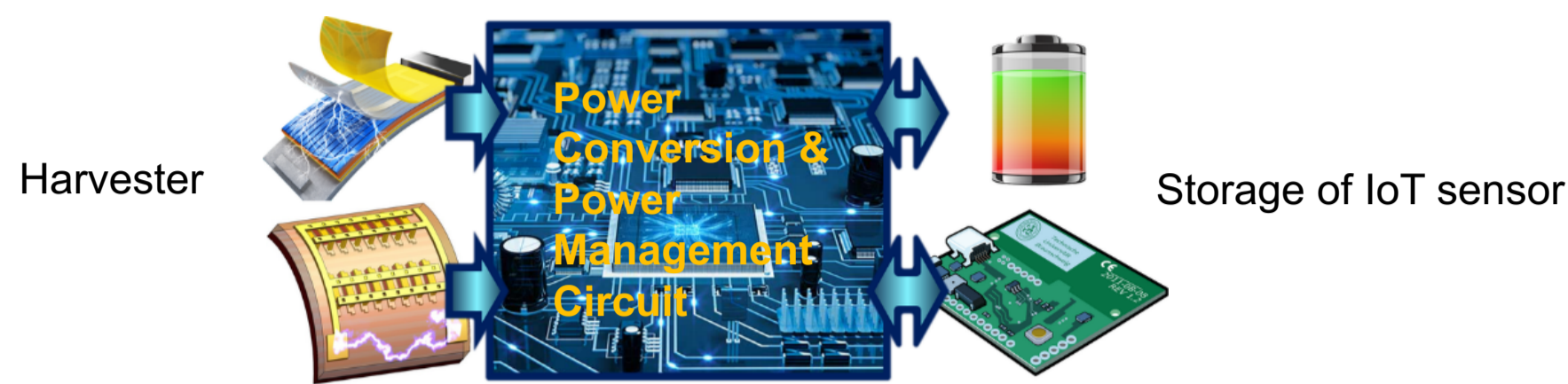


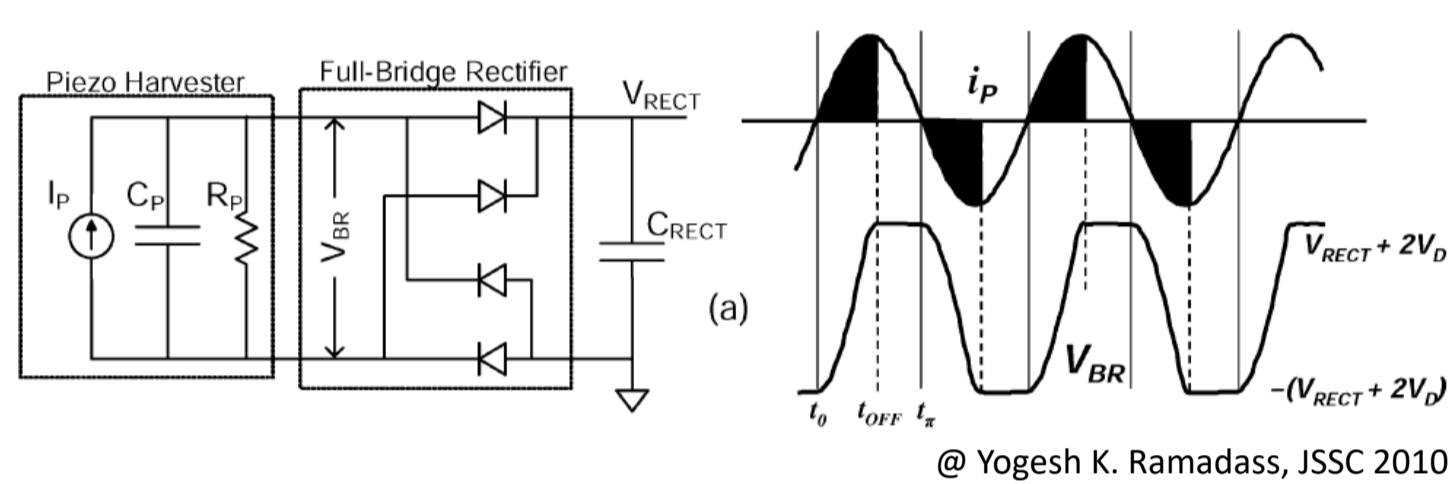
INTRODUCTION

Energy Harvester as Power Supply for IoT sensor



- To use the piezoelectric energy harvester as a power supply for IoT sensor, the power conversion and power management circuits are required.

