

Visvesvaraya Technological University, Belagavi



A project report on

“HOME AUTOMATION USING ESP8266 Wi-Fi MODULE”

Submitted in partial fulfillment of the requirement for the award of the degree
Bachelor of Engineering
in
Electronics and Communication Engineering

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ACKNOWLEDGEMENT

Before we get into the thick of things, we would like to add a few words of appreciation for the people who have been part of this project right from its inception.

It gives us an immense pleasure in presenting this project report on “HOME AUTOMATION”.

We express our sincere gratitude to our reverend principal **Dr.B G Naresh Kumar, Maharaja Institute of Technology** for providing facilities.

We take this momentous opportunity to express our heartfelt gratitude ,respect and regards to our highly esteemed project guide **Dr. Mahesh Rao, Head of the Department, Electronics and Communication Engineering** for providing us an opportunity to present this project.

We are thankful for his invaluable suggestions, support, encouragement and constructive criticism without which this project would not have seen the light of the day.

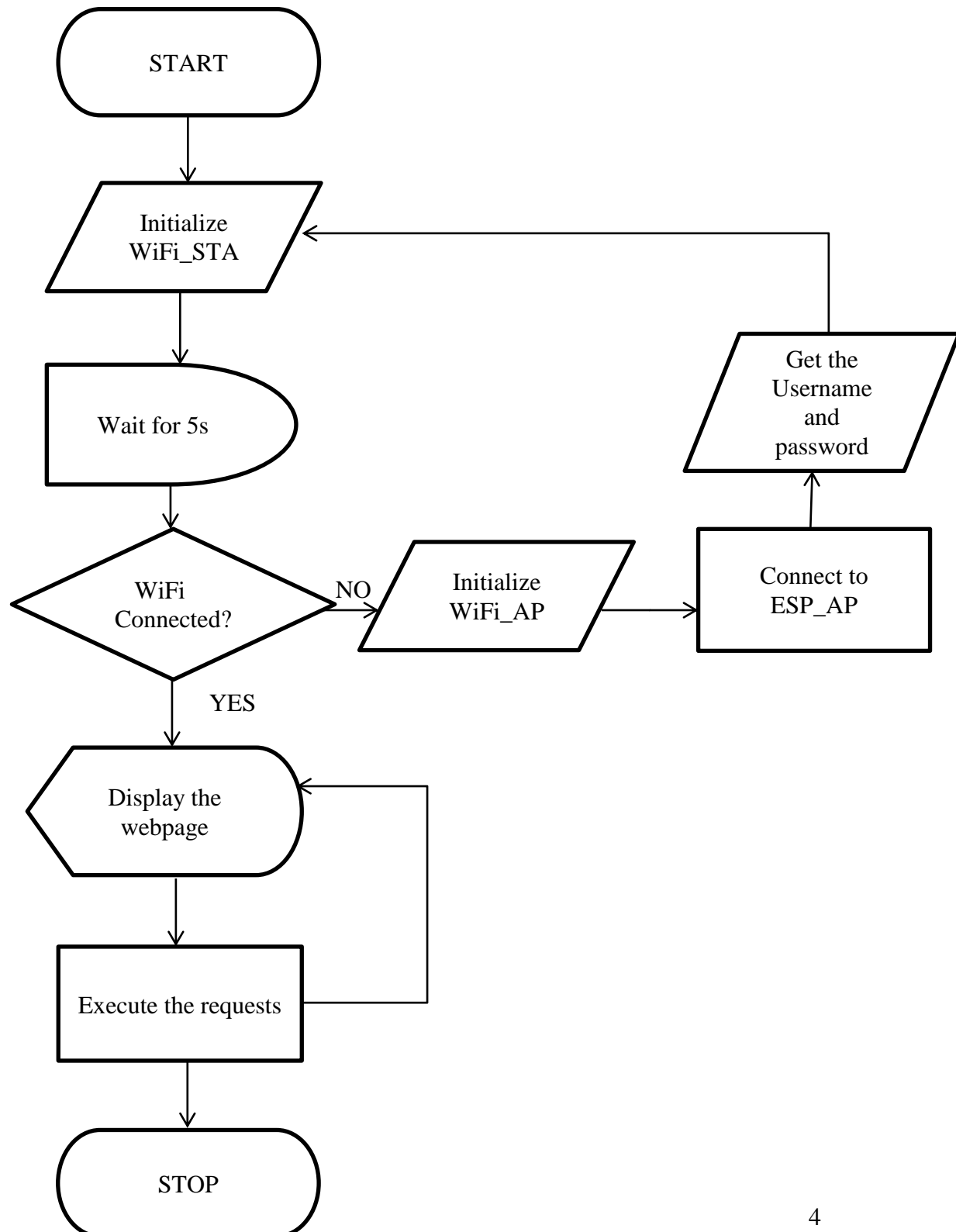
We attribute hearties thanks to all the *faculty members* & gratitude to our *parents* for their constant support and encouragement. And last but not the least, *friends* and *well-wishers* for their help and cooperation and solutions to problems during the course of the project.

