NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

Project Report

Title:

Wireless AC Power control Circuit

Prepared by:

Mohammed Omer Ali 1NH18EE031
Sahana B 1NH18EE050
Siddhartha Sunil Singh 1NH18EE057

Guided By:

Mr. Vinod Kumar S

Sr. Asst. Professor, Dept. of Electrical and Electronics Engineering, NHCE, Bengaluru.

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CERTIFICATE

Certified that the Mini Project work entitled "**Wireless AC Power Control Circuit**" carried out by "M.D. Omer Ali 1NH18EE031", "Siddhartha Sunil Singh 1NH18EE057", "Sahana 1NH18EE050" students of New Horizon College of Engineering submitted the report in completion of project at Department of Electrical and Electronics Engineering, New Horizon College of Engineering during the Academic Year 2019-20. It is certified that all the corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for said Degree.

Project Guide	**HOD-EEE**
Mr. Vinod Kumar S	**Dr. S. Ramkumar**

ABSTRACT

This Project is based on the concept of home automation, but what differentiates it from others is that we can deploy this system on existing lights of houses irrespective of its type i.e. CFL, LED, Fluorescent, etc. And not only on lights but Fans as well. This solution can be deployed to the existing circuitry of the house and has a very optimal cost of installation.

Working with the ESP Wi-Fi Modules to build a **smart Wi-Fi socket** that enables users to **control their AC loads wirelessly through smart phone**. While products like these are already available in the market, like the popular Moko WIFI Smart Plug or Sonoff, they are a bit costlier. So, this project enables us to build a **smart plug using ESP8266 WIFI module which is affordable and cost convenient.** The device that we built can easily be plugged into any exiting AC socket and then on the other point you can connect the actual load simply by plugging it into this socket on device. later just keep the main switch of the socket always on, and hence we can control load directly from the Smartphone.

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of ant task would be impossible without the mention of the people who made it possible, whose constant guidance and encouragement crowned our efforts with success.

I have great pleasure in expressing gratitude to **Dr. Mohan Manghnani**, Chairman of New Horizon Educational Institutions for providing necessary infrastructure and creating good environment.

I take this opportunity to express my profound gratitude to Dr. Manjunath, Principle NHCE, for his constant support and encouragement.

I am grateful to **Dr. Prashanth C.S.R**, Dean Academics, for his unfailing encouragement and suggestions, given to me in the course of my project work.

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His valuable suggestions were the motivating factors in completing the work.

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CHAPTER 1:

INTRODUCTION

The process of regulating/operating various appliances, machines, industrial processes, other functions using various control systems and with less or no human interference is termed as automation. There are various types of automation based on their applications.

Home automation aims to bring the control of performing your home electrical appliances to the tip of your finger, thus giving customer a reasonable lighting solutions and better energy conservation with optimum use of energy. Leaving just lighting solutions behind, the concept also further extends to have a complete control over your home security as well as build a integrated home entertainment system and much more. The IoT based Home Automation framework offer a great deal of flexibility over the wired frameworks as it approaches different preferences like simple to utilize, simple establishment, evades complexity of going through wires or free electrical associations, simple shortcoming location and activating or more all it even offers simple versatility.

By this we can automatically master fans lights in our house or anywhere with an app in our mobile or PC. **ESP8266** is a Wi-Fi based module. This module helps us to connect to the internet. In this we will not use MCU separately. Because it is an inbuilt module. Here a home automation system using **ESP8266** Wi-Fi module is being constructed. Using this we will be able to operate lights, electric fans and other home appliances through Blynk app or Google Assistant or other AR apps on your smart phone.

The main vision of this project is to ease the affordability of home automation solution for Indian illumination market as there is a lot of potential in this. The new part of this project is the integration of IOT with Blynk open platform. The is a standalone solution which can be deployed to any conventional light bulb or single-phase fan or any other similar AC appliances.

CHAPTER 2:

LITERATURE SURVEY

Phase-Cut Dimming:

In 1959 Joel Spira built up the SCR (silicon-controlled rectifier) controlled dimmer and following a year Eugene Alessio pronounced a TRIAC (Triode for AC) controlled dimmer. These thyristor-based controls are the pillar of dimmer innovation today, despite the fact that the IGBT (Insulated Gate Bipolar Transistor) is utilized in probably the most up to date dimmer structures since it is a simpler gadget to drive and control.

These gadgets work by cutting off piece of every half pattern of the AC line waveform. The sum that is cut off is estimated by the phase edge. A total sine wave is 360 degrees long; a half wave is 180 degrees. In the event that the dimmer cuts off 90 degrees of every half cycle, the compelling voltage applied to the light is diminished significantly in light of the fact that just a single portion of the waveform or 180 degrees remains. Phase-cut dimmers can work on the main edge (forward phase-cut) or trailing edge (switch phase-cut) of the waveform. Forward phase-cut grew normally from the thyristor conduct. The SCR or TRIAC is activated to turn it on and it kills when the waveform crosses zero voltage. Turn around phase-slice darkening was created to improve execution of low voltage incandescent lights working on an electronic transformer, a kind of switch mode power gracefully.

How about we take a gander at a portion of the difficulties in controlling LED lights with phase-cut dimmers, since this innovation has overwhelmed the market for quite a long time and there's an enormous introduced base of these dimmers.

Basic phase-cut dimmers are associated in arrangement (two wires) with a glowing light and can possibly draw power for its gadgets during the period when the AC line is cut off. This is when there is voltage present over the dimmer. Progressively complex dimmers require more force for their gadgets and have an additional wire (three wires) gave to control their hardware. A dimmable LED establishment has recently the two wires from the dimmer to give power, without the upside of the full line voltage being accessible during the cut off piece of the phase. Thyristor based dimmers require a base burden current for appropriate activity. The dimmable LED installation needs to give this heap current even at low line voltage, which is in opposition to the improved effectiveness of the LED contrasted with a glowing light.

In light of these confinements darkening LED apparatuses with existing phase-cut frameworks were commonly inadmissible. Diminishing beneath 30% brilliance was problematic. Apparatuses would fly on as the dimmer control was progressed. Here and there the apparatuses would carry on sporadically, cycling among zero and full brilliance. To beat these constraints, innovation engineers have sought advanced strategies for LED dimmable control. In numerous fields of designing, advanced development has frequently evacuated boundaries to improved item execution and application cost. Could a computerized arrangement correspondingly be composed for LED darkening?

The Digital Dimming Dilemma:

The two dimmers and drivers have different necessities that must be met in order to accomplish smooth LED activity. Advanced dimmers are probably the hardest issue to tackle with LED lights in light of the fact that the chip requires power even while the dimmer is off. This outcomes in a little current, normally around 20 mA that necessities to move through the light when the light ought to be off. The drivers must change over a slashed AC signal from the dimmer into a consistent DC signal for the LED's so as to produce a steady light, while deciphering the modified waveform to the suitable diminishing level. At the end of the day, drivers must be intended to decipher an obligation cycle balanced sign and move the data to consistent ebb and flow yield levels. As the conduction phase point is diminished, the yield current should likewise diminish. Giving consistent light yield requires an exercise in careful control between drawing current through the AC waveform while it is being removed by the dimmer. Putting away force in capacitors and inductors gives power when there is none.

