EICUT DNG-TOF20 Manual

Read Manual

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Revision History

Date	Version	Description	Author
2025-10-06	1.0.0	Creation of the document	Sam

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1. Product Overview

This chapter mainly introduces the working principle, specification parameters, structural appearance, and field of view of **TOF20**.

1.1. Working Principle

TOF20 is a miniaturized optoelectronic distance-measuring module based on **direct Time of Flight (dToF)** technology for distance measurement.
The emitted laser light is transmitted through the optical path and emits laser pulses outward. After being reflected by the measured object, the returned signal enters the receiving path and is detected by a highly sensitive **SPAD** detector. By calculating the time difference between the emitted and received signals, and based on the speed of light, the distance between the object and the **LiDAR** can be calculated.

1.2. Specification Parameters

Table 1-Specification Parameters

Item	Specification
Performance Parameters	
Measurement Range	0.2–20 m @90% reflectivity @0 KLux, 0.2–15 m @90% reflectivity @100 KLux 0.2–12 m @10% reflectivity @0 KLux, 0.2–9 m @10% reflectivity @100 KLux
Accuracy	±6 cm (0.2–6 m), ≤1% (>6 m)
Measurement Resolution	2 cm (0.2–6 m)
Frame Rate	0 / 20 / 50 / 100 (default) / 250 Hz
Ambient Light Immunity	100 KLux
Measurement Range	0.2–20 m @90% reflectivity @0 KLux, 0.2–15 m @90% reflectivity @100 KLux 0.2–12 m @10% reflectivity @0 KLux, 0.2–9 m @10% reflectivity @100 KLux
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Ambient Light Immunity	100 KLux
Optical Performance	
Light Source	VCSEL
Center Wavelength	905 nm
Field of View	<2°
Laser Safety Class	Class 1 Eye-safe (EN60825)
Mechanical and Electrical Parameters	
Average Power Consumption	≤0.35 W
Peak Current	115 mA @3.3 V
Supply Voltage	DC 3.3 ±9% V
Communication Level	LVTTL (3.3 V)
Operating Temperature	-20°C to +60°C
Storage Temperature	-40°C to +85°C
Dimensions	21 × 15 × 7.87 mm^3
Weight	1.35 g
Hardware Interface	0.8 mm – 6P (Model: WF08006-01207)
Protection Rating	None

Notes:

1. The accuracy is measured at an indoor temperature of 25°C with a 90% reflectivity background board; changes in conditions may cause measurement results to vary.
2. The measurement range is measured at an indoor temperature of 25°C; changes in conditions may cause measurement results to vary.
3. Peak current is measured under room-temperature conditions.

