DLRF-C1.5 (905nm/1.5Km)
Laser Range Finder Module

Technical Specification

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1. General

DLRF-C1.5 semiconductor laser rangefinder is an innovative product that integrates advanced technology and humanized design carefully developed by LUMISPOT. Using a unique 905nm laser diode as the core light source, this model not only ensures human eye safety, but also sets a new benchmark in the field of laser ranging with its efficient energy conversion and stable output characteristics. Equipped with high-performance chips and advanced algorithms independently developed by LUMISPOT, the DLRF-C1.5 achieves excellent performance with long life and low power consumption, perfectly meeting the market demand for high-precision and portable ranging equipment.

2. Main application

Used in UAV, sighting, outdoor handheld products and other ranging applications (aviation, police, railway, electricity, water conservancy, communication, environment, geology, construction, fire station, blasting, agriculture, forestry, outdoor sports, etc.)

3. Features

- **High precision ranging data compensation algorithm: optimization algorithm, fine calibration**

DLRF-C1.5 semiconductor laser rangefinder, in pursuit of the ultimate accuracy of the road, innovatively adopted the advanced range data compensation algorithm, the algorithm through the combination of complex mathematical model and measured data, to generate accurate linear compensation curve. This technical breakthrough enables the rangefinder to carry out real-time and accurate correction of errors in the ranging process under various environmental conditions, so as to achieve the excellent performance of the full range accuracy control within 1 meter, and the short-range ranging accuracy is accurate to 0.1 meters.

- **Optimized ranging method: accurate measurement, improve ranging accuracy**

The laser rangefinder adopts the high repetition frequency ranging method, through the continuous transmission of multiple laser pulses, and the accumulation and processing of the echo signal, so as to effectively suppress the noise and interference, and improve the signal to noise ratio. By optimizing the optical path design and signal processing algorithm, the stability and accuracy of the measurement results are ensured. This method can achieve accurate measurement of the target distance, even in the face of complex environments or small changes, but also to ensure the accuracy and stability of the measurement results.

- **Low power consumption design: Efficient energy saving and optimized performance**

With the ultimate energy efficiency management as the core, this technology significantly reduces the energy consumption of the overall system without affecting the distance and accuracy by finely regulating the power consumption of key components such as the main control board, the drive board, the laser and the receiving amplifier board. This low-power design not only reflects the commitment to environmental protection, but also greatly improves the economy and sustainability of the equipment, becoming an important milestone in promoting the green development of ranging technology.

- **Working capacity under extreme conditions: excellent heat dissipation, guaranteed performance**

DLRF-C1.5 laser rangefinder with its excellent thermal design and stable manufacturing process, showing extraordinary performance under extreme working conditions. While ensuring high precision ranging and long range detection, the product can withstand extreme operating ambient temperatures of up to 65 ° C, demonstrating its high reliability and durability in harsh environments.

- **Miniaturized design, no burden to carry**

The DLRF-C1.5 laser rangefinder uses an advanced miniaturization design concept,

which highly integrates the precision optical system and electronic components in a lightweight body weighing only 11 grams. This design not only greatly improves the portability of the product, allowing users to easily carry it around in a pocket or bag, but also makes it more flexible and convenient to use in complex outdoor environments or confined Spaces.

4. Technical parameter

Item	Parameter
Laser Eye Safety Class	Class Ⅰ
Wavelength	905nm±5nm
Ranging capacity	3~1500m (Building) ≥200m (target @0.6m×0.6m)
Ranging accuracy	±1m(≤1000m)，0.2±0.0015*L（>1000m）
Resolution	0.1m
Ranging frequency	1~10Hz（self-adaption）
Accurate ratio	≥98%
Beam divergency	≤6mrad
Power supply	DC2.7V~5.0V
Operating power consumption	≤1.5W
Standby power consumption	≤0.8W
Sleep power consumption	≤1mW
Communication type	UART (TTL_3.3V)
Baud rate	115200/9600
Dimension	25×26×13mm
Weight	11g+0.5g
Operating temperature	-20°C~+ 65°C (Customizable at -40 °C)
Storage temperature	-45°C~+70°C
False alarm rate	≤1%

Impact	1000g,20ms
Vibration	5~50~5Hz, 1 octave /min, 2.5g
Start-up time	≤200ms

Note:

- Visibility ≥10km, humidity ≤70%
- Large target: the target size is greater than the spot size

5. Interface

Communication interface: UART(TTL_3.3V),115200bps.

