SPD1200N3

USER MANUAL



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905 ± 5 nm
WAVELENGTH

IEC Class 1
LASER SAFETY CLASS
IEC classification

3–1000 m
MEASUREMENT RANGE

±0.5 m
RANGING ACCURACY
At ≤100 m; see notes

14 × 18 × 22.3 mm
BODY DIMENSIONS
Rectangular • 6061 aluminum

UART-TTL
COMMUNICATION
3.3 V TTL; customizable

For 100 m < d < 1000 m: ±(0.5 m + 0.00075d), where d is distance in meters.
Range conditions: building target, visibility ≥10 km, humidity ≤60%. See Section 5 for dimensions.

1 Product Overview

The SPD1200N3 is a compact, high-accuracy laser rangefinder module with a center wavelength of 905 nm. It measures distances from 3 to 1000 m at an update rate of 2.5–15 Hz, customizable to customer requirements. The module uses a UART-TTL interface and is supplied with test software and interface protocol documentation for system integration. It combines a small size and low weight with high ranging accuracy and a high measurement update rate.

The module can provide ranging functions for handheld equipment such as night vision devices, thermal imagers, telescopes, and laser illuminators. Other applications include infrastructure site monitoring, aviation, communications, railways, road monitoring, smart water management, and outdoor recreation.

2 Technical Specifications

No.	Parameter	Specification
1	Laser wavelength	905 ± 5 nm
2	Beam divergence	<6 mrad
3	Optical element type	Aspheric lens
4	Receive / transmit aperture	Ø6.5 mm
5	Measurement range	3–1000 m Building target; visibility ≥10 km; humidity ≤60%
6	Ranging accuracy	±0.5 m (d ≤100 m) ±(0.5 m + 0.00075d) (100 m < d < 1000 m)
7	Measurement update rate	2.5–15 Hz
8	Measurement success rate	≥98%
9	False alarm rate	≤1%
10	Communication interface	UART, 3.3 V TTL; customizable
11	Baud rate	115200 bps default
12	Supply voltage	DC 3.3–5 V
13	Startup time	≤200 ms
14	Instantaneous startup current	≈200 mA
15	Standby power consumption	≤0.3 W
16	Average power consumption	≤0.5 W
17	Operating temperature	−20 to +60 °C
18	Storage temperature	−30 to +70 °C
19	Ingress protection	Lens cavity: IP67
20	Laser safety class	IEC Class 1

No.	Parameter	Specification
21	Dimensions / material	14.0 × 18.0 × 22.3 mm; rectangular 6061 aluminum alloy
22	Weight	≤6 g

d is the measured distance in meters. See the mechanical drawing for dimensions and tolerances. The IP67 rating applies to the lens cavity only.

3 Functions

The module supports single and continuous measurements.

3.1 Baud Rate Configuration

The serial port baud rate can be changed by command to match the host communication requirements.

3.2 Single Measurement

A single-measurement command initiates a target distance measurement. For targets with low reflectivity, the module automatically repeats the measurement until it obtains a stable distance reading, then reports the result through the serial port in the standard data format.

3.3 Continuous Measurement

In continuous measurement mode, the module repeatedly measures the distance to the target. The update rate varies with distance; the typical range is 2.5–15 Hz.

4 Hardware Installation

4.1 Power and Serial Interface

Supply voltage: DC 3.3–5 V. Serial signal level: 3.3 V TTL. Default baud rate: 115200 bps.

Confirm the connector orientation against the N3 mechanical drawing before wiring. The supply-voltage range does not imply 5 V tolerance for the serial input.

4.2 Electrical Interface Pinout

Pin	Signal	Description
1	GND	Power supply ground
2	VCC	Positive supply input
3	IO (reserved)	Reserved for expansion
4	TXD	Signal output: module → host
5	RXD	Signal input: host → module
6	SW-SHOT	Function enable, active-high (>1.2 V). Lower-level requirements can be accommodated; confirm the supplied configuration before use.

