

A Practical activity Report submitted
for Engineering Design Project-II (UTA-
024) by

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Submitted to

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INDIA

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Experiment: 3

Objective:

- (a) To draw a schematic diagram of IR sensor module circuit using CAD tool.
- (b) To design a printed circuit board layout of IR sensor module circuit using CAD tool.

Software Used: Eagle Software

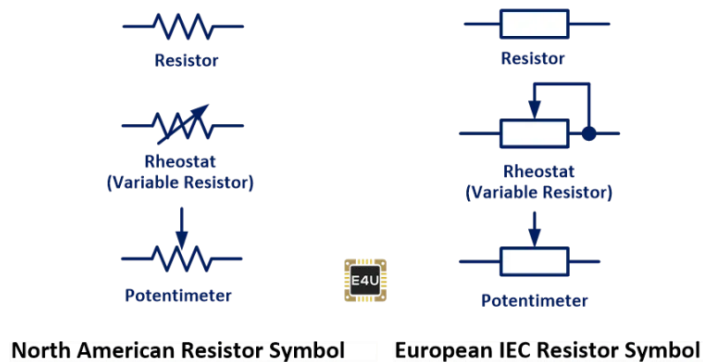
Component Used:

<u>Sr. No.</u>	<u>Name of the Component</u>	<u>Count</u>	<u>Specification</u>
1)	High Gain Operational Amplifier	02	LMV358
2)	IR sensor pair (Transmitter, Receiver)	02	SFH482
3)	Resistors	06	Four 330 ohm and Two 10K ohm
4)	Potentiometer (Variable resistance)	02	10KV
5)	LED	02	Any color
6)	Photodiode	02	BPX65
7)	DC Power supply	01	5V
8)	PCB (small piece)	01	General purpose
9)	Two pin connector	01	MTA02-100

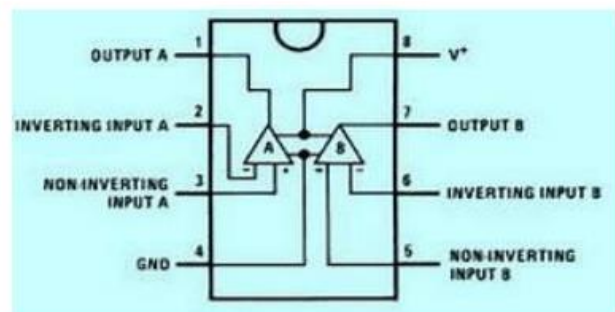
Theory:

1. Resistor:

A resistor (also known as an electrical resistor) is defined as a two-terminal passive electrical element that provides electrical resistance to current flow. Resistance is a measure of the opposition to the flow of current in a resistor. The larger a resistor's resistance, the greater the barrier against the flow of current. There are many different types of resistors, such as a thermistor



2) High Gain Operational Amplifier (LMV358): Operational amplifiers are one of the most fundamental components in electronics, especially in Analog circuits. It is a voltage amplifying device designed to be used as with an external feedback component such as resistors and capacitors between its input and output terminals. The LMV358 is a dual comparator, 8 pin IC with an operating voltage ranging between 3-32 V and current ranging from 20-40 mA. LMV358 is specifically a low-voltage operational amplifier with rail-to-rail output swing. Its low operation voltage, space saving and low costs makes it a useful component in different areas of electronics

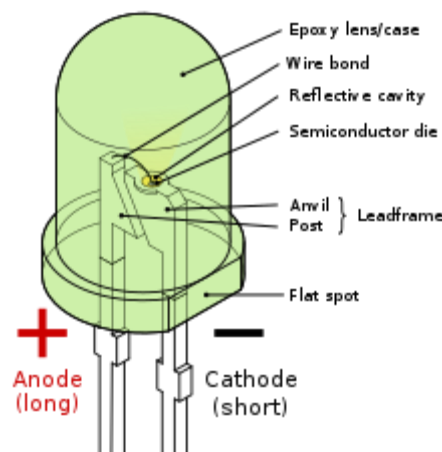


3. PCB Headers(22-23-2031):

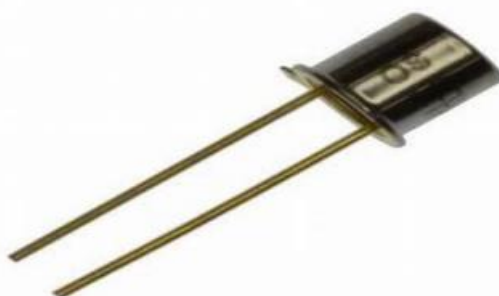
PCB (Printed circuit board) headers are a type of electrical connector that allows you to join connections to a PCB using a single block. Typically headers have one side that is designed to be surface mounted and soldered onto the board with the other side allowing connections. Pins on the header can also be surrounded by a shroud to make the unit more secure, prevent pins from bending and allow locking.

