

Fermion: MAX30102 PPG Heart Rate and Oximeter Sensor



Overview

The DFRobot heart rate and oximeter sensor integrates the Maxim MAX30102 chip and an MCU with heart rate and oximetry algorithm.

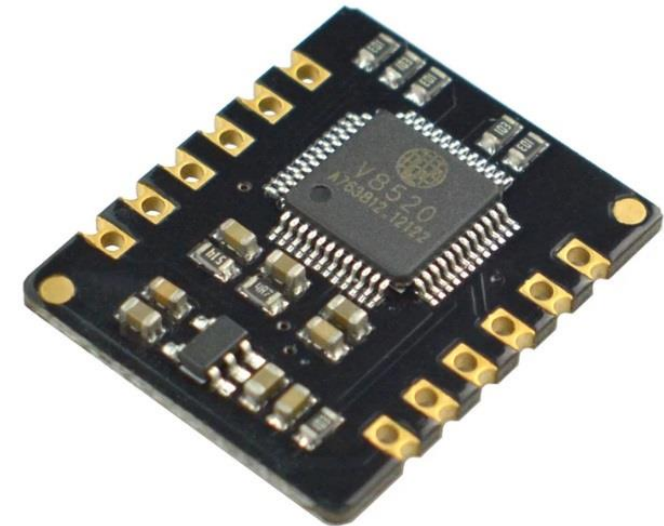
The MAX30102 uses PPG(PhotoPlethysmoGraphy) to measure data, which will be converted into heart rate and oximetry values when processed by the MCU, then output through I2C or UART, making the sensor easy to use and greatly reducing resource occupation of main controller. Meanwhile, the corresponding upper computer is provided to allow you to conveniently read data by a PC.

Note:

- The pressure may change when the finger is directly pressed down the sensor, which will affect the data output. So please try to fix the sensor on your finger.
- Wear the sensor on your finger and there is no difference in the direction of wearing.
- This product is not a professional medical instrument and should not be used as an auxiliary accessory in diagnosis and treatment.

Update:

The sensor V2.0 is equipped with a microprocessor that integrates heart rate and oximetry algorithm, which can directly output the relevant data. And it supports I2C/UART communication.



Order Code

Order Code	Brand	Description
E36005-001	DFRobot	Fermion: MAX30102 PPG Heart Rate and Oximeter Sensor

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Specification

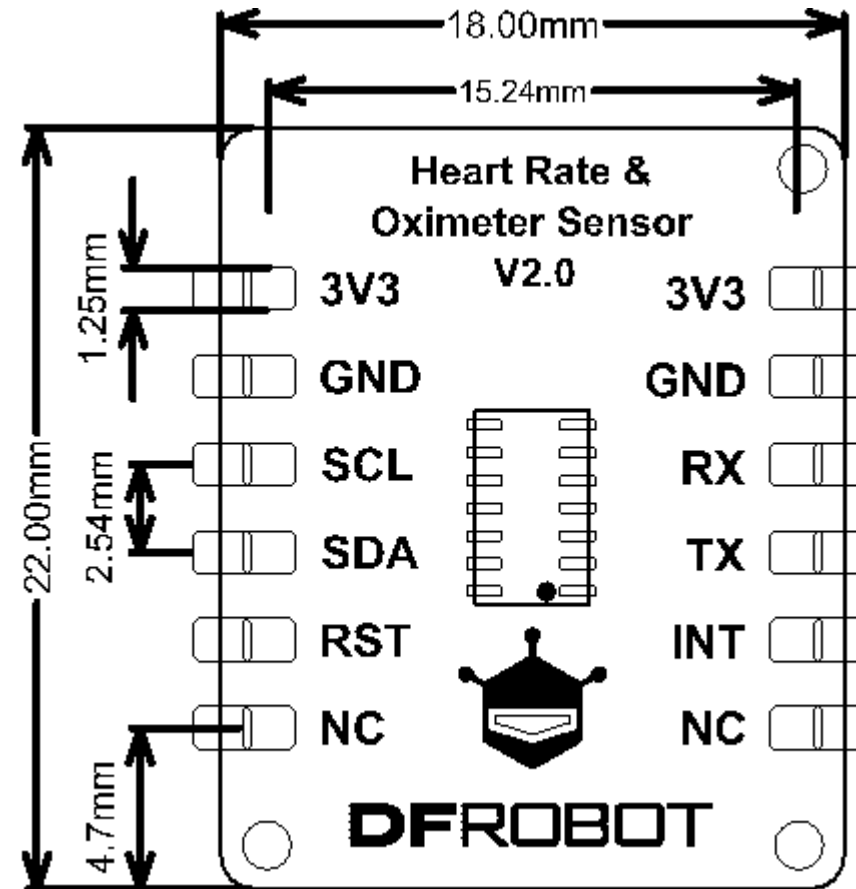
- Power Supply: 3.3V
- Working Current: <50mA
- Communication: I2C/UART
- I2C Address: 0x57
- Baud rate: 9600bps
- Operating Temperature Range: -40°C~85°C
- Dimension: 18×22mm/0.71×0.87"

