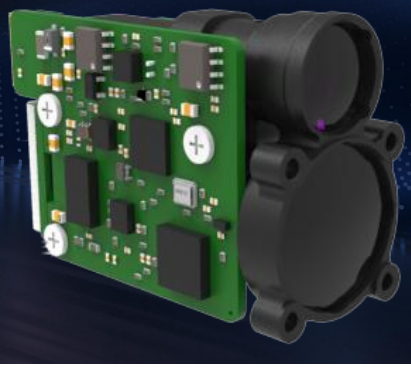
SentiAcu SPL6K

Datasheet



The SPL6K rangefinder features a compact and lightweight design, stable performance, high shock resistance, and Class 1 eye safety compliance. It is well-suited for integration into handheld, vehicle-mounted, meeting the demands of precision, durability, and safety in complex environments.

Technical Specifications

Performance Parameters	
Model	SPL6K
Ranging capability①	≥ 6km Large Target: Building ≥ 5km Vehicle size: 2.3 m × 2.3 m ≥ 3km Human: 1.7 m × 0.5 m
Blind zone	≤ 15m
Precision	≤ ±1m
Default frame rate	1 ~ 10Hz
Beam divergence	≤ 0.3mrad
False detection rate	≤ 1%
Target discrimination	≤ 30m
Central wavelength	1535 ±5nm
Mechanical and Electrical Parameters	
Size （L×W×H)	≤ 50 mm × 23 mm × 33.5 mm
Weight	≤ 40 g
Operating temperature	-40 ~ +60 ℃
Storage temperature	-55 ~ +70 ℃
Supply voltage	DC 5.0 ~ 28.0 V
Shock resistance	> 75 g @6ms
Vibration resistance	Vibration environment of propeller aircraft
Operating power consumption	≤ 1W @5V (at 1 Hz operation)
Peak power consumption	≤ 3W @5V

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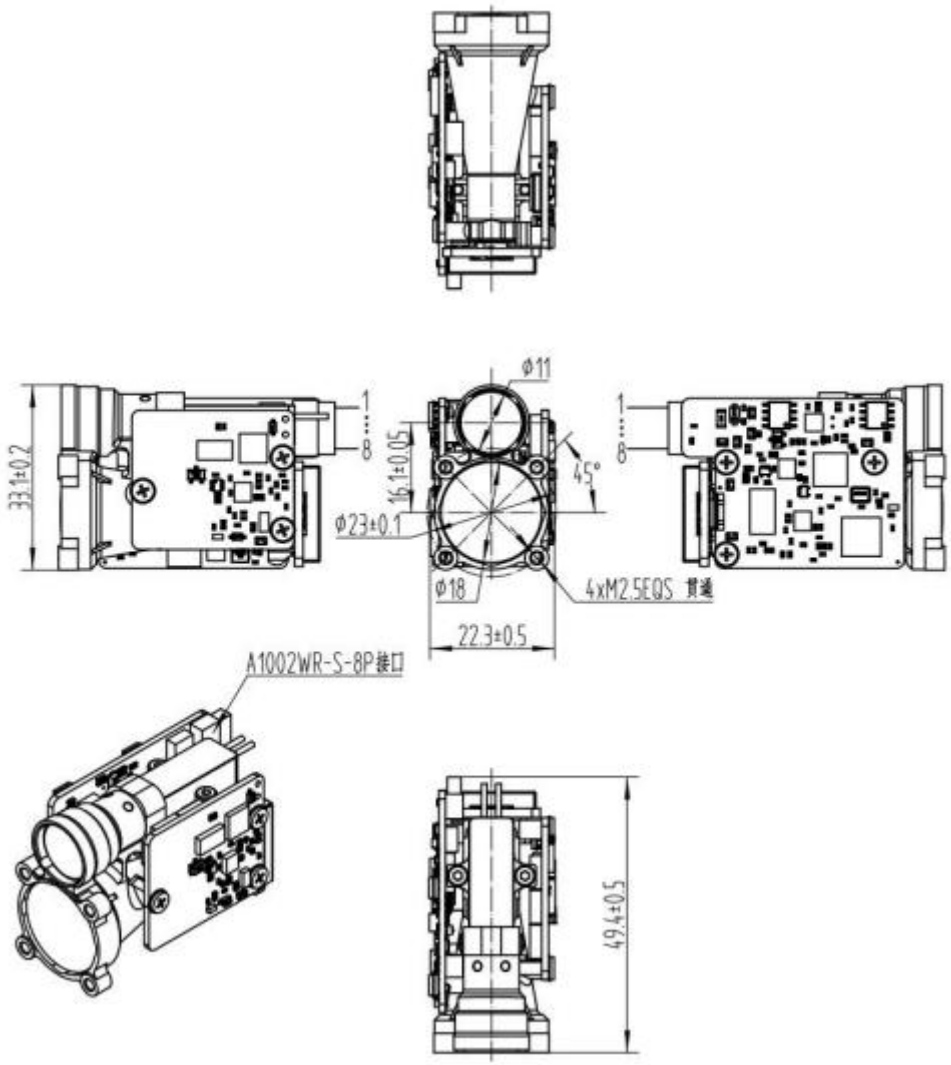
Standby Power Consumption	≤ 0.2W
Communication Protocol	
Communication Interface	UART (RS422 customizable)
Baud rate	115200bps
Dimensions (Unit: mm)	



