
VB22A

VB22A Single-Point, Cost-Effective dToF LiDAR

The VB22A LiDAR is a compact and cost-effective laser ranging sensor based on the dToF principle, designed for applications such as drones, robotic vacuum cleaners, and industrial robots.

Key Advantages

- ❖ Compact design
- ❖ Cost-effective solution
- ❖ Reliable dToF ranging technology
- ❖ Easy integration



Applications

- ❖ UAV Altitude Measurement
- ❖ Robotic Vacuum Navigation
- ❖ Industrial Automation
- ❖ Obstacle Detection & Distance Sensing



Important User Information

Thank you for choosing our product. To ensure safe and reliable operation, please read the following information carefully before use.

1. Safe Operation

Always follow the instructions provided in the manual. Improper use may result in device malfunction or personal injury. Keep the device away from direct eye exposure if it includes laser or optical components.

2. Handling and Maintenance

Handle the product with care. Avoid exposure to extreme temperatures, moisture, or dust. When cleaning, use a soft, dry cloth. Do not attempt to disassemble or modify the device, as this may void the warranty.

3. Specifications and Updates

Product specifications, features, and performance may change as improvements are made. Always refer to the official website for the latest technical information.

4. Documentation and Intellectual Property

This document is proprietary. Do not copy, alter, or translate it without written authorization.

5. Support and Inquiries

If you encounter any issues, questions, or need technical assistance, please contact our support team: surertech@surertech.cn

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Note: Proper use and regular maintenance will help maximize device performance and longevity. Following these guidelines ensures your product operates safely and efficiently.

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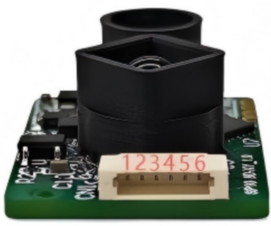
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1. Specifications

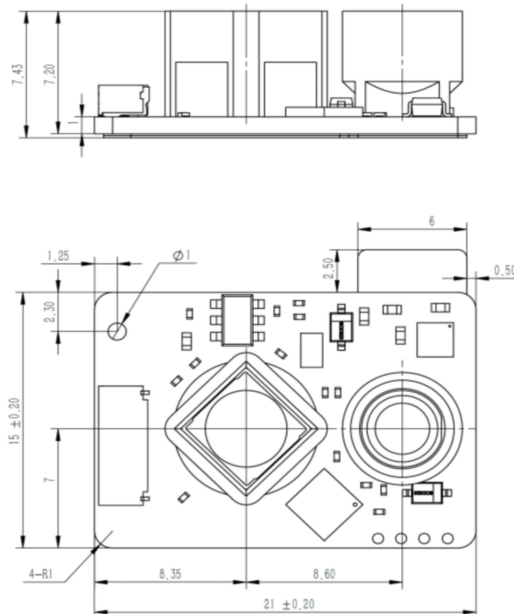
| No | Model | VB22A |
|----|---------------------------------------|--|
| 1 | Range | 0.05m ~ 20m (90%reflectivity), 0.05m ~ 10m (10%reflectivity) |
| 2 | Frequency | 200Hz(Alternative100/50/20/10/1Hz) |
| 3 | Accuracy | ±5cm (<5m) ,1% (≥5m) |
| 4 | Repeatability | ±30mm |
| 5 | Ambient Light Immunity | 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°C ~ +60°C |
| 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.)

2. Definitions of Pins

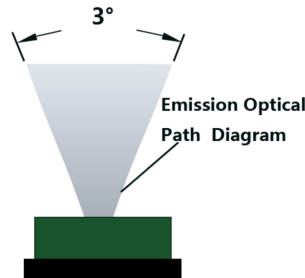
|  | | |
|---|-------------------------|------------------|
| No. | Definition / Wire Color | User Interface |
| 1 | NC (White) | / |
| 2 | 3.3V (Red) | External Power + |
| 3 | TX (SCL) (Yellow) | RX (SCL) |
| 4 | RX (SDA) (Green) | TX (SDA) |
| 5 | NC (Blue) | / |
| 6 | GND (Black) | External Power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

3. Dimensions



4. Measuring Characteristic

Due to the beam divergence, the laser spot size increases with distance on the target surface. For accurate distance measurement, the target surface area should be larger than the laser spot at the corresponding measurement distance.



