Allied Vision

GigE Vision Cameras

Prosilica GC

Technical Manual

V2.4.0

Allied Vision Technologies GmbH // Taschenweg 2a, 07646 Stadtroda / Germany

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Prosilica GC at a glance

Prosilica GC cameras have a GigE port and work with GigE hardware and cable lengths up to 100 meters. Prosilica GC cameras are GigE Vision V1.2 and GenICam SFNC V1.2.1 compliant.

Applied standards

GigE Vision®

The GigE Vision standard is an interface standard for digital machine vision cameras administered by the AIA that is widely supported in the machine vision industry. In contrast, Gigabit Ethernet is the network GigE Vision is built upon.

GenICam™

GenICam is a machine vision standard hosted by the EMVA. The aim of GenICam is to provide a generic configuration interface for cameras and devices independent of the used interface technology (for example, GigE Vision, USB3 Vision, DCAM IEEE 1394, Camera Link). This approach enables proper interoperability between GenICam compliant hardware and software solutions without the need for customization.

The GenICam standard consists of multiple modules that specify tasks to be solved. Allied Vision cameras and software make use of these modules, like the SFNC that standardizes feature names and types via an XML file or the transport layer interface (GenTL) that is used to grab images.

What else do you need?

Content	URL
Camera data sheets GigE Features Reference Modular Concept 3D CAD STEP files Software and firmware downloads	https://www.alliedvision.com/en/support/technical-documentation/prosilica-gc-documentation.html
Technical papers and knowledge base	https://www.alliedvision.com/en/support/technical-papers-knowledge-base.html

Read this manual carefully

Learn how to protect your camera from damage and fully understand its functions.

Contact us

Connect with Allied Vision by function

https://www.alliedvision.com/en/meta-header/contact.html

Find an Allied Vision office or Allied Vision distribution partner

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

Email

For general inquiries, please contact info@alliedvision.com

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Contents

Prosilica GC at a glance 2
Applied standards . . . 2
What else do you need? . . . 2
Contact us 3
Document history and conventions 8
Document history . . . 9
Manual conventions . . . 11
Styles . . . 11
Symbols . . . 12
Product naming . . . 12
Acronyms and abbreviations . . . 13
Compliance and intended use 15
Compliance notifications . . . 16
For customers in Europe . . . 16
For customers in the USA . . . 16
For customers in Canada . . . 16
Pour utilisateurs au Canada . . . 16
Avoid electromagnetic interferences . . . 16
Camera applications and intended use . . . 17
General use . . . 17
Use in medical devices . . . 17
Copyright and trademarks . . . 17
Installation and hardware 18
General cautions and warnings . . . 19
Electrical connections . . . 19
Optical components . . . 20
Configuring the host computer . . . 21
Installing the Ethernet adapter driver . . . 21
Optional: Modifying Ethernet adapter IP address . . . 21
Ethernet adapter driver settings . . . 22
Enabling jumbo packets . . . 22
Connecting your camera . . . 23
Optics . . . 23
Accessories . . . 23
Downloading camera drivers . . . 24
Powering up the camera . . . 24
Connecting to host application . . . 24
Allied Vision software . . . 24
Third-party software . . . 25
Specifications 26

Notes on specifications . . . 27
Frame memory . . . 27
Resolution and ROI frame rate . . . 28
Absolute quantum efficiency plots . . . 28
Spectral response plots . . . 29
Specifications common to all models . . . 29
Prosilica GC660, GC660C . . . 30
Absolute QE . . . 31
Spectral response . . . 31
ROI frame rate . . . 32
Prosilica GC1290, GC1290C . . . 33
Absolute QE . . . 34
Spectral response . . . 34
ROI frame rate . . . 35
Prosilica GC1380H, GC1380CH . . . 36
Absolute QE . . . 37
Spectral response . . . 37
ROI frame rate . . . 38
Prosilica GC1600H, GC1600CH . . . 39
Absolute QE . . . 40
Spectral response . . . 40
ROI frame rate . . . 41
Prosilica GC2450, GC2450C . . . 42
Absolute QE . . . 43
Spectral response . . . 43
ROI frame rate . . . 44
Prosilica GC model frame rate comparison . . . 45
Prosilica GC model comparison . . . 45
Camera feature highlights . . . 46
Camera feature comparison . . . 47
Image data flow . . . 48

Mechanical dimensions 49
Prosilica GC model housing (C-Mount) . . . 50
Tripod adapter . . . 51
Flange focal distance . . . 51
C-Mount . . . 51
Adjustment of C-Mount . . . 52
Lens protrusion for C-Mount cameras . . . 53
Sensor position accuracy . . . 54
IR cut filter . . . 55

Camera interfaces 56
Back panel . . . 57
Status LEDs . . . 58
GigE port . . . 58
Camera I/O connector pin assignment . . . 59
I/O definition . . . 60
Camera power . . . 60

Isolated IO ground . . . 61
RxD RS232 and TxD RS232 . . . 61
Input triggers . . . 61
Output signals . . . 62
Signal ground . . . 62
Video iris . . . 62
Reserved . . . 63
Video iris output . . . 63
Camera trigger . . . 64
Camera I/O opto-isolated user circuit example . . . 64
Camera I/O non-isolated user circuit example . . . 65
Trigger timing diagram . . . 66
Notes on triggering . . . 67
Trigger rules . . . 67

Cleaning optical components 69
Warranty . . . 70
Keep optical components clean . . . 70
Identifying impurities . . . 71
Locating impurities . . . 71
Materials for cleaning optical components . . . 72
Cleaning Instructions . . . 72
Cleaning with compressed air . . . 74

Firmware update 75

Appendix 80
Specifications common to all models . . . 81
Prosilica GC650, GC650C (02-2110A, 02-2111A) . . . 82
Absolute QE . . . 83
Spectral response . . . 83
ROI frame rate . . . 84
Prosilica GC655, GC655C (02-2115A, 02-2116A) . . . 85
Absolute QE . . . 86
Spectral response . . . 86
ROI frame rate . . . 87
Prosilica GC750, GC750C (02-2160A, 02-2161A) . . . 88
Absolute QE . . . 89
ROI frame rate . . . 90
Prosilica GC780, GC780C (02-2117A, 02-2118A) . . . 91
Absolute QE . . . 92
Spectral response . . . 92
ROI frame rate . . . 93
Prosilica GC1020, GC1020C (02-2165A, 02-2165B, 02-2166A, 02-2166B) . . . 94
Absolute QE . . . 95
Spectral response . . . 95
ROI frame rate . . . 96
Prosilica GC1350, GC1350C (02-2130A, 02-2131A) . . . 97
Absolute QE . . . 98

ROI frame rate 99
Prosilica GC1380, GC1380C (02-2140A, 02-2141A) 100
Absolute QE 101
Spectral response 101
ROI frame rate 102
Prosilica GC1600, GC1600C (02-2150A, 02-2151A) 103
Absolute QE 104
Spectral response 104
ROI frame rate 105
Camera feature comparison 107
Image data flow 108
Prosilica GC monochrome models 108
Prosilica GC color models 109
Prosilica GC750C 110
Mechanical dimensions 111
Prosilica GC CCD model housing (C-Mount) 111
Prosilica GC CMOS model housing (C-Mount) 112
Lens protrusion for C-Mount cameras 113

Index 114

Document history and conventions

This chapter includes:

- Document history
- Layout styles and symbols used in this manual
- Product naming
- Acronyms and abbreviations used in this manual

