

RC oscillator 1 MHz

SPECIFICATION

1 FEATURES

- Global Foundries CMOS 55 nm
- Low current consumption
- Low temperature dependence
- High accuracy (after trimming)
- Small area
- Supported foundries: TSMC, UMC, SMIC, iHP, AMS, Vanguard, SilTerra, X-FAB

2 APPLICATIONS

- RF ID
- Timekeeping devices
- GPS equipment to reduce time to first fix
- Applications that require an accurate process timing
- Products with long automated unattended operation time

3 OVERVIEW

IP is a low power high resolution RC oscillator nominally operates at 1.024 MHz output clock from a 1.2 V supply. No external components are required. The oscillator operates in a voltage range of 1.2 V +/-5% and is qualified over a broad temperature range of -40°C to 85°C. The oscillator has excellent nominal duty cycle 50% within +/-10%.

The block is designed on Global Foundries CMOS 55 nm technology.

4 STRUCTURE

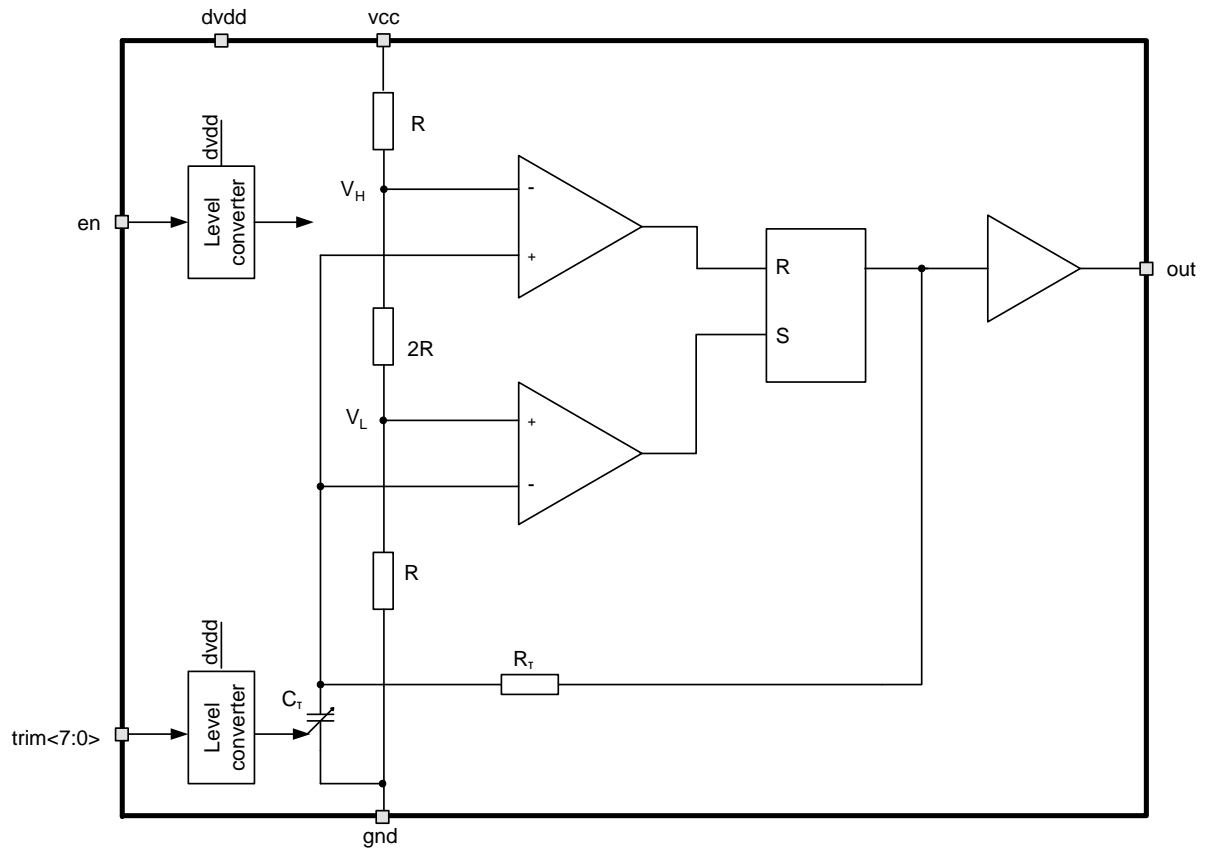


Figure 1: RC oscillator 1 MHz structure.

