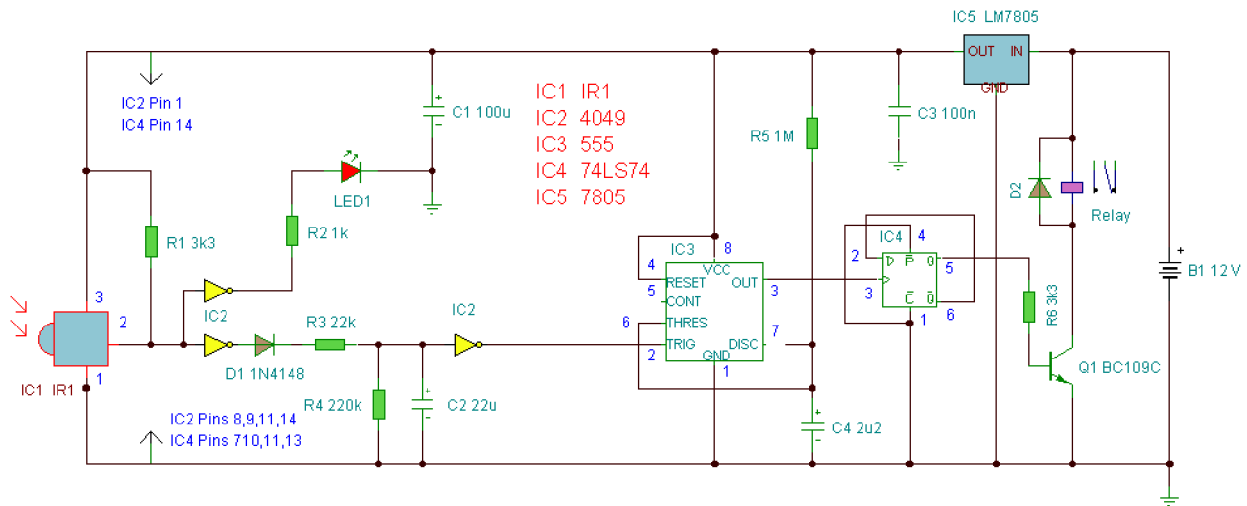


Infra Red Switch

Description:

This is a single channel (on / off) universal switch that may be used with any Infra Red remote control using 36-38kHz. (This is a very common remote handset frequency).



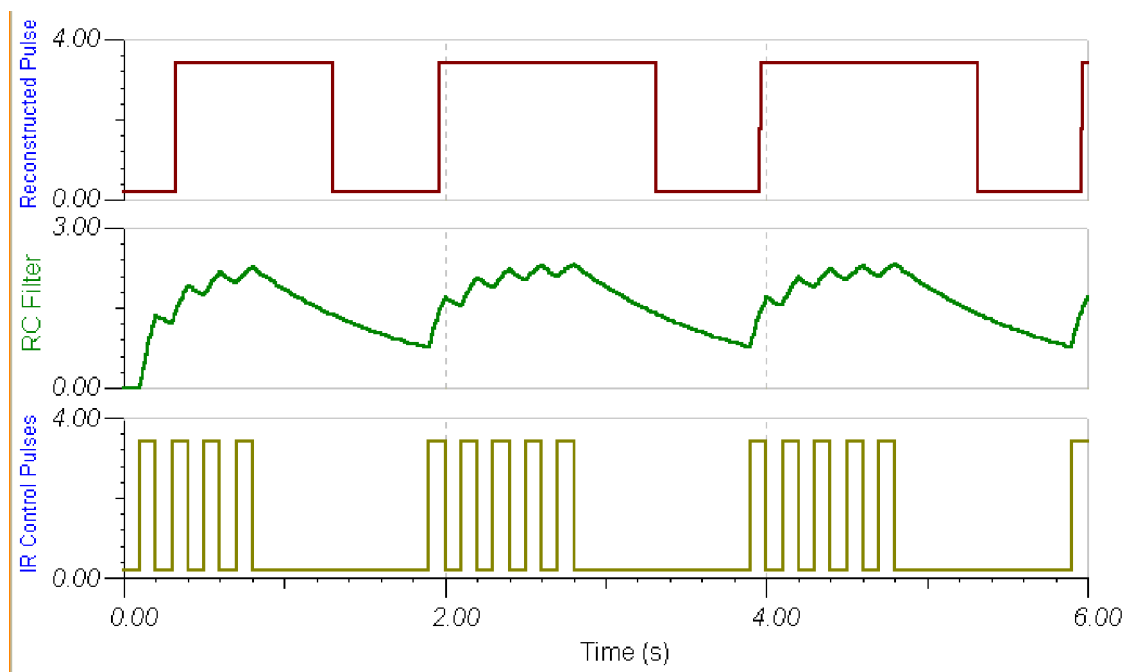
Notes:

