

# **A Regulated Charge Pump With a Low-Power Integrated Optimum Power Point Tracking Algorithm For Indoor Solar Energy Harvesting**

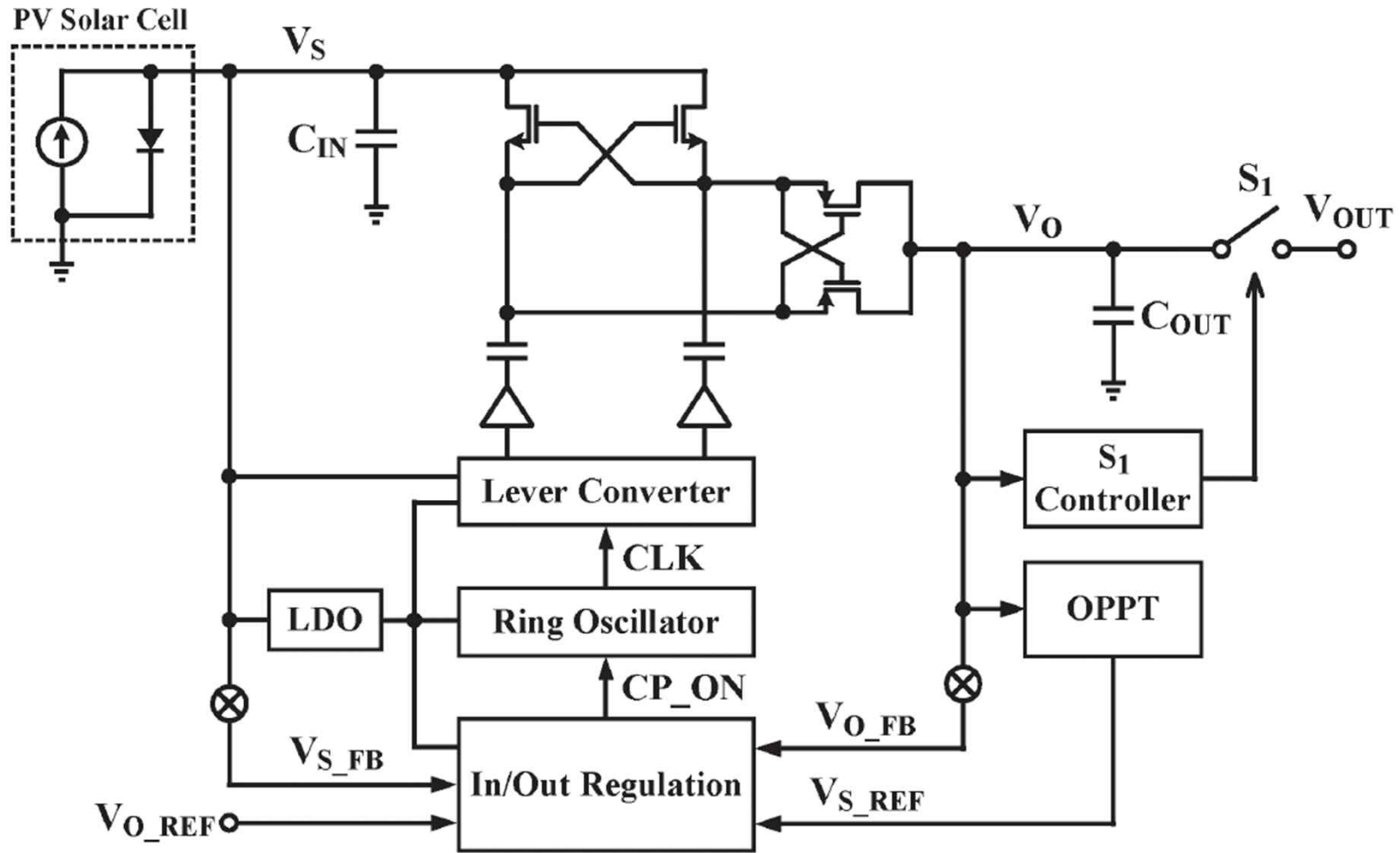
\*Jungmoon Kim, Jihwan Kim, Chulwoo Kim

Advanced Integrated Systems Lab.  
Korea University, Seoul, Korea

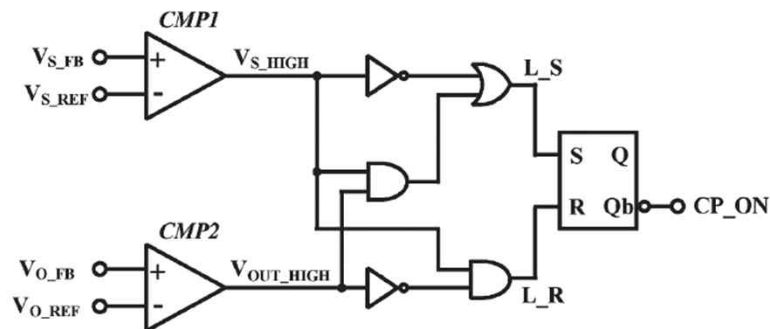
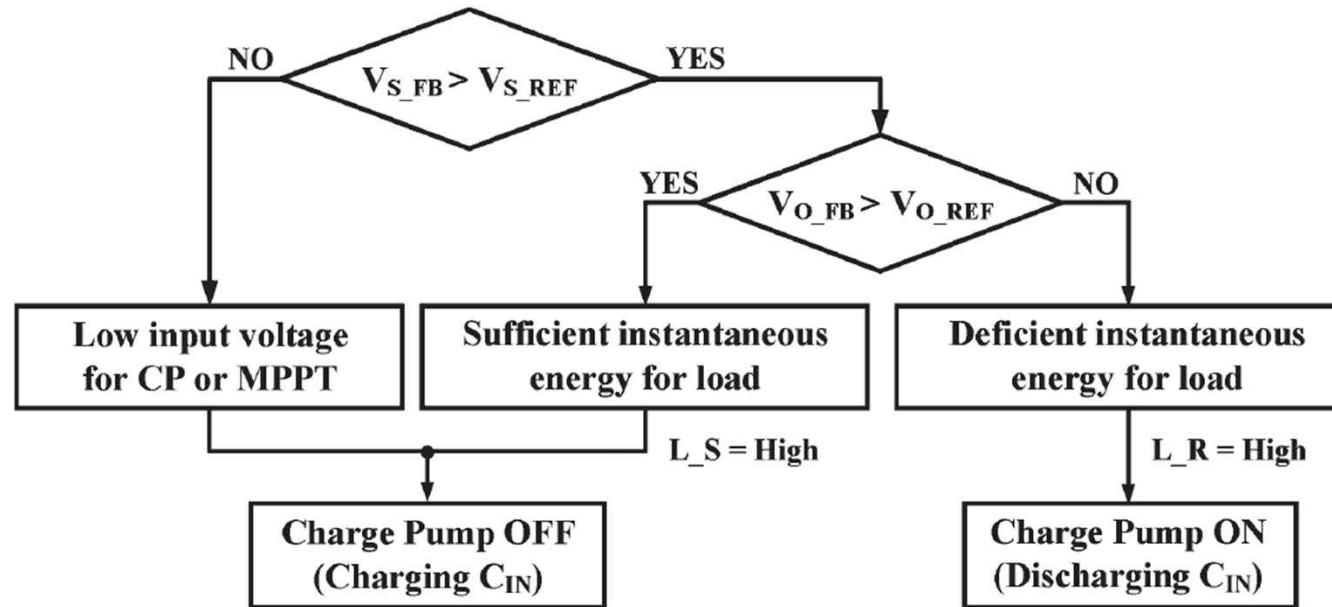
# Motivation

- **Solar energy harvesting in a dim light environment**
