10-bit DAC

SPECIFICATION

1. FEATURES

- SMIC EEPROM CMOS 0.18 um
- Resolution 10-bit
- 100 MHz update rate
- High spurious free dynamic range performance up to 25 MHz output
- Adjustable output current (from 1.3 mA to 21 mA)
- Standby mode (current consumption less than 200 nA)
- Supported foundries: TSMC, UMC, Global Foundries, SMIC, iHP, Vanguard, SilTerra

2. APPLICATION

- Wireless infrastructures
- Picocell, femtocell base stations
- Medical instrumentation
- Ultrasound transducer excitation
- Signals generators, arbitrary waveform generators

3. OVERVIEW

The 10-bit dual high-speed DAC is based on current steering architecture, which provides high-speed conversion rate and good dynamic performance. DAC consists of three principal blocks: adjustable reference voltage and current generator, decoding logic, current source and output switches array. Device has a feature of adjusting output current and entering sleep mode, turning the device off. DAC requires 1.8 V analog and digital supply, and digital and analog ground to work properly. Pins dac<2:0> adjust DAC output current.

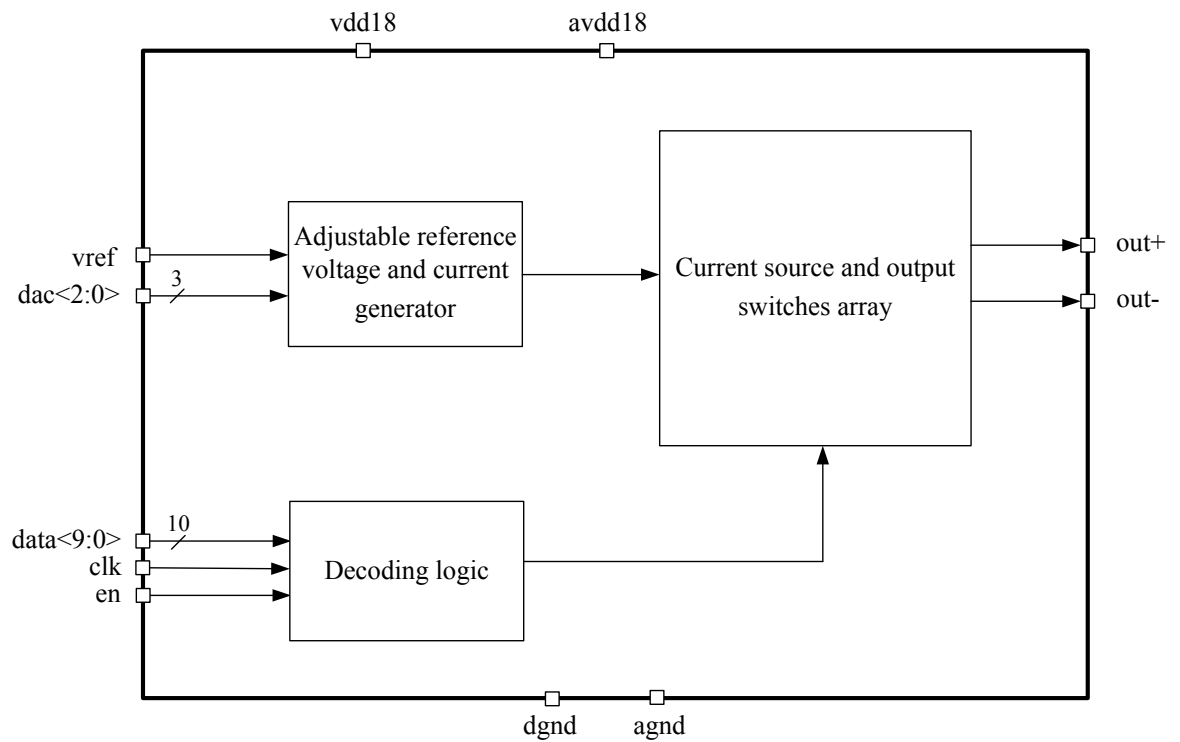The block is designed on SMIC EEPROM CMOS 0.18 um technology.

4. STRUCTURE

Figure 1: 10-bit DAC structure

5. PIN DISCRIPTION

Name	Direction	Description
en	I	Standby mode enable
clk	I	Clock input (100 MHz)
rst	I	Reset activation (the input is half of scale)
vref	I	Reference voltage input (1.2 V)
out+	O	Output differential signal
out-		
data<9:0>	I	Data input bus
dac <2:0>	I	Output current adjustment register
avdd18	I/O	Analog blocks supply voltage (1.8 V)
vdd18	I/O	Digital blocks supply voltage (1.8 V)
dgnd	I/O	Digital blocks ground
agnd	I/O	Analog blocks ground

6. LAYOUT DESCRIPTION

DAC layout dimensions are specified in table 1.

