

Millimeter wave radar

24GHz speed radar

HLK-LD2415H Technical Specifications (2024)

——Focus on the design and development of millimeter wave radar products

This manual will describe the design principles, technical parameters, installation specifications and other matters of the HLK-LD2415H radar module to guide you to understand and use the HLK-LD2415H radar module in detail.

radar product. Our company reserves the right to make regular changes to the contents of this manual without prior notice. Changes will be added to the new version of the product manual.

Please contact our company in time to obtain the latest information.

Version Information

Version	release date	Number of pages	Related chapters	author
1.0	2021.10.22	7	all	
2.0	2023.10.22	7	all	

1 Overview

HLK-LD2415H speed radar is a millimeter wave radar module that integrates microstrip antenna, RF circuit and signal processing circuit, and directly outputs the speed of the target

It can be used to measure the speed of cars at a distance of more than 180 meters, uses an integrated RF chip, has extremely high frequency stability, and a speed measurement accuracy of 1KM/h.

It is widely used in speed reminders on various roads such as expressways, urban trunk roads, municipal and county-level roads, urban and rural trunk roads, as well as road curve and intersection warnings.

2. Characteristic description

- K-band RF integrated circuit design;
- Frequency range: 24.125GHz (customizable frequency)
- Modulation method: CW detects moving vehicles, detection distance ≥180 meters
- Support RS485 interface and TTL serial port (baud rate 9600bps)
- Speed measurement range: 1KM/H~240KM/H
- The speed measurement error is less than ±1KM/H (when the angle between the movement direction and the radar beam azimuth is zero degrees)
- Voltage: 9~24V, current ≤50mA@12V
- Output power (EIRP): 20dBm; actual power consumption ≤1.2W
- Antenna angle: horizontal 40°, pitch 16° (3dB beam width, actual detection angle is greater than 4 lanes)
- Sensor size: 69*53*5mm

3. Product effect

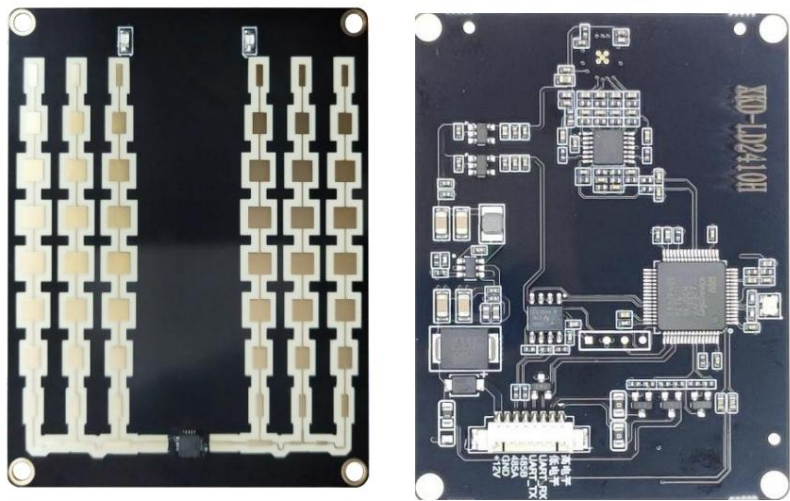


Figure-Product PCBA renderings

4. Main parameters and indicators

parameter	Symbol	Minimum value	Typical value	Maximum value	Unit	illustrate
transmitter						
Transmission frequency	<i>f</i>	24.075	24.125	24.175	GHz	customizable
Output Power (EIRP)	Pout		18	20	dBm	customizable
Antenna Angle						
Transmitting antenna			16		dBi	
gain Receiving antenna			18.4		dBi	
gain Transmitting antenna radiation angle			±20		you	level

