

Voltage-controlled oscillator

SPECIFICATION

1 FEATURES

- TSMC018 SiGe 0.18 μ m
- Low phase noise
- Wide frequency range
- Adjustable output amplitude
- Low current consumption
- Supported foundries: TSMC, UMC, Global Foundries, SMIC, iHP, AMS, Vanguard, SilTerra

2 APPLICATION

- Phase-locked loop synthesizer

3 FUNCTIONAL DESCRIPTION

Voltage-controlled oscillator (VCO) is the generator that can be tuned over a wide range of frequencies by applying a control voltage to it.

The block is fabricated on TSMC018 SiGe 0.18 μ m technology.

4 STRUCTURE

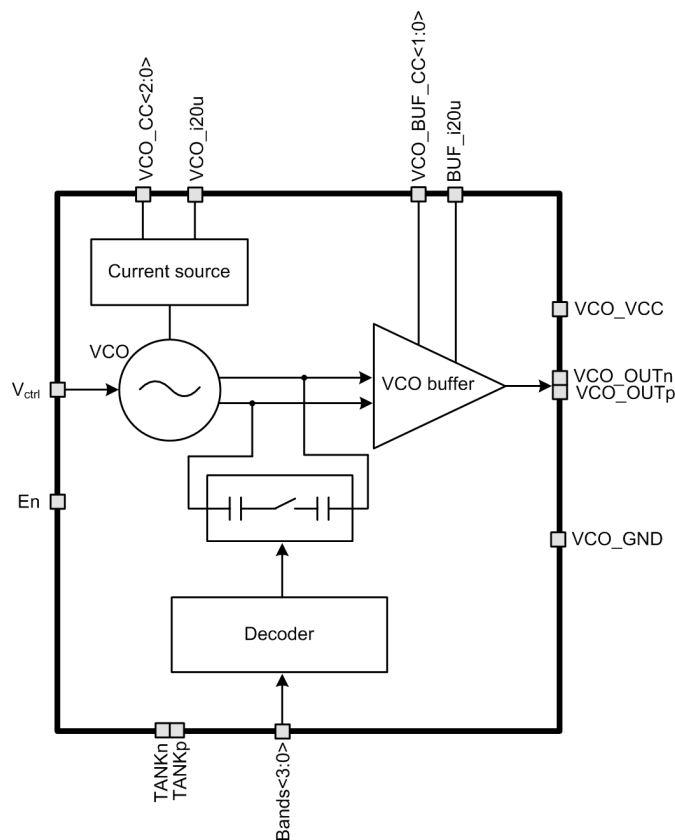


Figure 1: Voltage-controlled oscillator structure.

5 PIN DESCRIPTION

| Name | Direction | Description |
|-----------------|-----------|---------------------------------------|
| VCO_i20u | IO | VCO reference current |
| BUF_i20u | IO | VCO output buffer current |
| Vctrl | I | Control voltage |
| EN | I | VCO enable/disable |
| Bands<3:0> | I | Subband select system |
| VCO_BUF_CC<1:0> | I | VCO output buffer current consumption |
| VCO_CC<1:0> | I | VCO current consumption |
| TANKp | O | VCO differential output, unused |
| TANKn | O | |
| VCO_OUTp | O | VCO output buffer differential output |
| VCO_OUTn | O | |
| VCO_VCC18 | IO | Supply voltage 1.8 V |
| VCO_VCC | IO | Supply voltage 3.0 V |
| VCO_GND | IO | Ground |

6 LAYOUT DESCRIPTION

Voltage controlled oscillator dimensions are given in the table 1.

Table 1: Block dimensions.

| Dimension | Value | Unit |
|-----------|-------|---------------|
| Height | 370 | μm |
| Width | 730 | μm |

