

# RC oscillator 10 MHz

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## 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 10 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

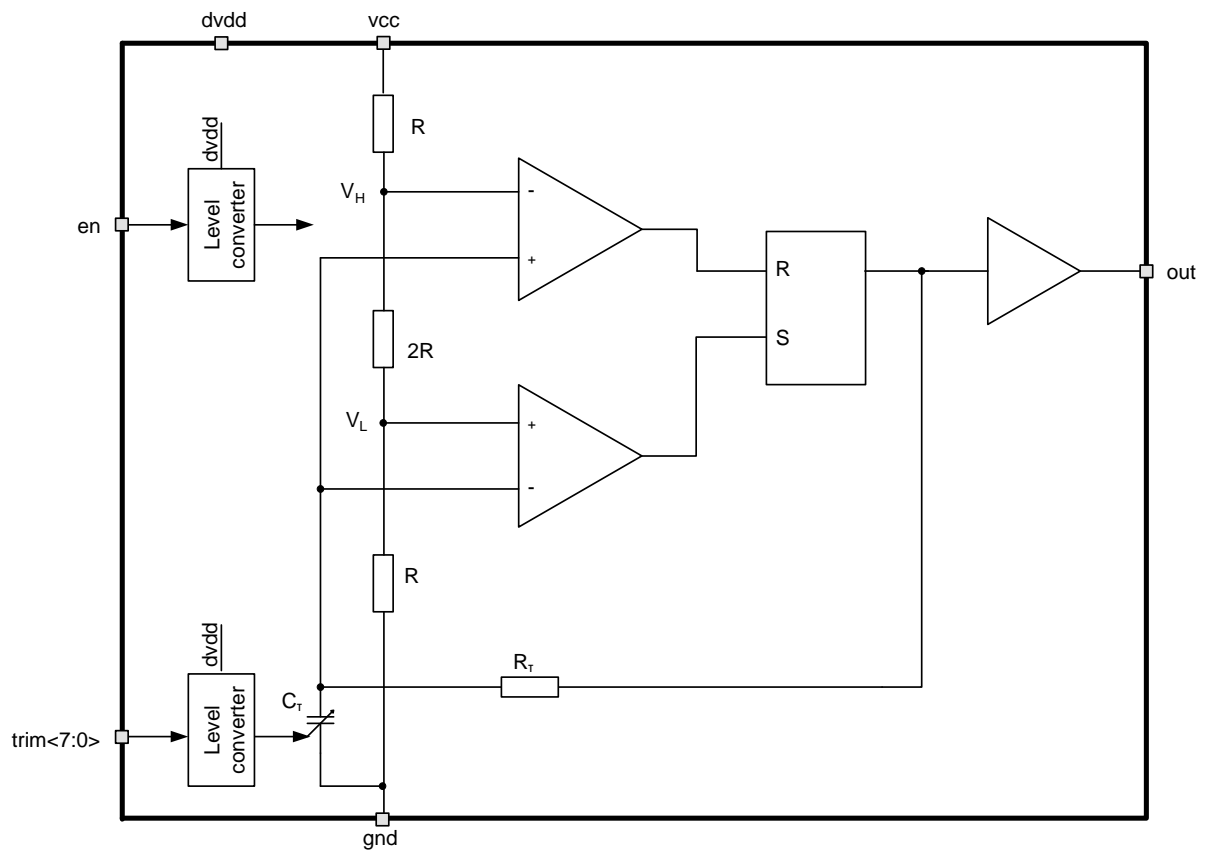


Figure 1: RC oscillator 10 MHz structure.

## 5 PIN DESCRIPTION

Name	Direction	Description
en	I	10 MHz oscillator enable: "0" disabled "1" enabled
trim<7:0>	I	10 MHz oscillator trimming value: "0000000" 6.0 MHz ... see Figure 3 "10001110" 10 MHz ... see Figure 3 "11111111" 21.9 MHz
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 10MHz is designed under Global Foundries CMOS 55 nm technology process with following options:

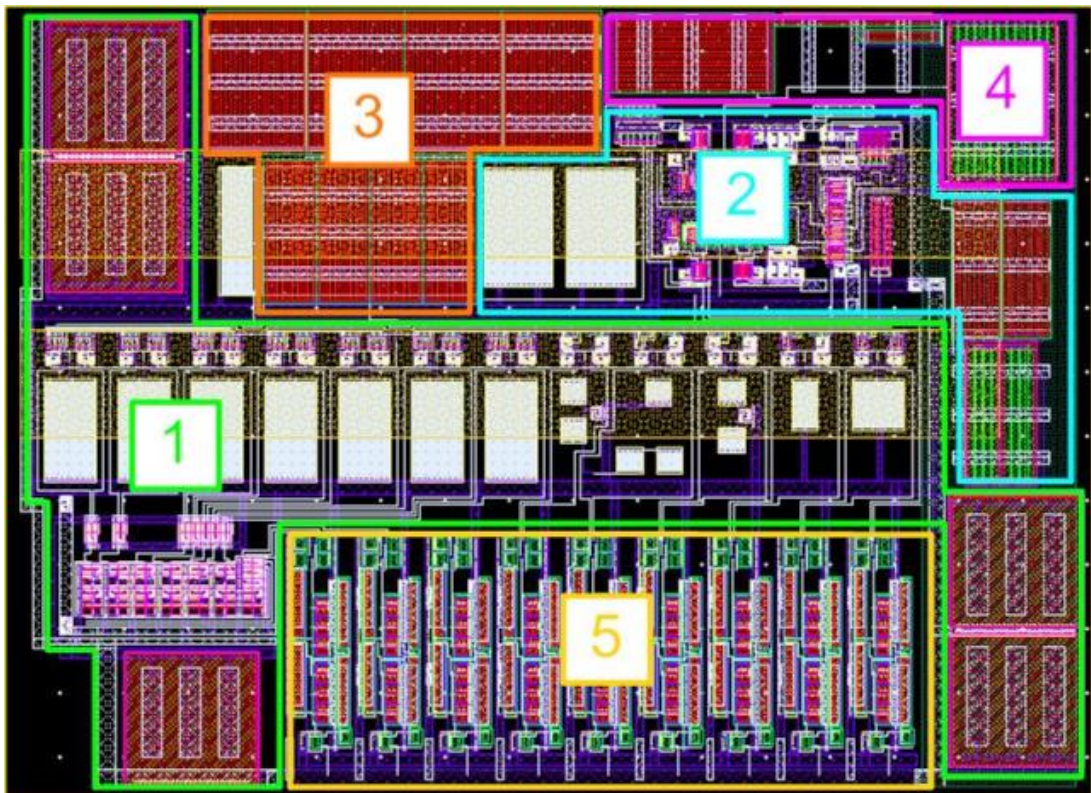
- 4\_02\_00\_00\_LB option
- High-Vt NFET and PFET
- Thin-oxide native NFET
- Thick-oxide I/O NFET and PFET (3.3 V)
- P+ polysilicon OP resistor
- N+ diffusion OP resistor
- APMOM capacitor

