VISVESVARAYA TECHNOLOGICAL UNIVERSITY

MINI PROJECT REPORT ON

"RF REMOTE ENCODER/DECODER CIRCUIT"

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CERTIFICATE

Certified that the mini project work entitled "**RF REMOTE ENCODER/DECODER CIRCUIT**" carried out by **Poornima R.M (1NH18EC086), N. Lakshmi Prasanna (1NH18EC072), Sneha N.S. (1NH18EC106), Vutukuri Gowtham (1NH18EC122),** bonafide students of Electronics and Communication Department, New Horizon College of Engineering, Bangalore.

The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

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We thank **Dr. Mohan Manghnani**, Chairman of **New Horizon Educational Institution**, for providing necessary infrastructure and creating good environment.

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ABSTRACT

This work presented here is to control independent electrical appliances through RF based remote system. From anywhere with none line of sight round the distance, RF based wireless remote system can change the state of the electrical appliances either in on state or off state. The controlling circuit is made around RF transmitter and RF Receiver modules which are operating at 434 MHz alongside encoder IC HT12E and decoder IC HT12D with few passive components. The four different channels at the encoder are used as input switches and therefore the four channels at the decoder output are connected to the appliances through a relay. Here the transmission technique is amplitude shift keying (ASK) and therefore the circuit is powered with 9 V. The main objective of this work is to create the circuit with none programming skill and to form it work without line of sight requirement using the RF technology.

With advanced technology, people attempt to avail wireless technologies in different roles. during this paper, the RF modules are implemented as modernized wireless system to beat the utilization of wire. RF transmitter and RF receiver are main devices of the system. then LED, transformer, relay, and push buttons are used as supporting components of the system. HT12E and HT12D are mainly used for decoding and encoding the info. The HT12E encoder IC converts the 4-bit data from the 4 data pins that are connected to buttons into serial data. This serial data is shipped to RF transmitter. The RF transmitter transmits this serial data using signals. At the receiver side, the RF receiver receives the serial data. This serial data is shipped to HT12D decoder IC which converts into 4-bit parallel data. The 4 data pins of decoder are connected to LEDs. consistent with the button pushed, the LEDs are often turned ON and OFF meaning that the precise task or function are often administered by mean of remote predefined key. In today's world, there's endless need for wireless control using with transmitter and receiver in standard and modern living.

Keywords: IC HT12E, IC HT12D, RF transmitter, RF receiver.

CHAPTER 1

INTRODUCTION

With all the advancements of technology we have got number of solutions to control four independent home appliances like TV equipment's even we have modern household appliances in which enhances its increasing level to music system ,fan etc. via remote this has made each individual life easier and comfortable operating these manually which has four switches it's a tedious job though problematic at fewer times .

If by just pressing a remote button our work is made simple. By operating at distant place then we have to how importantly the remote works by all these advancement home automations. Now it has fortunately become very common in all our lives. In order to switch on or off one individual has to move towards switch board.

Which is actually an inconvenience even for a normal human being. So, if this manual work is replaced by a single remote control then it would be definitely a boon for aged and physically challenged people. Because if this technique is improvised then it's highly possible for an aged people to do such task like a normal human does.

It's like the work assigned for the same task but it's gets completed by different groups and approaches. By this RF remote many home devices switch can be controlled by our designed system which is so called microcontroller which is the heart of circuit with Android based mobile phone.

Here the implementation of mode of controlling devices is by means of sending command wirelessly via Bluetooth now this marks the efficient wide application in the field of electronics. Also, the IR based remote controls many home appliances as will the with help of microcontroller which has been reported for the same function as RF remote does.

Now coming to another approach is by means of GSM based for the home automation which is easily done by sending small code from a mobile handset as it has a wide coverage area to manage well.

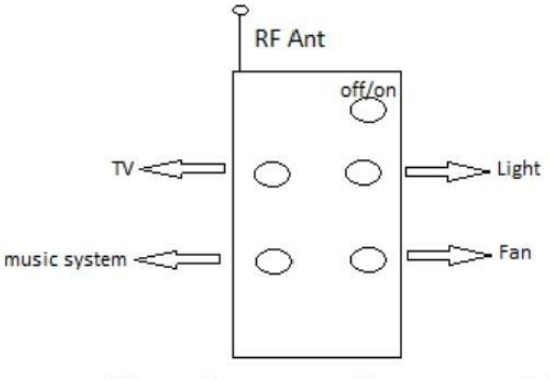


fig 1.1

Pictures above shown are the explanation of four appliances with regards to RF remote control as mentioned in our project point of view. As we know we have basic components transmitter and receiver. In the case of transmitter part again it has two basic components i.e., with encoder IC HT12E also the RF transmitter module which operates at 434 MHz as shown in the figure. Here in the encoder IC section had four main ports which has been used as four input buttons for controlling such appliances.

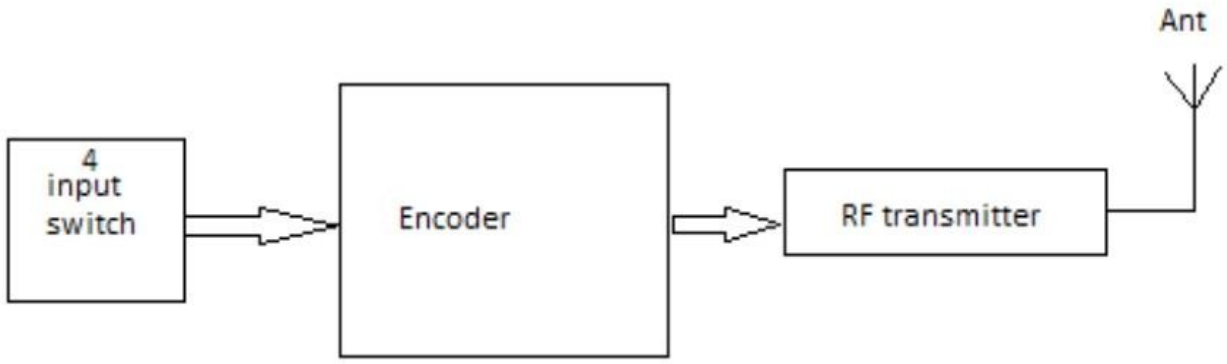


fig 1.2

Another section is receiver part it consists of decoder IC HT12D and RF receiver module as well. As we have four input ports likewise four output ports of decoder IC has been connected which is clearly shown in the figure as well press a button it corresponds output port.

Which will be automatically active as in turn it also activates the relay and it controls the appliances as well. Here we have our input pin remains open which has a value of 1.8V.

If it's closed then it should be connected to ground as shown in the figures mentioned above. IC's i.e., HT12E and HT12D which are of encoder and decoder. It has a wide application in switching that operates at RF frequency wirelessly with all these IC's.

It can transmit and receive 12 bits of parallel data serially. Here the 12 bits data consists of 8 bits address line and 4 bits data even.

This multiple receiver addresses with each single transmitter by addressing different address line given 8 bits security code for the data transmission. Now this transmission is via Radio frequency has many advantages over IR transmission.

However, the RF signal can extend to longer range. Howsoever it's coverage area for operating is too much larger. However, the main objective and intension of this work is to create another system to control multiple appliances by using our RF technology.

CHAPTER 2

LITERATURE SURVEY

This project does this application using wireless concept. one among wireless communication system is RF (Radio frequency) communication system because it's extremely cheap and very easy to implement. the hundreds like lights, motors, heaters, power controlling system and also current through the hundreds are often controlled during this project. we will control all loads at a time from one place (control room) without connecting any physical wire between loads and room.

The RF modules used here are STT-433 MHz Transmitter, STR-433 MHz Receiver, HT640 RF Encoder and HT648 RF Decoder. Switches are provided at the transmitter end, to manage the hundreds which are connected at the receiver side.

The switches are interfaced to the RF transmitter through RF Encoder. The encoder continuously reads the status of the switches, passes the data to the RF transmitter and thus the transmitter transmits the data. At the receiving end, the RF receiver receives this data, gives it to RF decoder.

