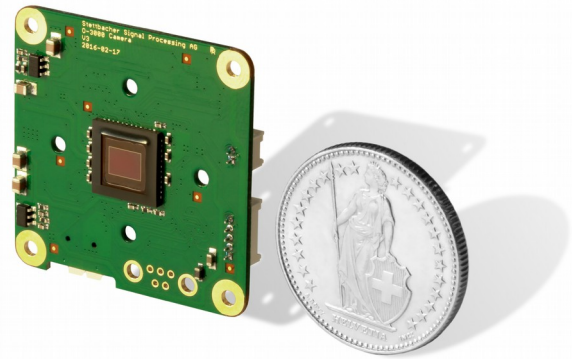


O-3000 Camera Series

1.2 MPixel Camera with High-Speed USB 2.0 Interface

Key Features

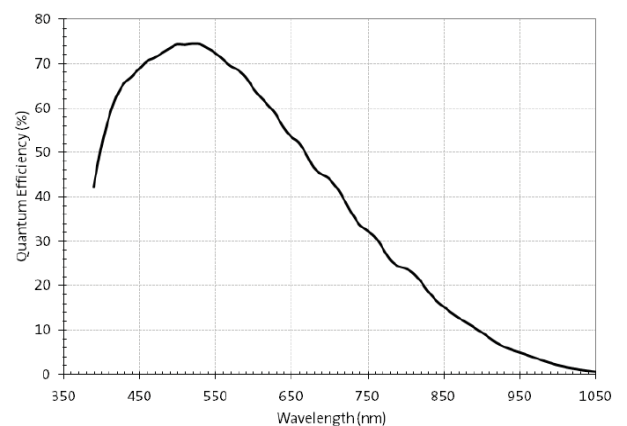
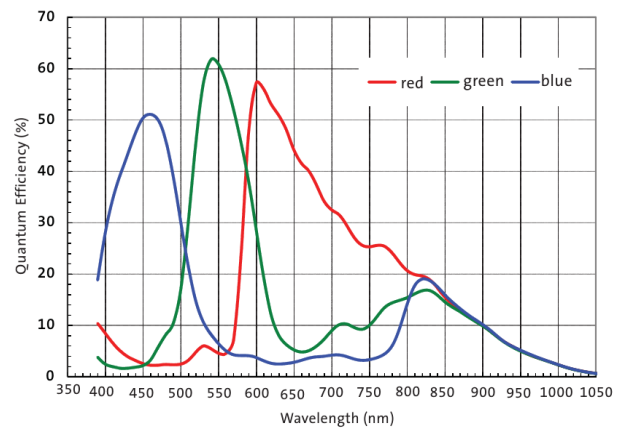
- Available in color and monochrome version
- Available as board level cam or with housing
- Very small form factor (board 36 x 36 mm)
- High-Speed USB 2.0 interface
- High dynamic range (HDR) mode
- Excellent low-light performance
- Automatic and manual exposure mode
- Available with S-, C- and CS-Mount lens holders
- External flash synchronization output
- Extended temperature range
- Open source driver for Linux, MacOS X, Windows
- Open API specification



Applications

- Machine vision and industrial automation
- HDR Surveillance and security
- Process monitoring, measurement
- Embedded solutions

Camera Specification	
Sensor type	CMOS with rolling shutter
Optical format	1/3 inch (6mm)
Pixel size	3.75 x 3.75 μm
Active sensor area	4.8 x 3.6 mm^2 / 1280 x 960 pixels
Lens holders	S-Mount / CS-Mount / C-Mount
Frame rates	> 30 fps @ 1280 x 960 > 40 fps @ 1024 x 768 > 60 fps @ 640 x 480
Bit depths	8/12/20 bit
Exposure	automatic or manual, min. 16 μs
Sensitivity	> 5.4 V/lux-sec
Dynamic range	> 115 dB
Signal to Noise	> 43 dB
Power supply	USB (max. 500 mA @ 5 V)
Connector	USB 2.0 Mini or Micro-B
Operating Temp	-30°C to +70 °C (non condensing)
Storage Temp	-40°C to +125 °C