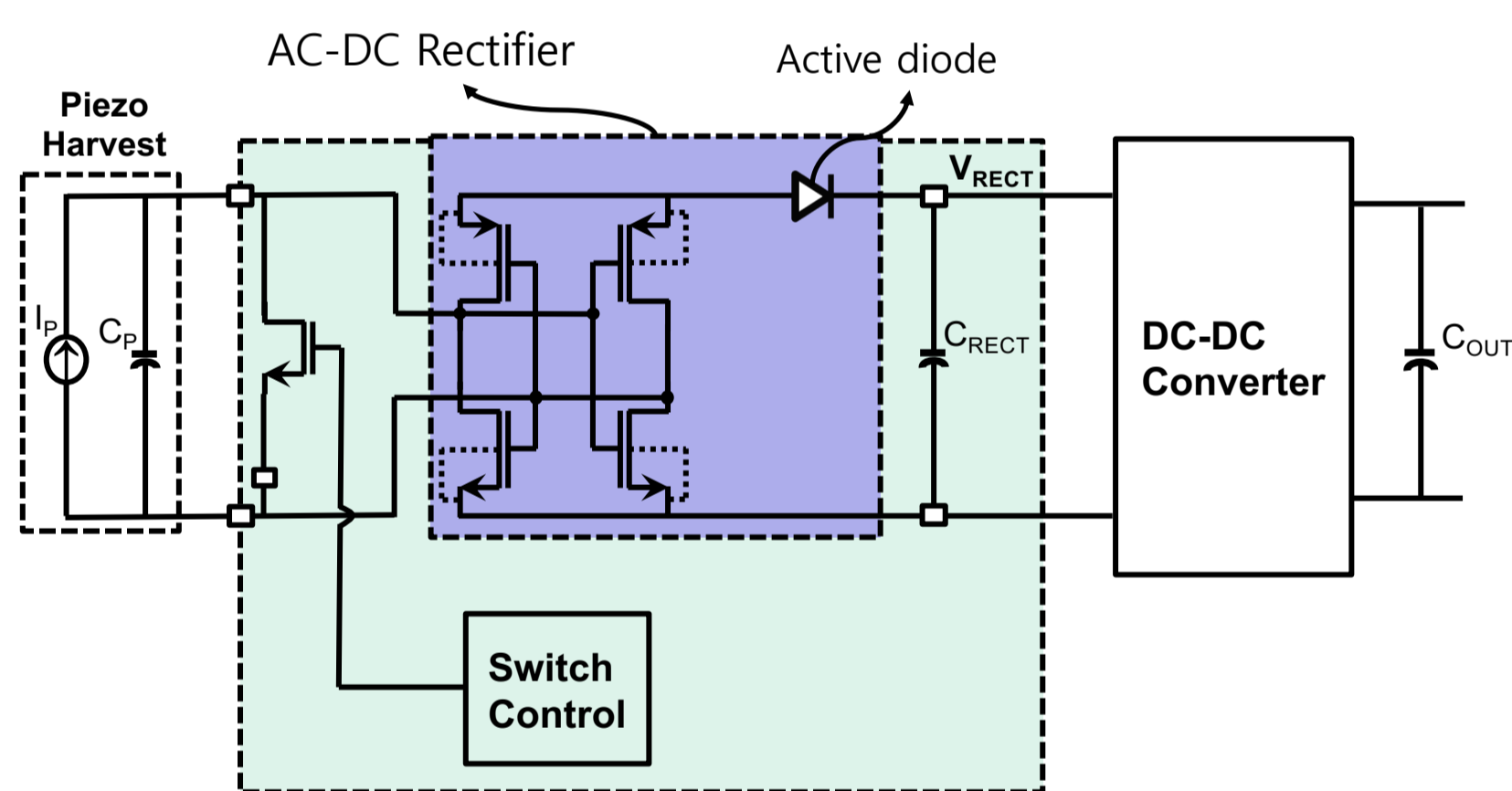
Piezoelectric Energy Harvest Interface IC



< Full Bridge Rectifier >

- Piezo Harvester can be modeled a current source (I_p) and a internal cap. (C_p).
- Charge or Discharge $C_p \rightarrow$ Loss