The device comprises of two sections

- Transmitting part
- Receiving part

Transmitting part

HT12E:

HT12E is an encoder microcircuit of 2^12 series of encoders. They're paired with 2^12 series of decoders to be used in remote system applications. It's mainly utilized in interfacing RF and infrared circuits. The chosen pair of encoder/decoder should have same number of addresses and format. Simply put, HT12E converts the parallel inputs into serial output. It encodes the 12-bit parallel data into serial for transmission through an RF transmitter. These 12 bits are divided into 8 address bits and 4 data bits.

RF Transmitter:

An RF transmitter module may be a small PCB sub-assembly capable of transmitting a radio emission and modulating that wave to hold data. Transmitter modules are usually implemented alongside a micro controller which may provide data to the module which can be transmitted. RF Transmitters are usually subject to Regulatory Requirements which dictate the utmost allowable Transmitter power output, Harmonics, and band edge requirements.

The transmitting part works as a far-off device to send the corresponding data to the receiver section. It further consists of three SPDT (single pole double throw) switch, one Encoder IC (HT12E) and a TX module (433 MHz). These 3 switches are connected to the three data pins of the encoder IC to get a 3-bit data to be transmitted.

Receiving part

HT12D:

The main task of the decoder is to convert the encoded serial data stream obtained from the RF receiver in to parallel form. The decoder that has been utilized is that the HT12D chip from Holtek semiconductors. This chip is manufactured specially for remote applications. The decoder has four data out lines, on VT signal out which is named the valid transmission

RF Receiver:

In this section, the RF signals generated it travels both in transmitter as well as receiver block though there's an opposition. It correctly works and operates at the appropriate frequency of 434Mhz. Which is known however the signals which had been received in transmitter section is passed through RF receiver module

The switches provide either high (+5V) or low (0V) signal levels. At the receiver's part, this 3-bit data is received wirelessly by the decoder IC via RX module then corresponding output is given at the info pins of the decoder. The relays are connected to those data outputs which react only to the high state (+5V) i.e. for (+5V) it'll remain on and for (0V) it'll get off. this system helps to figure appliances even working on 220 AC voltage.

CHAPTER 3

EXISTING SYSTEM AND PROBLEM STATEMENT

EXISTING SYSTEM:

fig 3.1

PROBLEM STATEMENT:

We used to operate TV using non which is attached to it, but now using wireless communication and RF module we can operate it from distance.

In order to avoid problems due to communication through wires in areas like AC's, radio we can replace it With RF modulators.

CHAPTER 4

PROPOSED METHODOLOGY

Block Diagram:

fig 4.1

1. A parallel data is given as input.
2. The IC HT12E will encode it and converts to serial.
3. The serial data will be sent to RF transmitter.
4. Transmitter will transmit data to receiver.
5. The receiver will receive the data and sends to decoder.
6. The decoder IC HT12D decodes the serial data to parallel data.

Circuit Diagram:

Transmitter Section:

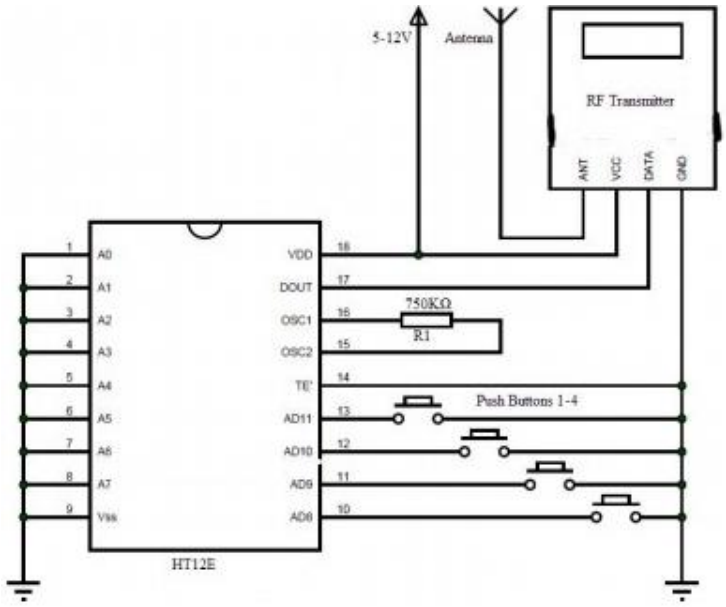


fig 4.2

Receiver Section:

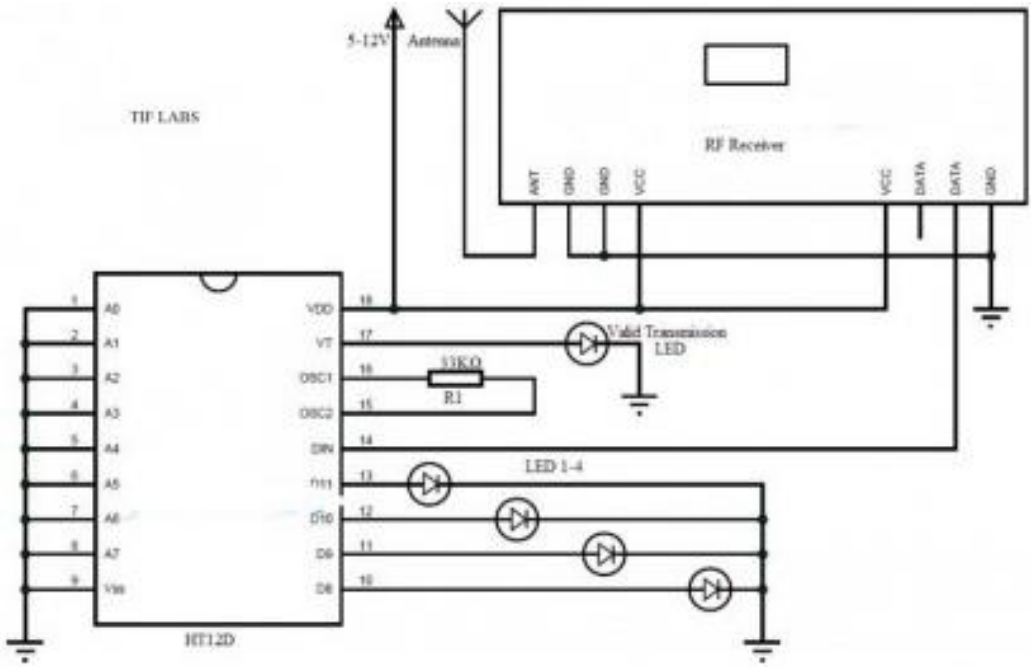


fig 4.3

The operation voltage of RF transmitter is: (3.3v - 5 v).

The operation voltage of RF receiver is: (5v - 9v).

PINOUT OF HT12E (ENCODER)

Pin 1-8: Assignment of receiver direction, it means it can change of addresses for communication individually if is required

9. VSS connected to GND

10-13. AD during this pin is for to transmitting data of three bits (in our case to the receptor)

14. Transmission enable, it is often done connecting this pin to GND

15-16. during this port it need to put an "oscillation resistor" very vital use the worth of 1 M ohm

17. This pin need to be connected to Data pin of our 433 MHz RF transmitter.

18. This pin goes connected to VCC or our positive terminal of our power supply or battery

PINOUT OF HT12D (DECODER)

1-8. Connected to god for enable communication with the HT12E

9. VSS this pin goes to GND.

10-13. "AD" the IC use this pin for the output data that's sanded with the transmitter, in our case lads for indicating receiving info and direct output for to connect a relay or anything you want.

14. "DIN" this pin goes connected to DATA of our 433 MHz RF receiver.

15-16. during this port goes connected a resistor with a worth of 51 k ohms or very very close value like 50 k or 52 k (IMPORTANT: Don't change the value of this resistor if you create that your circuit it doesn't work).

17. No connection.

18. this pin goes to VCC or the positive of our power source.

