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on Semiconductor and Electronics, Information and Communications Technology and Energy

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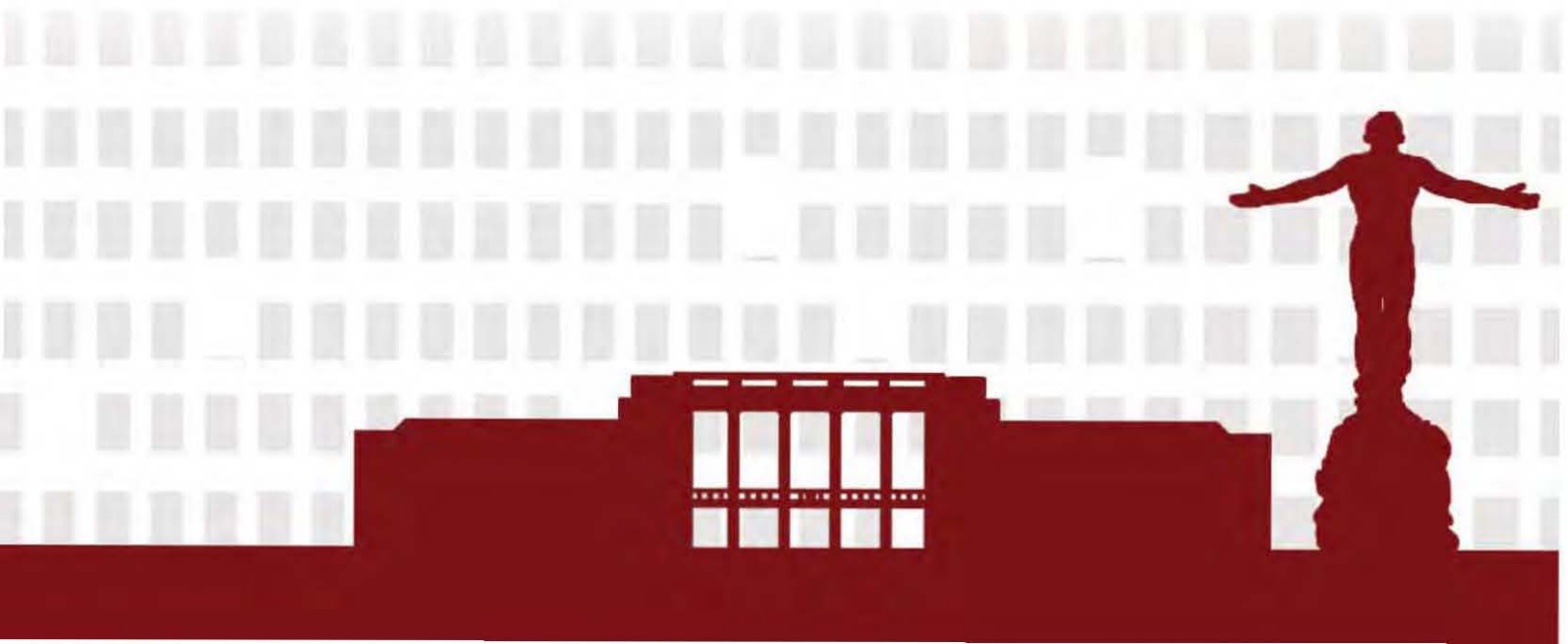
Metro Manila, Philippines



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REDUCTION OF PVT EFFECTS ON A SWITCHED-CAPACITOR DC/DC CONVERTER USING DIGITAL FEEDBACK CONTROL FOR RF HARVESTING APPLICATIONS

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ABSTRACT

RF-harvesting wireless sensors are under a tight power budget due to the limitations of RF energy transmission. To optimize power delivery and increase voltage headroom for succeeding blocks, a step-up switched-capacitor DC/DC (SC DC/DC) converter is used for efficient power delivery under variable input and output conditions. This work presents a 700-mV output SC DC-DC regulator in 65nm CMOS process designed for very low loading conditions, targeted to operate with a variable supply and input voltage of 450-600mV.

The SC DC/DC converter (Fig. 1) is a switch network operating with clock signals controlled by a feedback loop for load detection. Regulation of the output voltage is done by accurately detecting the load current and setting the output impedance to the corresponding value by manipulating one or more of the following—switching frequency, switch on-resistance and/or duty cycle [1].

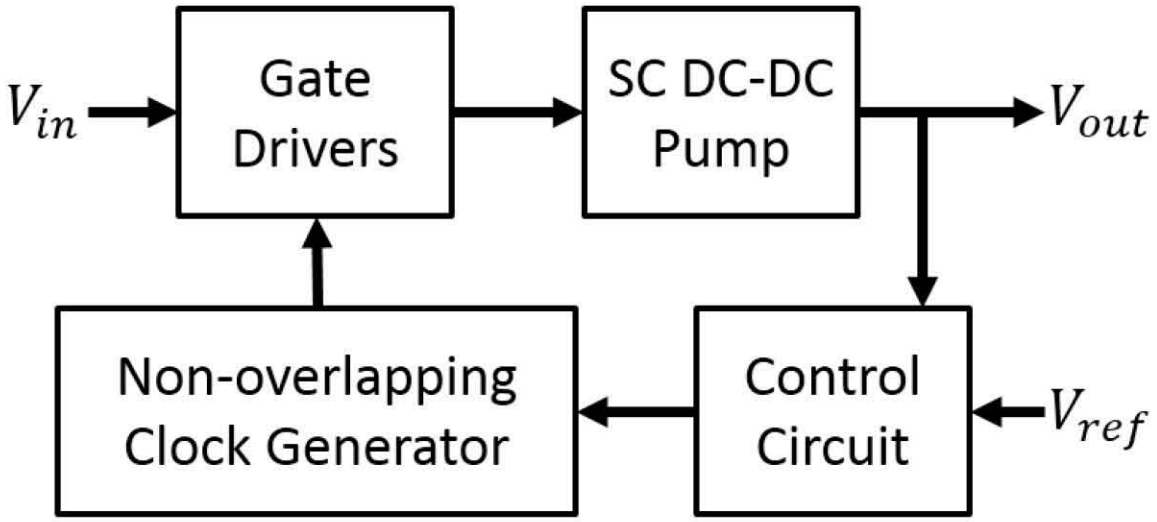

Figure 2. Basic blocks of an SC DC/DC regulator.

Simulations of a simple switch network using hysteretic feedback control [2] with no modifications show that the target specifications have been met. The output voltage across different process corners (Fig. 2) obtains a maximum ripple voltage of 100mV and minimum output of 650mV.

The maximum converter efficiency achieved in the simulations is 80%. Further testing shows that this can further be improved and optimized over the operating range.