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SEN0226 Gravity I2C BMP280 Barometer Sensor
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DFR0143 Triple Axis Accelerometer MMA7361
Triple Axis Accelerometer FXLN83XX Series
SEN0072 CMPS09 - Tilt Compensated Magnetic Compass
SEN0073 9 Degrees of Freedom - Razor IMU
DFR0188 Flymaple V1.1
SEN0224 Gravity I2C Triple Axis Accelerometer - LIS2DH
SEN0140 10 DOF Mems IMU Sensor V2.0
SEN0250 Gravity BMI160 6-Axis Inertial Motion Sensor
SEN0253 Gravity BNO055 + BMP280 intelligent 10DOF AHRS
SEN0001 URM37 V5.0 Ultrasonic Sensor
SEN0002 URM04 V2.0
SEN0004 SRF01 Ultrasonic sensor
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SEN0006 SRF05 Ultrasonic sensor
SEN0007 SRF08 Ultrasonic Sensor
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SEN0304 URM09 Ultrasonic Sensor (Gravity-I2C) (V1.0)
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SEN0301 Water-proof Ultrasonic Sensor ULA
SEN0307 URM09 Ultrasonic Sensor Gravity Analog
SEN0311 A02YYUW Waterproof Ultrasonic Sensor
SEN0312 ME007YS Waterproof Ultrasonic Sensor
SEN0313 A01NYUB Waterproof Ultrasonic Sensor
DFR0066 SHT1x Humidity and Temperature Sensor
DFR0067 DHT11 Temperature and Humidity Sensor
SEN0137 DHT22 Temperature and humidity module
DFR0023 DFRobot LM35 Linear Temperature Sensor
DFR0024 Gravity DS18B20 Temperature Sensor Arduino Compatible V2
DFR0024 Gravity DS18B20 Temperature Sensor Arduino Compatible V2
SEN0114 Moisture Sensor
TOY0045 TMP100 Temperature Sensor
TOY0054 SI7021 Temperature and humidity sensor
SEN0206 IR Thermometer Sensor MLX90614
SEN0227 SHT20 I2C Temperature & Humidity Sensor Waterproof Probe
SEN0236 Gravity I2C BME280 Environmental Sensor Temperature, Humidity, Barometer
SEN0248 Gravity I2C BME680 Environmental Sensor VOC, Temperature, Humidity, Barometer
DFR0558 Gravity Digital High Temperature Sensor K-type
SEN0308 Waterproof Capacitive Soil Moisture Sensor
SEN0019 Adjustable Infrared Sensor Switch
SEN0042 DFRobot Infrared sensor breakout
SEN0143 SHARP GP2Y0A41SK0F IR ranger sensor 4-30cm
SEN0013 Sharp GP2Y0A02YK IR ranger sensor 150cm
SEN0014 Sharp GP2Y0A21 Distance Sensor 10-80cm
SEN0085 Sharp GP2Y0A710K Distance Sensor 100-550cm
DFR0094 Digital IR Receiver Module
DFR0095 DIGITAL IR Transmitter Module
SEN0018 Digital Infrared motion sensor
DFR0107 IR Kit
SEN0264 TS01 IR Thermal Sensor (4-20mA)
SEN0169 Analog pH Meter Pro
DFR0300-H Gravity: Analog Electrical Conductivity Sensor(K=10)
DFR0300 Gravity Analog Electrical Conductivity Sensor Meter V2 K=1
SEN0165 Analog ORP Meter
SEN0161-V2 Gravity Analog pH Sensor Meter Kit V2
SEN0161 PH meter
SEN0237 Gravity Analog Dissolved Oxygen Sensor
SEN0204 Non-contact Liquid Level Sensor XKC-Y25-T12V
SEN0205 Liquid Level Sensor-FS-IR02
SEN0244 Gravity Analog TDS Sensor Meter For Arduino
SEN0249 Gravity Analog Spear Tip pH Sensor Meter Kit For Soil And Food Applications
SEN0121 Steam Sensor
SEN0097 Light Sensor
DFR0026 DFRobot Ambient Light Sensor
TOY0044 UV Sensor
SEN0172 LX1972 ambient light sensor
SEN0043 TEMT6000 ambient light sensor
SEN0175 UV Sensor v1.0-ML8511
SEN0228 Gravity I2C VEML7700 Ambient Light Sensor
SEN0101 TCS3200 Color Sensor
DFR0022 DFRobot Grayscale Sensor
SEN0017 Line Tracking Sensor for Arduino V4
SEN0147 Smart Grayscale sensor
SEN0212 TCS34725 I2C Color Sensor For Arduino
SEN0245 Gravity VL53L0X ToF Laser Range Finder
SEN0259 TF Mini LiDAR ToF Laser Range Sensor
SEN0214 20A Current Sensor
SEN0262 Gravity Analog Current to Voltage Converter for 4~20mA Application
SEN0291 Gravity: I2C Digital Wattmeter
DFR0027 DFRobot Digital Vibration Sensor V2
DFR0028 DFRobot Tilt Sensor
DFR0029 DFRobot Digital Push Button
DFR0030 DFRobot Capacitive Touch Sensor
DFR0032 Digital Buzzer Module
DFR0033 Digital magnetic sensor
DFR0034 Analog Sound Sensor
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DFR0075 ADKeyboard Module
DFR0332 Fan Module
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SEN0160 Weight Sensor Module
SEN0170 Wind Speed Sensor Voltage Type 0-5V
TOY0048 High Accuracy Dual Axis Inclinometer Sensor Arduino Gadgeteer Compatible
SEN0187 RGB and Gesture Sensor
SEN0186 Weather Station with Anemometer Wind vane Rain bucket
SEN0192 MicroWave Sensor
SEN0185 Hall sensor
FIT0449 DFRobot Speaker v1.0
SEN0203 Heart Rate Sensor
DFR0423 Self-Locking Switch
SEN0213 Heart Rate Monitor Sensor
SEN0221 Gravity Hall Angle Sensor
SEN0223 Conductivity Switch Sensor
SEN0230 Incremental

