Shenzhen Launston Technology Co., Ltd.

PRODUCT MANUAL

RBT-5261

24 GHz Agricultural Harvester Obstacle-Avoidance Radar

农产品收割机避障雷达

24 GHz mmWave | Forward 50 m detection | Up to 32 targets | CAN bus | Broadband LFM | Infineon MMIC | IP67

Product Model: RBT-5261 | Version: V1.0 | Date: 2026.06

1. Product Overview

RBT-5261 is a 24 GHz mmWave radar that uses a broadband coded-LFM waveform and multi-channel reception to measure target distance, angle, and velocity with high accuracy, while simultaneously detecting and tracking up to 32 targets. It is purpose-built for forward collision warning and automatic obstacle avoidance of low-speed vehicles operating in relatively enclosed environments such as ports, scenic areas, and agricultural harvesting.

1.2 Core Features

- 24 GHz band with dynamic automatic frequency calibration for stable, reliable operation.
- Broadband coded-LFM + multi-channel reception for high target-identification accuracy.
- Tracks up to 32 targets; outputs multi-target info and minimum time-to-collision (TTC).
- Intelligent obstacle alert within 50 m forward; graded warning by distance / TTC.
- Based on Infineon highly-integrated 1Tx/2Rx MMIC RF chip with in-house RF front-end and signal processing.
- Standard CAN interface for easy ECU integration; data frame rate > 15 Hz.
- Validated by rigorous environmental tests and extensive real-road verification.

1.3 Application Scenarios

- Agricultural harvester obstacle avoidance (combine, grain, corn harvesters, etc.).
- Agricultural machinery driver-assistance systems.
- Low-speed port vehicles (forklifts, tractors, etc.).
- Scenic-area sightseeing and patrol vehicles.
- Enclosed-road vehicles in industrial parks and mining areas.
- Delivery robots and low-speed autonomous vehicles.

2. System Design

2.1 System Architecture

RBT-5261 uses a highly-integrated Infineon 1Tx/2Rx MMIC RF chip combined with advanced signal processing to perform target detection, tracking, recognition, and intelligent alerting. The architecture comprises:

- RF front-end MMIC: 1Tx/2Rx, 24 GHz band.
- 4-channel data acquisition (LNA + I/Q signals).
- Data processing unit: target detection, tracking, and recognition algorithms.
- Interface circuit: standard CAN interface to the ECU.
- Control / target information output.

2.2 Mechanical Structure

Item	Parameter
RF front-end PCB size	70 × 70 mm
Acquisition & processing PCB size	70 × 70 mm
Single PCB weight	≈ 100 g
Radar head max dimension	104 mm

Thickness	24.5 mm
Rear mounting holes	4 × M2.5 threaded holes
Total assembly screws	9
Electrical interface	8-pin waterproof connector (incl. 1 address line)

2.3 Interface Definition

The radar uses an 8-pin waterproof connector; pin 5 is the address line used for multi-radar networking identification. Detailed pin definitions should be used together with the physical connector diagram.

3. Data Output & Metrics

3.1 CAN Bus Parameters

Parameter	Specification
CAN baud rate	250 kbps
Frame format	Extended frame
Data frame ID (negotiable)	0x1555AA00
Fault-code frame ID (negotiable)	0x1555AA01
Data refresh rate	> 15 frames/s
Max targets per frame	8
Fault-code refresh rate	1 frame/s

3.2 Data Frame Format

When the radar detects N targets (N < 8) it uploads them as multi-packet data: 8 bytes per packet, one target per packet.

Byte	Field	Range	Description
Data[0]	Frame header	0xAA	Fixed frame-header identifier
Data[1]	Sensor ID	0–15	Multi-radar networking address
Data[2]	PRF counter	0–255	Circular frame counter
Data[3]	Range code	0–199 (200–254 reserved, 0xFF invalid)	Resolution 0.2 m, range 0–40 m
Data[4]	Azimuth code	-60° ~ +60° (MSB = sign)	Resolution 0.5°
Data[5]	Speed code	value × 0.5 m/s	Relative speed; + = approaching, - = receding
Data[6]	Reserved	-	Reserved
Data[7]	Reserved	-	Reserved

3.3 Encoding Examples

- Range code 0x06 → actual distance = 0x06 × 0.2 m = 1.2 m.
- Azimuth code 0x06 → 6° left of normal; 0x86 → 6° right of normal.
- Speed code 0x06 → approaching, relative speed = 0x06 × 0.5 m/s = 3 m/s.

- Speed code 0x86 → receding, relative speed = -3 m/s.

3.4 Fault-Code Protocol

The fault-code packet has the same 8-byte structure as the data frame at 1 frame/s. Each bit of Data[2] and Data[3] represents one fault (0 = normal). The detailed fault-code table is reserved and provided by the manufacturer.

