Product Description

DTS6012M Is a fully integrated single channel dToF Small distance measurement Module, integrated with self-developed high-sensitivity infrared enhancement SPAD sensor, have 18m On-chip integrated time-correlated photon threshold algorithm Method, histogram statistical algorithm and fast TDC Architecture, etc., implementation While achieving high-precision ranging 12m@100KLux Anti-ring Ambient light capability and reflectivity correction function.

DTS6012M Integrated power module, using 3.3V Single power supply Electric, built-in temperature compensation function. Support I2C, SPI, data port, easy to integrate and use, And adopt compact and reliable optical LGA Packaging is an excellent choice for micro-sized applications. ToF

The pictures are for reference only

DTS6012M

Single Point dToF Sensor small module

Features:

- High integration dToF Distance measurement small module solution;
- Millimeter-level ranging accuracy, maximum range 18m;
- Integrated histogram statistical algorithm, output double peak position, easy to Calibration;
- Integrated time-correlated photon threshold anti-ambient light algorithm, with 12m@100KLux Ambient light resistance;
- TDC The time window is configurable to meet the needs of different application scenarios;
- Data is output stably according to the configured cycle. Maximum frame rate 4kfps.
- Equipped with reflectivity correction function.

Application Areas:

- Sweeping machine, AGV Obstacle Avoidance
- Drone altitude determination and obstacle avoidance
- Security monitoring
- Capacity detection
- Proximity Detection
- Whether there is perception

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1 Parameter Table

1.1 Basic parameters

parameter	Numeric
Package size	21mm×15mm×7.87mm
Number of connector pins	6
Interface Type	I2C, , SPI UART
Operating voltage	3.3V
Frame rate	250fps
FoV	<2°
Multi-target detection	Twin Peaks
Temperature compensation	have
Reflectivity correction	have
Laser wavelength	905nm

1.2 Performance parameters

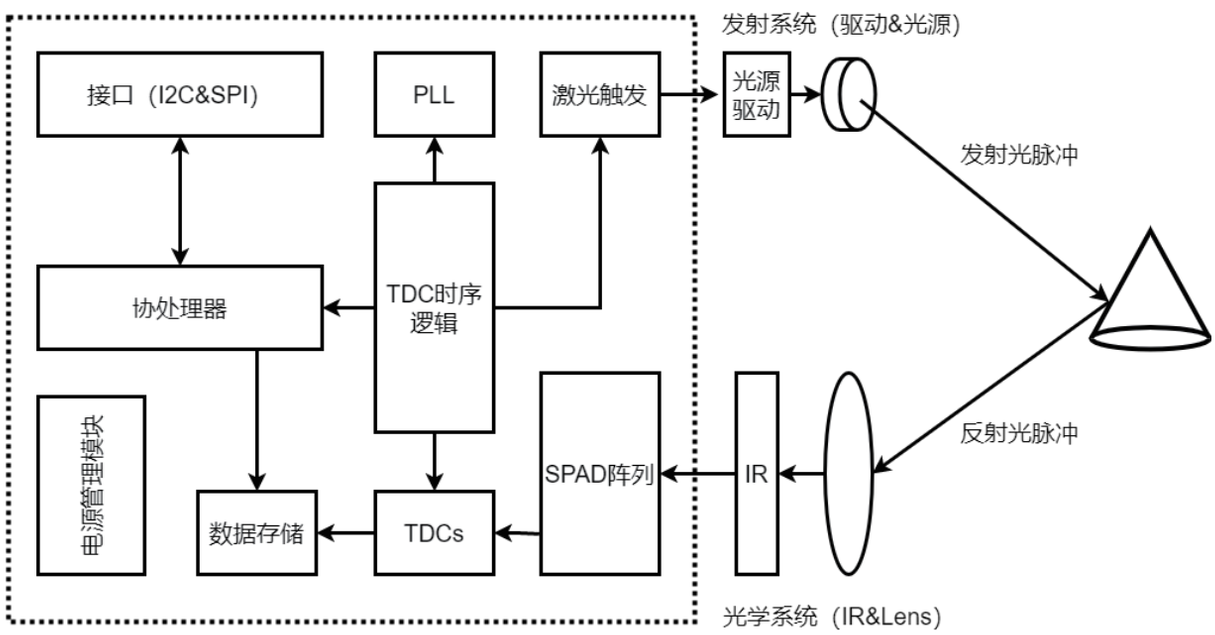
parameter	Minimum	Typical Value	Maximum	unit
Strong light ranging range (@100KLux Ambient Light	0.02	-	12	m
Maximum measuring distance	-	-	18	m
I2C Interface rate	-	400K	1M	Hz
SPI Interface rate	-	6.25M	15M	Hz

