

IOT Based Electrical Equipments Control for Automation

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Abstract

Automation of a device has a comprehensive scope for this Group as well as in forthcoming generation. In this wide scope, Mobile communication skill is playing a main role in the world of modernization. This Paper is completely centred on low cost and reliable home controller monitoring system for opening and controlling devices and appliances distantly using Android created Smart phone application. While using this technology the system expands the living standard at home, decreases human effort, energy effective and time convertible and thus create a smart home. And also it was precise helpful for providing provision to spiked people and fulfil their desires in home and thus they leads a normal life. The planned systems consist of android mobile, Arduino Uno board, Wi-Fi module and a relay circuit. We are using Wi-Fi technology to monitor the device because of its correctness, great range and prompt connectivity. This module controls the home appliances with a actual ease of fixing and it is user pleasant.

Keywords: Automation, Android, Wi-Fi module.

I. INTRODUCTION:

Home computerization is develop more constructive because of its safety and security. Nowadays, home automation became more develop and exact to display all the home appliances. Home automation system convert energy effective and extremely welcoming smart home technique. It includes basic features to uphold the user pleasure and comfort. [3] This planned system is a exact blend of Android smart phone and implanted system which include Arduino Uno Board, Wi-Fi module and Relay circuit.[4]

In this paper, we used a Wi-Fi wireless technology to display the device. An android request is fit in a mobile device i.e. android smart phone and it has inherent switch edge of all the appliances distinctly in it. Through which all the individual devices can be regulate and monitor separately. The Wi-Fi module obtains the grasp from mobile phone and permits to relay circuit. As per the assumed signal from the user, the relay circuit swapped ON/OFF the respective devices. The main drive of by Wi-Fi wireless technology is to deliver a better level to variety and better feasibility.[2] This paper will deliver the future access to switch the various home appliances with the help of android smart phone.

A.HOME AUTOMATION:

Home Automation is a exclusive system that can regulate and start communication between nearly all aspects of your house. [1] Home Computerization is a term used to label the occupied together of all household facilities and pleasure. For case, a centrally microcontroller panel can have the ability to switch all from heating, air taming, safety system, lighting and overall electrical appliances. [3] Home mechanization can contain regulatory aspects of our home distantly over a computer or any mobile equipment, software design electronics devices to react automatically to some circumstances or scenarios or integrating the control of a variety of appliances in our home into a single regulator center. For case, Switch of lights in and everywhere our house from one central location so there is no necessity to become out of to that place or go to below if we forgot to turn OFF or ON any appliances, just we can regulate remotely. [5] It is important that the dissimilar manageable appliances be organized and communicates with each other. The main resolve of Home automation is to switch or monitor signals from different appliances, or basic services. A smart phone or web browser can be used to switch or monitor the home automation system.[1]

II. LITERATURE SURVEY:

A.IMPLEMENTATION OF INTERNET OF THINGS FOR HOME AUTOMATION:

Mamata Khatu, Neethu Kaimal, Pratik Jadhav and Syedali Adnan Rizvi [1] they offered a paper on the application of Internet of things for home automation. This paper primarily absorbed on IoT attention that attaches all the change of objects like smart phone, tablets, digital cameras and sensors in the internet and thus delivers many facilities and vast amount of data and material. They also absorbed on Cloud computing, Cloud based stage help to attach the things that environs as so that we can simply access everything at any time and in any residence. They have showed detecting as a facility on cloud by using firm application like Enlarged Reality, Agriculture Environment monitoring etc. and finally they have planned a prototype model for providing sensing as a service on cloud. The society want new and scalable, well-matched and secure solutions for both the administration of the ever broader complexly networked Internet of Things. Safety distress is dazed by this model since we are using Wi-Fi Wireless Equal Privacy (WEP) and Wi-Fi Protected Access (WPA) are two most security accesses used in Wi-Fi.

B. BLUETOOTH BASED WIRELESS HOME AUTOMATION

SYSTEM USING FPGA:

B.Murali Krishna, V.Narasimha Nayak, K.Ravi Kishore Reddy, B.Rakesh, P.Manoj Kumar and N.Sandhya [2] they obtainable a paper on the Bluetooth based Wireless Home automation system using FPGA.They primarily absorbed on Bluetooth skill. With the help of the Bluetooth module (HC-05) and Android Phone, they switch the home appliances, which all linked to FPGA board. Thus, they have stated the advantages of the home automation, which not only decreases the human efforts, but it is also energy well-organized and time redeemable. Moreover, they have included that it is also help to the handicapped and old aged people to switch the home appliance without any difficulties. We want module so that the range will be great as well as it can operate in different frequencies. This drawback is overcome by our model. Wi-Fi based networks work at 2.4, 3.6 and 5 GHz. In addition, it can range up to range 100m.

C. HAND GESTURE BASED HOME AUTOMATION FOR VISUALLY CHALLENGED:

Smitha M, T.Ayesha Rumana and Sutha P [3] published a paper entitled Hand gesture based Home Automation for Visually Challenged People. They have intended a device for the visually dared people to assist them to working the home appliances. They have used MEMS (Microelectromechanical Systems) accelerometer which is hand-me-down to logic the accelerations of a hand in consistent three vertical direction that is (x y z) and thus convey the signal to wireless protocol using Radio frequency. The movement templates were kept in a microcontroller at the receiver end. The established sign and the hand sign were likened by the templates. If the corresponding sign were coordinated with the templates then accordingly home appliances were organized. In accumulation, these devices were help for the old aged person too. Since they have used four types of gesture and deposited in the microcontroller and it processed further. However, we need the system to be mechanized without the use of gesture.

