



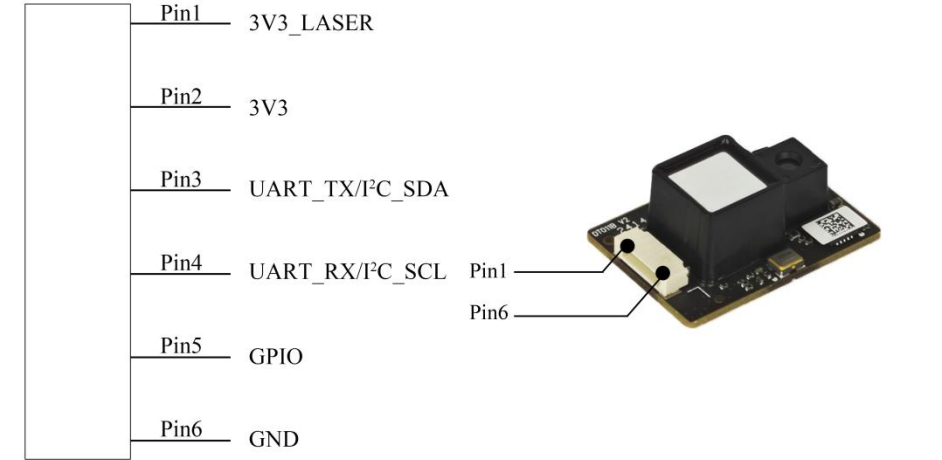
SDAM Laser rangefindingModule

SDAMIt is a fully integrated single-channel direct time-of-flight (dToF) laser ranging device developed by Siman Sensing Technology Co., Ltd.Module.It integrates a self-developed, high-sensitivity infrared-enhanced SPAD sensor with a 20-meter measurement range. On-chip integration includes a time-correlated photon threshold algorithm, a histogram statistical algorithm, and a high-speed TDC architecture. While achieving highly accurate distance measurement, it also delivers a performance of 12 meters @ 1.00KLux features anti-environmental-light capability and includes a reflectance correction function..

The SDAM integrated power module operates on a single 3.3V supply and features built-in temperature compensation. It supports I<sup>2</sup> C and UART interfaces, making it easy to integrate and use. Featuring a compact and reliable optical package, this module is small in size and lightweight, making it an excellent choice for ultra-small DTOF applications.This product is widely used in fields such as industrial automation and intelligent transportation, and is particularly well-suited for high-precision measurement applications in industries including manufacturing, transportation, robotics, security, and healthcare. For more information about the product, please visit:[www.siman.asia](http://www.siman.asia)

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Warning                                                                             | Please follow the equipment usage guidelines! This product is not a safety sensor and cannot be used for personnel protection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|  | <div><div>➤ Laser measurement (905 nm): Class 1 laser product. Safe under normal operating conditions.</div><div>➤ This product does not have an explosion-proof design and must not be used in flammable or explosive environments.</div><div>➤ Do not disassemble this product.</div><div>➤ Be sure to turn off the power before performing any operations. Do not perform wiring operations while the power is still on!<div><div>1. Avoid use in dusty/vapor environments or environments with corrosive gases;</div><div>2. Avoid using in environments that produce corrosive gases.;</div></div></div><div>➤ This product cannot be used in water.</div><div>➤ When using outdoors, be sure to add a waterproof cover.</div></div> |

Wiring diagram



| Pin Function                                                                           |                           |                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pin                                                                                    | name                      | Description                                                                                                                                                                                                                                                                                                                                                              |
| 1                                                                                      | 3.3V LASER (Red)          | Power supply for the module's laser boost circuit, voltage: 3.3V.                                                                                                                                                                                                                                                                                                        |
| 2                                                                                      | 3.3V Power Supply (Black) | Power supply for the module's low-voltage circuit, voltage: 3.3V.                                                                                                                                                                                                                                                                                                        |
| 3                                                                                      | UART_TX/I²C_SDA (Yellow)) | The module supports UART and I² C communication modes, selected via external pull-up/pull-down configuration on GPIO (Pin 5).<br>In UART mode, this pin functions as UART TX (module communication output).<br>In I² C mode, this pin functions as I² C SDA (data line).                                                                                                 |
| 4                                                                                      | UART_RX/I²C_SCL (Green)   | The module supports UART and I² C communication modes, selected via external pull-up/pull-down configuration on GPIO (Pin 5).<br>In UART mode, this pin functions as UART RX (module communication input).<br>In I² C mode, this pin functions as I² C SCL (clock line).                                                                                                 |
| 5                                                                                      | GPIO (Blue)               | The module supports UART and I² C communication modes. When GPIO is pulled down externally at startup, the module operates in UART mode, and this pin is non-functional. When GPIO is pulled up or left floating at startup, the module operates in I² C mode, and this pin acts as an interrupt output, generating a high pulse upon completion of a measurement frame. |
| 6                                                                                      | GND (White)               | Ground connection.                                                                                                                                                                                                                                                                                                                                                       |
| Note: Pins 3, 4, and 5 are multiplexed interfaces supporting both UART and I² C modes. |                           |                                                                                                                                                                                                                                                                                                                                                                          |

