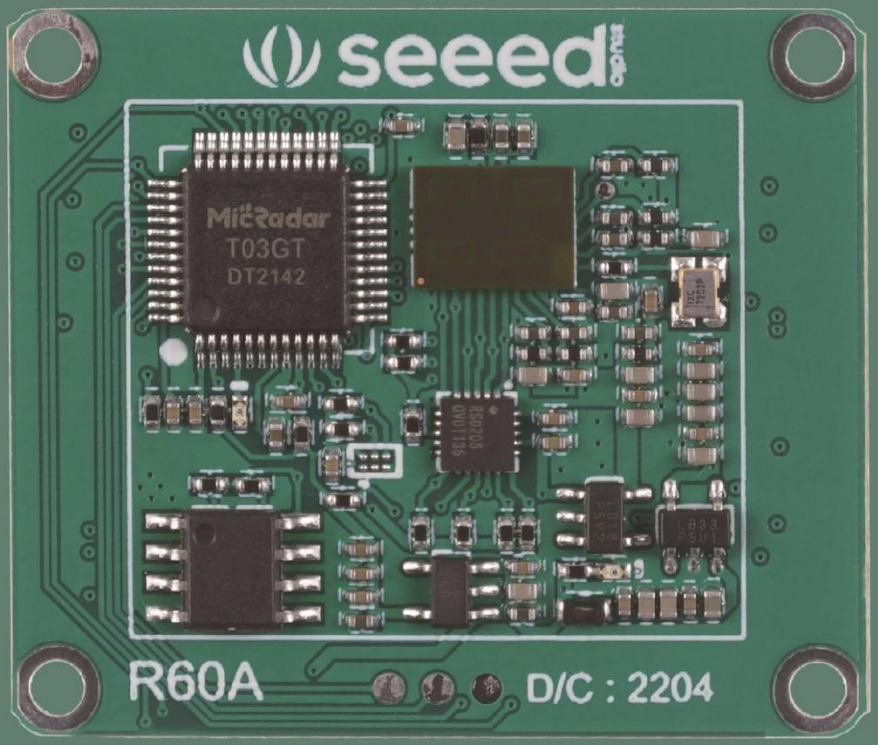
MR60BHA1

Respiratory Heartbeat Radar



1. Overview

Radar module MR60BHA1 uses 60g millimeter wave technology for monitoring non-contact respiration and heart rate.

The following are the characteristics of the radar module:

1. To achieve radar detection utilizing FMCW frequency modulated continuous waves;
2. To achieve the synchronous perception of human respiratory rate and heart rate;
3. Respiration and heartbeat are observed at a distance of 0.4-2 meters
4. Power output is small, causing no harm to the human body;
5. Temperature, humidity, noise, airflow, dust, light, and other environment do not affect the product's performance.
6. The product supports secondary development and can be adapted to various scenarios.
7. Providing general-purpose UART communication interfaces
8. Four groups of input/output resources are reserved, which may be used for user-defined interface scenarios or simple interface simulations.

2.Main parameters

2.1. detection angle and distance

Parameter content	Minimum	Typical	Maximum	Unit
Performance				
Detection distance (thoracic)	0.4		2	m
Respiratory measurement accuracy		90		%
Heartbeat measurement accuracy		85		%
Refresh time	1		30	S
Observation set-up time		20		S
Operating parameters				
Operating voltage (VCC)	4.6	5	6	V
Operating current (ICC)		150		mA

Parameter content	Minimum	Typical	Maximum	Unit
Operating temperature (TOP)	–20		60	℃
Storage temperature (TST)	–40		80	℃
Launch parameters				
Operating frequency (fTX)	58	60	63.5	GHz
Transmitted power (Pout)		6		dBm
Antenna parameters				
Antenna gain (GANT)		4		dBi
Horizontal beam (–3dB)	–40		40	o
Vertical beam (–3dB)	–40		40	o

