TIME & EFFORT ESTIMATION DOCUMENT

Migration: ESP-12F (ESP8266) to ESP32-C5

1. Hardware Engineering

- PCB redesign (2-layer or 4-layer): 18–25 hours

- Updated schematic design: 6–8 hours

- Power supply redesign & testing: 4–6 hours

- Prototype assembly and board bring-up: 8–12 hours

Subtotal Hardware: 36–51 hours

2. Firmware Engineering

- GPIO remapping & boot-strapping handling: 4–6 hours

- ADC redesign, calibration & knob logic rewrite: 6–8 hours

- WiFi migration (ESP32 WiFi + SmartConfig v2): 10–14 hours

- EEPROM $\rightarrow$ Preferences/NVS migration & testing: 5–7 hours

- MQTT, OTA, sensor, relay, LED logic porting: 10–14 hours

- Integration testing & optimization: 12–16 hours

Subtotal Firmware: 47–65 hours

3. Mobile Application Impact

- Migrate SmartConfig to ESPTouch v2: 12–18 hours

- Android/iOS re-testing & provisioning validation: 8–10 hours

Subtotal Mobile App: 20–28 hours

4. QA & Validation

- Functional testing: 8–12 hours

- Temperature accuracy and stability validation: 4–6 hours

- WiFi provisioning & reconnection stress tests: 4–6 hours

Subtotal QA: 16–24 hours

5. Total Estimated Effort

Overall Estimate: 119 – 168 hours

(Approximately 3–5 weeks of engineering time, depending on test cycles)

Notes:

This migration involves significant hardware and firmware redesign. It is not a direct chip swap due to architectural, electrical, and WiFi provisioning differences.