

# Bandgap voltage reference

## SPECIFICATION

### 1 FEATURES

- SMIC CMOS 0.18 $\mu$ m
- Output voltage 0.6 V
- Temperature-compensated voltage in a wide temperature range
- Low supply voltage systems availability
- Bipolar diode characteristics control
- Small area
- Supported foundries: TSMC, UMC, Global Foundries, SMIC, iHP, AMS, Vanguard, SilTerra

### 2 APPLICATION

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

- Supply voltage stabilization systems
- Comparison and detection systems
- System-on-chip for different purposes
- Measurement and calibration systems
- Technological research of microelectronic components
- Low supply voltage systems
- Navigation systems

### 3 OVERVIEW

Bandgap voltage reference forms temperature-compensated voltage level due to mutual compensation of temperature dependence of bipolar diodes and resistors.

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

### 4 STRUCTURE

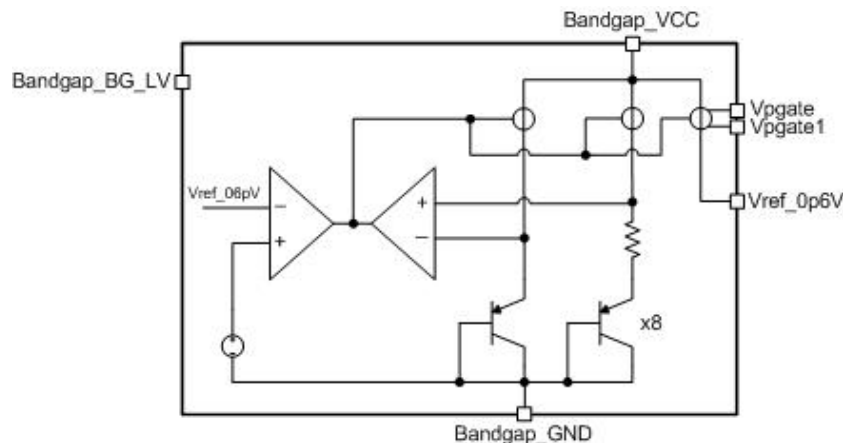


Figure 1: Bandgap voltage reference structure.

## 5 PIN DESCRIPTION

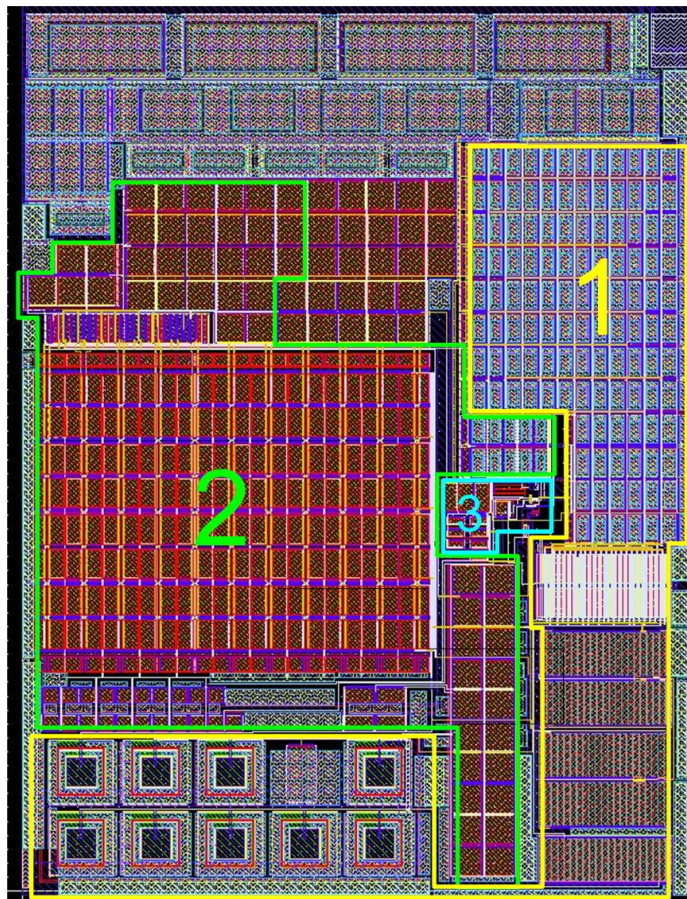
Name	Direction	Description
Bandgap_BG_LV	I	Enable/disable
Vpgate	O	Current rise
Vpgate1	O	
Vref_0p6V	O	Reference voltage
Bandgap_VCC	IO	Supply voltage
Bandgap_GND	IO	Ground

## 6 LAYOUT DESCRIPTION

The block dimensions are given in the table 1.

**Table 1:** Block dimensions.

Dimension	Value	Unit
Height	319.77	$\mu\text{m}$
Width	239.91	$\mu\text{m}$



**Figure 2:** Device layout view.

1. Temperature-compensated reference voltage source bipolar base
2. OTA
3. Start up circuit

## 7 OPERATING CHARACTERISTICS

### 7.1 TECHNICAL CHARACTERISTICS

Technology \_\_\_\_\_ SMIC CMOS 0.18 $\mu$ m  
 Status \_\_\_\_\_ silicon proven  
 Area \_\_\_\_\_ 0.08mm<sup>2</sup>

### 7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for  $V_{cc} = 2.7 \div 3.6$  V and  $T = -45 \div +90^{\circ}\text{C}$ . Typical values are at  $V_{cc} = 3.15$  V and  $T = +27^{\circ}\text{C}$ , 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	$^{\circ}\text{C}$
Reference voltage	$V_{ref}$	-	598.8	612.7	624.24	mV
Current consumption	$I_{cc}$	-	-	65.55	76.98	$\mu\text{A}$
Current consumption in a standby mode	$I_{stb}$	-	-	0.02	-	nA
Reference voltage deviation	$\Delta V_{ref}$	-	-	2.28	-	%
Temperature error	$\Delta T$	-	-	0.48	-	%
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

IP contents:

- Schematic or NetList
- Layout or blackbox
- Extracted view (optional)
- GDSII
- DRC, LVS, antenna report
- Test bench with saved configurations (optional)
- Documentation