

# LDO voltage regulator (output voltage value 1.8V, 2.1V, 2.4V, 2.7V)

## SPECIFICATION

### 1 FEATURES

- SMIC CMOS 0.18 $\mu$ m
- High precision stabilization voltage
- Several operating modes
- Different output voltage value (1.8V, 2.1V, 2.4V, 2.7V)
- Low current consumption
- Small area
- Low output level vs. supply voltage in a wide range
- Supported foundries: TSMC, UMC, Global Foundries, SMIC, iHP, AMS, Vanguard, SilTerra

### 2 APPLICATION

The output voltage can be used for both analog and digital blocks. The main application:

- Portable electronic devices
- System-on-chip for different purposes
- Measurement and calibration systems
- Navigation systems
- Communication systems

### 3 OVERVIEW

The regulator stabilizes the external voltage and forms an output level of the specified value. Adjustment is carried out by negative feedback through the operational amplifier. CMOS-transistors keys are used for commutation of different output voltage values. Feedback allows for voltage drop on the wire by which stabilized voltage is supplied to the cell.

The block is fabricated on SMIC CMOS 0.18 $\mu$ m technology.

### 4 STRUCTURE

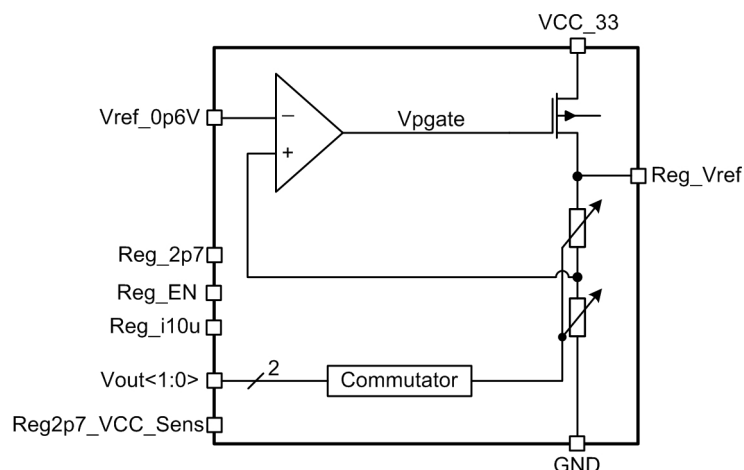


Figure 1: Voltage regulator structure

## 5 PIN DESCRIPTION

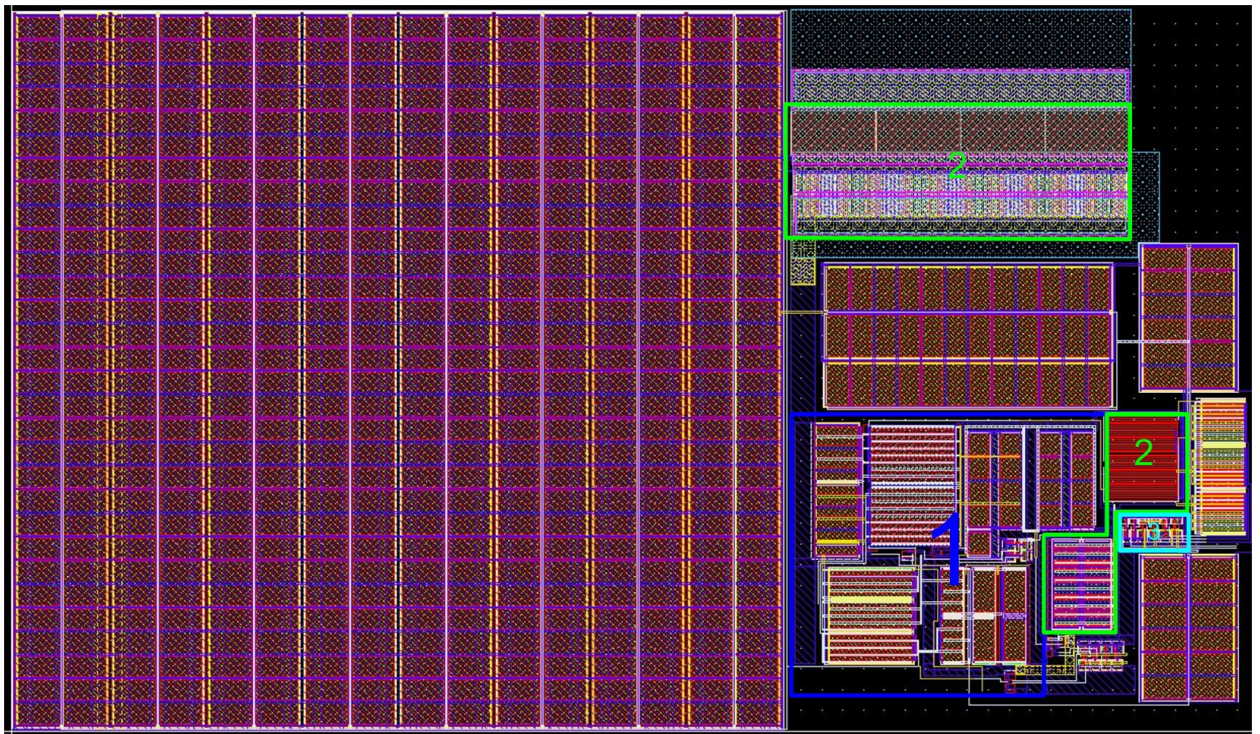
Name	Direction	Description
Reg_i10u	I	Reference current (10 $\mu$ A)
Reg_EN	I	Enable/disable
Reg_2p7	I	Output voltage control
Reg_2p7_VCC_Sens	I	Feedback output
Vout<1:0>	I	Output voltage digital code control
