24GMilimeterwave Bio-sensing radar

R24AFD1-Stationary Resident module manual

Please read the product instructions carefully before use and keep them properlyV1.0

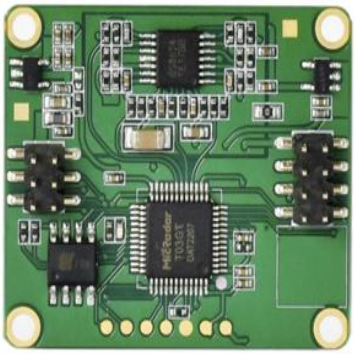
MicRadar Technology (Shenzhen) Co. ,LTD

1. Product description

Stationary resident detection radar is based on the millimeter wave radar system to realize the perception of human biological presence and human motion, and continuously record the existence of the human body and the range of body motion . Respond to alarms for long-term abnormal stay , and can notify the gateway through wireless signals to realize timely response to abnormal alarms . This product is installed on the top of the room. The detection of human presence function and static resident function is not affected by factors such as temperature, humidity, noise airflow, dust, light, and complete stillness of the human body.

2. Appearance introduction

Antenna surface (8 array element)



Pin

3. Main performance description

3.1. Main functions of radar

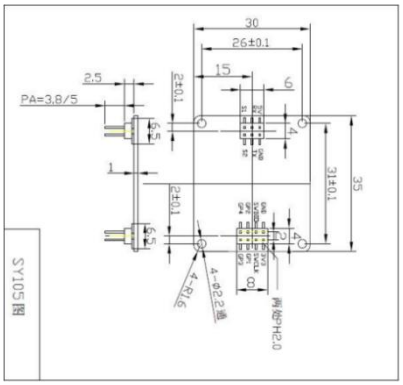
Function points	State change time/function explanation
DP1:Someone/Nobody	No one to someone, report within 0.5s From someone to no one, output stateless within 1 minute
DP2: Someone is stationary / Someone is active	Static and dynamic switching, reporting within 0.5 seconds
DP3: Someone approaching the device/someone moving away from the device/someone moving	Output status once every 2 seconds

without direction	
DP4:Body Motion Amplitude Parameter 0 - 100	Output data once every 5 seconds [Reference: Description of Body Motion Amplitude Parameter Output]
DP5: Stationary park alarm	Reported in four times, the first/second/third/fourth stationary parking alarm cumulative over time Report in turn when 5min,10min,30min,60min are satisfied
DP 6 : Sedentary Sensitivity Settings 1 - 10	Can support 10 gear adjustment
DP7: Scene mode (area detection , bathroom, hotel, bedroom, office, maximum scene mode)	Adapt to different scenarios according to the size of the area

3.2. Body Motion Amplitude Parameter Output Description

Body Motion Parameter		
0%	unmanned	unmanned environment
1%	still	Only breathing without limb
2%-30%	micro-motion	Only slight head or limb movement
31%-60%	Ambulation/rapid	slower body movement
61%-100%	running/close range	rapid body movement

4. Module package size and pin description



interface	pin	describe	Typical values	instructions
Interface1	1	5V	5.0V	Positive end of power
	2	GND		GND
	3	RX	3.3V	Serial receiving
	4	TX	3.3V	Serial port send
	5	S1	3.3V/0V	Someone/no one
	6	S2	3.3V/0V	Active/still
Interface2	1	3v3	3.3V	Serial port send
	2	GND		GND
	3	SL		keep
	4	SD		keep
	5	GP1		Spare expansion pin
	6	GP2		Spare expansion pin
	7	GP3		Spare expansion pin
	8	GP4		Spare expansion pin

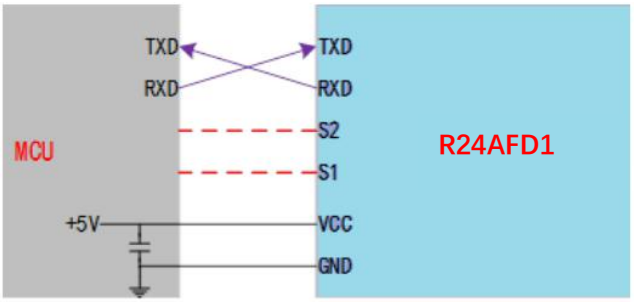
Radar module structure diagram Pin description

Note: 1) S1 output: high level - someone, low level - no one;