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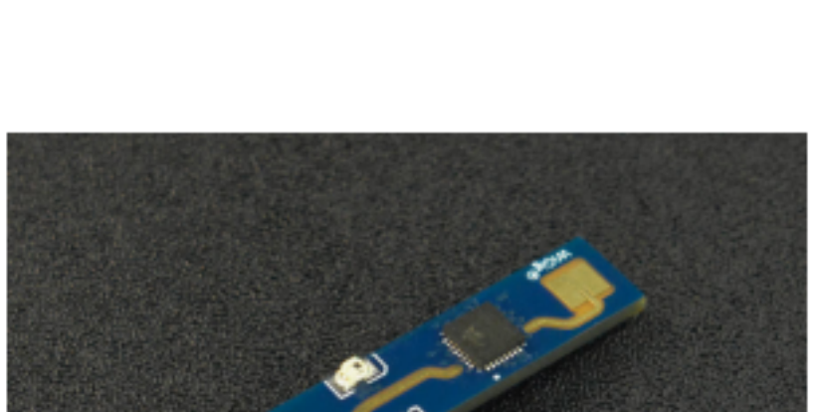
SKU:SEN0557

Introduction



This high-sensitivity 24GHz human presence sensing radar module utilizes FMCW (frequency-modulated continuous wave) to detect human targets in the set space. Combined with radar signal processing and accurate human sensing algorithm, it can achieve high-sensitivity sensing of human presence status, which can identify human body in motion and stationary state and calculate auxiliary information like the distance to the target. The sensing effect of the radar module is insusceptible to environmental factors like temperature, brightness, humidity, light fluctuations, etc. Besides, FMCW radars can penetrate materials, which enables this module to work well in a shell without opening holes.

