

## Qwiic ToF Imager - VL53L5CX Hookup Guide

## Introduction

The Qwiic ToF Imager - VL53L5CX is here! This little breakout board is built around ST Electronics' VL53L5CX; a state of the art, Time-of-Flight (ToF), multizone ranging sensor enhancing the ST FlightSense product family. This chip integrates a SPAD array, physical infrared filters, and diffractive optical elements (DOE) to achieve the best ranging performance in various ambient lighting conditions with a range of cover glass materials.

Multizone distance measurements are possible up to 8x8 zones with a wide 63° diagonal FoV which can be reduced by software. Thanks to ST Histogram patented algorithms, the VL53L5CX is able to detect different objects within the FoV. The Histogram also provides immunity to cover glass crosstalk beyond 60 cm.

Ideal for 3D room mapping, obstacle detection for robotics, gesture recognition, IoT, laser-assisted autofocus, and AR/VR enhancement, the Qwiic connector on this sensor makes integration easy.



SparkFun Qwiic ToF Imager - VL53L5CX SEN-18642

Product Showcase: SparkFun Time of Flight Sensor





#### **Required Materials**

To follow along with this tutorial, you will need the following materials. You may not need everything though depending on what you have. Add it to your cart, read through the guide, and adjust the cart as necessary.



#### Suggested Reading

If you aren't familiar with the Qwiic system, we recommend reading here for an overview.



We would also recommend taking a look at the following tutorials if you aren't familiar with them.

Logic Levels Learn the difference between 3.3V and 5V devices and logic levels.

#### I2C

An introduction to I2C, one of the main embedded communications protocols in use today.



How to Work with Jumper Pads and PCB Traces Handling PCB jumper pads and traces is an essential skill. Learn how to cut a PCB trace, add a solder jumper between pads to reroute connections, and repair a trace with the green wire method if a trace is damaged. Hookup Guide for the SparkFun Artemis Thing Plus

Get started with our SparkFun Artemis Thing Plus - our popular Thing Plus footprint with the powerful Artemis module for ultimate functionality.

## Hardware Overview

#### VL53L5CX

The SparkFun Qwiic ToF Imager is a state of the art, 64 pixel Time-of-Flight (ToF) 4 meter ranging sensor built around the VL53L5CX from ST. To see more details, refer to the datasheet.

▲ Note: This board ships with vacuum tape over the sensor. Please be sure to remove this tape before first use!



Our Qwiic Ecosystem makes sensors pretty much plug and play. There are two Qwiic connectors on either side of the Qwiic Air Velocity Sensor board to provide power and I<sup>2</sup>C connectivity simultaneously.

The 7-bit I<sup>2</sup>C address (most commonly used with Arduino) is 0x29. The unshifted 8-bit I<sup>2</sup>C address of the board is 0x52.



#### Power

Ideally power will be supplied by the Qwiic connector, but if you wish to supply your own power, pins have been broken out along the bottom side of the board labeled 3V3 and GND. The input voltage range should be between **2.7-3.3V**.



#### I<sup>2</sup>C

The I<sup>2</sup>C pins break out the functionality of the Qwiic connectors. Depending on your application, you can connect to these pins via the plated through holes for SDA and SCL.



#### INT and RST

The interrupt pin is the interrupt output and defaults to an open-drain output. A 47 k $\Omega$  pull-up resistor to IOVDD is included.

The reset pin is the  $l^2C$  interface reset pin and is active high. It is pulled to ground with a 47 k $\Omega$  resistor.



### LP, VDDIO, & VDDA

LP is a *low power* enable pin. Drive this pin to logic 0 to disable the  $I^2C$  comms to reduce power consumption. Drive this pin to logic 1 to enable  $I^2C$  comms. This pin is typically only needed when you need to change the I2C address in multidevice systems. A 47 k $\Omega$  pull-up resistor to IOVDD is included so it can be left unconnected.

VDDIO/VDDA: These pins are used as an alternate power supply. By default, VDDIO and VDDA are tied together but by opening the PSU jumper they can be isolated. A user must then provide separate VDDIO and VDDA supplies. This is most applicable for users who want to use IO voltages (1.8, 2.8, or 3.3V) separate from AVDD voltages (2.8 or 3.3V) for maximum power reduction.



