

Experiment: 2

Objective:

- To draw a schematic diagram of IR sensor module circuit (required to move Buggy module on a predefined the path) using CAD tool (Eagle).
- To design a printed circuit board layout of IR sensor module circuit using CAD tool (Eagle).

Software Used: Eagle Software

Components Used:

Sr. No	Name of Components	Value	Specifications	Quantity
1.	Resistor	330ohm	Carbon Resistor with 5% Tolerance	4x
2.	Resistor	10k	Carbon Resistor with 5% Tolerance	2x
3.	Potentiometer	10k		2x
4.	LED3mm	5V	Dome Lamp	2x
5.	IR Transmitter	SFH482		2x
6.	IR Receiver	BPX65	PCB Header	2x
7.	Operational Amplifier	LM358P	Microcontroller	1x

Theory:

1. **Resistor:** A resistor is an electric component which is introduced in the circuit to introduce resistance. Resistance is the opposition to the flow of current, in other words resistor limits the current passing through the circuit elements as different electrical components may have different current need.

Applications of resistors:

- Heating
- Signal Conditioning
- Temperature sensing (Thermistors)
- Light Sensing (LDRs)

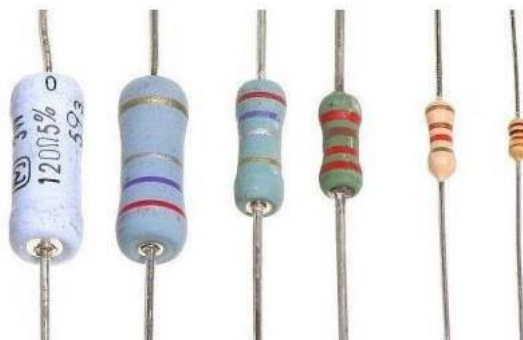


Fig 2.1 Resistors [1]

2. **IR Transmitter (BPX65):** An IR transmitter LED, is a device that emits infrared light in order to send signals to other devices. It is typically a small, clear, or translucent device that emits IR light in a specific frequency range. IR transmitter LEDs are commonly used in remote controls and other IR signalling devices. BPX65 is a high sensitivity photodiode.



Fig 2.2 IR Transmitter [2]

3. **IR Receiver (SFH482):** An IR receiver LED is a device that detects infrared signals from remote controls and other IR sources. It is typically a small, clear, or translucent device that is sensitive to IR light in a specific frequency range. When an IR signal is detected, the IR receiver LED will emit a small amount of visible light, which can be used to confirm that a signal has been received.



Fig 2.3 SFH482 [3]

4. **LED3mm:** It refers to a 3mm LED, which is a type of Light Emitting Diode (LED) with a diameter of 3 millimetres. LEDs are semiconductor devices that emit light when an electric current flows through them. They are commonly used as indicator lights in various electronic devices due to their small size, energy efficiency, and long lifespan.



Fig 2.4 LEDs [4]

5. **Potentiometer:** A potentiometer, often referred to simply as a "pot," is a type of variable resistor used to control electrical resistance in a circuit manually. It consists of a resistive element with three terminals: two fixed outer terminals and a movable centre terminal (wiper). The resistance between the centre terminal and one of the outer terminals varies as the wiper is moved along the resistive element. This allows the potentiometer to provide a variable voltage output or to act as a voltage divider.

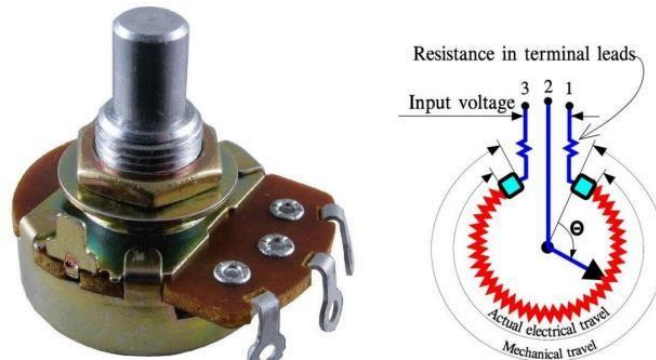


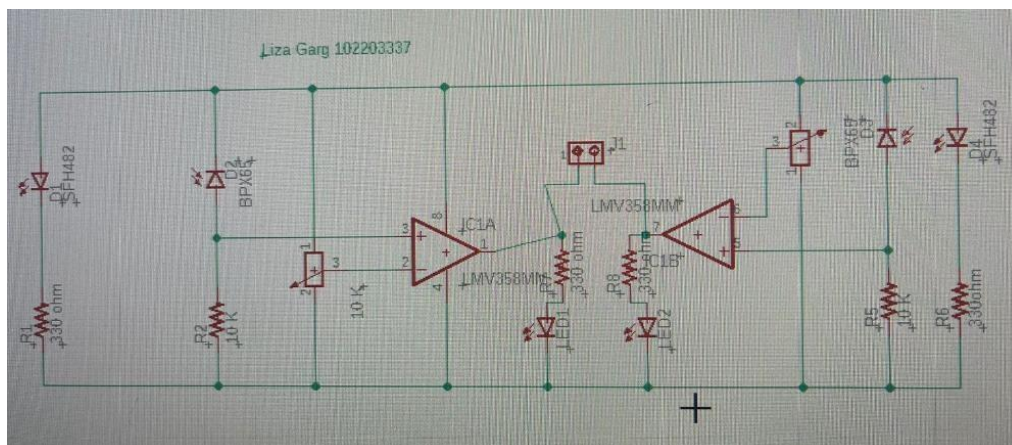
Fig 2.5 Potentiometer [5]

6. **Operational Amplifier (LM358P):** LM358 IC (a comparator/op amp) is used for comparing the sensor and reference voltages. The positive terminal of photodiode is connected to non-inverting input of op amp and the reference voltage is connected to inverting input of op amp. The op amp functions in a way that whenever the voltage at non-inverting input is more than the voltage at inverting input, the output turns ON.