Vref_0p6V	O	Reference voltage
Reg_Vref	O	Output voltage
VCC33	IO	Supply voltage
GND	IO	Ground

## 6 LAYOUT DESCRIPTION

The block dimensions are given in the table 1.

**Table 1:** Block dimensions

Dimension	Value	Unit
Height	173.44	$\mu$ m
Width	298.91	$\mu$ m



**Figure 2:** Device layout

1. OTA
2. Basic control elements
3. Control logic

## 7 OPERATING CHARACTERISTICS

### 7.1 TECHNICAL CHARACTERISTICS

Technology \_\_\_\_\_ SMIC CMOS 0.18 $\mu$ m  
 Status \_\_\_\_\_ silicon proven  
 Area \_\_\_\_\_ 0.05mm<sup>2</sup>

### 7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for  $V_{cc}=2.7 \div 3.6$  V and  $T = -45 \div +90$  °C. Typical values are at  $V_{cc}=3.15$  V and  $T = +27$  °C, unless otherwise specified.

Parameter	Symbol	Condition	Value			Unit
			min	typ.	max	
Supply voltage	$V_{cc}$	-	2.7	3.15	3.6	V
Operating temperature range	T	-	-45	27	90	°C
Reference voltage	$V_R$	-	-	0.6	-	V
Voltage regulator output level	$V_{ref}$	$v_{out}<1:0> = 0$	1.75	1.81	1.85	V
		$v_{out}<1:0> = 1$	2.07	2.11	2.15	
		$v_{out}<1:0> = 2$	1.77	2.41	2.46	
Reference current	$I_R$	-	-	10	-	$\mu$ A
Maximum load current	$I_L$	-	-	10	-	mA
Current consumption	$I_{cc}$	$v_{ref}=1.8V$	-	42.31	48.74	$\mu$ A
		$v_{ref}=2.1V$	-	42.31	48.74	
		$v_{ref}=2.4V$	-	42.31	48.74	
		$v_{ref}=2.7V$	-	42.31	48.53	
Current consumption in a standby mode	$I_{stb}$	-	-	0.07	0.5	nA
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

## REVISION HISTORY

1. From version 1.0:  
Section 4 “Structure” (refer to page 1)