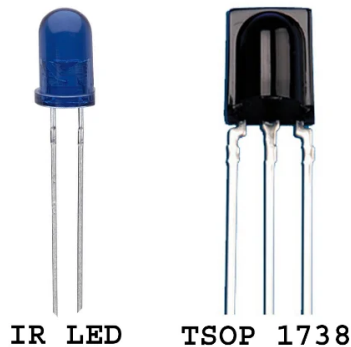




# IR communication using AVR ATmega16/ATmega32.



## Overview of IR Communication



IR LED and TSSOP1738 receiver

IR communication uses IR (Infrared) waves from the electromagnetic spectrum.

IR waves are the waves in the frequency range of 300 GHz to 430 THz and having wavelengths in the range of around 700 nm to 1mm.

Communication between remote and television is an example of IR communication.

An IR LED is used to transmit data wirelessly in digital form (0 – LED OFF or 1 – LED ON).

An IR photodiode or IR phototransistor receives this data. The IR photodiode or IR phototransistor gives different current values according to the intensity of light.

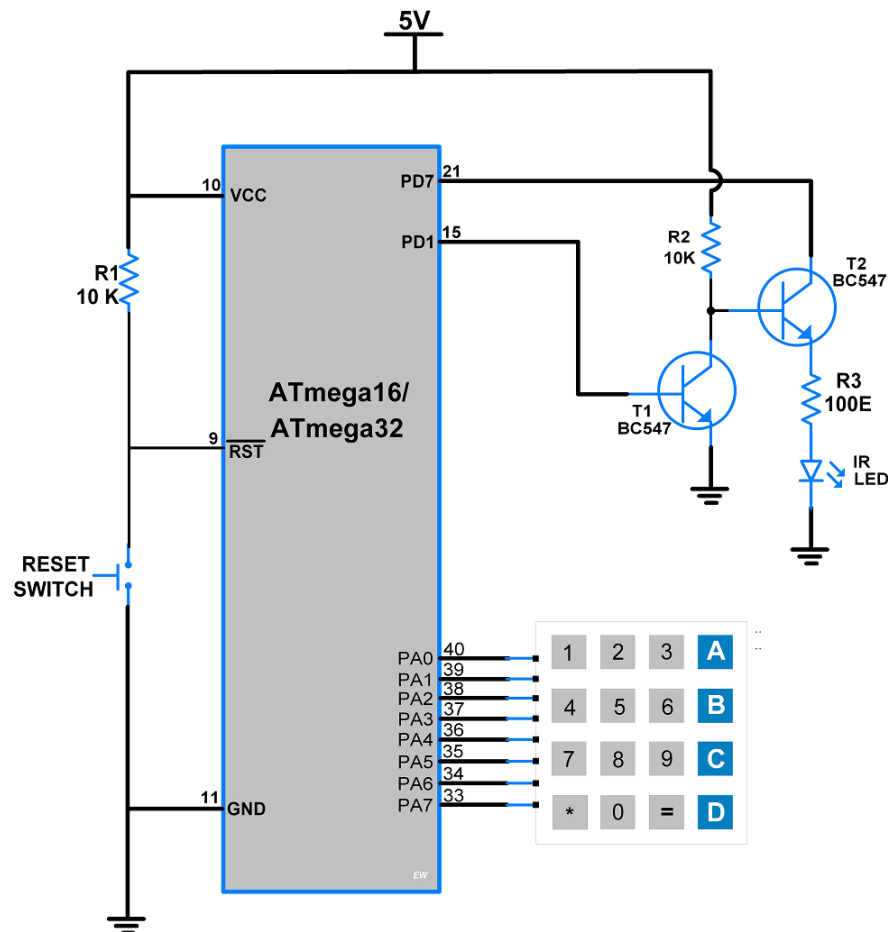
[Platforms \(/explore\)](#)[Projects \(/projects\)](#) is possible to modulate the data transmitted and there are special decoder IR projects available ([/projects](#)) to receive the modulated data.

For more information about IR communication, refer to the topic **IR Communication** (<http://electronicwings.com/sensors-modules/ir-communication>) in the sensors and modules section.

## IR Communication using ATmega16/32 Microcontroller

Let's build IR communication with IR LED and TSOP1738 by interfacing them with AVR ATmega16. In this example, we are going to interface the keypad at the transmitter end to transmit keys and display them at the receiver end.

