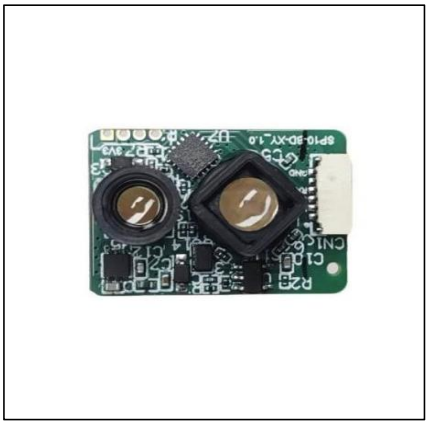
LRF22VB Single-Point LiDAR Based on DTOF Principle

200Hz Measuring Frequency / 20 meters Range / Outdoor Light Immunity 60Klux / High Cost-performance

Features

- Based on DTOF principle (Direct Time of Flight)
- Maximum Measuring Range：20m
- Measuring Blind Zone：5 cm
- Measuring Frequency：200Hz
- Accuracy：±5cm(<5m) , 1%(≥5m)
- Resolution：1mm
- Operating Temperature：-20℃ ~ +60℃
- Supply Voltage：3 ~ 3.6VDC
- Compact Size：21 x 15 x 7.43 mm
- Weight：1.5g
- Anti-ambient light：8m@60KLux



Applications

- Drone Altitude Holding and Obstacle Avoidance
- Robots Obstacle Avoidance
- Industrial Grade Light Curtain
- AGV Obstacle Avoidance
- Camera Focusing

1. Product Overview

The LRF22VB LiDAR sensor is our newly launched laser ranging product and is specially designed for applications such as drones, sweeping robots, and industrial robots. Based on the DTOF principle, it features a compact size, low cost, superior performance, and high resistance to ambient light interference. This product is easy to use, flexible to install, convenient for expansion, and extremely cost-effective.

2. Specifications

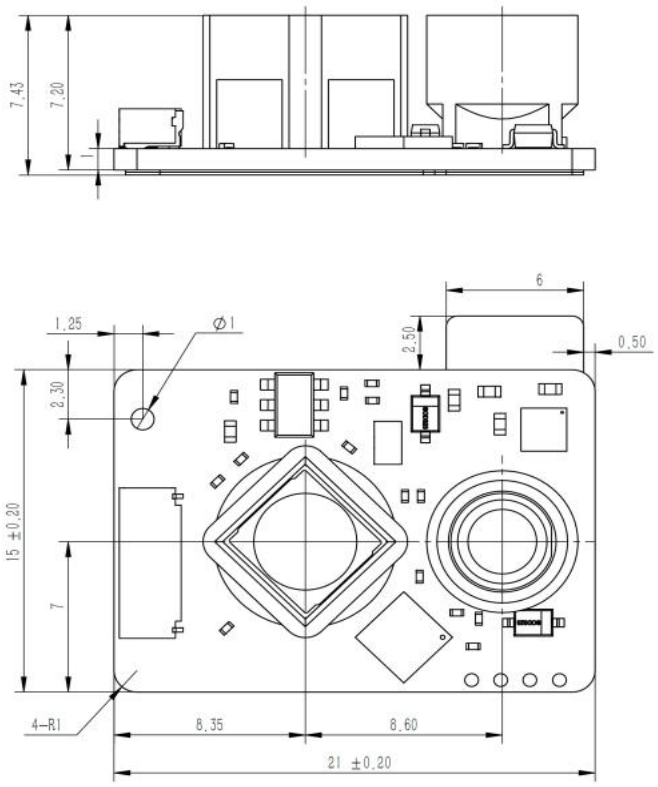
#	Model	**LRF22VB**
1	Range	0.05m ~ 20m (90%reflectivity), 0.05m ~ 10m (10%reflectivity)
2	Frequency	200Hz(Alternative100/50/20/10/1Hz)
3	Accuracy	±5cm (<5m) ,1% (≥5m)
4	Repeatability	±30mm
5	Ambient Light Immunity	8m@60KLux
6	Central Wavelength	905nm
7	Photobiological Safety	Class1
8	FOV	3°
9	Wavelength for Indication	N/A
10	Photobiological Safety for Indication	N/A
11	Supply Voltage	3 ~ 3.6VDC
12	Peak Current	3.3V@70mA
13	Average Current	3.3V@40mA
14	Average Power Consumption	<0.2W
15	Communication Interface	UART/IIC
16	Protection Level	N/A
17	Dimension	21x 15 x 7.43 mm
18	Weight	1.5g
19	Operating Temperature	-20℃ ~ +60℃
20	Wire Specification	6pin 0.8mm terminal, HC-0.8-6PWT with 20cm tinned stranded wires
21	Customization	available in appearance / structure / output protocol

(Note: 1. This parameter was measured at 25°C in an indoor environment. 2. This parameter was measured with a 90% reflector in an outdoor environment at 25°C.)

