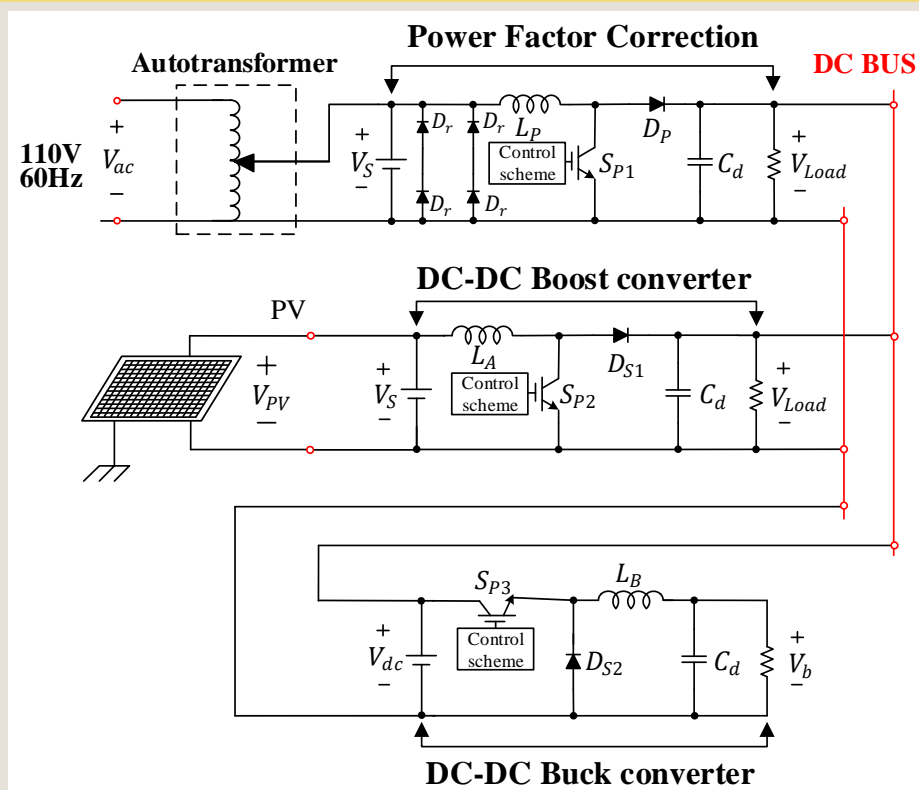


# 國立清華大學電機工程學系：實作專題研究成果報告

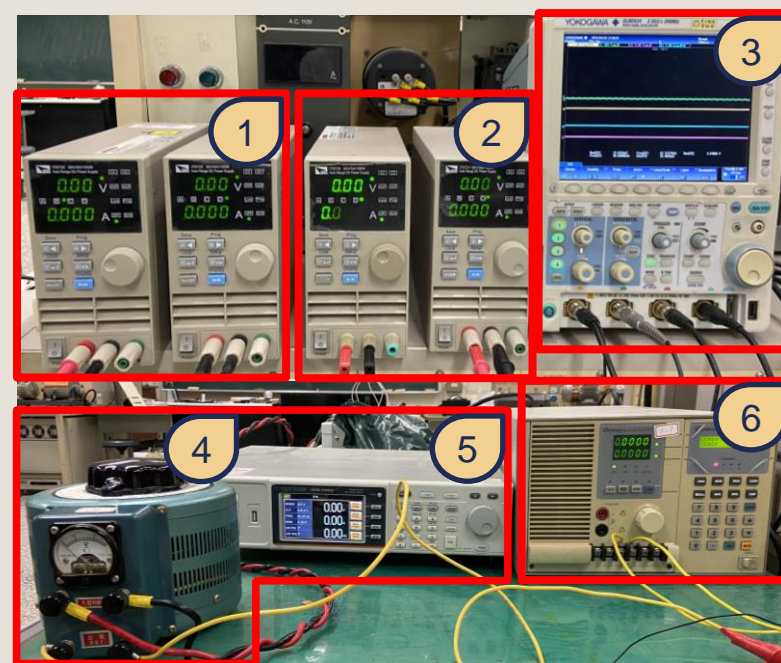
## 電網交流轉直流及太陽能電能轉換器研製應用於電動載具充電樁儲能系統 (Development of AC/DC Grid Conversion and Solar Energy Conversion Systems Applied in Energy Storage of Electric Vehicle Charging Stations)

