
11MHz to 25MHz band-pass filter

SPECIFICATION

1 FEATURES

- SMIC CMOS 0.18 μm
- Wide cut-off frequency adjustment range (11MHz...25MHz)
- Programmable bandwidth
- Narrowband and wideband modes (3MHz, 5MHz)
- Automatic cut-off frequency adjustment system
- There are 4 operation modes
- No external components required
- Supported foundries: TSMC, UMC, Global Foundries, SMIC, iHP, AMS, Vanguard, SilTerra

2 APPLICATION

- Intermediate frequency signal processing
- Navigation systems

3 FUNCTIONAL DESCRIPTION

Band-pass filter (BPF) is two coupled circuits with capacitive external coupling. There are two modes for cut-off frequency programming: manually or automatically. In automatic mode one of the circuits is used in an oscillator mode therewith the oscillation frequency correlates with the BPF central frequency.

BPF operates in narrowband (GPS) or wideband (Galileo) modes with a bandwidth of 3 MHz and 5 MHz, respectively.

There are 4 operation modes with different rated signal level under the same value of distortion. Greater level of signal corresponds to a higher current consumption.

The block is fabricated on SMIC CMOS 0.18 μm technology.

4 STRUCTURE

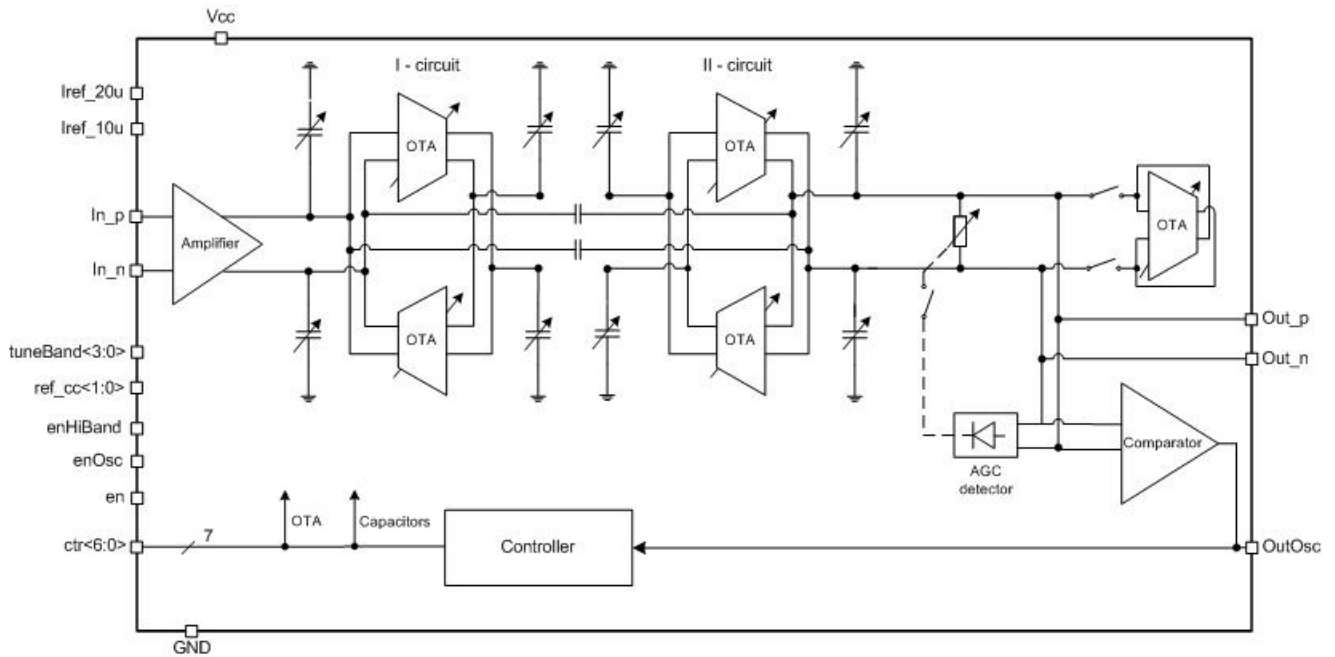


Figure 1: Band-pass filter structure

5 PIN DESCRIPTION

Name	Direction	Description
In_p	I	Analog differential input
In_n	I	
ctr<6:0>	I	Digital code controlling a central frequency
tuneBand<3:0>	I	Passband width adjustment
ref_cc<1:0>	I	Reference voltage control
Iref_20uA	I	Reference current (20 μ A)
Iref_10uA	I	Reference current (10 μ A)
enHiBand	I	Galileo mode enable (wideband))
enOsc	O	Oscillator mode enable
en	I	Enable/disable
Out_p	O	Analog differential output
Out_n	O	
OutOsc	O	Oscillator digital output
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		541.2	μm
Width		540.87	μm

