

## 3 to 5 GHz Low noise amplifier

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### SPECIFICATION

#### 1 FEATURES

- iHP SiGe BiCMOS 0.13 um
- Operating frequency range 3 to 5 GHz
- High gain (19.75 dB)
- Low noise figure (2.387 dB)
- High linearity
- Gain temperature compensation mode
- Build-in reference current source
- Internal matching network
- Small area
- Supported foundries: TSMC, UMC, Global Foundries, SMIC, iHP, AMS, Vanguard, SilTerra

#### 2 APPLICATION

- Front-end RF signal amplification in receivers

#### 3 OVERVIEW

LNA is consists of two bipolar amplifier stages. The block used correction circuit for frequency range extension. Amplifier output based on common collector circuit for low output impedance. Built-in bias circuit has temperature compensation and bias level control for optimal stages functioning. Internal amplifier supply filter provides supply noise suppression.

The block is designed on iHP SiGe BiCMOS 0.13 um technology.

## 4 STRUCTURE

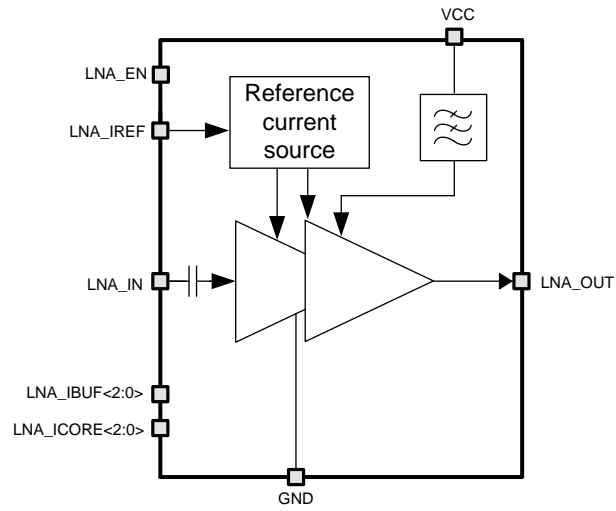


Figure 1: Low-noise amplifier structure.

## 5 PIN DESCRIPTION

Name	Direction	Description
LNA_IREF	IO	Reference current 5 uA
LNA_IN	I	LNA input
LNA_EN	I	Enable/disable
LNA_OUT	O	LNA output
LNA_ICORE<2:0>	I	LNA core current control
LNA_IBUF<2:0>	I	LNA buffer current control
VCC	IO	Supply voltage
GND	IO	Ground

## 6 LAYOUT DESCRIPTION

The block dimensions are given in the table 1.