5 PIN DESCRIPTION

Name	Direction	Description
en	I	1 MHz oscillator enable: “0” disabled “1” enabled
trim<7:0>	I	1 MHz oscillator trimming value: “0000000” 686.038 kHz ... see Figure 3 “1010000” 1.024 MHz ... see Figure 3 “1111111” 1444.3 kHz
out	O	Output
dvdd	IO	Supply voltage for level converters
vcc	IO	Supply voltage
gnd	IO	Ground

6 LAYOUT DESCRIPTION

6.1 TECHNOLOGY OPTIONS

RC oscillator 1MHz is designed under Global Foundries CMOS 55nm technology process with following options:

- 4_02_00_00_LB option
- High-Vt NFET and PFET
- Thin-oxide native NFET
- Thick-oxide I/O NFET and PFET (3.3V)
- P+ polysilicon OP resistor
- N+ diffusion OP resistor
- APMOM capacitor

6.2 PHYSICAL DIMENTIONS

The block dimensions are given in the table 1.

Table 1: Block dimensions.

Dimension	Value	Unit
Height	73	um
Width	100	um

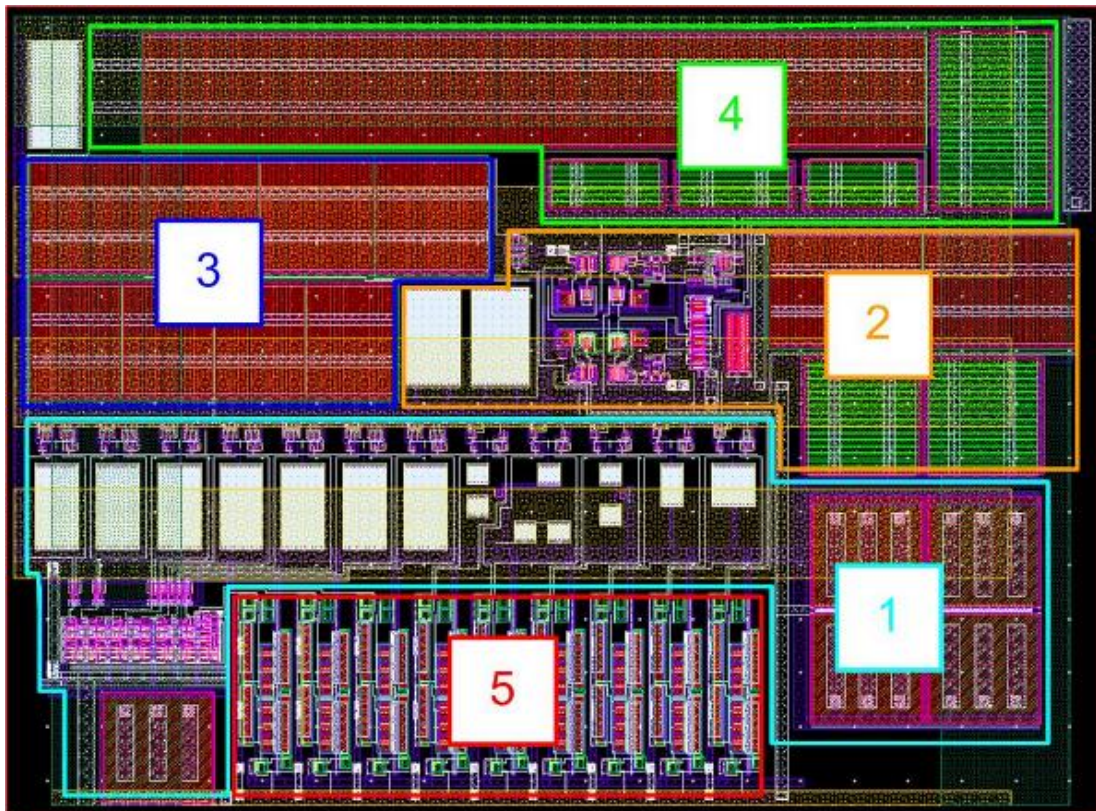


Figure 2: RC oscillator 1MHz layout view.

1. Capacitor with trimming structure
2. Trigger and comparators
3. Resistive divider
4. Resistor
5. Level converters

7 INTEGRATION GUIDELINES

7.1 PLACE AND ROUTE GUIDELINES

For stable frequency is necessary to provide stable supply voltage. Wires supply and ground must be shorter as possible.

8 OPERATION CHARACTERISTICS

8.1 TECHNICAL CHARACTERISTICS

Technology _____ Global Foundries CMOS 55 nm
 Status _____ silicon proven
 Area _____ 0.007mm²

8.2 ELECTRICAL CHARACTERISTICS

The values of electrical characteristics are specified for $V_{cc} = 1.14 \div 1.26$ V and $T_j = -40 \div 85^\circ\text{C}$. Typical values are at $V_{cc} = 1.2$ V and $T_j = 27^\circ\text{C}$, unless otherwise specified.

Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Supply voltage	V_{cc}	-	1.14	1.2	1.26	V
Operating temperature range	T_j	-	-40	27	85	$^\circ\text{C}$
Output frequency	F_{out}	After trimming	-	1.024	-	MHz
Frequency trim range		-	-	± 10	-	%
Frequency accuracy		After trimming	$0 \leq T \leq 50$	1	-	%
			$-40 \leq T \leq 0$,	3	-	
			$50 \leq T \leq 85$			
Input logic-level low	V_{IL}	For digital signals	-	-	$0.3V_{cc}$	V
Input logic-level high	V_{IH}	For digital signals	$0.7V_{cc}$	-	-	V
Output logic-level low	V_{OL}	Output	0	-	$0.2V_{cc}$	V
Output logic-level high	V_{OH}	Output	$0.8V_{cc}$	-	V_{cc}	V
Supply current	I_{cc}	-	-	-	10	μA

9 TYPICAL CHARACTERISTICS

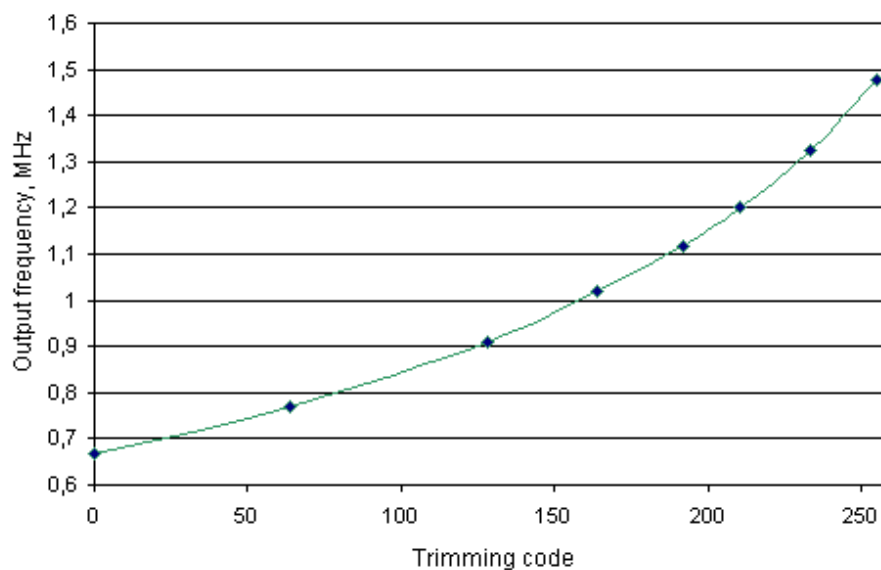


Figure 3: Output frequency vs trimming code.

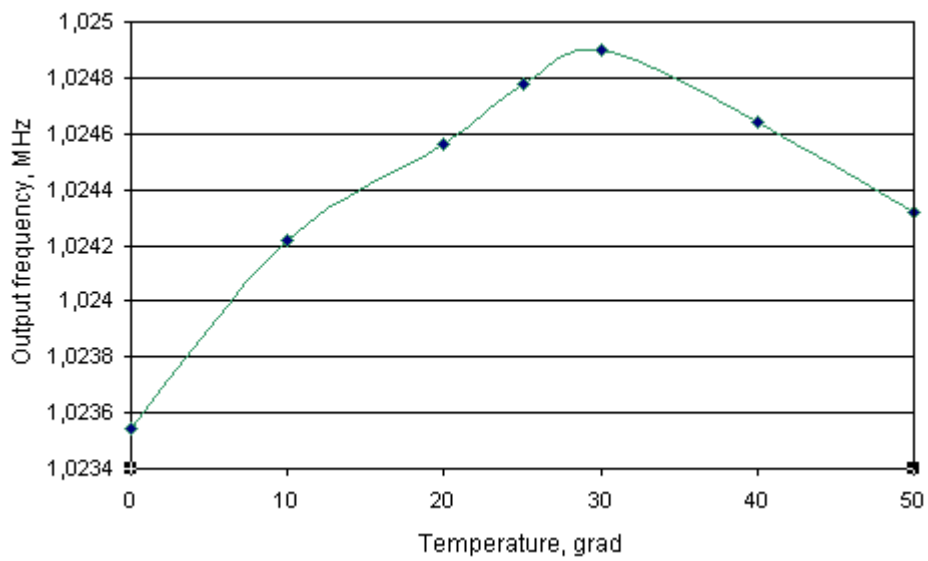


Figure 4: Output frequency vs temperature.

10 DELIVERABLES

IP contents:

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