			±8		you	vertical
Receiving antenna radiation angle			±20		you	level
			±8		you	vertical
power supply						
Operating Voltage	VCC	9	12	24	IN	
Working current	ICC		50		mA	
interface parameters						
Pulse interface	VCC	9	12	24	IN	
environment						
Operating	TOP	ÿ20		+ 85 ÿ		
temperature	TOP	ÿ40		+ 125 ÿ		
Storage temperature Dimensions	Length 69 x Width 53 x Height 5				mm	

Table - Module main technical parameters table

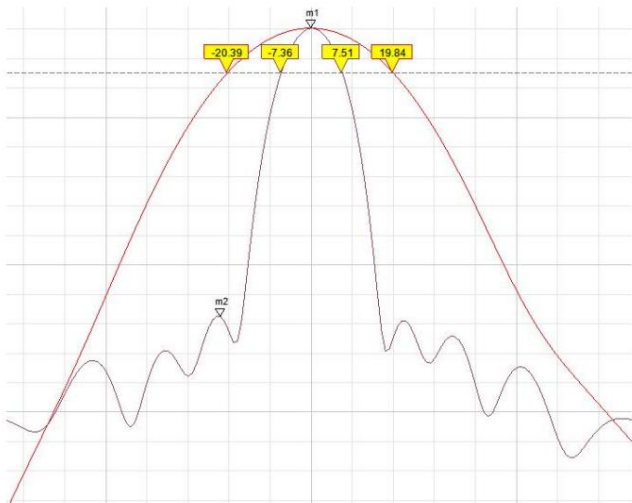


Figure 3-Antenna pattern

5. Interface description

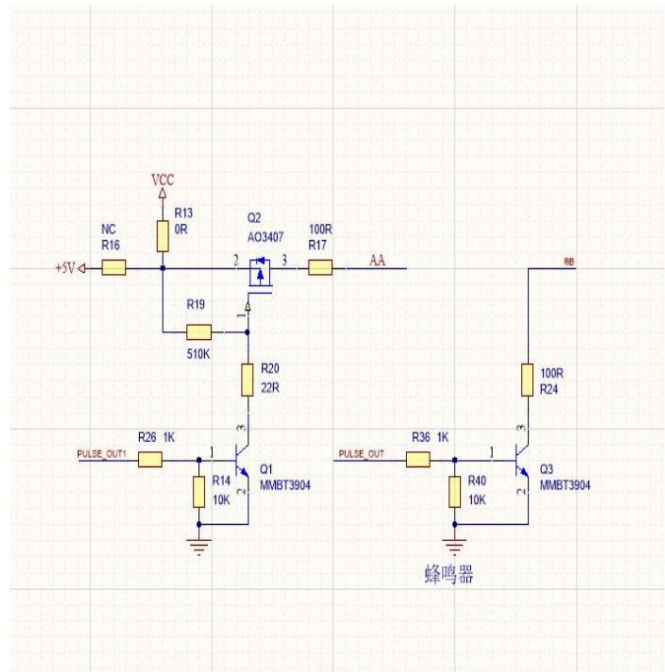
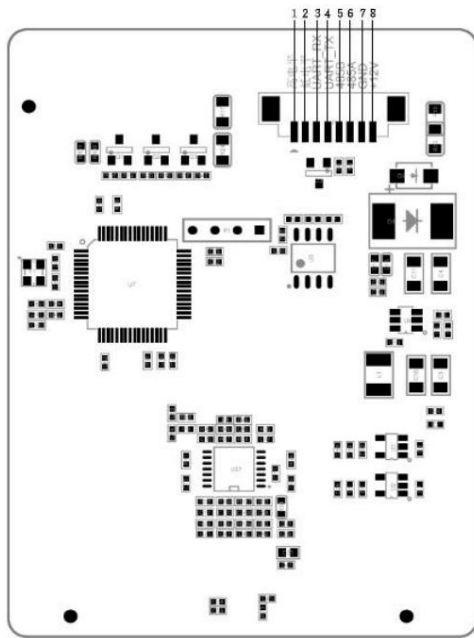


Figure - Schematic diagram of the interface (the picture shows the direction from the back of the module)

When the warning signal function is required, the radar can directly output a high-level active signal (pin 1) or a low-level active signal (pin 2).