ABSTRACT

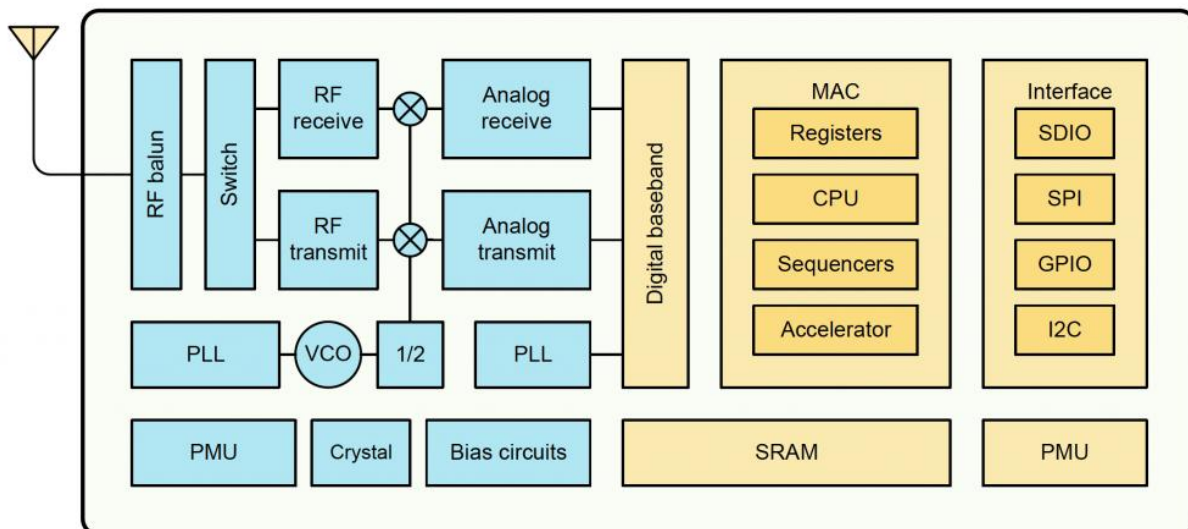
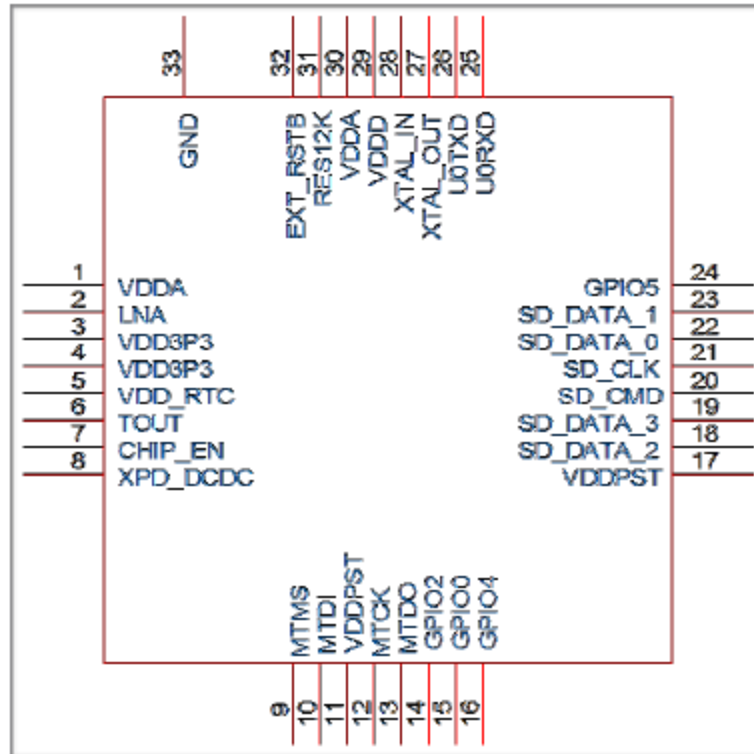
*The Engineering project is based around the development of controlling the home appliances remotely using Wi-Fi. This project deals with the development of controlling the home appliances using **ESP8266**, a Wi-Fi chip and a microcontroller and allows to connect to Wi-Fi network and make simple TCP/IP connections. It is a system on chip(SOC) developed by **Espressif**, a Shanghai based company that can host a server, which is accessible from anywhere in the world.*

