EC 4050 – ELECTRONIC CIRCUITS AND DESIGNS
MINI PROJECT – DARK DETECTOR USING 555 TIMER IC

REGISTRATION NO.
2020/E/063
2020/E/064
DATE ASSIGNED:
19 MAY 2023

CONTENTS

ABSTRACT

This report presents the design and implementation of a dark detector circuit using a 555 timer IC, as well as the process of creating the PCB layout using Circuit Wizard software. The dark detector circuit is designed to detect the absence of light. The role of the 555 timer IC as the primary component for generating timing signals and controlling the circuit is explained.

The design methodology for the dark detector circuit is discussed, including the selection of components. The functionality and performance of the dark detector circuit are evaluated both in simulation and in practical implementation. The report presents experimental results, including measurements and observations, to assess the circuit's sensitivity to light, response time, and overall reliability.

Finally, the report concludes with reflections on the project, discussing the advantages and challenges. It also provides suggestions for further improvements and modifications to enhance the circuit's performance.

OBJECTIVE:

- To study and draw circuits with PCB design and development.

APPARATUS:

- 555 timer IC
- Resistors (330 ohms, 470 ohms, 4.7k)
- Capacitors (100nF, 100uF)
- LDR
- LED
- Power supply (9V)

INTRODUCTION:

The Dark Detector mini project combines the use of Light Dependent Resistor (LDR) and the versatile 555 Timer IC to create a simple but effective circuit that detects the absence of light in its surroundings.

The LDR, a widely used integrated circuit that adjusts its resistance according on the quantity of light it receives, and the 555 Timer IC, a versatile timer and oscillator, are the project's main components. We can design a circuit that activates an output when the light intensity drops below a set threshold by integrating these components.

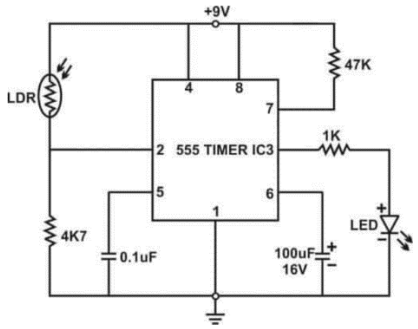

Figure 01: Basic Dark Detector

In delving into the workings of this apparatus, whose purpose lies in uncovering what is concealed in the shadows, we shall examine the fundamental tenets on which its design is predicated and explicate how it may be fabricated and harnessed. By understanding the interplay between the LDR and the 555 Timer IC, we can gain insight into the fascinating world of light sensing and create a functional device with practical applications.

METHODOLGY:

- The required circuit was designed using Proteus Software.
- Then, we were created the circuit on a breadboard.
- Later it was changed to PCB layout. The printout of PCB was transferred into the Copper board by ironing.
- After that Fe_2Cl_3 (Ferric chloride) was used to dissolve the surplus copper from the board.
- Then, Copper board was drilled to connect the components.
- Finally, the required components were soldered into the board and then the circuit was assembled.
- The above works were carried out under proper precautions and safety measures.
- Finally, we were done additional testing to ensure the circuit’s performance.

CIRCUIT DESIGN:

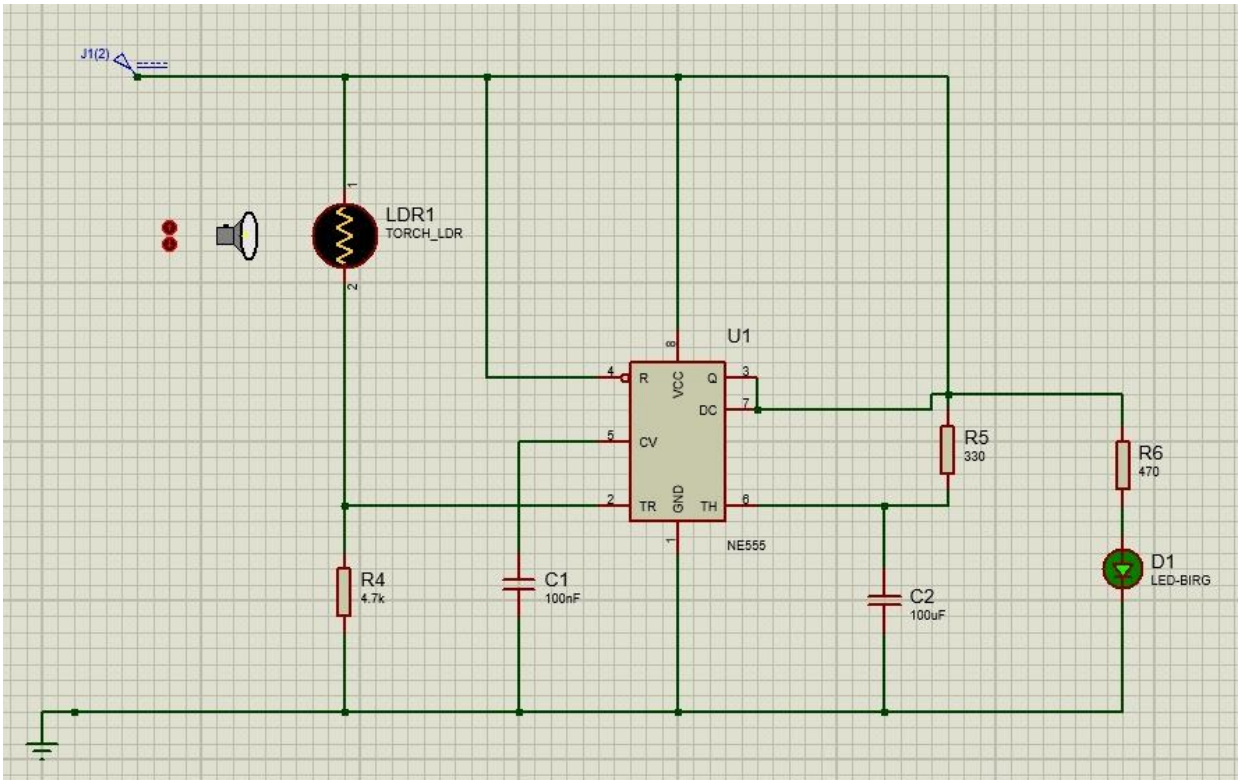

Figure 02: Proteus Schematic Diagram for Dark Detector

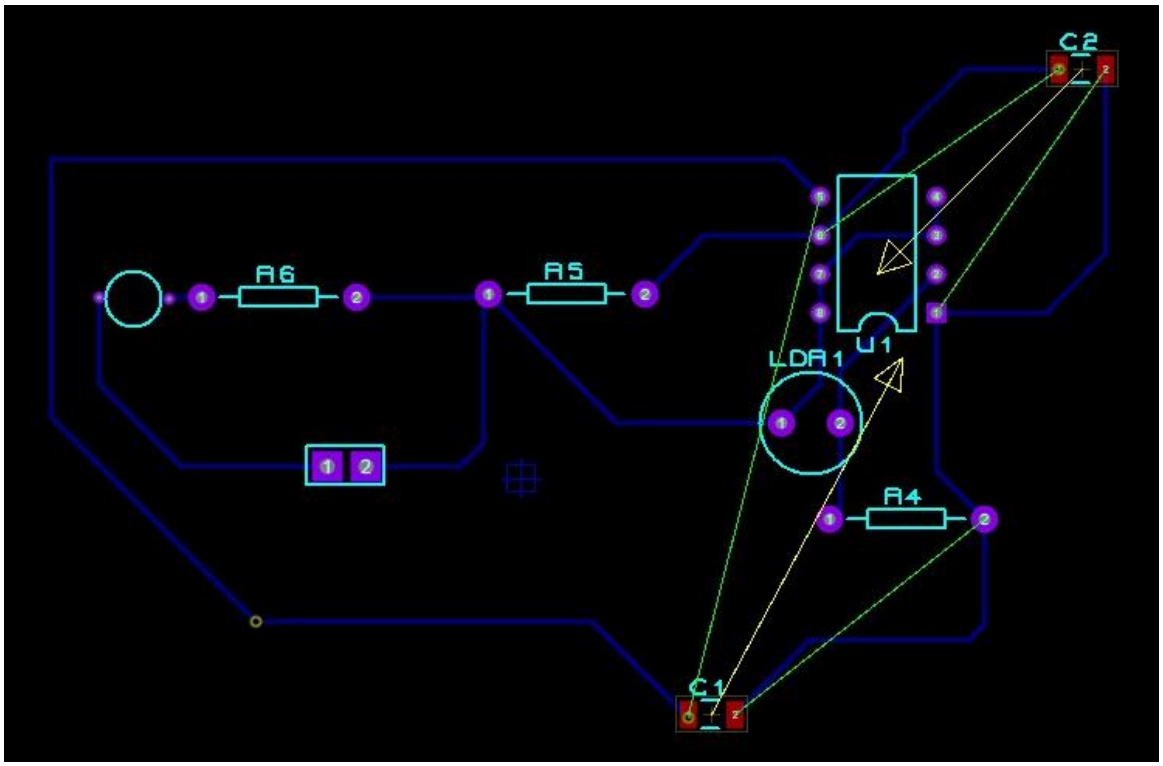

Figure 03: PCB layout of the circuit with components

