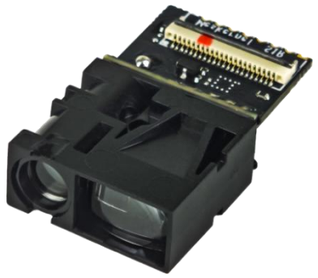
Siman



SDXMSeries Laser RangingModule

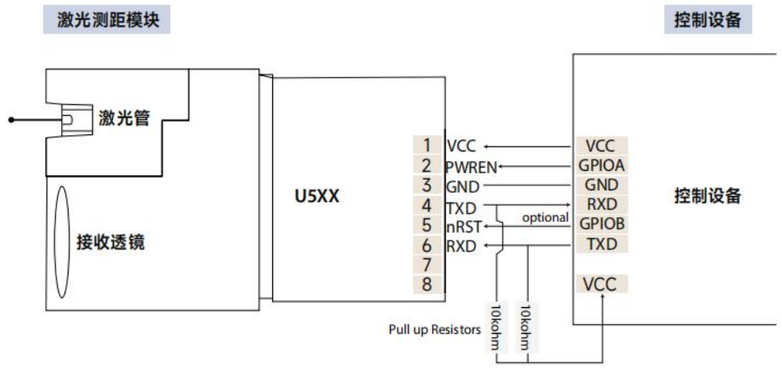
The SDXM series is an indirect Time-of-Flight (iToF) measurement device developed by Siman Sensor Technology Co., Ltd. More specifically, it features a laser ranging module that employs the phase-difference laser ranging method, offering rapid response and high-precision distance measurement capabilities. This module achieves a ranging accuracy of up to ±1 mm, with a data update rate of up to 100 Hz and a maximum measurable range of 70 meters. Its compact design and USART digital interface make it easy to integrate into systems and facilitate secondary development.

Phase-based laser ranging boasts advantages such as high ranging accuracy, a wide measurement range, and strong anti-interference capability, making it widely used in fields including industry, surveying and mapping, and remote sensing.

For more product information, please visit:www.siman.asia

Warning	Please follow the equipment usage guidelines! This product is not a safety sensor and cannot be used for personnel protection.
	➢ Measuring laser (610nm~690nm)Class 2: Do not look directly at the beam or observe it using optical instruments. ➢ This product does not have an explosion-proof design and is prohibited from use in flammable and explosive environments. ➢ Do not disassemble this product. ➢ Be sure to turn off the power before performing any operations. Do not perform wiring operations while the power is still on! 1. Avoid use in dusty/vapor environments or environments with corrosive gases; 2. Avoid using in environments that produce corrosive gases.; ➢ This product cannot be used in water. ➢ When using outdoors, be sure to add a waterproof cover.

Pin definitions



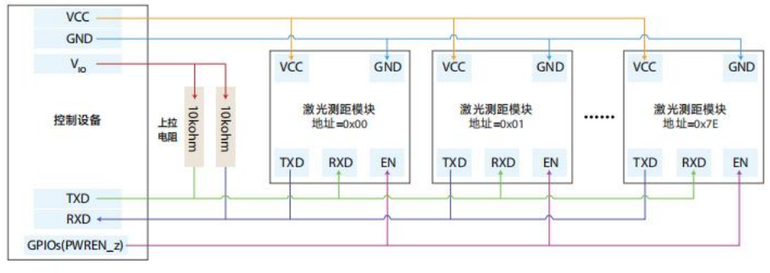
Pin Function

Pin	Name	Function	Default value	Description
1	VCC	Power input	Power supply determined	Typical module input power requirements: >300mA @ DC: 3.3V
2	PWREN	Digital input	Low	The module’s power-on enable pin is triggered by a high-level signal, with VIH = 2.0V and VIL = 0.5V.
3	GND	Ground wire	Ground wire determination	Module power supply grounding
4	TXD	Digital output	High	Module serial port transmit pin, open-drain by default.
5	nRST	Digital input	High	ModuleReset pin, low-level trigger (optional)
6	RXD	Digital input	High	Module serial port receive pin

Note: When the PWREN input level is higher than the VIH value, PWREN is considered to be at a high level.

When the PWREN input level falls below the VIL threshold, PWREN is considered to be at a low level. To ensure reliable module activation or deactivation, pay attention to the initial level and control level of the PWREN pin.

Multi-module connection



Note: The number of modules within a single network segment should not exceed 8. In multi-network-segment environments, the maximum number of modules should not exceed 128, and connections must be made according to the bus topology.The number of modules should be adjusted appropriately to regulate the pull-up resistor value on the bus (when multiple modules are connected, the pull-up resistor value can be appropriately reduced)..