### 6.2 PHYSICAL DIMENSIONS

The block dimensions are given in the table 1.

**Table 1:** Block dimensions.

Dimension	Value	Unit
Height	60	um
Width	83	um



**Figure 2:** RC oscillator 10 MHz 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 \_\_\_\_\_ 0.005 mm<sup>2</sup>

### 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	Condition	Value			Unit
			min	typ	max	
Supply voltage	$V_{cc}$	-	1.14	1.2	1.26	V
Supply voltage	$Dv_{dd}$	-	-	1.2	-	V
Operating temperature range	$T_j$	-	-40	27	85	$^\circ\text{C}$
Output frequency	$F_{out}$	After trimming	-	10	-	MHz
Frequency trim range		-	-	-20/+10	-	%
Frequency accuracy		After trimming	-	3	-	%
Supply current	$I_{cc}$	-	-	-	30	$\mu\text{A}$
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

## 9 TYPICAL CHARACTERISTICS

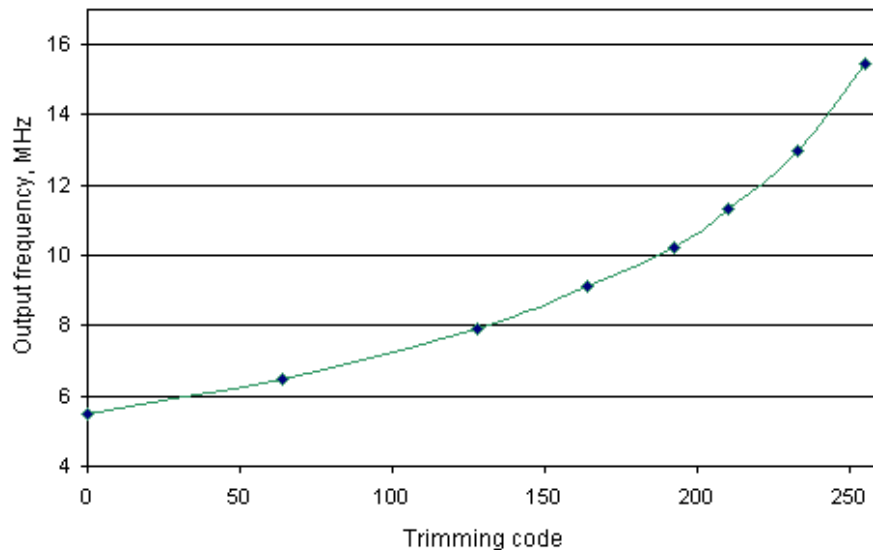


Figure 3: Output frequency vs trimming code.

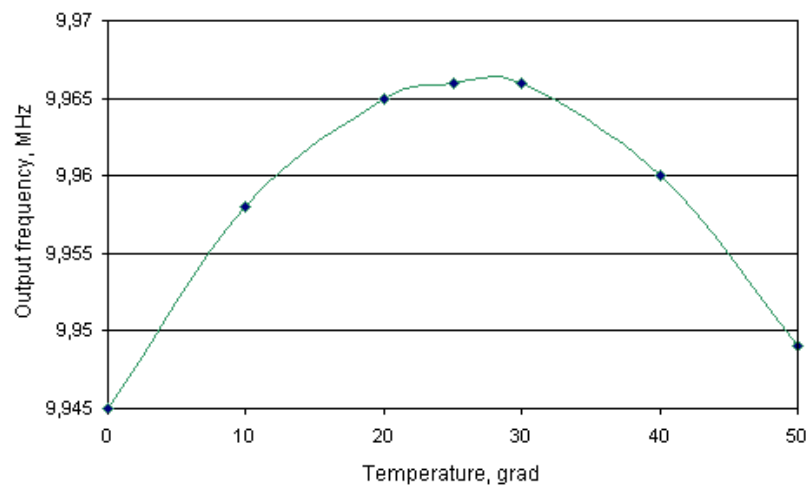


Figure 4: Output frequency vs temperature.

## 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