AITRIP VL53L0X

AITRIP VL53L0X Time-of-Flight Laser Ranging Sensor Module User Manual

Model: VL53L0X

1. Introduction

The AITRIP VL53L0X is a Time-of-Flight (ToF) laser ranging sensor module designed for precise distance measurement. This breakout board simplifies integration for hobbyists and students, addressing the challenges of the sensor's small LGA package and 2.8V operating voltage by providing level shifters and a regulated 2.8V output. It communicates via an I²C (TWI) interface and is compatible with microcontrollers operating at 3.3V or 5V, such as Arduino boards.

2. Product Overview and Features

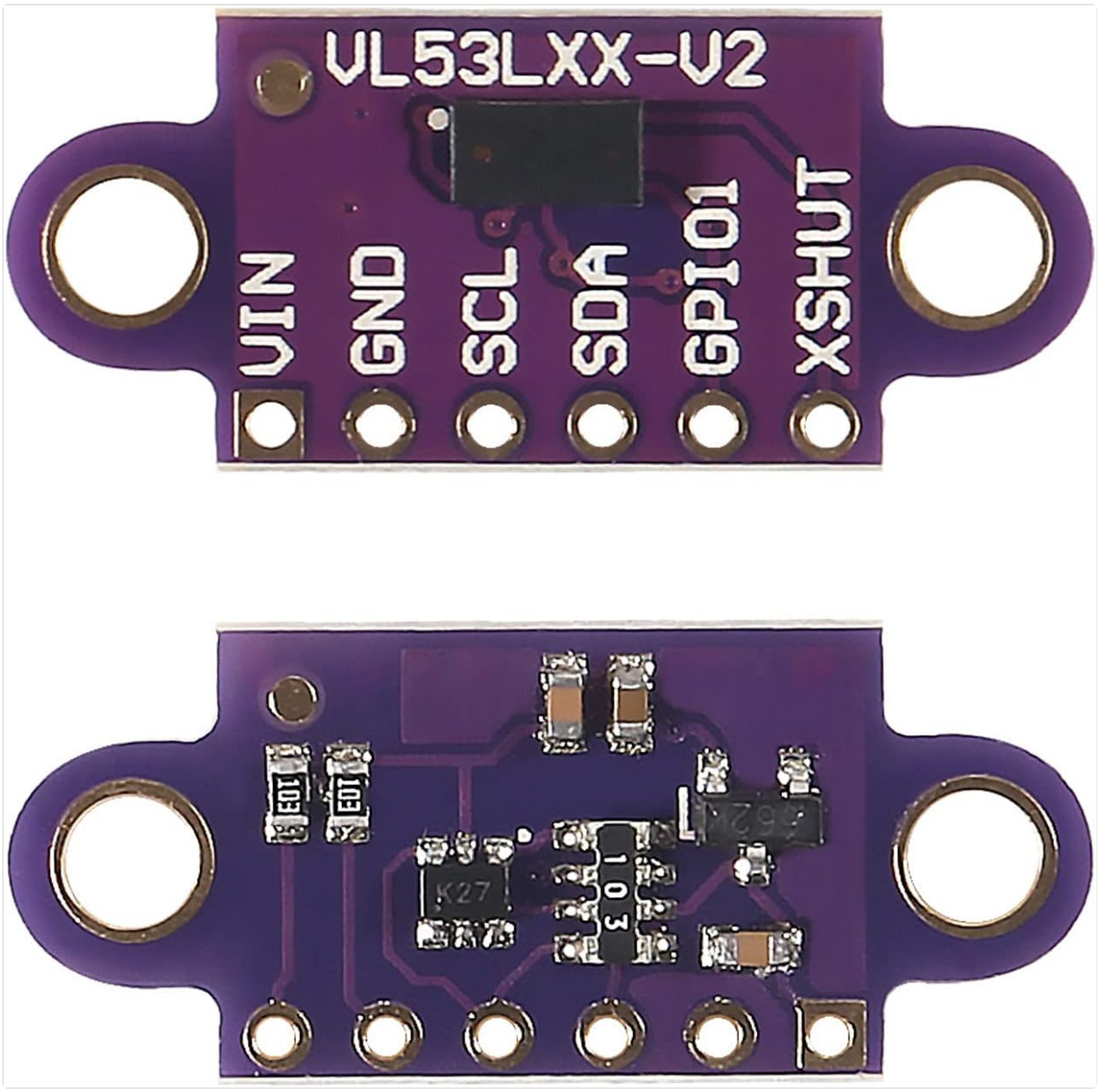
The VL53L0X sensor utilizes Time-of-Flight technology to measure distances up to 2 meters. Its capabilities support a wide range of applications, including gesture sensing, proximity detection for user interfaces, wall and cliff detection for robotics (e.g., sweeping robots), and various IoT products. The breakout board ensures ease of use while maintaining a compact form factor.

