SDM18 and ESP32 Microcontroller Communication

SDM18 Introduction

- The YDLIDAR SDM18 LiDAR (hereafter referred to as the SDM18) is a high-performance single-point LiDAR. This product utilizes the time-of-flight ranging principle and incorporates relevant optical, electrical, and algorithmic design to achieve high-precision laser distance measurement and output point cloud data at a high frame rate.

- Product Features
  ➢ High ranging frequency, internal high sampling rate combined with filtering algorithm, ensures highly stable data
  ➢ Long detection range, up to 18 meters
  ➢ Lightweight, approximately 1.35g
  ➢ Laser power meets FDA Class I safety standards

1. Experimental Preparation

- SDM18 Laser Ranging Module

- ESP32 Series This tutorial uses the ESP32S3

2. Experimental Wiring

ESP32	SDM18
TX1 (IO36)	RX
RX1 (IO35)	TX
GND	GND
3.3V	3.3V

Note: You need to solder the pin headers to the serial port adapter board yourself. The default pin headers are not included. For this experiment, you will need to solder the pin headers to the adapter board (UART1 baud rate is 921600).

The wiring diagram is shown in the figure.
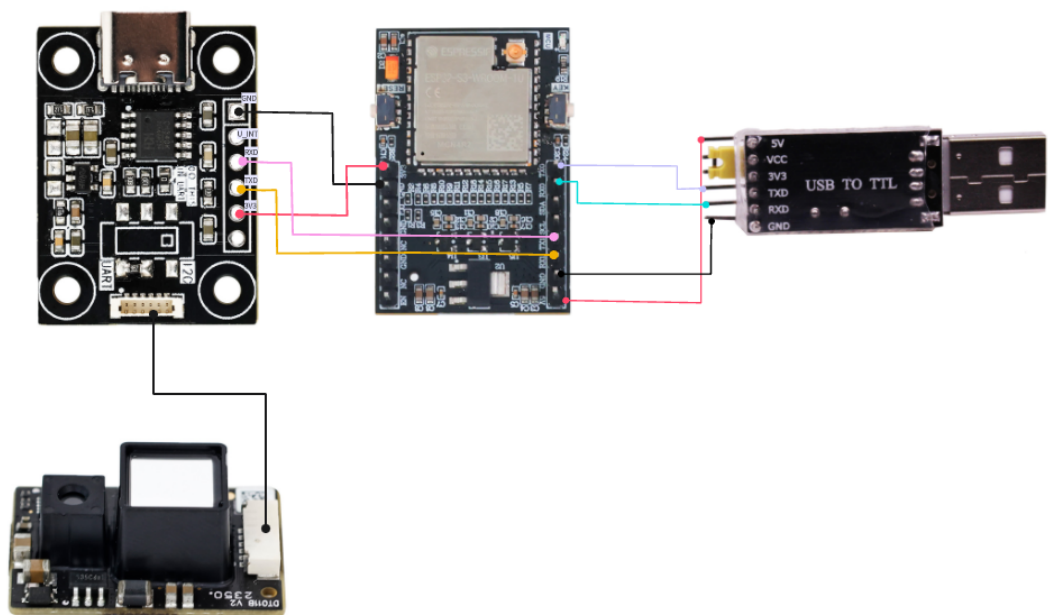
ESP32S3	USB-to-TTL module (needs to be purchased separately if not available)
RX0	TX
TX0	RX
GND	GND
5V	5V

3. Experimental Steps

1. Download the provided program to the ESP32.

2. Open the serial port assistant and set the baud rate to 115200 (UART0: Communicates with the computer - outputs the received radar distance and signal strength)

4. Experimental Results

After connecting the cables and communicating normally, the serial port assistant will print out the measured distance information, as shown in the figure.

```
Distance: 2543mm, Strength: 787
Distance: 2535mm, Strength: 829
Distance: 2537mm, Strength: 797
Distance: 2537mm, Strength: 819
Distance: 2532mm, Strength: 811
Distance: 2537mm, Strength: 880
Distance: 2526mm, Strength: 948
Distance: 2543mm, Strength: 769
Distance: 2552mm, Strength: 841
Distance: 2537mm, Strength: 863
```