5 Mechanical Interface

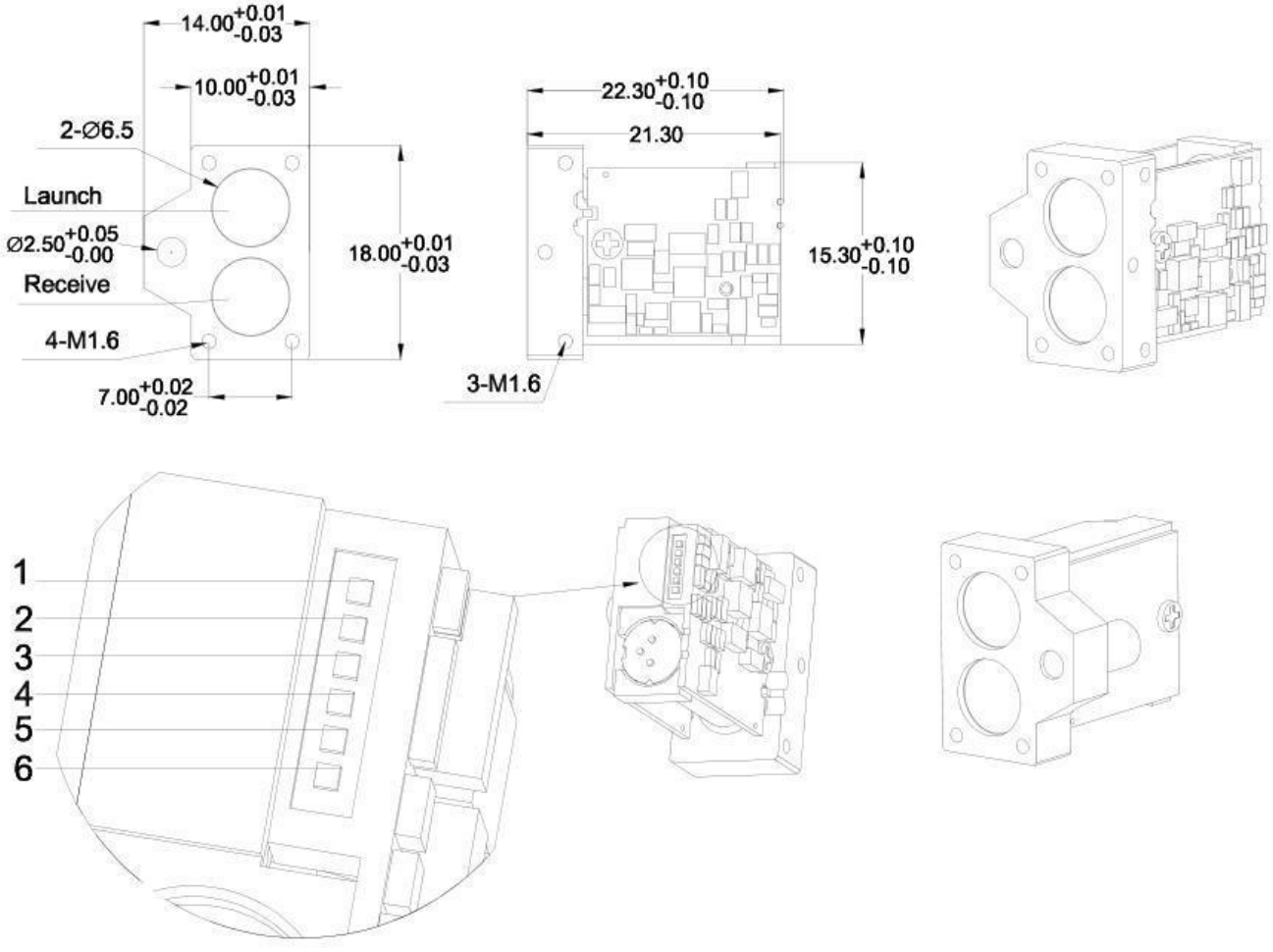


Figure 1 SPD1200N3 Mechanical Drawing and Electrical Interface (mm)

Drawing terminology: “Launch” identifies the transmit aperture; “Receive” identifies the receive aperture. Use the numbered connector view to locate pins 1–6.

6 Optical Window Selection

6.1 Material Recommendations

Use H-K9L optical glass or fused silica for the optical window. These colorless optical materials are suitable for the 300–2100 nm wavelength range and offer favorable physical properties and cost effectiveness.

6.2 Fabrication Recommendations

Keep the optical window wedge-angle tolerance as small as possible. A tolerance of ≤3′ is recommended (tolerance grade ≤7).