We do not want the sign to be kept in the controller. Nowadays, the application can be rummage-sale by any means of people by the option "TALKBACK" in the android application.

D. HOME AUTOMATION USING ATmega328 MICROCONTROLLER AND ANDROID APPLICATION:

S.Anusha, M.Madhavi and R.Hemalatha [4] accessible a paper on Home automation using AT mega Microcontroller and Android application. In this paper they have label the plan and growth of a remote household appliance governor system using the ATmega328 microcontroller and android mobile over GSM

technology. In addition, this appliances remotely using the SMS-based system that filling user wants and necessities. Thus, all electrical household appliances can be precise by sending a text message from an Android mobile. For Controlling, the remote appliances carried out by sending a SMS message from a mobile phone, which again congestion process and make system, convoluted for the disabled persons. Here, we does not carry out this technique, we are using simple open source android application over Wi-Fi we can directly switch the whole appliance with a greater extent. Thus, intend to be a reliable technique.

E. E-MAIL INTERACTIVE HOME AUTOMATION SYSTEM:

Sirisilla Manohar and D.Mahesh Kumar [5] presented a paper on E-mail interactive Home automation system. They have instruct on a basic home computerization application on the public field over the issue of E-mail ID.The swapping action were complete by LED hint. They deliver a basic request of home automation using GVT app, which can be easily applied and recycled as efficiently. The coding which they deliver is basic and supple in user-friendly manner and can be skillful in any application like power control, surveillance etc easily. In addition, all the results were made by a series of E-mail shown to the user of G-mail account. For each and every interjects one email will made and will send to the user of the Gmail account, which over a We can easily switch the appliances in its place of successful through such process.

III. PROPOSED SCHEME:

Home Computerization typically is included of three main parts:

- 1. Main Controller
- 2. Interfaces
- 3. Control methods

A. MAIN AUTOMATION SUPERVISOR:

1) ARDUINO UNO BOARD

The 8-bit AT mega 328P microcontroller founded on Arduino UNO is rummage-sale in this suggestion is to switch the different mechanisms like Wi-Fi module and relay circuit networks. The advantage to having a distinct controller is to focus only on the wanted task.

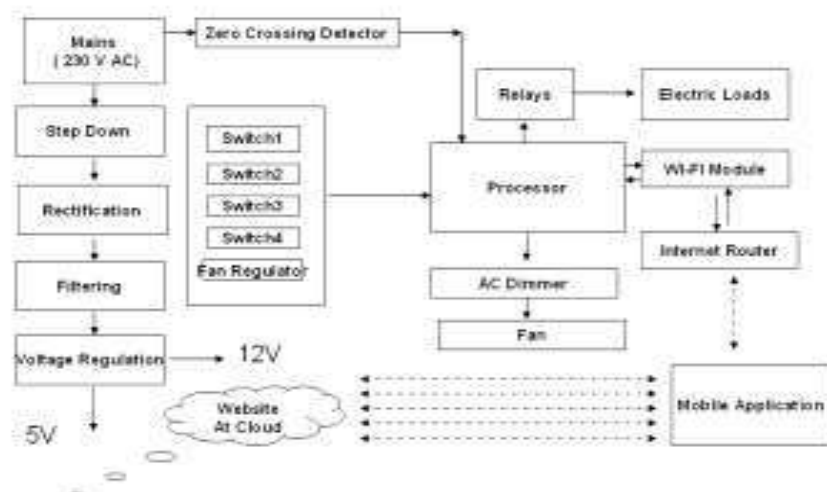
2) INTERFACES:

An Boundary is the method we interrelate with the Home automation supervisor. There are several types of borders like Touch Panels, Keypads, Remotes, Mobile Devices and Internet. In this suggestion, we cast-off a Mobile device (Android smart phone).Nowadays it is a exact common device for every user. We essential to install an appliance controller application in it. In addition, inside the mobile border it can be capable to switch all the appreciated appliances of the home. Wouldn't it be nice to be upstairs, pull out your mobile phone, and turn off all the lights in your house with the press of a button right beforehand you go to bed?

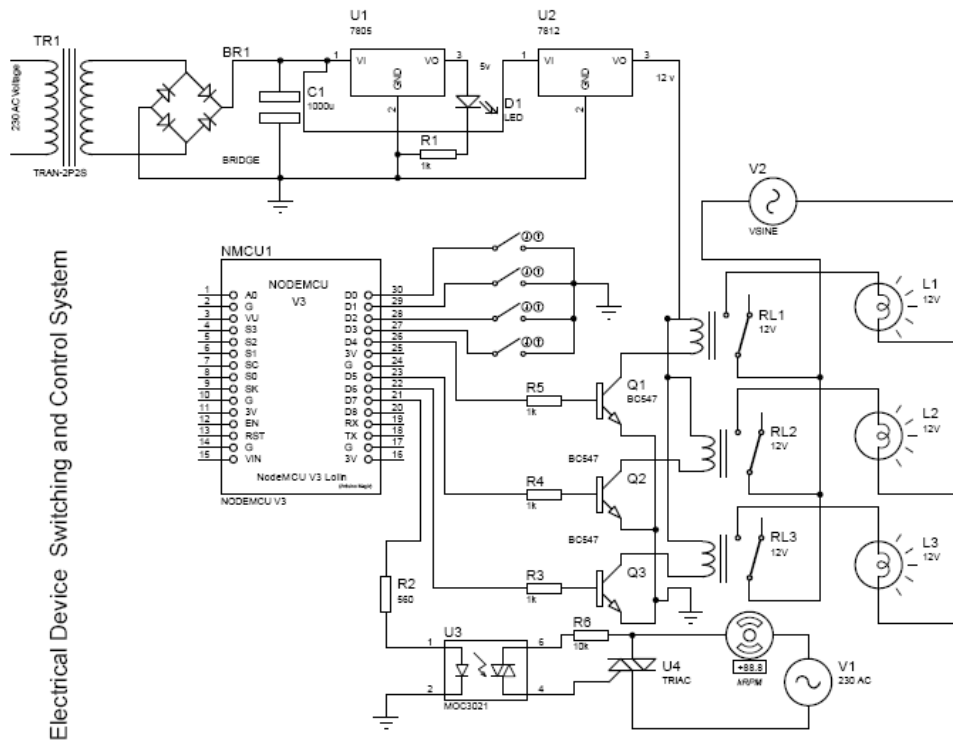
3) CONTROL METHODS:

