

A Digital Pulse-Width Modulation Controller for High-Temperature DC-DC Power Conversion Application

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Abstract : This paper presents a digital non-linear pulse-width modulation (PWM) controller in a high-voltage (HV) buck-boost DC-DC converter for the piezoelectric transducer of the down-hole acoustic telemetry system. The proposed design controls the generation of output signal with voltage higher than the supply voltage and is targeted to work under high temperature. To minimize the power consumption and silicon area, a simple and efficient design scheme is employed to develop the PWM controller. The proposed PWM controller consists of serial to parallel (S2P) converter, data assign block, a mode and duty cycle controller (MDC), linearly PWM (LPWM) and noise shaper, pulse generator and clock generator. To improve the reliability of circuit operation at higher temperature, this design is fabricated with the 1.0- μm silicon-on-insulator (SOI) CMOS process. The implementation results validated that the proposed design has the advantages of smaller size, lower power consumption and robust thermal stability.

Keywords : DC-DC power conversion, digital control, high temperatures, pulse-width modulation

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