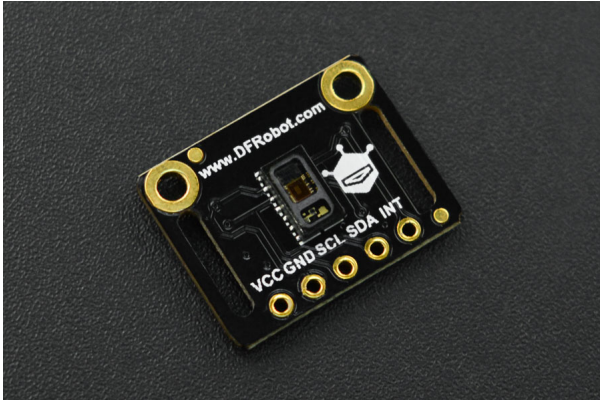


**SKU:SEN0344 (<https://www.dfrobot.com/product-2164.html>)**

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(<https://www.dfrobot.com/product-2164.html>)

## Introduction

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The MAX30102 is an integrated pulse oximetry and heart-rate monitor biosensor module based

on PPG ((PhotoPlethysmoGraphy). It is so small that you can just wear it on your finger or wrist for data collecting. Internally integrated 18bit ADC, the sensor supports I2C data output, which could be compatible for most controllers.



### Note:

1. Try to fix the sensor on your finger in using to avoid the effect of pressure change on data output.
2. This product is not a professional medical device, and should not be used as an auxiliary accessory in medical diagnosis and treatment.

## Features

---

- Extremely low standby current
- High sampling rate
- High SNR

## Application

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- Heart-rate Measurement
- SPO2 Detection

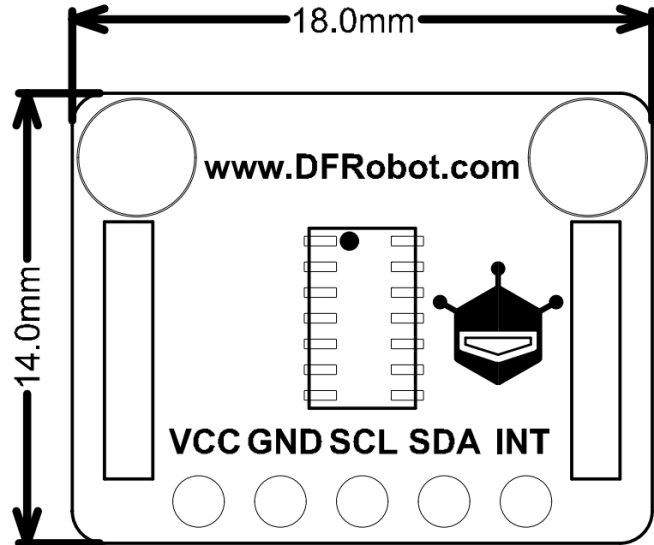
## Specification

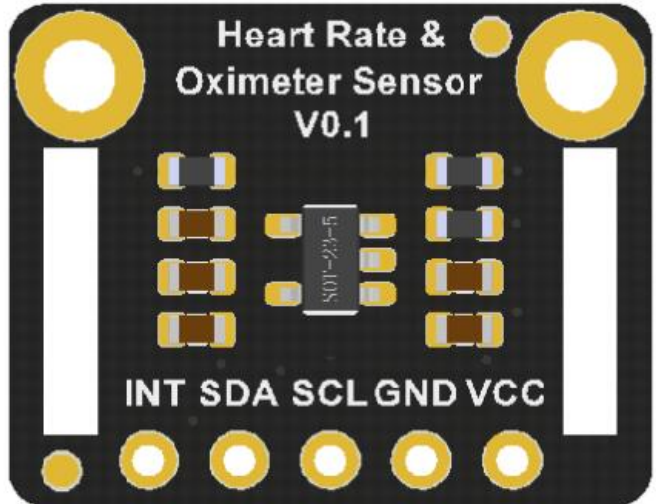
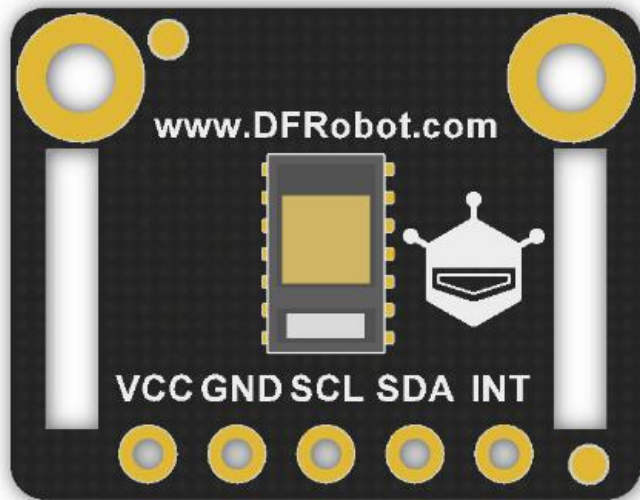
---

