

Low pass filter

SPECIFICATION

1 FEATURES

- TSMC018 SiGe
- Wide cut-off frequency adjustment range (6.5 MHz...23 MHz)
- Low pass filter cut-off frequency adjustment system (LPF CFAS)
- Supported foundries: TSMC, UMC, Global Foundries, SMIC, iHP, AMS, Vanguard, SiTerra

2 APPLICATION

- Receivers

3 OVERVIEW

Low pass filter (3rd order Chebyshev filter) is based on the gyrators with cut-off frequency adjustment in wide range. There are two modes for cut-off frequency programming: manually and automatically. The generator is used to adjust filter cut-off (CO) frequency in automatic mode. Also CO frequency can be fixed by the digital code CFAS_Code<6:0>. The block is fabricated on TSMC018 SiGe technology.

4 STRUCTURE

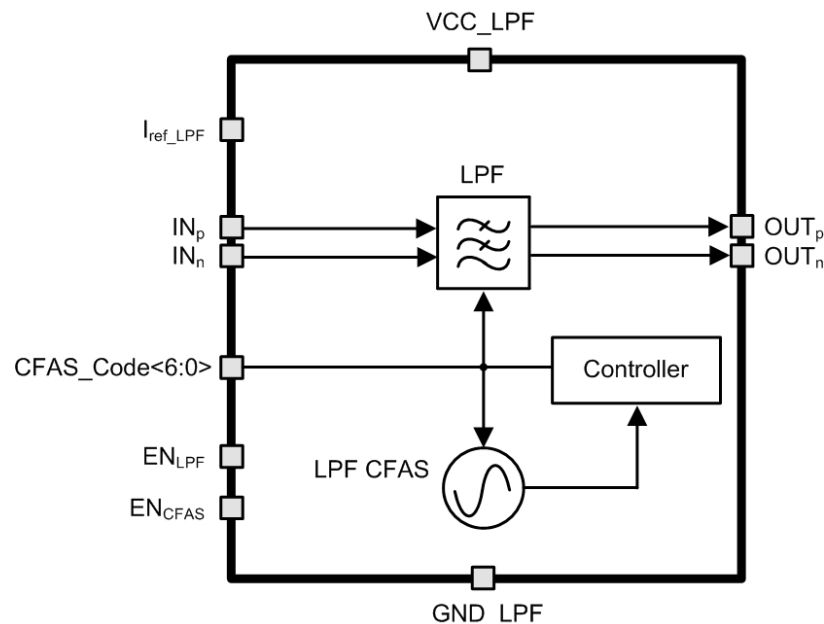


Figure 1: Low pass filter structure.

5 PIN DESCRIPTION

Name	Direction	Description
I _{ref_LPF}	IO	Reference current 20 μ A
IN _p	I	Differential input
IN _n	I	
CFAS_Code<6:0>	I	Digital code of LPF cut-off frequency adjustment system
EN	I	LPF enable/disable
EN _{CFAS}	I	LPF cut-off frequency adjustment system enable/disable
OUT _p	O	LPF differential output
OUT _n	O	
VCC_LPF	IO	LPF supply voltage
GND_LPF	IO	LPF ground

6 LAYOUT DESCRIPTION

Low pass filter dimensions are given in the table 1.

Table 1: Block dimensions.