Working:

The aim of this project is to implement a wireless transmitter and receiver using RF modules. It uses radio signals to transmit the data. The working of the project is as follows. The transmitter and receiver sections are placed at a distance of at least 20 meters.

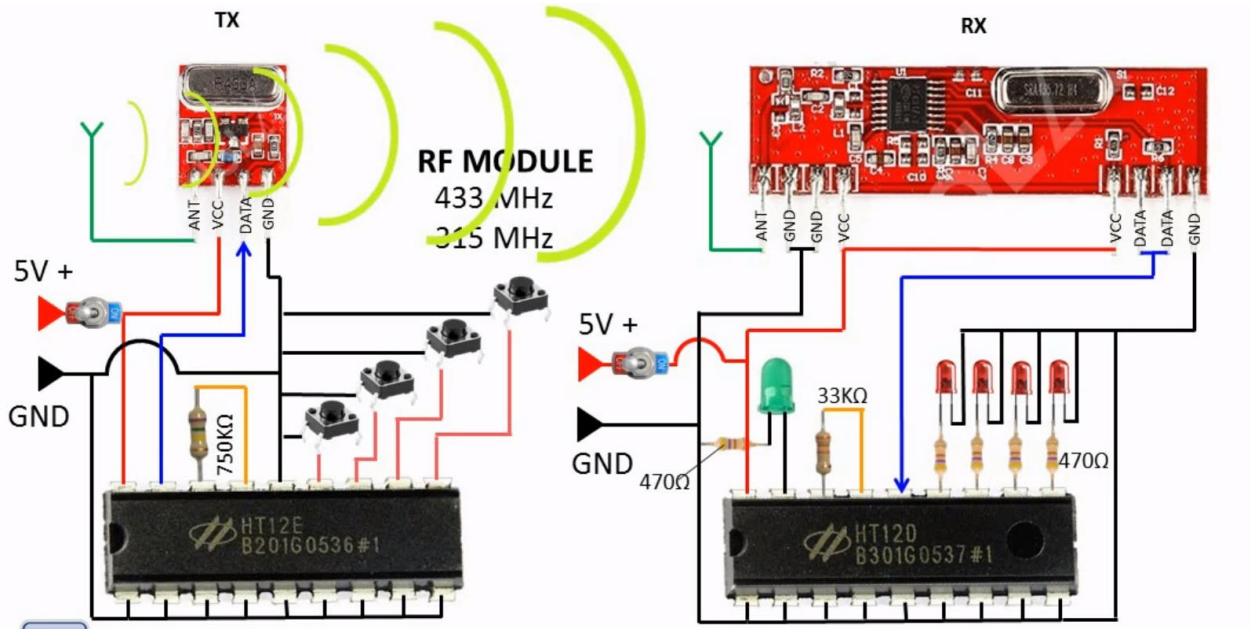
In order to show the working of wireless communication between transmitter and receiver, 4 LEDs at receiver side are controlled by 4 buttons at transmitter section. The HT12E encoder IC converts the 4-bit data from the 4 data pins that are connected to buttons into serial data.

This serial data is sent to RF transmitter. The RF transmitter transmits this serial data using radio signals. At the receiver side, the RF receiver receives the serial data.

This serial data is sent to HT12D decoder IC which converts into 4-bit parallel data. The 4 data pins of decoder are connected to LEDs. According to the buttons pushed, the LEDs can be turned ON or OFF.

The RF module as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz and 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift keying (ASK).

Transmission through RF is better than IR because of many reasons. Mainly, the signal through RF can travel through larger distances making it suitable for long range applications.



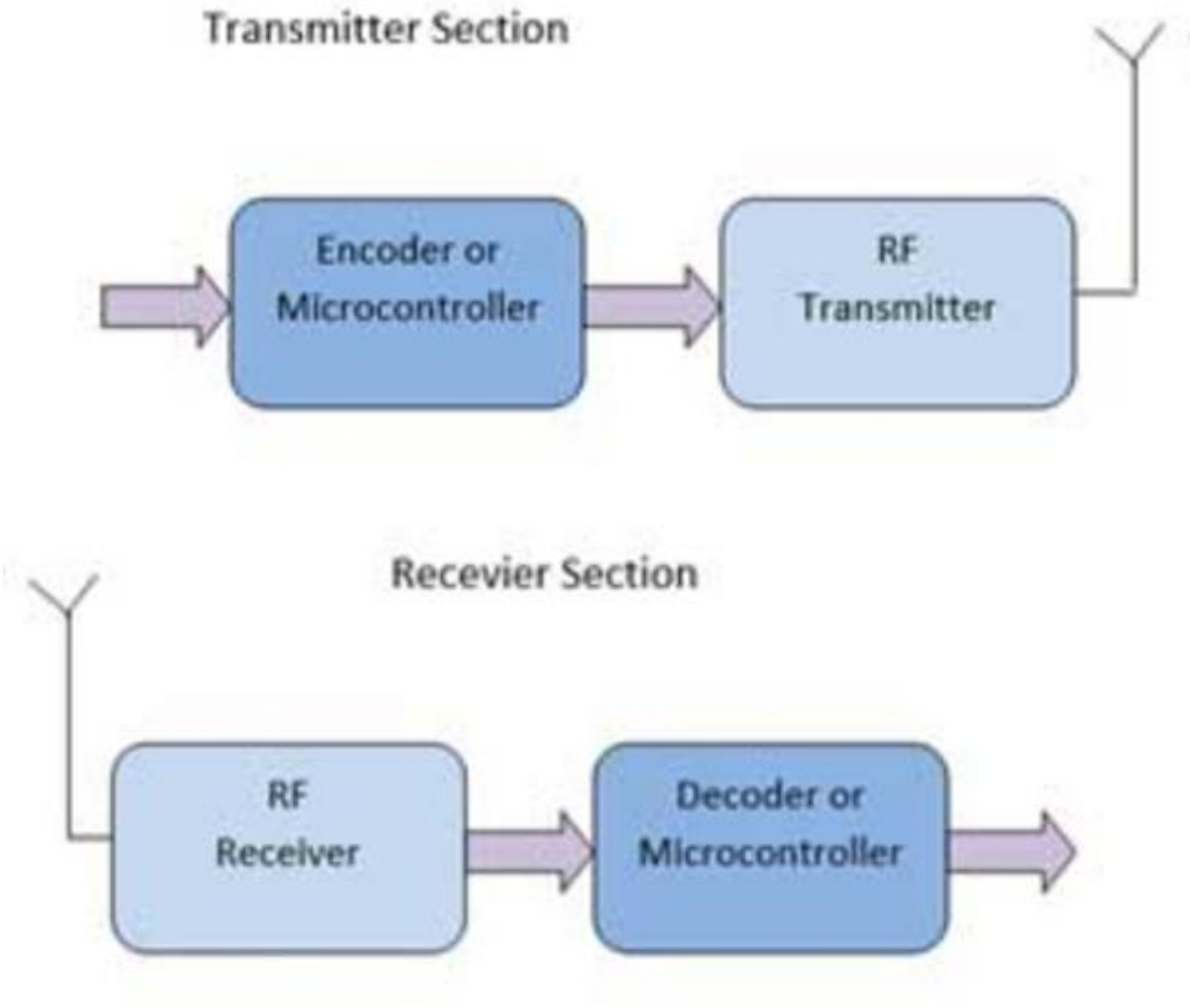
This RF module comprises of a RF Transmitter and a RF Receiver. The transmitter/receiver pair operates at a frequency of 434 MHz An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna. The transmitted data is received by an RF receiver operating at the same frequency as of transmitter.

The RF module is often used along a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by decoder.

We built the circuit on two individual breadboard both being powered by a separate 5V battery. Once we power both the breadboards, we notice that the LED's start glowing. Now, if we press any button on the transmitter breadboard and the respective LED will be turned off in the receiver circuit.

This is because the push button pins are pulled up internally by encoder IC. Hence all the three LED's will glow and when we press a button the da ta pin is connected to ground and so the respective LED on receiver side will be turned off.