Serial number	Pin name	J4 Description
1	Pin 1	PULSE (radar board is active high output signal version: active high output pin)
2	Pin 2	AA (radar board is active low output signal version: active low output pin)
3	UART_RX	take over
4	UART_TX	send
5	B	485 Serial port data B
6	A	485 serial port data A
7	GND	Power Ground
8	VCC	9~24V power supply

Table 2 - Interface function description

6. Communication protocol description

RS485 and UART serial port (3.3V TTL level signal) speed data output format (baud rate 9600bps each frame data packet 9 bytes).

6.1: Towards the target

V (ascii) + (ascii) hundreds (ascii) tens (ascii) ones (ascii) decimal point (ascii) decimal place (ascii) 0x0D 0x0A

V+001.8
V+001.8
V+001.8

6.2: Go to the target

V (ascii) - (ascii) hundreds (ascii) tens (ascii) units (ascii) decimal point (ascii) decimal place (ascii) 0x0D 0x0A

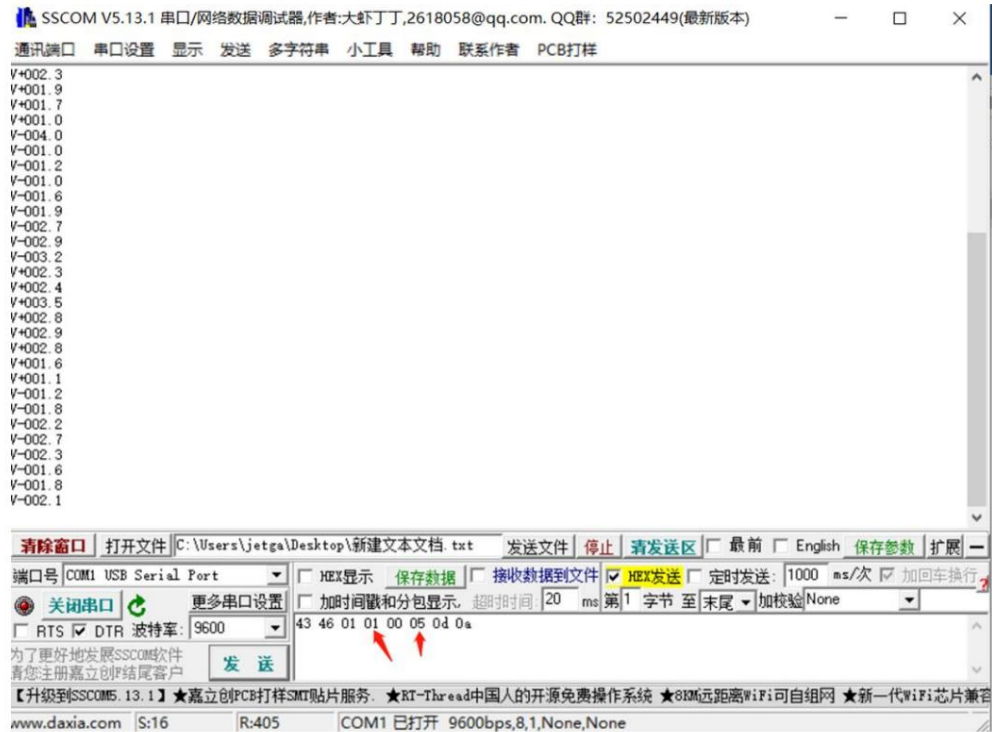
V-001.9
V-001.9
V-001.9

6.3: Radar parameter setting commands

0x43+0x46+0x01 Function code command		
format: 0x43+0x46+0x01+speed range lower limit value+angle compensation+sensitivity+0x0d+0x0a Set the speed range lower limit		
value, angle compensation and sensitivity	Command 43 46 01 01 00 05 0d 0a Description Note 1: 0x01 is the lower limit of the speed range 1KM/H (factory default is 0X01). If 0x01 is set, the speed will not be less than 1km/h. Detected output; Note 2: 0x00 is the angle compensation of the angle between the center of the radar beam axis and the motion of the moved target (car) (factory default is 0x00), if 0x0a is set , the angle compensation angle is 10 degrees; Note 3: 0x05 is the radar The sensitivity setting can be set in the range 0x01~0x0f (factory default is 0x05); the smaller the sensitivity value, the higher the sensitivity, the farther the detection distance (poor anti-interference); the larger the sensitivity value, the lower the sensitivity, the closer the detection distance (strong anti-interference) ; If there is interference caused by a strong radio transmitting antenna near the radar sensor or the ripple coefficient of the radar sensor power supply is large, the sensitivity value needs to be appropriately increased to improve the anti-interference performance. Please make your own choice based on the application conditions.	
0x43+0x46+0x02 Function code command		
format: 0x43+0x46+0x02+coming/going target detection output+measurable speed output times per second+km/h/mph switch+0x0d+0x0a Set coming/going target detection output, measurable		