4. Antenna Pattern

4.1 Angle Measurement

The radar uses the boresight (0°) as reference, dividing the forward detection zone into two quadrants: negative-angle zone -60°~0° (left of normal) and positive-angle zone 0°~+60° (right of normal). The MSB of the azimuth code indicates the sign; the remaining bits indicate the absolute value.

4.2 Coverage

Coverage	Beam width (-6 dB)
Horizontal coverage	±35° (-6 dB)
Vertical coverage	±9° (-6 dB)

5. Technical Parameters

Category	Parameter	Min	Typ	Max	Unit
System	Tx frequency	24.0	24.2	-	GHz
System	Tx power	-	15	-	dBmW
System	Update rate	>15	-	-	Hz
System	Power @12V DC / 25°C	1.6	1.8	2.0	W
Ranging/ Speed/Angle	Range — vehicle	-	0.5	50	m
Ranging/ Speed/Angle	Range — pedestrian	-	0.5	30	m
Ranging/ Speed/Angle	Range accuracy	-	-	0.5	m
Ranging/ Speed/Angle	Speed	-20	-	20	m/s
Ranging/ Speed/Angle	Speed accuracy	-	-	1	m/s
Ranging/ Speed/Angle	Angle range	-35	-	35	°
Ranging/ Speed/Angle	Angle accuracy	-	-	1	°
Antenna	Horizontal coverage (-6 dB)	-	-	70	°
Antenna	Vertical coverage (-6	-	-	18	°

	dB)				
Other	Operating voltage	8	12	30	V
Other	Ingress protection	-	IP67	-	-
Other	Storage temperature	-50	-	95	°C
Other	Operating temperature	-40	-	85	°C

6. Usage Notes

- Power: operating voltage 8–30 V, typical 12 V. Use a stable DC supply with proper filtering.
- Mounting: 4 × M2.5 threaded holes on the rear for fixation; 9 screws for full assembly. Ensure the waterproof connector is reliably mated.
- Interface protection: tighten the 8-pin waterproof connector fully to maintain IP67 and prevent moisture ingress.
- Multi-radar networking: configure the sensor ID (0–15) via pin-5 address line; keep IDs unique to avoid conflicts.
- CAN integration: 250 kbps, extended-frame format. Confirm baud/frame format before connecting to the vehicle bus; use a protocol-conversion module if needed.
- Product integrity: the radar is a precision instrument; do not disassemble (disassembly voids sealing and warranty).

Figures / Illustrations

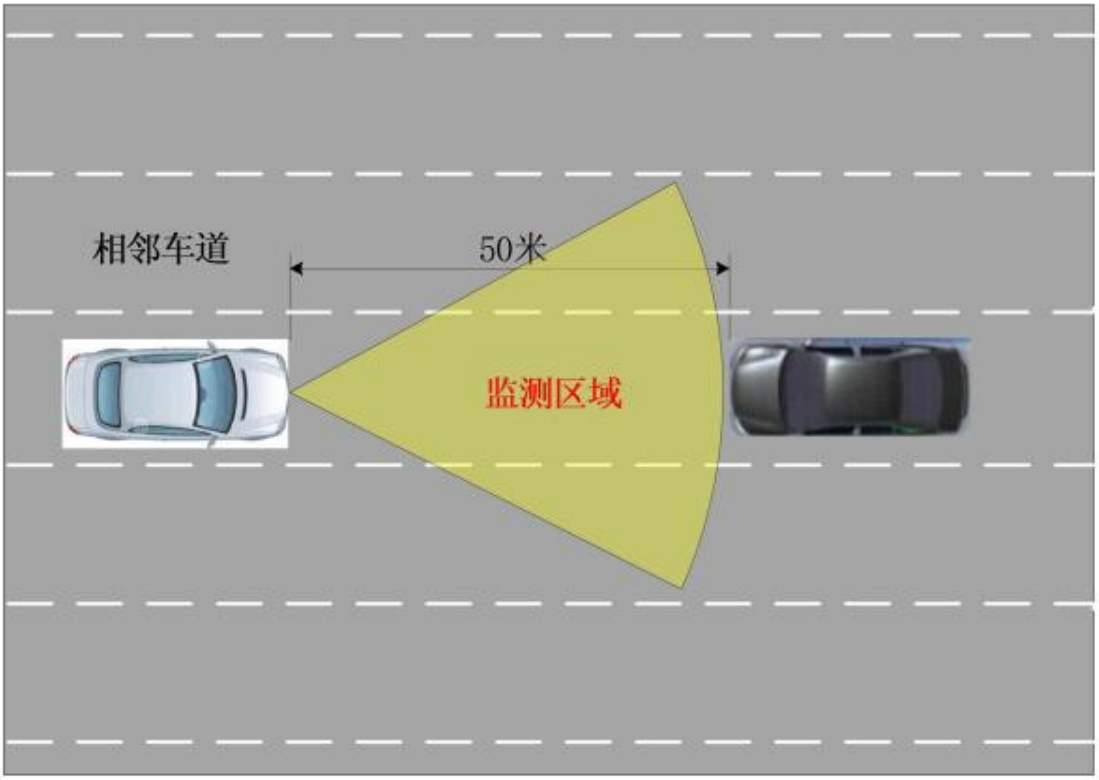

Figure 1 — original illustration from the Chinese manual (replace/remove as needed)

