

Practical Activity Report submitted for Engineering Design

Project-II (UTA-014)

by

HEMANT DUBEY 102215009 2NC8

Submitted to

Ms. NIDHI UPADHYAY



THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY, (A
DEEMED TO BE UNIVERSITY), PATIALA, PUNJAB**

INDIA

Jan-May 2024

Experiment: 2

Objective:

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

Software Used: Eagle Software

Components Used:

Sr. No	Components Name	Value	Specifications	Quantity
1.	IR Transmitter	SFH482	Infrared Emitter	2x
2.	IR Receiver	BPX65	Silicon PIN Photodiode	2x
3.	Resistor	220 Ω	Carbon Resistor with 5% Tolerance	4x
4.	Resistor	10k Ω	Carbon Resistor with 5% Tolerance	2x
5.	PT-10	10k Ω	Potentiometer (3 terminal resistor)	2x
6.	Operational Amplifier	LMV358MM	Dual,5.5V,1M-Hz op amp	1x
7.	Amp Connector	MTA02-100	Wire-to-Board Connector	1x
8.	LED 3mm	5V	Light Emitting Diode (3mm LED)	2x

Theory:

- SFH482:** SFH482 is an infrared emitter. An IR emitter generates infrared light that transmits information and commands from one device to another. It's minimum to maximum operating time lies between -40 C to +125 C. The lens is Dome in shape with length 5.6mm. These IR Emitters have mounting style through holes having wavelengths of 880nm.



Fig 1.1 SFH482 [1]

2. **BPX65:** BPX65 is a silicon PIN photodiode. It is a light sensitive semiconductor diode. It produces current when it absorbs photons. A Depletion Region is formed from diffusion of electrons from the N layer to the P layer and the diffusion of holes from the P layer to the N layer. This creates a region between the two layers where no free carriers exist. This develops a built-in voltage to create an electric field across the depletion region. This allows for current to flow.



Fig 1.2 BPX65 [2]

3. **Resistor:** Resistors are electronic components that provide resistance (or obstruction) to the flow of electric current through it. The resistor's resistance limits the flow of electrons through a circuit. Heat energy is generated in the resistor when current flows through it.



Fig 1.3 Various types of resistors [3]

4. **PT-10:** PT-10 is a type of potentiometer. It can be used as a variable resistor. It operates where frequent resistance adjustment is required, and control variable outputs including frequency, motor speed and volume.



Fig 1.4 PT-10 [4]

5. **LMV358MM:** LMV358MM is a type of Dual, 5.5V, 1M-Hz operational amplifier. It has two mono-comparators. Voltage Comparator compares an input voltage with a known reference voltage and changes its output state depending on whether the input was above or below the reference. It is a single general purpose low voltage Operational Amplifier with rail-to-rail output swing capability.

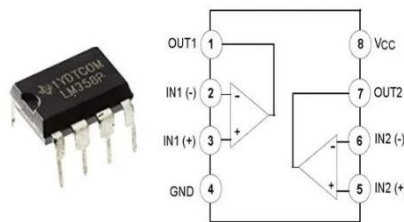


Fig 1.5 LMV358MM [5]

6. **MTA02-100:** MTA02-100 is a type of MTA Connector which is based on insulation displacement contact (IDC) technology. It is basically a wire-to-board and wire-to-wire system. MTA-100 connectors have contacts in a single row.



Fig 1.6 MTA02-100 Connector [6]

7. **LED 3MM:** A light-emitting diode is a semiconductor device that emits light when current flows through it. Electrons in the semiconductors recombine with electron holes, releasing energy in the form of photons. The light emitted from LEDs varies from visible to infrared and ultraviolet regions.

