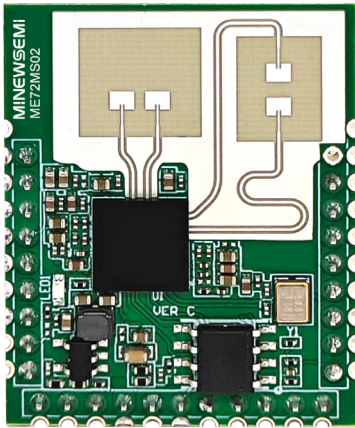


60GHz Respiration & Heart Rate Detection Radar Module

ME72MS02



Datasheet

V 1.0.2



Version Note

Version	Details	Contributor(s)	Date	Notes
1.0.0	First edit	Vincle	2026.07.03	
1.0.1	Optional PC Software Versions	Vincle	2026.07.15	
1.0.2	Revise certain parameters	Vincle	2026.09.22	

Part Number

Model	Hardware Code
ME72MS02-001(With sleep report)	-
ME72MS02-002(Without sleep report)	

Click the icon to view and download the latest product documents electronically.
https://en.minewsemi.com/file/ME72MS02_Datasheet_C_EN.pdf



ME72MS02

Low-Power 60GHz mmWave Radar Module for Real-Time Single-Person Respiration & Heart Rate Monitoring

The ME72MS02 is a 60GHz millimeter-wave radar module designed for non-contact respiration and heart rate monitoring. It integrates a 57–64GHz RF transceiver, 2T2R PCB microstrip antennas, 1MB Flash, a radar signal processing unit, and an ARM® Cortex®-M3 processor.

Based on FMCW (Frequency Modulated Continuous Wave) radar technology and advanced signal processing algorithms, the module detects radar echoes reflected from the human body to perform real-time measurement of respiration rate and heart rate for a single person.

The module can simultaneously detect:

- Respiration rate
- Heart rate
- Body movement
- Target distance

FEATURES



FMCW-based millimeter-wave radar sensing



Non-contact respiration and heart rate monitoring



Standard UART communication interface



Up to 3 m detection distance

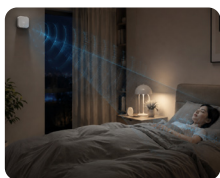


High-performance real-time monitoring for a single target

KEY PARAMETERS

ME72MS02			
Working Frequency	57~64GHz	Antenna	PCB
Module Size	25×31.5 mm	Data Update Interval	60s
Installation Method	Ceiling/tilted mount	Detection Distance	0.3 ~ 3m
Respiration Measurement Range	9 ~ 30bpm	Heart Rate Measurement Range	60 ~ 150bpm
Peak Consumption	1.98W	Maximum Targets	1
Firmware	Hex firmware		

APPLICATIONS



Smart Home Health Monitoring



Respiration & Heart Rate Monitoring Systems



Elderly Care



Smart Healthcare



Wellness Monitoring

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1 MODULE OVERVIEW

1.1 Function Description

No.	Function	Description
1	Real-Time Respiration & Heart Rate Monitoring	Enables non-contact measurement of human respiration rate and heart rate for a single person.

1.2 Features

No.	Function	Description
1	Detection Range	Detection distance: 0.3–3.0 m. Optimum performance is achieved within 2 m. Note: Detection performance depends on factors including installation environment, target body size, relative orientation, and body movement. The values above are measured under MinewSemi laboratory test conditions. Actual performance may vary depending on the application environment.
2	Environmental Immunity	Performance is not affected by ambient temperature, humidity, dust, lighting conditions, or acoustic noise.
3	Flexible Configuration	Detection parameters, operating modes, and other settings can be configured through the UART interface

2 ELECTRICAL SPECIFICATION

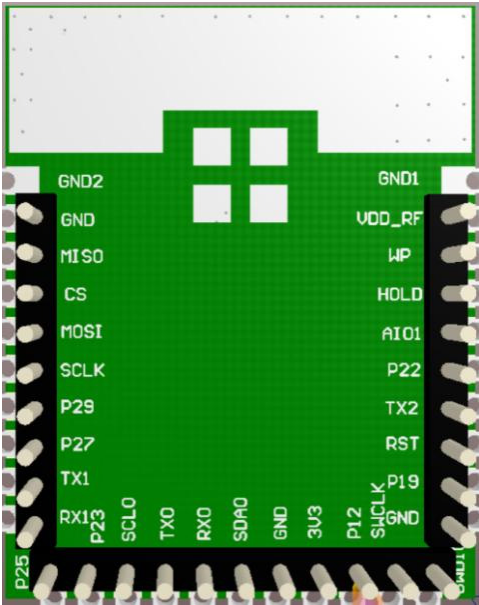
Parameter	Value	Notes
Operating Voltage	3.1 ~ 3.5V	Standard supply voltage: 3.3V
Operating Temperature	-20 ℃ ~ +85 ℃	Storage temperature: -40 ℃ ~ +85 ℃
Operating Current	40mA	Maximum current: 600mA
Peak power consumption	1.98W	Average power consumption: 1.39W
Respiration Measurement Accuracy	92%	Measured under a resting supine condition using ECG as the reference. A result within ± 3 bpm is considered accurate. Accuracy indicates the percentage of samples falling within this tolerance.
Heart Rate Measurement Accuracy	90%	Measured under a resting supine condition using ECG as the reference. A result within ± 5 bpm is considered accurate. Accuracy indicates the percentage of samples falling within this tolerance.