Special Features

- **User programmable region of interest (ROI).** If defined, the camera does only record and transmit the selected area. Due to the reduced image size a higher frame rate can be achieved.
- **High dynamic range mode (HDR).** The camera includes additional logic to increase its dynamic range. This is particularly useful when the illumination in the same scene varies from dark to bright or when the illumination changes over time. This is typically the case in surveillance and monitoring applications where the camera delivers an excellent low-light performance. The output format in HDR mode is 20 bit per pixel.
- **Horizontal and vertical mirroring modes.** The camera is able to flip its image in horizontal and/or vertical direction. This gives the user more freedom for mounting the camera conveniently.
- **Digital binning mode.** In binning mode, the output resolution is reduced by a factor of two in horizontal or in horizontal and vertical mode. Binning reduces noise and leads to a higher SNR. This particularly improves low-light performance.
- **Pulse width modulation (PWM) outputs.** The camera provides two independent PWM outputs which can be used to control an external light source. Alternatively, the two pins can either be used as digital inputs or digital outputs. Note that the corresponding connector is only accessible on the board-level cameras. For further information please contact Stettbacher Signal Processing.
- **Flash synchronization.** A flash synchronization signal can be used to gate a flash light. Note that the corresponding connector is only accessible on the board-level cameras. For further information please contact Stettbacher Signal Processing.
- **Synchronized operation of multiple cameras.** The camera provides an additional connector for synchronization inputs and outputs. This feature can be used for example to implement a stereo camera or for 3d measurements. Please contact Stettbacher Signal Processing if you plan to use this feature.

Open API Specification

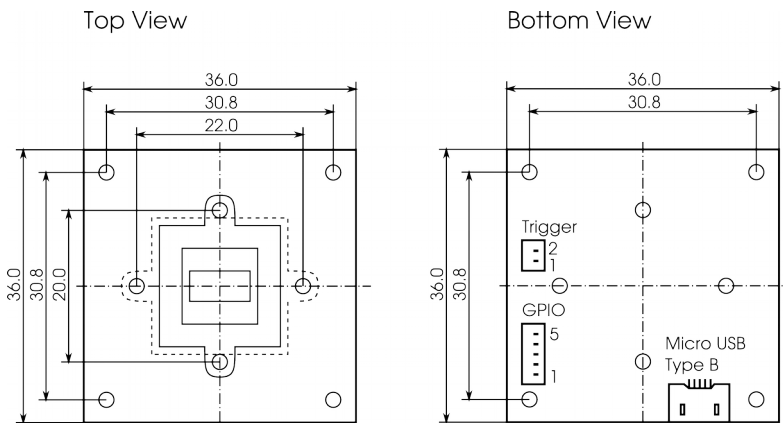
- The complete application programming interface (API) of the camera is freely available. This allows the user to access the camera from any hardware supporting USB 2.0. Please see the website for more information.
- By using the open API specification the user is able to write his own efficient camera interface for every hardware with and without operating system. The user does not depend on a closed-source driver which would limit the application to some selected hardware platforms. Hence the choice of possible platforms is virtually unlimited.
- The open API specification is a key for using the camera in embedded or deeply embedded applications. This is a considerable advantage particularly for price-sensitive applications and for embedded systems with limited performance.

Open Source Driver

- For using the camera on PCs or embedded PC platforms, Stettbacher Signal Processing has published the source code of a driver and a demo application. The driver and demo application are available for Linux, MacOS X and Windows (XP and above). Please see the website for more information.
- The open source driver is written in C. It can be re-used for end applications. The driver is available under the LGPL license. There is no charge for using the driver.
- The open source demo application is written in Java. It is available under the GPL license.

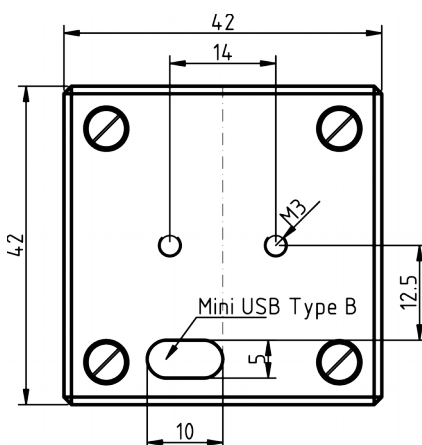
Physical Characteristics	
Board dimensions	36.0 x 36.0 mm
Mounting holes	30.8 x 30.8 mm
Mounting screw	M2
Mass	approx. 5 g (w/o lenses)
Housing dimension	42.0 x 42.0 x 24.5 mm
Housing mounting holes	14 mm
Housing mounting screws	M3

Board dimensions



all dimensions in mm
all mounting holes $\varnothing 2.1$ mm (M2)

Housing dimensions (back view)



Connectors

Trigger Connector	
Pin 1	Ground
Pin 2	Trigger input, 5 V tolerant Schmitt trigger input, $V_{\text{positive threshold}} = 1.75 \text{ V}$, $V_{\text{negative threshold}} = 1.00 \text{ V}$