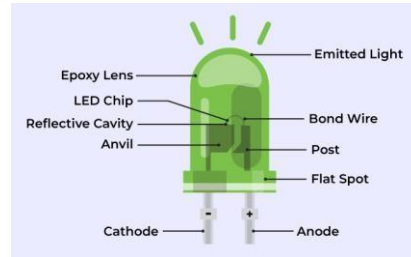


Fig 1.7 LED [7]

Schematic diagram:

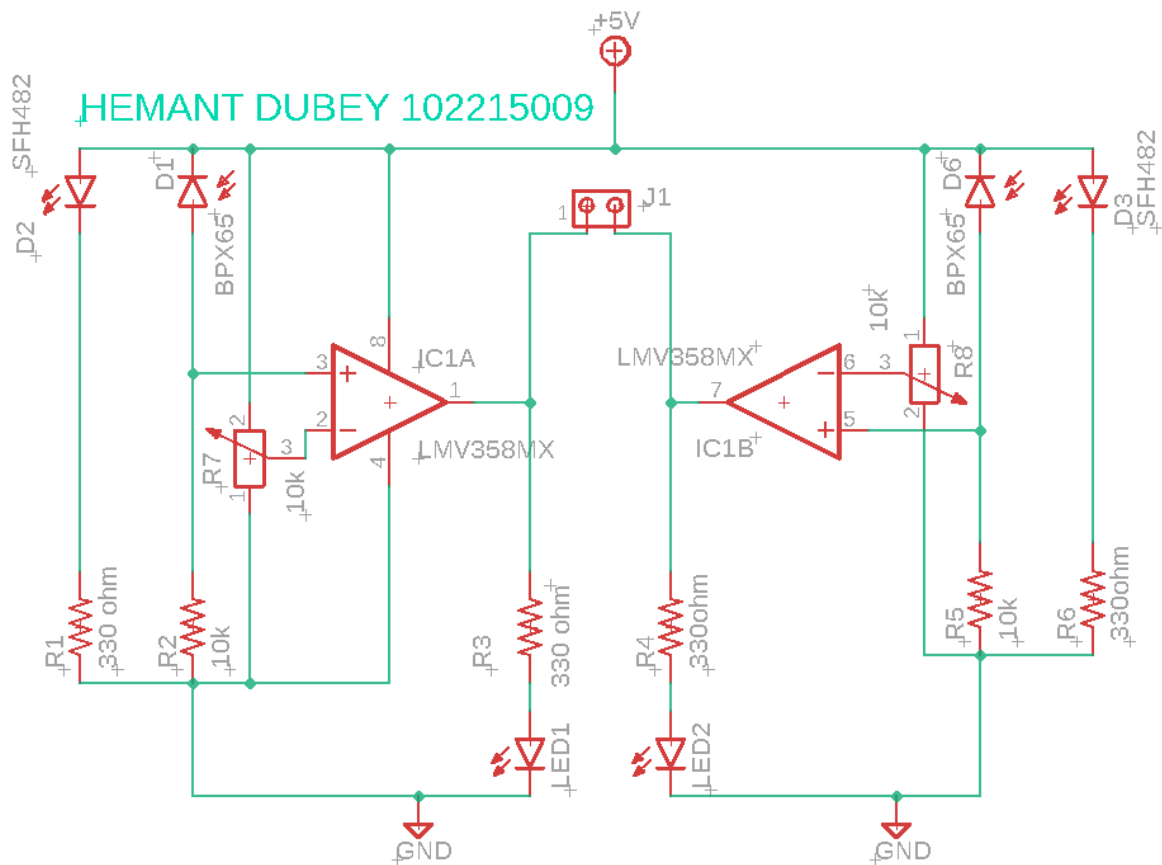


Fig 1.8 Schematic diagram of IR sensor module circuit

Printed Circuit Board layout:

