1. Objective
COT ripple-based control DC-DC converter
1. For large load current
   Multi-Phase configuration
2. Automatic current imbalance correction
   Feedback the current difference
   COT: Constant On-Time

2. Background
Current imbalance from L, C element variation
Causes overcurrent
Increase voltage ripple
Current imbalance
Goal
Automatic current balancing

3. Proposed Circuit
Dual Phase COT Converter
Proposal 1
For large load current
Parallel connection of power stages
Proposal 2
Current imbalance correction
Feedback the current difference to On-Time

4. Simulation
Conditions
Element variation: $C_{12}$ increase by 10%

Before imbalance correction
Inductor current difference 41%

Increase load current 4A to 10A

After imbalance correction
Inductor current difference 1%

$I_o = 10A$: Inductor current difference 2%
Proposal correction circuit in large load current: Stable

5. Conclusion
COT ripple-based control converter for large load current
- Automatic current imbalance correction
  - Correcting the on-time of the COT pulse by the error amplifier feedback control
  - Error amplifier feedback the inductor current difference to on-time reference
- Simulate proposal correction circuit
  - Increase 10% COT timer capacitor $C_{12}$
  - Without correction circuit:
    - Inductor current difference 41%
  - Within correction circuit:
    - Inductor current difference 1%
    - Current balance improves significantly

References