# EP ASSIGNMENT

## ➢ TEAM MEMBERS:


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## 555 TIMER

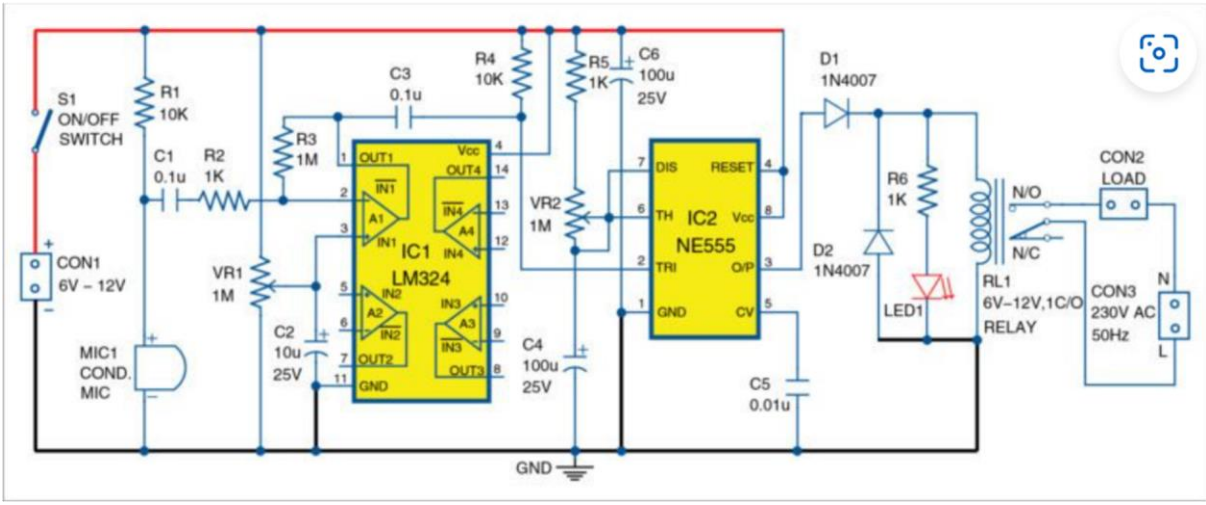
The 555 timer, a versatile integrated circuit, has been a mainstay in electronics for decades due to its adaptability in a wide range of applications. It functions as a timer, oscillator, or pulse generator, offering precise timing, stability, and ease of use. With the ability to generate accurate square waves or pulses, it has found applications in timers, oscillators, pulse-width modulation, and as a monostable or astable multivibrator.

## ❖ SOUND OPERATED TIMER

## ➢ SOURCE:

- Sound Operated Timer | Full Circuit Diagram with Explanation (electronicsforu.com)

## ➢ REPORT:




This is the sound-operated timer based on the LM324 quad-operational amplifier and NE555 timer. Time delay can be set from a few seconds to 30 minutes. It can also be used as a sound-sensitive burglar alarm. A sound-operated timer, often referred to as a sound-activated timer or clap switch, serves the purpose of automatically initiating or stopping a

timer or a timed action in response to a sound or noise input. Its primary role is to provide hands-free control for various applications by using sound as a trigger.

## ➢ OBSERVATIONS:

- **Amplification:** In a sound-operated timer circuit, the LM324, which is a quad operational amplifier (op-amp), plays a crucial role in amplifying the audio signal from the microphone (MIC1) and conditioning it for further processing by the NE555 timer (IC1). This amplification is essential because microphone signals are typically very low in amplitude, and they need to be boosted to a level suitable for further processing.
- **Signal Conditioning:** The LM324 also helps in shaping and conditioning the audio signal. Depending on the circuit design, it can be used to filter or adjust the characteristics of the signal to meet the specific requirements of the timer circuit. This may involve setting the gain, adjusting the signal level, or filtering out unwanted noise or frequencies.

In summary, the LM324 in the sound-operated timer circuit serves as an amplifier and signal conditioner for the audio input from the microphone, ensuring that it is in a suitable form to trigger the timer when a sound is detected. This amplification and conditioning step is crucial to make the circuit responsive to sound signals and control the timing function effectively.

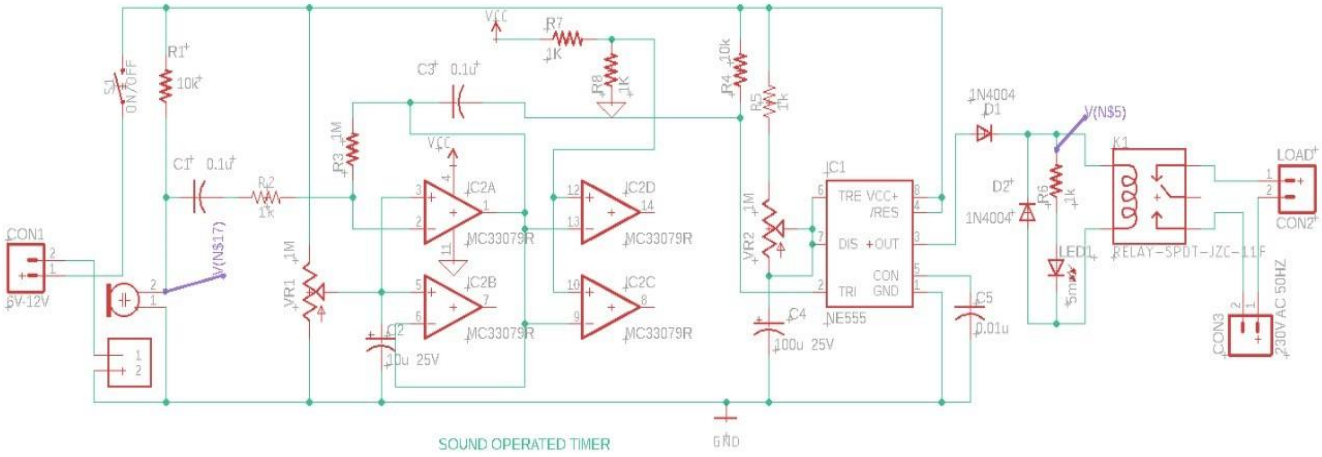
## ➢ MODIFICATIONS:

I am replacing the LM324 with the MC33079 which is an operational amplifier (op-amp) application that offers several advantages.

- The MC33079 features a higher bandwidth, making it suitable for processing higher-frequency signals.
- It boasts lower input offset voltage and bias current, ideal for precision applications demanding accurate signal processing.
- Additionally, the MC33079 offers a higher slew rate, enabling quick responses to changing input signals.
- It operates over a wider supply voltage range, making it versatile for applications with varying power requirements.
- Its extended temperature range suits more extreme environments, and it often exhibits lower noise characteristics, critical for signal quality. Moreover, the MC33079 offers enhanced stability, especially in high-frequency or high-speed configurations.

