Allied Vision Prosilica GE

Technical Manual

GigE Vision Cameras

V2.3.3

2018-Sep-28

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Allied Vision

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Allied Vision

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Introduction

This Prosilica GE Technical Manual describes in depth the technical specifications of the Prosilica GE camera family including dimensions, feature overview, I/O definition, trigger timing waveforms, and frame rate performance.

For information on software installation read the GigE Installation Manual. For detailed information on camera features and controls specific to the Prosilica GE refer to the *GigE Features Reference* and *GigE Camera and Driver Attributes* documents.

www Prosilica GE documentation
https://www.alliedvision.com/en/support/technical-documentation/prosilica-ge-documentation

Document history

Version	Date	Remarks
V2.0.0	2011-Jul-14	New Manual- Release status
V2.0.1	2013-Jul-05	• Renamed Camera IO signals • Reworked Cleaning optics section • Reworked the absolute QE plots and frame rate vs. height plots • Updated the RoHS directive • Updated the exposure control values in the specifications chapter • Added Status LEDs section • Updated the pixel format naming according to the GenICam naming convention • Added frame rate formulas in the Resolution and ROI frame rates chapter • Added Vimba SDK link in Additional references section • Updated recommended cabling to category 6 or higher in the Gigabit Ethernet port section • Added contact information for Allied Vision Technologies (Shanghai) Co. Ltd. • Updated the links to GigE Installation Manual • Added links to GigE Camera and Driver Features document

Table 1: Document history

Version	Date	Remarks
V2.0.2	2013-Oct-02	• Added optical flange focal distance and maximum lens protrusion information • Added a note on locking screw cables • Updated Cleaning optics section • Updated vertical binning values in the Specifications chapter • Updated Table 12 • Updated links for PvAPI SDK
V2.0.3	2013-Nov-26	• Added chapter Description of the data path • Updated the Index
V2.0.4	2014-Oct-15	• Replaced the optical flange focal distance section with the following sections: – C-Mount flange focal distance – F-Mount flange focal distance • Added description of power barrel connector • Updated datapath diagram for Prosilica GE color cameras • Added Prosilica GE C-Mount (adjustable) • Updated Prosilica GE tripod mount mechanical drawing • Truesense references renamed to ON Semiconductor
V2.1.0	2015-Mar-20	• Updated Allied Vision logo • Replaced old links with new Allied Vision website links • Changed file name from ‘GigE Camera and Driver Features’ to ‘GigE Features Reference’ • Changed chapter name from ‘Description of data path’ to ‘Camera data path’
V2.2.0	2017-Feb-10	• Updated the absolute QE plots for Prosilica GE models with ON Semiconductor CCD sensors to reflect the changes in the Gen 2 CFA material change made by ON Semiconductor • Removed the Prosilica GE1900C. For more information, refer to the Product Change Notification on the Allied Vision website • Various minor updates and corrections
V2.2.1	2017-Apr-07	• Added cable color to camera I/O connector pin assignment including pin assignment figure and cross reference to the Allied Vision I/O cable data sheet
V2.3.0	2017-Dec-18	• Various minor updates and corrections
V2.3.1	2018-Jan-16	• Removed references to the Modular Concept
V2.3.2	2018-Jun-19	• Updated RoHS statement to include amendment 2015/863/EU
V2.3.3	2018-Sep-28	• Editorial updates

Table 1: Document history (continued)

Manual conventions

To give this manual an easily understandable layout and to emphasize important information, the following typographical styles and symbols are used:

Styles

Style	Function	Example
Bold	Programs, inputs, or highlighting important information	**bold**
Courier	Code listings	`Input`
Upper case	Register	REGISTER
Italics	Modes, fields, Publications	*Mode*
Blue	Links	Link

Table 2: Styles

Symbols

Note This symbol highlights important information.

Caution This symbol highlights important instructions. You have to follow these instructions to avoid malfunctions.

www This symbol highlights URLs for further information. The URL itself is shown in blue.

Example:

https://www.alliedvision.com

Precautions

Caution

Do not disassemble the camera housing. Warranty is void if camera has been disassembled.

This camera contains sensitive internal components.

Caution

Keep shipping material

Poor packaging of the product may cause damage during shipping.

Caution

Verify all external connections

Verify all external connections in terms of voltage levels, power requirements, voltage polarity, and signal integrity prior to powering the device.

Caution

Cleaning

This product can be damaged by some volatile cleaning agents. Avoid cleaning the image sensor unless absolutely necessary. Please see instructions on optics cleaning in this document.

Caution

Do not exceed environmental specifications

See environmental specifications limits in the Specifications chapter of this document. Special care must be taken to maintain a reasonable operating temperature. If the camera is operated in temperatures higher than the specified range, the camera should be mounted on a heat sink.

Cleaning optics

Caution

Allied Vision does not warranty against any physical damage to the sensor, filter, protection glass or lenses. Use utmost care when cleaning optical components.

Caution Do not touch any optics with fingers. Oil from fingers can damage fragile optical coatings.

Identifying debris

Debris on the image sensor or optical components appears as a darkened area or smudge on a camera image. Do not confuse this with a pixel defect which appears as a distinct point.

Locating debris

First determine whether the debris is on the sensor glass, IR filter (if used), or lens. The farther away the debris is from the sensor, the blurrier the debris appears on a camera image.

Stream a live image from the camera using a uniform target, such as a piece of paper. To determine if the debris is on the camera lens, rotate the lens independent of the camera. If the spot moves, the debris is on the lens. Otherwise, the debris is on the IR filter (if used) or sensor glass.

Color cameras with IR filter

Prosilica GE color cameras are equipped with an IR filter. With no lens or lens cap on a camera, the IR filter is exposed and debris can accumulate on it. This is the most probable location for debris. It should not be necessary to remove the IR filter for cleaning. Clean the outside of the IR filter glass using the techniques explained in the next section.

If it is determined that the debris is on the inside surface of the filter glass, or on the sensor glass, IR filter removal is necessary. Depending on the manufacturing date of your Prosilica GE camera, the IR filter may be slot type, or pinhole type. Slot type filters can be removed using a small flat head screw driver. Pinhole type filters require a pin spanner wrench for removal.

Note A pin spanner wrench suitable for IR filter removal is available for purchase from Allied Vision.
Order code: E9020001

Cleaning with air

Blow directly on the contaminated surface with moderate pressure, clean compressed air.

Caution

Do not exceed 6 bar (90 psi). If using canned air, approximately ~ 4.8 bar (70 psi) when full, do not shake or tilt the can, as extreme changes in temperature due to sudden cold air can crack the optic glass.

View a live image with the camera after blowing. If debris is still present, repeat the process until it is determined that the particulate cannot be dislodged. If this is the case, proceed to the contact cleaning technique.

Contact cleaning

Only use this method if the above air cleaning method does not sufficiently clean the surface. Use 99% pure isopropyl alcohol and clean cotton swabs. Wet the swab in the alcohol. Quickly wipe the optics in a single stroke. Prolonged exposure of alcohol on the swab can cause the swab glue to loosen and transfer to the optic glass. Do not reuse the same swab. Repeat this process until the debris is removed. If this process fails to remove the debris, contact Allied Vision.

Compliance notifications

For customers in Europe

CE

Allied Vision has demonstrated the fulfillment of the requirements relating to the Prosilica GE camera family:

- Directive 2011/65/EU, including amendment 2015/863/EU (RoHS)

Avoid electromagnetic interferences

For all power and interface connections, only use shielded cables or cables recommended by Allied Vision.

Camera applications and intended use

General use

- The user is responsible for operating the camera within the specifications that are defined in this document, and within appropriate environmental conditions and technical prerequisites, to ensure trouble-free camera operation.
- The camera is compliant with current data communication standards; however, those standards do not allow for self-monitoring. Thus, the camera cannot be used as a standalone device for security-related monitoring operations.
- The camera is a hardware product. Only when used with appropriate accompanying software, the camera will produce the desired results. The realization of intelligent solutions requires additional software that is suitable to run with the camera.
- The camera is a component, it is neither a complete product, nor is it a ready-made technical solution.
- The camera-supporting software can be obtained and installed separately from the camera. Usage of the software is solely the responsibility of the user.
- The intended use of the camera is to be integrated into a system that adds a housing ensuring EMC compliance.
- The camera must not be opened. For all repair tasks, contact Allied Vision or one of Allied Vision's authorized representatives.
- Observe the intended use. The camera must only be used for purposes that are in conformity with the stated intended use.
- Additionally, refer to the warranty information on the Allied Vision website.

Use in medical devices

The camera provides basic adequacy to be used in medical devices as well, however, is not specially designated for operation in medical devices. When used as part of a medical device, a review of the specific application is necessary. Users who integrate the camera into an application must comply with the rules and regulations concerning medical devices.

Specifications

Specifications common to all models

Feature	Specification
TTL I/Os	1 input, 3 output
RS232	1
Voltage requirements	5 to 16 VDC: Cameras SN: 02-XXXXA-XXXXX, 02-XXXXB-XXXXX 5 to 25 VDC: Cameras SN: 02-XXXXC-XXXXX
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Interface	IEEE 802.3 1000BASE-T, 100BASE-TX
Interface standard	GigE Vision Standard 1.2

Table 3: Specifications common to all models

Prosilica GE680, GE680C

Feature	Specification	
	Prosilica GE680	Prosilica GE680C
Resolution	640 (H) × 480 (V) 0.3 MP	
Sensor	ON Semiconductor KAI-0340	
Sensor type	Interline CCD, Progressive Scan	
Sensor format	Type 1/3	
Sensor size	5.920 mm diagonal	
Pixel size	7.4 µm × 7.4 µm	
Lens mount	C-Mount	
Optical filter	No filter	IRC30 IR cut filter
Maximum frame rate at full resolution	205 frames per second	
A/D	12-bit	
Image buffer	32 MB	
Image bit depth	8/12	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixel formats		YUV411Packed
RGB color pixel formats		RGB8Packed, BGR8Packed, RGBA8Packed, BGRA8Packed, RGB12Packed
RAW pixel formats		BayerGR8, BayerGR12, BayerGR12Packed
Exposure control	25 µs to 53.7 s; 1 µs increments	
Gain control	0 to 34 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	Typical < 4.5 W at 12 VDC (full resolution and maximum frame rate)	
Mass (typical)	169 g	
Body dimensions (L × W × H)	80 × 51 × 39 mm	
Trigger latency	1.2 µs	
Trigger jitter	±10 ns	
Propagation delay (t_{pd})	90 ns	

Table 4: Prosilica GE680, GE680C camera specifications

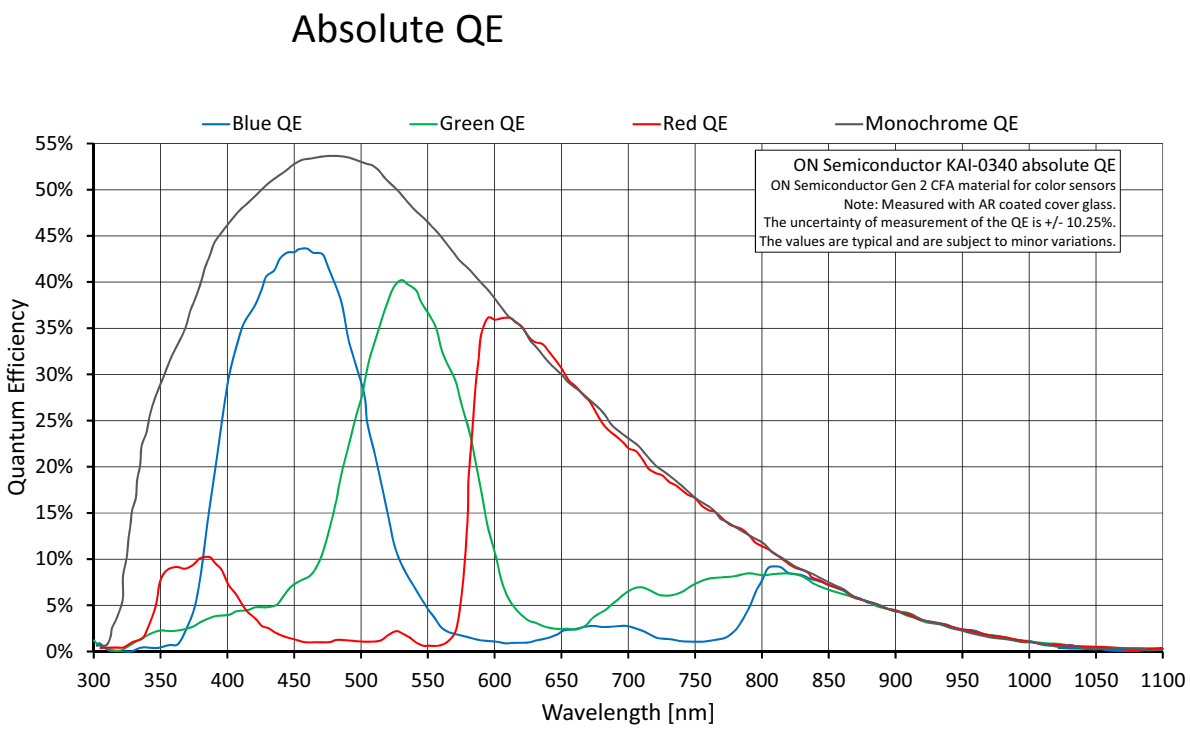


Figure 1: Prosilica GE680, GE680C (ON Semiconductor KAI-0340) absolute QE

Prosilica GE1050, GE1050C

Feature	Specification	
	Prosilica GE1050	Prosilica GE1050C
Resolution	1024 (H) × 1024 (V) 1 MP	
Sensor	ON Semiconductor KAI-01050	
Sensor type	Interline CCD, Progressive Scan	
Sensor format	Type 1/2	
Sensor size	7.96 mm diagonal	
Pixel size	5.5 µm × 5.5 µm	
Lens mount	C-Mount	
Optical filter	No filter	IRC30 IR cut filter
Maximum frame rate at full resolution	59 frames per second	
A/D	12-bit	
Image buffer	32 MB	
Image bit depth	8/12	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixel formats		YUV411Packed
RGB color pixel formats		RGB8Packed, BGR8Packed, RGBA8Packed, BGRA8Packed, RGB12Packed
RAW pixel formats		BayerGR8, BayerGR12, BayerGR12Packed
Exposure control	10 µs to 53.7 s; 1 µs increments	
Gain control	0 to 34 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	Typical < 5 W at 12 VDC (full resolution and maximum frame rate)	
Mass (typical)	178 g	
Body dimensions (L × W × H)	80 × 51 × 39 mm	
Trigger latency	5 µs	
Trigger jitter	±10 ns	
Propagation delay (t_{pd})	90 ns	