- Power Supply: 3.3V~5V
- Working Current: <5mA
- RED/IR LED Driving Current: 0-50mA
- Communication: I2C
- I2C Address: 0x57
- Operating Temperature: -40°C~85°C
- Dimension: 18×14mm/0.71×0.55"

## Board Overview

---





| Num | Label | Description |
|-----|-------|-------------|
| 1   | VCC   | +           |
| 2   | GND   |             |

| 2<br>Num | GND<br>Label | -<br>Description |
|----------|--------------|------------------|
| 3        | SCL          | I2C Clock line   |
| 4        | SDA          | I2C Data line    |

|   |     |               |
|---|-----|---------------|
| 5 | INT | Interrupt Pin |
|---|-----|---------------|

## Tutorial

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Fix the sensor(either side is ok) on your finger with a rubber band.

## Requirements

- **Hardware**
  - DFRduino UNO R3 (<https://www.dfrobot.com/product-838.html>) (or similar) x 1
  - MAX30102 Heart Rate and Oximeter Sensor x1
  - Jumper wires
- **Software**

- Arduino IDE (<https://www.arduino.cc/en/Main/Software>)
- Download and install the **MAX30102 Library**  
([https://github.com/DFRobot/DFRobot\\_MAX30102](https://github.com/DFRobot/DFRobot_MAX30102)) (About how to install the library?  
(<https://www.arduino.cc/en/Guide/Libraries#.UxU8mdzF9H0>))

## API Function List

```

/*
Macro definition options in sensor configuration
sampleAverage: SAMPLEAVG_1 SAMPLEAVG_2 SAMPLEAVG_4
                SAMPLEAVG_8 SAMPLEAVG_16 SAMPLEAVG_32
ledMode:       MODE_REDONLY  MODE_RED_IR  MODE_MULTILED
sampleRate:    PULSEWIDTH_69 PULSEWIDTH_118 PULSEWIDTH_215 PULSEWIDTH_411
pulseWidth:    SAMPLERATE_50  SAMPLERATE_100 SAMPLERATE_200 SAMPLERATE_400
                SAMPLERATE_800 SAMPLERATE_1000 SAMPLERATE_1600 SAMPLERATE_3200
adcRange:     ADCRANGE_2048 ADCRANGE_4096 ADCRANGE_8192 ADCRANGE_16384
*/
/*!
 *@brief Use macro definition to configure sensor
 *@param ledBrightness LED brightness, default value: 0x1F (6.4mA), Range: 0~255 (0=Off,
 *@param sampleAverage Average multiple samples then draw once, reduce data throughput,
 *@param ledMode LED mode, default to use red light and IR at the same time
 *@param sampleRate Sampling rate, default 400 samples every second
 *@param pulseWidth Pulse width: the longer the pulse width, the wider the detection range
 *@param adcRange ADC Measurement Range, default 4096 (nA), 15.63(pA) per LSB
 */

```

```
void sensorConfiguration(uint8_t ledBrightness = 0x1F, uint8_t sampleAverage = SAMPLEAVERAGE_4,
                        uint8_t ledMode = MODE_MULTILED, uint8_t sampleRate = SAMPLERATE_100,
                        uint8_t pulseWidth = PULSEWIDTH_411, uint8_t adcRange = ADCRANGE_1000);
```

```
/*!
```

```
 *@brief get red value
 *@return Red light reading
 */
```

```
uint32_t getRed(void);
```

```
/*!
```

```
 *@brief Get IR value
 *@return IR reading
 */
```

```
uint32_t getIR(void);
```

