NanoUSB3 Evaluation Kit for NanEye XS

Revision History:

Version	*Date*	*Modifications*	*Author*
1.0.0	22/05/17	Document Creation	Luciano Calaça
1.0.1	21/06/17	Updated Debug Section – 5.4	Luciano Calaça

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1 Overview

NanEye XS is an image sensor for medical applications. It has a high sensitive rolling shutter pixel with large full well capacitance, specially designed for medical endoscopic applications where high SNR is mandatory. The sensor has a high frame rate to permit SNR enhancement and smooth, low delay display on a wide range of display interface standards.

The sensor features on chip 10 bits ADC and a bit serial interface over LVDS data line. The data line is semi duplex such that configuration can be communicated to the sensor in the frame break.

The exposure time and analogue gain can be programmed over the serial configuration interface.

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.

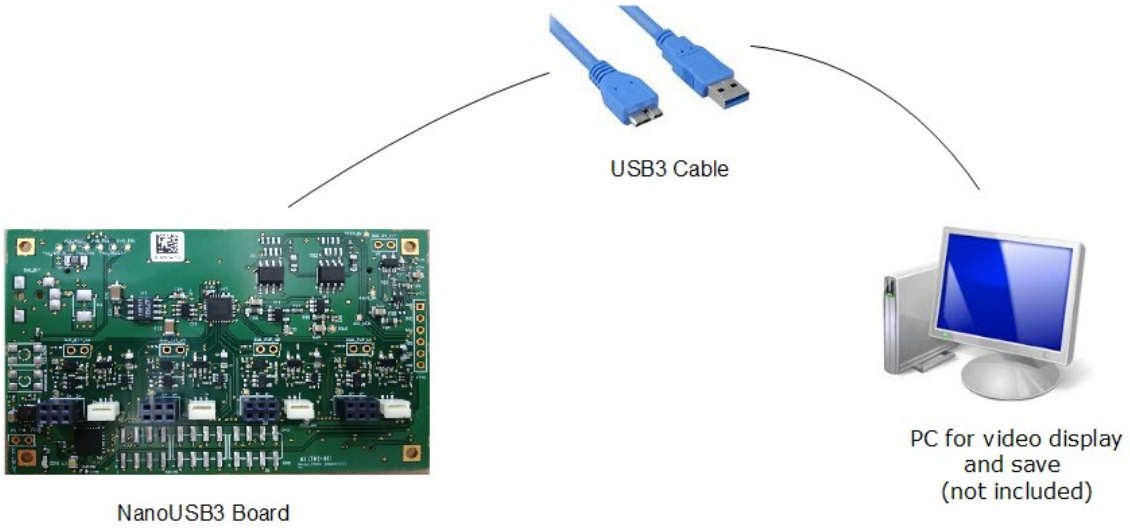

Figure 1: NanEye Evaluation Kit

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.