Any "button" of any remote control may be used to work this universal switch. The button must be pressed for about one and a half seconds (determined by R3 and C2) before the relay will operate. The circuit will remain in this state (latched) until reset. To reset, any button is pressed on the remote handset and held for a short duration.

For example, if you were watching TV, you could press and hold any button on the TV remote to trigger the circuit. In order not to change channel, you could press the button of the channel you are watching. You can connect anything to the relay, for example a lamp, but make sure that the relay contacts can handle the rated voltage and current.

Circuit Operation:

IC1 is an Infra Red module. IR modulated pulses are received and buffered by this IC. It has a standard TTL output, the output with no signal is held high by R1. One gate of a CMOS inverter drives LED1 as a visible switching aid. Another gate buffers the signal and applies it to the time constant circuit, comprising R3,C2,R4 and D1. C2 charges via R3, and discharges via R4, D1 prevents quick discharge via the low output impedance of the CMOS buffer. The time taken to charge a capacitor is the product of resistance and capacitance, more commonly known as the RC time constant. At one RC a capacitor will only charge to 63% of the supply voltage. It takes 5 RC's for a capacitor to reach 99% charge. In this circuit the capacitor charge has to reach the logic threshold of the CMOS inverter. As the power supply is 5 Volts, the input threshold is around 3.6V, which takes about 3RC's or about 1.5 seconds. Once reached the inverter triggers the 555 timer and operates the flip flop. A simulation of received pulses, filtering and output pulse is shown below. Note that this is not from the actual circuit (in which case the reconstructed pulse would be high for the duration of the 555 monostable) but only a spice simulation.



The pulses are further buffered and contain "jagged edges" as shown above. These edges are produced by the modulated IR data, and have to be removed. This is achieved using a 555 timer wired as a monostable, IC3, having an output pulse duration R5, C4. A clean output pulse is produced to activate the bistable latch, IC4. This is a D type flip flop, built with a TTL 7474 series IC and configured as a bistable. Any version of the 7474 may be used, i.e. schottky 74LS74, high speed 74HCT74 etc. The input is applied to the clock pin, the inverted output fed back to the data input and clear and preset lines are tied to ground. For every pulse the relay will operate and latch, the next pulse will turn off the relay and so on. Note that quick turn on and off of the relay is not possible. The output pulse is set at about 2.4 seconds. and input delay by R3, C2 set about 1.5 seconds.

Parts List:

R1 3k3
 R2 1k
 R3 22k
 R4 220k
 R5 1M
 R6 3k3
 B1 12 V
 D1 1N4148
 D2 1N4003
 Q1 B109
 LED1 CQX35A
 IC1 IR1 available from Harrison Electronics or TSOP1838 or similar
 IC2 4049
 IC3 CA555
 IC4 SN74HCT74 or SN74LS74
 IC5 LM7805
 Relay 12 Volt coil with changeover contact
 C1 100u
 C2 22u
 C3 100n
 C4 2u2