Document history

Version	Date	Remarks
V2.0.0	2011-Jul-22	New manual release status
V2.0.1	2011-Oct-07	Added note to figure 34
V.2.0.2	2012-Sep-21	Renamed Camera IO signals Reworked cleaning optics section
V.2.0.3	2013-Jan-14	Updated the exposure control values Updated the Frame rate vs. Height graphs Removed the internal I/O circuit diagram
V2.0.4	2013-Mar-26	Added Status LEDs section Added appendix Updated the RoHS directive Updated the pixel format naming according to the GenICam naming convention Added caution regarding the drive voltage for the video iris lens Added frame rate formulas in the Resolution and ROI frame rates chapter
V2.0.5	2013-May-07	Updated the exposure control values in the Specifications chapter Added Vimba SDK link in the Additional references section Updated Allied Vision recommended cabling to Cat 6 or higher in the Gigabit Ethernet interface section
V2.0.6	2013-Jul-05	Added contact information for Allied Vision Technologies (Shanghai) Co. Ltd. Updated the links to Allied Vision GigE Installation Manual Added links to Allied Vision GigE Camera and Driver Features document
V2.0.7	2013-Oct-02	Added optical flange focal distance and maximum lens protrusion information Updated Cleaning optics section Updated vertical binning values in Specifications chapter Updated Table 17 Updated links for PvAPI SDK
V2.0.8	2013-Nov-26	Added chapter Description of the data path Updated the Index
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’ Replaced the optical flange focal distance section with C-Mount flange focal distance section Updated datapath diagram for Prosilica GC: color models Updated exposure control and power requirements in Specifications chapter

Table 1: Document history

Version	Date	Remarks
V2.2.0	2016-July-04	Changed the technical manual layout Changed chapter name from Camera dimensions to Mechanical dimensions Moved Sensor position accuracy section from Appendix to Mechanical dimensions chapter Added Appendix for all older Prosilica GC hardware revision A models Added Cleaning optical components chapter to replace Cleaning optics section in V2.1.0 Added Contact us section to replace Contacting Allied Vision section in V2.1.0 Added D revision feature changes for Prosilica GC660, GC660C, GC1290, GC1290C, GC1380H, GC1380CH, GC1600H, GC1600CH, GC2450, GC2450C Added Installation chapter Removed image flow chapter and added the diagrams to the Appendix Added new image flow diagram for new Prosilica GC hardware revision D models at the end of the Specifications chapter Updated frame rate information Aligned the information in the Specification tables with the information on the product web pages Various other minor improvements and corrections New trigger latency and trigger jitter values for Prosilica GC hardware revision D models Updated absolute QE plots and new spectral response plots for all hardware revision D models For Prosilica GC660 and GC660C, the image width was changed from 659 to 658. It was changed to 658 so that the color version would image with Vimba when using default values. Prosilica GC hardware revision A models support five user sets. Prosilica GC hardware revision D models support three user sets. Added optical filter information to specification tables New features for hardware revision D models include: • Gamma correction • Three look-up tables • Hue, saturation, and color transformation • Main board temperature readout
V2.2.1	2017-Feb-10	Updated QE plot and added spectral response plots Corrected error in Installation and hardware chapter
V2.2.2	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
V2.2.3	2017-May-24	Corrected the measurements for the Prosilica GC750 Added note to all models that dimensions include connectors and C-Mount Updated the measurements to reflect the dimensions shown in the technical drawing

Table 1: Document history (continued)

Version	Date	Remarks
V2.3.0	2017-Oct-18	Removed references to Prosilica GC660, GC1290, GC1380H, GC1600H, GC2450 hardware revision A models in the Appendix. The last time shipment period for these models ended on June 30, 2017 as detailed in PCN AVTPR-112. These hardware revision A models were replaced by hardware revision D models. Changed Cell size terminology to Pixel size Various other minor improvements and corrections
V2.4.0	2017-Dec-15	Updated exposure time values (GC660, GC1290, GC1380H, GC2450) and gain values (GC1600H, GC2450) for latest firmware Added Specifications common to all models to simplify the model specific tables Simplified the Contact us section, please click the link to find contact information for your region or email us at one of the provided email addresses. Various other minor enhancements and corrections

Table 1: Document history (continued)

Manual conventions

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

Styles

Style	Function	Example
Bold	Program names, UI elements, highlighting important things	**bold**
Italics	Publication names, chapter titles, UI non-interactive elements	*Italics*
Courier New	Code listings, feature names	`Input`
Courier New Italics	Feature options	*`Mode`*
Blue	Cross references, web page links, email links	Link

Table 2: Character styles used in this manual

Symbols

Safety note

Note to prevent physical injury.

Possible material damage

This symbol addresses important information to avoid material damage; however, is not related to physical injury.

Damage to the camera by ESD

This symbol addresses important information to avoid material damage by ESD.

Safety-related instructions to avoid malfunctions

This symbol indicates important or specific instructions or procedures that are related to product safety. You have to follow these instructions to avoid malfunctions.

Practical hint

This symbol highlights a practical hint that helps to better understand the camera‘s features and functions, and to make better use of it.

Further information available online

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

https://www.alliedvision.com

Product naming

Names of third-party products in this document are shortened to ease reading. Nevertheless, we respect all manufacturer rights and trademarks.

Official product name	Naming in this manual	Manufacturer website
Sony Semiconductor Solutions	Sony	http://www.sony-semicon.co.jp/
ON Semiconductor	ON Semi	http://www.onsemi.com/

Table 3: Third-party product naming used in this manual

Acronyms and abbreviations

The following table provides a list of abbreviations used in this document.

Acronym or Abbreviation	Description
°C	Degrees Celsius
AIA	Automated Imaging Association
CAD	Computer aided design
Cat 6	Category 6, Ethernet cable
CCD	Charge-coupled device
CMOS	Complementary metal-oxide semiconductor
dB	Decibel
DHCP	Dynamic Host Control Protocol
EMVA	European Machine Vision Association
ESD	Electrostatic discharge
FIFO	First-in first-out
fps	Frames per second
g	Grams
GigE	Gigabit Ethernet
GND	Ground (power)
GVSP	GigE Vision Streaming Protocol
H × V	Horizontal × Vertical (sensor resolution measurement)
I/O	Input/Output
KΩ	Kiloohm
mA	Milliampere
MB	Megabyte
Mbps	Megabits per second
mm	Millimeter
MP	Megapixel
MSDS	Material safety data sheet
nm	Nanometer
ns	Nanosecond
psi	Pound per square inch (atmospheric pressure)
QE	Quantum efficiency
RoHS	Restriction of Hazardous Substances Directive
ROI	Region of interest

Table 4: Acronyms and abbreviations used in this document

Acronym or Abbreviation	Description
s	Second
SDK	Software Development Kit
SFNC	Standard Feature Naming Convention
TTL I/O	Transistor-transistor logic input/output
TxD and RxD	Transmit and receive
V	Volts
VDC	Volts of direct current
W	Watts
WEEE	Waste of Electric and Electronic Equipment
XML	Extensible Markup Language
µA	Microampere
µm	Micrometer or micron
µs	Microsecond

Table 4: Acronyms and abbreviations used in this document (continued)

Compliance and intended use

This chapter includes:

- Information about the legal requirements and restrictions for Prosilica GC cameras based on current and relevant regulations
- Particular emphasis has been given to Europe, the United States of America, and Canada
- Intended use statements

Compliance notifications

For customers in Europe

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

- Directive 2014/30/EU (Electromagnetic compatibility)
- Directive 2011/65/EU (RoHS)
- Directive 2012/19/EU (WEEE)

For customers in the USA

Class A digital device

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

We caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For customers in Canada

This apparatus complies with the Class A limits for radio noise emissions set out in the Radio Interference Regulations.