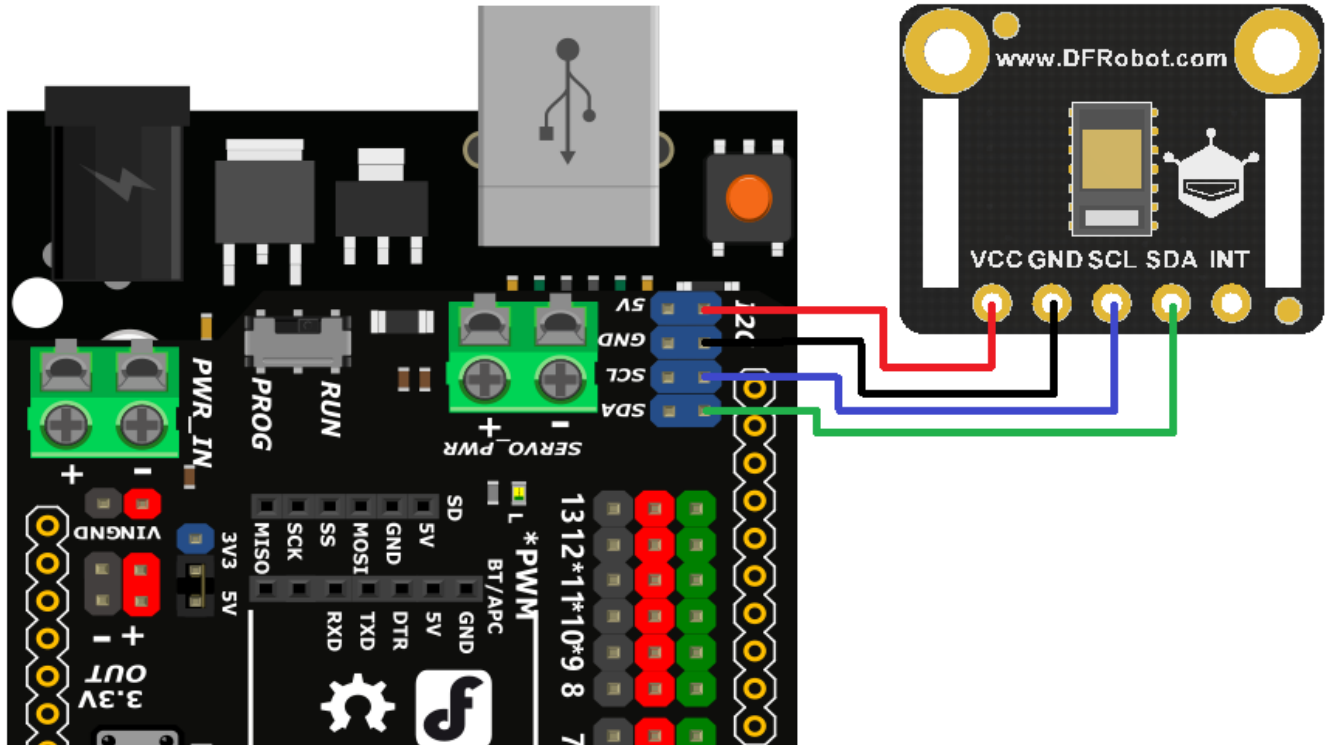
```
/*!
```

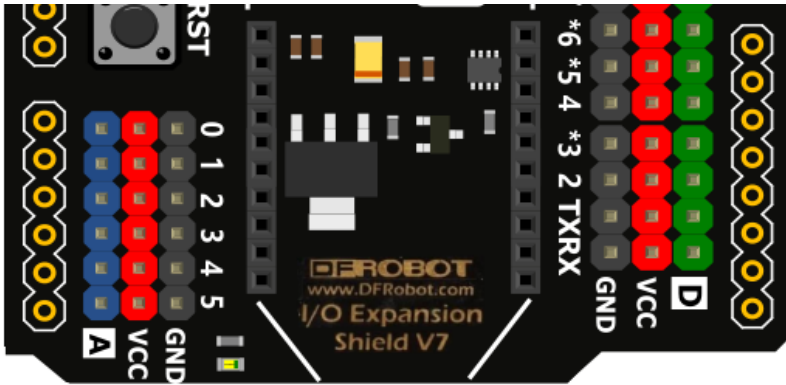
```
 *@brief Calculate heart rate and SPO2
 *@param *SPO2 [out]Calculated SPO2
 *@param *SPO2Valid [out]If the calculated SPO2 is valid, the value is 1
 *@param *heartRate [out]Calculated heart-rate
 *@param *heartRateValid [out]If the calculated heart-rate is valid, the value is 1
 */
```



```
void neartrateAndOxygenSaturation(int32_t* SPO2,int8_t* SPO2Valid,int32_t* heartRate,int
```