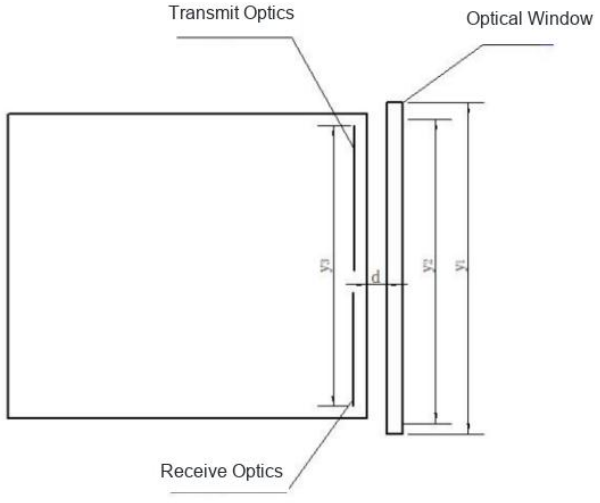
The optical surfaces should be as smooth as possible. Surface roughness is specified as an arithmetic mean roughness, Ra.

6.3 Coating Recommendations

For a 905 nm laser rangefinder, an antireflection coating covering 855–955 nm is recommended for the optical window, with transmittance ≥99.5%. Depending on the operating environment, the outer surface may also receive a hydrophobic coating, hard coating, or other protective coating. Other specifications should follow GJB2485-95, with transmittance ≥98%.

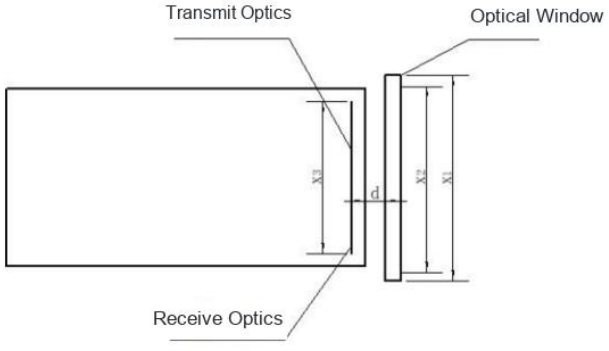
6.4 Dimensions and Installation

Select a clear aperture that does not obstruct the transmit and receive optical paths. Window dimensions depend on the mechanical arrangement. A window thickness of 2–4 mm is recommended, depending on its overall dimensions. Align the transmit optical axis parallel to the window surface normal. Keep the air gap between the window and the rangefinder below 0.5 mm. Figure 2 shows two window mounting arrangements.



y1: window outside size; y2: clear aperture
y3: optical assembly size
Window-to-module air gap: d < 0.5 mm

(a) Arrangement 1



x1: window outside size; x2: clear aperture
x3: optical assembly size
Window-to-module air gap: d < 0.5 mm

(b) Arrangement 2

Figure 2 Optical Window Dimensions and Mounting Arrangements

7 Communication Protocol

Communication method: serial communication

Baud rate: 115200 bps (default)

Data bits: 8

Frame length: 8 bytes

Data Frame Format									
		Header H	Header L	Function	D1	D2	D3	D4	Checksum
	Command	55	AA						SUM(Function+DATA1+…+DATA4)
	Response	55	AA						SUM(Header H+Header L+…+DATA4)
Measurement Commands									
Single Measurement	Command	55	AA	88	FF	FF	FF	FF	SUM[3:7]
		55 AA 88 FF FF FF FF 84							
	Response	55	AA	88	STA	FF	DIS_H	DIS_L	SUM[1:7]
		STA = 1: measurement successful; any other value: measurement failed. DIS_H: high byte of the distance result; DIS_L: low byte of the distance result. Data is returned in hexadecimal format. Each reported result is the actual measured value multiplied by 10.							
Continuous Measurement	Command	55	AA	89	FF	FF	FF	FF	SUM[3:7]
		55 AA 89 FF FF FF FF 85							
	Response	55	AA	89	STA	FF	DIS_H	DIS_L	SUM[1:7]
		STA = 1: measurement successful; any other value: measurement failed. DIS_H: high byte of the distance result; DIS_L: low byte of the distance result. Data is returned in hexadecimal format. Each reported result is the actual measured value multiplied by 10.							
Stop Measurement	Command	55	AA	8E	FF	FF	FF	FF	SUM[3:7]
		55 AA 8E FF FF FF FF 8A							
	Response	55	AA	8E	STA	FF	FF	FF	SUM[1:7]
		STA = 0: failed to stop continuous measurement; STA = 1: continuous measurement stopped successfully.							
Angle Measurement	Command	55	AA	8A	FF	FF	FF	FF	SUM[3:7]
		55 AA 8A FF FF FF FF 86							
	Response	55	AA	8A	STA	FF	ANG_H	ANG_L	SUM[1:7]
		STA = 0: measurement failed; STA = 1: measurement successful. ANG_H: high byte of the angle result; ANG_L: low byte of the angle result. Data is returned in hexadecimal format. Each reported result is the actual measured value multiplied by 10. Available only on modules equipped with an angle sensor.							
Power On Self Test									
Self Test Status	Response	55	AA	80	STA	00	00	ErrCode	SUM[1:7]
		STA = 0: initialization failed; ErrCode contains the error code. STA = 1: initialization successful.							

