



# NanEye Camera System





# NanEye CSP

## Revision History

<b>Version</b>	<b>Date</b>	<b>Modifications</b>	<b>Author</b>
0.0.01	23/02/09	Document Creation	Stephan Voltz
0.0.02	24/03/09	Modification for 80cm Flex	Stephan Voltz
0.0.03	15/07/09	Update Drawing	Stephan Voltz
0.0.04	20/11/09	General Review and formating	M. Wány
1.0.06	19/02/10	General Update and enclosure of CSP package	M. Wány
1.0.07	19/02/10	Correct typo in best focus range	M. Wány
1.0.08	06/02/12	General Review	A. Vieira
1.0.09	22/02/12	Update of Drawing new cable version	S.Voltz

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# NanEye CSP

## 1 Overview

NanEye is a tiny camera module which consists of an CMOS image sensor with a footprint size of 1mm x 1mm and, optionally, an adapted miniature optics. The device is mounted on a flat ribbon cable up to 3m length that connects to the Awaiba base station. The base station is connected with a standard USB cable up to 5m length to a PC.

The base station is the hardware between the camera and the PC and it does the deserialisation of the data stream that comes from the camera. The Windows based Camera Viewer is a software tool that is able to grab images from the camera via USB and does image corrections like offset, gain correction, demosaic color reconstruction, etc.