We now have a supervisor, lines to interact with the controller, and sensors that tell the controller what things are occurring in the house. Supervisors can connect and switch the many dissimilar parts of a Home Automation System in a variety of ways. Some of these are IP (Internet Protocol sp), Wi-Fi, Bluetooth, Zig-bee, IR, Serial Data, and Relays (for

Block Diagram



CIRCUIT DIAGRAM

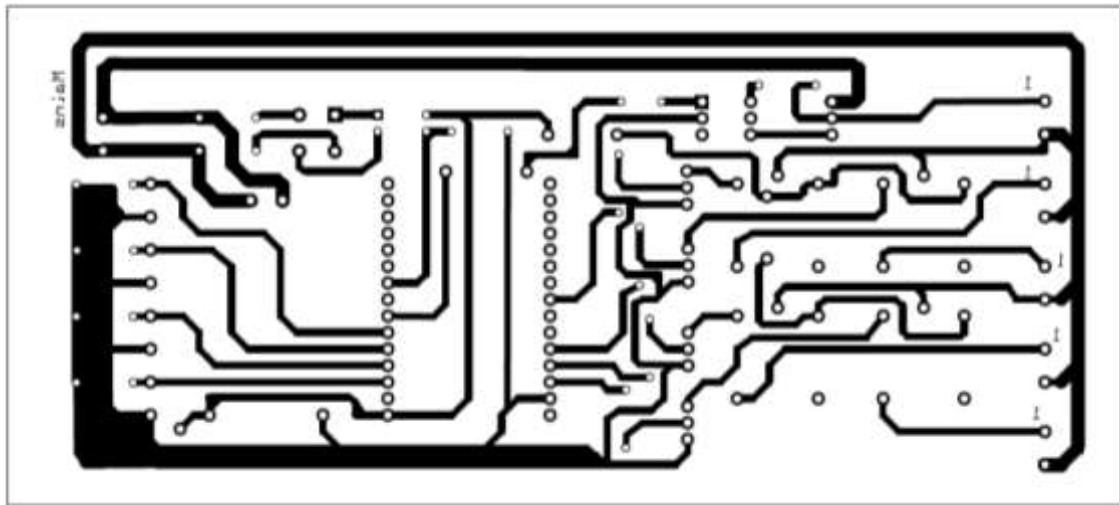


Electrical Device Switching and Control System

WORKING

ESP 8266 board is connected with four input switches at D0, D1, D2 and D3 pins. These pins are bidirectional pin. Through program code we can defined these pins as input or output pins. In this circuit diagram D0, D1, D2 and D3 are defined as input pins. The board read the values from these pins like values digital zero or digital one. The microcontroller then accordingly process these values and accordingly switches the electrical loads. Electrical loads are connected to board at pin D4, D5, D6 and D7. These pins are defined as output pins. These pins are connected to the relays through transistors. The 12 volt relays are used to switch the loads. BT 136 TRIAC is connected at pin D7. TRIAC is connected with the electrical fan. The Fan Speed is control through Pulse Width Modulation technique. The ESP8266 board is connected to the Mobile through WIFI. The ESP 8266 board software is developed through ARDUINO IDE, and the mobile software is developed in Android Studio IDE (Integrated Development Environment). The mobile application has three button controls for switching the devices and one track bar control for controlling the fan speed. The manual switching of the electrical loads also refresh the status of the switching into the mobile application also as well as to the internet server also.

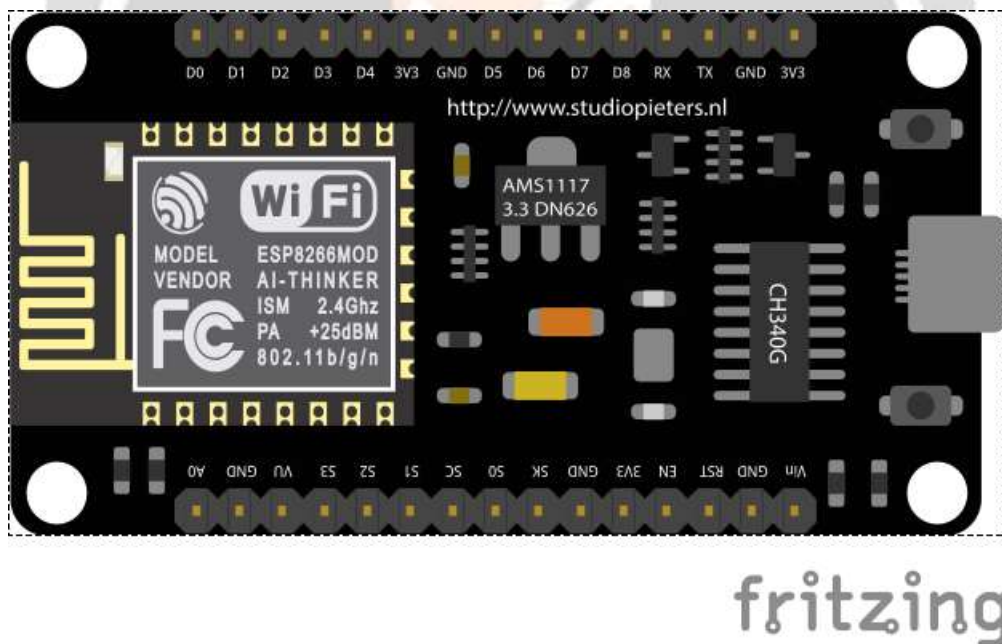
Layout Design of the System



This layout is developed using EXPRESS PCB software.

