GITAM(DEEMED TO BE UNIVERSITY)

TITLE : Blinking LED(ON/OFF)

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ACADEMIC YEAR:2022-2026

1.Prototype Title : Blinking LED(ON/OFF)

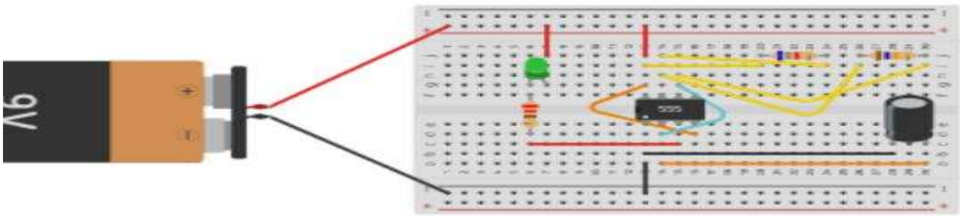
2. Simulation Results

a. Detailed Description of the simulation Results

The simulation was conducted to analyze the performance of the Blinking LED(ON/OFF) using software tools such as Thinkercad and easyEDA. The primary focus was to observe the behavior of the circuit under various conditions and ensure it met the desired specifications.

b. Include Screenshots Note:

Screenshots of the simulation results will be included here. These should capture the significant outputs and shows 3D image.



To illustrate the key aspects of simulating an LED turning ON and OFF, let's break down the process into essential components and steps, including the circuit setup, simulation software, and the behavior of the LED in response to control inputs.

1. Circuit Components

- **LED**: The main light-emitting component.
- **Resistor**: Limits the current to prevent damage to the LED.
- **Power Supply**: Provides the necessary voltage.
- **Switch or Control Mechanism**: Turns the LED ON and OFF.

2. Circuit Diagram

- **Power Source**: Typically 5V DC.
- **Resistor**: Calculated based on the power supply voltage and LED specifications.
- **LED**: Connected in series with the resistor.
- **Switch**: Used to control the LED.

6. Circuit Building on EasyEDA Tools:

Outline the Process of Translating the Finalized Design into a Circuit Layout.

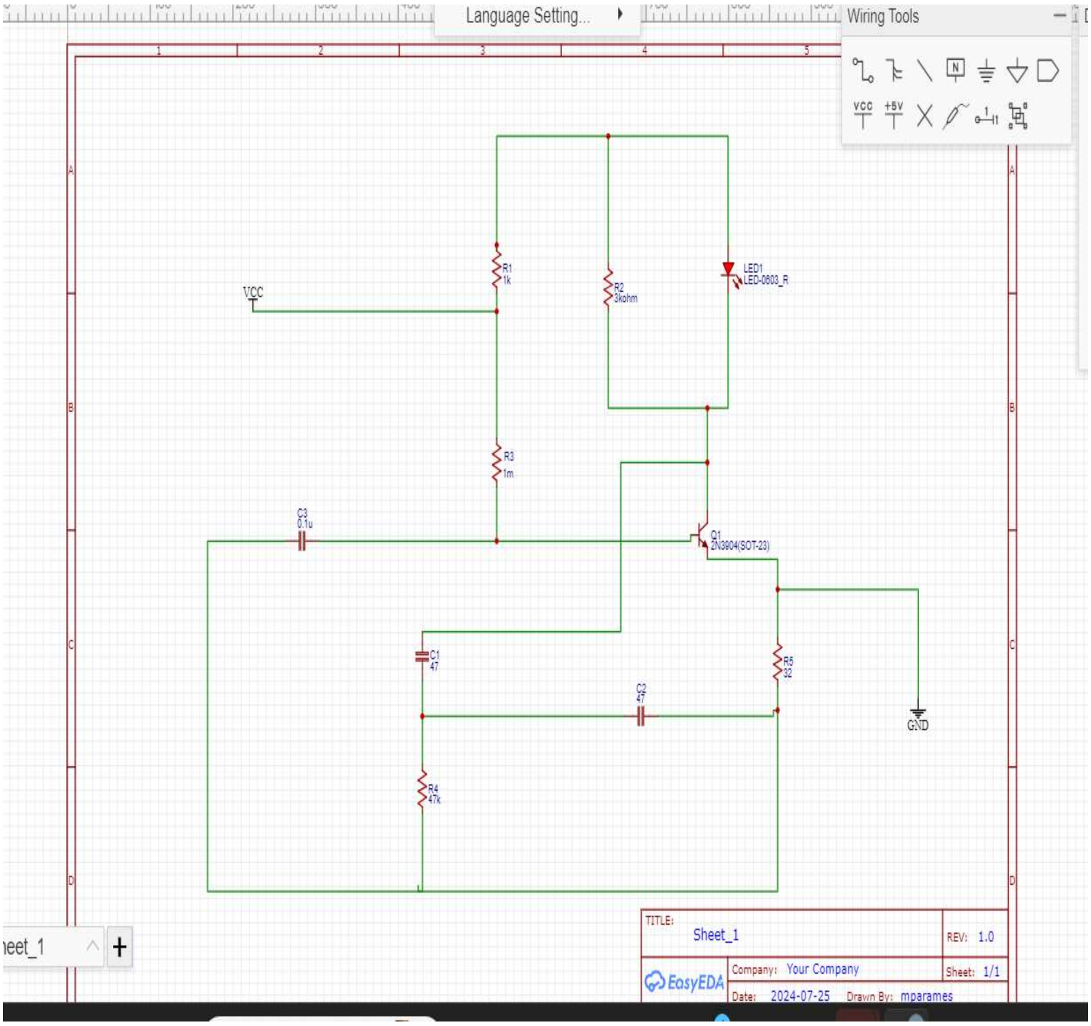
- Provide Step-by-Step Instructions, Screenshots

