

# 1160 to 1250 MHz and 1560 to 1610 MHz image rejection mixer

## SPECIFICATION

### 1 FEATURES

- AMS BiCMOS 0.35  $\mu\text{m}$
- Input frequency range from 1160 MHz to 1250 MHz and from 1560 MHz to 1610 MHz
- Controllable gain
- Temperature compensated gain mode
- Supported foundries: TSMC, UMC, Global Foundries, SMIC, iHP, AMS, Vanguard, SilTerra

### 2 APPLICATION

- Radio receivers

### 3 OVERVIEW

The device converts an incoming high-frequency signal (RF) to intermediate frequency (IF) with image-rejection.

The block is fabricated on AMS BiCMOS 0.35  $\mu\text{m}$  technology.

### 4 STRUCTURE

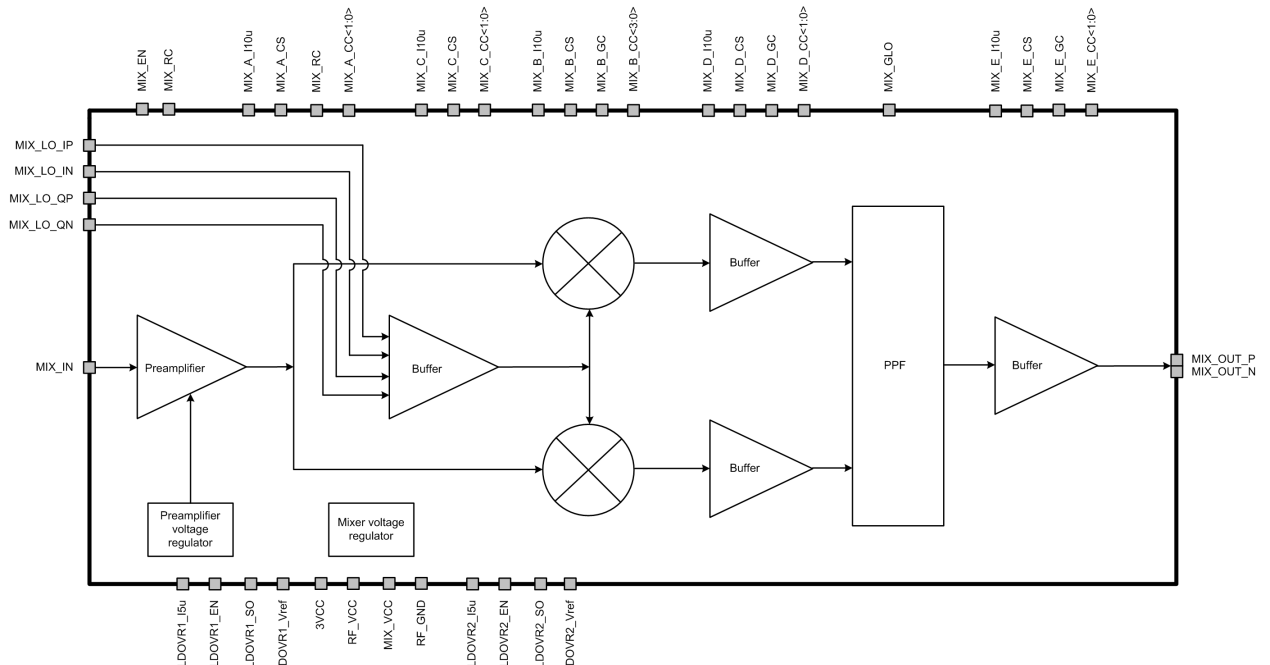


Figure 1: Mixer structure

## 5 PIN DESCRIPTION

Name	Direction	Description
MIX_A_I10u	IO	Preamplifier reference current 10 uA
MIX_B_I10u	IO	Mixer reference current 10 uA
MIX_C_I10u	IO	Local-oscillator buffer reference current 10 uA
MIX_D_I10u	IO	Mixer output buffer reference current 10 uA
MIX_E_I10u	IO	Polyphase filter (PPF) output buffer reference current 10 uA
MIX_IN	I	Mixer input
MIX_LO_IP	I	I channel local-oscillator differential input
MIX_LO_IN		
MIX_LO_QP	I	Q channel local-oscillator differential input
MIX_LO_QN		
MIX_EN	I	Mixer enable/disable (without voltage regulators)
MIX_A_CS	I	Preamplifier current source type (temperature independent/temperature dependent)
MIX_B_CS	I	Mixer current source type (temperature independent/temperature dependent)
MIX_C_CS	I	Local-oscillator current source type (temperature independent/temperature dependent)
