FOUR RELAY MODULE

Project Overview

This project involves designing and developing an ESP-controlled four relay module PCB. The module enables control of four different loads through the ESP12F microcontroller, which is a widely used module for IoT applications due to its Wi-Fi capabilities. The design includes essential components like the relays, transistors, resistors, and power regulation components to ensure smooth operation and reliable performance.

Objectives

- To design a PCB that can control four different relays using an ESP12F microcontroller.
- To ensure proper power regulation and safe switching of loads.
- To create a user-friendly interface for controlling the relays via Wi-Fi.

Components

- **Capacitors**:
  - 220uF
  - 10uF
- **Diode**:
  - M7
- **Headers**:
  - J-Header-Male-2.54_1x2
- **Transistor**:
  - BC847BLT1G
- **Resistors**:
  - 10kΩ
  - 1kΩ
- **Relay**:
  - RE-H042TD-1190(LF)(SN)
- **Power Module**:
  - HILINK 5V
  - AMS1117-3.3V
- **Relay Module**:
  - RELAY-SPST
- **Microcontroller**:
  - ESP12F

Schematic Design

The schematic design involves creating circuits for the following sections:

1. **Power Regulation**:

- o Converts AC to DC using a HILINK 5V module.
- o Uses AMS1117-3.3V for regulating the 3.3V required for the ESP12F.
2. **Relay Control Circuit**:
   - o Each relay is controlled by a BC847BLT1G transistor, which acts as a switch.
   - o The base of each transistor is connected through a 10kΩ resistor to the ESP12F.
   - o The relay coils are protected by M7 diodes to prevent back EMF.
3. **Microcontroller Section**:
   - o The ESP12F is connected to control the relays and interface with external devices via Wi-Fi.
   - o Includes header pins for easy programming and interfacing.

PCB Layout

The PCB layout was designed using EasyEDA, ensuring proper spacing and routing for each component to prevent interference and ensure reliable connections. The layout includes:
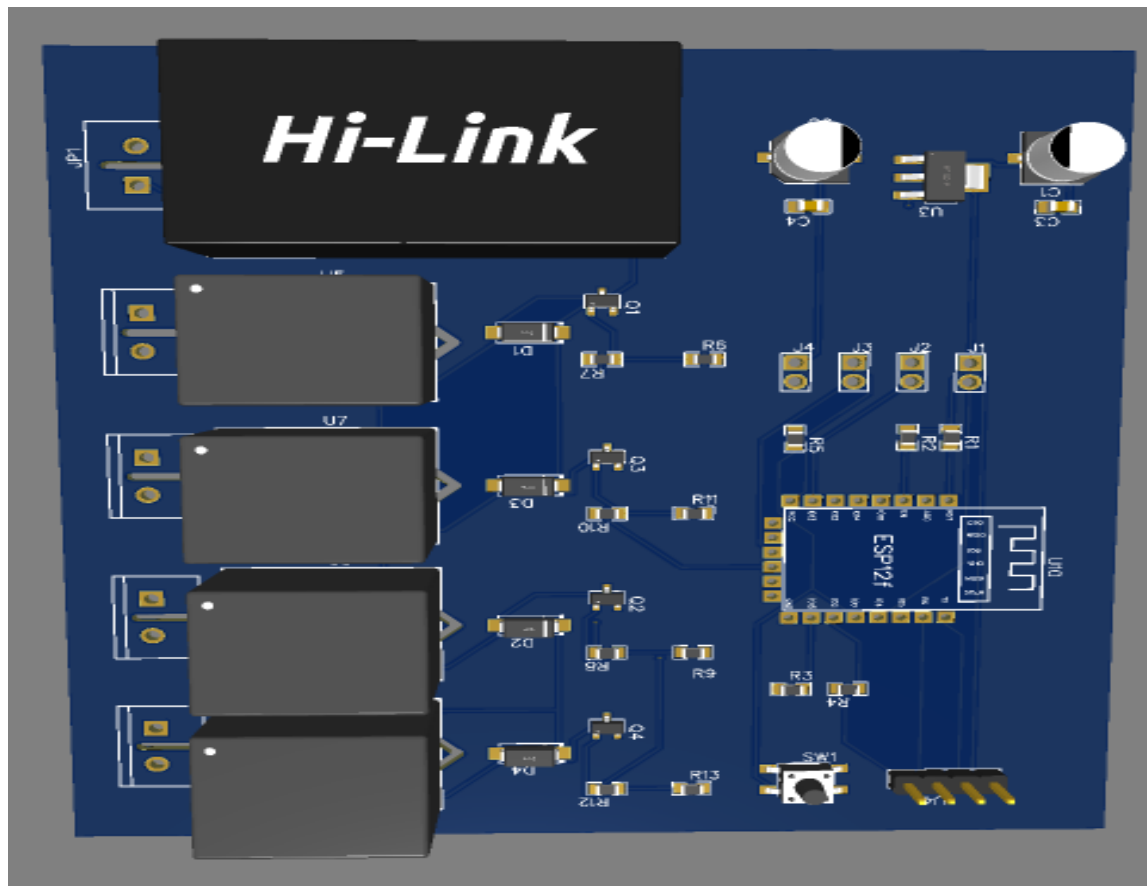
- **Four Relay Module**: Positioned to allow easy connection to loads.
- **Power Regulation Circuit**: Located near the power input for efficient distribution.
- **ESP12F Module**: Centrally located for optimal signal routing to all relays.