◆組員：周昱辰 洪若筑 郭奕倫 ◆指導教授：張淵智 ◆組別：A401

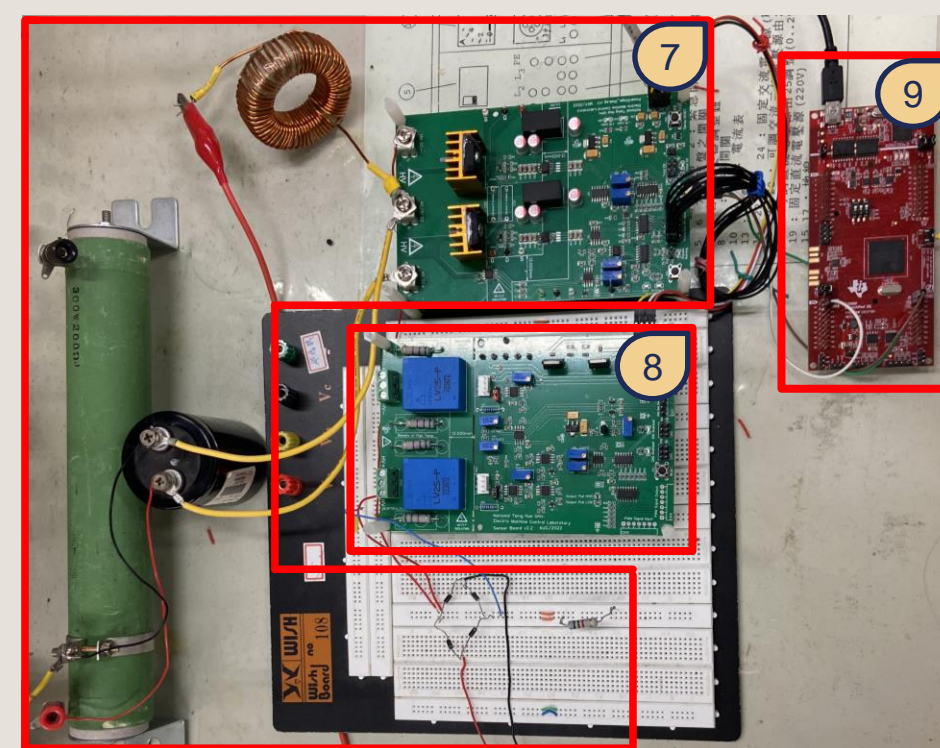
### Circuit diagram of the Energy Storage System of Solar Charging Function



