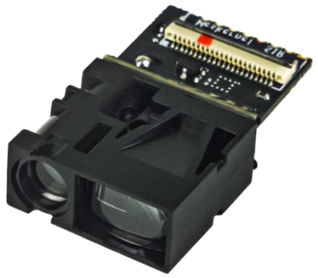
Siman



SDXM Series Laser Range Finder Module

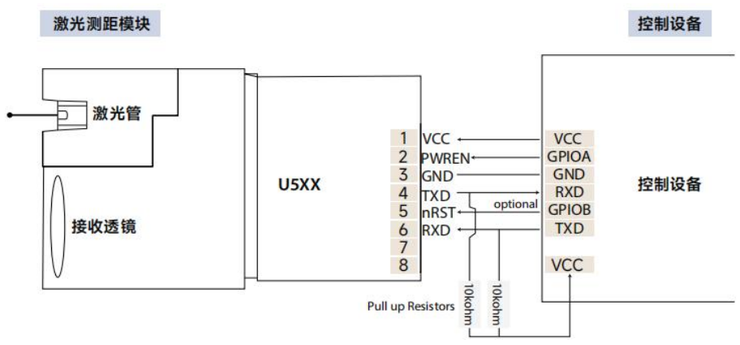
The SDXM series is an indirect flight time (iToF) laser ranging module developed by Siman Sensing Technologies, specifically employing phase-difference laser ranging technology. It delivers rapid response and high-precision ranging capabilities, with an accuracy of ±1mm, data update frequency up to 100Hz, and a maximum range of 70 meters. The compact design and USART digital interface output facilitate system integration and secondary development.

Phase laser ranging has the advantages of high ranging accuracy, wide measurement range and strong anti-interference ability, so it has been widely used in industry, surveying and mapping, remote sensing and other fields.

For more product information, please log in: www.siman.asia

warn	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 use optical instruments to observe. ➢ This product has no explosion-proof structure, and it is forbidden to use in flammable and explosive environments. ➢ Do not remove this product. ➢ Be sure to turn off the power before operating. Do not connect wires while powered on! 1. Avoid use in dust/steam or corrosive gas environment; 2. Avoid use in environments where corrosive gases are produced; ➢ Do not use this product in water. ➢ When used outdoors, pay attention to adding a waterproof cover.

Pin definition

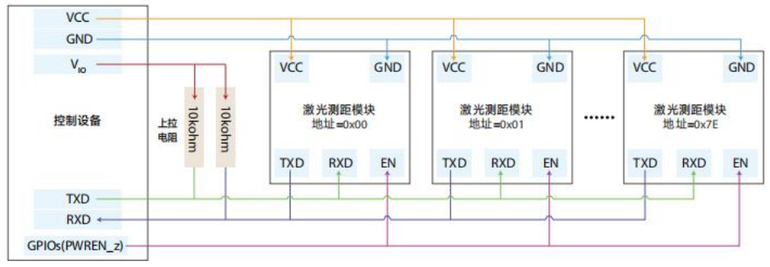


Pin functions

pin Pin	name	function	Windows default	description
1	VCC	power input	Power supply determines	Typical module input power requirements:300mA@DC:3.3V
2	PWREN	digital input	low	Module power-on enable pin, high-level trigger, VIH=2.0V, VIL=0.5V
3	GND	earth wire	Grounding determines	Module power ground
4	TXD	numeric output	Gao	Module serial port send pin, open drain by default
5	nRST	digital input	Gao	Module reset pin, low-level trigger (optional)
6	RXD	digital input	Gao	Module serial port receiver pin

Note: When the PWREN input level exceeds VIH, it is considered that PWREN is receiving a high-level input.
When the PWREN input level falls below VIL, it indicates a low-level input. To ensure reliable module activation or deactivation, carefully monitor both the initial and control levels of the PWREN pin.