Table 5: Prosilica GE1050, GE1050C camera specifications

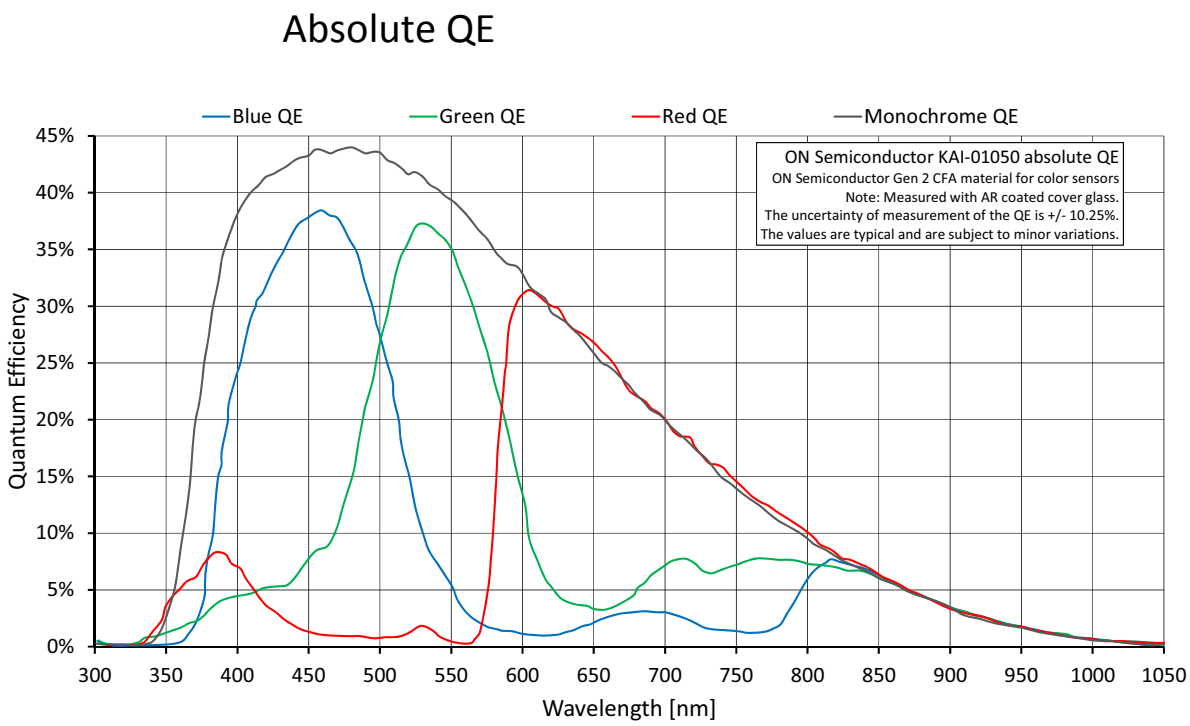


Figure 2: Prosilica GE1050, GE1050C (ON Semiconductor KAI-01050) absolute QE

Prosilica GE1650, GE1650C

Feature	Specification	
	Prosilica GE1650	Prosilica GE1650C
Resolution	1600 (H) × 1200 (V) 1.9 MP	
Sensor	ON Semiconductor KAI-2020	
Sensor type	Interline CCD, Progressive Scan	
Sensor format	Type 1	
Sensor size	14.80 mm diagonal	
Pixel size	7.4 µm × 7.4 µm	
Lens mount	C-Mount	
Optical filter	No filter	IRC30 IR cut filter
Maximum frame rate at full resolution	32 frames per second	
A/D	12-bit	
Image buffer	32 MB	
Image bit depth	8/12	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixel formats		YUV411Packed
RGB color pixel formats		RGB8Packed, BGR8Packed, RGBA8Packed, BGRA8Packed, RGB12Packed
RAW pixel formats		BayerGR8, BayerGR12, BayerGR12Packed
Exposure control	50 µs to 53.7 s; 1 µs increments	
Gain control	0 to 34 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	Typical < 5 W at 12 VDC (full resolution and maximum frame rate)	
Mass (typical)	169 g	
Body dimensions (L × W × H)	80 × 51 × 39 mm	
Trigger latency	5 µs	
Trigger jitter	±10 ns	
Propagation delay (t_{pd})	90 ns	

Table 6: Prosilica GE1650, GE1650C camera specifications

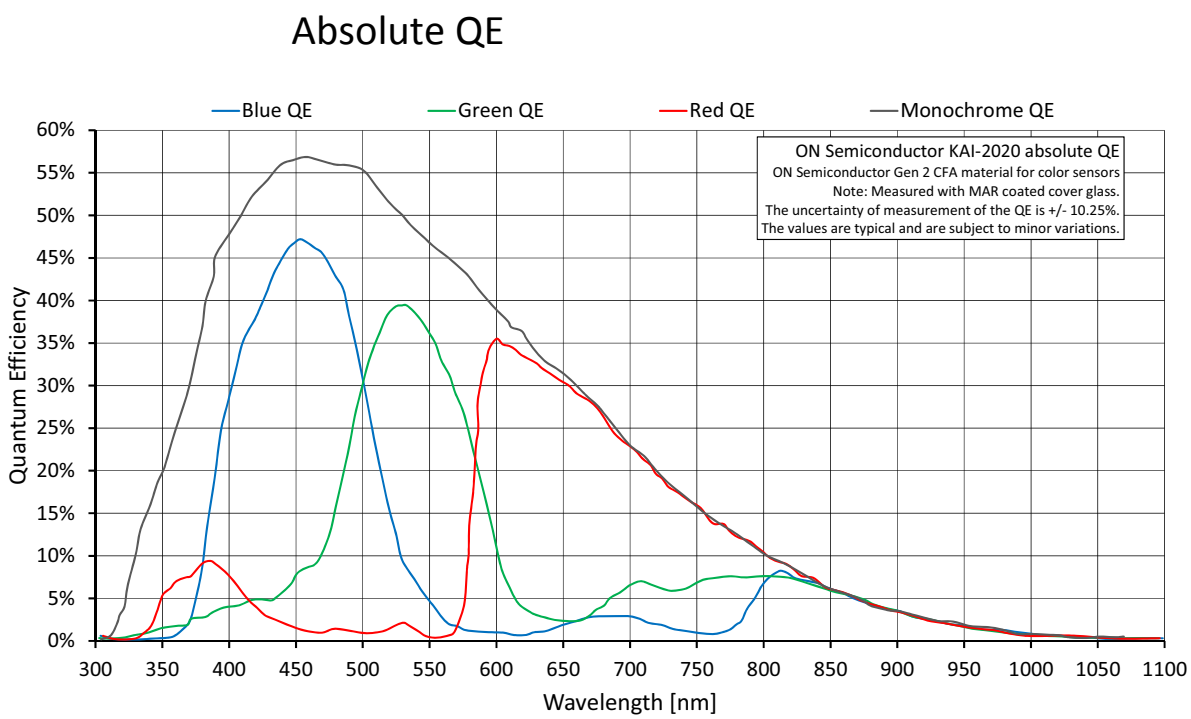


Figure 3: Prosilica GE1650, GE1650C (ON Semiconductor KAI-2020) absolute QE

Prosilica GE1660, GE1660C

Feature	Specification	
	Prosilica GE1660	Prosilica GE1660C
Resolution	1600 (H) × 1200 (V) 1.9 MP	
Sensor	ON Semiconductor KAI-02050	
Sensor type	Interline CCD, Progressive Scan	
Sensor format	Type 2/3	
Sensor size	11.0 mm diagonal	
Pixel size	5.5 µm × 5.5 µm	
Lens mount	C-Mount	
Optical filter	No filter	IR cut filter
Maximum frame rate at full resolution	34.6 frames per second	
A/D	12-bit	
Image buffer	32 MB	
Image bit depth	8/12	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixel formats		YUV411Packed
RGB color pixel formats		RGB8Packed, BGR8Packed, RGBA8Packed, BGRA8Packed, RGB12Packed
RAW pixel formats		BayerGR8, BayerGR12, BayerGR12Packed
Exposure control	10 µs to 53.7 s; 1 µs increments	
Gain control	0 to 34 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	Typical < 5 W at 12 VDC (full resolution and maximum frame rate)	
Mass (typical)	178 g	
Body dimensions (L × W × H)	80 × 51 × 39 mm	
Trigger latency	5 µs	
Trigger jitter	±10 ns	
Propagation delay (t_{pd})	90 ns	

Table 7: Prosilica GE1660, GE1660C camera specifications

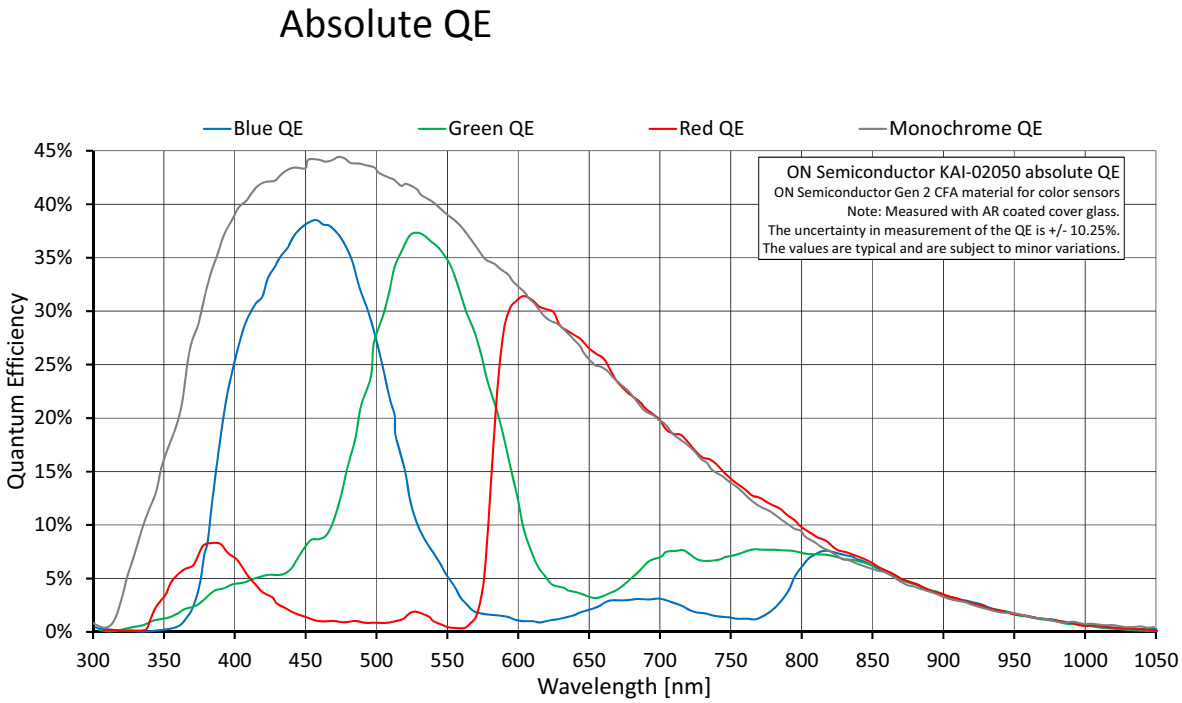


Figure 4: Prosilica GE1660, GE1660C (ON Semiconductor KAI-02050) absolute QE

Prosilica GE1900

Feature	Specification
Resolution	1920 (H) × 1080 (V) 2.1 MP
Sensor	ON Semiconductor KAI-2093
Sensor type	Interline CCD, Progressive Scan
Sensor format	Type 1
Sensor size	16.3 mm diagonal
Pixel size	7.4 µm × 7.4 µm
Lens mount	C-Mount
Optical filter	No filter
Maximum frame rate at full resolution	30 frames per second
A/D	12-bit
Image buffer	32 MB
Image bit depth	8/12
Monochrome pixel formats	Mono8, Mono12, Mono12Packed
Exposure control	50 µs to 53.7 s; 1 µs increments
Gain control	0 to 34 dB
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution
Power consumption	Typical < 5 W at 12 VDC (full resolution and maximum frame rate)
Mass (typical)	169 g
Body dimensions (L × W × H)	80 × 51 × 39 mm
Trigger latency	5 µs
Trigger jitter	±10 ns
Propagation delay (t_{pd})	90 ns

Table 8: Prosilica GE1900 camera specifications

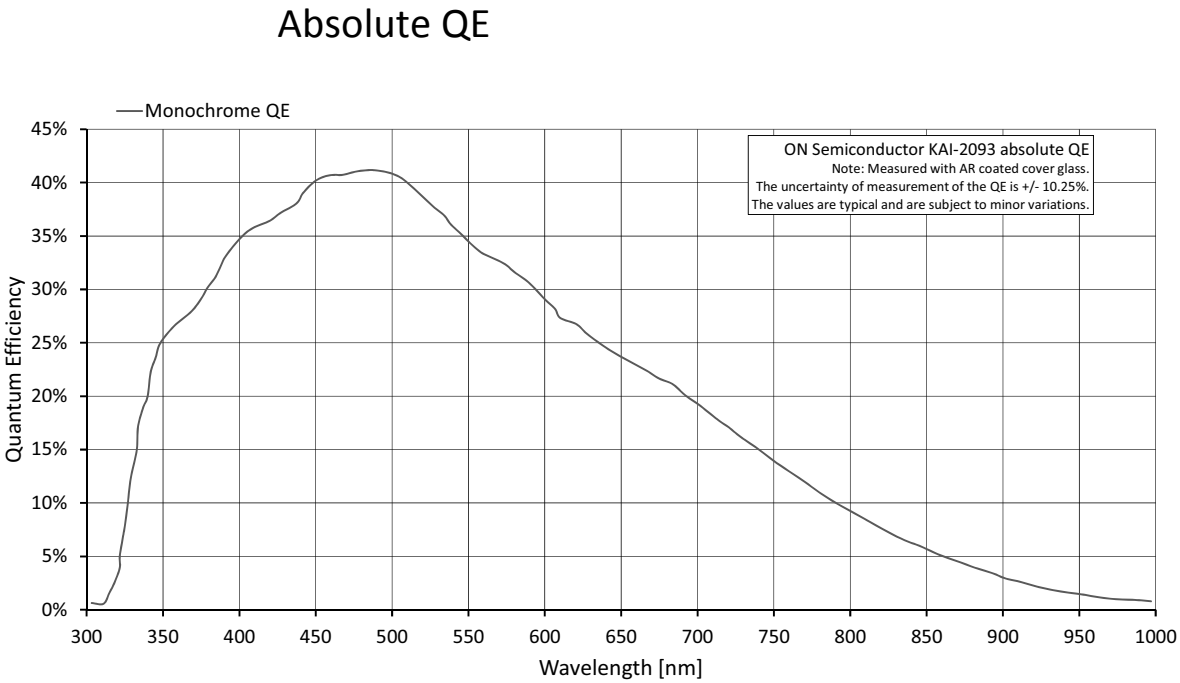


Figure 5: Prosilica GE1900 (ON Semiconductor KAI-2093) absolute QE

Prosilica GE1910, GE1910C

Feature	Specification	
	Prosilica GE1910	Prosilica GE1910C
Resolution	1920 (H) × 1080 (V) 2.1 MP	
Sensor	ON Semiconductor KAI-02150	
Sensor type	Interline CCD, Progressive Scan	
Sensor format	Type 2/3	
Sensor size	12.1 mm diagonal	
Pixel size	5.5 µm × 5.5 µm	
Lens mount	C-Mount	
Optical filter	No filter	IRC30 IR cut filter
Maximum frame rate at full resolution	32 frames per second	
A/D	12-bit	
Image buffer	32 MB	
Image bit depth	8/12	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixel formats		YUV411Packed
RGB color pixel formats		RGB8Packed, BGR8Packed, RGBA8Packed, BGRA8Packed, RGB12Packed
RAW pixel formats		BayerGR8, BayerGR12, BayerGR12Packed
Exposure control	10 µs to 53.7 s; 1 µs increments	
Gain control	0 to 34 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	Typical < 5 W at 12 VDC (full resolution and maximum frame rate)	
Mass (typical)	178 g	
Body dimensions (L × W × H)	80 × 51 × 39 mm	
Trigger latency	5 µs	
Trigger jitter	±10 ns	
Propagation delay (t_{pd})	90 ns	