### Photos of the Energy Storage System of Solar Charging Function



1 Power Supply for One-leg and sensor board



2 Power supply for simulating solar panels

3 Oscilloscope

4 Autotransformer

5 AC power source

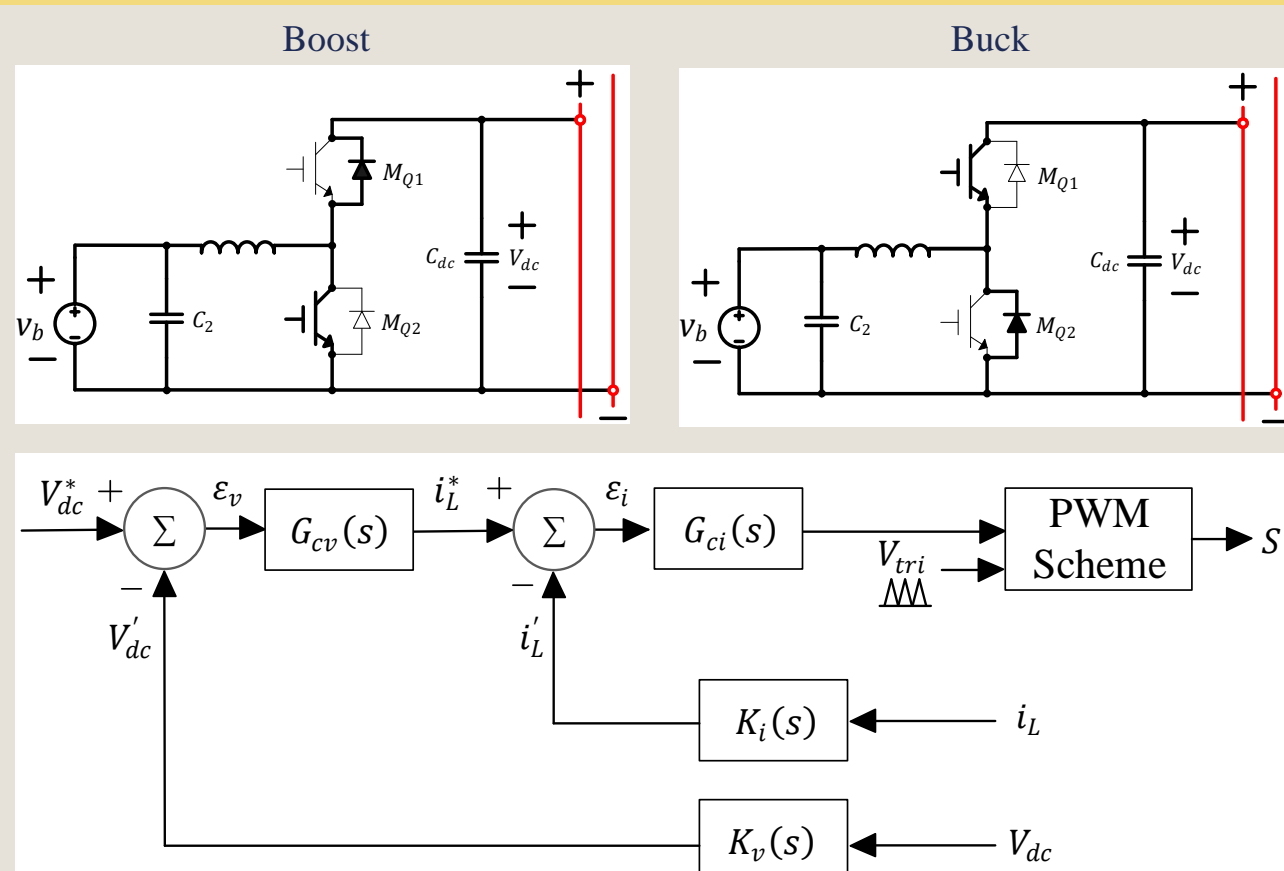
6 Electronic load

7 One-leg DC-DC converter

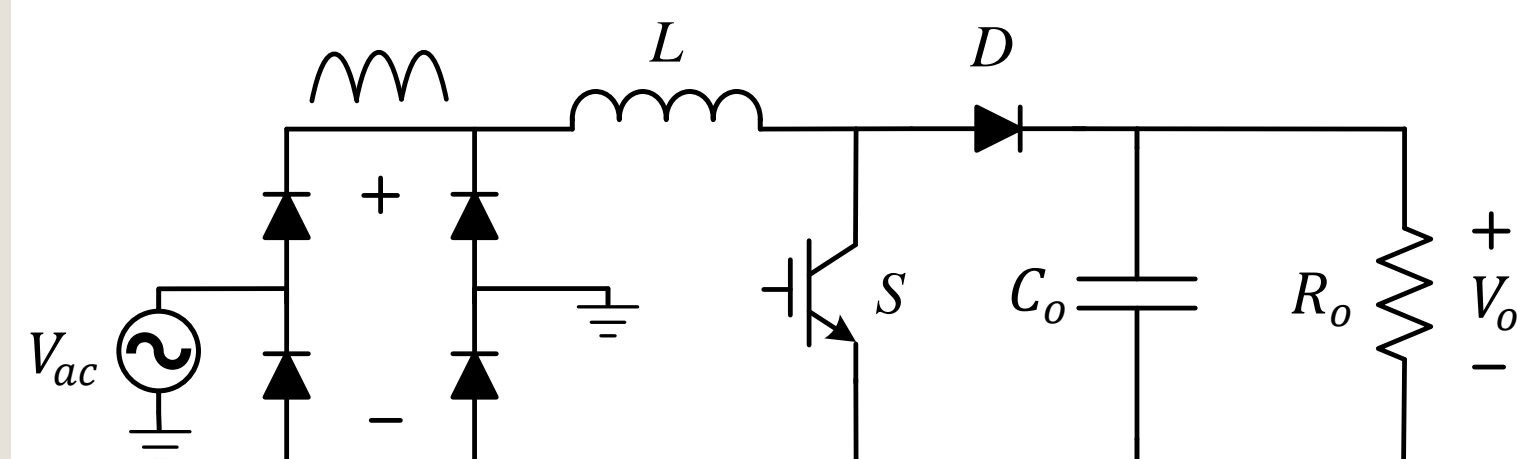
8 Voltage sensor and current sensor

9 TMS28379 microcontroller

### Circuit diagram and control scheme of One-leg DC-DC converter

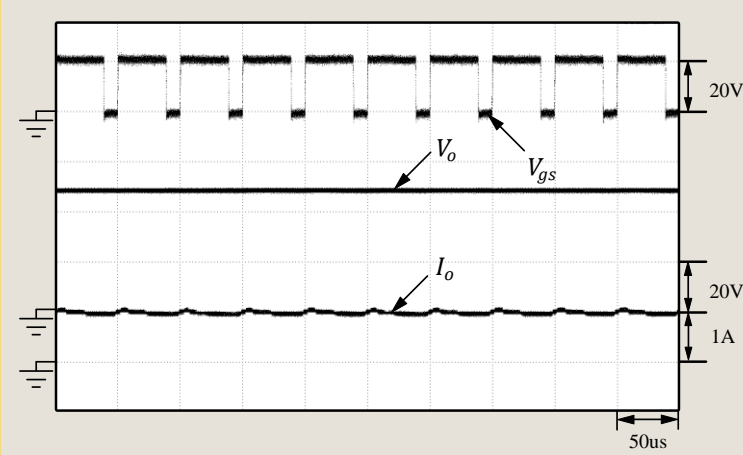


### Circuit diagram of a boost converter with Power Factor Correction

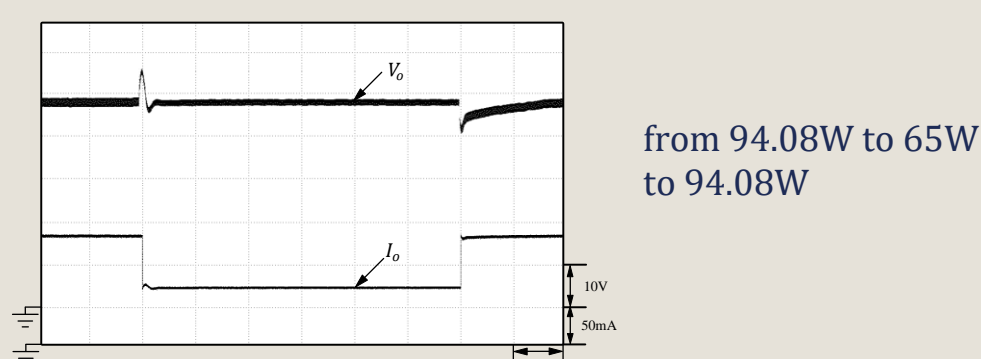


### Results: One-leg boost

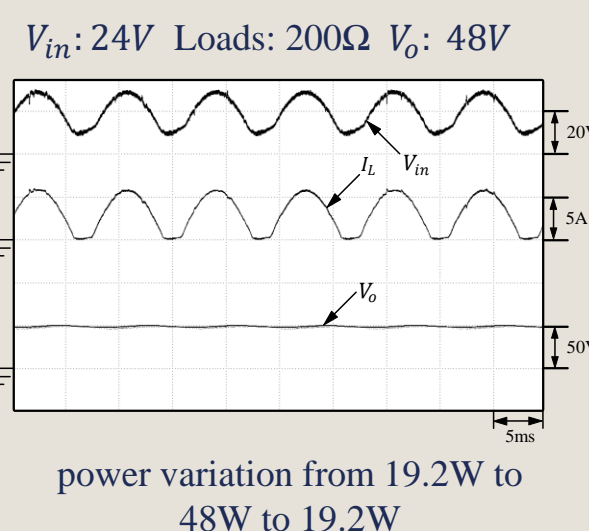