Multi-module connection



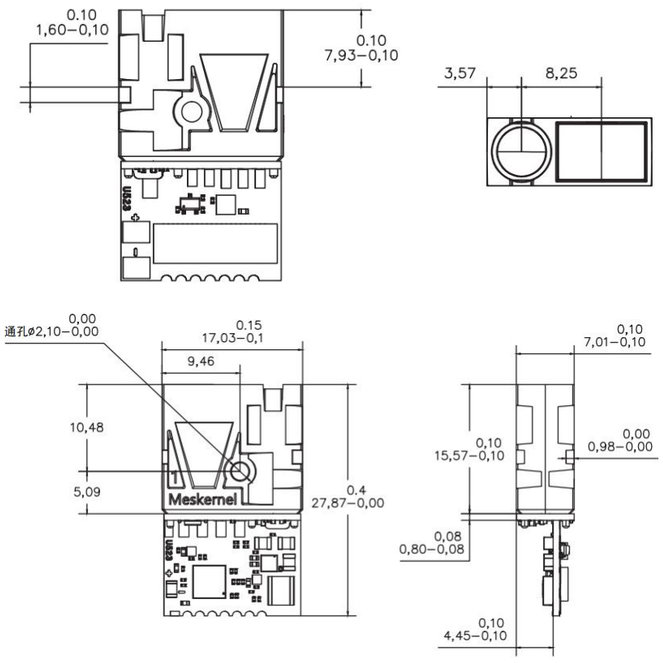
Note: The number of modules in a single network segment should not exceed 8, and the maximum number of modules in a multi-network segment should not exceed 128. The value of the bus pull-up resistor should be adjusted appropriately according to the number of modules connected to the bus (the value of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

Specifications

model	SDXM		
measuring range	0.03...70m (reflectivity: 1.0, interference light intensity: 3kLux)		
Accuracy	±(1mm + D × 1/10,000) (Reflectivity: 0.2-1.0, Interference light intensity: 1kLux)		
range resolution	1mm		
measuring frequency	5Hz	30Hz	100Hz
laser light source	610nm~690nm, Class 2		
Measure the target object	Natural surface or dedicated reflector for static or dynamic targets		
Typical spot size (oval)	<8mm@10m <20mm@20m <40mm@40m		
Spot Spreading	Scatter target circle diameter <100mm@10m target Scatter target circle diameter <200mm@20m target Scatter target circle diameter <300mm@30m target		
data interface	USART		
current	Shut-off leakage current	<10μA@3.3V	
	Standby current	<30mA@3.3V	
	Turn on laser	<50mA@3.3V	
	Continuous measurement mode	<100mA@3.3V	
working voltage	DC:2.6~3.6V; recommended 3.3V		
Laser Power Consumption	< 1mW		
specification and dimension	27.87mm××17.03mm×7.01mm		
weight	3g±0.5g		
working temperature	0~40℃		
Storage temperature	-25~60℃		
Laser life	Over 10,000h		

1) Under the condition of bad measurement, the range will be reduced and the error will be increased, such as the ambient light is too strong, the diffuse reflection coefficient of the measured point is too large or too small.
2) The wider operating temperature range can be customized;
3) Higher working frequency can be customized.

dimensional drawing



contact us

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Zhengzhou City, Henan Province

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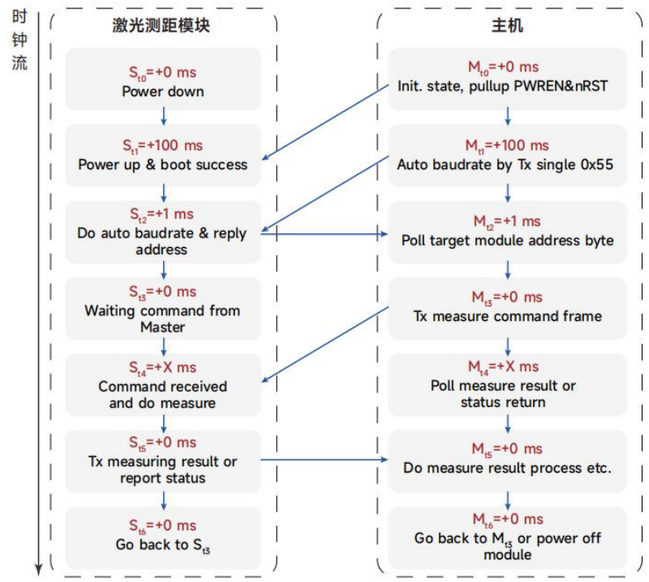
Scan the QR code to follow us