Important component's

NodeMCU V3



The best way to develop quickly an IoT application with less Integrated circuits to add is to choose this circuit “NodeMCU”. Today, we will give a detailed Introduction on NodeMCU V3. It is an open-source firmware and development kit that plays a vital role in designing a proper IoT product using a few script lines. The module is mainly based on ESP8266 that is a low-cost Wi-Fi microchip incorporating both a full TCP/IP stack and microcontroller capability. It is introduced by manufacturer Espressif Systems. The ESP8266 NodeMcu is a complex device, which combines some features of the ordinary Arduino board with the possibility of connecting to the internet. Arduino Modules and Microcontrollers have always been a great choice to incorporate automation into the relevant project. But these modules come with a little drawback as they don't feature a built-in WiFi capability, subsequently, we need to add external WiFi protocol into these devices to make them compatible with the internet channel. This is the famous NodeMCU which is based on ESP8266 WiFi SoC. This is version 3 and it is based on ESP-12E (An ESP8266 based WiFi module). NodeMCU is also an open-source firmware and development kit that helps you

to prototype your IOT product within a few LUA script lines, and of course you can always program it with Arduino IDE.

In this article, We will try present useful details related to this WiFi Development Kit, its main features, pinout and everything we need to know about this module and the application domain.

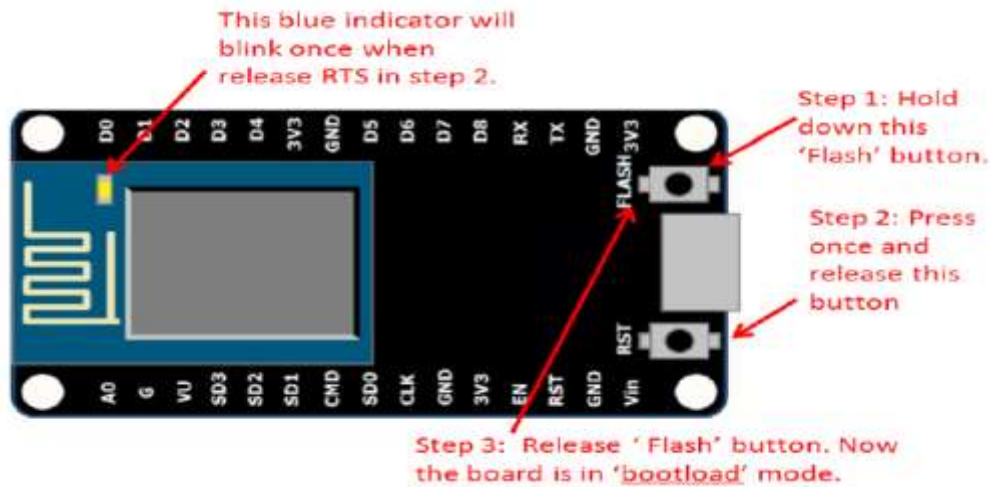
Introduction NodeMCU V3

NodeMCU V3 is an open-source firmware and development kit that plays a vital role in designing an IoT product using a few script lines.

Multiple GPIO pins on the board allow us to connect the board with other peripherals and are capable of generating PWM, I2C, SPI, and UART serial communications.

□ The interface of the module is mainly divided into two parts including both Firmware and Hardware where former runs on the ESP8266 Wi-Fi SoC and later is based on the ESP-12 module.

The firmware is based on Lua – A scripting language that is easy to learn, giving a simple programming environment layered with a fast scripting language that connects you with a well-known developer community.



And open source firmware gives you the flexibility to edit, modify and rebuild the existing module and keep changing the entire interface until you succeed in optimizing the module as per your requirements.

□ USB to UART converter is added on the module that helps in converting USB data to UART data which mainly understands the language of serial communication.

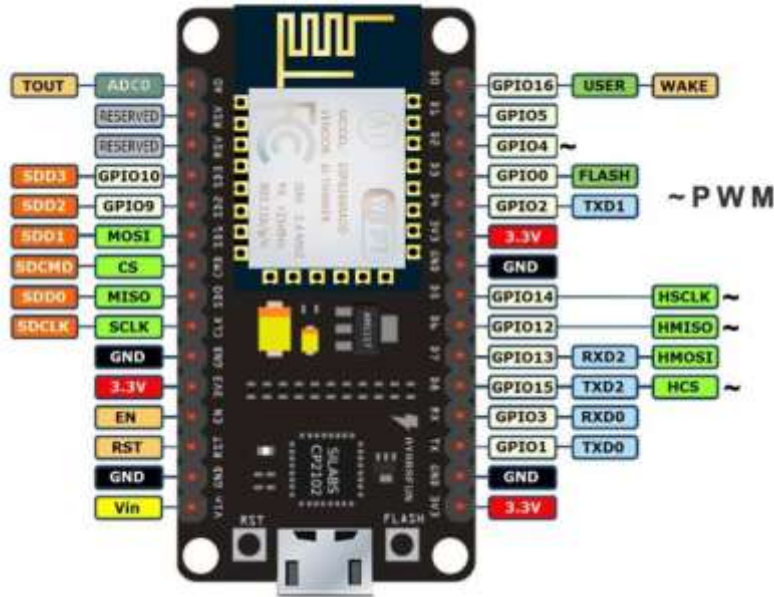
Instead of the regular USB port, MicroUSB port is included in the module that connects it with the computer for dual purposes: programming and powering up the board.