This microwave radar is mainly used in indoor scenarios to sense whether there is a moving or micro-moving human in the detection area and output the detection results in real time. It offers a sensing distance of up to 6 meters and a resolution of 0.75m. Besides, it provides serial communication protocol so users can configure the sensing distance range, sensing sensitivity in different intervals, and delay time for different applications.

The module supports UART and GPIO (high and low level) output. When used with Arduino or other controllers, it can be flexibly applied to various projects such as smart light control, human body induction wake-up of advertising screen, UV light control, and home security.

Features

- 5-12V wide supply voltage
- High sensitivity, wide detection angle of 120°
- Sensing distance up to 6m, capable of outputting distance value
- Long and narrow shape with a width of 7mm, small size, easy to embed
- Support UART & GPIO (high/low level) output

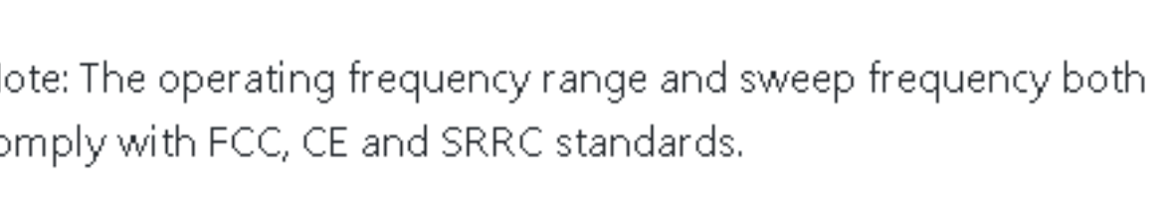
Specification

- Nominal Voltage: 5V
- Operating Frequency Range: 24GHz-24.25GHz
- Modulation Mode: FMCW
- Operating Voltage: DC5V-12V
- Average Operating Current: 80mA
- Detection Distance: 0.75m-6m (measured blind zone distance of 30cm)
- Detection Angle: ±60°
- Output Interface: UART & GPIO (3.3V)
- Default Baud Rate: 256000
- Distance Resolution: 0.75m
- Sweep Bandwidth: 250MHz
- Ambient Temperature: -40 to 85℃
- Dimension: 7mm×35mm/0.28×1.38"
- Connector: SH 1.27mm to DuPont Female 2.54

Note: The operating frequency range and sweep frequency both comply with FCC, CE and SRRC standards.

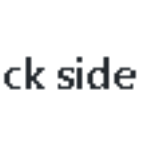
Dimensions

Back side



Board Overview

Front side



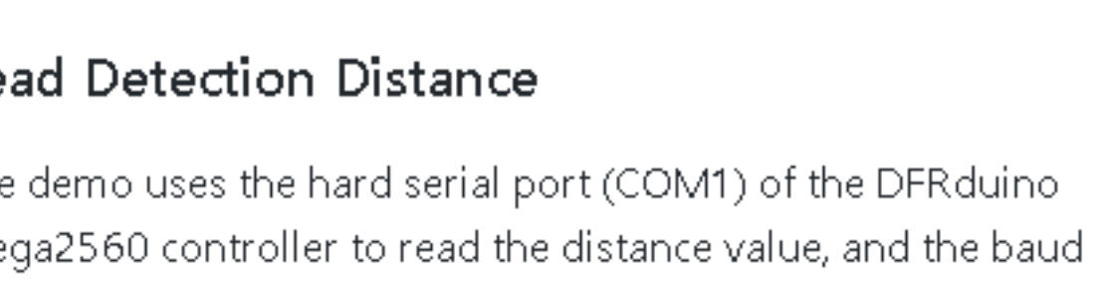
Wire Color	Name	Description
Blue	OUT	Object status output, human is detected: output high (3.3V); nobody is detected: output low (0V)
Green	UART_Tx	Serial Tx, transmit data
Yellow	UART_Rx	Serial Rx, receive data
Black	GND	Power ground
Red	VCC	Power input