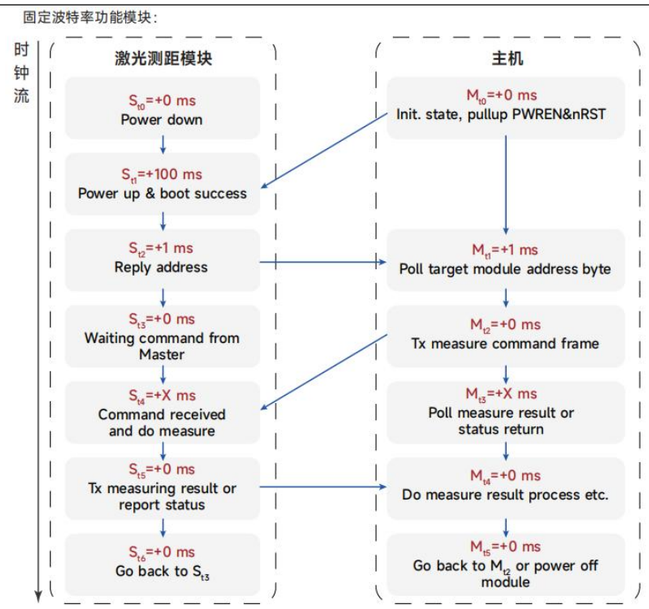
Communication Note: USART				
Module that supports automatic baud rate detection	9600bps, 19200bps, 38400bps, 115200bps;			
Fixed baud rate module	115200bps, customizable options: 4800bps, 9600bps, 38400bps, 115200bps, 19200bps;			
Start position: 1	Data bit 8	Stop position 1	Check bit: None	Serial stream control: None
For modules supporting auto baud rate, if they fail to receive the auto baud rate handshake byte 0x55 or an incorrect handshake byte within 2.5 seconds after power-on, the module will communicate at a fixed rate of 115200 bps.				

Control flow

All communication commands are issued by the host, with the laser ranging module functioning as a slave to respond to these commands. The communication timeline is illustrated in the diagram. The automatic baud rate function module:



固定波特率功能模块：



In the initial state, the slave device (laser ranging module) remains in power-off mode until its PWREN pin is activated by the master. When the PWREN pin is activated, if the slave supports auto baud rate, it performs a 100ms self-check before entering the auto baud rate handshake phase. During this phase, the master transmits a handshake byte (0x55) at the target baud rate. If communication succeeds, the slave responds with a 1-byte data packet containing its communication address. In a master-slave configuration, the master may receive multiple address acknowledgments from slaves after sending the handshake byte, which could cause USART bus conflicts. Such byte responses should be ignored.

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

measurement pattern

single measurement	Send a single measurement command and return the result upon successful completion.
continuous measurement	Send a continuous measurement command, and the module remains in continuous measurement mode. Each successful measurement returns a result. To exit continuous measurement, the host must send a 1-byte 0x58 (ASCII uppercase 'X') during measurement.

work pattern

- Automatic mode: The module automatically selects the measurement speed based on the reflection signal strength or signal quality. The measurement result is more reliable when the signal quality (SQ) value is smaller or the signal strength is larger.
- Low speed mode: Module measurement accuracy is prioritized.
- Quick mode: prioritize module measurement speed.

work / pattern measurement pattern	voluntarily	low speed	fast
Master single test	Auto single	Single low speed	Single quick
continuation	Automatic continuous measurement	Low-speed continuous measurement	Quick Continuous Measurement
Measure speed	intermediate speed	low speed	fast
certainty of	standard	high-accuracy	Low precision

measurement			

Control Command Framework

Head	RW	Address	Register	Payload count	Payload	Checksum
8-bit	1st	7	16-bit	16-bit	Data length *16 bits	8-bit
Frame header	Read the direction indicator	Current slave address	Register address	DL	Effective target data	check sum
Byte [0]	Bytes[1]		Bytes [2:3]	Bytes [4:5]	Bytes [6: N]	Bytes [6: N]

Checksum = (byte[1] + byte[2] + byte[3] +... + byte[N]) & 0xFF

R/W (Read/Write Direction Indicator): 0 for host writing to slave, 1 for host reading from slave.

