



60G Radar Module for Falling Detection (FDS) IR60FD1A

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1. Overview

IR60FD1A radar module adopts 60G millimeter wave radar technology to realize the Human Pose Recognition and the fall detection function. This module is based on FMCW radar system to realize wireless perception of personnel status in specific places.

The radar module has the following working characteristics:

1. Motion perception and fall detection function;
2. Limit the detection object to people with biological characteristics (moving or stationary), and eliminate the interference of other inanimate objects in the environment;
3. This module can effectively eliminate the interference of non living objects, and can also realize the detection of non living moving objects;
4. The product supports secondary development and adapts to a variety of scenarios;
5. General UART communication interface, providing general protocol;
6. Four groups of I \ o are reserved, which can be input and output according to user-defined or simple interface simulation;
7. The output power is small and does no harm to human body ;
8. The module is not affected by temperature, light, dust and other factors, with high sensitivity and wide application fields

2. Main Parameters

2.1 Detection Angle and Distance

Parameter Contents	Minimum	Typical	Maximum	Unit
IR60FD1A				
Detection Range of Moving Personnel (radius) [1]	-	6		m
Fall Detection Range (radius)[2]	-	2.5		m
Radar Detection Angle (Horizontal)	-	100	-	°
Radar Detection Angle (Pitch)	-	100	-	°

Note : The radar was at an altitude of 2.8 meters

2.2 Electrical Characteristics

Operating Parameters	Minimum	Typical	Maximum	Unit
Operating Voltage (VCC)	4.5	5.0	6	V
Operating Current (ICC)	90	93	100	mA
Operating Temperature (TOP)	-20	-	+60	°C
Storage Temperature (TST)	-40	-	+80	°C

2.3 RF Performance

Transmit Parameters				
Operating Frequency (fTX)	58	-	63.5	GHz
Transmitting Power (Pout)	-	-	6	dBm

3. Module Dimension and Pin Definition

3.1 Outline Dimension

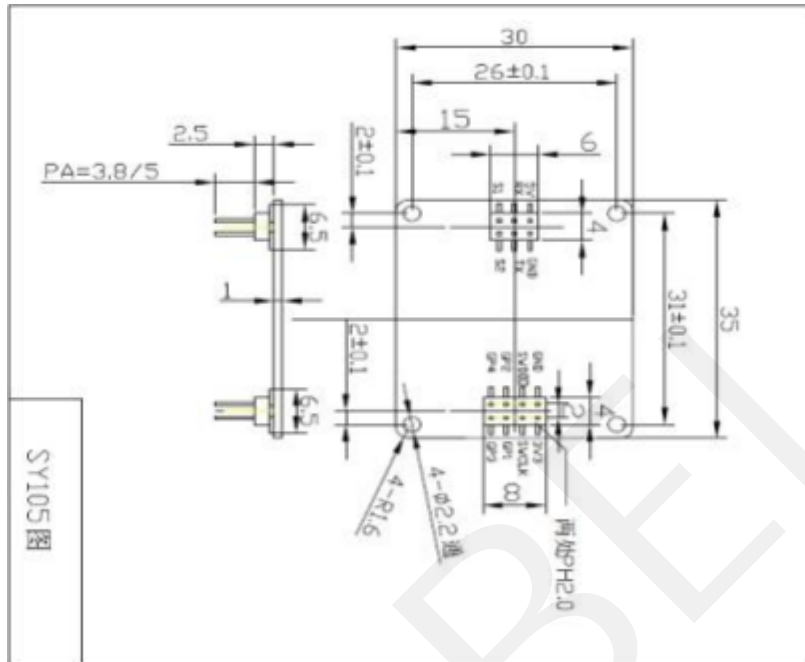


Figure 1 Diagram of Radar Module Outline Dimension

3.2 Pin Definition

Interface	Pin	Description	Typical	Remark
Interface1	1	5V	5.0V	Positive end of power input
	2	GND		Ground
	3	RX		Serial port receive
	4	TX		Serial port send
	5	S1	3.3V/0V	
	6	S2	3.3V/0V	
Interface 2	1	3V3	3.3V	Output power supply
	2	GND		Ground
	3	SL		Reserve
	4	SD		Reserve
	5	GP1		Spare extension pin
	6	GP2		Spare extension pin
	7	GP3		Spare extension pin
	8	GP4		Spare extension pin