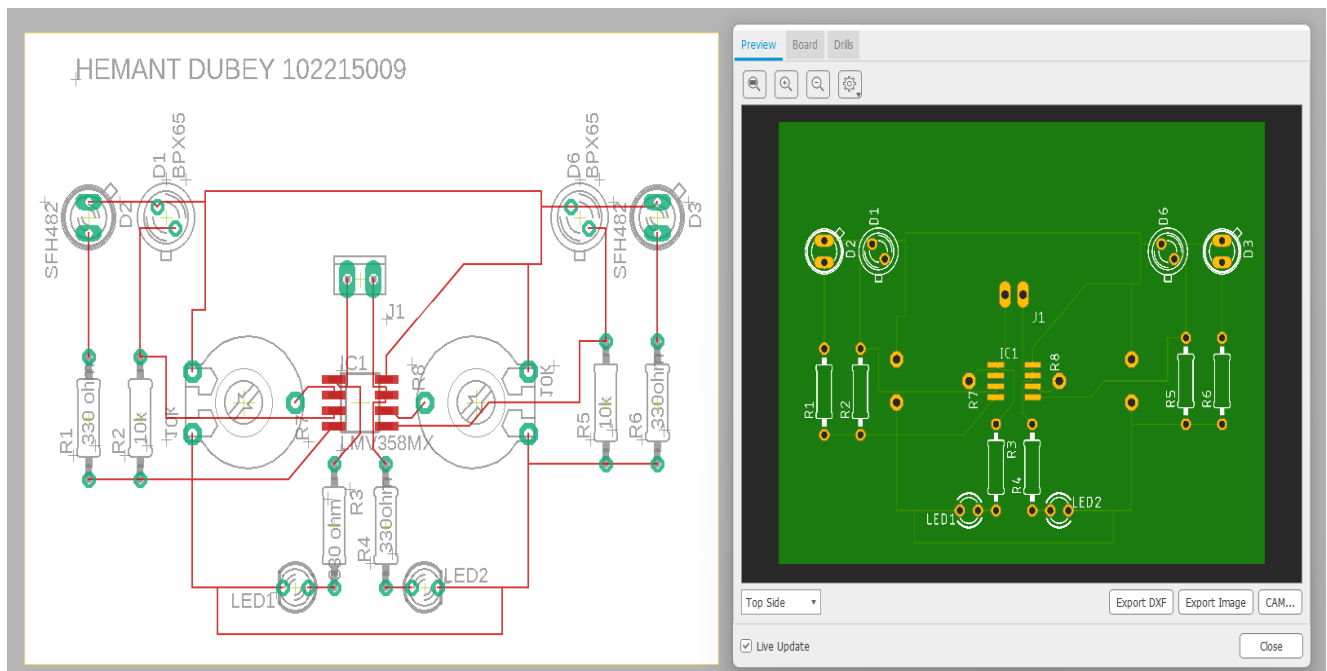


Fig 1.9 PCB layout of IR sensor module circuit

Discussion:

In this experiment, we have learnt how with the help of EAGLE software, which is an electronic design automation (EDA) software, we can design a printed circuit board (PCB). Here we have learnt about IR sensor module which is to be mounted on our buggy. This sensor module will help the buggy to move in path. For this purpose, SFH482 will be used as an infrared emitter and BPX65 will be used as a photodiode. Here we have also used different electronic components such as LMV358MM which is used as a voltage comparator and also potentiometer PT-10 which is used as a voltage regulator. We have also learnt the use of MTA02-100 connector. Finally, we can obtain a PCB layout of the PCB by switching from schematic editor to related board where we can perform PCB routing to ensure that no two different signals overlap each other.

Reference:

- [1]<https://www.digikey.si/en/products/detail/osram-opto-semiconductors-inc/SFH482/2205965>
- [2]<https://www.rapidonline.com/osram-bpx65-silicon-pin-photodiode-58-0142>
- [3]<https://collegedunia.com/exams/mcq-on-types-of-resistors-physics-articleid-6967>

[4]<https://www.piher.net/products/contacting-position-sensors/trimmers-and-controlpotentiometers/through-hole/pt-10/>

[5]<https://www.electroniclinic.com/lm358-ic-pin-configuration-working-lm358circuit-examples/>

[6]<https://eshineconn.en.made-in-china.com/product/sOkASNTHMfWd/China-Mta-1002-54mm-Pitch-Board-in-Connectors-and-Headers-for-Power-Supply.html>

[7]<https://www.geeksforgeeks.org/led-blinking-using-arduino/>

Signature of Faculty member