3. Definitions of Pins

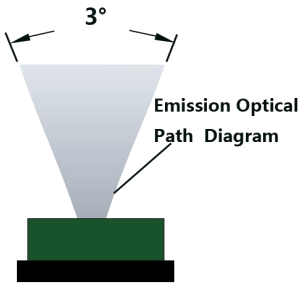
No.	Definition / Wire Color	User Interface
1	NC (White)	/
2	3.3V (Red)	External Power +
3	TX （SCL）(Yellow)	RX（SCL）
4	RX（SDA） (Green)	TX（SDA）
5	NC (Blue)	/
6	GND (Black)	External Power -

4. Dimensions



5. Measuring Characteristic

Because of the divergence angle, there would be a light spot with changing size on the target surface depending on the distance. In actual use, the surface area of the target object should be larger than the light spot so that the distance can be accurately measured.



The diameters of the light spot of LRF22VB in different distances are shown below:

Distance	1m	2m	5m	10m	20m
Diameter of the light spot	5cm	10cm	25cm	50cm	100cm

6. Communication Protocol: UART

6.1 Communication Interface

UART	
Baud Rate	460800 (adjustable)
Data Bit	8
Stop Bit	1
Parity Bit	N/A

6.2 Output Format

This product uses little-endian mode for both input and output in hexadecimal.

Output example:

4 Bytes Output

5C: Fixed frame header: 1 byte

02 11: Distance value 2 bytes means the measuring distance is 4354mm,little-endian, Range:0-20000,When out of range, its output is 20000.

EC: The checksum byte is calculated by summing all bytes from the second byte (02) to the second-last byte (11), then inverting the result.

6.3 UART Commands

#	Description	Send	Return	Note
1	Reading serial no.	5A 0D 04 0D 0D 0D 0D BA(checksum)	5A 8D 04 10 01 00 00 5D(checksum)	10 01 00 00 means the serial no. is 272: little-endian, the serial no. shown in the upper computer is: S0000000272(Add S before the number).
2	Reading software version no.	5A 16 02 16 16 BB(checksum)	5A 96 02 03 02 62(checksum)	03 02 means the software version no. is V2.3: little-endian, 02 represents 2, 03 represents 3, Add a point (.) in the middle.
3	Baud rate setting	5A 06 02 80 04 73(checksum)	5A 86 02 80 04 F3(checksum)	60 00 (9600) C0 00 (19200) 80 01 (38400) 80 04 (115200) 00 09 (230400) 00 0A (256000) 00 12 (460800) Any other baud rate is not available
4	Set Frequency	5A 0B 02 E7 03 08(checksum)	5A 8B 02 E7 03 88(checksum)	E7 03 (little-endian) represents the frequency divisor: 999. Output frequency: f=10000/(999+1)=10Hz. Supported frequencies: 200/100/50/20/10/1Hz.
5	Read Frequency	5A 1B 02 1B 1B AC(checksum)	5A 9B 02 31 00 31(checksum)	31 00 (little-endian) indicates the current divisor: 49. Output frequency: f=10000/(49+1)=200Hz. Supported frequencies: 200/100/50/20/10/1Hz
6	Switch to IIC	5A 1F 02 1F 1F A0(checksum)	5A 9F 02 1F 1F 20 (checksum)	5A 9F 02 1F 1F 20 Response confirms successful switch.
7	Stop Ranging	5A 0A 02 00 00 F3	5A 8A 02 00 00 73	Stops distance measurement.
8	Start Ranging	5A 0A 02 02 00 F1	5A 8A 02 02 00 71	5A 8A 02 02 00 71 Initiates distance measurement.