| SpecificationsParameter        |                                                                                 |       |
|--------------------------------|---------------------------------------------------------------------------------|-------|
| Model                          | SDAM                                                                            |       |
| Measurement range              | 0.2...20m                                                                       |       |
| Sunlight resistance            | 12m 100Klux Sunshine                                                            |       |
| Accuracy                       | ±3cm 0.2m~6m; ± 1% >6m<br>( Corresponding target surface reflectance: 18% - 88% |       |
| Measure frequency              | Default100fps,50Adjustable from 100/250 fps                                     |       |
| Measure the laser light source | 905nm,Class 1                                                                   |       |
| Field of View FOV              | 1.3°                                                                            |       |
| Interface type                 | I² C, UART                                                                      |       |
| Temperature compensation       | There is                                                                        |       |
| Reflectance Correction         | There is                                                                        |       |
| Operating voltage              | DC+3.3V                                                                         |       |
| StandbyCurrent                 | Typical49mA@3.3V DC                                                             |       |
| Operating current              | Typical 100mA@3.3V DC                                                           |       |
| Standby power consumption      | 160mW                                                                           |       |
| Operating power consumption    | 329mW                                                                           |       |
| Weight                         | 1.35g                                                                           |       |
| Size                           | 21mm × 15 mm × 7.87 mm                                                          |       |
| Operating temperature          | -20~50°C                                                                        |       |
| Storage temperature            | -40~85°C                                                                        |       |
| Electrical connection          | 60.8mm pitch pin Single-head piercing terminal wire                             |       |
| Human-computer interaction     | The accompanying host computer software displays in real time.                  |       |
| Antistatic rating              | Human Body Model Electrostatic Discharge (HBM) Level                            | 2000V |
|                                | Machine model antistatic rating (MM)                                            | 200V  |
|                                | Charging Device Model—Electrostatic Discharge (CDM) Resistance                  | 500V  |
|                                | Reference standards: HBM: JESD22-A114; CDM: JESD22-C101; MM: JESD22-A11         |       |

Dimensional drawing



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |        |               |             |      |              |                |        |                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------|---------------|-------------|------|--------------|----------------|--------|----------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | io        |        |               |             |      |              |                |        |                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Send      | 0×A5   | 0×03          | 0×20        | 0×0A | 1 Byte       | 0×00<br>0×00   | None   | According to actual calculations |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Receive   | 0×A5   | 0×03          | 0×20        | 0×0A | 1 Byte       | 0×00<br>0×01   | 1 Byte |                                  |
| <div>The host computer sendsExampleA5 03 20 0a 00 00 00 6C 26</div> <div>Command code area: 0x0a</div> <div>Data Area: No data</div> <div>Example of lower-level device response: A5 03 20 0A 00 00 12 44 54 53 36 30 31 32 5F 41 50 50 5F 56 31 2E 32 36 43 0F 0B</div> <div>0A: Version query command</div> <div>00Reserved bit</div> <div>00 12Data area length (high byte first, low byte second)</div> <div>44 54 53 36 30 31 32 5F 41 50 50 5F 56 31 2E 32 36 43: The version number is DTS6012_APP_XXXXX</div> <div>0F 0B: 16-bit CRC check (high byte first, low byte second)</div>        |           |        |               |             |      |              |                |        |                                  |
| End the measurement task                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | direct io | Baotou | Device number | Device type | CMD  | Reserved bit | Length         | Data   | CRC16                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Send      | 0×A5   | 0×03          | 0×20        | 0×02 | 1 Byte       | 0 × 00<br>0×00 | None   | According to actual calculations |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Receive   | 0×A5   | 0×03          | 0×20        | 0×02 | 1 Byte       | 0 × 00<br>0×01 | 1 Byte |                                  |
| <div>Host computer sending example: A5 03 20 02 00 00 00 6E 46</div> <div>Command code area: 0x02. This command is a frame rate overlay command.</div> <div>Data Area: No data</div> <div>Lower-level device response: A5 03 20 02 00 00 01 00 7C C6</div> <div>Command code area: 0x02; this command is used to end the measurement.Command.</div> <div>Data Area: Returns a byte variable. A return value of 0 indicates that the setting was successful; a return value of 1 indicates that the setting failed.</div> <div>0×7C 0×C6: 16-bit CRC check (high byte first, low byte second)</div> |           |        |               |             |      |              |                |        |                                  |
| Set the baud rate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | direct io | Baotou | Device number | Device type | CMD  | Reserved bit | Length         | Data   | CRC16                            |