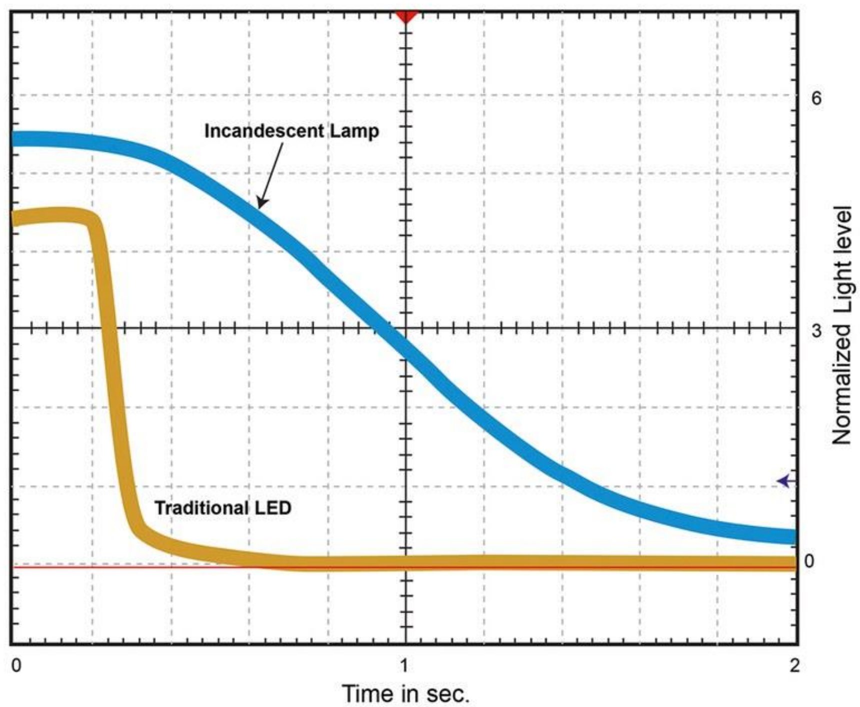


Figure 2.1. The relative light output curve of a digitally controlled LED dimming power supply fails to produce the low-end, full-range "S" curve that is characteristic of traditional incandescent dimming.

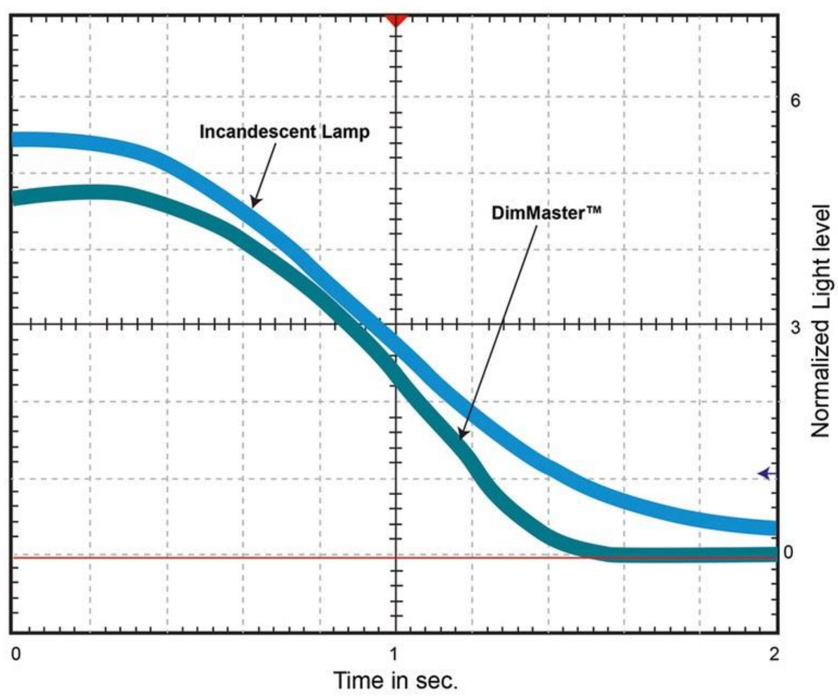


Figure 2.2: A recently introduced LED dimming technology produces an "S" curve that emulates the light output of traditional incandescent dimming

CHAPTER 3:

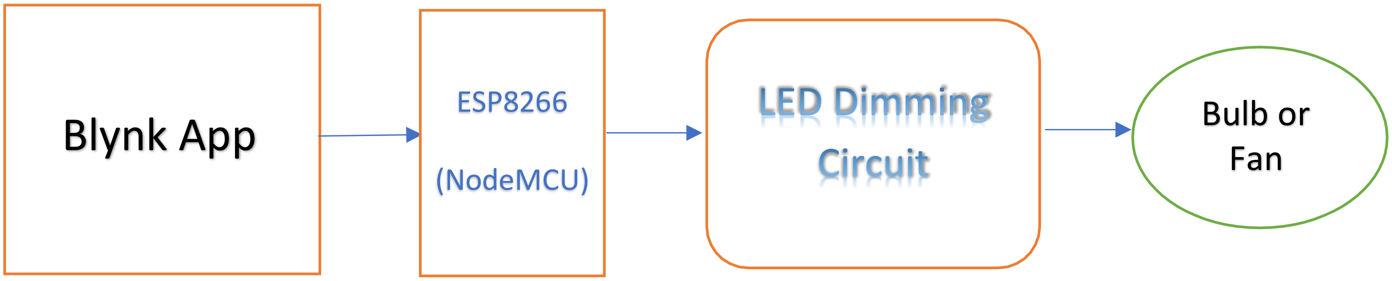
PROPOSED SYSTEM DESIGN

The primary Idea is to execute Leading edge stage cutting technique utilizing a zero voltage cross sign. For a 50 Hz AC mains gracefully, one cylce length rises to 1/50 seconds, that is 20 ms. furthermore, one half cyle is 10 ms. we get zero voltage cross sign at each half cycle (10ms). so if the switch for the AC machine is open for all the 10ms, the apparatus gets 100% or full force. in the event that by one way or another we limit the switch ON schedule for the machine for a small amount of this millisecond, at that point that apparatus gets that portion of intensity as it were. this is accomplished by utilizing a triac. assume we need to flexibly half power then we will offer sign to triac for just 5 ms between 0 to 10 ms interval.and consequently the machine gets just half force. to accomplish recurrence coordinating zero voltage cross sign is utilized.

At the source side the information AC signal is being provided to the scaffold rectifier and the bulb parallelly the yield side of the extension rectifier goes to the MCT 2E pin 1&2. The pin 6 is associated with the zero cross identifier contribution to the microcontroller and to the 5v contribution also. The ground of the MCU is associated with the MOC3021 through the pin 4 of the MCT 2E and a 330E Ώ resistor. The pin 6&4 of the MOC3021 is associated with the terminal 2 of the BT136 TRIAC and back to the impartial of the principle input AC power source.

At the point when the sign is at first turned on the AC sine waveform begins to move through the Bridge rectifier and afterward to the phototransistor optocoupler, at that point the zero cross finder circuit is finished by the MCU unit and a 5V DC flexibly. The MOC3021 TRIAC driver is associated with the TRIAC and afterward to the bulb. This makes the darkening of the bulb or fan through the force control procedure called Phase cut diminishing. This stage cut innovation is certainly not another innovation yet what the new part here is the usage of this circuit with a microcontroller and the IoT stage.

Block Diagram:



SCHEMATIC:

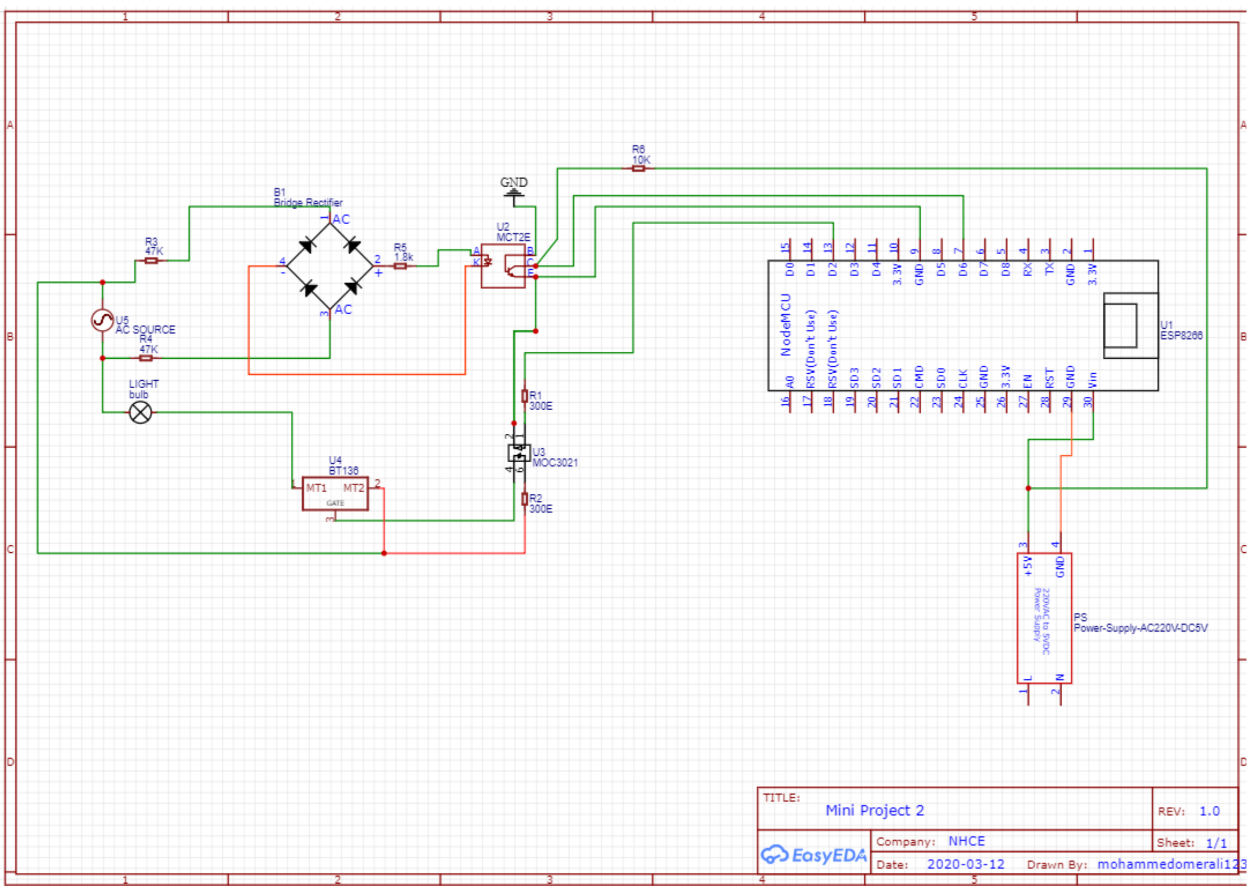


Fig 3.1 Schematic

Instrumentation used and their Specifications:

1. ESP8266 (MCU):

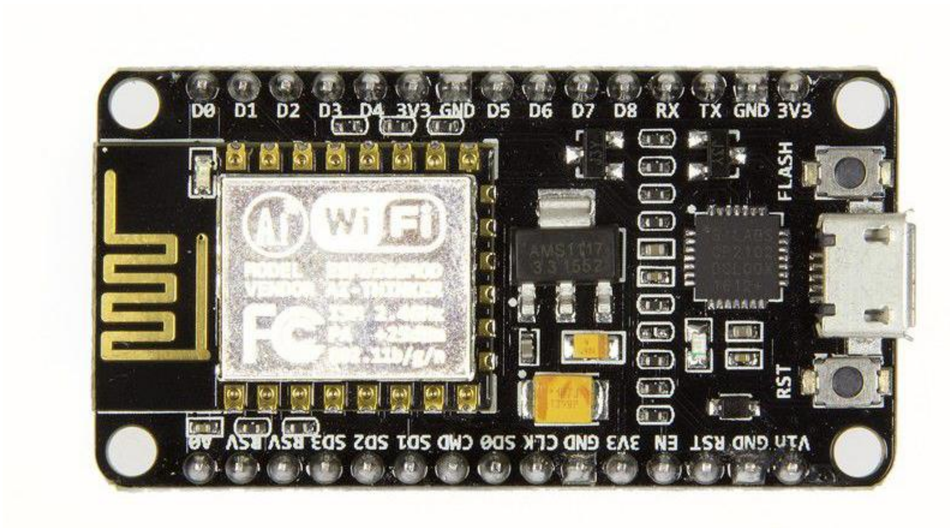


Fig 3.2 ESP8266

Detailed Diagram/Schematic:

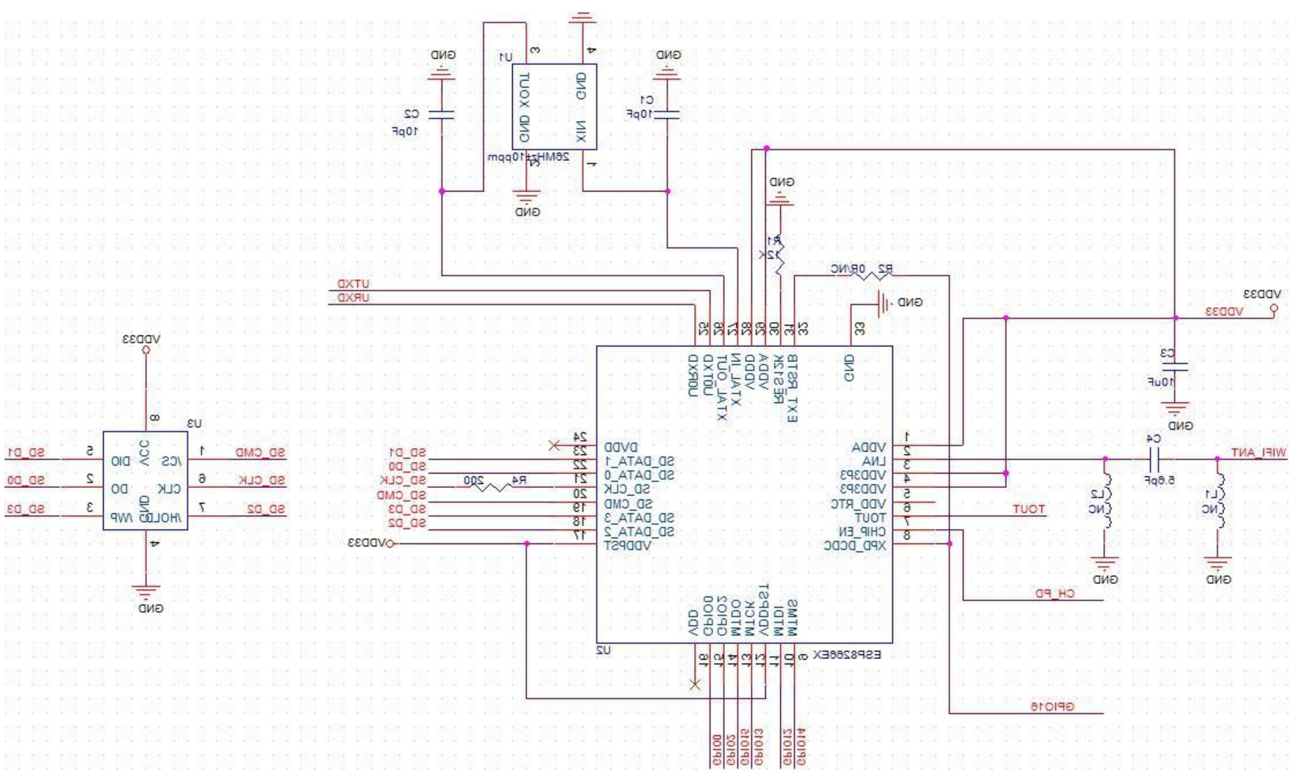
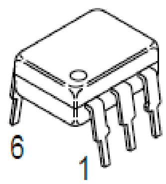


Fig 3.3 Schematic of ESP8266

2. MOC3021 (DIP Random-Phase Optoisolatos TRIAC Driver):

STYLE 6 PLASTIC



STANDARD THRU HOLE
CASE 730A–04

Fig 3.4 MOC3021

Here are some electrical and thermal specifications for the reference of the parts electrical and Thermal limitations. Though there are better TRIAC output drivers. But this driver is used for the sole purpose of cost efficiency and availability. But there are some limitations and drawbacks to this 6-pin DIP Random-Phase Optoisolatos TRIAC Driver Output.

