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NanoUSB3 Evaluation Kit for NanEye



Revision History:

<i>Version</i>	<i>Date</i>	<i>Modifications</i>	<i>Author</i>
1.0.4	27/10/16	Updated NanEye FlexPCB connector mechanical drawing	Fátima Baptista
1.0.5	02/03/17	Updated sections 2 and 3.3	Fátima Baptista

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1 Overview

NanEye 2D is a tiny camera module with a footprint size of 1mm x 1mm and, optionally, adapted miniature optics. The sensor provides a high sensitivity rolling shutter pixel, frame rate up to 60Fps and a 10 bit digital LVDS. The device is mounted on a flat ribbon cable measuring up to 3m in length. Other cable lengths, up to 3m are possible upon request.

The supplied viewer software allows to display the images from the sensor on a screen and also manipulate the sensor registers. It also has the possibility to run up to 4 NanEye's at the same time.

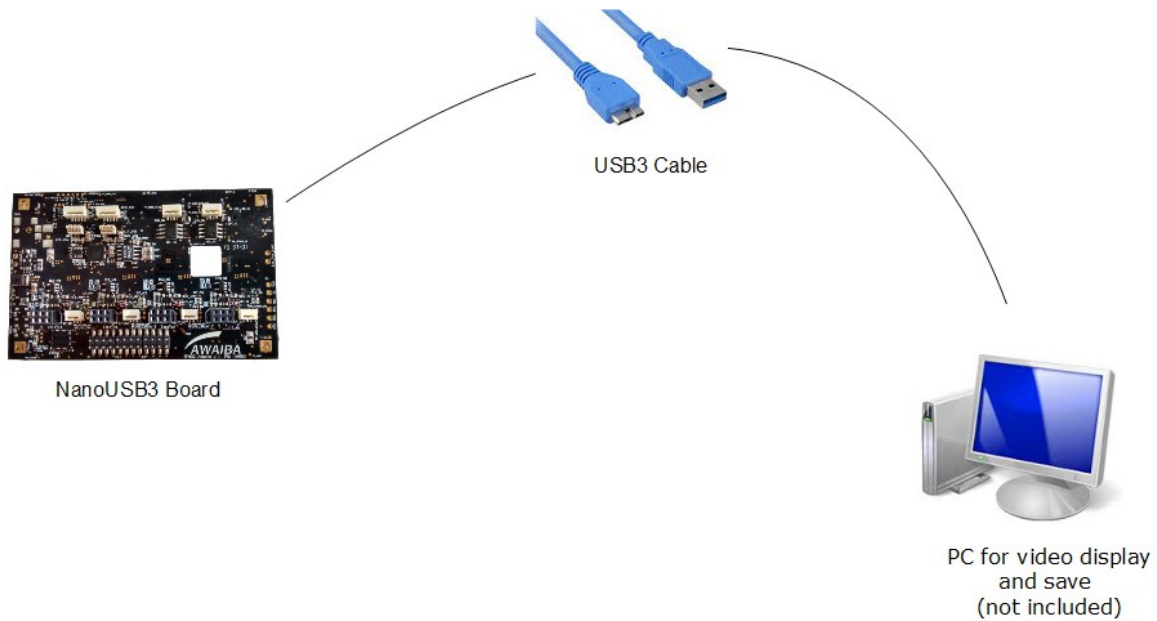


Figure 1: NanEye Evaluation Kit

2 USB3 Evaluation Board

The evaluation kit is composed of two boards, one with the FPGA and USB3 interface and another for the specific NanEye sensor.

