Produce Taste Specifications

Product Specification V1.6

Product Model: R24AVD3-FIH

Product Name: 24G Personnel detection radar

Product Description: 24G, human body detection, high sensitivity

I. Product Features

This radar is a high-sensitivity radar. 24GHz Millimeter-wave radar module for human body detection and location detection .

This radar module has the following features:

1) based on FMCW The radar system enables the detection of the presence of people within the area .

2) To achieve synchronous sensing of both moving and stationary individuals;

3) Maximum motion sensing distance: ATARI models≤2 meters , Nintendo models ≤4 meters ;

4) Maximum static human body sensing distance: ATARI models≤ 2 Meters , Nintendo models ≤ 4 meters ;

5) Adaptable to meeting screen scenarios, with no one making a judgment within 15 seconds;

6) Antenna beamwidth (3dB):≤ 100° (H);≤ 80° (E);

7) It has scene recognition capabilities, identifying whether there are people or no people and the status of people's activities;

8) Unaffected by temperature, humidity, noise, airflow, dust, or light, it is suitable for harsh environments;

9) It has low output power and will not cause harm to the human body even after prolonged exposure.

II. Scope of Application

- Conference screen scenario
- Home appliances
- Office energy saving
- Automatic doors, elevators, etc.

III. Main Functions and Performance Parameters

1: Functional Requirements

1) Presence detection of personnel;

2) GPIO high and low level output (person - high level / no person - low level);

3) Other radar functions ;

a. OTA

b. Self-test and fault diagnosis

2: Electrical parameters

parameter	Minimum value	Typical value	Maximum value	unit
Radar operating parameters				
Operating voltage (VCC)	4.5	5	5.5	V
Operating current (I_{CC})	80	100	1 20	mA
Operating temperature(T_{OP})	-20		+70	℃
Storage temperature (TST)	-40		+85	℃
launch parameters				
Operating frequency (F_{TX})	24.0 5		24.25	GHz
Transmit power (P_{out})		6	8	dBm
Antenna parameters				

Antenna gain (GANT)		5		dBi
Horizontal beam (3dB)		100		°
Vertical beam (3dB)		80		°

3. Radar detection performance parameters

1) Motion sensing distance: ATARI models≤ 2 meters (radial) , Nintendo models ≤ 4 meters ;

2) Stationary human perception distance: ATARI models ≤ 2 meters (radial) , Nintendo models ≤ 4 meters ;

3) FOV (Field of View): ≤90 ° ;

4) Motion trigger time: ≤0.5s;

5) Presence detection time: ≤15s;

IV. Applications and Interfaces

1. Power Requirements

1) Input voltage: DC +5V±0.5V;

2) Operating current: Module current 100mA (Max) , the power supply end should have a margin of more than 3 times, approximately 300mA ;

3) Power supply ripple: ≤50mV;

2. Environmental Adaptability Description

1) Temperature: -20℃ to 70℃ (operating and storage)