Specification parameters

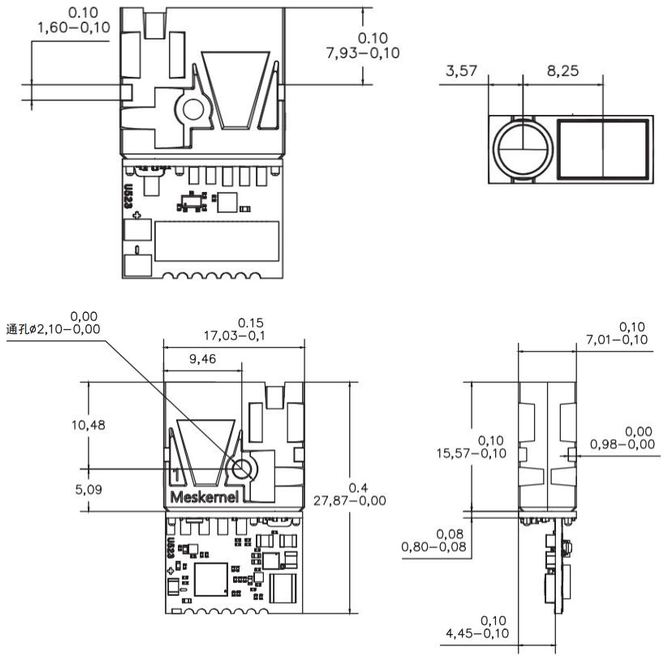
Model	SDXM		
Measurement range	0.03…70m(Reflectance:1.0, interference light intensity: 3 kLux)		
Accuracy and precision	±(1mm + D × (1/10000)) (Reflectance:0.2-1.0, interference light intensity: 1 kLux)		
Range resolution	1mm		
Measure frequency	5Hz	30Hz	100Hz
Laser light source	610nm~690nm,Class2		
Measure the target object	Natural surfaces or dedicated reflectors for static or dynamic targets		
Typical spot size （Oval)	<8mm@10m <20mm@20m <40mm@40m		
Light spot distribution range	Target plate circle diameter <100mm @ 10mTarget Target plate circle diameter <200mm @ 20m target Target plate circle diameter <300mm @ 30m target		
Data interface	USART		
Current	Shutdown leakage current	<10 μ A @ 3.3V	
	Standby current	<30mA@3.3V	
	Turn on the laser	<50mA@3.3V	
	Continuous measurement mode	<100mA@3.3V	
Operating voltage	DC:2.6~3.6V;Recommended 3.3V		
LaserPower consumption	<1mW		
Specification dimensions	27.87mm×17.03mm×7.01mm		
Weight	3g±0.5 g		
Operating temperature	0~40℃		
Storage temperature	-25~60℃		
Laser lifetime	10000above h		

1) Under adverse measurement conditions, the measurement range will decrease and the error will increase—for example, when ambient light is too intense or the diffuse reflectance coefficient of the measured point is either too high or too low.

2) Customizable wider operating temperature range;

3) Higher operating frequencies are customizable.