## Connection Diagram





## Sample Code 1- Read Raw Data

Read red and IR data that have not been processed by algorithms.

```
/*!
 * @file basicRead.ino
 * @brief Output readings of red light and IR
 * @n This library supports mainboards: ESP8266, FireBeetle-M0, UNO, ESP32, Leonardo, Mega
 * @copyright Copyright (c) 2010 DFRobot Co.Ltd (http://www.dfrobot.com)
 * @licence The MIT License (MIT)
 * @author [YeHangYu](hangyu.ye@dfrobot.com)
 * @version V0.1
 * @date 2020-05-29
 * @url https://github.com/DFRobot/DFRobot\_MAX30102
 */

#include <DFRobot_MAX30102.h>

DFRobot_MAX30102 particleSensor;

/*
Macro definition options in sensor configuration
SAMPLE_AVERAGE_1 SAMPLE_AVERAGE_2 SAMPLE_AVERAGE_4
```

```

sampleAverage: SAMPLEAVG_1 SAMPLEAVG_2 SAMPLEAVG_4
                SAMPLEAVG_8 SAMPLEAVG_16 SAMPLEAVG_32
ledMode:       MODE_REDONLY MODE_RED_IR MODE_MULTILED
sampleRate:    PULSEWIDTH_69 PULSEWIDTH_118 PULSEWIDTH_215 PULSEWIDTH_411
pulseWidth:    SAMPLERATE_50 SAMPLERATE_100 SAMPLERATE_200 SAMPLERATE_400

                SAMPLERATE_800 SAMPLERATE_1000 SAMPLERATE_1600 SAMPLERATE_3200
adcRange:      ADCRANGE_2048 ADCRANGE_4096 ADCRANGE_8192 ADCRANGE_16384
*/
void setup()
{
  //Init serial
  Serial.begin(115200);
  /*!
   *@brief Init sensor
   *@param pWire IIC bus pointer object and construction device, can both pass or not pass
   *@param i2cAddr Chip IIC address (0x57 in default)
   *@return true or false
   */
  while (!particleSensor.begin()) {
    Serial.println("MAX30102 was not found");
    delay(1000);
  }

  /*!
   *@param pWire IIC bus pointer object and construction device, can both pass or not pass
   *@param i2cAddr Chip IIC address (0x57 in default)
   *@return true or false
   */
}

```

```

  *@brief Use macro definition to configure sensor
  *@param ledBrightness LED brightness, default value: 0x1F (6.4mA), Range: 0~255 (0=Off,
  *@param sampleAverage Average multiple samples then draw once, reduce data throughput,
  *@param ledMode LED mode, default to use red light and IR at the same time
  *@param sampleRate Sampling rate, default 400 samples every second

  *@param pulseWidth Pulse width: the longer the pulse width, the wider the detection range
  *@param adcRange Measurement Range, default 4096 (nA), 15.63(pA) per LSB
  */
particleSensor.sensorConfiguration(/*ledBrightness=*/0x1F, /*sampleAverage=*/SAMPLEAVG_4
                                   /*ledMode=*/MODE_MULTILED, /*sampleRate=*/SAMPLERATE_400
                                   /*pulseWidth=*/PULSEWIDTH_411, /*adcRange=*/ADCRANGE_4096
}

void loop()
{
  //Print result
  Serial.print("R=");
  /*!
  *@brief Get red value
  *@return Red light reading
  */
  Serial.print(particleSensor.getRed());
  Serial.print(" IR=");
  /*!
  *@brief Get IR value
  */

```

```
  *@brief Get IR value
  *@return IR reading
  */
  Serial.print(particleSensor.getIR());
  Serial.println();

  delay(100);
}
```

## Result 1

COM22

Send

R=90559 IR=88798  
R=90573 IR=88855  
R=90625 IR=88973  
R=90733 IR=89182  
R=90780 IR=89335  
R=90813 IR=89384  
R=90718 IR=89081  
R=90420 IR=88467  
R=90568 IR=88808  
R=90601 IR=89294  
R=90658 IR=88988  
R=90750 IR=89158  
R=90772 IR=89336  
R=90906 IR=89534  
R=90907 IR=89634  
R=90583 IR=88787  
R=90671 IR=89085  
R=90669 IR=89125



