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NanoUSB3 Evaluation Kit for NanEye RS



History Record

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Table of Contents

History Record	2
1 Overview.....	4
2 USB3 Evaluation Board	5
3 Operating Instructions	8
3.1 Recommended Equipment	8
3.2 Basic operational instructions	8
3.3 Connect NanEye Sensor.....	8
4 Evaluation Software.....	9
5 Troubleshooting.....	10
5.1 How to Install Awaiba Viewer.....	10
5.2 How to Start Awaiba Viewer	10
5.3 How to Debug USB3 board.....	10

Index of Figures

Figure 1 - NanEye RS Evaluation Kit.....	4
Figure 2 - NanEyeRS interface board.....	5
Figure 3 - FPGA – USB3 board functional Diagram.....	6
Figure 4 - Connecting NanEye RS to the NANOUSB3 board.....	8
Figure 5 - FPGA Configuration for NanEye.....	11
Figure 6 - NanEye USB3 Endpoints list.....	11
Figure 7 - Streamer example data from endpoint 0x86.....	12

Index of Tables

Table 1 - Description of the connections on NANOUSB3 board EFM02.....	5
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1 Overview

The NanEye_RS project is the realization of a minimal form factor chip with high resolution and a maximum diameter of 3.2 mm sensor diagonal, including the sensor package.

The sensor is suitable for general purpose endoscopic applications, dental imaging, drones, smart surveillance, EoT, etc.

The supplied viewer software allows to display the images from the sensor on a screen and also manipulate the sensor registers. It is the same USB3 board that is used with NanEye 2D sensor, but with different connectors for the RS sensor.

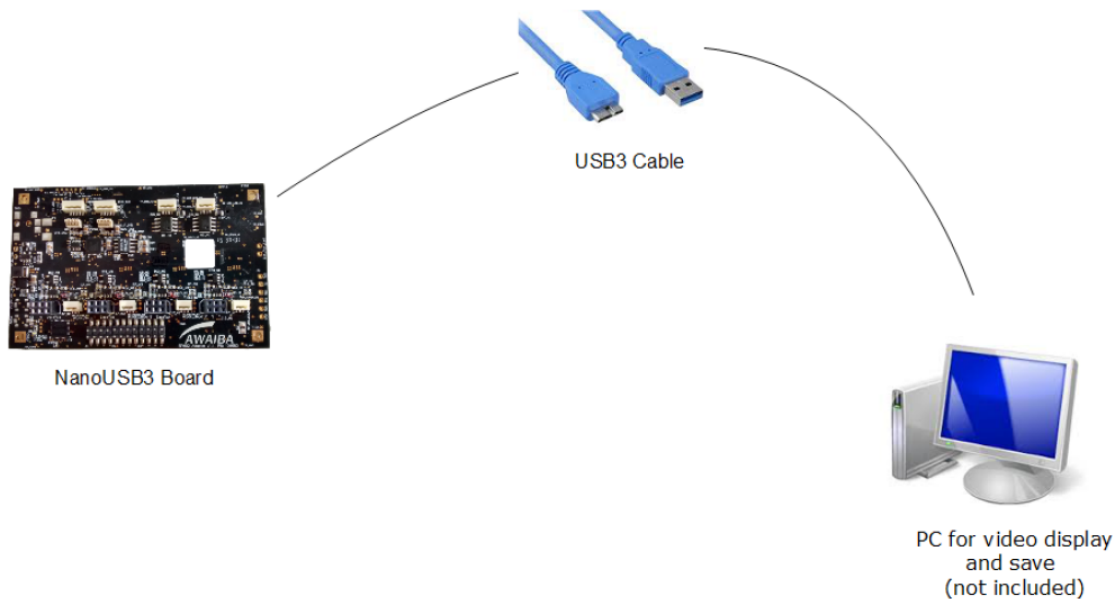


Figure 1 - NanEye RS Evaluation Kit.

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. Board dimensions are 85x53x20 mm.