|                         |                                                                             |        |                  |                |        |                  |                |        |                                                |
|-------------------------|-----------------------------------------------------------------------------|--------|------------------|----------------|--------|------------------|----------------|--------|------------------------------------------------|
|                         | n                                                                           |        |                  |                |        |                  |                |        |                                                |
|                         | S<br>e<br>n<br>d                                                            | 0×A5   | 0×03             | 0×20           | 0×10   | 1 Byte           | 0 × 00<br>0×01 | 1 Byte | Accord<br>ing to<br>actual<br>calcula<br>tions |
|                         | R<br>e<br>c<br>e<br>i<br>v<br>e                                             | 0×A5   | 0×03             | 0×20           | 0×10   | 1 Byte           | 0 × 00<br>0×04 | 4 Byte |                                                |
|                         | Host computer sending example: A5 03 20 10 00 00 01 0C 7E 7A                |        |                  |                |        |                  |                |        |                                                |
|                         | Command code area: 0×10, baud rate setting command.                         |        |                  |                |        |                  |                |        |                                                |
|                         | Data Area: 1 byte in total, containing the 0 - 12 baud rate selection code. |        |                  |                |        |                  |                |        |                                                |
|                         | Lower-level device response:                                                |        |                  |                |        |                  |                |        |                                                |
|                         | Example: 0xA5 0x03 0x20 0x10 0x00 0x00 0x04 0x00 0x0E 0x10 0x00 0x2B 0xE0   |        |                  |                |        |                  |                |        |                                                |
|                         | 0×10: Baud rate setting command                                             |        |                  |                |        |                  |                |        |                                                |
|                         | 0×00: Reserved bit                                                          |        |                  |                |        |                  |                |        |                                                |
|                         | 0×00 0×04: Data area length (high byte first, low byte second)              |        |                  |                |        |                  |                |        |                                                |
|                         | 0×00 0×0E 0×10 0×00: Baud rate of 921600 (high byte first, low byte second) |        |                  |                |        |                  |                |        |                                                |
|                         | 0×2B 0×E0: 16-bit CRC check (high byte first, low byte second)              |        |                  |                |        |                  |                |        |                                                |
|                         | Baud rate selection code                                                    |        |                  |                |        | Baud rate        |                |        |                                                |
|                         | 0×00                                                                        |        |                  |                |        | 9600             |                |        |                                                |
|                         | 0×01                                                                        |        |                  |                |        | 14400            |                |        |                                                |
|                         | 0×02                                                                        |        |                  |                |        | 19200            |                |        |                                                |
| 0×03                    |                                                                             |        |                  |                | 38400  |                  |                |        |                                                |
| 0×04                    |                                                                             |        |                  |                | 43000  |                  |                |        |                                                |
| 0×05                    |                                                                             |        |                  |                | 57600  |                  |                |        |                                                |
| 0×06                    |                                                                             |        |                  |                | 76800  |                  |                |        |                                                |
| 0×07                    |                                                                             |        |                  |                | 115200 |                  |                |        |                                                |
| 0×08                    |                                                                             |        |                  |                | 128000 |                  |                |        |                                                |
| 0×09                    |                                                                             |        |                  |                | 230400 |                  |                |        |                                                |
| 0×0A                    |                                                                             |        |                  |                | 256000 |                  |                |        |                                                |
| 0×0B                    |                                                                             |        |                  |                | 460800 |                  |                |        |                                                |
| 0×0C                    |                                                                             |        |                  |                | 921600 |                  |                |        |                                                |
| Get the<br>baud<br>rate | di<br>re<br>ct<br>io<br>n                                                   | Baotou | Device<br>number | Device<br>type | CMD    | Reserv<br>ed bit | Length         | Data   | CRC16                                          |
|                         | S<br>e<br>n<br>d                                                            | 0×A5   | 0×03             | 0×20           | 0×11   | 1 Byte           | 0×00<br>0×00   | None   | Accord<br>ing to<br>actual<br>calcula<br>tions |
|                         | R<br>e<br>c<br>e<br>i<br>v<br>e                                             | 0×A5   | 0×03             | 0×20           | 0×11   | 1 Byte           | 0×00<br>0×04   | 4 Byte |                                                |