Flow Chart:


Transmitter Section
Encoder or Microcontroller
RF Transmitter
Recevier Section
RF Receiver
Decoder or Microcontroller

CHAPTER 5

HARDWARE SPECIFICATIONS

TRANSMITTER SECTION:

It includes the following:

- HT12E encoder
- RF transmitter module
- 4 push buttons
- Bc848 transistor
- LED
- Resistors - 2.2K, 10K.

RECEIVER SECTION:

It includes the following:

- HT12D decoder
- RF receiver module
- Slide switch
- Push button, led, resistors -1K (2), 15K, 22K.

TRANSMITTING PART:

1. HT12E:

HT12E is an encoder microcircuit of 2^12 series of encoders. They're paired with 2^12 series of decoders to be used in remote system applications. It's mainly utilized in interfacing RF and infrared circuits. The chosen pair of encoder/decoder should have same number of addresses and format.

Simply put, HT12E converts the parallel inputs into serial output. It encodes the 12-bit parallel data into serial for transmission through an RF transmitter. These 12 bits are divided into 8 address bits and 4 data bits.

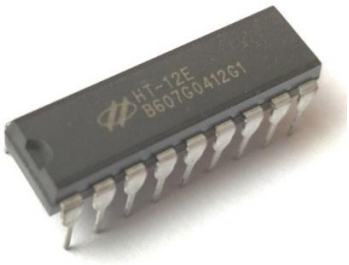


Fig 5.1

HT12E during a position is ready"> is in a position to work in a wide voltage range from 2.4V to 12V and features a built-in oscillator which needs only a little external resistor.

Its power consumption is extremely low, standby current is 0.1μA at 5V VDD and has high immunity against noise. it's available in 18 pin DIP (Dual Inline Package) and 20 pin SOP (Small Outline Package) as given below

Features

- Operating voltage
- 2.4V~5V for the HT12A
- 2.4V~12V for the HT12E
- Low power and high noise immunity CMOS technology
- Low standby current: 0.1μA (typ.) at VDD=5V
- HT12A with a 38kHz carrier for infrared transmission medium
- 18-pin DIP, 20-pin SOP package.
- Minimum transmission word
- Four words for the HT12E
- One word for the HT12A
- Built-in oscillator needs only 5% resistor
- Data code has positive polarity
- Minimal external components
- Pair with Holtek's 2^12 series of decoders.

Pin Name	I/O	Internal Connection	Description
A0~A7	I	NMOS TRANSMISSION GATE PROTECTION DIODE (HT12E)	
AD8~AD11	I	NMOS TRANSMISSION GATE PROTECTION DIODE (HT12E)	Input pins for address/data AD8~AD11 setting These pins can be externally set to VSS open
TE	I	CMOS IN Pull-high	Transmission enable, active low
OSC1	I	OSCILLATOR	Oscillator input pin
OSC2	O	OSCILLATOR	Oscillator output pin
VSS	I	----	Negative power supply, ground
VDD	I	----	Positive power supply

table 5.1

2. RF Transmitter:

An RF transmitter module may be a small PCB sub-assembly capable of transmitting a radio emission and modulating that wave to hold data. Transmitter modules are usually implemented alongside a micro controller which may provide data to the module which can be transmitted. RF Transmitters are usually subject to Regulatory Requirements which dictate the utmost allowable Transmitter power output, Harmonics, and band edge requirements.

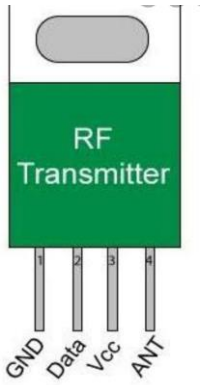


fig 5.2

RF transmitter module it does receives serial data and then transfers to the receiver via an antenna. Which has been connected to the fourth pin of transmitter. It implies that when given the high-power supply in the range of 4.5 mA with 3V voltage supply then we can say that the transmitter is in ON condition

fig 5.3

RECEIVING PART:

1. RF Receiver:

In this section, the RF signals generated it travels both in transmitter as well as receiver block though there's an opposition. It correctly works and operates at the appropriate frequency of 434Mhz. Which is known however the signals which had been received in transmitter section is passed through RF receiver module.

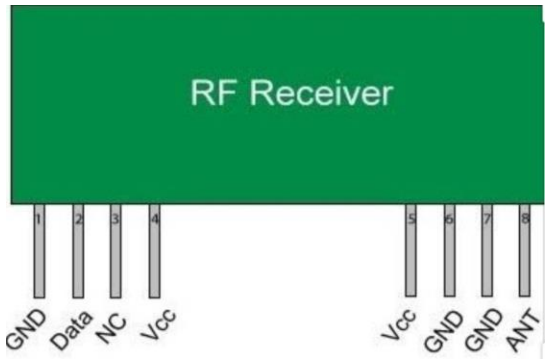


fig 5.4

An RF Receiver module receives the modulated RF signal, and demodulates it. There are two sorts of RF receiver modules: super heterodyne receivers and super-regenerative receivers. Super-regenerative modules are usually low cost and low power designs employing a series of amplifiers to extract modulated data from a carrier. Super-regenerative modules are generally imprecise as their frequency of operation varies considerably with temperature and power supply.

fig 5.5

Features of RF Transmitter and Receiver:

1. Receiver frequency: 433MHz
2. Receiver typical sensitivity: 105Dbm
3. Receiver current supply: 3.5mA
4. Receiver operating voltage: 5V
5. Low power consumption
6. Transmitter frequency range: 433.92MHz
7. Transmitter supply voltage: 3V~6V
8. Transmitter output power: 4~12Dbm

2. HT12D:

The main task of the decoder is to convert the encoded serial data stream obtained from the RF receiver in to parallel form. The decoder that has been utilized is that the HT12D chip from Holtek semiconductors. This chip is manufactured specially for remote applications. The decoder has four data out lines, on VT signal out which is named the valid transmission.

fig 5.6

fig 5.7

Features

- Operating voltage: 2.4V~12V
- Low power and high noise immunity CMOS technology
- Low standby current
- Capable of decoding 12 bits of information
- Pair with Holtek's 2^12 series of encoders
- Binary address setting
- Received codes are checked 3 times
- Address/Data number combination
- HT12D: 8 address bits and 4 data bits
- HT12F: 12 address bits only
- Built-in oscillator needs only 5% resistor
- Valid transmission indicator
- Easy interface with an RF or an infrared transmission medium
- Minimal external components

Pin Description:

Pin Name	**I/O**	**Internal Connection**	**Description**
A0~A11	I	NMOS TRANSMISSION GATE	Input pins for address A0~A11 setting They can be externally set to VDD or VSS.
D8~D11	O	CMOS OUT	Output data pins
DIN	I	CMOS IN	Serial data input pin
VT	O	CMOS OUT	Valid transmission, active high
OSC1	I	OSCILLATOR	Oscillator input pin
OSC2	O	OSCILLATOR	Oscillator output pin
VSS	I	-----	Negative power supply (GND)
VDD	I	-----	Positive power supply

table 5.2

Push Button:

A push-button also pronounced as pushbutton or just simple can spell button. It's a kind of simple sort of mechanism of switch that controls few aspects of a process like our RF remote control or any such types of aspects. Button is made of metal or hard material.

fig 5.8

LED:

A light emitting diode it's a type of semiconductor in which light source emits light when current flows through it. Here the LED plays an essential role of indicating light signifying that the circuit connections done right with respective of our components. Because of electrons which releases an energy in the form of photons.

fig 5.9

Resistors:

It's one of the passive elements. In which two non-terminal electrical components implement electrical resistance. In the section of electronic circuits these resistors are used to lower or deduct the current flow and adjust accordingly to the signal levels. In case or divide voltage, bias active elements same time has to terminate transmission line among others based on the requirements. It dissipates many watts of electrical power resistors which is neon used as a part of motor, generator and so on. Resistors consists of two types…

1.Variable resistors

2.Fixed resistors

Fixed resistors: it has slight changes with respect to time, voltage etc...

