Mini Project Report

SRM Institute of Science and Technology
Faculty of Engineering and Technology
Department of Electronics and Communication Engineering

21ECO104J – PCB Design and Manufacturing
Fifth Semester, 2024-25 (ODD Semester)

Lab code & Title   : PCB Design and Manufacturing (21ECO104J)

Year & Semester   : 3rd year 5th semester

Project Title   : Clap Switch

Lab Supervisor   : Dr.A.Manikandan

Team Members Registration No & Name:

Reg. No & Name → Mark split up ↓	Joel Tajan RA2211003010209	Ashwani Kumar RA2211003010225	Gautam Kondreddy RA2211003010284
Novelty of the project (5 marks)	5	5	5
Circuit Schematic (10 marks)	10	10	10
PCB CAM file (SS/DS) (10Marks)	10	10	10
PCB Fabrication and Assembly (Hardware) (15 marks)	15	15	15
Project Report (10 Marks)	8	8	8
Total (50 Marks)	48	48	48

REPORT VERIFICATION

Date: 9.11.24

Signature of Lab Supervisor
(Dr.A.Manikandan)

OBJECTIVE

The objective of this project is to design and manufacture a clap switch circuit, allowing a device to toggle on and off with sound-based activation. This project emphasizes PCB design considerations and circuit assembly techniques.

ABSTRACT

This clap switch project uses a microphone to detect clap sounds, triggering an electronic response that toggles connected devices. By converting sound into an electrical signal, the circuit enables hands-free control. This project explores PCB design, assembly, and testing processes essential for manufacturing small electronic devices.

INTRODUCTION

Clap switches are sound-activated circuits commonly used for convenience or assistive technology. These switches can be applied in lighting systems, security, or automation. By clapping, a sound wave triggers the microphone, which sends a signal to activate a relay, allowing devices to be toggled without physical contact.

SOFTWARE REQUIREMENT/DESCRIPTION

The clap switch circuit PCB design is created using EasyEDA, an online platform that offers tools for circuit design, PCB layout, and simulation. EasyEDA provides a user-friendly interface for beginners, allowing component selection, circuit schematic drawing, and layout generation. It also enables users to export Gerber files for PCB manufacturing and offers cloud-based project storage, simplifying collaboration and accessibility.

CIRCUIT DIAGRAM AND DESCRIPTION

The clap switch circuit includes a microphone, 555 timer IC, transistors (BC547, BC557), relay, and a power supply. When a sound is detected, the microphone converts it into a small electrical signal, which is amplified and processed by the 555 timer. This signal then triggers the relay, which controls the connected device.

- Microphone: Detects sound waves and converts them to an electrical signal.
- 555 Timer: Acts as a monostable multivibrator, generating a pulse to drive the relay.
- Relay: Enables switching of external devices.
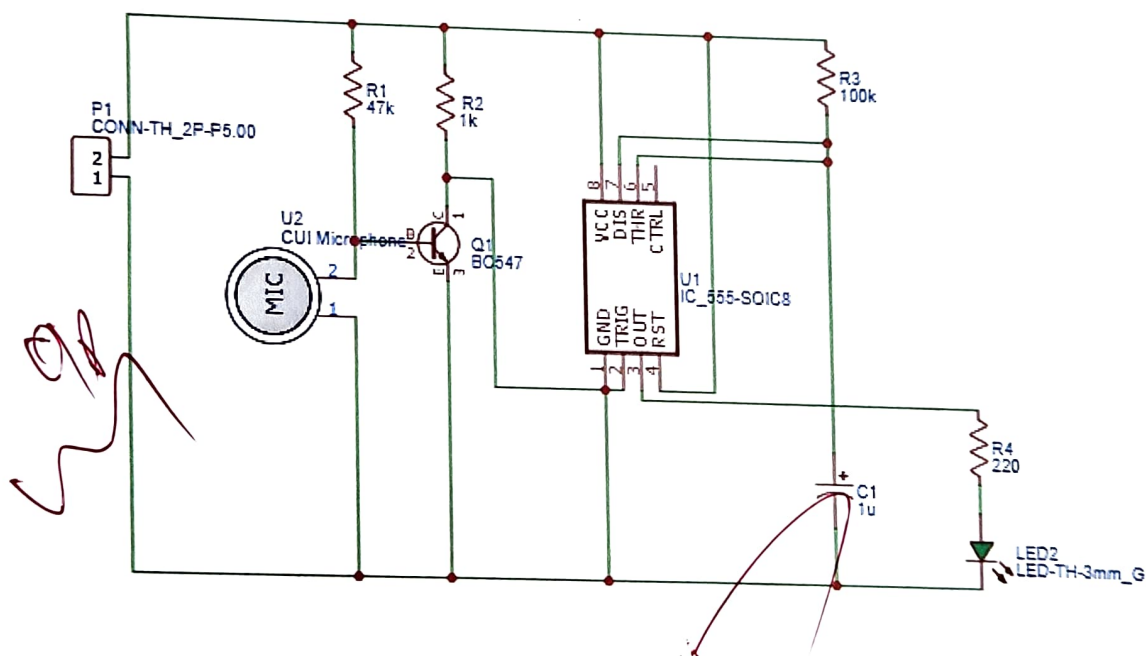
1. Initial Setup: The microphone has a high resistance when no sound is present, maintaining a steady voltage level across it. This keeps the 555 timer's output in a low state, preventing the relay from activating any device. Resistors and capacitors are arranged to set the circuit's timing and sensitivity.
2. Sound Detection: When a sound (like a clap) is detected, the microphone's resistance changes, creating a voltage variation across it. This voltage change reaches the trigger pin (Pin 2) of the 555 timer, crossing the threshold to activate the timer.
3. 555 Timer Activation: When triggered, the 555 timer moves to an active state, and the output (Pin 3) goes high, which triggers the relay. In monostable mode, this high signal is temporary, toggling the connected device for a short duration with each clap.
4. Device Control: The relay connects to a device (e.g., a light) that can be controlled by sound. Each clap activates the relay, switching the connected device on or off.