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
INFRARED EMITTING DIODE			
Reverse Voltage	V_R	3	Volts
Forward Current — Continuous	I_F	60	mA
Total Power Dissipation @ T_A = 25°C Negligible Power in Triac Driver Derate above 25°C	P_D	100 1.33	mW mW/°C
OUTPUT DRIVER			
Off–State Output Terminal Voltage	V_{DRM}	400	Volts
Peak Repetitive Surge Current (PW = 1 ms, 120 pps)	I_{TSM}	1	A
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	300 4	mW mW/°C
TOTAL DEVICE			
Isolation Surge Voltage(1) (Peak ac Voltage, 60 Hz, 1 Second Duration)	V_{ISO}	7500	Vac(pk)
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	330 4.4	mW mW/°C
Junction Temperature Range	T_J	–40 to +100	°C
Ambient Operating Temperature Range(2)	T_A	–40 to +85	°C
Storage Temperature Range(2)	T_{stg}	–40 to +150	°C
Soldering Temperature (10 s)	T_L	260	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
INPUT LED					
Reverse Leakage Current (V_R = 3 V)	I_R	—	0.05	100	µA
Forward Voltage (I_F = 10 mA)	V_F	—	1.15	1.5	Volts
OUTPUT DETECTOR (I_F = 0 unless otherwise noted)					
Peak Blocking Current, Either Direction (Rated V_{DRM}(1))	I_{DRM}	—	10	100	nA
Peak On–State Voltage, Either Direction (I_{TM} = 100 mA Peak)	V_{TM}	—	1.8	3	Volts
Critical Rate of Rise of Off–State Voltage (Figure 7, Note 2)	dv/dt	—	10	—	V/µs
COUPLED					
LED Trigger Current, Current Required to Latch Output (Main Terminal Voltage = 3 V(3))	I_{FT}				mA
MOC3021		—	8	15	
MOC3022		—	—	10	
MOC3023		—	—	5	
Holding Current, Either Direction	I_H	—	100	—	µA

