

Changing Method of Multi-Phase Buck Type Switching Converter

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1. Objective

Development of high efficiency multi-phase switching converter

☹ Efficiency for **small** load circuit

Approach

Number of operating phases **Limit**

2. Background

Multi-phase switching converter compared to Single-phase

Ripple : **Smaller**

Transient speed : **Faster**

Efficiency :

for **small** current **Good !**

for **large**

Bad !

Application :

Microprocessor for server

Max current : 100A → Instantaneous

Load current **increase / decrease**



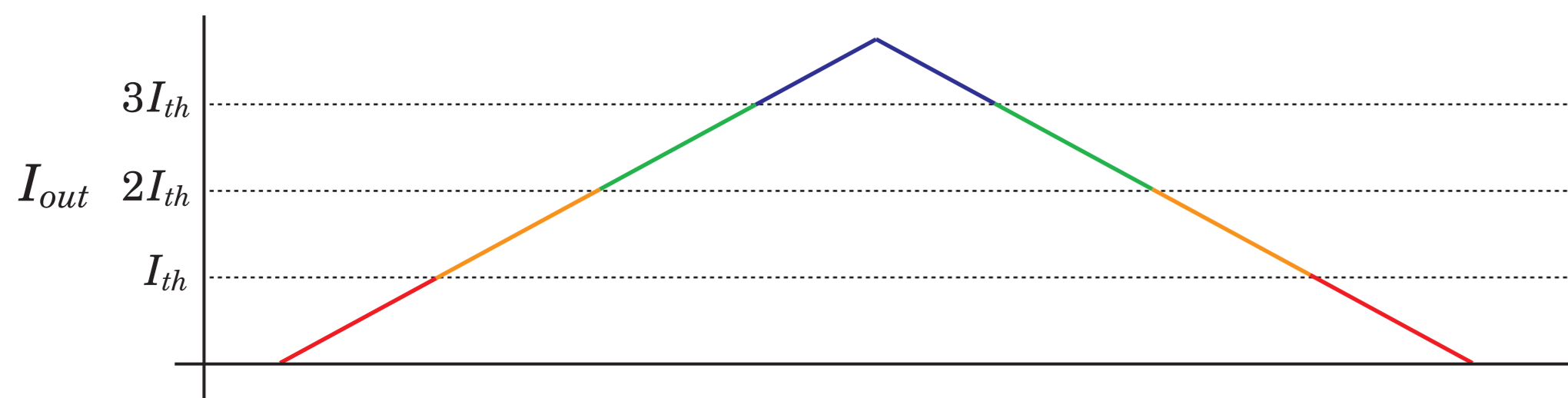
Number of operating phases

increase / decrease dynamically



Good efficiency for small & large load current

3. Proposed Circuit



Operating phases

0 to I_{th} Converter 1

I_{th} to $2I_{th}$ Converter 1 and 2

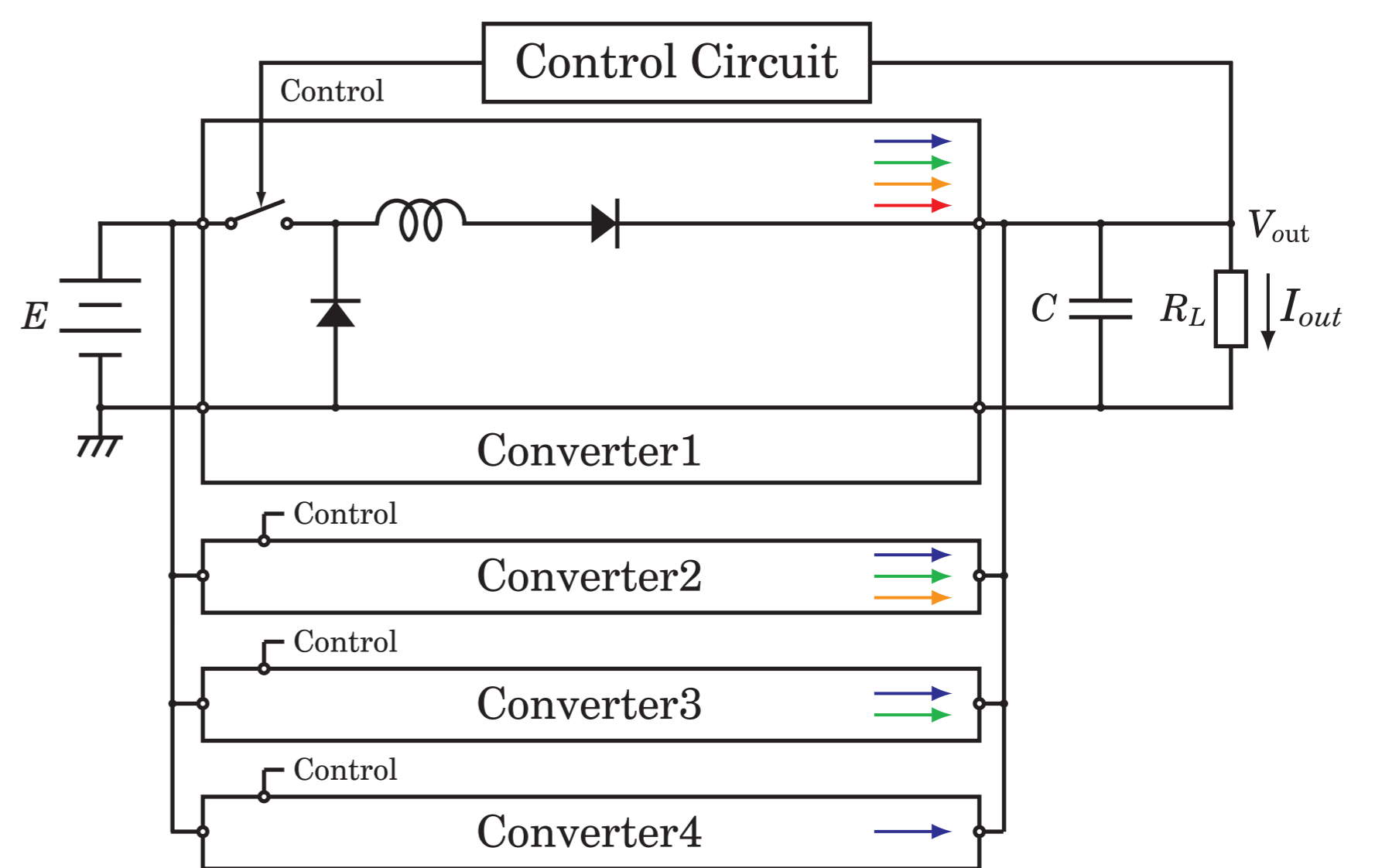
$2I_{th}$ to $3I_{th}$ Converter 1, 2 and 3