Table 9: Prosilica GE1910, GE1910C camera specifications

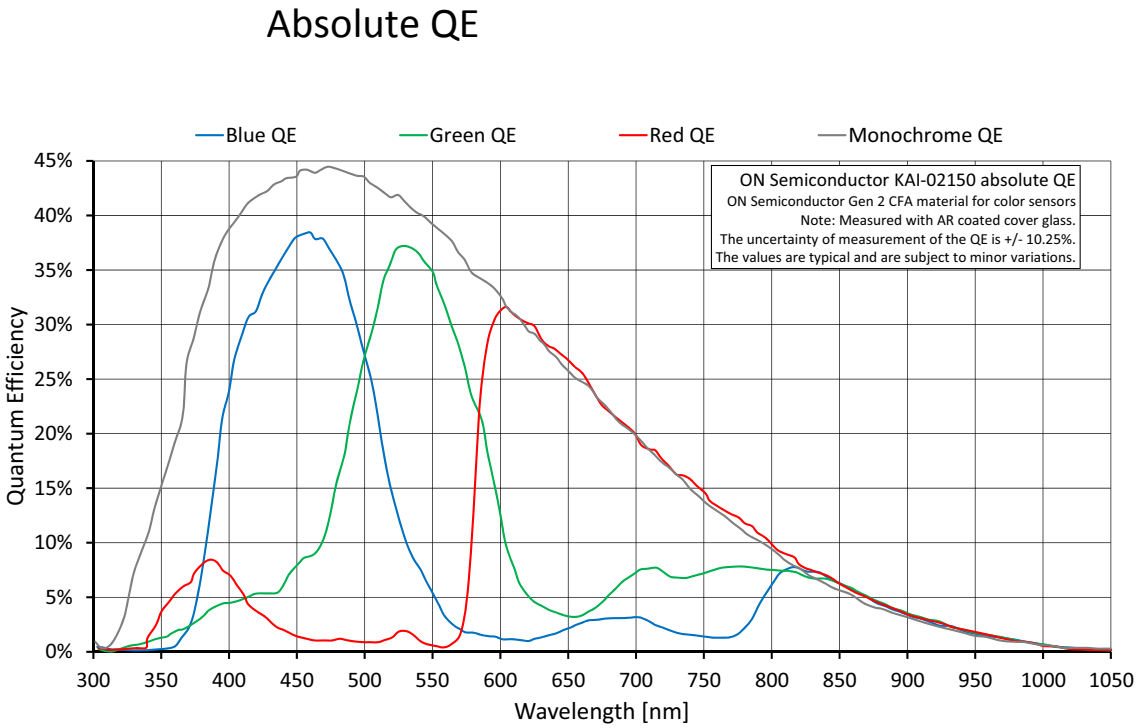


Figure 6: Prosilica GE1910, GE1910C (ON Semiconductor KAI-02150) absolute QE

Prosilica GE2040, GE2040C

Feature	Specification	
	Prosilica GE2040	Prosilica GE2040C
Resolution	2040 (H) × 2048 (V) 4.2 MP	
Sensor	ON Semiconductor KAI- 04022	
Sensor type	Interline CCD, Progressive Scan	
Sensor format	Type 1.2	
Sensor size	21.43 mm diagonal	
Pixel size	7.4 µm × 7.4 µm	
Lens mount	C-Mount	
Optical filter	No filter	IRC30 IR cut filter
Maximum frame rate at full resolution	15 frames per second	
A/D	12-bit	
Image buffer	32 MB	
Image bit depth	8/12	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixel formats		YUV411Packed
RGB color pixel formats		RGB8Packed, BGR8Packed, RGBA8Packed, BGRA8Packed, RGB12Packed
RAW pixel formats		BayerGR8, BayerGR12, BayerGR12Packed
Exposure control	75 µs to 53.7 s; 1 µs increments	
Gain control	0 to 34 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	Typical < 5.5 W at 12 VDC (full resolution and maximum frame rate)	
Mass (typical)	169 g	
Body dimensions (L × W × H)	80 × 51 × 39 mm	
Trigger latency	4.2 µs	
Trigger jitter	±10 ns	
Propagation delay (t_{pd})	90 ns	

Table 10: Prosilica GE2040, GE2040C camera specifications

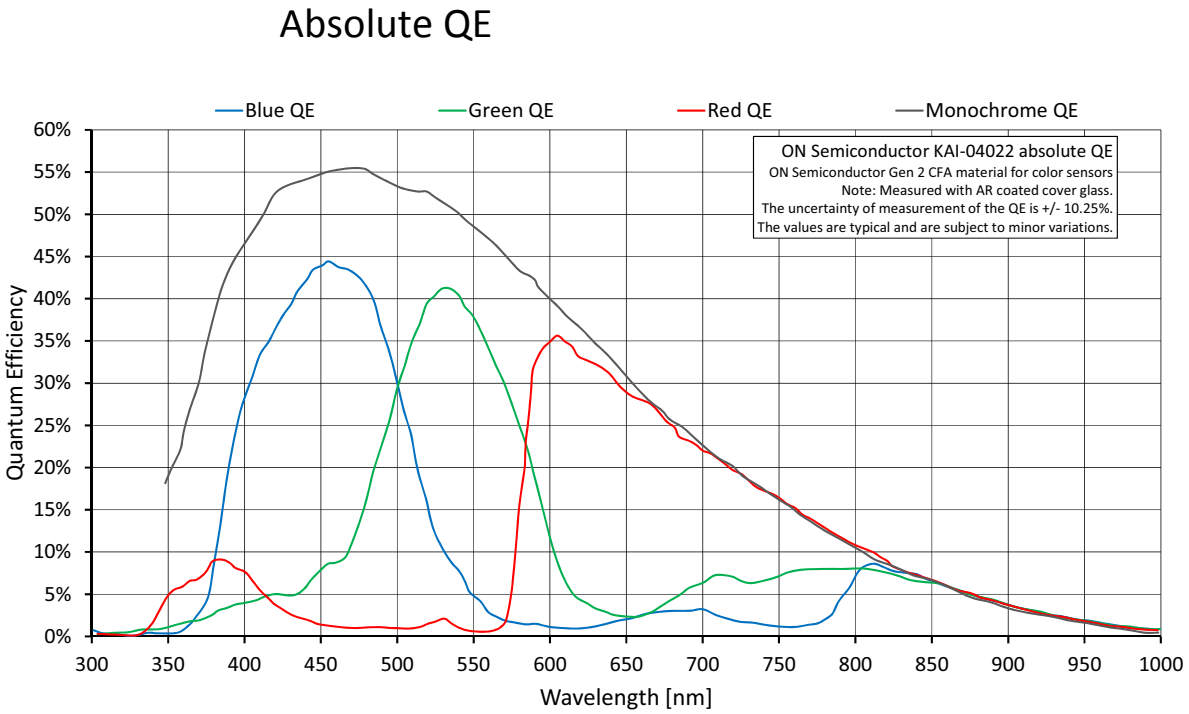


Figure 7: Prosilica GE2040, GE2040C (ON Semiconductor KAI-04022) absolute QE

Prosilica GE4000, GE4000C

Feature	Specification	
	Prosilica GE4000	Prosilica GE4000C
Resolution	4008 (H) × 2672 (V) 10.7 MP	
Sensor	ON Semiconductor KAI-11002	
Sensor type	Interline CCD, Progressive Scan	
Sensor format	Type 35 mm	
Sensor size	43.3 mm diagonal	
Pixel size	9 µm × 9 µm	
Lens mount	Default: F-Mount	
Optical filter	No filter	IRC30 IR cut filter
Maximum frame rate at full resolution	5 frames per second	
A/D	12-bit	
Image buffer	32 MB	
Image bit depth	8/12	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
RAW pixel formats		BayerGR8, BayerGR12, BayerGR12Packed
Exposure control	140 µs to 68.7 s; 1 µs increments	
Gain control	0 to 34 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	Typical < 6 W at 12 VDC (full resolution and maximum frame rate)	
Mass (typical)	402 g	
Body dimensions (L × W × H)	110 × 66 × 66 mm	
Trigger latency	4.2 µs	
Trigger jitter	±10 ns	
Propagation delay (t_{pd})	90 ns	

Table 11: Prosilica GE4000, GE4000C camera specifications

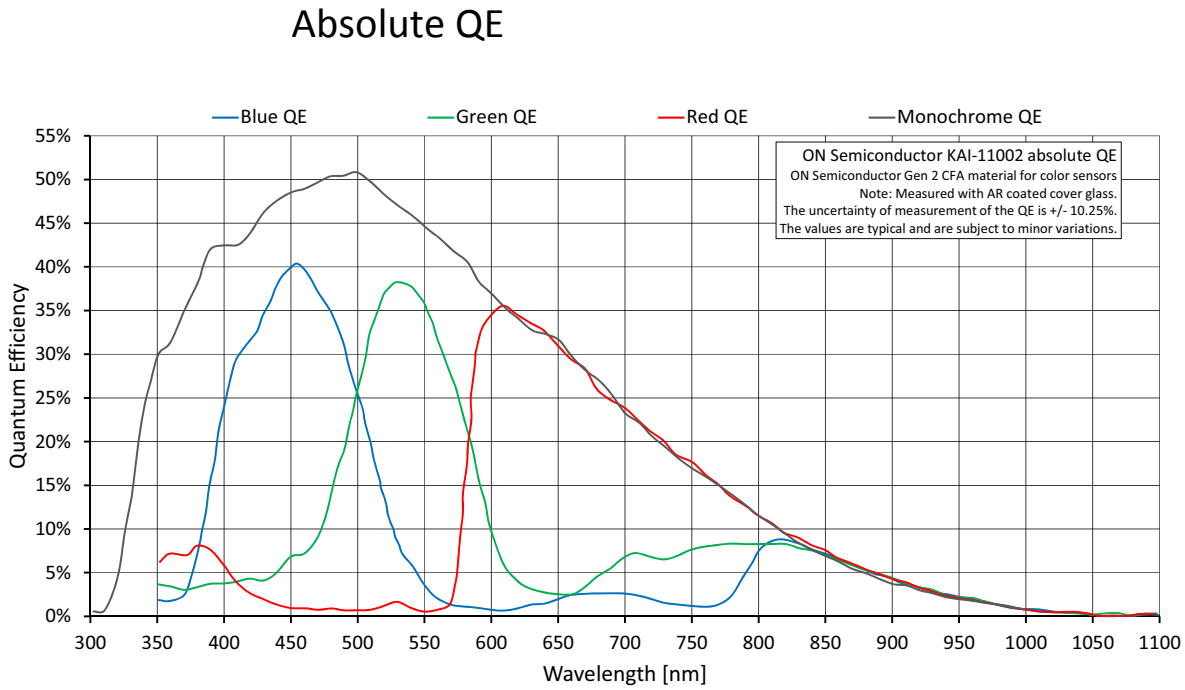


Figure 8: Prosilica GE4000, GE4000C (ON Semiconductor KAI-11002) absolute QE

Prosilica GE4900, GE4900C

Feature	Specification	
	Prosilica GE4900	Prosilica GE4900C
Resolution	4872 (H) × 3248 (V) 15.8 MP	
Sensor	ON Semiconductor KAI-16000	
Sensor type	Interline CCD, Progressive Scan	
Sensor format	Type 35 mm	
Sensor size	43.3 mm diagonal	
Pixel size	7.4 µm × 7.4 µm	
Lens mount	F-Mount	
Optical filter	No filter	IRC30 IR cut filter
Maximum frame rate at full resolution	3 frames per second	
A/D	12-bit	
Image buffer	32 MB	
Image bit depth	8/12	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
RAW pixel formats		BayerGR8, BayerGR12, BayerGR12Packed
Exposure control	625 µs to 68.7 s; 1 µs increments	
Gain control	0 to 34 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	Typical < 6 W at 12 VDC (full resolution and maximum frame rate)	
Mass (typical)	391 g	
Body dimensions (L × W × H)	110 × 66 × 66 mm	
Trigger latency	4.2 µs	
Trigger jitter	±10 ns	
Propagation delay (t_{pd})	90 ns	

Table 12: Prosilica GE4900, GE4900C camera specifications

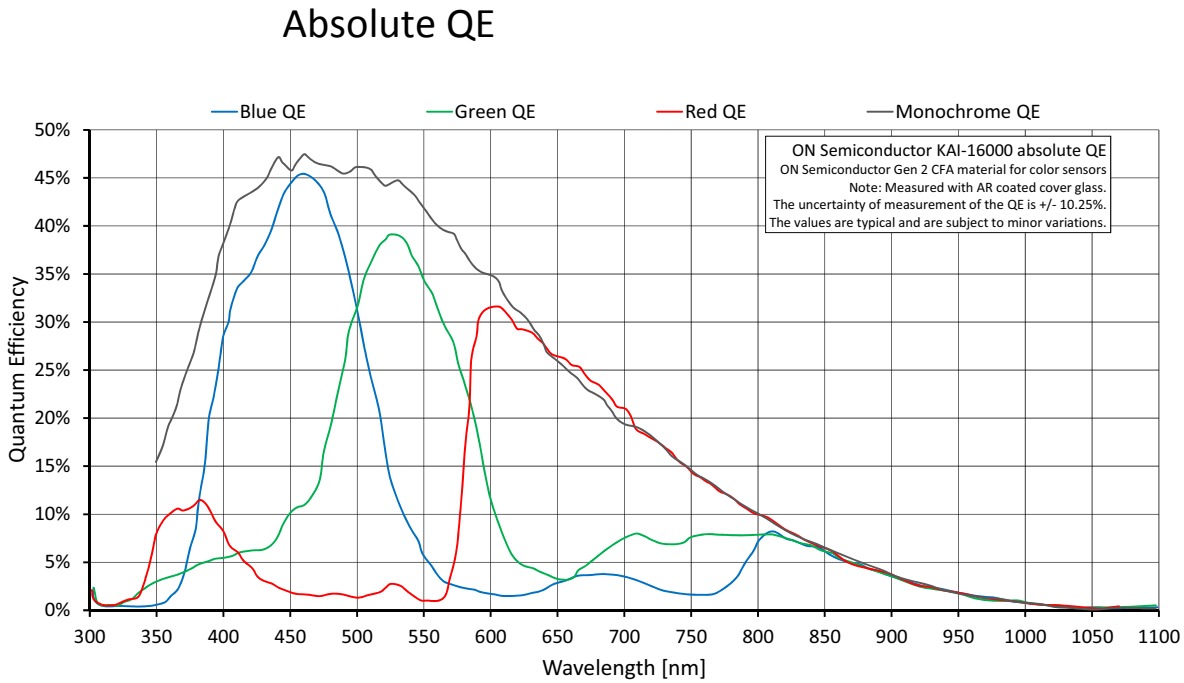


Figure 9: Prosilica GE4900, GE4900C (ON Semiconductor KAI-16000) absolute QE

Camera attribute highlights

Allied Vision cameras support a number of standard and extended features. The table below identifies a selection of interesting capabilities of the Prosilica GE camera family.

www

A complete listing of camera controls, including control definitions can be found online:

PvAPI users: GigE Camera and Driver Attributes document
Vimba users: GigE Features Reference

Control	Description
Gain control	Manual and auto
Exposure control	Manual and auto
White balance	Red and blue channel; manual and auto control
External trigger event	Rising edge, falling edge, any edge, level high, level low
External trigger delay	0 to 60* s; 1 µs increments
Fixed rate control	0.001 fps to maximum frame rate
Imaging modes	Free-running, external trigger, fixed rate, software trigger
Sync out modes	Trigger ready, trigger input, exposing, readout, imaging, strobe, GPO
Region of interest	Independent x and y control with 1 pixel resolution
Multicast	Streaming to multiple computers
Event channel	In-camera events including exposure start and trigger are asynchronously broadcasted to the host computer
Chunk data	Captured images are bundled with attribute information such as exposure and gain value
*May vary depending on the camera model	

Table 13: Prosilica GE camera and driver attribute highlights

IRC30 filter

All Prosilica GE color models are equipped with an infrared block filter (IR filter). This filter is employed to prevent infrared wavelength photons from passing to the sensor. In the absence of IR filter, images are dominated by red and incapable of being properly color balanced. Monochrome cameras do not employ an IR filter.

The figure below shows the filter transmission response for the IRC30 filter employed in the Prosilica GE cameras.