Tutorial for Arduino

Requirements

- **Hardware**
  - DFRduino Mega2560 × 1
  - Gravity: IO Sensor Shield For Arduino Mega Due × 1
  - 24GHz Human Presence Sensing Module × 1
  - Connector × 1
- **Software**
  - Arduino IDE

Connection Diagram



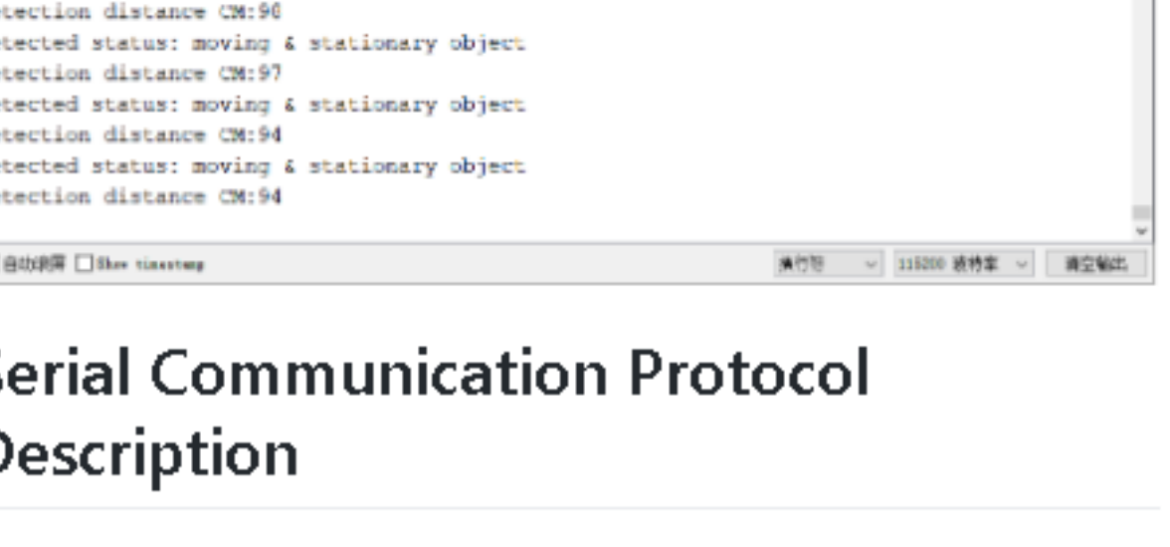
Read Detection Distance

The demo uses the hard serial port (COM1) of the DFRduino Mega2560 controller to read the distance value, and the baud rate of the serial port is set to 115200. If you want to use the module with Arduino UNO R3, please change the baud rate to 57600 or below. For details, please refer to "Serial Communication Protocol Description".

```
//#include <SoftwareSerial.h>
//SoftwareSerial mySerial(2, 3); //Define soft serial

size_t readN(uint8_t *buf, size_t len);

bool recdData(uint8_t *buf);

uint8_t Cache[23] = {0};    //Cache

void setup()
{
  Serial.begin(115200);
  Serial1.begin(256000);
  //mySerial.begin(57600); //Soft serial port
}

void loop()
{
  recdData(Cache);
}

size_t readN(uint8_t *buf, size_t len)
{
  size_t offset = 0, left = len;
  int16_t Tineout = 1500;
  uint8_t  *buffer = buf;
  long curr = millis();
  while (left) {
    if (Serial1.available()) {
      buffer[offset] = Serial1.read();
      // buffer[offset] = Serial.read();
      offset++;
      left--;
    }
    if (millis() - curr > Tineout) {
      break;
    }
  }
  return offset;
}

bool recdData(uint8_t *buf)
{
  int16_t Tineout = 50000;
  long curr = millis();
  uint8_t ch;
  bool ret = false;
  const char *P;
  while (!ret) {
    if (millis() - curr > Tineout) {
      break;
    }
    if (readN(&ch, 1) == 1) {
      if (ch == 0xF4) {
        buf[0] = ch;
        if (readN(&ch, 1) == 1) {
          if (ch == 0xF3) {
            buf[1] = ch;
            if (readN(&ch, 1) == 1) {
              if (ch == 0xF2) {
                buf[2] = ch;
                if (readN(&ch, 1) == 1) {
                  if (ch == 0xF1) {
                    buf[3] = ch;
                      if (readN(&buf[4], 19) == 19) {
//                        printdf(buf, 23); //Print ra
                        uint16_t Adistance = buf[10] <
                        uint16_t Sdistance = buf[13] <
                        uint16_t Distance = buf[16] <<
                        switch (buf[8]) {
                          case 0x00 : Serial.println("
                          case 0x01 : Serial.println("
                          case 0x02 : Serial.println("
                          case 0x03 : Serial.println("
                        }
//                        Serial.print("Energy value c
//                        Serial.println(buf[11]);
//                        Serial.print("Energy value c
//                        Serial.println(buf[14]);
//                        Serial.print("Distance to th
//                        Serial.println(Adistance);
//                        Serial.print("Distance to th
//                        Serial.println(Sdistance);
                        Serial.print("Detection dista
                        Serial.println(Distance);
                        break;
                      }
                  }
                }
              }
            }
          }
        }
      }
    }
  }
  return ret;
}
void printdf(uint8_t *buf, int len)
{
  for (int i = 0; i < len; i++) {
    if (buf[i] < 0x10) {
      Serial.print("0");
    }

    Serial.print(buf[i], HEX);
    Serial.print(" ");
  }
  Serial.println();
}
```