|                                                                                              |                                                                             |        |               |             |      |              |           |        |                                  |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------|---------------|-------------|------|--------------|-----------|--------|----------------------------------|
|                                                                                              | e                                                                           |        |               |             |      |              |           |        |                                  |
|                                                                                              | Host computer sending example: A5 03 20 11 00 00 00 6A C2                   |        |               |             |      |              |           |        |                                  |
|                                                                                              | Command code area: 0×11, baud rate acquisition command.                     |        |               |             |      |              |           |        |                                  |
|                                                                                              | Data Area: None                                                             |        |               |             |      |              |           |        |                                  |
|                                                                                              | Lower-level device response:                                                |        |               |             |      |              |           |        |                                  |
|                                                                                              | Example: 0xA5 0x03 0x20 0x11 0x00 0x00 0x04 0x00 0x0E 0x10 0x00 0xE7 0x21   |        |               |             |      |              |           |        |                                  |
|                                                                                              | 0×11: Get Baud Rate Command                                                 |        |               |             |      |              |           |        |                                  |
|                                                                                              | 0×00: Reserved bit                                                          |        |               |             |      |              |           |        |                                  |
|                                                                                              | 0×00 0×04: Data area length (high byte first, low byte second)              |        |               |             |      |              |           |        |                                  |
|                                                                                              | 0×00 0×0E 0×10 0×00: Baud rate is 921600 (high byte first, low byte second) |        |               |             |      |              |           |        |                                  |
| 0×E7 0×21: 16-bit CRC check (high byte first, low byte second)                               |                                                                             |        |               |             |      |              |           |        |                                  |
| Set the I <sup>2</sup> C address                                                             | direct ion                                                                  | Baotou | Device number | Device type | CMD  | Reserved bit | Length    | Data   | CRC16                            |
|                                                                                              | Send                                                                        | 0×A5   | 0×03          | 0×20        | 0×12 | 1 Byte       | 0×00 0×01 | 1 Byte | According to actual calculations |
|                                                                                              | Receive                                                                     | 0×A5   | 0×03          | 0×20        | 0×12 | 1 Byte       | 0×00 0×01 | 1 Byte |                                  |
|                                                                                              | Host computer sending example: A5 03 20 12 00 00 01 00 07 BF                |        |               |             |      |              |           |        |                                  |
| Command code area: 0×12, I <sup>2</sup> C address setting command.                           |                                                                             |        |               |             |      |              |           |        |                                  |
| Data area: 1 byte in total; Data[0] is the I <sup>2</sup> C device address (7-bit << 1 + 0). |                                                                             |        |               |             |      |              |           |        |                                  |
| Lower-level device response:                                                                 |                                                                             |        |               |             |      |              |           |        |                                  |
| Example: 0xA5 0x03 0x20 0x12 0x00 0x00 0x01 0xA2 0x06 0x86                                   |                                                                             |        |               |             |      |              |           |        |                                  |