6.4 Checksum Function: All checksum bytes above are calculated using this function.

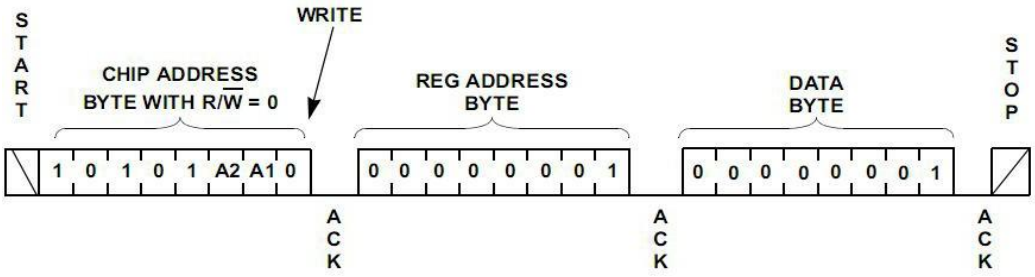
Begin with the second byte and end with the last second byte, find the inverse of the sum.

```
uint8_t Check_Sum(uint8_t *_pbuff, uint16_t _cmdLen)
{
        uint8_t cmd_sum=0;
        uint16_t i;
        for(i=0;i<_cmdLen;i++)
        {
                cmd_sum += _pbuff[i];
         }
         cmd_sum = (~cmd_sum);
         return  cmd_sum;
}
```

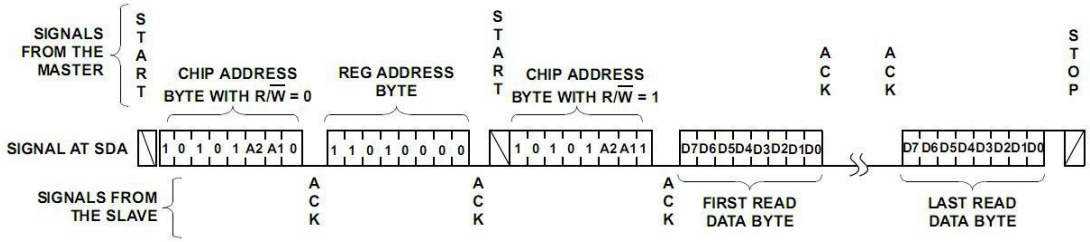
7. Communication Protocol: IIC

LRF22VB LiDAR IIC slave interface supports maximum clock frequency 400K. The default address is 0x52 (7bit address mode).

I2C single register write sequence is as follow:



I2C multiple registers read sequence is as follow:

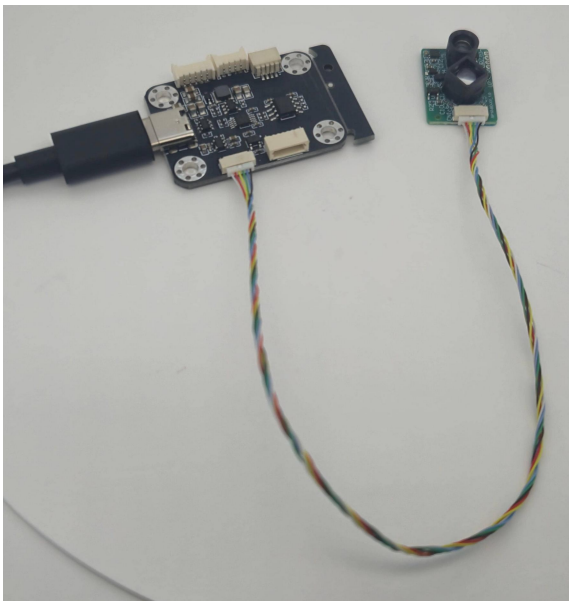


Definitions of registers

No.	Register address	Register definition	Attribute	Remarks
0	0x00	Distance-High byte	Read-only	2byte for distance
1	0x01	Distance-Low byte	Read-only	2byte for distance
3	0x02	Laser control	Write-only	0: laser off; 1: laser on
4	0x03	LiDAR ID	Read-only	default 0x4A, be used to communicate read&write tests
5	0x04	IIC to UART Switch	Write-only	Write 0xA5 to register 0x04 and 0x5A to register 0x05 simultaneously
6	0x05		Write-only	
7	0x06	Software Version - High Byte	Read-only	Software version is 2 bytes, high byte first, then low byte
8	0x07	Software Version - Low Byte	Read-only	
9	0x08	Serial Number - High Byte	Read-only	Serial number is 4 bytes, high byte first, range: 1-4294967294
10	0x09	Serial Number - Sub-high Byte	Read-only	
11	0x0A	Serial Number - Sub-low Byte	Read-only	
12	0x0B	Serial Number - Low Byte	Read-only	
13	0x0C	IIC Slave Address	Read/write	IIC slave address in 7-bit mode, range: 0-127
14	0x0D	Factory Reset	Write-only	Write 0x01 to perform factory reset