## Sample Code 2- Display Heartbeat Diagram

Display heartbeat diagram on the Arduino serial plotter: click tool->"Serial Plotter".



```
/*!
 * @file heartbeatPlotter.ino
 * @brief Display heartbeat diagram on the Arduino serial plotter: click tool->"Serial Plotter"
 * @n Try to fix the sensor on your finger in using to avoid the effect of pressure change
 * @n This library supports mainboards: ESP8266, FireBeetle-M0, UNO, ESP32, Leonardo, Mega
 * @copyright Copyright (c) 2010 DFRobot Co.Ltd (http://www.dfrobot.com)
 * @licence The MIT License (MIT)
 * @author [YeHangYu](hangyu.ye@dfrobot.com)
 * @version V0.1
 * @date 2020-05-29
 * @url https://github.com/DFRobot/DFRobot\_MAX30102
 */

#include <DFRobot_MAX30102.h>

DFRobot_MAX30102 particleSensor;

/*
 * Macro definition options in sensor configuration
 */
```

```

macro definition options in sensor configuration
sampleAverage: SAMPLEAVG_1 SAMPLEAVG_2 SAMPLEAVG_4
                SAMPLEAVG_8 SAMPLEAVG_16 SAMPLEAVG_32
ledMode:       MODE_REDONLY  MODE_RED_IR  MODE_MULTILED
sampleRate:    PULSEWIDTH_69 PULSEWIDTH_118 PULSEWIDTH_215 PULSEWIDTH_411

pulseWidth:    SAMPLERATE_50 SAMPLERATE_100 SAMPLERATE_200 SAMPLERATE_400
                SAMPLERATE_800 SAMPLERATE_1000 SAMPLERATE_1600 SAMPLERATE_3200
adcRange:      ADCRANGE_2048 ADCRANGE_4096 ADCRANGE_8192 ADCRANGE_16384
*/
void setup()
{
  //Init serial
  Serial.begin(115200);
  /*!
  *@brief Init sensor
  *@param pWire IIC bus pointer object and construction device, can both pass or not pass
  *@param i2cAddr Chip IIC address (0x57 in default)
  *@return true or false
  */
  while (!particleSensor.begin()) {
    Serial.println("MAX30102 was not found");
    delay(1000);
  }
}