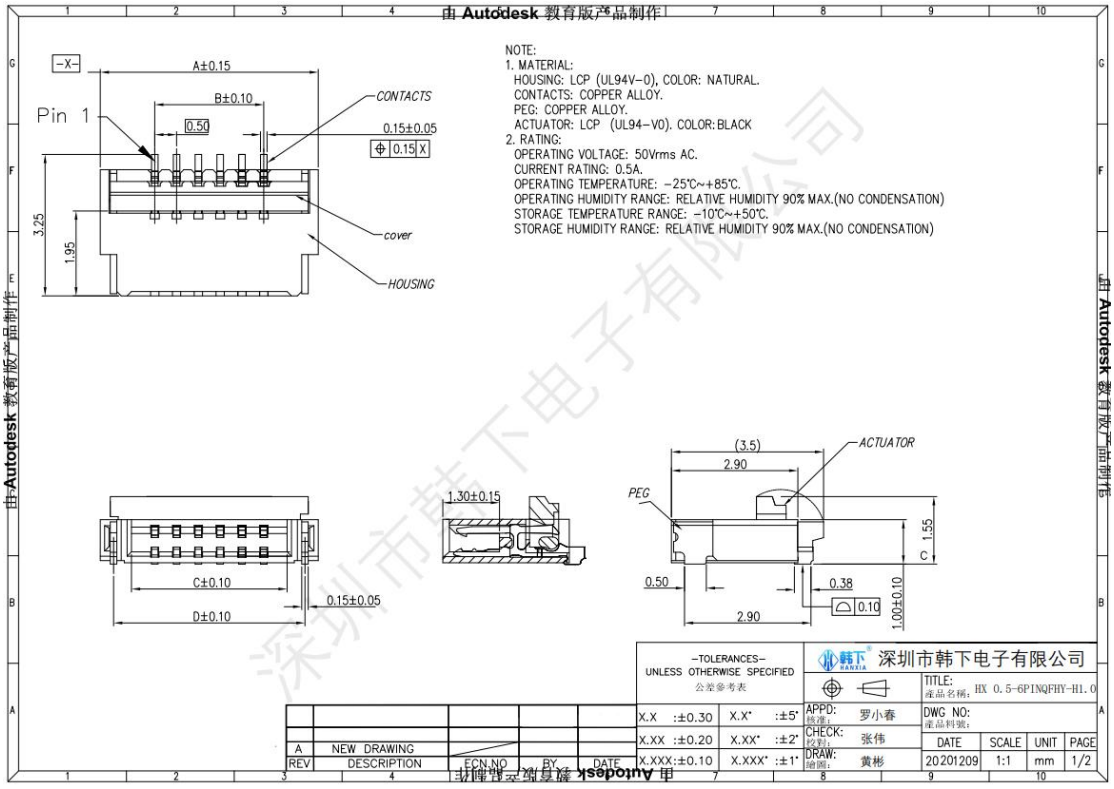
2) Humidity: ≤85%, no condensation

3) Vibration: No vibration

3. Interface Description

3.1 Physical Interface Description

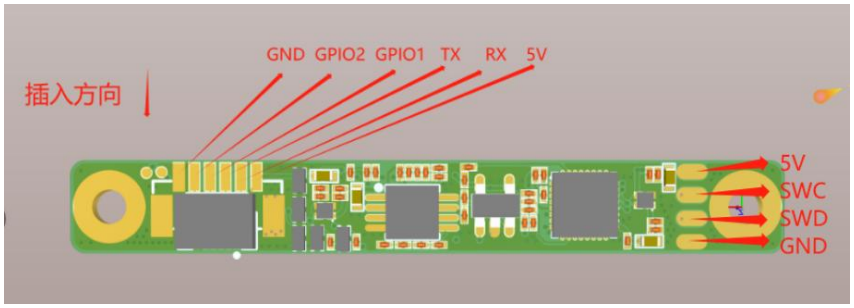
This radar provides a 6-pin interface, including one UART and one pair of GPIOs. The GPIOs can be used as an IIC interface to replace the UART as needed, using an FPC connector . (FPC 0.5mm 6-pin horizontal mount)

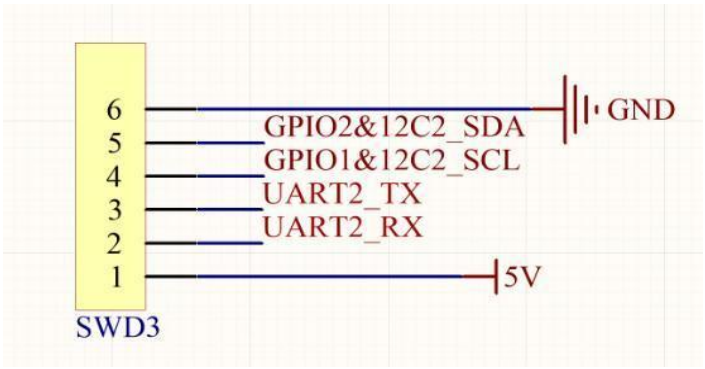


The interfaces are ordered as follows:

pin	describe	Typical value	illustrate
1	5V	5.0V	Positive power input terminal
2	RX	3.3V	Serial port reception
3	TX	3.3V	Serial port transmission
4	GPIO1	3.3V	High level when someone is present / Low level when no one is present
5	GPIO2	3.3V	High level when someone is present / Low level when no one is present

6	GND	0V	land





Note: The default interface uses UART Serial port ; Current GPIO 1 and GPIO 2 The output is redefined according to user needs , and high and low level outputs are provided for radar judgment status (high level for manned/low level for unmanned status indication) .