1.3. Structural Appearance

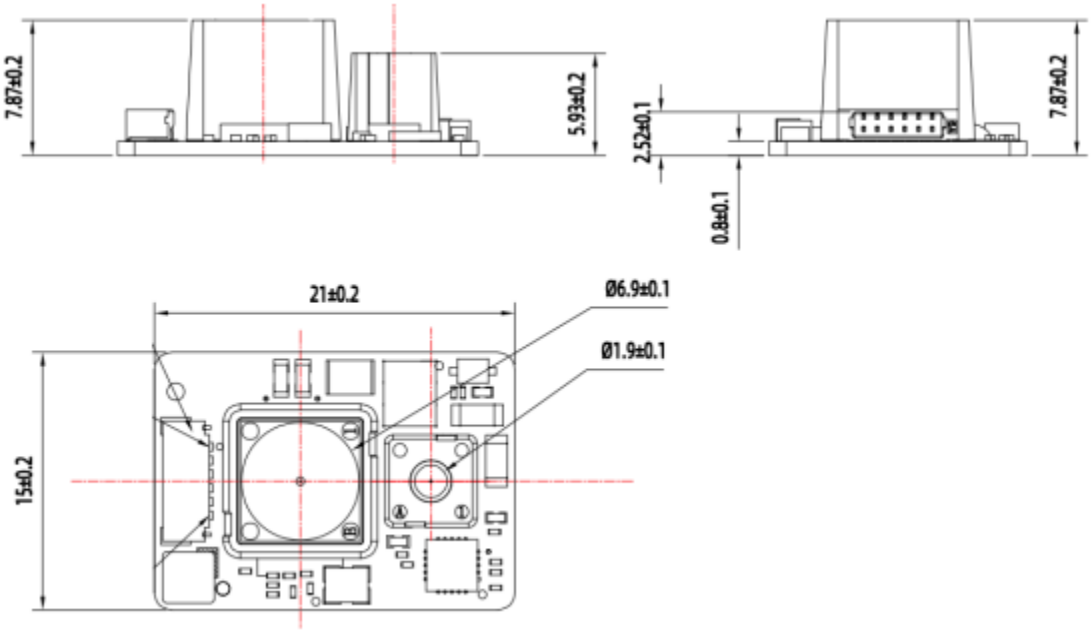

Figure 1- TOF20 Dimension Drawing

2. Hardware Interfaces and Protocols

2.1. Pin Description

The connector model is **WF08006-01207**, with a pin pitch of **0.8 mm**.

Figure 2- TOF20 Pin Order

No.	Function	Description
1	3V3_LASER	Laser power supply
2	3V3	Power supply positive
3	UART_TX / I2C_SDA	Receive / data
4	UART_RX / I2C_SCL	Transmit / clock
5	GPIO	Communication selection
6	GND	Power ground

The module supports both **UART** and **I²C** communication modes, but only **one mode can be selected at power-on**. See the figure below:

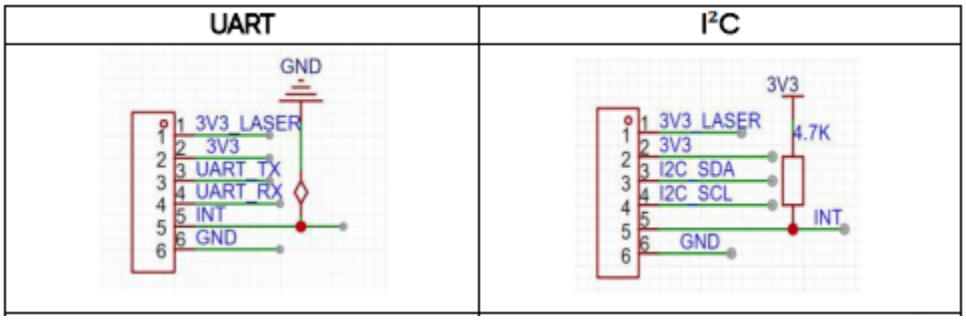

Figure 3-UART vs I2C

- **UART mode**:
  INT pin is pulled down to ground at power-on.
- **I²C mode**:
  INT pin is pulled up to **3.3 V** through a **4.7 kΩ** resistor at power-on, and the sensor address can be configured.

2.2. Serial Data Communication

Table 2- UART Communication Protocol

Interface Parameter	Default Value	Configurable?
Baud Rate	115200	Configurable
Data Bits	8	Not configurable
Stop Bits	1	Not configurable
Parity Check	None	Not configurable

Note: The baud rate can be set to: 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600. The default baud rate for TFS20-L is 115200. If the baud rate is configured incorrectly, it will reset to 115200 upon power cycle.

2.3. Serial Output Format

Each data packet consists of 9 bytes in hexadecimal format. Details are as follows:

Table 3- Data Frame

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x59	0x59	Dist_L	Dist_H	Strength_L	Strength_H	Temp_L	Temp_H

Data Frame Explanation

- **Byte0** → 0x59 (Frame header, identical in every frame)
- **Byte1** → 0x59 (Frame header, identical in every frame)
- **Byte2** → Dist_L (Distance – low 8 bits)
- **Byte3** → Dist_H (Distance – high 8 bits)
- **Byte4** → Strength_L (Signal strength – low 8 bits)
- **Byte5** → Strength_H (Signal strength – high 8 bits)
- **Byte6** → Temp_L (Temperature – low 8 bits)
- **Byte7** → Temp_H (Temperature – high 8 bits)
- **Byte8** → Checksum (Low 8 bits of the cumulative sum of the previous 8 bytes)

3. Custom Configuration

3.1. Frame Format

The TOF20 parameters can be customized by the client (user), for example, data output format, frame rate, etc. These parameters can be configured by sending specific commands to the TOF20, and successfully configured parameters will be saved in **Flash** format. After power-off, they are retained and do not need to be reconfigured on next power-up.

Please follow the specified format and rules when configuring parameters to avoid sending invalid commands.