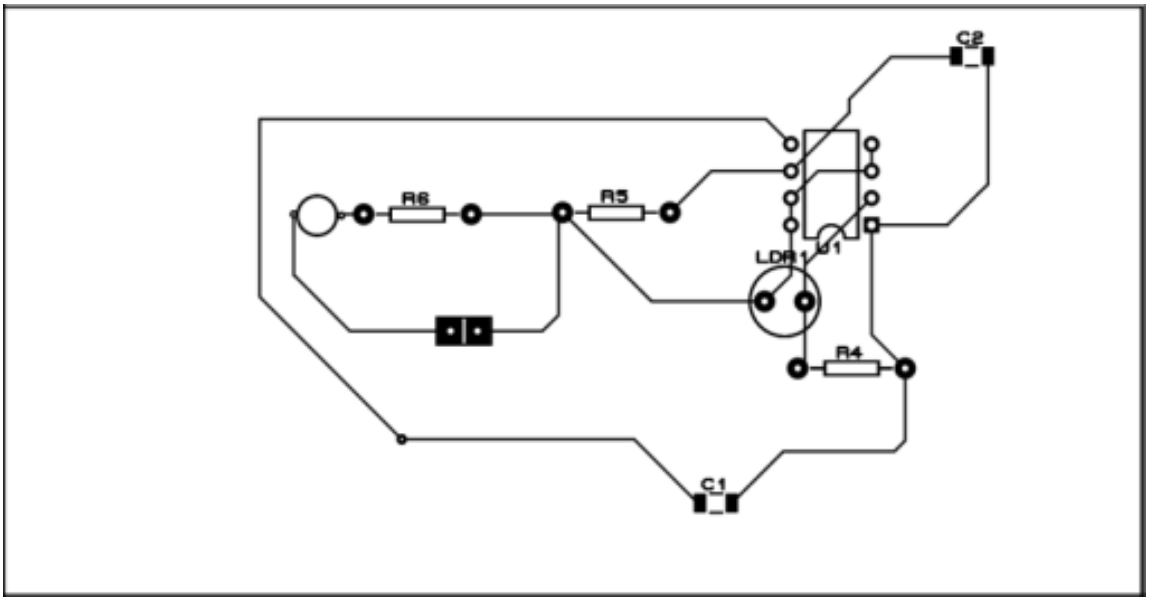

Figure 04: PCB layout of the circuit

OBSERVATIONS:

When we connect the ECD to the power supply, led was bling. When we press the LDR, LED was not bling.