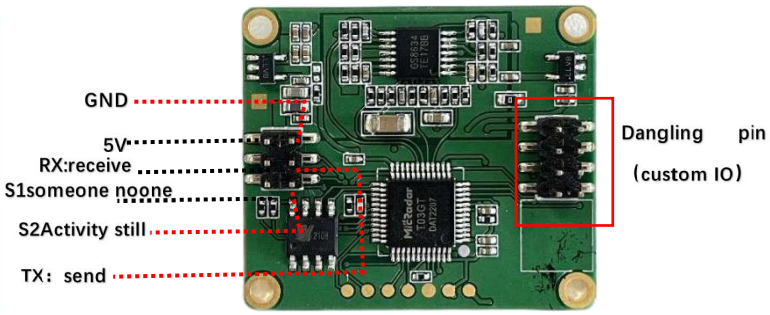
2) S2 output: high level - active, low level - still

3) GP1~GP4 are parameter selection control terminals, which can be redefined according to user needs.

4) The output signals of this interface are all 3.3V level.



Use wiring diagrams



Module wiring diagram

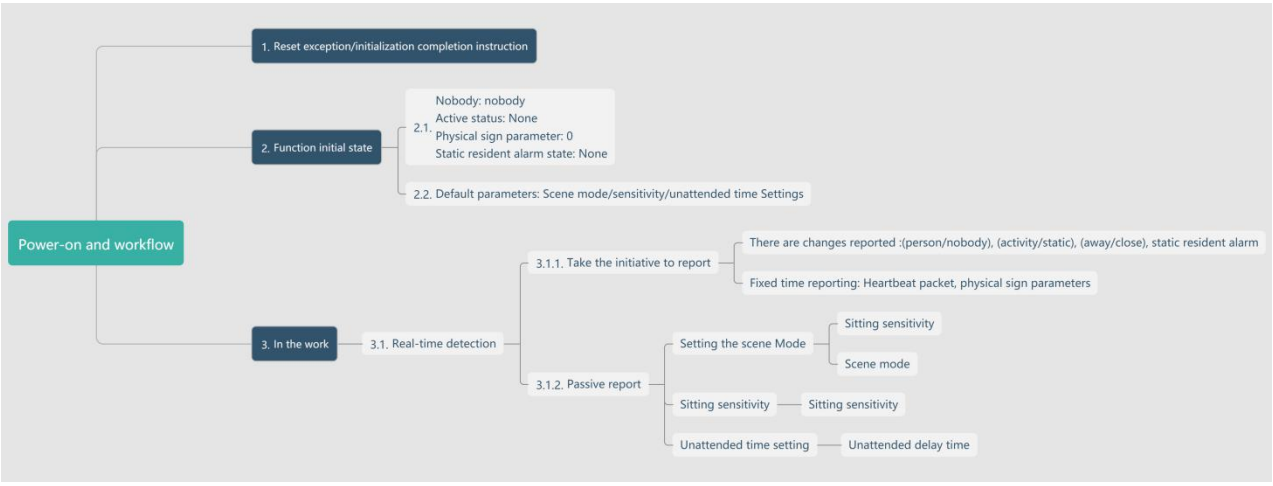
5. Tool preparation

5.1. TTL serial port tool, DuPont line, PC computer, serial port assistant terminal

5.2. Radar-EVB demo board (default Tuya platform, you can freely adapt your own communication module)

5.3. Radar User Manual (Protocol)

6. Power-up and data rules



7. Sensitivity setting

The sensitivity setting is used to adapt to the different use environments of the product to avoid false positives and false negatives from the sensor.

Sensitivity adjustment range: 1-10; 1 is low sensitivity, 10 is high sensitivity, and the default parameter is 7.

High Sensitivity (7-10): It is suitable for scenarios with relatively small environmental interference and high requirements for detection sensitivity, and can detect subtle movement changes, such as confined spaces, warehouses, insurance banks, etc.; (note that this mode is too sensitive to be easily affected by the environment Interfere with misjudging someone)