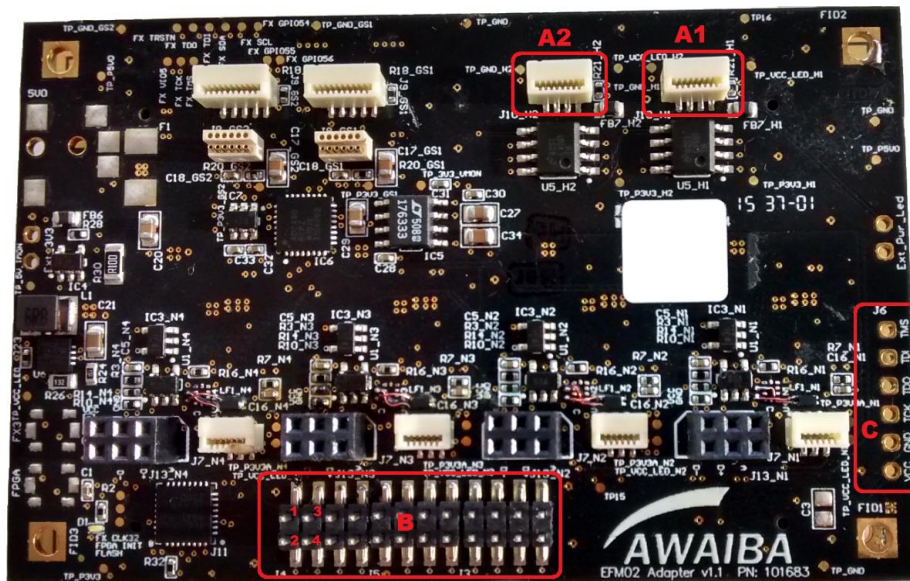


Figure 2 - NanEyeRS interface board.

Legend	
A1	– RS Connector 1
A2	– RS Connector 2
B	– GPIO: 1 - FVAL Sensor 1 2 - FVAL Sensor 2 3 - FVAL Sensor 3 4 - FVAL Sensor 4
C	– JTAG Connection

Table 1 - Description of the connections on NANOUSB3 board EFM02.

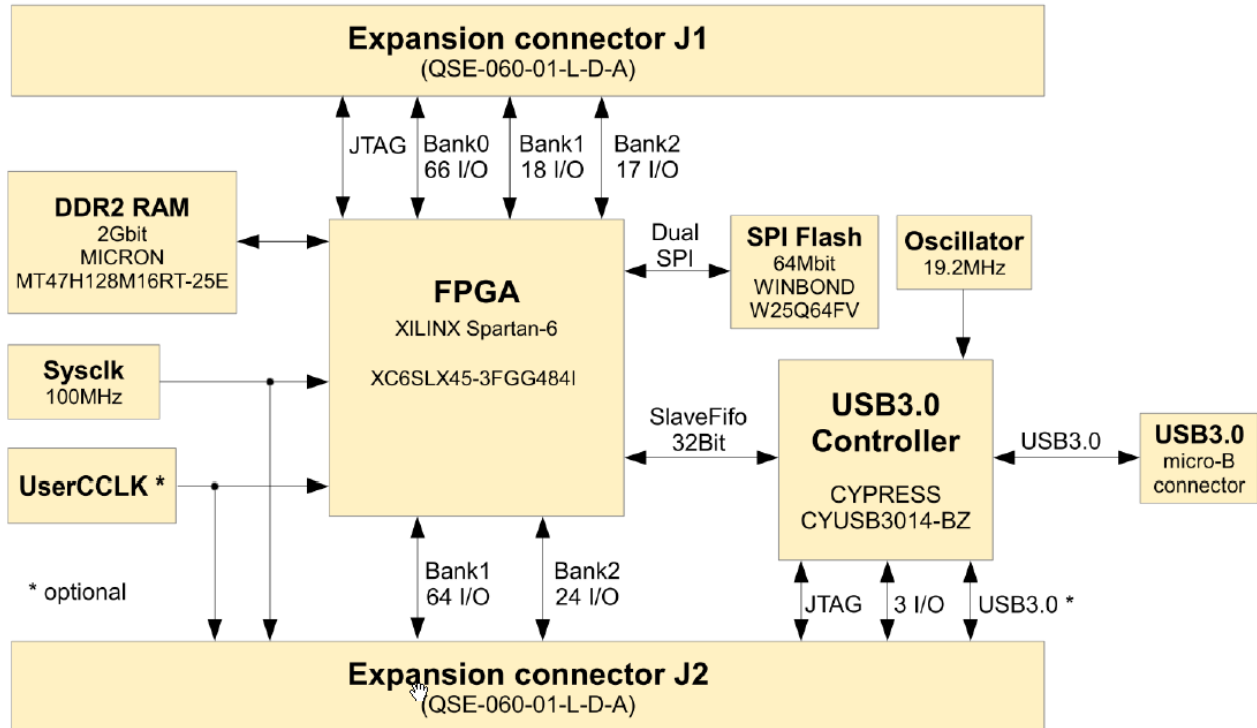


Figure 3 - FPGA – USB3 board functional Diagram.

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 on board 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 (v.2.22.2.12) the Cypress drivers are installed.

When you run the program 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 RS to the NANOUSB3 board.



Note: Connecting the sensor in a wrong way can cause irreparable damage!

4 Evaluation Software

Along with the USB3 board to evaluate NanEye RS sensors, a Windows compatible software is provided to display and store images from the sensor. The Awaiba Viewer provides a software interface for NanEye RS since its version 2.22.2.12.

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 at the first two chapters on the document “*Awaiba_Viewer_QuickStart_v1.4.2*”.

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. Since version 2.22.2.12 that the Viewer automatically presents the correct configuration for NanEye RS on “*Camera*”, “*Board*” and “*Viewer*”. So after starting the Viewer the user just needs to press “*Load Default Configuration*” in order to start the Viewer. If the sensor is correctly connected as on the above image, the user needs to choose “*Sensor 1*” when the Viewer asks for the sensor to be used.