Dimension	Value	Unit
Height	350	μm
Width	445	μm

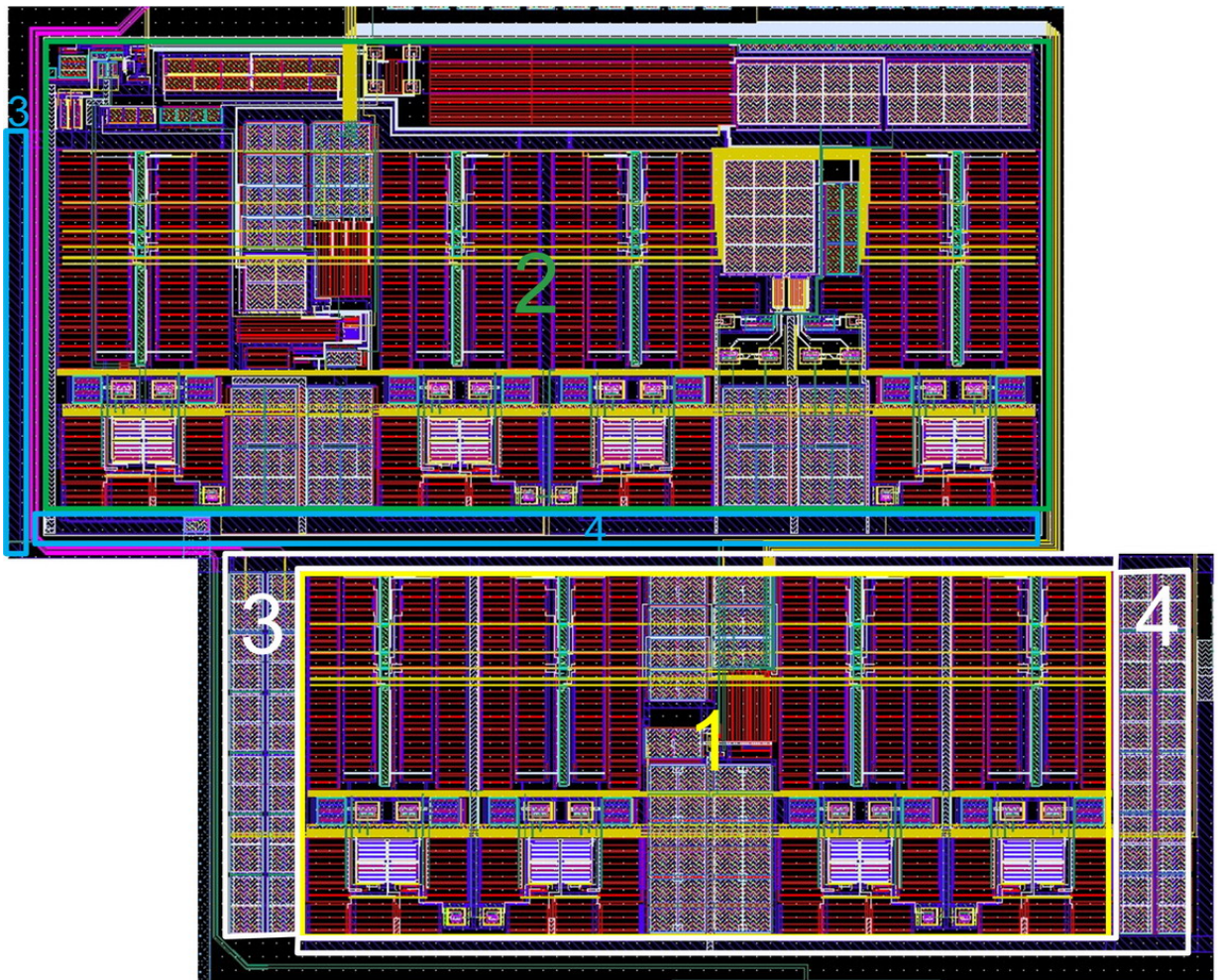


Figure 2: Low pass filter layout view.

1. LPF operational amplifiers
2. Cut-off frequency adjustment system
3. Ground bus with filter capacitors
4. Supply voltage bus with filter capacitors

7 OPERATING CHARACTERISTICS

7.1 TECHNICAL CHARACTERISTICS

Technology _____ TSMC018 SiGe
 Status _____ silicon proven
 Area _____ 0.15 MM²

7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for $V_{cc} = 2.8 \div 3.6$ V and $T = -40 \div +85^{\circ}\text{C}$. Typical values are at $V_{cc} = 3.15$ V, $T = +27^{\circ}\text{C}$, unless otherwise specified.

Parameter	Symbol	Condition	Value			Unit
			min	typ	max	
Supply voltage	V_{cc}	-	2.8	3.15	3.6	V
Operating temperature range	T	-	-40	+27	+85	$^{\circ}\text{C}$
Cut-off frequency	F	-1 dB	6.5	-	23	MHz
Group delay time ripple	t_{del}	-	-	6	-	ns
Noise figure	NF	-	-	12.9	13.5	dB
Transmission gain	G	-	-1	-0.6	-	dB
Input/output impedance	R	-	-	2000	-	Ω
Supply current	I_{cc}	-	-	1.32	1.35	mA
Stand-by current	I_{stb}	-	-	0.01	0.1	μA
Input logic-level low	V_{IL}	For digital inputs	-0.25	-	0.3	V
Input logic-level high	V_{IH}		$0.7V_{cc}$	-	$V_{cc} + 0.25$	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