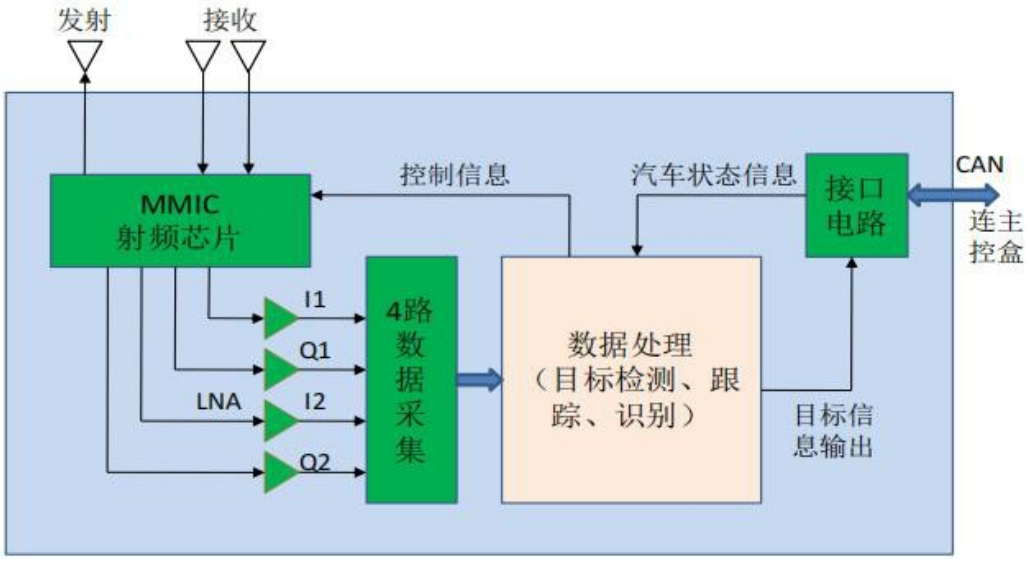

Figure 2 — original illustration from the Chinese manual (replace/remove as needed)

Figure 3 — original illustration from the Chinese manual (replace/remove as needed)

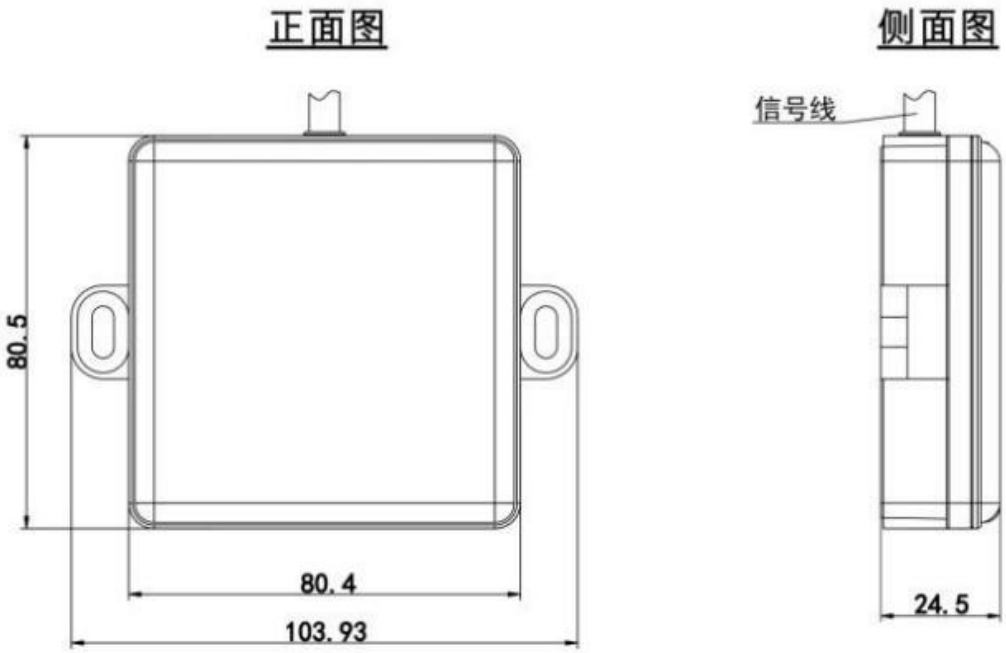

Figure 4 — original illustration from the Chinese manual (replace/remove as needed)

