

## KY-011 2-Color LED Module – Detailed Explanation

### 1. What is KY-011?

The **KY-011 module** is a **bi-color LED** that contains **two LEDs (red and green)** inside a single 5mm LED package. It is designed for **visual signaling and lighting effects** and is commonly used in Arduino and microcontroller projects.

### 2. How Does KY-011 Work?

- The module has **three pins**:
  - **GND (Ground)** – Connected to the ground of the circuit.
  - **Red Pin** – Controls the **red LED** inside the module.
  - **Green Pin** – Controls the **green LED** inside the module.
- By adjusting the voltage or **PWM (Pulse Width Modulation) signals** to the **red and green pins**, you can mix red and green light to create **different colors**.

### 3. Electrical Characteristics

Parameter	Value
Operating Voltage	3.3V – 5V
Current Consumption	~10-20mA per LED
LED Type	Common Cathode (GND shared)
Colors	Red, Green, and Yellow (mix of both)

### 4. Color Combinations

Red Pin	Green Pin	Color Output
HIGH (255)	LOW (0)	Red
LOW (0)	HIGH (255)	Green
HIGH (255)	HIGH (255)	Yellow
LOW (0)	LOW (0)	Off

## 5. How to Use KY-011?

The **KY-011 module** is controlled using **PWM signals** on the red and green pins. By adjusting the brightness of each LED using **analogWrite() in Arduino**, you can create smooth transitions and effects.

### Example Uses:

- **Status Indicators** (Red for error, Green for success)
- **Simple Traffic Lights**
- **Multi-Color Light Effects**
- **Sensor Feedback Display**
- **DIY Electronic Decorations**

## 6. Difference Between KY-011 and KY-009

Feature	KY-011	KY-009
LED Type	2-Color (Red & Green)	RGB (Red, Green, Blue)
Number of Colors	3 (Red, Green, Yellow)	16+ million
Control Pins	2 (Red, Green)	3 (Red, Green, Blue)
Complexity	Simple	More advanced

## 7. Advantages of KY-011

**Simple to Use** – Requires only two PWM pins.

**Low Power Consumption** – Uses only a few milliamps.

**Multiple Colors Possible** – Can mix red and green for yellow.

**Versatile** – Useful for indicators, status lights, and light effects.

## 8. Limitations

**Limited Colors** – Only **red, green, and yellow** are possible (no blue like KY-009).

**Not Addressable** – Cannot control each LED individually like **WS2812 RGB LEDs**.

**No Built-in Resistors** – Requires external resistors for safe operation.

## Conclusion

The **KY-011 2-Color LED Module** is a simple but effective **bi-color LED** that can be used in various electronics projects. By controlling the red and green LEDs using **PWM signals**, you can create **flashing, pulsing, and fading effects**. It is a great module for **beginners** and is widely used in **microcontroller projects** for **visual indications and simple lighting effects**.