Address (address bit): The address consists of 7 bits, with a range from 0x00 to 0x7F.0x00 is the default address for slave devices upon factory delivery, while 0x7F is the broadcast address for the host to communicate with multiple slave devices.

control register

order number	register	nominate	function
1	0x0000	REG_ERR_CODE	System status code
2	0x0006	REG_BAT_VLTG	working 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 result
7	0x01BE	REG_CTRL_LD	Laser diode control

order

function	direction	data

Read the latest module status — transmit by radio

byte	0	1	2	3	4
name	First	address	register		verification
data	0xAA	0x80	0x00	0x00	0x80

Read the latest module status — receive

byte	0	1	2	3	4	5	6	7	8
name	First	address	register		Effective Calculation		effective byte		verification
data	0xAA	0x80	0x00	0x00	0x00	0x01	0xYY	0xZZ	sum

Read the hardware version — transmit by radio

byte	0	1	2	3	4
name	First	address	register		verification
data	0xAA	0x80	0x00	0x0A	0x8A

Read the hardware version — receive

byte	0	1	2	3	4	5	6	7	8
name	First	address	register		Effective Calculation		effective byte		verification

number		data	0xAA	0x80	0x00	0x0A	0x00	0x01	0xVV	0xYY	sum
Read the software version number	transmit by radio	byte	0	1	2	3	4				
		name	First	address	register		verification				
		data	0xAA	0x80	0x00	0x0C	0x8C				
	receive	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x80	0x00	0x0C	0x00	0x01	0xVV	0xYY	sum
Read module serial number	transmit by radio	byte	0	1	2	3	4				
		name	First	address	register		verification				
		data	0xAA	0x80	0x00	0x0E	0x8E				
	receive	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x80	0x00	0x0E	0x00	0x01	0xSS	0xNN	sum
Read input voltage	transmit by radio	byte	0	1	2	3	4				
		name	First	address	register		verification				
		data	0xAA	0x80	0x00	0x06	0x86				
	receive	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x80	0x00	0x06	0x00	0x01	0x32	0x19	sum
Read the current offset	transmit by radio	byte	0	1	2	3	4				
		name	First	address	register		verification				
		data	0xAA	0x80	0x00	0x12	0x92				
	receive	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x00	0x12	0x00	0x01	0xVV	0xYY	sum
Re	trans	byte	0	1	2	3	4				

admeasurement by radio		name	First	address	register		verification			
		data	0xAA	0x80	0x00	0x22	0xA2			
admeasurement results	receive	byte	0	1	2	3	4	5	6:9	10:11	12
		name	First	address	register		Effective Calculation		Effective distance value	signal quality	verification
		data	0xAA	0x00	0x00	0x22	0x00	0x03	0xAABBCCDD	0x0101	sum
Set module address	transmit by radio	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x00	0x10	0x00	0x01	0x00	0xYY	sum
	receive	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x00	0x10	0x00	0x01	0x00	0xYY	sum
Set module measurement offset	transmit by radio	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x00	0x12	0x00	0x01	0xZZ	0xYY	sum
	receive	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x00	0x12	0x00	0x01	0xZZ	0xYY	sum
Turn laser on or off	transmit by radio	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x01	0xBE	0x00	0x01	0x00	0xZZ	sum
	receive	Send the same									
Single automatic measure	transmit by radio	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x00	0x21
	receive	byte	0	1	2	3	4	5	6:9	10:11	12

ment		name	First	address	register		Effective Calculation		Effective distance value	signal quality	verification
		data	0xAA	0x00	0x00	0x22	0x00	0x03	0xAABBCCDD	0x0101	verification
Single low-speed measurement	transmit by radio	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x01	0x22
	receive	Same as a single automatic measurement feedback command									
High-speed single measurement	transmit by radio	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x02	0x23
	receive	Consistent with single automatic measurement feedback command									
Continuous automatic measurement	transmit by radio	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x04	0x25
	receive	Consistent with single automatic measurement feedback command									
Low-speed continuous measureme	transmit by radio	byte	0	1	2	3	4	5	6	7	8
		name	First	address	register		Effective Calculation		effective byte		verification
		data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x05	0x26
	receive	Consistent with single automatic measurement feedback command									