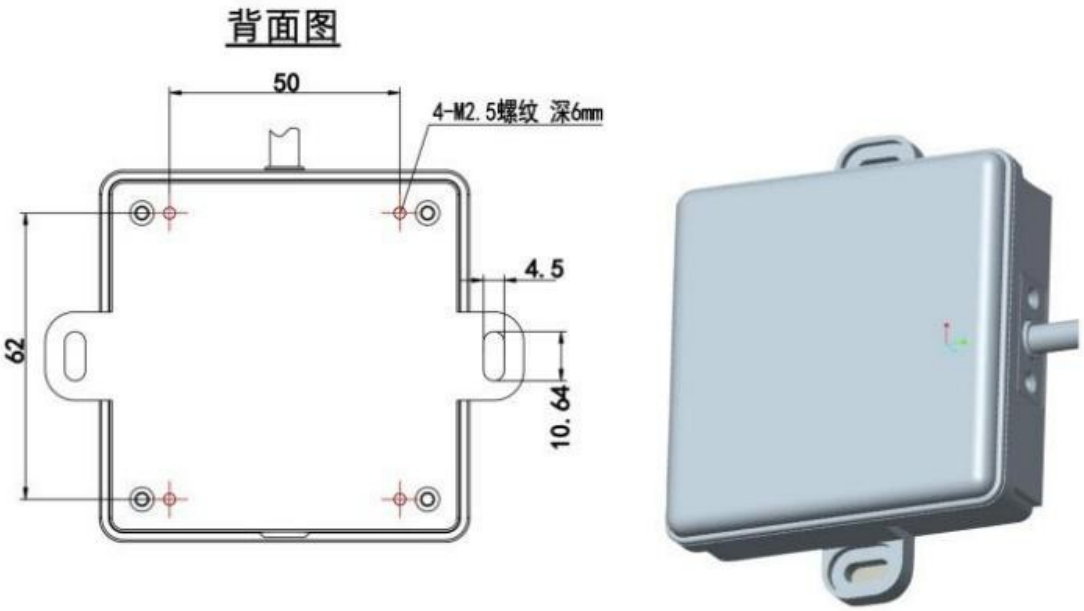

Figure 5 — original illustration from the Chinese manual (replace/remove as needed)

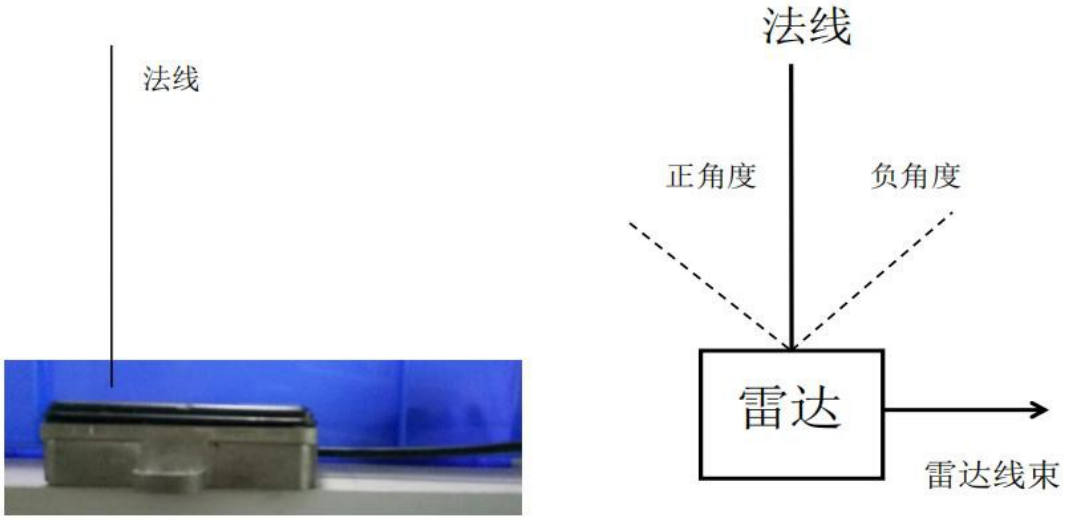

Figure 6 — original illustration from the Chinese manual (replace/remove as needed)

