A

Report on Mini Project

HOME AUTOMATION SYSTEM

Submitted in partially fulfillment of the requirements

For the award of the degree

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING (2nd year)

Submitted by

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B.N. COLLEGE OF ENGINEERING AND TECHNOLOGY

Session-(2019-20) ODD Semester

CERTIFICATE

The undersigned certify that they have read and recommended to the Department of Electronics And Communication Engineering for acceptance, a mini project report entitled "FIRE ALARM SYSTEM" submitted by

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Session: 2019-20.

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HOME AUTOMATION USING TV REMOTE

The project is designed to operate electrical loads using a TV remote. The remote transmits coded infrared data which is then received by a sensor interfaced to the control unit. The system operates electrical loads depending on the data transmitted from the TV remote. Operating conventional wall switches is difficult for elderly or physically handicapped people. This proposed system solves the problem by integrating house hold appliances to a control unit that can be operated by a TV remote. RC5 based coded data sent from the TV remote is received by an IR receiver interfaced to the Arduino Pro Mini. The program on the microcontroller refers to the RC5 code to generate respective output based on the input data to operate a set of relays through a relay driver IC. The loads are interfaced to the control unit through the relays. The system can be used in existing domestic area for either operating the loads through conventional switches or with the TV remote.
The project can be enhanced by using radio frequency technology where the operational range shall be independent of line of sight distance as often encountered with IR type of remote control.

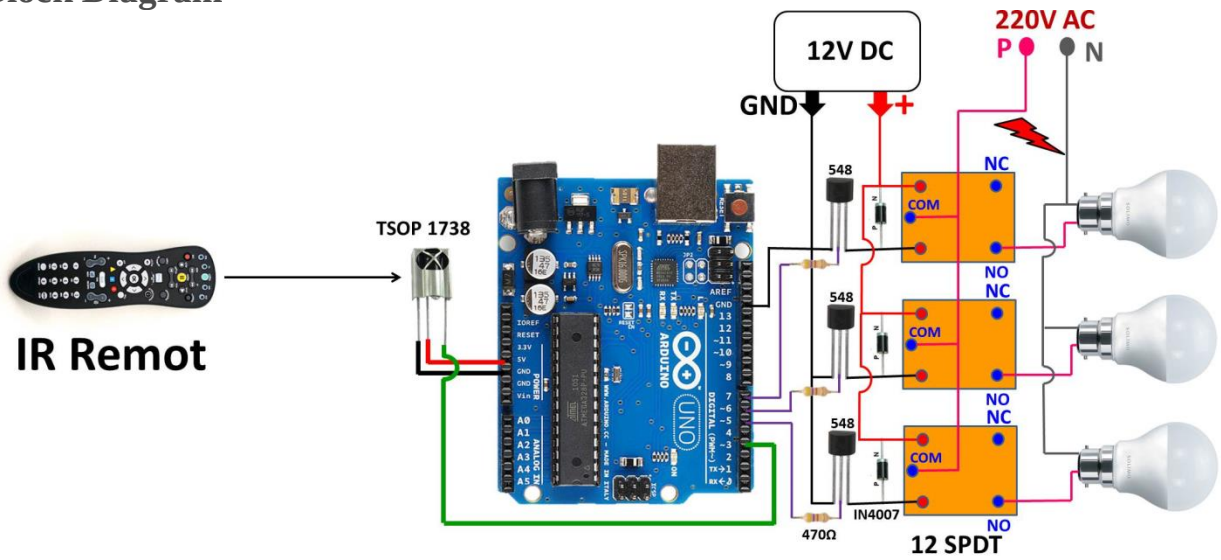
Hardware Specifications

- Arduino Pro Mini
- T.V Remote
- IR Receiver
- Relay
- Voltage Regulator IC
- Resistors
- Transistors
- Cables and Connectors
- Diodes
- PCB and Breadboards
- LED
- Transformer/Adapter
- DC Barrel Jack
- IC Sockets
- TBC Connectors

Software Specifications

- Arduino.cc
- Programming Language is Embedded

Block Diagram



Arduino CODE

```
#include <IRremote.h>

int RECV_PIN = 11;

int output1 = 2;

int output2 = 4;

int output3 = 6;

int itsONled[] = {0,0,0,0};

int itsOFFled[] = {0,0,0,0};

#define code1 0xFFD827 //

#define code2 0xFFB04F //

//Interfacing Arduino with IR Receiver (TSOP 1738);

#define code3 0xFF9867//

#define code4 0xFFC03F//
```

