



LDS01RR Laser ranging radar

Product specification

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version control				
Version	date	write	Number of pages	Release Notes
0.1				
0.2	20190111	Liang Bing	8	1.Change 6 Section of the ranging accuracy value in the general specifications; 2.Increase the accuracy requirements after special tests.
0.3	20190118	Panko	8	Update structural drawings
0.4	20190321	Liang Bing	8	NS 6 The section horizontal angle parameter is changed to the upper elevation angle, and the parameter description method is changed;
0.5	20190610	Liang Bing	9	1.NS 6 In the section general specifications, add the standard deviation parameter of the ranging value; 2.Increase 8 Section time domain characteristics; 3.Increase 13 Section certification label 4.Increase 14 Festival Manufacturing Information
1.0	20190802	Chen Hongtao	12	1. NS 5 Renewal of environmental protection requirements 2. NS 10 Section update 2D Figure, increase cable management requirements 3. Increase 14 Section, packaging and transportation requirements 4. Increase 15 Section, test requirements

LDS01RR Laser ranging radar

Product specification

1. Overview

LDS01RR The laser ranging radar adopts the time-of-flight method (TOF) of 360° Single-line laser scanning ranging system.

The system can 360° Yes 15cm~9m The environment within the range is scanned and ranging, resulting in 2D Lattice data can be used for positioning

And environmental modeling.

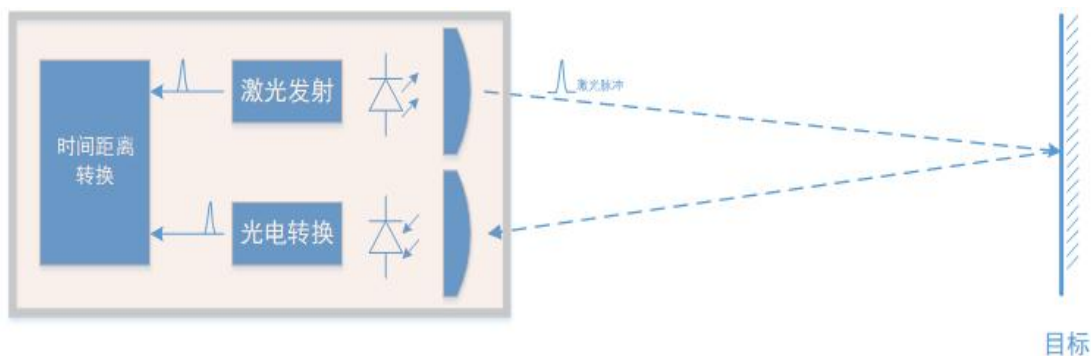
2. Measuring principle

LDS01RR The use of laser ranging radar TOF Method for distance measurement.

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

The sensor receives the light returned from the object, and obtains the target by detecting the flight (round trip) time of these emitted and received light pulses.

Target distance. The figure below is a block diagram of the measurement principle.



3. System composition and connection

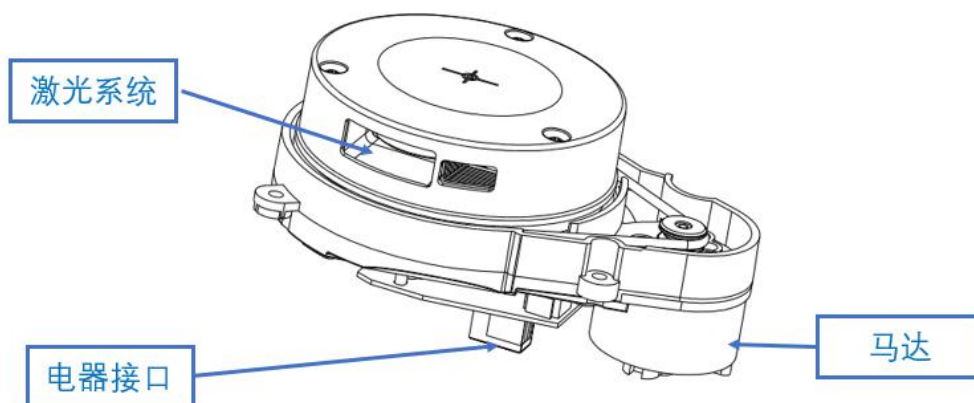
LDS01RR Contains a laser scanning system and a motor motor system.