Application

- Heart rate blood oxygen project
- Home heart rate oximeter
- Long-term heart rate and blood oxygen monitoring project

Feature

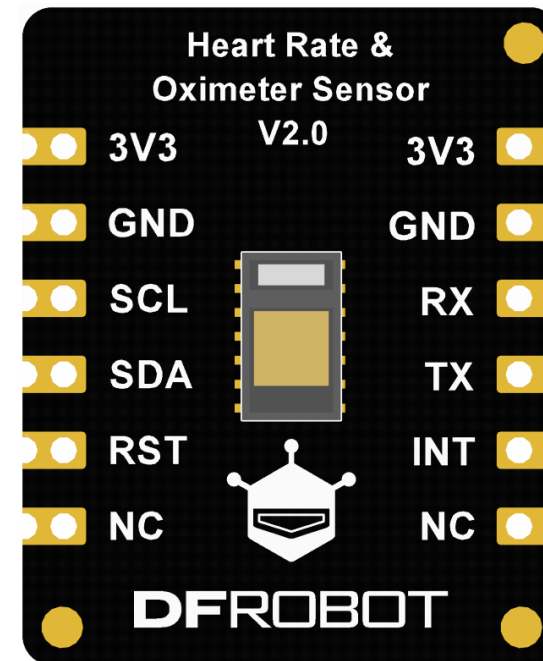
- Microcontroller with integrated algorithm
- Data can be read directly through the host computer



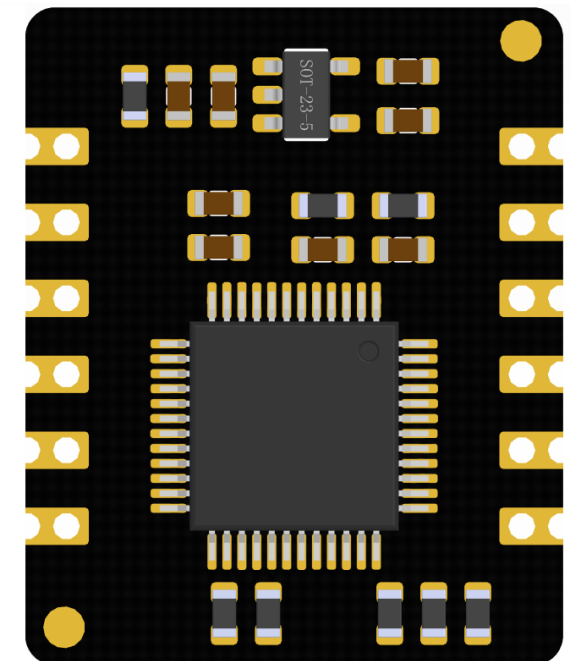
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Board Overview

NO.	Silkscreen	Description
1	3V3	+
2	GND	-
3	SCL	I2C Clock Line
4	SDA	I2C Data Line
5	RST	Reset Pin
6	NC	Empty Pin
7	3V3	+
8	GND	-
9	RX	Serial Port Received Pin
10	TX	Serial Port Transmitted Pin
11	INT	Interrupt Pin The pulse when heart rate and blood oxygen data is updated
12	NC	Empty Pin



