Low pass filter

SPECIFICATION

1 FEATURES

- AMS BiCMOS 0.35 µm
- Low noise figure
- High linearity
- Low pass filter cut-off frequency adjustment system (LPF CFAS)
- Very low amplitude ripple
- Portable to other technologies (upon request)

2 APPLICATION

- Receivers

3 OVERVIEW

The IP1_LPF_02R5 is the 4th order Butterworth low pass filter with cut-off frequency adjustment. It is based on the two amplifiers with feedback and has differential input and output. 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 set by the digital code CFAS_Code<6:0>.
The block is fabricated on AMS BiCMO 0.35 µm S technology.

4 STRUCTURE

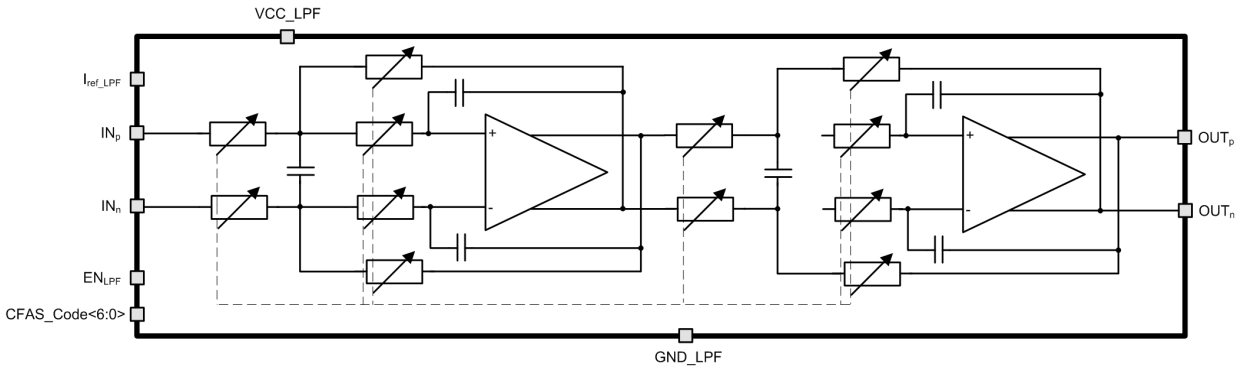

Figure 1: Low pass filter structure.

5 PIN DESCRIPTION

Name	Direction	Description
I_{ref_LPF}	IO	Reference current 60 µA
IN_p	I	Differential input
IN_n	I	
CFAS_Code<6:0>	I	Digital code of LPF cut-off frequency adjustment system
EN_{LPF}	I	LPF 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	305	µm
Width	810	µm

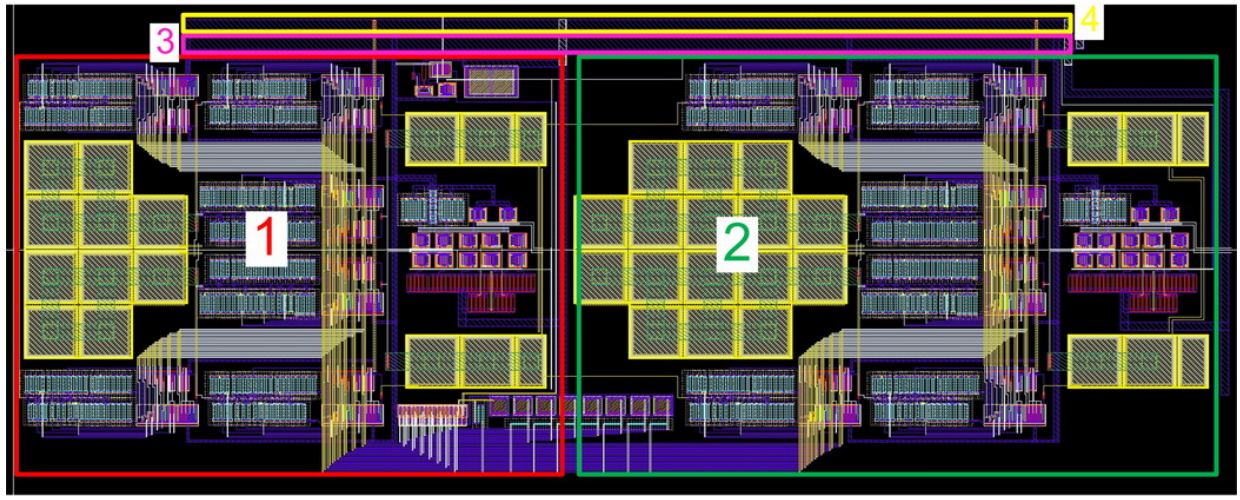

Figure 2: Low pass filter layout view.

1. The 1st amplifier with feedback
2. The 2nd amplifier with feedback
3. Supply voltage bus
4. Ground bus

7 OPERATING CHARACTERISTICS

7.1 TECHNICAL CHARACTERISTICS

Technology _____ AMS BiCMOS 0.35µm
Status _____ silicon proven
Area _____ 0.25 mm^2

7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for V_{cc} = 2.75 ÷ 3.2 V and T = -45 ÷ +85°C. Typical values are at V_{cc} = 3.15 V, T = +27°C, unless otherwise specified.

Parameter	Symbol	Condition	Value			Unit
			min	typ.	max	
Supply voltage	V_{cc}	-	2.75	3.0	3.2	V
Operating temperature range	T	-	-45	+27	+85	°C
Filter order	k	-	-	4	-	-
Insertion loss	G	In passband	-5.6	-3.0	-1.6	dB
Filter bandwidth	F	-1 dB	20.6	24.0	27.6	MHz
		-5 dB	-	30	-	MHz
		-20 dB	-	50	-	MHz
Group delay ripple	t_{del}	2.5…18.5 MHz	-	7.1	8.7	ns
		4.5…22.5 MHz		7.7	9.0	
Input referred noise	RN	Differential input 100 Ω	-	25.9	34.4	$\frac{nV}{\sqrt{Hz}}$
1 dB compression point	P_{1dB}	1 dB	-4.5	-4.0	-	dBm
3rd order input intercept point	IP3	Differential input	-	17	-	dBm
Input impedance	R	Differential input	78	102	131	Ω
Supply current	I_{cc}	-	-	4.4	4.6	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