Dimensional drawing



Contact Us

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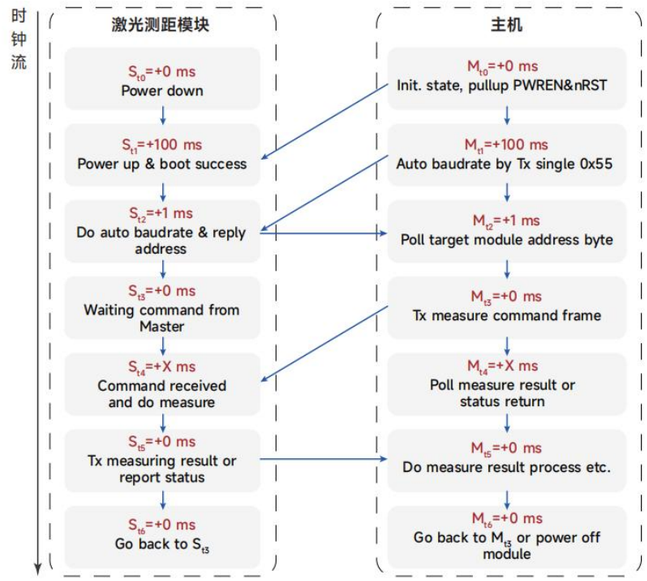
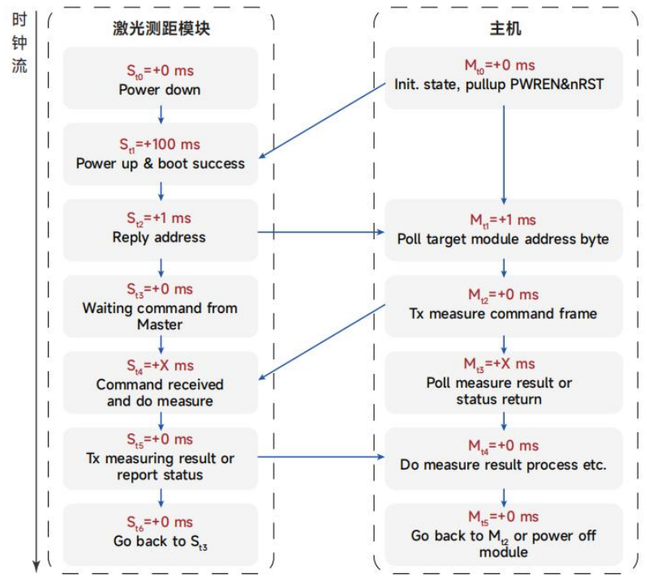
Communication Instructions:USART				
Module that supports automatic baud rate detection	9600bps, 19200 bps, 38400 bps, 115200 bps;			
Fixed Baud Rate Module	115200bps, customizable (4800 bps, 9600 bps, 38400 bps, 115200 bps, 19200 bps);			
Start bit: 1	Data bit 8	Stop bit 1	Check digit: None	Serial portFlow control: None
For modules that support automatic baud rate, if the module is powered on for 2.5...If no automatic baud rate handshake byte 0x55 is received within one second, or if an incorrect handshake byte is received, the module will communicate at a fixed baud rate of 115,200 bps.				

Control Flow Diagram

All communication commands are issued by the host, and the laser ranging module acts as a slave device, responding to the host’ s instructions. The communication timeline is shown in the figure:Automatic Baud Rate Function Module:



固定波特率功能模块：



In the initial state, the slave device (laser ranging module) is in a power-off mode before the host pulls its PWREN pin; once PWREN is pulled...After the foot is raised, if the slave device supports automatic baud rate detection, it will enter the automatic baud rate handshake phase after approximately 100 ms of self-checking. At this point, the master device sends a handshake byte (0x55) to the slave device at the required baud rate. If the communication is successful, the slave device will reply to the master device with a single byte of data, which represents the slave device’s communication address (1 byte of data). In a scenario where there is one master and multiple slaves, after the master sends the handshake byte, it may receive address responses from multiple slave devices. This could lead to a USART bus conflict; therefore, this byte should be ignored.

After the automatic baud rate setting is successful, communication between the master and slave has been established successfully.

Measurement mode	
Single measurement	Send a single measurement command; upon successful measurement, return a single measurement result.
Continuous measurement	Send a continuous measurement command once, and the module will remain in continuous measurement mode. Each time a measurement is successfully completed, a measurement result will be returned. To exit continuous measurement, the host needs to send one byte of 0x58 (the uppercase character 'X' in ASCII) during the measurement.

Work mode

- Automatic modeThe module automatically selects the measurement speed based on the strength of the reflected signal or the signal quality (SQ).The smaller the value, the more reliable the measurement result; or, the stronger the signal intensity, the more reliable the measurement result.
- Low-speed modeModule measurement accuracy takes priority.
- Quick modeThe module prioritizes measurement speed.

Work mode / Measurement mode	Automatic	Low speed	Quick
Single time	Single automatic	Single low-speed	Single rapid
Continuous	Automatic continuous measurement	Low-speed continuous measurement	Rapid continuous measurement
Measurement speed	Medium speed	Low speed	Quick
Measurement accuracy	Standard	High precision	Low precision

Control instructionframework

Head	RW	Address	Register	Payload count	Payload	Checksum
8position	1position	7position	16position	16position	Data length × 16 bits	8position
Frame header	Read/Write Direction Indicator Bit	Current slave address	Register address	Data length	Valid target data	Checksum
Byte [0]	Byte[1]		Byte [2:3]	Byte [4:5]	Byte [6:N]	Byte [6:N]

Checksum =(Byte[1] + Byte[2] + Byte[3] + ⋯ + Byte[N]) & 0xFF

R/W (Read/Write Direction Indicator))Host writes data to slave—0; Host reads data from slave—1;

Address (address bit): The address is only7Address range: 0x00–0x7F; 0x00 is the factory-default address for the slave device; 0x7F is the broadcast address used by a master device to send messages to multiple slave devices.