Variable resistors: it can adjust for the particular circuit elements such as sensing devices which is best example like in the form of heat, light etc.…

fig 5.10

fig 5.11

Antenna:

An antenna is just called a transducer, which converts frequency (RF) electrical current into an electromagnetic (EM) wave at an equivalent frequency and the other way around. It can work as a transmitter of signals also as receivers them.

fig 5.12

fig5.13

Bread Board:

A breadboard may be a rectangular board with many mounting holes. they're used for creating electrical connections between electronic components and single board computers or microcontrollers like Arduino and Raspberry Pi. The connections aren't permanent and that they are often removed and placed again.

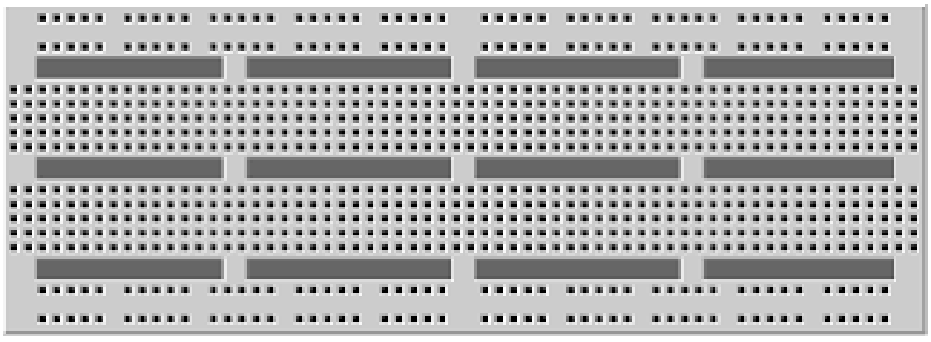


fig 5.14

Battery:

A battery is the conversion of chemical energy into electrical energy. By means of chemical reaction actually chemicals are induced inside the battery. Because it's used regarding to the power-based circuit. A normal battery produces direct current electricity. Which flows through in single direction and same time it doesn't switch back to any of the multiple direction. Also, the battery provides electricity especially in the area where there's no proper power distribution example rural areas. However secondary battery is efficient and worth as it can be reused and rechargeable.

fig 5.15

Connecting Wires:

Connecting wires, it provides a medium to an electrical current. As they can easily pass via from one end to another end in a circuit. Wires are generally made up of copper or aluminum. Because copper is cheap and same time it conducts electricity. In a normal circuit analysis wire comes from one terminal of a power supply which then connects to a switch that determines circuit is open or closed. Its process is to draw power and electricity.

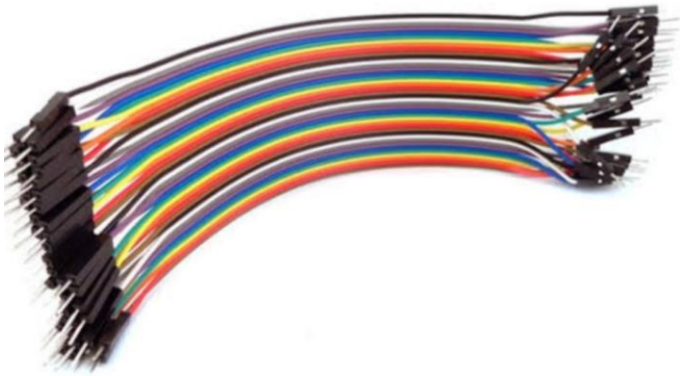


fig 5.16

CHAPTER 6

RESULTS AND DISCUSSION

RESULT:

The system has been implemented step-by-step and, in each step, experimental testing has been made to form sure that there's no error. Moreover, the important thing is to urge expected results. Tests and results of the most steps involved in implementing the system are described as follows.

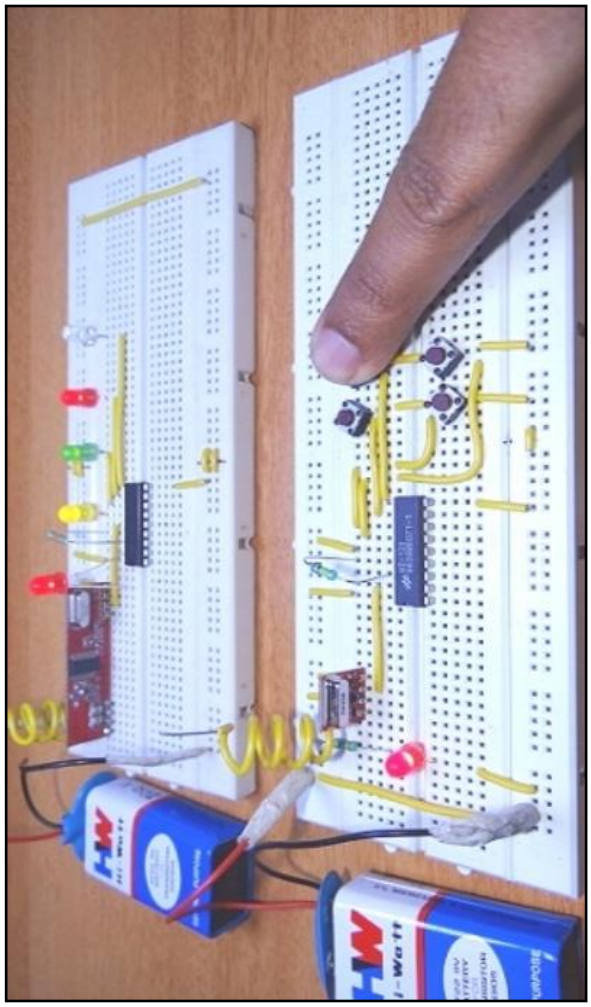


Fig – 6.1

DISCUSSION:

The LED's at the receiver side will be switched ON when we press the push buttons.

- When we press the push button 1 the LED 1 will be switched ON.
- When we press the push button 2 the LED 2 will be switched ON.
- When we press the push button 3 the LED 3 will be switched ON.
- When we press the push button 4 the LED 4 will be switched ON.

In the same way when we release the push button the respective LED will be switched OFF.

The HT12E encoder IC converts the 4-bit data from the 4 data pins that are connected to buttons into serial data.

This serial data is sent to RF transmitter. The RF transmitter transmits this serial data using radio signals. At the receiver side, the RF receiver receives the serial data.

This serial data is sent to HT12D decoder IC which converts into 4-bit parallel data. The 4 data pins of decoder are connected to LEDs. According to the buttons pushed, the LEDs can be turned ON or OFF.

CHAPTER 7

Advantages and Applications

ADVANTAGES:

The main advantages of the RF remote encoder and decoder circuit are

- Standalone operation
- LED indication of signal transmission
- Battery low indication
- Manchester modulation
- Sleep mode

APPLICATIONS:

There are so many applications for RF remote encoder and decoder in that the main application are

- It can be used in general-purpose remote-control applications
- It can be used in burglar alarm systems
- It can used in automotive systems
- It can be used in electronic door locks

CHAPTER 8

Future Scope

Radio frequency which is wireless can be used in communication of the required information makes this very special which we can find many applications of this in the future. As technology advancement is very fast with this RF remote encoder and decoder circuit, we can operate any devices or robots. Instructions given by the person are sensed by RF module will perform operation.

CHAPTER 9

CONCLUSION

CONCLUSION:

To make life simpler technology has a gift to mankind.

In this work, a remote control for multiple LED's is designed, presented and implemented.

The design is durable, robust and sturdy which is built with an available compact RF module and IC's.

Four appliances can be control without the requirement of line of sight.

The relay action which is onnected to the load to be controlled is operated with radio frequency which transmits only when a switch is pressed.

Using different receiver with different addressing mode multiple devices can be control using single remote.

The transmitter circuit is power with 5V.