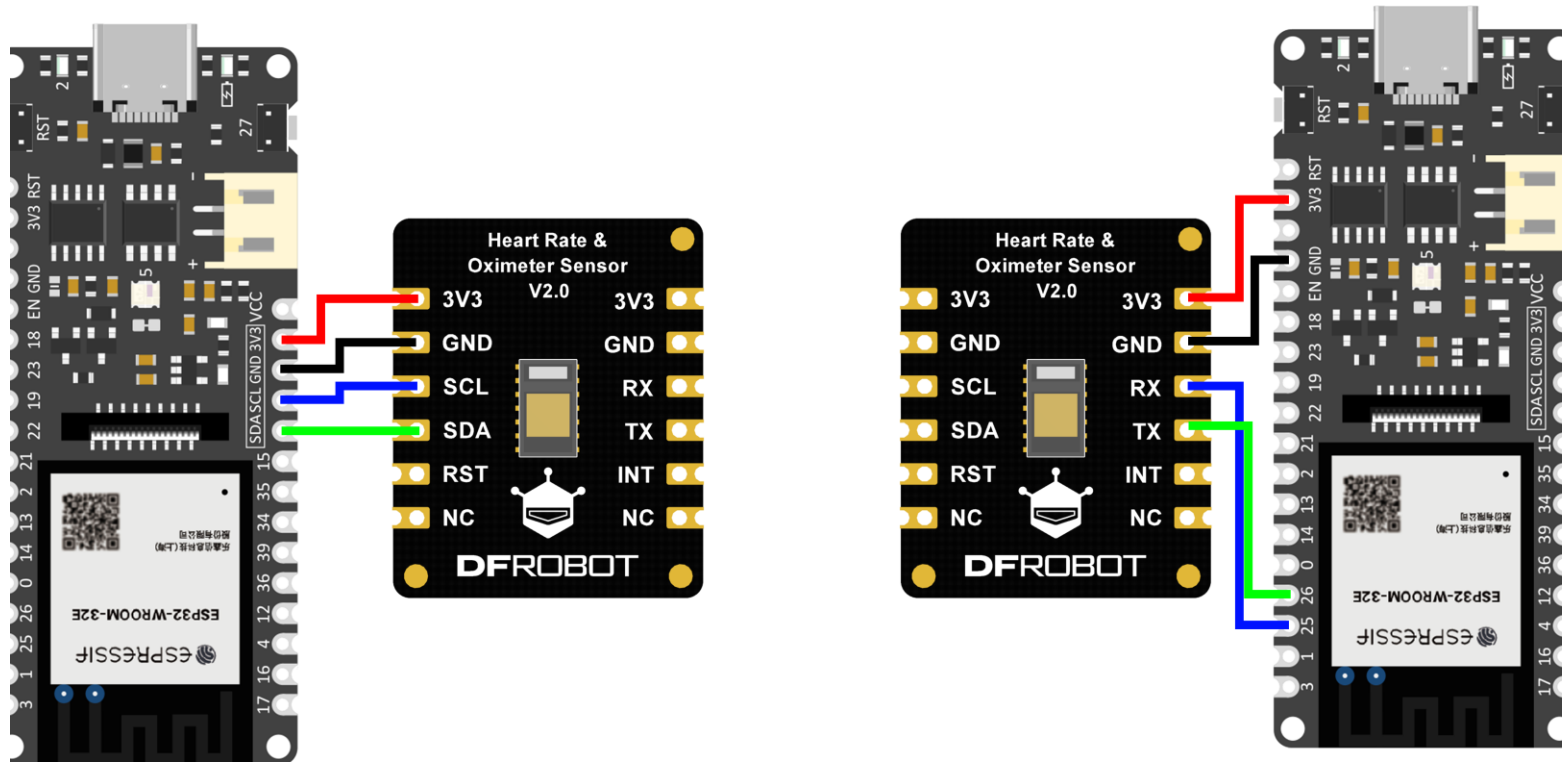
TOP



BOTTOM

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Connection Diagram



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Sample Code

Sample Code 1 - Get the Heart Rate and Blood Oxygen Data

In this sample, the heart rate and blood oxygen data is obtained through interrupts, and the heart rate is measured when the sensor's red light is on. If the interrupts is shielded, the data can still be obtained, but during the update the data obtained does not change.

