LDS01RR Laser Ranging Radar

Product Specification

Beijing Stone Century Technology Co., Ltd.

2019.8

version control				
version date		Number of pages written		Release Notes
0.1				
0.2	20190111 Liang Bing		8	1. Change the ranging accuracy value in Section 6 General Specifications; 2. Add accuracy requirements after special tests.
0.3	20190118 Panko		8	Update structural drawings
0.4	20190321 Liang Bing		8	In Section 6, the horizontal angle parameter is changed to the upward angle, and the parameter description method is changed;
0.5	20190610 Liang Bing		9	1. In Section 6 General Specifications, the standard deviation parameter of ranging values is added; 2. Add section 8 time domain characteristics; 3. Add Section 13 certification label 4. Add production and manufacturing information in Section 14
1.0	20190802 Chen Hongtao12			1. Section 5 Updated Environmental Protection Requirements 2. Section 10 updates the 2D diagram and adds cable management requirements 3. Add Section 14, Packaging and Transportation Requirements 4. Add Section 15, Testing Requirements

LDS01RR laser ranging radar

product specifications

1 Overview

LDS01RR laser ranging radar is a 360° single-line laser scanning ranging system using the time-of-flight (TOF) method.

The system can scan and measure the environment within a range of 15cm to 9m at 360°, and the 2D dot matrix data generated can be used for positioning.

and environment modeling.

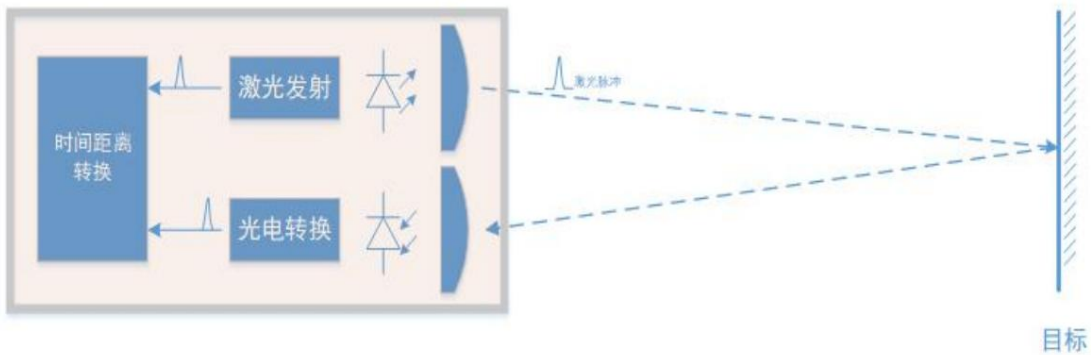
2.Measurement principle

LDS01RR laser ranging radar uses the TOF method to measure distance.

TOF is the abbreviation of Time of Flight, literally translated as time of flight, by continuously sending light pulses to the target, and then using

The sensor receives the light returned from the object and detects the flight (round trip) time of these emitted and received light pulses.

Target distance. The figure below shows the measurement principle block diagram.



3. System composition and connection

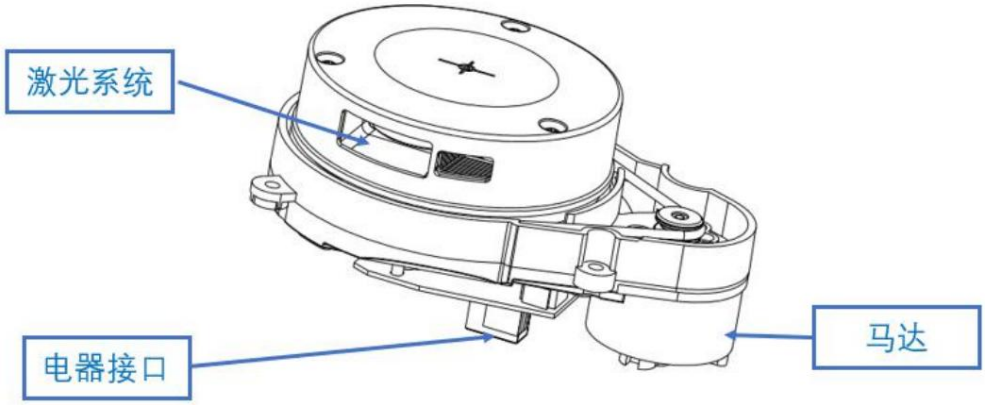
The LDS01RR consists of a laser scanning system and an electric motor system.