REFERENCES

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4. http://letslearnelectronics.blogspot.com/2012/07/ introduction-to-encoding-and-decoding_1610.html
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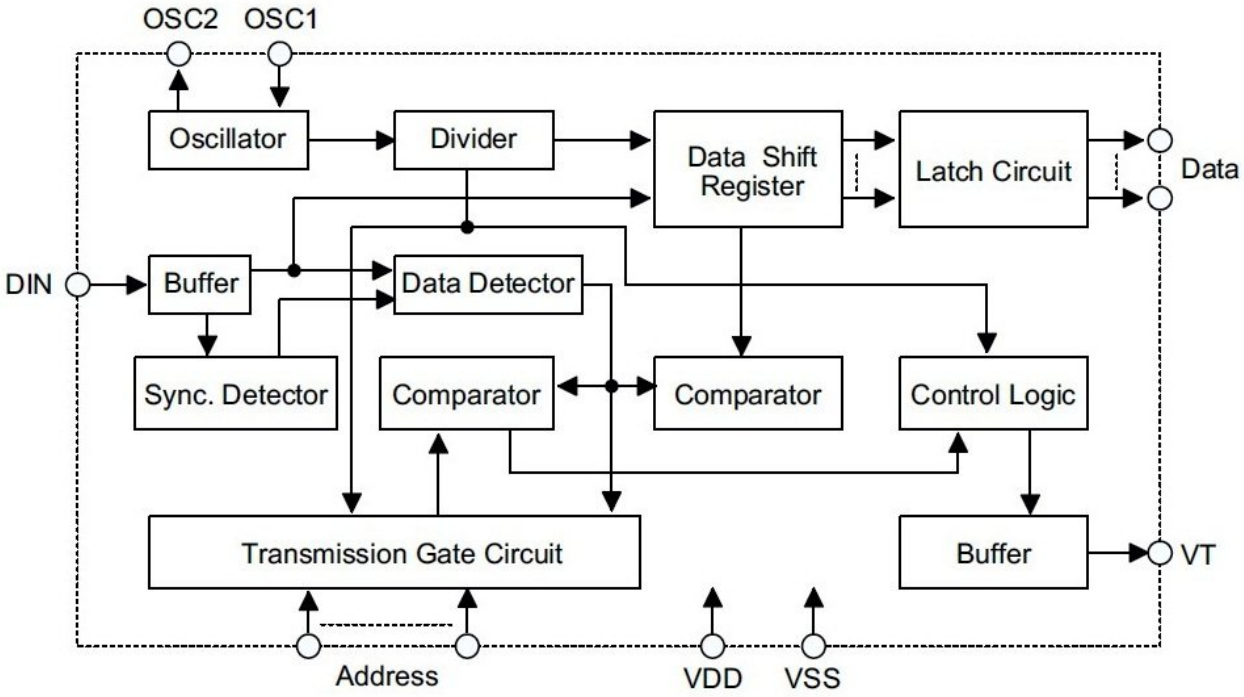
APPENDIX

IC HT12D and IC HT12E Data sheets:

HT12D:

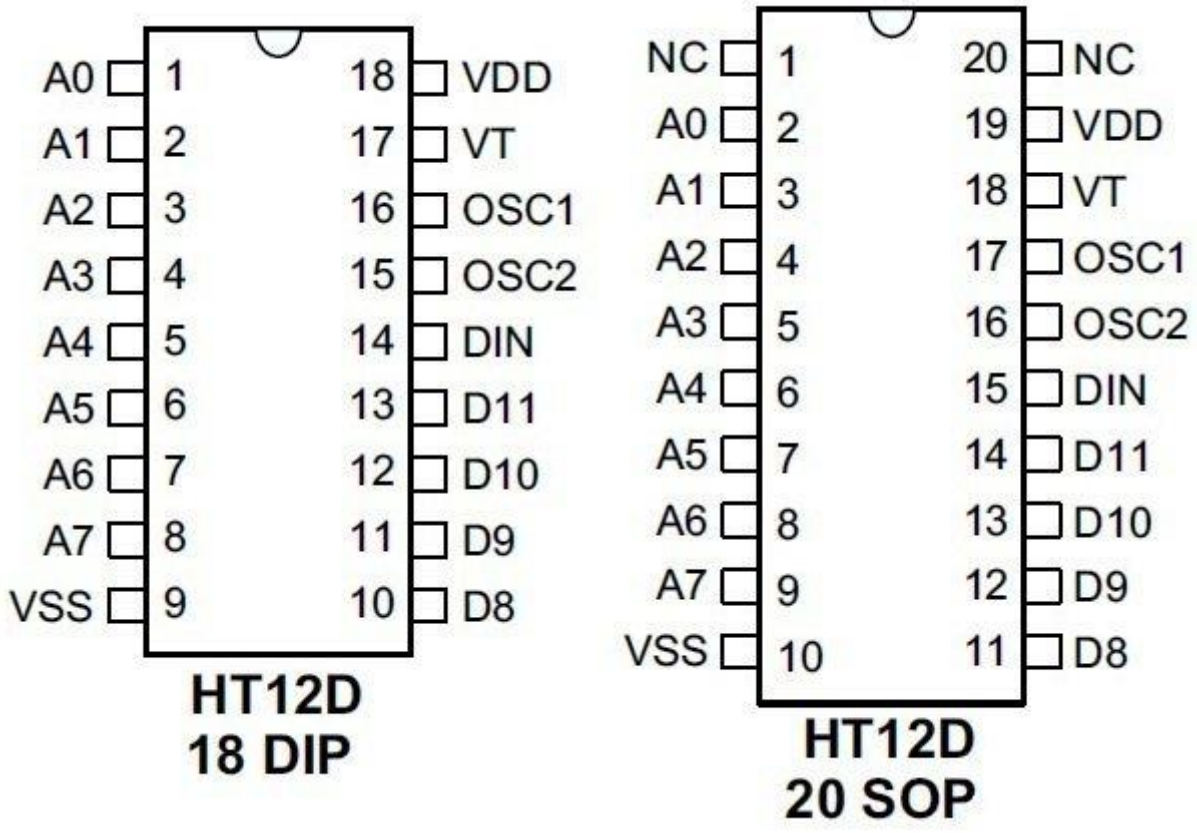
HT12D is a 2^{12} series decoder IC (Integrated Circuit) for remote control applications manufactured by Holtek. It is commonly used for radio frequency (RF) wireless applications. By using the paired HT12E encoder and HT12D decoder we can transmit 12 bits of parallel data serially. HT12D simply converts serial data to its input (may be received through RF receiver) to 12-bit parallel data. These 12-bit parallel data are divided in to 8 address bits and 4 data bits. Using 8 address bits we can provide 8-bit security code for 4-bit data and can be used to address multiple receivers by using the same transmitter.



HT12D – Block Diagram

HT12D is a CMOS LSI IC and is capable of operating in a wide voltage range from 2.4V to 12V. Its power consumption is low and has high immunity against noise. The received data is checked 3 times for more accuracy. It has built in oscillator; we need to connect only a small external resistor. As HT12E, it is available in 18 pin DIP (Dual Inline Package) and 20 pin SOP (Small Outline Package) as given below.

