Shenzhen Hi-Link Electronic Co., Ltd

HLK- LD2451

Vehicle Status Detection Module

User Manual

Contents

1 Product Profile

HLK-LD2451 is a high sensitivity 24GHz mobile vehicle status sensing module developed by Hi-Link Electronics. Its working principle is to use FMCW FM continuous wave to detect the target within the detection range, combined with radar signal processing, accurate algorithm recognition, to realize high sensitivity vehicle status detection, which can identify the vehicles close or far away, and calculate the output of the target's speed, angle, distance and other auxiliary information.

This product is mainly used in outdoor scenes, sensing whether there is a vehicle close to or far away from the area, real-time output detection results, the longest sensing distance up to 100m. The longest sensing distance can be up to 100 m. Mobile software is provided to easily configure parameters such as sensing distance, speed, target direction and sensitivity to meet different application requirements.

Support GPIO and UART output, plug and play, can be flexibly applied to different intelligent scenes and terminal products.

2 Product Characteristics

- Plug and play, easy assembly method

- Sensing distance up to 100m

- Multi-level intelligent parameterization to meet the needs of scene changes

- Mobile debugging and configuration tools

- Configurable detection distance (10-100m freely adjustable)

- Wide detection angle covering up to 3 lanes of traffic

- 24GHz ISM band, FCC and CE spectrum regulation certifiable

- The Ultimate Cost-Effective Choice

3 Application Scenarios

HLK-LD2451 vehicle sensing module can detect and recognize vehicles close to or far away from the vehicle, supports multi-level parameterization, and can be widely used in various intelligent products and terminal products, commonly used types are as follows

- Highway intersection

  Installed at highway intersections, it senses the direction of vehicles traveling on the highway as close or far away, speed, distance, etc.

- Non-motorized road

Detecting the blind spot in the rear field of vision, avoiding a car accident caused by a vehicle approaching from behind and changing lanes suddenly
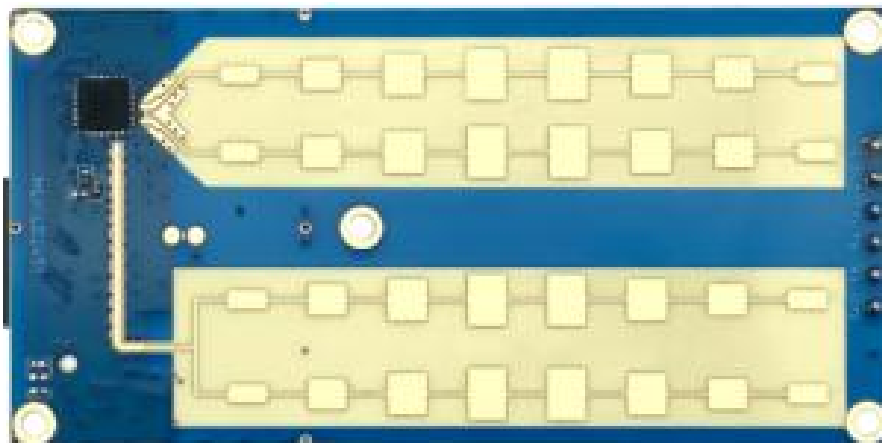
● Motorway