Result

The module only outputs the target distance value of the moving state, and the distance value of the non-moving state is 0.For details, please refer to the serial communication protocol description.



```
Detected status: stationary
Detection distance CM:94
Detected status: moving & stationary object
Detection distance CM:90
Detected status: moving & stationary object
Detection distance CM:100
Detected status: moving & stationary object
Detection distance CM:95
Detected status: moving & stationary object
Detection distance CM:95
Detected status: moving & stationary object
Detection distance CM:95
Detected status: moving & stationary object
Detection distance CM:90
Detected status: moving & stationary object
Detection distance CM:97
Detected status: moving & stationary object
Detection distance CM:94
Detected status: moving & stationary object
Detection distance CM:94
```

Serial Communication Protocol Description

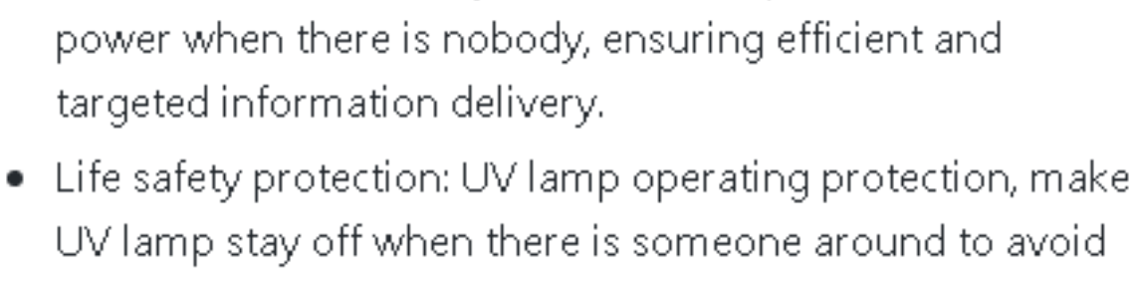
LD2410 Serial Communication Protocol V1.02.pdf//Including the upper computer usage, config description & serial communication protocol commands