```

```

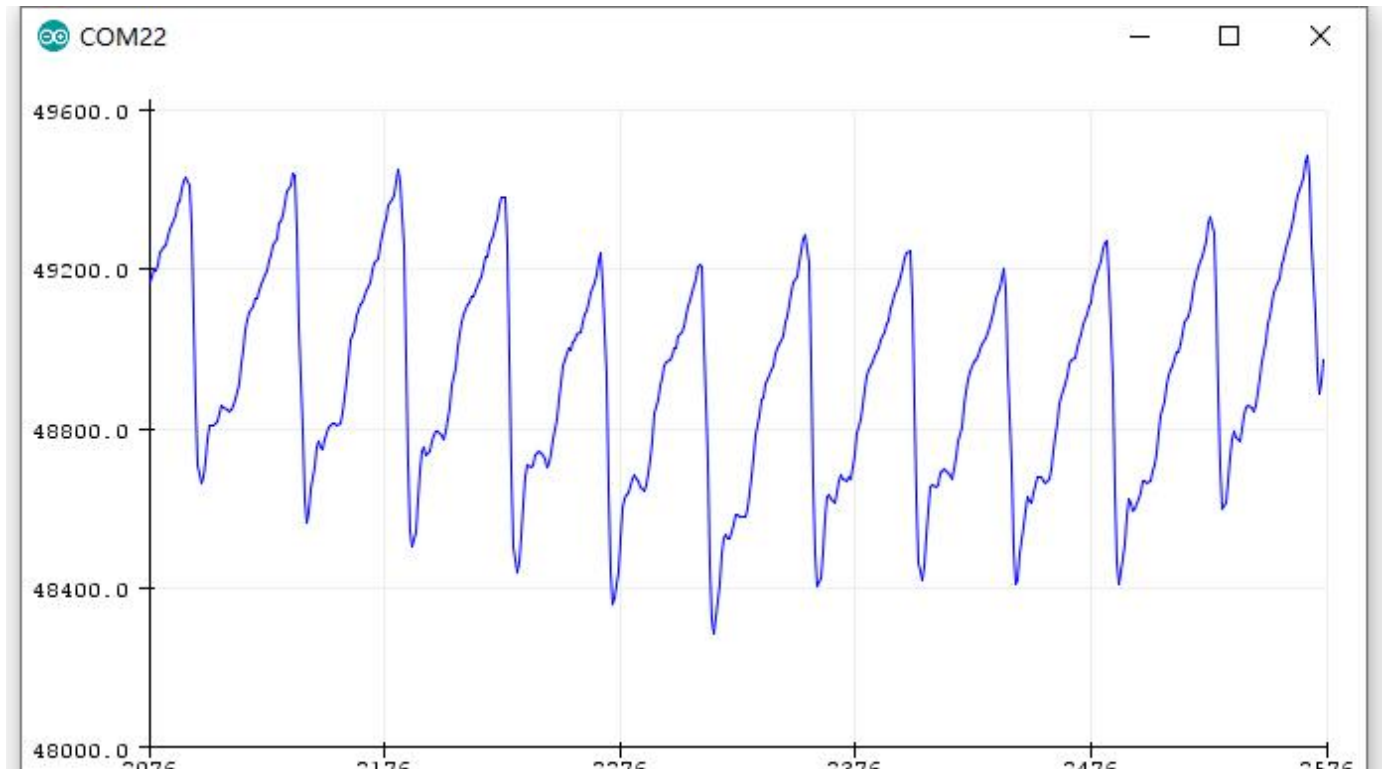
//Set reasonably to make sure there is clear sawtooth figure on the serial plotter
/*!
 *@brief Use macro definition to configure sensor
 *@param ledBrightness LED brightness, default value: 0x1F (6.4mA), Range: 0~255 (0=Off,
 *@param sampleAverage Average multiple samples then draw once, reduce data throughput,

 *@param ledMode LED mode, default to use red light and IR at the same time
 *@param sampleRate Sampling rate, default 400 samples every second
 *@param pulseWidth Pulse width: the longer the pulse width, the wider the detection range
 *@param adcRange Measurement Range, default 4096 (nA), 15.63(pA) per LSB
 */
particleSensor.sensorConfiguration(/*ledBrightness=*/60, /*sampleAverage=*/SAMPLEAVG_8,
                                   /*ledMode=*/MODE_MULTILED, /*sampleRate=*/SAMPLERATE_400,
                                   /*pulseWidth=*/PULSEWIDTH_411, /*adcRange=*/ADCRANGE_16384);
}

void loop()
{
  //Send raw data to serial, open serial plotter to check
  /*!
   *@brief Get IR value
   *@return IR reading
   */
  Serial.println(particleSensor.getIR());
}

```

## Result 2





## Sample Code 3- Heart-rate and SPO2 Measurement

Display the heart rate and SPO2 on Arduino serial monitor. Normal heart rate(adult): 60 ~ 100 beats per minute. Normal SPO2: 95~100.

```
/*!
 * @file SPO2.ino
 * @brief Display heart-rate and SPO2 on serial in real-time, normal SPO2 is within 95~100
 * @n Try to fix the sensor on your finger in using to avoid the effect of pressure change
 * @n This library supports mainboards: ESP8266, FireBeetle-M0, UNO, ESP32, Leonardo, Mega
 * @copyright Copyright (c) 2010 DFRobot Co.Ltd (http://www.dfrobot.com)
 * @licence The MIT License (MIT)
 * @author [YeHangYu](hangyu.ye@dfrobot.com)
 * @version V0.1
 * @date 2020-05-29
 * @url https://github.com/DFRobot/DFRobot\_MAX30102
 */

#include <DFRobot_MAX30102.h>

DFRobot_MAX30102 particleSensor;

/*
 * Macro definition options in sensor configuration
 */
```

```

macro definition options in sensor configuration
sampleAverage: SAMPLEAVG_1 SAMPLEAVG_2 SAMPLEAVG_4
                SAMPLEAVG_8 SAMPLEAVG_16 SAMPLEAVG_32
ledMode:        MODE_REDONLY  MODE_RED_IR  MODE_MULTILED
sampleRate:     PULSEWIDTH_69 PULSEWIDTH_118 PULSEWIDTH_215 PULSEWIDTH_411

pulseWidth:     SAMPLERATE_50 SAMPLERATE_100 SAMPLERATE_200 SAMPLERATE_400
                SAMPLERATE_800 SAMPLERATE_1000 SAMPLERATE_1600 SAMPLERATE_3200
adcRange:       ADCRANGE_2048 ADCRANGE_4096 ADCRANGE_8192 ADCRANGE_16384
*/
void setup()
{
  //Init serial
  Serial.begin(115200);
  /*!
  *@brief Init sensor
  *@param pWire IIC bus pointer object and construction device, can both pass or not pass
  *@param i2cAddr Chip IIC address (0x57 in default)
  *@return true or false
  */
  while (!particleSensor.begin()) {
    Serial.println("MAX30102 was not found");
    delay(1000);
  }
  ...