The project uses the latest version of the controller i.e the ESP8266-12E.

FLOW DIAGRAM



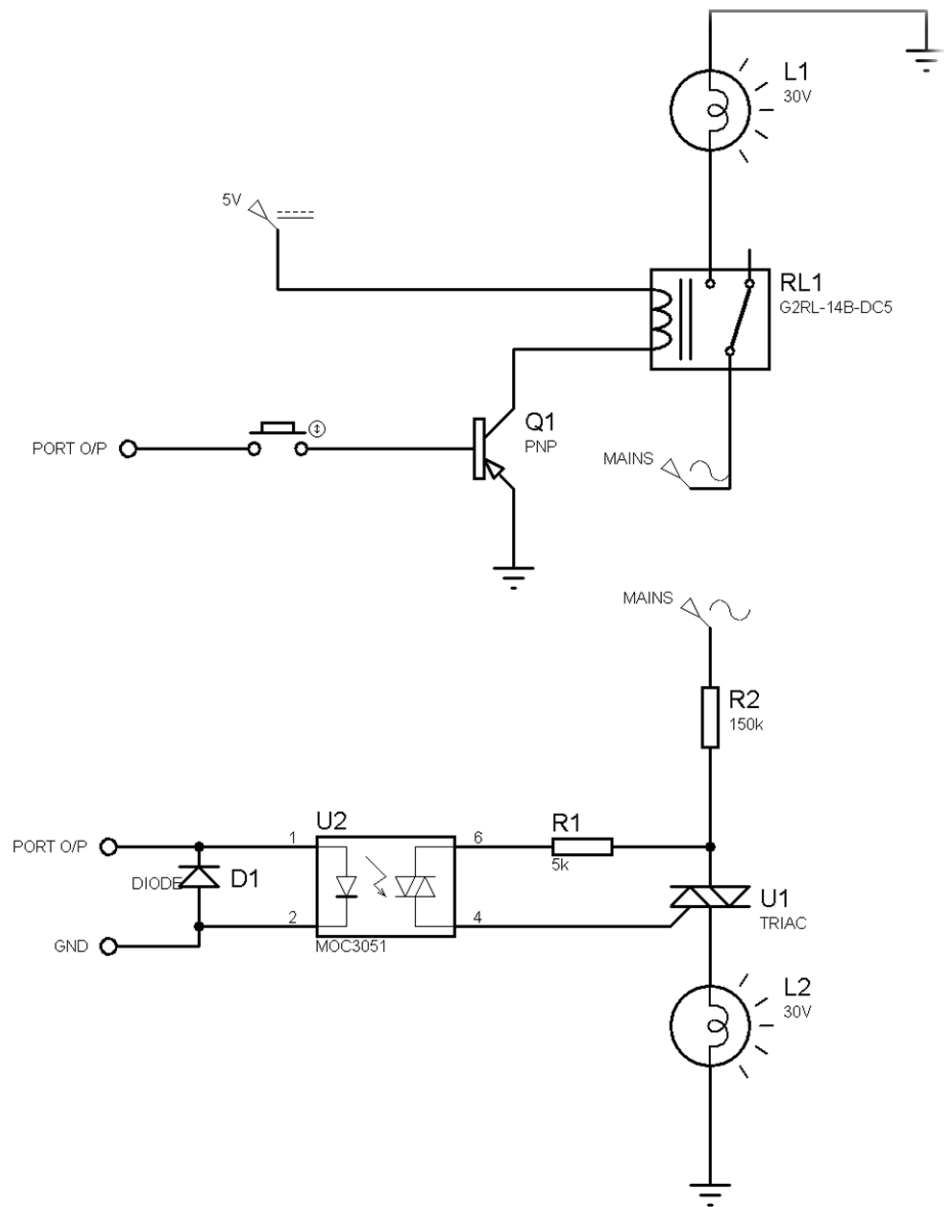
Pinout & Architecture of ESP8266



Features of ESP8266

- 802.11 b/g/n
- Integrated low power 32-bit MCU
- Integrated 10-bit ADC
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLL, regulators, and power management units
- Supports antenna diversity
- WiFi 2.4 GHz, support WPA/WPA2
- Support STA/AP/STA+AP operation modes
- Support Smart Link Function for both Android and iOS devices
- SDIO 2.0, (H) SPI, UART, I2C, I2S, IR Remote Control, PWM, GPIO
- STBC, 1x1 MIMO, 2x1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4s guard interval
- Deep sleep power <10uA, Power down leakage current < 5uA
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)
- +20 dBm output power in 802.11b mode
- Operating temperature range -40C ~ 125C
- FCC, CE, TELEC, WiFi Alliance, and SRRC certified

Circuit and Schematic



Working of the Project

When the module is switched on, the module will be initialized in *STATION MODE* . Then the module tries connecting to the home network whose **SSID** and **PASSWORD** was previously inputted and configured. A delay of several seconds is given for the Wi-Fi connection to get complete. If the module fails in connecting to the network even then, the module boots in configuration mode, that is the module is now in AP(Access point) mode which will pop a webpage which consists text fields for inputting your Home Wi-Fi configuration details.

After the form submission the module again switches back to the *STATION MODE* by creating an instance of server and displays the webpage from the web server which it is hosting. When the server begins the home router returns a IP address of the module which is of the dynamic type. Each time the module is made to hard reset the IP address of the module changes.

Using the Wi-Fi controller just to connect to a network will be of no use, Therefore it should perform some tasks and it is done by toggling the GPIO pins available on it. Each pin can be configured in two ways , they are either as input pin or output pin, the output pins can be further configured in two ways; either as

