

Product Specification

Model: HL3240CG

Product name: Human Sensory Module

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



I. Product features

This radar is a highly sensitive 24GHz millimeter wave radar module used for human and location detections.

This radar module has the following characteristics:

- 1) Based on the FMCW radar system, the function of sensing the motion of people in the area is realized;
- 2) Max. sensing distance for motion: ≤ 2 m;
- 3) Width of antenna beams (3dB): $\geq 100^\circ$ (horizontal beam); $\geq 80^\circ$ (vertical beam);
- 4) Immune from temperature, humidity, noise, air flow, dust, lighting, etc., and hence applicable to severe environments;
- 5) Low output power, harmless to the human body under long-term irradiation.

II. Application scope

- ✧ Home appliances (air conditioning, refrigerator, TV, etc.)
- ✧ Office energy conservation (ACs/lighting)
- ✧ Sleep monitoring
- ✧ Regional security
- ✧ Automatic doors, elevators, etc.



III. Main functions and performance parameters

1. Functional Requirements

- 1) Moving target detection;
- 2) Other functions of radar
 - a. OTA
 - b. Self inspection and fault diagnosis

2. Electrical Parameters

Parameter	Minimum	Typical value	Maximum	Unit
Radar operating parameters				
Working voltage (VCC)	4.5		5.5	V
Working current (I _{CC})		90	100	mA
Working temperature (T _{OP})	-20		+85	°C
Storage temperature (T _{ST})	-40		+85	°C
Transmission parameter				
Working frequency (f _{TX})	24.0		24.25	GHz
Transmission power (P _{out})		6	8	dBm
Parameters of antenna				
Antenna gain (G _{ANT})		5		dB _i
Horizontal beam (3 dB)		100		°
Vertical beam (3 dB)		80		°

3. Radar Detection Performance Parameters

- 1) Motion perception distance: ≤ 2 m;
 - 2) Motion detection distance error (single person): ≤ 0.2 m;
 - 3) Vertical beam range (FOV): $\geq \pm 50^\circ$;
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- 4) Triggering time for motion: ≤ 0.5 s;

Note: The current performance parameters were tested under the conditions of an adult height of 1.7 m and an approach speed of 0.5 m/s towards the radar.

IV. Application and Interface

1. Power Requirements

- 1) Input voltage: $+5V \pm 0.5V$;
- 2) Average operating current: $\leq 100mA$;
- 3) Power ripple: $\leq 50mV$;

2. Environmental Adaptability Explanation

- 1) Working temperature: $-20^{\circ}C \sim 85^{\circ}C$
Storage temperature: $-40^{\circ}C \sim 85^{\circ}C$
- 2) Humidity: $\leq 85\%$, no condensation
- 3) Vibration: It is recommended to use a vibration-free environment or work with the manufacturer to resolve the vibration issue.

3. Description of interfaces

Interface model: GH1.25-7P

Communication level: 3.3V

Electrostatic characteristics: Contact type $\pm 4KV$; non-contact type \pm

8KV.

Interface line sequence:

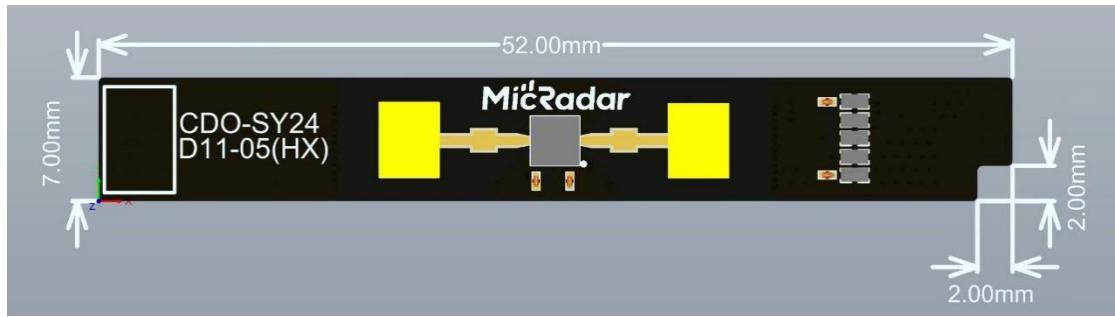
PIN	SYMBOL	DESCRIPTION	I/O
1	5V	5V power input	I
2	WAKEUP	Radar activation	I/O
3	GND	GND	/
4	RST	Radar hardware reset	I
5	RX	Radar serial port RX	I/O
6	HX-IO	Single IO port output pin	O
7	GND	GND	/