Jumpers

PSU

By default, VDDIO and VDDA are tied together. Cutting the **PSU** jumper will isolate the power rails. A user must then provide separate VDDIO and VDDA supplies. This is most applicable for users who want to use IO voltages (1.8, 2.8, or 3.3V) separate from AVDD voltages (2.8 or 3.3V) for maximum power reduction.



#### INT

Cut the **INT** jumper to remove the 47 k $\Omega$  pull-up resistor from the INT pin.



#### I<sup>2</sup>C

The SparkFun Qwiic ToF Imager Sensor has two 2.2 k $\Omega$  pull-up resistors attached to the I<sup>2</sup>C bus by default. If multiple sensors are connected to the bus with the pull-up resistors enabled the parallel equivalent resistance may create too strong of a pull-up for the bus to operate correctly. As a general rule of thumb, disable all but one pair of pull-up resistors if multiple devices are connected to the bus. If you need to disconnect the pull-up resistors they can be removed by cutting the traces on the corresponding jumper highlighted below.



#### LED

If minimal power consumption is a concern, or you just don't want that Power LED on the front of the board to light up, go ahead and cut this jumper.



#### **Board Outline**

This sensor measures 1" x 1".



Click the image for a closer view

## Hardware Hookup

▲ A note on choosing a board: The VL53L5CX is unique in that it requires its firmware to be loaded at power-on over the I2C bus. Because this firmware is ~90k bytes, we recommend a microcontroller with enough flash to store VL53L5CX's firmware as well as your program code. Sorry, Uno's are out. But didn't you want an excuse to try out something new? We recommend choosing either an Artemis Thing Plus or an ESP32 Thing Plus board as your development board.

Using the Qwiic system, assembling the hardware is simple. All you need to do is connect your VL53L5CX Imager Breakout to your chosen development board with a Qwiic cable or adapter cable. If Qwiic is not your thing, or if your dev board doesn't have one built in you can always solder directly to the I<sup>2</sup>C pins. If you are not using a Qwiic-enabled board, make sure your input voltage and logic are either running at **3.3V** or you are shifting the logic level from whatever logic your controller runs at to **3.3V**.



Click the image for a closer view

A Before Use: Make sure to remove the vacuum tape from the VL53L5CX sensor before first use!

## Software Setup and Programming

**Note:** Make sure you are using the latest stable version of the Arduino IDE on your desktop. If this is your first time using Arduino IDE, library, or board add-on, please review the following tutorials.

- Installing the Arduino IDE
- Installing an Arduino Library
- Installing Board Definitions in the Arduino IDE

We've written a simple Arduino library to quickly get started reading data from the Qwiic ToF Imager. Install the library through the Arduino Library Manager tool by searching for **"SparkFun VL53L5CX"**. Users who prefer to manually install it can get the library from the GitHub Repository or download the ZIP by clicking the button below:

#### SPARKFUN QWIIC TIME-OF-FLIGHT SENSOR VL53L5CX ARDUINO LIBRARY (ZIP)

## Example1\_DistanceArray

Hook up your ToF imager to your Artemis Thing Plus via the Qwiic cables, and click "File > Examples > SparkFun VL53L5CX Arduino Library > Example1\_DistanceArray".