5.3 How to Debug USB3 board

If you can't receive any 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 manually.

You can find the bit file (**NANEYE_RS_EFM02_XC6SLX45_v0.0.3.bin**) at **\ProgramData\Awaiba\Awaiba Viewer\Fpga Files\NanEye_USB3**.

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

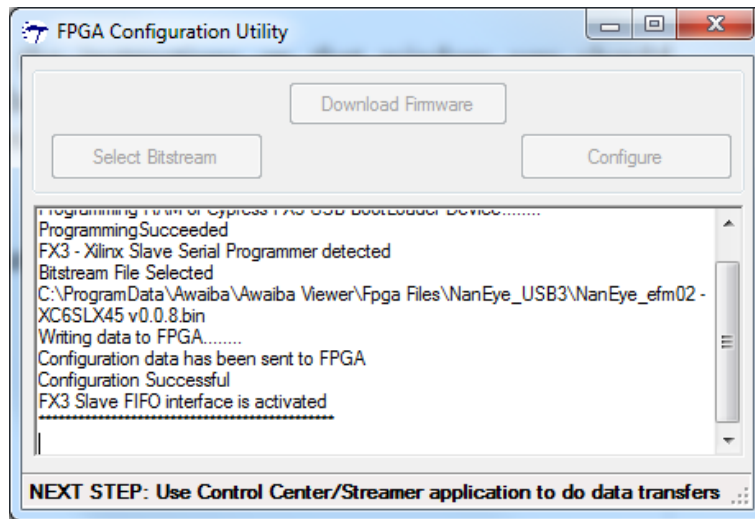


Figure 5 - FPGA Configuration for NanEye.

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 8.

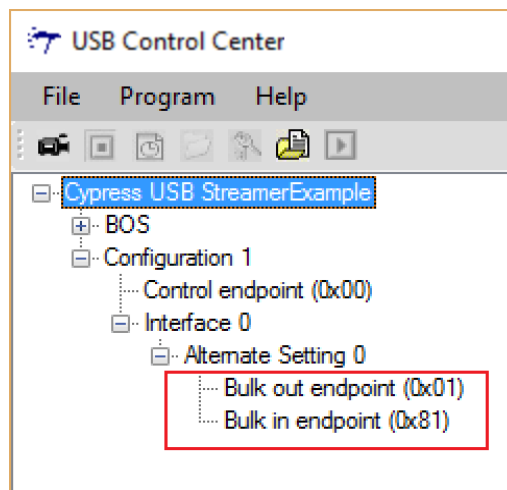


Figure 6 - NanEye USB3 Endpoints list.

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 endpoint, as shown in figure 9.

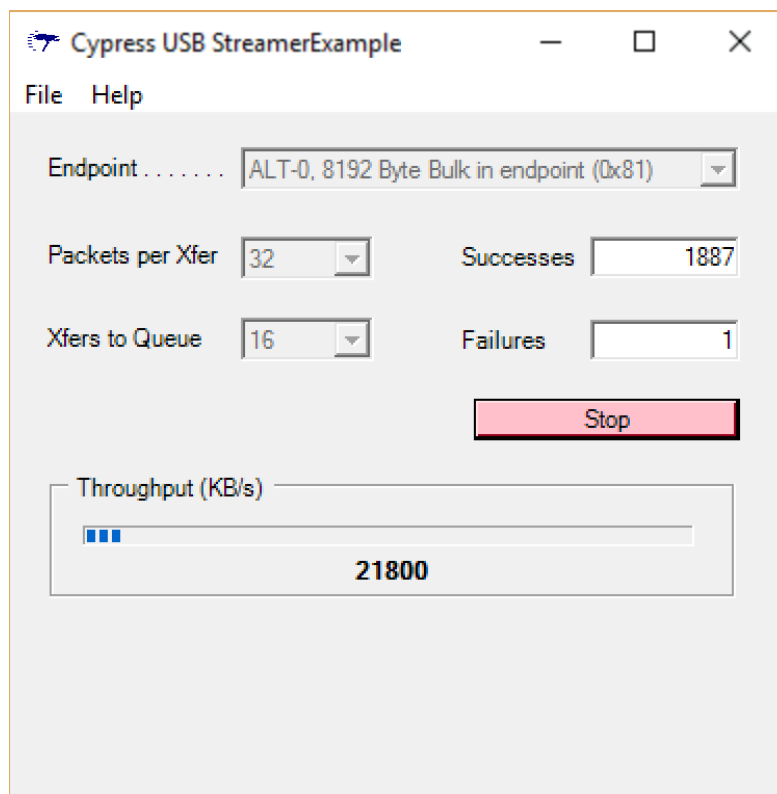


Figure 7 - Streamer example data from endpoint 0x86.

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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