Interface timing (HX-IO):

High level
Between two consecutive triggers, there is a high-level signal lasting for time T5
Low level
Module power on
Module initialization completed
Maintain a high level when there is no trigger
Output a low-level signal for the duration of T4 when there is trigger
Time
Minimum
Center value
Maximum
Unit

V. Dimensions and product photos

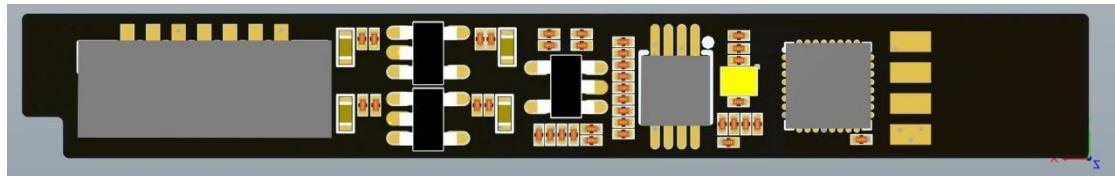
1) Dimensions: 6mmX46mm



2) Product photos (3D)



(a) Front photo



(b) Back photo

VI. Installation and usage instructions

This radar can be installed in the following ways: Ceiling installation, horizontal installation, tilted installation.

1. Top mounting

The figure below shows the ceiling installation. With this installation method, the radar is capable of monitoring individuals within the beam coverage area whether they are standing, moving, or lying down, such as in bedrooms, elderly care facilities, hospital beds, and similar settings.

The radar is installed vertical with a horizontal deviation angle of $\leq 5^\circ$ to make



sure the main beam of the radar covers the detection area. The recommended height of installation is 2-3 m without noticeable obstacles and coverings in front.

In this installation mode, the radar beam projection is equivalent to a circle or an ellipse.

Affected by the radar installation height and radar beam range, the horizontal action area length $L \approx 3$ m to 5 m.

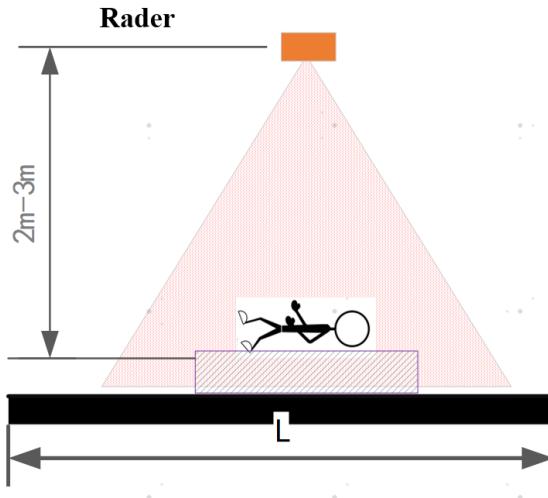


Fig. 3Top mounting

2. Horizontal Installation

The figure below shows a horizontal installation method. This installation method is mainly used for human body detection in standing or sitting positions, such as in living rooms, home appliance applications, etc.

The radar is recommended to be installed at a height of 0.5 m - 1.5 m, horizontally in forward direction, with a tilt $\leq \pm 10^\circ$. The front of the radar should not be blocked or covered whatsoever.

The normal line of the radar should be aligned with the main point of detection to ensure the main beam of the radar antenna covers the detection area and the airspace of body activities.

In this installation mode, the maximum detection distance of moving human body $L \geq 6$ meters; The maximum distance for stationary human detection is $L \geq 4$ meters;

Limited by the beam coverage of the radar antenna, the effective working distance will be reduced if displaced from the normal line direction of the radar.

Electromagnetic waves in millimeter-wave frequency band can penetrate non-metallic matters - common glass, wooden boards, screens, and thin partition walls - to a certain degree, and hence can detect moving objects behind such obstacles. However, thick load-bearing walls, metal doors, and the like are not penetrable.