We'll assume that you have selected the board (in this case the **SparkFun Artemis Thing Plus**) and the correct COM port at this point. If you have the code open, hit the upload button. Otherwise, copy and paste the following into the Arduino IDE, make sure to select the correct board and COM port, and then upload:

```
/*
  Read an 8x8 array of distances from the VL53L5CX
  By: Nathan Seidle
  SparkFun Electronics
  Date: October 26, 2021
  License: MIT. See license file for more information but you can
  basically do whatever you want with this code.
  This example shows how to read all 64 distance readings at once.
  Feel like supporting our work? Buy a board from SparkFun!
  https://www.sparkfun.com/products/18642
*/
#include <Wire.h>
#include <SparkFun_VL53L5CX_Library.h> //http://librarymanager/All#SparkFun_VL53L5CX
SparkFun VL53L5CX myImager;
VL53L5CX_ResultsData measurementData; // Result data class structure, 1356 byes of RAM
int imageResolution = 0; //Used to pretty print output
int imageWidth = 0; //Used to pretty print output
void setup()
{
  Serial.begin(115200);
  delay(1000);
  Serial.println("SparkFun VL53L5CX Imager Example");
 Wire.begin(); //This resets to 100kHz I2C
  Serial.println("Initializing sensor board. This can take up to 10s. Please wait.");
  if (myImager.begin() == false)
  {
    Serial.println(F("Sensor not found - check your wiring. Freezing"));
    while (1);
  }
  myImager.setResolution(8*8); //Enable all 64 pads
  imageResolution = myImager.getResolution(); //Query sensor for current resolution - either 4x4
or 8x8
  imageWidth = sqrt(imageResolution); //Calculate printing width
  myImager.startRanging();
}
void loop()
{
  //Poll sensor for new data
  if (myImager.isDataReady() == true)
```

```
{
    if (myImager.getRangingData(&measurementData)) //Read distance data into array
    {
      //The ST library returns the data transposed from zone mapping shown in datasheet
      //Pretty-print data with increasing y, decreasing x to reflect reality
      for (int y = 0 ; y <= imageWidth * (imageWidth - 1) ; y += imageWidth)</pre>
      {
        for (int x = imageWidth - 1 ; x \ge 0 ; x - -)
        {
          Serial.print("\t");
          Serial.print(measurementData.distance_mm[x + y]);
        }
        Serial.println();
      }
      Serial.println();
    }
  }
  delay(5); //Small delay between polling
}
```

Open up your Serial Monitor, make sure the baud rate is set appropriately, and you should see something like the following:

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xa 10:54:57.98	9 ->	SparkFun VL53	L5CX Imag	er Examp	le					
10:54:57.98	9 ->	Initializing	sensor bo	ard. Thi	s can ta	ke up to	10s. Pl	ease wai	t.	
10:55:07.99	1 ->	2013	2030	2027	1998	1993	2042	1500	1319	
10:55:07.99	1 ->	2063	2029	2012	2009	2001	2012	1959	1575	
10:55:07.99	1 ->	2036	2010	1994	1990	2010	1990	2007	2007	
10:55:07.99	1 ->	2061	2037	1987	2009	1994	1998	1992	1981	
10:55:07.99	1 ->	2104	2019	1993	2005	2000	2011	1998	1985	
10:55:07.99	1 ->	2077	2001	2024	1991	2000	1989	1982	1977	
10:55:07.99	1 ->	472	2000	2021	2004	1993	1988	1959	1960	
10:55:07.99	1 ->	378	1978	1979	1992	2008	1994	1990	1964	
10:55:07.99	1 ->									
a 10:55:08.89	2 ->	2013	2032	2014	2031	1952	1779	1437	1280	
10:55:08.89	2 ->	88	2012	1996	2001	2006	1999	1971	1846	
10:55:08.89	2 ->	2031	2012	2008	2009	2016	2014	1998	1997	
10:55:08.89	2 ->	84	1986	2009	2022	2009	2011	1996	1994	
10:55:08.94	0 ->	2054	2017	1985	2017	2006	1995	1998	2014	
10:55:08.94	0 ->	2045	2010	1991	1995	2021	1968	1983	1978	
10:55:08.94	0 ->	2042	1985	1987	1999	1986	1999	1982	1978	
10:55:08.94	0 ->	2039	2011	1977	1978	1994	1972	2001	2015	
10:55:08.94	0 ->									
10:55:09.89	2 ->	20	15	2120	1868	0	7	1875	1169	
10:55:09.89	2 ->	19	1982	1	2071	2050	1899	2132	1962	
10:55:09.89	2 ->	16	4	0	0	2022	1825	2171	2125	
10:55:09.89	2 ->	18	1964	0	0	2081	1833	6	16	
10:55:09.89	2 ->	14	5	1908	0	2189	2037	1932	2099	
10:55:09.89	2 ->	16	2032	1952	1926	2005	1896	1904	7	
10:55:09.89	2 ->	2019	9	1965	0	2149	1955	1836	1883	
10:55:09.89	2 ->	20	2130	1785	2055	1929	0	0	2145	
10:55:09.93	9 ->									
10:55:10.88	6 ->	18	18	17	17	15	13	13	13	
10:55:10.88	6 ->	21	18	18	12	17	12	12	12	
10:55:10.88	6 ->	20	18	13	12	12	11	11	13	
10:55:10.88	6 ->	22	18	16	14	13	9	10	10	
10:55:10.88	6 ->	22	20	14	14	15	11	10	13	
10.55.10 00										