□ The board incorporates status LED that blinks and turns off immediately, giving you the current status of the module if it is running properly when connected with the computer.

The ability of module to establish a flawless WiFi connection between two channels makes it an ideal choice for incorporating it with other embedded devices like Raspberry Pi.

NodeMCU V3 Pinout

NodeMCU V3 comes with a number of GPIO Pins. Following figure shows the Pinout of the board.



There is a candid difference between Vin and VU where former is the regulated voltage that may stand somewhere between 7 to 12 V while later is the power voltage for USB that must be kept around 5 V.

Pin Configuration

Pin Category	Pin Name	Details
Power	Micro-USB, 3.3V, 5V, GND	<p>Micro-USB: ESP32 can be powered through USB port</p> <p>5V: Regulated 5V can be supplied to this pin which is we be again regulated to 3.3V by on board regulator, to power the board.</p> <p>3.3V: Regulated 3.3V can be supplied to this pin to power the board.</p> <p>GND: Ground pins.</p>
Enable	En	The pin and the button resets the microcontroller.
Analog Pins	ADC1_0 to ADC1_5 and ADC2_0 to ADC2_9	Used to measure analog voltage in the range of 0-3.3V. 12-bit 18 Channel ADC
DAC pins	DAC1 and DAC2	Used for Digital to analog Conversion
Input/Output Pins	GPIO0 to GPIO39	Totally 39 GPIO pins, can be used as input or output pins. 0V (low) and 3.3V (high). But pins 34 to 39 can be used as input only
Capacitive Touch pins	T0 to T9	These 10 pins can be used a touch pins normally used for capacitive pads
RTC pins	GPIO RTCIO0 to RTCIO17	These 18 GPIO pins can be used to wake up the ESP32 from deep sleep mode.

Serial	Rx, Tx	Used to receive and transmit TTL serial data.
External Interrupts	All GPIO	Any GPIO can be use to trigger an interrupt.
PWM	All GPIO	16 independent channel is available for PWM any GPIO can be made to work as PWM though software
VSPI	GPIO23 (MOSI), GPIO19(MISO), GPIO18(CLK) and GPIO5 (CS)	Used for SPI-1 communication.
HSPI	GPIO13 (MOSI), GPIO12(MISO), GPIO14(CLK) and GPIO15 (CS)	Used for SPI-2 communication.
IIC	GPIO21(SDA), GPIO22(SCL)	Used for I2C communication.
AREF	AREF	To provide reference voltage for input voltage.

ESP32 Technical Specifications

Microprocessor	Tensilica Xtensa LX6
Maximum Operating Frequency	240MHz
Operating Voltage	3.3V
Analog Input Pins	12-bit, 18 Channel
DAC Pins	8-bit, 2 Channel
Digital I/O Pins	39 (of which 34 is normal GPIO pin)
DC Current on I/O Pins	40 mA
DC Current on 3.3V Pin	50 mA
SRAM	520 KB
Communication	SPI(4), I2C(2), I2S(2), CAN, UART(3)
Wi-Fi	802.11 b/g/n
Bluetooth	V4.2 – Supports BLE and Classic Bluetooth

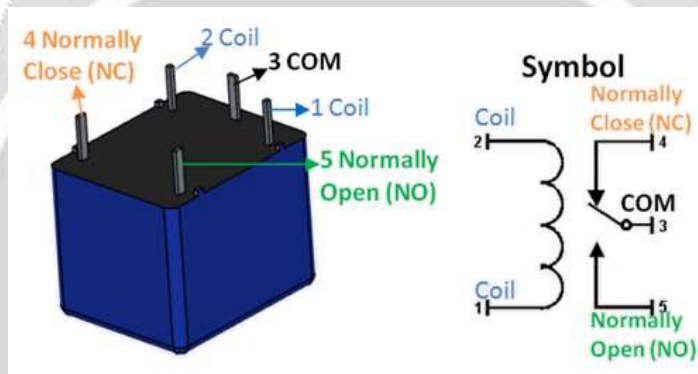
Features

1. Open-source
2. Arduino-like hardware
3. Status LED
4. MicroUSB port
5. Reset/Flash buttons
6. Interactive and Programmable
7. Low cost

8. ESP8266 with inbuilt wifi
9. USB to UART converter
10. GPIO pins
11. Arduino-like hardware IO
12. Advanced API for hardware IO, which can dramatically reduce the redundant work for configuring and manipulating hardware.
13. Code like arduino, but interactively in Lua script.
14. Nodejs style network API
15. Event-driven API for network applicaitons, which facilitates developers writing code running on a 5mm*5mm sized MCU in Nodejs style.
16. Greatly speed up your IOT application developing process.
17. Lowest cost WI-FI
18. Less than \$2 WI-FI MCU ESP8266 integrated and esay to prototyping development kit.
19. We provide the best platform for IOT application development at the lowest cost.

As mentioned above, a cable supporting micro USB port is used to connect the board. As you connect the board with a computer, LED will flash. You may need some drivers to be installed on your computer if it fails to detect the NodeMCU board. You can download the driver from this page.