Parameter	Value	Notes
Respiration Rate Measurement Range	9 - 30bpm	Breaths per minute
Heart Rate Measurement Range	60 - 150bpm	Beats per minute
Data Update Interval	60s	
Detection Initialization Time	30s	
Module Dimensions	25*31.5mm	

3 RF FEATURES

Parameter	Value	Remarks
Operating Frequency	57 ~ 64GHz	
Transmit Power	12dBm	
Antenna Gain	4dBi	
Depression Angle	±60°	
Elevation Angle	±60°	

4 PIN DESCRIPTION



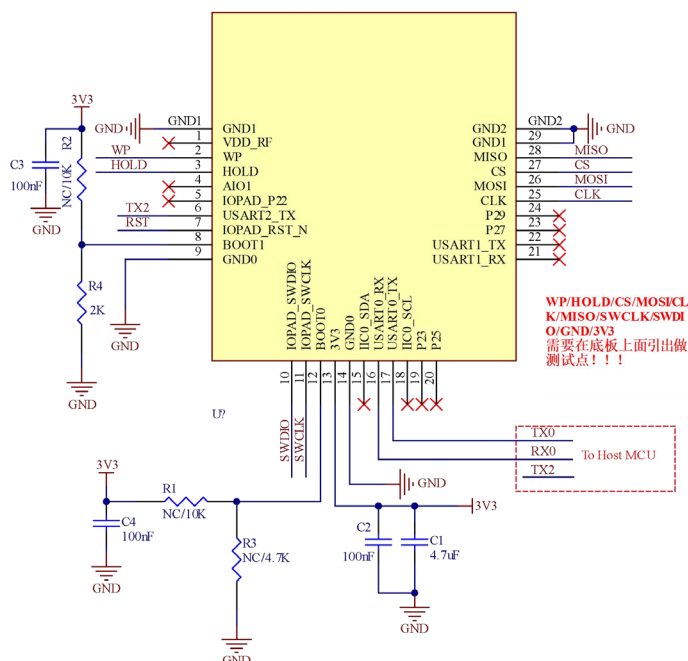
(BOTTOM VIEW)



5 PIN DEFINITION

Pin Number	Pin Name	Description	Remark
GND1	GND	Ground	SMT package only
1	VDDRF	External RF Power/1.35V	
2	WP	Write protection active low	Flash function pin
3	HOLD	To pause the device without deselecting the device	Flash function pin
4	AIO1	Temperature index test interface	Can be used as analog output
5	P22	Interface GPIO_P22/LDO_EXT_EN_H	1.35V power enable pin
6	TX2	GPIO_P20/uart2 txd	
7	RST	Reset signal input	
8	P19	GPIO_P19/boot1	Boot, which starts the program from Flash, must be grounded.
9	GND0	Ground	
10	SWDIO	SWD Debug Signal	
11	SWCLK	SWD Debug Clock	
12	P12	GPIO_P12/boot0	
13	3.3V	POWER INPUT 3.3V	
14	GND	GND	External 3.3V power input
15	SDA	GPIO_P08/IIC0_SDA/CAN0_RXD	
16	RX0	GPIO_P01/UART0 _RXD/CAN0_RXD	
17	TX0	GPIO_P00/UART0 _TXD/CAN0_TXD	UART communication RX
18	SCL	GPIO_P07/IIC0_SCL/CAN0_TXD	UART communication TX
19	P23	IOPAD_P23	
20	P25	IOPAD_P25	
21	RX1	GPIO_P1 1 /uart1 rxd	
22	TX1	GPIO_P1 0/uart1 txd	
23	P27	IOPAD_P27	
24	P29	IOPAD_P29	
25	SCLK	IOPAD_P03/SPI0_SCLK	
26	MOSI	IOPAD_P06/SPI0_MOSI	
27	CS	IOPAD_P04/SPI0_CS	
28	MISO	IOPAD_P05/SPI0_MISO	
29	GND1	GND	
GND2	GND2	GND	

6 REFERENCE CIRCUIT DESIGN



6.1 Boot Configuration

	BOOT1	BOOT0	Remark
Configuration Level	0	1	Boot from the internal Flash memory
Pin Number	Pin 8	Pin 12	

*BOOT1 and BOOT0 are internally pulled up within the module. Before powering up the module, BOOT1 must be pulled low to ensure booting from the internal Flash memory.

6.2 Typical Application Circuit

The module can directly output detection results through UART0 according to the specified communication protocol. The sleep report is not included in this data; however, it is included in the UART data:

(Phase data output is disabled by default.)

- Total phase information
- Respiration phase information
- Heartbeat phase information
- Respiration rate
- Heart rate information
- Result data output frequency: 50 Hz

For versions that include the sleep report, no phase data is output.

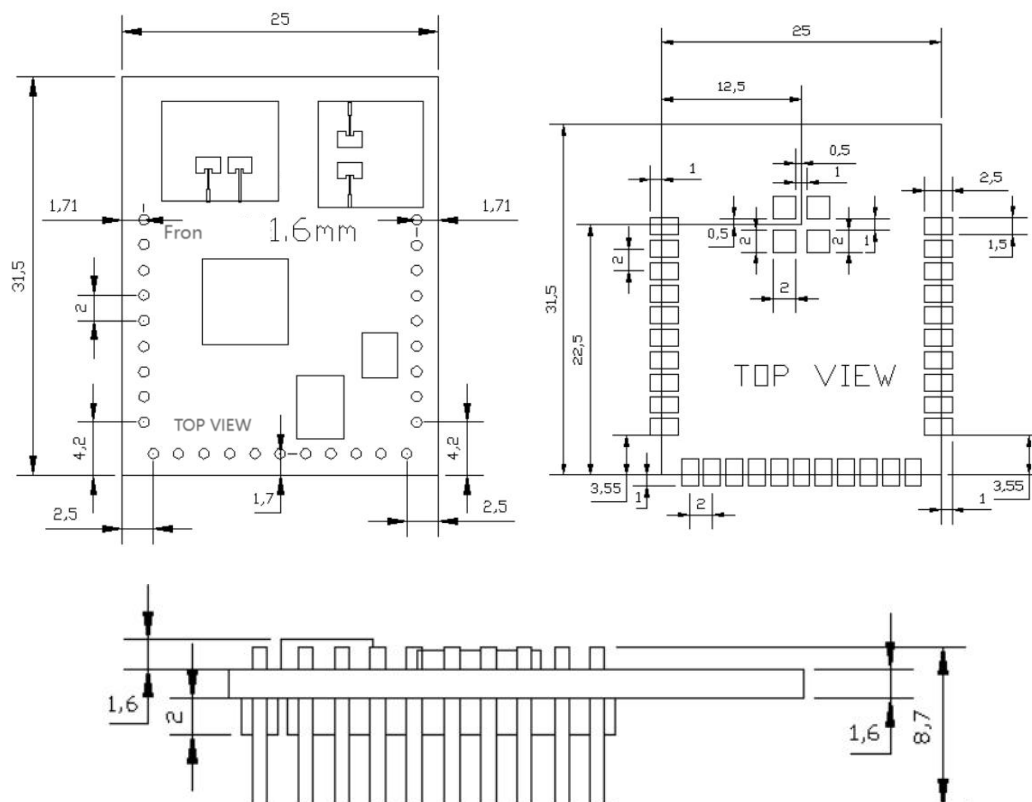
Users can select the appropriate option according to their specific application requirements.

