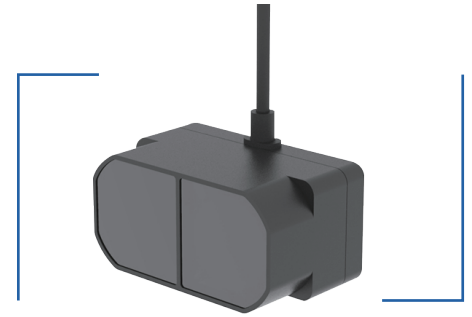


TFmini Plus is a milestone of Benewake in the process of promoting the cost-effective -LiDAR. Apart from low-cost, small-size and low-power-consumption, TFmini Plus also improves the frame rate, introduces IP65 enclosures and optimizes various compensation algorithms. These new characters greatly expand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



## ■ Technical Specifications and Parameters

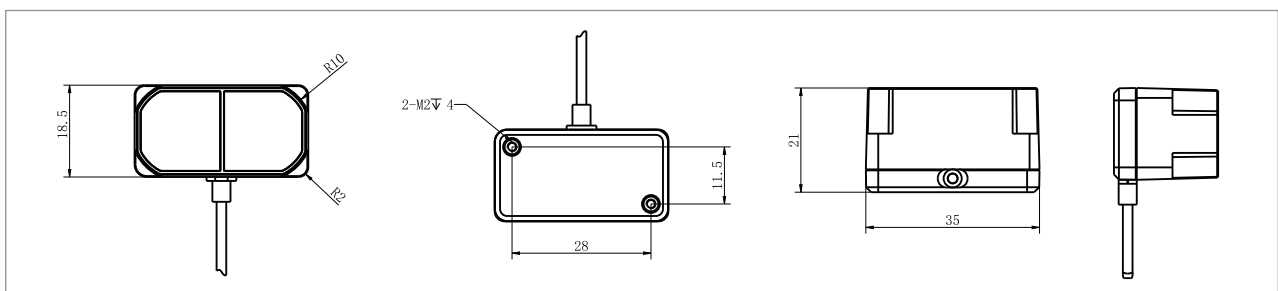
Parameter		Value
Product parameters	Operating Range	0.1m~12m <sup>①</sup>
	Accuracy	±5cm@(0.1-6m)
		±1%@(6m-12m)
	Distance resolution	5mm
	Frame rate	1-1000Hz(adjustable) <sup>②</sup>
	Ambient light immunity	70klux
	Operating temperature	-20°C~60°C
Enclosure rating	IP65	
Optical parameters	Light source	LED
	Central wavelength	850nm
	FOV	3.6° <sup>③</sup>
Electrical parameters	Supply voltage	5V±0.5V
	Average current	≤110mA
	Power consumption	550mW(low power mode 85mW)
	Peak current	500mA
	Communication level	UART,I <sup>2</sup> C,I/O
Miscellaneous	Material of enclosure	ABS+PC
	Storage temperature	-20°C~75°C
	Weight	12g
	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;

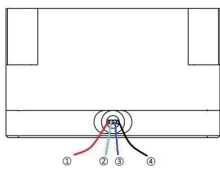
③ This is the theoretical number,the is some offset for the real number.

## ■ Product Appearance and Structure

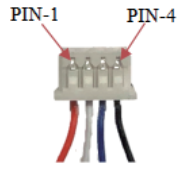


Dimensions of TFmini Plus module (Unit:mm)

## Wiring Guide



Wiring diagram of TFmini Plus



No.	Color	Corresponding PIN	PIN	Function
①	Red	PIN-1	+5V	Power supply
②	White	PIN-2	RXD/SCL	Receive/Clock
③	Blue	PIN-3	TXD/SDA	Transmit/Data
④	Black	PIN-4	GND	Ground

## Communication Protocol

<b>Communication port</b>	UART
<b>Default Baud rate</b>	115200(adjustable)
<b>Data bits</b>	8
<b>Stop bit</b>	1
<b>Parity</b>	None

<b>Communication port</b>	I <sup>2</sup> C
<b>Max transmission rate</b>	400kbps
<b>Master/Slave mode</b>	Slave
<b>Default address</b>	0x10
<b>Address range</b>	0x01~0x7F

## Data Format

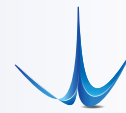
The data frame contains 9 bytes, 2 bytes of frame head, 2 bytes of distance value (Dist\_L and Dist\_H), 2 bytes of signal strength (Strength\_L and Strength\_H), 2 bytes of temperature (Temp\_L and Temp\_H) and 1byte of checksum. All the data and commands are transmitted in hexadecimal format.

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.

## Configurable parameters

Configurable item	Description	Factory setting
<b>Communication interface</b>	UART,I <sup>2</sup> C and I/O	UART
<b>Frame rate</b>	1~1000Hz	100Hz
<b>Baud rate setting</b>	9600~921600bps	115200
<b>Trigger source</b>	Measure automatically or by trigger	auto
<b>Reset to factory</b>	All of setting reset to factory	/



## Command Protocols

### Convention

- (1) Little endian transmission has been applied in multi byte data,i.e. low byte of data will be saved in lower address
- (2) Downlink frame:data from master computer to LiDAR
- (3) Uplink frame: data from LiDAR to master computer or other terminal

### 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 Frame rate (1~1000Hz) <sup>①</sup>
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 rate <sup>②</sup>
Enable/Disable output	5A 05 07 00 SU	5A 05 07 00 SU	0-Disable 1-Enable
Modify IIC slave address	5A 05 0B ADDR SU	5A 05 0B ADDR SU	Change the I <sup>2</sup> C slave address(default 0x10)
Restore factory settings	5A 04 10 6E	5A 05 10 00 SU	00-Succeeded 01-Failed
Save settings <sup>③</sup>	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 frame rate is 100Hz. The customized frame rate should be calculated by the formula: 1000/n (n is positive integer). Data stability will decrease with frame rate increasing.

② Only standard baud rates are supported. When setting a high frame 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 after power off.