3.3 Wiring Diagram

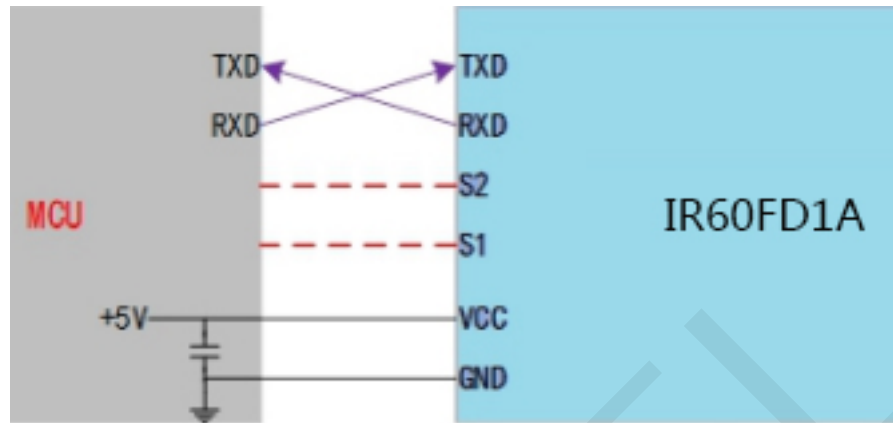


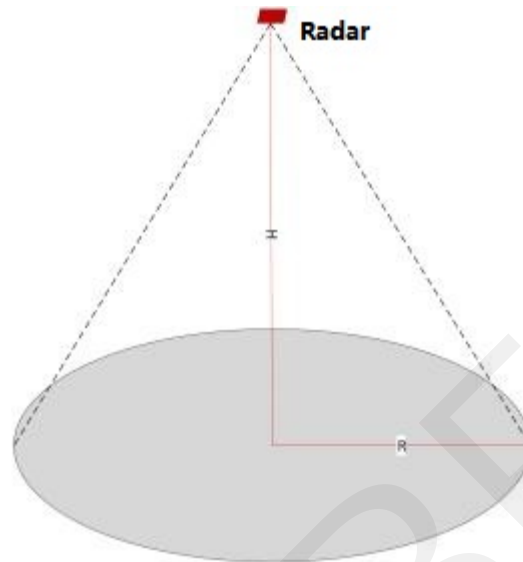
Figure 2 Wiring Diagram of Radar Module and Peripheral Equipment

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4. Main Operating Performance

4.1 Radar Module Operating Coverage

The beam coverage of radar module is shown in. The radar coverage is a three-dimensional sector area with 100 ° horizontal and 100 ° pitch.



Due to the influence of radar beam characteristics, the radar operates far in the normal direction of the antenna surface, but the operating distance deviates from the normal direction of the antenna will become shorter.

When the radar is installed on the top or obliquely, the radar action range will be reduced due to the influence of the radar beam range and effective radiation space, which should be paid attention to during use.

4.2 Main Functions and Performance

1) Main functions and performance

a. Fall detection

a) Detection range :