1.3 Conditions of Use

parameter		Numeric	unit
Operating temperature range		-20 ~ 85	℃
Storage temperature range		-40 ~ 85	℃
Reflow maximum temperature		260	℃
Antistatic grade [3]	Human body model antistatic grade (HBM)	2000	V
	Machine model antistatic grade (MM)	200	V
	Antistatic grade of charging device model (CDM)	500	V
Input port voltage limit high value		4	V
Input port voltage limit low value		-0.5	V

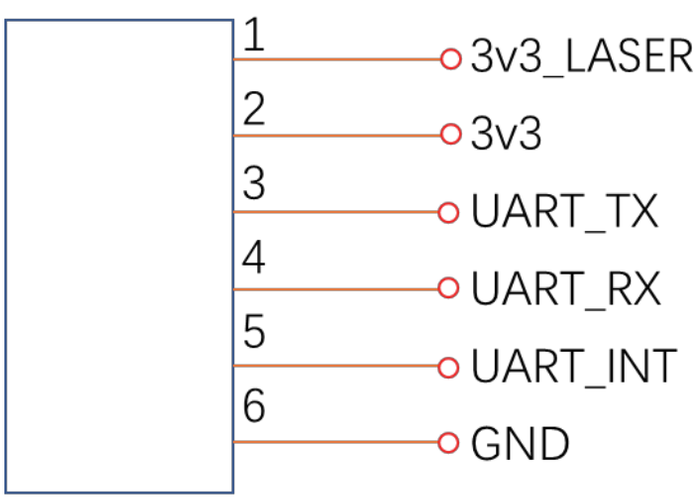
Reference standards: HBM: JESD22-A114; CDM: JESD22-C101; MM: JESD22-A115

2 System Block Diagram



picture 1 DTS6012M System Diagram

3 Pin Diagram



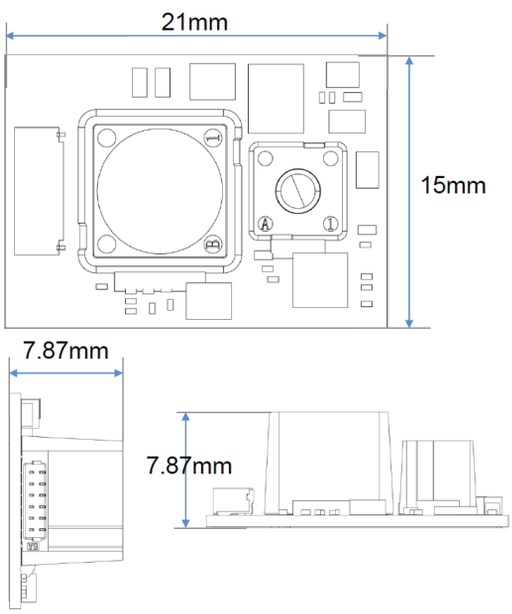
The function description of each pin is as follows:

Serial number	Port Name	Functional Description
1	3.3V LASER	Internal laser power supply (additional filtering circuit can be added to ensure cleaner power supply)
2	3.3V powered by	3.3V powered by
3	UART_TX	Three modes reuse UART_TX / SPI_SCK / I2C_INT

4	UART_RX	Three modes reuse UART_RX / SPI_MOSI / I2C_SDA
5	UART_INT	Three modes reuse UART_INT / SPI_NSS / I2C_SCL
6	GND	Grounding

Note: 3\4\5 The interface is a multiplexed interface. UART， SPI， I2C Three modes.