<table>
<tr><td>nt</td><td></td><td></td></tr>
<tr><td>High-speed continuous measurement</td><td>transmit by radio</td><td><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>First</td><td>address</td><td colspan="2">register</td><td colspan="2">Effective Calculation</td><td colspan="2">effective byte</td><td>verification</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></td></tr>
<tr><td></td><td>receive</td><td>Consistent with single automatic measurement feedback command</td></tr>
<tr><td>Machine error feedback</td><td>transmit by radio</td><td>Command description: Send an error status code to the host. Error status code =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>First</td><td>address</td><td colspan="2">register</td><td colspan="2">Effective Calculation</td><td colspan="2">effective byte</td><td>verification</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></td></tr>
<tr><td>Exit continuous measurement</td><td>transmit by radio</td><td>When the host is in continuous measurement mode, sending a byte 0x58 (the uppercase character 'X') will immediately stop the continuous measurement mode.</td></tr>
<tr><td>Enable secondary device measures</td><td>transmit by radio</td><td><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>First</td><td>address</td><td colspan="2">register</td><td colspan="2">Effective Calculation</td><td colspan="2">effective byte</td><td>verification</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></td></tr>
<tr><td></td><td>receive</td><td>No reply</td></tr>
<tr><td colspan="3">condition code</td></tr>
<tr><td>condition code</td><td>description</td><td>treatment measure</td></tr>
<tr><td>0×0000</td><td>inerrancy</td><td>—</td></tr>
<tr><td>0×0001</td><td>The input voltage is too low. The</td><td>Check the battery voltage</td></tr>
<tr><td></td><td>input voltage value should ≥2.0V</td><td></td></tr>
<tr><td>0×0002</td><td>Network error, can be ignored</td><td>—</td></tr>
<tr><td>0×0003</td><td>The module temperature is low (less than <-20°C)</td><td>Increase module temperature</td></tr>
<tr><td>0×0004</td><td>The module temperature is high (+60° C)</td><td>Lower module temperature</td></tr>
<tr><td>0×0005</td><td>Target exceeds the range</td><td>Use in the two percent measurement specified in the module manual</td></tr>
<tr><td>0×0006</td><td>Invalid measurement</td><td>remeasure</td></tr>
<tr><td>0×0007</td><td>The ambient light is too bright</td><td>Reduce the light intensity in the measurement environment</td></tr>
<tr><td>0×0008</td><td>The laser signal is weak</td><td>Export the mirror to check for contamination or enhance the reflectivity of the measurement target</td></tr>
<tr><td>0×0009</td><td>The laser signal is strong</td><td>Reduce the reflectivity of the measurement target</td></tr>
<tr><td>0×000A</td><td>Hardware error 1</td><td>Contact customer service with the error code</td></tr>
<tr><td>0×000F</td><td>The laser signal is unstable</td><td>Stabilize the body or check the power supply</td></tr>
<tr><td>0×0081</td><td>Invalid communication format</td><td>Check if the command sends errors</td></tr>
</table>

fault treatment

1. After connecting the computer to the USB-to-TTL module, the system failed to detect the serial port device.

a. Check if the CH340 driver is installed on the computer. If not, download and install the "CH340 Driver" application from the official website.

b. Verify the stability of the communication interface between the USB-to-TTL module and the computer;

c. Check if the computer's USB port is damaged or if the USB-to-TTL converter module is faulty.

2. Handling measures when the sending command module fails to respond after successful power-on and computer connection:

a. Verify that the TXD and RXD modules are not reversed;

b. Check whether the baud rate is set correctly;

c. Verify if the TXD and RXD modules operate in open-drain mode. If so, check for the presence of pull-up or pull-down resistors.

3. The module can communicate normally, but the received data is garbled. Handling measures:

a. Verify if the serial port debug assistant is configured for HEX display (hexadecimal format);

b. Check communication stability:

1. Check whether there is electromagnetic interference or other signal interference nearby. If so, stay away as far as possible.

2. Check if the serial communication cable is too long. For standard USART (TTL level) communication, the cable should not exceed one meter.

Precautions

(1) Do not look directly at the laser;

(2) Do not use this product outside the specified electrical parameters;

(3) Do not connect the product without power off;

(4) Please follow this instruction strictly for wiring;

(5) Keep the front end of the optical lens clean to ensure normal use of the product.

After-sales and maintenance

(1) The product has a 12-month warranty from the date of delivery;

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

a. Product malfunction or damage caused by improper operation;

b. Force majeure causes the product to break down or be damaged;

c. For other matters not covered herein, please contact Siman Customer Service Center.