After the system is powered on, the motor motor system drives the laser scanning system to rotate clockwise through the belt. 360° Ranging Scan

The distance, angle, speed and other information are sent out through the connector at the bottom in real time.

LDS01RR With speed detection and adaptive capabilities, the system will automatically adjust the laser sampling frequency according to the speed of the motor

The current actual speed can be obtained by connecting 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:

Meet the relevant EMC requirements of China CCC, European CE and North American FCC.

5. Environmental requirements

a. Meet the requirements of RoHS 2.0 standards.

b. Meet REACH standard requirements.

c. Comply with "Restricted Substance Requirements for Rock Technology"

6. General specifications

parameter	Typical value	Annotation
Ranging method	Time of Flight (TOF)	
Working wavelength	905±10nm	
Ranging range	0.15m~9m@90 % reflectivity	

Ranging accuracy	0.15m~0.5m: $\pm 15\text{mm}$ 0.5m~2m: $\pm 20\text{mm}$ > 2m: $\pm 1\%$	Test environment: normal temperature Target reflectivity: 10%~90%
Standard Deviation of Ranging Value	0.15m~1m: 4mm > 1m: 6mm	Reference
Accuracy after special test	0.15m~0.5m: $\pm 25\text{mm}$ 0.5m~2m: $\pm 30\text{mm}$ > 2m: $\pm 1.5\%$	Special tests include: high and low temperature cycles, High temperature, high humidity and low temperature storage, monomer drop Non-destructive tests such as drop and life
Ranging resolution	8mm	
Measuring angle	0~360°	
Angular resolution	1°	
Elevation angle	0.6°~1.6°	Relative to LDS mounting surface
scanning frequency	5Hz	
Operating temperature	-5°~45°	
Relative humidity	93%	
Supply voltage	DC5V \pm 0.5V	
Power consumption	1.5W	
size	107.7*76.1*54.7	Length*width*height
weight	184.4g	

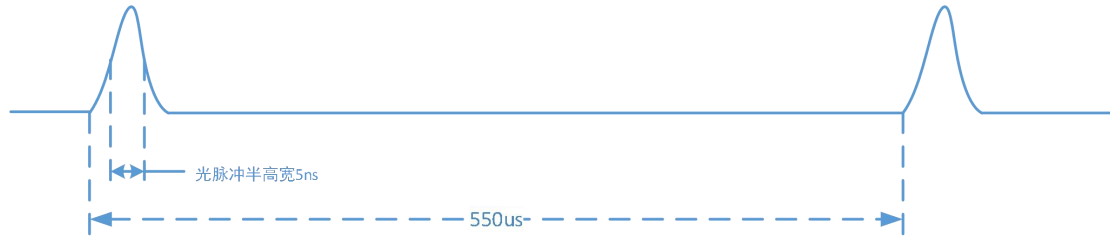
7. Optical parameters

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

8. Time domain characteristics

When the product is working, it emits a light pulse every 550us. The wavelength of the light pulse is 905nm, and the half-height width is about

5ns, the peak power is about 25w. The following figure is a timing diagram:



9. Electrical Interface

The LDS main serial port connector is a USB connector.