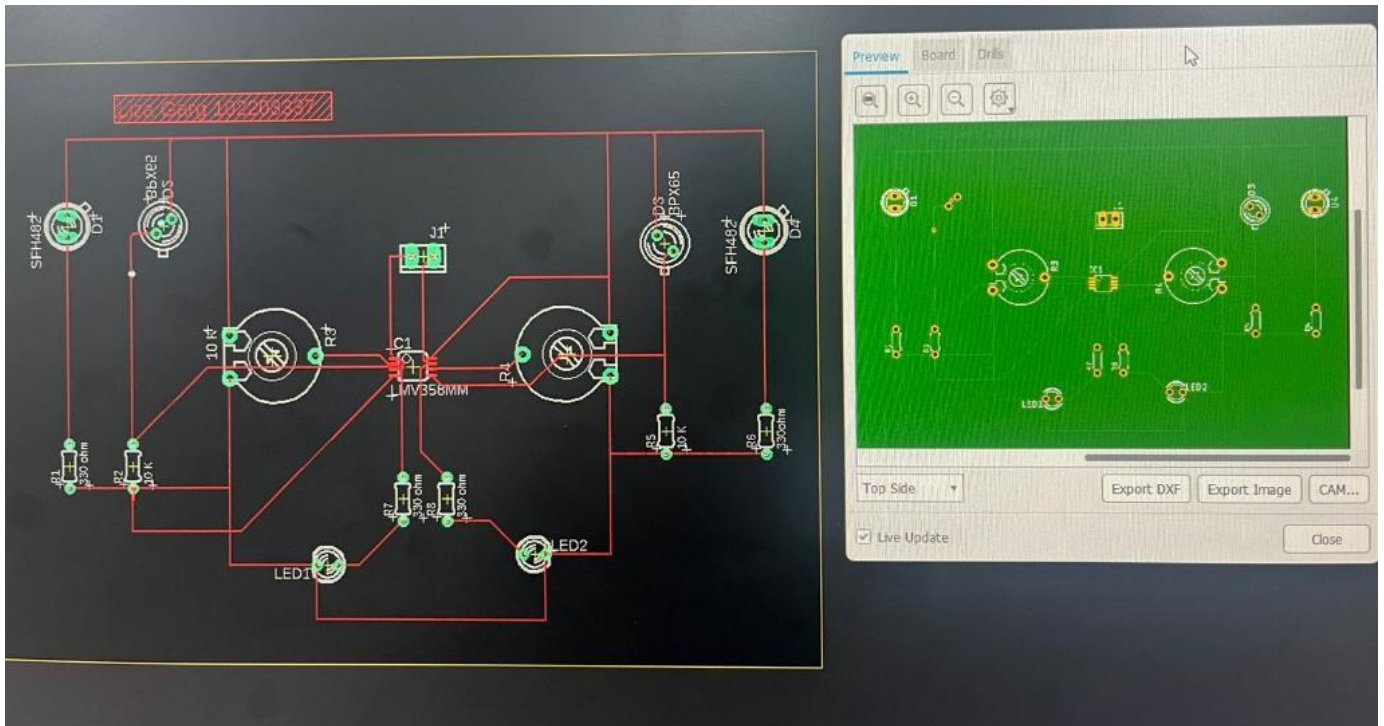


Fig 2.6 LM358P(op-amp) [6]

Schematic Diagram:



PCB layout of IR Sample:



Discussion:

From this experiment, we have learned the practical aspects of designing a receiver circuit for specified pulse width IR signals. We came across some new components like potentiometer, 3mm LED, IR transmitter and IR receiver, Op-Amp (LM358P). We were able to draw Schematic diagram and printed circuit board (PCB) layout on CAD software (EAGLE). The transmitter and receiver uses Infrared radiations.

References:

1. <https://en.wikipedia.org/wiki/Resistor>
2. <https://in.rsdelivers.com/product/centronic/bpx65/centronic-bpx65-full-spectrum-si-photodiode-hole/0304346>
3. <https://www.electronicshub.org/technology-trends/learn-electronics/ir-led-infrared-sensor-basics#:~:text=An%20IR%20transmitter%20LED%2C%20on,and%20other%20IR%20signaling%20devices.>
4. <https://www.make-it.ca/3mm-led-specifications/>
5. <https://en.wikipedia.org/wiki/Potentiometer>
6. <https://elonics.org/infrared-ir-proximity-obstacle-sensor-using-lm-358/#:~:text=We%20compare%20this%20voltage%20change,the%20sensor%20and%20reference%20voltages.>

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