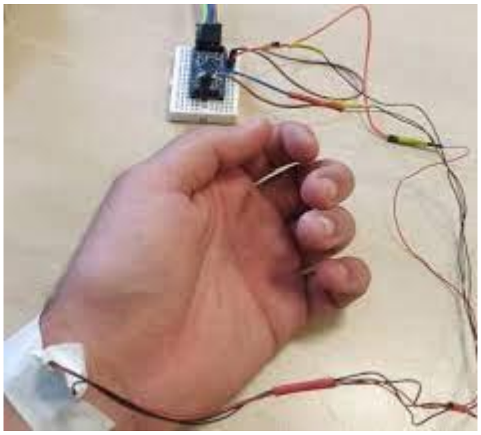
max30102



measuring the oxygen concentration in the blood (SpO2 percentage)

see [2] to know how to add it in ur arduino

Reading Temperature Code:

```
#include <Wire.h>

#include "MAX30105.h"
MAX30105 particleSensor;

void setup() {
  Serial.begin(9600);
  Serial.println("Initializing...");

  // Initialize sensor
  if (particleSensor.begin(Wire, I2C_SPEED_FAST) == false) { //Use default I2C port, 400kHz speed
    Serial.println("MAX30102 was not found. Please check wiring/power. ");
    while (1);
  }

  //The LEDs are very low power and won't affect the temp reading much but
  //you may want to turn off the LEDs to avoid any local heating
  particleSensor.setup(0); //Configure sensor. Turn off LEDs

  particleSensor.enableDIETEMPRDY(); //Enable the temp ready interrupt. This is required.
}

void loop() {
  float temperature = particleSensor.readTemperature();

  Serial.print("temperatureC=");
  Serial.print(temperature, 4);

  float temperatureF = particleSensor.readTemperatureF();

  Serial.print(" temperatureF=");
  Serial.print(temperatureF, 4);

  Serial.println();
}
```

Measuring Heart-Rate (BPM) Code:

```
#include <Wire.h>
#include "MAX30105.h"
#include "heartRate.h"

MAX30105 particleSensor;

const byte RATE_SIZE = 4; //Increase this for more averaging. 4 is good.
byte rates[RATE_SIZE]; //Array of heart rates
byte rateSpot = 0;
long lastBeat = 0; //Time at which the last beat occurred

float beatsPerMinute;
int beatAvg;

void setup() {
  Serial.begin(115200);
  Serial.println("Initializing...");

  // Initialize sensor
  if (!particleSensor.begin(Wire, I2C_SPEED_FAST)) {
    Serial.println("MAX30102 was not found. Please check wiring/power. ");
    while (1);
  }
  Serial.println("Place your index finger on the sensor with steady
pressure.");

  particleSensor.setup(); //Configure sensor with default settings
  particleSensor.setPulseAmplitudeRed(0x0A); //Turn Red LED to low to
indicate sensor is running
  particleSensor.setPulseAmplitudeGreen(0); //Turn off Green LED
}

void loop() {
  long irValue = particleSensor.getIR();

  if (checkForBeat(irValue) == true) {
    //We sensed a beat!
    long delta = millis() - lastBeat;
    lastBeat = millis();

    beatsPerMinute = 60 / (delta / 1000.0);

    if (beatsPerMinute < 255 && beatsPerMinute > 20) {
      rates[rateSpot++] = (byte)beatsPerMinute; //Store this reading in the
array
      rateSpot %= RATE_SIZE; //Wrap variable

      //Take average of readings
      beatAvg = 0;
      for (byte x = 0 ; x < RATE_SIZE ; x++)
        beatAvg += rates[x];
      beatAvg /= RATE_SIZE;
    }
  }

  Serial.print("IR=");
  Serial.print(irValue);
  Serial.print(", BPM=");
  Serial.print(beatsPerMinute);
  Serial.print(", Avg BPM=");
  Serial.print(beatAvg);

  if (irValue < 50000)
    Serial.print(" No finger?");

  Serial.println();
}
```