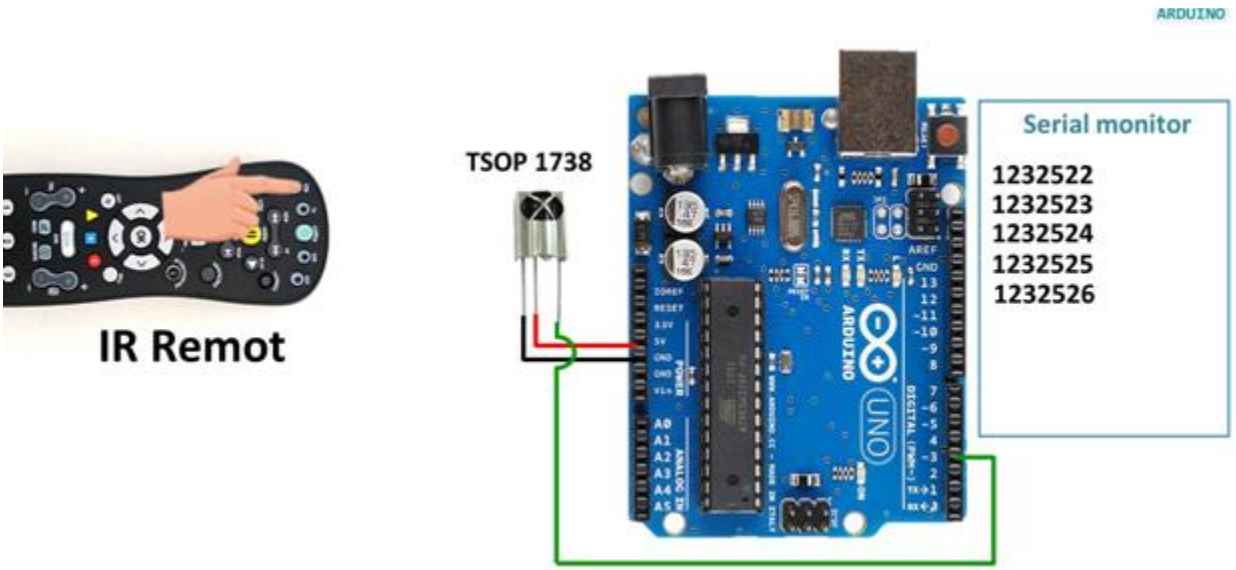
```
IRrecv irrecv(RECV_PIN);
decode_results results;
void setup() {
Serial.begin(9600); //
irrecv.enableIRIn(); //
pinMode(output1, OUTPUT);
pinMode(output2, OUTPUT);
pinMode(output3, OUTPUT);
}
void loop() {
if (irrecv.decode(&results)) {
unsigned int value = results.value;
switch(value) {
case code1:
if(itsONled[1] == 1) { //
digitalWrite(output1, LOW); //
itsONled[1] = 0; } else {
digitalWrite(output1, HIGH);
itsONled[1] = 1;
}
break;
case code2:
if(itsONled[2] == 1) {
digitalWrite(output2, LOW);
itsONled[2] = 0; } else {
```

```
digitalWrite(output2, HIGH);
itsONled[2] = 1;
}
break;
case code3:
if(itsONled[3] == 1) {
digitalWrite(output3, LOW);
itsONled[3] = 0; } else {
digitalWrite(output3, HIGH);
itsONled[3] = 1;
}
break;
}
Serial.println(value); // you can comment this line
irrecv.resume(); // Receive the next value
}
if (irrecv.decode(&results)) {
switch (results.value) {
case code4:
if(itsOFFled[4] == 0){
digitalWrite(output1,LOW);
digitalWrite(output2,LOW);  //all off
digitalWrite(output3,LOW);
delay(250);
}
```

break;

