pmd

IMAGINE YOU CAN

pmd 3D Sensing Family

Getting Started Guide flexx2

Complies with FDA performance standards for laser products except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019

Compliant product labeling not affixed to the product due to size restrictions. Compliant labeling is provided here within the user information

- No scheduled maintenance is necessary to keep the product in compliance.
- No service is allowed by the user. Unit is to be serviced or repaired only by factory authorized technicians. Please contact pmd directly if you require servicing.
- The product and embedded laser is never to be operated if the unit is defective or the cover or seal is broken or damaged.
- Product is not to be opened. Disassembly of product my result in eye or skin exposure to laser radiation.

Use the device in accordance with its designated use. Installation and connection must comply with applicable national and international standards.

Do not operate the device with a power supply other than a standard USB3.0 power supply.

Caution – use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure

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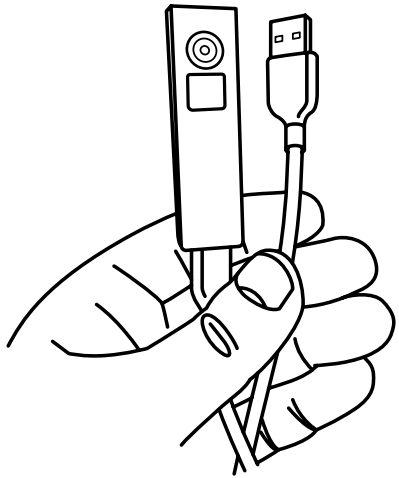
1. flexx2 Overview

- The flexx2 is a 3D imaging, Time-of-Flight (ToF) USB camera that can be used for experimentation, development, or as a component in an end-product
- The flexx2 has a USB3 connection which is plugged into a Windows PC or an embedded Linux development system such as a Raspberry Pi 3
- The flexx2 has 43,200 depth points, and the camera outputs two data streams: the depthmap and the Infrared (IR) image, both of which can be used in 3D imaging algorithms



Although tested on many devices, we cannot guarantee seamless operation with all USB chipsets on the market. Utilize an active USB hub if problems occur with notebook or tablet operation

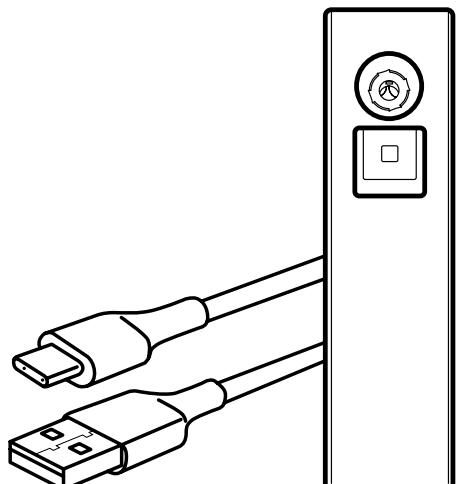
2. flexx2 Specifications

Parameter	flexx2
Dimensions	71.9 x 19.2 x 10.6 mm
Time of Flight (ToF) Sensor	IRS2381C Infineon® REAL3™ 3D Image Sensor IC based on pmd technology
Resolution	224 x 172 Depth Pixels 38k Depth Points
Weight, without USB Cable	13g
Measurement range	0.1 – 4 m
Framerate	Up to 60fps (3D frames); 9 pre-defined operation modes
Power consumption	570mW – 680mW. USB 3.0 compliant
Illumination	940 nm, VCSEL, Laser Class 1
Software	Royale SDK (C/C++ based, supports Matlab, OpenCV, ROS 1/2)
Viewing angle (H x V)	56° x 44°
Interface	USB3.0 (data & power)
Depth resolution	<= 1% of distance, all modes
Sunlight Tolerance	At 100K Lumens (Full Sunlight), Loses ~50% max range vs. Indoors
Operating System	Windows 10, Linux/ARM, macOS* (Apple Silicon)

**Requires Royale 5.9 and newer.*

3. Included with the Product

1. flexx2 USB3 3D Camera
2. One Meter USB3 Cord with USBC at one end for flexx2, the other end USB-B for PC or Embedded Device
3. Getting Started Guide



3.1. Operation Requirements

The camera development kit may be use under the following conditions:

- The flexx2 is intended for indoor use
- Connect this module to a compliant USB 3.0 port only.
- Do not use the flexx2 in hot, cold, dusty or humid environment.
- Keep the flexx2 away from moisture.
- Do not touch the lens with your hand or any sharp objects.
- Use only a clean, dry, soft cloth for cleaning.

4. Installation

Please use the software download at www.pmdtec.com/software to download the software package including full API documentation for Royale, the pmd Software Development Kit (SDK).

The password for the download is: **Sh!2CBpf**

Unpack the ZIP file. You will find several packed files inside that correspond to the supported OS platforms. Choose the file for your OS and unpack it to a location of your choice e.g. your desktop or a folder on your PC.

4.1. Windows 10

- There are installers for installing software and drivers for the flexx2 (libroyale-X.X.-WINDOWS-x86-64Bit.exe and libroyale-X.X.-WINDOWS-x86-32Bit.exe).
- Please follow the instructions of the installation assistant. Choose “Weiter”/ ”Continue” on the first screen, then accept the license agreement on the second screen (“Annehmen”/”Accept”).
- Make sure that the checkboxes for Desktop icon and install of the drivers on the third screen are checked.
- On the fourth screen you may change the installation path.
- After successful installation you may
  - Connect the flexx2 to your PC via USB
  - Open the device manager (on a console or in the Windows search type „mmc devmgmt.msc“ and hit RETURN)
  - The flexx2 should show up in the „PMD Devices“ section. For each connected flexx2 an entry should exist.