TYPICAL ELECTRICAL CHARACTERISTICS

T_A = 25°C

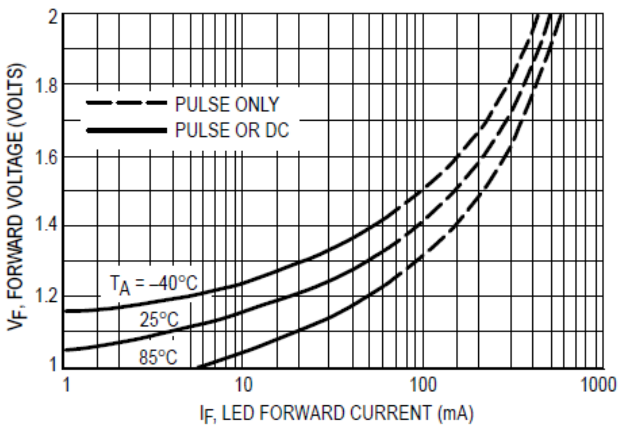


Figure 1. LED Forward Voltage versus Forward Current

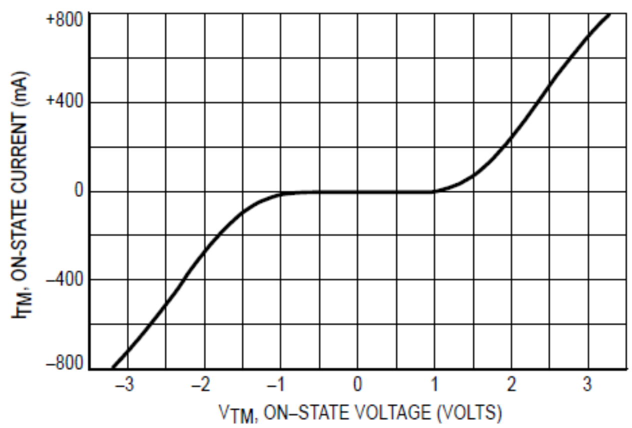


Figure 2. On–State Characteristics

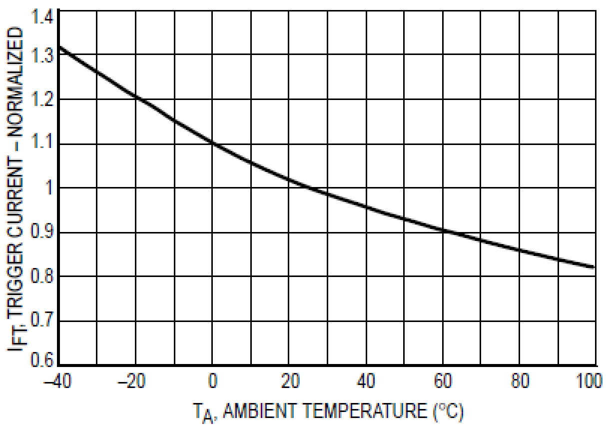


Figure 3. Trigger Current versus Temperature

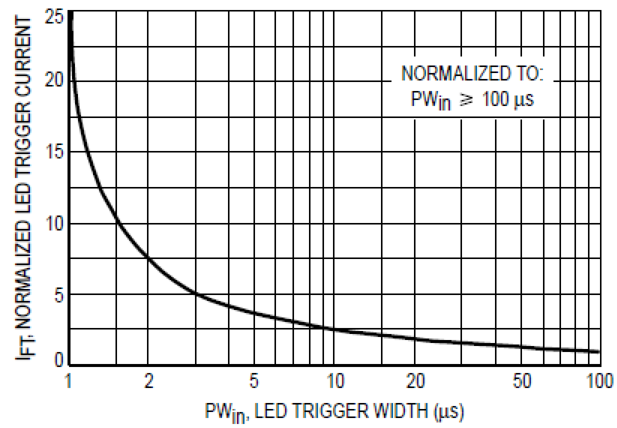


Figure 4. LED Current Required to Trigger versus LED Pulse Width

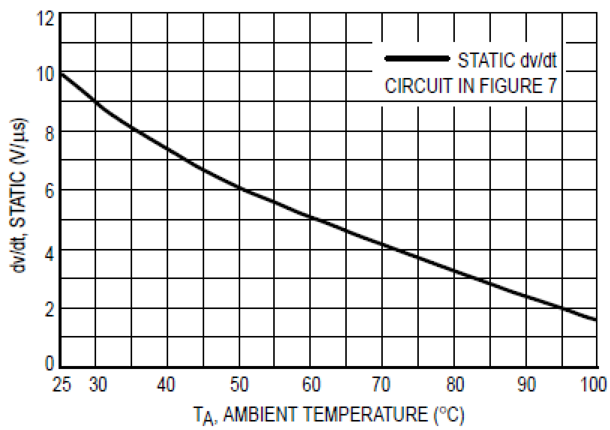


Figure 5. dv/dt versus Temperature

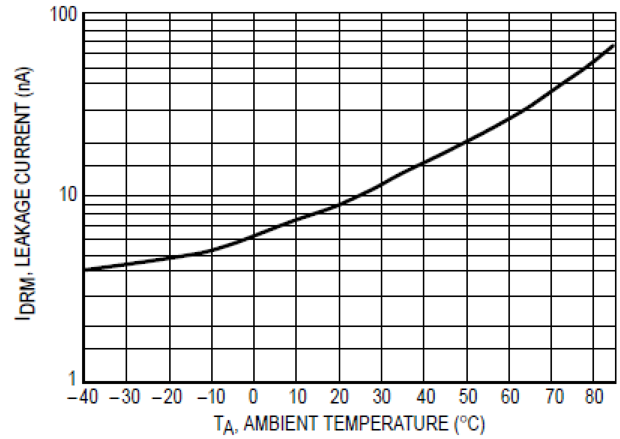


Figure 6. Leakage Current, I_{DRM} versus Temperature

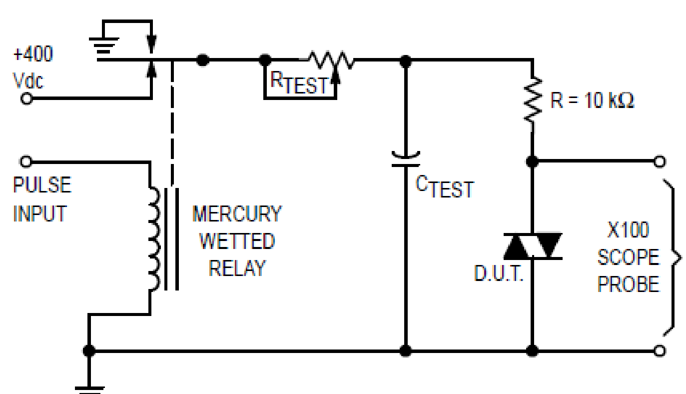


Fig 3.5 Schematic Diagram of the IC

3. MCT2E (OPTOCOUPLER):

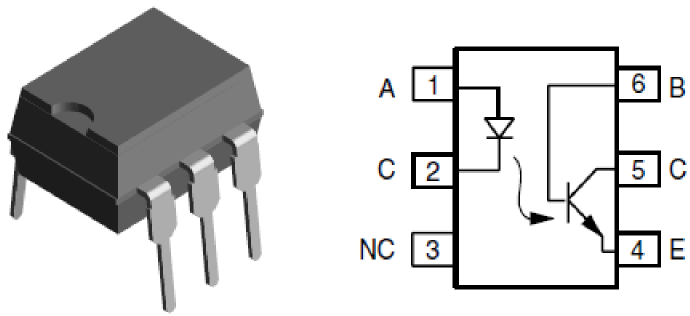


Fig 3.6 MCT2E

This device is an optocoupler that is used for switching purposes in the circuit. In our project this switching technique is utilized in order to make the dimming of light and speed control of the fan more accurate. And moreover, it is justifiably efficient and reliable solution. Here I will list some of the switching characteristics of this optocoupler.

Switching Characteristics

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Switching time	I_C = 2 mA, R_L = 100 Ω, V_{CE} = 10 V	t_{on}, t_{off}		10		μs

Typical Characteristics (T_{amb} = 25 °C unless otherwise specified)

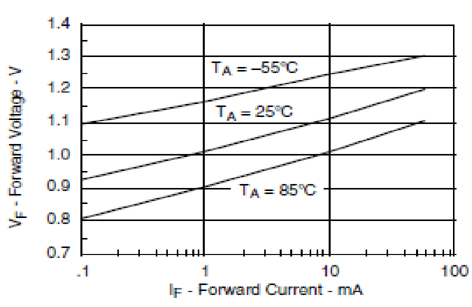


Fig. 1 Forward Voltage vs. Forward Current

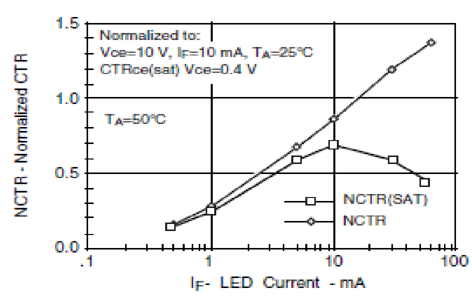


Fig. 3 Normalized Non-saturated and Saturated CTR vs. LED Current

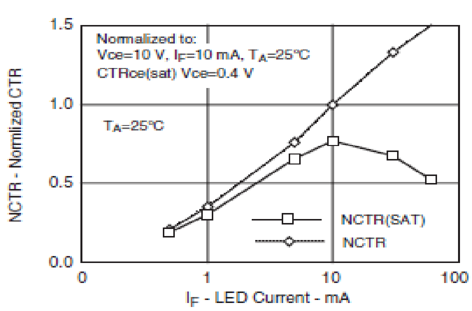


Fig. 2 Normalized Non-Saturated and Saturated CTR vs. LED Current

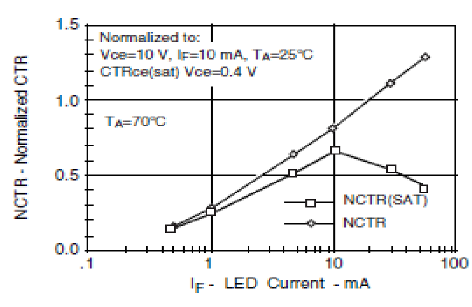


Fig. 4 Normalized Non-saturated and saturated CTR vs. LED Current

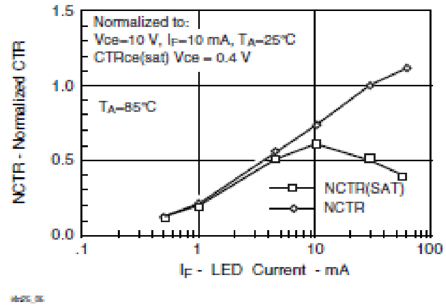


Fig. 5 Normalized Non-saturated and saturated CTR vs. LED Current

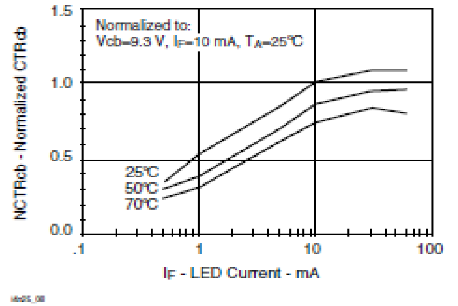


Fig. 8 Normalized CTRcb vs. LED Current and Temp.

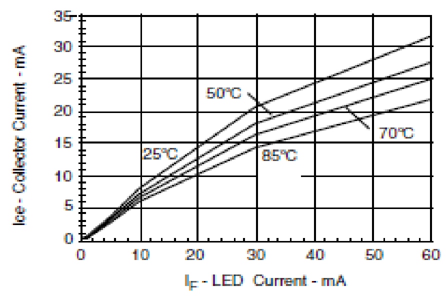


Fig. 6 Collector-Emitter Current vs. Temperature and LED Current

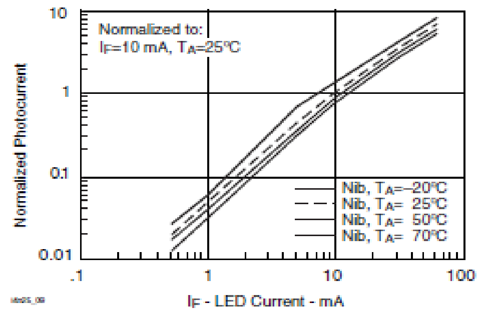


Fig. 9 Normalized Photocurrent vs. I_F and Temp.

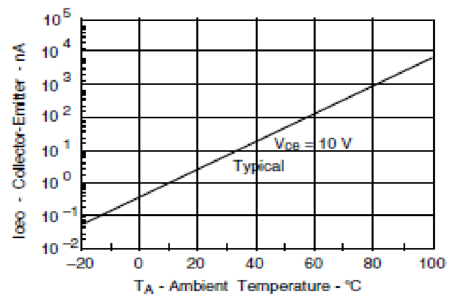


Fig. 7 Collector-Emitter Leakage Current vs.Temp.

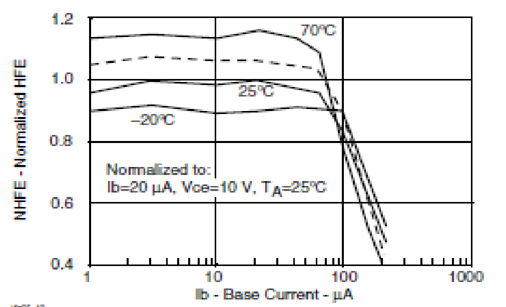
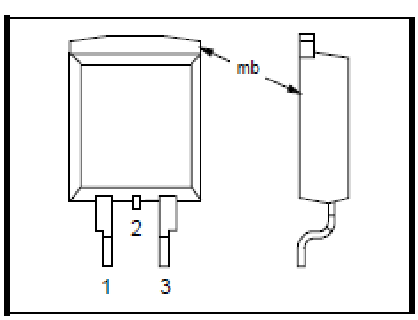


Fig. 10 Normalized Non-saturated HFE vs. Base Current and Temperature

4. BT136 (TRIAC):

PIN CONFIGURATION



SYMBOL

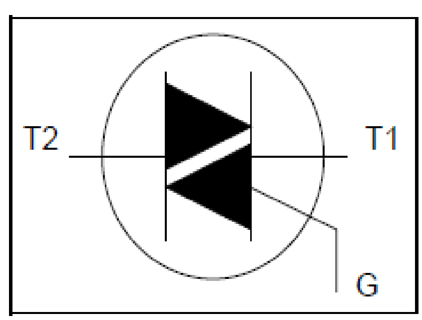


Fig 3.7 Symbol & Pin Config.