**Table 1:** Block dimensions.

Dimension	Value	Unit
Height	250	um
Width	200	um

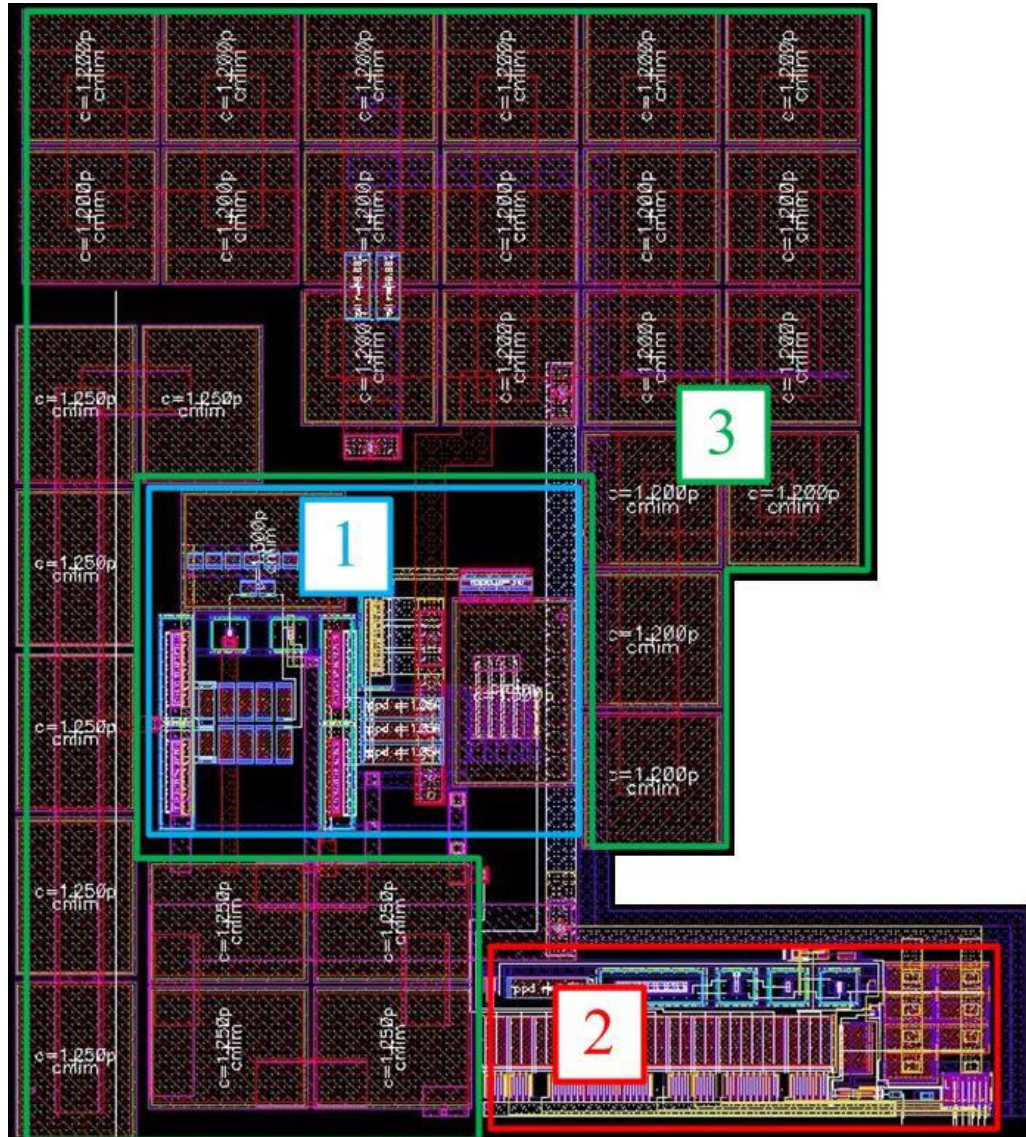


Figure 2: Device layout view.

1. Amplifier stages
2. Reference current source
3. Filtering capacitors

## 7 OPERATING CHARACTERISTICS

### 7.1 TECHNICAL CHARACTERISTICS

Technology \_\_\_\_\_ iHP SiGe BiCMOS 0.13  $\mu\text{m}$   
 Status \_\_\_\_\_ silicon proven  
 Area \_\_\_\_\_  $0.05 \text{ mm}^2$

### 7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for  $V_{cc} = 2.7 \div 3.6 \text{ V}$  and  $T_a = -45 \div +85^\circ\text{C}$ . Typical values are at  $V_{cc} = 3.0 \text{ V}$  and  $T_a = 27^\circ\text{C}$ , unless otherwise specified.

Parameter	Symbol	Condition	Value			Unit
			min	typ	max	
Supply voltage	$V_{cc}$	-	2.7	3.0	3.6	V
Operating temperature range	$T_a$	-	-45	27	85	$^\circ\text{C}$
Frequency input range	$F_{IN}$	-	3	-	5	GHz
Bandwidth	$B_W$	3 dB	0.5	-	6.8	GHz
Gain	G	$F_{IN} = 3 \text{ GHz}$	-	20.9	-	dB
		$F_{IN} = 5 \text{ GHz}$	-	19.75	-	
Noise figure	NF	-	-	2.87	-	dB
Input VSWR	$VSWR_{IN}$	$F_{IN} = 3 \text{ GHz}$	-	1.8	-	-
		$F_{IN} = 5 \text{ GHz}$	-	2.2	-	
Output VSWR	$VSWR_{OUT}$	$F_{IN} = 3 \text{ GHz}$	-	1.5	-	-
		$F_{IN} = 5 \text{ GHz}$	-	1.3	-	
Output resistance	$R_{OUT}$	-	-	50	-	$\Omega$
Input 1dB compression point	$P_{1dB}$	-	-	-18.2	-	dBm
Current consumption	$I_{cc}$	-	4.5	5.0	5.6	mA
Stand-by current	$I_{stb}$	-	-	0.326	3.2	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 TYPICAL CHARACTERISTICS

