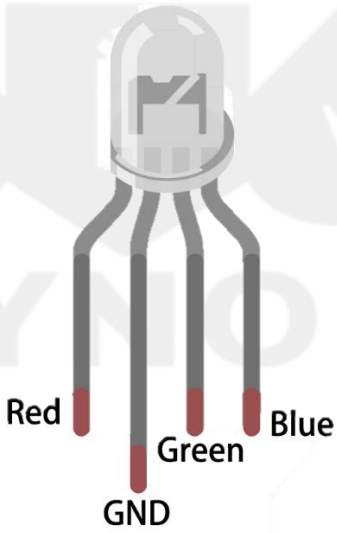
LAUNCH THE PROJECT - 08

RGB LED

(4-Pin, Common Cathode)

On AYNOP® UNO Launchpad Kit



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1. Overview

This project demonstrates how to use a **4-pin RGB LED (common cathode type)** with the Arduino UNO R4 Minima. The LED has four pins: **one cathode (GND)** and three anodes for the **red, green, and blue** channels.

You will learn to:

- Wire an RGB LED to Arduino.
- Understand **colour mixing basics** using three separate anodes.
- Cycle through Red, Green, and blue colours automatically.

2. Components Required

- Arduino® UNO R4 Minima board
- USB Type-C data cable
- 4-pin RGB LED (common cathode type)
- 1 × 220Ω resistor (for the common cathode pin)
- Breadboard
- Jumper wires

3. Software Required

- Arduino IDE (v2.3.6 or later recommended)
- No additional libraries required.

Note:

We assume the **Arduino UNO R4 Minima board package** is already installed on your machine, as explained in the 00_Getting_Started/00_GettingStarted_Arduino_R4_Minima guide. If it is not installed, please refer to that document and complete the installation before proceeding.

4. Hardware Setup

This section explains how to connect the components the **RGB LED**. It includes a **Wiring Diagram** and a **Circuit Schematic**.

4.1 Wiring Diagram

The RGB LED is a 4-pin device with three anodes (Red, Green, Blue) and one common cathode (GND). A single resistor is placed on the common cathode to limit current for all colours.

- Red anode → D13.
- Green anode → D12.
- Blue anode → D11.
- Common cathode → Resistor (220Ω) → GND.

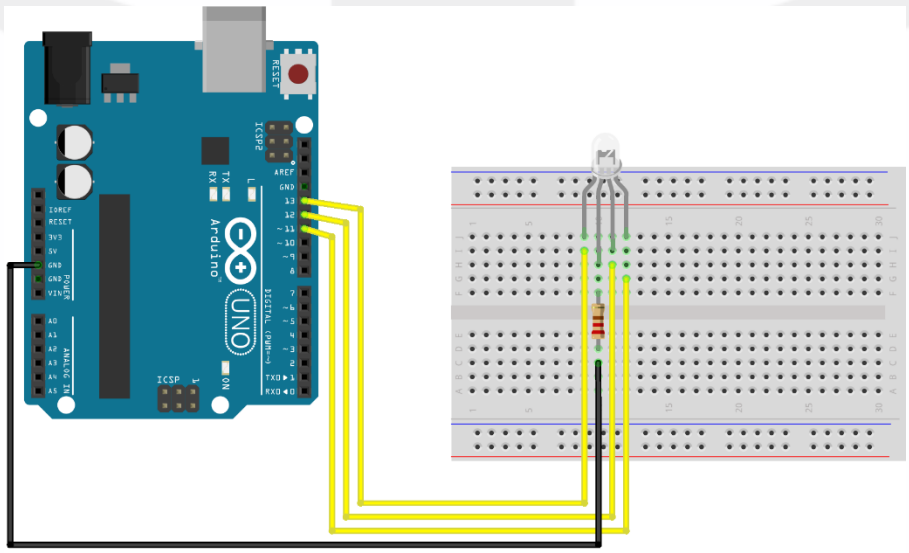

Figure 4.1 – Wiring diagram for RGB LED Project

Tip: Always disconnect the USB cable before making or changing hardware connections.

4.2 Circuit Schematic

- **D13 → Red anode**
- **D12 → Green anode**
- **D11 → Blue anode**
- **Common Cathode → Resistor → GND**