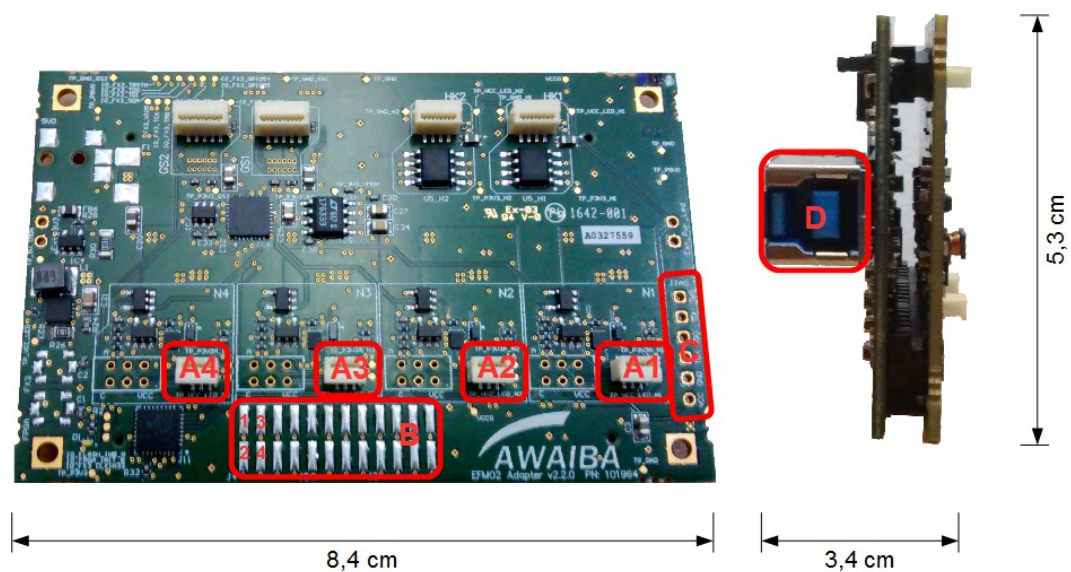


Figure 2: NanEye interface board

Legend

A1 - Connector J1

A3 - Connector J3

A2 - Connector J2

A4 - Connector J4

B - GPIO: 1 - FVAL Sensor 1
2 - FVAL Sensor 2

3 - FVAL Sensor 3
4 - FVAL Sensor 4

C - JTAG Connection

D - USB3 plug

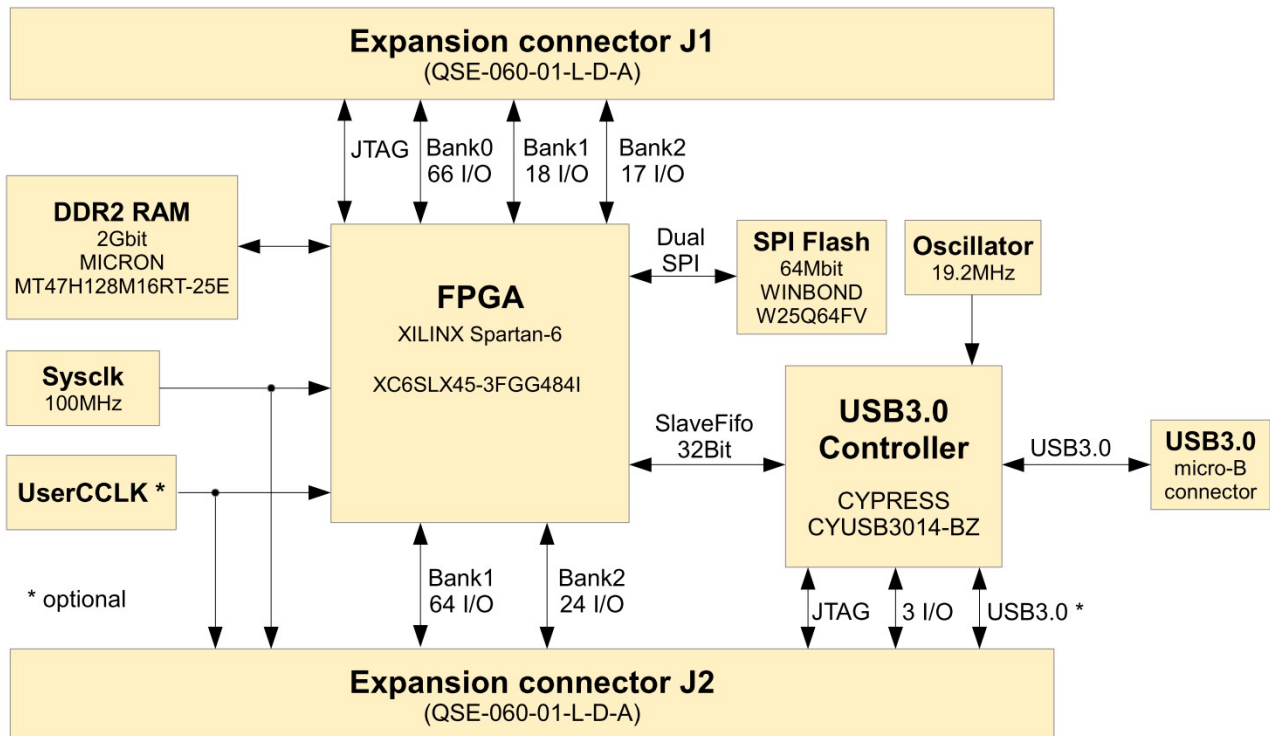


Figure 3: FPGA – USB3 board functional Diagram

The FPGA/USB3 board is an embedded module featuring a XILINX™ SPARTAN-6 FPGA in conjunction with the CYPRESS™ FX3 SuperSpeed USB 3.0 interface controller.

Features:

- USB3.0 SuperSpeed interface through versatile Cypress™ EZ-FX3 controller
- USB bus-powered, no external power supply necessary
- Two FX3 GPIO on expansion connector
- Xilinx™ Spartan-6 FPGA (LX45)
- 2Gbit DDR2 memory
- 64Mbit dual SPI configuration/data memory
- High stability 100MHz +/-25ppm onboard clock oscillator
- 512Kbit I²C EEPROM for FX3 configuration data
- I²C interface available on expansion connector to increase available FX3 configuration memory for standalone applications