CAN ICES-3 (A)/NMB-3(A)

Pour utilisateurs au Canada

Cet appareil est conforme aux normes classe A pour bruits radioélectriques, spécifiées dans le Règlement sur le brouillage radioélectrique.

CAN ICES-3 (A)/NMB-3(A)

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 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.

Copyright and trademarks

Installation and hardware

This chapter describes the components required for your vision system including configuring the host computer, Ethernet adapter settings, and connecting your Prosilica GC camera.

General cautions and warnings

Electrical connections

ESD

The phenomenon is commonly known: when walking on a carpet, we get charged. Touching a door handle, we get an electric shock. ESD is dangerous for electronic devices, especially when tools or hands get in contact with connectors. We recommend measures to avoid damage by ESD:

- Unpacking: Remove the camera from its anti-static packaging only when your body is grounded.
- Workplace: Use a static-safe workplace with static-dissipative mat and air ionization.
- Wrist strap: Wear a static-dissipative wrist strap to ground your body.
- Clothing: Wear ESD-protective clothing. Keep components away from your body and clothing. Even if you are wearing a wrist strap, your body is grounded but your clothes are not.

Do not operate the camera beyond the environmental specifications

See environmental specifications limits in the *Specifications* section of this document. Special care must be taken to maintain a reasonable operating temperature.

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.

Heat dissipation

Operation outside the allowed temperature range can damage the camera. For best performance and to protect the camera from damage, keep the housing temperature between the specified operating temperature.

Observe the following:

- To avoid camera crashes, operate the camera with a lens or lens adapter attached only.
- For maximum heat dissipation, affix the camera to a heat sink, using the mounting threads.
  - Use mounting base and heat sink with large surface areas.
  - Use a mounting base with a high thermal conductivity.
- Reduce ambient temperature. For example, in an outdoor application with direct sunlight, provide shading by an enclosure.
- Provide ventilation or other active cooling of camera, mounting base, and heat sink.

Optical components

Image sensor

Image sensors are sensitive to excessive radiation: focused sunlight, lasers, and ×-rays can damage the sensor. Monochrome models are not fitted with filter or protection glass. Consider, when removing the lens or dust cap on these cameras, the sensor is not protected against dirt or scratches.

Cleaning optical components

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

Allied Vision can clean your camera as a service for you, if necessary. For more information, contact Allied Vision support at https://www.alliedvision.com/en/support/contact-support-and-repair.html.

Lenses

Provide the following conditions to keep dirt and droplets out of the optical system of camera and lens:

- Dust-free environment
- Low relative humidity
- No condensation

To keep dirt out of the lens mount, hold the camera with the lens mount facing the ground. Keep filter and camera back lens clean, because dirt becomes more visible the closer it gets to the sensor.

Configuring the host computer

Allied Vision GigE Vision cameras can operate on 10/100 or Gigabit speed Ethernet adapters. In order to reach the maximum camera frame rate, a Gigabit speed Ethernet adapter with jumbo packet support is required.

If your host computer has an available Ethernet port, this can be used with Allied Vision GigE cameras. We recommend that your camera system uses a dedicated Ethernet port not shared with Internet or local area networks. If more ports are needed, or your existing Ethernet adapter is unable to operate at GigE speeds, installing additional hardware may be required.

Usage on mixed-use networks (with printers, Internet, email) is possible but may impact camera performance (for example, framerate). Check with your IT administrator if required for network configuration.

Installing the Ethernet adapter driver

Install the network card driver from your network card manufacturer. If no installation application is provided, update the driver manually.

To update the driver manually

1. Click the **Start icon** and select *Control Panel* in the menu.
2. Click **View by Large Icons** and select *Device Manager* in the list.
3. Under *Network Adapters*, locate the Ethernet network adapter, right-click the entry, and select *Update Driver Software* in the menu.
4. Select the *Search automatically for updated driver software* or *Browse my computer for driver software*.
5. Click **Close** once the driver has been installed.

Optional: Modifying Ethernet adapter IP address

After initial Ethernet adapter hardware installation, connect the Ethernet adapter directly to the camera. The default configuration assigns an IP address automatically using the Link-Local Address range of 169.254.xxx.xxx or an address defined by the DHCP server, if present.

Users can fix the adapter address to minimize the time required for a camera to be recognized by the host application. Systems that employ multiple Ethernet adapters connected to multiple cameras will also be required to fix the address of the Ethernet adapter.

To connect to the camera, edit the host PC's adapter settings and configure the following settings:

- IP Address: 169.254.100.1
- Subnet mask: 255.255.0.0
- Default gateway: blank

Ethernet adapter driver settings

The Ethernet adapter should be adjusted to improve system performance when using a GigE Vision camera. This performance is related to minimizing CPU usage and dropped or resent packets.

Edit the Ethernet adapter driver properties according to the values in the following table. The names and availability of the properties listed may vary depending on adapter manufacturer and model.

Property	Value
Packet size or maximum transmission unit (MTU)	8228 bytes or larger
Interrupt Moderation	Enable
Interrupt Moderation Rate	Extreme
Receive Buffers	Maximum value configurable
Transmit Buffers	256 bytes

Default packet size

The default packet size of Allied Vision GigE cameras is 8228 bytes. The host network adapter needs to support a packet size of equal or larger size to stream from the camera.

Ethernet adapter

For desktop systems, use a PCI Express bus Ethernet adapter. For laptops, use an expansion slot via an ExpressCard®.

A list of Allied Vision recommended Ethernet adapters is available on the Allied Vision website. See the *Hardware Selection for Allied Vision GigE Cameras* application note at https://www.alliedvision.com/en/support/technical-papers-knowledge-base.html.

Ethernet adapter settings

The Ethernet adapter settings may also vary depending on your system configuration and the network adapter manufacturer.

Enabling jumbo packets

Jumbo Frames or Jumbo Packets

The properties listed for the network adapter may include either **Jumbo Packet** or **Jumbo Frames** depending on the manufacturer. If neither is listed under properties, your network card may not support this feature. You must use a network adapter that supports Jumbo Frames or Jumbo Packets.

To enable jumbo packets

1. Click the **Start** icon and select *Control Panel* in the menu.

2. Click **View by Large Icons** and select *Device Manager* in the list.
3. Under *Network Adapters*, locate the Ethernet network adapter, right-click the entry, and select *Properties* in the menu.
4. Select the *Advanced* tab.
5. Select the property *Jumbo Packet* and set the value to *9014 Bytes*.
6. Click **OK** to save the setting.

Connecting your camera

Use a Cat 6 or higher rated Ethernet cable to connect the camera to the host adapter. Crossover cabling is not required but does work. The camera has circuitry to determine if a crossover cable is being used.

Allied Vision recommends Cat 6 or higher rated Ethernet cables for Prosilica GC cameras. A different rating may not sustain peak interface bandwidth; leading to lost connectivity or image data coming from the camera.

Optics

Allied Vision Prosilica GC cameras offer various mechanical interfaces for installing a lens including C-Mount and CS-Mount. Lenses can be purchased directly from Allied Vision or from an Allied Vision distributor. Users need to select the desired focal length and appropriate optical format for the target camera model.

For more information on mechanical interface options for your Prosilica GC camera, see the *Modular Concept* at https://www.alliedvision.com/en/support/technical-documentation.html.