This device is a BT series TRIAC used to switch optically. This is a very integral part of the project. As it also acts as a switch for the AC side of the connection which switches the appliance (load). Here is some of the characteristics.

LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.			UNIT
				-500	-600	-800	
V_{DRM}	Repetitive peak off-state voltages		-	500[1]	600[1]	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 107$ °C	-	4			A
I_{TSM}	Non-repetitive peak on-state current	full sine wave; $T_j = 25$ °C prior to surge					
		t = 20 ms	-	25			A
		t = 16.7 ms	-	27			A
I^2t	I^2t for fusing	t = 10 ms	-	3.1			A^2s
dI_T/dt	Repetitive rate of rise of on-state current after triggering	$I_{TM} = 6$ A; $I_G = 0.2$ A; $dI_G/dt = 0.2$ A/µs					
		T2+ G+	-	50			A/µs
		T2+ G-	-	50			A/µs
		T2- G-	-	50			A/µs
		T2- G+	-	10			A/µs
I_{GM}	Peak gate current		-	2			A
V_{GM}	Peak gate voltage		-	5			V
P_{GM}	Peak gate power		-	5			W
$P_{G(AV)}$	Average gate power	over any 20 ms period	-	0.5			W
T_{stg}	Storage temperature		-40	150			°C
T_j	Operating junction temperature		-	125			°C

STATIC CHARACTERISTICS

$T_j = 25$ °C unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.			UNIT
		BT136B-			...	...F	...G	
I_{GT}	Gate trigger current	$V_D = 12$ V; $I_T = 0.1$ A						
		T2+ G+	-	5	35	25	50	mA
		T2+ G-	-	8	35	25	50	mA
		T2- G-	-	11	35	25	50	mA
		T2- G+	-	30	70	70	100	mA
I_L	Latching current	$V_D = 12$ V; $I_{GT} = 0.1$ A						
		T2+ G+	-	7	20	20	30	mA
		T2+ G-	-	16	30	30	45	mA
		T2- G-	-	5	20	20	30	mA
		T2- G+	-	7	30	30	45	mA
I_H	Holding current	$V_D = 12$ V; $I_{GT} = 0.1$ A	-	5	15	15	30	mA
V_T	On-state voltage	$I_T = 5$ A	-	1.4	1.70			V
V_{GT}	Gate trigger voltage	$V_D = 12$ V; $I_T = 0.1$ A	-	0.7	1.5			V
		$V_D = 400$ V; $I_T = 0.1$ A; $T_j = 125$ °C	0.25	0.4	-			V
I_D	Off-state leakage current	$V_D = V_{DRM(max)}$; $T_j = 125$ °C	-	0.1	0.5			mA

DYNAMIC CHARACTERISTICS

$T_j = 25$ °C unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.			TYP.	MAX.	UNIT
		BT136B-	...	...F	...G			
dV_D/dt	Critical rate of rise of off-state voltage	$V_{DM} = 67\%$ $V_{DRM(max)}$; $T_j = 125$ °C; exponential waveform; gate open circuit	100	50	200	250	-	V/µs
dV_{com}/dt	Critical rate of change of commutating voltage	$V_{DM} = 400$ V; $T_j = 95$ °C; $I_{T(RMS)} = 4$ A; $dI_{com}/dt = 1.8$ A/ms; gate open circuit	-	-	10	50	-	V/µs
t_{gt}	Gate controlled turn-on time	$I_{TM} = 6$ A; $V_D = V_{DRM(max)}$; $I_G = 0.1$ A; $dI_G/dt = 5$ A/µs	-	-	-	2	-	µs

Characteristic Graphs:

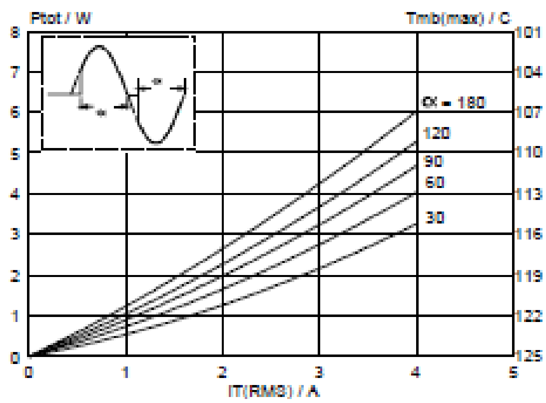


Fig.1. Maximum on-state dissipation, P_{tot}, versus rms on-state current, $I_{T(RMS)}$, where α = conduction angle.

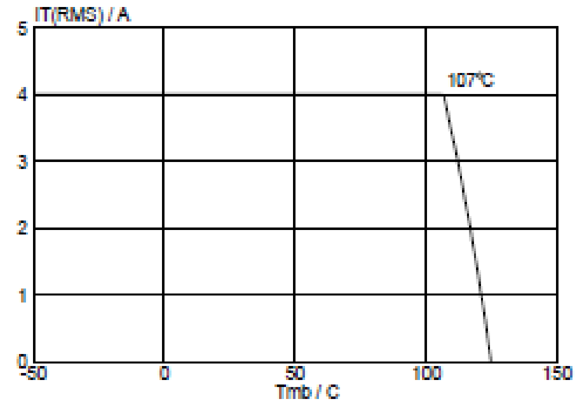


Fig.4. Maximum permissible rms current $I_{T(RMS)}$, versus mounting base temperature T_{mb}.

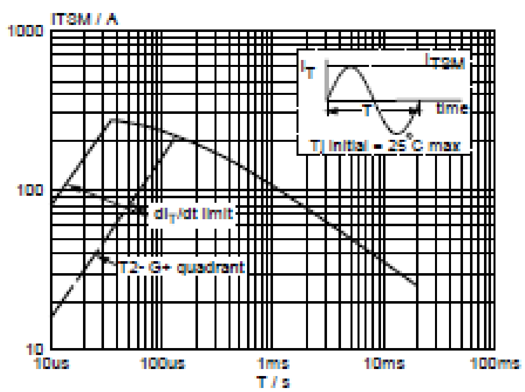


Fig.2. Maximum permissible non-repetitive peak on-state current I_{TSM}, versus pulse width t_p, for sinusoidal currents, $t_p \leq$ 20ms.

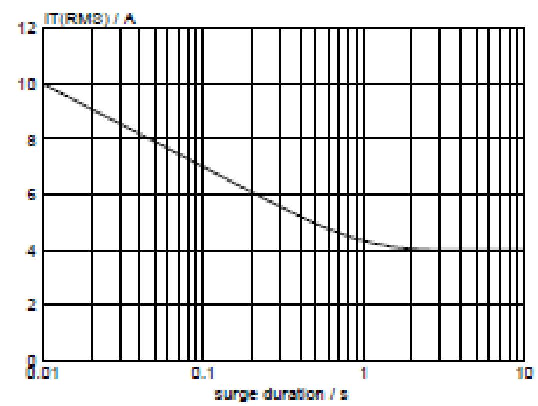


Fig.5. Maximum permissible repetitive rms on-state current $I_{T(RMS)}$, versus surge duration, for sinusoidal currents, f = 50 Hz; $T_{mb} \leq$ 107°C.