2.1 Pin Description

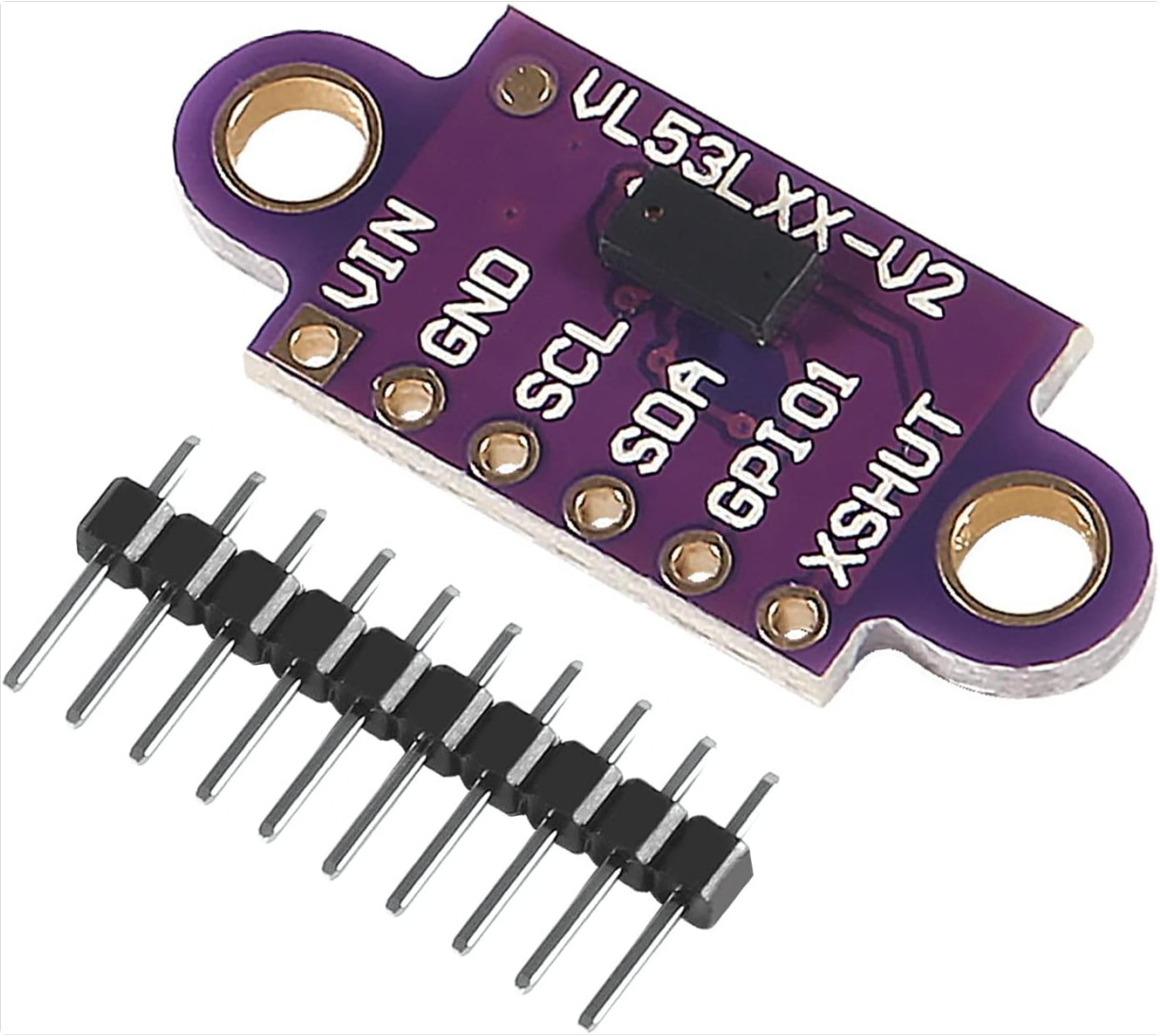
The module features several pins for power, communication, and control:

- **VDD:** Regulated 2.8 V output. Provides approximately 150 mA to power external components. This pin can also serve as a 2.8 V input if VIN is disconnected, bypassing the internal regulator.
- **VIN:** Main power supply connection, accepting 2.6 V to 5.5 V. The I²C level shifters pull the I²C lines high to this voltage level.
- **GND:** Ground (0 V) connection for the power supply. Your I²C control source must share a common ground with this board.
- **SDA:** Level-shifted I²C data line. HIGH is VIN, LOW is 0 V.
- **SCL:** Level-shifted I²C clock line. HIGH is VIN, LOW is 0 V.
- **XSHUT:** Active-low shutdown input. The board pulls this pin up to VDD by default to enable the

sensor. Driving this pin low places the sensor into hardware standby. This input is not level-shifted.



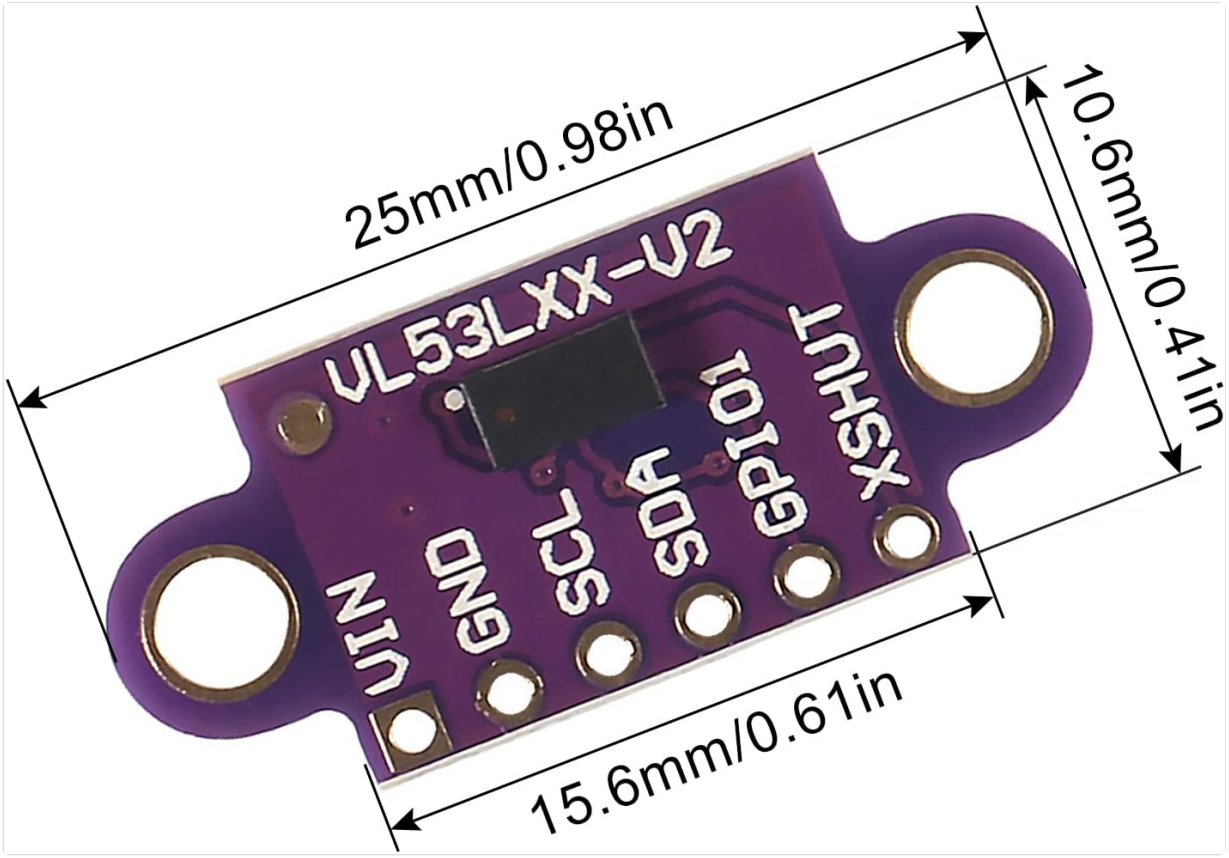
This image displays the top side of the AITRIP VL53L0X sensor module, clearly showing the labeled pins: VIN, GND, SCL, SDA, GPIO1, and XSHUT. The VL53LXX-V2 marking is also visible.