Detecting distant vehicles behind, assisting the driver to determine the trajectory of the vehicle behind them
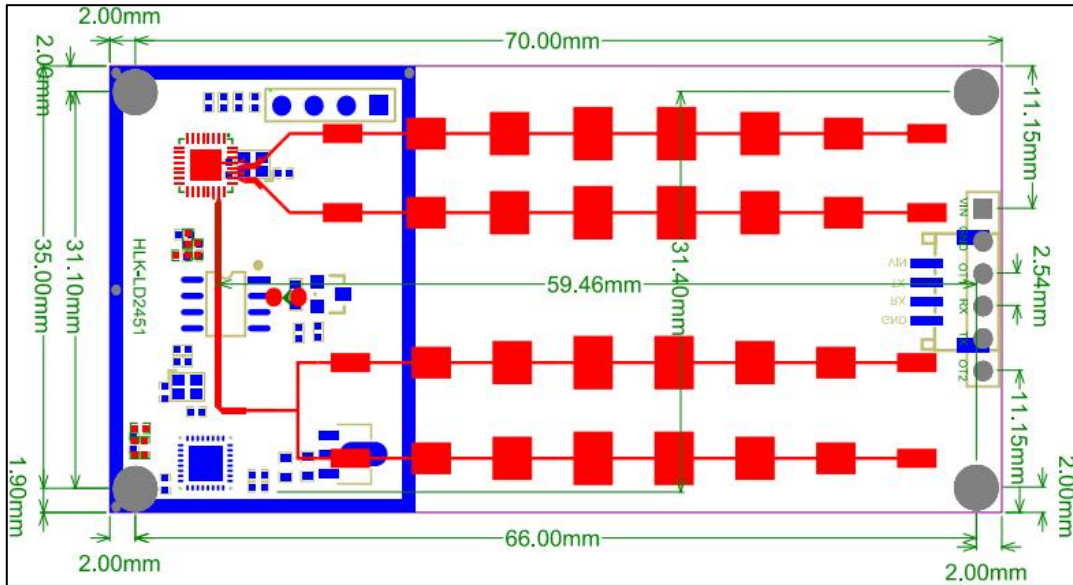
● Smart Scene

Sensing the approach of vehicles, automatic control of road gates, garage doors and other scenes automatically opened or closed

4 Hardware Description
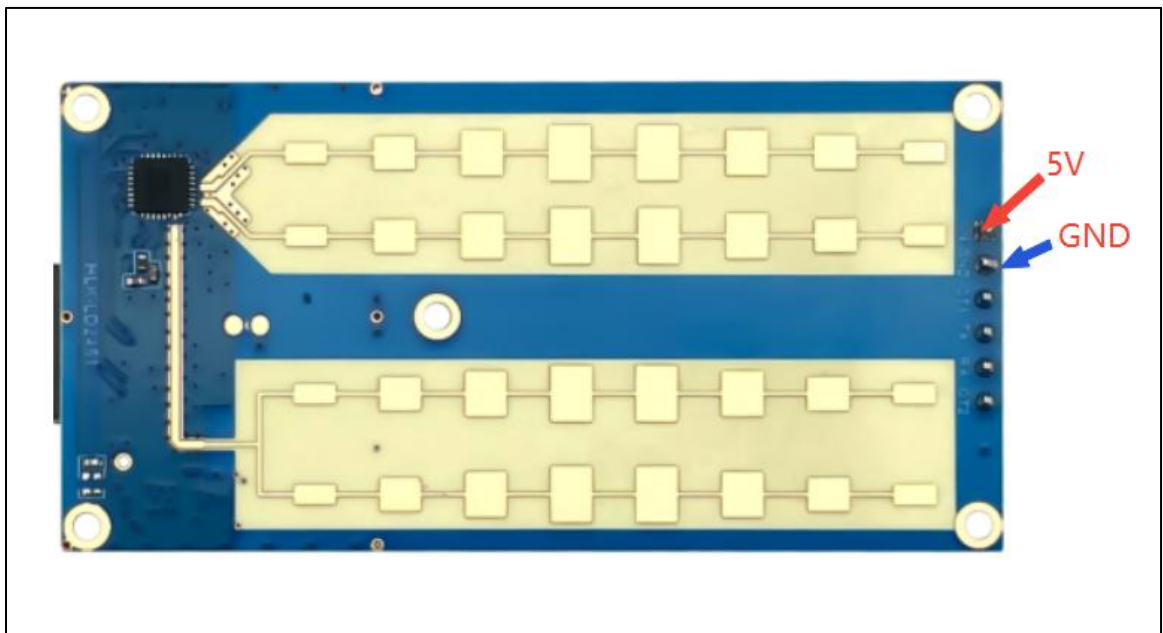
4.1 External dimensions

Module Physical Picture

Module Dimension Drawing

Module size size: 70mm x 35mm

Pin hole spacing: 2.54mm

4.2 Pin Definitions

Pin Number	notation	name (of a thing)	functionality
1	VIN	Power Input	Power supply input 5V
2	GND	POWER GROUND	POWER GROUND
3	OT1	GPIO1	Indicator pin, 3 consecutive high and low outputs on first startup Outputs high level when a person is detected approaching
4	TX	Serial TX	Serial TX Pin
5	RX	Serial port RX	Serial RX Pin
6	OT2	GPIO2	Temporarily unavailable

