

# Quadrature former 0.75-3 GHz

## SPECIFICATION

### 1 FEATURES

- TSMC CMOS 65 nm
- Output frequency range 0.75-3 GHz
- Input signal division (by 2 or 4)
- High accuracy of the phase control
- Operating-temperature range: from -40 °C to + 125 °C
- Portable to other technologies (upon request)

### 2 APPLICATION

- Quadrature signal processing for mixer

### 3 OVERVIEW

This device is designed to generate a quadrature heterodyne signal. CML logic quadrature generator consists of divider by 2 or 4 that form quadrature. MUX to select the one is running, and phase adjustment block implemented on signal delay time.

### 4 STRUCTURE

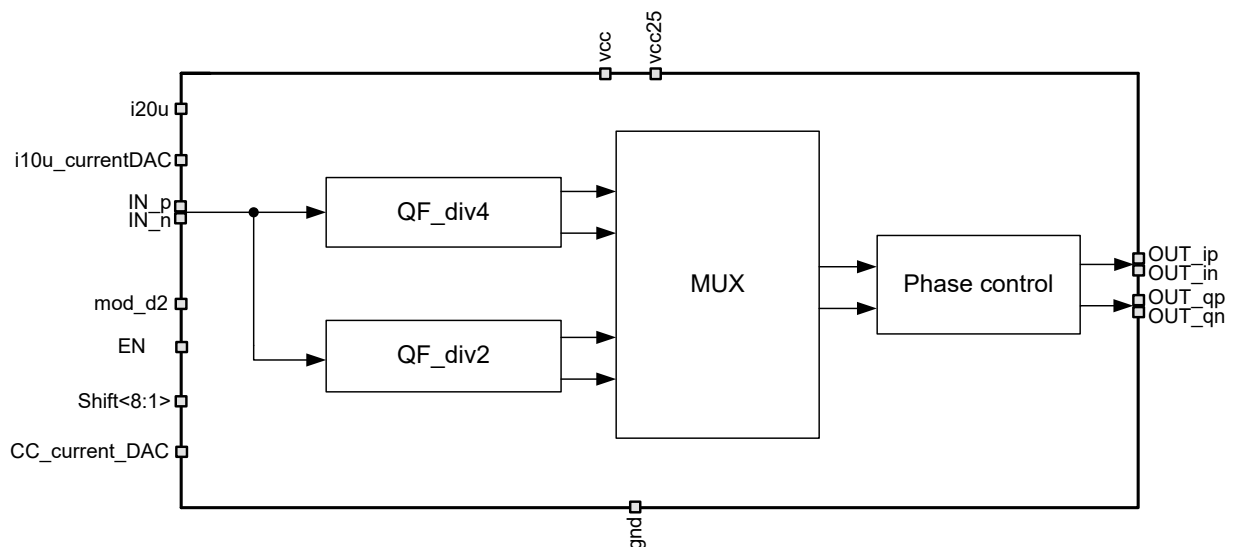


Figure 1: Quadrature former 0.75-3 GHz structure

## 5 PIN DESCRIPTION

Name	Direction	Description
i20u	IO	Reference current 20 $\mu$ A
i10u_currentDAC	IO	Reference current 10 $\mu$ A
EN	I	QF enable:
CC_current_DAC	I	DAC current consumption
Shift<8:1>	I	Phase correction control
mod_d2	I	Divider mode
IN_p	I	Differential input
IN_n	I	
OUT_ip	O	I channel differential output
OUT_in	O	
OUT_qp	O	Q channel differential output
OUT_qn	O	
vcc25	I	Supply voltage 2.5 V
vcc	I	Supply voltage 1.2 V
gnd	I	Ground

## 6 LAYOUT DESCRIPTION

The block dimensions are given in table 1.

