# TSD50-C Single-Point LiDAR Based on DTOF Principle

500Hz Measuring Frequency / 50 meters Range / Ambient Light Immunity 60Klux / Cost-effective

## 一、Product Overview

The TSD50-C LiDAR 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.

## 二、Features

- Based on DTOF principle (Direct Time of Flight)
- Maximum Measuring Range：50 m
- Measuring Blind Zone：5 cm
- Measuring Frequency：500Hz
- Accuracy：±5cm(<5m), 1%(≥5m)
- Resolution：1mm
- Operating Temperature：-20℃~+60℃
- Supply Voltage：3.3～5VDC
- Compact Size：45.5x24.5x27.5 mm
- Weight：55g
- Ambient Light Immunity：10m@60Klux



## 三、 Applications

- Drone Altitude Holding and Obstacle Avoidance
- Robots Obstacle Avoidance
- Industrial Grade Light Curtain
- AGV Obstacle Avoidance
- High-speed Measuring and Safety Monitoring in Traffic and Industrial Automation

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## 四、 Specifications

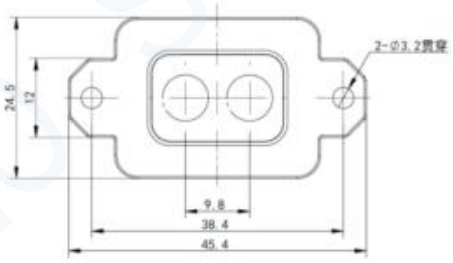
| # | Model | **TSD50-C** |
|---|---|---|
| 1 | Range | 0.05m ~ 50m (90%reflectivity),<br>0.05m ~ 10m (10%reflectivity) |
| 2 | Frequency | 500Hz |
| 3 | Accuracy | ±5cm(<5m), 1%(≥5m)(2σ) |
| 4 | Repeatability | ±10mm |
| 5 | Ambient Light Immunity | 10m@60KLux |
| 6 | Central Wavelength | 905nm |
| 7 | Photobiological Safety | Class 1 |
| 8 | FOV | 1.9° |
| 9 | Wavelength for Indication | N/A |
| 10 | Photobiological Safety for Indication | N/A |
| 11 | Supply Voltage | 3.3~5VDC |
| 12 | Peak Current | 5V@70mA |
| 13 | Average Current | 5V@40mA |
| 14 | Average Power Consumption | <0.3W |
| 15 | Communication Interface | UART/IIC |
| 16 | Protection Level | IP65 |
| 17 | Dimension | 45.5 x 24.5 x 27.5mm |
| 18 | Weight | 55g |
| 19 | Operating Temperature | -20℃ ~ +60℃ |
| 20 | Wire Specification | 4pin 0.2mm terminal, 2m tinned stranded wires |

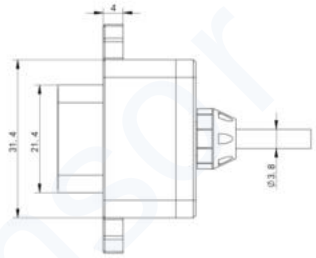
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## 五、Definitions of Pins

| No. | Definition / Wire Color | User Interface | Colour |
|---|---|---|---|
| 1 | GND | External Power - | White |
| 2 | 3.3～5V | External Power + | Black |
| 3 | RX （SDA) | TX （SDA) | Blue |
| 4 | TX （SCL) | RX （SCL) | Brown |

## 六、Dimensions




## 七、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 TSD50-C in different distances are shown below：

| Distance | 1m | 2m | 5m | 10m | 20m |
|---|---|---|---|---|---|
| Diameter of the light spot | 3cm | 6cm | 15cm | 30cm | 60cm |

## 八、Communication Protocol: UART

### 1. Communication Interface

| UART | |
|---|---|
| Baud Rate | 460800 (adjustable) |
| Data Bit | 8 |
| Stop Bit | 1 |
| Parity Bit | None |

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## 2. Output Format

| Frame Header | Distance 2 Bytes | | Check Byte |
|---|---|---|---|
| 5C | 02 | 11 | EC |
| Frame header 1 byte | Distance value 2 bytes means the measuring distance is 4354mm, little-endian, range 0-65535. When out of range, it would output 50000 | | From 02 to 11, opposite of the Check byte, 1 byte |

Both the input and output of this product adopt the Hexadecimal Little-Endian Mode.

## 3. UART Commands

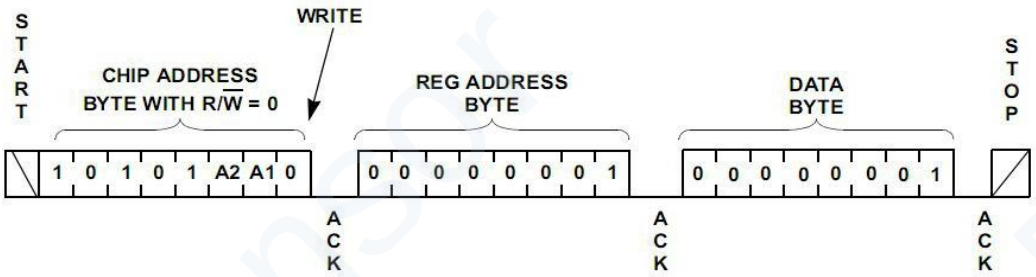
| # | Description | Send | Return | Note |
|---|---|---|---|---|
| 1 | Reading serial no. | 5A 0D 04 0D 0D 0D 0D BA (checksum) | 5A 8D 04 10 01 00 00 5D (checksum) | 10 01 00 00 means the serial no. is 272: little-endian, the serial no. shown is: S0000000272 (Add S before the number). |
| 2 | Reading 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)<br>C0 00 (19200)<br>80 01 (38400)<br>80 04 (115200)<br>00 09 (230400)<br>00 0A (256000)<br>00 12 (460800)<br>Any other baud rate is not available |
| 4 | Change IIC | 5A 1F 02 1F 1F A0(checksum) | 5A 9F 02 1F 1F 20(checksum) | Change Succeed |
| 5 | Start Ranging | 5A 0A 02 02 00 F1 | 5A 8A 02 02 00 71 | Return 5A 8A 02 02 00 71 |
| 6 | Stop Ranging | 5A 0A 02 00 00 F3 | 5A 8A 02 00 00 73 | Stops distance measurement. |