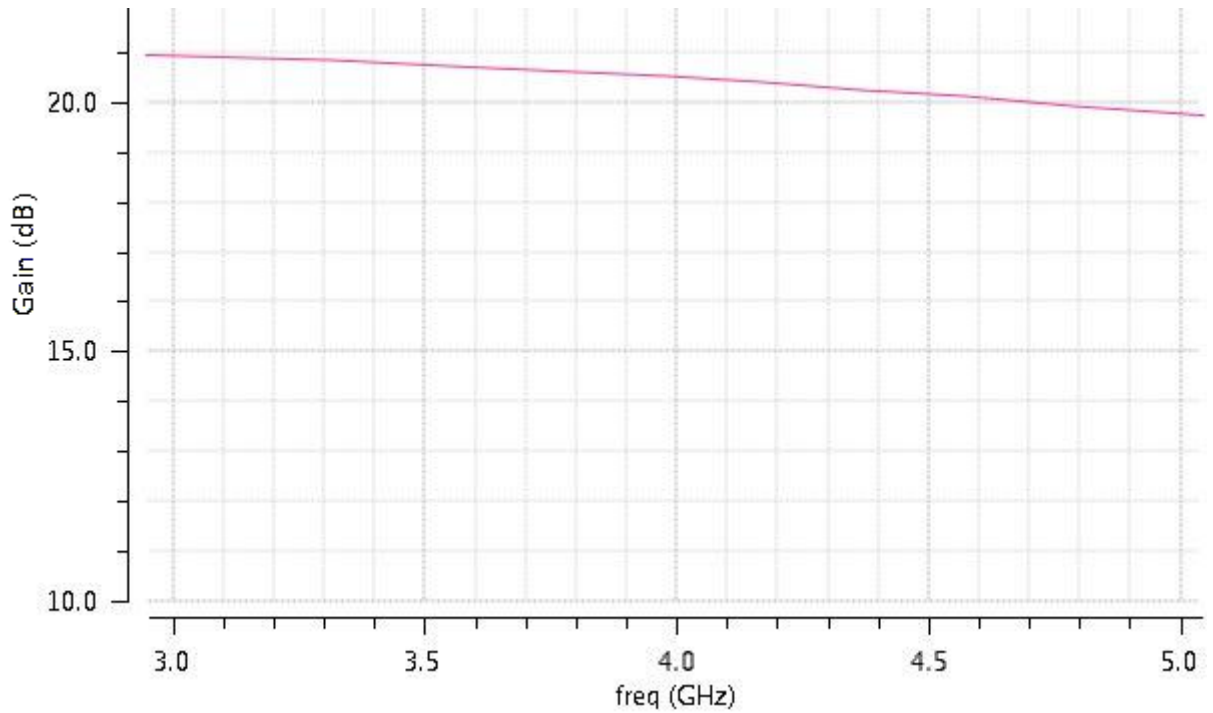


Figure 3: Gain vs. Frequency dependence.