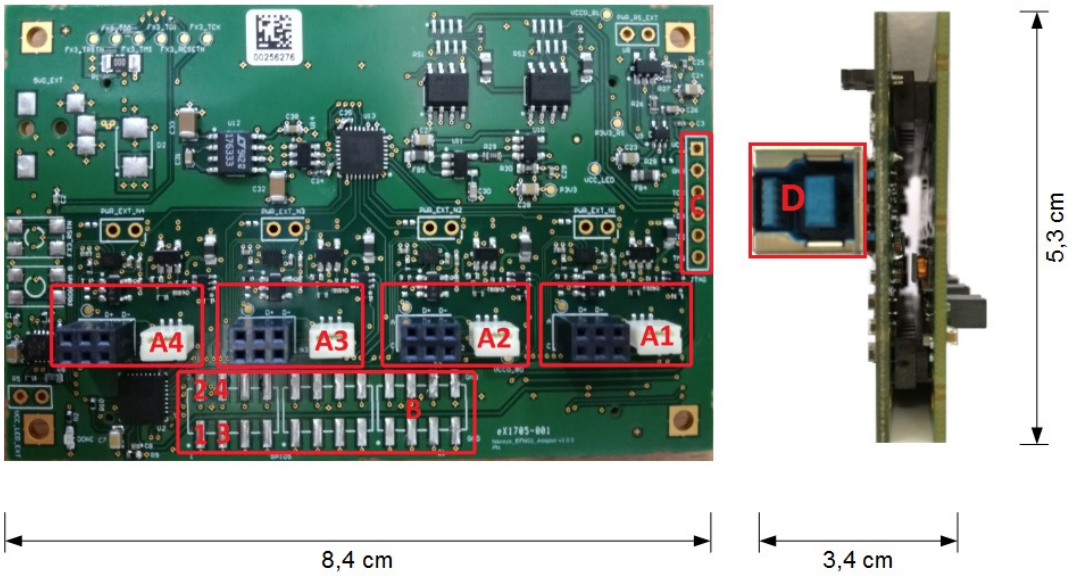

Figure 2: NanEye interface board

Legend	
A1 - Connector Sensor 1	A3 - Connector Sensor 3
A2 - Connector Sensor 2	A4 - Connector Sensor 4
B - GPIO: 1 - FVAL Sensor 1 2 - FVAL Sensor 2	3 - FVAL Sensor 3 4 - FVAL Sensor 4
C - JTAG Connection	
D - USB3 plug	

Note: *For each sensor section there are two connectors, but is only possible to connect one sensor for section. If you connect two sensors in the same section (for example, A1) you may damage both sensors.*

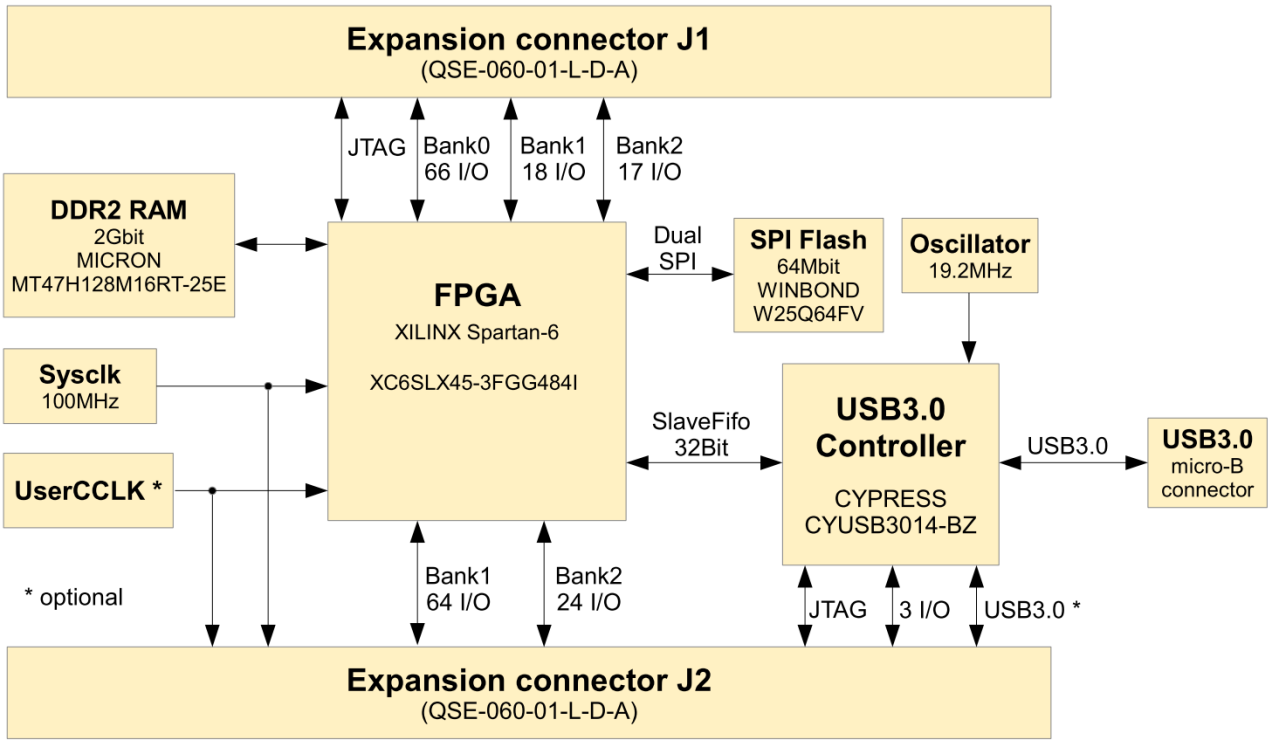

Figure 3: FPGA – USB3 board functional Diagram

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 CypressTM EZ-FX3 controller
- USB bus-powered, no external power supply necessary
- Two FX3 GPIO on expansion connector
- XilinxTM 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 reconsigned 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