3.2 Interface Description

The radar-user interface mainly includes the following:

A. Radar information parameters ;

B. Radar detection data ;

C. Radar test and self-test information; D. OTA interaction, etc.

3.3 Firmware Version Rules

Nintendo model: SVD3.LJN.XX.XX.X X

ATAR model: SVD3.LJA.XX.XX.XX

SVD3 - Firmware Number

LJN/LJA - Abbreviation for User Application

XX.XX.XX - Version number iteration (initial version was 00.00.01)

For example: SVD3.LJN-00.00.01

3.4 Interface Protocol Description

The frame format is defined as follows:

Serial Number	Fields	mark	Length (B)	illustrate
1	Frame header	FH	2	Fixed as "0x53 0x59"" //" S Y"
2	control word	CD	1	0x00 - Heartbeat Packet Identifier; 0x01 - Product Information; 0x02- OTA Upgrade; 0x03 - Radar Test; 0x80 - Exclusive features;
3	command word	OD	1	The current data content needs to be identified; this is yet to be defined.
4	Length indicator	L1	2	equal DA Data length
5	data	DA	_	0~2048 Byte
6	Validation fields	CH	1	Checksum
7	Frame end	FT	2	Fixed as "0x54 0x43"" //" T C"

Protocol address :

Protocol address								
Function Description	Transmission direction	Frame header	control word	command word	length	data	Validation fields	Frame end
Product Information								
Initialization complete information	Actively report	5359	05	01	0001	0F	SUM	5443
Initialization completion information query	Issued	5359	05	81	0001	0F	SUM	5443
	reply	5359	05	81	0001	01: Completed 02: Incomplete	SUM	5443
Firmware version query	Issued	5359	02	A4	0001	0F	SUM	5443
	reply	5359	02	A4	Len	Len Byte firmware version	SUM	5443
Radar UID Query	Issued	5359	02	A0	0001	0F	SUM	5443
	reply	5359	02	A0	Len	Len Byte (Unique Number)	SUM	5443
Information exists in the human body								
Human body presence information reporting	Actively report	5359	80	01	0001	0x00: No one 0x01: Someone	SUM	5443
Human body information query	Issued	5359	80	81	0001	0F	SUM	5443
	reply	5359	80	81	0001	0x00: No one 0x01: Someone	SUM	5443
OTA								
Start OTA upgrade	Issued	5359	03	01	0004	4-byte firmware package size (For example: firmware size is 150K (150*102) When it is 4 bytes, the content of 4 bytes is: 00 02 58 00 (big-endian).	Sum	5443
	reply	5359	03	01	0004	4-byte upgrade packet size per frame	Sum	5443
Upgrade package transfer	Issued	5359	03	02	0404	4-byte packet offset address + 1024-byte data packet	Sum	5443
	reply	5359	03	02	0001	01: Received successfully 02: Reception failed	Sum	5443
End OTA upgrade	Issued	5359	03	03	0001	01: Firmware package sent successfully 02: Firmware package delivery incomplete	Sum	5443

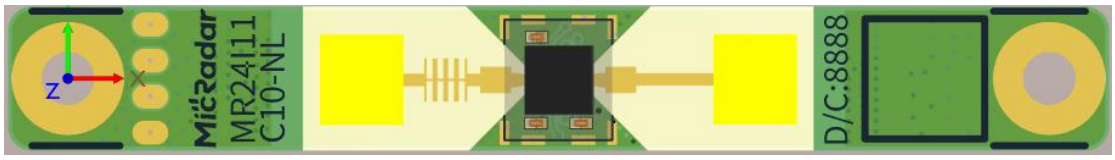
	reply	5359	03	03	0001	01: Received successfully 02: Reception failed	Sum	5443
Production energy value								
Production measurement energy value output	Issued	5359	08	8A	0001	0F	Sum	5443
	reply	5359	08	8A	0005	4B Energy Value 1B Distance Value	Sum	5443