Notes:

① Test conditions: line-of-sight visibility not less than 20 km, relative humidity ≤ 80%, and target surface reflectivity greater than 0.3.

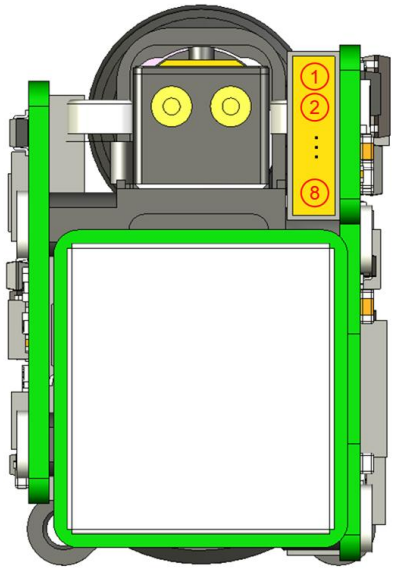
Interface

Communication interface: TTL, baud rate: 115200bps (default).

Electrical interface: The interface model is connector A1002WR-S-8P, and the interface definition is detailed in the table below.

Pin Number	Definition	Notes
1	Vin+	Power input+
2	Vin-	Power input-
3	-	Not used
4	TTL Tx	Serial port transmitter, TTL_3.3 V
5	TTL Rx	Serial port receiver, TTL_3.3 V
6	-	Not used
7	POWER_EN	Module power supply enable, TTL_3.3V level; Module is activated (>2.7V or floating), Module is turned off (<0.3V)
8	GND	GND

Pin sequence description: The pins of the interface terminal are numbered 1 ~ 8 from top to bottom.



Precautions for use

- The laser emitted by this ranging module is 1535 nm, which is safe for the human eye. Although it is a safe wavelength for the human eye, it is recommended not to look directly at the laser;
- When adjusting the parallelism of the three axes, it is necessary to block the receiving lens, otherwise the detector will be permanently damaged due to excessive echo;
- This distance measurement module is non airtight, and it is necessary to ensure that the relative humidity of the usage environment is less than 80%, and that the usage environment is clean and hygienic to avoid damaging the laser;
- The range of the distance measurement module is related to atmospheric visibility and the nature of the target. Distance measurement will be reduced in foggy, rainy, and windy conditions. Green clusters of leaves, white walls, exposed limestone, and other targets have good reflectivity, which can increase the measurement range. In addition, as the inclination angle of the laser beam increases, the measurement range will be reduced;
- It is strictly prohibited to emit laser light towards highly reflective targets such as glass and white walls **within 15 meters**, in order to avoid strong echoes that may damage the APD detector;
- It is strictly prohibited to unplug or plug cables while they are powered on;
- Be sure to ensure the correct polarity connection of the power supply, otherwise it will cause permanent damage to the equipment.