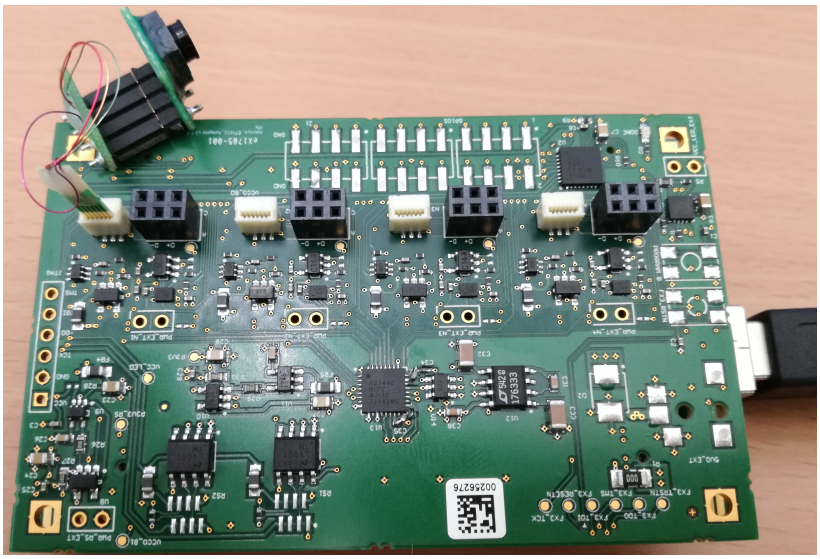

Figure 4:Connecting NanEye XS on NanoUSB3 Adapter v3.0.0

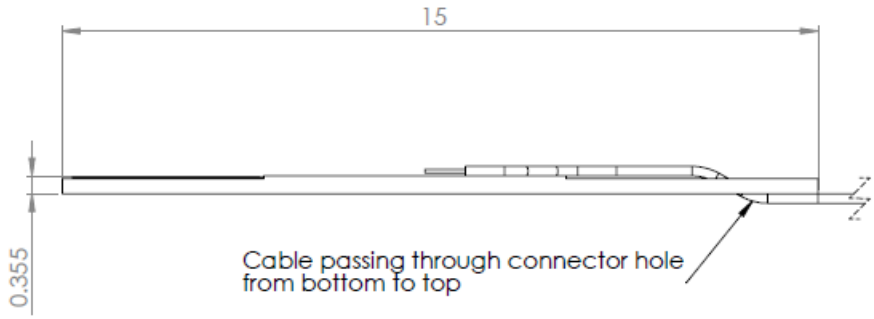

Figure 5: NanEye Flex standard connector. If not otherwise noted all tolerances are +/- 0.1mm.