6.2.1 Electrical Requirements

- Supply Voltage: 3.3 V
- Recommended Power Supply Capability: > 1 A
- IO Output Voltage Level: 3.3 V

The default UART baud rate is 115200, with no parity check.

7 MECHANICAL DRAWING



* (Default unit: mm Default tolerance: ± 0.1)

8 HARDWARE CONNECTION

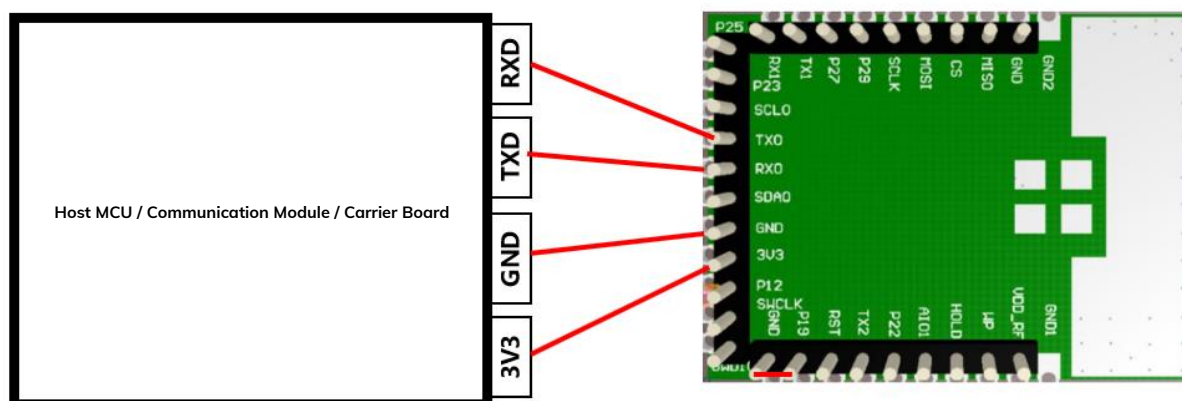
The radar module uses a 2.0 mm pin header spacing.

For normal operation:

- Connect P19 to GND.
- Connect TX0 of the radar module to the RX pin of the host device.
- Connect RX0 of the radar module to the TX pin of the host device.
- Connect an external 3.3 V power supply and GND.

Unused pins may be left floating.

The electrical connection is illustrated in the reference diagram.



9 DESIGN GUIDELINES

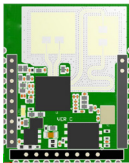
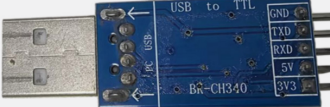
To achieve optimum performance, follow the recommendations below:

1. The module should be powered with a stable 3.3 V–3.6 V supply featuring low ripple and proper grounding.
2. For the module power supply, it is recommended to use a dedicated LDO regulator rather than sharing an LDO with other devices, in order to ensure a stable power supply for the module.
3. Do not place connectors, metal parts, or other PCB structures in front of the antenna surface.
4. The enclosure in front of the antenna should be made of PC or ABS material.
5. Metal-containing materials may attenuate radar signals and reduce detection performance.
6. The enclosure surface in front of the antenna should be parallel to the PCB plane and positioned as close to the antenna as possible (< 3 mm recommended).
7. The enclosure surface should be:
 - Smooth and flat
 - Uniform in thickness
 - Free of uneven structures, bumps, or curved surfaces

These factors help ensure consistent radar signal transmission and detection accuracy.

10 INSTALLATION ENVIRONMENT

10.1 Hardware Components

NO.	Item	Image	Description
1	Radar Module		Model: ME72MS02
2	USB to TTL Module		Used for UART communication, parameter configuration, antenna calibration, and debugging

10.2 Installation Methods

The ME72MS02 is primarily designed for monitoring the vital signs of a person in a resting or sleeping state.

Two installation methods are recommended:

- Ceiling Mounting
- Tilted Mounting

To ensure reliable performance, the following requirements should be observed:

1. The radar must have a clear view of the upper body of the monitored person. The antenna boresight should be oriented toward the chest area whenever possible.
2. Moving, vibrating, or swinging objects may generate radar reflections that interfere with measurement accuracy.

Examples include:

- Electric fans
- Curtains
- Vibrating equipment
- Moving objects

Appropriate installation position, mounting angle, and monitoring distance settings should be selected to minimize such interference.