Contact your Allied Vision Sales team or your local Allied Vision distribution partner for information on accessories and lens recommendations:

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

Accessories

Allied Vision offers a wide range of accessories for the use of Allied Vision GigE cameras and the easy integration in already existing applications including:

- GigE accessories including standard GigE components.

- Lenses for corresponding sensor sizes and resolutions.

Contact your Allied Vision Sales team or your local Allied Vision distribution partner for information on accessories and lens recommendations:

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

Recommended accessories

A list of Allied Vision recommended accessories is available on the Allied Vision website. See the *Hardware Selection for Allied Vision GigE Cameras Application Note* at https://www.alliedvision.com/en/support/technical-papers-knowledge-base.html.

Downloading camera drivers

Allied Vision GigE cameras work with any or all of the following software options.

Vimba Viewer or Vimba SDK:

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

Third-party software solutions:

https://www.alliedvision.com/en/products/software/third-party-libraries.html

Powering up the camera

A camera power adapter for each GigE camera is available from Allied Vision. See Specifications on page 26 for connector definition and voltage specifications.

For Prosilica GC cameras

- Use only DC power supplies with insulated cases.
- For all power connections use only shielded cables to avoid electromagnetic interferences.

Connecting to host application

Once you have installed the **Vimba Viewer** or third-party application to your host computer, you can connect your Allied Vision GigE camera via an Ethernet cable. Connect the Hirose cable to power the camera to power the camera.

Allied Vision software

All software packages provided by Allied Vision are free of charge and contain the following components:

- Drivers
- SDK for camera control and image acquisition
- Examples based on the provided APIs of the SDK
- Documentation and release notes
- Viewer application to operate and configure the cameras

Vimba Viewer documentation

Vimba Viewer documentation is included with the software download. Once Vimba Viewer is installed on your host PC, documentation is located under *\Program Files\Allied Vision\Vimba*.

Third-party software

In addition to the software provided by Allied Vision, there are numerous GigE Vision standard compliant third-party software options available. In general, third-party software provides increased functionality such as image processing and video recording.

Allied Vision's Vimba SDK is based on the GenICam standard. GenICam-based third-party software automatically connects with Vimba's transport layers. Additionally, Vimba includes the Cognex Adapter for VisionPro.

Specifications

This chapter provides:

- Technical specifications
- Absolute QE plots
- Spectral response plots
- ROI height vs. frame rate plots
- Camera feature comparison for hardware revision D models (serial number 02-21XXD-XXXXX)
- Image data flow diagram

Notes on specifications

Dimensions and mass

Dimensions include C-Mount and connectors but not the tripod and lens.

Mass does not include the tripod and lens.

Hardware revision

This chapter includes camera specifications for all Prosilica GC models (hardware revision D). For previous Prosilica GC models (hardware revision A) see Appendix on page 80.

Hardware revision incompatibility

Prosilica GC hardware revision D models and firmware are not compatible with Prosilica GC hardware revision A models.

Monochrome models

As monochrome models do not have an optical filter always attach a dust cap when a lens is not attached to minimize the possibility of contaminants falling on the sensor surface.

Frame memory

Normally, an image is captured and transported in consecutive steps. The image is taken, read out from the sensor, digitized and sent over the GigE network. Prosilica GC cameras are equipped with an image buffer. The memory operates according to the FIFO principle. Specification tables show how many frames can be stored by each model.

Number of frames

The number of frames (`StreamHoldCapacity`) depends on resolution, pixel format, and GVSP packet size. The stated number of frames is typical for full resolution, Mono8 or Bayer8, and a `GevSCPSPacketSize` = *8192* bytes per packet.

Resolution and ROI frame rate

This section charts the resulting frame rate from changing sensor height from full image to a single line. Unless otherwise noted, sensors do not give an increase in readout speed with a reduction in width.

Resolution and ROI measurements

- Data was generated using `StreamBytesPerSecond` = 124 Mbps (full bandwidth) and an 8-bit pixel format. Frame rates may be lower if using network hardware incapable of 124 Mbps.
- ROIs are taken as center image for maximum speed advantage, where feature `OffsetY` = (full sensor height – ROI height)/2.
- `BinningVertical` is horizontal row summing on CCD before readout. The frame rate for an ROI at the same effective height as binning is slower because the CCD still needs to read out the “fast readout rows” in ROI mode.

Frame rate and readout

Although the sensor is capable of higher frame rates, readout is limited by GigE bandwidth and exposure value. You can improve frame rates with a reduced ROI and shorter exposure values.

Absolute QE plots

Important notice before reading the QE plots

All measurements were done without protection glass or IR cut filter. With protection glass or filters, QE decreases by approximately 10%.

The uncertainty in measurement of the QE values is ±10.25%. This is mainly due to uncertainties in the measuring apparatus itself (Ulbricht sphere, optometer). Manufacturing tolerance of the sensor increases overall uncertainty.

Absolute QE plots for Sony CCD sensors

Sony provides relative response curves in their sensor data sheets. To create the absolute QE plots shown in this chapter, the relative response was converted to a normalized QE response and then adjusted as per three measured QE values (at 448 nm, 529 nm, 632 nm) for color sensors and one measured QE value (at 529 nm) for monochrome sensors.

Absolute QE plots for ON Semi CCD sensors

The curves in the absolute QE plots shown in this chapter are from the sensor manufacturer data sheet. The information was correct at the time of publishing. Sensor specifications may change without notice.

Wavelength

The wavelength range in the absolute QE plots is based on the information available in the sensor manufacturer data sheet at the time of publishing. Many color sensors are documented by the sensor manufacturer only for wavelengths from 400 nm to 700 nm.

For additional wavelength information, contact the sensor manufacturer.

Spectral response plots

Sony provides relative response curves in their sensor data sheets. To create the spectral response plots shown in this chapter, the relative response was adjusted as per three measured QE values (at 448 nm, 529 nm, 632 nm) for color sensors and one measured QE value (at 529 nm) for monochrome sensors.

Specifications common to all models

Feature	Specification
Lens mount	Default: C-Mount Optional: CS-Mount
TTL (non-isolated) I/Os	1 input, 1 output
Opto-isolated I/Os	1 input, 1 output
RS232	1
Operating temperature	0 °C to +50 °C ambient temperature (without condensation)
Storage temperature	-10 °C to +70 °C ambient temperature (without condensation)
Operating humidity	20% to 80% non-condensing
Power requirements	5 to 25 VDC
Interface	IIEEE 802.3 1000BASE-T (GigE)
Interface standard	GigE Vision® Standard V1.2
Camera control standard	GenICam SFNC V1.2.1
Temperature monitoring	Available for main board only. Resolution: 0.031; Accuracy: ± 1 °C

Table 5: Specifications common to all Prosilica GC models

Prosilica GC660, GC660C

Feature	Specification	
	Prosilica GC660	**Prosilica GC660C**
Resolution	658 (H) × 494 (V) 0.3 MP	
Sensor	Sony ICX618ALA with EXview HAD CCD™ technology	Sony ICX618AQ with EXview HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 1/4	
Sensor size	4.5 mm diagonal	
Pixel size	5.6 µm × 5.6 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	121 fps	
Bit depth	8-bit, 12-bit	
A/D	12-bit	
Image buffer	64 MB	
StreamHoldCapacity	Up to 194 frames at full resolution	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerRG12Packed
Exposure time control	10 µs to 72.9 s; 1 µs increments	
Gain control	0 to 34 dB; 1 dB increments	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to 14 rows	
Power consumption	3.0 W at 12 VDC	
Trigger latency	0.9 µs for non-isolated I/O; 0.9 µs for isolated I/O	
Trigger jitter	±50 ns for non-isolated I/O; ±50 ns for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	105 g	