4. LED

A **light-emitting diode (LED)** is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.



- 5. IR Sensor Pair (SFH482):** SFH482 is an IR LED made up of gallium arsenide and it ranges from 700nm to 1mm wavelength. It is a special purpose LED where receiver is commonly used as a sensor. It consists of a positive and a negative terminal which can be identified as the shorter pin is the negative terminal. In this, when a direct incidence hits, the IR LED is placed in front of the photodiode with no obstacle in between. For an indirect incidence, both the diodes are placed side by side with an opaque object in front of the sensor. The light from the IR LED hits the opaque surface and reflects back to the photodiode. Hence, we can say that the photodiode's resistance and the output voltage change proportionally when IR light is received.



6. **Photodiode (BPX65):** A photodiode is a semiconductor p-n junction diode that operates in reverse bias and converts light energy into electrical current. The BPX65 is an ultra-high-speed photodiode which is highly sensitive. It is because of these reasons that this component is also used in laser warning systems and as an encoder. This photodiode is sensitive to the IR emitted by the IR LED and thus its change in resistance is proportional with the change in output voltage, which is the working principle of the IR sensor.



7. **Potentiometer:** A Potentiometer is a passive electronic, three terminal component. It is basically a variable resistor in which the resistance can be varied manually by varying the position of the sliding contact. The potentiometer in our IR sensor circuit is used to calibrate the output of the sensor. It works on the principle that when there is no potential difference between any two nodes, there will be no flow of electric current. Potentiometers are also used for measuring the emf of a cell and its internal resistance



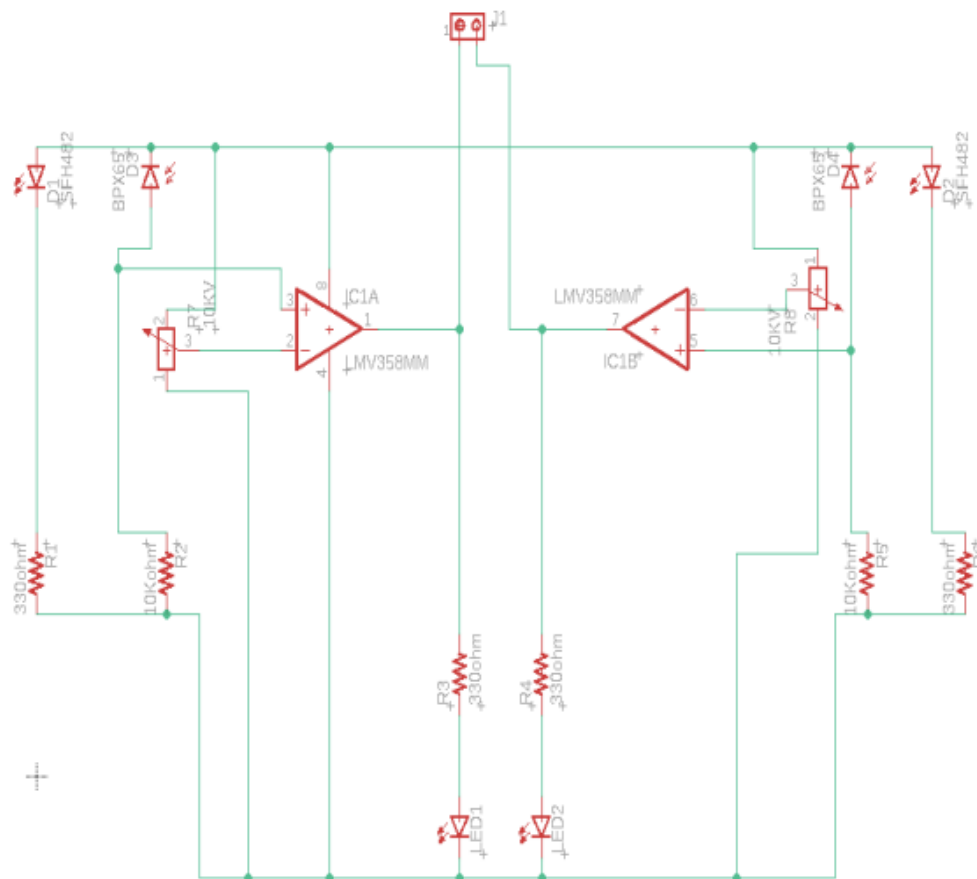
8. **Two-Pin Connector (MTA02-100):** An electrical connector is a fundamental component that joins the electrical terminations to create an electrical circuit. These connectors basically enables the contact between wires, cables, PCBs, etc. MTA-100 is a wire-to-wire or wire-to-board connection system. It is based on IDC (Insulation Displacement Contacts) and eliminates the need to strip wires. The connector and header are end-to end stackable.