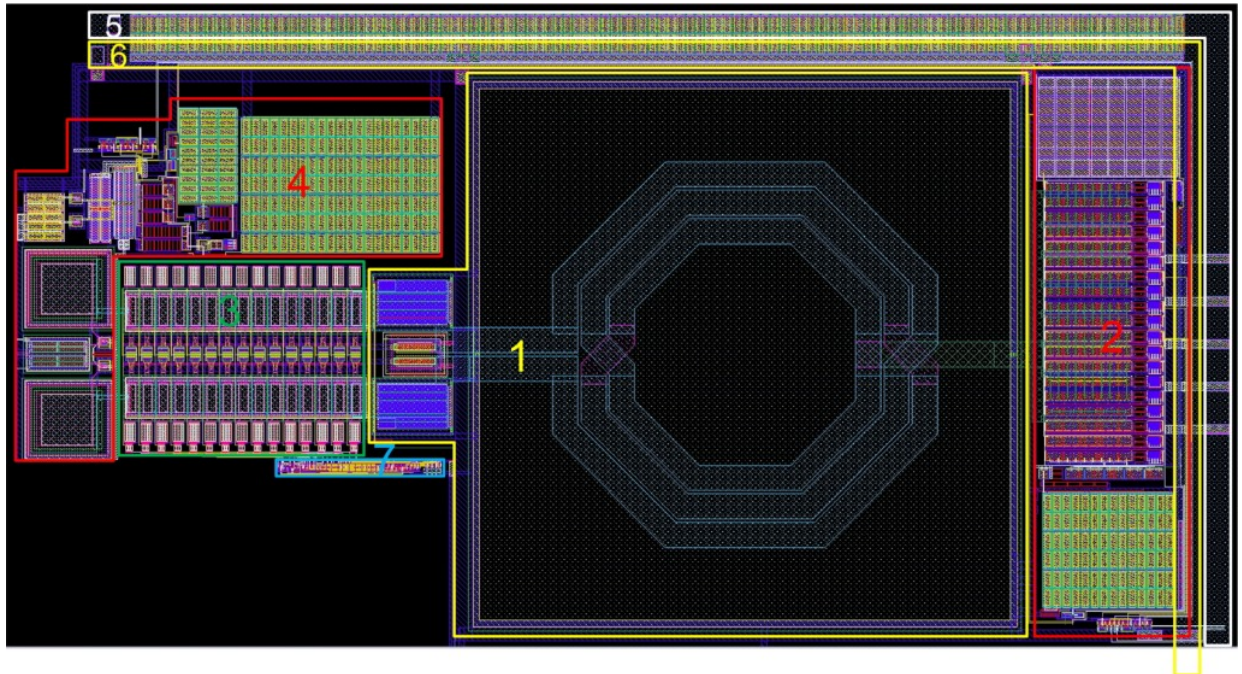


Figure 2: Voltage-controlled oscillator layout view.

1. VCO core
2. Current source
3. Band cells
4. VCO buffer
5. Supply voltage bus with filter capacitors
6. Ground bus with filter capacitors
7. Decoder

7 OPERATING CHARACTERISTICS

7.1 TECHNICAL CHARACTERISTICS

Technology _____ TSMC018 SiGe
 Status _____ silicon proven
 Area _____ 0.27 mm²

7.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for $V_{cc_{3.0v}} = 2.8 \div 3.6$ V, $V_{cc_{1.8v}} = 1.6 \div 2.0$ V and $T = -40 \div +85^{\circ}\text{C}$. Typical values are at $V_{cc_{3.0v}} = 3.15$ V, $V_{cc_{1.8v}} = 1.8$ V, $T_A = +27^{\circ}\text{C}$, unless otherwise specified.

| Parameter | Symbol | Condition | Value | | | Unit |
|-----------------------------|-----------------|---|--------------------|------|----------------------|--------|
| | | | min | typ | max | |
| Supply voltage | $V_{cc_{1.8v}}$ | - | 1.6 | 1.8 | 2.0 | V |
| | $V_{cc_{3.0v}}$ | | 2.8 | 3.15 | 3.6 | |
| Operating temperature range | T | - | -40 | +27 | +85 | °C |
| VCO frequency tuning range | F | Min. frequency | - | 2731 | 2995 | MHz |
| | | Max. frequency | 3589 | 3782 | - | MHz |
| Phase noise | NF | 100 KHz | - | -99 | - | dBm/Hz |
| | | 1 MHz | - | -119 | - | dBm/Hz |
| Control voltage | U_{VCO} | - | 0.3 | - | 2.6 | V |
| Supply current | I_{cc} | - | 1.94 | 2.84 | 3.34 | mA |
| Stand-by current | I_{stb} | - | - | 1.35 | - | nA |
| Input logic-level high | V_{IH} | For inputs EN, VCO_BUF_CC<1:0>, VCO_CC<1:0>, Bands<3:0> | $0.7V_{cc_{3.0v}}$ | - | $V_{cc_{3.0v}}+0.25$ | V |
| Input logic-level low | V_{IL} | For inputs EN, VCO_BUF_CC<1:0>, VCO_CC<1:0>, Bands<3:0> | -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