



An ultra-low power 32kHz oscillator: Pulsed driver techniques, characterization and EMC

Master thesis (in combination with a research internship possible) at the chair of circuit design

Every self-sustainable system or energy-critical application needs ultra-low power operation modes. Still, classical devices, like mobile phones, use different operation modes to save energy during standby. A typical way to reduce power is by decreasing the clock frequency. Therefore, 32kHz oscillators generate a stable clock with almost zero power consumption.

The topic concerns recently published 32kHz oscillators and their techniques for achieving the lowest power consumption. The thesis focuses on the methods used to regulate the resonator into its power optimum and the corresponding circuit designs. The aim of this work is to understand the weaknesses or strengths of circuit implementations that are against conventional realizations.

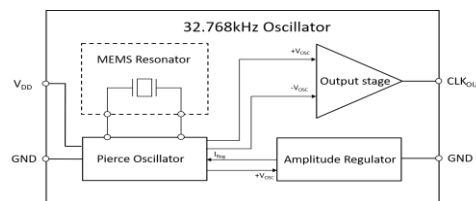


Figure 1. Typical oscillator block diagram

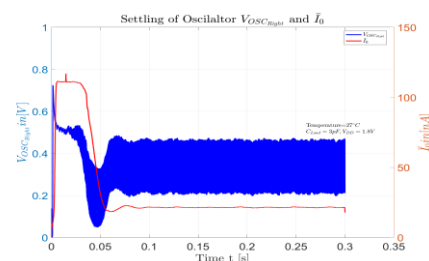


Figure 2. Settling of an crystal/MEMS oscillator

How does the work look like?

The work will involve:

- A survey of state-of-the-art ultra-low power oscillators (with a recent starting point)
- Implementation of different techniques on a circuit level: It includes DLL-Design for pulsed-driver, start-up circuitry, and so on ... in Cadence Virtuoso
- EMC characterization in the simulator: Is the design stable against environmental factors?
- Measuring an oscillator-ASIC and validating of the physical resonator model
- Design of a test setup for a low-power 32kHz oscillator to characterize EMC stability on an actual sample
- If it's doable in the framework of a master thesis, Layout of the circuitry and parasitic extraction

What are prerequisites to start this work?

- Theoretical knowledge of analog circuits from lectures like: Mixed-Signals, PLL, ADC, Labs at the chair, etc
- Experience in simulation of circuits (ideally with Cadence Virtuoso)
- Experience in lab work like e.g., measurements, ...
- Independent, solution-oriented way of working
- Assistance from the supervisors is always given during the thesis
- Please note: Not all pre-requisites are mandatory, everyone is encouraged to apply

Interested?

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