTION

Name	Direction	Description
I _{ref}	IO	Reference current 10 μ A
LNA_IN	I	LNA input
LNA_OUT	O	LNA output
LNA_CS	I	Digital code defined the current source type (temperature independent/temperature dependent)
LNA_CC _A <2:0>	I	LNA first stage current consumption control
LNA_CC _B <2:0>	I	LNA second stage current consumption control
LNA_EN	I	Enable/disable
LNA_VCC	IO	Supply voltage
LNA_GND	IO	Ground

6 LAYOUT DESCRIPTION

Low noise amplifier dimensions are given in the table 1.

Table 1: Block dimensions.

Dimension	Value	Unit
Height	381	μm
Width	661	μm

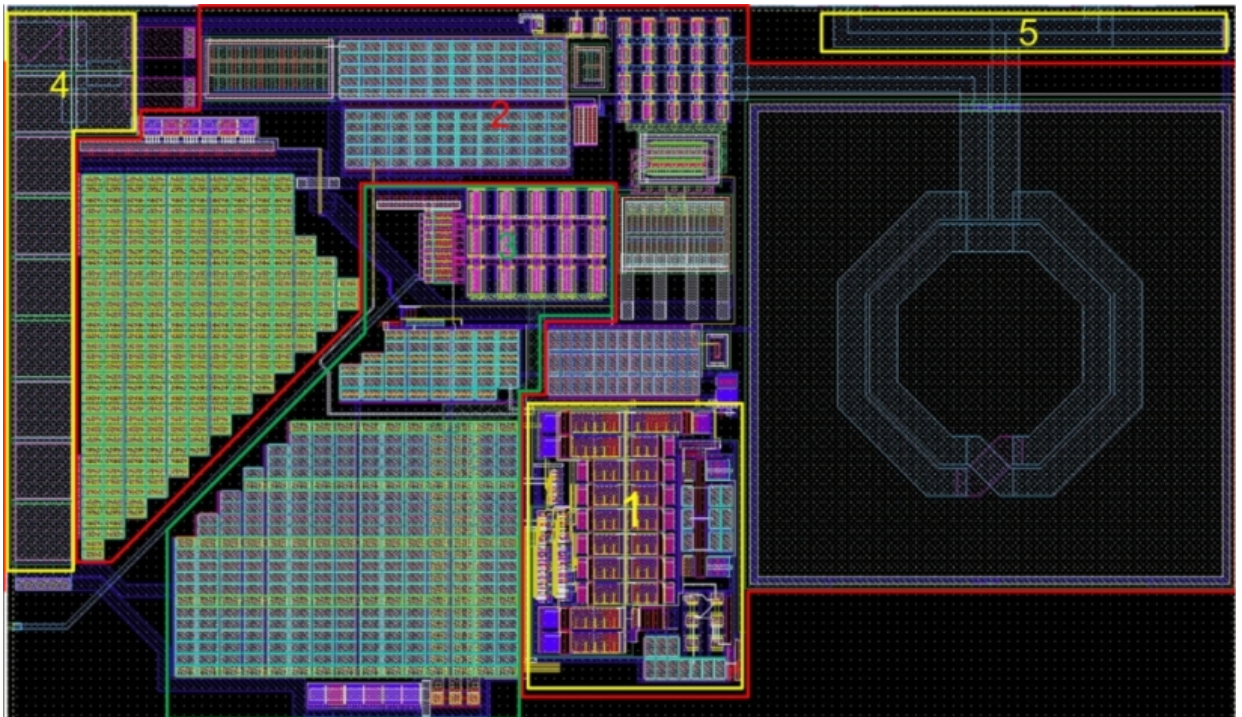


Figure 2: Low noise amplifier layout view.

1. Reference voltage and current source
2. LNA 1st stage
3. LNA 2nd stage
4. Supply voltage bus with filtering capacitors
5. Ground bus

7 OPERATING CHARACTERISTICS

7.1 TECHNICAL CHARACTERISTICS

Technology _____ TSMC018 SiGe
 Status _____ silicon proven
 Area _____ 0.26 mm²

7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for $V_{cc} = 2.8 \div 3.6$ V and $T = -40 \div +85^{\circ}\text{C}$. Typical values are at $V_{cc} = 3.15$ V, $T = +27^{\circ}\text{C}$, unless otherwise specified.

Parameter	Symbol	Condition	Value			Unit
			min	typ	max	
Supply voltage	V_{cc}	-	2.8	3.15	3.6	V
Operating temperature range	T	-	-40	+27	+85	$^{\circ}\text{C}$
Operating input frequency	F_{IN}	-	1550	-	1610	MHz
Noise figure	NF	-	-	1.5	-	dB
Gain	G	-	-	20	-	dB
Input VSWR	$VSWR_{IN}$	50 Ω	-	1.5	-	-
Output VSWR	$VSWR_{OUT}$	50 Ω	-	1.5	-	-
Input 1dB compression point	P_{1dB}	-	-	-28	-	dBm
Intermodulation point 3 rd order	IIP3	-	-	-18	-	dBm
Current limit	I_{cc}	-	4.3	7.2	11.2	mA
Stand-by current	I_{stb}	-	-	-	250	nA
Input logic-level high	V_{IH}	For digital inputs	$0.7V_{cc}$	-	$V_{cc}+0.25$	V
Input logic-level low	V_{IL}		-0.25	-	0.3	V

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