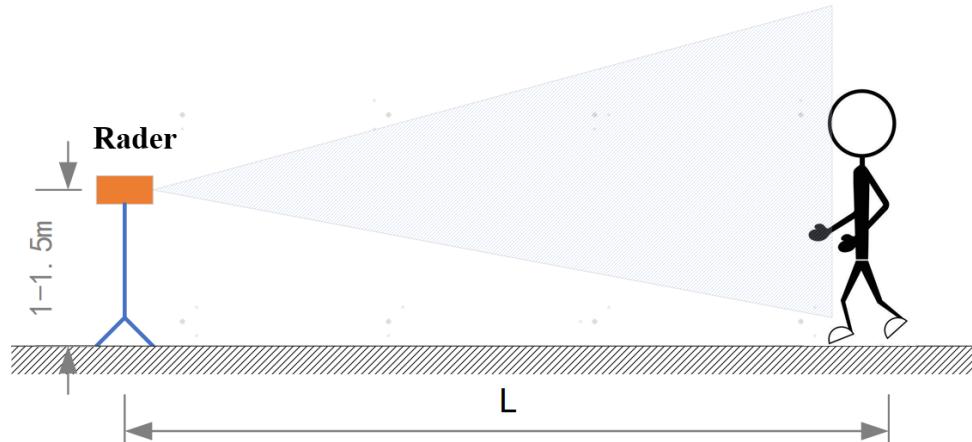


Fig.1 Horizontal mounting diagram

3. Inclined installation

The figure below shows the inclined installation. This mounting method is designed for detection of human motion in a room and hence applicable to hotels, lobbies and similar places.

The recommended installation height of this radar is 2 ~ 3 meters, higher than the height of human body. The downward tilt angle of this radar ranges from 10° to 45° and there should be no obvious obstructions and coverings in front of it.

The normal line of the radar should be aligned with the main point of detection to ensure the main beam of the radar antenna covers the detection area and the airspace of body activities.

In this installation mode, the maximum distance for moving human body detection is $L \geq 5$ m; the maximum distance for stationary human body detection is

$L \leq 4$ m (radial);

In this mode, the area right beneath the radar as well as its adjacent areas might involve a dead zone.

With the increase in look-down tilt angle, the distance of body detection will be considerably reduced.

Limited by the radiation characteristics of the radar antenna, the effective working distance will be reduced if displaced from the normal line direction of the radar.

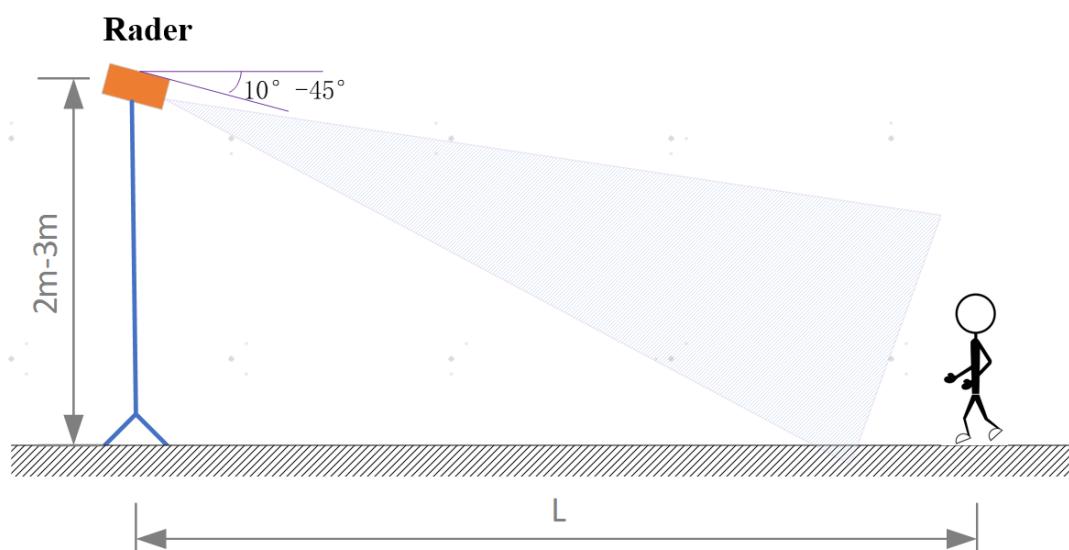


Fig. 2 Look-down mounting

Note:

- A. All mounting methods mentioned above require coverage over the main area of body motion by main beam of the radar, with the alignment with the direction of normal line as far as possible;
- B. In inclined mounting, horizontal working distance is reduced due to the change in horizontal projection of the coverage;
- C. When the module works, no metal obstacles should exist on module surface;
- D. Affected by the transmission characteristics of electromagnetic waves, the working distance of the radar varies with RCS, material of cover and thickness of the target.
- E. For stay-still detection, the working distance of the radar is affected by

postures. The maximum working distance is not guaranteed for all postures.