```

```

/^!
 *@brief Use macro definition to configure sensor
 *@param ledBrightness LED brightness, default value: 0x1F (6.4mA), Range: 0~255 (0=Off,
 *@param sampleAverage Average multiple samples then draw once, reduce data throughput,
 *@param ledMode LED mode, default to use red light and IR at the same time

 *@param sampleRate Sampling rate, default 400 samples every second
 *@param pulseWidth Pulse width: the longer the pulse width, the wider the detection range
 *@param adcRange ADC Measurement Range, default 4096 (nA), 15.63(pA) per LSB
 */
particleSensor.sensorConfiguration(/*ledBrightness=*/50, /*sampleAverage=*/SAMPLEAVG_4,
                                   /*ledMode=*/MODE_MULTILED, /*sampleRate=*/SAMPLERATE_100, \
                                   /*pulseWidth=*/PULSEWIDTH_411, /*adcRange=*/ADCRANGE_16384);
}

int32_t SPO2; //SPO2
int8_t SPO2Valid; //Flag to display if SPO2 calculation is valid
int32_t heartRate; //Heart-rate
int8_t heartRateValid; //Flag to display if heart-rate calculation is valid

void loop()
{
  Serial.println(F("Wait about four seconds"));
  particleSensor.heartrateAndOxygenSaturation(**SPO2=&SPO2, **SPO2Valid=&SPO2Valid,
  //Print result
  Serial.println(F("SPO2: "));
}

```



```
Serial.print(F("heartRate="));  
Serial.print(heartRate, DEC);  
Serial.print(F(", heartRateValid="));  
Serial.print(heartRateValid, DEC);  
Serial.print(F("; SPO2="));  
  
Serial.print(SPO2, DEC);  
Serial.print(F(", SPO2Valid="));  
Serial.println(SPO2Valid, DEC);  
}
```

## Result 3

COM22

Send

```
heartRate=71, heartRateValid=1; SPO2=100, SPO2Valid=1  
Wait about four seconds  
heartRate=88, heartRateValid=1; SPO2=100, SPO2Valid=1  
Wait about four seconds  
heartRate=68, heartRateValid=1; SPO2=100, SPO2Valid=1  
Wait about four seconds  
heartRate=68, heartRateValid=1; SPO2=99, SPO2Valid=1  
Wait about four seconds  
heartRate=65, heartRateValid=1; SPO2=99, SPO2Valid=1  
Wait about four seconds  
heartRate=68, heartRateValid=1; SPO2=100, SPO2Valid=1  
Wait about four seconds  
heartRate=78, heartRateValid=1; SPO2=99, SPO2Valid=1  
Wait about four seconds
```

Autoscroll  Show timestamp

Newline

115200 baud

Clear output

## FAQ


---

For any questions, advice or cool ideas to share, please visit the **DFRobot Forum** (<https://www.dfrobot.com/forum/>).

## More Documents

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- Schematics Diagram (<https://dfimg.dfrobot.com/nobody/wiki/67f301a3256405293ddea908b0affb07.pdf>)
- Dimension Diagram (<https://dfimg.dfrobot.com/nobody/wiki/45fa1db165bae2293913b095eba7ae8b.pdf>)
- MAX30102 Datasheet (<https://dfimg.dfrobot.com/nobody/wiki/ce7659ceeda5f7b482044ac0a74bc71b.pdf>)

 Get **MAX30102 Heart Rate and Oximeter Sensor** (<https://www.dfrobot.com/product-2164.html>) from DFRobot Store or **DFRobot Distributor**. (<https://www.dfrobot.com/index.php?route=information/distributors>)

route=information/distributors/logo)

**Turn to the Top**