TFmini Plus LiDAR module
Short-range distance sensor

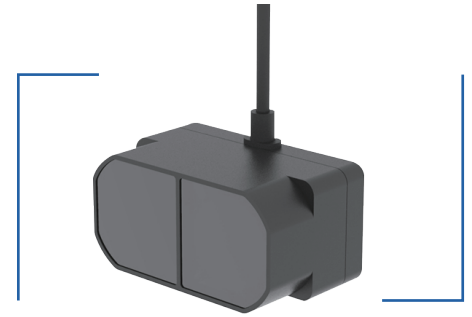北醒（北京）光子科技有限公司
Benewake（Beijing）Co., Ltd.

TFmini Plus is a milestone of Benewake in the process of promoting the cost-effective -LiDAR. Apart from low-cost, small-size and low-power-consumption, TFmini Plus also improves the frame rate, introduces IP65 enclosures and optimizes various compensation algorithms. These new characters greatly expand the application fields and scenarios of TFmini Plus.
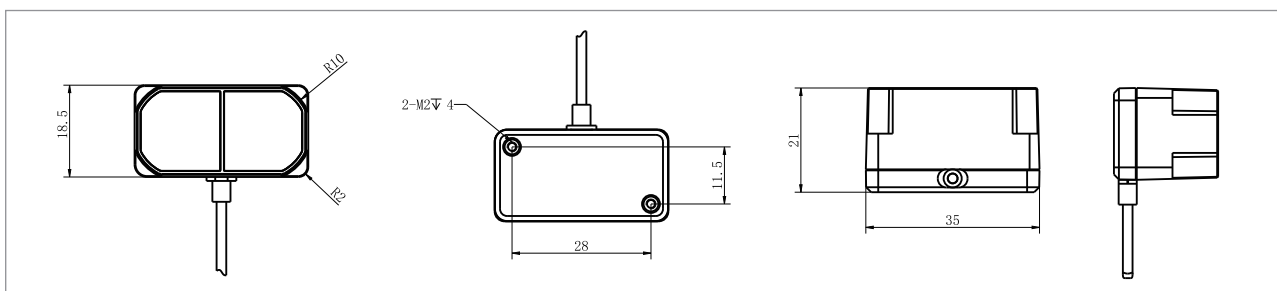
■ Technical Specifications and Parameters

Parameter		Value
Product parameters	Operating Range	0.1m~12m[①]
	Accuracy	±5cm@(0.1-6m)
		±1%@(6m-12m)
	Distance resolution	5mm
	Frame rate	1-1000Hz(adjustable)[②]
	Ambient light immunity	70klux
	Operating temperature	-20℃~60℃
	Enclosure rating	IP65
Optical parameters	Light source	LED
	Central wavelength	850nm
	FOV	3.6°
Electrical parameters	Supply voltage	5V±0.5V
	Average current	≤110mA
	Power consumption	550mW
	Peak current	500mA
	Communication level	LVTTL（3.3V）
Miscellaneous	Material of enclosure	ABS+PC
	Storage temperature	-20℃~75℃
	Weight	11g
	Wire length	30cm

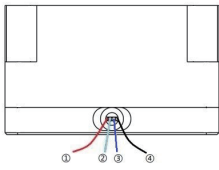① Range based on a standard whiteboard with reflectivity 90% in indoor condition;
② Only frame rates meet the formula – 1000/n (n is Positive integer) can be set;

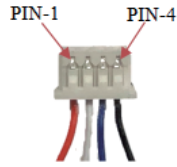## ■ Product Appearance and Structure

Dimensions of TFmini Plus module (Unit:mm)

■ Wiring Guide

Wiring diagram of TFmini Plus

Number	Color	Corresponding PIN	PIN	Function
①	Red	PIN-1	+5V	Power
②	White	PIN-2	RXD	Receive
③	Blue	PIN-3	TXD	Transmit
④	Black	PIN-4	GND	Ground

■ Communication Protocol

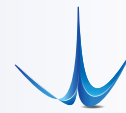| Communication port	UART
Default Baud rate	115200(adjustable)
Data bits	8
Stop bit	1
Parity	None

■ Data Format

The data frame contains 9 bytes, 2 bytes of frame head, 2 bytes of distance value (Dist_L and Dist_H), 2 bytes of signal strength (Strength_L and Strength_H), 2 bytes of temperature (Temp_L and Temp_H) and 1byte of checksum. All the data and commands are transmitted in hexadecimal format.

Byte0-1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
0×59 59	Dist_L	Dist_H	Strength_L	Strength_H	Temp_L	Temp_H	Checksum

Data code explanation	
Byte0	0x59，frame header, same for each frame
Byte1	0x59，frame header, same for each frame
Byte2	Dist_L distance value lower by 8 bits
Byte3	Dist_L distance value higher by 8 bits
Byte4	Strength_L low 8 bits
Byte5	Strength_L high 8 bits
Byte6	Temp_L low 8 bits (suit for version later than V1.3.0)
Byte7	Temp_H high 8 bits (suit for version later than V1.3.0)
Byte8	Checksum is the low 8 bits of the cumulative sum of the numbers of the first 8 bytes.

Temperature($℃$) = Temp / 8 - 256

北醒（北京）光子科技有限公司
Benewake (Beijing) Co., Ltd.

■ Command Protocols

TFmini Plus has released the commands of setting frame rate, baud rate and measurement unit.

Frame Definition

Byte	0	1	2	3-Len-2	Len-1
Description	Head	Len	ID	Payload	Checksum

Head：frame head of command frame(0x5A)

Len：length of the frame, head and checksum included

ID：identifier code of command

Payload：data segment. Little endian format

Checksum：sum of all bytes from Head to payload. Lower 8 bits.

Commands

Commands	Downlink frame	Uplink frame	Description
Obtain firmware version	5A 04 01 5F	5A 07 01 01 02 03 SU	Represent V3.2.1
System reset	5A 04 02 60	5A 05 02 00 SU	00-Succeeded 01-Failed
Set update rate	5A 06 03 00 00 SU	5A 06 03 00 00 SU	Set update rate (1~1000Hz)①
Set measurement unit	5A 05 05 01 SU	5A 05 05 01 SU	01-cm 06-mm
Set baud rate	5A 08 06 00 00 00 00 SU	5A 08 06 00 00 00 00 SU	Set baud rate②
Enable/Disable output	5A 05 07 00 SU	5A 05 07 00 SU	0-Disable 1-Enable
Restore factory settings	5A 04 10 6E	5A 05 10 00 SU	00-Succeeded 01-Failed
Save settings③	5A 04 11 6F	5A 05 11 00 SU	00-Succeeded 01-Failed

Bytes with yellow undertone represents checksum. Bytes with blue undertone represents data segment.

① The default update rate is 100Hz. The customized update rate should be calculated by the formula: 1000/n (n is Positive integer). Increasing frame rate will decrease the data stability.

② Only standard baud rates are supported. When setting a high update rate, a high baud rate is recommended to ensure data security.

③ Please always send the command of save settings when try to modify parameters of TFmini Plus,otherwise the settings will not take effect.