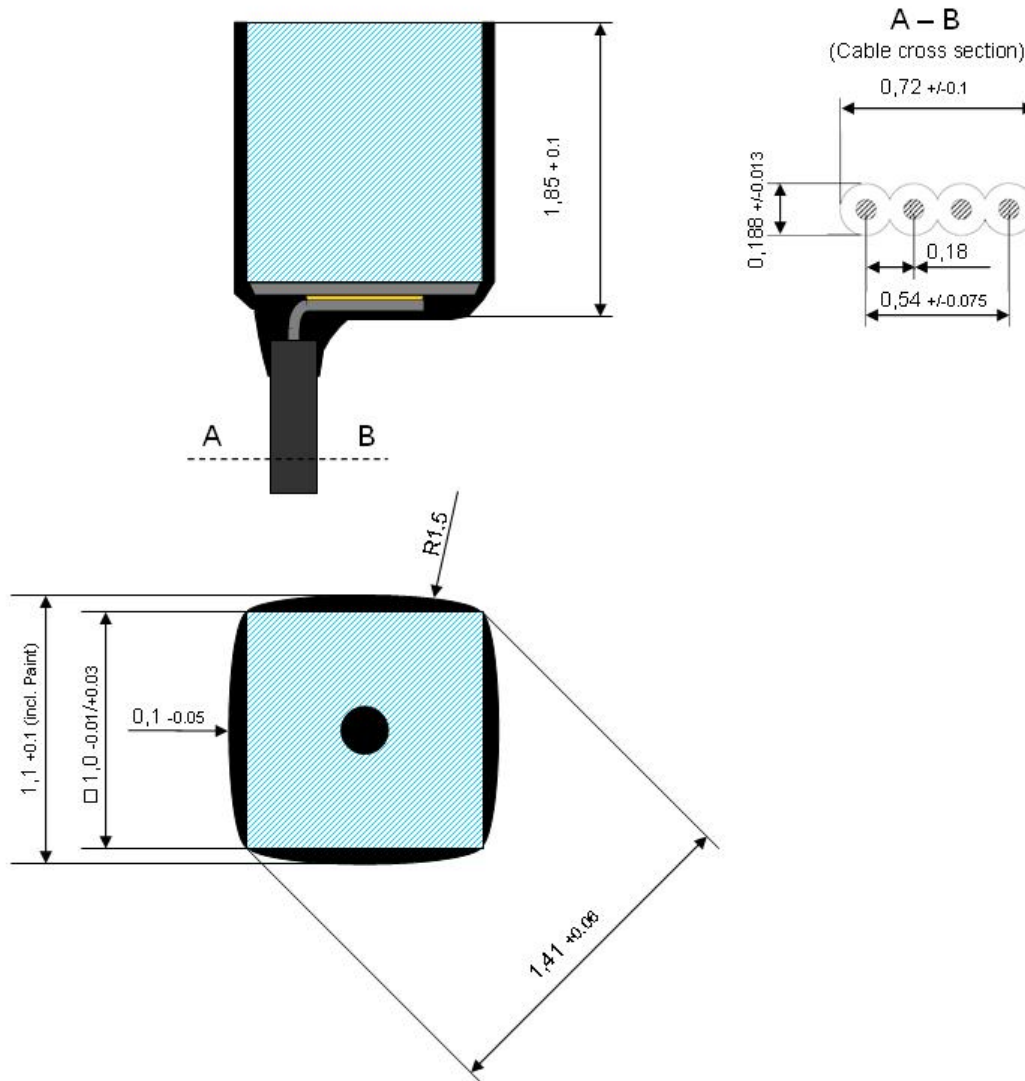


Figure 1: Measures of NANEYE module, Cable length may be adjusted to different lengths

## 2 NanEye image sensor

The NanEye image sensor is based on CMOS technology and is a system on chip, which means that no external component close to the sensor is needed to run the sensor, not even an external capacitor.