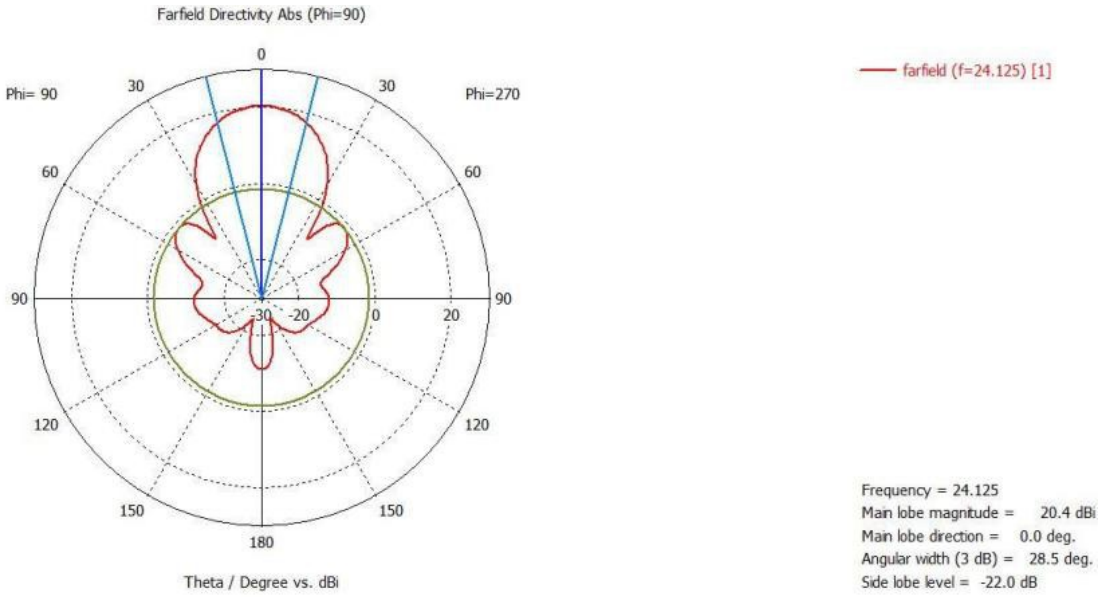

图 6 雷达水平方向方向图

Figure 7 — original illustration from the Chinese manual (replace/remove as needed)

Contact

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深圳朗斯顿科技有限公司

RBT-5261

农产品收割机避障雷达

—— 技术手册 ——

24GHz 毫米波雷达 | 适用于港口 / 景区 / 收割机 / 低速作业车

前向 50m 探测 | 多目标跟踪（最多 32 个）| CAN 总线通信

宽带 LFM 体制 | 高集成度英飞凌 MMIC 芯片 | IP67 防护

智能农业装备核心感知方案提供商

目 录

一、产品概述

1.1 产品简介

RBT-5261 是一款 24GHz 毫米波雷达，采用宽带编码 LFM 体制和多通道接收技术，能够高精度测量目标的距离、角度、速度信息，并可同时探测跟踪最多 32 个目标。该雷达特别适合港口、景区、农业收割等相对封闭环境下低速运行车辆的前向碰撞预警与自动避障。

1.2 核心特点

- 24GHz 工作频段，动态自动频率校准，工作稳定可靠
- 采用宽带编码 LFM 体制 + 多通道接收，目标识别精度高
- 支持同时跟踪 32 个目标，可输出多目标信息及最小碰撞时间
- 前向 50m 范围内障碍物智能告警，依据距离碰撞时间（TTC）分级预警
- 基于英飞凌高集成度 1 发 2 收 MMIC 射频芯片，自主开发射频前端与信号处理
- 标准 CAN 接口，对接行车电脑方便，输出数据帧率 > 15 帧/秒
- 系统经过严格环境测试和大量实际道路验证，稳定可靠

1.3 应用场景

RBT-5261 适用于以下典型场景：

- 农产品收割机避障（联合收割机、谷物收割机、玉米收割机等）
- 农机辅助驾驶系统
- 港口低速作业车辆（叉车、牵引车等）
- 景区观光车、巡逻车
- 工业园区、矿区的封闭道路车辆
- 无人配送车、自动驾驶低速车辆

二、系统设计

2.1 系统架构

RBT-5261 雷达采用高集成度英飞凌 1 发 2 收 MMIC 射频芯片，搭配先进的信号处理技术实现目标检测、跟踪、识别与智能告警。系统整体架构包含：

- 射频前端 MMIC：1 发 2 收，24GHz 频段
- 4 路数据采集（LNA + I/Q 信号）
- 数据处理单元：目标检测、跟踪、识别算法
- 接口电路：标准 CAN 接口，对接行车电脑
- 控制信息 / 目标信息输出