1.Open EasyEDA and create a new project

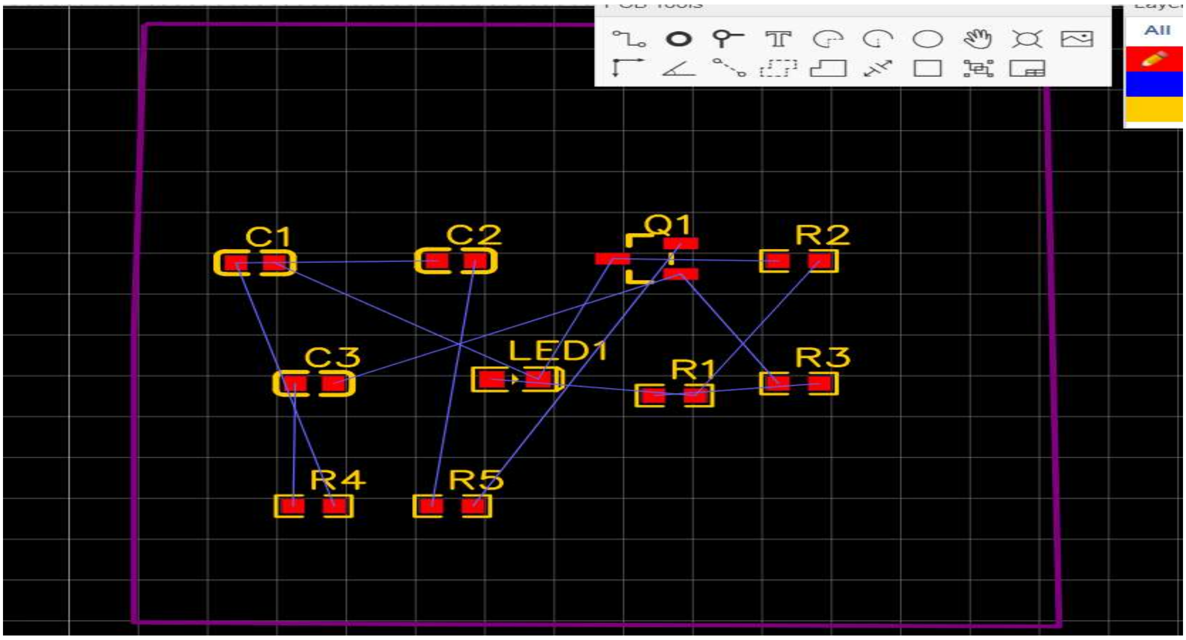
2.Schematic capture: Place all components on the schematic editor and connect them.