Click the image for a closer view

## Example2\_FastStartup

Hook up your ToF imager to your Artemis Thing Plus via the Qwiic cables, and click "File > Examples > SparkFun VL53L5CX Arduino Library > Example2\_FastStartup".



We'll assume that you have selected the board (in this case the **SparkFun Artemis Thing Plus**) and the correct COM port at this point. If you have the code open, hit the upload button. Otherwise, copy and paste the following into the Arduino IDE, make sure to select the correct board and COM port, and then upload:

```
/*
  Read an 8x8 array of distances from the VL53L5CX
  By: Nathan Seidle
  SparkFun Electronics
  Date: October 26, 2021
  License: MIT. See license file for more information but you can
  basically do whatever you want with this code.
  This example shows how to setup the I2C bus to minimize the amount
  of time taken to init the sensor.
 At each power on reset, a staggering 86,000 bytes of firmware have to be sent to the sensor.
  At 100kHz, this can take ~9.4s. By increasing the clock speed, we can cut this time down to ~
1.4s.
  Two parameters can be tweaked:
   Clock speed: The VL53L5CX has a max bus speed of 400kHz but we have had success up to 1MHz.
   Max transfer size: The majority of Arduino platforms default to 32 bytes. If you are using o
ne
    with a larger buffer (ESP32 is 128 bytes for example), this can help decrease transfer times
a bit.
  Measurements:
    Default 100kHz clock and 32 byte transfer: 9.4s
    400kHz, 32 byte transfer: 2.8s
    400kHz, 128 byte transfer: 2.5s
    1MHz, 32 byte transfer: 1.65s
    1MHz, 128 byte transfer: 1.4s
 Feel like supporting our work? Buy a board from SparkFun!
  https://www.sparkfun.com/products/18642
*/
#include <Wire.h>
#include <SparkFun VL53L5CX Library.h> //http://librarymanager/All#SparkFun VL53L5CX
SparkFun VL53L5CX myImager;
VL53L5CX_ResultsData measurementData; // Result data class structure, 1356 byes of RAM
int imageResolution = 0; //Used to pretty print output
int imageWidth = 0; //Used to pretty print output
void setup()
{
  Serial.begin(115200);
  delay(1000);
  Serial.println("SparkFun VL53L5CX Imager Example");
 Wire.begin(); //This resets I2C bus to 100kHz
```

```
Wire.setClock(400000); //Sensor has max I2C freq of 400kHz
  //Wire.setClock(1000000); //Run sensor out of spec
  //myImager.setWireMaxPacketSize(128); //Increase default from 32 bytes to 128 - not supported
 on all platforms
  Serial.println("Initializing sensor board. This can take up to 10s. Please wait.");
  //Time how long it takes to transfer firmware to sensor
  long startTime = millis();
  bool startup = myImager.begin();
  long stopTime = millis();
  if (startup == false)
  {
    Serial.println(F("Sensor not found - check your wiring. Freezing"));
    while (1);
  }
  Serial.print("Firmware transfer time: ");
  float timeTaken = (stopTime - startTime) / 1000.0;
  Serial.print(timeTaken, 3);
  Serial.println("s");
  myImager.setResolution(8*8); //Enable all 64 pads
  imageResolution = myImager.getResolution(); //Query sensor for current resolution - either 4x4
or 8x8
  imageWidth = sqrt(imageResolution); //Calculate printing width
  myImager.startRanging();
}
void loop()
{
  //Poll sensor for new data
  if (myImager.isDataReady() == true)
  {
    if (myImager.getRangingData(&measurementData)) //Read distance data into array
    {
      //The ST library returns the data transposed from zone mapping shown in datasheet
      //Pretty-print data with increasing y, decreasing x to reflect reality
      for (int y = 0 ; y <= imageWidth * (imageWidth - 1) ; y += imageWidth)</pre>
      {
        for (int x = imageWidth - 1; x \ge 0; x \ge -)
        {
          Serial.print("\t");
          Serial.print(measurementData.distance mm[x + y]);
        }
        Serial.println();
      }
      Serial.println();
    }
  }
```