- FPGA configuration from SPI memory, JTAG or USB 3
- JTAG for FPGA and FX3 controller available on expansion connectors
- 2 EndPoints enabled for read images and write control registers from FPGA

3 Operating Instructions

3.1 Recommended Equipment

- Oscilloscope
- Desktop PC, Portable
- USB3
- Signal Generator

3.2 Basic operational instructions

When the USB3 board is connected to a PC (as shown in figure 4) it is recognised as **Cypress FX3 USB BootLoader Device**, on Device Manager.

When you install the Awaiba Viewer software the Cypress drivers are installed.

When you run the program (as shown in figure 7, for instance) the firmware is loaded to the RAM and the board is recognised as **Cypress FX3 USB StreamerExample Device**. Also the bit file is programmed in the FPGA.

3.3 Connect NanEye Sensor

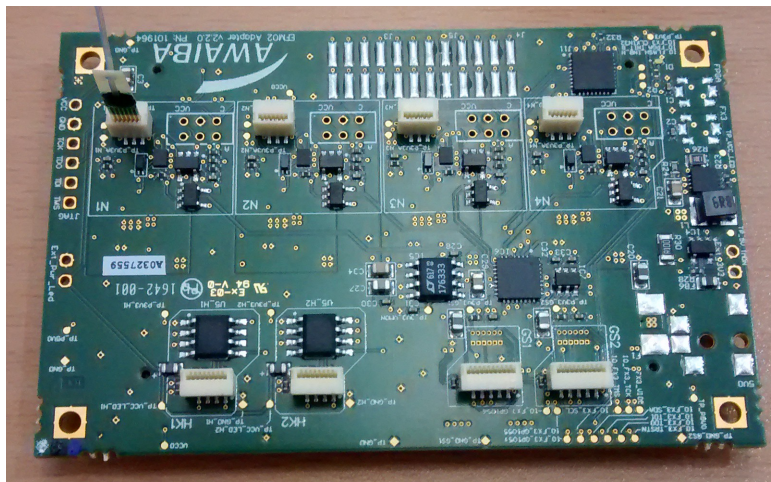


Figure 4: Connecting NanEye on NanoUSB3 Adapter v2.2

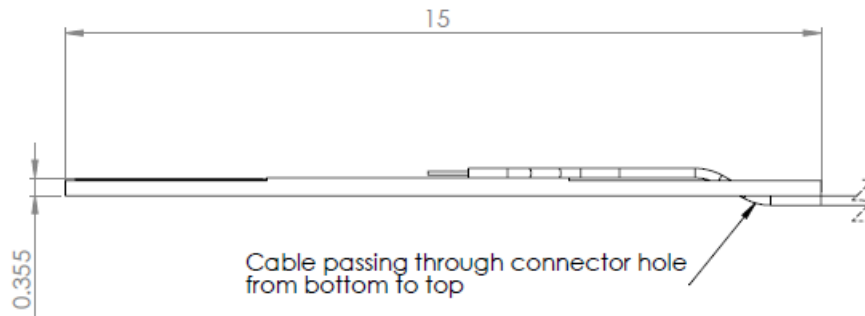


Figure 5: NanEye Flex standard connector. If not otherwise noted all tolerances are +/- 0.1mm.