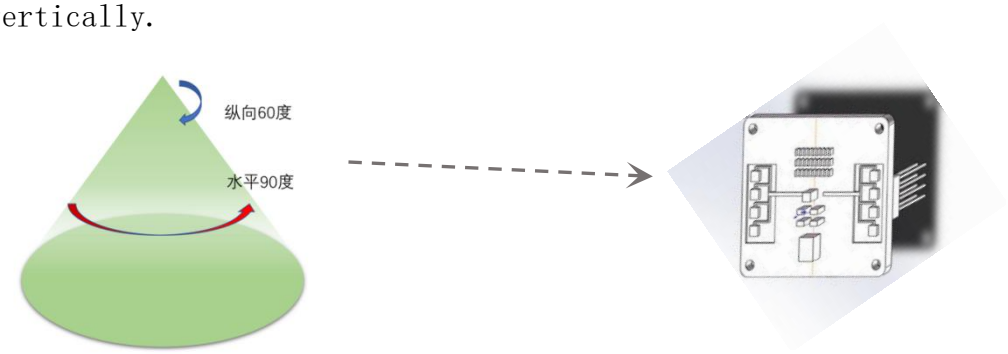
Medium sensitivity (4-6): suitable for common indoor scenes such as homes, hotels, etc.; (default)

Low Sensitivity (1-3): It requires a large amount of movement to trigger, and is not easily disturbed by the shaking of curtains and plants. This scene is suitable for corridors, parking lots and other scenes.

8. Radar Installation Instructions

8.1. Radar module working range

beam coverage of the R24AFD1 radar module is shown in the figure below. The radar coverage is a three-dimensional sector of 90° horizontally and 60° vertically.



R24AFD1 radar coverage area

8.2. Radar installation direction and detection range

8.2.1. Top installation

* To ensure the accuracy of radar detection, please install it on the top!

(About the use of the static resident function, it needs to be installed on the top of the

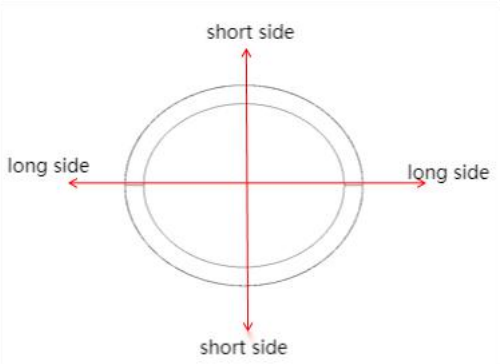
bathroom/kitchen and other scenes that are prone to fainting)

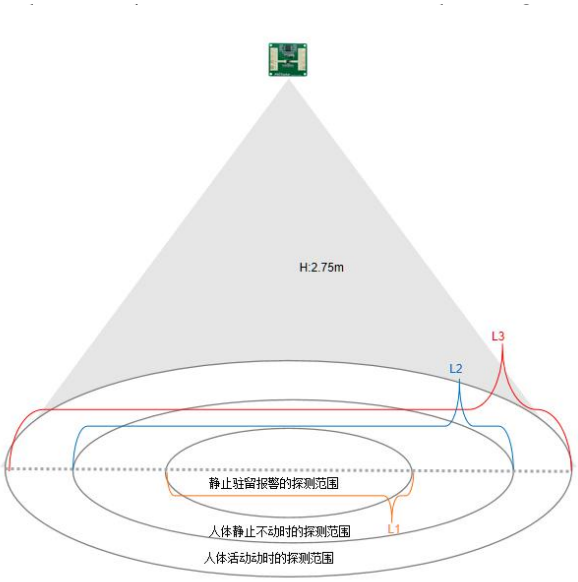
The radar is installed vertically, and the horizontal deviation angle is ≤3° to ensure that the main beam of the radar covers the detection area; the recommended installation height of the radar is ≤2.75 meters; there are no obvious obstructions and coverings in front of the radar.

Affected by the radar installation height and radar beam range, in this installation mode, the maximum diameter of moving human detection is L3 ≈ 12 meters; the maximum diameter of human sitting/fretting detection is L2 ≈ 6 meters , and the maximum diameter of stationary resident detection is L1 ≈ 3 meters .

Detection range

The range of the overhead radar t
meters * 12 meters, the range of dete
* 6 meters, and the range of detectin
* 3 meters .





8.2.2. Scene setting (sensing range setting)

	Trigger detection distance (diameter)	Static detection distance (diameter)	Static dwell detection distance (diameter)
maximum area mode	Wide angle 12 m/Narrow angle 8 m	Wide angle 6 m/Narrow angle 4 m	Wide angle 3 m/Narrow angle 3 m
office mode	Wide angle 10 m/Narrow angle 7 m	Wide angle 6 m/Narrow angle 4 m	Wide angle 3 m/Narrow angle 3 m
Hotel Mode (default scene)	Wide angle 9 m/Narrow angle 6 m	Wide angle 6 m/Narrow angle 4 m	Wide angle 3 m/Narrow angle 3 m
living room mode	Wide angle 7 m/Narrow angle 5 m	Wide angle 6 m/Narrow angle 4 m	Wide angle 3 m/Narrow angle 3 m
bedroom mode	Wide angle 4 m/Narrow angle 3 m	Wide angle 6 m/Narrow angle 4 m	Wide angle 3 m/Narrow angle 3 m
Area detection mode	Wide angle 3 m/Narrow angle 2 m	Wide angle 6 m/Narrow angle 4 m	Wide angle 3 m/Narrow angle 3 m
bathroom mode	Wide angle 1.8 m/Narrow angle 1.5 m	Wide angle 6 m/Narrow angle 4 m	Wide angle 3 m/Narrow angle 3 m