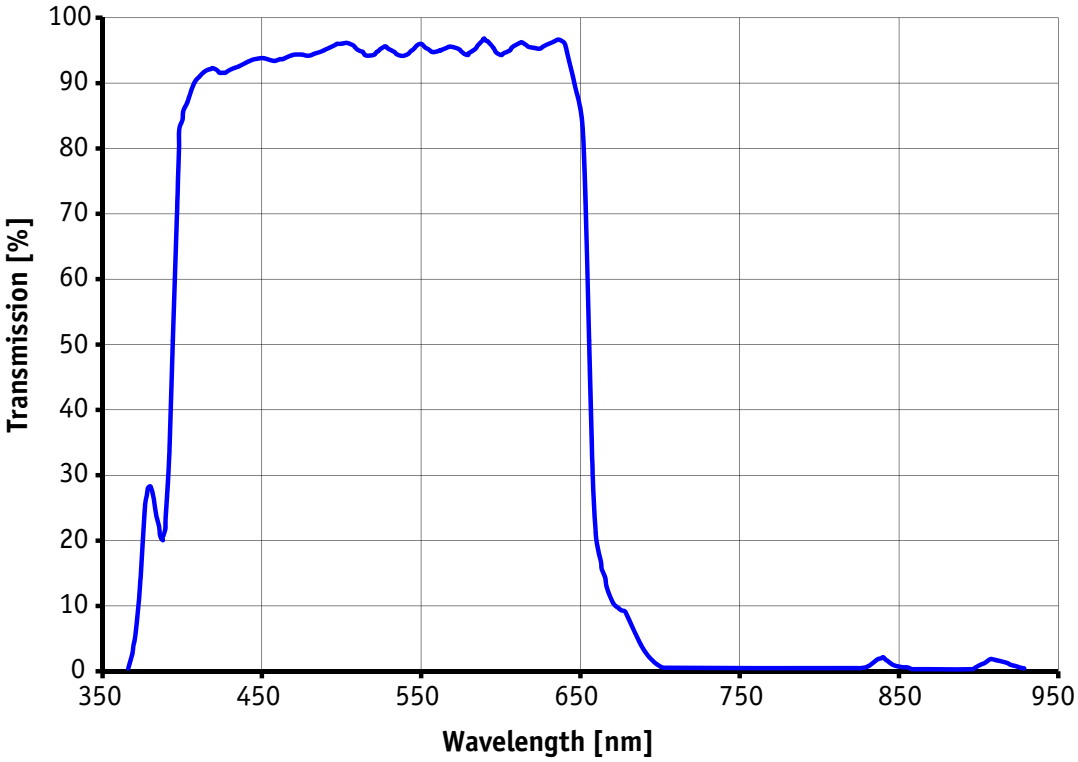


Figure 10: IRC30 filter transmission response

Camera dimensions

Prosilica GE C-Mount (adjustable)

Prosilica GE680, GE680C

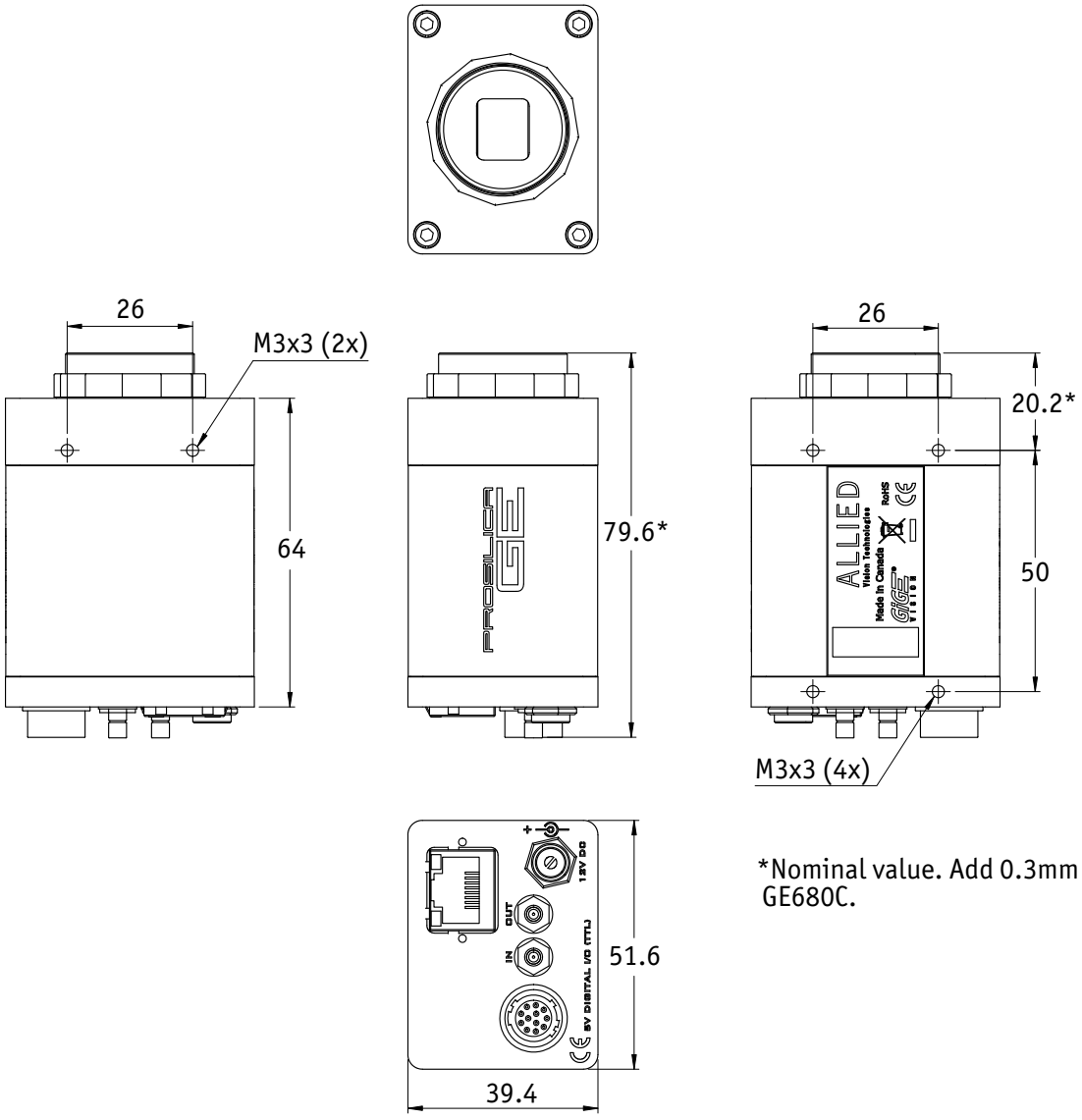


Figure 11: Prosilica GE680 adjustable C-Mount mechanical dimensions

Prosilica GE1050, GE1650, GE1660, GE1900, GE1910, GE2040

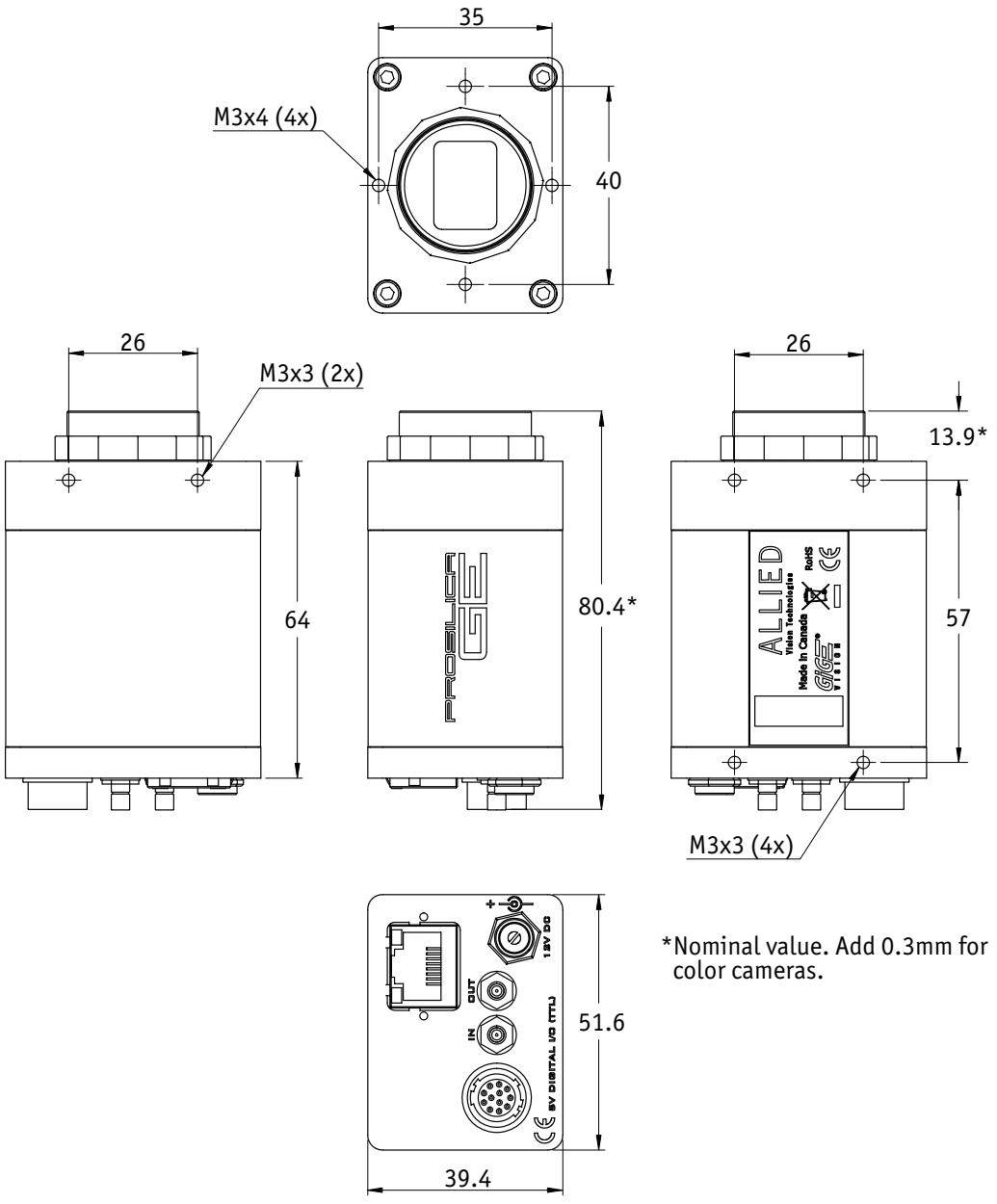


Figure 12: Prosilica GE adjustable C-Mount models mechanical dimensions

Prosilica GE F-Mount

Prosilica GE2040

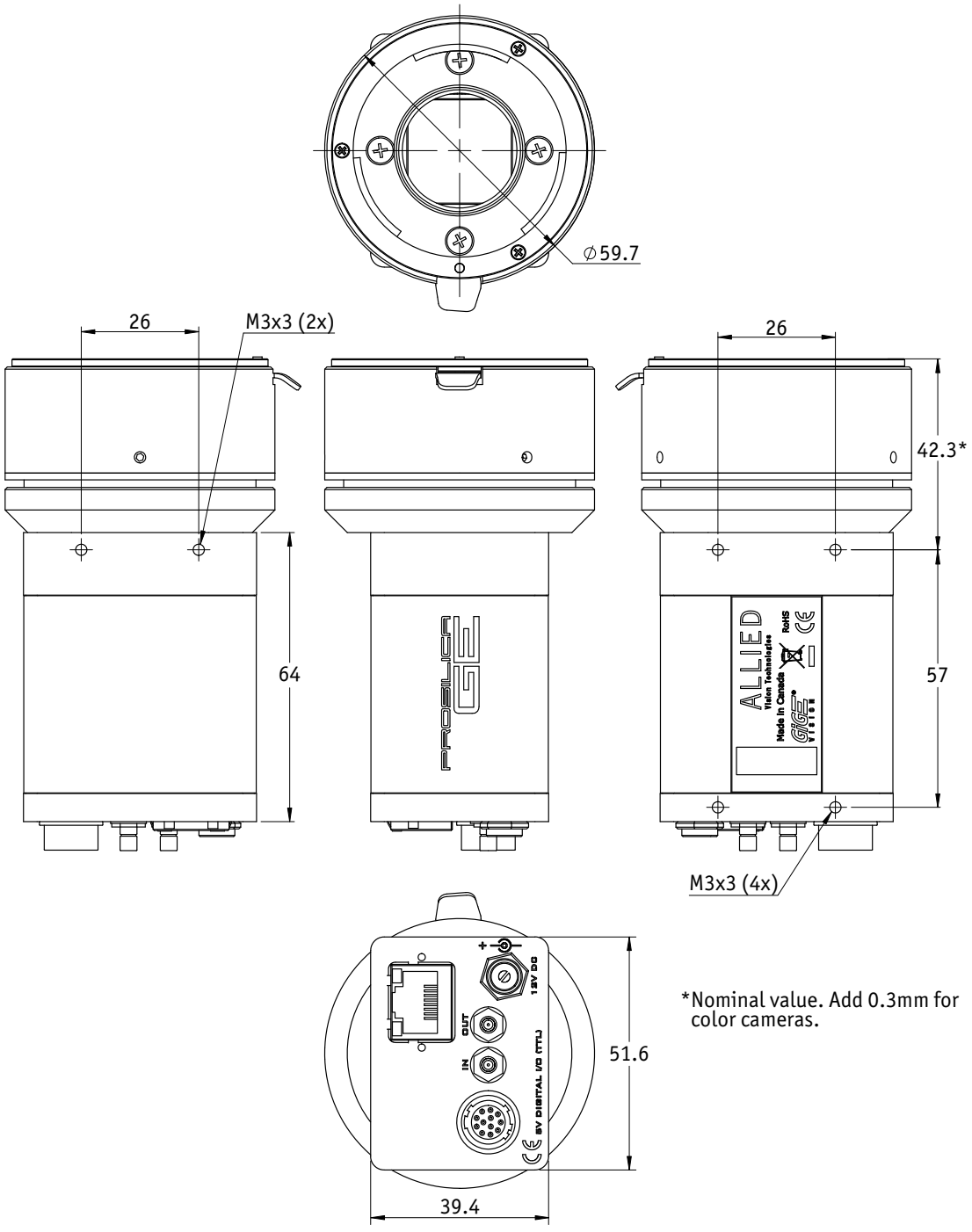


Figure 13: Prosilica GE F-Mount mechanical dimensions

Prosilica GE large format F-Mount

Prosilica GE4000, GE4900

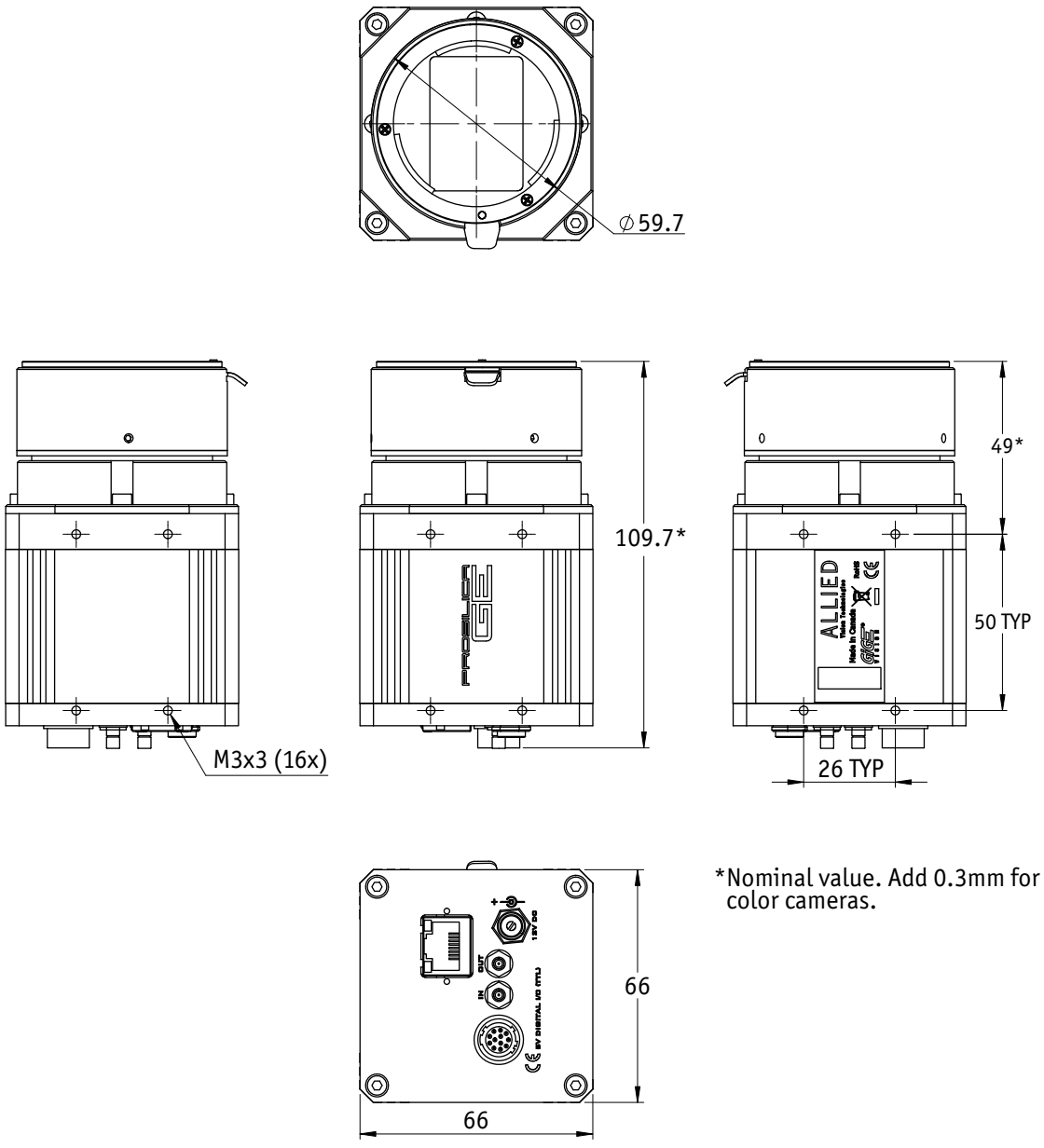


Figure 14: Prosilica GE large format F-Mount mechanical dimensions

Tripod adapter

A Prosilica GE camera can be mounted on a camera tripod by using a tripod adapter. The same mounting plate can be used for all models within the Prosilica GE camera family.

