

# HKN Induction Project

Fall 2009

**Title:** IR Remote Switch Circuit

**Brief Description:** This circuit lets you turn an LED on/off from a distance by using an ordinary TV/Stereo remote control. Practically, this can be used to control power to any device in your house such as lamps with appropriate load driving enhancements.

**Parts in each kit:**

1. TSOP32238 Infrared Receiver
2. 74HC74 Dual D Flip Flops
3. 14 pin IC socket
4. Ceramic capacitor 0.001uF
5. Electrolytic capacitor 1uF (x2)
6. Resistors: 1.2M Ohm, 3M Ohm, 470 Ohm
7. LED
8. 3 cell Battery holder (batteries not included)
9. Perforated soldering board
10. This document.

Any household remote control can be used to control the circuit. These are not included with the kit, but we will have one at our office in case you don't have access to one at home.

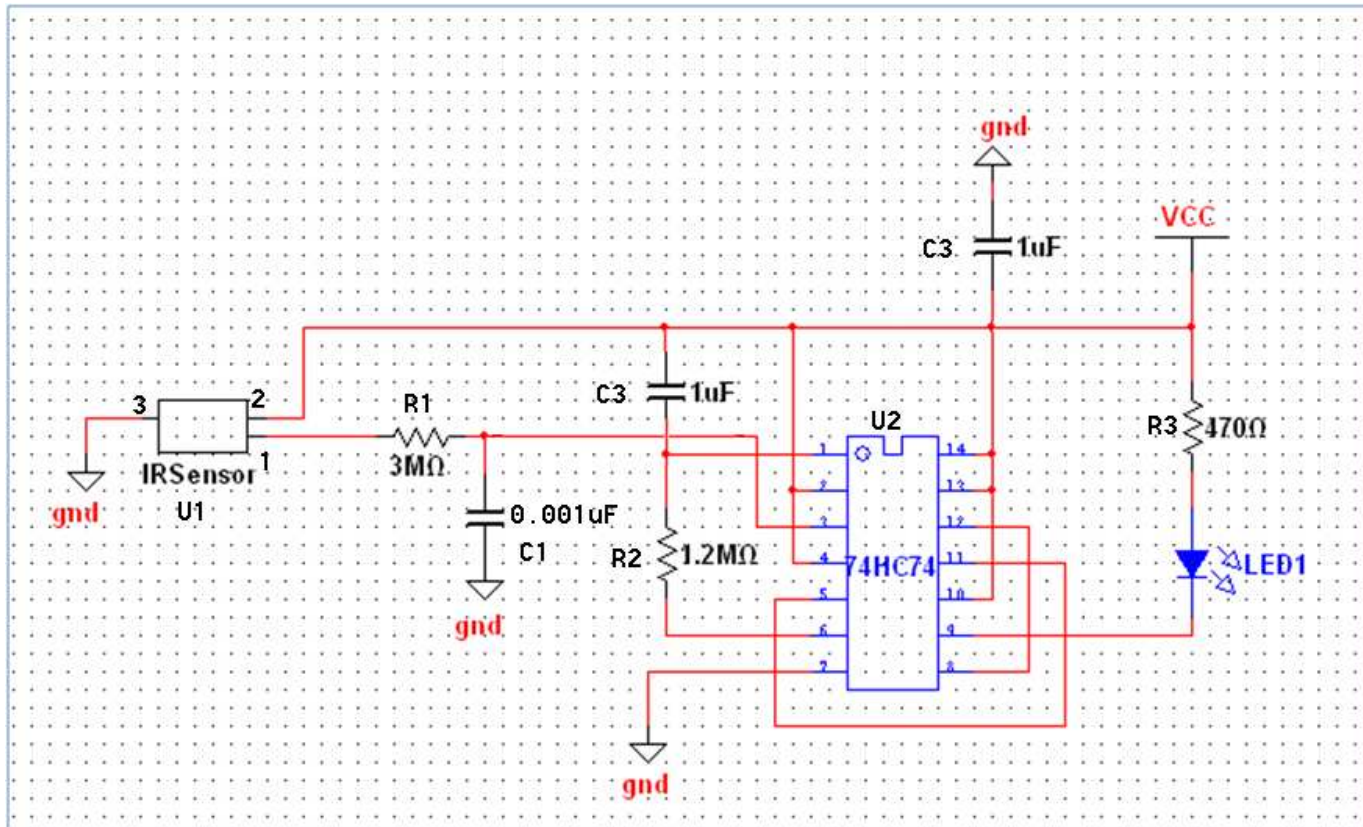
The project has been tested, and a prototype is in our office for you to take a look.

**Original Source:** [http://www.aaroncake.net/CIRCUITS/IR\\_Remote\\_Switch\\_Circuit.asp](http://www.aaroncake.net/CIRCUITS/IR_Remote_Switch_Circuit.asp) (The original circuit has been modified to strip out all AC electronics, including the Zener Diode based power supply and the optoisolator+triac based driver, which have been replaced with batteries and an LED load respectively. The modified schematics are included with the kits.)

