# OUC's All-In-One Photovoltaic Sensor Phase II

Final Demo

Group 6

Sponsored by The Orlando Utilities Commission, OUC

# SPECIFICATIONS

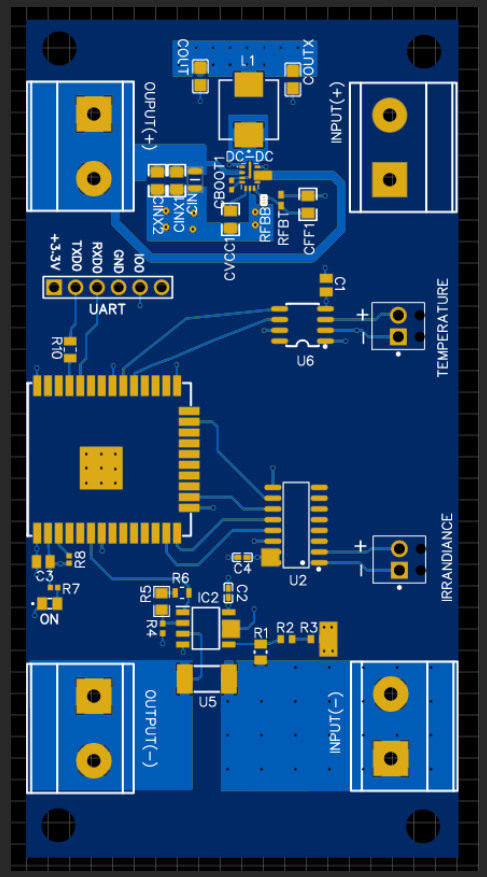
## Sponsor Requirements

| Requirement | Priority |
|---|---|
| Capable of handling & sensing 40 V, 10 A, DC. | High |
| Modular design for Temperature & Irradiance Sensing | High |
| MC4 Insertion or Connections | High |
| Wirelessly communicate with local node for data storage | High |
| About or below $20 per sensor | Moderate |
| Plastic enclosure capable of withstanding outdoors | Low |
| Year-long lifespan | Low |

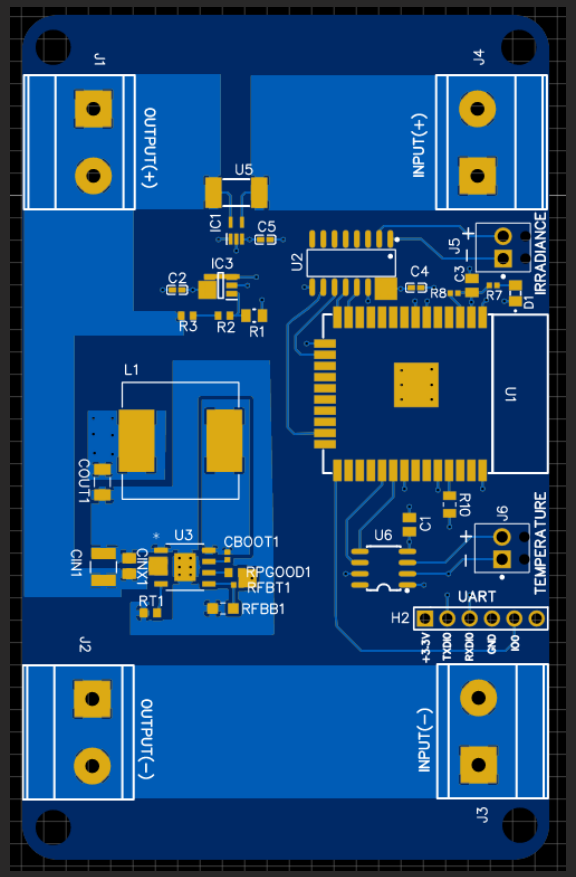
## Engineering Requirements

| Requirement | Constraint |
|---|---|
| Voltage Accuracy | ±5% of actual value |
| Current Accuracy | ±5% of actual value |
| Temperature Accuracy | ±5% of actual value |
| Irradiance Accuracy | ±5% of actual value |
| Data Transmission Interval | <10 seconds between datapoints |
| Wireless protocol | Self-Generated Wi-Fi or Bluetooth |
| PCB Power | Powered by Panel Generation, no external battery |