Note

Prosilica GE tripod adapter is available for purchase from Allied Vision.

Order code: 02-5000A

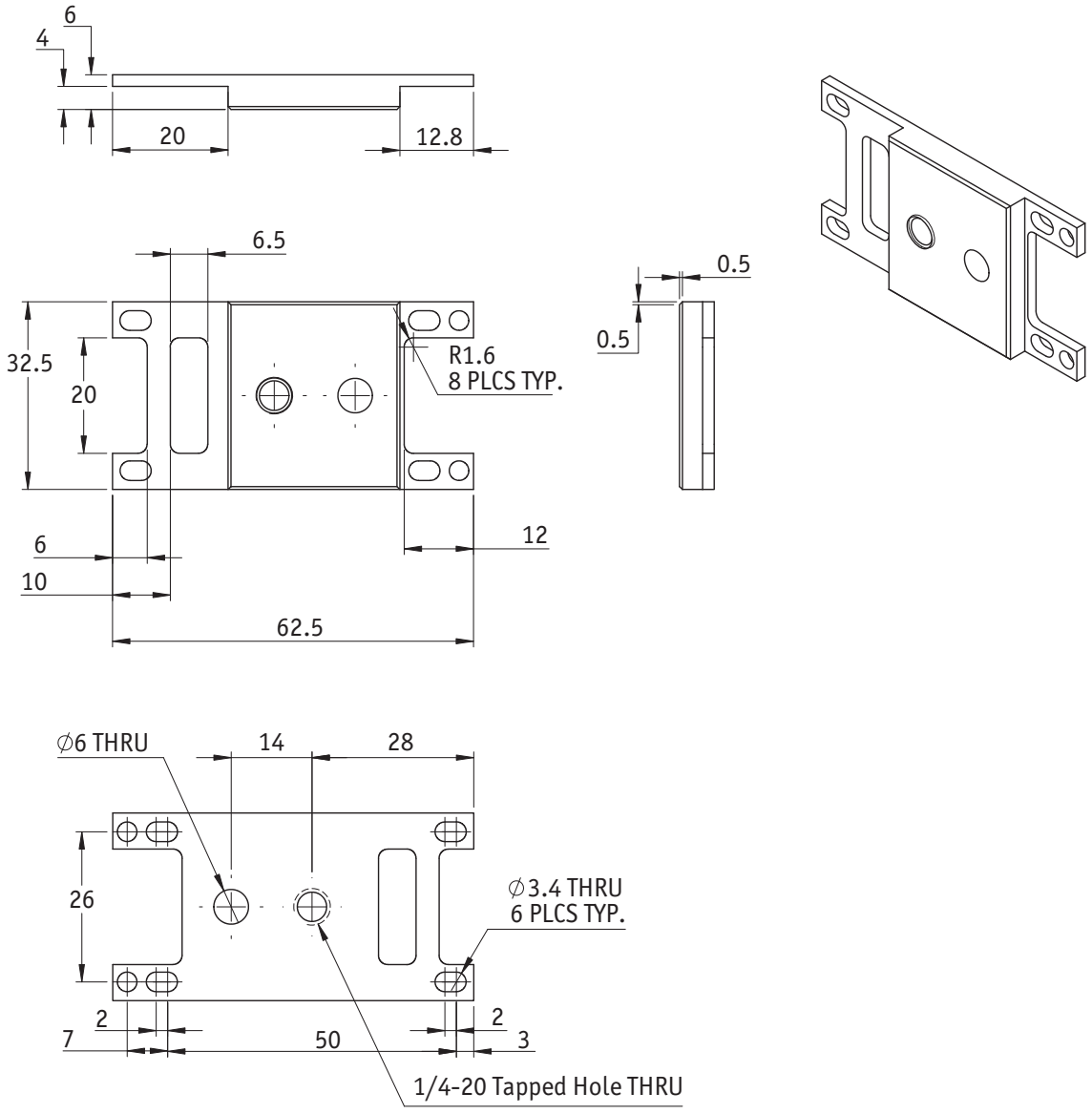


Figure 15: Prosilica GE tripod mount mechanical drawing

C-Mount flange focal distance

Flange focal distance is the optical distance from the mounting flange to image sensor die. Prosilica GE C-Mount cameras are optically calibrated to a standard 17.526 mm optical flange focal distance, with a ±10 µm tolerance.

Prosilica GE standard format cameras are shipped with adjustable C-Mount.

Adjustment of C-Mount

The C-Mount is adjusted at the factory and should not require adjusting. If for some reason the lens mount requires adjustment, use the following method.

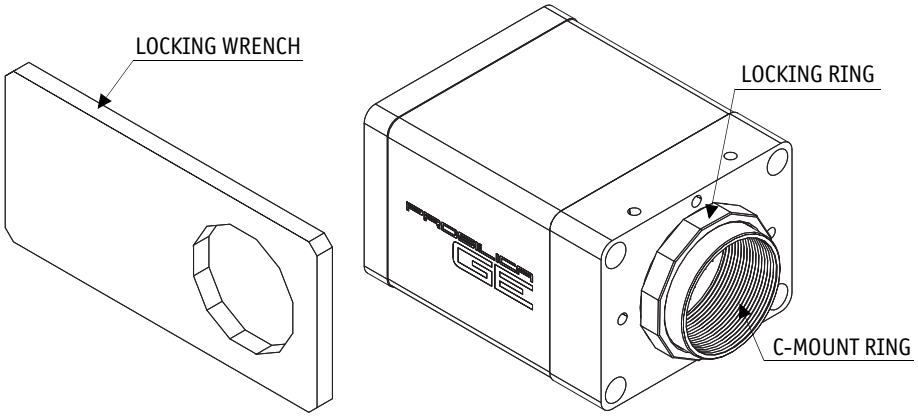


Figure 16: Prosilica GE C-Mount camera and locking wrench

Loosen locking ring

Use an adjustable wrench to loosen the locking ring. Be careful not to scratch the camera. When the locking ring is loose, unthread the ring a few turns from the camera face.

Note

A wrench suitable for this procedure is available for purchase from Allied Vision.
Order code: 02-5003A

Image to infinity

Use a C-Mount compatible lens that allows an infinity focus. Set the lens to infinity and image a distant object; 10 to 15 m should suffice. Make sure the lens is firmly threaded onto the C-Mount ring. Rotate the lens and C-Mount ring until the image is focused. Carefully tighten the locking ring and recheck focus.

Lens protrusion for C-Mount cameras

Lens protrusion is the distance from outer edge of C-Mount ring to contact point of first surface internal to C-Mount ring. For color cameras this surface is the IR-filter holder, and for mono cameras this surface is the internal camera front plate (see figure 17:). Table 14 presents lens protrusion values for Prosilica GE cameras with C-Mount.

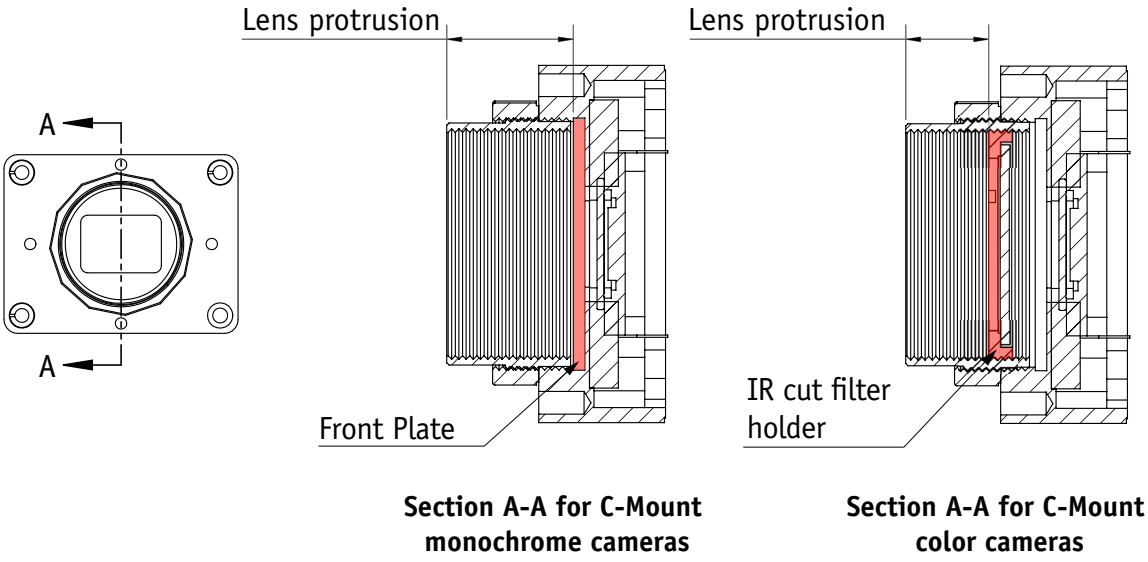


Figure 17: Cross section of typical Prosilica GE front assembly with C-Mount

Model	Lens protrusion [mm]
Prosilica GE680	13.64
Prosilica GE680C	9.01
Prosilica GE1050	13.64
Prosilica GE1050C	9.71
Prosilica GE1650	13.64
Prosilica GE1650C	9.20
Prosilica GE1660	13.64

Model	Lens protrusion [mm]
Prosilica GE1660C	9.67
Prosilica GE1900	13.64
Prosilica GE1910	13.64
Prosilica GE1910C	9.67
Prosilica GE2040	13.64
Prosilica GE2040C	13.64

Table 14: Lens protrusion for Prosilica GE cameras with C-Mount

F-Mount flange focal distance

Flange focal distance is the optical distance from the mounting flange to image sensor die. Prosilica GE F-Mount cameras are optically calibrated to a standard 46.5 mm optical flange focal distance.

Adjustment of F-Mount

The F-Mount is adjusted at the factory and should not require adjusting. If for some reason, the lens mount requires adjustment, use the following method.

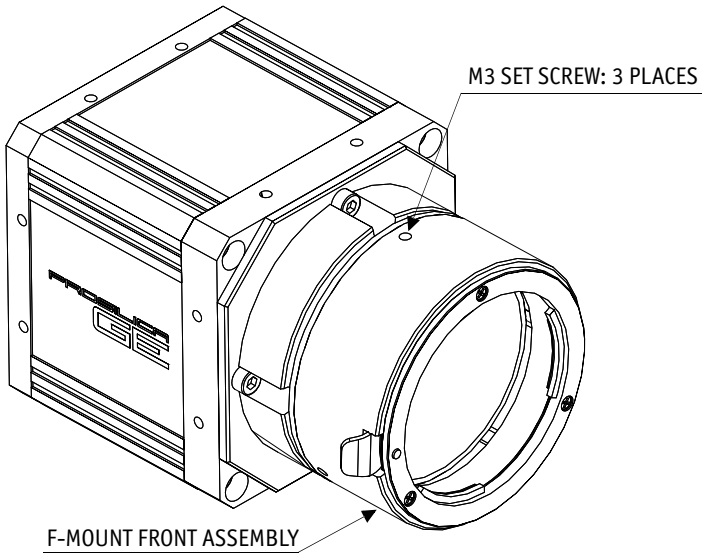


Figure 18: Prosilica GE F-Mount isometric view

Attach F-Mount compatible lens

Use an F-Mount compatible lens that allows an infinity focus. Attach the lens to the camera using a counter-clockwise rotation of about a quarter turn. The lens should snap into place such that the lens flange and camera flange mate over the full circumference.

Loosen F-Mount front assembly

Use a 1.5 mm hex wrench to loosen the three set screws than hold the F-Mount front assembly to the camera body.

Image to infinity

Set the lens to infinity and image a distant object; 10 to 15 m should suffice. Gently move the F-Mount front until focused and lock it in place.

Camera interfaces

This chapter provides information on Gigabit Ethernet port, inputs and outputs, and trigger features.

www Accessories

Please contact the Allied Vision Sales team or your local Allied Vision distribution partner for information on accessories:

https://www.alliedvision.com/en/about-us/where-we-are.html

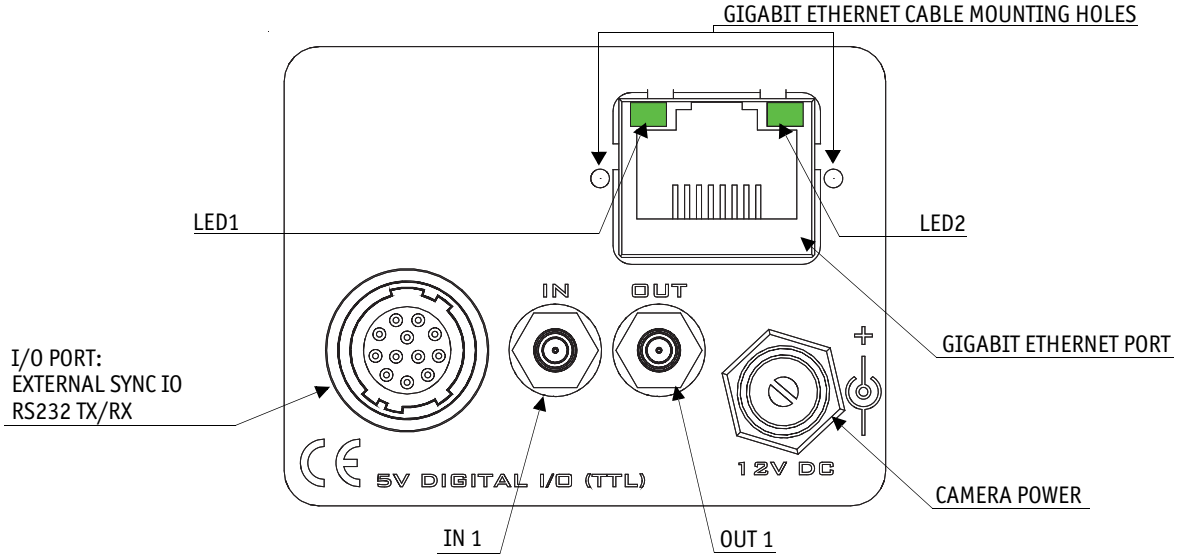


Figure 19: Prosilica GE connection ports

Status LEDs

The color of the LEDs have the following meaning:

	LED color	Status
LED1	Flashing/solid green	Ethernet activity
LED2	Flashing green	Camera is powered
	Solid green	Camera is booted, and link with the host is established

Table 15: Prosilica GE status LEDs

Note

Once the camera is booted, LED2 will remain solid green as long as the camera is powered, even if connection with the host is lost.