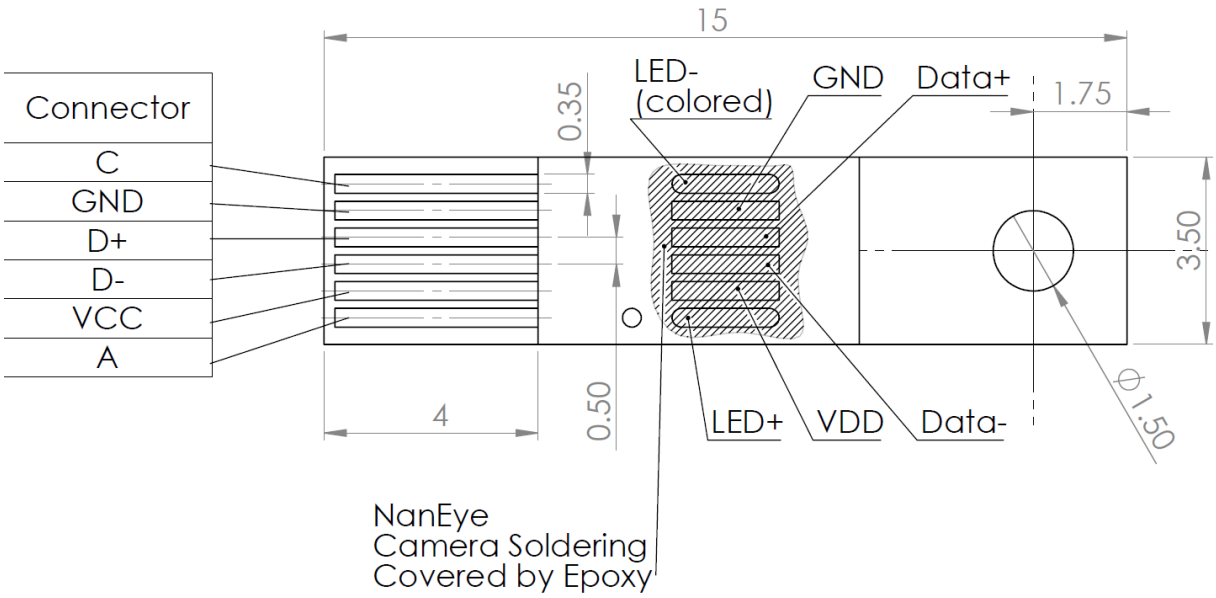

Figure 6: NanEye Flex PCB connector. If not otherwise noted all tolerances are +/- 0.1mm.

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 adjust white balance automatically

This software also contains some image processing algorithms:

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

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.

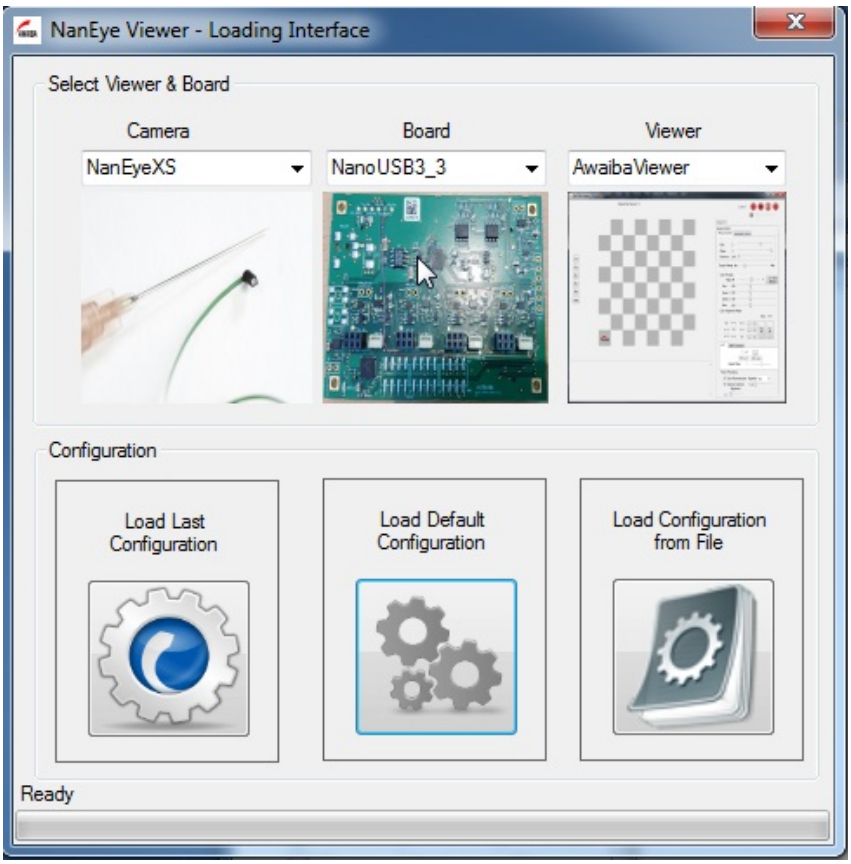

Figure 7: Start the Viewer

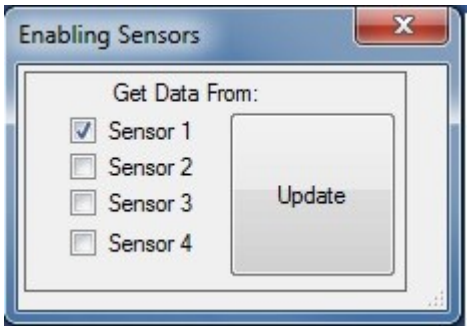

Figure 8: Start the Viewer with the sensor connected on the A1 connector, for instance

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 click on **Download Firmware** (choose **fx3_fw_2EP** file) and then **Select Bitstream** to program the FPGA. You can find the bit file (for instance, NanEye_efm02 - XC6SLX45 v4.0.1.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.