FABRICATED PCB ASSEMBLY IMAGE AND ITS OUTPUT MEASUREMENT
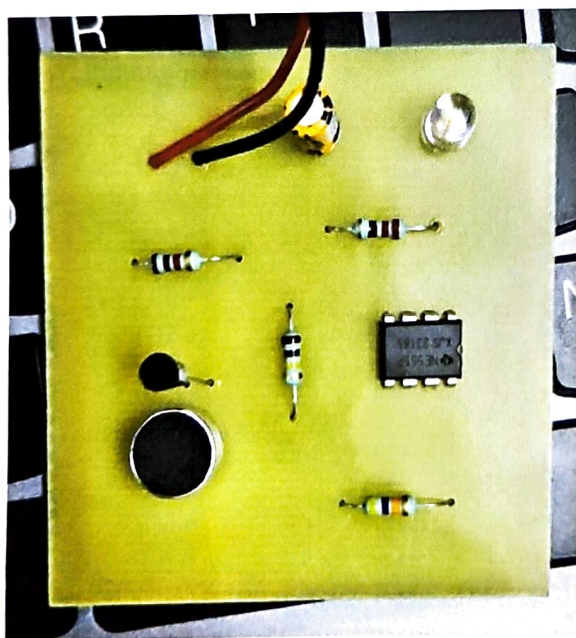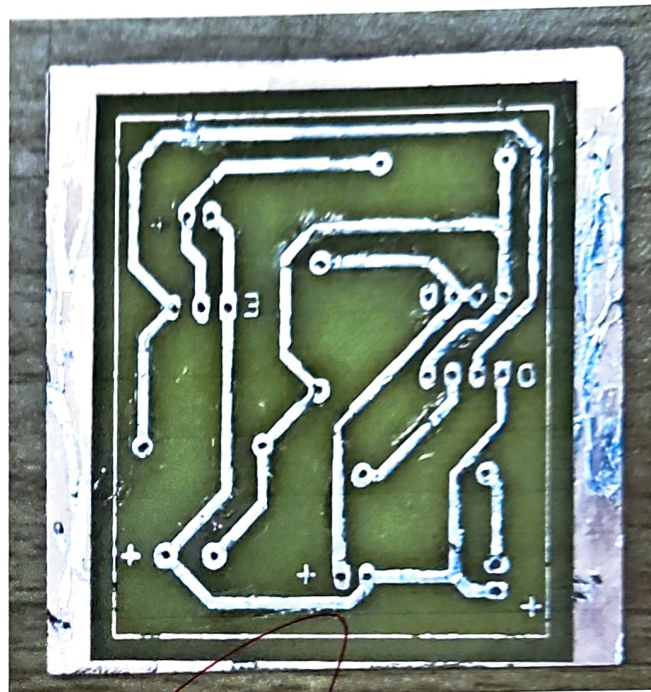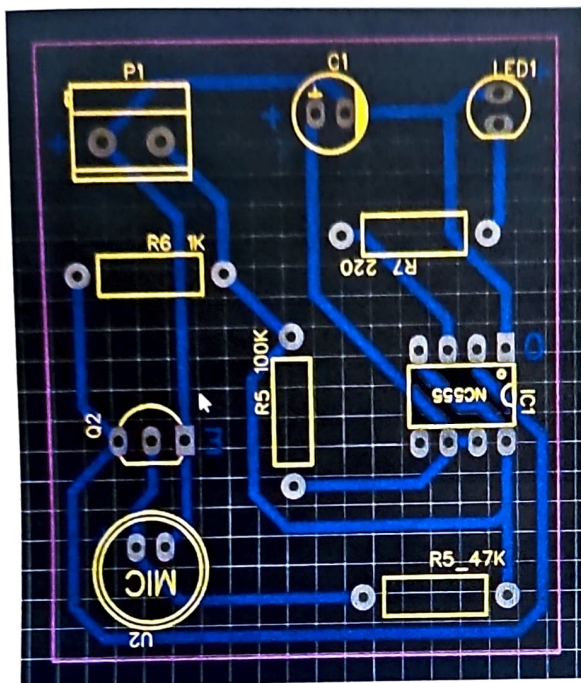
RESULTS AND DISCUSSION

Results
The clap switch circuit using a 555 timer IC successfully detects sound and toggles connected devices. When tested, the circuit consistently activated the relay and toggled the connected device with each clap, demonstrating reliable sound-based activation.

Discussion
The results indicate that the circuit is effective for basic sound-activated switching. The microphone's sensitivity and the 555 timer's quick response are key to successful operation. However, ambient noise could trigger false activations. Adding a sound filter or sensitivity adjustment could improve accuracy, ensuring the circuit responds only to distinct claps.

CONCLUSIONS

The clap switch circuit successfully demonstrates sound-triggered control in PCB form. The project highlights the importance of accurate PCB design and component selection for functional electronic devices. Future improvements could include sensitivity adjustment and wireless integration.

REFERENCES
[1] https://circuitdigest.com/electronic-circuits/clap-switch-project
[2] https://www.electronicshub.org/clap-switch-circuit-for-devices