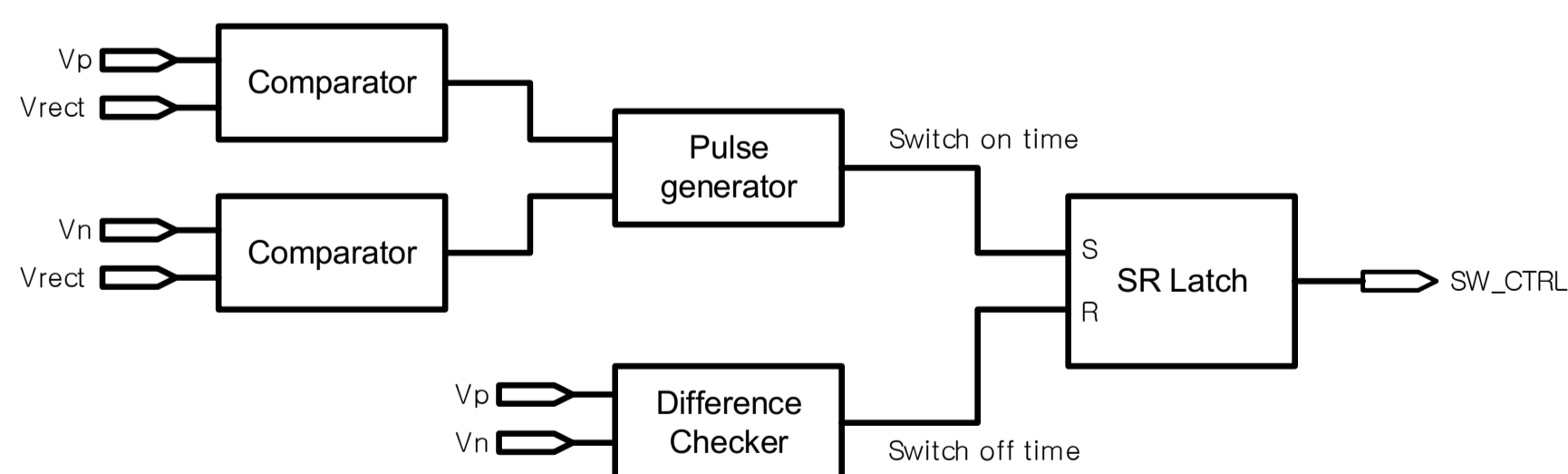
PROPOSED SWITCH-ONLY RECTIFIER



< Proposed Switch-only Rectifier >

- Design a piezoelectric energy harvest interface circuit using 0.35um CMOS technology

Switch Control Block



< Switch Control Block >

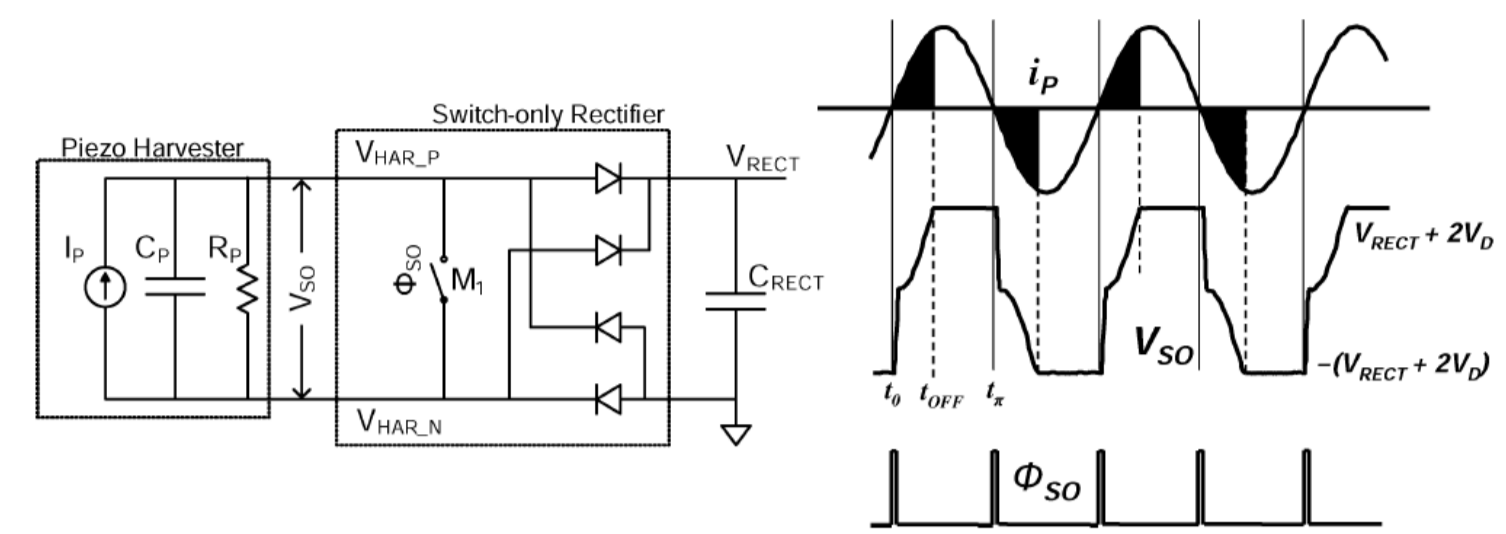
- Switch on time
 - When V_p or V_n (Harvest output) begins to decrease (= Zero cross point of I_p)
- Switch off time
 - When the difference of V_p and V_n is '0' (= C_p is sufficiently discharged.)