Gigabit Ethernet port

The Gigabit Ethernet port conforms to the IEEE 802.3 1000BASE-T standard for Gigabit Ethernet over copper. Allied Vision recommends using Category 6 or higher compatible cabling and connectors for best performance.

www

The *GigE Installation Manual* offers detailed instructions for using Prosilica GE cameras.

https://www.alliedvision.com/en/support/technical-documentation/prosilica-ge-documentation.html

Note

See the *Hardware Selection for Allied Vision GigE Cameras* application note for a list of recommended Ethernet adapters:

https://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

Note

A standard Ethernet adapter is available for purchase from Allied Vision:
Order code: 02-3002A
Model: Intel Pro 1000/PT

Note

Cable lengths up to 100 m are supported.

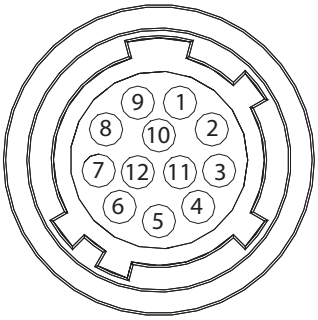
The 8P8C RJ45 jack has the pin assignment according to the Ethernet standard (IEEE 802.3 1000BASE-T).

Note

Prosilica GE cameras support cables with horizontal locking screw connector for a secured connection (see figure 19:).

Allied Vision recommends using locking-screw cables from Components Express, Inc. for a perfect fit. Visit the CEI product configurator to customize the cable according to your needs.

Camera I/O connector pin assignment



Camera side Hirose HR10A-10R-12SB connector					
Pin	**Signal**	**Direction**	**Level**	**Description**	**I/O cable color code**
1	In 1	In	TTL Maximum 5 V	Camera input galvanic isolated (SyncIn1)	Blue
2	Out 2	Out	TTL Maximum 5 V	Camera output 2 galvanic isolated (SyncOut2)	Red
3	Out 3	Out	TTL Maximum 5 V	Camera output 3 galvanic isolated (SyncOut3)	Pink
4	RxD RS232	In	RS232	Terminal receive data	Grey
5	TxD RS232	Out	RS232	Terminal transmit data	Yellow
6	Reserved	---	---	---	Green
7	Reserved	---	---	---	Brown
8	Reserved	---	---	---	White
9	Reserved	---	---	---	Black
10	Isolated IO GND	In/Out	Common GND for In/Out	Isolated input and output signal ground	Orange
11	Isolated IO GND	In/Out	Common GND for In/Out	Isolated input and output signal ground	White/Black
12	Isolated IO GND	In/Out	Common GND for In/Out	Isolated input and output signal ground	White/Brown

Table 16: Camera I/O connector pin assignment and cable color coding

Note

For cable color and pin out information, see the *Allied Vision I/O cable data sheet*:

https://www.alliedvision.com/en/support/technical-documentation/accessories-data-sheets.html

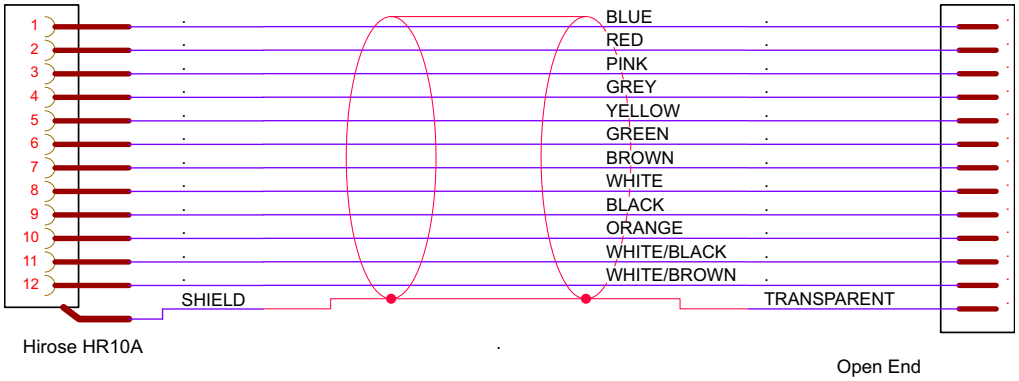


Figure 20: Prosilica GE I/O cable color coding

The general purpose I/O port uses a Hirose HR10A-10R-12SB connector on the camera side. The mating cable connector is Hirose HR10A-10P-12P.

Note

This cable side Hirose connector can be purchased from Allied Vision.

Order code: K7600039

I/O definition

Camera power

The Prosilica GE camera family supports a wide input power voltage range. The camera will not power in reverse polarity. Exceeding the voltage range specified below will damage the camera.

Caution

5 to 24 V. 12 V nominal.

Note

Prosilica GE has a built-in power barrel connector (Switchcraft PC712a). A 12 V power adapter with barrel connection plug (Switchcraft 760K)is available for purchase from Allied Vision:

- Order code: 02-8005C North America Supply.
- Order code: 02-8010C Universal Supply.

Isolated IO GND

Isolated IO GND must be connected to the user's external circuit ground if In 1, Out 1, Out 2, Out 3, RxD RS232, and TxD RS232 is to be used. Note that Isolated IO GND is common with power ground; however, it is good practice to provide a separate ground connection for power and signaling when designing the cabling.

RxD RS232 and TxD RS232

These signals are RS232 compatible. These signals allow communication from the host system via the Ethernet port to a peripheral device connected to the camera. Note that these signals are not isolated; therefore, cabling should be carefully designed for the noisy environments.

Input triggers

In 1

In 1 allows the camera to be synchronized to an external event. The camera can be programmed to trigger on the rising edge, falling edge, both edges, or level of this signal. The camera can also be programmed to capture an image at some programmable delay time after the trigger event.

Caution

Do not exceed 5.5 V on In 1.

The Mini-SMB trigger input is internally connected to the In 1 of the general purpose I/O port. The Mini-SMB port on the camera uses an Amphenol 903-406J-51R connector. A suitable mating cable connector is Amp 413985-3 which can be used with RG174 coaxial cable.

Note

SMB to SMB cables are available for purchase from Allied Vision with various lengths. Example:

Order code: 02-6007A

Output signals

Out 1

This Mini-SMB trigger output is not internally connected to other camera output pins of the Camera I/O connector described above. This connector is particularly useful for triggering multiple cameras in a “daisy chain” fashion. It can be configured as follows:

Exposing	Corresponds to when camera is integrating light
Trigger Ready	Indicates when the camera will accept a trigger signal
Trigger Input	A relay of the trigger input signal used to “daisy chain” the trigger signal for multiple cameras
Readout	Valid when camera is reading out data
Imaging	Valid when camera is exposing or reading out
Strobe	Programmable pulse based on one of the above events
GPO	User programmable binary output

Any of the above signals can be set for active high or active low. The Mini-SMB port on the camera uses an Amphenol 903-406J-51R connector. A suitable mating cable connector is Amp 413985-3 which can be used with RG174 coaxial cable.

Note

SMB to BNC cables are available for purchase from Allied Vision.

Order code: 02-6014A

Out 2 and Out 3

Out 2 and Out 3 can be configured to active high or active low. The internal camera signals are listed as follows:

Exposing	Corresponds to when camera is integrating light
Trigger Ready	Indicates when the camera will accept a trigger signal
Trigger Input	A relay of the trigger input signal used to “daisy chain” the trigger signal for multiple cameras
Readout	Valid when camera is reading out data
Imaging	Valid when camera is exposing or reading out
Strobe	Programmable pulse based on one of the above events
GPO	User programmable binary output

Auto iris video type

This signal can be used to drive the video input of a video iris lens.

Reserved

These signals are reserved for future use and should be left disconnected.

Camera I/O connector internal circuit diagram

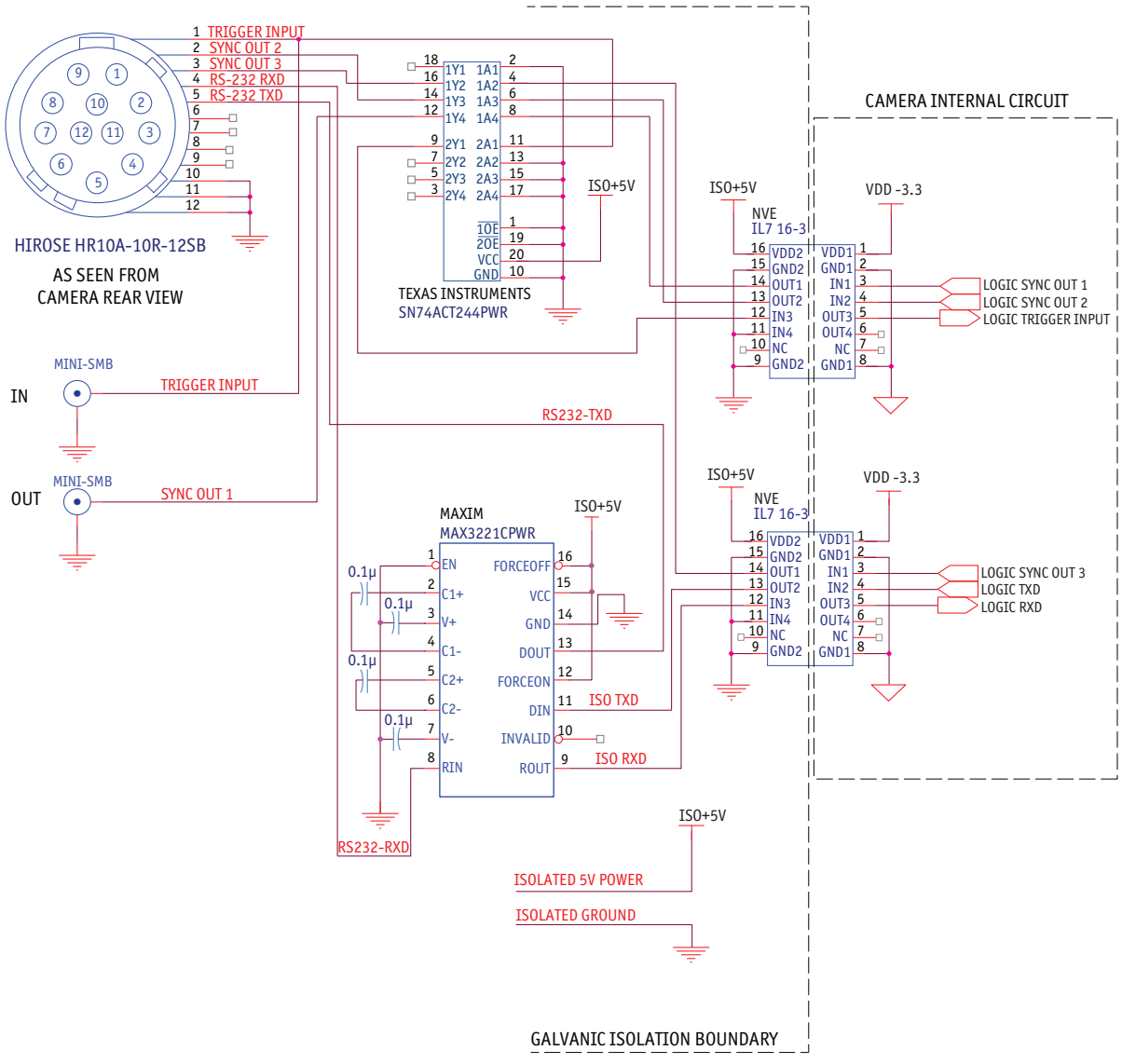


Figure 21: Prosilica GE internal circuit diagram

Maxim MAX3221CPWR Used to drive the RS232 signal logic via the external connector.	Texas Instruments SN74ACT244PWR Used as trigger buffer/driver. The required trigger input current is less than 10 µA and the maximum sync output current is 24 mA.

Camera I/O connector external circuit example

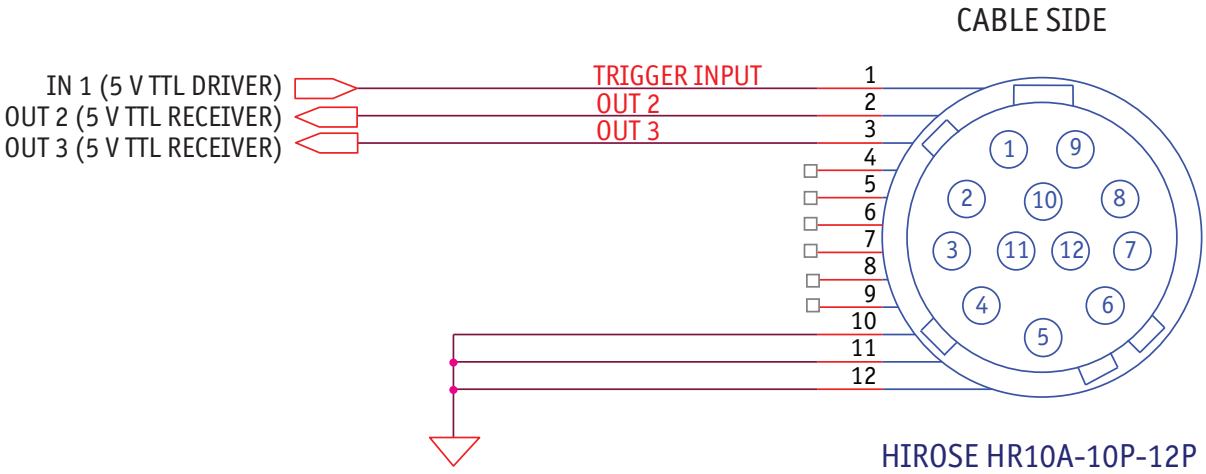


Figure 22: Prosilica GE external circuit

The trigger circuit is connected to a Texas Instruments SN74ACT244PWR buffer/driver inside the camera.

Caution

Input: Incoming trigger must be able to source 10 µA.

Output: Sync output current is 24 mA.

In 1, Out 1 external circuit example

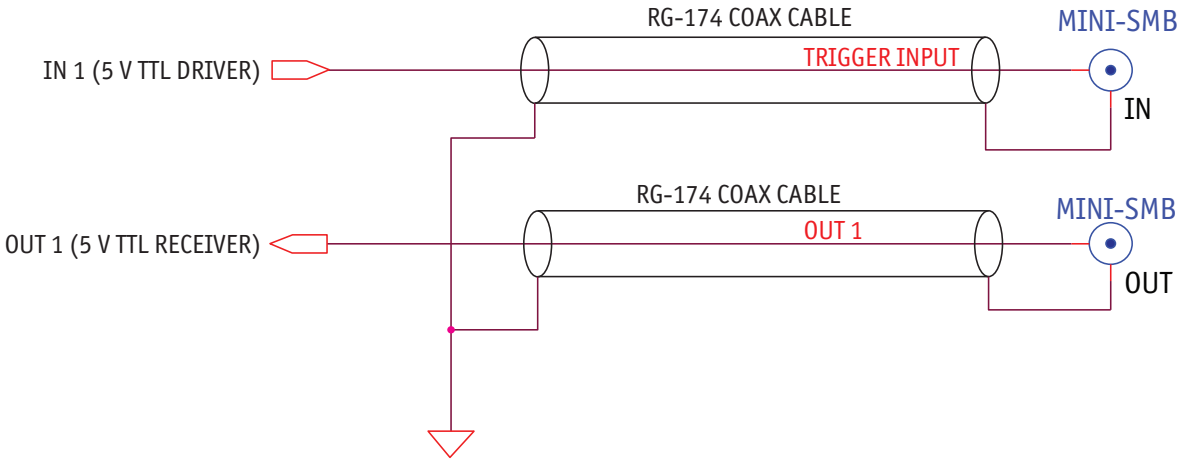


Figure 23: Prosilica GE In 1, Out 1 external circuit

The trigger circuit is connected to a Texas Instruments SN74ACT244PWR buffer/driver inside the camera. Note that the trigger input signal is not terminated to match the cable impedance.

Caution

Input: The required trigger input current is less than 10 µA.

Output: The maximum sync output current is 24 mA.