10.2.1 Ceiling Mounting

As illustrated in Figure 9-1, the radar module is mounted horizontally on the ceiling. The radar beam points vertically downward toward the subject. The center of the radar beam should align with the subject's chest area.

Recommended Installation Height

$H \leq 3 \text{ m}$

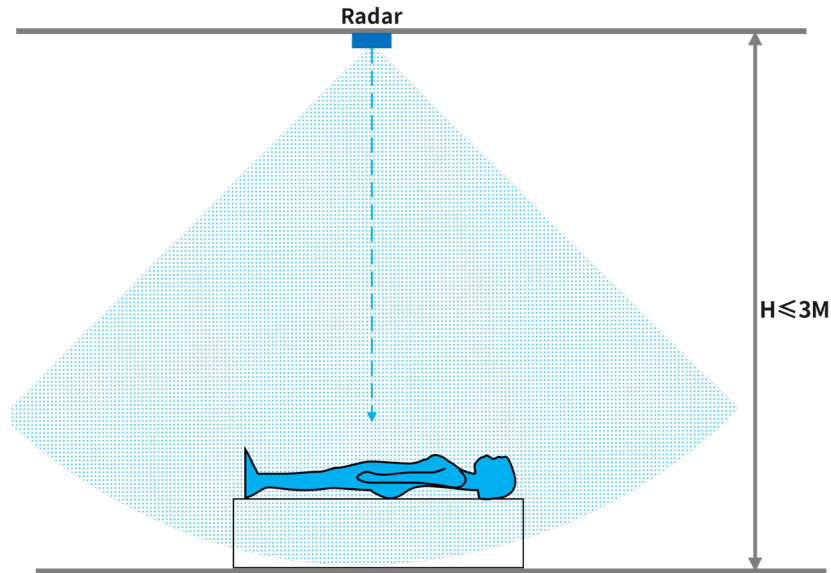


Figure 9-1 Ceiling Mounting Diagram

10.2.2 Tilted Mounting

As illustrated in Figure 9-2, the radar module is mounted on a wall near the head of the bed or on a bedside structure with a downward tilt.

The radar beam should be directed toward the chest area of the monitored person.

Recommended Installation Height

$H = 1.0\text{--}1.5 \text{ m}$

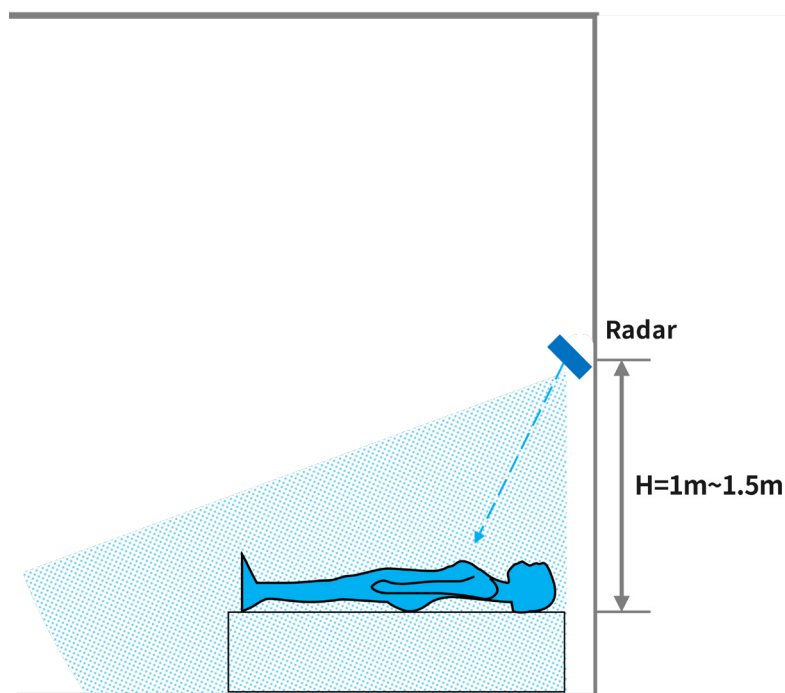


Figure 9-2 Tilted Mounting Diagram

10.2.3 Installation Precautions

- 1) The radar must be securely mounted to prevent movement, vibration, or loosening.
- 2) The detection area between the radar and the subject should be free of moving objects, swinging objects, and large metallic objects.
- 3) The antenna normal direction should be aligned with the subject's chest as accurately as possible.
- 4) The current radar module supports monitoring of one person only.

When multiple people are present within the detection area, the module will monitor the vital signs of the person closest to the radar.

For multi-person monitoring applications, multiple radar modules should be deployed. Each module should be installed as close as possible to its intended target and configured with an appropriate maximum monitoring distance to avoid interference from other individuals.

11 FUNCTION AND PARAMETER CONFIGURATION

The radar module communicates with the host controller via the UART interface. Two types of communication are supported:

1. Parameter Configuration

Users can configure operating modes and detection parameters according to specific application requirements. Default parameters may also be used without modification.

2. Monitoring Data Reporting

The module periodically reports monitoring data based on the configured parameters. The host controller can configure the module and receive, parse, and process the reported data according to the communication protocol.

Baud Rate	115200
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	None



11.1 Parameter Configuration

To facilitate users in selecting appropriate functions and parameters for different application scenarios, this module allows for changes to some parameters, as shown in the table below.

Parameter		Minimum	Typical	Maximum	Unit	Remark
Minimum Monitoring Distance (1)		30	50	-	cm	Defines the minimum to maximum detection distance. The default monitoring range is 50–200 cm.
Maximum Monitoring Distance (1)		-	200	300	cm	
Report Data When No Person Is Detected (6)		Disabled				Used to reduce communication traffic.
Data Reporting Interval (7)	When the display terminal is online	1	1	255	s	Used to reduce communication traffic.
	When the display terminal is offline	1	30	255	s	

Notes

(1) Monitoring Distance

Users can customize the monitoring range by configuring the minimum and maximum monitoring distances.