Protocol

Communication Format: Default baud rate: 115,200 bps

Data format: 8 data bits, 1 start bit, 1 stop bit, no parity. Data structure consists of Header, Command, Data Length, Parameters, and Checksum.

Communication Method:

Master-slave architecture. The host sends commands to the rangefinder, which executes them. During ranging operations, the rangefinder periodically returns data and status to the host. Communication formats are described below.

a) Host Transmission

Packet Format:

STX0	CMD	LEN	DATA1H	DATA1L	CHK

Transmission Packet Structure

No.	Name	Description	Code
1	STX0	Packet Start Flag	0x55
2	CMD	Command Code	See Table
3	LEN	Data Length	Parameter length (bytes)
4	DATAH	Parameter High Byte	See Table
5	DATAL	Parameter Low Byte	See Table
6	CHK	XOR Checksum	XOR of all bytes except CHK

Command Descriptions:

Host-to-Rangefinder Commands

No.	CMD	Function	Data Bytes	Remarks	Length	Example
1	0x00	Standby (Stop Continuous Ranging)	0x00 0x00	Stops operation	6B	55 00 02 00 00 57
2	0x01	Single Measurement	0x00 0x00		6B	55 01 02 00 00 56
3	0x02	Continuous Ranging	XX(H) YY(L)	Data = ranging period (ms)	6B	55 02 02 03 E8 BE(1Hz)
4	0x03	Self-Test	0x00 0x00		6B	55 03 02 00 00 54
5	0x04	Minimum Range Gate (Blind Zone)	XX(H) YY(L)	Data = min distance (1m)	6B	55 04 02 00 64 37(100m)
6	0x06	Query Laser Pulse Count	0x00 0x00		6B	55 06 02 00 00 51
7	0x07	Set HV Reference (Factory)	XX(H) YY(L)	Resolution 0.1V	6B	55 07 02 01 90 C1(40.0V)
8	0x08	Set APD Gain Mode	XX(H) YY(L)	0x0000: Low Gain 0x0001:	6B	55 08 02 00 00 5F(Low) 55 08 02 00 01

No.	CMD	Function	Data Bytes	Remarks	Length	Example
				High Gain Default: High Gain		5E(High)
9	0x09	Query APD Gain Mode	0x00 0x00		6B	55 09 02 00 00 5E
10	0x0B	Set Maximum Range	XX(H) YY(L)	Data = max distance (1m)	6B	55 0B 02 4E 20 32(20,000m)
11	0x11	Enable APD Power	0x00 0x00		6B	55 11 02 00 00 46
12	0x12	Disable APD Power	0x00 0x00		6B	55 12 02 00 00 45
13	0x1A	Clear Laser Pulse Count (Factory)	-		-	-
14	0x1B	Laser Trigger Test (Factory)	-	Not supported on 3KM model	-	-
15	0x1C	AMR Firmware Update	-		-	-

No.	CMD	Function	Data Bytes	Remarks	Length	Example
		(Factory)				
16	0x20	Set Laser Timeout	XX(H) YY(L)	Data = timeout (1 min)	6B	55 20 02 00 14 63(20 min)
17	0x22	Set Target Mode	XX(H) YY(L)	0x0000: Single Target 0x0001: Three Targets 0x0002: First/Last Target	6B	55 22 02 00 01 74(Three Targets)
18	0x23	Set TPG (Factory)	XX(H) YY(L)		6B	-
19	0x28	Query Ranging Parameters	0x00 0x00		6B	55 28 02 00 00 7F
20	0xEB	Query Device ID	0x00 0x00	Board ID	6B	55 EB 02 00 00 BC
21	0x26	Set Baud Rate	XX(H) YY(L)	Baud Rate × 0.01	6B	55 26 02 04 80 3C(115,200 bps)

b) Host Reception

Packet Format:

STX0	CMD_JG	LEN	DATAn	...	DATA0	CHK

Reception Packet Structure

No.	Name	Description	Code	Remarks
1	STX0	Packet Start Flag	0x55	
2	CMD_JG	Response Command	See Table	
3	LEN	Data Length	Parameter length (bytes)	
4	DATAn	Parameter Byte n	See Table	
5	DATA0	Parameter Byte 0	See Table	
6	CHK	XOR Checksum	XOR of all bytes except CHK	