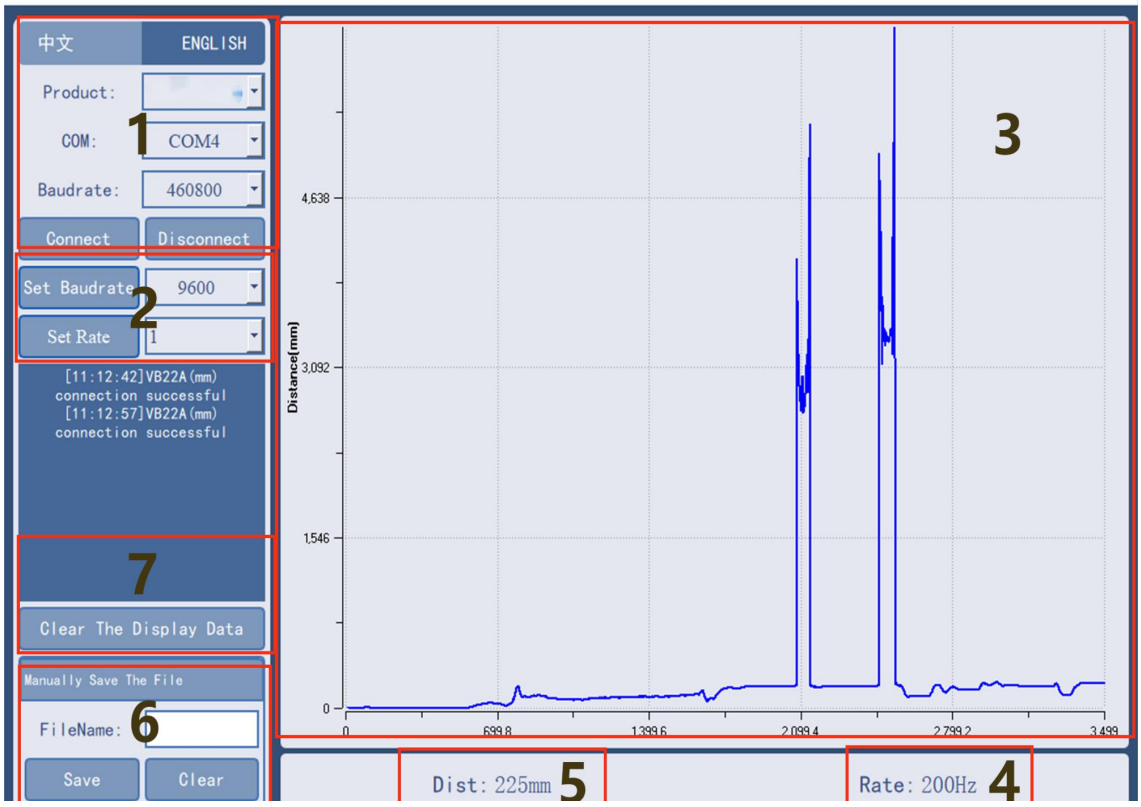
8. Quick Test

TTL to USB converter board, 3.3V power supply / Alternatively, use our self-developed universal test kit + Type-C data cable (as shown in the figure below) Host computer / serial port assistant.



After the LRF22VB successfully connected to your computer， select the baud rate and click “connect”, then the data can be monitored on the upper computer.

Here is a sample figure of upper computer:



Region 1 Set serial port baud rate and other parameters for corresponding models

Region 2 Configure baud rate and frequency

Region 3 Real-time distance point-line graph

Region 4 Read real-time frequency values

Region 5 Read real-time distance values

Region 6 Save data to file

Region 7 Clear all displayed data

9. Attentions

- This specification is copyrighted by ERDI. Any modifications are subject to change without prior notice.

- There is NO protection for reverse polarity and overvoltage, please strictly follow the specification for correct power supply and wiring.

- The photobiological safety of this product is Class 1, so please DO NOT look straight at the lens after successfully connected.

- When operating this product in a dusty place, it is better to add a piece of red transparent glass or acrylic plate over the lens for dust prevention. (905nm wavelength needs a transmittance ≥ 85%.)

- When touching this product, please wear anti-static gloves to prevent the product from failing.

- There is a risk of failure when using this product to measure high-reflective objects (such as 3M tapes) and mirrors.

10. Update History

Version	Date (YY/MM/DD)	Content
V0.5	24/08/06	Mass produced first editions
V1.0	24/12/30	Updated the format
V2.0	25/03/05	Revised some parameters
V2.1	25/03/31	Added the IIC protocol
V3.0	25/06/09	Expanded Function,New Host Computer Added