After the system is powered on, the motor system drives the laser scanning system through the belt to perform a clockwise rotation of 360° ranging scanning.

scan, and send distance, angle, speed and other information in real time through the connector at the bottom.

LDS01RR has speed detection and adaptive capabilities. The system will automatically adjust the laser sampling frequency according to the speed of the motor.

speed, the current actual speed can be obtained by connecting to the main control system through the serial port.



4.Safety _

a. Eye Safety Standard:

The safety level reaches Class I Laser safety standard. satisfy:

GB7247.1-2012 (China)

IEC/EN 60825-1-2014 (Europe)

IEC60825-1-2007 (North America)

b. EMC standards:

Meets China CCC, European CE and North American FCC related EMC requirements.

5. Environmental protection requirements

a. Comply with RoHS 2.0 standard requirements.

b. Comply with REACH standard requirements.

c. Comply with the "Restricted Substance Requirements of Stone Technology"

6.General specifications

parameter	Typical value	Comment
Ranging mode	Time of flight (TOF)	
Working wavelength	905±10nm	
Ranging range	0.15mÿ9m@90% reflectivity	

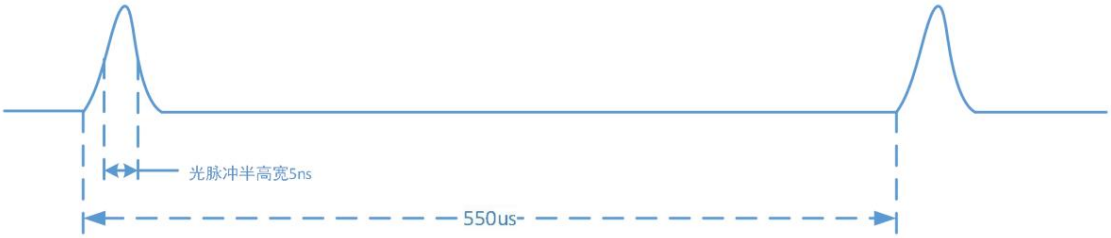
Ranging accuracy	0.15mÿ0.5m : ±15mm 0.5mÿ2m: ±20mm >2m : ±1%	Test environment: normal temperature Target reflectivity: 10% ~ 90%
Standard deviation of ranging values	0.15mÿ1m : 4mm >1 m : 6mm	Reference
Accuracy after special testing	0.15mÿ0.5m : ±25mm 0.5mÿ2m: ±30mm >2m : ±1.5%	Special tests include: high and low temperature cycles, High temperature, high humidity and low temperature storage, monomer drop Drop, life and other non-destructive tests
Ranging resolution	8mm	
Measure angle	0ÿ360°	
Angular resolution	1°	
elevation angle	0.6°ÿ1.6°	Relative to LDS mounting surface
scanning frequency	5Hz	
Operating temperature	-5°ÿ45°	
maximum relative humidity	93%	
Supply voltage	DC5V±0.5V	
Power consumption	1.5W	
size	107.7*76.1*54.7	length*width*height
weight	184.4g	

7. Optical parameters

parameter	Typical value	illustrate
central wavelength	905±10nm	
Laser peak power	25±2W	
Laser pulse width	5±0.5ns	
Spot size	5mm*10mm@0.5 meters; 140mm*20mm@6 meters	height width

8. Time domain characteristics

When this product is working, it will emit a light pulse every 550us. The wavelength of the optical pulse is 905nm, and the half-maximum width is approximately 5ns, peak power is about 25w. The following figure is the timing diagram:



9. Electrical interface

The LDS main serial port connector is a USB connector.