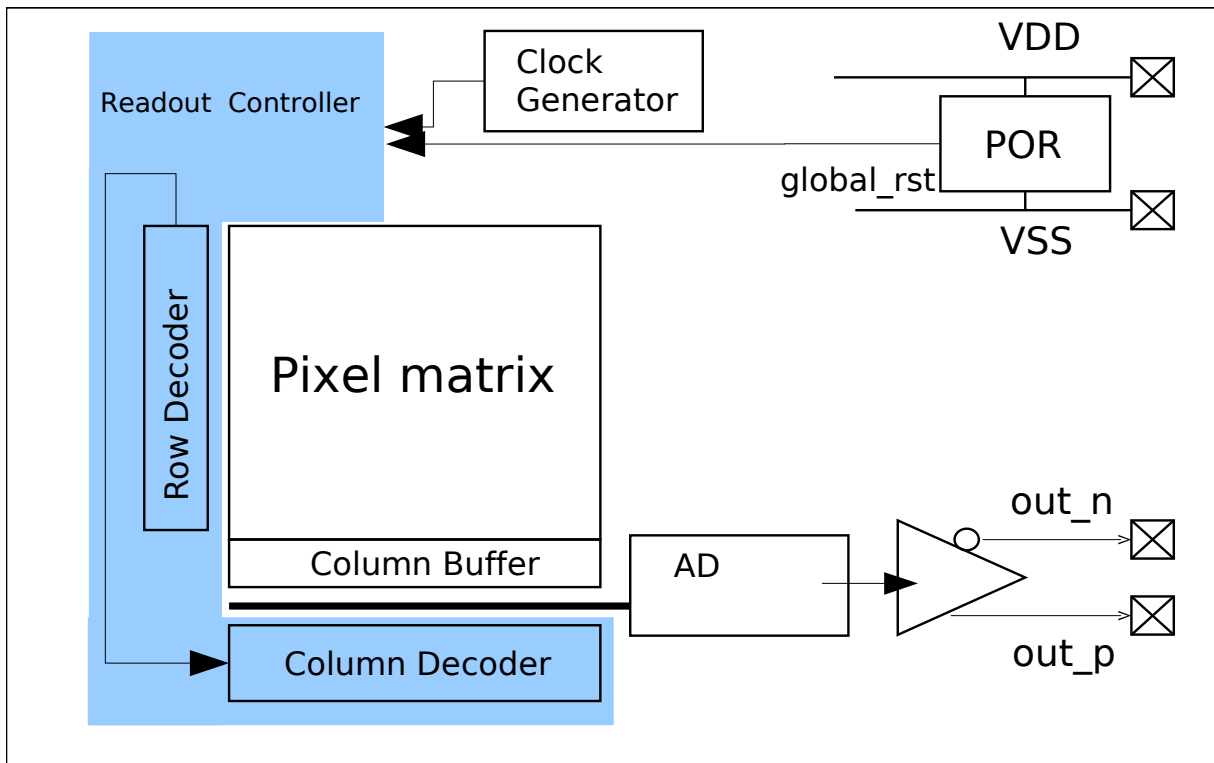


Figure 2: NanEye Simplified Block Diagram



# NanEye CSP

## 2.1 Specification NanEye image sensor

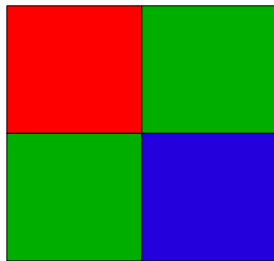
<b>Parameter</b>	<b>Value</b>	<b>Remark</b>
Number of Pixels	62,5k, 250 x 250	
Pixel size	3µm x 3µm	
Color	Bayer Pattern RGB	
Shutter	Rolling	
Dynamic range	42dB	
Responsivity	8DN/nJ/cm <sup>2</sup>	
Full well capacity	10ke-	
FPN	<0.5%	Corrected by Software
PRNU	<1%	Corrected by Software
Data output	10bit digital LVDS	
Supply	1.8V – 2.4V	
Framerate	44fps	At Nominal supply of 1.8V
Size (footprint)	1000µm x 1000µm	
Number of pads	4	VDD, VSS Data+, Data-

Notes:

1. Typical operation mode 1.8V@37 degrees.

## 2.2 Pixel Matrix

The pixels are placed in a square matrix of 250x250 pixels. The Pixel matrix features a Bayer pattern color filter array. The CFA and u-Lens shift is optimized for a chief ray angle (CRA) of the optics.



## 3 Optic

The optional optics available for the sensor is a high performance miniature lens module. It will be directly mounted on the image sensor and has its best focus position defined by design, so no mechanical set of focus is needed. The material is based on B33 (Borofloat glass). The design is made in such way that the surface towards the object is flat, so the lens performance is not influenced by the medium between the object and lens, only the opening angle of the lens is reduced when the system operates in water.

Two Different Lens Configurations are available:

### NanEye\_FOV90\_F4.0

FOV (diagonal in air) : 90°

FOV (diagonal in water) : 62°

F# : 4.0

Max Distortion (diagonal in air) : 23%

Max Distortion (diagonal in water) : 7,5%

MTF @ Niquist @80% horizontal field : 20%

Best Focus : 5mm

Depth of focus : 3,5mm – 30mm

Size (incl image sensor cover glass) : 1,62mm x 1mm x 1mm

### NanEye\_FOV90\_F6.0

FOV (diagonal in air) : 90°

FOV (diagonal in water) : 62°

F# : 6.0

Max Distortion (diagonal in air) : 23%

Max Distortion (diagonal in water) : 7,5%

MTF @ Niquist @80% horizontal field : 18%

Best Focus : 5mm

Depth of focus : 3mm – 50mm

Size (incl image sensor cover glass) : 1,62mm x 1mm x 1mm

## 4 USB evaluation kit (base station) and software

With the camera AWAIBA provides optionally electronic and software to run the camera on a PC in real-time with all necessary image corrections. The complete system consists on the camera, the USB base station and the PC software.

The base station is an electronics box which is the interface between the camera and a PC. The camera interface is differential LVDS and the PC interface is USB 2.0. The base station is supplied with 5V from the USB interface and feeds the NanEye camera with an adjustable power supply.

The NanEye software runs under WINDOWS XP, Vista and 7, and consists of the USB driver and the viewer software. The viewer software is able to display the image on the PC in real-time and perform the following features:

- offset correction (Fix Pattern Noise correction)
- gain correction (PRNU correction)
- demosaic color reconstruction
- white balance
- brightness adjustment
- grab bitmaps
- store raw video files of any length
- replay raw video files
- enable external image processing
- sensor communication over the LVDS uplink for adjustment of exposure time and gain.

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

The most recent version of the software is available under:  
<http://www.awaiba.com/documents/software/evaluation-software/>