5 Utilization and configuration

5.1 Typical Application Circuit

LD2451 module mainly through the serial port in accordance with the prescribed protocol for the detection of the results of the data output, the serial port output data contains a target of the alarm information (with or without the target close) angle, distance, speed direction (close or far away) and other information, but also through the bluetooth to accept the results of the detection of the data, the contents of the serial port part of the output and the same. Users can use it flexibly according to specific application scenarios.

The module supply voltage is 5V, and the palace capacity of the input power supply is required to be more than 300mA.

The module IO output level is 3.3V, the default baud rate of the serial port is 115200, 1 stop bit, no parity bit.

5.2 Role of configuration parameters

Users can modify the configuration parameters to the module through the serial port of LD2451 or Bluetooth to adapt to different application requirements, and the configuration content will not be lost after power-down.

Configurable parameters include the following:

Maximum detection distance

Set the farthest detection distance, only targets appearing within this farthest distance will be detected and the result will be output.

Setting range 0~100m

Inspection Direction

Configurable to detect only targets that are near or far and near and far.

Set to close and only output the target when the vehicle traveling in the same direction approaches and meets certain conditions, set to far away and only output the target when the opposite vehicle or the surrounding environment enters the radar detection range, close and far away regardless of whether the vehicle in the same direction or in the opposite direction enters the detection range will be outputting the detected target information.

Detection speed

The detected target speed is greater than the set detection speed before it will be judged as having a target, otherwise it is ignored

Detecting speed can be set range 0~120km/h

Detection delay

Alarm delay time after radar detects a target approaching, range 1~30s, e.g. if the time is set to 5s, if the radar detects a target approaching, it will output a delayed alarm message of 5s, and if the radar detects a target approaching again within this time period, it will refresh this time.

Sensitivity

This parameter has two sub-parameters, cumulative trigger count and signal-to-noise ratio threshold. Both word parameters can be set independently, the trigger count parameter setting range is 1~10, and the signal-to-noise ratio parameter setting range is 1~255.

If the Trigger Count is set to 3, the detected target is triggered 3 times consecutively before the detection information of the target is reported.

The signal-to-noise ratio parameter determines the detection sensitivity of the radar, the lower the value of the detection sensitivity the higher the trigger is more sensitive, the higher the value of the detection sensitivity the lower the trigger is more difficult (the default value is 4, no special circumstances this parameter is not recommended to modify)

5.3 Description of the mobile app tool

In order to facilitate users to quickly and efficiently test and configure the module, to provide mobile APP configuration and detection tools, users can use this tool software link module Bluetooth, the module for parameter configuration, reading, but also can receive the module to report the detection results of the data, real-time display of the detection of the target's information, greatly facilitating the use of the user.

Download Address:

Android APP download link: https://www.pgyer.com/Lq8p

IOS APP: Search for: **HLKRadarTool** in the App Store App Store

APP Usage:

1. After powering up the module normally, it will send out a Bluetooth with the name "LD2451_XXXX";

2. After opening the APP to enable the corresponding permissions, click Connect Module Bluetooth;

3. The detected target data information will be displayed to this interface as well as the corresponding protocol data after successful connection;

4. Click on the upper right corner of the settings interface to enter the parameter setting interface, the parameters that can be set and the role of the above "configuration parameters role".

