

# LamaPLC: Waveshare TOF Laser Range Sensor with UART / I<sup>2</sup>C communication



- [UART](#) / [I<sup>2</sup>C / \[CAN\]\(#\) / IO Communication Support, 25m / 50m Measuring Range](#)
- This is a TOF-based (*time of flight*) laser ranging sensor with embedded MCU and ranging algorithm, which is capable of offering up to 25m / 50m measuring range, and  $\pm 3\text{cm}$  accuracy.
- It supports UART or I<sup>2</sup>C communication bus, features longer measuring distance and higher light interference tolerance capability due to its ultra-narrow FOV, suitable for either indoor or outdoor conditions. Its ambient light tolerance is up to 100K lux.
- This sensor can be widely used in applications like standard distance measuring, robot obstacle avoidance/route planning/ceiling detection, and more...
- long range low cost ranging module, high stability, high accuracy, high sensitivity ranging; UART / I<sup>2</sup>C / IO communication support UART mode: supports active query output I<sup>2</sup>C mode: up to 8x cascades I/O mode: unable to output distance parameter



TOF Laser Range Sensor (C)  
25m measuring range



TOF Laser Range Sensor (D)  
50m measuring range

## Core Product Comparison

Waveshare offers several versions to match different distances and environmental requirements:


Model	Range	Accuracy	Interface	Best For
Standard TOF	0.01 - 5m	$\pm 1.5\text{cm}$	UART / CAN	Indoor robots, obstacle avoidance
TOF (B)	0.10 - 15m	$\pm 2\%$	UART / I <sup>2</sup> C Long-range indoor/outdoor use	
TOF (C)	0.05 - 25m	$\pm 3\text{cm}$	UART / I <sup>2</sup> C	Outdoor navigation, material levels
TOF (D)	0.05 - 50m	$\pm 3\text{cm}$	UART / I <sup>2</sup> C	Extreme long-distance detection

Model	Range	Accuracy	Interface	Best For
TOF Mini	0.02 - 7.8m	±4cm	UART / I2C	Ultra-compact builds (1g weight)

### Key Technical Features

- **Cascading Support:** Up to 8 sensors on UART and 7 on CAN can be connected in series to a single bus, each assigned a unique ID.
- **High Ambient Light Resistance:** Most “B,” “C,” and “Mini” models resist up to 100K LUX, making them functional in direct sunlight.
- **Configurable FOV:** The standard model offers an adjustable Field of View (15° to 27°), while long-range models feature a narrow FOV (1° to 2°) to minimize interference.
- **Integrated Processing:** Includes an embedded MCU and ranging algorithm, providing filtered distance data rather than raw phase shifts.
- **Software Tools:** Waveshare provides a PC Assistant Software for real-time waveform monitoring, configuration, and data recording.

Specification	Data
<b>Typical measuring range</b>	0.05..25 m / 0.05..50 m
<b>Measuring accuracy</b>	+ -3 cm
<b>Wavelength</b>	905 nm
<b>Field of view</b>	1°..2°
<b>Communication interface</b>	default: UART (3.3V TTL) I2C Addr: 0x08
<b>Baudrate</b>	UART: 4.8 kbps .. 3000 kbps (921.6 kbps default) I2C: up to 400 kbps
<b>Power supply</b>	4.3 .. 5.2 V
<b>Power consumption</b>	250 mW (UART active output, 5.0 V power supply, 50 mA current)
<b>Operation temperature</b>	-10 °C .. 60 °C



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2026/02/14 23:38

### Wiring Diagram (UART)

The sensor operates at 3.3V TTL signal levels, but the module has voltage translation for 5V compatibility.

Waveshare Pin	Arduino Uno/Nano Pin	Description
<b>VCC</b>	5V (or 3.3V)	Power Supply
<b>GND</b>	GND	Ground
<b>TX</b>	D10	Arduino RX (SoftwareSerial pin)
<b>RX</b>	D11	Arduino TX (SoftwareSerial pin)

## Arduino Example Code (UART Communication)

This example utilizes the SoftwareSerial library to actively read distance data from the sensor, which outputs at the default baud rate of 115200.

```
#include <SoftwareSerial.h>

SoftwareSerial TOFSerial(10, 11); // RX, TX pins for the sensor
unsigned char TOF_data[32] = {0}; // Buffer to store the data frame
unsigned char TOF_length = 16;
unsigned long TOF_distance = 0;
unsigned char TOF_check = 0;

void setup() {
  Serial.begin(9600); // Initialize hardware serial for monitoring
  TOFSerial.begin(115200); // Initialize software serial for the sensor
  Serial.println("Waveshare TOF Sensor Test");
}

void loop() {
  if (TOFSerial.available() > 0) {
    // Read the incoming bytes from the sensor
    if (readTOFData()) {
      Serial.print("Distance: ");
      Serial.print(TOF_distance);
      Serial.println(" mm");
    }
  }
}

// Function to read and parse the data frame based on Waveshare protocol
bool readTOFData() {
  if (TOFSerial.available() >= TOF_length) {
    for (int i = 0; i < TOF_length; i++) {
      TOF_data[i] = TOFSerial.read();
    }

    // Verify the checksum
    TOF_check = 0;
    for (int k = 0; k < TOF_length - 1; k++) {
      TOF_check += TOF_data[k];
    }

    if (TOF_check == TOF_data[TOF_length - 1] && TOF_data[0] == 0x57) { //
      Check header 0x57
      // Data is valid. Distance is a 3-byte value (little-endian)
      TOF_distance = (TOF_data[8]) | (TOF_data[9] << 8) | (TOF_data[10] <<
16);
      return true;
    }
  }
}
```

```
}  
return false;  
}
```

[distance measurement](#), [laser](#), [range](#), [sensor](#), [TOF](#), [Waveshare](#)

This page has been accessed for: Today: 3, Until now: 5

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