Note: All configuration commands (and responses) are sent in hexadecimal (HEX) format, with a total length of 16 bytes.

Table 4- TOF20 Command Format

Byte0	Byte1	Byte2	Byte3 ~ Byte N-2	Byte N-1
Head	Len	ID	Payload	Checksum

Command Encoding Explanation

- **Byte0 Head**: Command frame header (fixed value: 0x5A)
- **Byte1 Len**: Total frame length (including Head and Checksum), in bytes
- **Byte2 ID**: Represents the parsing method for different function commands
- **Byte3 to Byte N-2 Payload/Data**: Data section, parsed according to ID; data is in little-endian format
- **Byte N-1 Checksum**: Perform sum calculation on all bytes from Head to Payload, take the low 8 bits

3.2. General Parameter Configuration and Description

To set the relevant parameters of TOF20, first establish a connection with TOF20 (connection method reference section 4.2). After the connection is successful, send the relevant configuration commands to the product via PC software or your own tool; the configured parameters will be saved after power-off.

After sending the configuration command, the default is to power off and restore power.

Table 5- Common Configuration Commands

Configuration Item	Downlink Command (PC → Module)	Uplink Command (Module → PC)	Description	Factory Default
Output frame rate①	5A 06 03 LL HH SU④	5A 06 03 LL HH SU	Only supports 0/20/50/100/250 Hz	100 Hz
Single trigger command	5A 04 04 62	Data frame	After setting the frame rate to 0, the module can be triggered manually or by other means to send one measurement; suitable for low-frequency or on-demand testing via serial port trigger	–
Output mode	5A 05 05 01 65	5A 05 05 01 65	Standard 9-byte (cm)	√
	5A 05 05 06 6A	5A 05 05 06 6A	Standard 9-byte (mm)	/
Baud rate②	5A 08 06 H1 H2 H3 H4 SU	5A 08 06 H1 H2 H3 H4 SU	Set baud rate Example: 256000 (DEC) = 3E800 (HEX), H1=00, H2=E8, H3=03, H4=00	115200
Output switch③	5A 05 07 00 66	5A 05 07 00 66	Disable data output	/
	5A 05 07 01 67	5A 05 07 01 67	Enable data output	/
Checksum switch	5A 05 08 00 68	5A 05 08 00 68	Enable checksum	/
	5A 05 08 01 67	5A 05 08 01 67	Disable checksum	/
Signal strength threshold and low-threshold output value	5A 07 22 XX LL HH D0	5A 07 22 XX LL HH SU	Modification example: When Strength < 100, Dist is modified to 1200. XX = 100/10 = 10 (DEC) = 0A (HEX) 1200 (DEC) = 4B0 (HEX) → LL=B0, HH=04 After Strength < 300, Dist output value is 500	/

① The main purpose of configuration is to adjust the product's output frequency. The default output frequency value is 100 Hz and supports custom configuration.

② The baud rate can be set to: 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600. The default baud rate for TFS20 is 115200. When the baud rate is configured incorrectly, it will reset to 115200 upon power cycle.

③ Each time power is applied, the enable/disable command must be sent.

④ 'SU' represents the checksum, which places the low 8 bits into the command.

If you do not want to send a checksum command, after sending a specific configuration command, first change 460800 to HEX (0x00070808 00), then calculate the checksum as 0x77, resulting in the following command: 5A 08 06 00 08 07 00 77.