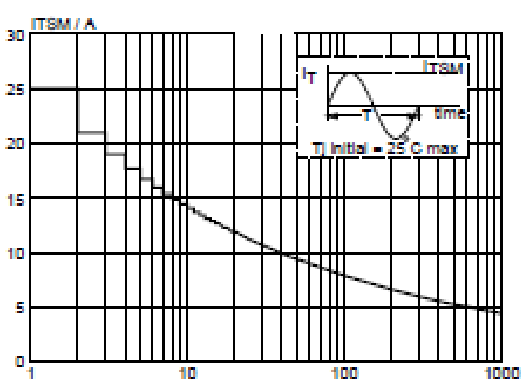


Fig.3. Maximum permissible non-repetitive peak on-state current I_{TSM}, versus number of cycles, for sinusoidal currents, f = 50 Hz.

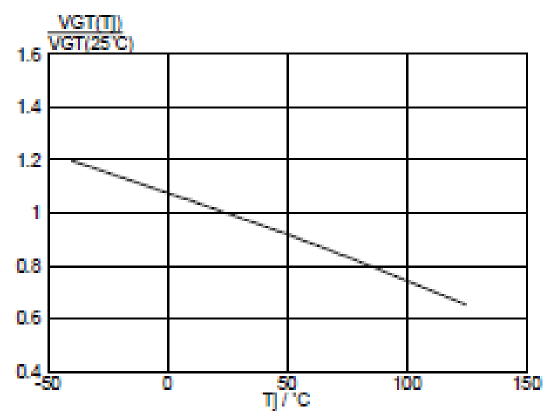


Fig.6. Normalised gate trigger voltage $V_{GT}(T_j)$/ V_{GT}(25°C), versus junction temperature T_j.

5. Bridge rectifier:

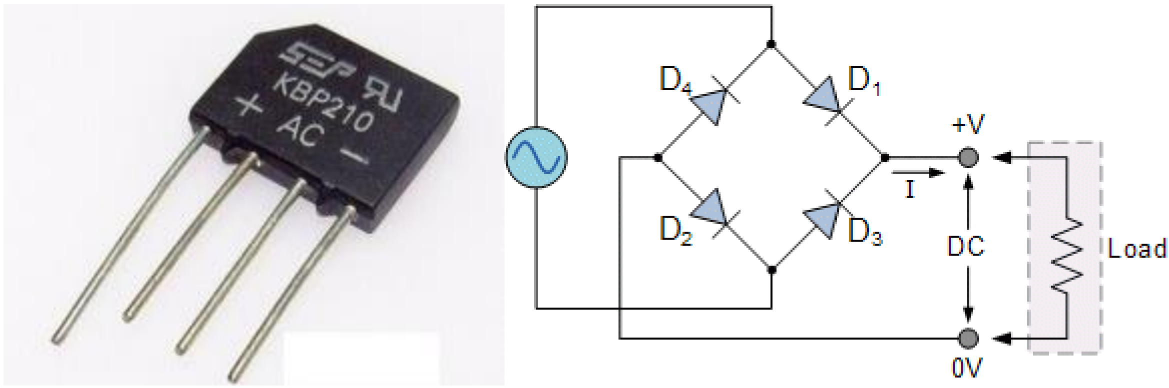


Fig 3.8 Bridge rectifier and its Internal Diagram

This bridge rectifier is used to rectify the input signal for MCU reference and is being used also to convert to a DC wave.

6. 5V DC Supply:

Fig 3.9 5V AC to DC supply

This is the 220V 1A AC to 5V DC power supply this part is used to convert the 220V AC source to 5V dc for the micro controller unit.

CHAPTER 4:

ESP8266

The ESP8266 is the product name of a mini scale controller planned by Espressif Systems. The ESP8266 is an standalone Wireless Fidelity providing arrangement offering as an extension from existing miniaturized scale controller to Wi-Fi and is likewise fit for running self-contained applications. This module accompanies a worked in USB connector and a rich combination of pinouts. With a miniaturized scale USB link, you can interface NodeMCU devkit to your PC and glimmer it without any issue, much the same as Arduino. It is additionally right away breadboard well disposed.

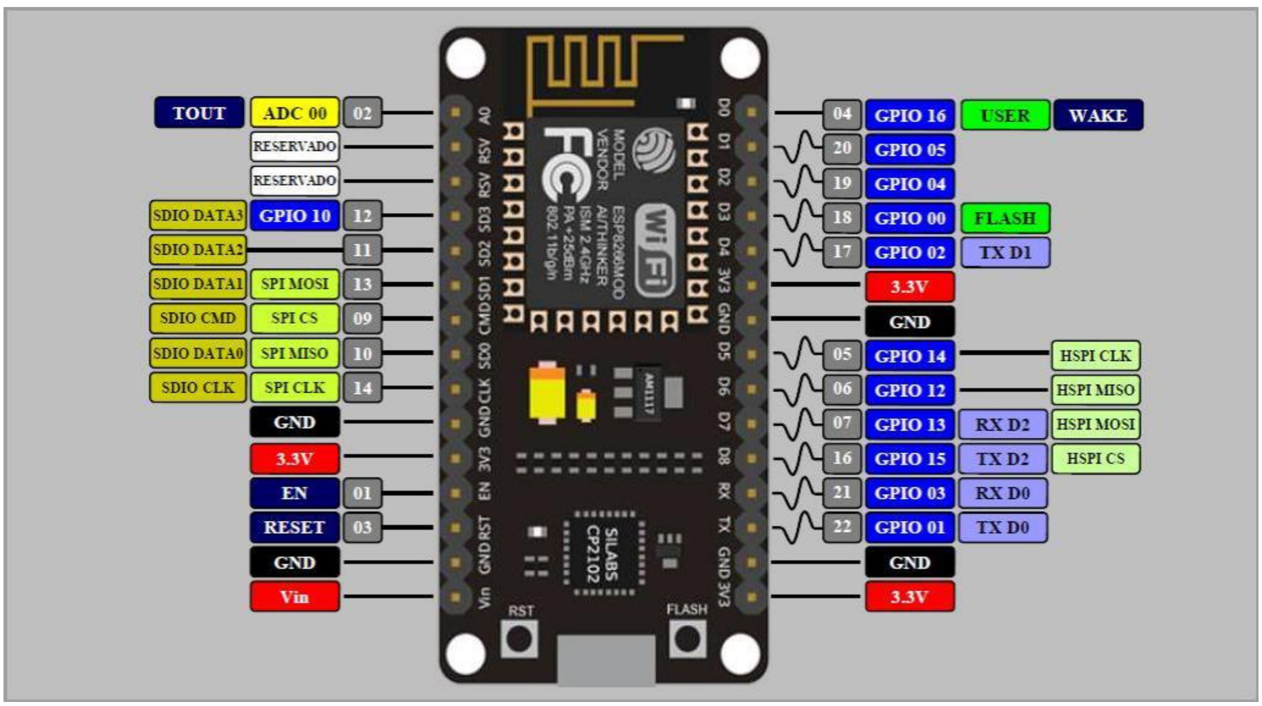


Fig 4.1

The most fundamental approach to utilize the ESP8266 module is to utilize sequential directions, as the chip is essentially a WIFI/Serial handset. Be that as it may, this isn't helpful. What we suggest is utilizing the cool Arduino ESP8266 venture, which is an altered variant of the Arduino IDE that you have to introduce on your PC. This makes it helpful to utilize the ESP8266 chip as we will utilize the outstanding Arduino IDE. Following the beneath venture to introduce ESP8266 library to work in Arduino IDE condition.

The GPIO(General Purpose Input/Output) enables us to access to pins of ESP8266 , every one of the pins of ESP8266 got to utilizing the direction GPIO, all the entrance depends on the I/O list number on the NodeMCU dev packs, not the inside GPIO stick, for instance, the stick 'D7' on the NodeMCU dev unit is mapped to the inward GPIO stick 13, in the event that you need to turn 'High' or 'Low' that specific stick you have to called the stick number '7', not the inner GPIO of the stick. At the point when you are modifying with conventional ESP8266 this disarray will emerge, which stick should be called during programming, in the event that you are utilizing NodeMCU devkit, it has come arranged for working with Lua mediator which can undoubtedly program by looking the stick names related on the Lua board. In the event that you are utilizing conventional ESP8266 gadget or some other merchant sheets please allude to the table beneath to know which IO list is related to the inward GPIO of ESP8266.