speed output times per second, km/h/mph switch 0x43+0x46+0x03 Function code command format:	Command 43 46 02 00 01 00 0d 0a Description Note 1: 0x00 detects and outputs both coming and going targets; 0X01 only detects and outputs coming and going targets; 0X02 only detects and outputs going to targets; Note 2: The larger the value of 0x01, the lower the number of times the radar sensor can measure speed per second; 0X00 is about 22 frames per second; each increment of 1 to the setting value increases the time by 1 times, if 0x01 is set , the output is 11 frames per second (factory default is 0X01, about 11 frames per second); Note 3: The speed unit of 0x00 is kilometers per hour; the speed unit of 0x01 is miles per hour; the speed unit of 0x02 is meters per second;	
0x43+0x46+0x03+0x00+0x00+0x00+0x0d+0x0a		
Set the anti-interference coefficient range of vibration interference 0x00-0x70 (factory default is		
0X00y	Command 43 46 03 00 00 00 0d 0a Description Note 1: 0x00 vibration interference refers to targets with small swing "coming and going" motion (such as the sound of a speaker or the vibration of the radar sensor's mounting bracket or interference from an electric fan, etc.); the larger the XU value range, the greater the anti-vibration swing, but it is easy to miss targets with short-stroke motion. Please make adjustments based on the application scenario.	
0x43+0x46+0x04 function code (only for photoelectric coupler function) Command		
format: 0x43+0x46+0x04+relay closure time (seconds)+relay closure minimum speed value (km/h)+0x00+0x0d+0x0a Set relay output command 43 46 04 00 00 0d 0a Parameter		
Description Note 1: 0x00	Setting range 0x00~0xff; default value 0; When the speed value exceeds 00 , the photoelectric coupler closure time (seconds);	
	Note 2: 0x00 setting range is 0x00~0xff; default value is 0; the lowest speed value for photocoupler pickup (km/h).	
0x43+0x46+0x05+0x01 Function code command		
format: 0x43+0x46+0x05+0x01+0x00+0x00+0x00+0x00+0x00+0x00 Switch to custom protocol		
Negotiation Mode 01	Command 43 46 05 01 00 00 00 00 00 00 00 Description Radar response: Switch to CSR Mode... Done.	
Switch to standard protocol mode 02	Command FA 31 30 30 FB [Wait for radar reply before sending next one] FA 55 AA FF FB Describing the radar response: Switch to CSR Mode... Done.	
0x43+0x46+0x07 Function code		

