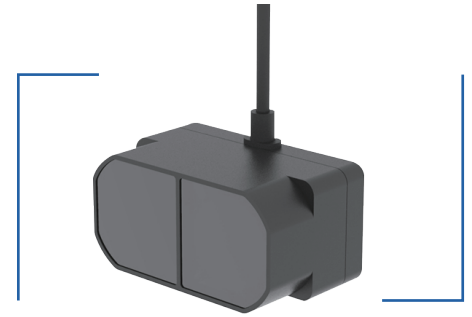


TFmini Plus is a milestone of Benewake in the process of promoting the cost-effective -LiDAR. Apart from low-cost, small-size and low-power-consumption, TFmini Plus also improves the frame rate, introduces IP65 enclosures and optimizes various compensation algorithms. These new characters greatly expand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



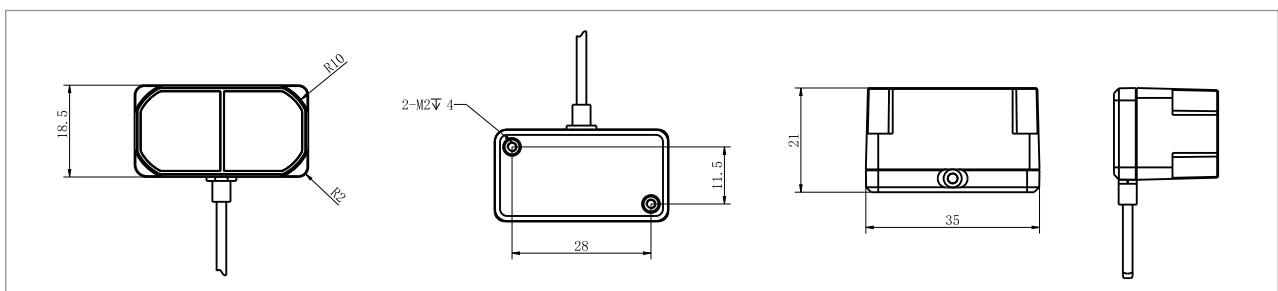
## Technical Specifications and Parameters

Parameter		Value
Product parameters	Operating Range	0.1m~12m <sup>①</sup>
	Accuracy	±5cm@(0.1-6m)
		±1%@(6m-12m)
	Distance resolution	5mm
	Frame rate	1-1000Hz(adjustable) <sup>②</sup>
	Ambient light immunity	70klux
	Operating temperature	-20°C~60°C
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°C~75°C
	Weight	11g
	Wire length	30cm

① Range based on a standard whiteboard with reflectivity 90% in indoor condition;

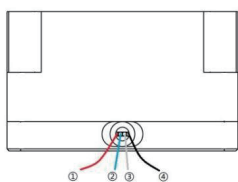
② Only frame rates meet the formula – 1000/n (n is Positive integer) can be set;

## Product Appearance and Structure



Dimensions of TFmini Plus module (Unit:mm)

## ■ Wiring Guide



Wiring diagram of TFmini Plus

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

## ■ Communication Protocol

<b>Communication port</b>	UART
<b>Default Baud rate</b>	115200(可调)
<b>Data bits</b>	8
<b>Stop bit</b>	1
<b>Parity</b>	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
0x59 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.

$$\text{Temperature}(\text{°C}) = \text{Temp} / 8 - 256$$

## ■ 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 <b>5F</b>	5A 07 01 <b>01 02 03 SU</b>	Represent V3.2.1
System reset	5A 04 02 <b>60</b>	5A 05 02 <b>00 SU</b>	00-Succeeded 01-Failed
Set update rate	5A 06 03 <b>00 00 SU</b>	5A 06 03 <b>00 00 SU</b>	Set update rate (1~1000Hz) <sup>①</sup>
Set measurement unit	5A 05 05 <b>01 SU</b>	5A 05 05 <b>01 SU</b>	01-cm 06-mm
Set baud rate	5A 08 06 <b>00 00 00 00 SU</b>	5A 08 06 <b>00 00 00 00 SU</b>	Set baud rate <sup>②</sup>
Enable/Disable output	5A 05 07 <b>00 SU</b>	5A 05 07 <b>00 SU</b>	0-Disable 1-Enable
Restore factory settings	5A 04 10 <b>6E</b>	5A 05 10 <b>00 SU</b>	00-Succeeded 01-Failed
Save settings <sup>③</sup>	5A 04 11 <b>6F</b>	5A 05 11 <b>00 SU</b>	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.