**Table 1:** Block dimensions.

Dimension	Value	Unit
Height	282	$\mu\text{m}$
Width	180	$\mu\text{m}$

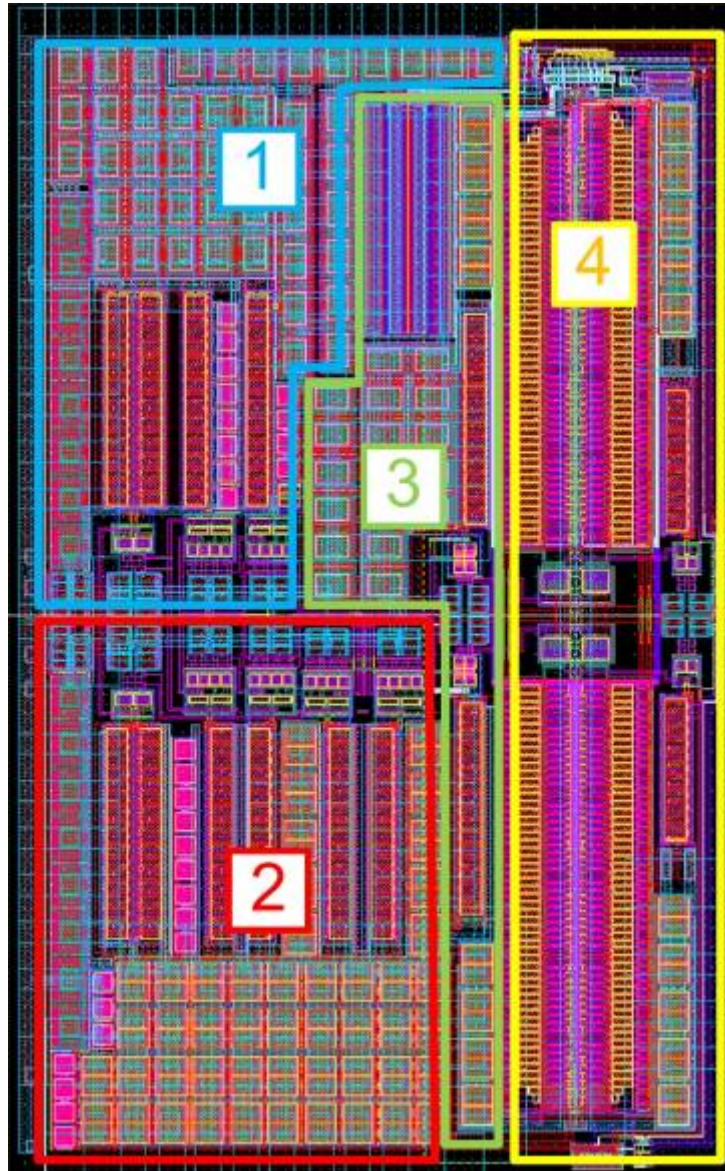


Figure 2: Quadrature former layout view

1. Divider by 2
2. Divider by 4
3. MUX
4. Phase tuner block

## 7 OPERATING CHARACTERISTICS

### 7.1 TECHNICAL CHARACTERISTICS

Technology \_\_\_\_\_ TSMC CMOS 65 nm

Status \_\_\_\_\_ silicon proven

 Area \_\_\_\_\_ 0.068 mm<sup>2</sup>

### 7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for  $V_{cc} = 1.14 \div 1.26$  V,  $V_{cc25} = 2.375 \div 2.625$  V and  $T = -40 \div 125$  °C. Typical values are at  $V_{cc} = 1.2$  V,  $V_{cc25} = 2.5$  V and  $T = 85$  °C, unless otherwise specified.

Parameter	Symbol	Condition	Value			Unit
			min	typ	max	
Supply voltage	$V_{cc25}$	-	2.375	2.5	2.625	V
	$V_{cc}$	-	1.14	1.2	1.26	V
Temperature range	T	-	-40	+85	+125	°C
Input frequency range	$F_{in}$	-	3.0	-	6.0	GHz
Output frequency range	$F_{out}$	-	0.75	-	3	GHz
Division ratio	N	Division by 2	-	2	-	-
		Division by 4	-	4	-	-
Output amplitude	$V_{out-p-p}$	-	-	0.5	-	V
Input amplitude	$V_{in-p-p}$	-	0.5	-	-	V
IQ phase error	$\varphi$	-	-	-	±2	degree
Phase adjustment range	$\varphi_{corr.}$	-	±0.05	-	±5	degree
Current consumption	$I_{av}$	-	-	15	17	mA
Input logic-level high	$V_{IH}$	-	$0.85V_{cc}$	-	$2.45V_{cc}$	V
Input logic-level low	$V_{IL}$	-	-0.1	-	+0.1	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