Measuring Oxygen Saturation (SpO2) code:

```
#include <Wire.h>
#include "MAX30105.h"
#include "spo2_algorithm.h"

MAX30105 particleSensor;

#define MAX_BRIGHTNESS 255

#if defined(__AVR_ATmega328P__) || defined(__AVR_ATmega168__)
//Arduino Uno doesn't have enough SRAM to store 100 samples of IR led data
and red led data in 32-bit format
//To solve this problem, 16-bit MSB of the sampled data will be truncated.
Samples become 16-bit data.
uint16_t irBuffer[100]; //infrared LED sensor data
uint16_t redBuffer[100];  //red LED sensor data
#else
uint32_t irBuffer[100]; //infrared LED sensor data
uint32_t redBuffer[100];  //red LED sensor data
#endif

int32_t bufferLength; //data length
int32_t spo2; //SPO2 value
int8_t validSPO2; //indicator to show if the SPO2 calculation is valid
int32_t heartRate; //heart rate value
int8_t validHeartRate; //indicator to show if the heart rate calculation is
valid

byte pulseLED = 11; //Must be on PWM pin
byte readLED = 13; //Blinks with each data read

void setup()
{
  Serial.begin(115200); // initialize serial communication at 115200 bits per
second:

  pinMode(pulseLED, OUTPUT);
  pinMode(readLED, OUTPUT);

  // Initialize sensor
  if (!particleSensor.begin(Wire, I2C_SPEED_FAST)) //Use default I2C port,
400kHz speed
  {
    Serial.println(F("MAX30105 was not found. Please check wiring/power."));
    while (1);
  }

  Serial.println(F("Attach sensor to finger with rubber band. Press any key
to start conversion"));
```

```
  while (Serial.available() == 0) ; //wait until user presses a key
  Serial.read();

  byte ledBrightness = 60; //Options: 0=Off to 255=50mA
  byte sampleAverage = 4; //Options: 1, 2, 4, 8, 16, 32
  byte ledMode = 2; //Options: 1 = Red only, 2 = Red + IR, 3 = Red + IR +
Green
  byte sampleRate = 100; //Options: 50, 100, 200, 400, 800, 1000, 1600, 3200
  int pulseWidth = 411; //Options: 69, 118, 215, 411
  int adcRange = 4096; //Options: 2048, 4096, 8192, 16384

  particleSensor.setup(ledBrightness, sampleAverage, ledMode, sampleRate,
pulseWidth, adcRange); //Configure sensor with these settings
}

void loop()
{
  bufferLength = 100; //buffer length of 100 stores 4 seconds of samples
running at 25sps

  //read the first 100 samples, and determine the signal range
  for (byte i = 0 ; i < bufferLength ; i++)
  {
    while (particleSensor.available() == false) //do we have new data?
      particleSensor.check(); //Check the sensor for new data

    redBuffer[i] = particleSensor.getRed();
    irBuffer[i] = particleSensor.getIR();
    particleSensor.nextSample(); //We're finished with this sample so move to
next sample

    Serial.print(F("red="));
    Serial.print(redBuffer[i], DEC);
    Serial.print(F(", ir="));
    Serial.println(irBuffer[i], DEC);
  }

  //calculate heart rate and SpO2 after first 100 samples (first 4 seconds of
samples)
  maxim_heart_rate_and_oxygen_saturation(irBuffer, bufferLength, redBuffer,
&spo2, &validSPO2, &heartRate, &validHeartRate);

  //Continuously taking samples from MAX30102.  Heart rate and SpO2 are
calculated every 1 second
  while (1)
  {
    //dumping the first 25 sets of samples in the memory and shift the last
75 sets of samples to the top
    for (byte i = 25; i < 100; i++)
    {
      redBuffer[i - 25] = redBuffer[i];
      irBuffer[i - 25] = irBuffer[i];
    }

    //take 25 sets of samples before calculating the heart rate.
    for (byte i = 75; i < 100; i++)
    {
      while (particleSensor.available() == false) //do we have new data?
        particleSensor.check(); //Check the sensor for new data

      digitalWrite(readLED, !digitalRead(readLED)); //Blink onboard LED with
every data read

      redBuffer[i] = particleSensor.getRed();
      irBuffer[i] = particleSensor.getIR();
      particleSensor.nextSample(); //We're finished with this sample so move
to next sample

      //send samples and calculation result to terminal program through UART
      Serial.print(F("red="));
      Serial.print(redBuffer[i], DEC);
      Serial.print(F(", ir="));
      Serial.print(irBuffer[i], DEC);

      Serial.print(F(", HR="));
      Serial.print(heartRate, DEC);

      Serial.print(F(", HRvalid="));
      Serial.print(validHeartRate, DEC);

      Serial.print(F(", SPO2="));
      Serial.print(spo2, DEC);

      Serial.print(F(", SPO2Valid="));
      Serial.println(validSPO2, DEC);
    }

    //After gathering 25 new samples recalculate HR and SP02
    maxim_heart_rate_and_oxygen_saturation(irBuffer, bufferLength, redBuffer,
&spo2, &validSPO2, &heartRate, &validHeartRate);
  }
}
```

Datasheet

https://cdn.shopify.com/s/files/1/0672/9409/files/MAX30102_datasheet.pdf?v=1598906487

Ref

[1] https://store.fut-electronics.com/products/pulse-oximeter-spo2-heart-rate-sensor-max30100#:~:text=The%20MAX30102%20can%20be%20used,the%20infrared%20light%20is%20needed.

[2] https://lastminuteengineers.com/max30102-pulse-oximeter-heart-rate-sensor-arduino-tutorial/