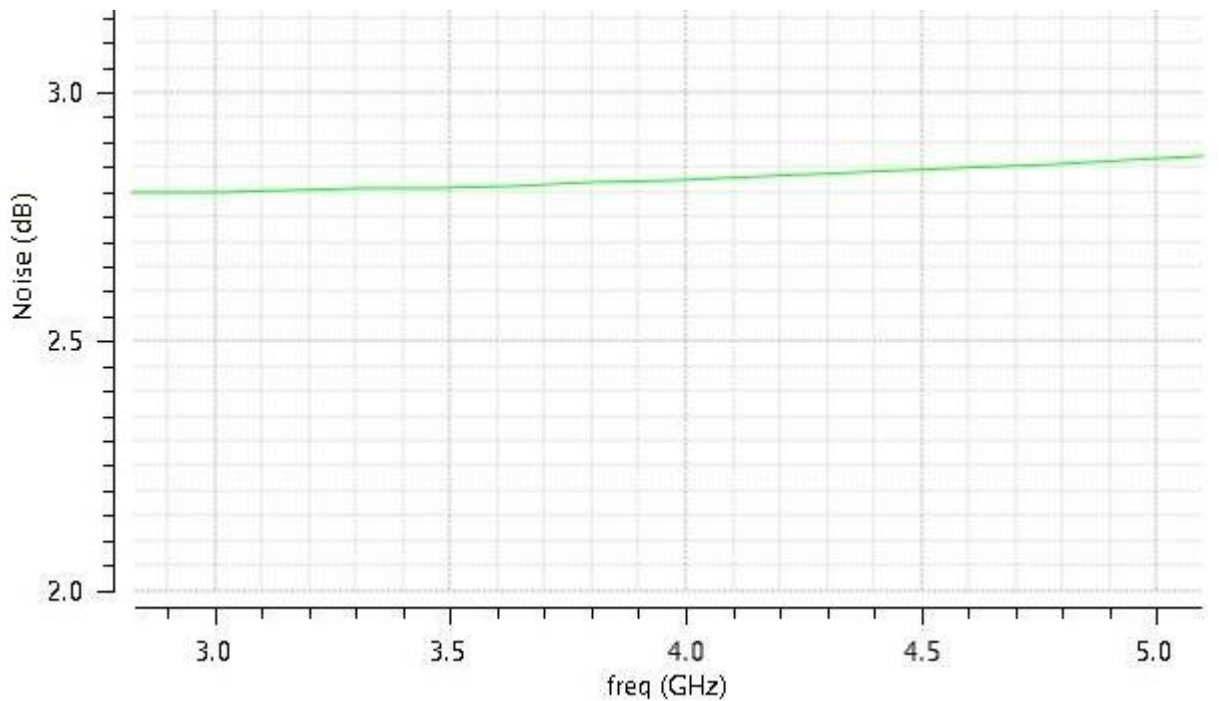


Figure 4: Noise figure vs frequency dependence.

