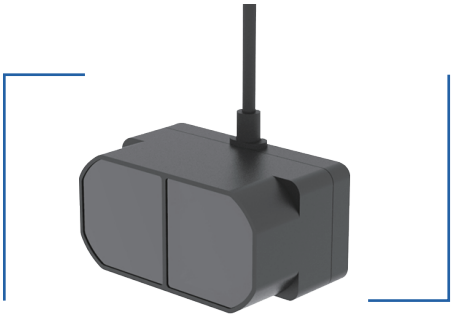
TFmini Plus is a milestone of Benewake in the process of promoting the cost-effective -LiDAR. Apart from low-cost, small-size and low-power-consumption, TFmini Plus also improves the frame rate, introduces IP65 enclosures and optimizes various compensation algorithms. These new characters greatly expand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

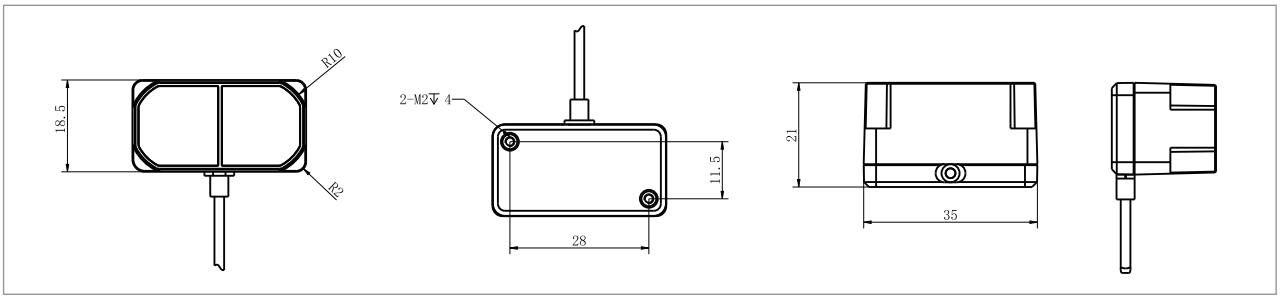


Technical Specifications and Parameters

Parameter		Value
Product parameters	Operating Range	0.1m~12m①
	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°③
Electrical parameters	Supply voltage	5V±0.5V
	Average current	≤110mA
	Power consumption	550mW(low power mode 85mW)
	Peak current	140mA
	Communication level	UART,I²C,I/O
Miscellaneous	Material of enclosure	ABS+PC
	Storage temperature	-20℃~75℃
	Weight	12g
	Wire length	30cm

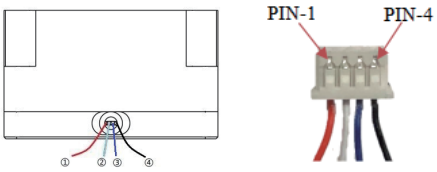
① Range based on a standard whiteboard with reflectivity 90% in indoor condition;
② Only frame rates meet the formula – 1000/n (n is Positive integer) can be set;
③ This is the theoretical number,the is some offset for the real number.

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	Receiving/Data
③	Blue/Green	PIN-3	TXD/SCL/IO	Transmitting/Clock/IO
④	Black	PIN-4	GND	Ground

Communication Protocol

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

Communication port	I²C
Max transmission rate	400kbps
Master/Slave mode	Slave
Default address	0x10
Address range	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
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.

Configurable parameters

Configurable item	Description	Factory setting
Comunication interface	UART,I²C and I/O	UART
Frame rate	1~1000Hz	100Hz
Baud rate setting	9600~921600bps	115200
Trigger source	Measure automatically or by trigger	auto
Reset to factory	All of setting reset to factory	/

Common configuration commands

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)①
Set measure-ment 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
Communication interface mode	5A 05 0A MODE SU	/	MODE 0：UART，1：IIC
Modify IIC slave address	5A 05 0B ADDR SU	5A 05 0B ADDR SU	Change the I²C slave address(default 0x10)
Obtain data frame	5A 05 00 01 60	Data Frame(9 Bytes – cm)	Only works in I²C Mode
	5A 05 00 06 65	Data Frame(9 Bytes – mm)	
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 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.