  - May provide less than 10uW of power from a 1-cm<sup>2</sup> solar cell.
- **Low lighting environment requires**
  - Low power consumption of the converter's controller
  - Low power MPPT block
- **Conventional MPPT block**
  - Uses current sensor ( dependent on load )

# Overall Block Diagram

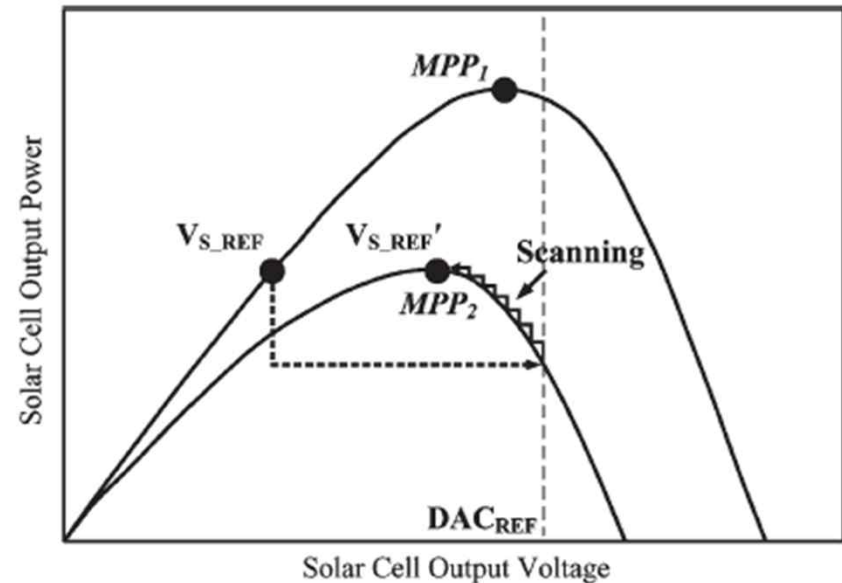
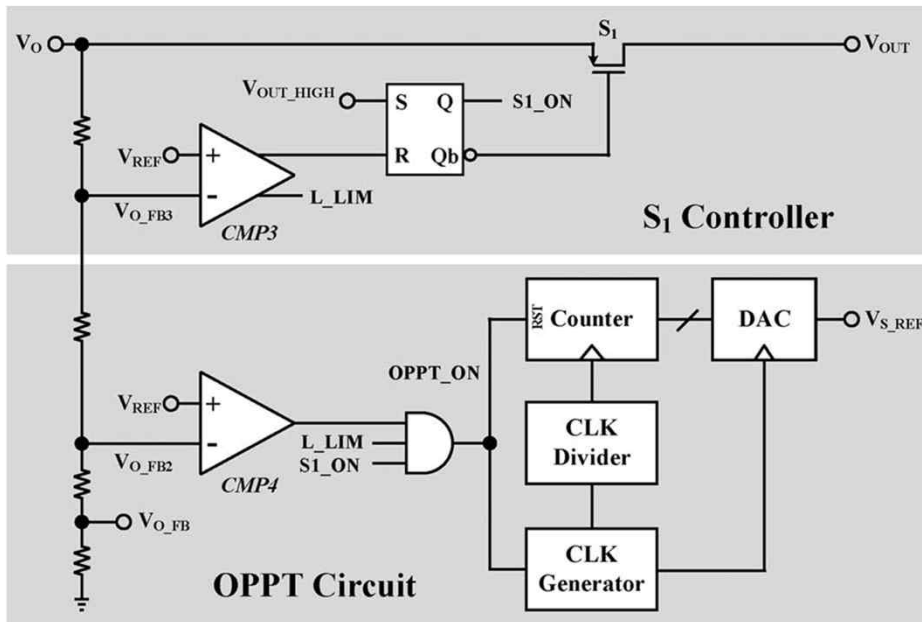