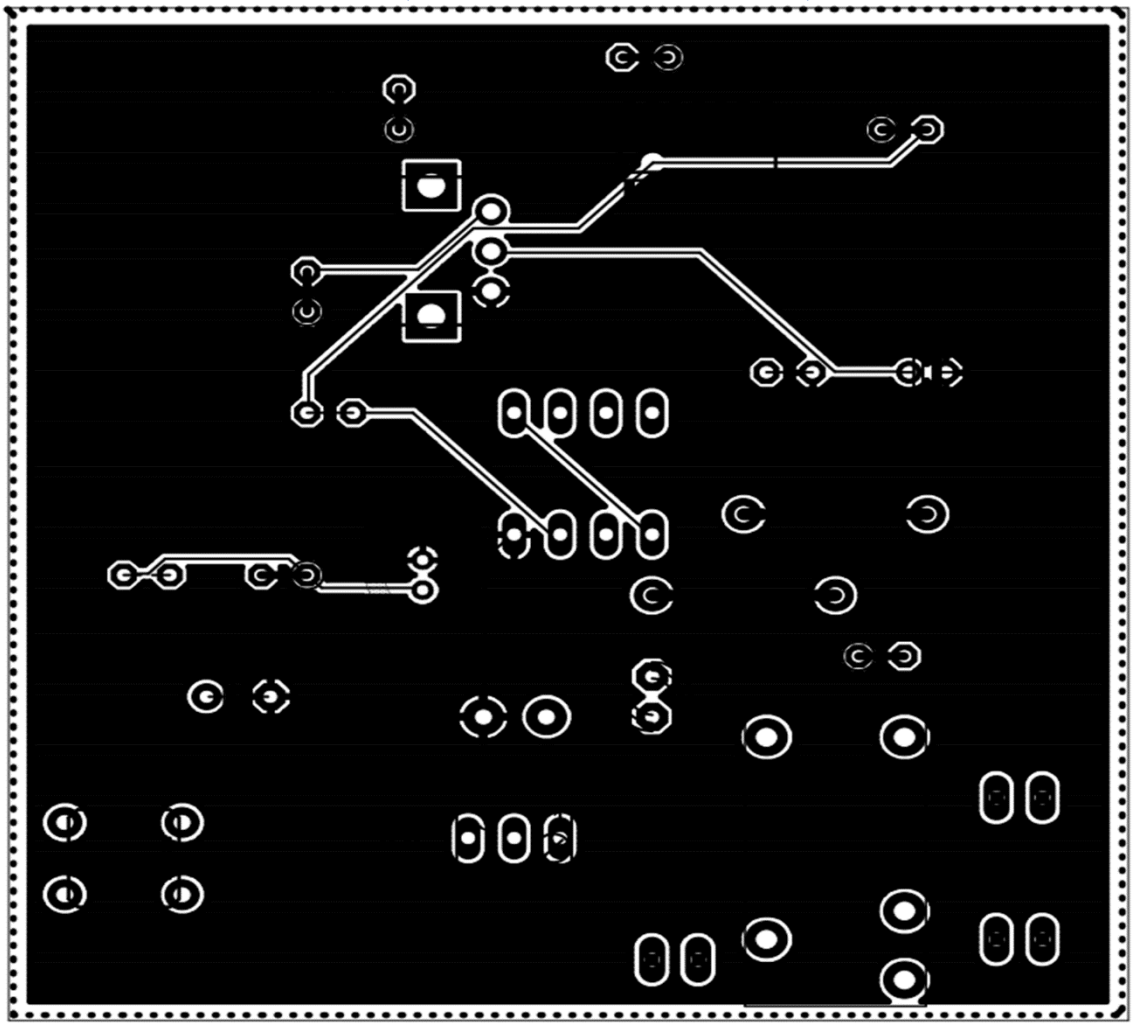
So as I am replacing the amplifier I removed the capacitor(C6) by referring to the datasheets and properties of both lm324 and MC330379. We can decrease the resistor values also. In place of a diode(1N4007),I kept diode(1N4004).

## ➢ SCHEMATIC DIAGRAM:

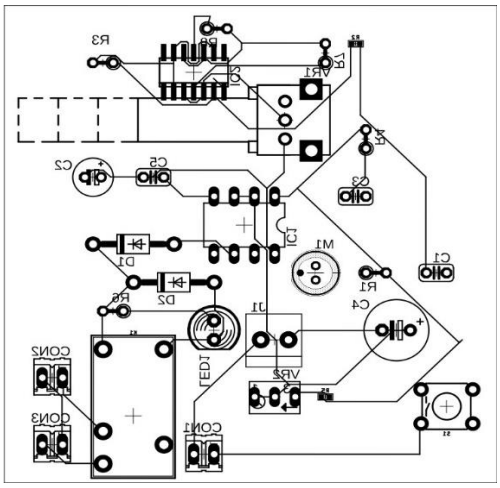



## ➢ PCB BOARD:

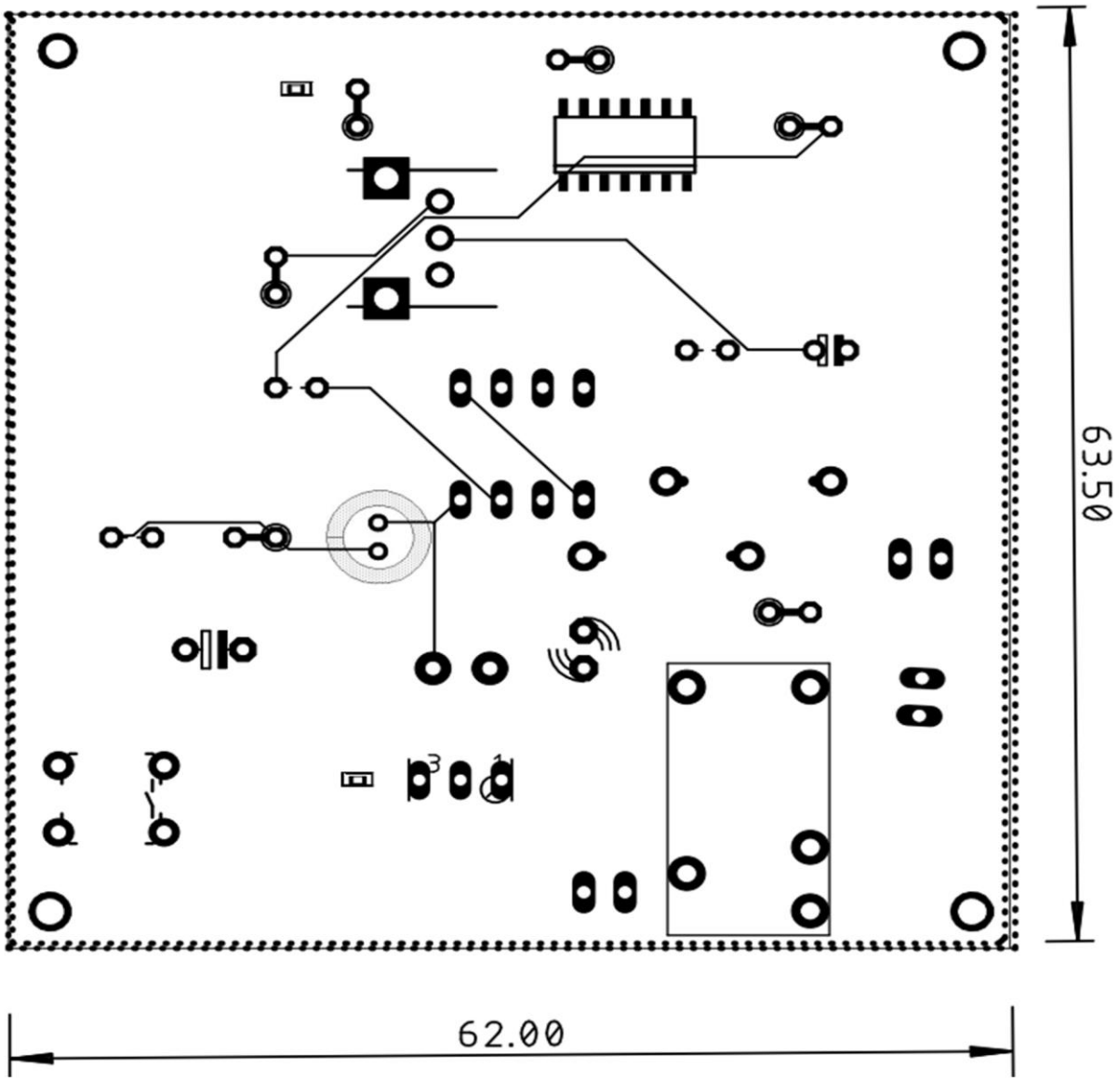
COPPER FILL OF PCB (SOLDER-SIDE PCB LAYOUT)



