Single Inductor Dual Output DC-DC Boost Converter with Serial Control

Shu Wu, Yasunori Kobori, Mu Rong Li, Zhao Feng, Qulin Zhu, Shaiful Nizam Mohyar (Gunma Univ)
Takahiro Odaguchi, Tetsuji Yamaguchi, Isao Nakanishi, Kimio Ueda (AKM Tech), Jun-ichi Matsuda (AKPD)
Nobukazu Takai, Haruo Kobayashi (Gunma Univ)

Research Objective

- **Single Inductor Dual Output converter**
  - Development of simple, low cost control method

- **Serial control**
  - Both ch1 and ch2 control serially in one period, first served for urgent one.
  - Only a few additional components
  - No current sensor
Proposed Serial Control of SIDO DC-DC Boost Converter

Circuit Configuration
Timing Chart of Proposed Serial Control of SIDO DC-DC Boost Converter

⊿V1
⊿V2
SAW
PWM1
PWM2
OR PWM
I_L
SEL
P1
P2

Ch1 is urgent
Ch2 is urgent
Ch2 is urgent
Ch1 is first served
Ch2 is first served
Ch2 is first served
In one period: 1. Inductor charge, \( S_0 \) ON
In one period:

2. Inductor uncharge, \( S_0 \) turn OFF.

If \( \Delta V_1 < \Delta V_2 < 0 \), \( S_2 \) OFF, \( P_1 \) and \( P_2 \) both are High.
Proposed Serial Control of SIDO DC-DC Boost Converter

In one period:
3. Inductor uncharge, $S_0$ keep OFF.  
   $\Delta V_1 > 0, \Delta V_2 < 0, P_1$ Low, $S_2$ turn ON, $P_2$ keep High
Proposed Serial Control of SIDO DC-DC Boost Converter

In one period: Next period, $S_0$ turn ON