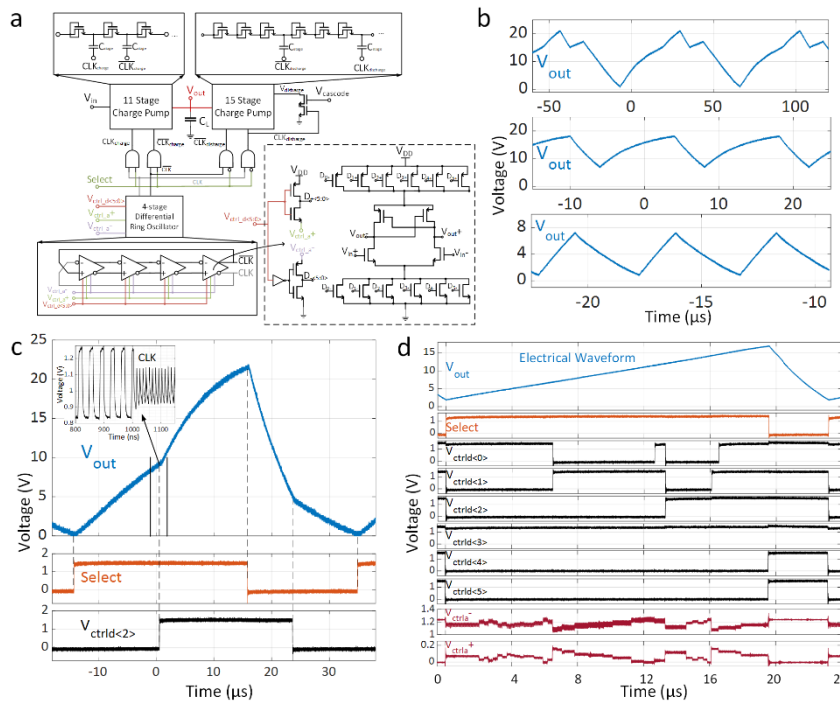


High Voltage Arbitrary Waveform Generator



(a) Circuit schematic showing the charge pump and the voltage-controlled oscillator. (b) Measured arbitrary high-voltage waveforms generated with the circuit, fabricated in a 130 nm technology. (c) Output voltage and control signals showing principles of operation: 'Select' signal controls increasing or decreasing of output, digital frequency control signal changes the waveform. (d) Generation of a linear output waveform with multiple control signals, showing fine control.

Description

Charge pump circuits, like Dickson charge pump, have been commonly used to generate high voltages in integrated circuits using capacitors, transistors and diodes. The output voltage rise-time depends on the frequency of the clock signals driving the circuits. The invention modulates the frequency of the clock signals with a voltage-controlled oscillator to control the rise-time in time domain. Changing the rise-time allows controlling the voltage waveform, therefore the circuit can generate arbitrary waveforms at high voltages.

Advantages

The architecture allows generating arbitrary high-voltage waveforms in standard CMOS technologies. It can be implemented as a high-voltage driver in advanced nodes, eliminating the need for an additional integrated circuit in a

high-voltage technology. Therefore, systems requiring high voltages can be further miniaturized with better efficiency and less cost.

Applications

- Frequency Modulated Continuous-wave LiDAR
- MEMS Devices
- Ultrasound transducers
- Single-photon Avalanche Diode (SPAD) sensors

Ref. Nr

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Keywords

Arbitrary Waveform Generator, High-Voltage, Charge Pump, Frequency Modulation, Voltage controlled oscillator, Voltage driver

Intellectual Property

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