TITLE : DC-DC Voltage Multiplier Using Dickson Charge Pump Topology

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PROBLEM STATEMENT :

Low-power devices like IoT sensors and RFID tags need compact voltage boosting circuits that eliminate bulky inductors. The Dickson charge pump, built with diodes and capacitors, provides a suitable solution but suffers from diode drops, load effects, and clocking inefficiencies. Proper optimization of capacitor sizing, load resistance, and clock signals is essential for achieving higher output voltage with good efficiency. This project aims to design and simulate a Dickson charge pump using eSim to evaluate its performance and identify an optimized configuration for low-power applications.

ABSTRACT :

The Dickson charge pump is a widely used voltage multiplier circuit that enables boosting of low input voltages without the need for bulky inductors. It is particularly suitable for integration in low-power applications such as RFID, IoT devices, and energy harvesting systems. In this project, a multi-stage Dickson charge pump is designed and simulated using the open-source eSim tool. The impact of capacitor sizing, load resistance, and clock signal configuration on the output voltage and efficiency is analyzed. Simulation is carried out under varying input voltages and clock frequencies to study the transient and steady-state behavior of the circuit. Results demonstrate the capability of the Dickson charge pump to generate higher output voltages with optimized component values. The findings provide insight into designing compact and efficient voltage multipliers for modern CMOS technologies.

PROPOSED CIRCUIT :

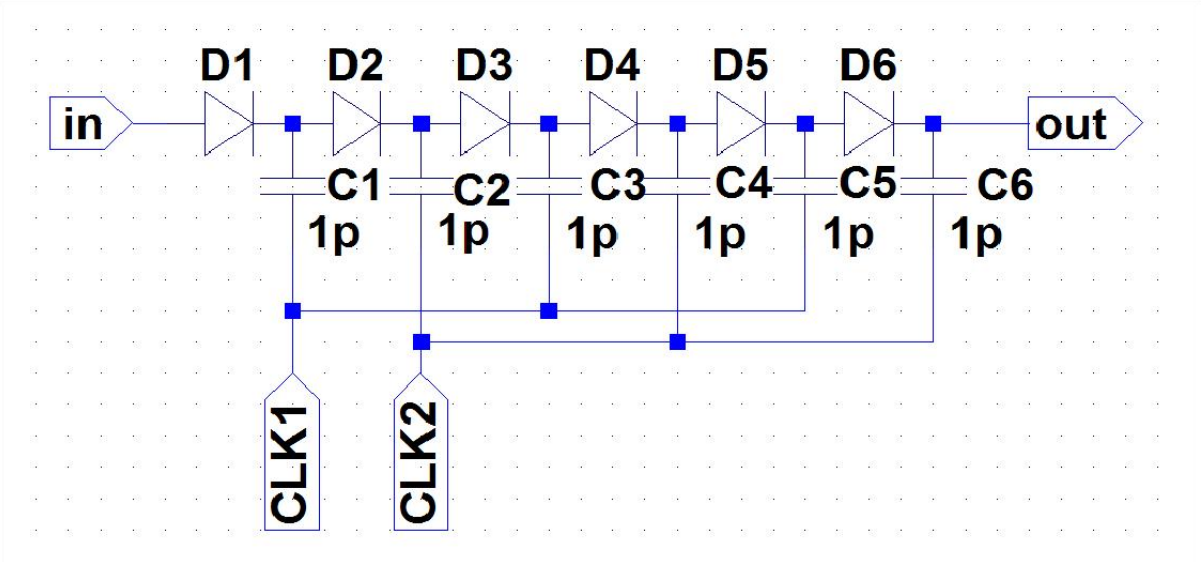

Fig 1 : Dickson Charge Pump

REFERENCES :

1 J. F. Dickson, “On-Chip High-Voltage Generation in MNOS Integrated Circuits Using an Improved Voltage Multiplier Technique,” *IEEE Journal of Solid-State Circuits*, vol. SC-11, no. 3, pp. 374–378, June 1976.

2 S. K. Saha, *Design Analysis of Dickson Charge Pump in 90 nm Technology*, Research Publish Journals, 2017.