KEY CONTRIBUTIONS

This research first presented the switch-off time control of switch only rectifier (SOR), one of the types of synchronized switch harvesting (SSH). It is also important to turn on the switch at the correct time in SSH, but determining the switch off-time also affects efficiency. In this work, SOR with switch off-time control was proposed, and achieved the efficiency improvement of 25%.

SWITCH CONTROL

When the switch on and off ?



@ Yogesh K. Ramadass, JSSC 2010

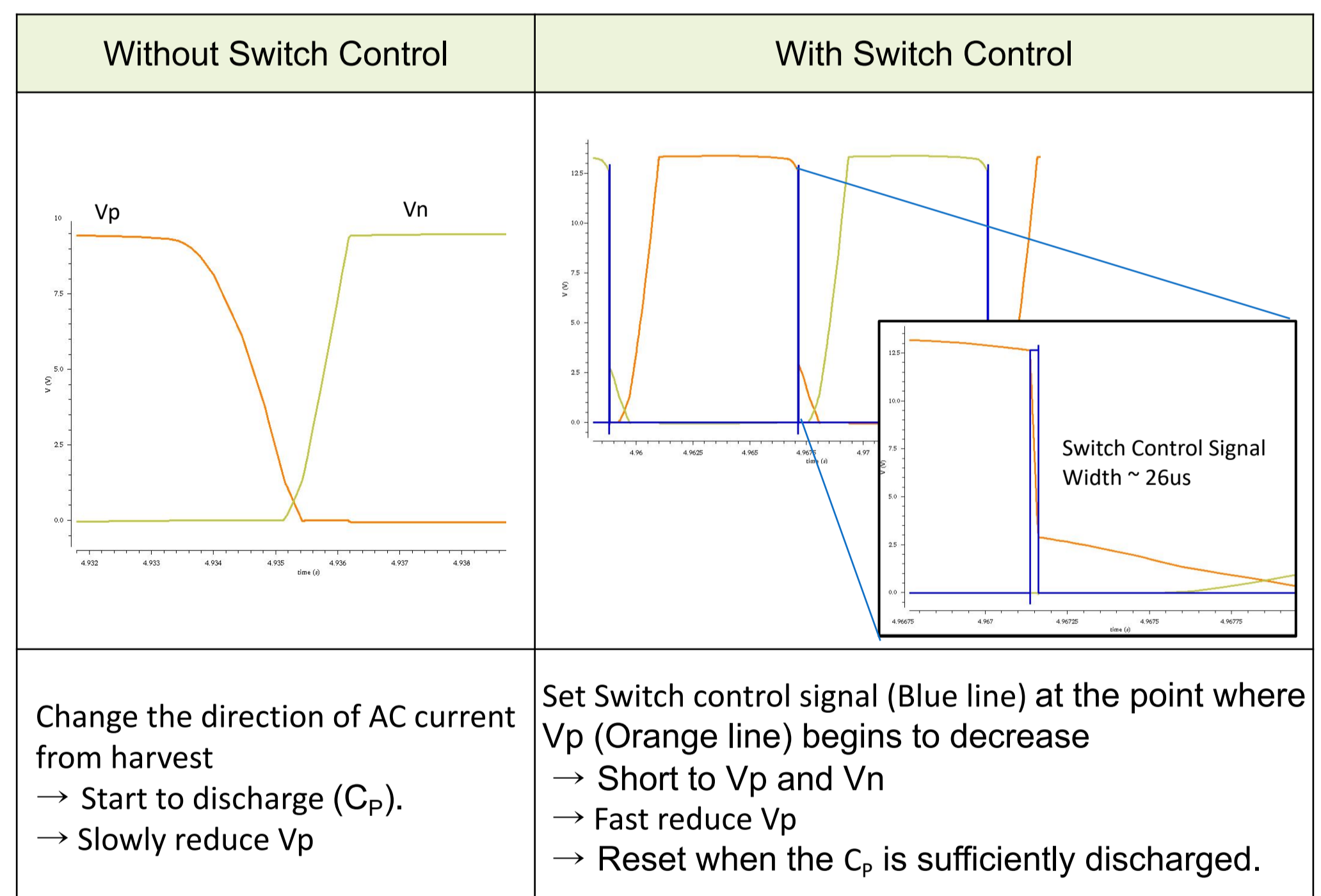
< Switch-only Rectifier >

- Switch-only Rectifier reduces the loss by discharging C_p at the zero-cross point of I_p .