- Default minimum monitoring distance: 0.5 m
- Default maximum monitoring distance: 2.0 m

The minimum monitoring distance shall not exceed the maximum monitoring distance, and the maximum monitoring distance shall not exceed 3.0 m.

(2) Reporting Data When No Person Is Detected

Users may choose whether monitoring data should continue to be reported when no person is detected.

When enabled, the reported respiration rate, heart rate, and other vital-sign parameters are all 0.

Disabling this function helps reduce communication traffic and unnecessary data exchange.

(3) Data Reporting Interval

For custom display terminals (such as mobile applications or Wechat mini program), the reporting interval can be adjusted depending on whether the terminal is currently online.

Increasing the reporting interval while the terminal is offline helps reduce communication bandwidth and system power consumption.



11.2 Monitoring Data Reporting

During operation, the radar module continuously monitors the vital signs of the person within the detection area. The module periodically outputs Real-Time Data, including:

- Human body status: Detects the presence or absence of a human body and its movements;
- Respiration rate: The average number of breaths per minute (bpm);
- Heart rate: The average number of heartbeats per minute (bpm);
- Signal strength: The strength of the reflected vital-sign signal received by the radar.
- Distance: The straight-line distance from the radar to the nearest slightly moving part of the human body;
- Continuous presence / absence duration: Duration for which a person has continuously remained present or absent. These values can be used to implement applications such as bed occupancy monitoring or bed-exit alerts

11.2.1 Real-Time Data Description

Human Status

Five human status conditions are defined:

Status	Description
No Person	No human target detected.
Resting	A person is detected with stable vital signs and no body movement.
Calm	A person is detected with unstable vital signs but no body movement.
Motion	A person is detected with body movement.
Continuous Motion	Continuous body movement is detected.

Detection Characteristics

- 1) When No Person is detected, all reported real-time data values are 0.
- 2) If a person enters the detection area while the module is in the No Person state, human presence will typically be detected within 1 second, after which real-time monitoring data will be reported.
- 3) When body movement (Motion or Continuous Motion) occurs, measurement accuracy may be temporarily affected:
 - Respiration rate and distance may deviate for approximately 15 seconds.
 - Heart rate may deviate for approximately 50 seconds.
- 4) When the subject remains in the Resting or Calm state without body movement for approximately 50 seconds, measurement accuracy returns to the specified performance level.
- 5) To improve detection stability and reduce false absence alarms, the module performs multiple confirmation checks after a person leaves the monitoring area.

Therefore, it typically requires approximately 30 seconds before the status changes from Person Present to No Person.

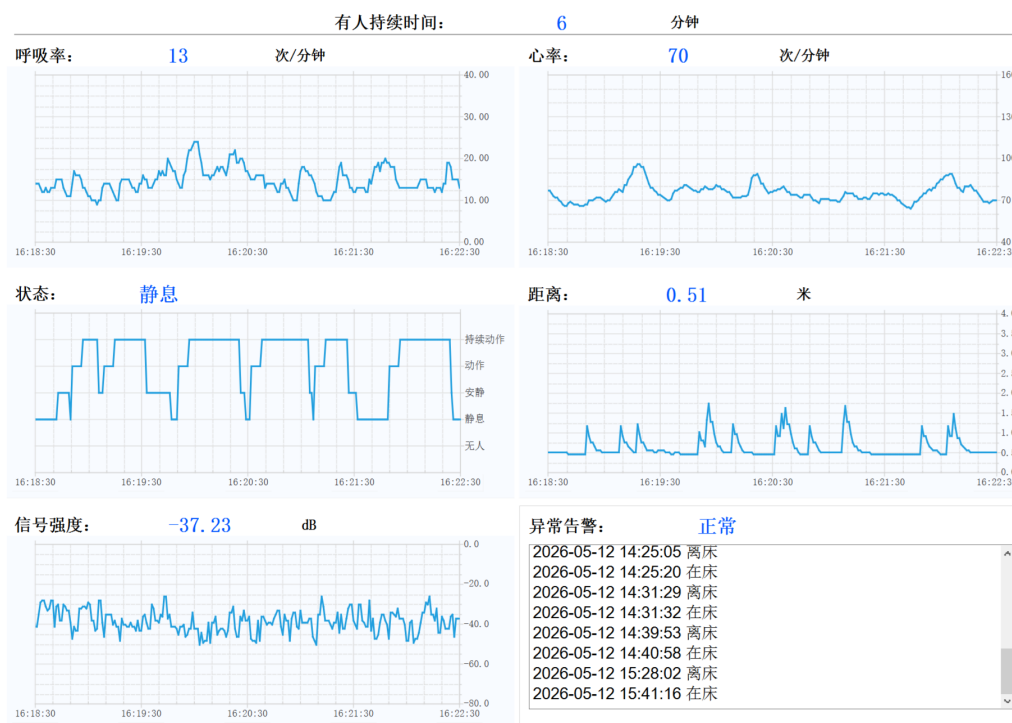


Figure 10-1 Real-time Data Display(Include sleep report software)

12 GETTING STARTED

To simplify product evaluation and application development, MinewSemi provides a dedicated evaluation software package for the radar module.