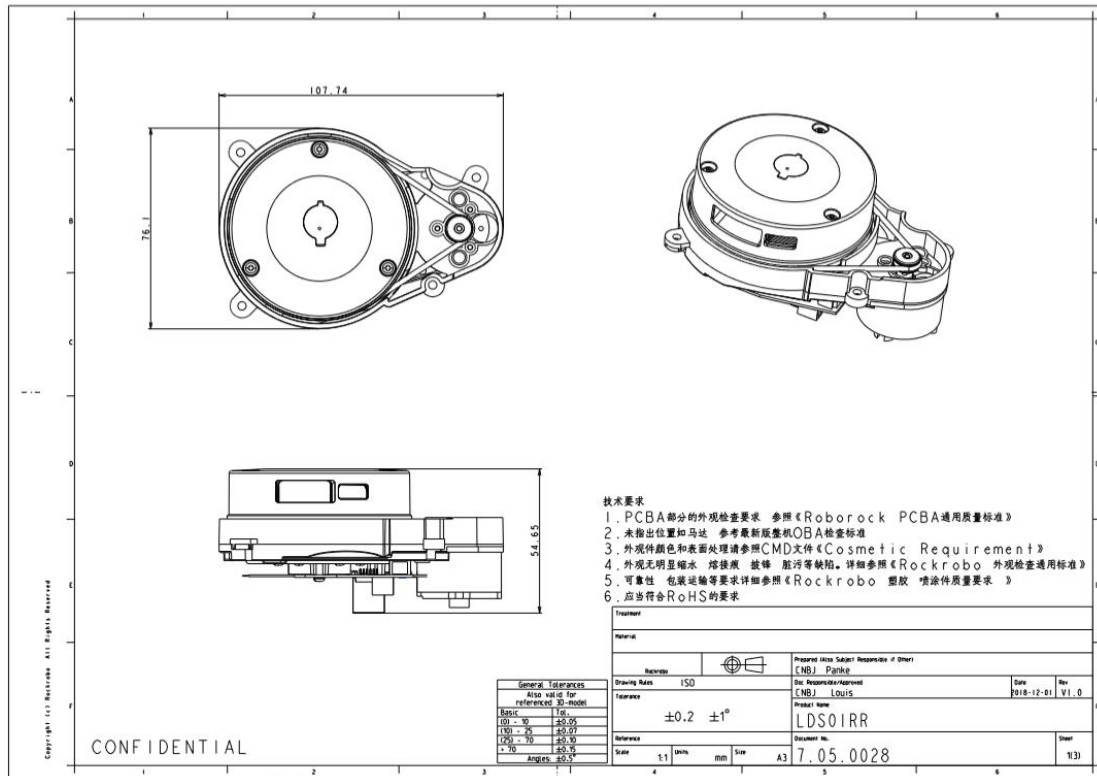
(1) USB connector specifications:

(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
3,4,11,12	GND	

10. Structure size chart

10.1 Tanos Series size chart, please refer to the detailed size 3D drawing.



2. The height of the motor cable should not exceed the golden finger terminal
3. The outer coil wire must pass through the wire management slot of the lower cover (the position of the yellow dotted line in the figure below)

11. Temperature and humidity

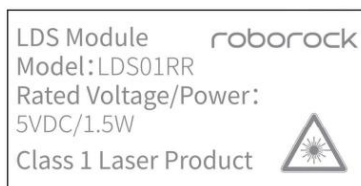
project	value	unit	illustrate
storage temperature	-20~65	Celsius	Packing status
Storage humidity	<93%	Relative humidity	Packing status
Operating temperature	-5~45	Celsius	
Working humidity	<93%	Relative humidity	

12. Service life

project	value	unit	illustrate
Normal service life	1 hour per day, 3 years of work		

13. Certification label

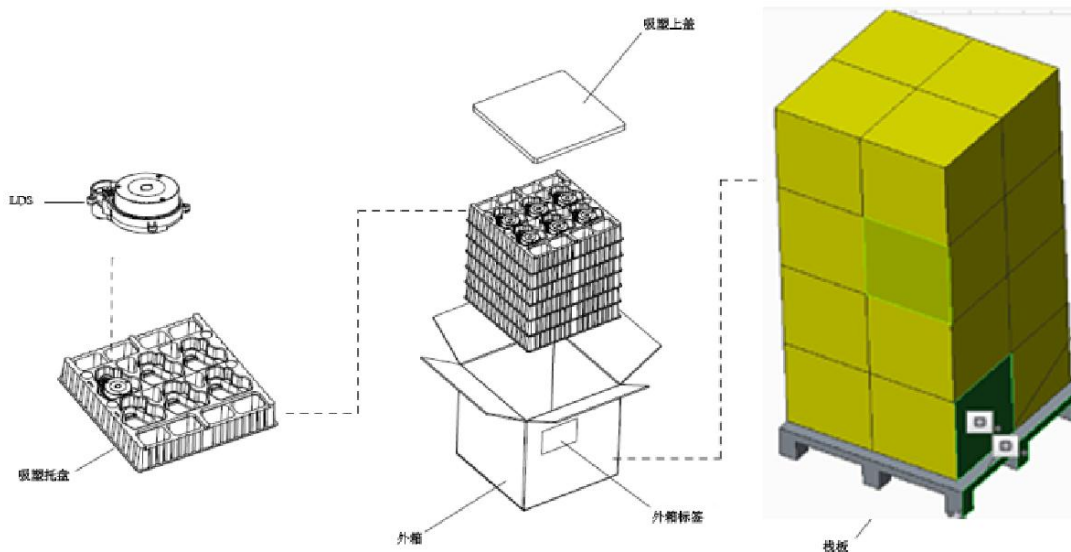
The following certification labels need to be affixed on the body:



14. Packaging materials and transportation

See illustration

- a. Packed in each blister tray 6 individual LDS
- b. Pack each carton 6 Layer blister tray and add cover on top
- c. Pallet stacking method: each layer 4 Box, stack 4 Floor



15. Testing requirements

Serial number	Test items	Test Methods
1	Basic test	Prepare distance measurement according to the distance to be measured (150mm, 300mm, 500mm, 1000mm, 2000mm, 3000mm, 4000mm, 5000mm, 6000mm), and prepare the material according to the required material (white paper, gray paper and 3M reflective paper) with a camera Monitor the LDS spot, make it hit the target material, record the rising height of the LDS at 6 meters, and perform distance measurement of 100 measurements, average the light intensity, and calculate the variance, and record the distance measurement corresponding to each distance Three values: average AVA, variance STD, light intensity LIGHT
2	Different material testing	Prepare distance measurement according to the distance to be measured (150mm, 300mm, 500mm, 1000mm, 2000mm, 3000mm, 4000mm, 5000mm, 6000mm), and prepare the material according to the required material (gray paper and 3M reflective paper). Use the camera to monitor the LDS spot , Make it hit on the target material, record the rising height of LDS at 6 meters, measure the distance of 100 times, average the light intensity and calculate the variance, record the average value AVA of each distance , Variance STD, light intensity LIGHT three values Test the halogen lamp irradiation under the same conditions.
3	Stability curve test	Let LDS conduct a 10min distance measurement log capture on a white paper target at 6 meters from the cold start, draw a curve, take 900 data from 7-10min to average, and the value within $\pm 1\%$ of the average Stable interval, the first time to enter the stable interval is the stable time
4	High temperature and humidity storage	Put the LDS monomer into the thermostat set temperature 65°C and humidity 93 for 72 hours storage
5	Low temperature storage	Put the LDS monomer into the thermostat set temperature -30°C for 72 hours storage
6	High and low temperature cycle	Put the LDS monomer into the thermostat set temperature -30°C, cool down for 2 hours, keep -30°C for 2 hours, increase to 65°C for 2 hours, keep 65°C for 2 hours, perform 9 cycles, and store for a total of 72 hours
7	LDS low temperature operation test	1 Check the appearance and function of the tested sample 2 Set the temperature of the incubator to drop to -5°C at a rate of 1°C/min, and keep it for 30 minutes; 3 The product runs the test program at -5°C for 72 hours, and monitors the stabilization time, accuracy, and stability. 4 The temperature of the incubator rises to 22°C at a rate of 1°C/min and keeps it for 30 minutes; 5 Take out the sample, and check the appearance and function of the tested sample again