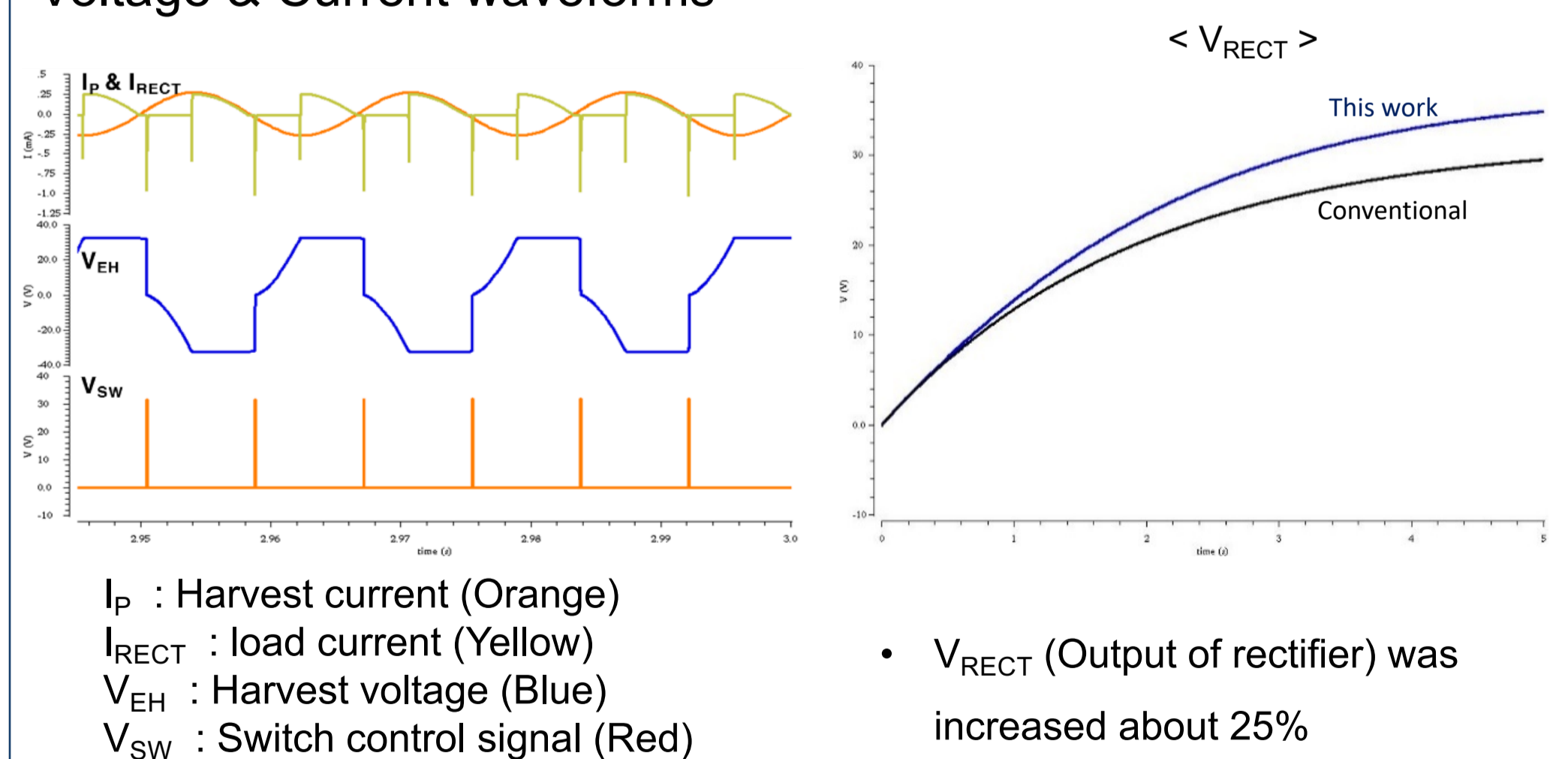
	Switch on	Switch off
On-Time	Zero-cross point of I_p	Zero-cross point of $V_{HARVEST}$
Mismatch	Loss because of discharging C_p	Reducing the efficiency because the current cannot be delivered to the output.

SIMULATION RESULTS

Switch Control Signal



Voltage & Current waveforms



ACKNOWLEDGEMENTS / CONTACT

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