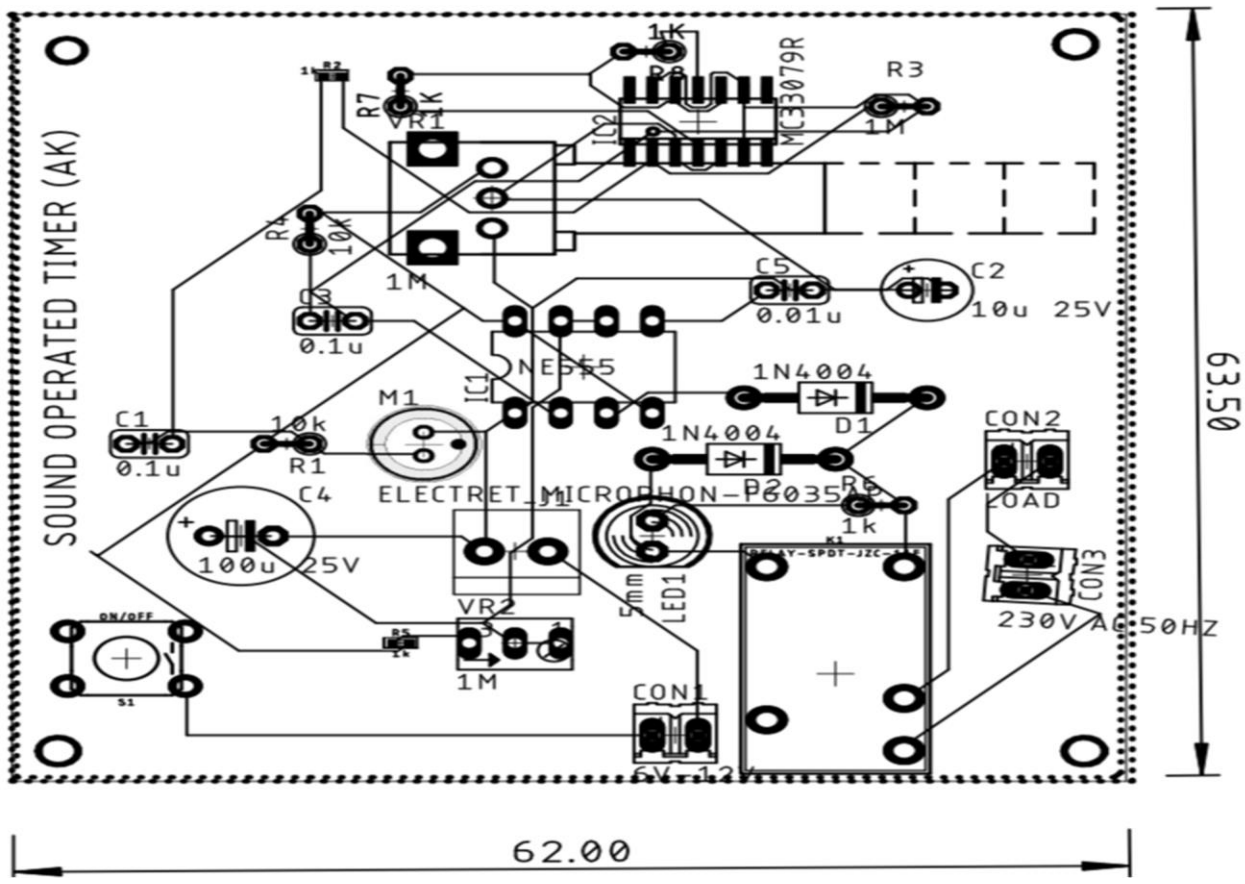
## TOP VIEW OF PCB



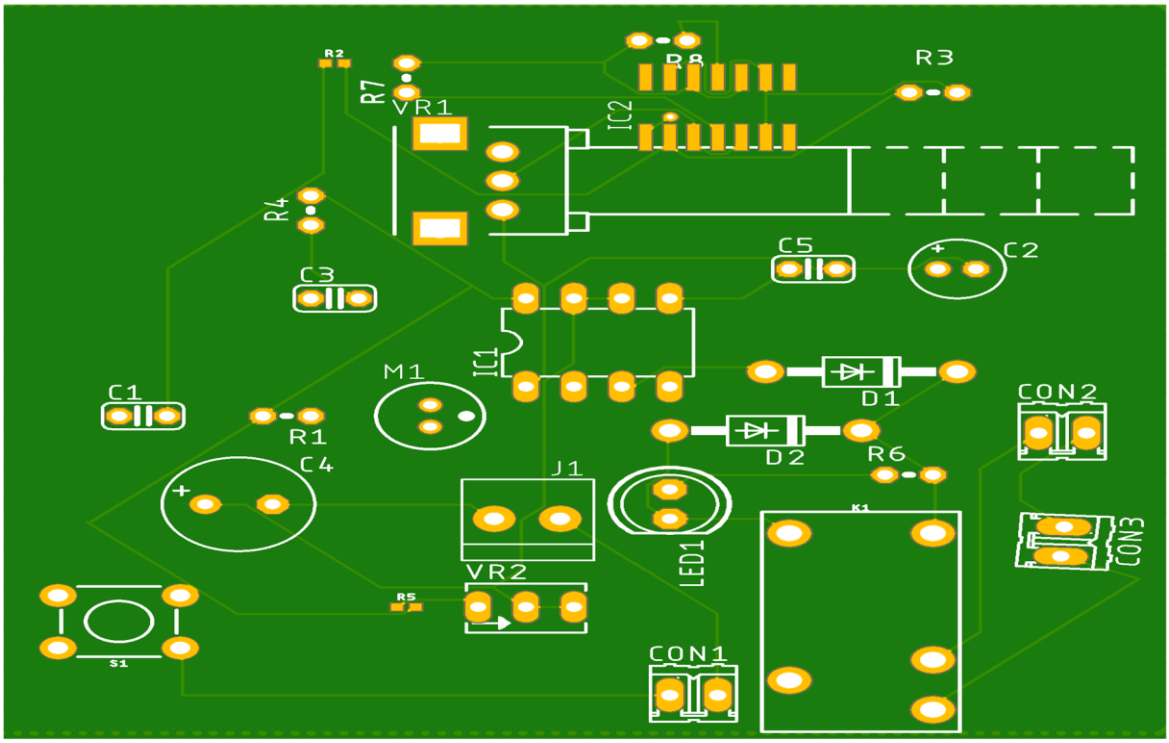
## HOLES, DIMENSIONS OF PCB



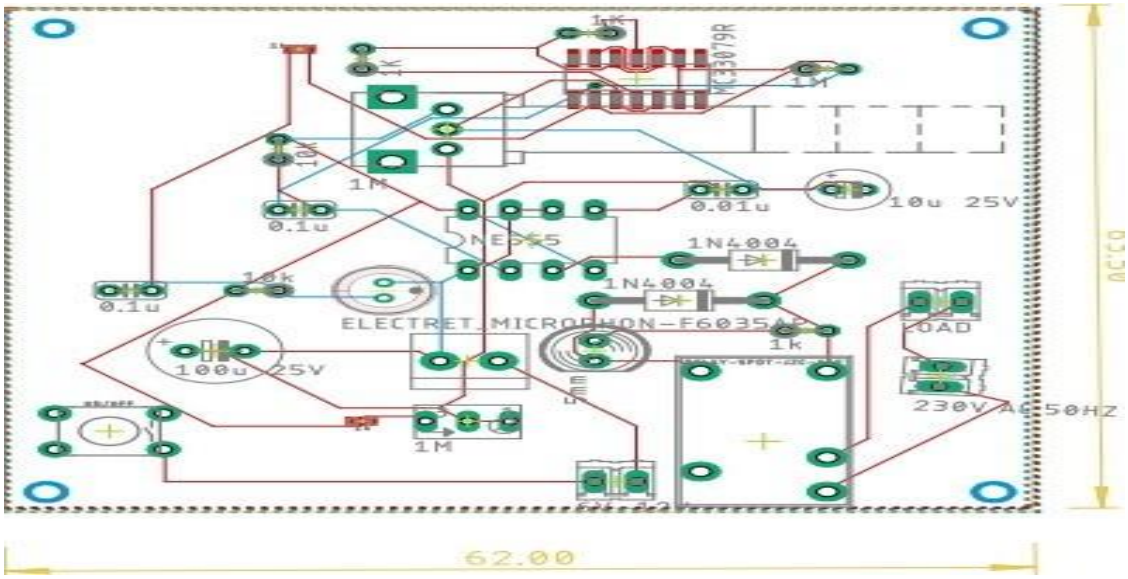
## COMPONENT LAYOUT OF PCB




## MANUFACTURING BOARD(TOP VIEW)



PCB




The no.of layers in my PCB is 2 layers.
The dimensions are 62mm X63.5mm.