4 Module structure diagram



1	3_3v_LASER
2	3V3
3	UART_TX(Reusable)
4	UART_RX(Reusable)
5	UART_INT(Reusable)
6	GND

5 Contents of the Agreement

This protocol adopts the master-slave communication mode, which stipulates: PC The host computer is the upper computer, and the microcontroller is the lower computer. The upper computer transmits data to the lower computer.

The sending of data from the lower computer to the upper computer is called response.

The communication rate of this protocol is: 921600 pbs;

The hardware communication format used in this article is: 1 start bit, 2 data bits and 1 stop bit, and no other bits. CRC16 Data calculation, which includes all data except the checksum.

All data in this protocol are in big-endian mode with high bits first and low bits last.

5.1 Agreement Summary

serial number	Command Name	Command Code	page number
1	Start Streaming	0x01	
2	End Stream	0x02	
3	Write register contents	0x03	
4	Read register capacity	0x04	

5.2 Protocol frame format

The entire agreement contains two forms of communication:

1. The command is 0x01,0x02,0x04,0x05,0x06 All of them adopt PC The end machine asks and the lower machine answers (i.e. one question and one answer).

2. The command is 0x03 The adopted PC The client asks the lower computer and multiple answers are given (one question, multiple answers)

1, the sending frame format (i.e. upper computer → lower computer) is:

Table sending frame format

Baotou	Device Number	Device Type	CMD	Reserved bits	length	Data	CRC16
1byte	1 byte	1 byte	1 byte	1 byte	2 byte	N byte	2 byte

2, the response frame format (lower computer → upper computer) is:

Table response frame format

Baotou	Device Number	Device Type	CMD	Reserved bits	length	Data	CRC16
1 byte	1 byte	1 byte	1 byte	1 byte	2 byte	N byte	2 byte

in:

1) Baotou: 1 bytes, that is 0xA5.

2) Device number: 1 bytes, that is 0x03.

3) Device type: 1 bytes, depending on the type of the lower computer evaluation board. 0x2c.

4) :for CMD 1 Bytes, command function code, is the function that the upper computer wants the lower computer to execute.

5) Reserved bit: 1 bytes for subsequent use.

6) Length: 2 Bytes, which is the length of the zone data.

7) Data:for N Bytes are related data area.

8) CRC16:for 2 bytes, all data CRC16 The result of the verification is that the higher position is in front and the lower position is in the back.

The functions corresponding to the command codes are shown in the following table, where the command codes are expressed in hexadecimal. The "command" in the response frame is consistent with the command in the send frame, that is, the same command is responded to as the command sent.

5.3 Commands and analysis

The sent command and the corresponding response command are matched one by one, either in the table or with 0x The data are all in hexadecimal.

5.3.1 Start measurement command 0x01

The command format is shown in the following table

Table lower computer frame rate setting command

direction	Baotou	Device Number	Device Type	CMD	Reserved bits	length	Data	CRC16
send	A5	0x03	0x20	0x01	1 byte	00 00	0 byte	According to the facts
take over	A5	0x03	0x20	0x01	1 byte	00 01	1 byte	International Computing

PC End sends:

Command code area: 0x01, this command is used to set the frame rate.

Data Area: None

The lower computer responds: A5 03 20 01 00 00 0E FF FF 17 02 FF FF 28 00 00 00 AB 0D 01 00 AB B1

01: Open a stream for the command. (After sending once, the lower computer will automatically respond periodically)

00: Reserved Bytes

00 0E: Data area length

FF FF 17 02 FF FF 28 00 00 00 AB 0D 01 00: FF FF Submodality 17 02 Temperature code FF FF Second peak intensity 28 00 Main peak quality Heart peak correction 00 00 AB 0D Main peak intensity 01 00 Sunlight base (low in front, high in back)

AB B1:16 Bitcrc check

5.3.2 End the measurement task 0x02

The command format is shown in the following table

Table lower machine frame rate overlay configuration command

direction	Baotou	Device Number	Device Type	CMD	Reserved bits	length	Data	CRC16
send	A5	0x03	0x20	0x02	1 byte	00 00	none	According to the facts
take over	A5	0x03	0x20	0x02	1 byte	00 01	1 byte	International Computing

PC End sends:

Command code area: 0x02, this command is the frame rate overlay command.