GPIO Connector	
Pin 1	Ground
Pin 2	Flash output, $V_{\text{output high}} = 2.5 \text{ V to } 2.8 \text{ V}$, $V_{\text{output low}} = 0 \text{ to } 0.4 \text{ V}$
Pin 3	GPIO 2 (Input, Output, PWM) $V_{\text{input low}} = -0.3 \text{ V to } 0.8 \text{ V}$, $V_{\text{input high}} = 2.0 \text{ V to } 3.6 \text{ V}$ $V_{\text{output low}} = 0.4 \text{ V @ } I_{\text{sink max}} = 25 \text{ mA}$, $V_{\text{output high}} = 2.9 \text{ V @ } I_{\text{source max}} = 25 \text{ mA}$ $f_{\text{PWM min}} = 1 \text{ kHz}$, $f_{\text{PWM max}} = 100 \text{ kHz}$, bit resolution = $\log(20 \text{ MHz} / f_{\text{PWM}}) / \log(2)$
Pin 4	GPIO 1 (Input, Output, PWM) $V_{\text{input low}} = -0.3 \text{ V to } 0.8 \text{ V}$, $V_{\text{input high}} = 2.0 \text{ V to } 3.6 \text{ V}$ $V_{\text{output low}} = 0.4 \text{ V @ } I_{\text{sink max}} = 25 \text{ mA}$, $V_{\text{output high}} = 2.9 \text{ V @ } I_{\text{source max}} = 25 \text{ mA}$ $f_{\text{PWM min}} = 1 \text{ kHz}$, $f_{\text{PWM max}} = 100 \text{ kHz}$, bit resolution = $\log(20 \text{ MHz} / f_{\text{PWM}}) / \log(2)$
Pin 5	+5 V (nominal USB) power supply output, shared with camera power supply (see table in chapter "Power consumption")

Connector type		
Trigger	1.25 mm male vertical shrouded header	Würth Elektronik Part No. 653 002 114 822
GPIO	1.25 mm male vertical shrouded header	Würth Elektronik Part No. 653 005 114 822

Power Consumption

The following table shows USB power consumption measured for different operating modes. The GPIO and Trigger connector were left open. The camera was running in auto-exposure mode. The measured power is an average value and varies depending on operating mode and temperature. Approximate values are shown.

Mode	Power [mW]
Idle (no image capturing)	310
Linear mode, 8 bit per pixel, 10 fps, 1280x960	520
Linear mode, 8 bit per pixel, 20 fps, 1280x960	600
Linear mode, 8 bit per pixel, 30 fps, 1280x960	660
Linear mode, 8 bit per pixel, 40 fps, 1024x768	670
Linear mode, 8 bit per pixel, 60 fps, 640x480	630
Linear mode, 8 bit per pixel, 30 fps, Binning (640x480)	600
Linear mode, 12 bit per pixel, 15 fps, 1280x960	570
HDR mode, 15 fps, 1280x960	700
HDR mode, 15 fps, Binning (640x480)	640

Ordering Information

Order Code	Color	Lens Mount	Housing	Connector
O-3010-0-0	mono	none	none	Micro-B (at side)
O-3010-C-0	mono	C-Mount	none	Micro-B (at side)
O-3010-S-0	mono	S-Mount (M12)	none	Micro-B (at side)
O-3010-CS-0	mono	CS-Mount	none	Micro-B (at side)
O-3010-C-H	mono	C-Mount	yes	Mini-B (on back)
O-3010-S-H	mono	S-Mount (M12)	yes	Mini-B (on back)
O-3010-CS-H	mono	CS-Mount	yes	Mini-B (on back)
O-3020-0-0	color	none	none	Micro-B (at side)
O-3020-C-0	color	C-Mount	none	Micro-B (at side)
O-3020-S-0	color	S-Mount (M12)	none	Micro-B (at side)
O-3020-CS-0	color	CS-Mount	none	Micro-B (at side)
O-3020-C-H	color	C-Mount	yes	Mini-B (on back)
O-3020-S-H	color	S-Mount (M12)	yes	Mini-B (on back)
O-3020-CS-H	color	CS-Mount	yes	Mini-B (on back)

Contact

Stettbacher Signal Processing AG
Neugutstrasse 54
CH-8600 Dübendorf

Phone: +41 43 299 57 23

Email cam@stettbacher.ch

HTTP www.open-cam.ch
www.stettbacher.ch

Version History

Version	Date	Changes
V1.00	2013-02-11	<ul style="list-style-type: none">Initial release
V1.10	2013-05-13	<ul style="list-style-type: none">Updated Order Codes
V1.20	2013-09-09	<ul style="list-style-type: none">Camera name changed from "Streaming Camera" to "O3000 Camera"Added connector description
V1.30	2015-08-10	<ul style="list-style-type: none">Updated power supply output on GPIO connector pin 5
V1.40	2016-02-19	<ul style="list-style-type: none">Added camera power consumption for different operating modesUpdated power supply output on GPIO connector pin 5
V 1.50	2016-09-12	<ul style="list-style-type: none">Updated contact dataUpdated active sensor areaAdded C-Mount option to specification tableUpdated camera picture
V1.60	2019-12-03	<ul style="list-style-type: none">GPIO Connector pins 3 and 4 changed