GY-31 TCS3200 Color Sensor Recognition Module

The **GY-31 TCS3200 Color Sensor Recognition Module** is a powerful and versatile sensor designed for accurate color detection and recognition. Built around the **TCS3200 programmable color light-to-frequency converter chip**, this module is widely used in **robotics, industrial automation, and DIY electronics projects**. It can detect and distinguish colors like **red, green, blue, and white light intensity**, making it an essential component for smart devices, robotics, and machine vision applications.

With its **high precision, fast response time, and wide operating range**, the GY-31 color sensor is a popular choice among **electronics hobbyists, engineering students, and IoT developers**.

## Key Features of the GY-31 TCS3200 Color Sensor

- 🎨 **Accurate Color Recognition** – Detects red, green, blue, and white light intensity.
- ⚡ **Fast Frequency Output** – Converts light intensity into square wave output for quick data processing.

- ⚡ **Wide Voltage Compatibility** – Works with **3V to 5V systems**, suitable for Arduino, ESP32, Raspberry Pi, and STM32.
- 🔧 **Programmable Frequency Scaling** – Adjustable output frequency (2%, 20%, 100%) for better integration and flexibility.
- 🌐 **Compact & Lightweight Design** – Easy to mount in robotics and embedded systems.
- 🔥 **High Sensitivity** – Stable performance even in varying light conditions.
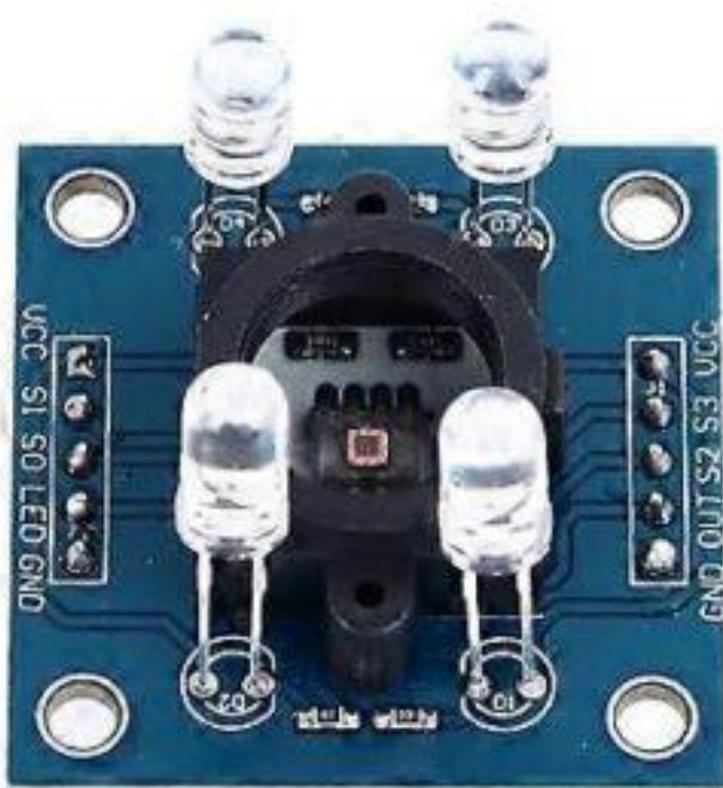
Technical Specifications