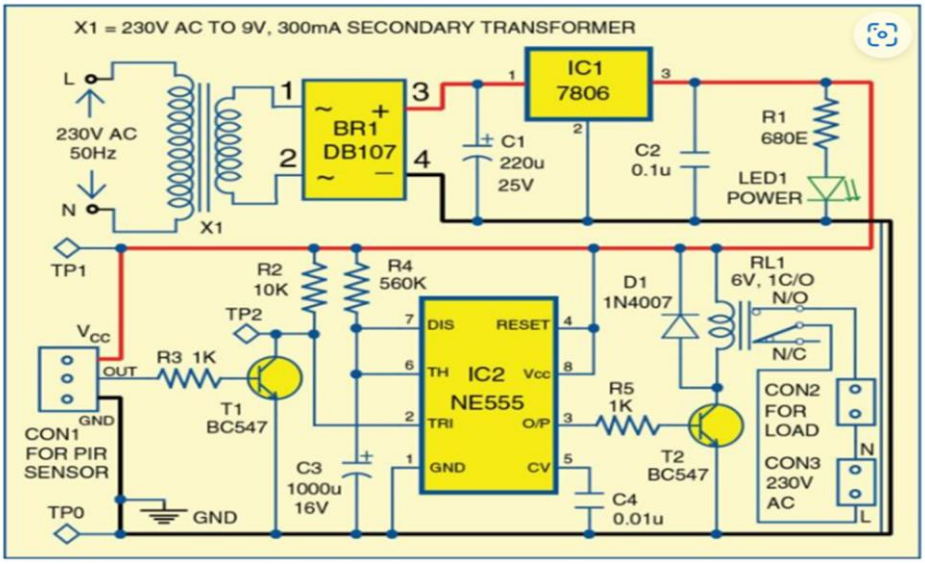
- Components:
  - Semiconductors:
    1. IC1 - MC33079 quad op-amp
    2. IC2 - NE555 timer
    3. D1, D2 - 1N4007 rectifier diodes
    4. LED1 - 5mm LED
  - Resistors (all 1/4-watt, ±5% carbon):
    1. R1, R4 - 10-kilo-ohm
    2. R2, R5, R6 - 1-kilo-ohm
    3. R3 - 1-mega-ohm
    4. VR1, VR2 - 1-mega-ohm potentiometer
  - Capacitors:
    1. C1 - 0.1uF ceramic disk
    2. C2 - 10µF, 25V electrolytic
    3. C3 - 0.1uF ceramic disk
    4. C4 - 100µF, 25V electrolytic
    5. C5 - 0.01µF ceramic disk
  - Miscellaneous:
    1. CON1, CON2, CON3 - 2-pin terminal connectors
    2. S1 - On/off switch
    3. MIC1 - Electret microphone
    4. RL1 - 6V-12V, 1 C/O relay ,230V electric bell or 100W,230V AC lamp (load),6V-12V DC power supply

# ❖Motion Detector using NE555 Timer

## ➢ SOURCE:

- https://www.electronicsforu.com/electronics-projects/hardware-diy/motion-detector-using-ne555-timer

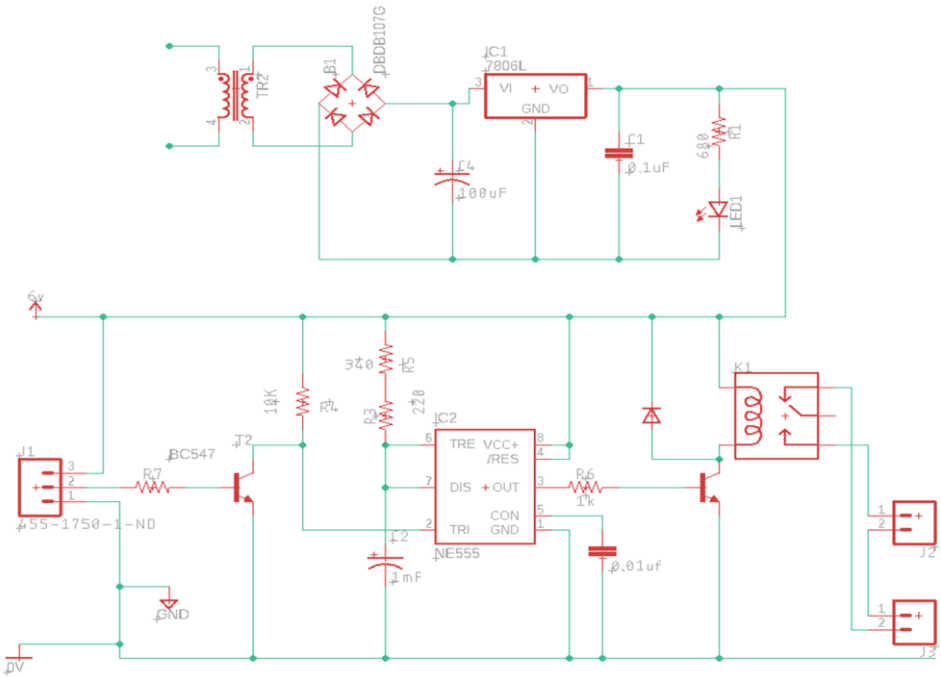
## ➢ Report:



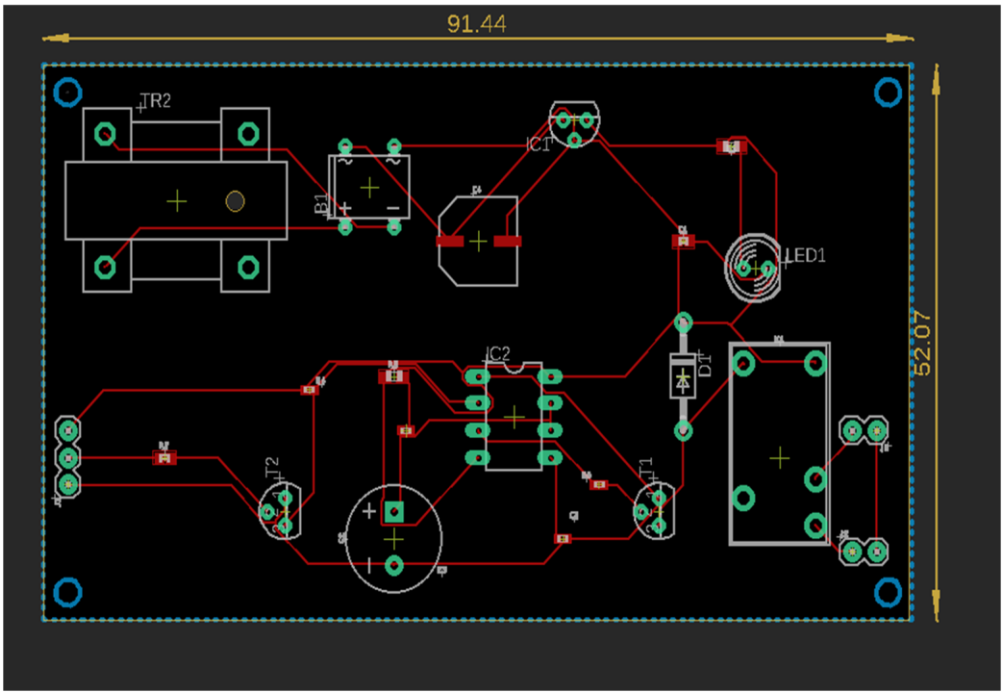

This circuit utilizes a Passive Infrared (PIR) sensor to create a system that automatically turns on a device when someone gets close to it. It has various practical applications, such as detecting theft or unauthorized access in restricted areas or buildings. It's also handy for turning on lights when someone approaches a specific area. You can use this circuit in security systems, corridor lighting, and even in bathrooms to make the lights come on when someone enters.

The circuit diagram consists of components like a 230V AC to 9V, 300mA transformer (X1), a bridge rectifier DB107 (BR1), a 6V voltage regulator 7806 (IC1), and the NE555 timer (IC2). By combining these elements with a few more components, this circuit offers an effective and reliable solution for motion detection and device activation.