VII. Common troubleshooting

(Omitted tentatively)

VIII. Reliability test requirements

Serial number	Test step	Test Conditions	Judgment criteria
1	Low-temperature storage test	The module is not powered and placed in a $-40\pm2^{\circ}\text{C}$ test chamber (without humidity requirement) for 24 h, then restored to room temperature for 1 h before evaluation.	<ul style="list-style-type: none">a. Performance test: All performance indicators should meet the requirements.b. The test samples must not have any mechanical structural damage, and the test samples must not have any obvious material degradation, including but not limited to the following problems, such as fading, peeling, bubbling, paint shedding, obvious changes in the hardness of the material, etc.
2	Low-temperature working test	Use a power supply to supply 5V to the module, set it to power on and keep it in standby mode, put it in a test box at $-40\pm2^{\circ}\text{C}$ for 8 h, and then perform electrical performance parameter tests and function, structure, and appearance inspections in this environment.	Same as “Low-temperature storage test criteria”.
3	High-temperature storage test	The module is not powered and placed in a $85\pm2^{\circ}\text{C}$ test chamber (without humidity requirement) for 24 h, then restored to room temperature for 1 h before evaluation.	Same as “Low-temperature storage test criteria”.
4	High-temperature working test	Use a power supply to supply 5V to the module, set it to power on and keep it in standby mode, put it in a test box at $85\pm2^{\circ}\text{C}$ for 8 h, and then perform electrical performance parameter tests and function, structure, and appearance inspections in this environment.	Same as “Low-temperature storage test criteria”.

5	Accelerated life test	<p>The samples underwent storage pretreatment, with the storage test conditions being “60°C, 93% RH, without power supply for 168 h”</p> <p>Upon completion of the pretreatment, the test conditions were adjusted to “85°C 85% RH, power on and running for 1000 h”;</p> <p>No functional failure is allowed within 500 h of power-on (except when the temperature exceeds the specification range); between 500-1000 h, only safety issues are required not to occur.</p>	All performance indicators meet the requirements
6	Thermal shock test	<p>Temperature setting: -20°C -20°C to 80°C 80°C 80°C to -20°C</p> <p>Humidity setting: Low Low Low Low 0.5 hour <20s 0.5 hour <20s,</p> <p>Running time: 0.5 h < 20 s 0.5 h < 20 s, 500 cycles</p> <p>After the test, the final state of the solder joints of the components was observed under a microscope and compared with the same position of the solder joints photographed before the test to confirm the extent of the change. The appearance is intact and the electrical performance test meets the requirements.</p>	All performance indicators meet the requirements

Note: The actual reliability testing process is subject to equipment conditions and time constraints, and is executed using alternative solutions communicated by both parties.

Antenna used

Antenna Type	Brand/ manufacturer	Model No.	Max. Antenna Gain
PCB Antenna	Chengdu Songyuan Technology Co., LTD	SY-ANT-1	5dBi

Notice to Host Product Manufacturer

Any deviation(s) from the defined parameters of the antenna trace, as described by this instruction, host product manufacturer must notify us that you wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID and IC ID (new application) procedure followed by a Class II permissive change application.

Every new host configuration requires FCC/IC Class II Permissive Change filing by the grantee.



Notice to Host manufacturer when installing our Limited Module and intend to use Contains FCC ID: 2A4A3-HL3240 and Contains IC: 32735-HL3240.

Limited module approve procedure:

The module doesn't have its own RF shielding, The host should provide the RF shielding to the modular, which belong to Limited module.

Standard requires: Clear and specific instructions describing the conditions, limitations and procedures for third parties to use and/or integrate the module into a host device (see Comprehensive integration instructions below).

Supply example as follows: Installation Notes:

(1). Power supply for the limited module with FCC ID: 2A4A3-HL3240, IC: 32735-HL3240 is DC 5V, when you use product with this module design, the power supply cannot exceed this value.

(2). When connect the module to the host device, the host device must be powered off.

(3). Make sure the module pins correctly installed.

(4). Make sure that the module does not allow users to replace or demolish.

Information on test modes and additional testing requirements

Host manufacturer which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C: 15.249 requirement and 15.209 requirement, only if the test result comply with FCC part 15.249 requirement, then the host can be sold legally.

