

IR Receiver Toggle Switch

The IR receiver circuit featured here is basically a simple toggle switch that responds to IR signals from common hand held remote controls. It provides a means of controlling power to electrical appliances not equipped for remote operation, without needing an additional controller.

The heart of the circuit is a 38Khz IR receiver module that converts the IR signals to 5 volt digital data, representing the particular command sent. This circuit responds to any of the commands and performs a toggling action to control power to external loads. To avoid interference, the receiver should be located where it will not respond to unwanted signals. It may be necessary to add some sort of shielding to the IR lens to narrow the coverage angle.

Operation:

Along with the IR receiver module, the circuit employs a CMOS dual D flip flop (CD4013) with one section wired as a monostable flip flop, and the second section used as a bi-stable, or toggle flip flop.

In the idle state, the 470nF capacitor will be charged, producing a logic "1" to the data input of the first stage on pin 5, and the output of the IR module will be high, producing a low level from the transistor to the clock input at pin 3.

When an IR signal is received, the IR module output moves to a low level, supplying a rising clock signal to pin 3 and loads a logic "1" into the first FF stage and begins the monostable output at pin 1. This also provides a rising edge to the clock input at pin 11 of the second stage, and causes a toggling action at pin 13.

As the incoming IR data train continues, the 470nF capacitor discharges through the 10K resistor and diode until the level is low enough to clock a "0" into the first stage, ending the cycle at pin 1. When the incoming data stream ends, the capacitor begins charging to a high level through the 1 Meg resistor for maybe a second, and the circuit is ready for the next toggling action. The circuit will not re-toggle without some recovery time of around 1 second.

There seems to be several different IR remote control protocols which all appear to use some sort of pulse width modulation (PWM) to define the difference between data "1" and data "0". Transmission usually begins with a long start pulse used to adjust the receiver AGC, followed by possibly 32 data bits of about 2mS each for a total transmission time of about 60mS. This may vary somewhat depending on the complement of ones and zeros, since they are not of equal time. The timing diagram illustrates a typical IR transmission from a hand held remote control, and relationship to the toggle circuit activity.

Parts List	Allied Part Number
CD4013 Dual D Flip Flop	735-1325
2N3904 Transistor (2)	568-8253
2N2219A Transistor	248-2077
1N914 Diode (2)	431-0618
78L05 5 Volt Regulator	288-0630
Relay 12 volt SPST	788-1268
470nF Capacitor	586-0469
10uF Capacitor	613-0743
1 Meg Resistor	895-0889
100K Resistor	296-5610
10K Resistor (2)	895-0633
1K Resistor	840-0399
240 Ohm Resistor	296-6495

Additional Parts:

38KHz IR Receiver Module (Radio Shack 276-640)
 12 Volt DC Power Supply