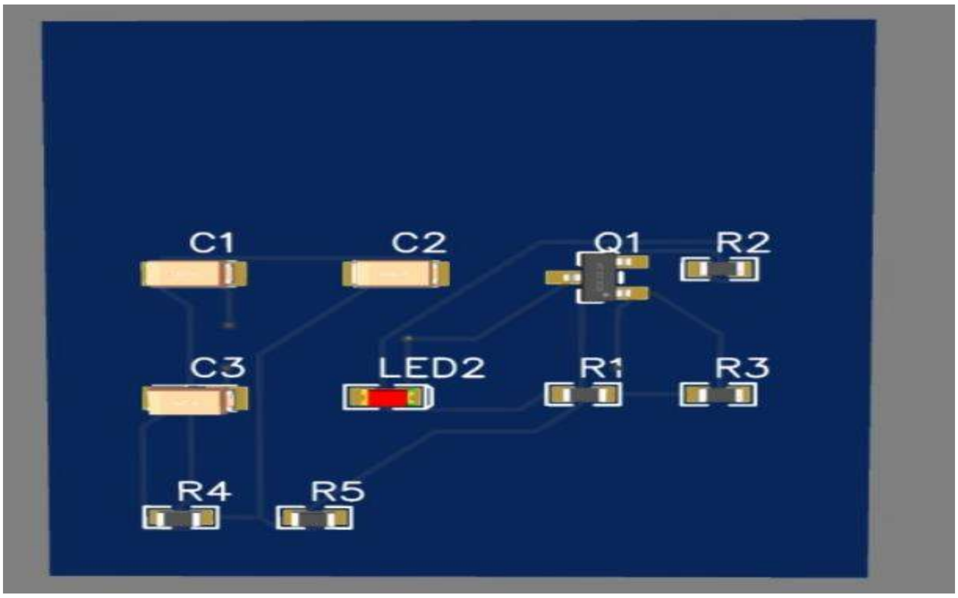
3. Annotation and netlist generation.

4. PCBlayout: Transfer the schematic to PCB layout, place components, and route traces.



Language Setting...
Wiring Tools
VCC
R1
1k
R2
3kohm
LED1
LED-0603_R
R3
1m
C3
0.1u
Q1
2N3904(SOT-23)
C1
47
C2
47
R5
32
GND
R4
47k
TITLE:
Sheet_1
REV: 1.0
Company: Your Company
Sheet: 1/1
Date: 2024-07-25
Drawn By: mparames
EasyEDA





7. PCB Designing on EasyEDA Tools:

Describe the Process of Designing the PCB Layout Based on the Circuit Layout

Designing a PCB layout on EasyEDA involves several systematic steps to ensure that the circuit is correctly and efficiently translated from the schematic to a manufacturable PCB.

Below are the detailed steps:

step 1: Open EasyEDA and Create a New Project

- Log in to EasyEDA.
- Click on "New Project" and enter the project details (name, description).

Step 2: Import the Schematic

- Ensure your schematic is complete and error-free.
- Click on "Convert Project to PCB" to start the PCB layout process. 2. PCB Layout Preparation .

Step 3: Set the PCB Board Outline

- Define the shape and size of your PCB according to your design requirements.
- Use the "Board Outline" tool to draw the boundary of your PCB. 3. Component Placement

Step 4: Place Components on the PCB

- Initially, place all components within the board outline
- Prioritize the placement of key components such as power supply connectors, microcontrollers, and other large components.
- Arrange components in a logical manner to minimize trace lengths and crossovers.

Tips for Component Placement:

- Keep components that interact closely near each other.
- Place decoupling capacitors close to their respective IC power pins.
- Ensure orientation consistency for similar components to facilitate easier assembly.