24GHz_Tool_EN.rar//Upper computer

Application

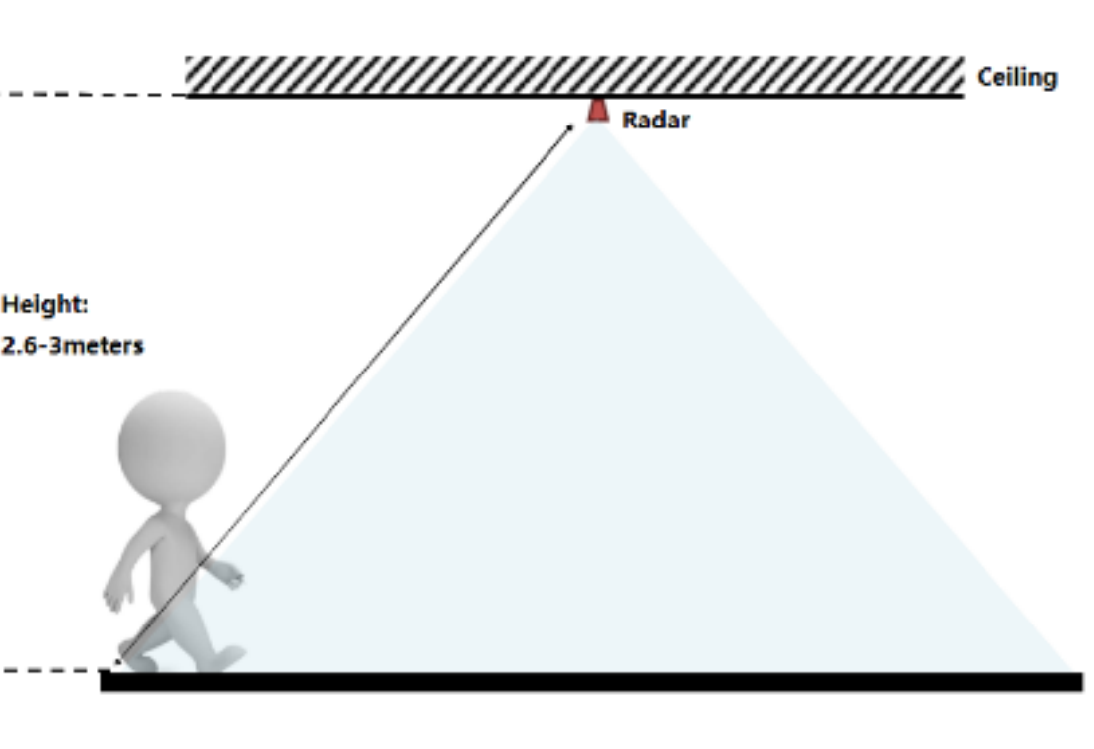
This module is able to detect and identify human bodies in moving, micro-moving, standing, sitting and lying-down states. It supports multi-level parameter setting and can be widely used in various AIoT scenarios. The common applications are as follows:

- Human body sensing light control: the device sense whether there is a human body in the space, and automatically control lights, such as lighting equipment in public places, various sensing lights, and LED bulbs.
- Human body induction wake-up of advertising screen and other devices: the device will automatically be on when someone comes nearby and enter sleep mode to save power when there is nobody, ensuring efficient and targeted information delivery.
- Life safety protection: UV lamp operating protection, make UV lamp stay off when there is someone around to avoid personal injury; the device automatically detects and gives an alarm in dangerous places to prevent people from entering specific high-risk spaces, such as the workplace for coal mine blasting.
- Smart home appliances: the TV, air conditioner and other electrical appliances will automatically be off when there is no one in the room for a long time, which is more power-saving and safe.
- Smart security: detection and identification of people intruding in the specified range