-SCHEMATIC:-
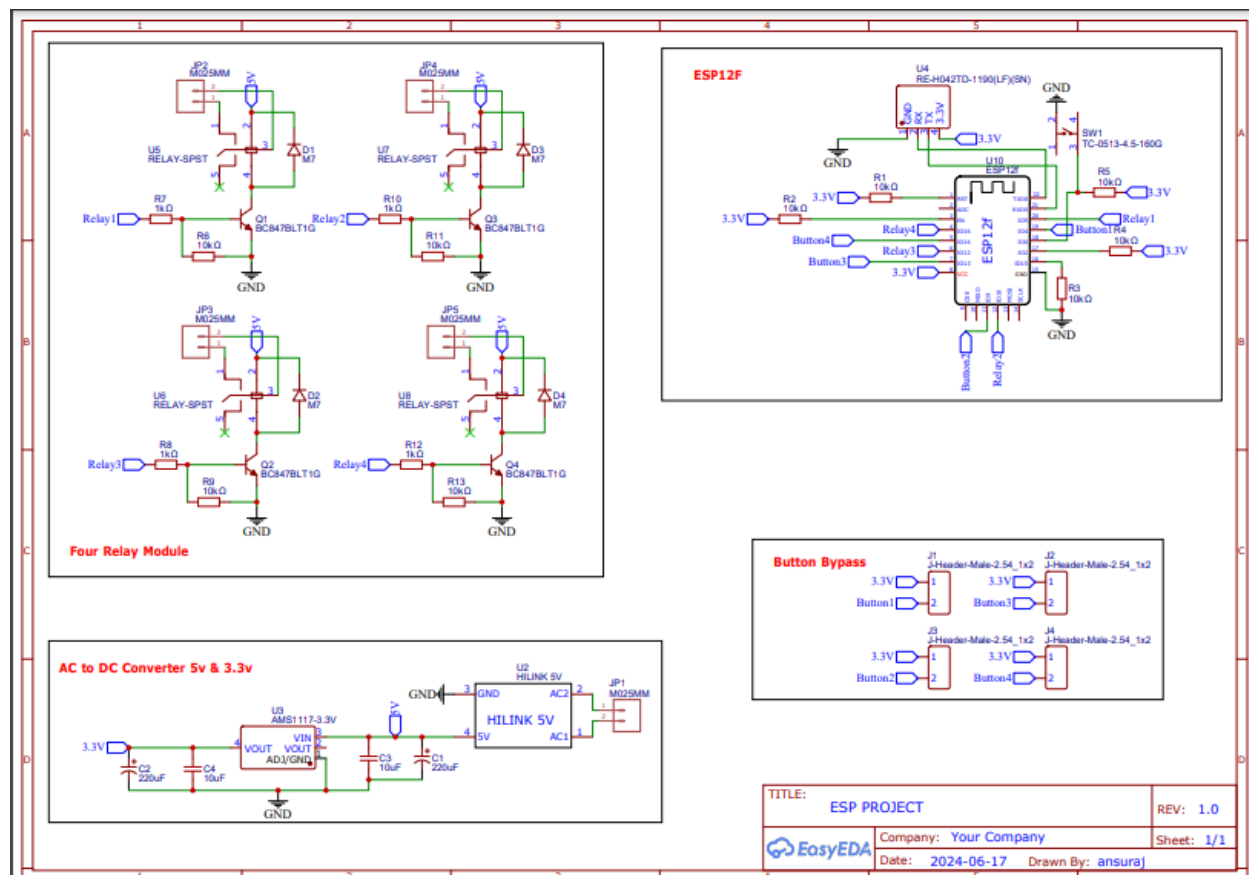
PCB:-
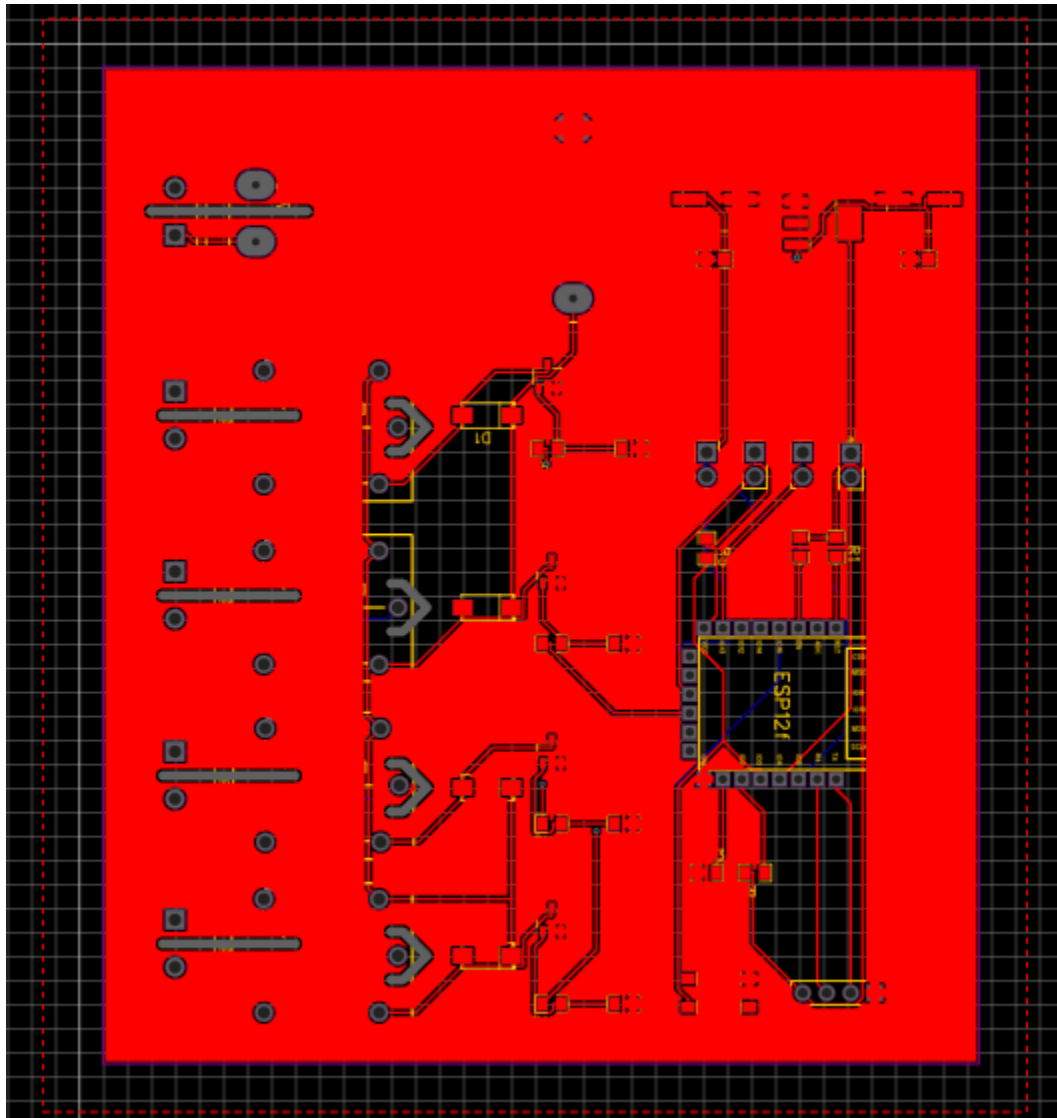
Software Implementation

The software involves programming the ESP12F microcontroller to control the relays based on Wi-Fi commands received from a user interface. The main functionalities include:

- Connecting to a Wi-Fi network.
- Receiving relay control commands via a web interface or mobile app.
- Switching the relays on or off based on received commands.
- Ensuring safe operation by handling errors and edge cases.

Conclusion

This project successfully demonstrates the design and implementation of an ESP-controlled four relay module PCB. The module provides a versatile solution for controlling multiple loads through a Wi-Fi-enabled microcontroller, making it suitable for various IoT applications. The careful selection of components and thoughtful PCB design ensures reliable performance and ease of use.