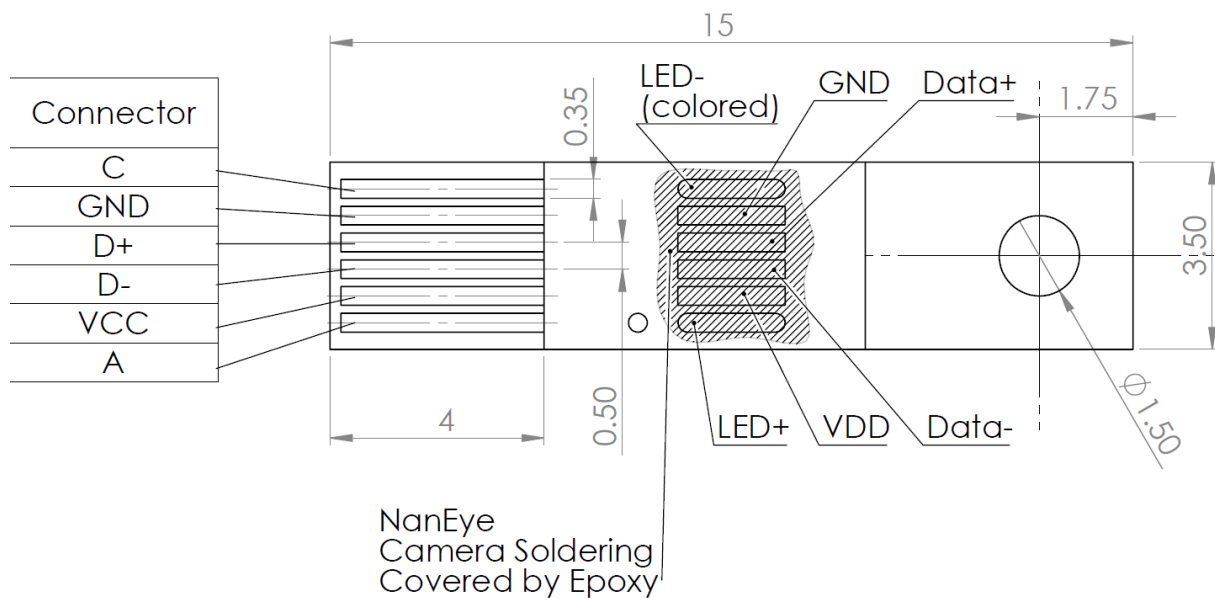


Figure 6: NanEye Flex PCB connector. If not otherwise noted all tolerances are +/- 0.1mm.

4 Evaluation Software

Along with the USB3 board to evaluate NanEye sensors, a windows software is provided to display and store images from the sensor.

The **Viewer Software** has the following features:

- Possibility to save directly to .avi streams of the processed image, or save the raw data in the awvideo format
- Possibility to save snapshots in PNG and in PGM (saving the 10 bit raw data)
- Possibility to display the pixel graphic
- Dynamic Gain, Offset and Exposure switching
- Possibility to acquire black and white gain masks
- Possibility to apply the algorithm automatic exposure control
- Possibility to adjust white balance automatically
- Possibility to control the LED intensity automatically

This software also contains some Image processing algorithms:

- Colour Reconstruction
- Adjust colour saturation
- Gamma Correction (only for colour version)
- Adjust brightness

An **API interface** to the data stream is available for easy integration in existing display systems and evaluation of image processing algorithms.

5 Troubleshooting

5.1 How to Install Awaiba Viewer

Please take a look in *Awaiba Viewer Quick Start* file.

5.2 How to Start Awaiba Viewer

After installing the Awaiba Viewer Software and with the board connected to a PC, you can start the Viewer with the following options, for instance.