V. External Dimensions and Product Photos

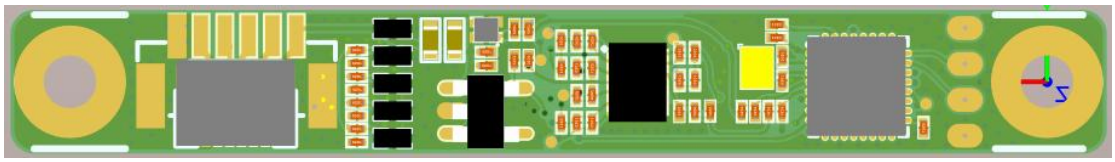
1) External dimensions: 6mm x 46mm

2) Fixing method: screw holes on both sides

3) Product photos



(a) Front view

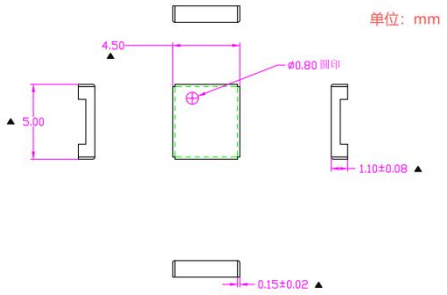


(b) Back view photo

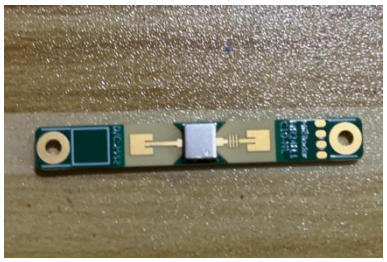
Note: A shielding cover is installed at the front radar chip location;

Shielding cover specifications: (Unit: mm)

Shielding cover height: 1.2mm (height after SMT)



Front view photo:



VI. Installation and Usage Instructions

This radar can be installed in the following ways: side wall mounting.

1: Horizontal installation

The image below shows a horizontal installation method. This installation method is mainly for detecting human bodies while they are standing , such as in the application of conference screens inside and outside doors .

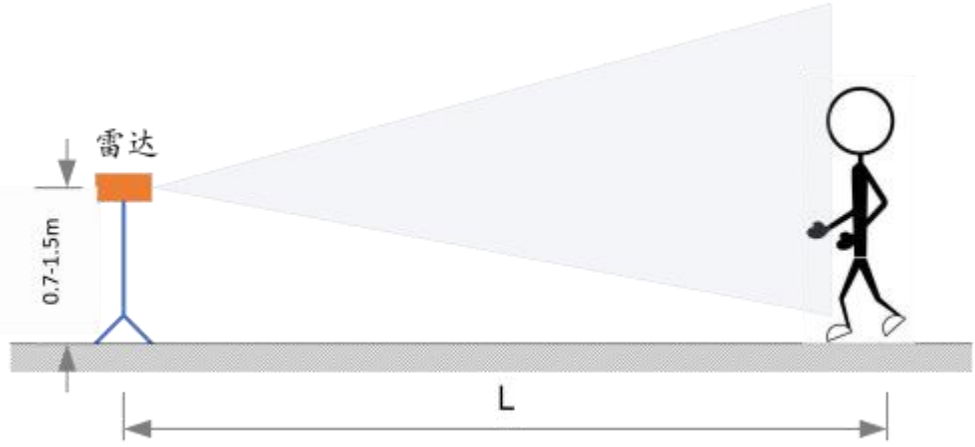
The recommended installation height for radar is 1.2 meters to 1.5 meters. Meters, the radar is installed horizontally and facing forward. There are no obvious obstructions or coverings directly in front of the radar.

The radar's normal direction is aligned with the main detection position to ensure that the radar antenna's main beam covers the

detection area, and the radar... The beam can cover the airspace where people are active.

Due to the limitations of radar antenna beam range, the effective range will decrease if the position deviates from the radar normal direction.

Millimeter-wave electromagnetic waves have a certain penetrating characteristic for non-metallic materials. They can penetrate common glass, wood, screens, and thin partitions, and can detect moving objects behind obstructions; however, they cannot penetrate thicker load-bearing walls, metal doors, etc.



picture 1 Horizontal installation diagram

Notice:

A. All of the above installation methods require the radar main beam to cover the main activity area of the human body and to be aligned with the normal direction as much as possible;

B. When installed at an angle, the horizontal effective distance will decrease accordingly due to the change in the horizontal projection of the covered area;

C. When the module is working, there should be no metal objects obstructing the module surface;

D. Due to the influence of electromagnetic wave transmission characteristics, the effective range of radar is related to the target's RCS, the material and thickness of the target's covering material, and the effective range of radar will vary to some extent.