}}}

Diagram for Input Bit Encoding

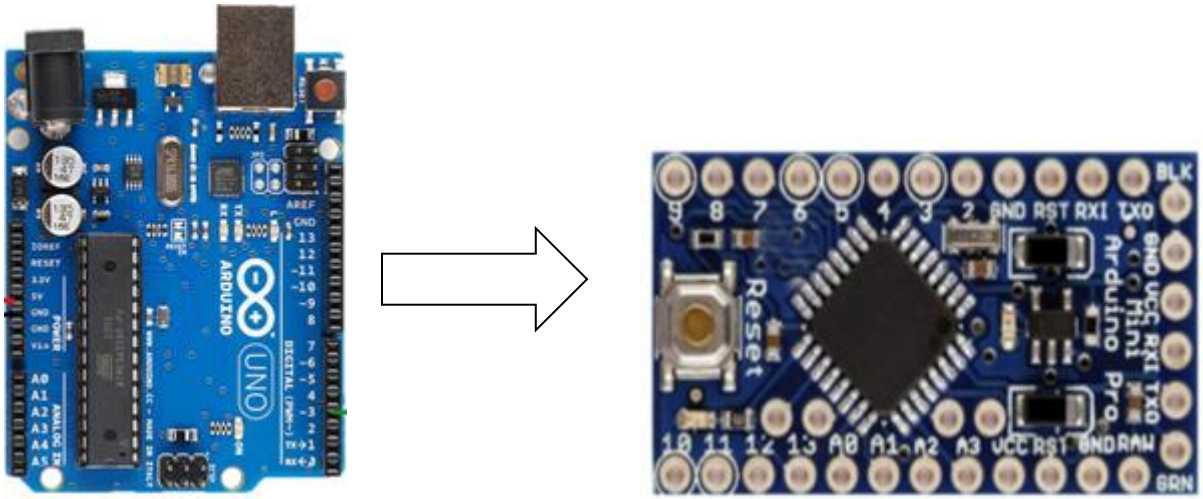


CODE

```
#include <IRremote.h>
int RECV_PIN = 3;
IRrecvirrecv(RECV_PIN);
decode_results results;
void setup(){
Serial.begin(9600);
irrecv.enableIRIn();
}
void loop() {
if (irrecv.decode(&results)) {
Serial.println(results.value, DEC);
```

```
irrecv.resume();
 }
}
```

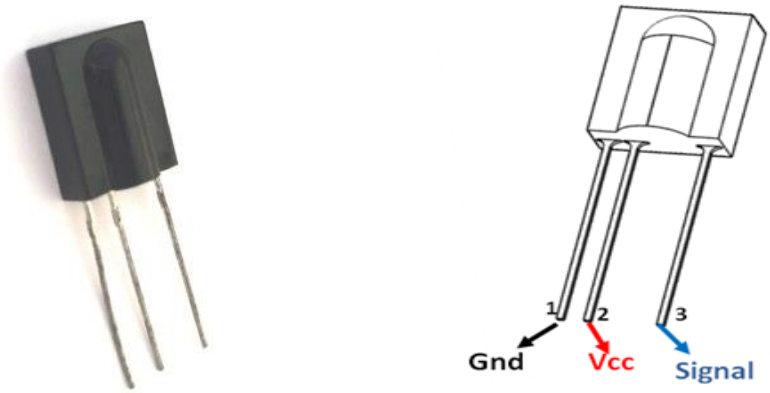
Introduction to Arduino Pro Mini



- Here we are replacing Arduino Uno Board by Arduino Pro Mini.
- **Arduino Pro Mini** is a microcontroller board developed by Arduino.cc and comes with Atmega328 microcontroller incorporated inside the board.
- This board comes with 14 digital I/O out of which 6 pins are used for providing PWM output. There are 8 analog pins available on the board.
- It is very small as compared to Arduino Uno i.e. 1/6 of the total size of the Arduino Uno.
- There is only one voltage regulator incorporated on the board i.e 3.3V or 5V based on the version of the board.
- The Pro Mini runs at 8 MHz for the 3.3V version which is half than Arduino Uno board that runs at 16MHz

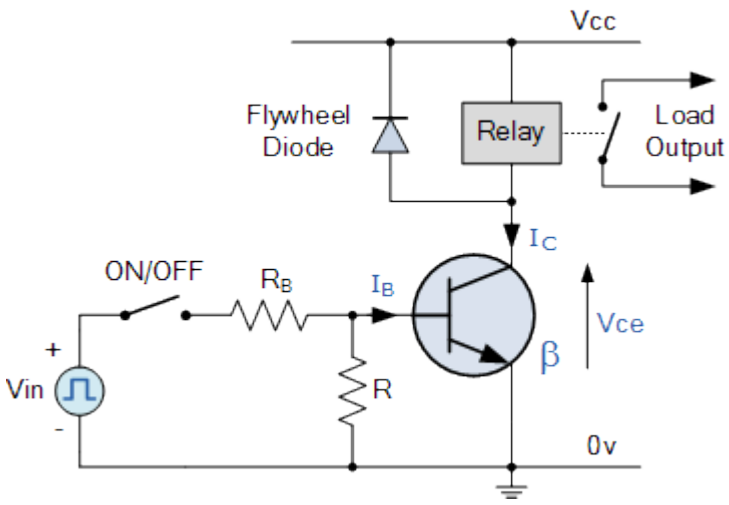
- The labeling on the regulator defines the version of the board i.e. KB33 represents 3.3V edition and KB50 represents 5V edition. However, the board version can also be indicated by measuring the voltage between Vcc and GND pin.
- This board doesn't come with built-in connectors that give you the flexibility to solder the connector in any way you can, based on the requirements and space available for your project
    - Like other Arduino boards, Arduino Pro Mini is open source i.e. you can modify and use the board according to your requirements as all the data and support related to this board is readily available.
    - Overcurrent protection ability is another feature that makes this device safe to use in the applications where passing current can affect the overall performance of the project.
    - It comes with a flash memory of 32KB out of which 0.5 is used for a bootloader. The flash memory is used for storing the code of the board. It is a non-volatile memory and stores information even if the connection with voltage supply is lost.
    - SRAM is a Static Random Access Memory which is 2KB. RAM memory is highly volatile in nature and mainly depends on the constant source of power supply.
    - EEPROM comes with a memory of 1KB. It is a read-only memory (ROM) which can be erased and reprogrammed. This memory can be erased by using higher than normal electrical signal.