4.2. Linux

Please extract the Linux package (will result in a “libroyayle-5.X.-LINUX-x86-64Bit” or “libroyale-3.X.-LINUX-x86-32Bit” folder). Then transfer the complete folder to your computer.

Make sure that you have proper permissions to the USB device. The installation package contains a proper rules file which can be used. It is located in the /driver/udev directory. Make sure to read the README file for more details.

5. API Documentation (Royale Documentation)

The Royale software package provides a light-weight camera framework for time-of-flight (ToF) cameras. While being tailored to pmd cameras, the framework enables partners and customers to evaluate and/or integrate 3D TOF technology on/in their target platform. This reduces time to first demo and time to market.

The full html documentation can be found within the doc subfolder in the installation path (Windows) or in the unpacked folder (Linux, Android, and Mac OS X).

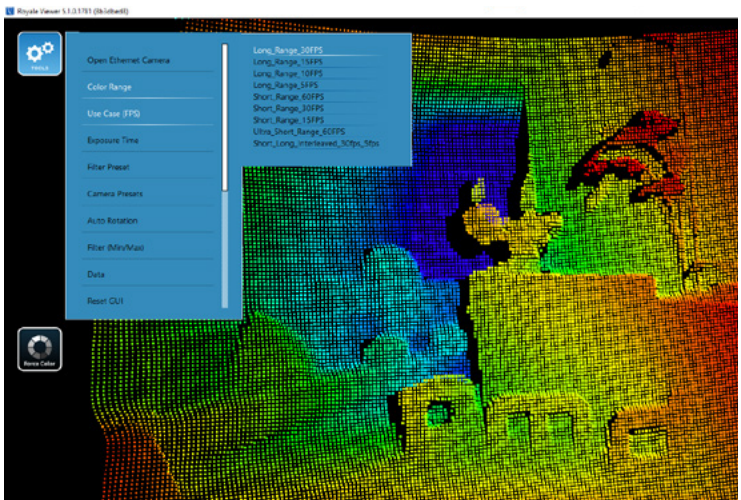
- C:\Program Files\libroyale\4.X.\doc\html\index.html
- libroyale-4.X.-[platform]/doc/html/index.html

6. Royale Viewer

Once the flexx2 is attached to a free USB port, and the drivers are in place, you may start the Royale viewer application which gives you a first indication, if the flexx2 is working on your target system. The Royale viewer displays a 2D and a 3D representation of the captured depth data.

In an application, the user would use the C/C++ compatible Royale API.

Please refer to the separate RoyaleViewer.pdf for an explanation of the functionality.



7. Use Cases - Modes That Change the Range and Framerate

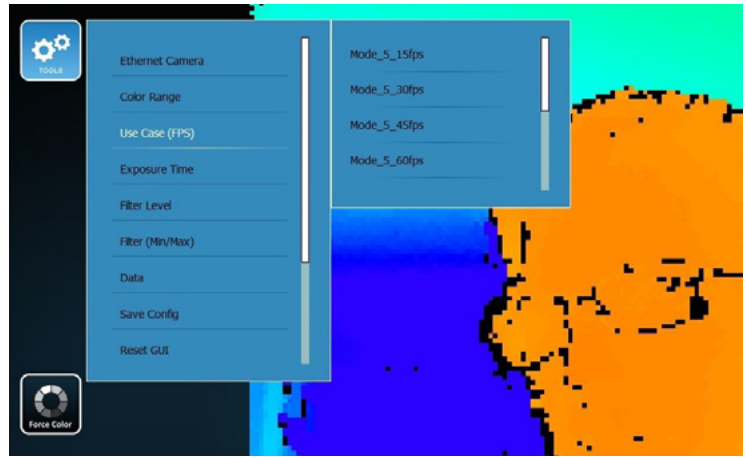
The flexibility of Time-of-Flight is that it is not locked into one distance. Through the use of Use Cases, a user can change the distance and framerate to dial in a mode that is best for their application. On a working system it takes one frame rate to change between modes, allowing a single ToF camera device to change from near range, far range, or in between within a single frame rate.

- The “5” modes (5 sub-frames) are better for short distances, or in the case where processor loading is a concern. The Mode 5 cases use about 30% less processing overhead than the Mode 9 Cases
- The “9” modes (9 sub-frames have longer range and depth quality as they use two modulation frequencies

Frequency Pairs	Mode Name	Exposure Time (uS)	Number of Phases (including dark phase)	FPS	Unambiguous Range*
Use the „5“ modes for faster processing, lower distance					
60Mhz	MODE_5_15FPS Video half	1040	5	15	2,4m
60Mhz	MODE_5_30FPS Video	500	5	30	2,4m
60Mhz	MODE_5_45FPS Video	310	5	45	2,4m
60Mhz	MODE_5_60FPS Very Fast Acquisition	220	5	60	2,4m
Use the „9“ modes for longer distance, better depthmap					
80Mhz-60Mhz	MODE_9_10FPS	760	9	5	7,5m
80Mhz-60Mhz	MODE_9_15FPS	500	9	10	7,5m
80Mhz-60Mhz	MODE_9_20FPS	390	9	15	7,5m
80Mhz-60Mhz	MODE_9_30FPS	220	9	30	7,5m
80Mhz-60Mhz	MODE_9_10FPS Low Noise Extended	1500	9	5	7,5m

* Actual measurement range can vary with ambient light conditions and reflectivity.

To change the camera range in the Royale Viewer, go to Tools->Use Case (FPS), and select one of the modes on the following page.



8. Support

Any issues or problem please send an email to info@pmdtec.com.

We try to answer all emails within one business day.

Technical information subject to change without notice.

This document may also be changed without notice.

September 2023