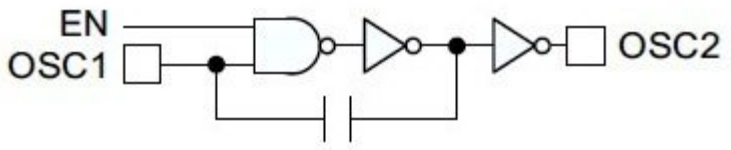
Pin Diagram and Description



HT12D – Pin Diagram

- VDD and VSS are used to provide power to the IC, Positive and Negative of the power supply respectively. As I said earlier its operating voltage can be in the range 2.4V to 12V

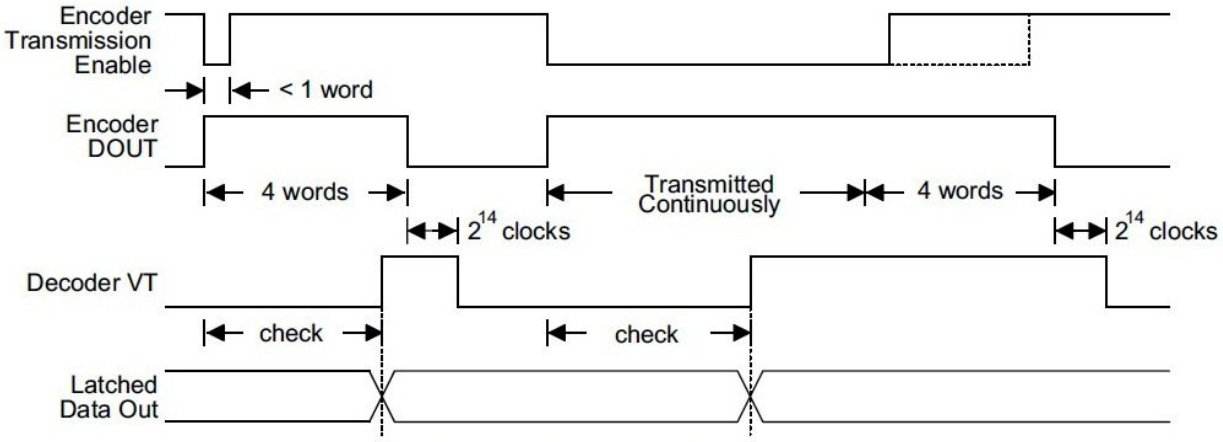
- OSC1 and OSC2 are used to connect external resistor for internal oscillator of HT12D. OSC1 is the oscillator input pin and OSC2 is the oscillator output pin as shown in the figure below.



Oscillator of HT12D

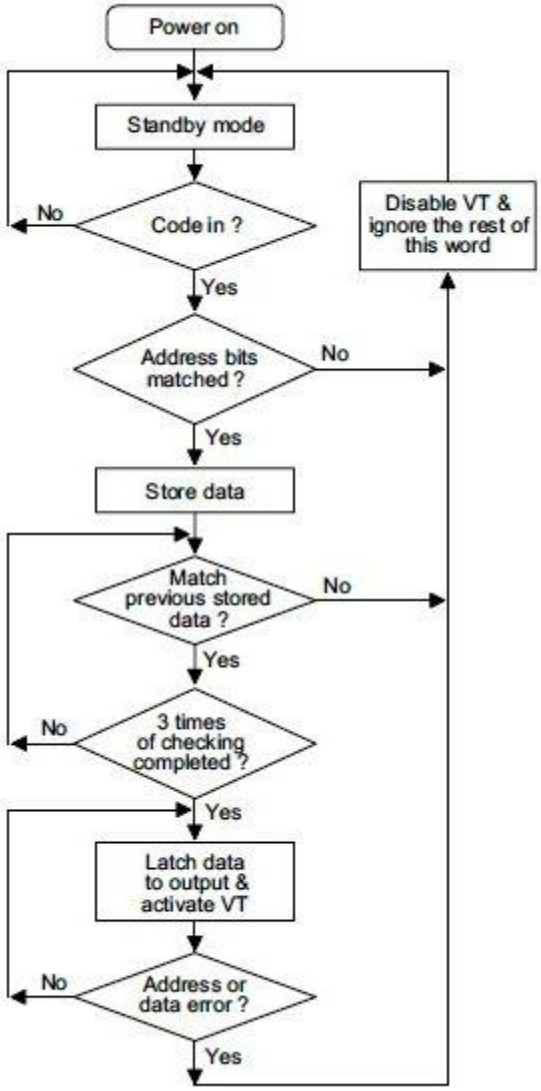
- A0 – A7 are the address input pins. Status of these pins should match with status of address pin in HT12E (used in transmitter) to receive the data. These pins can be connected to VSS or left open.
- DIN is the serial data input pin and can be connected to a RF receiver output.
- D8 – D11 are the data output pins. Status of these pins can be VSS or VDD depending upon the received serial data through pin DIN.
- VT stand for Valid Transmission. This output pin will be HIGH when valid data is available at D8 – D11 data output pins.

Working



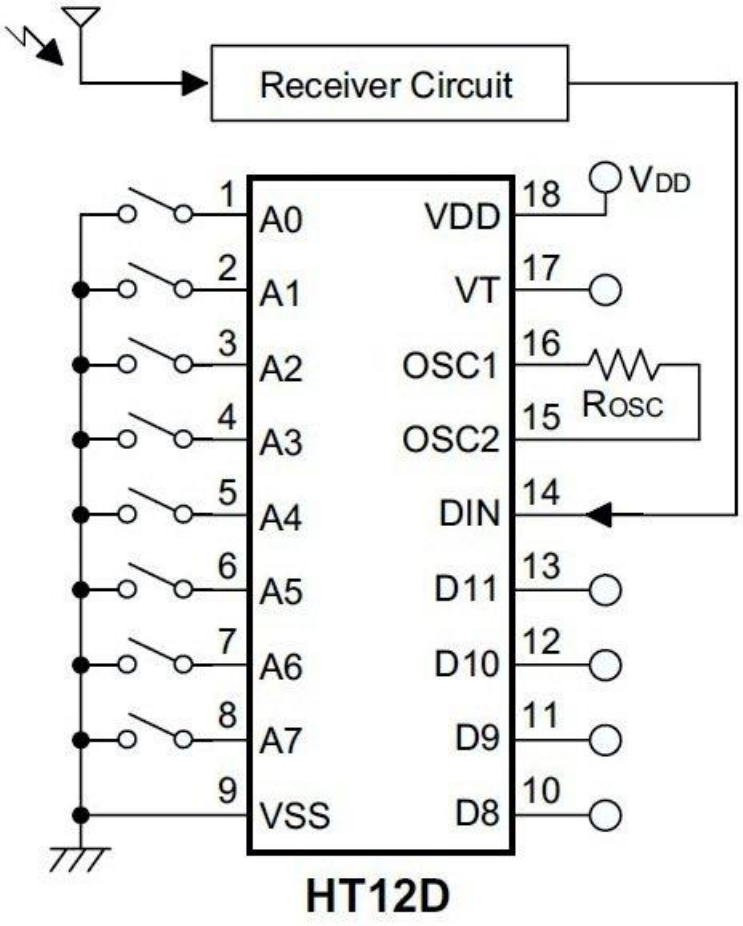
HT12D Decoder Timing

HT12D decoder will be in standby mode initially i.e., oscillator is disabled and a HIGH on DIN pin activates the oscillator. Thus, the oscillator will be active when the decoder receives data transmitted by an encoder. The device starts decoding the input address and data. The decoder matches the received address three times continuously with the local address given to pin A0 – A7. If all matches, data bits are decoded and output pins D8 – D11 are activated. This valid data is indicated by making the pin VT (Valid Transmission) HIGH. This will continue till the address code becomes incorrect or no signal is received.



HT12D Decoder working Flowchart

Typical Application Circuit

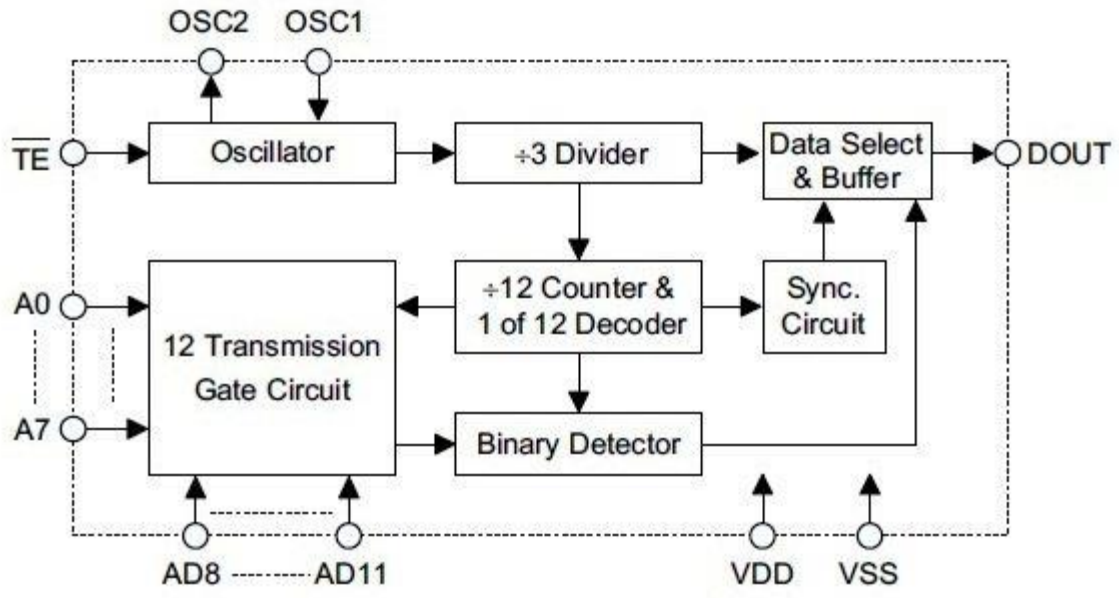


HT12D – Typical Application Circuit

Use Rosc 51KΩ as recommended in the datasheet.