# In/Out Regulation Circuit



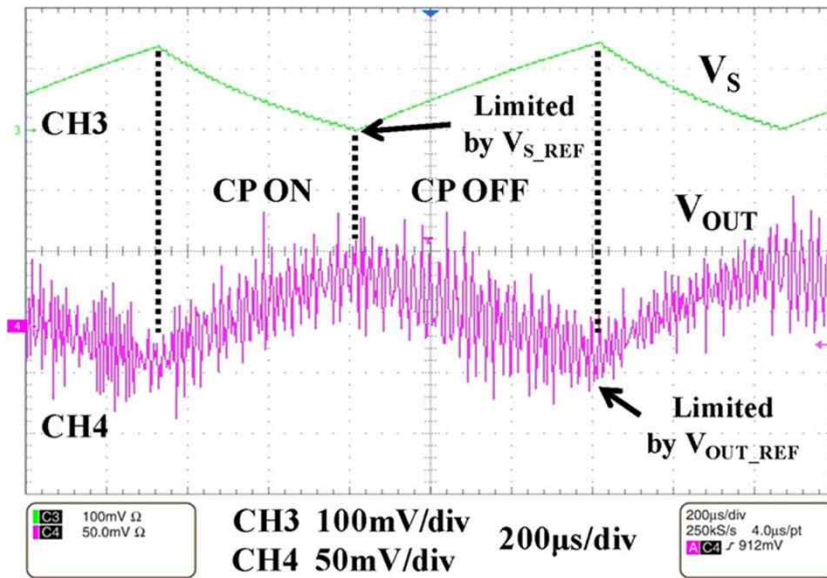
-Enables the CP according to the relationship between **the energy that a sola cell can provide** and **the energy that the load demands**

# Load Switch Controller and OPPT Circuit

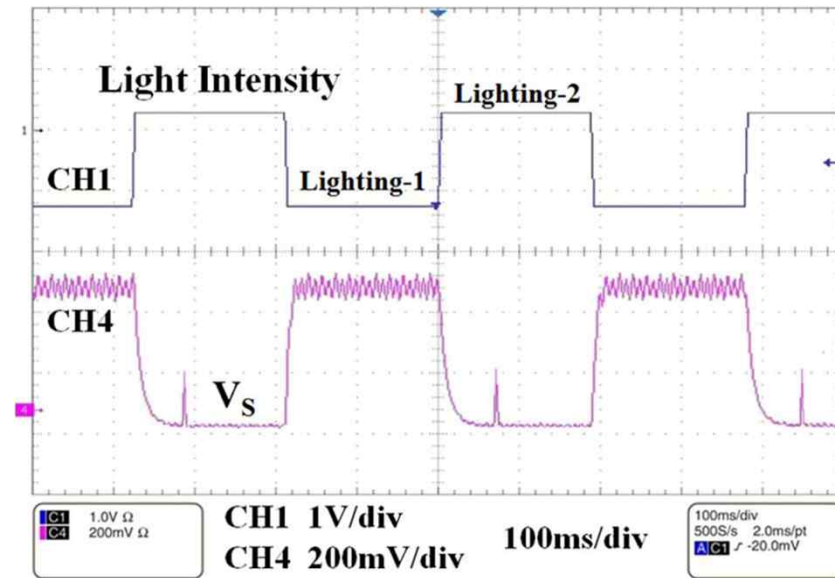


- A low-power OPPT circuit without a current sensor
- Sensing the drop of the output voltage
- A part of the entire range is scanned

# Measurement Results



- Steady-state waveforms for the input and output of the CP



-Transient response of the solar cell voltage to the change in the light intensity