# **Color Sensor User Manual**

#### 1. Features

Sensing chip	TCS3200 (full color detector)
Identification type	Static identification
Dimensions	36.0mm*20.5mm
Fixing hole size	2.0mm
Best detecting distance	10mm

Table 1: Product features

Operating principle:

The functional block diagram of TCS3200D is shown in the figure below.



TCS3200D contains four types of filters: red filter, green filter, blue filter and clear with no filter. When the sensor is illuminated by a ray of light, the types of filters (blue, green, red, or clear) used by the device can be selected by two logic inputs, S2 and S3. Table 2 illustrates the relationship among S2, S3 and filter type.

S2	S3	Filter type
L	L	Red
L	Н	Blue
Н	L	Clear (no filter)
Н	Н	Green

Table 2: Relationship among S2, S3 and filter type

TCS3200D outputs a square wave (50% duty cycle) with frequency corresponding to light intensity and color, and the frequency is directly proportional to light intensity. The typical output frequency of TCS3200D is in a range of 2Hz to 500KHz. User can control frequency values of 100%, 20%, and 2% by two programmable outputs, S0 and S1, as Table 3 shown.

S0	S1	Output Frequency Scaling
L	L	Power down
L	Н	2%
Н	L	20%
Н	Н	100%

Table 3: Relationship among S0, S1 and output frequency scaling

TCS3200D has different sensitivities to red, green and blue. As a result, the RGB output of pure white is not always 255. Therefore, white balance adjustment is required after power up within 2 seconds. Here are the processes.

- Place a white paper at the top of the sensor in a distance of 1cm, and input a High level voltage to LED port to light up 4 bright white LED indicators.
- ② The program selects R, G and B filters respectively, and measures the corresponding RGB values of red, green and blue.
- ③ Calculate 3 adjustment parameters corresponding to red, green and blue respectively, and perform automatic white balance adjustment.

## 2. Applications

This module can be applied to color sorting, environmental light induction and calibration, test strip reading, color matching test, etc.

Pin No.	Symbol	Descriptions
1	LED	Control the states of 4 LED indicators
2	OUT	Read the output frequency of RGB
3	S3	Combined with S2, select filters for different color lights
4	S2	Combined with S3, select filters for different color lights
5	S1	Combined with S0, select output frequency scaling
6	S0	Combined with S1, select output frequency scaling
7	GND	Power ground
8	VCC	Positive power supply (2.7V-5.5V)

### 3. Interfaces

Table 4: Interface specifications

### 4. How to use

We will illustrate the usage of the module with an example of color identification by connecting a development board.

① Download relative codes to the development board.

The configuration of the connection between the module and the development board are shown in Table 5 and Table 6.

Port	STM32 MCU pin
LED	3.3V
OUT	GPIOA.0
S3	GPIOA.4
S2	GPIOA.3
S1	NC
S0	NC
GND	GND
VCC	3.3V

Table 5: Connection between STM32 development

board and the module

Port	Arduino pin
LED	3.3V
OUT	D2
S3	D3
S2	D4
S1	D5
S0	D6
GND	GND
VCC	5V

Table 6: Connection between Arduino and the

module

#### The configuration of the serial port is listed in Table 7.

Baud rate	115200
Data bits	8
Stop bit	1
Parity bit	None

Table 7: Serial port configuration

- 2 Place a white paper at the top of the sensor in a distance of 1cm.
- ③ Power up the development board, and input a High level to LED port to light up 4 bright white LED indicators.

- ④ Wait for 2 seconds or more after power up (automatic white adjustment is conducted during this period).
- (5) After the adjustment completed, place an objective to be measured at the front side of the sensor. Then, you can see relative data of RGB are outputted. A color check list is helpful for finding out what the measured color it is.
- 5. Considerations
  - Light interference from outside should be avoided, which may affect the result of color identification. It is recommended to place the light source and Color Sensor in a close, light reflection free box for testing.
  - 2 White balance adjustment is required whenever Color Sensor module is reset or light source is changed.