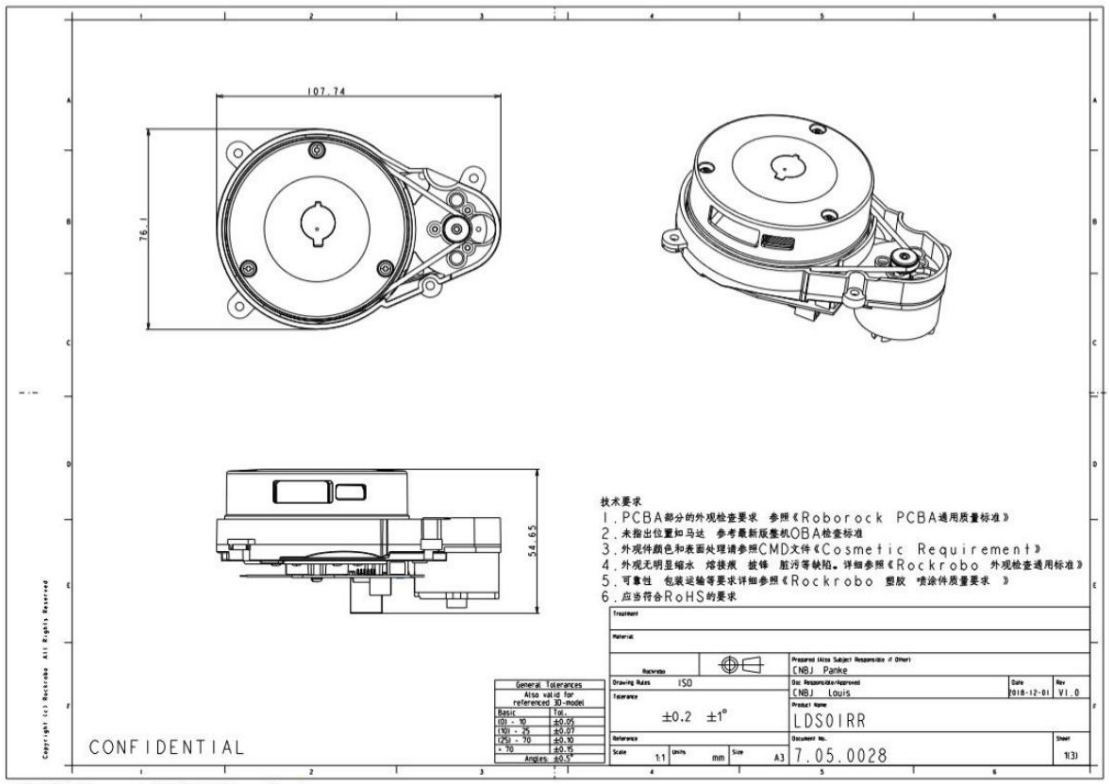
(1) USB connector specifications:

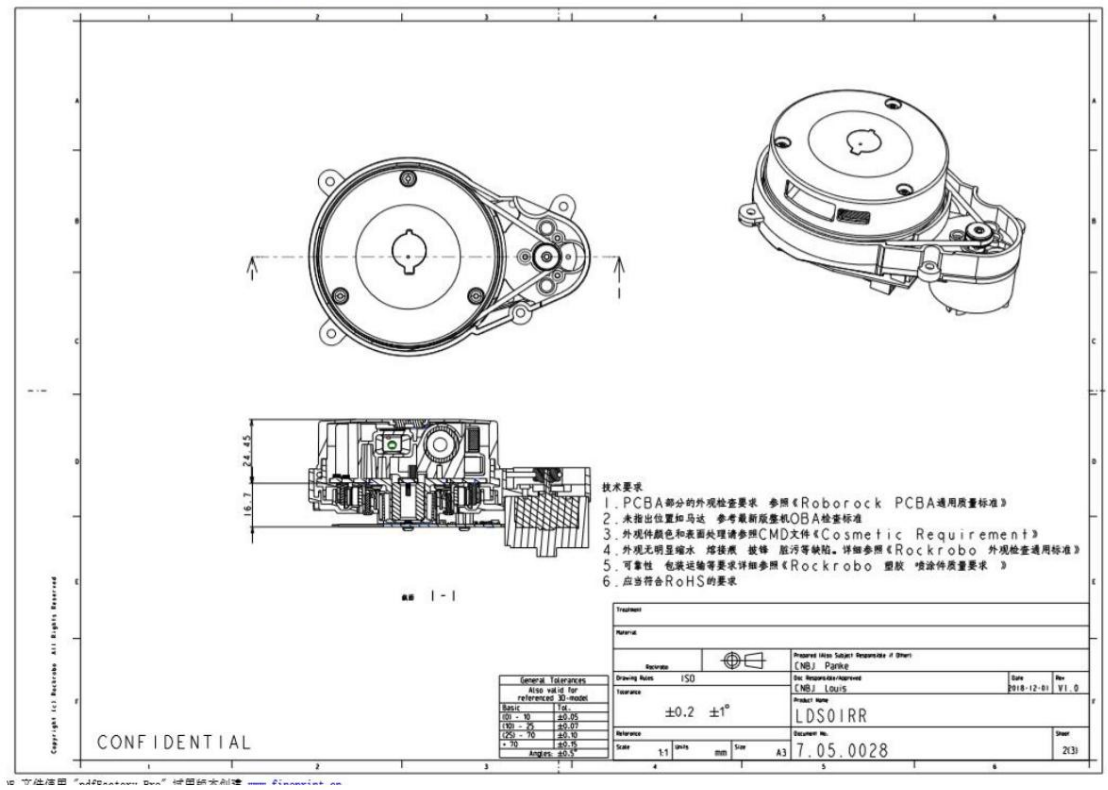
(2) Electrical definition:

Pin number	definition	illustrate
1,2	Driver_+	Motor drive
5,6	Driver_-	
7,8	UART_TX	output
9,10	VCC_5V	circuit power supply
3,4,11,12	GND	

10. Structural dimension drawing

10.1 Tanos series dimension drawing, please refer to the 3D drawing for detailed dimensions.





10.2 Tanos series cable management instructions:

1. The motor terminal wire cannot exceed the edge of the wireless board and the edge of the golden finger terminal (red dotted area in Figure 2 below)

2. The height of the motor cable must not exceed the gold finger terminal.

3. The outer coil wire must pass through the cable management slot of the lower cover (yellow dotted line position as shown below)

11.Temperature and humidity

project	value	unit	illustrate
storage temperature	-20ÿ65	degrees celsius	Packaging status
Storage humidity	<93%	Relative humidity	Packaging status
Operating temperature	-5ÿ45	degrees celsius	
Working humidity	<93%	Relative humidity	

figure 1

figure 2

12. Service life

project	value	unit	illustrate
Normal service life is 1 hour per day, working for 3 years			

13. Certification label

The following certification label needs to be affixed on the body:

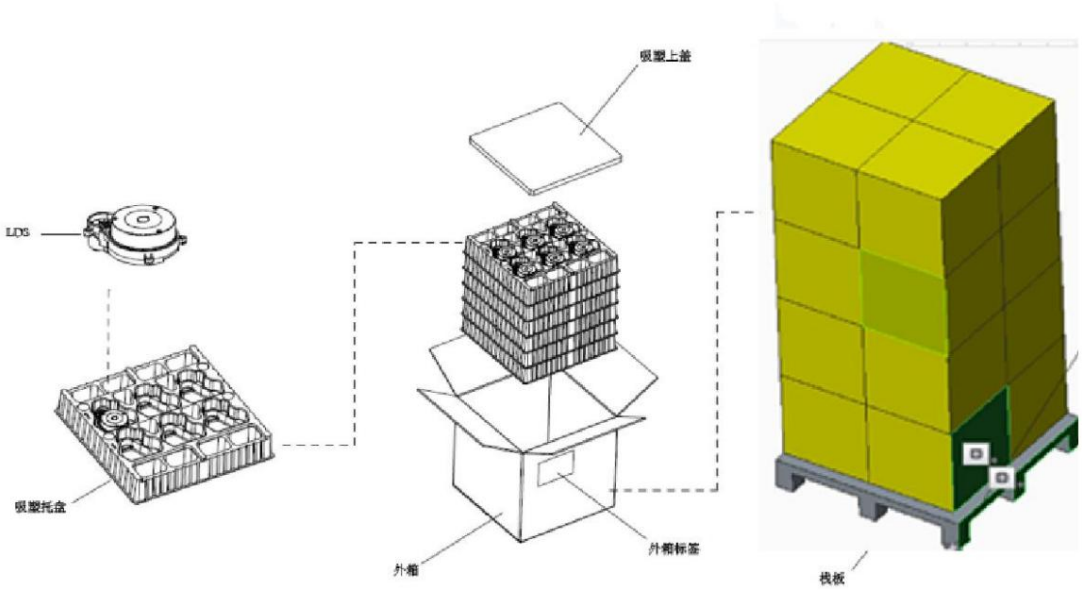
14. Packaging materials and transportation

