

---

## 130 to 935 MHz quadrature mixer

---

### SPECIFICATION

#### 1 FEATURES

- iHP SiGe BiCMOS 0.25  $\mu\text{m}$
- Operating frequency range from 130 to 935 MHz
- Adjusted gain
- Temperature compensation mode
- The input matching to an operating subband by the resonant circuit external components and phase shifter
- Overload protection
- Portable to other technologies (upon request)

#### 2 APPLICATION

- Receivers
- Transmitters

#### 3 OVERVIEW

Quadrature mixer is based on Gilbert cells and consists of two double-balanced mixers converting RF frequency to a low intermediate frequency (IF)). An external phase shifter is used for RF signal phase conversion. An external resonant circuit is applied to adjust the input matching and the component values are selected according to an operating subband.

The block is fabricated on iHP SiGe BiCMOS 0.25  $\mu\text{m}$  technology.

## 4 STRUCTURE

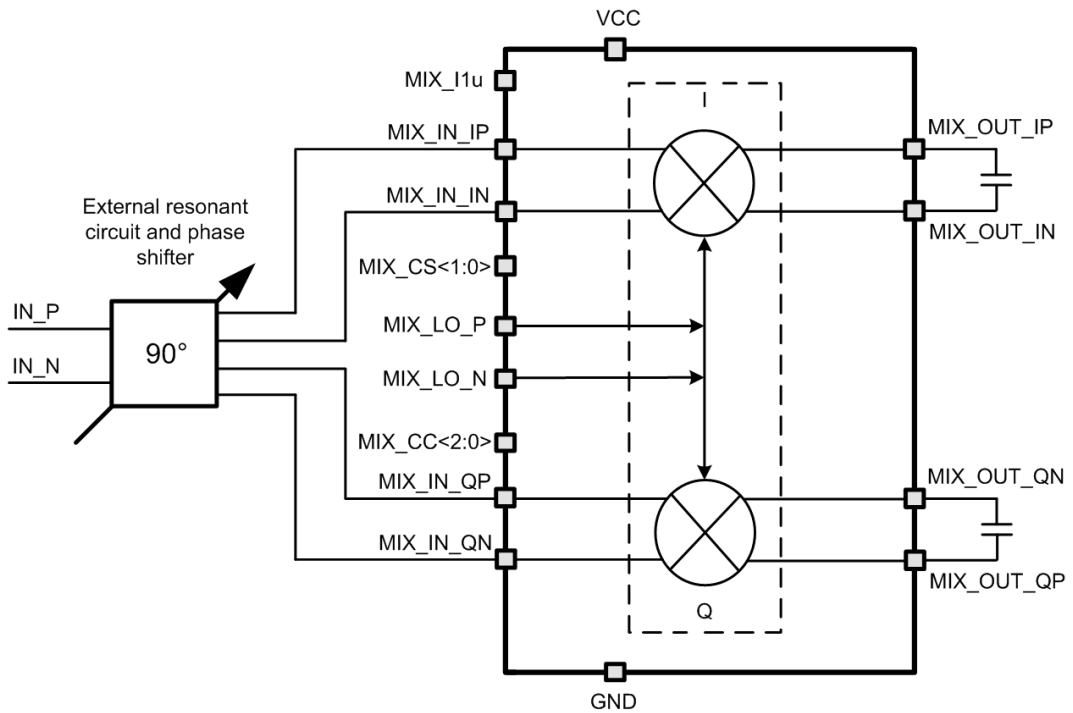


Figure 1: Quadrature mixer structure

## 5 PIN DESCRIPTION

Name	Direction	Description
MIX_i1u	I	Reference current (1 uA)
MIX_IN_IP	I	I channel differential RF mixer input
MIX_IN_IN	I	
MIX_IN_QP	I	Q channel differential RF mixer input
MIX_IN_QN	I	
MIX_LO_P	I	Local-oscillator signal differential input
MIX_LO_N	I	
MIX_EN	I	Enable/disable
MIX_OP	I	Overload protection enable
MIX_OUT_IP	O	I channel differential IF mixer output
MIX_OUT_IN	O	
MIX_OUT_QP	O	Q channel differential IF mixer output
MIX_OUT_QN	O	
MIX_CS<1:0>	I	Temperature compensation mode enable
MIX_CC<2:0>	I	Current consumption 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	621.3	um
Width	375.06	um