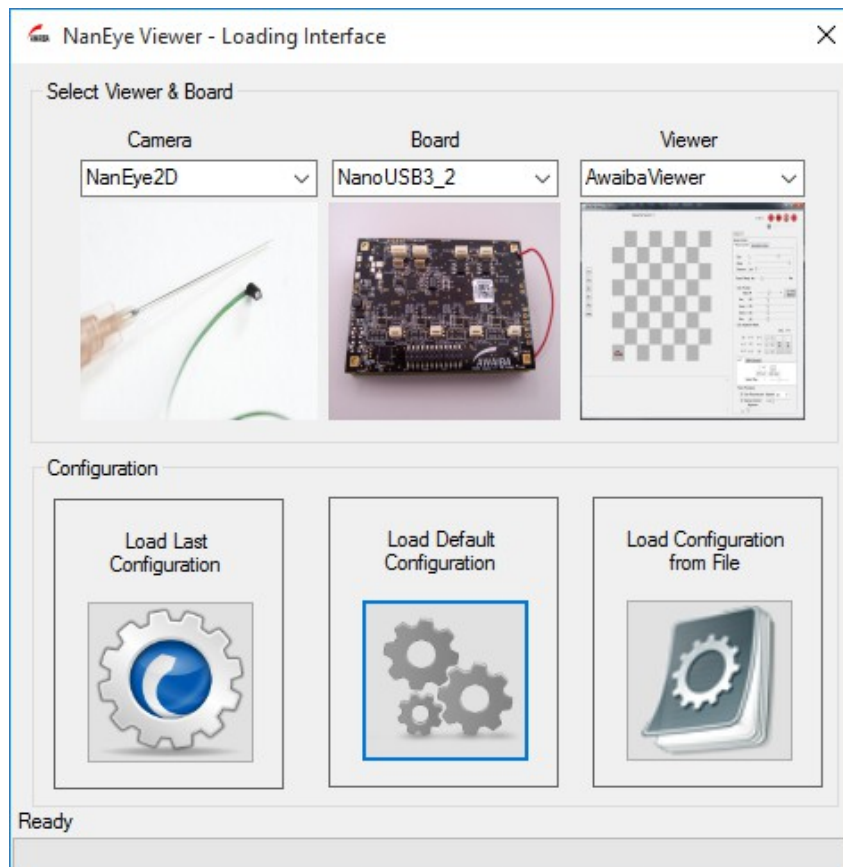


Figure 7: Start the Viewer

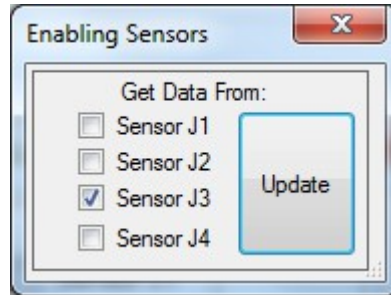


Figure 8: Start the Viewer with the sensor connected on the J3 connector, for instance

5.3 How to Use NanEye Awaiba Viewer

Please take a look in *NanEye in Awaiba Viewer* file.

5.4 How to Debug USB3 board

If you can not receive images, this section can help you to debug the board.

When the viewer is installed, inside the **application/debug/USB3** folder, there are several programs that can be used to debug the user's problem.

First, you should start the Template. Following the instructions on that window you should download the firmware and then program the FPGA. You can find the bit file (for instance, NanEye_efm02 - XC6SLX45 vX.X.X.bin) at **\ProgramData\Awaiba\Awaiba Viewer\Fpga Files\NanEye_USB3**.

When this task is completed you should be able to have the information as in the image 9.