Table 6: Prosilica GC660, GC660C model specifications

Absolute QE

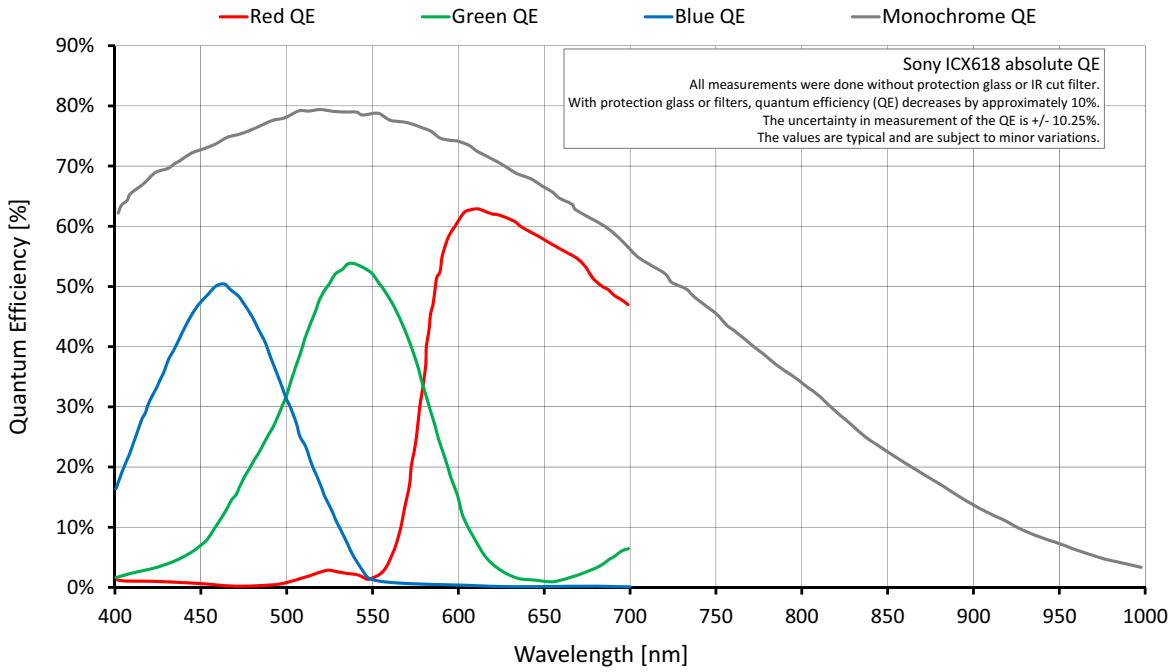


Figure 1: Prosilica GC660, GC660C (Sony ICX618) absolute QE

Spectral response

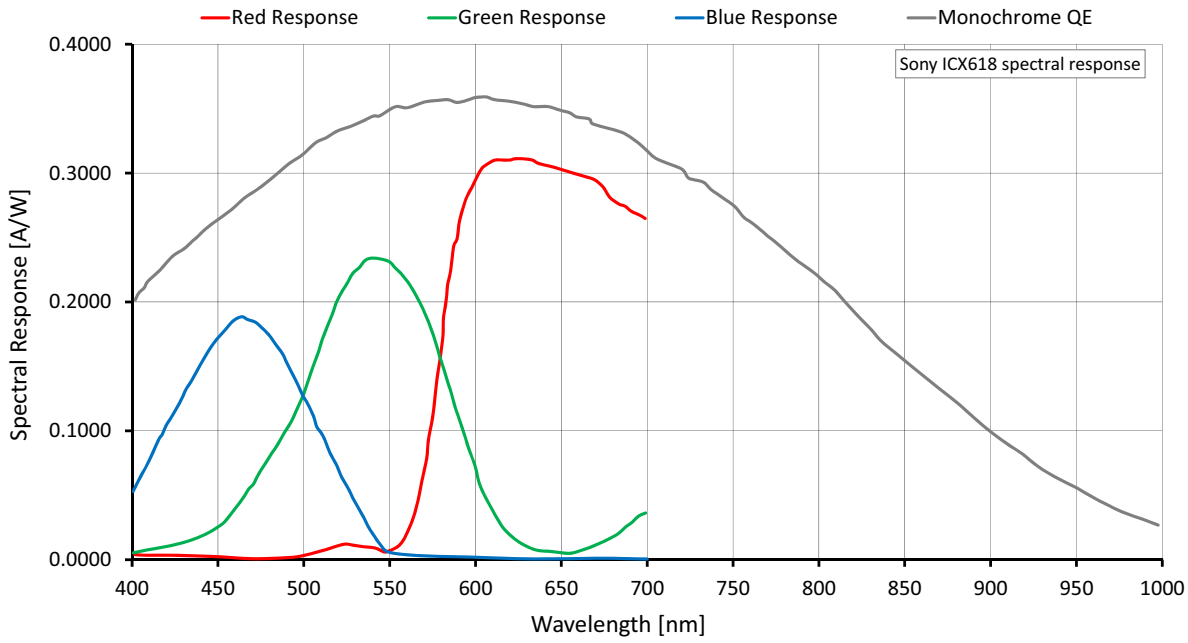


Figure 2: Prosilica GC660, GC660C (Sony ICX618) spectral response

ROI frame rate

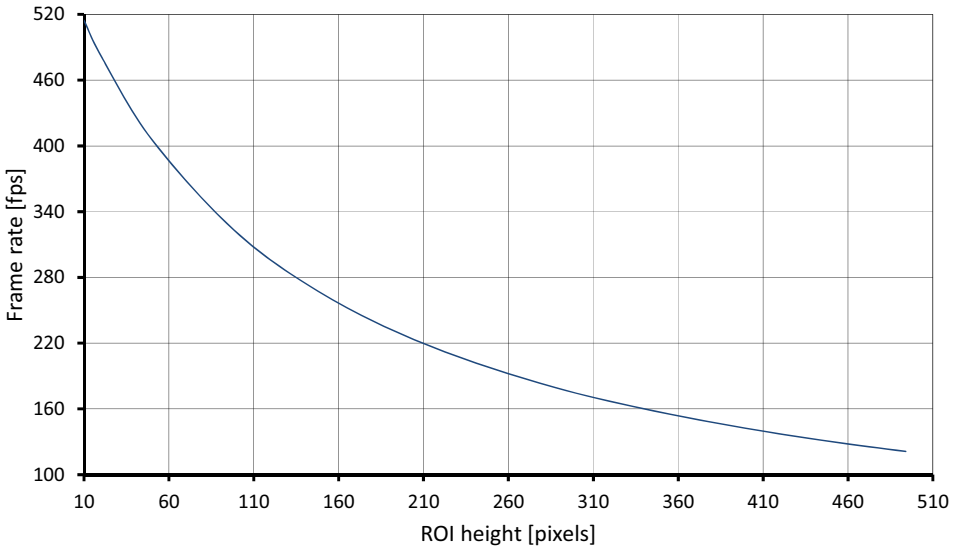


Figure 3: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)	Height (pixels)	Frame rate (fps)
494	121.18	200	226.23
450	130.23	150	265.35
400	142.31	100	320.82
350	156.86	50	405.61
300	174.32	20	482.06
250	197.16	10	514.37