3. Module dimensions and pin description

3.1. Module size package

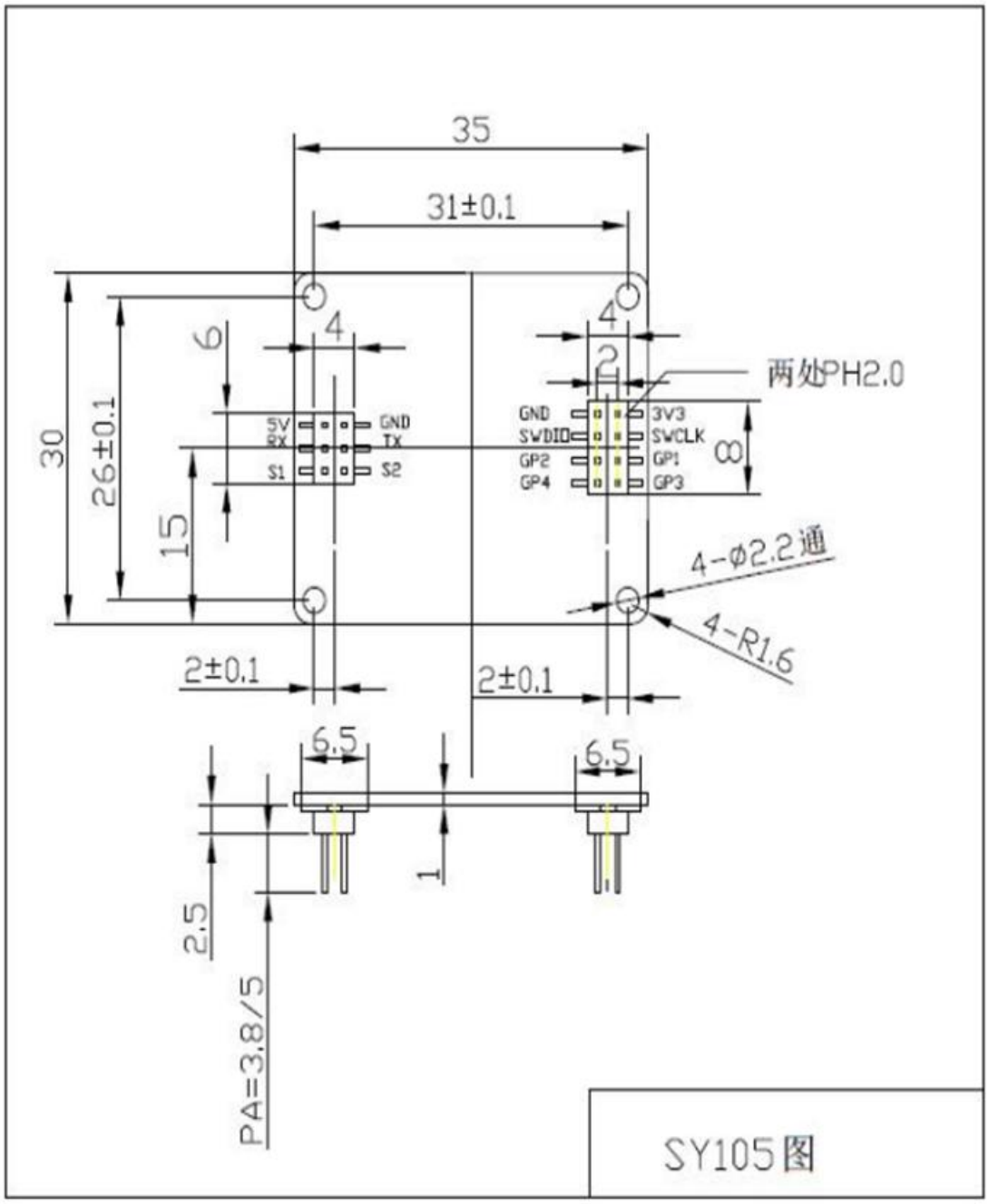


Fig. 1 Schematic diagram of the radar module structure

3.2. pin descriptions

Interface	Pins	Description	Typical values	Description
Interface 1	1	5V	5.0V	Positive power input
	2	GND		Ground
	3	RX		Serial port reception
	4	TX		Serial port send
	5	S1	3.3V/0V	occupied/unoccupied
	6	S2	3.3V.0V	Stationary / Active
Interface 2	1	3V3	3.3V	Output power
	2	GND		Ground
	3	SL		Reserved
	4	SD		Reserved
	5	GP1		Spare expansion pins
	6	GP2		Spare expansion pins
	7	GP3		Spare expansion pins
	8	GP4		Spare expansion pins

3.3. using the wiring diagram

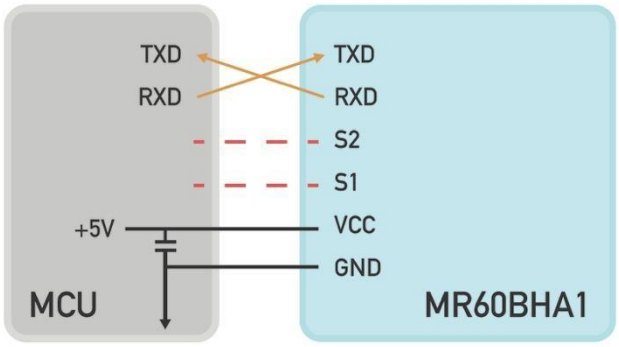
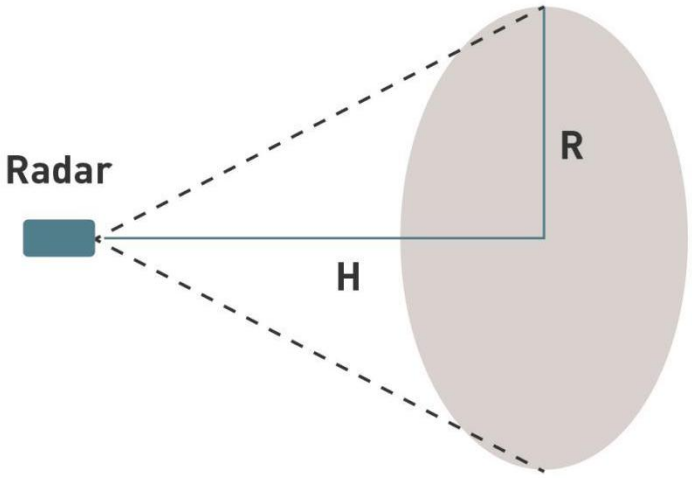


Fig. 2 Schematic diagram of the radar module and peripheral connections

4. Main operating properties

4.1 Radar module operating range

The figure illustrates MR60BHA1 radar beam coverage. It has a 3D range of 80° horizontally and 80° tilted.



Due to the characteristics of the radar's beam, it has a long-range coverage in the direction normal to the antenna surface but a short-range if it deviates from the normal direction of the antenna surface.

In addition, when the radar is mounted on top or inclined, its range will be reduced. This is due to the influence of its beam and effective radiation space. This should be put into consideration during usage.

4.2. main functions and performance

1. Main functions and performance
    a. Breath detection function
        i. Detection distance:
            1. 0.4m ≤ x ≤ 2m / / detection distance between thorax and radar antenna surface
        ii. accuracy: ≥ 90%
    b. Heartbeat detection function
        i. Detection distance:
            1. detection distance between thorax and radar antenna surface is as follows 0.4m ≤ x ≤ 2m.
            2. accuracy: ≥ 85%
    c. Presence awareness
        i. Detection distance: distance between antenna surface and human ≤ 3m
        ii. Accuracy: ≥ 90%
    d. Motion detection function
        i. Motion trigger
        ii. Motion direction and position perception

5. Radar installation and mode

5.1. installation method

The radar works by detecting the respiratory rhythm, so its placement must be such that it is capable of detecting a person's chest and back. Following are the main radar installation modes, depending on the radar's application mode