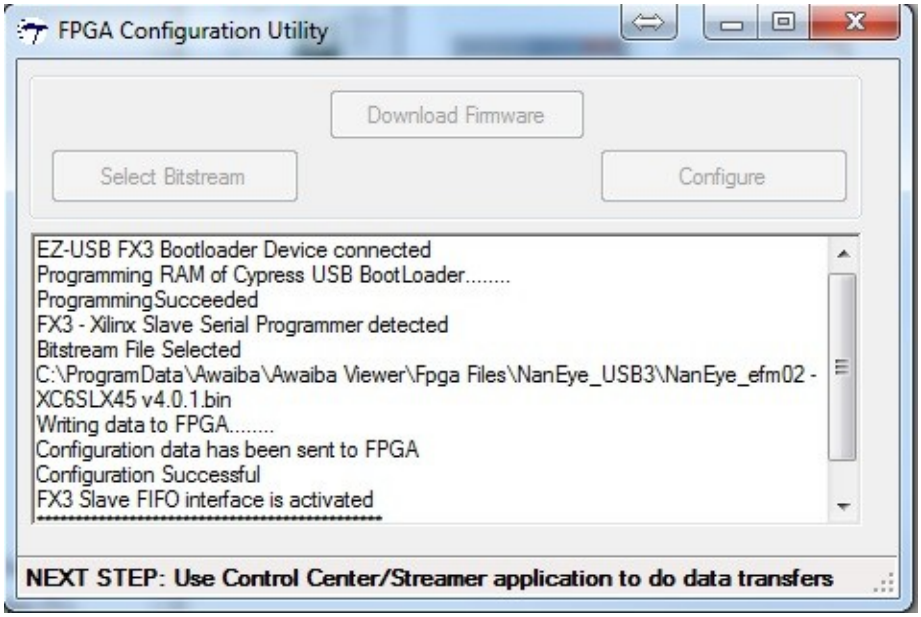

Figure 9: FPGA Configuration for NanEye

After this, the top LED on the USB3 board, referenced in Figure 10, should turn on.

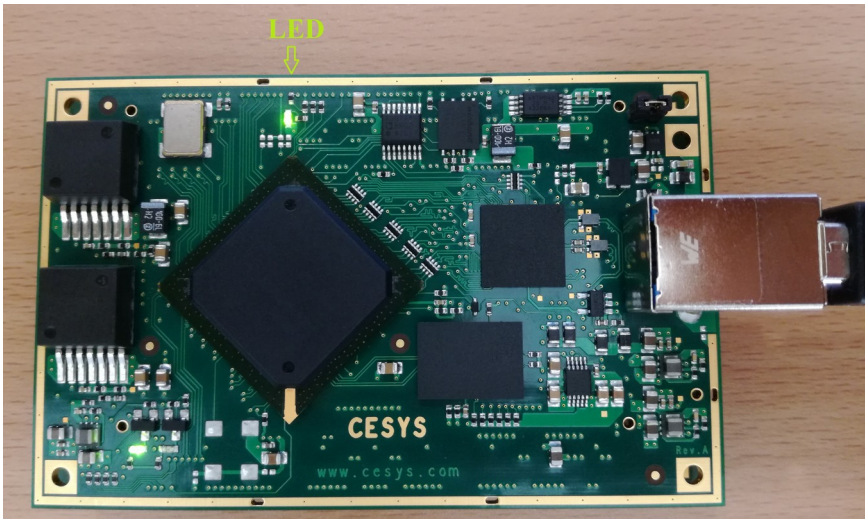

Figure 10: FPGA Configuration for NanEye

Secondly, start the USB Control Center (**CyControl.exe**). You should have 2 end points (Bulk out endpoint 0x01 and Bulk in endpoint 0x81) as shown in figure 11.

Choose **Bulk in endpoint 0x81** and select the tab **Data Transfers.** Click on **Transfer Data-In** and you should see the transferred data.