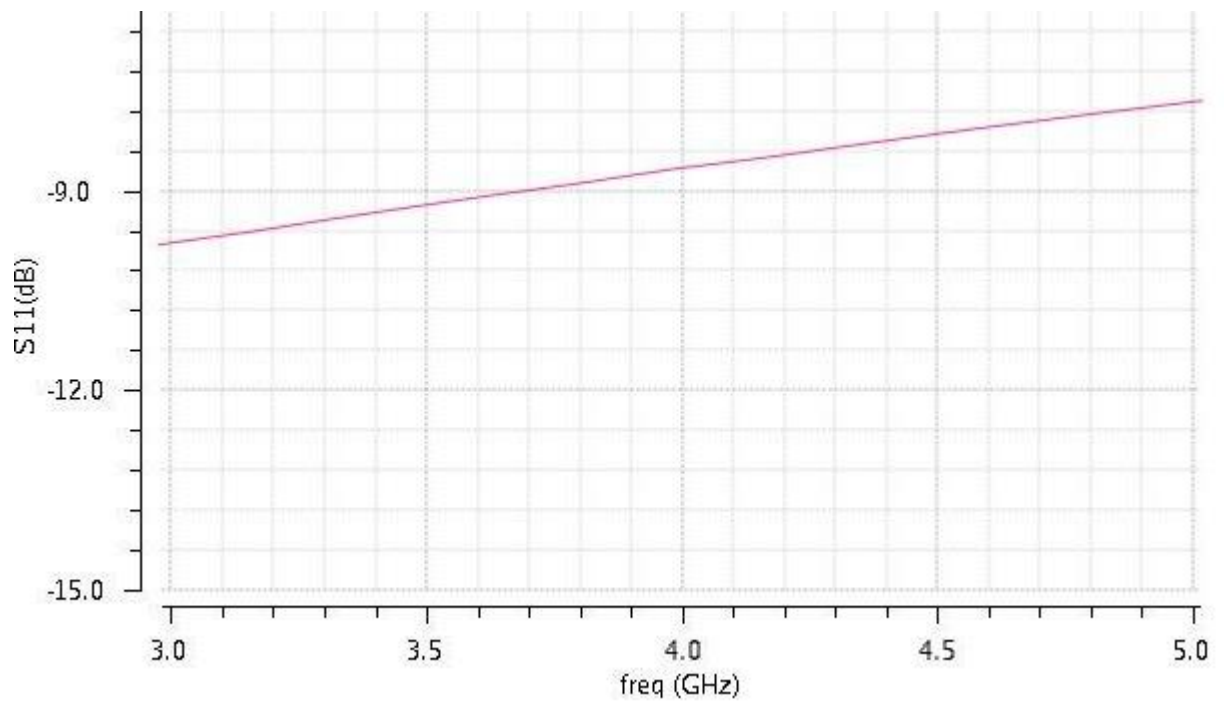


Figure 5: Input reflection coefficient vs frequency dependence.

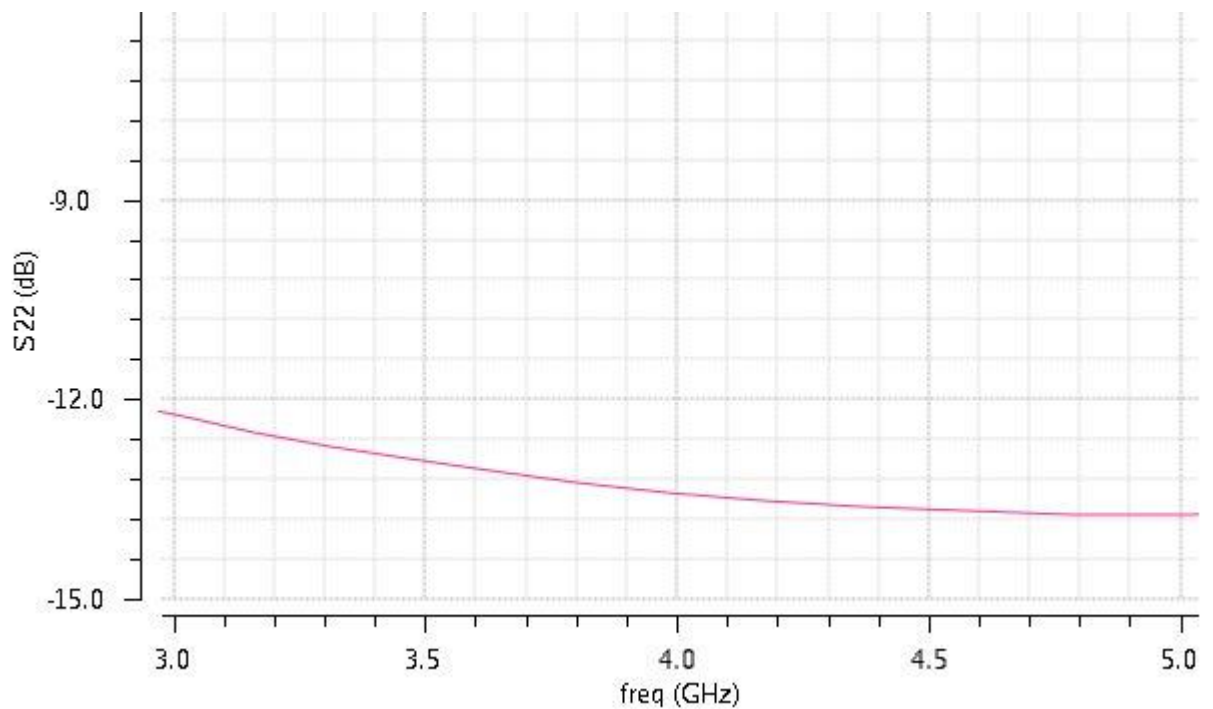


Figure 6: Output reflection coefficient vs frequency dependence.

## 9 DELIVERABLES

IP contents:

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