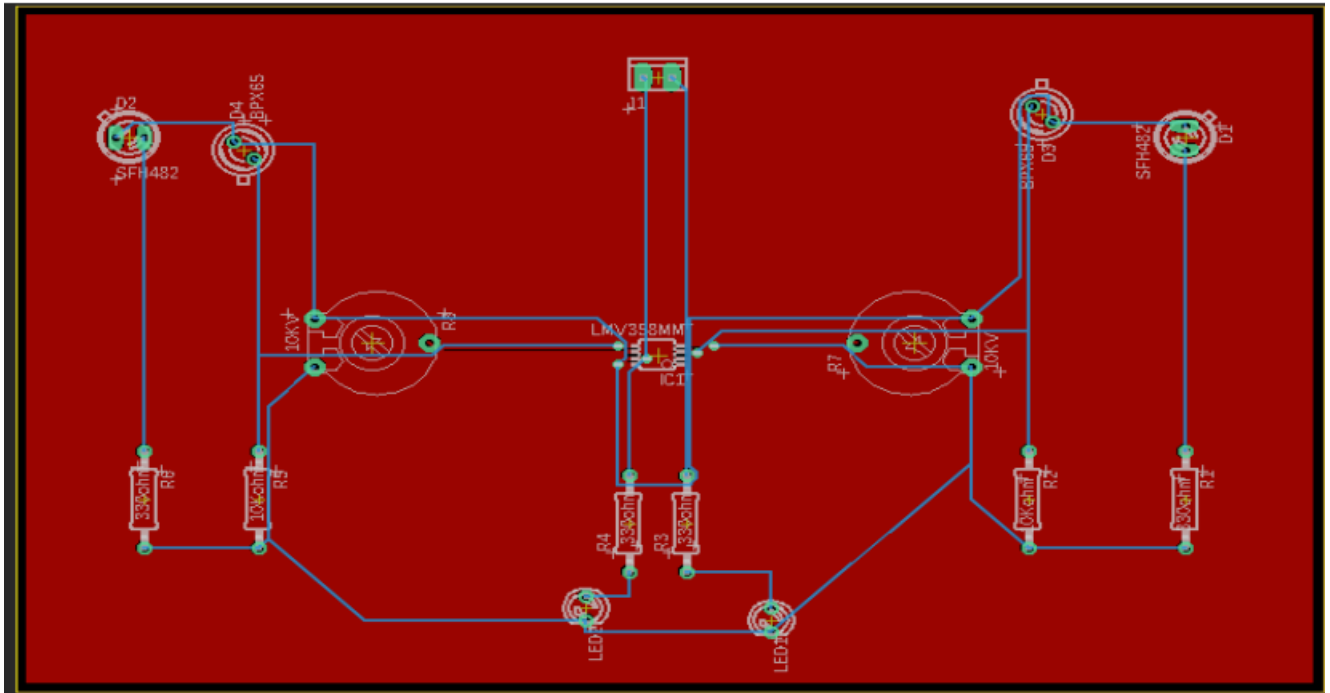
9) **DC Power Supply:** A DC power supply is basically the use of DC voltage to power a device. It is one of the most basic and widely used devices that deliver electric power to one or several loads. This device generates the output power by converting an input signal into an output signal. A basic DC power supply can be built with four circuits or components that includes Transformer, Rectifier, Filter and Regulator. In our IR sensor circuit, we require a supply of 5V.



SCHEMATIC DIAGRAM



Printed Circuit Board layout:



Discussion:

In this experiment, we have learnt how to design an IR sensor module circuit which helps our buggy to move on a predefined path as a line follower. A schematic circuit diagram and its PCB layout has been made with the help of Autodesk Eagle software.

Signature Of Faculty Member