Width=658 pixels

Table 7: Frame rate as a function of ROI height

Prosilica GC1290, GC1290C

Feature	Specification	
	Prosilica GC1290	**Prosilica GC1290C**
Resolution	1280 (H) × 960 (V) 1.2 MP	
Sensor	Sony ICX445ALA with EXview HAD CCD™ technology	Sony ICX445AQA with EXview HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 1/3	
Sensor size	6.0 mm diagonal	
Pixel size	3.75 µm × 3.75 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	33 fps	
Bit depth	8-bit, 12-bit	
A/D	12-bit	
Image buffer	64 MB	
StreamHoldCapacity	Up to 52 frames at full resolution	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerRG12Packed
Exposure time control	12 µs to 72.4 s; 1 µs increments	
Gain control	0 to 24 dB; 1 dB increments	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to 14 rows	
Power consumption	3 W at 12 VDC	
Trigger latency	1.7 µs for non-isolated I/O; 1.7 µs for isolated I/O	
Trigger jitter	±50 ns for non-isolated I/O; ±50 ns for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	106 g	

Table 8: Prosilica GC1290, GC1290C model specifications

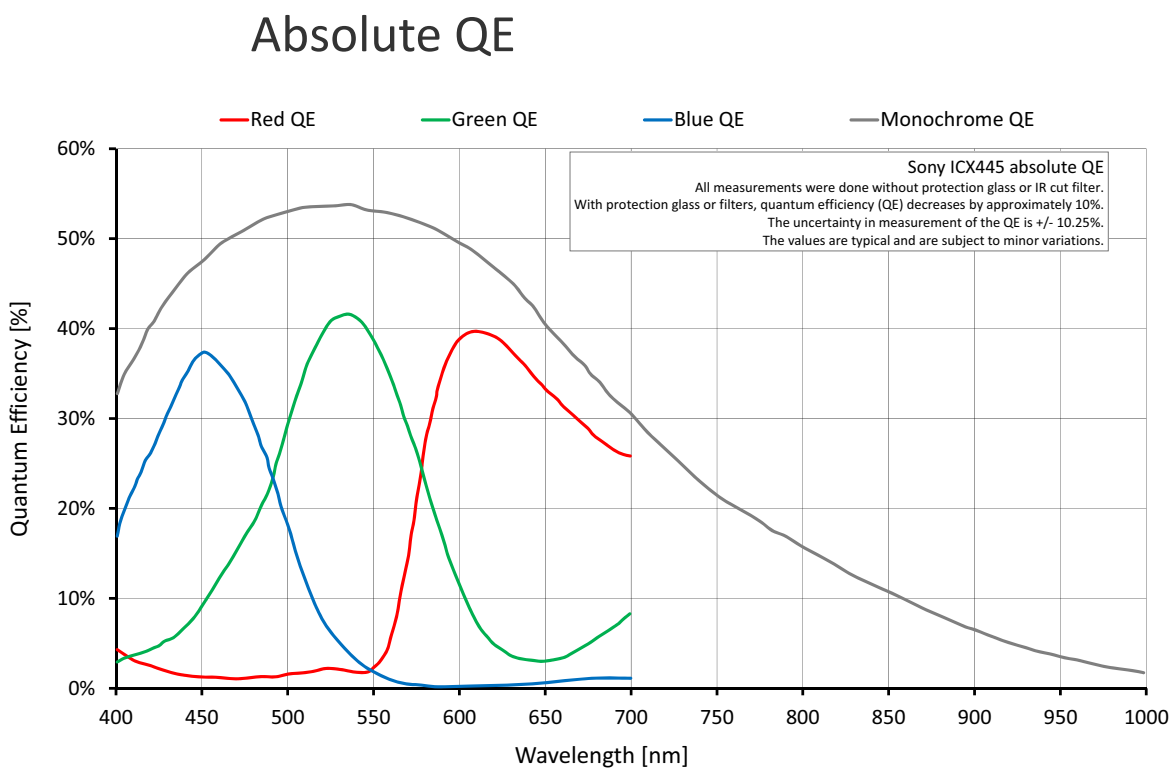


Figure 4: Prosilica GC1290, GC1290C (Sony ICX445) absolute QE

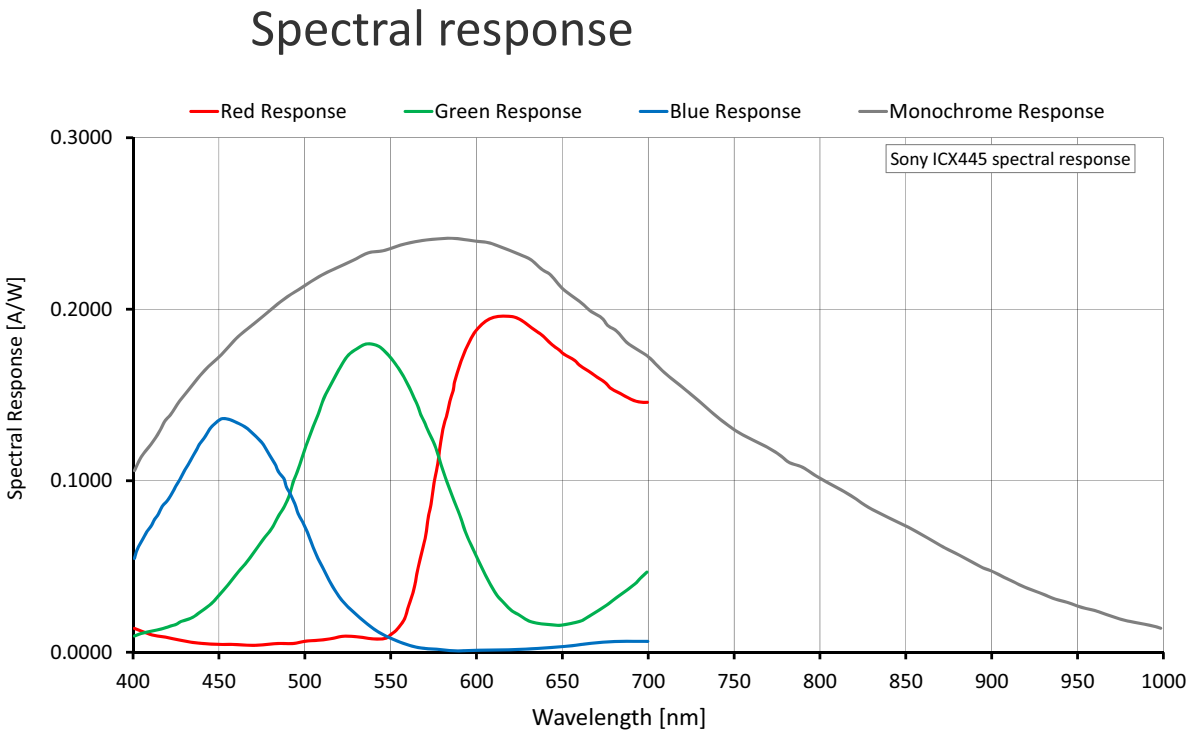


Figure 5: Prosilica GC1290, GC1290C (Sony ICX445) spectral response

ROI frame rate

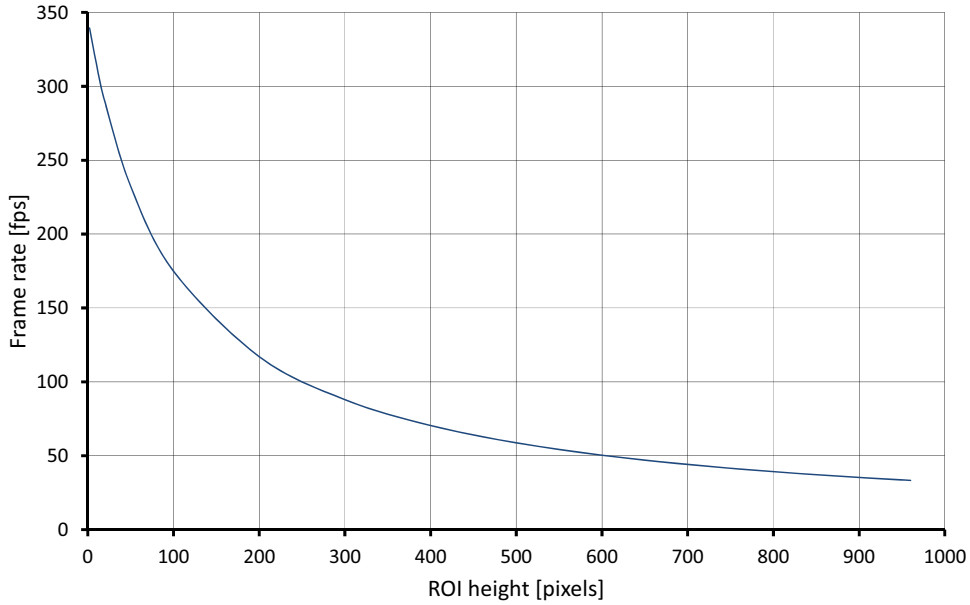


Figure 6: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)
960	33.31
900	35.30
800	39.21
700	44.10
600	50.38
500	58.75
400	70.45

Height (pixels)	Frame rate (fps)
300	87.96
200	117.07
100	174.96
50	232.41
20	289.45
10	315.23
2	339.43

Width=1280 pixels

Table 9: Frame rate as a function of ROI height

Prosilica GC1380H, GC1380CH

Feature	Specification	
	Prosilica GC1380H	**Prosilica GC1380CH**
Resolution	1360 (H) × 1024 (V) 1.4 MP	
Sensor	Sony ICX285AL with EXview HAD CCD™ technology	Sony ICX285AQ with EXview HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 2/3	
Sensor size	11.0 mm diagonal	
Pixel size	6.45 µm × 6.45 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	30 fps	
A/D	12-bit	
Image buffer	64 MB	
StreamHoldCapacity	Up to 46 frames at full resolution	
Bit depth	8-bit, 12-bit	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerRG12Packed
Exposure time control	10 µs to 72.9 s; 1 µs increments	
Gain control	0 to 33 dB; 1 dB increments	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to 14 rows	
Power consumption	3.3 W at 12 VDC	
Trigger latency	1.9 µs for non-isolated I/O; 1.9 µs for isolated I/O	
Trigger jitter	±50 ns for non-isolated I/O; ±50 ns for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	111 g	