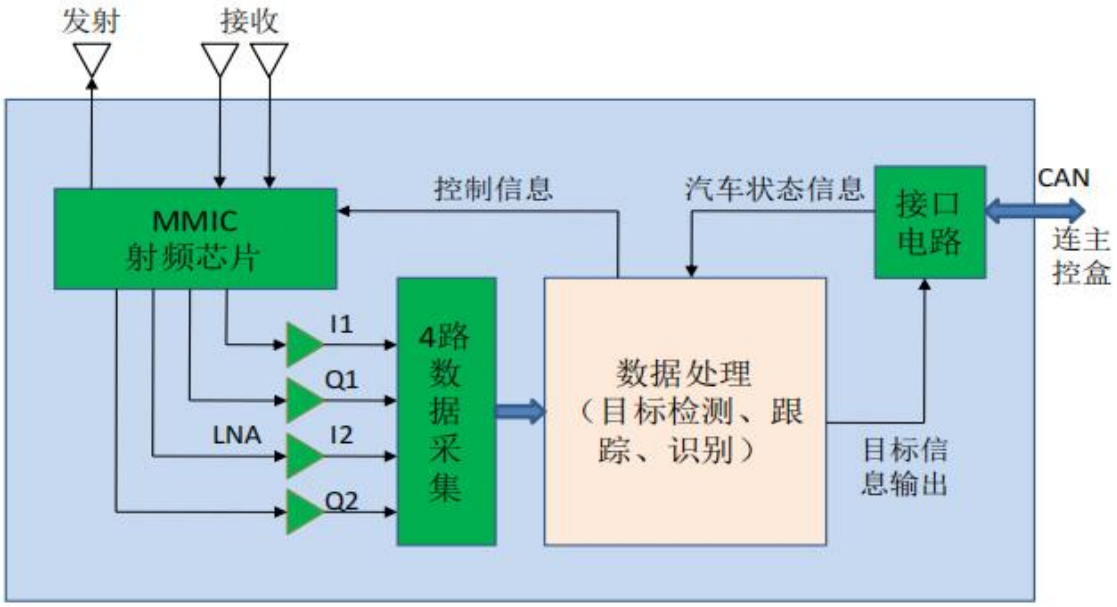
2.2 机械结构

雷达射频前端 PCB 板与信号采集处理 PCB 板尺寸均为 70mm × 70mm，单个重量约 100g，使用 9 颗螺丝固定。

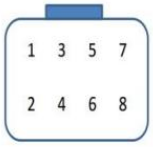
结构项	参数
射频前端 PCB 尺寸	70 mm × 70 mm
信号采集处理 PCB 尺寸	70 mm × 70 mm
单个 PCB 重量	约 100 g
雷达头最大尺寸	104 mm
厚度	24.5 mm
背面固定孔位	4 × M2.5 螺纹螺孔
整机固定螺丝	9 颗
电气接口	8 芯防水接头（含 1 根地址线）

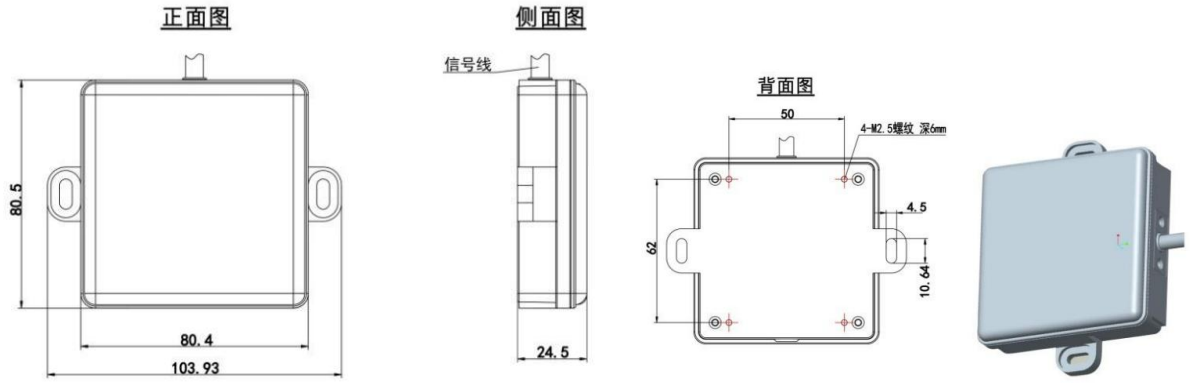
2.3 接口定义

雷达采用 8 芯防水接头设计，其中 5 号针脚为地址线（用于多雷达组网识别）。详细接口定义需配合实物接口图与针脚定义表使用。



线束上针脚定义
1: CAN-H
2: CAN-L
3: GND
4: VCC
5: ID0
6: ID1
7: ID2
8: ID3





三、数据输出与指标

3.1 CAN 总线参数

参数项	技术指标
CAN 波特率	250 Kbps
帧格式	扩展帧（Extended Frame）
数据帧 ID（可商定）	0x1555AA00
故障码帧 ID（可商定）	0x1555AA01
数据刷新率	> 15 帧/秒
单帧最大目标数	8 个
故障码刷新率	1 帧/秒