See illustration

a. Load 6 LDS into each blister tray

b. Put each carton into a 6-layer blister tray and add a cover on the top

c. Pallet stacking method: 4 boxes per layer, 4 layers stacked



15.Testing requirements

Serial number test item		Test Methods
1	Basic test	Make distance measurement preparations according to the distance to be measured (150mm, 300mm, 500mm, 1000mm, 2000mm, 3000mm, 4000mm, 5000mm, 6000mm), prepare materials according to the required materials (white paper, gray paper and 3M reflective paper) and use cameras to monitor Use the LDS light spot to hit the target material, record the LDS rising height at 6 meters, and conduct 100 measurements. Measure distance, average light intensity and calculate variance, record the ranging average AVA, variance STD and light intensity corresponding to each distance DegreeLIGHT three values
2	Tests on different materials	Make distance measurement preparations according to the distance to be measured (150mm, 300mm, 500mm, 1000mm, 2000mm, 3000mm, 4000mm, 5000mm, 6000mm), prepare the material according to the required material (gray paper and 3M reflective paper) and use a camera to monitor the LDS light Spots are placed on the target material, the LDS rising height at 6 meters is recorded, and 100 measurements are taken for ranging, Average the light intensity and calculate the variance, and record the ranging average AVA, variance STD, and light intensity LIGHT corresponding to each distance. three values , test halogen lamp irradiation under the same conditions.
3	Stability curve test	Let the LDS start from cold start to capture the range log of the white paper target at 6 meters for 10 minutes, draw a curve, and take 7-10 minutes Calculate the average of 900 data. The value within ±1% of the average value is the stable interval. The time when it first enters the stable interval is stable schedule
4	High Temperature and High Humidity Storage	Place the LDS monomer into a thermostat with a set temperature of 65°C and a humidity of 93 for 72 hours of storage.
5	Low-temperature storage	Place the LDS monomer in the thermostat at a set temperature of -30°C for 72 hours.
6	high and low temperature cycles	Place the LDS monomer into the thermostat to set the temperature to -30°C, lower the temperature for 2 hours and maintain -30°C for 2 hours, then raise the temperature to 65°C for 2 hours and maintain 65°C. 2 hours, 9 cycles, total 72 hours of storage
7	LDS Low Temperature Operation Test try	1. Check the appearance and function of the sample under test 2 Set the temperature of the thermostat to drop to -5°C at a rate of 1°C/min and maintain it for 30 minutes; 3 The product runs the test program at -5°C for 72 hours to monitor the stabilization time, accuracy, and stability. 4. Raise the temperature of the thermostat to 22°C at a rate of 1°C/min and maintain it for 30 minutes; 5. Take out the sample and check the appearance and function of the tested sample again.