Command format: 0x43+0x46+0x07+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00 to read the set		
parameters	Command	43 46 07 00 00 00 00 00 00 00 00 00 00 00 (This command is only applicable in standard protocol mode)
	Describing	<div>radar response:</div> <div>No. 20210726 v3.0</div> <div>X1:01 X2:00 X3:05 X4:00 X5:01 X6:00 X7:00 X8:00 X9:00 X0:01</div> <div>X1: lower limit of speed range (default is 0X01): the lower limit is 1KM/H, which means that speeds less than 1km/h will not be detected and output);</div> <div>X2: Angle compensation (default is 0x00): Angle compensation between the center of the radar beam axis and the moving target (car). If 0x0a is set , the compensation angle is 10 degrees.</div> <div>X3: Sensitivity (default is 0x05): The setting range is 0x01~0x0f. The smaller the sensitivity value, the higher the sensitivity, the farther the detection distance (poor anti-interference). The larger the sensitivity value, the lower the sensitivity, the closer the detection distance (strong anti-interference). ;</div> <div>X4: Coming and going target detection (default is 0x00): 0x00 means detection output for both coming and going targets; 0X01 means only coming target detection output; 0X02 means only going target detection output;</div> <div>: Output 11 frames per second;</div> <div>X6: Speed unit (default 0x00): 0x00 unit is kilometers/hour, 0x01 unit is miles/hour; 0x02 unit is meters/second;</div> <div>X7: Vibration anti-interference coefficient range: 0x00~0x70 (default is 0X00);</div> <div>X8: Photocoupler pull-in time: default value 00;</div> <div>X9: The minimum speed value for triggering the photoelectric coupler to close: the default value is 00;</div> <div>X0: Protocol mode (default is 0X01): 0X01 represents standard protocol mode, 0X02 represents customized protocol mode (Sichuan speed mode)</div>

6.4: Command setting example:



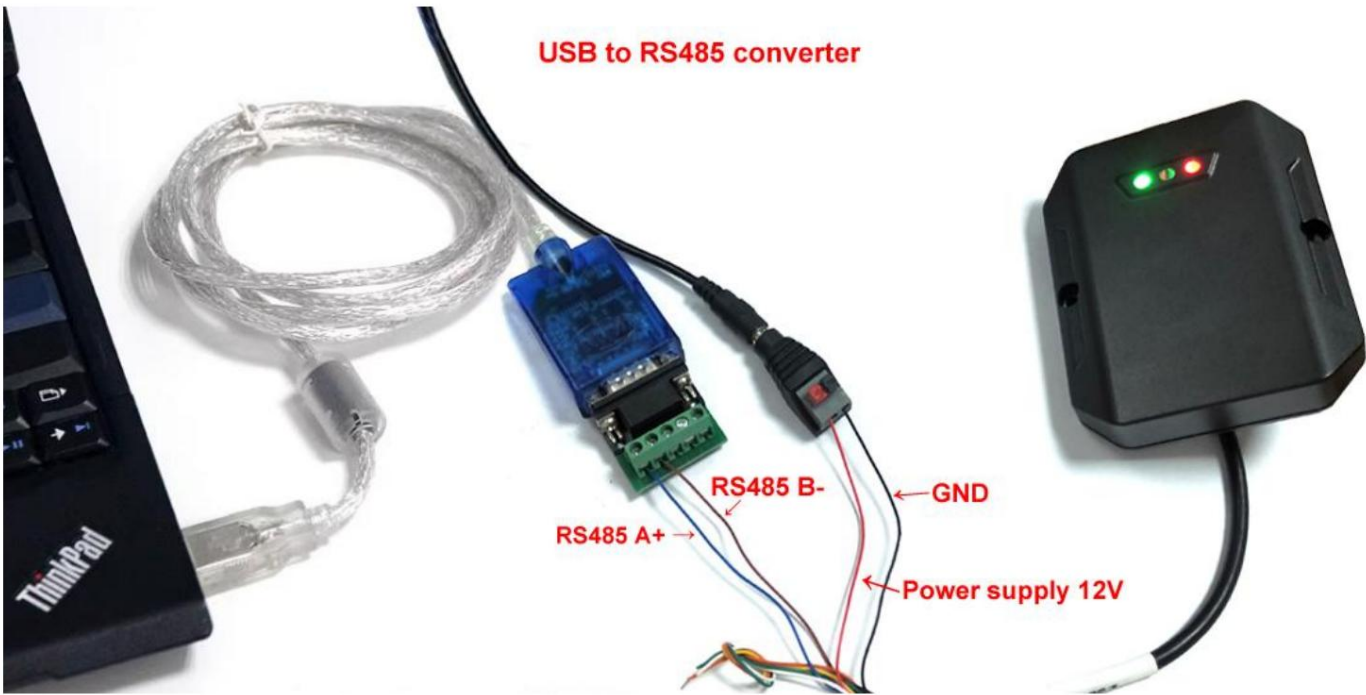
43 46 01 03 0a 05 0d 0a Command A Example: Minimum detection speed 3km/h, angle correction 10°, sensitivity 5. 43 46 02 01 02 00 0d 0a Command B Example: Only output incoming target detection, radar speed measurement data output about 5.5 frames per second.