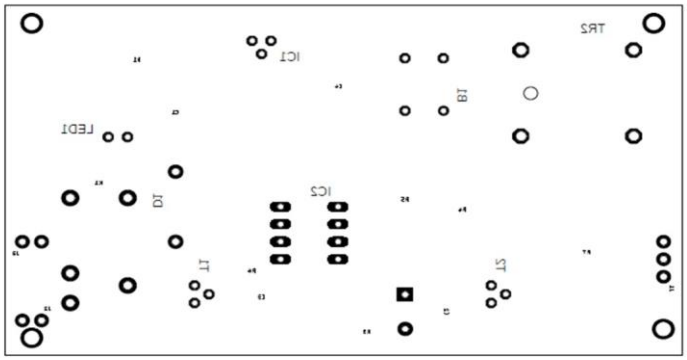
## ➢ Schematic Diagram:




## PCB BOARD:

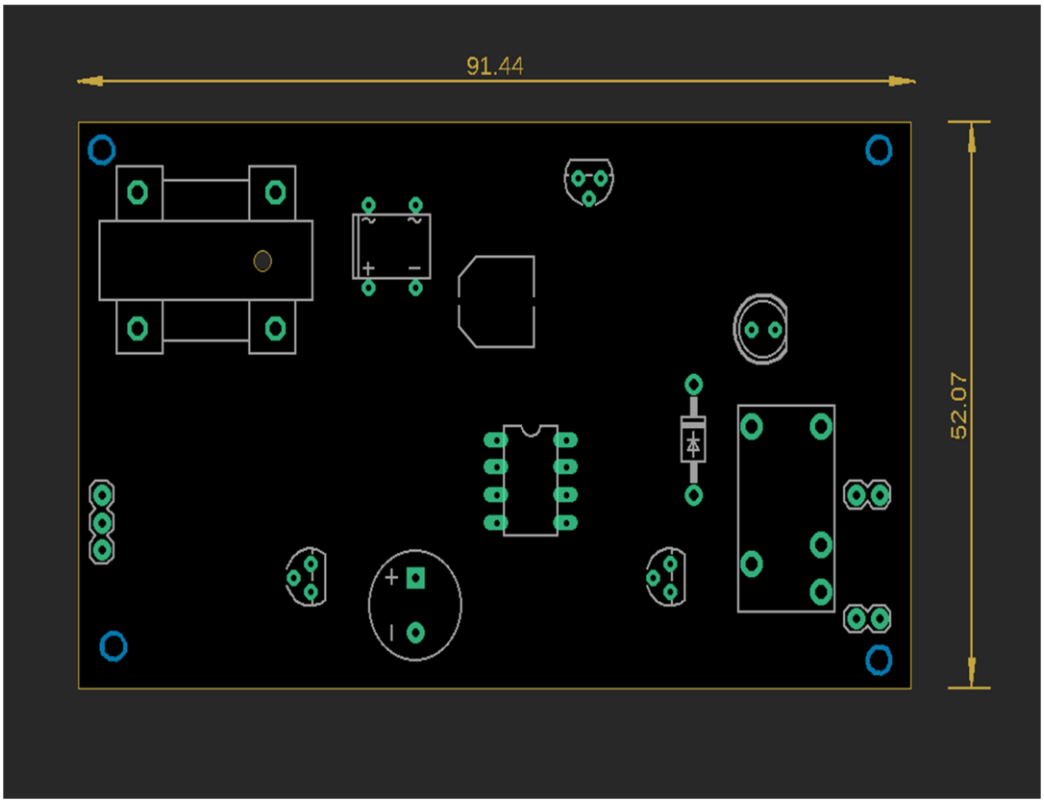


# IMAGE OF HOLES:

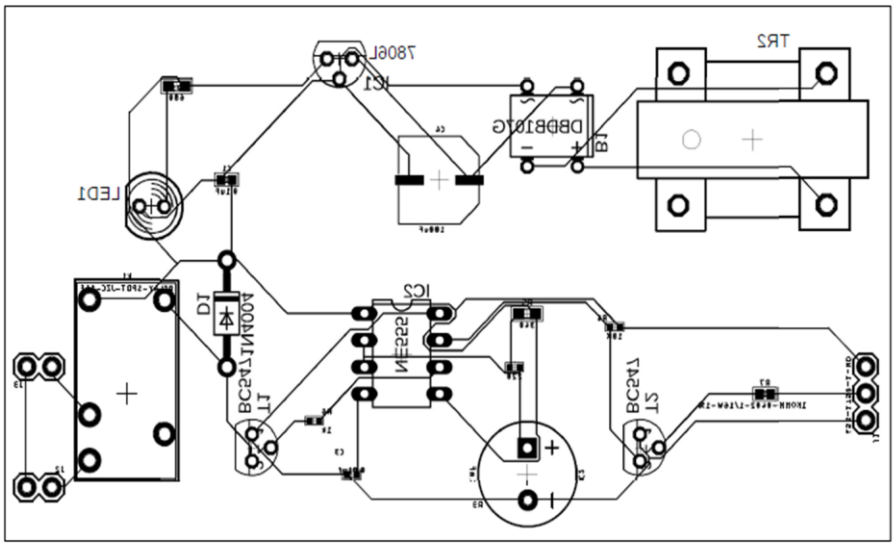


# PCB COMPONENTS AND DIMENSIONS:

## PCB COMPONENTS:

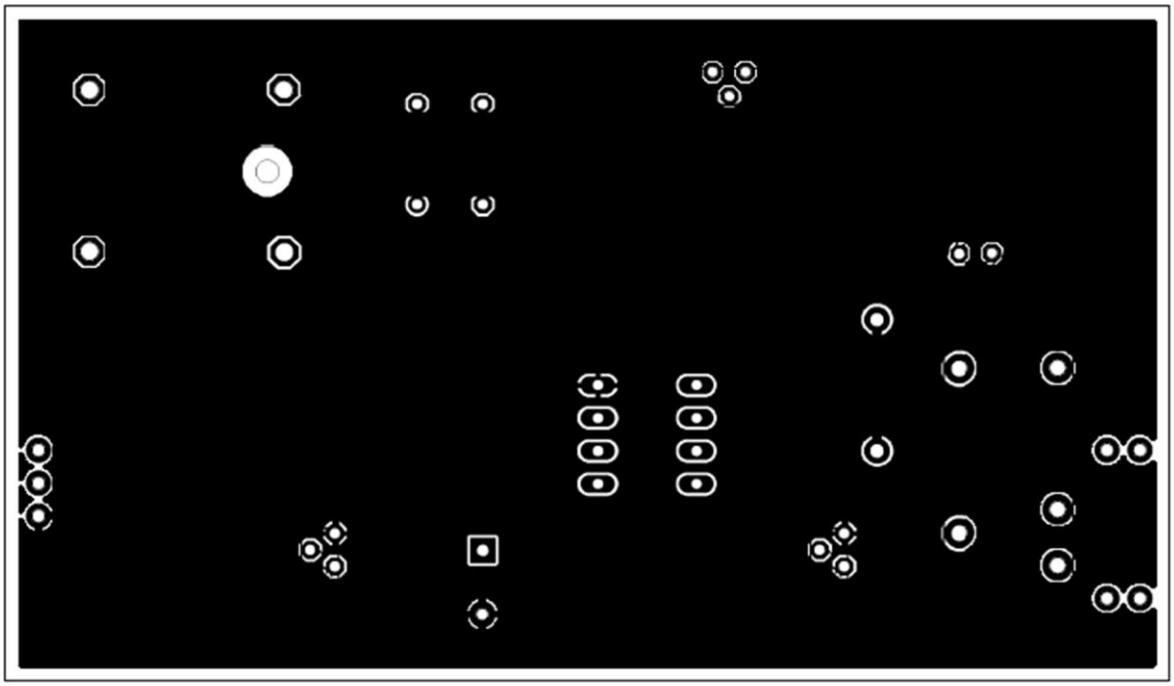


## PCB LAYOUT WITH COMPONENTS:

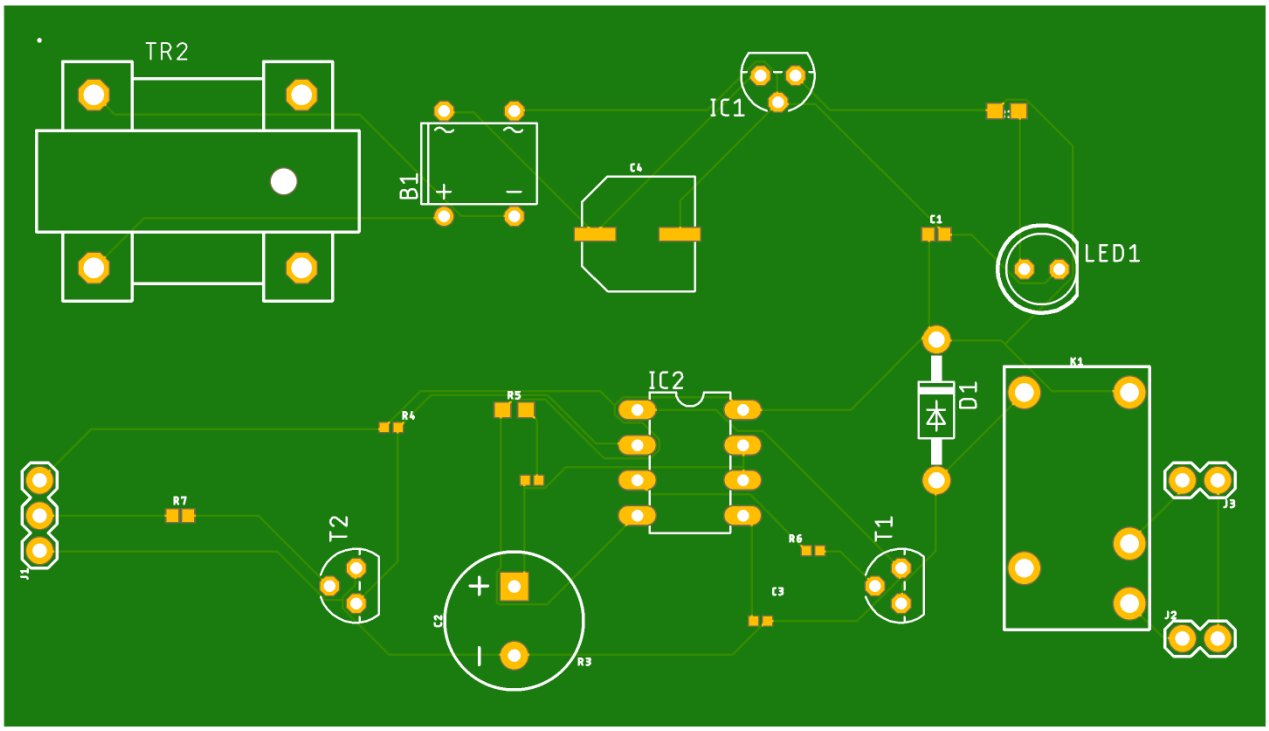



COPPER FILLING:

## COPPER FILLING(SOLER-SIDE PCB)



# MANUFACTURING BOARD (TOP VIEW)




The no.of layers=2
Dimensions =91.44mm X 52.07mm

# ❖ Tick Tock sound generator using 555Timer IC

## ➢ Source: Circuit link

## ➢ Components Required:

- 555 Timer IC
- 8 Ohm Speaker
- LED (Optional)
- Capacitors: 2 x 10uF
- Resistors: 47K, 220R
- Breadboard
- Few Breadboard Connectors
- (5-9)V Power Supply

## ➢ Working of the Circuit:

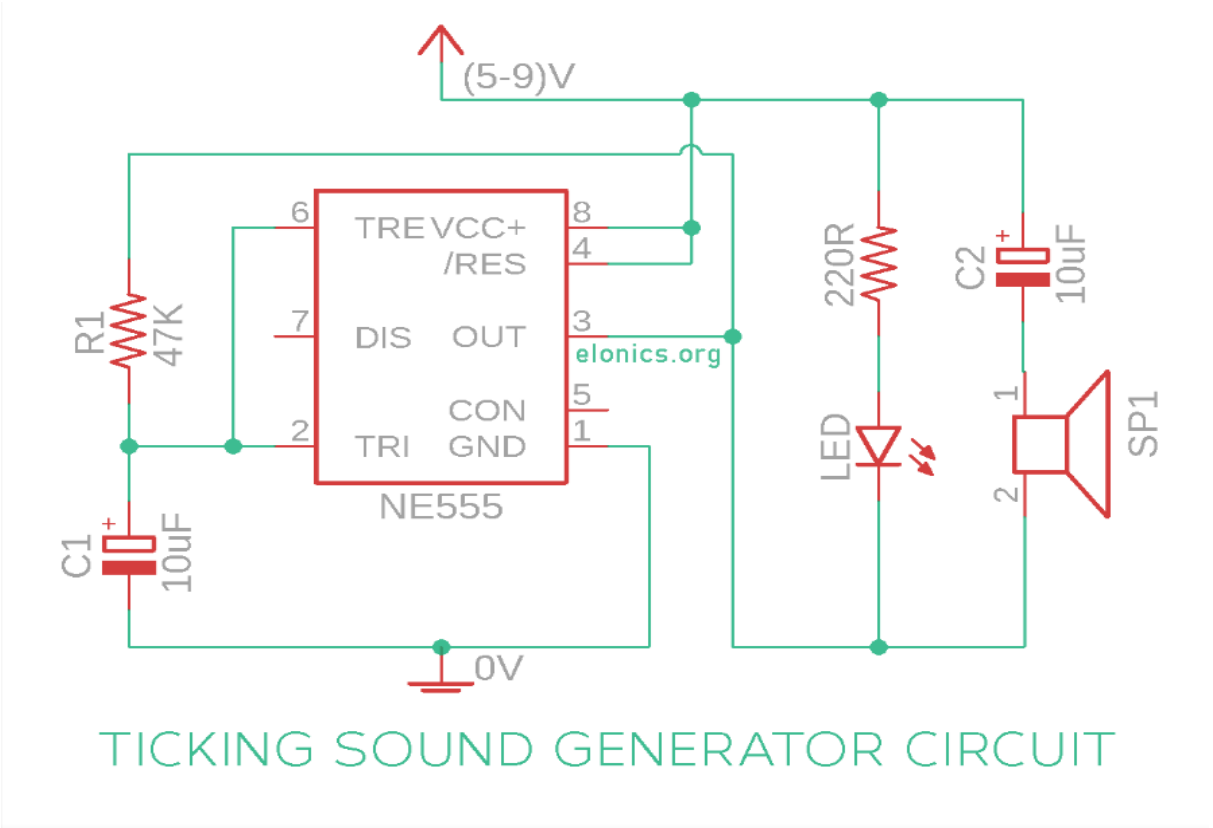
In this circuit, 555 timer IC is configured to work in astable / bistable mode. It means that voltage at the output of 555 IC continuously toggles between 0V and Vs (The supply voltage).