- **Operating Voltage**: 3V – 5V
- **Chipset**: TCS3200
- **Light Detection**: Red, Green, Blue, White
- **Output**: Frequency signal (square wave)
- **Programmable Frequency Scaling**: 2%, 20%, 100%
- **Sensor Array**: 8 × 8 (64 photodiodes with RGB filters)
- **Dimensions**: Compact module with standard pin headers
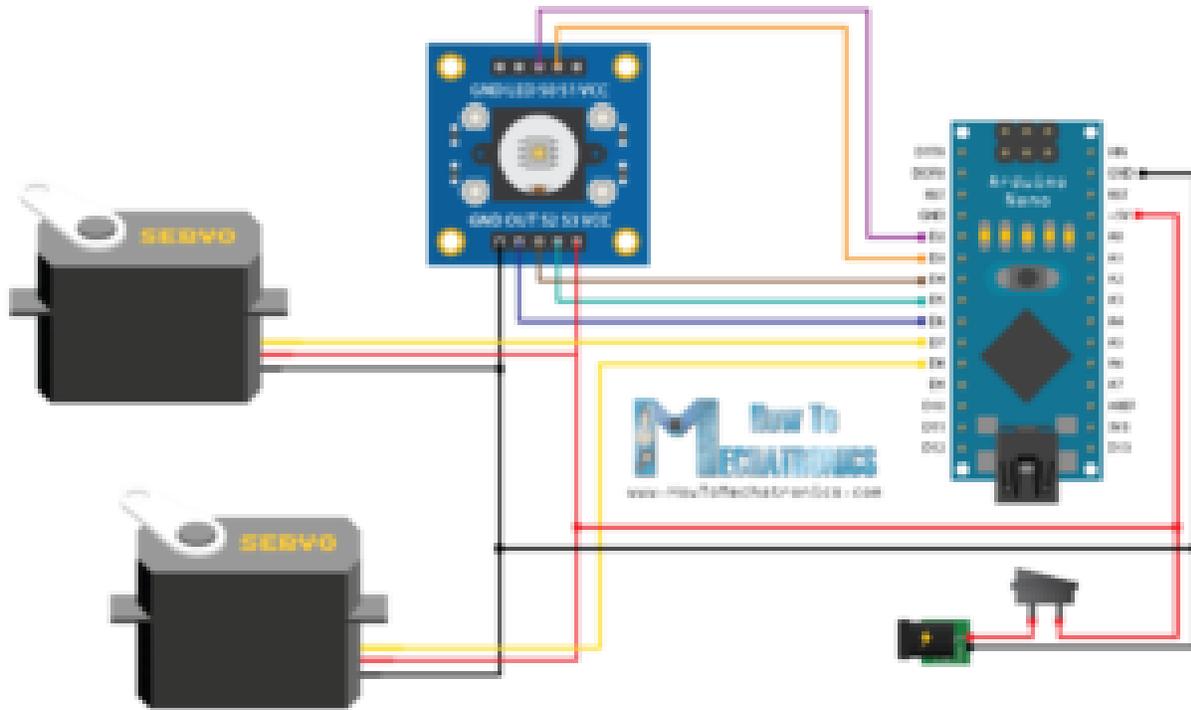
How the GY-31 Color Sensor Works

The **TCS3200 sensor chip** on the GY-31 module uses an array of photodiodes with filters for **red, green, and blue light detection**. The light intensity detected by these photodiodes is converted into a frequency output signal. This output can then be read by a microcontroller (Arduino, Raspberry Pi, ESP8266, etc.), allowing your project to recognize and classify colors.

With programmable frequency scaling, the sensor's sensitivity can be adjusted for **different lighting conditions and accuracy requirements**. This makes it suitable for both **indoor and outdoor applications**.

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Applications of the GY-31 TCS3200 Color Sensor

The versatility of this module makes it a key component in many **electronics and industrial projects**:

1. **Robotics and Automation**
   o Line-following robots that detect colored paths.
   o Automated sorting systems that categorize objects by color.
2. **Industrial Quality Control**
   o Color matching in packaging and printing industries.
   o Detecting product defects based on color differences.
3. **IoT & Smart Systems**
   o Smart lighting systems that adapt based on detected colors.
   o Environmental monitoring devices for detecting light changes.
4. **DIY & Academic Projects**
   o Educational kits for learning about **color sensing and machine vision**.
   o Projects for students in electronics and computer science.
5. **Consumer Electronics**
   o Used in some display calibration systems and color-sensitive devices.

Why Choose the GY-31 TCS3200 Color Sensor?

- ✓ **High Accuracy** – Detects colors precisely with consistent results.
- ✓ **Flexibility** – Programmable frequency scaling adapts to multiple project needs.
- ✓ **Wide Compatibility** – Works with most popular microcontrollers.
- ✓ **Cost-Effective** – Affordable solution for advanced projects.
- ✓ **Educational Value** – Great tool for learning embedded systems and computer vision.

Integration with Arduino and Raspberry Pi

The GY-31 module is **plug-and-play friendly** with popular development boards. With just a few lines of code, you can connect it to an Arduino or Raspberry Pi and start detecting colors. Libraries and tutorials are readily available, making it beginner-friendly while still offering advanced features for professionals.

Conclusion

The **GY-31 TCS3200 Color Sensor Recognition Module** is a powerful yet affordable tool for detecting and analyzing colors in real time. With its **high accuracy, wide voltage compatibility, and easy integration with Arduino and Raspberry Pi**, this sensor is suitable for everything from **simple DIY experiments to advanced industrial automation systems**. If you're looking for a **reliable, versatile, and cost-effective color sensor**, the GY-31 module is the perfect choice for your next project.