8	LDS high and low temperature test	<p>1 Check the appearance and function of the tested sample</p> <p>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. Each temperature is stable for 30°C.</p> <p>3 The product runs the test program operation minutes (including heating and cooling process) directly after 4 minutes (read 300 data per minute).</p> <p>3 Grab the data and draw a curve to observe the influence of different temperatures</p> <p>4 The temperature of the incubator is increased to 22°C at a rate of 1°C/min and kept for 30 minutes; 5</p> <p>Take out the sample, and perform the appearance and function inspection of the tested sample again.</p>
9	LDS high temperature and high humidity exercise To test	<p>1 Check the appearance and function of the tested sample</p> <p>2 Set the temperature of the thermostat to rise to 45°C at a rate of 1°C/min, with a humidity of 93%, and keep it for 30 minutes</p> <p>3 The product runs the test program for 72 hours at 45°C and 93% humidity, and monitors the stabilization time, accuracy, and stability. 4 The temperature of the thermostat increases to 22°C at a rate of 1°C/min and keeps it for 30 minutes;</p> <p>5 Take out the sample and perform an appearance inspection on the tested sample again</p>
10	The whole package dropped	<p>Install the LDS on the whole machine and put it in the package, and wrap the outer box, and carry out the 91cm corner, three sides and six sides of the package drop test. The floor is steel plate or ceramic tile.</p>
11	LDS vibration operation test try	<p>1 Check the appearance and function of the tested sample</p> <p>2 The test sample is fixed on the vibrating table, and the vibration conditions are as follows:</p> <p>a. Carry out 12 times (5 minutes) sine wave logarithmic sweep vibration test on each of the X/Y/Z planes);</p> <p>b. The frequency band is 10HZ-150HZ, and the acceleration is 9.8 m/s (1G). 3 Perform</p> <p>appearance and function inspection on the tested sample again</p>
12	Bundle vibration test	<p>1 Check the appearance and function of the tested sample</p> <p>2 Place it on a vibration table in the packed state, and the vibration conditions are as follows:</p> <p>a. Carry out 12 times (5 minutes) sine wave logarithmic sweep vibration test on each of the X/Y/Z planes</p> <p>b. The frequency band is 10HZ-150HZ, and the acceleration is 9.8 m/s (1G). 3 Perform</p> <p>appearance and function inspection on the tested sample again</p>
13	Bundle Crash Test	<p>1 Check the appearance and function of the tested sample</p> <p>In the packaged state:</p> <p>a. Apply a 100G impact twice on each of the 6 sides of the package</p> <p>b. Impact frequency 2 times/min</p> <p>2 Check the appearance and function of the tested sample again</p>
14	Packaging squeeze test	<p>1. Check the appearance of the tested packaging and accessories</p> <p>2. Place the package on the test bench;</p> <p>3. Start the press and pressurize at a speed of 1.2cm/min until the calculated AH value;</p> <p>ISTA 2A compression test is aimed at the test conditions of package weight less than 150 lb (68kg): $AH = W \times (S-1) \times F \times 9.8$</p> <p>= Test Load for Apply and Hold -Machine (N); W = product weight (kg);</p> <p>S = the number of layers that the product is stacked in the library;</p> <p>F = stress factor (if the stacking time in the warehouse exceeds 24 hours, set it to 5 or if the stacking time in the warehouse is less than 24, set it to 4). Generally select 5</p> <p>Pressure holding time = 1 hr</p> <p>3. After the test is completed, check the appearance of the packaging material again</p>
15	LDS standing test	<p>1 Perform functional inspection on the tested sample</p> <p>2 The warehouse is allowed to stand for 3 months</p> <p>3 Perform functional inspection on the tested sample</p>

16	life span test	Install the LDS on the life test machine for life test, and perform basic test inspection and comparison at 500h, 1000h, and 1500h respectively
17	EMC testing	1 Perform functional inspection on the tested sample 2 EMC test
18	ESD testing	1 Perform functional inspection on the tested sample 2 ESD test
19	Laser safety test	1 Perform functional inspection on the tested sample 2 Laser safety test
20	LDS component resistance to substances test	1 Measure relevant performance parameters of the tested sample 2 Use chemicals to soak/wipe 3 Perform relevant performance measurements on the tested sample
twenty one	Important electronic component temperature	1 Perform functional inspection on the tested sample Liter test 2 The tested sample continues to work until the temperature is stable
twenty two	Electronic interface signal test	1 Perform functional inspection of the tested sample Trial 2 Carry out electrical interface signal test
twenty three	Connector plug test	1 Perform functional inspection on the tested sample 2 Perform 20 plug-in tests on the connector
twenty four	ROHS	Meet the requirements of the single ROHS standard
25	Dusting experiment	Keep smearing the LDS receiving end with talcum powder until the LDS can't measure the distance normally
26	In the LDS drop test, the tested sample will be dropped twice on each side (the front end face is free to fall at a height of 45cm, and the other end face is free to fall at a height of 30cm)	Perform appearance and function inspection on the tested sample Check the appearance and function of the tested sample again
27	Condensation test	1 Check the appearance and function of the tested sample 2 LDS is kept at 40°C for 2 hours, cooled rapidly to -10°C for 10 minutes, and then returned to normal temperature, kept for 24 hours. 3 Perform appearance and function inspection on the tested sample

16. Manufacturing information

(1) Manufacturer information

Manufacturer Name: Beijing Roborock Technology Co., Ltd.

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(2) Manufacturer information

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

Manufacturer Address: 101, No. 6-6, Yanshan Road, Yanchuan Community, Yanluo Street, Bao'an district, Shenzhen City, Guangdong Province, PRChina.

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

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Guangdong Province, China.