The above are sample parameters. Please set the parameters according to the actual situation during installation. For example, if it is set to incoming speed, there is a speed trigger when going, and the radar sensitivity can be set. The default value is 0x05 and it is increased (the larger the value, the lower the sensitivity) until there is no abnormal speed value.

7. Description of radar-specific host computer

7.1: The radar needs to communicate with the computer through the RS485 USB switching tool. The positive and negative poles of the radar power supply need to be connected to 12V DC power supplies separately. Radar power on

After that, the red and green lights flash 3 times simultaneously, indicating that the power-on is successful.

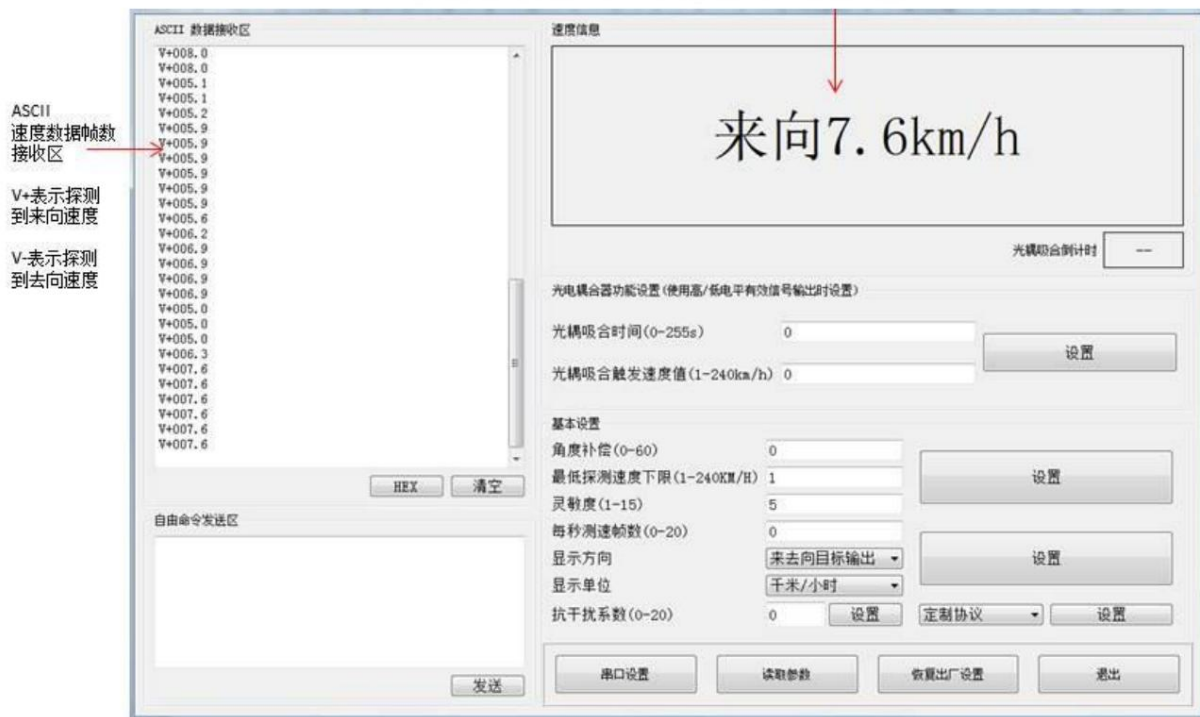


7.2: Host computer interface description





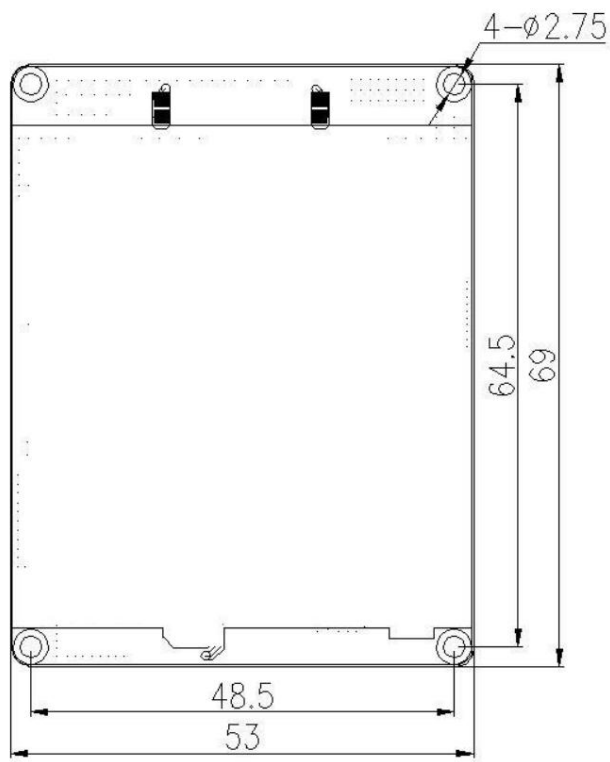
使用上位机时请先点击这里，会弹出如上红色框内容，
请选择正确端口、波特率9600，然后点击“Open”打开上位机