Trigger timing diagram

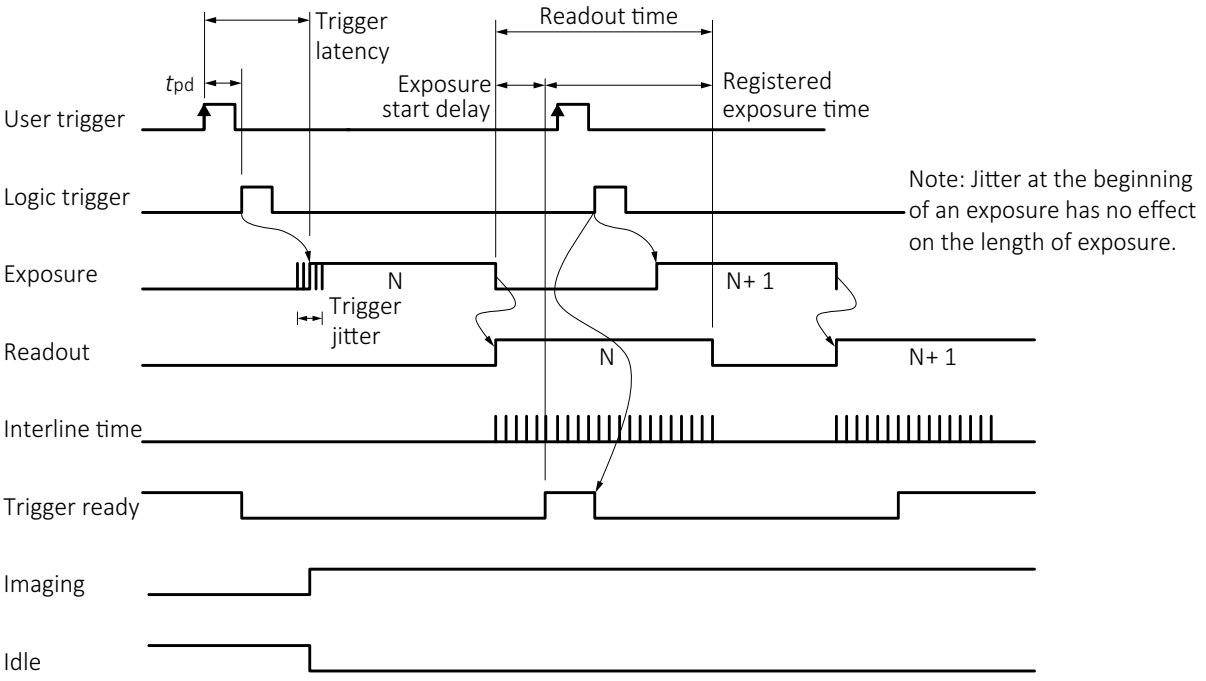


Figure 24: Prosilica GE internal signal timing waveforms

Notes on triggering

Term	Definition
User trigger	Trigger signal applied by the user (hardware trigger, software trigger)
Logic trigger	Trigger signal seen by the camera internal logic (not visible to the user)
t_{pd}	Propagation delay between the user trigger and the logic trigger
Exposure	High when the camera image sensor is integrating light
Readout	High when the camera image sensor is reading out data
Trigger latency	Time delay between the user trigger and the start of exposure
Trigger jitter	Error in the trigger latency time

Table 17: Explanation of signals in timing diagram

Term	Definition
Trigger ready	Indicates to the user that the camera will accept the next trigger
Registered exposure time	Exposure time value currently stored in the camera memory
Exposure start delay	Registered exposure time subtracted from the readout time and indicates when the next exposure cycle can begin such that the exposure will end after the current readout
Interline time	Time between sensor row readout cycles
Imaging	High when the camera image sensor is either exposing and/or reading out data
Idle	High if the camera image sensor is not exposing and/or reading out data

Table 17: Explanation of signals in timing diagram (continued)

Trigger rules

Note

The user trigger pulse width should be at least three times the width of the trigger latency as indicated in Chapter Specifications on page 15.

- The end of exposure will always trigger the next readout.
- The end of exposure must always end after the current readout.
- The start of exposure must always correspond with the interline time if readout is true.
- Exposure start delay equals the readout time minus the registered exposure time.

Triggering during the idle state

For applications requiring the shortest possible *Trigger Latency* and the smallest possible *Trigger Jitter* the *User Trigger* signal should be applied when *Imaging* is false and *Idle* is true. In this case, *Trigger Latency* and *Trigger Jitter* are as indicated in the camera specifications.

Triggering during the readout state

For applications requiring the fastest triggering cycle time whereby the camera image sensor is exposing and reading out simultaneously, apply the *User Trigger* signal as soon as a valid *Trigger Ready* is detected. In this case, *Trigger Latency* and *Trigger Jitter* can be up to 1 row time since *Exposure* must always begin on an *Interline* boundary.

Firmware update

Firmware updates are carried out via the GigE connection. Allied Vision provides an application for all Prosilica GE cameras that loads firmware to the camera using a simple interface. New feature introductions and product improvements motivate new firmware releases. All users are encouraged to use the newest firmware available and complete the firmware update if necessary.

www

Download the latest GigE firmware loader from the Allied Vision website:
https://www.alliedvision.com/en/support/firmware

www

For more information on GigE firmware update:

https://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

Resolution and ROI frame rate

This section provides the performance information that identifies the impact of reducing the region of interest on the camera's maximum frame rate.

Note

- Frame rate data was generated using StreamBytesPerSecond = 124 MB/s and an 8 bit pixel format such as Mono8, BayerGR8, or BayerRG8. Frame rates may be lower if using network hardware incapable of 124 MB/s.
- The camera frame rate can be increased by reducing the camera's Height attribute, resulting in a decreased region of interest (ROI) or "window".
- The camera frame rate can also be increased by increasing the camera's BinningY attribute, resulting in a vertically scaled image (less overall height with same field of view).
- There is no frame rate increase with reduced width.

Prosilica GE680, GE680C

$$\text{Frame rate} = \frac{1}{9.49\ \mu s \times \text{Height} + 320.06\ \mu s}$$

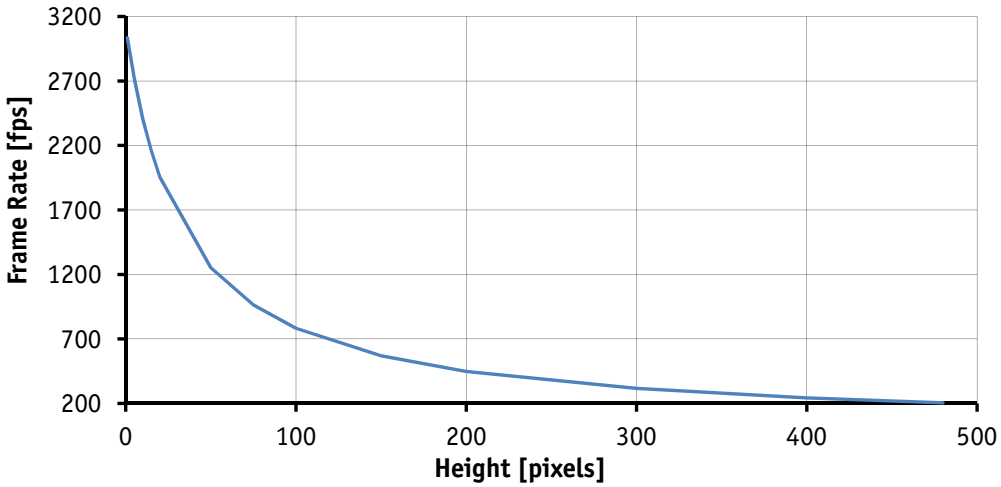


Figure 25: Frame rate as a function of ROI height

Prosilica GE1050, GE1050C

$$\text{Frame rate} = \frac{1}{11.72\ \mu s \times \text{Height} + 4948.66\ \mu s}$$

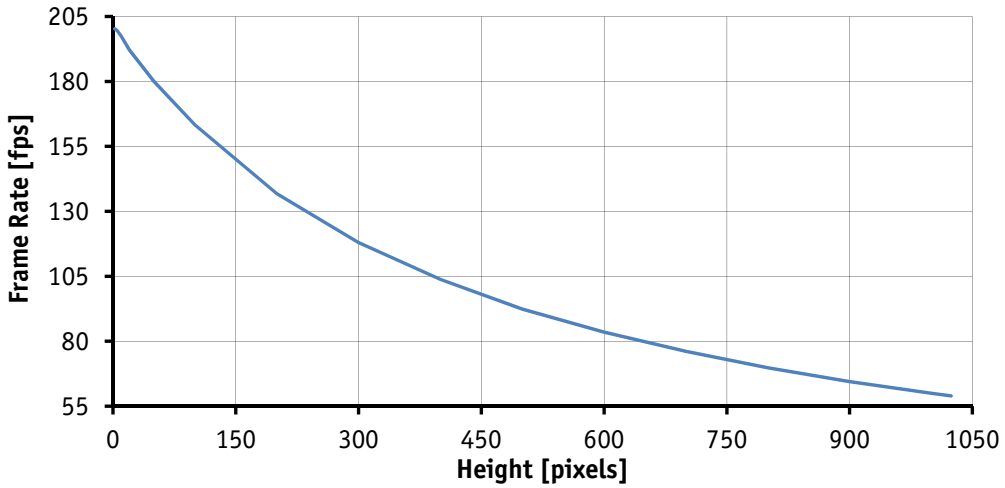


Figure 26: Frame rate as a function of ROI height

Prosilica GE1650, GE1650C

$$\text{Frame rate} = \frac{1}{17.61\ \mu s \times \text{Height} + 10119.0\ \mu s}$$

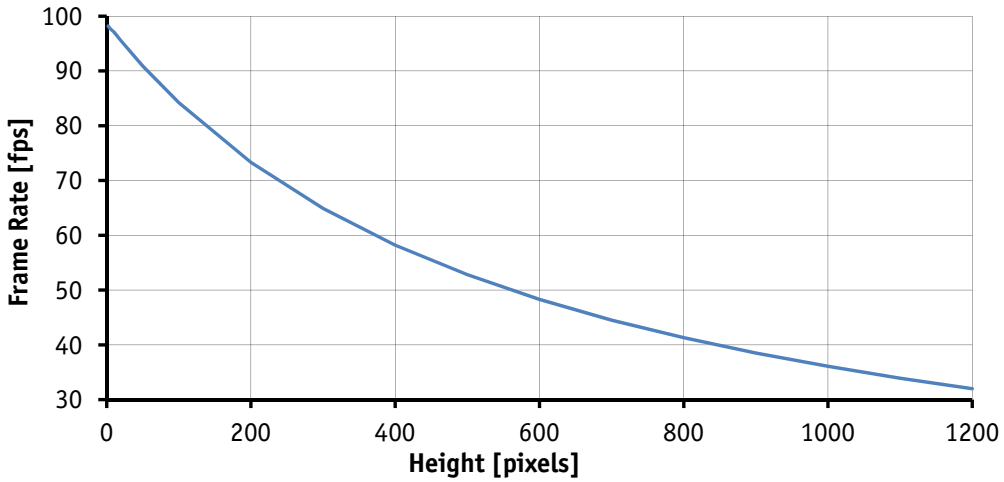


Figure 27: Frame rate as a function of ROI height

Prosilica GE1660, GE1660C

$$\text{Frame rate} = \frac{1}{17.99\ \mu s \times \text{Height} + 7398.16\ \mu s}$$

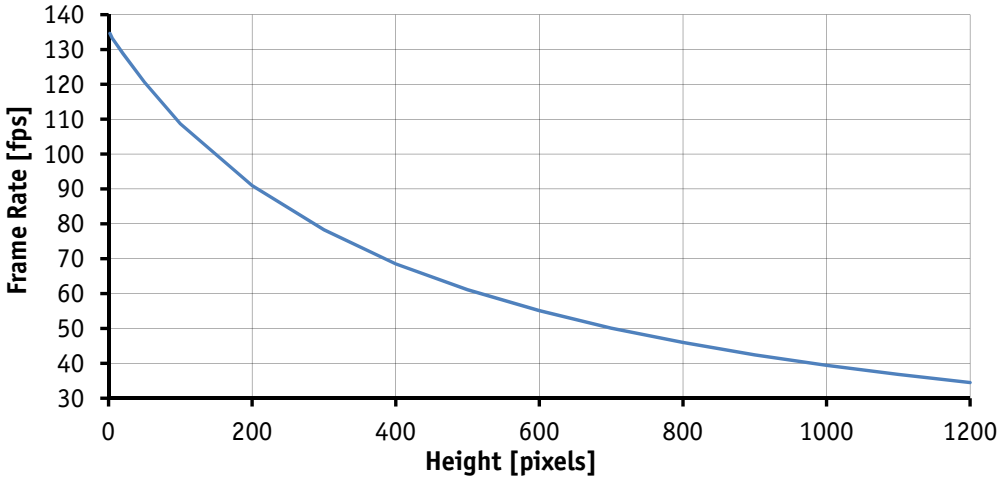


Figure 28: Frame rate as a function of ROI height

Prosilica GE1900

$$\text{Frame rate} = \frac{1}{18.31\ \mu s \times \text{Height} + 13114.72\ \mu s}$$

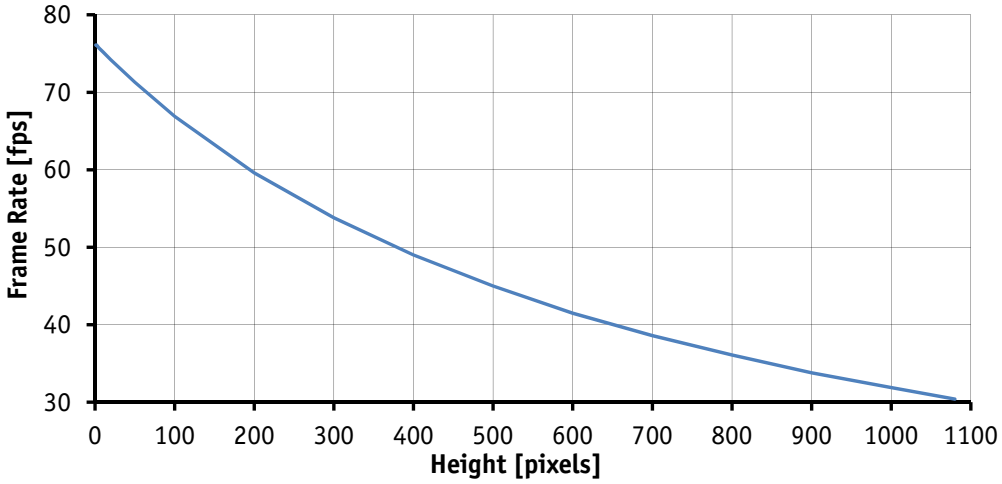


Figure 29: Frame rate as a function of ROI height

Prosilica GE1910, GE1910C

$$\text{Frame rate} = \frac{1}{21.35\ \mu s \times \text{Height} + 7526.47\ \mu s}$$

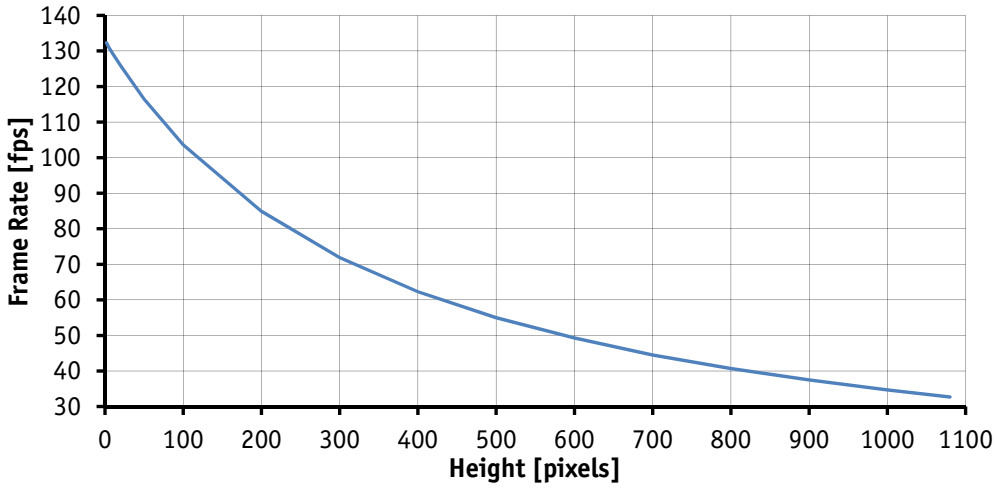


Figure 30: Frame rate as a function of ROI height

Prosilica GE2040, GE2040C

$$\text{Frame rate} = \frac{1}{15.63\ \mu s \times \text{Height} + 33773.85\ \mu s}$$