Relay

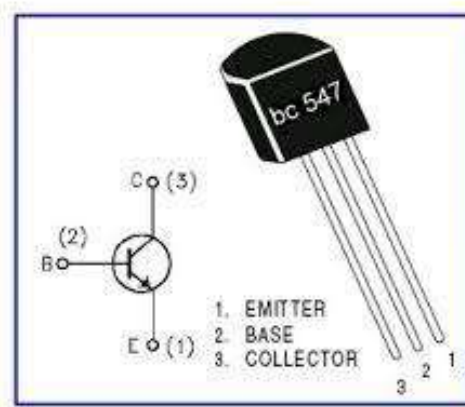


- 5 pin relays provide 2 pins (85 & 86) to control the coil and 3 pins (30, 87 & 87A) which switch power between two circuits. They have both normally open and normally closed connection pins. When the coil is activated, power will be switched from the normally closed pin to the normally open pin.
- Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.

Pin Configuration

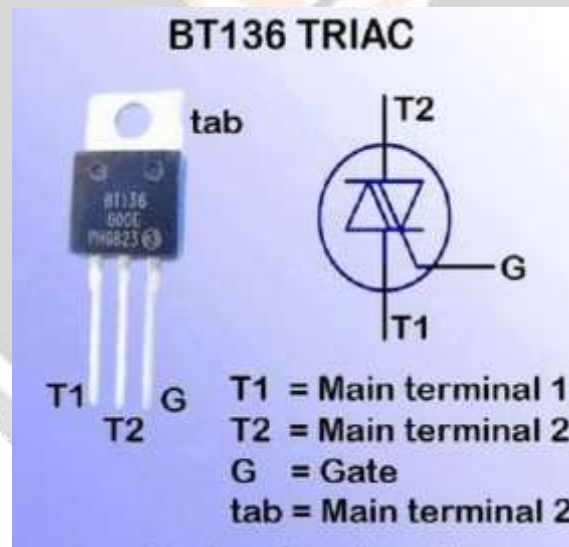
Pin Number	Pin Name	Description
1	Coil End 1	Used to trigger(On/Off) the Relay, Normally one end is connected to 12V and the other end to ground
2	Coil End 2	Used to trigger(On/Off) the Relay, Normally one end is connected to 12V and the other end to ground
3	Common (COM)	Common is connected to one End of the Load that is to be controlled
4	Normally Close (NC)	The other end of the load is either connected to NO or NC. If connected to NC the load remains connected before trigger
5	Normally Open (NO)	The other end of the load is either connected to NO or NC. If connected to NO the load remains disconnected before trigger

BC 547 Transistor



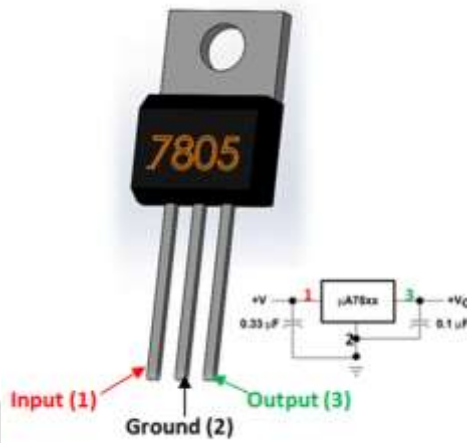
- BC547 is a NPN transistor hence the collector and emitter will be left open (Reverse biased) when the base pin is held at ground and will be closed (Forward biased) when a signal is provided to base pin. BC547 has a gain value of 110 to 800, this value determines the amplification capacity of the transistor.
- The BC547 transistor is an NPN transistor. A transistor is nothing but the transfer of resistance which is used for amplifying the current. A small current of the base terminal of this transistor will control the large current of emitter and base terminals. The main function of this transistor is to amplify as well as switching purposes. The maximum gain current of this transistor is 800A.

TRAIAC BT 136



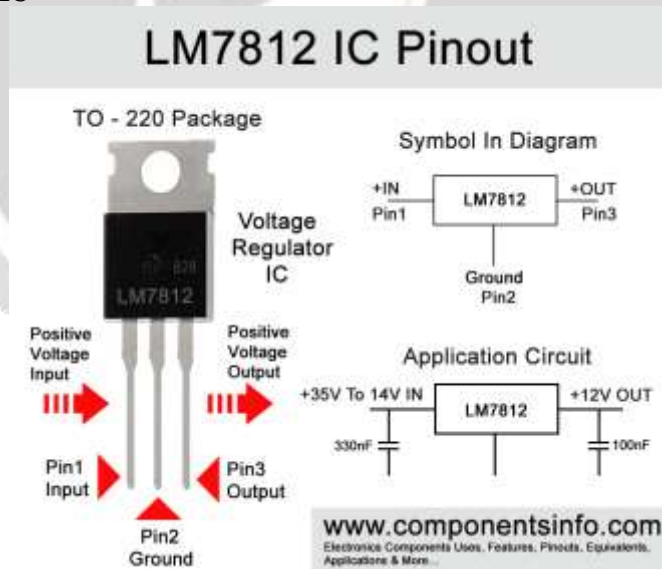
- There are many different ways to use a TRIAC, since the device is bi-directional the TRIAC gate can be trigger with either positive voltage or negative voltage. So this allows the TRIAC to be operated in four different modes. You can read this article if you want to know more about the switching modes.
- In this circuit the TRIAC can be turned using the switch, when the switch is pressed the TRIAC closes the connection for the AC bulb though the AC mains.

