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Slope Adjustable Triangular Wave Generator Design for Improving Dynamic Performance of Buck Converter

Shu Wu, Yasunori Kobori, Nobukazu Tsukiji, Nobukazu Takai, Haruo Kobayashi
Division of Electronics and Informatics, Faculty of Science and Technology, Gunma University
1-5-1 Tenjin-cho, Kiryu 376-8515, Japan
t12802472@ gunma-u.ac.jp

Continuous advancement of signal processing technologies for integrated circuits has posed stringent challenges to the design of DC-DC converters. High speed clock and fast dynamic current slew rate for advanced processors make the transient response performance of switching power supply to be more important. In this paper

--a simple control method is proposed to improve the dynamic performance of dc-dc buck converter.

--a slope adjustable triangular wave generater (TWG) is designed. The slope can be controlled by input voltage and the output deviation.

-- the desgined slope adjustable TWG provides not only a line feed-forward control, but also a wider band for VMC buck converter.

Fig.1 shows the proposed system block diagram. Op-amp1 is used to generate an error signal. Op-amp2 senses and amplifies the output deviation, and its output works as control variable for the TWG. TWG is a time-variant function of the voltage, and it is reset every period by CLK pulse signal. The slope is proportional to the input voltage, and inversely proportional to the control variable.

Fig. 2 shows the SIMetrix simulation results when input voltage is changed between 5V and 8V. The line feed-forward control eleminates the change in the input voltage. Therefore, the down-shoot and the over-shoot in output voltage are distinctly decreased.

Fig. 3 shows the simulation results when load current is changed step-wise between 100mA and 420mA. The wider band improves the load transient response. Response time is shortened and the peak amplitude of the output voltage is decreased.

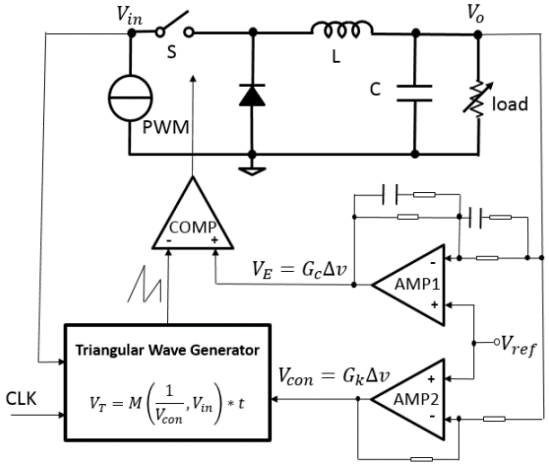

Fig. 1 Dc-dc buck converter with a slope adjustable TWG.

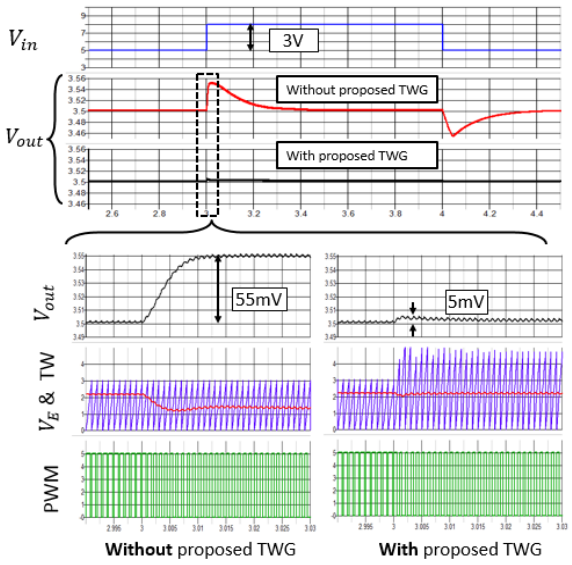

Fig. 2 Simulation of line transient response.

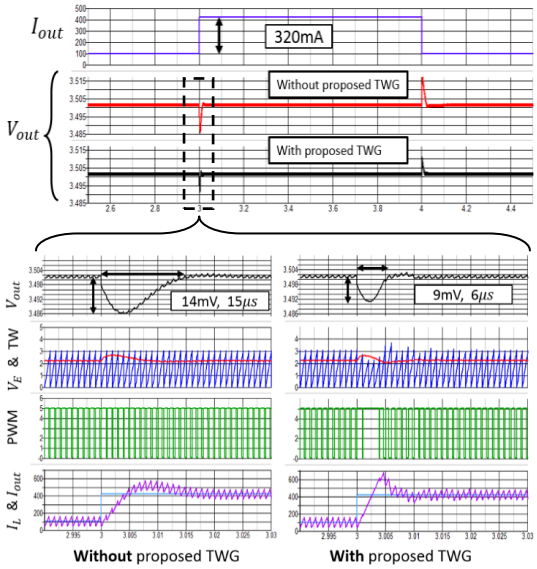

Fig. 3 Simulation of load transient response.