

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: $\pm 5\text{cm}(<5\text{m})$, $1\%(\geq 5\text{m})$
- Resolution: 1mm
- Operating Temperature: $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$
- 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



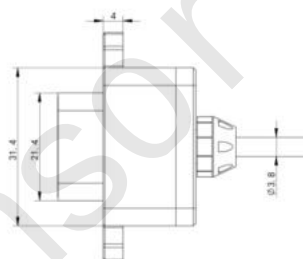
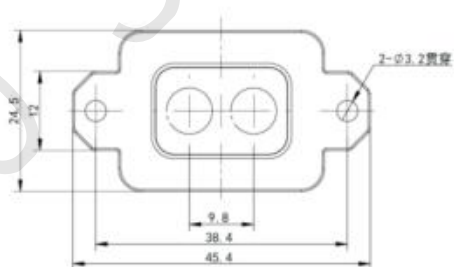
四、Specifications

#	Model	TSD50-C
1	Range	0.05m ~ 50m (90%reflectivity), 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

五、Definitions of Pins

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

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

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.

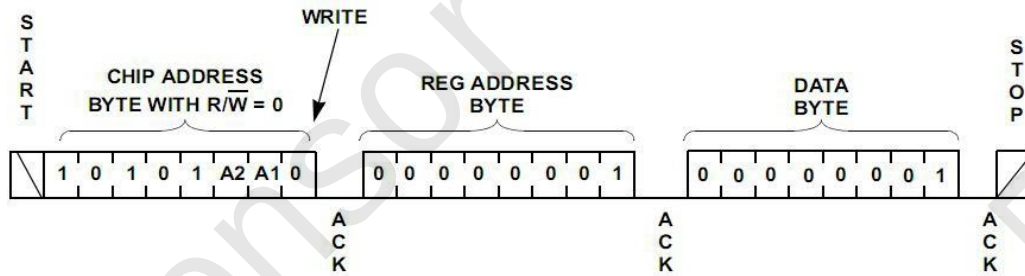
3. UART Commands

#	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) 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	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.

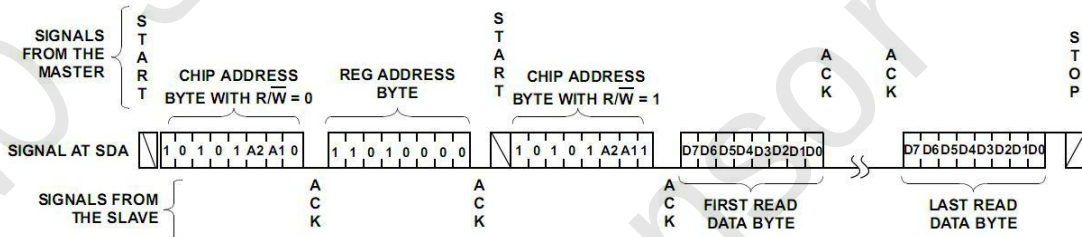
九、Communication Protocol: IIC

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:



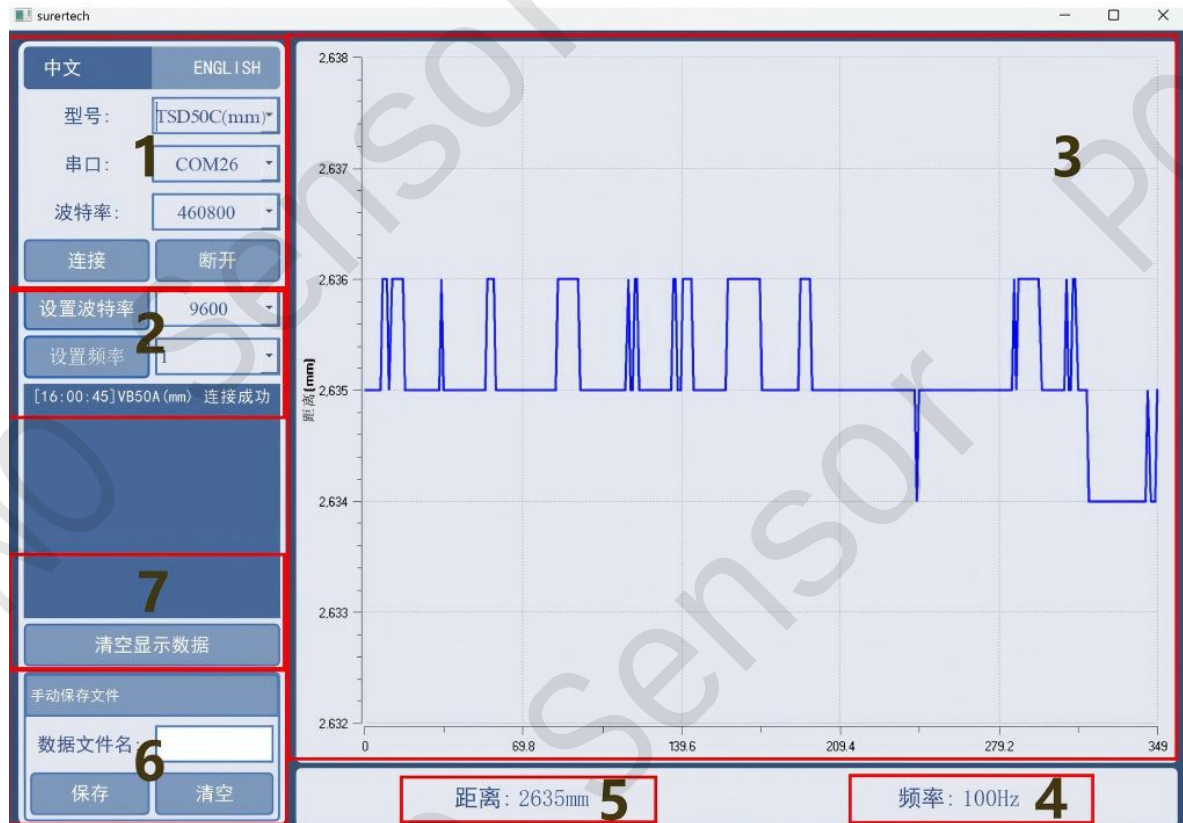
Definitions of registers

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

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 $\geq 85\%$.)
- 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.