Project Report

CLAP SWITCH USING 555 TIMER IC

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- Course : Analog and Digital Electronics

1. Introduction

The clap switch is a sound-activated circuit that triggers an electrical load (LED) when it detects a clap or sharp sound. This project utilizes the **NE555 timer IC** in monostable mode to create a reliable switching mechanism with adjustable timing.

Key Features:

- **Input:** Electret microphone (GMI30 SP-2C64DB)
- **Core IC:** NE555 timer (monostable configuration)
- **Output:** LED indicator (expandable to relays)
- **Timing Range:** Adjustable via RC components (default: 11s)
- **Power Supply:** 5-12V DC

2. Circuit Design & Working Principle

How It Works,

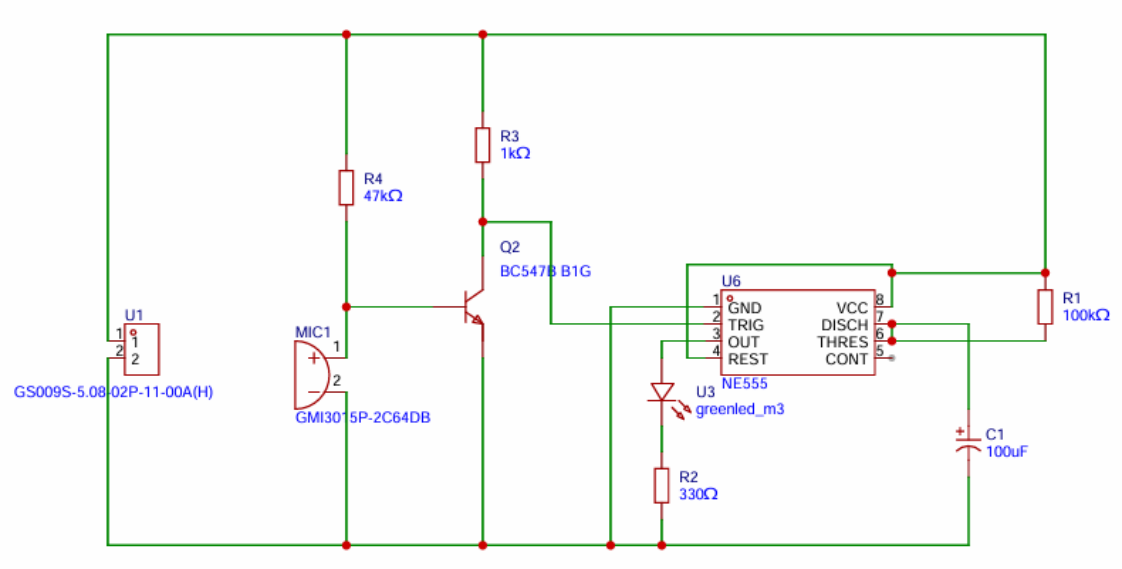
1. **Sound Detection:**
    - The electret mic (MIC1) picks up sound vibrations.
    - A voltage spike is generated and fed to the **TRIGGER pin (Pin 2)** of the 555 IC.
2. **Monostable Operation:**
    - When triggered, the 555 output (**Pin 3**) goes **HIGH** for a fixed duration:

$$T = 1.1 \times R1 \times C1 = 1.1 \times 100k\Omega \times 100\mu F = 11 \text{ seconds}$$

- During this period, the **LED** lights up via current-limiting resistor **R2 (330Ω)**.

3. **Reset:**
   - After 11 seconds, the output automatically turns **OFF** until the next clap.