Table 10: Prosilica GC1380H, GC1380CH model specifications

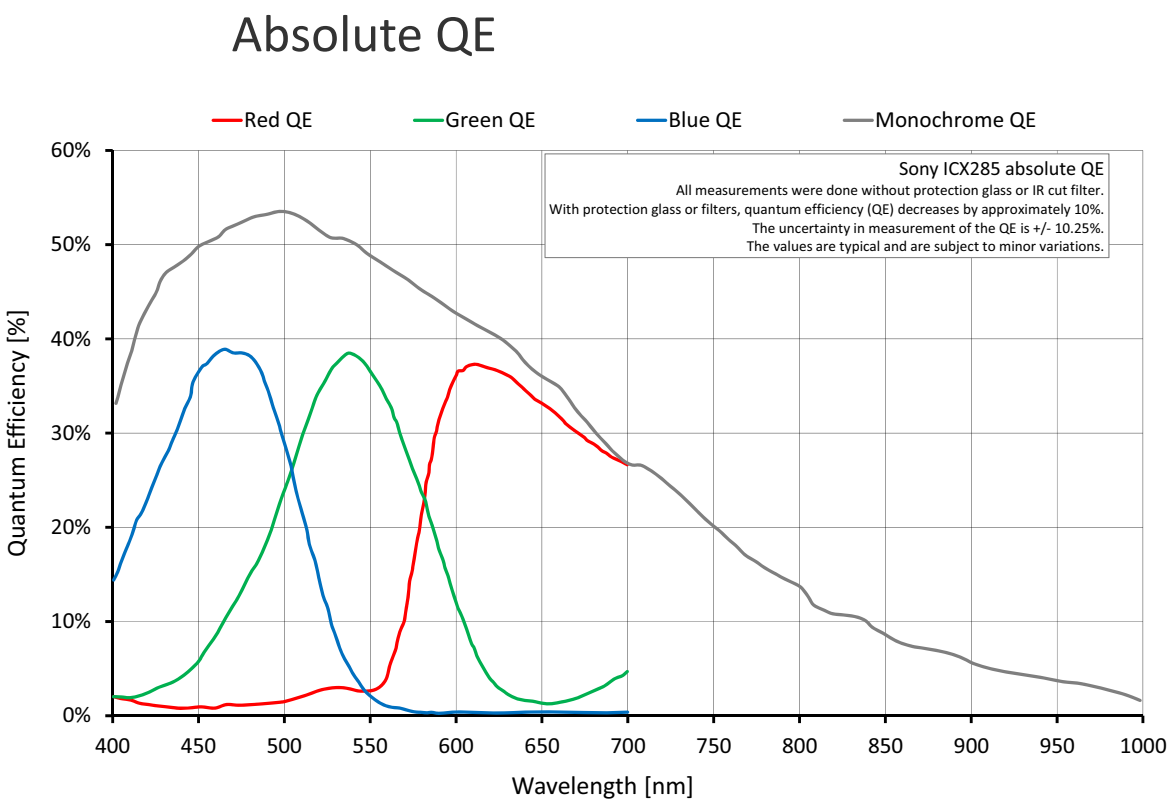


Figure 7: Prosilica GC1380H, GC1380CH (Sony ICX285) absolute QE

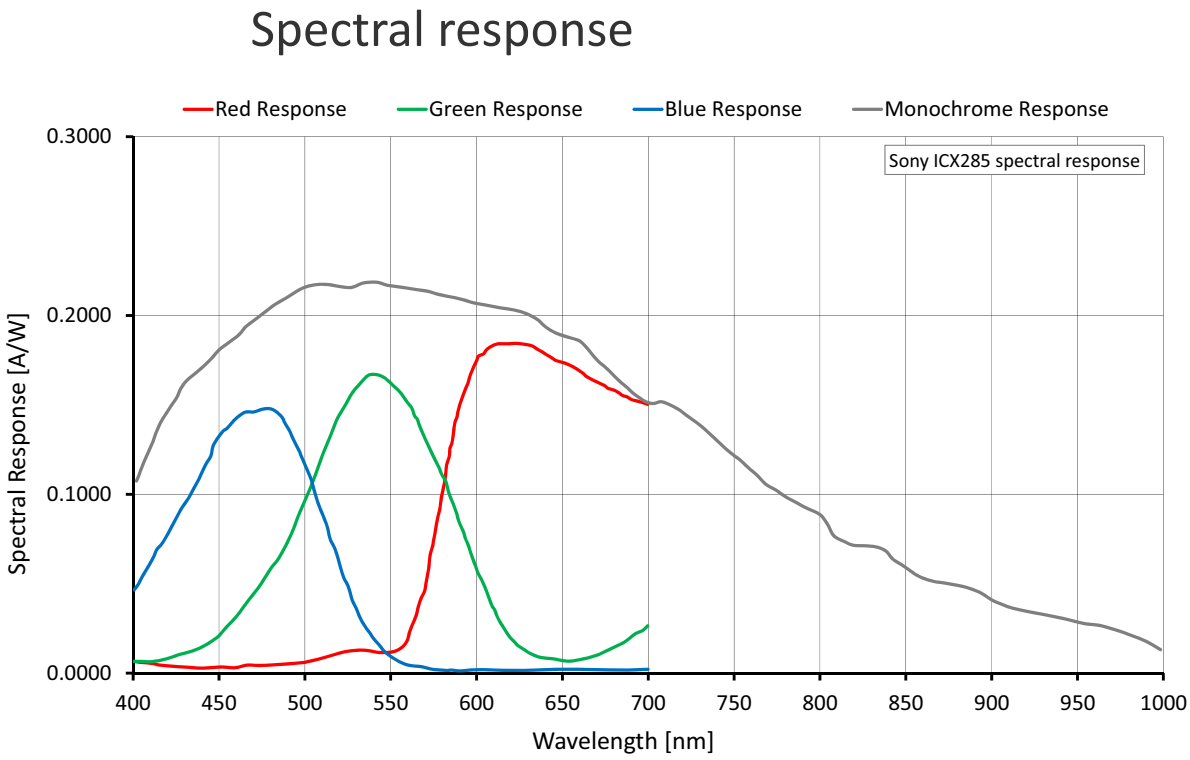


Figure 8: Prosilica GC1380H, GC1380CH (Sony ICX285) spectral response

ROI frame rate

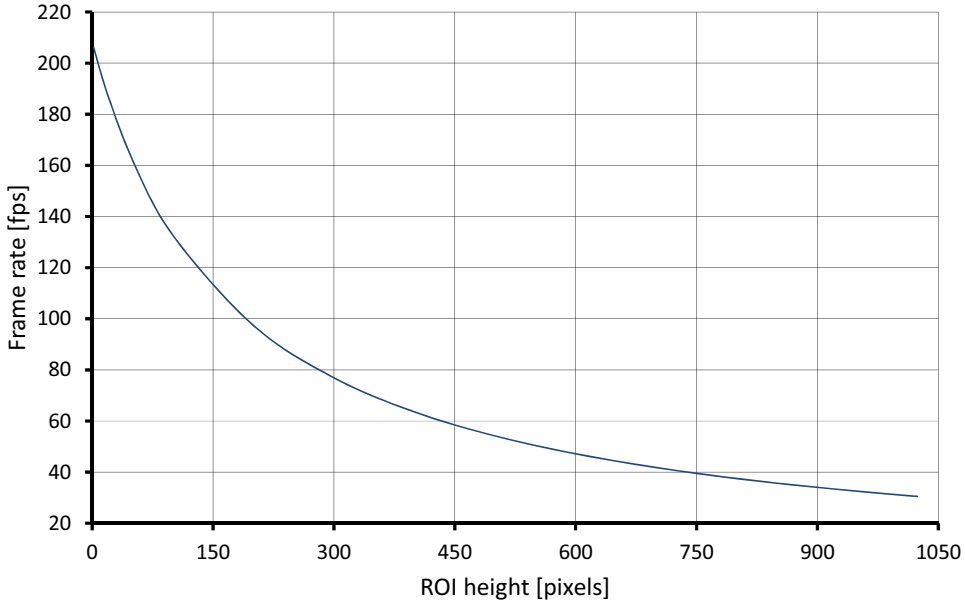


Figure 9: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)
1024	30.48
1000	31.1
900	34
800	37.48
700	41.76
600	47.15
500	54.13
400	63.53
300	76.89
200	97.36
100	132.68
50	162.08
20	186.93
10	197.01
2	205.88

Width=1360 pixels

Table 11: Frame rate as a function of ROI height

Prosilica GC1600H, GC1600CH

Feature	Specification	
	Prosilica GC1600H	**Prosilica GC1600CH**
Resolution	1620 (H) × 1220 (V) 2 MP	
Sensor	Sony ICX274AL with Super HAD CCD™ technology	Sony ICX274AQ with Wfine Super HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 1/1.8	
Sensor size	8.923 mm diagonal	