The diameters of the light spot of VB22A in different distances are shown below:

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

5. Communication Protocol: UART

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

5.1 Communication Interface

5.2 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.

5.3 UART Commands

| No | 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: $f=10000/(999+1)=10\text{Hz}$. 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(c hecksum) | 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. |

5.4 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.

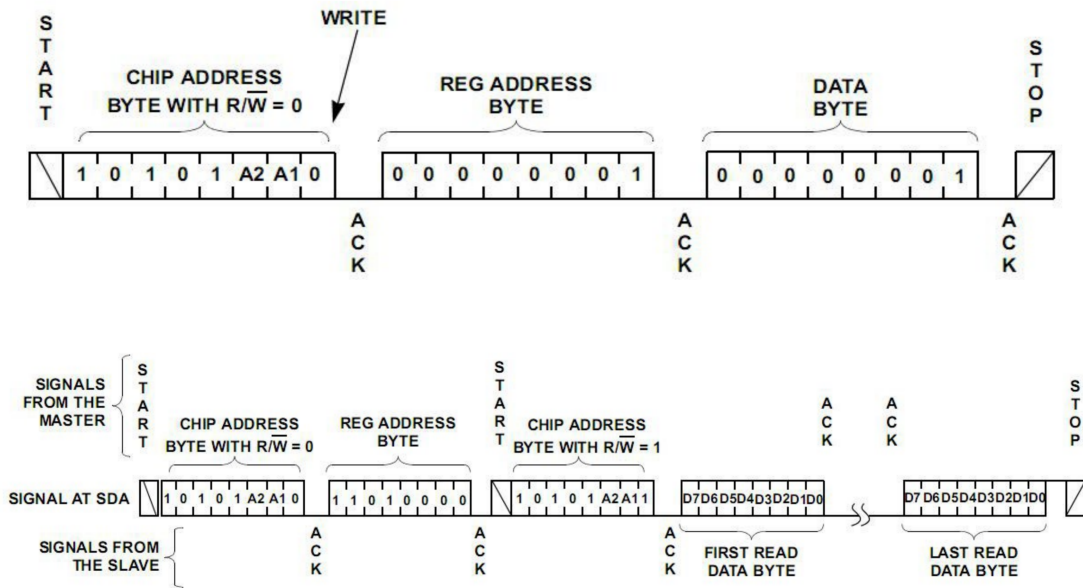
```
uint8_t Check_Sum(uint8_t *_pbuff, uint16_t _cmdLen)
```

```
{
    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;
}
```

6. Communication Protocol: IIC

VB22A 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:

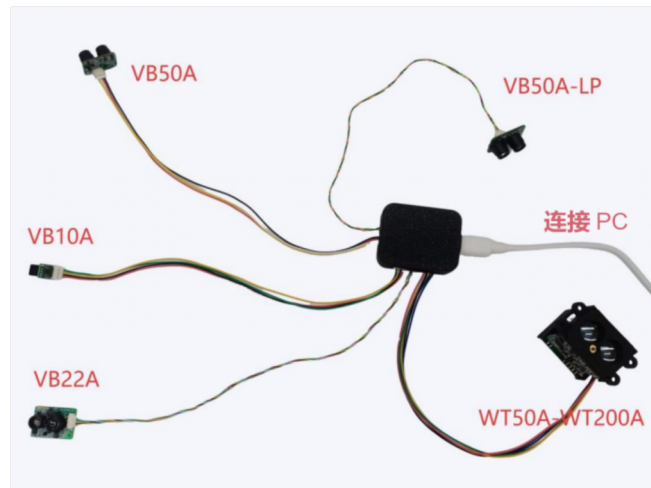
Definitions of registers

| 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 |

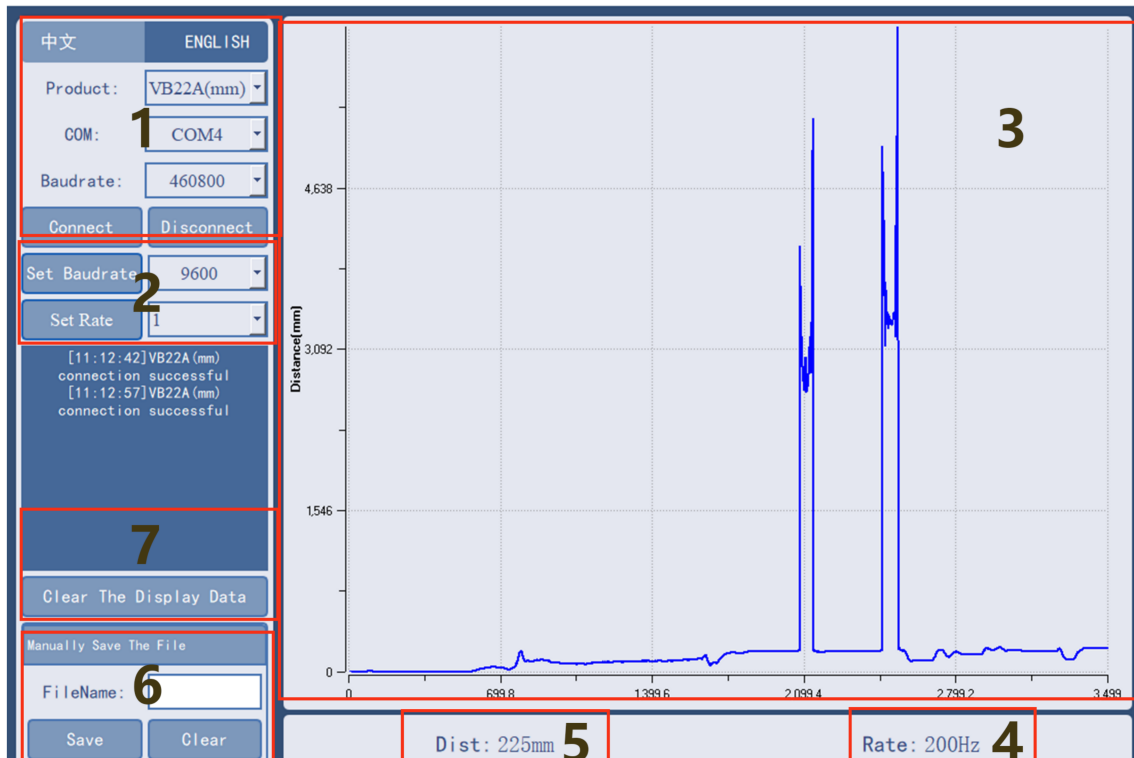
7. Quick Test

- TTL-to-USB converter board (3.3 V power supply) + host computer with serial port assistant.
- Universal test kit + Type-C data cable (as shown below) connected directly to the host computer.



After the VB22A 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 | Function Description |
|----------|--|
| Region 1 | Set the baud rate and other parameters of the serial port for the corresponding model, click Disconnect, then click Connect. |
| Region 2 | Configure baud rate |
| 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 |

8. Precautions

- This specification is the property of Surertech and may be updated without prior notice.
- The product does not support reverse polarity or overvoltage protection. Please strictly follow the specified power supply and wiring requirements.
- The laser safety classification of this product is Class 1. Do not look directly into the lens after the device is powered on.
- When operating in dusty environments, it is recommended to place a red transparent glass or acrylic protective cover over the lens for dust protection.
- The material should have a transmittance $\geq 85\%$ at 905 nm wavelength.
- Please wear anti-static gloves when handling the product to prevent electrostatic damage.
- Measurement errors or failures may occur when measuring highly reflective objects (e.g., 3M reflective tapes) or mirror surfaces.

9. 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 |



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