7805 Voltage Regulator IC



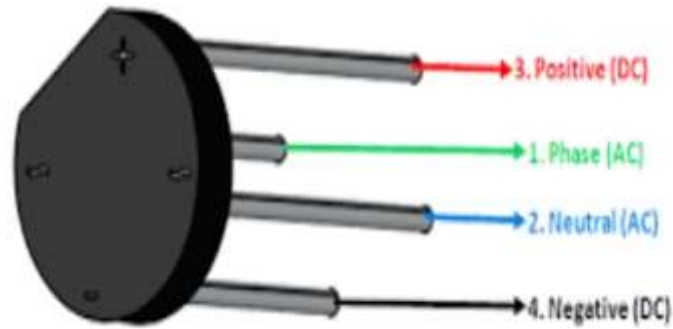
- Brief Description on 7805 Voltage Regulator IC
Voltage regulators are very common in electronic circuits. They provide a constant output voltage for a varied input voltage. In our case the 7805 IC is an iconic regulator IC that finds its application in most of the projects. The name 7805 signifies two meaning, “78” means that it is a positive voltage regulator and “05” means that it provides 5V as output. So our 7805 will provide a +5V output voltage.
- The output current of this IC can go up to 1.5A. But, the IC suffers from heavy heat loss hence a Heat sink is recommended for projects that consume more current. For example if the input voltage is 12V and you are consuming 1A, then $(12-5) * 1 = 7W$. This 7 Watts will be dissipated as heat.

7812 Voltage Regulator IC



- The 7812 ic have 3 pins.The positive input is at pin 1. The Pin 2 is common between both input as well as output voltage. Pin 3 is a positive output.When using the voltage regulator setup, you need to take care of the current through the voltage regulator ic do not exceed beyond the capacity which is mentioned in the datasheet or else it may blow off.
- You also have to be careful with the connection you are making with the voltage supply. Reverse polarity does get the ic heat up really quickly, you can also use a pn junction diode in order to prevent such a condition. Also read jk flip flop.You can use the capacitors in order to minimize the voltage fluctuations in the circuit and maintains the constant voltage across the input as well as output of the circuit.Also see difference between microprocessor and microcontroller.

Bridge Rectifier 1.5 Ampere

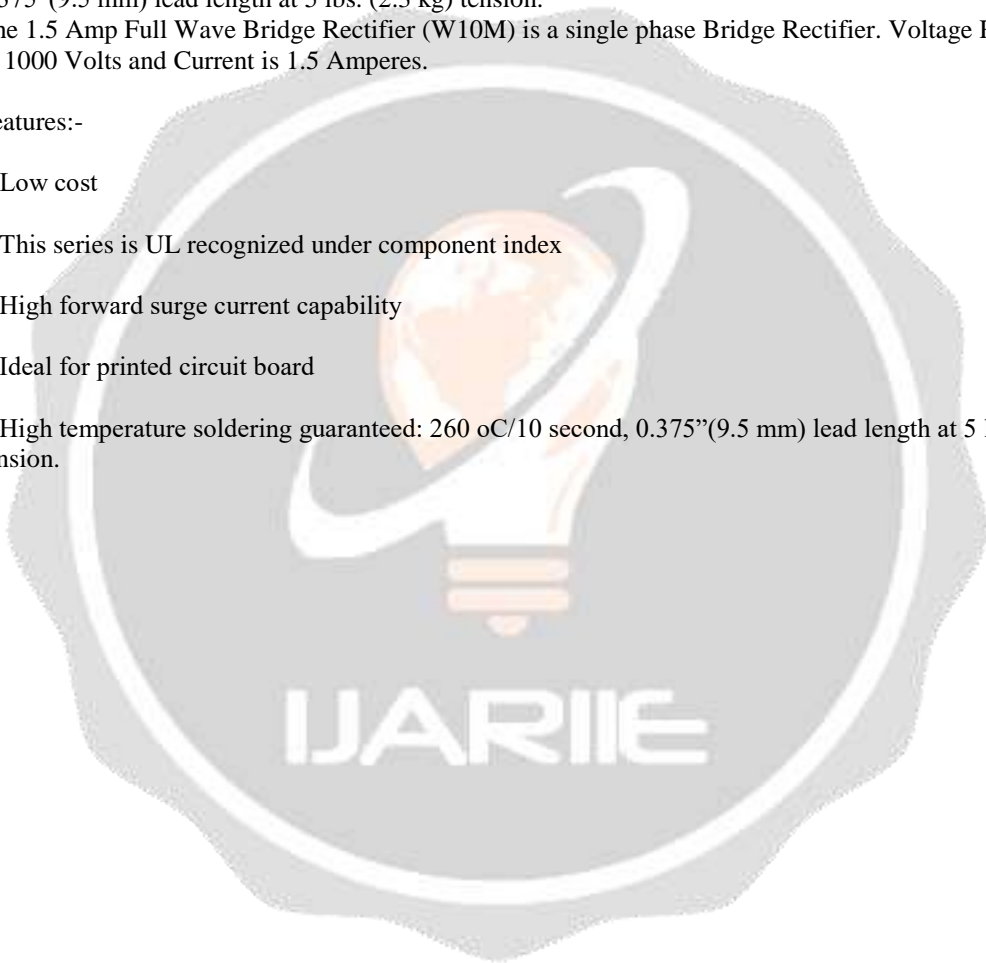


The 1.5 Amp Full Wave Bridge Rectifier (W10M) is a single phase Bridge Rectifier. Voltage Range is 50 to 1000 Volts and Current is 1.5 Amperes. High temperature soldering guaranteed: 260 oC/10 second, 0.375"(9.5 mm) lead length at 5 lbs. (2.3 kg) tension.