Control register

Serial number	Register	Naming	Function
1	0x0000	REG_ERR_CODE	System status code
2	0x0006	REG_BAT_VLTG	Operating voltage
3	0x0010	REG_ADDRESS	Module address
4	0x0012	REG_OFFSET	Module measurement result offset

5	0x0020	REG_MEA_START	Start measuring
6	0x0022	REG_MEA_RESULT	Measurement results
7	0x01BE	REG_CTRL_LD	Laser diode control

Command

Function	direction	Data

Read the module's latest status

Send

Byte	0	1	2	3	4
Name	head	address	register		check
Data	0xAA	0x80	0x00	0x00	0x80

Receive

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x80	0x00	0x00	0x00	0x01	0xYY	0xZZ	sum

Read the hardware version number

Send

Byte	0	1	2	3	4
Name	head	address	register		check
Data	0xAA	0x80	0x00	0x0A	0x8A

Receive

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x80	0x00	0x0A	0x00	0x01	0xVV	0xYY	sum

Read the software version number

Send

Byte	0	1	2	3	4
Name	head	address	register		check
Data	0xAA	0x80	0x00	0x0C	0x8C

Receive

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x80	0x00	0x0C	0x00	0x01	0xVV	0xYY	sum

Read module serial number

Send

Byte	0	1	2	3	4
Name	head	address	register		check
Data	0xAA	0x80	0x00	0x0E	0x8E

Receive

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x80	0x00	0x0E	0x00	0x01	0xSS	0xNN	sum

Read the input voltage

Send

Byte	0	1	2	3	4
Name	head	address	register		check
Data	0xAA	0x80	0x00	0x06	0x86

Receive

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x80	0x00	0x06	0x00	0x01	0x32	0x19	sum

Read the current offset

Send

Byte	0	1	2	3	4
Name	head	address	register		check
Data	0xAA	0x80	0x00	0x12	0x92

Receive

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x00	0x00	0x12	0x00	0x01	0xVV	0xYY	sum

Read the measurement results

Send

Byte	0	1	2	3	4
Name	head	address	register		check
Data	0xAA	0x80	0x00	0x22	0xA2

Receive

Byte	0	1	2	3	4	5	6:9	10:11	12
Name	head	address	register		effective calculation		effective distance value	signal quality value	check
Data	0xAA	0x00	0x22	0x00	0x03		0xAABBCCDD	0x0101	sum

Set the module address

Send

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x00	0x00	0x10	0x00	0x01	0x00	0xYY	sum

Receive

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x00	0x00	0x10	0x00	0x01	0x00	0xYY	sum

Set the module to measure the offset.

Send

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x00	0x00	0x12	0x00	0x01	0xZZ	0xYY	sum

Receive

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x00	0x00	0x12	0x00	0x01	0xZZ	0xYY	sum

Turn the laser on or off

Send

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x00	0x01	0xBE	0x00	0x01	0x00	0xZZ	sum

Receive: Same as sending

Single automatic measurement

Send

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x00	0x21

Receive

Byte	0	1	2	3	4	5	6:9	10:11	12
Name	head	address	register		effective calculation		effective distance value	signal quality value	check
Data	0xAA	0x00	0x22	0x00	0x03		0xAABBCCDD	0x0101	check

Low speed single measurement

Send

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x01	0x22

Receive: With a singleAutomatic measurement feedback commandSame

High-speed single shot Measurement

Send

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x02	0x23

Receive: With a singleAutomatic measurement feedback command consistent

Continuous aut

Send

Byte	0	1	2	3	4	5	6	7	8
Name	head	address	register		effective calculation		valid byte		check
Data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x04	0x25