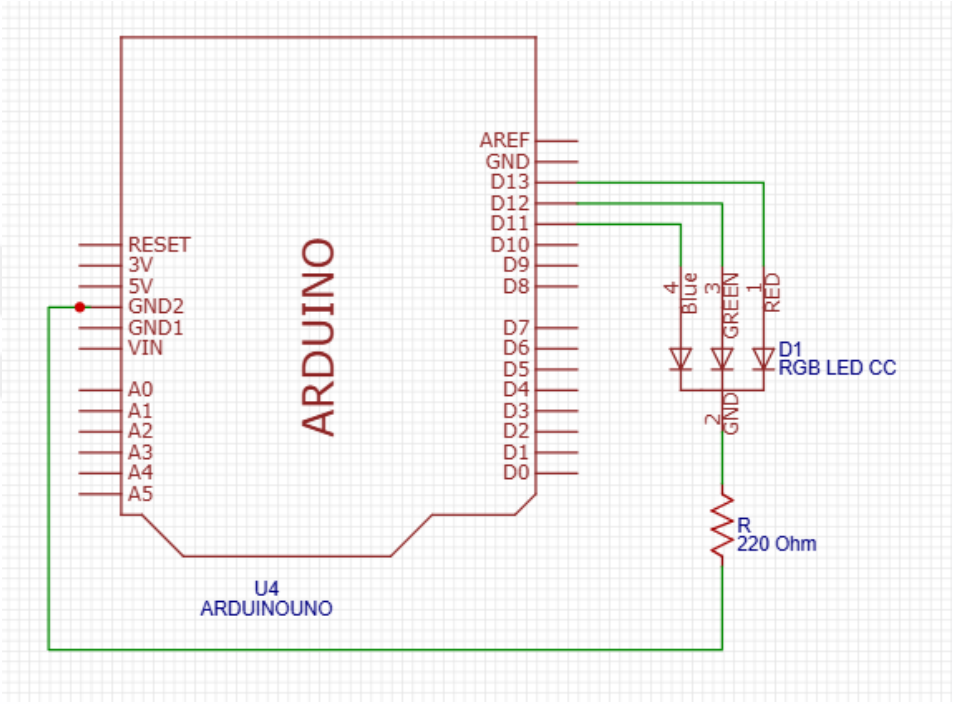

Figure 4.2 – Circuit schematic for RGB LED Project

5. Principle – How It Works

An **RGB LED** is essentially three LEDs (Red, Green, Blue) packaged into a single component. By lighting these LEDs individually or together, you can create many different colours.

In this project:

- A **common cathode RGB LED** is used, where all cathodes share one pin.
- Instead of using one resistor per colour, we connect the **common cathode pin through a single resistor** to GND**.**
- While this method saves components and wiring, brightness balance may not be perfect across all colours (since each LED colour has different voltage drops).
- The sketch turns on one colour at a time (Red, Green, Blue) to demonstrate basic operation.

6. Procedure – Steps to Run

1. **Build the Circuit**
   a. Assemble the connections for RGB LED project as shown in the **Wiring Diagram (Figure 4.1)**.

2. **Connect the Board**
   a. Use a USB Type-C data cable to connect your UNO R4 Minima to your computer.

3. **Open the Project Code**
   a. Simply **double-click** the file *08_RGB_LED.ino* in the project folder, and it will open directly in the Arduino IDE (if installed).

4. **Confirm Board Selection**
   a. The IDE usually auto-detects the UNO R4 Minima if the package is installed.
   b. If not installed, refer to the *00_Getting_Started/00_GettingStarted_Arduino_R4_Minima* document to install the necessary board package.
   c. Verify that *Arduino UNO R4 Minima* is selected in the IDE's board selector (top toolbar).

5. **Upload the Code**
   a. Click the **Upload** button (arrow icon) in the top-left corner of the IDE.
   b. Wait until the console displays "**Done uploading**."

6. **Observe the Behaviour**
   a. The RGB LED will glow **Red** for 1 second, then **Green** for 1 second, then **Blue** for 1 second.
   b. After this sequence, the cycle repeats continuously.

7. Expected Output

The RGB LED will cycle colours:

- Red → Green → Blue, each for ~1 second

💡 You can experiment by turning on multiple pins at once to create mixed colours (like Red + Green = Yellow)

8. Code

The source code for this project is included in the downloaded folder:

📂 *uno-launchpad-kit/01_Basic_Projects/08_RGB_LED/08_RGB_LED.ino*

👉 **Tip:**

- To open the project, simply **double-click the .ino file**. If the Arduino IDE is installed, it will launch automatically and load the code.
- If you **haven't installed the Arduino IDE yet**, please refer to:
  📂 uno-launchpad-kit/00_Getting_Started/00_GettingStarted_Arduino_R4_Minima
  to **download and install it.**

8.1 Function References

- setup() – runs once when the board is powered on or reset.
- loop() – runs continuously after setup() finishes.
- digitalWrite(pin, value) – writes HIGH/LOW to a pin.
- pinMode(pin, mode) – configures pin as INPUT/OUTPUT.
- delay(ms) – pauses execution.

📚 **For more details and advanced usage, visit:**

🔗 Arduino Language Reference — The official guide for all Arduino functions.

9. Troubleshooting Tips

- **LED not lighting?**
  - Check polarity: the longest leg is usually the common cathode.
  - Ensure the common pin is connected to **GND via resistor**.
  - Verify correct Arduino pins (D11, D12, D13).

- **Colours look unbalanced?**
  - This is normal when using **a single resistor**. Different LED colours have different forward voltages.
  - If more accurate colours are needed, use **separate resistors per colour.**

- **Upload error in Arduino IDE?**
  - Verify that the correct board (**Arduino UNO R4 Minima**) is selected in the IDE.
  - Check that the correct **COM port** is chosen.

- **Board not detected via USB?**
  - Ensure you are using a **data-capable USB Type-C cable** (some cables only provide charging).
  - Try reconnecting the cable or using a different USB port.

- **Board not listed in Arduino IDE?**
  - If you don't see **Arduino UNO R4 Minima** in the board selector, the **board package is not installed**.
  - To fix this, follow the installation steps in:
    uno-launchpad-kit/00_Getting_Started/00_GettingStarted_Arduino_R4_Minima

Tip: If nothing works, press the **RESET** button on the UNO R4 Minima and try uploading the code again.

10. License

11. Support & Feedback

We value your feedback and are happy to assist with any questions, troubleshooting, or suggestions you may have.

Email: *support@aynop.com*

When sending an email, please include your kit name (AYNOP® UNO Launchpad Kit) and, if applicable, the project name in the subject line. This will help our team respond faster and more accurately. We aim to respond to all queries within 2–3 business days. Your feedback helps us improve our products and create even better learning experiences for all Arduino beginners.