| 0×12: Set I <sup>2</sup> C address command                                                   |                                                                             |        |               |             |      |              |           |        |                                  |
| 0×00: Reserved bit                                                                           |                                                                             |        |               |             |      |              |           |        |                                  |
| 0×00 0×01: Data area length (high byte first, low byte second)                               |                                                                             |        |               |             |      |              |           |        |                                  |
| 0×A2: The configured I <sup>2</sup> C address                                                |                                                                             |        |               |             |      |              |           |        |                                  |
| 0×06 0×86: 16-bit CRC check (high byte first, low byte second)                               |                                                                             |        |               |             |      |              |           |        |                                  |
| Get the I <sup>2</sup> C address                                                             | direct ion                                                                  | Baotou | Device number | Device type | CMD  | Reserved bit | Length    | Data   | CRC16                            |
|                                                                                              | Send                                                                        | 0×A5   | 0×03          | 0×20        | 0×13 | 1 Byte       | 0×00 0×00 | None   | According to actual calculations |
|                                                                                              | Receive                                                                     | 0×A5   | 0×03          | 0×20        | 0×13 | 1 Byte       | 0×00 0×01 | 1 Byte |                                  |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |             |      |               |           |        |                                    |  |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------|------|---------------|-----------|--------|------------------------------------|--|
|  | e                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |             |      |               |           |        |                                    |  |
|  | The host computer sendsExampleA5 03 20 13 00 00 00 6B 7A<br>Command code area: 0×13, I² C address acquisition command.<br>Data area: None<br>Lower-level device response:<br>Example: 0xA5 0x03 0x20 0x13 0x00 0x00 0x01 0xA2 0xC6 0xBB<br>0×13: Retrieve I² C command<br>0×00: Reserved bit<br>0×00 0×01: Data area length (high byte first, low byte second)<br>0×A2: The I² C address obtained<br>0xC6 0xBB: 16-bit CRC check (high byte first, low byte second) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |             |      |               |           |        |                                    |  |
|  | directio n                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Baotou                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Device number | Device type | CMD  | Reserv ed bit | Length    | Data   | CRC16                              |  |
|  | Send                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0×A5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0×03          | 0×20        | 0×1B | 0×00          | 0×00 0×00 | None   | Accord ing to actual calcula tions |  |
|  | Receive                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0×A5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0×03          | 0×20        | 0×1B | 0×00          | 0×00 0×01 | 1 Byte |                                    |  |
|  | Get frame rate                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The host computer sendsExample:A5 03 20 1B 00 00 00 69 1A<br>Command code area: 0x1B, frame rate acquisition command.<br>Data Area: None<br>Lower-level device response:<br>Example: 0xA5 0x03 0x20 0x1B 0x00 0x00 0x01 0x01 0x7E 0x1A<br>n 0×1B: Frame Rate Acquisition Command<br>n 0×00: Reserved byte<br>n 0×00 0×01: Data area length (high byte first, low byte second)<br>n 0×01: 1 byte, 0×00: 50 FPS      0×01: 100 FPS      0×02: 250 FPS.<br>n 0×7E 0×1A: 16-bit CRC check (high byte first, low byte second)<br>Note: When frame rate information is not set, the retrieved value defaults to 0×FF, while the configured default is 100 FPS. |               |             |      |               |           |        |                                    |  |
|  | directio n                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Baotou                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Device number | Device type | CMD  | Reserv ed bit | Length    | Data   | CRC16                              |  |
|  | Send                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0×A5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0×03          | 0×20        | 0×1A | 0×00          | 0×00 0×01 | 1 Byte | Accord ing to actual calcula tions |  |
|  | Receive                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0×A5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0×03          | 0×20        | 0×1A | 0×00          | 0×00 0×01 | 1 Byte |                                    |  |