The module is limited module and complies with the requirement of FCC Part 15.249. According to FCC Part Subpart C section 15.212, the radio elements must have the radio frequency circuitry shielded.

However, Due to there is no shield for this module, this module is granted as a Limited Modular Approval.

A C2PC is required for new host application. Only Grantees are permitted to make permissive changes. Please contact us for further process with Hisense Ronshen (Guangdong) Refrigerator Co., Ltd. The OEM integrators should follow the following the test plan, Base on Module RF report "KSCR250300040102 under FCC ID: 2A4A3-HL3240 and IC: 32735-HL3240."

For the host product installed this module exactly according to this guide, and did not make any hardware or software modifications to this module or modified the software but does not affect the radio characteristics,

1. Part 15 Subpart B disclaimer: This module was tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to final host. The host will still need to be reassessed for compliance to this portion of rule requirements. Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15B. These tests should be based on ANSI C63.4 as guidance.

2. The host product will need to evaluate according to FCC Part 15 Subpart C 15.249 for these test items:

(1). Maximum EIRP of channel 24GHz-24.25GHz: not exceed 107.93dBuV/m @3m for Peak.
(2). Check 99% OBW within the operate band 24GHz-24.25GHz.
(3). Radiated spurious emissions and band edge on channel 24GHz-24.25GHz with the other co-located transmitters, the radiated emission shall not exceed the 15.249(a) limit.
3. RF Exposure evaluation: The host product operating conditions must be such that there is a minimum separation distance of 20 cm (or possibly greater than 20 cm) between the antenna radiating structures and nearby persons. The host manufacturer is obligated to confirm the use conditions of the host product to ensure that the distance specified in the instructions is met. In this case the host product is classified as either a mobile device or a fixed device for RF exposure purposes. If the modular transmitter is authorized to be used in a specific type of host platform and installed such that it can be operated at closer than 20 cm to users or nearby persons, it requires routine evaluation or SAR testing, and for the simultaneous transmission of the co-located transmitters according to KDB 447498. The portable host product shall be evaluated for ensuring to continue compliance FCC rule part 2.1093 & part 1.1310. The additional guidance for the portable host products is provided in KDB Publication 996369 D02 and D04.

For the host product is not installed according to this guide, the module certification will be invalid, and a new grant certification will be required for the host product.

Contact Information:

Company Name: Hisense Ronshen (Guangdong) Refrigerator Co., Ltd.

Address: No. 8 Ronggang Road Ronggui Shunde Foshan China

Contact Email: huangruixia@hisense.com

Contact Phone: 86-757-28362087

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FCC&IC regulatory compliance statement

§15.19 Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

§15.21 Information to user

Warning: changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure compliance statement

This Module complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body. This transmitter must not be co-located or

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operating in conjunction with any other antenna or transmitter.

Labelling Instruction for Host Product Integrator

Please notice that if the FCC and IC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. For FCC, this exterior label should follow "Contains FCC ID: 2A4A3-HL3240". In accordance with FCC KDB guidance 784748 Labeling Guidelines. For IC, this exterior label can use wording "Contains IC: 32735-HL3240".

§ 15.19 Labelling requirements shall be complied on end user device.

Labelling rules for special device, please refer to §2.925, § 15.19 (a)(5) and relevant KDB publications. For E-label, please refer to §2.935.

Installation Notice to Host Product Manufacturer

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The module is limited to installation in mobile application, a separate approval is required for all other operating configurations, including portable configurations with respect to §2.1093 and difference antenna configurations.

Antenna Change Notice to Host manufacturer

If you desire to increase antenna gain and either change antenna type or use same antenna type certified, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID&IC ID (new application) procedure followed by a Class II permissive change application.

FCC other Parts, Part 15B Compliance Requirements for Host product manufacturer

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements.

Please note that For a Class B or Class A digital device or peripheral, the instructions furnished the user manual of the end-user product shall include statement set out in §15.105 *Information to the user* or such similar statement and place it in a prominent location in the text of host product manual. Original texts as following:

For Class B

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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RF Exposure Information

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

EU Conformity Statement



This product is marked with "CE" and comply therefore with the applicable harmonized European standards listed under the Radio Equipment Directive 2014/53/EU.

For EU: 24.00GHz to 24.25GHz :11.55dBm (Max EIRP)