Each time there is a transition in the output voltage from 0V to Vs or from Vs to 0V, the diaphragm of the speaker moves rapidly. This movement generates a tick or tock sound depending on whether the diaphragm is moving up or down.Creating a tick-tock sound generator involves additional design considerations for the sound generation circuit, such as pulse generation and amplification. The specific components and values in your circuit will depend on the desired frequency and sound characteristics.

### Flow Process:

- Launch Eagle
- Schematic Design
- Component and Symbol Libraries
- Schematic Capture
- PCB Layout

- Ground Plane
- Design Rules
- Design Checks
- PCB Footprints
- Review and Verification
- Fabrication



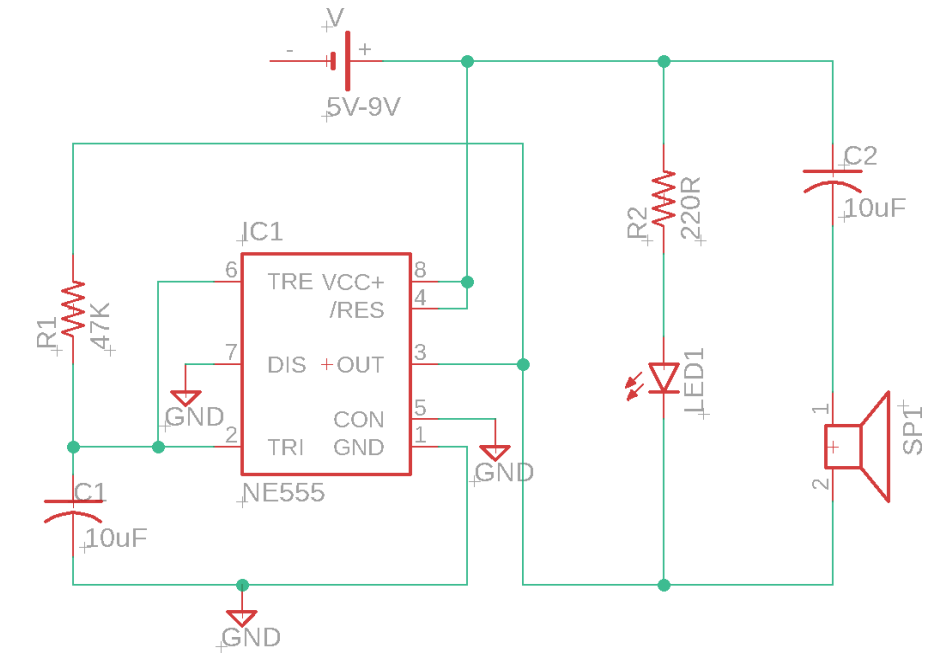

The frequency of the tick-tock sound depends on the values of R1, R2, and C1. You can choose these values according to your desired frequency. Here's a rough formula to calculate the frequency:

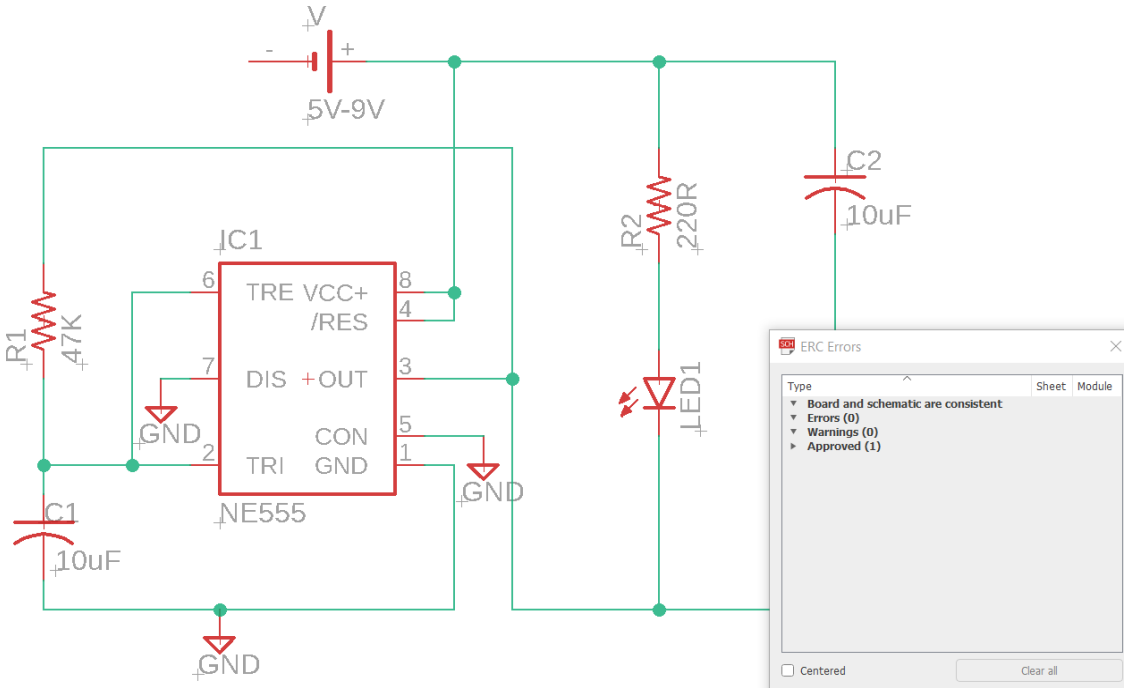
Frequency (Hz) = 1.44 / ((R1 + 2 * R2) * C1)

## Summary:

- The timer IC operates as an astable multivibrator, which continuously generates a square wave.
- When power is applied, Pin 3 (OUT) of the 555 timer oscillates between low and high levels,creating a square wave output.
- The square wave drives the speaker or buzzer, creating a tick-tock sound.

➢ Schematic:

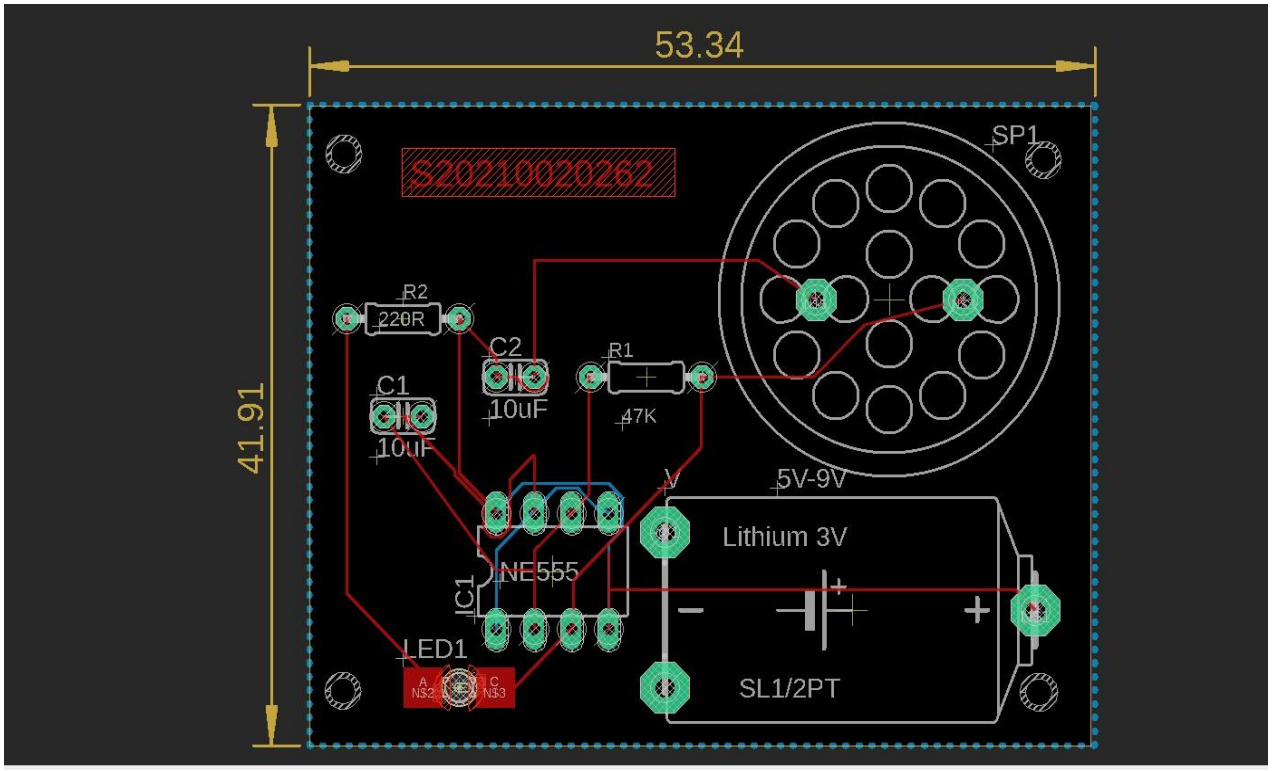


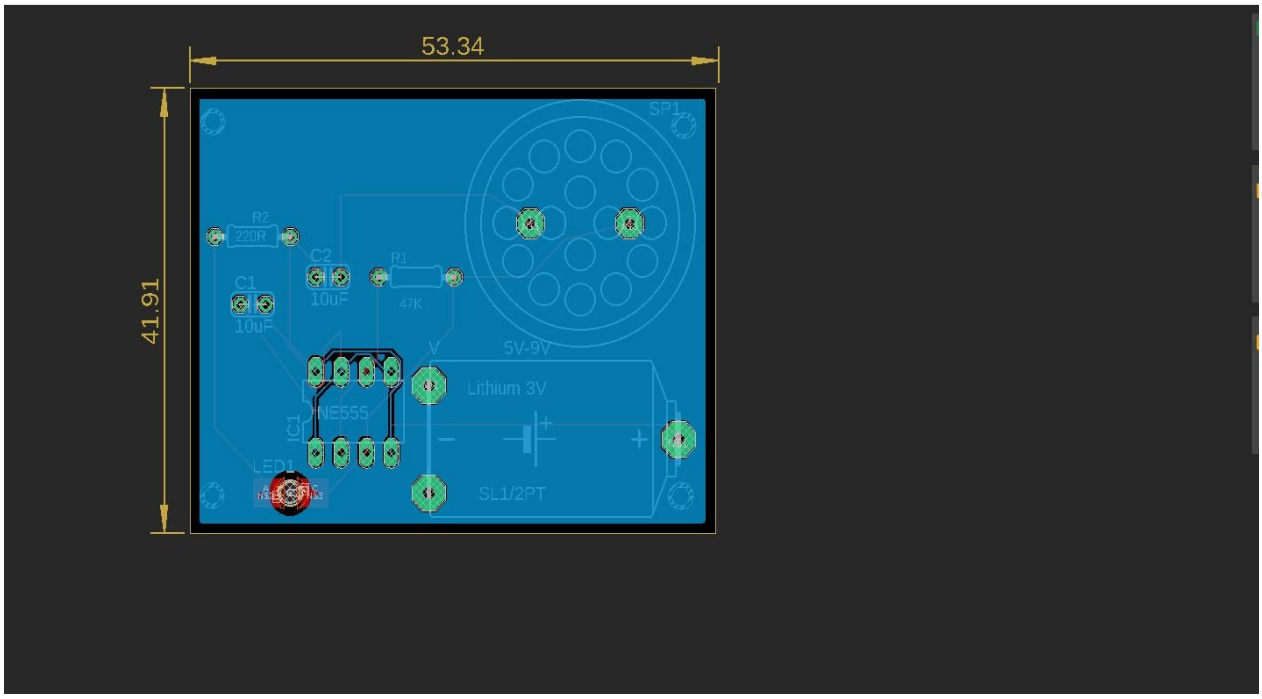

Implementation of schematic of the circuit with 0 errors following ERC.