Electrical interface: The interface model is FWF08002-S06B13W5M. See the following table for the interface definition.

6-pin connection definition

No	Pin	Color	Remarks
1	GND	Green	Power input -/ Serial port
2	VIN+	Yellow	Power input +(DC2.7V~5.0V)
3	NC	Orange	Vacant
4	UART_TX	Red	TTL serial port transmitter, 3.3V level
5	UART_RX	Brown	TTL serial port receiver, 3.3V level
6	POWER_EN	Black	Module power supply is enabled, TTL_3.3V level; Module on (>2.5V or suspended), module off (<0.3V);

Sequence description: The serial number of the terminal pins of the interface is 1 to 6 from top to bottom.

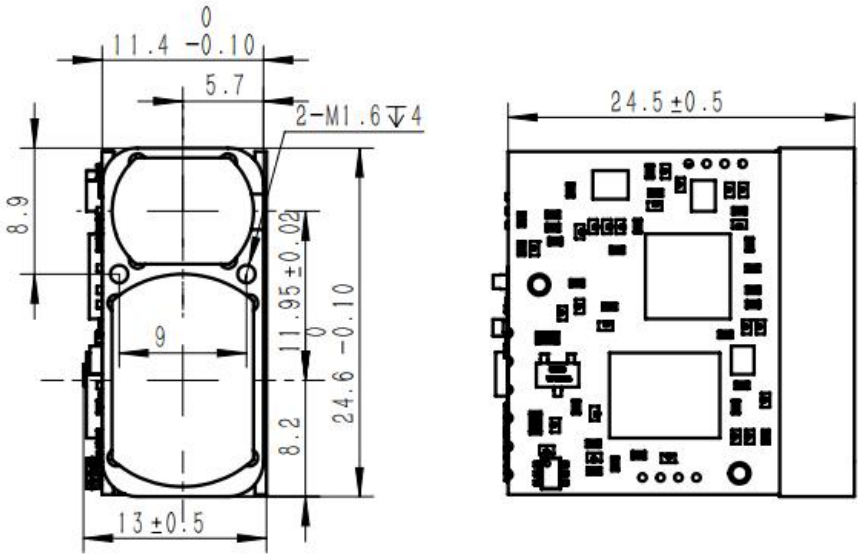
6. Safety & notifications

- The laser emitted by this rangefinder module is a 905nm laser that is safe for human eyes, but it is recommended not to look directly at the laser.
- The window lens in front of LRF needs to be coated with an anti reflective film (905 ± 20nm, T>95%).

- This measuring module is non-airtight, and must ensure that the relative humidity of the use environment is less than 70%, and ensure that the use of the environment is clean and sanitary, so as not to damage the laser.
- The range measurement of the range module is related to the atmospheric visibility and the nature of the target, and the range measurement will be reduced in the case of fog, rain and wind sand. Green leaf clusters, white walls, exposed limestone and other targets have better reflectivity, which can increase the measurement range. In addition, when the Angle of the target to the laser beam increases, the measurement range will be reduced.
- Do not plug and unplug the cable in the energized state; Ensure that the power supply polarity is correctly connected; otherwise, the device will be permanently damaged.
- After the ranging module is powered on, there are high-pressure and heating components on the circuit board. Do not touch the circuit board with your hands when the ranging module is working.

7. Layout dimension

DLRF-C1.5 LRF Layout Drawing



8. Communication protocol

Laser ranging module adopts serial communication mode, the default baud rate is 115200bps.

Data format: eight bits of data, one start bit, one stop bit, no parity check. The data consists of header bytes, command part, data length, parameter part, and check bytes.