omatic measurement		
	Receive	With a singleAutomatic measurement feedback command consistent
Low-speed connectionMeasurement	Send	<table><tr><td>Byte</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>Name</td><td>head</td><td>address</td><td colspan="2">register</td><td colspan="2">effective calculation</td><td colspan="2">valid byte</td><td>check</td></tr><tr><td>Data</td><td>0xAA</td><td>0x00</td><td>0x00</td><td>0x20</td><td>0x00</td><td>0x01</td><td>0x00</td><td>0x05</td><td>0x26</td></tr></table>
	Receive	With a singleAutomatic measurement feedback command consistent
High-speed continuousMeasurement	Send	<table><tr><td>Byte</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>Name</td><td>head</td><td>address</td><td colspan="2">register</td><td colspan="2">effective calculation</td><td colspan="2">valid byte</td><td>check</td></tr><tr><td>Data</td><td>0xAA</td><td>0x00</td><td>0x00</td><td>0x20</td><td>0x00</td><td>0x01</td><td>0x00</td><td>0x06</td><td>0x27</td></tr></table>
	Receive	With a singleAutomatic measurement feedback command consistent
Slave device Error Feedback	Send	Command description: Send an error status code to the host; the error status code is 0x000F. <table><tr><td>Byte</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>Name</td><td>head</td><td>address</td><td colspan="2">register</td><td colspan="2">effective calculation</td><td colspan="2">valid byte</td><td>check</td></tr><tr><td>Data</td><td>0xEE</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x00</td><td>0x01</td><td>0x00</td><td>0x0F</td><td>0x10</td></tr></table>
Exit continuous measureme	Send	When the host is in continuous measurement mode, sending a single byte 0x58 (the uppercase character ‘X’) will immediately stop the continuous measurement mode.

nt		
Initiate multi-slave measures	Send	<table><tr><td>Byte</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>Name</td><td>head</td><td>address</td><td colspan="2">register</td><td colspan="2">effective calculation</td><td colspan="2">valid byte</td><td>check</td></tr><tr><td>Data</td><td>0xAA</td><td>0x7F</td><td>0x00</td><td>0x20</td><td>0x00</td><td>0x01</td><td>0x00</td><td>0x00</td><td>0xA0</td></tr></table>
	Receive	No reply

Status code

Status code	Description	Handling measures
0×0000	No errors	—
0×0001	The input voltage is lower; the input voltage value should... ≥2.0V	Check the input battery voltage.
0×0002	Network error; can be ignored.	—
0×0003	Module temperature is low (< -20° C)	Increase module temperature
0×0004	The module temperature is high (> +60° C)	Reduce module temperature
0×0005	The target exceeds the measurement range.	Use in the two-part measurement specified in the module manual.
0×0006	Invalid measurement value	Re-measure
0×0007	Ambient light is too strong.	Reduce the illumination intensity of the measurement environment.
0×0008	The laser signal is weak.	Check whether the output mirror is contaminated or enhance the reflectivity of the measurement target.
0×0009	The laser signal is strong.	Reduce the reflectivity of the measurement target.
0×000A	Hardware error 1	Ask customer service based on the error code.
0×000F	The laser signal is unstable.	Stabilize the body or check whether the power supply is stable.
0×0081	Invalid communication format	Check whether the command was sent incorrectly.

Troubleshooting

1.Computer and USBAfter connecting the TTL conversion module, the computer did not detect the serial port device—here's the handling procedure:

a. Check whether the computer has CH340 installed.the drive; if not available, it can be...On the official websiteFind and install the “CH340 Driver” application;

b. Check whether the communication interface connection between the USB-to-TTL module and the computer is stable.

c. Check whether the computer’s USB port is damaged or whether the USB-to-TTL module is damaged;

2.After the module is successfully powered on and connected to the computer, the troubleshooting steps to take when the command module does not respond are as follows:

a. Check module TXDWhether the RXD is connected in reverse;

b. Check whether the baud rate is set correctly;

c. Check whether the module’s TXD and RXD are open-drain outputs. If they are in open-drain mode, verify whether pull-up or pull-down resistors are connected.

3. Measures to address the issue where the module can communicate normally but the received data appears as garbled text:

a. Check whether the serial port debugging assistant is set toHEX display (hexadecimal display);

b. Check communication stability:

1. The primary check is to see whether there’s any electromagnetic interference or other signal interference nearby. If there is, try to stay as far away as possible.

2. Is the serial communication cable too long? If it’s a standard USART (TTL-level) communication, the cable length should ideally not exceed one meter.

Precautions for Use

(1) Do not look directly at the laser;

(2) Do not use this product beyond the specified electrical parameters.

(3) Do not perform product wiring operations without first disconnecting the power supply.

(4) Please perform the wiring strictly according to these instructions.

(5) Please keep the front end of the product’s optical lens clean to ensure normal operation of the product.

After-sales and Repair

(1) The product comes with a 12-month warranty from the date of manufacture.

(2) The following situations are not covered by the free warranty:

a. The product malfunctions or gets damaged due to improper operation;

b. Product failure or damage caused by force majeure;

c. For any other outstanding matters, please contact us.SimanCustomer Service Center.