## ➢ PCB board:

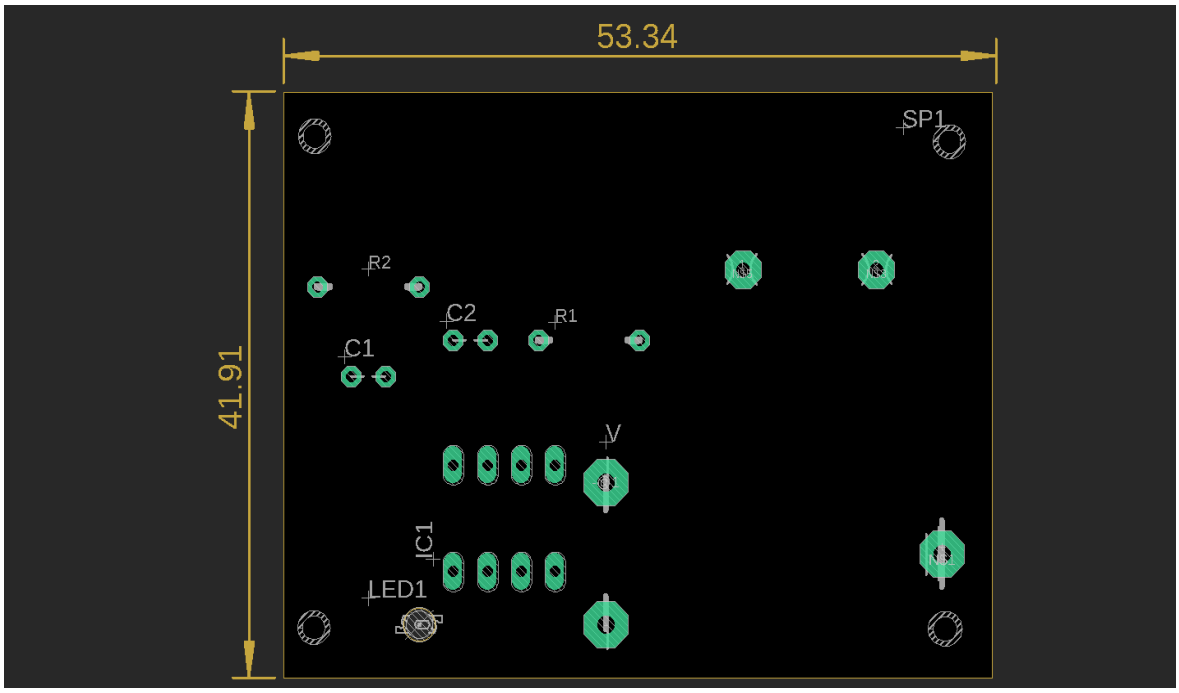
### 1.Overall PCB from top view:



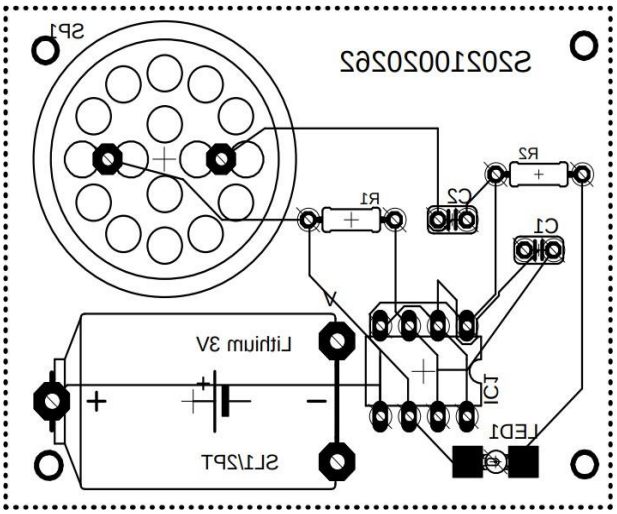

### 2.Bottom view of the PCB:



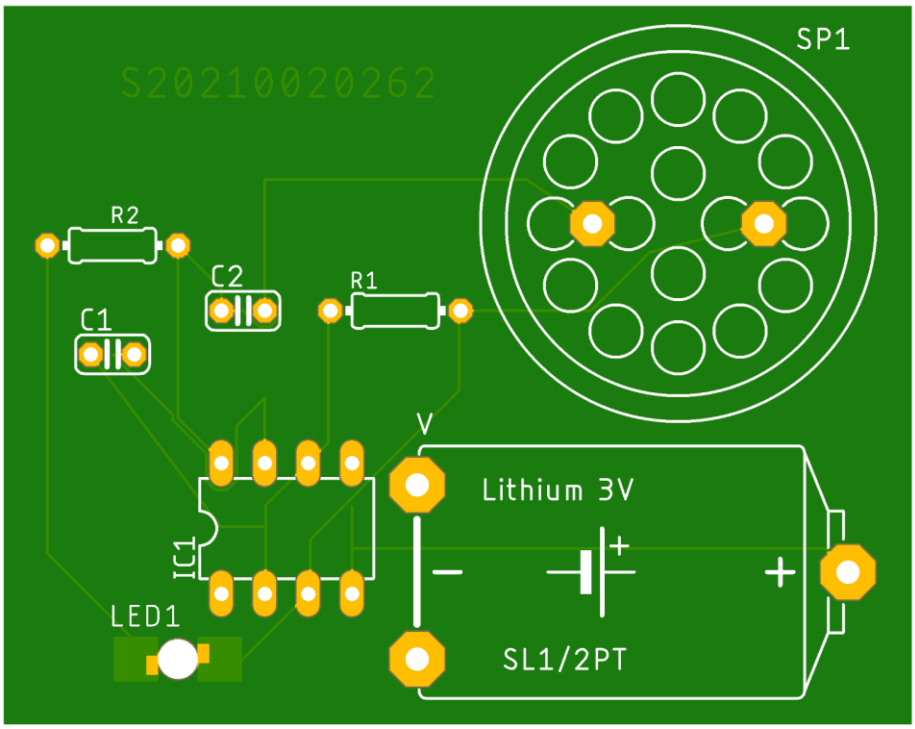
## 3. Copper Filling of the PCB holes:




## 4. PCB LAYOUT WITH COMPONENTS:



## 5. Manufacturing board:




**Contribution:**I Implemented the Whole Schematic design, PCB designing, and obtained PCBLayout, As this is my Individual Circuit.

No.of Layers: 2
Dimensions of PCB: 53.34mm X 41.91mm

## Further Improvements:

We can adjust the gap between successive beats, in real time, by replacing the Resistor R1 with a potentiometer. Multiple circuits with different beat/ticking frequencies can be combined to make audio synthesizer circuits.

## Applications

- To add a mechanical feel to digital clocks.
- In metronome circuits (The musicians maintain rhythm).
- In hypnotic devices that require flashing of lights and ticking sounds.

## ➢ Implementations By understanding EP course:

- -Reduced the area of the circuit
- -Reduced the board dimensions.
- -Power Optimization.
- -Integrated the whole circuit.
- -Increased the performance of the Circuit.
- -Made the Design Cost Effective.
- -Used effective models of each component according to the source circuit.
- -Interconnect level-1 and Interconnect level-2
- -Electronic packaging level-2

## ➢ Team Contributions:

**Team No: 04**

- **1.** A. Kiranmai - **S20210020251 (Group lead)**

  Contribution**: Sound Operated Timer using 555 Timer.**

- **2.** B .Havilah - **S20210020262**

  Contribution**: Tick-Tock Sound Generator using 555 Timer.**

- **3.**P. Jasmitha - **S20210020314**

  Contribution: **Motion Detector using 555 Timer.**

➢ Conclusion: We all Implemented the Schematic Designs, and PCB Layout Designing of IndividualCircuits Using 555 Timer in Eagle Autodesk Software.