The evaluation software enables users to:

- Receive monitoring data from the radar module
- Display real-time data graphically
- Store historical monitoring data
- Configure module operating parameters
- Evaluate module performance and functionality

12.1 Evaluation Platform Setup

12.1.1 Required Equipment

Without Sleep Report

- Radar module: ME72MS02-002
- Evaluation software: RadarGui( RadarGui.exe)

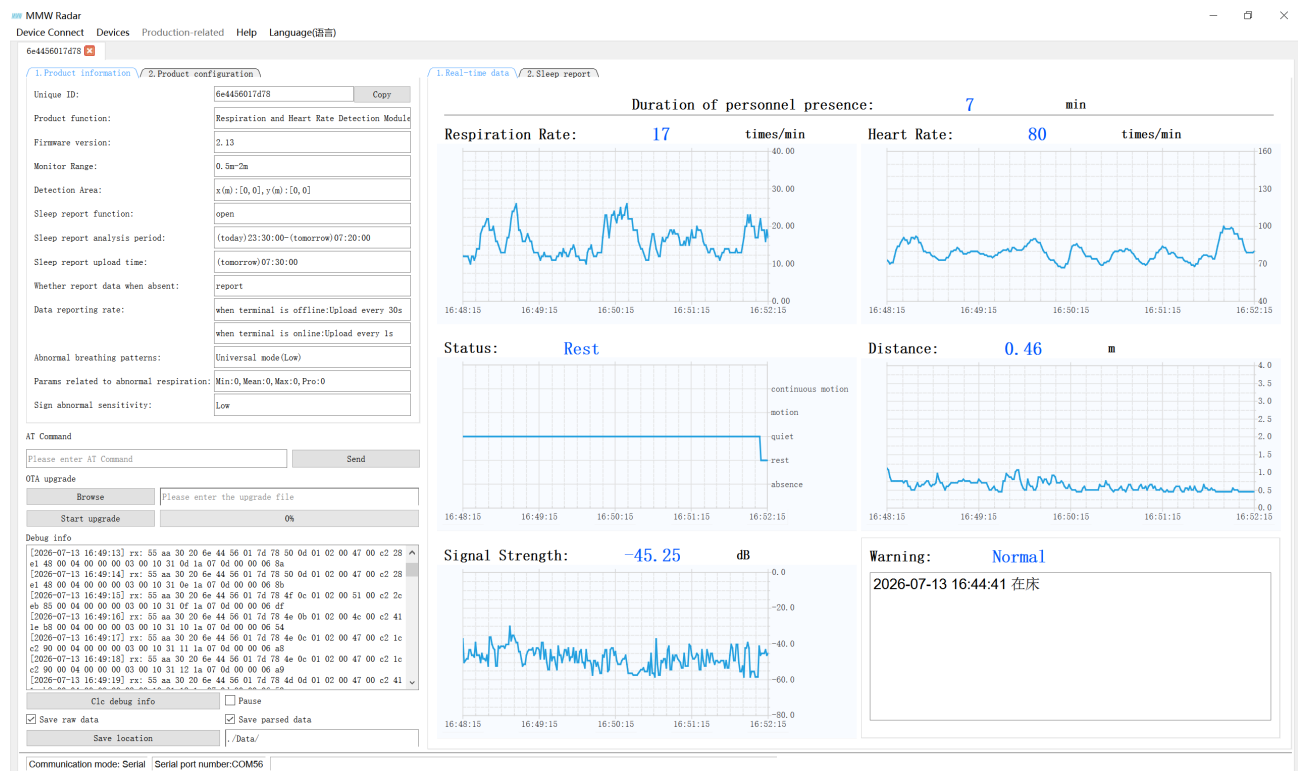
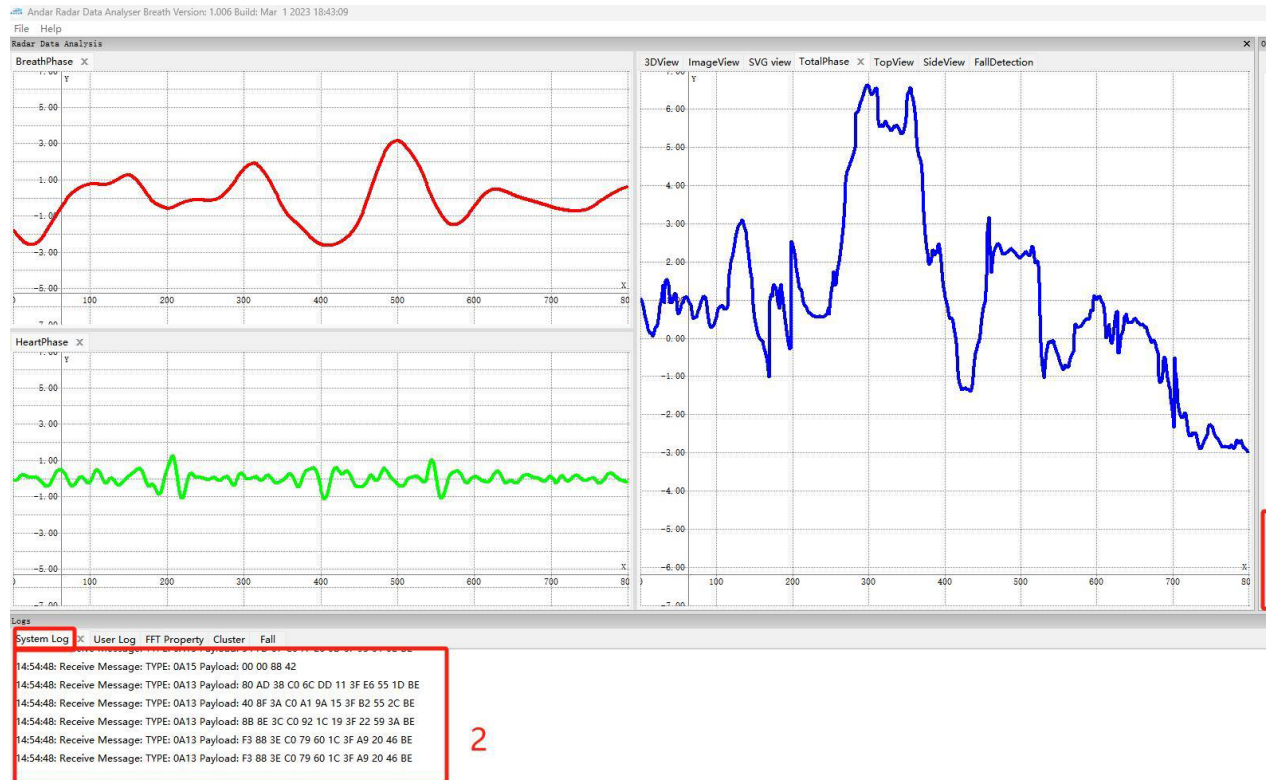
With Sleep Report