Note: This sample requires the use of interrupt pins. Change the INT_PIN pin in the codes according to the master.

[Click here to download sample code 1](#)

Result 2

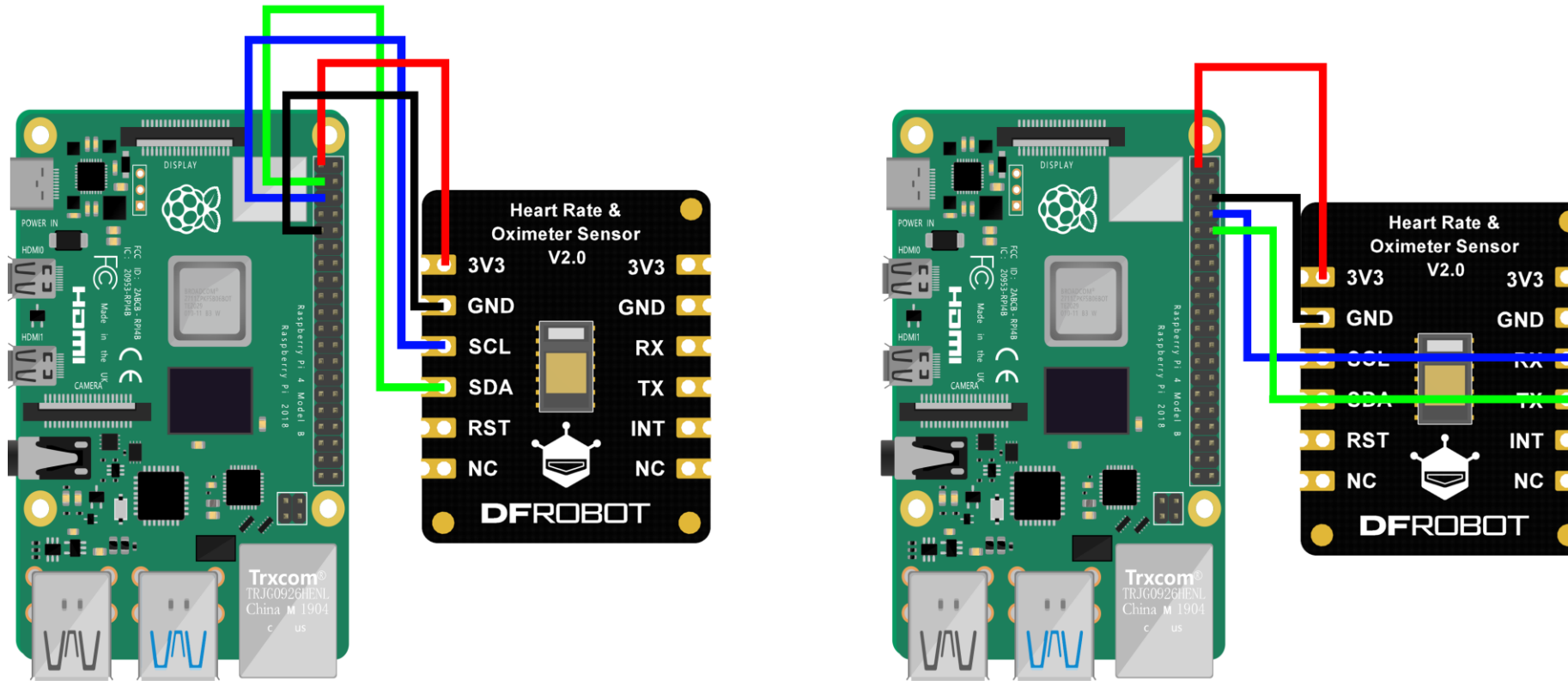
Stop the measurements after measuring the heart rate and blood oxygen content for 5 times.