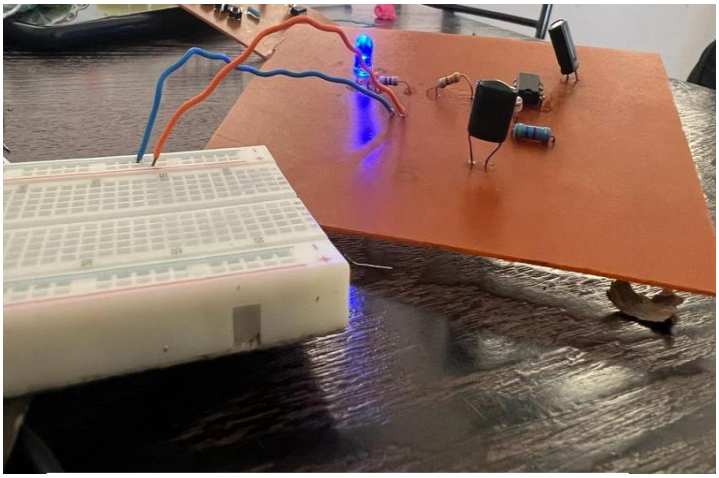

Figure 05: Output of the circuit

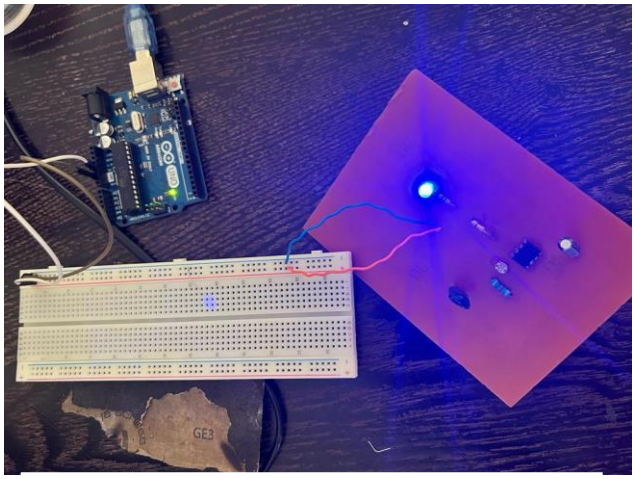

Figure 06: Output of the circuit

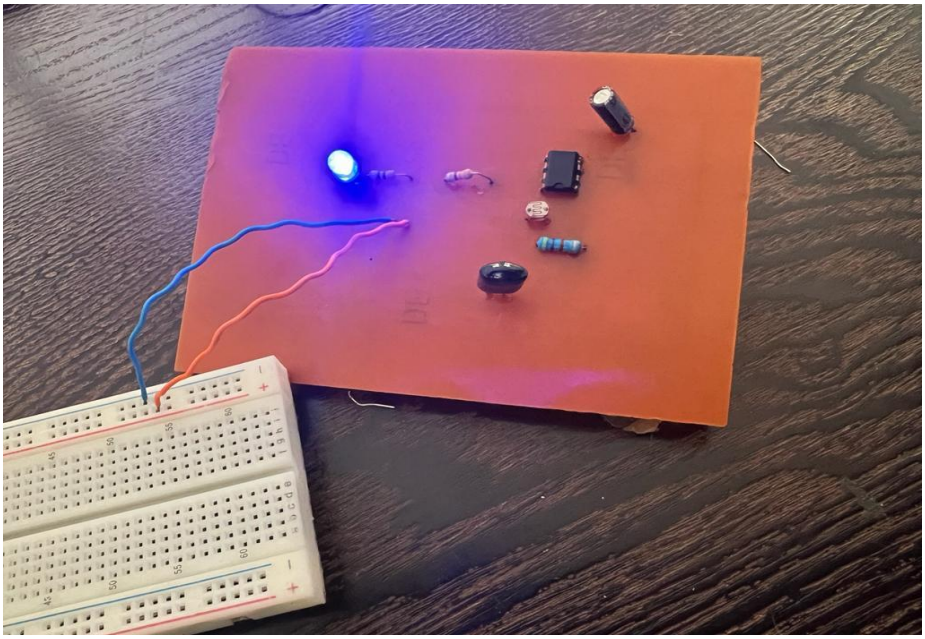

Figure 07: Output of the circuit

PROBLEMS FACED:

- During ironing, the layout was not transferred properly to the board. We got thin line.
- Marker was used to draw the lines which were not printed. But since the tip of the marker was big, we faced some difficulties in drawing thin lines in the circuit.
- Fe_2Cl_3 was used to remove the Cu. But it took a long time to precipitate because of the low concentration of Fe_2Cl_3.
- While soldering, on some occasions excessive heat was transferred to the board.

DISCUSSION:

This project provides a solution for applications which require light sensing capabilities. The project can be further improved by addressing stability issues and incorporating additional features like a relay to control external devices based on the detected light conditions.

By doing this practical we learned about PCB design and development. We learned to draw PCB layouts using Proteus software. We gain some technical knowledge on soldering and some other skills.

While the Dark Detector circuit demonstrates reliable performance, it is significant to consider certain limitations. The response time of the circuit depends on the values of the timing components.

Overall, the Dark Detector project is a great way to learn about the fundamentals of circuit design and light detection.

CONCLUSION

In conclusion, the design of Dark Detector using 555 Timer IC and LDR provides an effective and reliable solution for detecting darkness or low light conditions. The circuit uses a 555 Timer IC as an astable mode, while the LDR acts as a light sensor, detecting changes in ambient light levels.

By combining the 555 timer IC's astable mode of operation and the varying resistance of the LDR, the dark detector circuit can accurately sense changes in light intensity. When the ambient light falls below a certain threshold, the output of the circuit switches, triggering an associated device action.

Overall, this Dark Detector design offers a cost effective, efficient solution for applications that require reliable light sensing in low light or dark surroundings.