上位机正确打开，雷达也成功对接成功后，
即可开始使用该上位机进行调试设置参数

8. Product specifications

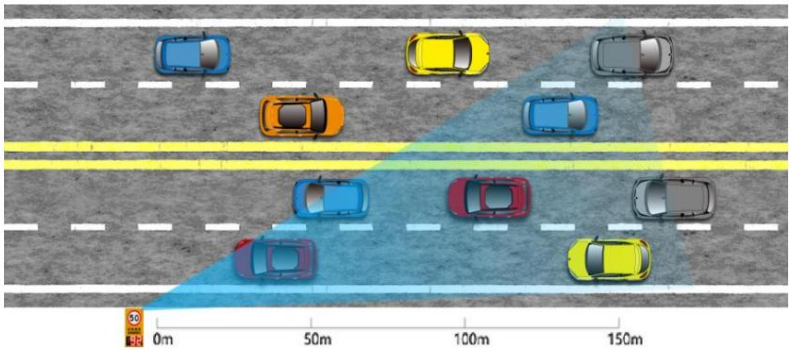
8.1: Module size

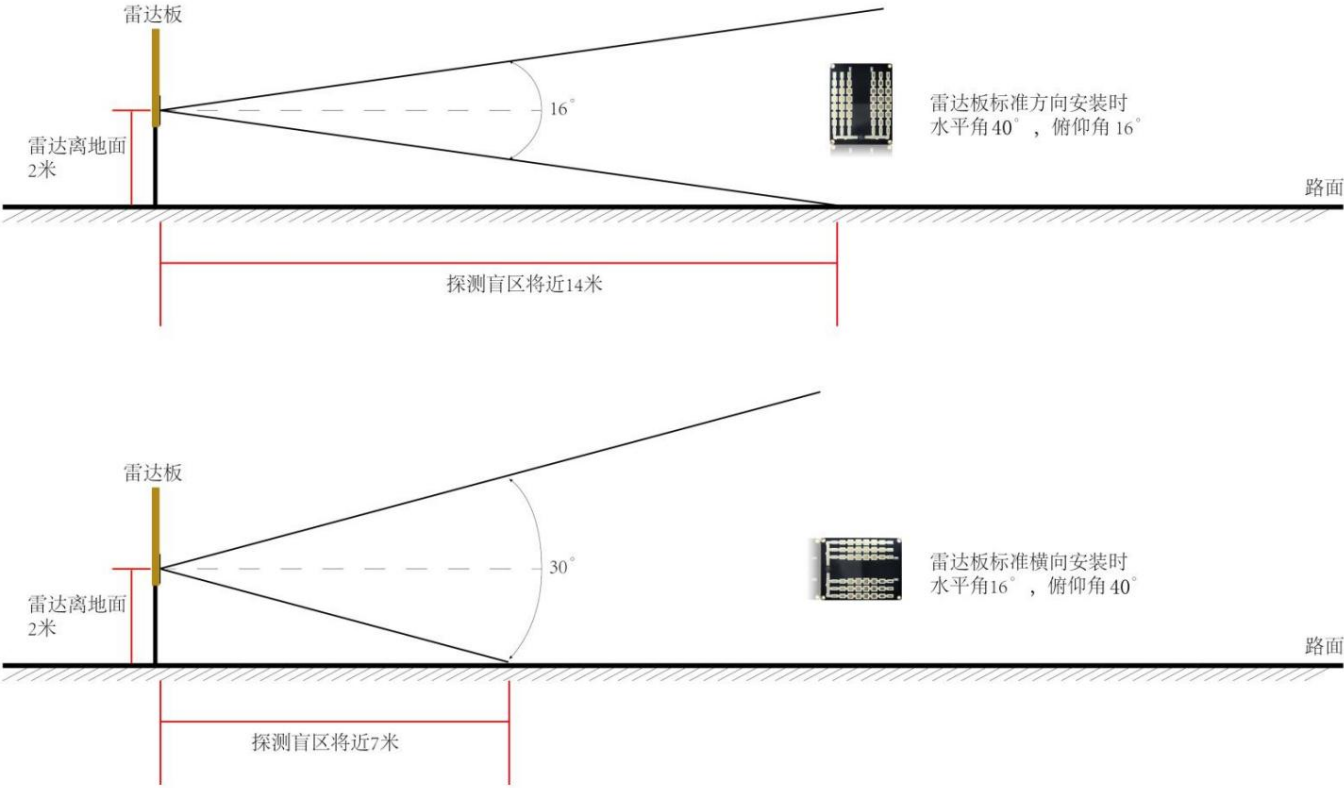


9. Installation instructions

9.1: Recommended application

scenarios: Install on the left or right side of the road according to the direction of road vehicles, as shown below, height: 1~2m; the recommended angle between the antenna emission surface and the road is less than 10°.





如上图示意：雷達安裝高度越低，則雷達探測盲区越小；雷達模塊安裝方向可根據實際需要選擇標準豎向或者橫向均可

Figure- Radar installation diagram

9.2: Other precautions: • This

radar only detects relatively moving targets within the detection area, and does not detect completely stationary targets. The output result is the speed of the nearest/fastest target in the detection area. • If there are

obstructions such as water and metal that have strong reflection of millimeter wave signals in the radar transmission direction, it will seriously affect the radar detection effect.

THANKS.