An angled perspective of the VL53L0X module, demonstrating its compact size and the included male header pins, ready for soldering or breadboard integration.

3. Specifications

Feature	Specification
Model Name	VL53L0X
Working Voltage	2.6V - 5.5V (VIN)
Max Sensing Distance	2 meters
Connectivity Technology	I²C (TWI)
Compatible Devices	Arduino boards
Item Weight	0.493 ounces
Package Dimensions	4 x 3 x 0.03 inches



This image provides the physical dimensions of the VL53L0X module, indicating a length of 25mm (0.98in), a width of 10.6mm (0.41in) at the narrowest point, and 15.6mm (0.61in) at the widest point including the mounting holes.

4. Setup

To set up your AITRIP VL53L0X sensor module, follow these steps:

1. **Power Connection:** Connect the VIN pin to your microcontroller's power supply (2.6V to 5.5V). Ensure the GND pin is connected to the common ground of your system.
2. **I²C Communication:** Connect the SCL pin to your microcontroller's I²C clock line and the SDA pin to your microcontroller's I²C data line. The breakout board includes level shifters, so direct connection to 3.3V or 5V I²C lines is possible.
3. **XSHUT Pin:** The XSHUT pin is pulled high to VDD by default, enabling the sensor. If you need to put the sensor into hardware standby, drive this pin low. This pin is not level-shifted, so ensure the voltage applied is compatible with the sensor's 2.8V logic.
4. **Software Library:** For Arduino compatibility, install a suitable VL53L0X library (e.g., Adafruit VL53L0X library) in your Arduino IDE. This library will handle the I²C communication and sensor configuration.
5. **Mounting:** Secure the module in your project, ensuring the sensor's optical path is clear and unobstructed for accurate measurements.

5. Operating Instructions

Once the module is set up, you can begin taking ranging measurements:

1. **Initialization:** Use the chosen software library to initialize the VL53L0X sensor. This typically involves calling an initialization function that configures the sensor's internal registers via I²C.
2. **Ranging Measurements:** The library will provide functions to request distance measurements. The sensor performs Time-of-Flight calculations and returns the distance data through the I²C interface.

3. **Configuration:** The I²C interface is also used to configure various sensor settings, such as measurement timing, accuracy modes, and interrupt thresholds. Refer to the specific library documentation for available configuration options.
4. **Interrupt Output:** The sensor provides an interrupt output pin (GPIO1) which can be configured to signal when a measurement is ready or when a certain distance threshold is crossed. This can be useful for event-driven applications.

6. Maintenance

The AITRIP VL53L0X sensor module is a robust electronic component. To ensure its longevity and optimal performance:

- Keep the sensor's optical lens clean and free from dust or obstructions. Use a soft, dry cloth if cleaning is necessary.
- Avoid exposing the module to extreme temperatures, humidity, or corrosive environments.
- Handle the module with care to prevent physical damage to the board or components.
- Ensure proper power supply within the specified voltage range to prevent damage.

7. Troubleshooting

If you encounter issues with your VL53L0X module, consider the following troubleshooting steps:

- **No I²C Communication:**
  - Verify all power (VIN, GND) and I²C (SCL, SDA) connections are correct and secure.
  - Check if the I²C address is correctly detected by your microcontroller.
  - Ensure the XSHUT pin is not being held low, which would put the sensor in standby.
- **Inaccurate Readings:**
  - Ensure the sensor's optical path is clear and there are no obstructions.
  - Check for strong ambient light sources that might interfere with the laser.
  - Verify the target surface is suitable for laser ranging (e.g., not highly reflective or transparent).
  - Confirm the software library is correctly configured for your application and environment.
- **Module Not Powering On:**
  - Double-check VIN and GND connections and ensure the power supply is providing the correct voltage.

For more detailed troubleshooting and community support, refer to online forums for Arduino and VL53L0X users.

8. Package Contents

Each package typically includes:

- VL53L0X Time-of-Flight Flight Distance Measurement Sensor Breakout Module
- Male Header Pins (for soldering)

9. Warranty and Support

AITRIP products are designed for reliability and performance. For any technical assistance or inquiries regarding your VL53L0X sensor module, please contact the manufacturer or refer to the official product support channels. Keep your purchase receipt for warranty claims, if applicable.