- i. 2 m //the projection radius of radar top-mounted
- ii. 4 m //the projection radius of radar obliquely-mounted

b) Accuracy: $\geq 90\%$

b. Perception of human presence

a) Detection range : 3 m //projection radius

b) Accuracy : 90%

c. Motion detection

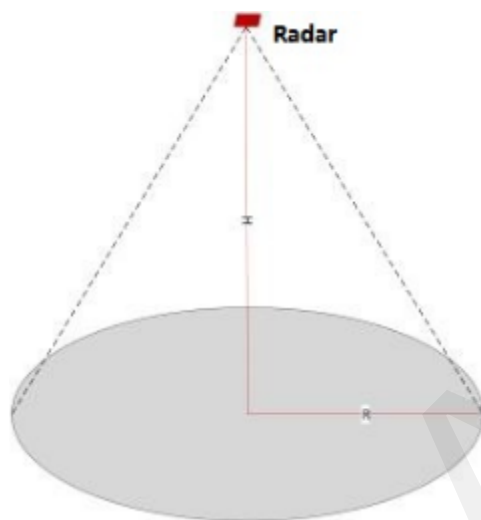
- a) motion-triggered
- b) perception of movement direction and location

5. Radar Operation and Installation Mode

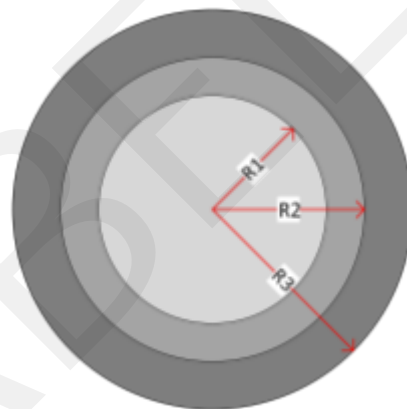
5.1 Vertical-mounted

The radar is installed on the roof and emits beams vertically downward.

The radar installation height is $H = 2.4\text{m} \sim 3\text{M}$; The radius of radar beam coverage area is R . within the radar projection area, it is considered to further divide the projection area into fall detection area, presence detection area and motion trigger detection area. The schematic diagram for function area division is shown in the following figure:



(a) Radar Projection

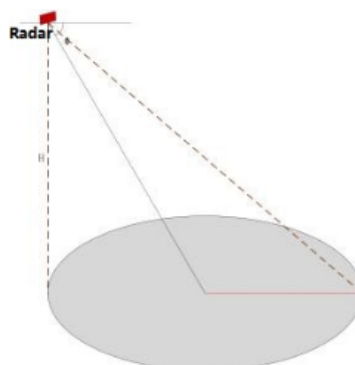


(b) Schematic diagram of beam division

5.2 Oblique-mounted

In some application scenarios, the radar needs to be installed obliquely, such as in the corner of the wall.

For this kind of installation method, consider the home gyroscope sensor on the radar to measure the radar inclination, and then assist the radar in angle correction.



5.3 Horizontal-mounted

In view of the current number of channels of radar chip, the fall detection function in horizontal installation mode is not considered temporarily.

6. Typical Application

- A. The product is suitable for small area scenes such as bathroom, bathroom and bedroom.
- B. The product is suitable for top-mounted and oblique-mounted modes.
- C. The product is suitable for single person / double person.
- D. The product needs to eliminate the influence of interference factors in combination with application scenarios.

7. Precautions

7.1. Start Time

When the module starts to work when it is initially powered on, it is necessary to completely reset the internal circuit of the module and fully evaluate the environmental noise to ensure the normal operation of the module. Therefore, when the module is initially powered on, it needs a startup stability time of 20s to ensure the validity of subsequent output parameters.

7.2. Radar biological detection performance

Because human biological characteristics belong to ultra-low frequency and weak reflection characteristic signals, radar processing requires a relatively long cumulative processing. During the cumulative process, many factors may affect the radar parameters, so occasional detection failure is normal.

7.3. Power

The radar module requires higher power quality than conventional low frequency circuits. When powering the module, it is required that the power supply has no threshold glitches or ripples and that it effectively shields the power supply noise caused by accessory equipment. The radar module needs to be well grounded. Due to the ground noise brought by other circuits, the performance of the radar module may even be reduced or even work abnormally; the most common cause is a shorter detection distance or an increased false alarm rate.

In order to ensure the normal operation of the VCO circuit inside the module, the power supply requirement for this module is +5V- +9V power supply, voltage of power supply no less than 5V. The external power supply must provide sufficient current output capability and transient response capability.

8. Disclaimer

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