3.2 数据帧格式

当雷达检测到 N 个目标（N < 8）时，会以多包数据形式上传，每包 8 字节，每包对应一个目标的信息。

字节	字段名称	取值范围	说明
Data[0]	帧头	0xAA	固定帧头标识
Data[1]	传感器 ID	0 ~ 15	多雷达组网地址
Data[2]	PRF 计数	0 ~ 255	对帧数循环计数
Data[3]	距离编码	0 ~ 199（200-254 保留，FF=无效）	分辨率 0.2m，量程 0~40m
Data[4]	方位编码	-60° ~ +60°（最高位表示正负）	分辨率 0.5°

Data[5]	速度编码	编码值×0.5m/s	相对速度，正值=靠近，负值=远离
Data[6]	备用	-	保留字段
Data[7]	备用	-	保留字段

3.3 编码示例

为方便理解编码含义，举例如下：

- 距离编码 0x06 → 实际距离 = 0x06 × 0.2m = 1.2m
- 方位编码 0x06 → 目标偏离法线左侧 6°；0x86 → 偏离法线右侧 6°
- 速度编码 0x06 → 目标靠近，相对速度 = 0x06 × 0.5m/s = 3 m/s
- 速度编码 0x86 → 目标远离，相对速度 = -3 m/s

3.4 故障码协议

故障码数据包与数据帧结构类似，每包 8 字节，刷新率 1 帧/秒。Data[2] 和 Data[3] 每位表示一种故障，0=正常。具体故障编码表为预留字段，可由厂家提供。