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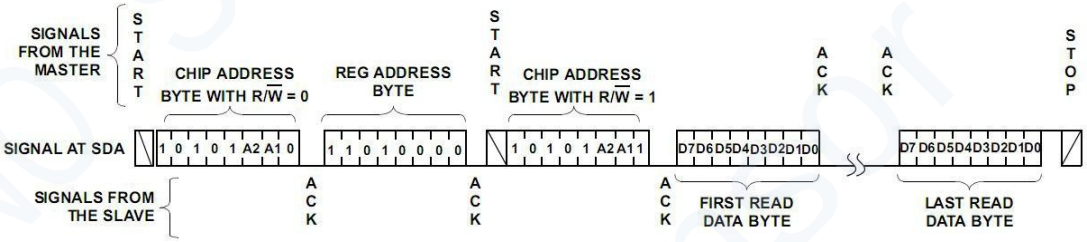
## 九、Communication Protocol: IIC

TSD50-C 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

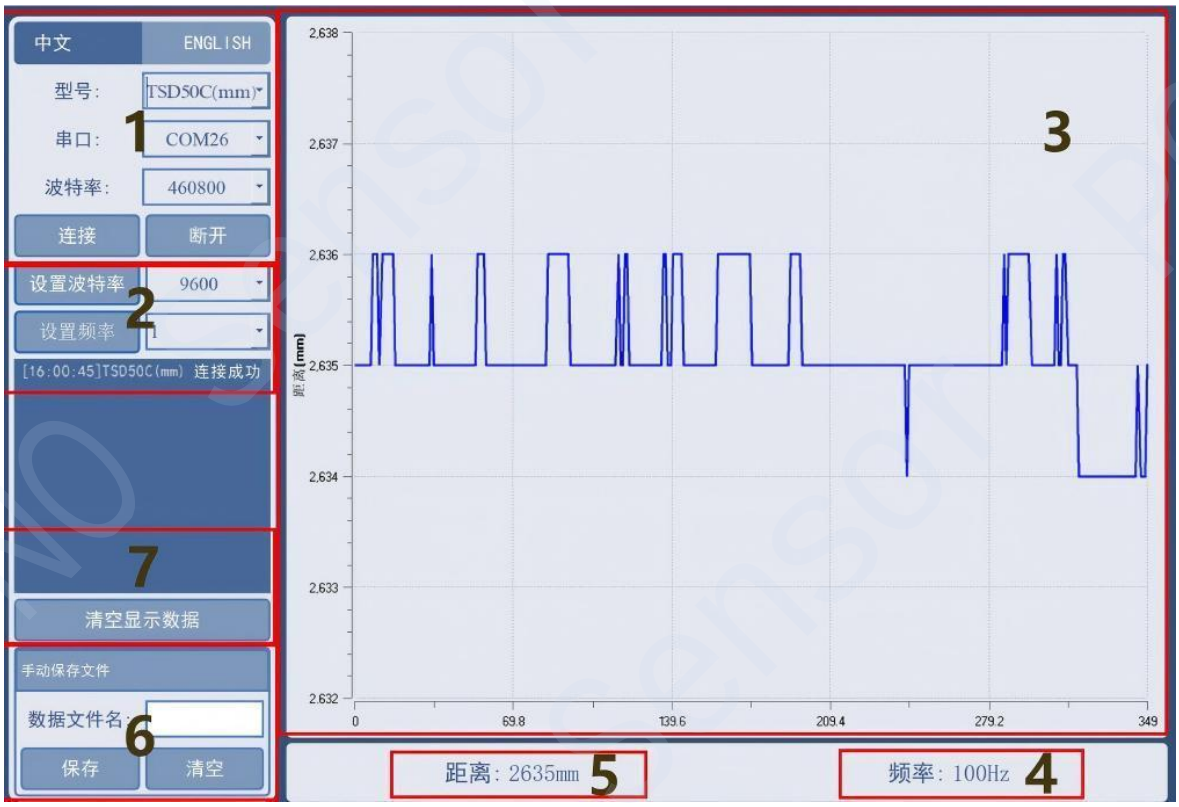
| No. | Register address | Register definition | Attribute | Remarks |
|---|---|---|---|---|
| 0 | 0x00 | Distance-High byte | Read-only | 2byte for distance |
| 1 | 0x01 | Distance-Low byte | Read-only | 2byte for distance |
| 3 | 0x02 | Laser control | Write-only | 0: laser off; 1: laser on |
| 4 | 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 |

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## 十、Quick Test

Test materials: TTL to USB adapter board, 5V DC power, Lidarviewer / serial port assistant. After the TSD50-C 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 Lidarviewer::




## 十一、Attentions

- 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.

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