(1) Overhead installation

The top mount installation method (as illustrated in Figure 5) is appropriate for bedridden people or those sleeping. The radar beams are vertically downward facing the human body, and the central position of the beams corresponds to the position of the human chest. In this installation mode, the distance between the radar and the human body should be ≤2 meter

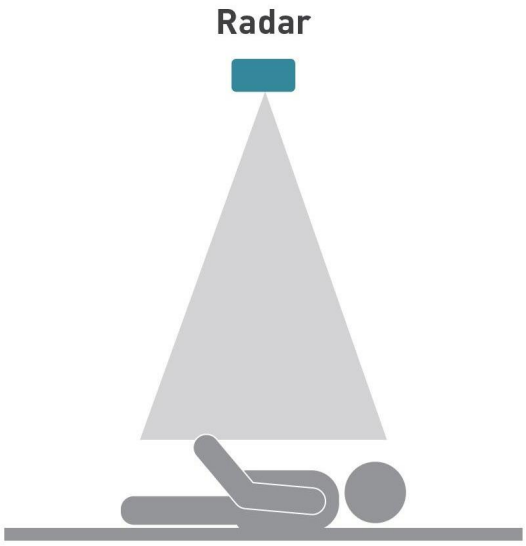


Fig. 5 Schematic diagram of the ceiling mount

(2) Tilt mounting

In this case, the radar is installed obliquely. It is either mounted on the wall or beside the bed. As shown in Figure 6, the radar is installed in an oblique position. A radar beam obliquely irradiates the human body. The center of the radar beam corresponds to the human chest. In this installation mode, the radar must be installed at a radial distance of at least 2 meters from the human body.

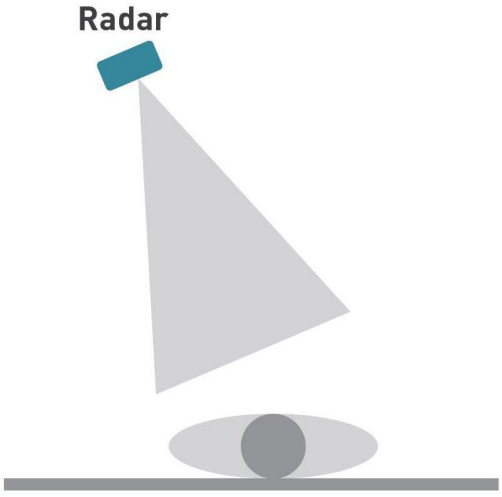


Fig. 6 Diagram of inclined installation

(3) Horizontal installation

The radar is mounted horizontally (as shown in Figure 7). The radar can be mounted on the wall or placed on top of a desk. Radar beams positively irradiate

the human body. The center of the radar beam corresponds to the human chest. The distance between the radar and the human body to be measured should be no less than 2 meters in this installation mode.

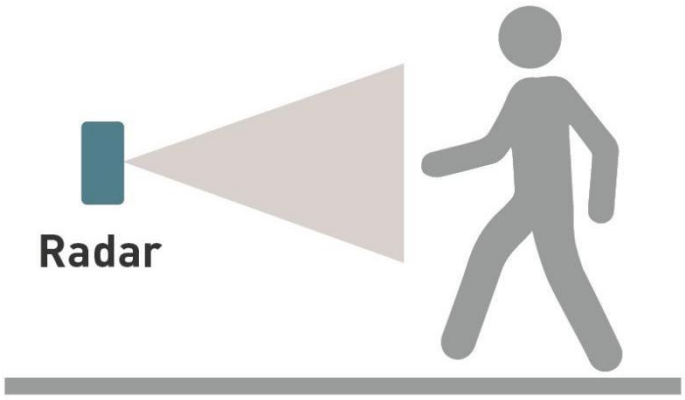


Fig. 7 Horizontal installation diagram

Fig. 8 Diagram of back mounting