8	LDS operates at high and low temperatures for 4 minutes (including the temperature rise and fall process) and then directly tests for 4 minutes (reading 300 data per minute). test	1. Check the appearance and function of the sample under test 2 Set the temperature of the thermostat to be maintained at 20°C, 0°C, 20°C, 40°C, and 20°C at a rate of 1°C/min, and each temperature is stable for 30 3. Grab data and draw curves to observe the effects of different temperatures. 4. Raise the temperature of the thermostat to 22°C at a rate of 1°C/min and maintain it for 30 minutes; 5. Take out the sample and check the appearance and function of the tested sample again.
9	LDS High Temperature and High Humidity Operation 3 The product is run at 45°C and 93% humidity, and the test program is run for 72 hours to monitor the stabilization time, accuracy, and stability. for testing	1. Check the appearance and function of the sample under test 2 Set the temperature of the thermostat to rise to 45°C at a rate of 1°C/min, and maintain the humidity at 93% for 30 minutes. 4. Raise the temperature of the thermostat to 22°C at a rate of 1°C/min and maintain it for 30 minutes; 5. Take out the sample and inspect the appearance of the tested sample again.
10	The whole machine package falls	Install the LDS on the complete machine and put it into the package. Wrap the outer box and conduct a 91cm package drop test on one corner, three sides and six sides. The falling ground is a steel plate or ceramic tile floor.
11	are as follows: LDS vibration operation test a. Conduct 12 times (5 minutes) of sine wave logarithmic sweep vibration test on the X/Y/Z planes each); try	1. Check the appearance and function of the sample under test 2 The test sample is fixed on the vibration table, and the vibration conditions b. Frequency range 10HZ~150HZ, acceleration 9.8 meters/second (1G) 3. Conduct appearance and functional inspection on the tested sample again.
12	Bale vibration test	1. Check the appearance and function of the sample under test 2. In the packaged state, place it on the vibration table. The vibration conditions are as follows: a. Conduct 12 times (5 minutes) sine wave logarithmic sweep vibration test on each of the X/Y/Z planes b. Frequency range 10HZ~150HZ, acceleration 9.8 meters/second (1G) 3. Conduct appearance and functional inspection on the tested sample again.
13	Bale Crash Test	1. Check the appearance and function of the sample under test In bundled state: a. Apply 2 times of 100G impact to each of the 6 sides of the package. b. Impact frequency 2 times/min 2. Conduct appearance and functional inspection on the tested sample again.
14	Packaging extrusion test	1. Check the appearance of the package and accessories under test 2. Place the package on the test bench; 3. Start the press and pressurize at a speed of 1.2cm/min until the calculated AH value; ISTA 2A compression test test conditions for packages weighing less than 150 lb (68kg): AH = W x (S-1) x F x 9.8 = Test Load for Apply and Hold -Machine (N); W = product weight (kg); S = the number of layers of products in the warehouse; F = pressure factor (if the stacking time in the warehouse exceeds 24 hours, set it to 5 or the stacking time in the warehouse is less than 24 is set to 4).Generally choose 5 Pressure hold time = 1 hr 3. After the test is completed, check the appearance of the packaging material again
15	LDS static test	1 Perform functional inspection on the sample being tested 2 Store in warehouse for 3 months 3. Perform functional inspection on the tested sample

16 Life test		Install the LDS on the life test machine for life testing, and perform basic tests at 500h, 1000h, and 1500h respectively. Check comparison
17	EMC testing	1 Perform functional inspection on the sample being tested 2 EMC test
18	ESD testing	1 Perform functional inspection on the sample being tested 2 ESD test
19 Laser safety testing		1 Perform functional inspection on the sample being tested 2 Laser safety testing
20	LDS parts are resistant to substances test	1 Measure the relevant performance parameters of the sample being tested 2 Soak/wipe with chemicals 3. Carry out relevant performance measurements on the tested samples
21	Temperature of important electronic components I test	1 Functional inspection of the sample under test 2. The sample under test continues to work until the temperature is stable.
22	Electronic interface signal test try	1 Functional check of the sample under test 2 Perform electronic interface signal testing
sample 23 connector plug-in and pull-out tests		1 Perform functional inspection on the tested 2 Perform 20 plug-in and pull-out tests on the connector
24	ROHS Just meet the individual ROHS standard requirements	
25 In the dusting experiment, talcum powder was continuously applied to the LDS receiving end until the LDS could no longer measure distance normally.		
26	LDS drop test	Conduct appearance and functional inspection of the tested samples Drop each side of the tested sample 2 times (the front end face is free to fall from a height of 45cm, and the other end faces are free to fall from a height of 30cm) Conduct appearance and functional inspection of the tested samples again
27 Condensation test		1. Check the appearance and function of the sample under test 2 LDS at 40ÿ for 2 hours, quickly cooled to -10ÿ for 10min, then returned to normal temperature, kept for 24 hours 3. Conduct appearance and functional inspection on the tested sample

16.Production and manufacturing information

(1)Manufacturer information

Manufacturer name: Beijing Roborock Technology Co., Ltd.

Manufacturer's address: Floor 6, Suite 6016, 6017, 6018, Building C, Kangjian Baosheng Plaza, No. 8 Heiquan Road, Haidian District, Beijing PR CHINA

(2)Manufacturer information

a.Manufacturer name: Shenzhen Sunwoda Intelligent Hardware Co., Ltd.

Manufacturer's address: 101, No. 6-6, Yanshan Road, Yanchuan Community, Yanluo Street, Bao'an district, Shenzhen City, Guangdong Province, P.R.China.

b.Manufacturer name: Dongguan Kaifa Technology Co.,Ltd.

Manufacturer's address: No. 2 Junma road, Chigang community, Humen town, Dongguan City, Guangdong Province,China.