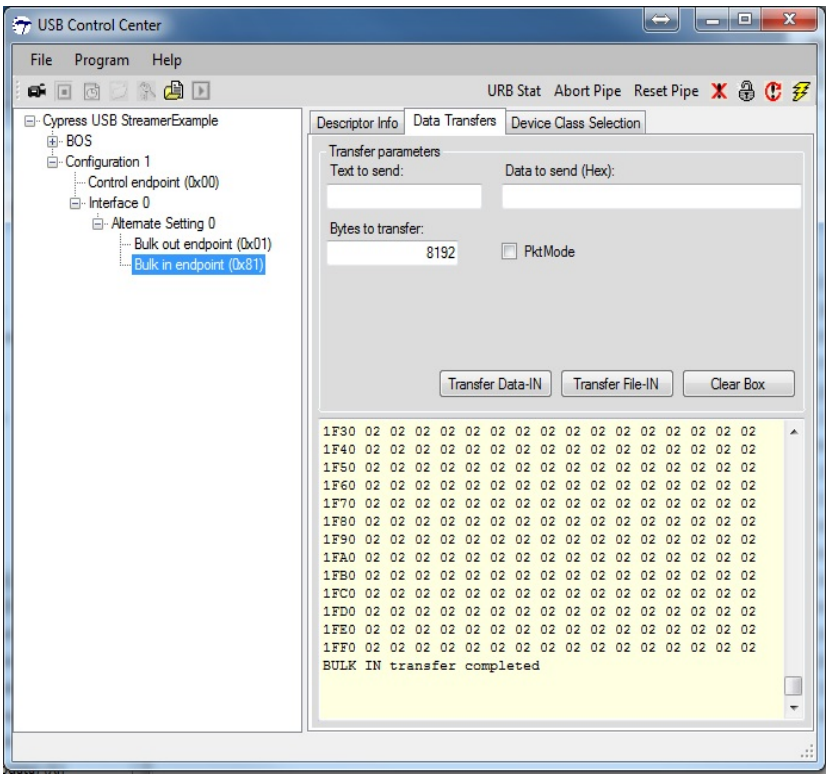

Figure11: NanEye USB3 Endpoints list

To check data rate, please start the **streamer** program with the **Bulk in endpoint (0x81)**, 128 packets per Xfer and 64 Xfers to Queue. Then click start, and you should get data from this end point, as shown in figure 12.

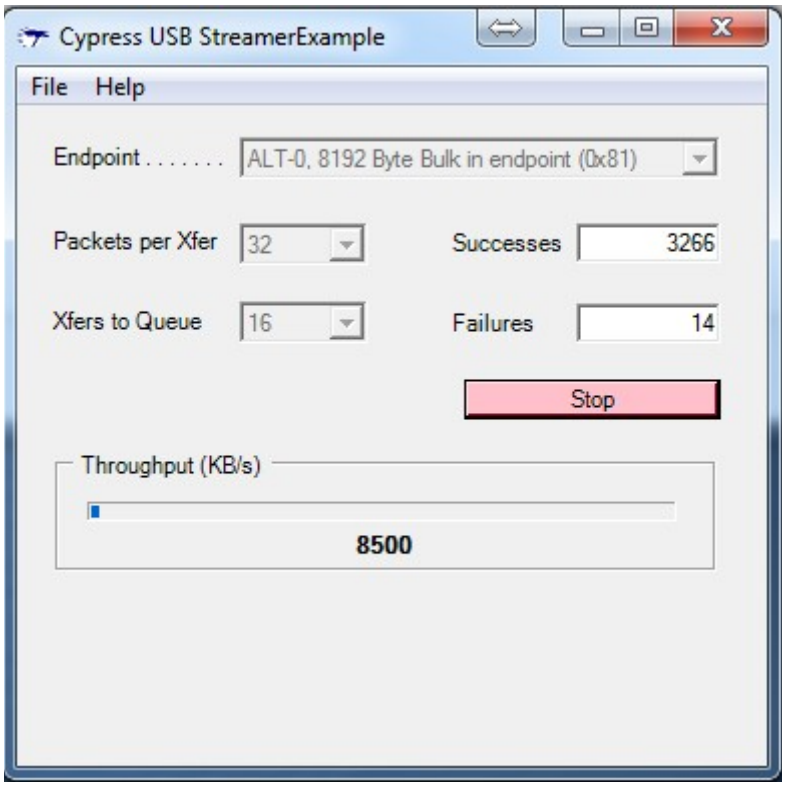

Figure 12: Streamer example data from endpoint 0x81

If you have around 8500 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**.

End of Document

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