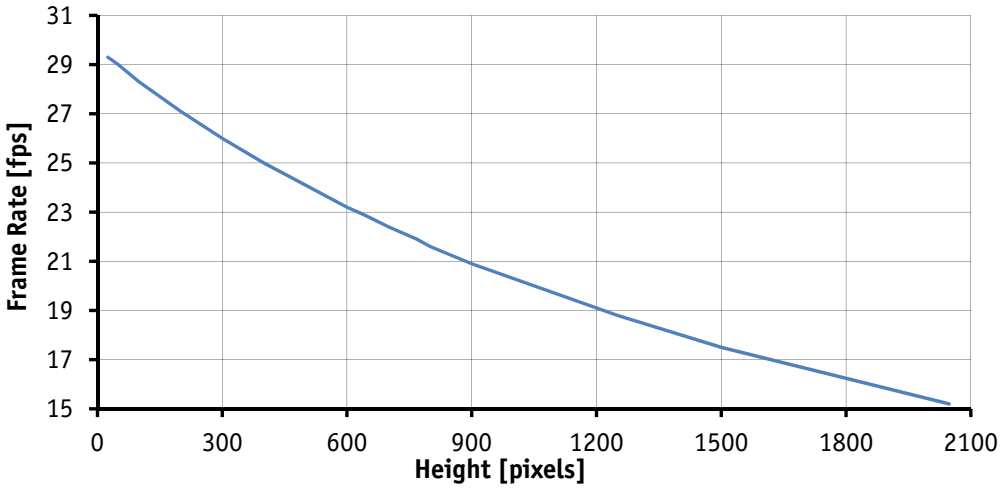


Figure 31: Frame rate as a function of ROI height

Prosilica GE4000, GE4000C

$$\text{Frame rate} = \frac{1}{52.45\ \mu s \times \text{Height} + 56713.22\ \mu s}$$

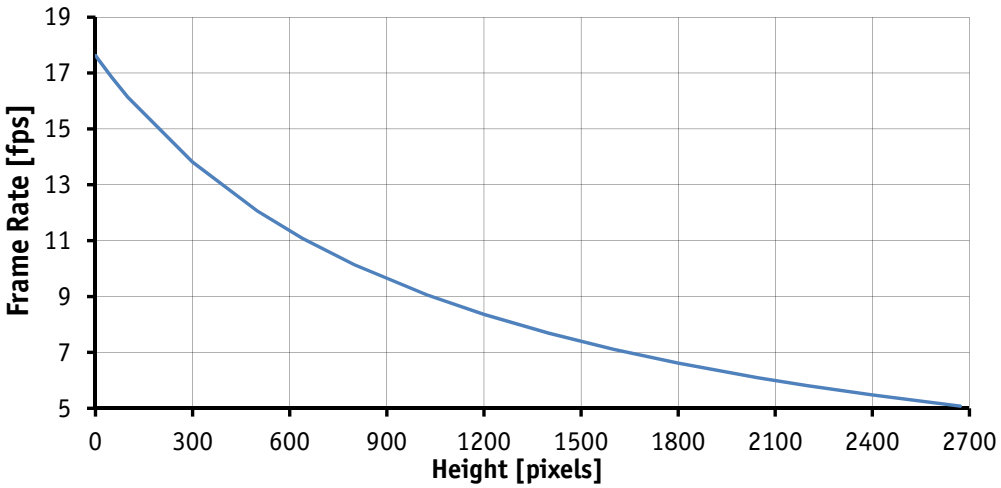


Figure 32: Frame rate as a function of ROI height

Prosilica GE4900, GE4900C

$$\text{Frame rate} = \frac{1}{70.73\ \mu s \times \text{Height} + 69676.59\ \mu s}$$

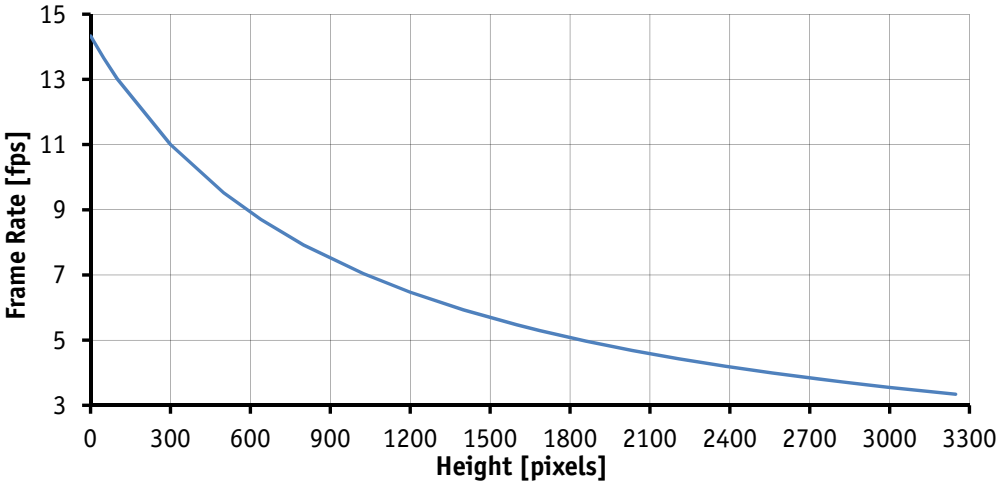


Figure 33: Frame rate as a function of ROI height

Prosilica GE model comparison

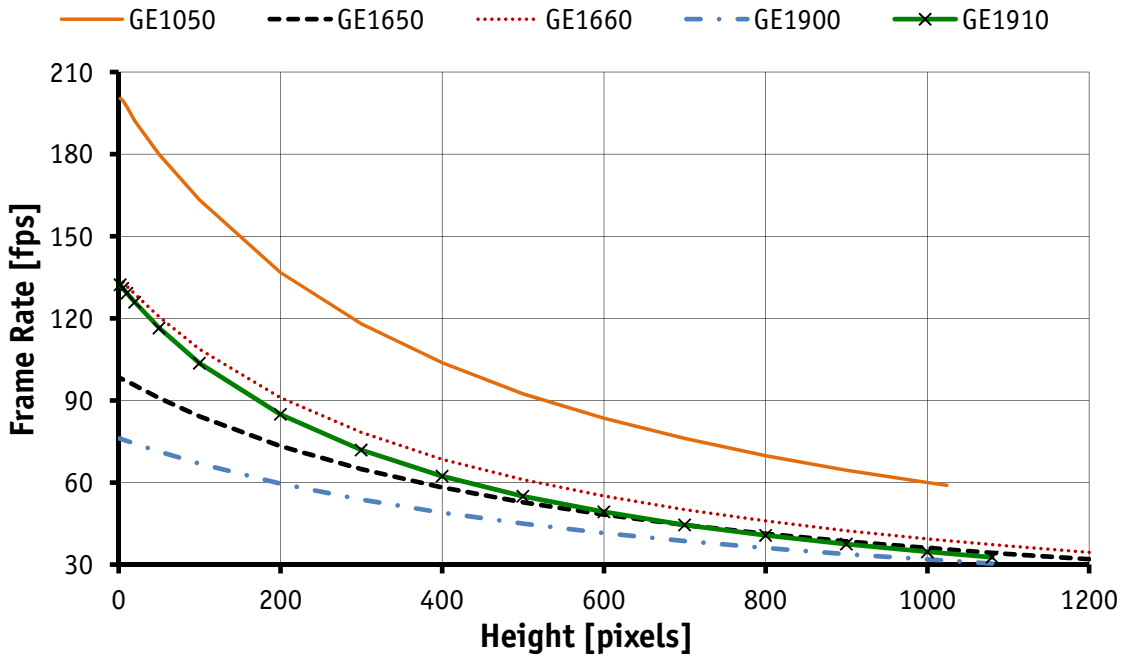


Figure 34: Maximum frame rate vs. height for select Prosilica GE camera models

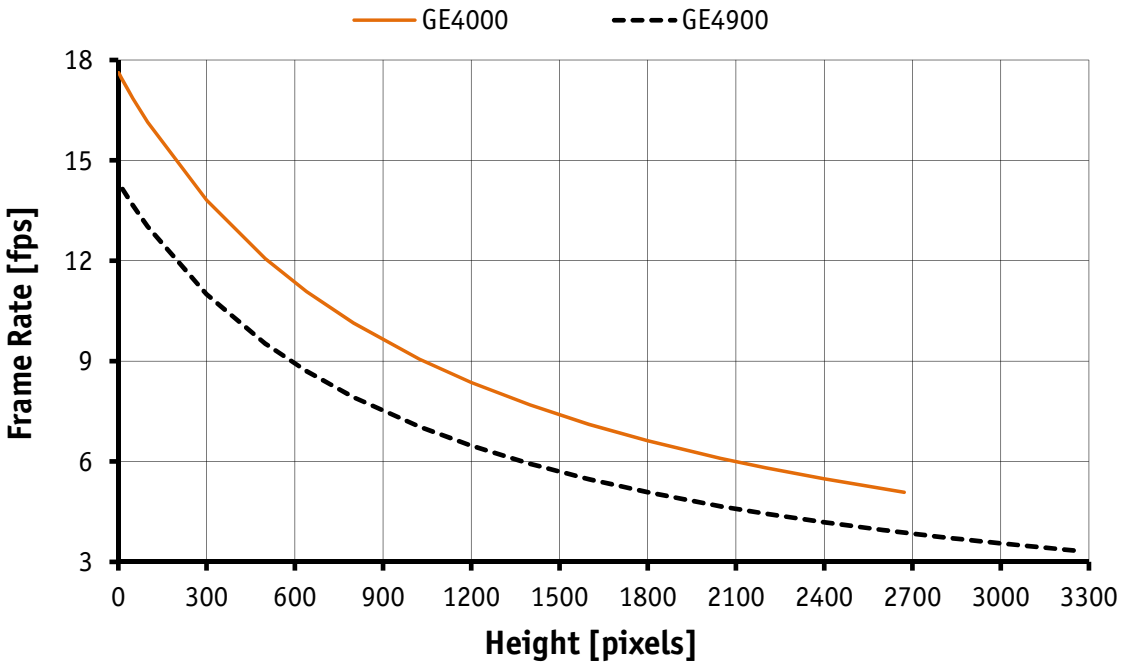


Figure 35: Maximum frame rate vs. height for Prosilica GE4000 and Prosilica GE4900

Camera data path

The following diagrams illustrate the data flow and the bit resolution of image data. The individual blocks are described in more detail in the *GigE Features Reference*.

Monochrome Prosilica GE cameras

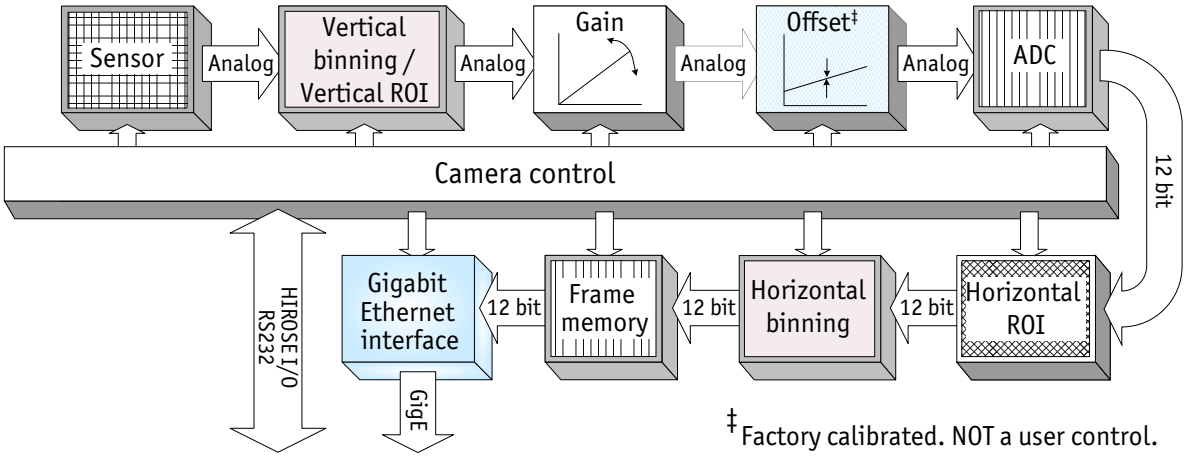


Figure 36: Block diagram of Prosilica GE monochrome cameras

Color Prosilica GE cameras

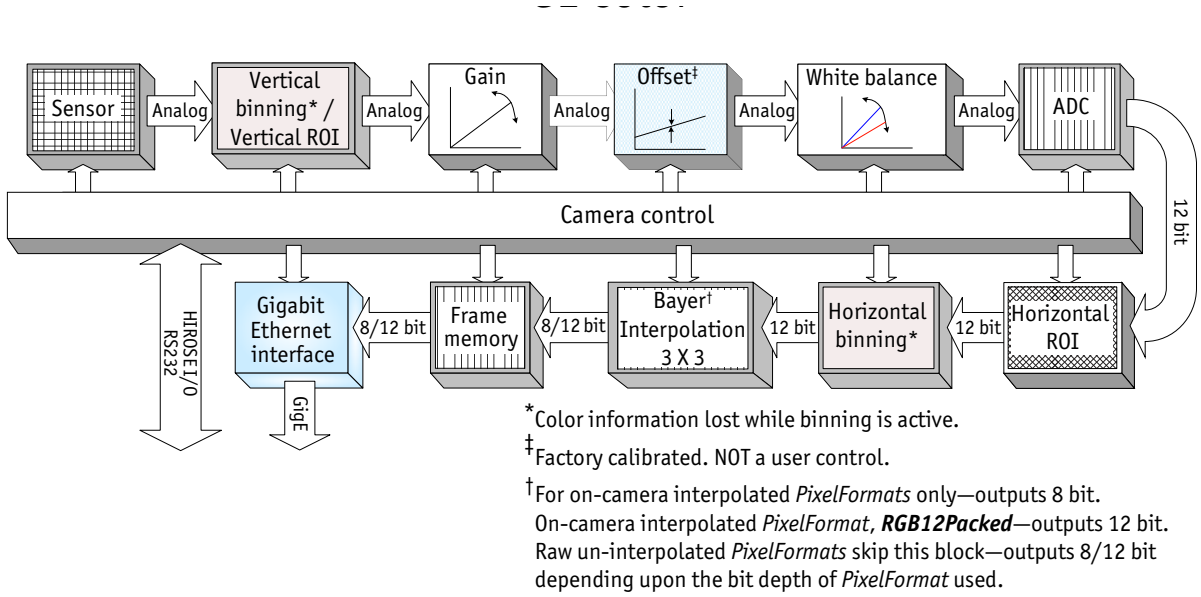


Figure 37: Block diagram of Prosilica GE color cameras

Additional references

Prosilica GE webpage

https://www.alliedvision.com/en/products/cameras

Prosilica GE Documentation

https://www.alliedvision.com/en/support/technical-documentation/prosilica-ge-documentation

Vimba SDK

https://www.alliedvision.com/en/products/software

PvAPI SDK- (Under Legacy Software)

https://www.alliedvision.com/en/support/software-downloads

Knowledge base

https://www.alliedvision.com/en/support/technical-papers-knowledge-base

Case studies

https://www.alliedvision.com/en/applications

Firmware

https://www.alliedvision.com/en/support/firmware

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