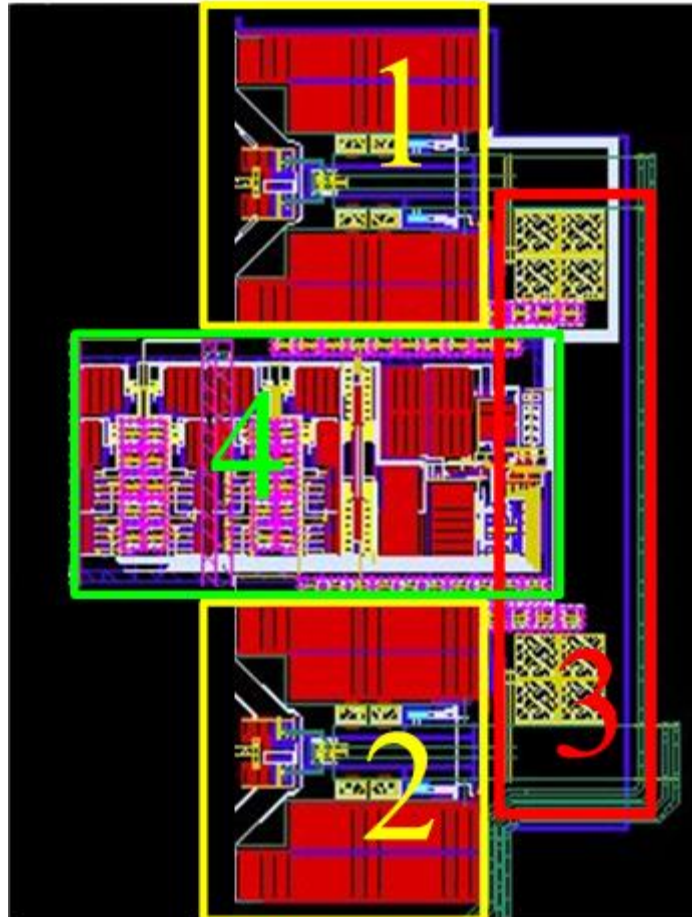


Figure 2: Device layout

1. I channel mixer
2. Q channel mixer
3. Block, specifying DC operating point
4. Mixer reference current source

## 7 OPERATING CHARACTERISTICS

### 7.1 TECHNICAL CHARACTERISTICS

Technology \_\_\_\_\_ iHP SiGe BiCMOS 0.25 um  
 Status \_\_\_\_\_ silicon proven  
 Area \_\_\_\_\_ 0.15 mm<sup>2</sup>

### 7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for  $V_{cc} = 1.8 \div 2.3$  V and  $T_a = -45 \div +85$  °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
Input frequency range	$F_{INMIX}$	-	130	-	935	MHz
Output frequency range	$F_{OUTMIX}$	-	-	-	10	kHz
Conversion gain	$G_{MIX}$	$F_{INMIX} = 140$ MHz	-4.2	-3.2	-2.5	dB
		$F_{INMIX} = 435$ MHz	-4.2	-3.3	-2.6	
		$F_{INMIX} = 930$ MHz	-4.6	-3.7	-2.9	
Noise figure	$NF_{MIX}$	$F_{INMIX} = 140$ MHz	-	10.7	12.2	dB
		$F_{INMIX} = 435$ MHz	-	10.7	12.2	
		$F_{INMIX} = 930$ MHz	-	10.7	12.2	
1dB compression point	$P_{1dB}$	$F_{INMIX} = 140$ MHz	-	-29	-	dBm
		$F_{INMIX} = 435$ MHz	-	-29	-	
		$F_{INMIX} = 930$ MHz	-	-29	-	
3 <sup>rd</sup> order intercept point	IP3	$F_{INMIX} = 140$ MHz	-	-13.45	-	dBm
		$F_{INMIX} = 435$ MHz	-	-13.20	-	
		$F_{INMIX} = 930$ MHz	-	-13.10	-	
Intermodulation immunity	IM3	$F_{INMIX} = 140$ MHz	-	77.58	-	dB
		$F_{INMIX} = 435$ MHz	-	64	-	
		$F_{INMIX} = 930$ MHz	-	83.12	-	
Peak-to-peak voltage at local-oscillator input	$A_{in\ p-p}$	-	-	600	-	mV
Input impedance	$R_{in}$	-	-	300	-	$\Omega$
Output impedance	$R_{out}$	-	-	20	-	k $\Omega$
Current consumption in an active mode	$I_{cc}$	-	0.17	0.23	0.294	mA
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

---

## 8 DELIVERABLES

Depending on license type IP may include:

- Schematic or NetList
- Abstract view (.lef and .lib files)
- Layout (optional)
- Verilog behavior model
- Extracted view (optional)
- GDSII
- DRC, LVS, antenna report
- Test bench with saved configurations (optional)
- Documentation