A screenshot of a serial monitor window titled 'COM55'. The window has a text input field at the top with a 'Send' button. The main area displays the following text: 'init success!', 'SPO2 is : -1%', 'heart rate is : -1Times/min', 'SPO2 is : 99%', 'heart rate is : 90Times/min', 'SPO2 is : 99%', 'heart rate is : 90Times/min', 'SPO2 is : 99%', 'heart rate is : 89Times/min', 'SPO2 is : 99%', 'heart rate is : 93Times/min', 'SPO2 is : 99%', and 'heart rate is : 93Times/min'. At the bottom, there are checkboxes for 'Autoscroll' (checked) and 'Show timestamp' (unchecked), a dropdown menu set to 'Both NL & CR', a baud rate dropdown set to '115200 baud', and a 'Clear output' button.

```
init success!
SPO2 is : -1%
heart rate is : -1Times/min
SPO2 is : 99%
heart rate is : 90Times/min
SPO2 is : 99%
heart rate is : 90Times/min
SPO2 is : 99%
heart rate is : 89Times/min
SPO2 is : 99%
heart rate is : 93Times/min
SPO2 is : 99%
heart rate is : 93Times/min
```

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Connection Diagram



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Sample Code

Driver Installation

Enable the I2C interface of Raspberry Pi, if enabled, skip this step. Open terminal, type the following command, and press Enter:

```
pi@raspberrypi:~ $ sudo raspi-config
```

Select "5 Interfacing Options" and press Enter. Select "P5 I2C" and press Enter to confirm "YES". Restart the Raspberry Pi master control.

Install Python dependencies with git, and Raspberry Pi needs to be connected to the Internet. If done, skip this step. In the terminal, type the following commands and press Enter:

```
pi@raspberrypi:~ $ sudo apt-get update pi@raspberrypi:~ $ sudo apt-get install build-essential python-dev python-smbus git
```

Download the BloodOxygen driver libraries. In the terminal, type the following commands and press Enter:

```
pi@raspberrypi:~ $ cd Desktop/
```

```
pi@raspberrypi:~/Desktop $ git clone https://github.com/DFRobot/DFRobot_BloodOxygen_S
```

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Sample Code

Sample Code 1 - Get the Heart Rate and Blood Oxygen Data (gain_heartbeat_SPO2.py)

In the terminal, type the following command and press Enter to run the sample code:

```
pi@raspberrypi:~/Desktop $ cd DFRobot_BloodOxygen_S/python/raspberry/example/gain_heartbeat_SPO2/
```

```
pi@raspberrypi:~/Desktop/DFRobot_BloodOxygen_S/python/raspberry/example/gain_heartbeat_SPO2/ $ python gain_heartbeat_SPO2.py
```

Result

```
pi@raspberrypi:~/Desktop/DFRobot_BloodOxygen_S/python/raspberry/example/gain_heartbeat_SPO2 $ python gain_heartbeat_SPO2.py
start measuring...
SP02 is : -1%
heart rate is : -1Times/min
SP02 is : -1%
heart rate is : -1Times/min
SP02 is : -1%
heart rate is : -1Times/min
SP02 is : 99%
heart rate is : 93Times/min
SP02 is : 99%
heart rate is : 93Times/min
SP02 is : 99%
heart rate is : 93Times/min
SP02 is : 99%
heart rate is : 93Times/min
SP02 is : 99%
```

API Functions List

```
/*!
 * @brief Get heart rate and oxygen saturation and store them into the structure sHeartbeatSP02
 * @param NULL
 * @return No value returned
 */
void getHeartbeatSP02();

/*!
 * @brief Get the sensor board temp
 * @param NULL
 * @return Temp (unit: °C)
 */
float getTemperature_C();

/*!
 * @brief Sensor starts to collect data
 * @param NULL
 * @return NULL
 */
void sensorStartCollect();

/*!
 * @brief Sensor stops collecting data
 * @param NULL
 * @return NULL
 */
void sensorEndCollect();
```