- DC Battery source: 12V
- Loads: 46Ω
- Vo: 48V



### Voltage and current waveforms of boost converter as the load changed

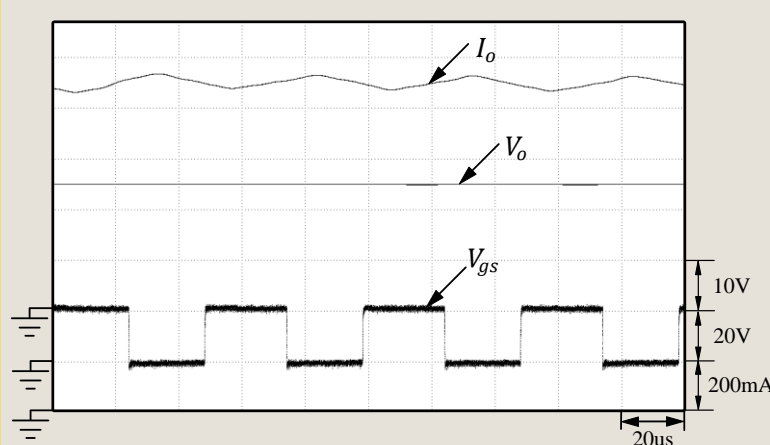


### Results: Power Factor Correction

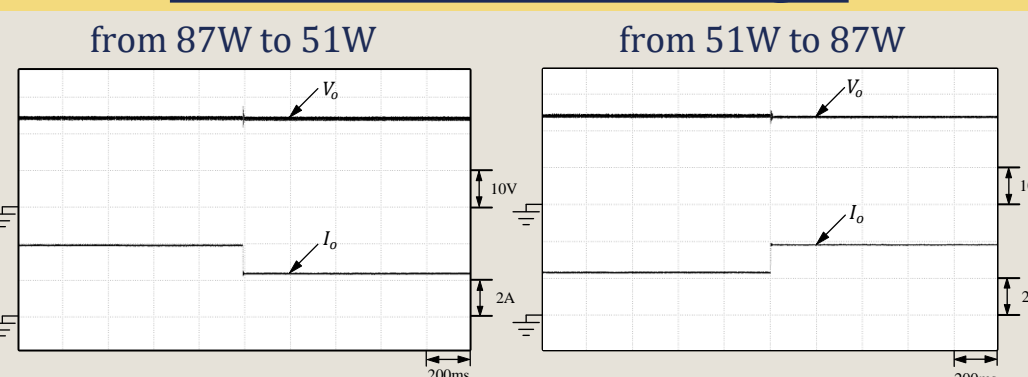


### Results: One-leg buck

- DC Battery source: 48V
- Loads: 20Ω
- Vo: 24V



### Voltage and current waveforms of buck converter as the load changed



### Conclusions:

This project combines modern power conversion technology with solar energy for efficient energy storage and stable output. Critical components, including a reliable power source, One-leg DC-DC converter, power factor correction circuit, and test load, form a solar energy storage system. It features a digital signal processing (DSP) control system for quick adaptation to diverse load conditions, ensuring stable voltage and current output. All hardware components, including converters and sensors, are successfully assembled, demonstrating the system's capability for normal charging and discharging operations even under fluctuating loads. With precise adjustments and future improvements, the project's framework can offer diverse choices for environmental sustainability and energy efficiency, applicable to solar-powered mobile sources, uninterruptible power supply (UPS) systems, and vehicle solar energy storage systems.