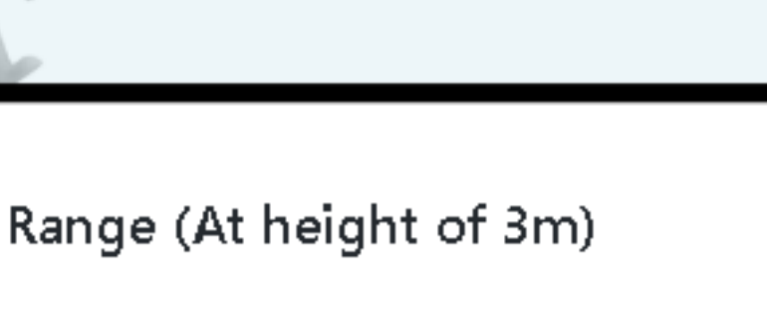


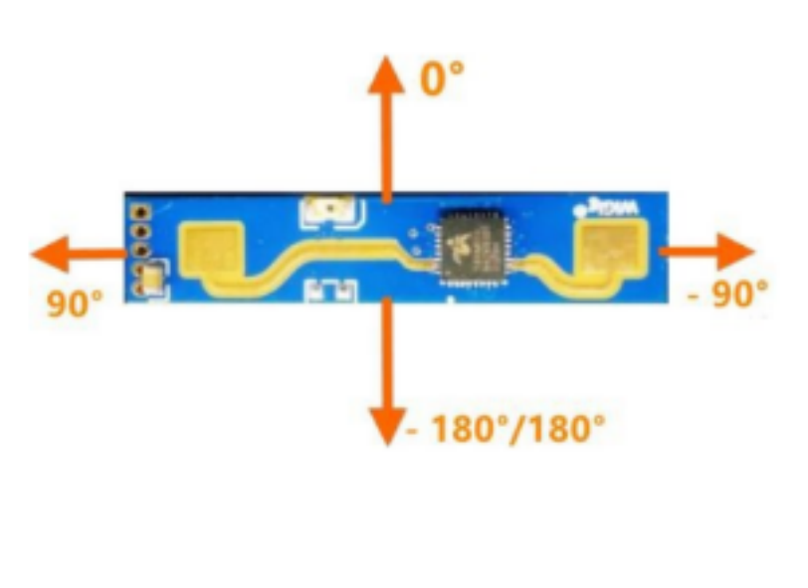
Installation Method & Sensing Range

Top Mount



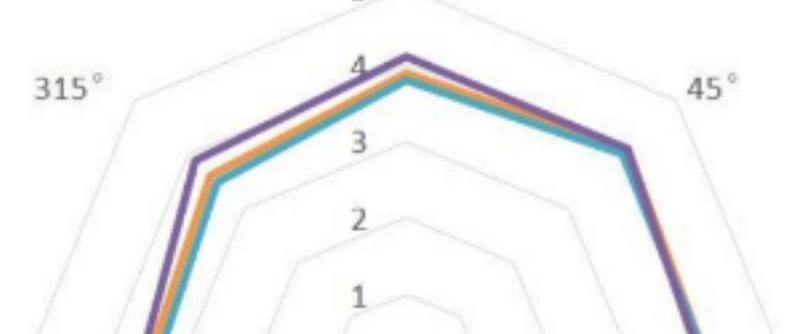
Detection Range (At height of 3m)