PCB Schematic Diagram



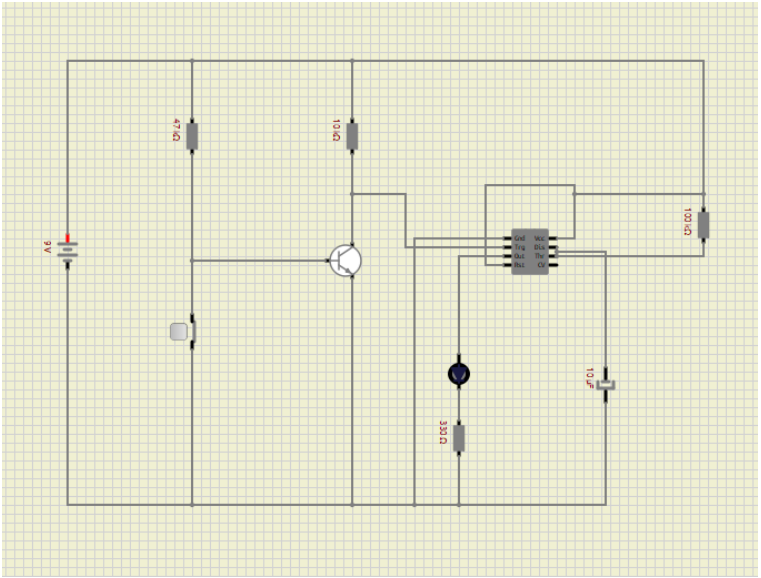
3. Clap Switch Component Summary

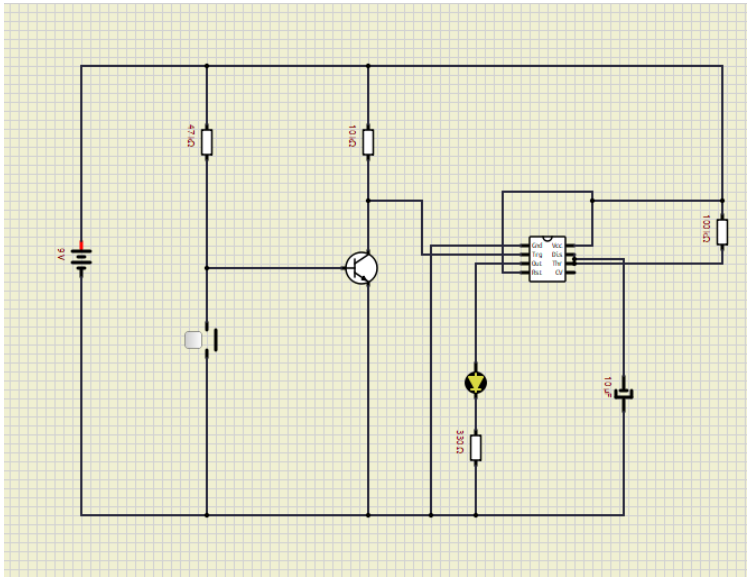
Component	Value/Specifications	Design Considerations
NE555 Timer IC (U3)	DIP-8 Package	Configure for monostable operation (Pin 2 trigger, Pin 3 output)
Terminal Block (U1)	GSO095-5.08-02P-11-00A(H)	5.08mm pitch, 2-pin for secure power input connections
Electret Mic (MIC1)	GMI30 SP-2C64DB (-44dB)	Requires 2-10V bias; R4 (47kΩ) sets sensitivity
Resistor (R1)	100kΩ, 1/4W	Critical for timing: Pulse width = 1.1 × R1 × C1 (≈11s)

Component	Value/Specifications	Design Considerations
Capacitor (C1)	100µF, 16V Electrolytic	Low ESR type for stable timing; verify polarity
Resistor (R2)	330Ω, 1/4W	Limits LED current to ~9mA @5V (If = (Vcc-Vf)/R2)
Transistor (Q2)	BC547B NPN (hFE:110-800)	Drives higher loads; base current ≥ (Ic/hFE)
Resistor (R4)	47kΩ, 1/4W	Microphone bias resistor; adjust for trigger sensitivity
Resistor (R3)	1kΩ, 1/4W	Pull-up resistor for microphone signal conditioning
LED	5mm Green (Vf=2V, If=20mA max)	Anode to R2 (330Ω); verify brightness at 9mA