Open up your Serial Monitor, make sure the baud rate is set appropriately, and you should see something like the following:

Example2_FastStartup		(								
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	10.52.43.503	2001	2033	2013	2000	2001	2012	1000	1301	
	10:52:43.503 -5	2040	1004	2025	1993	2010	2013	2012	1004	
	10.52.43.503	2030	2026	2003	1000	2013	2009	1004	2016	
	10:52:43:503	2103	2060	2002	2014	2012	2017	2006	1000	
	10:52:43.503 ->	2019	1004	1999	1997	2013	2011	1970	1990	
	10:52:43.503	2015	1991	2010	1999	1070	1077	1967	2019	
	10-52-43 503 ->	353	397	1973	1969	1970	1990	1995	2010	
	10:52:43 503 ->		337	1010	1000	1010	1000	1000	2022	
New Among and all and a	10-52-44 393 ->	2047	2061	2019	2026	1990	1701	1444	1336	
	10:52:44 393 ->	2055	2008	2018	2003	1999	1999	1950	0	
	10:52:44.393 -3	2050	1990	2002	1995	2008	1985	2017	1998	
	10:52:44.393 ->	2098	2038	2009	1988	2016	2025	1988	1989	
	10:52:44.440 -3	2041	2023	2009	2013	1981	1985	1992	1978	
	10:52:44.440 ->	2074	2025	1986	1992	2007	1979	1988	1979	
	10:52:44.440 ->	, 392	1984	1983	2005	1975	1997	2001	1969	
	10:52:44.440 ->	372	396	1984	1986	1990	1973	1988	1968	
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Click the image for a closer view

## Example3\_SetFrequency

Hook up your ToF imager to your Artemis Thing Plus via the Qwiic cables, and click "File > Examples > SparkFun VL53L5CX Arduino Library > Example3\_SetFrequency".

sketch_nov01	la   Arduino 1.8.1	16 (Windows Store 1.8.51.0)	
New Open Open Recen Sketchbook	Ctrl+N Ctrl+O it >		
Examples Close Save Save As	Ctrl+W Ctrl+S Ctrl+Shift+S	Examples for SparkFun RedBoard LilyPadProtoSnapPlus > Qduino >	
Page Setup Print	Ctrl+Shift+P Ctrl+P	Examples for Arduino AVR Boards EEPROM > SoftwareSerial >	
Preferences	Ctrl+Comma Ctrl+Q	SPI >	
		Examples from Custom Libraries SparkFun MCP9600 Thermocouple SparkFun MMA8452Q Acceleromet SparkFun Qwiic Alphanumeric Diså SparkFun Qwiic Alphanumeric Diså SparkFun Qwiic Alphanumeric Diså SparkFun TMP102 Breakout SparkFun TMP102 Breakout SparkFun TV53LIX 4m Laser Distan SparkFun VL53LIX 4m Laser Distan SparkFun HyperDisplay ILI9163C Ark SparkFun HyperDisplay ILI9163C Ark SparkFun HyperDisplay ILI9341 _> SparkFun HyperDisplay ILI9341 _> SparkFun HyperDisplay ILI9341 _> SparkFun HyperDisplay ILI9341 _>	Example 1_DistanceArray Example2_FastStartup Example3_SetFrequency Example4_MaxOutput Example6_AdvancedI2C Example6_AdvancedSettings Example7_Interrupts Example8_SetAddress Example9_TwoSensors

We'll assume that you have selected the board (in this case the **SparkFun Artemis Thing Plus**) and the correct COM port at this point. If you have the code open, hit the upload button. Otherwise, copy and paste the following into the Arduino IDE, make sure to select the correct board and COM port, and then upload:

}

```
/*
  Read an 8x8 array of distances from the VL53L5CX
  By: Nathan Seidle
  SparkFun Electronics
  Date: October 26, 2021
  License: MIT. See license file for more information but you can
  basically do whatever you want with this code.
  This example shows how to increase output frequency.
  Default is 1Hz.
  Using 4x4, min frequency is 1Hz and max is 60Hz
  Using 8x8, min frequency is 1Hz and max is 15Hz
  Feel like supporting our work? Buy a board from SparkFun!
  https://www.sparkfun.com/products/18642
*/
#include <Wire.h>
#include <SparkFun VL53L5CX Library.h> //http://librarymanager/All#SparkFun VL53L5CX
SparkFun VL53L5CX myImager;
VL53L5CX_ResultsData measurementData; // Result data class structure, 1356 byes of RAM
int imageResolution = 0; //Used to pretty print output
int imageWidth = 0; //Used to pretty print output
void setup()
{
  Serial.begin(115200);
  delay(1000);
  Serial.println("SparkFun VL53L5CX Imager Example");
 Wire.begin(); //This resets I2C bus to 100kHz
 Wire.setClock(400000); //Sensor has max I2C freq of 400kHz
  Serial.println("Initializing sensor board. This can take up to 10s. Please wait.");
  if (myImager.begin() == false)
  {
    Serial.println(F("Sensor not found - check your wiring. Freezing"));
    while (1);
  }
  myImager.setResolution(8 * 8); //Enable all 64 pads
  imageResolution = myImager.getResolution(); //Query sensor for current resolution - either 4x4
or 8x8
  imageWidth = sqrt(imageResolution); //Calculate printing width
  //Using 4x4, min frequency is 1Hz and max is 60Hz
  //Using 8x8, min frequency is 1Hz and max is 15Hz
```

```
bool response = myImager.setRangingFrequency(15);
  if (response == true)
  {
    int frequency = myImager.getRangingFrequency();
    if (frequency > 0)
    {
      Serial.print("Ranging frequency set to ");
      Serial.print(frequency);
      Serial.println(" Hz.");
    }
    else
      Serial.println(F("Error recovering ranging frequency."));
  }
  else
  {
    Serial.println(F("Cannot set ranging frequency requested. Freezing..."));
    while (1);
  }
  myImager.startRanging();
}
void loop()
{
  //Poll sensor for new data
  if (myImager.isDataReady() == true)
  {
    if (myImager.getRangingData(&measurementData)) //Read distance data into array
    {
      //The ST library returns the data transposed from zone mapping shown in datasheet
      //Pretty-print data with increasing y, decreasing x to reflect reality
      for (int y = 0 ; y <= imageWidth * (imageWidth - 1) ; y += imageWidth)</pre>
      {
        for (int x = imageWidth - 1 ; x \ge 0 ; x - -)
        {
          Serial.print("\t");
          Serial.print(measurementData.distance_mm[x + y]);
        }
        Serial.println();
      }
      Serial.println();
    }
  }
  delay(5); //Small delay between polling
}
```

Open up your Serial Monitor, make sure the baud rate is set appropriately, and you should see something like the following:

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nclude											Sen
nclude	11:07:53.432	->	SparkFun VL53	L5CX Ima	ter Examp	1e					
neruue	11:07:53.432	->	Initializing	sensor b	oard. Thi	s can ta	ke up to	10s. Pl	ease vai	t.	
arkFur	11:07:56.401	->	2054	1983	2030	1933	1909	1934	1948	1937	
531.503	11:07:56.401	->	2076	2034	1976	1970	1945	1953	1944	1922	
June	11:07:56.448	-5	2008	1994	1985	1988	1987	1984	1952	1944	
imag	11:07:56.448	->	1993	1983	2021	2016	1996	1987	1993	1991	
imag	11:07:56.448	->	2040	2036	1997	2028	2018	2019	2002	1988	
- Imag	11:07:56.448	-Ś	2064	2070	2023	2074	2060	2045	2052	2051	
d sot	11:07:56.448	-5	2128	2065	2066	2044	2075	2065	2045	2055	
u	11:07:56.448	->	2198	2133	2116	2133	2100	2083	2017	1911	
lori al	11:07:56.448	->									
olavi	11:07:57.344	-5	21	2103	2126	1895	5	8	11	17	
lerial	11:07:57.344	->	1973	15	1809	6	1817	11	1872	10	
eria	11:07:57.344	-5	2196	2178	1905	3	1851	1867	1891	1815	
lire b	11:07:57.344	-5	2145	1959	2101	1924	1974	1789	2	1987	
line e	11:07:57 391	-5	17	2041	2043	2084	1960	2132	1937	1933	
irre.s	11:07:57.391	-5	2179	1994	2091	2166	1917	13	2126	2170	
lori al	11:07:57.391	-5	2308	9	1994	1892	2098	11	2047	23	
eria.	11:07:57 391	1	2056	16	2210	2016	1976	2101	2133	1711	
r (m)	11:07:57 391	5	2000	**		2010	1010		2100		
Part	11:07:58.336	-5	21	2103	2126	1895	5	8	11	17	
ub i i	11:07:58.336	-5	1973	15	1809	6	1817	11	1872	10	
wnii	11:07:58 336	1	2196	2178	1905	3	1951	1867	1891	1815	
	11:07:58.336	5	2145	1959	2101	1924	1974	1789	2	1987	
	11:07:59 336		17	2041	2042	2094	1960	2122	1927	1933	
ay i mag	11.07.59 336	1	2179	1994	2093	2166	1917	13	2126	2170	
	11:07:50.336	1	2279	1994	1004	1002	2000	11	2047	22	
mager	11.07.50.336		2306	16	2210	2016	1076	2101	2122	1711	
magew	11.07.50.336	2	2036	±0	2210	2010	19/10	2101	2133	1/11	
	11:07:58.336	~~	2020	2026	1077	1044	1011	1002	1020	17	
/Usin	11.07:59.324	->	2020	2036	1077	1944	1911	1902	1920	1017	
/Usir	11:07:59.324	->	2029	1992	1911	1366	1328	1933	1924	1917	

Click the image for a closer view

## Visualizing the Output

To 'see' the output, *Example4\_MaxOutput* can be used with the SparkFun Processing visualization app.

Hook up your ToF imager to your Artemis Thing Plus via the Qwiic cables, and click "File > Examples > SparkFun VL53L5CX Arduino Library > Example4\_MaxOutput".



Load this sketch onto your platform and open the serial monitor. You should see the distance array output in CSV format.

Next, download the Processing sketch here and unzip it into a directory you can locate. If you don't have it installed, download and unzip Processing into a directory of your choice. Open the *SparkFun VL53L5CX 3D Depth Map* sketch and modify the following line to match your COM port:



#### Modify this line to connect Processing to the sensor

Once connected you should see output like this:



Visualizing the distances

Our apologies if you suddenly realize an hour has gone by and you've done nothing but wave your hand in front of the sensor and looked at things like coffee cups from a meter away. It's really a lot of fun. Enjoy!

## Troubleshooting

#### • Need help?

If your product is not working as you expected or you need technical assistance or information, head on over to the SparkFun Technical Assistance page for some initial troubleshooting.

If you don't find what you need there, the SparkFun Forums are a great place to find and ask for help. If this is your first visit, you'll need to create a Forum Account to search product forums and post questions.

## Resources and Going Further

Now that you've successfully got your Qwiic ToF sensor up and running, it's time to incorporate it into your own project!

For more information, check out the resources below:

- Schematic
- Eagle Files
- Datasheet
- Board Dimensions
- GitHub
- Library GitHub

Need some inspiration for your next project? Check out some of these related tutorials:

Displaying Your Coordinates with a GPS Module This Arduino tutorial will teach you how to pinpoint and display your GPS coordinates with a press of a button using hardware from our Qwiic Connect System (I2C). SparkFun Humidity Sensor Breakout - SHTC3 (Qwiic) Hookup Guide A Hookup Guide to get started using the SHTC3 breakout.



MicroMod All The Pins (ATP) Carrier Board Access All The Pins (ATP) of the MicroMod Processor Board with the Carrier Board!

# MicroMod RP2040 Processor Board Hookup Guide

This tutorial covers the basic functionality of the MicroMod RP2040 Processor Board and highlights the features of the dual-core ARM Cortex-M0+ processors development board. Get started with the first microcontroller from the Raspberry Pi Foundation!