

## Smart Internet-Controlled Ventilation Motor System Using ESP32

### Project Overview:

This project demonstrates the design and development of a smart mechatronic system that allows remote control of a ventilation opening using an ESP32 microcontroller. The system integrates sensors, a motor driver, and a web-based control interface, making it suitable for modern IoT applications in smart homes or industrial environments.

### Objective:

- To design a compact and cost-efficient PCB that allows:
- Controlling a motor that opens/closes a ventilation flap.
- Monitoring environmental conditions via sensors.
- Full remote control via Wi-Fi using a web interface hosted on ESP32.

### Key Features:

- ESP32 SoC: Dual-core microcontroller with integrated Wi-Fi and Bluetooth.
- Motor Driver Integration: Enables bidirectional control of DC or stepper motor.
- Sensor Support: Ready for temperature/humidity or gas sensors.
- Web-Based Interface: No external app needed—control directly from a browser.
- Compact PCB Design: Optimized layout for space efficiency.
- Mounting Holes & Protection: Includes fuse and mechanical fixing points.

### Tools:

- KiCad 7: For schematic capture and PCB layout.
- ESP32 (DevKit): Core microcontroller.
- HTML/CSS + Arduino: For the onboard web interface.
- JLCPCB: (if fabricated) For PCB manufacturing.

**How It Works:**

- The user connects to the ESP32 via Wi-Fi.
- From the browser interface, they can command the motor to open or close the ventilation.
- Optional sensors feed real-time data to the interface.
- The onboard motor driver executes the control signals.
- Safety is ensured through a fuse and diode protection.

**Applications:**

- Smart Home ventilation control
- Industrial airflow systems
- Greenhouses and climate control units
- Educational IoT/Mechatronics demonstration