Data Area: No data

The lower computer responds:

Command code area: 0x02, this command is to end the measurement.

Data Area: Returns a byte unsigned char Variable. Return 0 Indicates that the setting is successful and returns 1 Indicates that the setup failed.

5.3.3 Write IIC register 0x03

The command format is shown in the following table

Table lower computer starts measuring command

direction	Baotou	Device Number	Device Type	CMD	Reserved bits	length	Data	CRC16
send	A5	0x03	0x20	0x03	1 byte	2 byte	N	According to the facts
take over	A5	0x03	0x20	0x03	1 byte	00 01	1	International Computing

PC End sends:

Command code area: 0x03,Write IIC Register data. 1 The first byte indicates the register address; the second byte indicates the write length.

The following indicates the data to be written.

Data Area: Returns a byte unsigned char Variable. Return 0 indicates that the setting is successful, and return 1 indicates that the setting fails.

5.3.4 read iic register 0x04

The command format is shown in the following table

Table read register command

direction	Baotou	Device Number	Device Type	CMD	Reserved bits	length	Data	CRC16
send	A5	0x03	0x20	0x05	1 byte	00 02	2 byte	According to the facts
take over	A5	0x03	0x10	0x04	1 byte	00 0n	N byte	International Computing

PC End sends:

Command code area: 0x04,read iic Register command.

Data district:

The first byte indicates the register address to be read, and the second byte indicates the length to be read.

Data district:

The first byte indicates the address to be read, the first byte indicates the length to be read, and the following is the data to be read.

5.3.5 Start pushing histogram streaming commands 0x07

The command format is shown in the following table

Table lower computer frame rate setting command

direction	Baotou	Device Number	Device Type	CMD	Reserved bits	length	Data	CRC16
send	A5	0x03	0x20	0x07	1 byte	00 00	0 byte	According to the facts
take over	A5	0x03	0x20	0x07	1 byte	00 01	1 byte	International Computing

PC End sends:

Command code area: 0x07, the command that starts pushing the histogram stream.

Data Area: None

The lower computer responds:

Command code area

Returns a frame of heat map data.

Data district:

256 * 4 indivual unsigned int16 Type variables total 2048 Byte Data

5.3.6 Start pushing SPAD Heatmap Streaming Commands 0x09

The command format is shown in the following table

Table lower computer frame rate setting command

direction	Baotou	Device Number	Device Type	CMD	Reserved bits	length	Data	CRC16
send	A5	0x03	0x20	0x09	1 byte	00 00	0 byte	According to the facts
take over	A5	0x03	0x20	0x09	1 byte	00 01	1 byte	International Computing

PC End sends:

Command code area: 0x09, it' s time to start pushing SPAD Commands for heatmap streaming.

Data Area: None

The lower computer responds:

Command code area

Returns a frame of heat map data.

Data district:

16 * 8 indivualunsigned int16 Type variables total 256 Byte Data

5.3.7 Query version number 0x0a

The command format is shown in the following table

Table lower3achine frame rate overlay configuration command

direction	Baotou	Device Number	Device Type	CMD	Reserved bits	length	Data	CRC16
send	A5	0x03	0x20	0x0a	1 byte	00 00	none	According to the facts
take over	A5	0x03	0x20	0x0a	1 byte	00 01	1 byte	International Computing

PC End sends:

Command code area: 0x02, this command is the frame rate overlay command.

Data Area: No data

The lower computer responds:

Data Area: Return version number

6 Version Information

date	Version	Modifications
2023 Year9Month7Day	1.0	Initial Release
2023 years 9 11 day	1.1	Increase 6012M Contents of the Agreement
2023 Year11 Month9 Day	1.2	Update structure size