For working on the project, please use the lab **NH148A** when it is available. Please take adequate safety precautions while soldering and testing the circuit.

The perforated soldering boards and LEDs were donated by the lab.

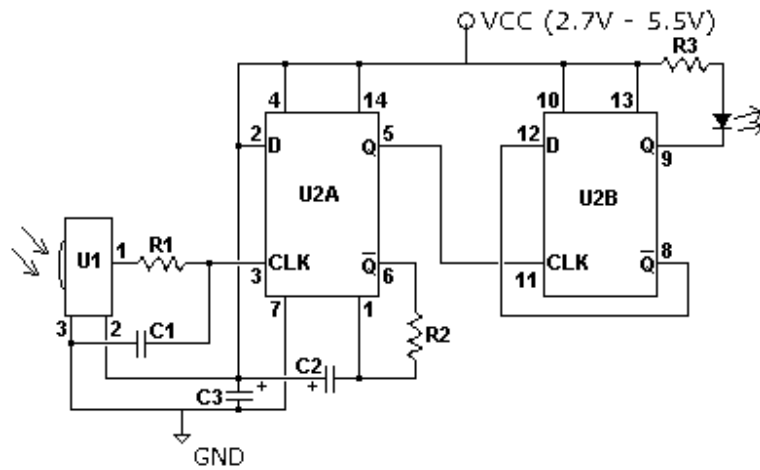
Schematic:



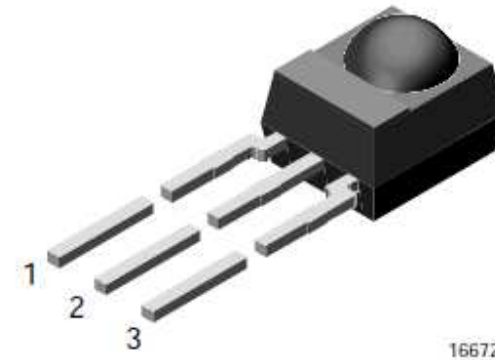
BOM:

U1	TSOP32238	U2	74HC74
R1	3M Ohm	R2	1.2M Ohm
R3	470 Ohm	C1	0.001uF Ceramic
C2	1uF Electrolytic	C3	1uF Electrolytic

Alternate schematic:



Adapted from:  
[http://www.aaroncake.net/CIRCUITS/IR\\_Remote\\_Switch\\_Schematic.gif](http://www.aaroncake.net/CIRCUITS/IR_Remote_Switch_Schematic.gif)



TSOP32238 Pinout

BOM:

U1	TSOP32238	U2	74HC74
R1	3M Ohm	R2	1.2M Ohm
R3	470 Ohm	C1	0.001uF Ceramic
C2	1uF Electrolytic	C3	1uF Electrolytic

## **Description:**

The TSOP32238 is an Infrared receiver that is commonly used in remote controlled household appliances. Remotes send out command codes on a modulation frequency commonly between 36KHz to 42KHz, depending on the manufacturer. This IR receiver has a band pass filter centered at 38KHz which is good enough for catching signals from all kinds of remotes. It rejects DC IR rays coming from sources like sunlight, and also spurious pulse generated by fluorescent lights. It has a built in demodulator that sends out the demodulated command code pulses at its output pin. The output pin is active low, and is normally high when no IR signal is present.

Every time a key is pressed on the remote, a code sequence is demodulated by the IR receiver. This sequence is made up of several pulses, which we are not interested in decoding. If this signal is directly used to control the device, it will turn on and off several times during a single key press. To overcome this, a simple RC low pass filter is connected to the IR receiver's output to average out the signal. So a sequence of pulse appears as a single high-low-high transition at the filter output.

A toggle flip flop has been designed using the two clocked D Flip Flops with Set & Reset. Every key press on the remote provides a clock pulse to the T(Toggle) flip flop causing it to toggle its output state. Please refer to a text on digital logic for details.

The output of the T flip flop is connected to an LED which turns on and off. The LED load can be replaced with an opto-isolator driving a triac, which can in turn drive a heavy AC load.

## **Additional Instructions:**

- Carefully review the circuit diagram, and pin outs of the IR receiver when soldering.
- Do not overheat the IR module when soldering its leads.
- Mount the IR module near an edge with its sensor dome pointing outwards.
- Use the supplied IC socket while soldering. Do not solder the IC directly to the board, or solder with the IC present in the socket.

## **Links to product datasheets:**

TSOP32238 Infrared Receiver : <http://www.vishay.com/docs/81747/tsop322.pdf>

74HC74 Dual D Flip Flops : <http://www.onsemi.com/pub/Collateral/MC74HC74A-D.PDF>

## **References:**

Original circuit: [http://www.aaroncake.net/CIRCUITS/IR\\_Remote\\_Switch\\_Circuit.asp](http://www.aaroncake.net/CIRCUITS/IR_Remote_Switch_Circuit.asp)

Soldering Guide: [http://www.apogeekits.com/electronic\\_tutorials.htm](http://www.apogeekits.com/electronic_tutorials.htm) (relevant pages included)