Communication mode: master and rangefinder adopt the master-slave communication mode, the master sends the control command to the rangefinder, and the rangefinder receives and executes the command. The range finder sends back the data and status of the range finder according to the range finder period, and the communication format and command content are shown in the following table.

a) Master transmitting

The format of the sent message is as follows:

STX0	CMD	LEN	DATA1H	DATA1L	CHK

Table 2 Description of the format of the sent packet

No	Name	Instruction	Code	Remarks
1	STX0	Start of message sent	55(H)	
2	CMD	Command word	See Table 3	
3	LEN	Data length	Refers to the length of the parameter	
4	DATAH	Parameter	See Table 3	
5	DATAL			
6	CHK	Xor check	Except for the validation byte, other bytes are either	

The command description is as follows:

Table 3 Command and data word description sent by the master to the rangefinder

No.	Command	Function	Data byte	Remarks	Length	Sample code
1	0x00	Standby (continuous range stop)	00 00	Rangefinder stopped working	6 bytes	55 00 02 00 00 57
2	0x01	Single ranging	20 00	20 indicates the start working status	6 bytes	55 01 02 20 00 76
3	0x02	Continuous ranging	20 00	20 indicates the start working status	6 bytes	55 02 02 20 00 75
4	0x03	self-inspection	00 00		6 bytes	55 03 02 00 00 54
5	0x07	High voltage reference setting	DATAH=XX (H) DATAL=YY (L)	Factory instruction; DATA Indicates voltage value *10, unit V	6 bytes	55 07 02 05 AA FF (Voltage 1450)
6	0xEB	Query version number	00 00	Factory order	6 bytes	55 CB 02 00 00 9C

b) Master receive format

The format of the received message is as follows:

STX0	CMD	LEN	DATAn	DATA0	CHK

Table 4 Format description of the received packet

No	Name	Instruction	Code	Remarks
1	STX0	Message start flag 1	55(H)	
2	CMD_JG	Data command word	See table 5	
3	LEN	Data length	Indicates length of the parameter	
4	Dn	Parameter	See table 5	
5	D0			
6	CHK	Xor check	Except for the validation byte, other bytes are either	

Master receiving status description:

Table 5 Description of data words sent by the rangefinder to the master

No	Command	Function	Data byte	Remarks	Total length
1	0x00	Standby (continuous range stop)	00 00	Same request frame	6 bytes
2	0x01	Single ranging	D6 D5 D4 D3 D2 D1 D0	D6 flag byte (not parsed for internal test use) : 0x20 indicates distant order 1, no previous target; 0x28 indicates distant order 1, with a previous target;	11 bytes

No	Command	Function	Data byte	Remarks	Total length
				0x30 indicates distant 2nd order, no previous target; 0x38 indicates distant order 2, with a previous target D5-D3 Target distance (distance value divided by 10, unit 0.1m) D1 APD High voltage (unit: 1V) D0 APD temperature (unit: 1℃)	
3	0x02	Continuous ranging	D3 D2 D1 D0	D6 flag byte (not parsed for internal test use) : 0x20 indicates distant order 1, no previous target; 0x28 indicates distant order 1, with a previous target; 0x30 indicates distant 2nd order, no previous target; 0x38 indicates distant order 2, with a previous target D5-D3 Target distance (distance value divided by 10, unit 0.1m) D1 APD High voltage (unit: 1V) D0 APD temperature (unit: 1℃)	11 bytes
4	0x03	self-inspection	D7	D6: APD high voltage	12 bytes

No	Command	Function	Data byte	Remarks	Total length
			~D0	reference value, unit 1V. D5-4: indicates the value of the blind area (unit: 1m) D3: APD high pressure value after temperature compensation, unit 1V; D2: APD temperature (unit: 1℃);	
5	0x07	High voltage reference setting	D1~D0	D1: High voltage value of the APD after temperature compensation D0: indicates the low voltage value of the APD after temperature compensation	6 bytes
Note: ① No data bytes/bits are defined. The default value is 0					