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Digitally Controlled Wide Range Pulse Modulator for On-Chip Power Supplies

esearchers at the University of South Florida have developed a digitally controlled wide range pulse width modulator (PWM) for onchip power supplies. The invention enables dynamic control of a pulse width for a switching signal having a duty cycle that can vary between 50% and 90%.

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In recent years, significant attention has been devoted to miniaturizing and reducing the energy consumption of electronic devices. In particular, mobile devices require low energy consumption to extend battery life, and satisfy the demands of modern consumers. For example, in mobile phones, point-of-load power supplies have emerged as a highefficiency replacement for low-cost linear regulators. In addition, as functionality is continually added to electronic devices (e.g., cameras, lights, etc.) it is becoming increasingly advantageous to employ multiple power rails. Placing power converters closer to the load can minimize efficiency losses and reduce the effects of interconnect parasitics.

Voltage controlled oscillators are widely used to generate a switching signal. In particular, ring oscillators are often favored, because of their smaller on-chip area and wide tuning range. For conventional ring oscillators, the duty cycle of a generated switching signal is typically 50%.

Our researchers have developed a digitally controlled wide range pulse width modulator for on-chip power supplies having a duty cycle that can be varied between 50% and 90%, and does not require any footer circuitry. A header circuit is used to control the duty cycle, and provides a high granularity control (about 2%). Additionally, a DC2V converter is utilized to maintain the accuracy of the PWM under process, voltage and temperature variations.

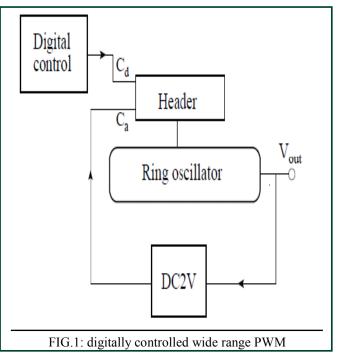
The digitally controlled wide range pulse width modulator has a small on chip-area, fast control circuitry, high accuracy under PVT variations, and dynamic duty cycle control.

Patent Pending

Advantages:

- Small on chip-area
- Fast control circuitry
- High accuracy under PVT variations
- Dynamic duty cycle control

Duty cycle variance of 50% to 90%



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