. TSOP1738 IR Receiver



The **TSOP sensor** has the ability to read the output signals from home remotes like TV remote, Home theatre remote, AC remote etc.. All these remotes will work with a frequency of 38kHz and this IC can pick up any IR signals process them and provide the output on pin 3. So if you are looking for a sensor to analyse, re-create or duplicate the functions of a remote then this IC will be the perfect choice for you. Also keep in mind that this series TSOP-17**38** will receive only 38Khz IR signals. All remotes in India will operate in 38Khz, kindly ensure if it is the same in your country

Transistors as a Switch and Relay Driver



When used as an AC signal amplifier, the transistors Base biasing voltage is applied in such a way that it always operates within its “active” region, that is the linear part of the output characteristics curves are used.

However, both the NPN & PNP type bipolar transistors can be made to operate as “ON/OFF” type solid state switch by biasing the transistors Base terminal differently to that for a signal amplifier.

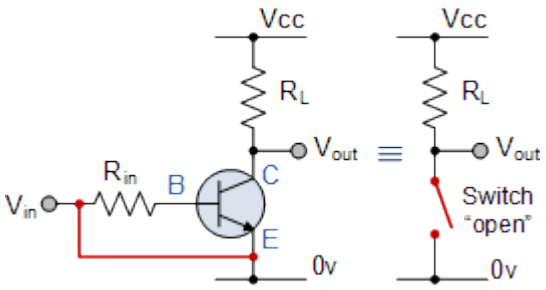
Solid state switches are one of the main applications for the use of transistor to switch a DC output “ON” or “OFF”. Some output devices, such as LED’s only require a few milliamps at logic level DC voltages and can therefore be driven directly by the output of a logic gate. However, high power devices such as motors, solenoids or lamps, often require more power than that supplied by an ordinary logic gate so transistor switches are used.

If the circuit uses the **Bipolar Transistor as a Switch**, then the biasing of the transistor, either NPN or PNP is arranged to operate the transistor at both sides of the “ I-V ” characteristics curves we have seen previously.

The areas of operation for a transistor switch are known as the **Saturation Region** and the **Cut-off Region**. This means then that we can ignore the operating Q-point biasing and voltage divider circuitry required for amplification, and use the transistor as a switch by driving it back and forth between its “fully-OFF” (cut-off) and “fully-ON” (saturation) regions as shown below.

Transistors as an Off Switch

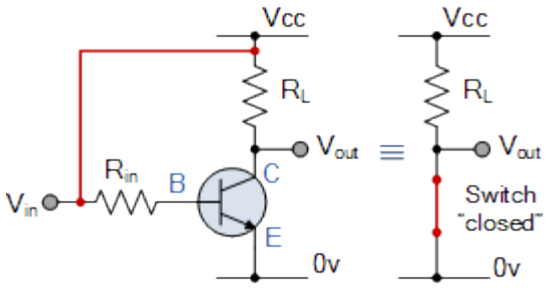
Here the operating conditions of the transistor are zero input base current (I_B), zero output collector current (I_C) and maximum collector voltage (V_{CE}) which results in a large depletion layer and no current flowing through the device. Therefore the transistor is switched “Fully-OFF”.