### IR LED Interfacing With ATmega16/32

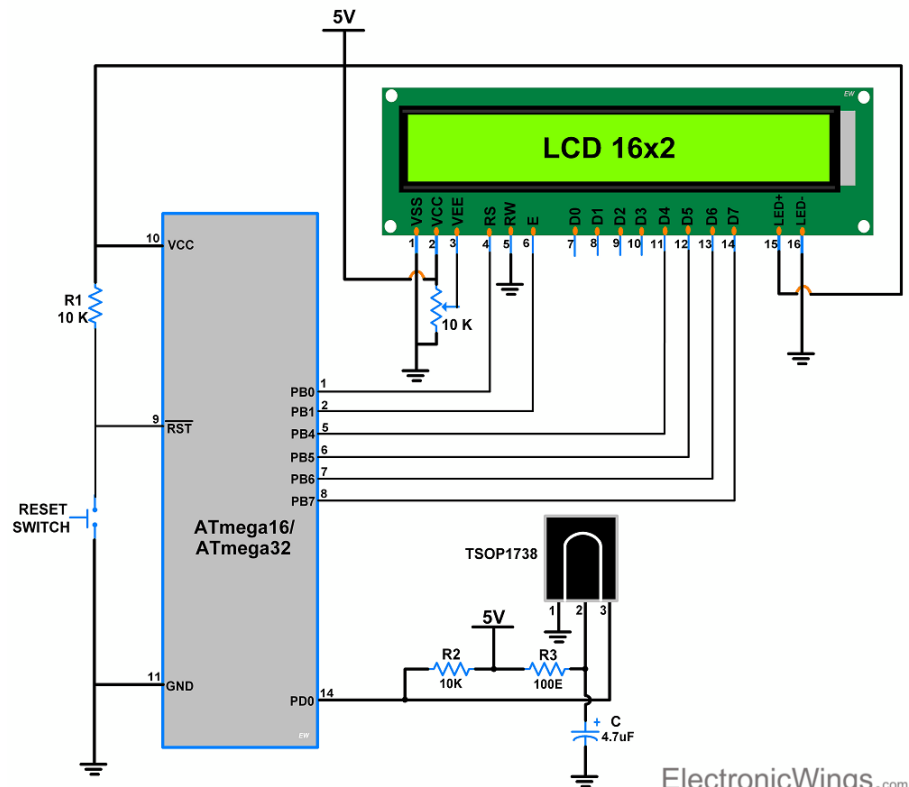


Interfacing IR LED With ATmega 16/32 As IR Transmitter

1. Connect serial data pin PD1 (TXD) to the base terminal of transistor T1, and 38kHz frequency generated at pin PD7 connected to the collector terminal of transistor T2.
2. Here transistor T1 is acting as an inverter and transistor T2 is acting as a switch. The output of transistor T2 is serial data modulating at 38kHz as shown



## TSOP1738 Interfacing With ATmega16/32



Interfacing TSOP1738 With ATmega 16/32 As IR Receiver

1. Connect LCD 16x2 display at PORTB as shown in the figure above.
2. Connect TSOP1738 to the (RXD) PD0 pin of PORTD as per other peripheral of the above connection.

## Programming of IR Communication

### Transmitter

#### Steps

1. Attach Keypad.h and USART\_RS232\_H\_file.h library.
2. Generate 38kHz frequency using timer interrupt at PD7 pin.
3. Using the keyboard find which key is pressed and assign the data using a switch case, for that key to transmit over serially.
  - Here we first send the special character '\$'.
  - Then send the actual data, and then send the invert of actual data.

## IR Transmitter Code for Atmega16



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\*/

```
* IR_Serial_Transmitter.c
*/

#define F_CPU 8000000UL
#include <avr/io.h>
#include <avr/interrupt.h>
#include <util/delay.h>
#include "USART_RS232_H_file.h"
#include "Keypad.h"
char g=0;

ISR(TIMER0_OVF_vect)
{
    g = ~g;
    if (g!=0)
        PORTD |= (1<<7);
    if (g==0)
        PORTD &= ~(1<<7);
}
```

## Receiver

### Steps

1. Attach LCD16x2\_4bit.h and USART\_Interrupt.h library from the given below.
2. Here use the USART serial receive interrupt.
  - When data received, check the first special character is '\$' if yes then counter increment by one.
  - Then take the second data and third inverted data and store on two different variables.
  - Here cross-check the data and invert data is received correctly or not by using logical operation (Here we use logical OR operation). If it is correct, then display the received data otherwise do not display.