HT12E:

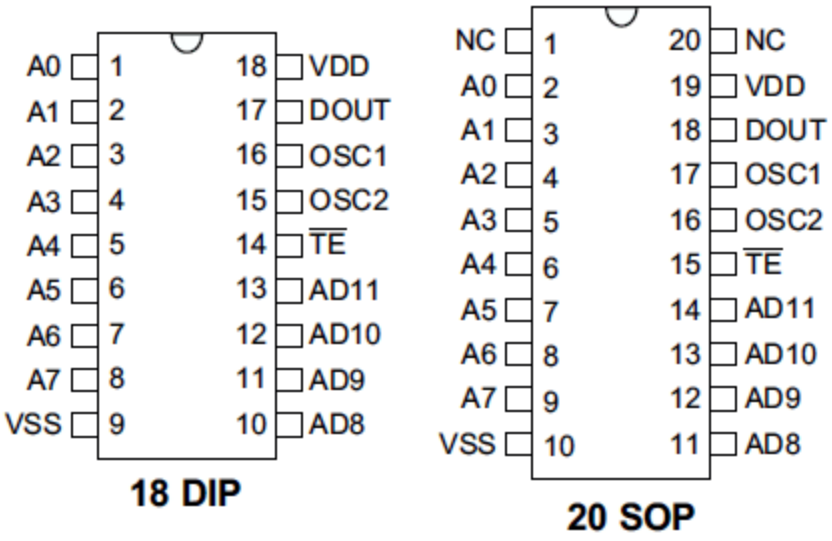
HT12E is a 2^{12} series encoder IC (Integrated Circuit) for remote control applications. It is commonly used for radio frequency (RF) applications. By using the paired HT12E encoder and HT12D decoder we can easily transmit and receive 12 bits of parallel data serially. HT12E simply converts 12-bit parallel data in to serial output which can be transmitted through a RF transmitter. These 12-bit parallel data are divided in to 8 address bits and 4 data bits. By using these address pins, we can provide 8-bit security code for data transmission and multiple receivers may be addressed using the same transmitter.



HT12E – Block Diagram

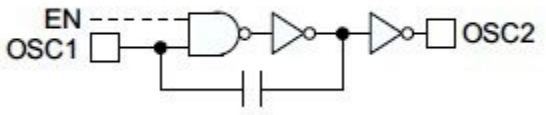
HT12E is able to operate in a wide voltage range from 2.4V to 12V and has a built-in oscillator which requires only a small external resistor. Its power consumption is very low, standby current is 0.1μA at 5V VDD and has high immunity against noise. It is available in 18 pin DIP (Dual Inline Package) and 20 pin SOP (Small Outline Package) as given below.

Pin Diagram and Description



HT12E – Pin Diagram

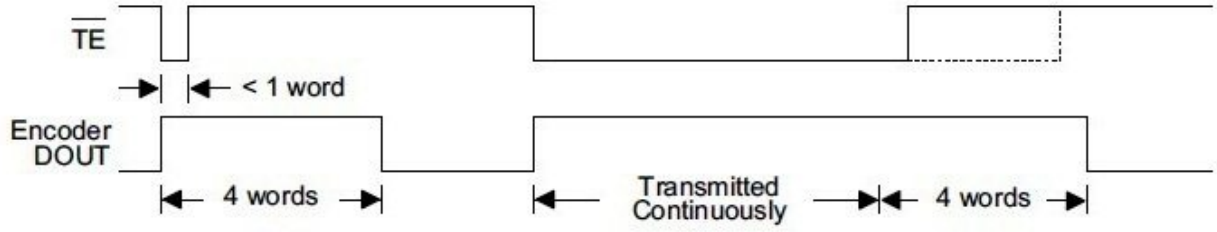
- VDD and VSS are power supply pins which are used to connect positive and negative of the power supply respectively.
- OSC1 and OSC2 are used to connect external resistance for the internal oscillator. OSC1 is the oscillator input pin and OSC2 is the oscillator output pin.



Oscillator of HT12E

- TE is used for enabling the transmission and is an active low input.
- A0 – A7 are the input address pins. By using these pins, we can provide a security code for the data. These pins can be connected to VSS or left open.
- D8 – D11 are the input data pins. These pins can be connected to VSS or may left open for sending LOW and HIGH respectively.
- DOUT – It is the serial data output of the encoder and can be connected to a RF transmitter.

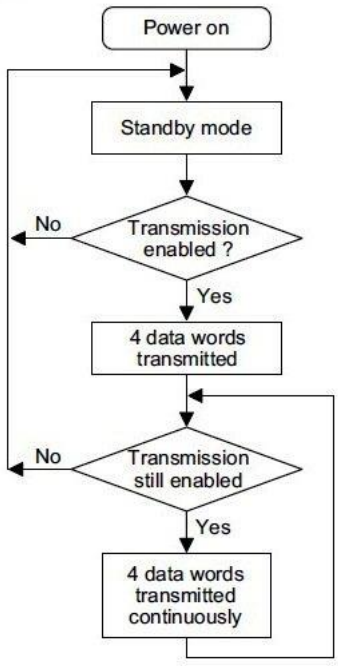
Working



Transmission timing for the HT12E

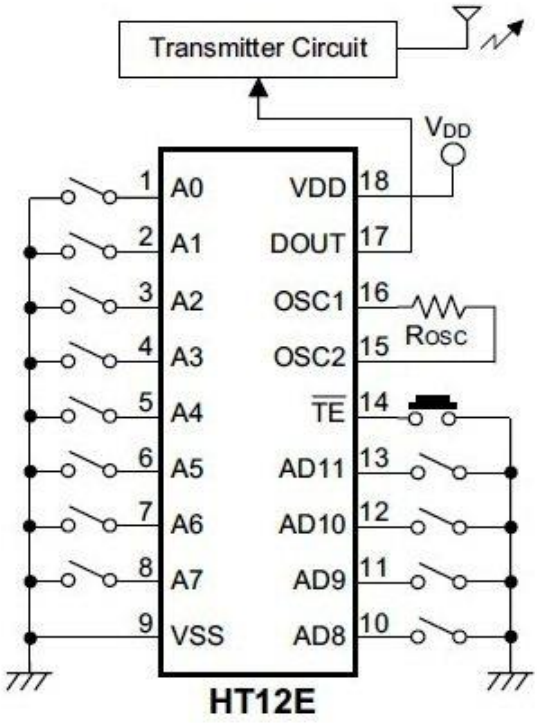
Transmission Timing for HT12E

The HT12E 2^{12} series encoder starts a 4-word transmission cycle upon receiving transmission enable signal on TE input. This output cycle will repeat as long as the transmission is enabled. When the transmission enables (TE) signal switches to HIGH, the encoder output completes the current cycle and stops as shown above. The encoder will be in the Standby mode when the transmission is disabled.



Working Flowchart of HT12E

Typical Application Circuit



Typical Application Circuit – HT12E

Use Rosc = 1.1MΩ as recommended in the datasheet.