MIX_D_CS	I	Mixer output buffer current source type (temperature independent/temperature dependent)
MIX_E_CS	I	PPF output buffer current source type (temperature independent/temperature dependent)
MIX_RC	I	Output resonant circuit preset
MIX_GLO	I	PPF rejection mode
MIX_B_GC	I	Mixer gain control
MIX_D_GC	I	Mixer output buffer gain control
MIX_E_GC	I	PPF output buffer gain control
MIX_A_CC<1:0>	I	Preamplifier current consumption control
MIX_B_CC<3:0>	I	Mixer current consumption control
MIX_C_CC<1:0>	I	Local-oscillator signal buffer current consumption control
MIX_D_CC<1:0>	I	Mixer output buffer current consumption control
MIX_E_CC<1:0>	I	PPF output buffer current consumption control
LDOVR1_EN	I	Preamplifier voltage regulator enable/disable
LDOVR1_SO	I	Preamplifier LDO bypass mode enable

Table "Pin description" (continue)

<b>Name</b>	<b>Direction</b>	<b>Description</b>
LDOVR2_EN	I	Mixer and buffers voltage regulator enable/disable
LDOVR2_SO	I	Mixer and buffers LDO bypass mode enable
MIX_OUT_P	O	Mixer differential output
MIX_OUT_N		
LDOVR1_I5u	IO	Preamplifier voltage regulator reference current 5 uA
LDOVR1_Vref	IO	Preamplifier voltage regulator reference voltage (1.13 V)
LDOVR2_I5u	IO	Mixer and buffers voltage regulator reference current 5 uA
LDOVR2_Vref	IO	Mixer and buffers voltage regulator reference voltage (1.13 V)
RF_VCC	IO	Preamplifier voltage regulator output
MIX_VCC	IO	Mixer and buffers voltage regulator output
3VCC	IO	Supply voltage
RF_GND	IO	Ground