## IR Receiver Code for Atmega16

[Platforms \(/explore\)](#)

\* IR\_Serial\_Receiver.c  
 Projects (/projects)  
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<http://www.electronicwings.com>  
 \*/

```
#define F_CPU 8000000UL
#include <avr/io.h>
#include <avr/interrupt.h>
#include <util/delay.h>
#include "USART_Interrupt.h"
#include "LCD16x2_4bit.h"
char check,data,invdata,count=0;

ISR(USART_RXC_vect)
{
    if(count == 0)
    {
        if (USART_RxChar() == '$')/* Check special character '$' */
            count++;                /* If yes, increment count by 1 */
    }
}
```

## Video of IR Communication using AVR ATmega16 Controller



Components Used

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ATmega 16  
ATmega 16

X 1

(https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA16L-8PU?qs=%2Fha2pyFaduiGCJtTvs2wv8fVZbVAaLu7lq%2FglTS0tALAx6fMenLvg%3D%3D&utm\_source=electronicswing&utm\_medium=display&utm\_campaign=mouser-componentslisting&utm\_content=0x0)

Datasheet (/components/atmega-16/1/datasheet)

Atmega32  
Atmega32

X 1

(https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA32-16PU?qs=aqrrBurbvGdpkmgj7RWmsQ%3D%3D&utm\_source=electronicswing&utm\_medium=display&utm\_campaign=mouser-componentslisting&utm\_content=0x0)


Datasheet (/components/atmega32/1/datasheet)


Components Used

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**BC547 TRANSISTORS**  
BC547 TRANSISTORS


X 4

 [https://www.mouser.in/ProductDetail/ON-Semiconductor-Fairchild/BC547BTA?qs=TABiY4F6Vcf01oKZdNLa0w%3D%3D&utm\\_source=electronicswings&utm\\_medium=display&utm\\_campaign=mouser-componentslisting&utm\\_content=0x0](https://www.mouser.in/ProductDetail/ON-Semiconductor-Fairchild/BC547BTA?qs=TABiY4F6Vcf01oKZdNLa0w%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

 [Datasheet \(/components/bc547-transistors/1/datasheet\)](/components/bc547-transistors/1/datasheet)


**4x4 Matrix Keypad**  
4x4 Matrix Keypad

X 1

 [https://www.mouser.in/ProductDetail/Adafruit/3844?qs=qSfuJ%252Bfl%2Fd6WS5%252BJGim1hw%3D%3D&utm\\_source=electronicswings&utm\\_medium=display&utm\\_campaign=mouser-componentslisting&utm\\_content=0x0](https://www.mouser.in/ProductDetail/Adafruit/3844?qs=qSfuJ%252Bfl%2Fd6WS5%252BJGim1hw%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

**LCD16x2 Display**  
LCD16x2 Display

X 1

 [https://www.mouser.com/ProductDetail/Adafruit/1447?qs=XAKIUOoRPe6ACImsjw7y7g%3D%3D&utm\\_source=electronicswings&utm\\_medium=display&utm\\_campaign=mouser-componentslisting&utm\\_content=0x0](https://www.mouser.com/ProductDetail/Adafruit/1447?qs=XAKIUOoRPe6ACImsjw7y7g%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)






# Components Used


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TSOP1738 Infrared Receivers  
Infrared Receivers 38kHz IR Receiver

X 1



(https://www.mouser.in/ProductDetail/Vishay-Semiconductors/TSOP13438?qs=%2Fha2pyFadugIU6ecBdcHKb1p%252B7CWVvX5dxF5gqwyrDVZo%2FW%252Bj4XhCw%3D%3D&utm\_source=electronicswings&utm\_medium=display&utm\_campaign=mouser-componentslisting&utm\_content=0x0)



Datasheet (/components/tsop1738-infrared-receivers/1/datasheet)

# Downloads

<div><div>&gt;-</div><div>IR Serial Transmitter Project File</div></div>	<div>Dow (/api/download/platform-attachment/192)</div>
<div><div>&gt;-</div><div>IR Serial Receiver Project File</div></div>	<div>Dow (/api/download/platform-attachment/193)</div>
<div><div></div><div>Datasheet of TSOP1738</div></div>	<div>Dow (/api/download/platform-attachment/194)</div>

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