- (i) digital pin (0v or 5v)
- (ii) analog pin (0-255 levels).

This configuration is helpful for ex: glowing a bulb at different intensities by reading the light intensity value in the room, as said earlier the basic idea of this project is Automation and the Home appliances includes TV, Air conditioning ,IP cams, Music systems, Lights ,fans etc.

When it comes to home appliances , maximum devices drives power from 220V Mains. But as the module can only output 3.3V on any of its GPIO pins. This cannot drive the high power devices , therefore you need to control high power devices using the low power module, this can be done by using an isolation circuit which isolates the high voltage loop with the low power loop.

Here we have used two types of isolation circuit, one consists of an 5V relay and the other is by using an bi directional thyristor, a triac which is driven by a Triac pre-driver(MOC30XX) , it is an opto-isolator .When the diac in the pre-driver gets is activated by glowing of the IR LED in the IC , the circuit closes and current flows through the path and there is a voltage drop at the gate terminal of the triac, this enables the triac and the diffusion of the electrons across the path (1 and 2 terminals) takes place and the current flows through the load.

The other method of isolation is by using a relay as shown in the circuit fig.1.1, a PNP transistor is connected with a relay for triggering a 5V relay by 3.3V, this is done by connecting 5V to one terminal of the coil and the other terminal is connected to the collector terminal of the PNP transistor(CK100).The moving coil terminal is fed by the mains, the load is connected across the normally closed terminals. The port output is fed to the base terminal of the transistor, when the port output is low the transistor activates and a short circuit is resulted across

the collector and emitter terminals thus forming a closed loop, this will switch the relay from the normally closed(NC) path to normally open(NO) path.

References

<https://github.com/esp8266>

<https://espressif.com/>