- dis: Distance in mm
- strength: Strength

5. Explanation of Some Important SDM18 Parameters and Default Values

1. The SDM18 interface is shown in the figure:

The external physical interface terminal of SDM18 is WF08006, which realizes system power supply and data communication functions.
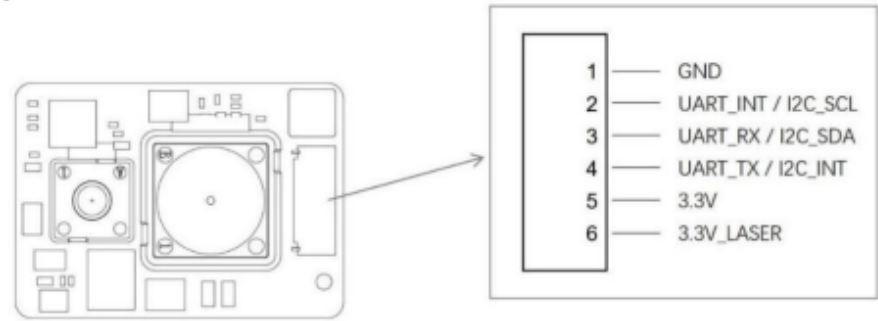

1	GND
2	UART_INT / I2C_SCL
3	UART_RX / I2C_SDA
4	UART_TX / I2C_INT
5	3.3V
6	3.3V_LASER

Figure 2 YDLIDAR SDM18 physical interface

2. Default Serial Port Configuration

   The default baud rate of the SDM18 is 921600

Interface	Min	Typical	Max	Unit	Remarks
UART	9600	921600	921600	bps	Signal level 3.3V, 8-bit data bit,1 stop bit, no parity

3. Important Serial Port Protocol Commands (All Sent in Hexadecimal)

   The SDM18 defaults to idle mode upon power-up. To perform ranging, you must first issue the ranging start command.

- Start ranging: A5 03 20 01 00 00 00 02 6E

- Stop ranging: A5 03 20 02 00 00 00 46 6E

- Protocol Analysis for Receiving Ranging

Packet Header	Device Number	Device Type	Command Type	Reserved Bit	Data Length	Data Segment	CheckSum
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes	N Bytes	2 Bytes

Reply:

Packet heade	Device number	Device type	Command type	Reserved bit	Data length	Data segment	CheckSum
0xA5	0x03	0x20	0x01	0x00	0x00 00	.. ..	CRC16

The equipment contains: A5 03 20 01 00 00 0E FF FF FF FF FF FF F6 06 42 00 74 26 01 00 0B 44, the data length = 0x00 0E, i.e. the data parameter 14; the data parameter FF FF FF FF FF FF F6 06 42 00 74 26 01 00, which satisfies the following data structure:

Byte offset	0	1	2	3	4	5	6	7	8	9	10	11	12	13

DistanceValue   Intensity value   Reserved

F6 06: distance value is **0x06f6 = 1782 mm**

74 26: strength value is **0x2674 = 9844**

4. Checksum Calculation

This checksum uses the CRC-16-modelbus calculation method, calculating all bytes except the check digit.

The following image shows the check digit calculation result for the "Start Ranging" command.

A5 03 20 01 00 00 00

Content Format	Hex		Algorithm selection	CRC-16-MODBU	calculate	empty
Polynomial formula	x16+x15+x2+1					
Width digits	16		POLY(HEX)	8005		
INIT(HEX)	FFFF		XOROUT(HEX)	0000		
Data reversal	(REFIN) ✓		(REFOUT) ✓			
result (HEX)	026E					

Other protocols will not be explained here. Interested parties can refer to the SDM18 Development Manual.