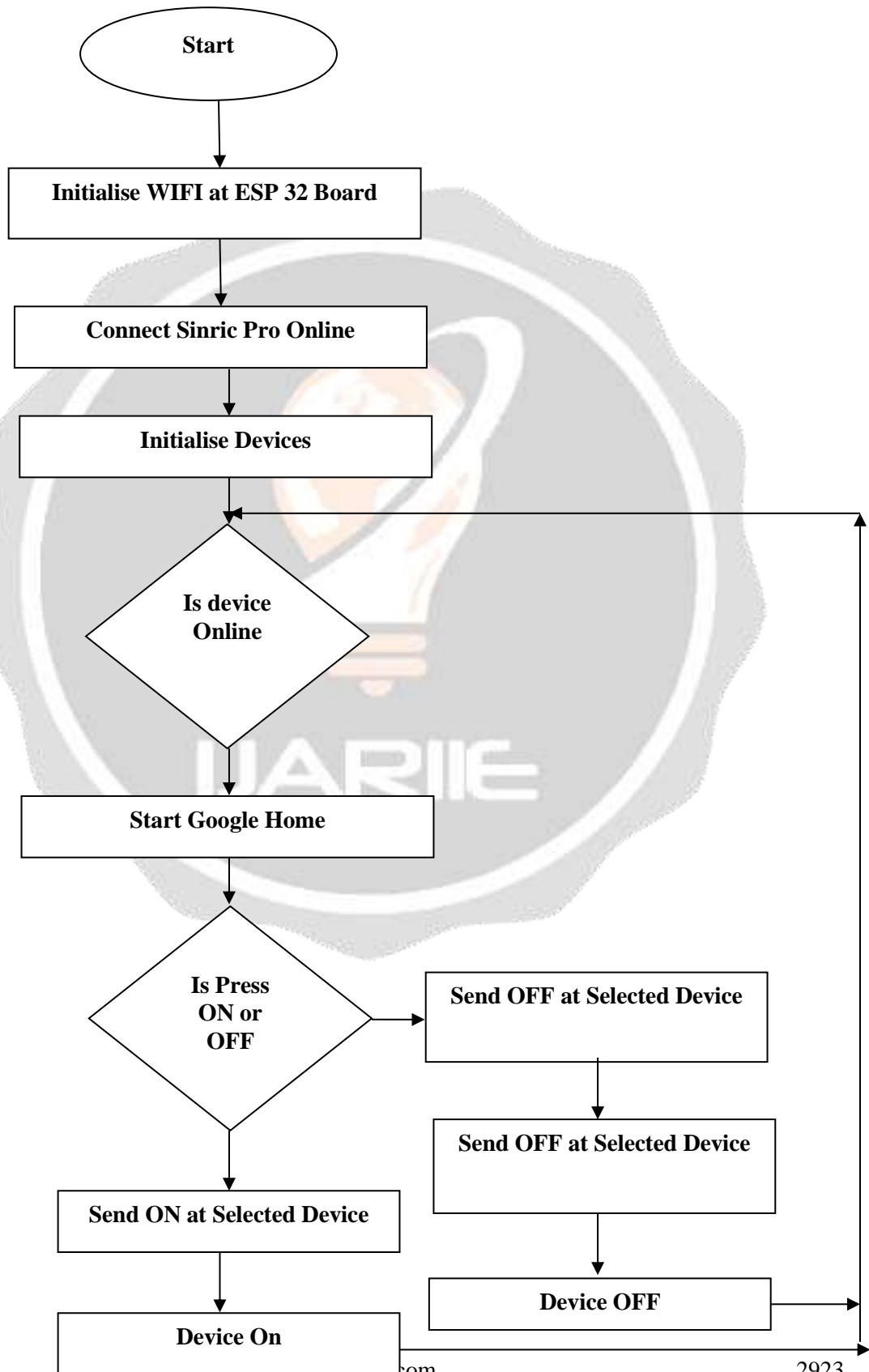
The 1.5 Amp Full Wave Bridge Rectifier (W10M) is a single phase Bridge Rectifier. Voltage Range is 50 to 1000 Volts and Current is 1.5 Amperes.

Features:-

- Low cost
- This series is UL recognized under component index
- High forward surge current capability
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260 oC/10 second, 0.375"(9.5 mm) lead length at 5 lbs. (2.3 kg) tension.



Program Flow Chart



IV. APPLICATION:

- I. Illumination control system
- II. Heating airing and air
- III. habituation(HVAC)
- IV. Appliance switch with a smart
- V. network
- VI. Indoor positioning systems
- VII. Home computerization for elderly and
- VIII. incapacitated people

V. Result and Conclusions

VI.

The project is working very fine. When the system is plug in the main socket, the system in energised through power supply of 5volt and 12 volt. The 12 volt supply is given to the relay system. The ESP32 board have a inbuilt WIFI module, which connects to the Internet Router. When the communication between the ESP32 board and router get connected, the sinric pro app goes to online. The Sinric Pro is interfaced with the Google home as well as with the Amazon Alexa. At that time system goes on line. The System can be controlled with online mode as well as offline mode. The Switches, which are connected to the ESP32 board act as input mode. These manually switches connected can be used in online as well as offline. In the online mode, the Google home is interface with the Sinric Pro credentials to controls the loads. The variables of these loads are defined in Sinric Pro portal for online. These variables get interfaced with the ESP32 board. Through program these variable values are read through board and accordingly controls the devices.

VI CONCLUSION:

Today, Automaton is the world's influential mobile platform open source working system to apt easily whatever the functionality we had in our attention. This paper is about wireless home computerization by Android mobile helps you to gadget such a fantastic system in our home at a very sensible price using cost-effective devices. Thus, it disables many problems like prices, stubbornness, safety etc. In count, will deliver greater rewards like it shrinkage our energy costs, it recovers home safety. In addition, it is exact suitable to usage and will recover the ease of our home.

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