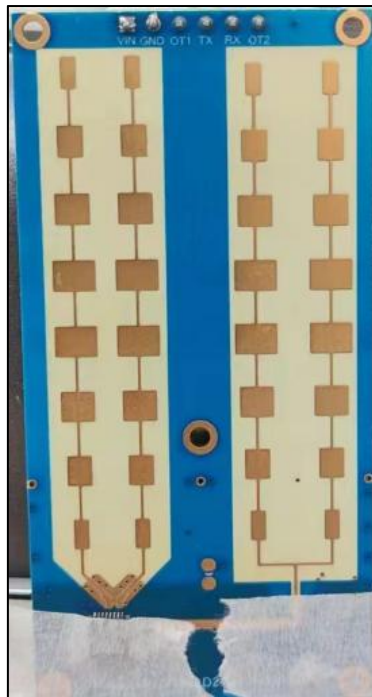**The APP detection data information is shown below:**
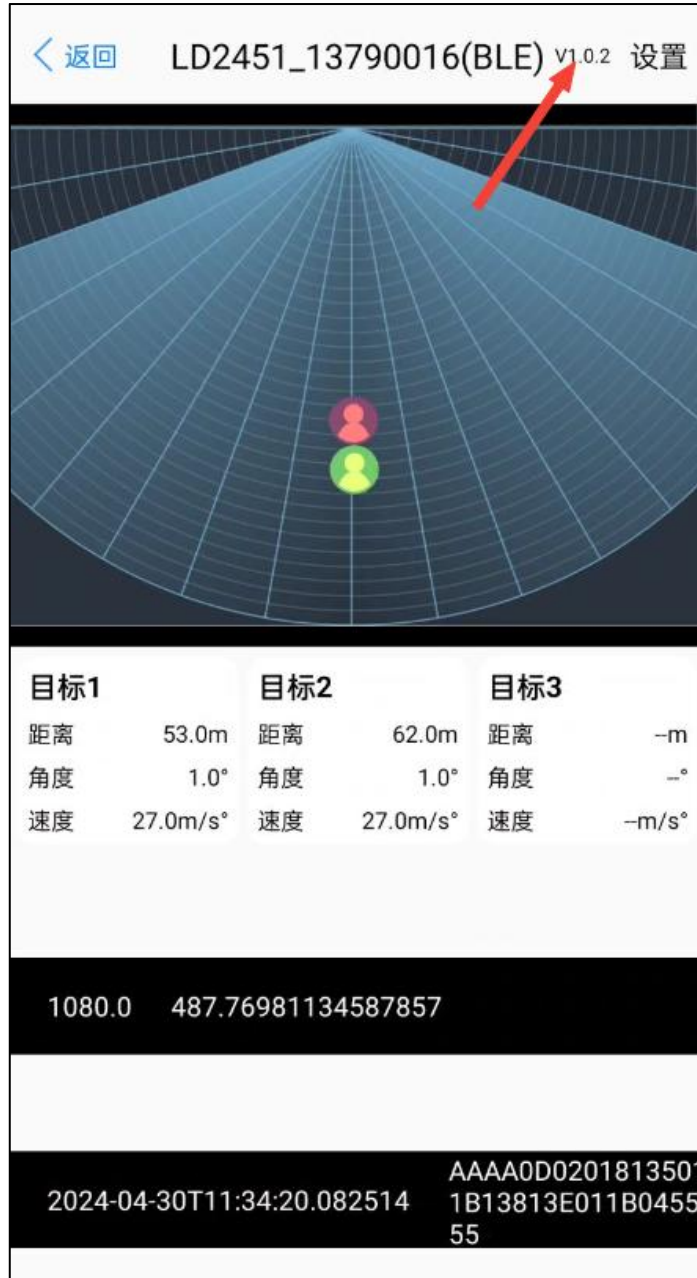
Parameter setting interface:

5.4 Installation Schematic and Mounting Orientation

Installation Placement:

5.5 Installation conditions

Verify minimum mounting clearance

If the radar is to be fitted with an enclosure, the enclosure must have good wave-transmission characteristics at 24 GHz and must not contain metallic materials or materials that are shielding against electromagnetic waves.