四、雷达天线方向图

4.1 测角方向说明

雷达以法线方向为基准（0°），将前向探测区域分为正负角度两个象限：

- 负角度区：法线左侧 -60° ~ 0°
- 正角度区：法线右侧 0° ~ +60°
- 方位编码最高位表示角度正负，剩余位表示角度绝对值

4.2 覆盖范围

雷达水平方向与垂直方向覆盖范围以 -6dB 波束宽度定义：

覆盖方向	波束宽度（-6dB）
水平覆盖	±35°（-6dB）
垂直覆盖	±9°（-6dB）

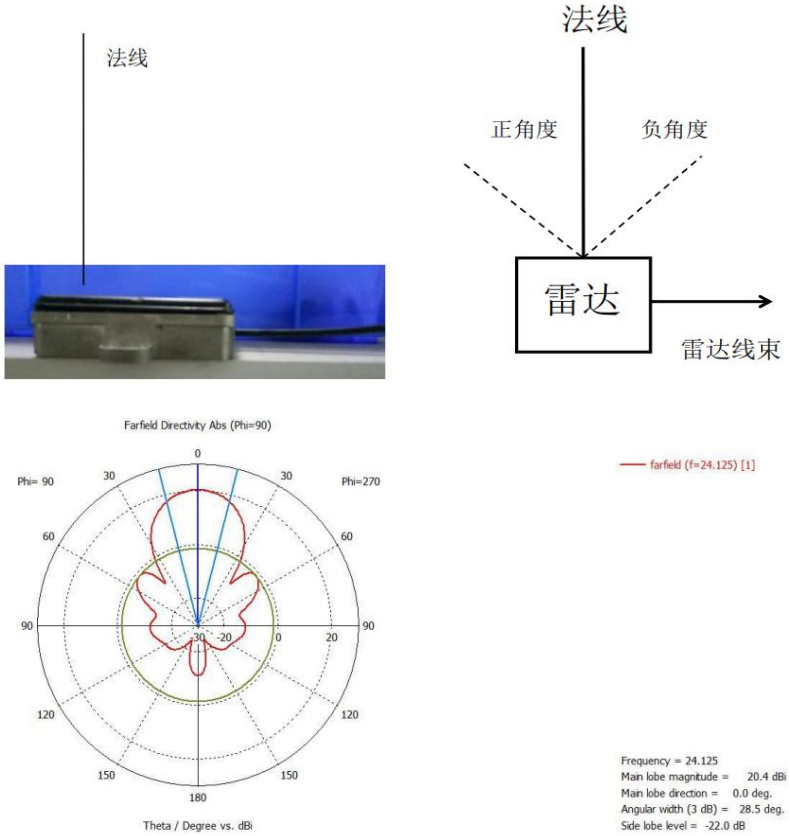


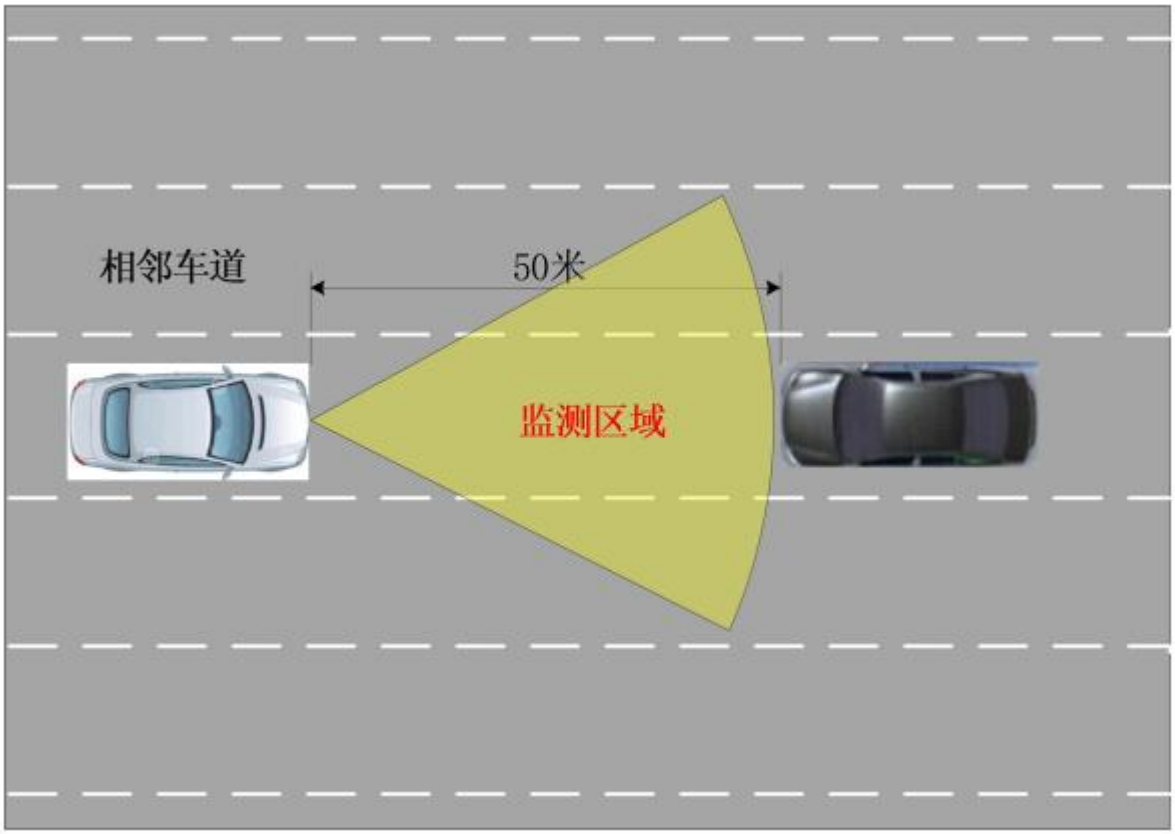
图 6 雷达水平方向方向图

五、雷达技术参数

RBT-5261 完整技术规格参数如下：

类别	参数	条件	最小值	典型值	最大值	单位
系统参数	发送频率	-	24.0	24.2	-	GHz
系统参数	发射功率	-	-	15	-	dBmW
系统参数	更新频率	-	>15	-	-	Hz
系统参数	功耗	@12VDC/25℃	1.6	1.8	2.0	W
测距/测速/测角	测距 — 乘用车辆	-	0.5	40	50	m
测距/测速/测角	测距 — 行人	-	0.5	20	30	m
测距/测速/测角	距离精度	-	-	-	0.5	m
测距/测速/测角	测速	-	-20	-	20	m/s
测距/测速/测角	测速精度	-	-	-	1	m/s
测距/测速/测角	测角范围	-	-35	-	35	°
测距/测速/测角	测角精度	-	-	-	1	°
测距/测速/测角						
测距/测速/测角						
测距/测速/测角						
天线特性	水平覆盖（-6dB）	-	-	70	-	°

天线特性	垂直覆盖（-6dB）	-	-	18	-	°
其他特性	工作电压	-	8	12	30	V
其他特性	防护等级	-	-	IP67	-	-
其他特性	存储温度	-	-50	-	95	℃
其他特性	工作温度	-	-40	-	85	℃



六、产品使用注意事项

⚠电源要求

工作电压范围为 8 ~ 30V，典型工作电压 12V。请使用稳定的直流电源供电，并做好电源滤波。

⚠安装方式

雷达背面有 4 个 M2.5 螺纹螺孔，可作为固定用孔，整机通过 9 颗螺丝装配。安装时确保防水接头与线束连接可靠。

⚠接口防护

8 芯防水接头需拧紧到位，确保 IP67 防护等级有效，避免水汽进入导致故障。

⚠多雷达组网

通过 5 号针脚地址线配置传感器 ID（0 ~ 15），避免多雷达同 ID 冲突。多台雷达协同工作时需保证地址唯一。

⚠CAN 协议对接

CAN 波特率 250Kbps，使用扩展帧格式。接入车辆总线前请确认波特率与帧格式一致，必要时使用协议转换模块。

⚠产品完整性

雷达属于精密仪器，切勿自行拆装（拆装将导致密封失效及保修失效）。