- The input and Base are grounded (0v)
- Base-Emitter voltage $V_{BE} < 0.7v$
- Base-Emitter junction is reverse biased
- Base-Collector junction is reverse biased
- Transistor is “fully-OFF” (Cut-off region)
- No Collector current flows ($I_C = 0$)
- $V_{OUT} = V_{CE} = V_{CC} = ”1″$
- Transistor operates as an “open switch”

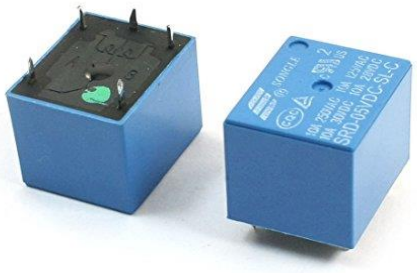
Transistors as an ON Switch

Here the transistor will be biased so that the maximum amount of base current is applied, resulting in maximum collector current resulting in the minimum collector emitter voltage drop which results in the depletion layer being as small as possible and maximum current flowing through the transistor. Therefore the transistor is switched “Fully-ON”.



- The input and Base are connected to V_C
- Base-Emitter voltage V_{BE} > 0.7v
- Base-Emitter junction is forward biased
- Base-Collector junction is forward biased
- Transistor is “fully-ON” (saturation region)
- Max Collector current flows ($I_C = Vcc/R_L$)
- V_{CE} = 0 (ideal saturation)
- $V_{OUT} = V_{CE}$ = ”0″
- Transistor operates as a “closed switch”

RELAYS



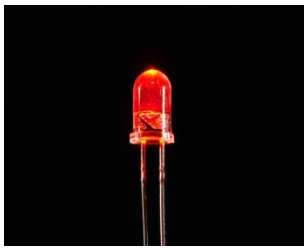
Relays are most commonly used switching device in electronics. There are two important parameters of relay, first is the Trigger Voltage, this is the voltage required to turn on the relay that is to change the contact from Common → NC to Common → NO. The other parameter is your Load Voltage & Current, this is the amount of voltage or current that the NC, NO or Common terminal of the relay could withstand, in our case for DC it is maximum of 30V and 10A. Make sure the load you are using falls into this range.

LED (Light Emitting Diode) :-

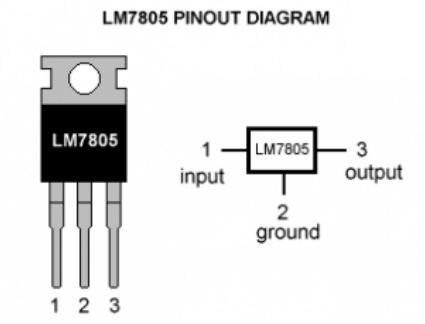
Led is uses in this project for indication of inputs and outputs.

Yellow LED = IR Receiver indication.

Red LED = OUTPUT indication .

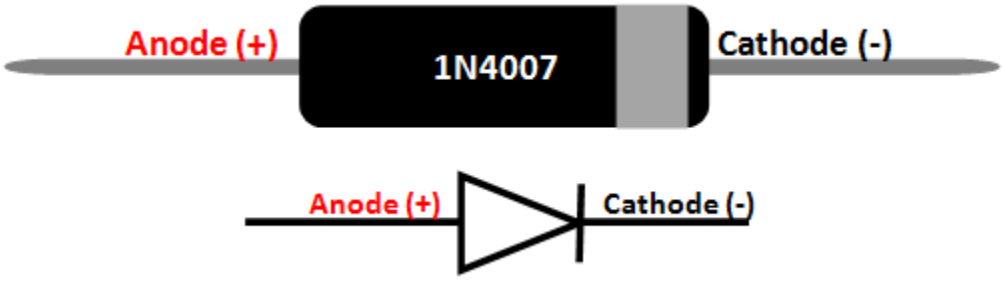


Voltage Regulator



Voltage sources in a circuit may have fluctuations resulting in not providing fixed voltage outputs. A voltage regulator IC maintains the output voltage at a constant value. 7805 IC, a member of 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC). The xx in 78xx indicates the output voltage it provides. 7805 IC provides +5 volts regulated power supply with provisions to add a heat sink.

DIODE (1N4007)



It is a PN junction diode. Diodes can be made by combining two different types of semiconductor e.g. P and N. PN junction is a junction formed between P and N types of semiconductors.1N4007 has a lot of real life applications in Embedded Systems, a few of the major application associated with the particular diode are given below:

- Converters.
- For switching purposes in Embedded systems.

- Free wheeling diodes applications.
- Inverters.
- General purpose rectification of power supplies.
- To avoid reverse current & protect Microcontrollers like Arduino or PIC Microcontroller etc

Other Components and Devices