Note: The overall detection range is elliptical and the sitting test range is all sensitivity 3

9. Guide to the actual installation steps of the radar

Step 1: Determine a scene mode by comparing the approximate area of the space

Step 2: Confirm the main activity and stay area of the person, and the center of this position is the installation position of the radar

Step 3: Determine the entrance and exit of the space, and point the long side of the radar to the entrance and exit to ensure the trigger effect of people entering

Step 4: Confirm whether there is an interference source within the radar detection range

Step 5 : When there is an interference source in the radar detection range, reduce the dynamic detection range

(Adjust smaller scene modes)

(Make a trade-off between the good triggering effect of the entrance and the anti-jamming stability of radar detection, it is recommended to give priority to ensuring the anti-jamming and stability of radar detection)

Step 6 : If the space is relatively small (≤15 ㎡), you can adjust the sensitivity one step smaller

If the space is relatively large (≥40 ㎡), the sensitivity can be adjusted by one step

(Small space will enhance the reflection of the radar, enhance the detection effect of the radar, and adjust the sensitivity to neutralize the reflection interference and ensure the stability of unmanned judgment)

(Large space will reduce the reflection of the radar, weaken the radar detection effect, increase the sensitivity to neutralize and weaken the interference, and ensure the stability of the presence of people)

Step 7 : Confirm whether the real use scene of the radar is a scene that is prone to fainting, such as bathroom/kitchen, and use the parking alarm function accordingly

Step 8: Follow the steps to confirm the final scene mode and sensitivity for normal use

Example:

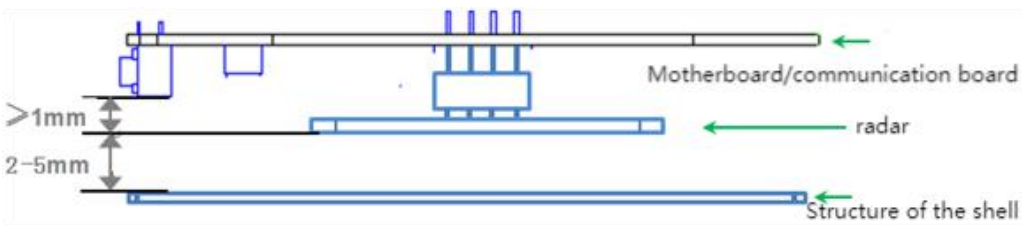
Space size: 3.5 ㎡ - 6 ㎡
Possible sources of interference: exhaust fans /metal shutters/ blackout coated curtains
Recommended installation sensitivity: 5 (adjust 4 according to the size of the space)
scene mode : bedroom/area detection /bathroom (need to evaluate the selected scene mode according to the actual space size)
Installation orientation: the long side faces the door

10. Layout Requirements for Antenna and Housing

PCBA: Need to keep the height of the radar patch ⩾ 1mm than other devices

Shell structure: It is necessary to maintain a distance of 3mm between the radar antenna surface and the shell surface

Shell detection surface: non-metallic shell, need to be straight, avoid curved surface, affect the performance of the entire scanning area.



3.1. Common problem

Interference factors: Radar is an electromagnetic wave detection sensor, and active non-living will cause false alarms. The movement of metals, liquids, can lead to false positives. Usually, electric fans, pets close to the radar, and the shaking of metal curtains can cause false positives. Radar needs to be planned in terms of installation angle.

Non-interfering factors: radar electromagnetic waves will penetrate human clothing, curtains, thin wood, and glass. The installation angle and performance of the radar need to be determined according to the application.

Semi-interference factor: Radar judges the existence of human body and is not suitable for directly facing the air conditioner. The motor inside the air conditioner can cause the radar to misjudge. It is required that the radar product does not directly face the air conditioner. Or in the same direction as the air conditioner.

11.Historical version update instructions

Revision	Release Data	Summary
V1.0_ 0520	202 2/05/20 _ _ _ _	first draft