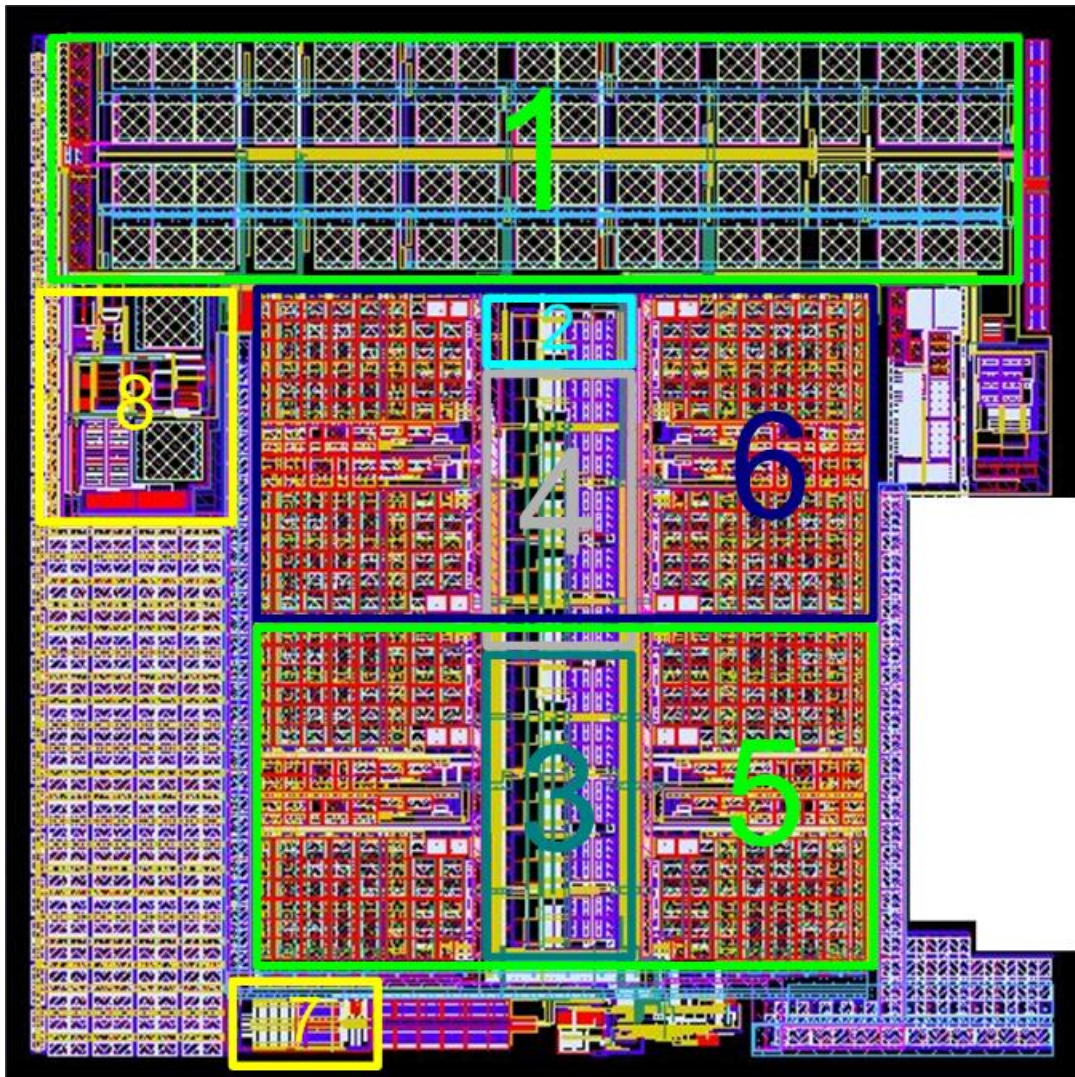


Figure 2: Device layout

1. Capacitive coupling
2. Negative resistance circuit
3. The 1st circuit gyrator
4. The 2nd circuit gyrator
5. The 1st circuit tuned capacitors
6. The 2nd circuit tuned capacitors
7. Amplifier
8. Detector

7 OPERATING CHARACTERISTICS

7.1 TECHNICAL CHARACTERISTICS

Technology _____ SMIC CMOS 0.18 μm
 Status _____ silicon proven
 Area _____ 0.3 mm^2

7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for $V_{cc} = 1.7 \div 1.9 \text{ V}$ and $T_a = -45 \div +90 \text{ }^\circ\text{C}$. Typical values are at $V_{cc} = 1.8 \text{ V}$ and $T_a = +27^\circ \text{C}$, unless otherwise specified.

Parameter	Symbol	Condition	Value			Unit
			min	typ.	max	
Supply voltage	V_{cc}	-	1.7	1.8	1.9	V
Operating temperature range	T_a	-	-45	27	90	$^\circ\text{C}$
Input frequency range	F_{in}	GPS	10.76	-	18.76	MHz
		Galileo	8.3	-	15.62	
Filter order	k	-	-	2	-	-
Insertion loss	G	GPS	-	10	-	dB
		Galileo	-	12	-	
Input signal bandwidth	F	GPS	-	3	-	MHz
		Galileo	-	5	-	
Noise figure	NF	GPS	-	18.86	9.4	dB
		Galileo	-	15.08	9.8	dB
1 dB compression point	P_{1dB}	-	-	-43.3	-	dBm
3 rd order intercept point	IP3	-	-	-12.6	-	dBm
Input impedance	R_{in}	Differential input	-	2	-	$\text{k}\Omega$
Output impedance	R_{out}	Differential output	-	2	-	$\text{k}\Omega$
Current consumption	I_{cc}	-	-	3.63	4.8	mA
Current consumption in a standby mode	I_{stb}	-	-	-	1	μA
Input logic-high level	V_{IH}	For digital inputs	$0.7 V_{cc}$	-	3.6	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