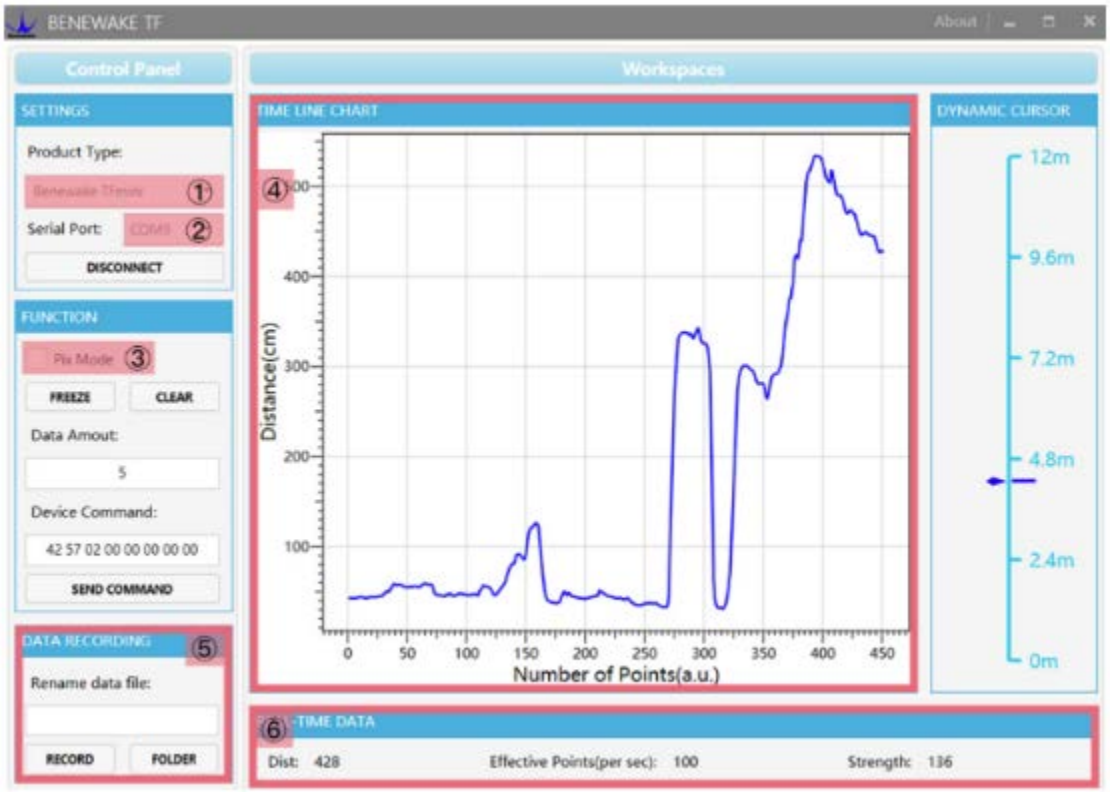

Figure 4- Upper Computer Interface and Display – TIME LINE CHART

If the red light on TOF20 is lit after power-on, it indicates that the connection and wiring are normal, and TOF20 is powered on correctly and is transmitting data normally.

Distance displayed on the upper computer may differ in units (mm or cm) depending on the output mode setting. If the **TIME LINE CHART** command has been used to modify the unit, for example, if TOF20 is actually measuring 1 m, but the output is set to mm mode, the value read on the upper computer will be **1000**. At this time, the value displayed on the upper computer is not uniform, and it is recommended to interpret it in cm.

Explanation:

- On the V1.1 version upper computer software, there is no command to disable data output by default. Please send command **5A 05 07 01 67** to enable continuous output if needed.
- If the product is shipped with continuous output disabled, or if the user has previously sent a disable command, data will not be output until the enable command is sent again.

4. FAQ

Common issues and handling on the TIME LINE CHART interface:

1. **No data output after connection** Reason 1: The upper computer is not sending the enable command by default (send **5A 05 07 01 67**). Reason 2: The product was shipped with continuous output disabled, or a disable command was sent during previous use. Handling: Check whether the enable command has been sent. If the TTL serial port and TOF20 wiring are correct, the red laser light should be on. If the laser head is not lit, check whether the power supply voltage is within the normal range. If the laser head is lit but there is still no data, please check whether the data output format command is correct.
2. **TOF20 works for a period of time, then the chip overheats and stops working** This is a normal phenomenon when the chip temperature is too high.
3. **TOF20 has no data output after being connected to the computer via USB** Reason 1: No enable command sent (send **5A 05 07 01 67** on the upper computer). Reason 2: The product was shipped with output disabled, or a disable command was sent during use. Handling: Check whether the power supply voltage is normal. If the TOF20 transmitting laser head is lit red, the connection is normal. If there is still no data, please check the data output format used in the software and adjust it accordingly.
4. **Does TOF20 support low-power transmission mode?** Yes, TOF20 supports low-power mode (command **5A 06 35 0X 00 SU**). In low-power mode, the frame rate cannot exceed 10 Hz. If using a 1000 mAh lithium battery at an average power consumption of **35 mW**, the battery can last approximately **6 days** (calculated at 1000 mAh capacity).