Project Scope: A 0.5-2.5 V On-Chip DC/DC Boost Converter

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Objective: To design and simulate an on-chip dc/dc boost converter that generates a 2.5 V of output voltage when given an input of 0.5 V.

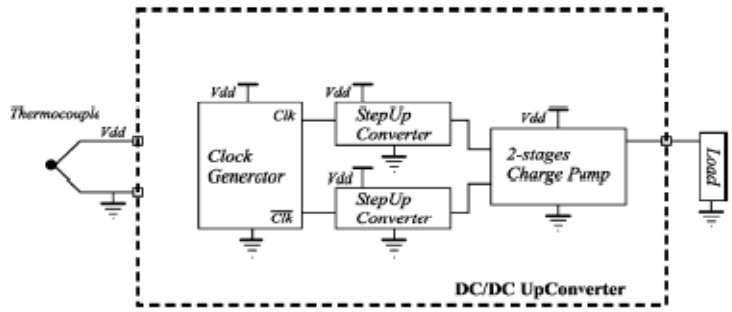

Fig 1. Dc/Dc converter block diagram.

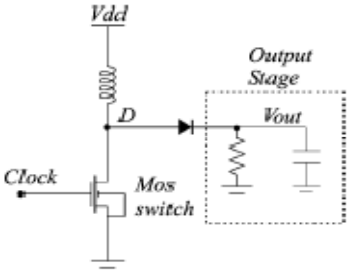

Fig 2. Basic Boost Converter

Plan: The basic blocks (fig. 1) of the dc/dc converter are clock generator, step-up converter and a 2-stage charge pump. Two non-overlapping clock signals have to be generated from a ring oscillator; each is given as an input for the two step-up converters. The clock signals are boosted through the step-up converters and given as inputs for the 2-stage charge pump which produces boosted output of 2.5 V.

In order to implement this boost converter (fig. 2) we need to understand the architecture of a basic charge pump. We will then implement this basic charge pump and extend it to a 2-stage charge pump which is used in the paper [1]. Further we are going to implement the inductive step-up converter which basically is a boost converter where inductor is an off-chip element.

Deliverable: These designs are implemented in Cadence tools using the 0.35µm AMI process technology. We are going to simulate the dc/dc converter and obtain the output voltage of 2.5 V with minimum ripple.

References: [1] A. Richelle, L. Colalongo, S. Tonali and Z. M. Kov´acs-Vajna, "A 0.2−1.2 V dc/dc boost converter for power harvesting applications", *IEEE Trans. Power Electronics,* vol. 2, no. 6, pp. 1541-1546, Jun. 2003.