Step 5: Lock Critical Components

- Once critical components are placed, lock them in place to prevent accidental movement during routing.

4. Routing Traces

Step 6: Route Power and Ground Traces.

- Use wider traces for power and ground to ensure they can handle the required current.
- Implement a ground plane if possible to reduce noise and improve signal integrity.

Step 7: Route Signal Traces

- Route signal traces, starting with high-frequency and critical signals.
- Maintain short and direct routes to reduce resistance and inductance.
- Follow design rules to maintain appropriate trace widths and spacing.

Tips for Routing:

● Avoid right-angle bends in traces to reduce impedance discontinuities.

● Use vias sparingly, as they add inductance and resistance.

Step 8: Add Copper Pours

● Add copper pours for ground and power planes to improve the performance and reliability of the PCB.

● Ensure the copper pours are connected to the appropriate nets.

5. Design Optimization

Step 9: Check Design Rules

● Perform a Design Rule Check (DRC) to ensure all traces, clearances, and other layout parameters comply with manufacturing requirements.

● Resolve any issues flagged by the DRC.

Step 10: Add Silkscreen Labels

● Add silkscreen labels, such as component designators, to help identify components during assembly.

● Ensure the text is legible and does not overlap with pads or traces. 6. Final Verification

Step 11: Electrical Rule Check (ERC)

● Perform an Electrical Rule Check (ERC) to ensure there are no electrical issues such as unconnected pins or shorts.

Step 12: Visual Inspection

● Conduct a thorough visual inspection of the PCB layout.

● Verify component placement, trace routing, and overall design integrity. 9. Download the Gerber File: Provide Instructions for Downloading the Gerber File of the Final PCB Design from EasyEDA

9. Download the Gerber File:

Provide Instructions for Downloading the Gerber File of the Final PCB Design from EasyEDA

1. Open the PCB layout in EasyEDA.
2. Goto the Fabrication Output tab.
3. Select "Gerber" and configure settings as required.
4. Click "Generate Gerber" to create the files.

5. Download the Gerber files for submission to the fabrication service.

10. Appendix:

Classroom Learnings: BLINKING LED(ON/OFF)

The appendix includes detailed notes and learnings from classroom sessions on the Blinking LED(ON/OFF), covering theory, design equations, practical tips, and other relevant information.

1. Theory of Blinking LED(ON/OFF)

An LED is a semiconductor device that emits light when an electric current passes through it. It consists of a p-n junction made from materials like gallium arsenide (GaAs), gallium phosphide (GaP), or indium gallium nitride (InGaN).

ON State of an LED

- **Current Flow**: In the ON state, a sufficient forward voltage is applied across the LED, allowing current to flow from the anode to the cathode.
- **Light Emission**: The LED emits light due to the recombination of electrons and holes in the semiconductor material.
- **Circuit Configuration**: To achieve the ON state, the LED is connected in series with a current-limiting resistor to prevent excessive current flow that could damage the LED.

OFF State of an LED

- **No Current Flow**: In the OFF state, the voltage applied across the LED is insufficient to forward bias it, or the circuit is open (switch is off).
- **No Light Emission**: Without the forward bias voltage, there is no electron-hole recombination, and hence no light is emitted.
- **Circuit Configuration**: The switch is open, or the control mechanism (such as a microcontroller) sets the output pin to LOW or 0V.

Applications

- **Indicators**: LEDs are widely used as indicator lights in electronic devices.
- **Displays**: LED displays for digital clocks, televisions, and monitors.
- **Lighting**: LED bulbs for residential and commercial lighting due to their energy efficiency.
- **Signaling**: Used in traffic lights, automotive lights, and other signaling devices.

Conclusion

Blinking an LED exemplifies the intersection of electronics and control systems. By understanding the principles of LED operation, circuit design, and control mechanisms, one can effectively harness this technology for a wide range of applications. The exercise of blinking an LED provides foundational knowledge that can be expanded upon in more complex electronic projects and systems.