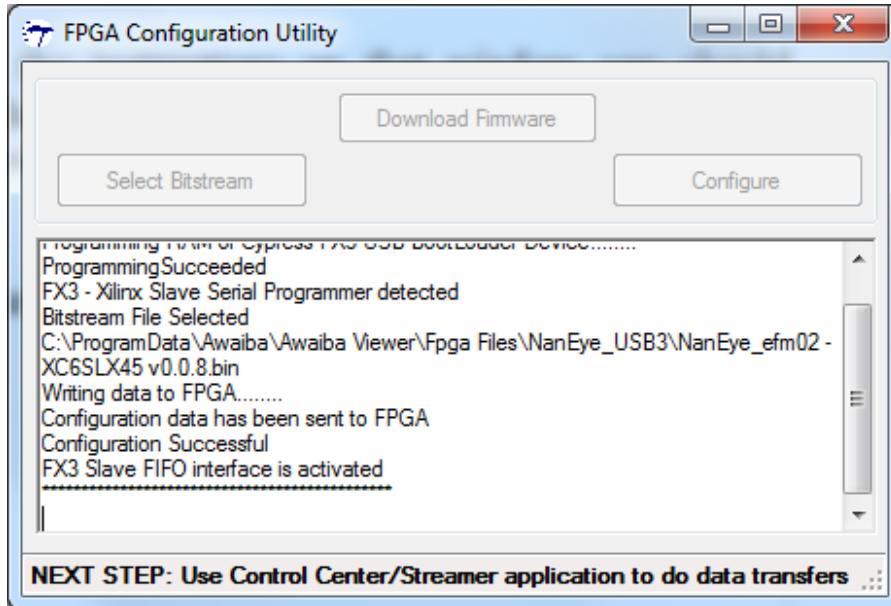


Figure 9: FPGA Configuration for NanEye

After this one LED should turn on, on the USB3 board.

Secondly, start the USB Control Center (CyControl.exe). You should have 2 end points as shown in figure 10.

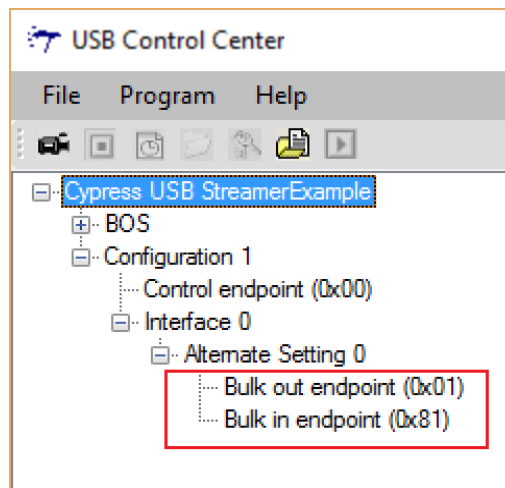


Figure 10: NanEye USB3 Endpoints list

Please start the streamer program with the **Bulk in endpoint (0x81)**, 32 packets per Xfer and 16 Xfers to Queue. Then click start, and you should get data from this end point, as shown in figure 11.

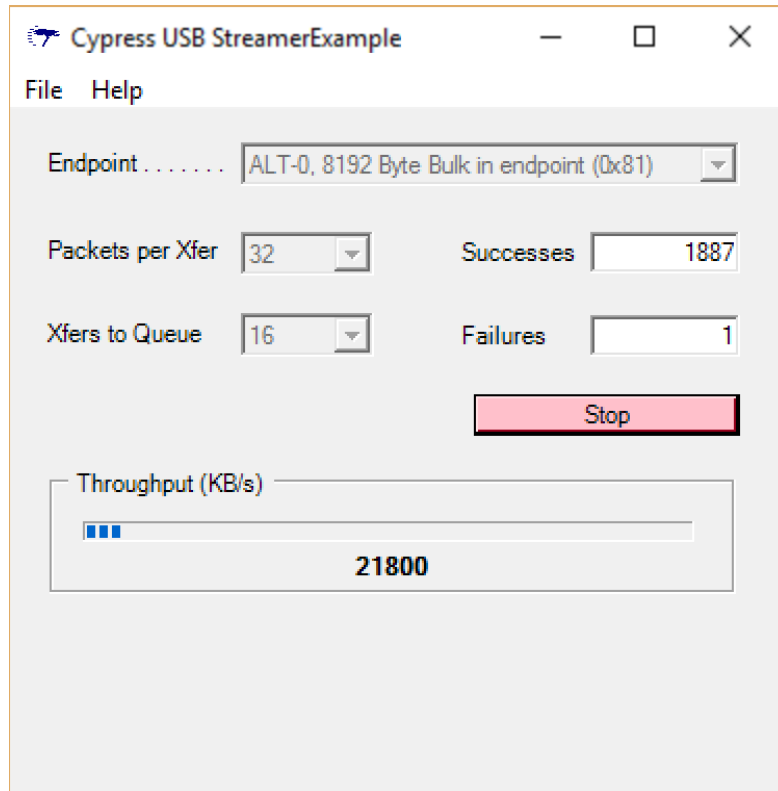


Figure 11: Streamer example data from endpoint 0x86

If you have around 21800 KB/s, then the transfer rate is good, and you are receiving all the data from the sensor. If the data is lower than that, you should use a **USB3 PCI adapter**.

For additional information or assistance please contact our technical support through support@awaiba.com.

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