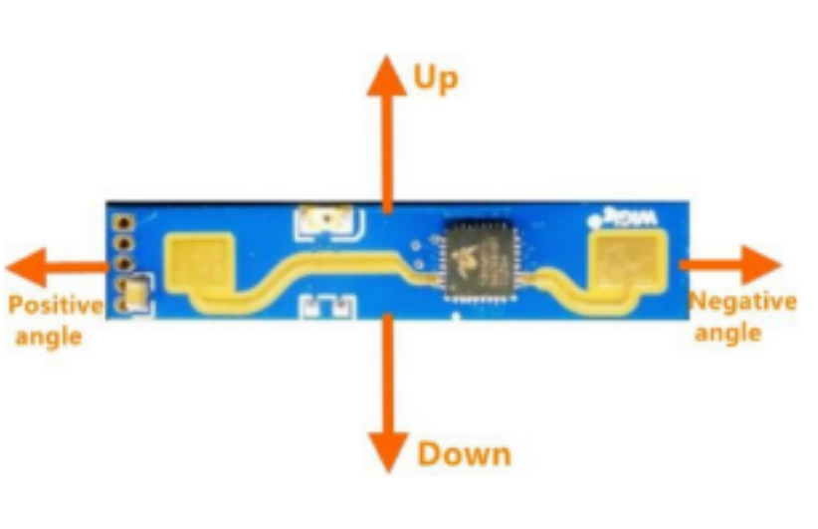


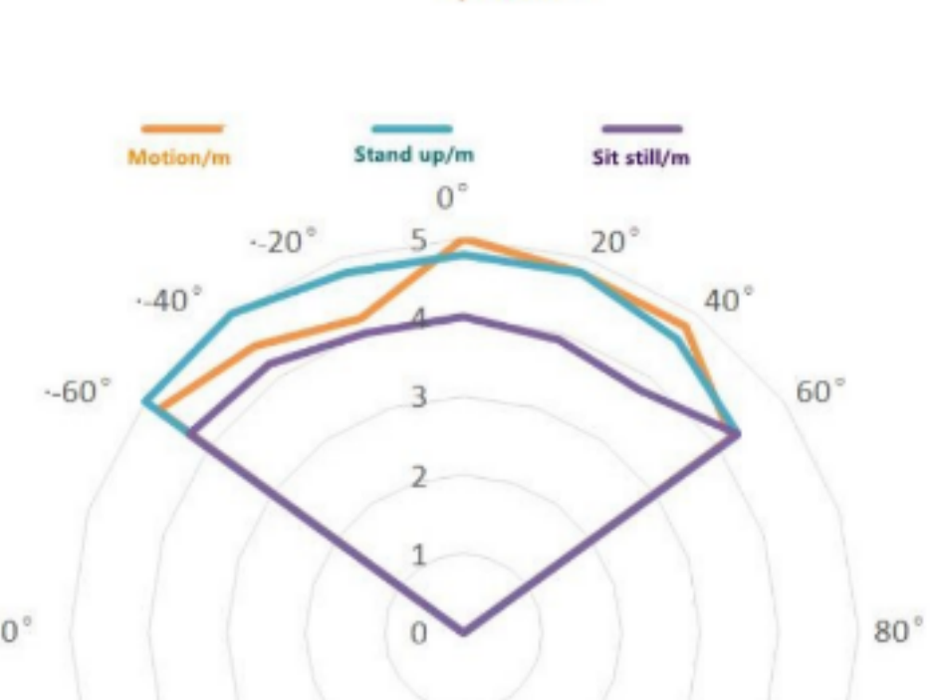
(Distance unit: meters, Angle unit: degrees)

Wall Mount Diagram



Detection Range (At height of 1.5m)





(Distance unit: meters, Angle unit: degrees)

Installation Conditions

Confirm the minimum installation clearance

If the radar module needs to be installed in a shell, then the shell must have good wave permeability at 24 GHz and contain no metal or materials that may block electromagnetic waves.

Installation Environment Requirements

This module needs to be installed in a suitable environment. The detection effect will be affected if it's used in the following environments:

- There are continuously moving non-human objects in the sensing area, such as animals, plants, continuously swinging curtains, etc.
- There are large-area high-reflectivity objects in the sensing area; high-reflectivity objects will interfere with the radar antenna
- When it's installed on the wall, the indoor top-mounted air conditioner, electric fan and other external interference factors should be taken into account.

Precautions During Installation

- Try to ensure that the radar antenna is facing the detected area, and the surrounding area is open and unobstructed
- Ensure the sensor is installed firmly and stably as the shaking of the radar itself will affect the detection effect
- Ensure that there is no moving or shaking object at the back side of the radar. Due to the penetrability of radar waves, the back lobe of antenna may mistakenly detect the moving object at the back side of radar. So it is recommended to use a metal shield or metal plate to shield the back lobe to reduce the influence caused by the back object.
- The theoretical distance accuracy of the radar is obtained by special algorithm processing based on the distance resolution (0.2m or 0.75m). Due to the differences in the size, state, and RCS of objects, the distance may fluctuate, and so does the farthest detection distance.

FAQ

For any questions, advice or cool ideas to share, please visit the DFRobot Forum.

More Documents

Get 24GHz Human Presence Sensing Module from DFRobot Store or DFRobot Distributor.

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