Data Frame Format									
		Header H	Header L	Function	D1	D2	D3	D4	Checksum
System Configuration									
Baud rate	Command	55	AA	TYPE	FF	FF	FF	FF	SUM[3:7]
		TYPE = 01: set baud rate to 9600 bps TYPE = 02: set baud rate to 14400 bps TYPE = 03: set baud rate to 19200 bps TYPE = 04: set baud rate to 38400 bps TYPE = 05: set baud rate to 56000 bps TYPE = 06: set baud rate to 57600 bps TYPE = 07: set baud rate to 115200 bps TYPE = 08: set baud rate to 128000 bps TYPE = 09: set baud rate to 230400 bps A baud rate change takes effect only after the module restarts.							
	Response	55	AA	TYPE	STA	FF	FF	FF	SUM[1:7]
		STA = 0: configuration failed; STA = 1: configuration successful.							
LD Continuous On Mode	Command	55	AA	86	FF	FF	FF	STA	SUM[3:7]
		STA = 0: disable LD continuous on mode; STA = 1: enable LD continuous on mode. 55 AA 86 FF FF FF 01 84 Enable 55 AA 86 FF FF FF 00 83 Disable							
	Response	55							
		STA = 0: enabled; STA = 1: disabled; STA = FF: operation failed. Caution: Do not leave continuous on mode enabled for extended periods.							

Protocol Notes

1. Command and response frames use different checksum byte ranges.
2. The checksum is the least significant 8 bits of the sum of the specified bytes.
3. All data is transmitted and received in hexadecimal format.

8 Safety Warnings and Precautions



WARNING

Do not look directly into the laser aperture. Avoid eye exposure even though the module complies with Class 1 requirements.

Operating ambient temperature: −20 to +60 °C. Avoid excessive heat, moisture, rain, snow, and dusty environments.

Do not disassemble the module. Doing so may void the warranty or damage the equipment.

This product is intended primarily for integration into civilian UAVs, outdoor observation equipment, engineering surveying instruments, and similar equipment.

If available, laser spot alignment mode is for developers only. Do not direct the beam toward anyone’s eyes in this mode.

Factors Affecting Ranging Performance

Target reflectivity: Higher reflectivity generally increases the measurement range and shortens the response time. In the SPD1200N0 example, a target with medium reflectivity may be measured at 1200 m, a highly reflective target at no less than 1500 m, and a target with low reflectivity at only 600 m. These are N0 examples, not SPD1200N3 range ratings; the SPD1200N3 specified range is 3–1000 m under the conditions in Section 2. Targets that provide little diffuse reflection, such as water surfaces, may not be measurable. Target shape: A small or uneven reflecting surface can reduce the measurement range and increase the response time.

Measurement angle: The measurement range and response time are generally better when the beam strikes the target surface perpendicularly. Oblique incidence can reduce the range and increase the response time. At extreme angles, the range and response time specified in this manual cannot be guaranteed.

Measurement environment: Range and response time are also affected by sunlight intensity, atmospheric water vapor and suspended particles, and the angle relative to incident sunlight. Rain, fog, snow, and haze can reduce the measurement range.

The following measurement setup is recommended:

1) The target has medium reflectivity, such as a building wall.

2) The target reflecting surface is perpendicular to the laser beam.

3) The weather is clear, without direct sunlight.

Recommendation: Secure the module on a tripod when measuring distant targets to reduce movement during measurement and improve results.

Suitable Measurement Targets

The product can measure targets with high reflectivity, such as highway signs; medium reflectivity, such as building walls; and low reflectivity, such as trees, golf flagsticks, and animals. The available range decreases as target reflectivity falls.



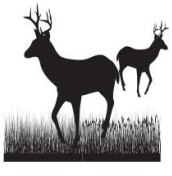
Highway Sign



Building Wall



Trees



Animals