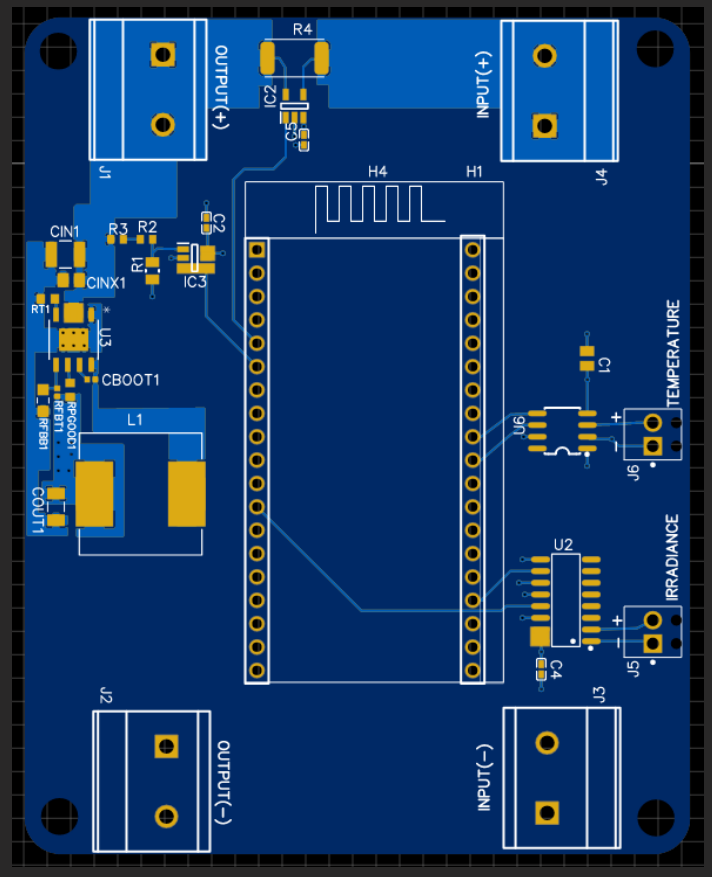
# PCB VERSIONS & LAYOUTS




Version 2



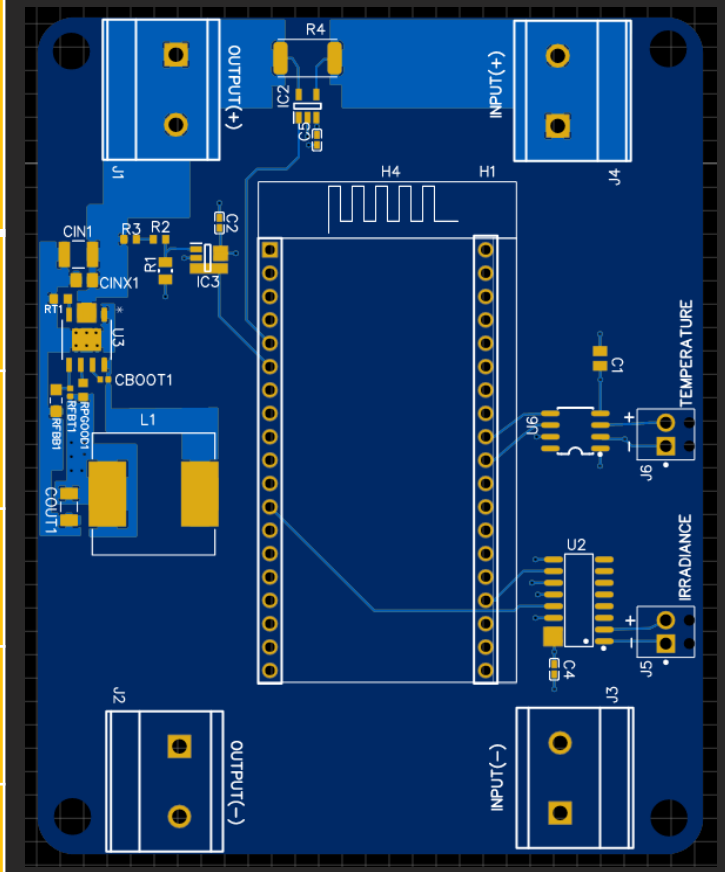

Version 3, SMD Edition



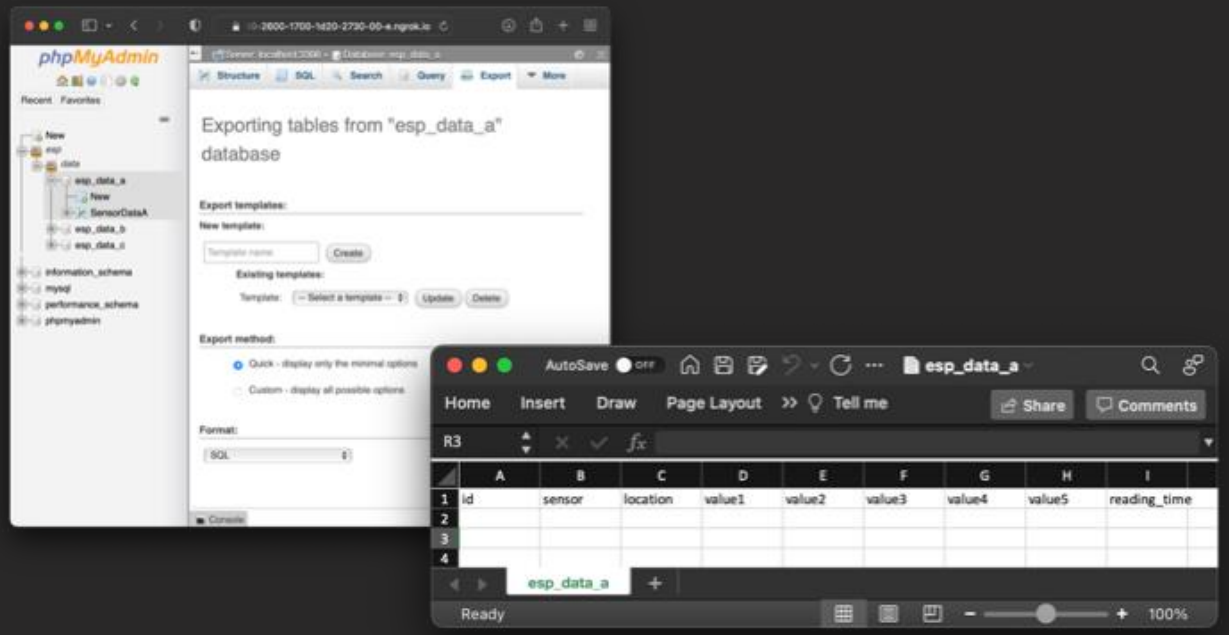

Version 3, Dev-Board Edition

# LAB TEST SUMMARY

| Input Voltage (Volts) | Input Current (Amps) | ESP32 Voltage (Volts) | ESP32 Current (Amps) | Voltage Error (Abs. Val) | Current Error (Abs. Val) |
|---|---|---|---|---|---|
| 7.34 | 6.14 | 7.04 | 6.21 | 4.09% | 1.14% |
| 7.34 | 6.14 | 7.02 | 6.11 | 4.36% | 0.49% |
| 7.34 | 6.14 | 6.99 | 6.13 | 4.77% | 0.16% |
| 9.85 | 8.20 | 9.51 | 8.25 | 3.45% | 0.61% |
| 9.85 | 8.20 | 9.48 | 8.22 | 3.76% | 0.24% |
| 9.85 | 8.20 | 9.44 | 8.27 | 4.16% | 0.85% |



# LAB TEST SUMMARY

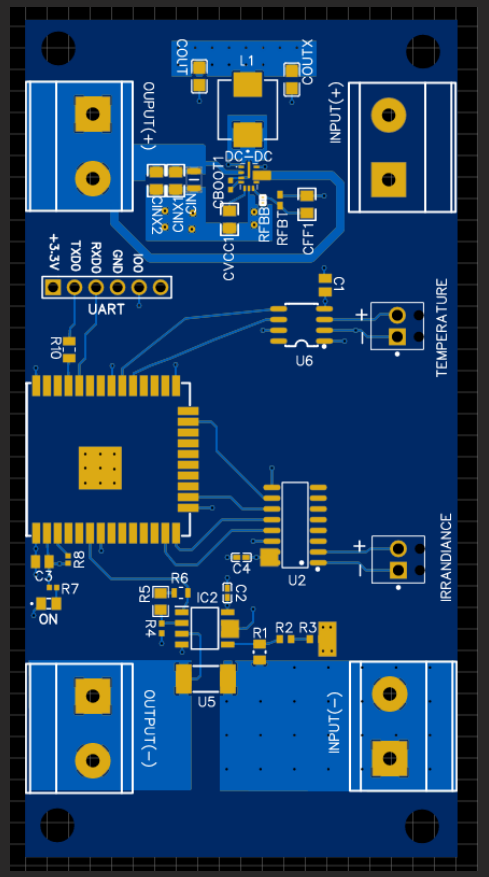



The ESP32 Access Point connected to the Raspberry Pi creates a self-generated Wi-Fi Signal and allows the All-In-One Photovoltaic Sensor to connect to it. This allows the sensors to store data wirelessly to the Raspberry Pi.

With a simple SD Card, the Raspberry Pi can hold years' worth of data.

# FIELD TEST SUMMARY

| ESP32 Voltage (Volts) | ESP32 Current (Amps) |
|---|---|
| 29.06 | 6.92 |
| 27.44 | 7.20 |
| 28.97 | 6.88 |
| 27.83 | 7.12 |
| 26.14 | 7.25 |
| 27.16 | 7.07 |

# FIELD TEST SUMMARY

| Record Number | Timestamp | Time Difference |
|---|---|---|
| 21791 | 00:33:52 | 1 second |
| 21790 | 00:33:51 | 1 second |
| 21789 | 00:33:50 | 1 second |
| 21788 | 00:33:49 | 1 second |


The ESP32 Access Point and Raspberry Pi Database were placed around 20 feet away from the sensing node.

Both the Database and the Sensing nodes were placed in NEMA rated boxes during testing and communication was not disrupted.

# THANK YOU!