E. For human body detection in a stationary state, different body positions will affect the radar's effective range. The radar does not guarantee that it will reach the maximum effective range in all states.

VII. Precautions

7.1. Radar biological detection performance

Because human biometrics are ultra-low frequency, weakly reflective signals, radar processing requires relatively long processing times. Intermittent accumulation processing involves numerous factors that can affect radar parameters during the accumulation process, thus leading to occasional detection failures. The effect is normal.

7.2. power supply

Radar modules have higher power quality requirements than conventional low-frequency circuits. When powering the module, the power supply must be free of threshold glitches or ripples, and effectively shield power noise from accessory devices.

The radar module requires proper grounding. Ground noise from other circuits can also cause issues with the radar module. Performance degradation or even malfunction; most commonly, it leads to a shorter detection range or an increased false alarm rate.

To ensure the internal VCO of the module For the circuit to function normally, this module requires a power supply of +5V to +6V. Electrical

voltage ripple ≤100mV. The external power supply must provide sufficient current output capability and transient response capability.

VIII. Frequently Asked Questions

Interference factors: Radar is an electromagnetic wave detection sensor, and moving inanimate objects can cause false alarms. The movement of metals and liquids can also lead to false detections. Typically, electric fans, pets close to the radar, and the swaying of metal curtains can all cause false alarms. This can lead to misjudgments. Radar installation angles need to be carefully planned.

Non-interference factors: Radar electromagnetic waves can penetrate clothing, curtains, thin wood panels, and glass. The installation angle and performance of the radar need to be determined based on the application .

Semi-interference factors: Radar cannot detect the presence of a human body by directly facing an air conditioner. The movement of air conditioner fan blades and significant vibrations from some air conditioners can cause radar misjudgments. Therefore, radar products should not be directly facing the air conditioner, or should be positioned in the same direction as the air conditioner.

IX. Disclaimer

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XI. Contact Information

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XII. Historical Version Update Notes

Revision	Release Data	Summary
V1.0_ 0827	2025/8/27	First draft
V1.1_1013	2025/10/13	Added UID query protocol
V1.2_1203	2025/12/03	Modify product photos and operating temperature
V1.3_1231	2025/12/31	The corrected bandwidth range is 200M.
V1.4_0108	2026/1/8	Added specifications for the shielding cover on the

		radar module
V1.5_0120	2026/1/20	The new radar shield has been adjusted to 1.2mm (illustrated), and the production test energy value protocol has been updated.
V1.6_0423	2026/4/23	1: Added firmware version information for Atari/Nintendo models 2: Added performance specifications for the detection range of Nintendo models

KDB 996369 D03 statements

2.2 List of applicable FCC rules:

The module complies with FCC Part 15.249.

FCC ID: 2BVOV-R01 on User manual and on the external of the packaging.

2.3 Summarize the specific operational use conditions

The module has been certified for Potable applications. This transmitter must not beco-located or operating in conjunction with any other antenna or transmitter

2.4 Limited module procedures

The module is not a limited module.

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

This equipment complies with FCC's RF radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

2.7 Antennas

The EUT use a permanently attached antenna

which is unique.

2.8 Label and compliance information

The host system using this module, should have label in a visible area indicated the

following texts: "Contains FCC ID: 2BVOV-R01

2.9 Information on test modes and additional testing requirements

When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements. In setting up the configurations, if the pairing and call box options for testing does not work, then the host product manufacturer should coordinate with the module manufacturer for access to test mode software.

The module has been certified for Potable applications. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter

2.10 Additional testing, Part 15 Subpart B disclaimer

The module without unintentional-radiator digital circuity, so the module does not

require an evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.

2.11 Note EMI Considerations

host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties

2.12 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure

a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do anevaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device(including unintentional radiators) as a composite. The host manufacturer must fix any failure