ESP8266 Pin	Description
CH_PD	Pull high, connect to Vcc +3.3V
Vcc	Power Supply +3.3V
TXD	Connect to RXD (white) of PL2303HX USB-Serial converter cable
RXD	Connect to TXD (Green) of PL2303HX USB-Serial converter cable
GPIO0	Pull low, connect to GND pin
GND	Power Supply ground

Table 4.1

Features:

- ✓ 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

CHAPTER 5:

Blynk IoT Platform

Blynk was intended for the Internet of Things. It can control equipment remotely, it can show sensor information, it can store information, visualize it and accomplish numerous other cool things.

There are three significant segments in the stage:

Blynk App - permits to you make stunning interfaces for your ventures utilizing different gadgets we give.

Blynk Server - answerable for every one of the interchanges between the cell phone and equipment. You can utilize the Blynk Cloud or run your private Blynk server locally. It's open-source, could undoubtedly deal with a huge number of gadgets and can even be propelled on a Raspberry Pi.

Blynk Libraries - for all the well-known equipment stages - empower correspondence with the server and procedure all the approaching and out-coming directions.

Presently envision: each time you press a Button in the Blynk application, the message goes to the Blynk Cloud, where it mysteriously discovers its way to your equipment. It works the equivalent the other way and everything occurs in a Blynk of an eye.

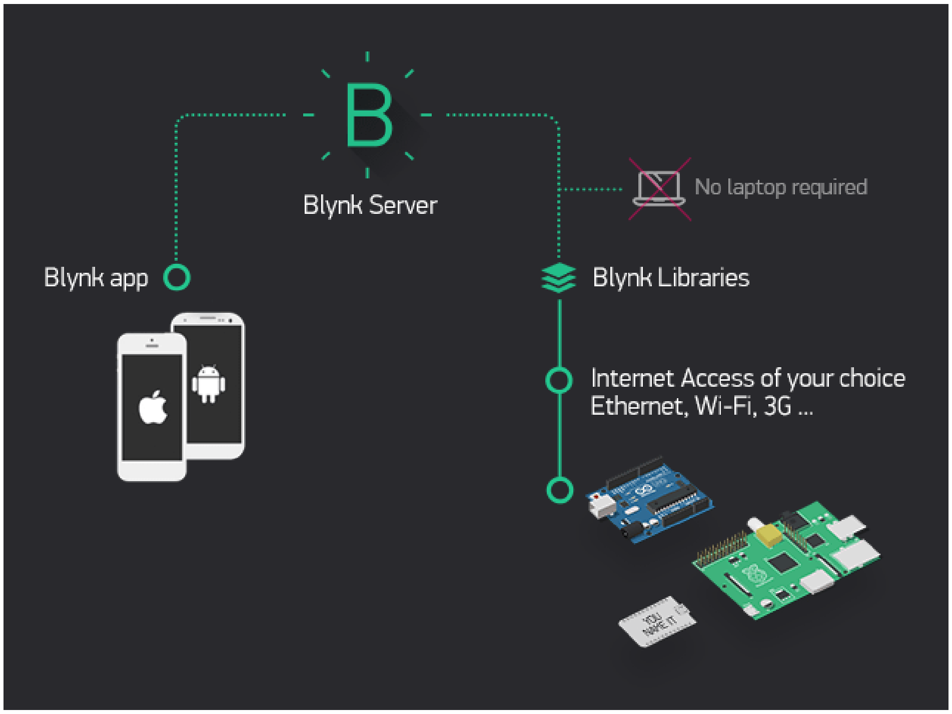


Fig 5.1 Blynk Platform

CHAPTER 6:

Program Code for the ESP8266


```
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

char auth[] = "Your auth token";
char ssid[] = "Your wifi SSID";
char pass[] = "Your wifi password";

volatile byte LOAD = 4;
volatile int dimming = 128;
volatile byte ZVC=12;
int Slider_Value = 0;

BLYNK_WRITE(V1)   // function to assign value to variable Slider_Value whenever slider changes position
{
  Slider_Value = param.asInt();
}
void zero_crosss_int()
{
  volatile int dimtime = (75*dimming);
  delayMicroseconds(dimtime);
  digitalWrite(LOAD, HIGH);
  delayMicroseconds(10);
  digitalWrite(LOAD, LOW);
}
ICACHE_RAM_ATTR void setup() {
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);
  pinMode(LOAD, OUTPUT);
  attachInterrupt(digitalPinToInterrupt(ZVC), zero_crosss_int, RISING);
}
void loop()
{
  Blynk.run();
  dimming=map(Slider_Value, 0, 100, 128, 8);
    delay(10);
}
```

Fig 6.1 Program

CHAPTER 7:

CONCLUSION & FUTURE SCOPE

The objective of the project **AC appliance power control using ESP8266 module** is to design a product which is very much useful to those who dream of building a smart home. Our project model is mainly focused on home automation using IoT which uses internet connection to control the home appliances like light, TV, fan etc. through a mobile. However, it not only helps us in reducing human effort but also conserves a lot of power and helps us in effective utilization of energy.

This model is very versatile and can be expanded into two major sectors i.e. software as well as hardware:

1. The project can be integrated with artificial intelligence to do the complete study and implement it without human needs.
2. Also, with the help of machine learning as well as deep learning, this concept can be integrated as a final product to be used in big firms as the basic concept of the model is saving power that is done by human error.
3. One of the major uses the model can be done is home automation as we all know the futuristic house should all the modern amenities, this will save power as well as money and also reduce the human effort towards energy saving.
4. The other major field of the scope of this model lies in the automobile sector as we all know the scope electric vehicle is coming years are going to increase, this will be a cheap and easy way to automate the vehicle, basically, we can integrate the program to our microcontroller server so everything can be controlled the car with the help of the app.
5. This can be used in all modern society and complexes, in order to save power in the various parts of the society where it is not in use, for leading to an economical and effective management.

APPENDIX

The summary of all the major component is given below

1. ESP8266- It is the microcontroller used in the project; this specific microcontroller is used to transmit the data wirelessly to the Blynk server. It acts as a medium of connection between the Blynk server and the hardware component.
2. MCT2E- It is an optocoupler, the basic module of the optocoupler helps to transmit electrical signals between two isolated electric circuits. It helps in preventing the damage from the passage of high voltage, keeping the rest of the circuit safe from damage.
3. MOC3021- It is TRIAC driven optocoupler, this optocoupler helps the circuit for phase cutting action happening which is used to control the duty cycle of the electric signals passing through it, it uses the TRIAC to send the signals to the external diodes, and helps to keep the circuit safe from high voltage damage.
4. BT 136- It is the TRIAC, a bidirectional triode thyristor is a general representation of the device with three-terminals i.e. gate, anode, and cathode to carry the current in either direction when it is being triggered, the basic function of TRAIC in this circuit is to allow the bidirectional flow of current received from the either ends of the circuit.
5. Bridge rectifier- A rectifier is an electronic device that is used for conversion of Alternating current to direct current or pulsating direct current i.e. AC->DC, as for our circuit this is a most vital device as we need to covert AC->DC for its further use. This gives a source of power and current to the vital devices in the circuit.
6. 220V AC Supply- This is the main power source for the circuit, can be taken from any alternating source.
7. 5V DC Supply- This is the power source for the microcontroller to work, it gives a safety by ensuring the passage of high voltage through it and perhaps can work independently of the circuit.

REFERENCE

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2. https://www.mouser.in/ProductDetail/ON-Semiconductor-Fairchild/MCT2E?qs=UFeyouyReuGXpzsHIdt%2FQA== **(MCT2E Datasheet)**
3. https://www.electroschematics.com/esp8266-datasheet/ **(ESP8266 Data Reference)**
4. https://www.ledsmagazine.com/architectural-lighting/retail-hospitality/article/16695046/improve-phasecut-dimming-performance-in-led-luminaires-magazine **(Phase Cut Dimming Information and Testing data)**
5. https://blynk.io/ **(Open Source Blynk server app)**