Response Descriptions:

Rangefinder-to-Host Responses

No.	CMD	Function	Data Bytes	Remarks	Length
1	0x00	Standby Acknowledge	0x00 0x00	Echoes request	6B
2	0x01	Single Measurement Result	D9-D0	D6-D8: Target 1 Dist (0.1m) D3-D5: Target 2	14B

No.	CMD	Function	Data Bytes	Remarks	Length
				Dist (0.1m) D0-D2: Target 3 Dist (0.1m) (Sorted near-to-far) D9 Status Byte (MSB first): Bit 7: Main Pulse (1=Detected) Bit 6: Echo Pulse (1=Detected) Bit 5: Laser Status (1=OK) Bit 4: Timeout Flag (1=Normal) Bit 3: Reserved (1) Bit 2: APD Status (1=OK) Bit 1: Pre-Target Flag (1=Exists) Bit 0: Post-Target Flag (1=Exists) Note: Targets 2/3 zero in Single/First-Last modes	
3	0x02	Continuous Ranging Result	D9-D0	Same format as 0x01	14B

No.	CMD	Function	Data Bytes	Remarks	Length
4	0x03	Self-Test Result	D7-D0	D7-D6: -5V Voltage (0.01V) D5-D4: Blind Zone (1m) D3: APD HV (1V) D2: APD Temp (°C) D1-D0: +5V Voltage (0.01V)	12B
5	0x04	Min Range Set Acknowledge	D1 D0	Min distance (1m), echoes request	6B (NV)
6	0x06	Laser Pulse Count Response	D3-D0	Pulse count (4B, big-endian)	8B
7	0x07	HV Set Acknowledge	-	Echoes request	6B
8	0x08	APD Gain Set Acknowledge	D1 D0	0x0000: Low Gain 0x0001: High Gain	6B
9	0x09	APD Gain Mode Response	D1 D0	Same as 0x08	6B
10	0x0B	Max Range Set	D1 D0	Max distance (1m),	6B (NV)

No.	CMD	Function	Data Bytes	Remarks	Length
		Acknowledge		echoes request	
11	0x11	APD Power On Acknowledge	0x00 0x00	Echoes request	6B
12	0x12	APD Power Off Acknowledge	0x00 0x00	Echoes request	6B
13	0x1A	Pulse Count Clear Acknowledge	0x00 0x00	Echoes request	6B
14	0x1B	Trigger Test Ack (Factory)	D1 D0	Not supported on 3KM model	6B
15	0x1C	Firmware Update Ack (Factory)	0x00 0x00	Echoes request	6B
16	0x20	Timeout Set Acknowledge	D1 D0	Timeout value (min), echoes request	6B
17	0x22	Target Mode Set Acknowledge	D1 D0	Echoes request	6B
18	0x23	TPG Set Ack (Factory)	D1 D0		6B
19	0x28	Ranging Parameters Response	D17-D0	D17-D16: TPG Param (BE)	22B

No.	CMD	Function	Data Bytes	Remarks	Length
				D15-D14: HV Param (BE) D13-D12: Max Range D11-D10: Min Trigger Width D9-D8: Max Trigger Width D7-D6: Specified Width D5-D4: Timeout Value D3-D2: Baud Rate D1: Target Mode D0: Protocol Ver	
20	0xEB	Device ID Response	D15-D0	D15-D12: Model Code D11-D10: Product ID D9-D6: Software	20B

No.	CMD	Function	Data Bytes	Remarks	Length
				Ver D5-D4: APD ID D3-D2: Laser ID D1-D0: FPGA Ver	
21	0xEC	Command Error	0x00 0x00	Invalid command	6B
22	0xED	Operation Timeout	0x00 0x00	Laser protection active	6B
23	0xEE	Checksum Error	0x00 0x00		6B
24	0xEF	UART Timeout	0x00 0x00	Not supported on 3KM model	6B
25	0x26	Baud Rate Set Ack	D1 D0	Baud rate param (BE)	6B