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Modbus RTU Protocols

Transmit	From Adevice to Bdevice				
Functions	Bdevice Address	Function Code	Register Address	Register Number	CRC Check
Get the Heart Rate and Blood Oxygen Data	0x20	0x03/Read	0x00 0x06	0x00 0x04	CRC_h CRC_l
Get the Temperature	0x20	0x03	0x00 0x0A	0x00 0x01	CRC_h CRC_l
Receive	Response from Bdevice				
Functions	Bdevice Address	Function Code	Valid Bytes	Data	CRC Check
Get the Heart Rate and Blood Oxygen Data	0x20	0x03	0x08	SPO2(1byte) xx(1byte reserved) Heartbeat(4byte) xx(2byte reserved)	CRC_h CRC_l
Get the Temperature	0x20	0x03	0x02	Temp_h Temp_l	CRC_h CRC_l

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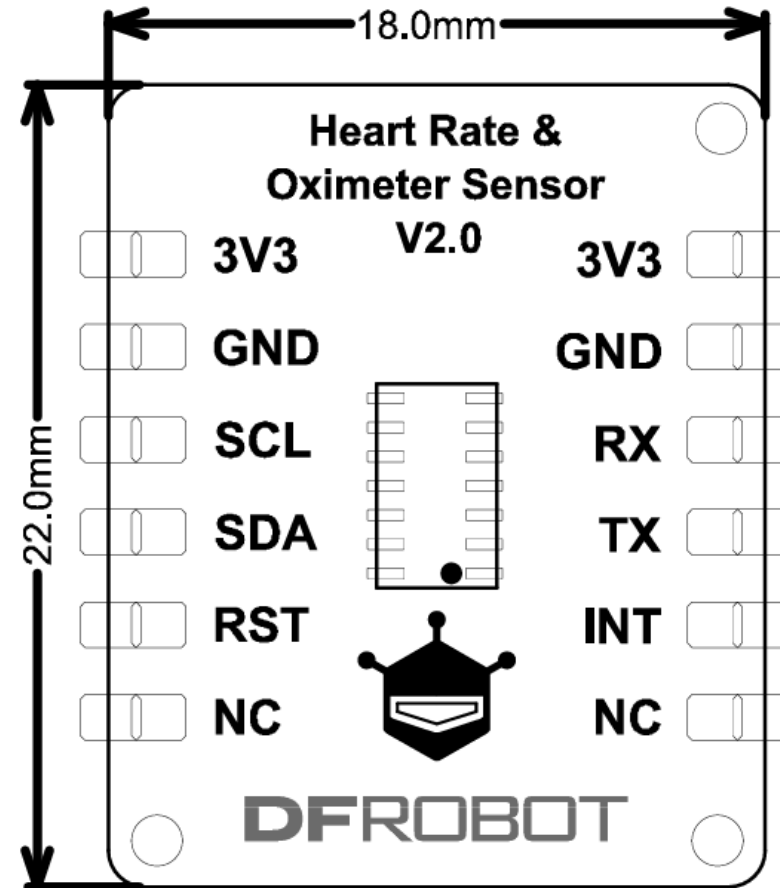
Modbus RTU Protocols

Set the Sensor	Transmit From Adevice				
Functions	Bdevice Address	Function Code	Register Address	Register Number	CRC Check
Start to Collet Data	0x20	0x06	0x00 0x10	0x00 0x01	CRC_h CRC_l
Stop Colleting Data	0x20	0x06	0x00 0x10	0x00 0x02	CRC_h CRC_l
Set the Sensor	Response From Bdevice				
Functions	Bdevice Address	Function Code	Valid Bytes	Data	CRC Check
Start to Collet Data	0x20	0x06	0x00 0x10	0x00 0x01	CRC_h CRC_l
Stop Colleting Data	0x20	0x06	0x00 0x10	0x00 0x02	CRC_h CRC_l

[Click here to download CRC check sample code](#)

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Layout



PCB Information	Name: SEN0344[V2.0]	Thickness: 1.0mm
Engineer: Ifwag_CD	Top SolderMask: Black	Bottom SolderMask: Black
Date: 20210910	Top Silkscreen: White	Bottom Silkscreen: White

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Documents

- [Max30102 datasheet](#)

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Revision History

Date	Revision	Change description
30/10/2025	1.0	Initial release