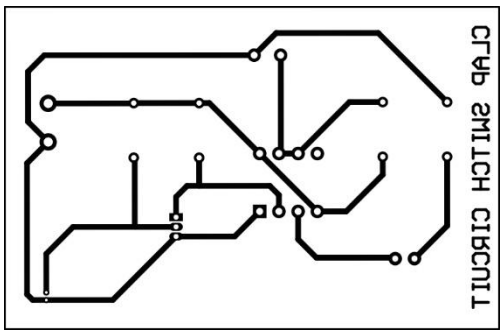
4. Construction & Testing

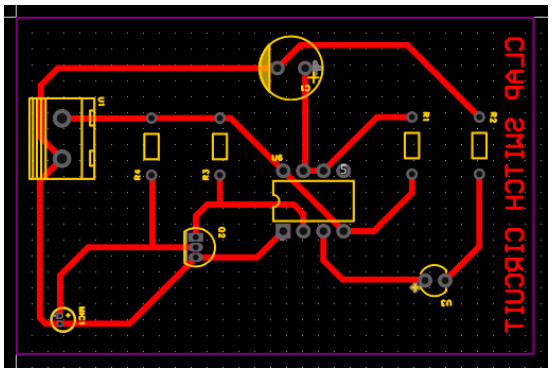
Simulation Results

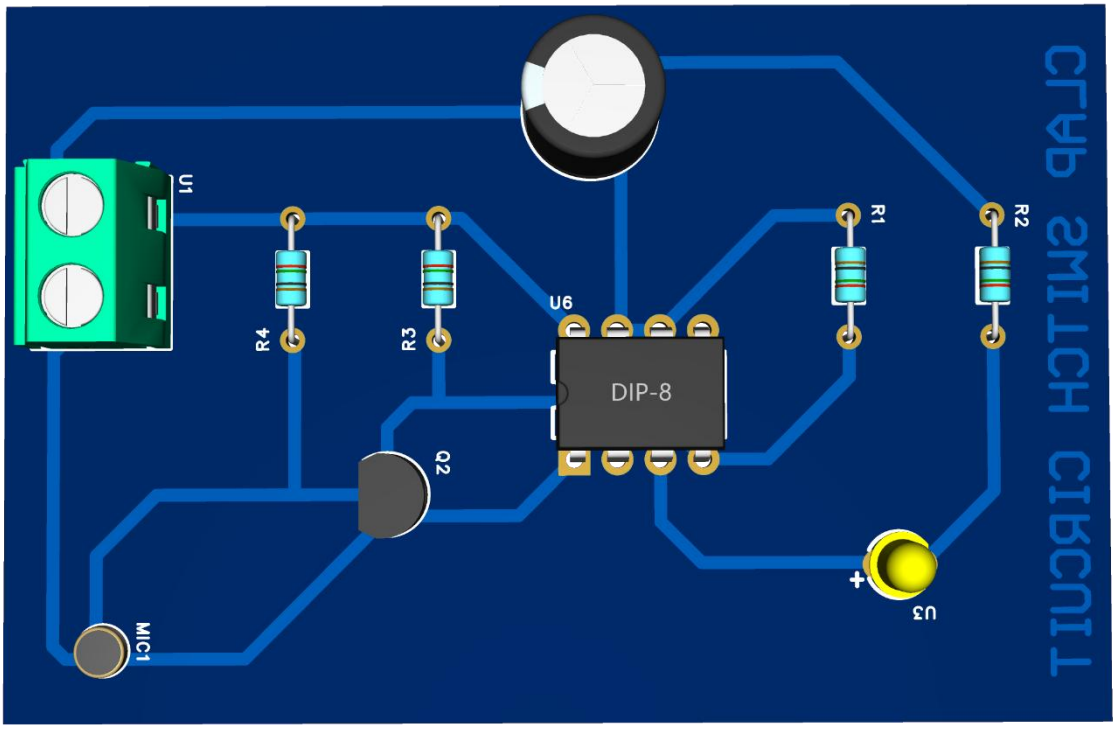




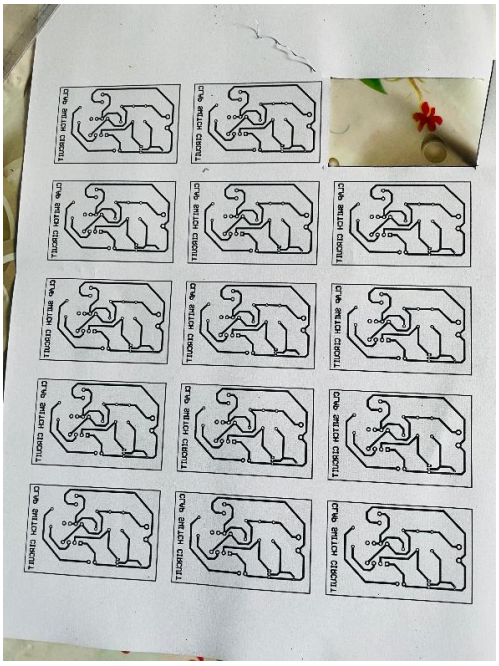
Layout of PCB

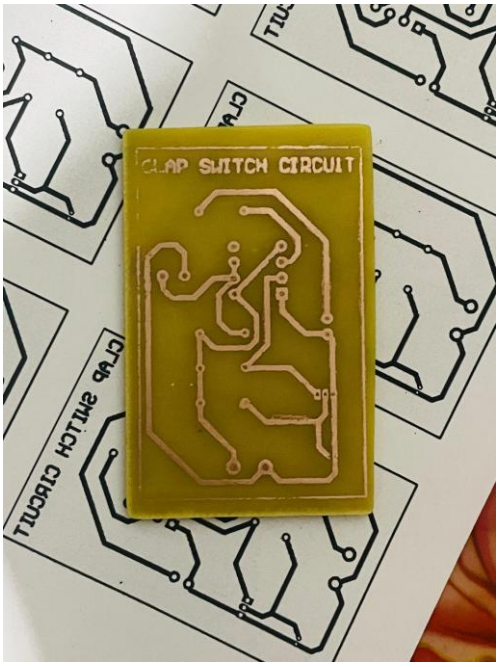


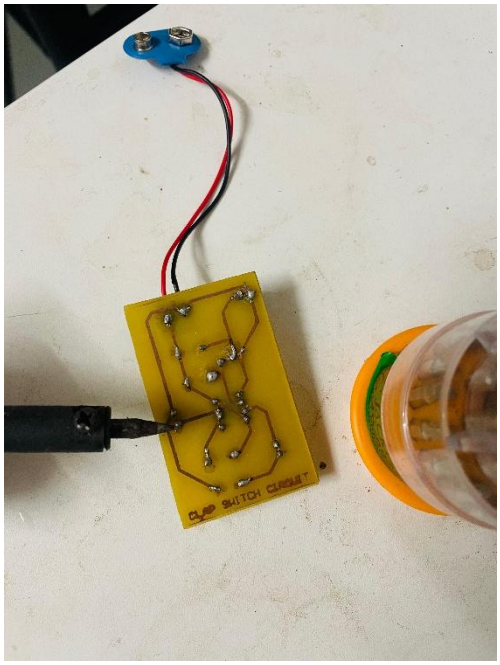


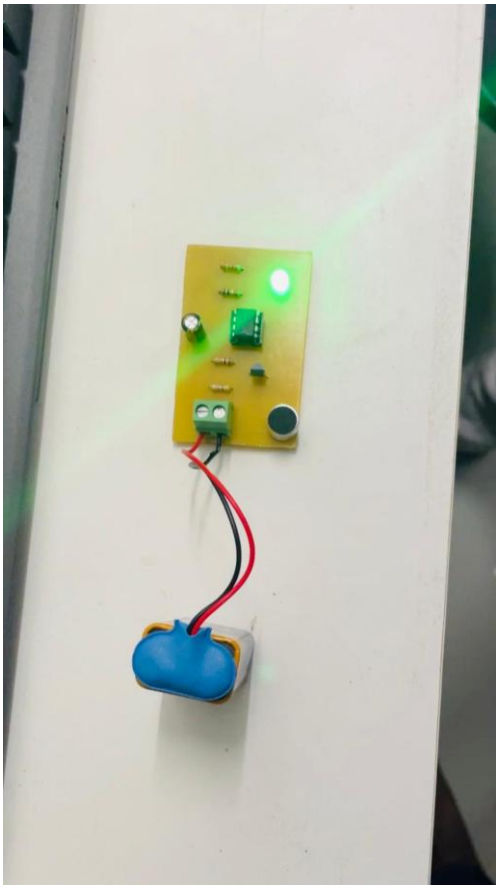


Construction of PCB









5. Applications & Improvements

Practical Uses

- **Home Automation:** Control lights/fans with claps.
- **Assistive Tech:** Hands-free switches for disabled users.
- **Education:** Demo circuit for electronics labs.

6. Conclusion

The clap switch circuit successfully demonstrates sound-activated control using the 555 timer IC. With **11s output duration** and **reliable triggering**, it serves as a cost-effective solution for basic automation needs. Future improvements could include wireless integration or IoT compatibility.

Appendices:

- Bill of Materials (BOM)
- Simulation Screenshots (Proteus/LTSpice)
- PCB Gerber Files