Precautions for installation

- Ensure that the radar antenna is facing the area to be detected as much as possible and that the area around the antenna is open and unobstructed.

- Ensure that the sensor is mounted in a firm and stable position, as shaking of the radar itself will affect the detection results.

- It is important to ensure that the back of the radar is not subject to object movement or vibration. Because radar waves are penetrating, the antenna signal back flap may detect moving objects on the back of the radar. A metal shield or metal backing plate can be used to shield the radar back flap and attenuate the effect caused by objects on the back of the radar.

6 Performance and electrical parameters

Operating frequency	24GHz~24.25GHz Complies with FCC, CE, No Commission certification standards
Power requirements	DC 5V, power supply capacity >300mA
Average operating current	107mA
Modulation method	FMCW
Connector	2 GPIOs, IO level 3.3V 1 UART
Target application	Outdoor vehicle target detection
Detection distance	Up to 100m
Detection angle	±20°
Sweep bandwidth	<200MHz Meets FCC, CE, and No Commission certification standards
Operating temperature	-40 ~85°C
Overall dimensions	70mm x 35mm
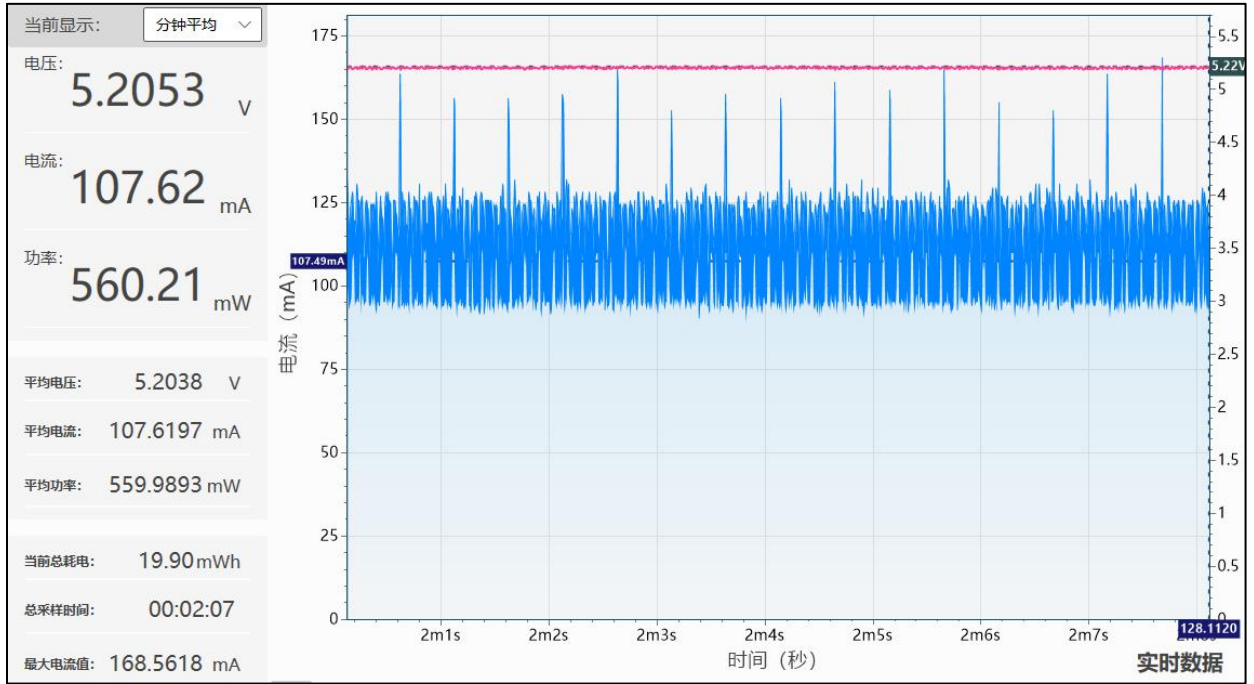
Measured module operating current

7 Revised records

Revision date	Releases	Content of the modification
2024-5-7	1.0	Initial version

8 Technical support and contacts

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