Table 1: DAC layout dimensions

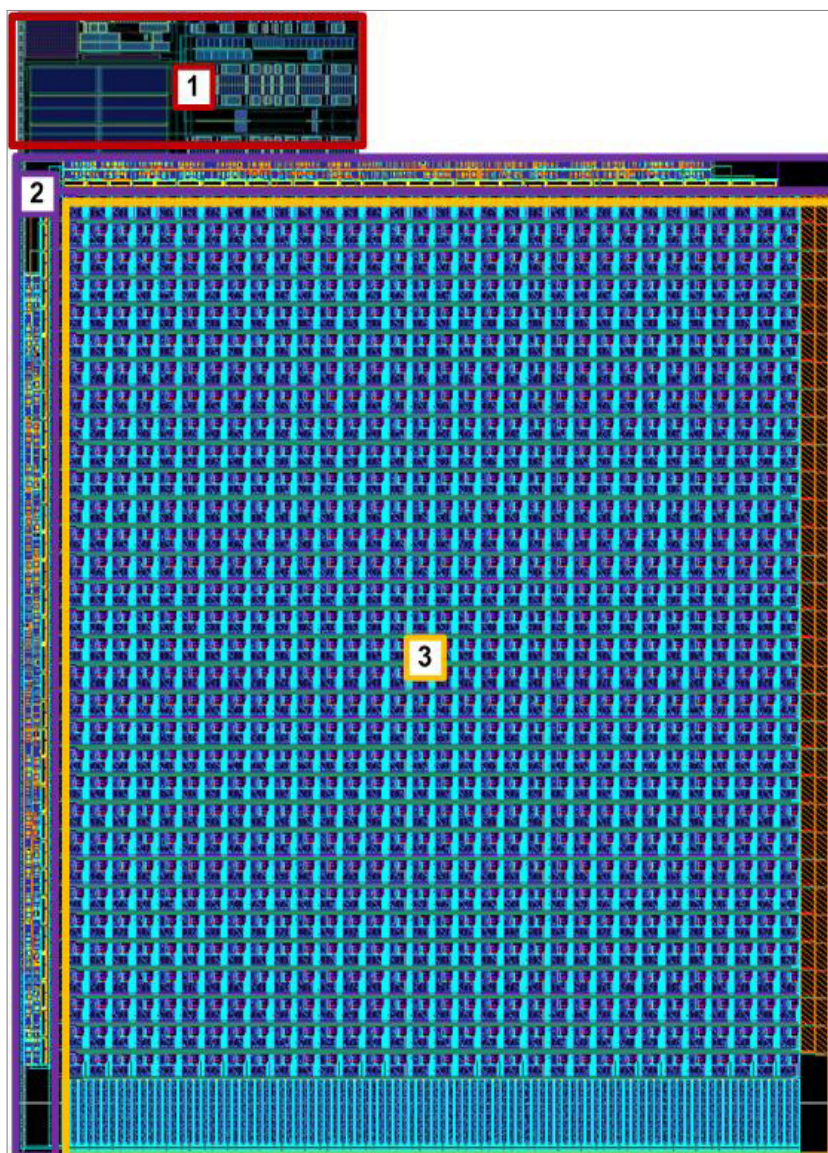| Dimensions	Value	Unit
Height	665	um
Width	570	um

Figure 2: DAC layout

1. Adjustable reference voltage and current generator
2. Decoding logic
3. Current source and output switches array

7. OPERATIONAL CHARACTERISTICS

7.1 TECHNICAL CHARACTERISTICS

Technology _____ SMIC EEPROM CMOS 0.18 um
Status _____ silicon proven
Area _____ 0.38 mm^2

7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for V_{dd18} = 1.7 ÷ 1.9 V, T_j = -60 ÷ +120 °C. Typical values are specified for V_{dd18} = 1.8 V, T_j = +27 °C.

Parameter	Symbol	Condition	Value			Unit
			min	typ.	max	
Analog and digital blocks supply voltage	V_{dd18}	-	1.7	1.8	1.9	V
Operating temperature range	T_j	-	-60	27	+120	°C
Resolution	N	-	-	10	-	bits
Clock frequency	F_{clk}	-	-	100	-	MHz
Standby current	I_{st}	-	-	200	-	nA
Power consumption	P_{diss}	-	5.7	38	38	mW
Output current	I_{out}	-	1.3	-	21	mA
Spurious-free dynamic range	SFDR	Input frequency ≤ 25 MHz, load resistance 25 Ohm, F_{clk} = 100 MHz, output current register`s values set to dac<2:0> = "111"	60	62	66	dB
High input voltage level	V_{IH}	For digital inputs	1.3	-	-	V
Low input voltage level	V_{IL}		-	-	0.4	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