

Color Sensor User Manual

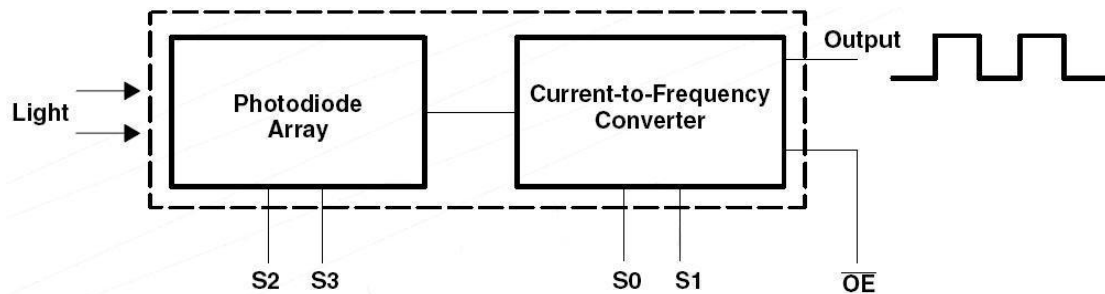
1. Features

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	H	Blue
H	L	Clear (no filter)
H	H	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	H	2%
H	L	20%
H	H	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.

- ① 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.

3. Interfaces

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)

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

- ① 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.