

Fixed-Frequency Pulse Width Modulation-Based Sliding Mode Controller for Switching Multicellular Converter

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Abstract : This paper features a sliding mode controller (SMC) for closed-loop voltage control of DC-DC three-cells buck converter connected in parallel, operating in continuous conduction mode (CCM), based on pulse-width modulation (PWM). To maintain the switching frequency, the approach is to incorporate a pulse-width modulation that utilizes an equivalent control, inferred by applying the SM control method, to produce a control sign to be contrasted and the fixed-frequency within the modulator. Detailed stability and transient performance analysis have been conducted using Lyapunov stability criteria to restrict the switching frequency variation facing wide variations in output load, input changes, and set-point changes. The results obtained confirm the effectiveness of the proposed control scheme in achieving an enhanced output transient performance while faithfully realizing its control objective in the event of abrupt and uncertain parameter variations. Simulations studies in MATLAB/Simulink environment are performed to confirm the idea.

Keywords : DC-DC converter, pulse width modulation, power electronics, sliding mode control

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