Over $3I_{th}$ All Converters

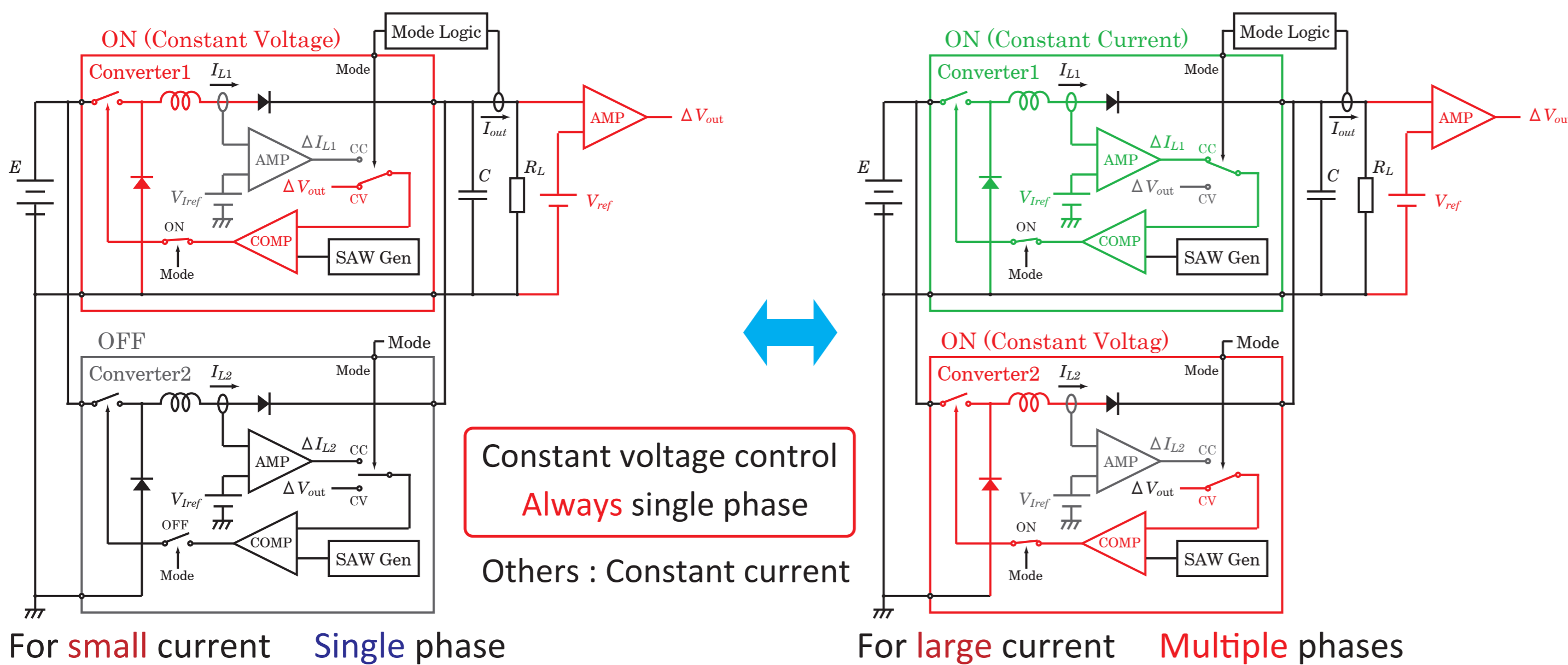
Output current **increase / decrease**

Operating phases

increase / decrease

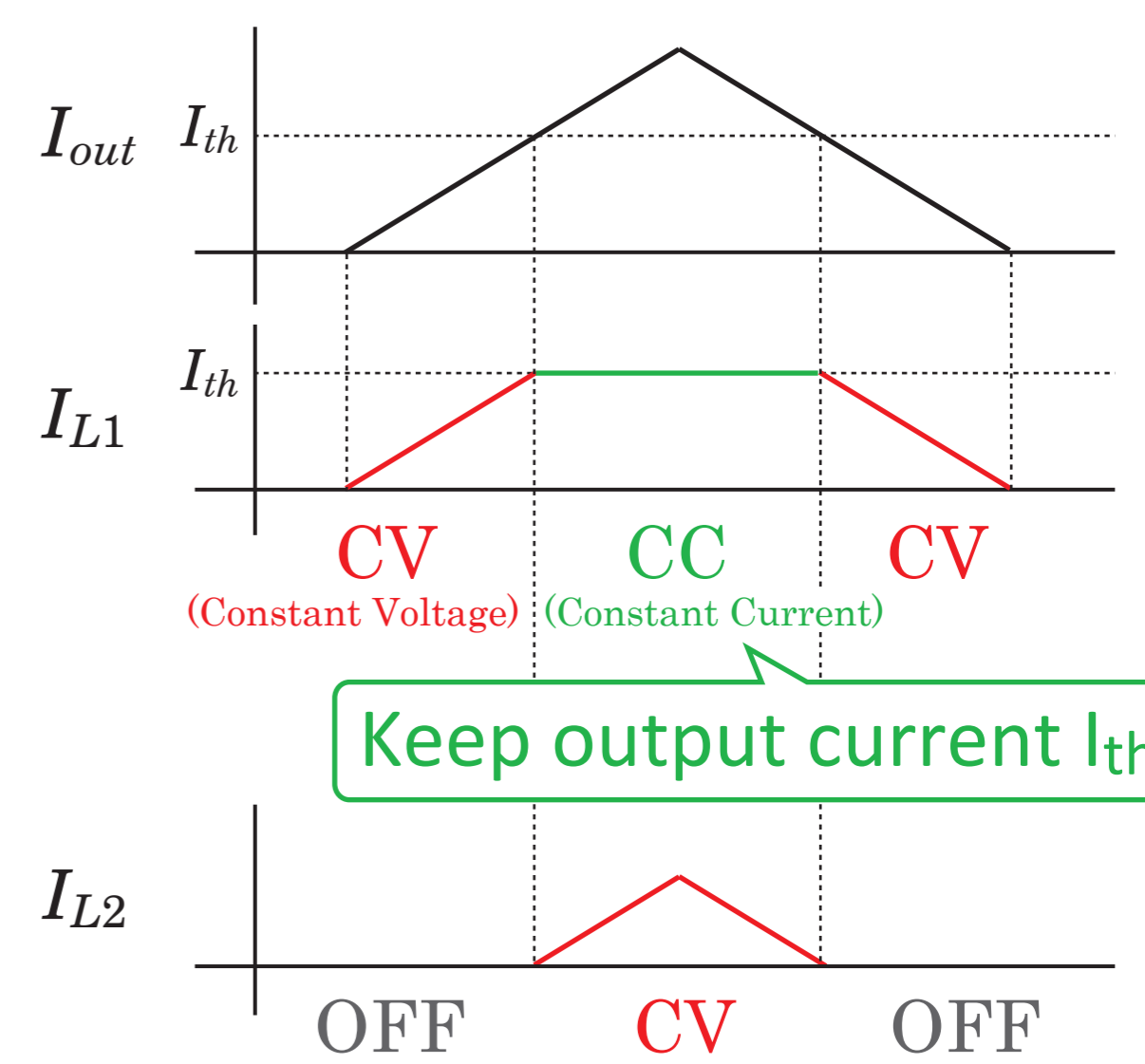


4. Phase Changing Method

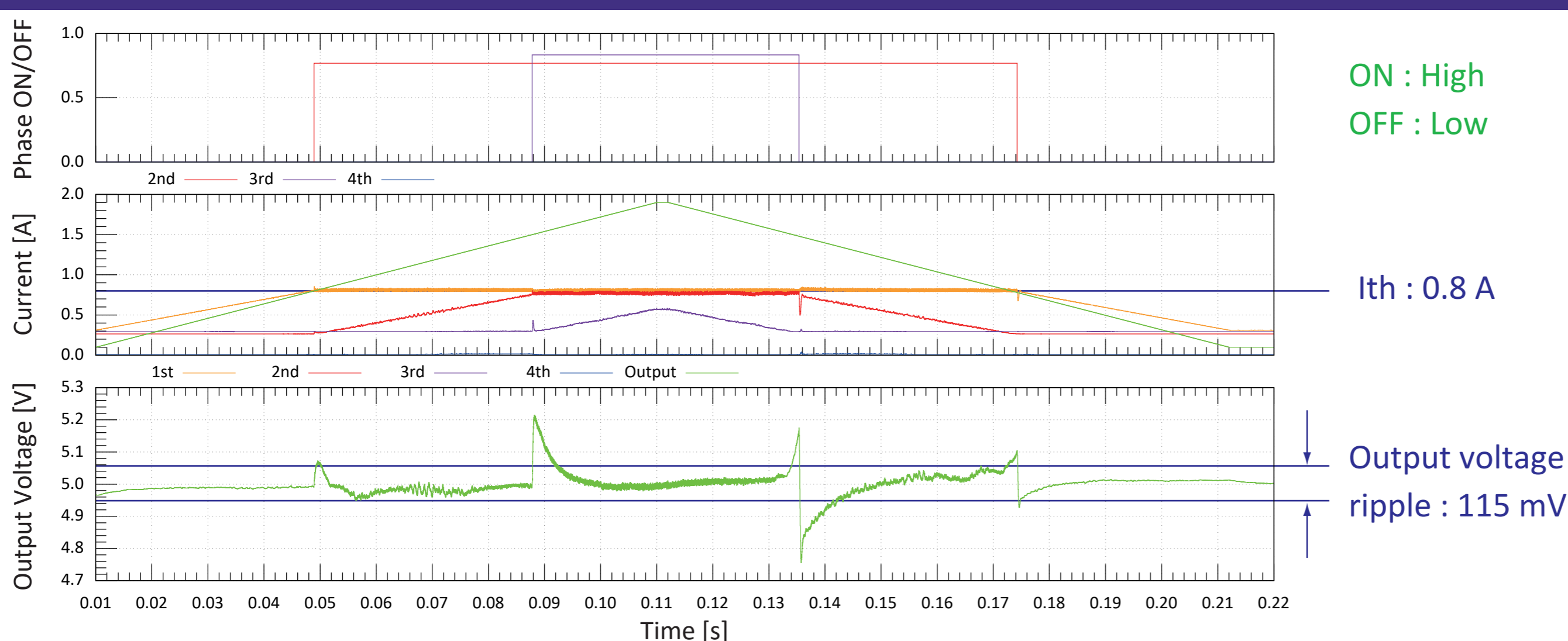


For **small** current **Single phase**

For **large** current **Multiple phases**

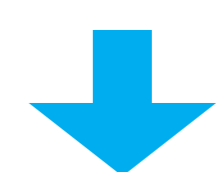


5. Simulation Result



6. Conclusion

Multi-phase switching converter
Efficiency for **small** load circuit **Bad !**



Proposed : **Phase changing** method
for large current **Increase** phases
for small **Decrease**

Improve efficiency