- Radar module: ME72MS02-001
- Evaluation software: RadarTestTool( 毫米波雷达检测系统测试软件安装包.msi)

12.1.2 Setup Procedure

1. Install RadarGui or RadarTestTool (including the USB driver) by following the installation wizard. Ensure that the firewall allows the application to communicate.
2. Connect the radar module to the USB-to-TTL converter.
3. Securely install the radar module in the intended monitoring position and adjust its orientation toward the subject's chest.

4. Connect the TTL interface of the USB-to-TTL converter to the radar module, and connect the USB interface to the PC.
5. Launch RadarGui or RadarTestTool. The software automatically detects the connected device and opens the monitoring interface.
6. The currently supported parameter settings are marked with a red box in the image below.



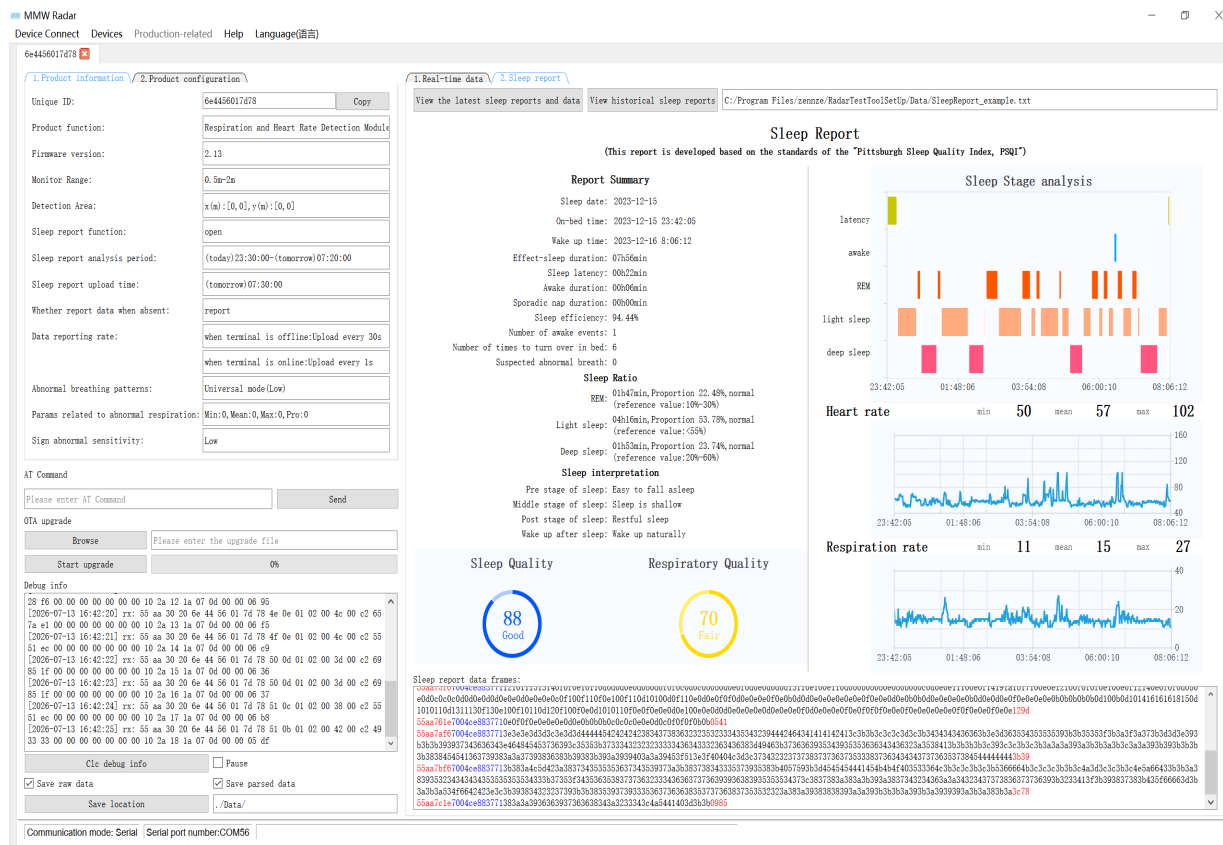


Figure 12-2-2 RadarTESTools Sleep Report Interface

13 ENCLOSURE DESIGN & SOLDERING REQUIREMENTS

To achieve optimum RF performance, the following recommendations should be observed:

- The recommended clearance between the antenna surface and the inner surface of the housing is 2.5 mm.
- The housing should be made of PC or ABS material.
- A recommended housing thickness is 1.44 mm or an integer multiple of 1.44 mm.

During SMT assembly:

- Avoid contaminating the radar module.
- Ensure the module is mounted flat without warping or deformation.