## 6 LAYOUT DESCRIPTION

Table 1: Mixer dimensions

Dimension	Value	Unit
Height	2300	um
Width	1500	um

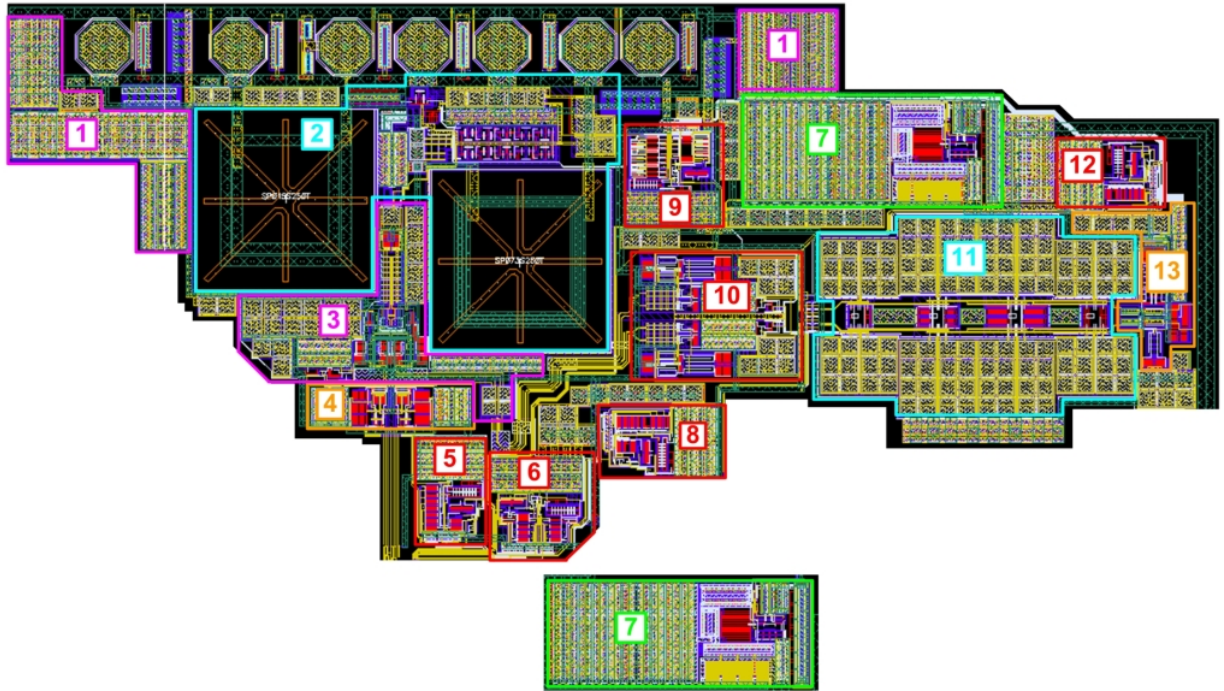


Figure 2: Mixer layout

1. Filtering capacitors
2. Preamplifier
3. Mixer
4. Local-oscillator buffer
5. Local-oscillator buffer reference source
6. Mixer reference source
7. Mixer voltage regulator
8. Mixer buffer reference source
9. Preamplifier reference source
10. Mixer buffer
11. Preamplifier voltage regulator
12. Polyphase filter
13. Polyphase filter buffer reference source
14. Polyphase filter buffer

## 7 OPERATING CHARACTERISTICS

### 7.1 TECHNICAL CHARACTERISTICS

Technology \_\_\_\_\_ AMS BiCMOS 0.35 um  
 Status \_\_\_\_\_ silicon proven  
 Total area \_\_\_\_\_ 2.07 mm<sup>2</sup>

### 7.2 ELECTRICAL CHARACTERISTICS

The values of electrical parameters are given for  $V_{cc} = 2.85 \div 3.15$  V,  $V_{MIX} = V_{RF} = 2.65 \div 3.15$  V and  $T_j = -40 \div +85^\circ\text{C}$ . Typical values are at  $V_{cc} = 3.0$  V and  $T_j = +27^\circ\text{C}$ , unless otherwise specified.

Parameter	Symbol	Note	Value			Unit
			min	typ.	max	
Supply voltage	$V_{cc}$	External	2.85	3.0	3.15	V
	$V_{MIX}$	Controllable	2.65	-	3.15	
	$V_{RF}$		2.65	-	3.15	
Operating temperature	$T_j$	-	-40	27	85	°C
Operating input frequency	$F_{IN}$	-	1160	-	1240	MHz
			1560	-	1610	MHz
Operating output frequency	$F_{OUT}$	-	3	-	25	MHz
Gain	$G$	-	-	22	-	dB
Noise figure	NF	-	-	3.0	-	dB
Preamplifier input VSWR	$VSWR_{IN}$	50 Ohm	-	1.5	-	-
Preamplifier output VSWR	$VSWR_{OUT}$	2000 Ohm on differential output	-	1.1	-	-
Gain ripple	$\Delta G_{MIX}$	In-band (3...25 MHz)	-	1	-	dB
Image rejection	S	In-band (3...25 MHz)	-	30	-	dB
Input 1dB compression point	$P_{1dB}$	-	-	-43	-	dBmW
3rd order intercept point	IIP3	-	-	-34	-	dBmW
Current consumption	$I_{cc}$	-	-	9.8	-	mA
Standby current	$I_{stb}$	-	-	-	280	nA
Input logic-level high	$V_{IH}$	-	$0.9V_{cc}$	-	3.15	V
Input logic-level low	$V_{IL}$		-0.2	0	0.2	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