ei v e

The host computer sendsExample:A5 03 20 1A 00 00 01 01 27 BE

Command code area: 0×1A, frame rate setting command.

Data Area: 1 byte, 0×00: 50 FPS, 0×01: 100 FPS, 0×02: 250 FPS.

Lower-level device response:

Example: 0xA5 0x03 0x20 0x1A 0x00 0x00 0x01 0x01 0xBE 0x27 0x1A: Frame Rate Setting Command

0×00: Reserved bit

0×00 0×01: Data area length (high byte first, low byte second)

0×01: Return to the set frame rate

0×00 0×01: Data area length (high byte first, low byte second)

0×01: 1 byte, 0×00: 50 FPS      0×01: 100 FPS      0×02: 250 FPS.

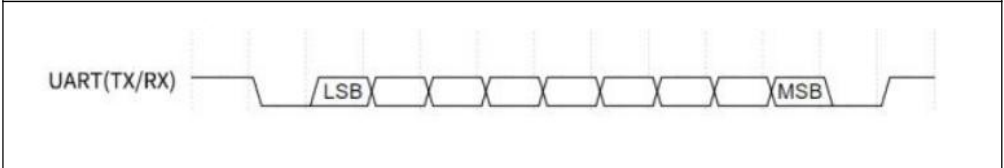
0xBE 0×27: 16-bit CRC check (high byte first, low byte second)

I<sup>2</sup> C protocol content

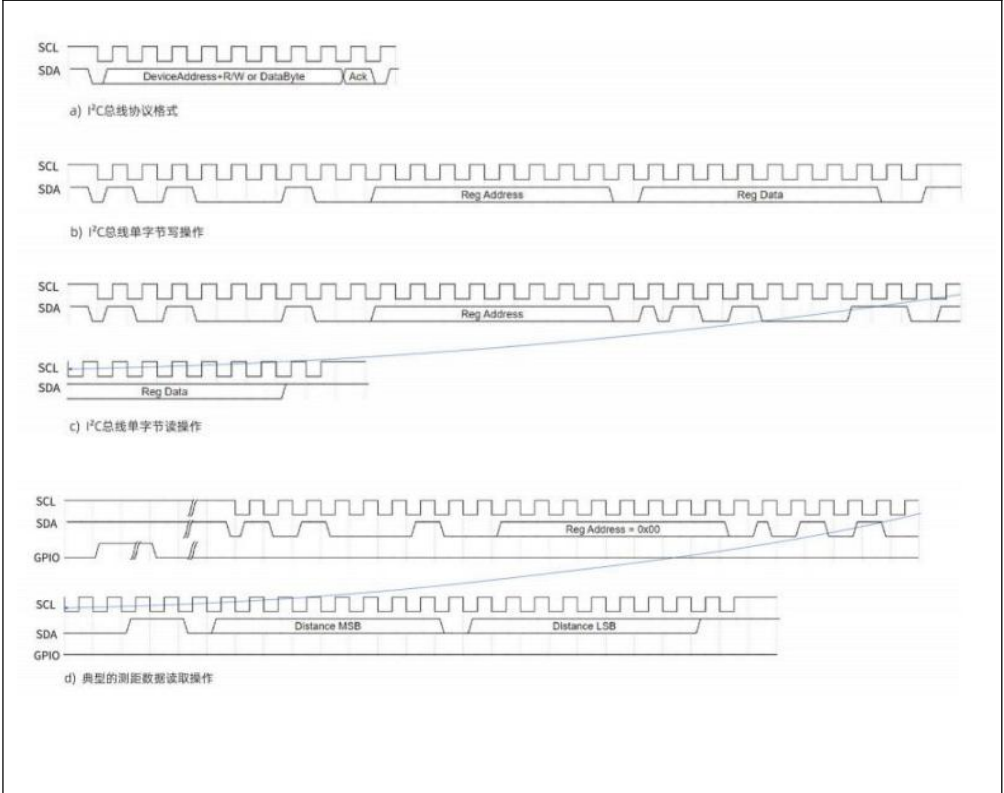
The I<sup>2</sup> C controller address is 7 bits, 0x51. The 0th bit is the read/write bit; (0x51 << 1) | (w/r).

Logical Timing

UART Bus Timing



I<sup>2</sup> C Bus Timing



IIC Register Table

The IIC controller address is 7 bits, with a value of 0x51. The 0th bit is the read/write bit; (0x51 << 1) | (w/r).

|         |                  |                      |      |
|---------|------------------|----------------------|------|
| Address | Register Meaning | Read-write attribute | Note |
|---------|------------------|----------------------|------|

|                                                                                                                                   |                                |    |                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----|-----------------------------------------------------------------------------------------------------------------------------------------|
| 0x00                                                                                                                              | Measure distance, 8 bits high. | RO | Distance is represented using 2 bytes (unit: mm)                                                                                        |
| 0x01                                                                                                                              | Measure distance, lower 8 bits | RO | Distance is represented using 2 bytes (unit: mm)                                                                                        |
| 0x02                                                                                                                              | Start/End Measurement Command  | RW | Write 1 to start measurement; the laser turns on, and distance data begins to refresh. Write 0 to end measurement; the laser turns off. |
| 0x03                                                                                                                              | Test register                  | RO | Default value 0x3B                                                                                                                      |
| Note: Depending on the firmware version, distance information may be output without needing to issue a start-measurement command. |                                |    |                                                                                                                                         |