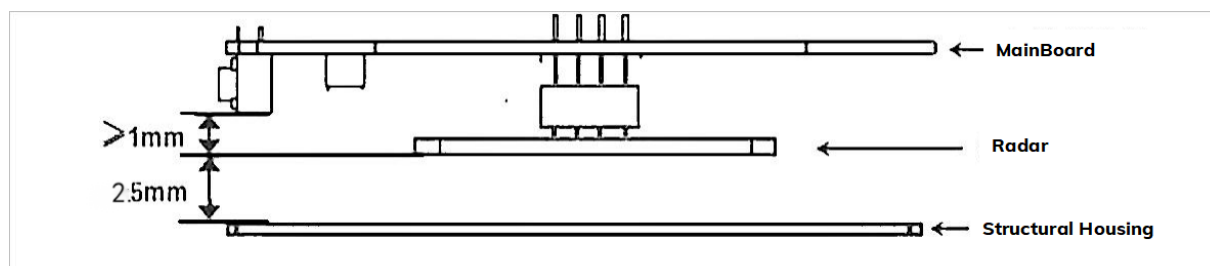


Figure2 Antenna-to-Enclosure Layout

14 FREQUENTLY ASKED QUESTIONS (FAQ)

Q1. Why does the radar module output no monitoring data?

Possible Causes

- Power supply issue
- Incorrect wiring
- Loose connection

Solutions

- Verify that the power supply is operating correctly.
- Check all cable connections.
- Confirm that the wiring matches the reference circuit.

Q2. Why are the respiration and heart rate measurements inaccurate?

Possible Causes

- Improper installation position
- Subject movement during measurement
- Additional people within the monitoring area

Solutions

- Adjust the installation position and angle so that the radar points toward the subject's chest.
- Perform measurements while the subject is lying still.
- Ensure that only one person remains within the monitoring area.

Q3. Why does the module detect a person when no one is present?

Possible Causes

Environmental interference, including:

- Vibrating appliances
- Moving curtains
- Other moving objects

Solutions

- Remove interference sources from the monitoring area.
- Adjust the installation position, mounting angle, or monitoring distance to avoid interference.

Q4. Why is the subject reported as absent while still in bed?

Possible Causes

- Improper installation position
- Subject outside the configured monitoring range

Solutions

- Reposition the radar module so that it faces the subject's chest.
- Verify that the subject remains within the configured monitoring range or adjust the monitoring distance accordingly.

15 DISCLAIMER

Every effort has been made to ensure the accuracy and completeness of this document.

However, due to the complexity of radar technology and variations in application environments, this document is provided for reference only. MinewSemi reserves the right to update product specifications without prior notice and makes no legally binding commitments or warranties regarding the information contained herein.

Users are encouraged to provide feedback and suggestions for product and development tool improvements.

This radar module is an electronic sensing device and is not intended for use as a medical device. It is designed solely to provide auxiliary health monitoring functions.

MinewSemi shall not be liable for missed detections, false alarms, or any resulting health risks or legal liabilities caused by factors including, but not limited to:

- Power failure
- Communication failure
- Environmental interference
- Operation outside the specified detection range

All performance data presented in this document are obtained under laboratory conditions or by certified third-party testing laboratories. Actual performance may vary depending on installation conditions and application environments.

16 STORAGE CONDITIONS

- **Please use this product within 6 months after signing the receipt.**
 - This product should be stored without opening the package at an ambient temperature of 5~35°C and a humidity of 20~70%RH.
 - This product should be left for more than 6 months after receipt and should be confirmed before use.
 - The product must be stored in a non-corrosive gas (Cl₂, NH₃, SO₂, NO_x, etc.).
 - To avoid damaging the packaging material, do not apply any excessive mechanical shocks, including but not limited to sharp objects adhering to the packaging material and product dropping.
- **This product is suitable for MSL2 (based on JEDEC standard J-STD-020).**
 - After opening the package, the product must be stored at ≤30°C/<60%RH. It is recommended to use the product within 3-6 months after opening the package.
 - When the color of the indicator in the package changes, the product should be baked before welding.
- **Baking is not required for one year if exposure is limited to <30°C and 60%RH. Refer to MSL2 for exposure criteria for moisture sensitivity level. If exposed to (≥168h@85°C/60%RH) conditions or stored for more than one year, recommended baking conditions.**
 1. 120 ±5/-5°C, 8 hours, 1 timeProducts must be baked individually on heat-resistant trays because the materials (base tape, reel tape, and cover tape) are not heat-resistant, and the packaging material may be deformed at temperatures of 120°C;
 2. 90°C ±8/-0°C, 24hours, 1timesThe base tape can be baked together with the product at this temperature. Please pay attention to the uniformity of heat.

17 HANDLING CONDITIONS

- Be careful in handling or transporting products because excessive stress or mechanical shock may break products.
- Handle with care if products may have cracks or damages on their terminals. If there is any such damage, the characteristics of products may change. Do not touch products with bare hands that may result in poor solder ability and destroy by static electrical charge.

18 QUALITY

Cognizant of our commitment to quality, we operate our own factory equipped with state-of-the-art production facilities and a meticulous quality management system. We hold certifications for ISO9001, ISO14001, ISO27001, OHSA18001, BSCI.

Every product undergoes stringent testing, including transmit power, sensitivity, power consumption, stability, and aging tests. Our fully automated module production line is now in full operation, boasting a production capacity in the millions, capable of meeting high-volume production demands.

19 COPYRIGHT STATEMENT

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The company has the right to change the content of this manual according to the technological development, and the revised version will not be notified otherwise. Without the written permission and authorization of the company, any individual, company, or organization shall not modify the contents of this manual or use part or all of the contents of this manual in other ways. Violators will be held accountable in accordance with the law.

20 RELATED DOCUMENTS

- [MinewSemi_Product_Naming_Reference_Manual](https://en.minewsemi.com/file/MinewSemi_Product_Naming_Reference_Manual_EN.pdf)
https://en.minewsemi.com/file/MinewSemi_Product_Naming_Reference_Manual_EN.pdf
- [MinewSemi_Connectivity_Module_Catalogue](https://en.minewsemi.com/file/MinewSemi_Connectivity_Module_Catalogue_EN.pdf)
https://en.minewsemi.com/file/MinewSemi_Connectivity_Module_Catalogue_EN.pdf



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