Pixel size	4.4 µm × 4.4 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	25 fps	
A/D	12-bit	
Image buffer	64 MB	
StreamHoldCapacity	Up to 33 frames at full resolution	
Bit depth	8-bit, 12-bit	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerRG12Packed
Exposure time control	10 µs to 68.7 s; 1 µs increments	
Gain control	0 to 30 dB; 1 dB increments	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to 14 rows	
Power consumption	3.3 W at 12 VDC	
Trigger latency	1.2 µs for non-isolated I/O; 1.2 µs for isolated I/O	
Trigger jitter	±50 ns for non-isolated I/O; ±50 ns for isolated I/O	
Propagation delay (t_{pd})	20 ns for non-isolated I/O; 0.5 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	105 g	

Table 12: Prosilica GC1600H, GC1600CH model specifications

Absolute QE

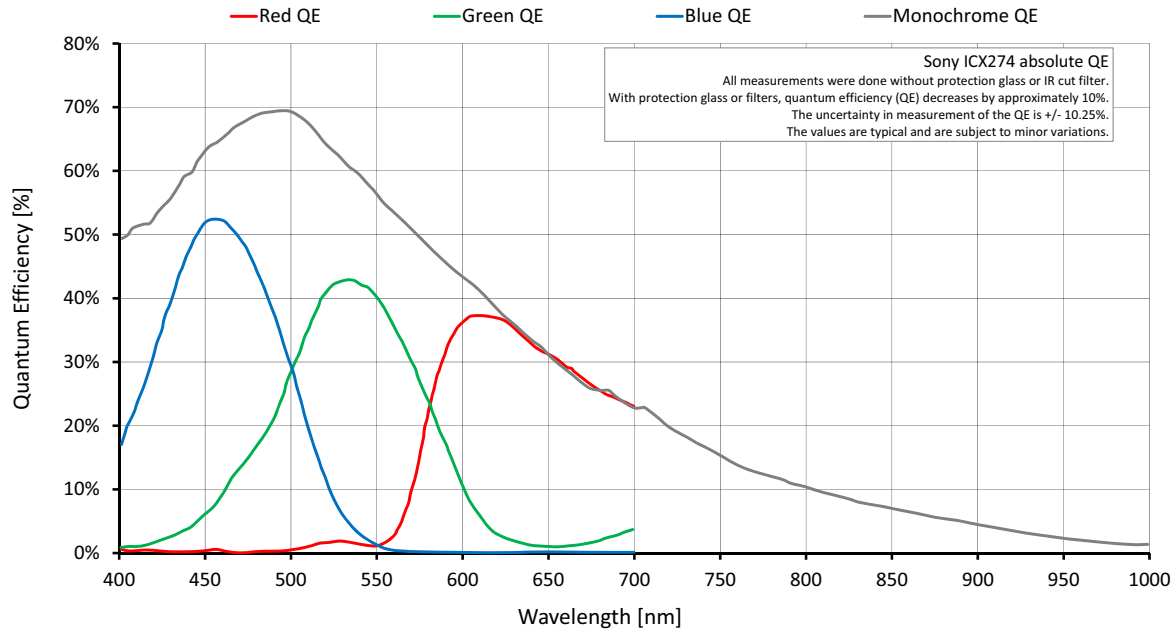


Figure 10: Prosilica GC1600H, GC1600CH (Sony ICX274) absolute QE

Spectral response

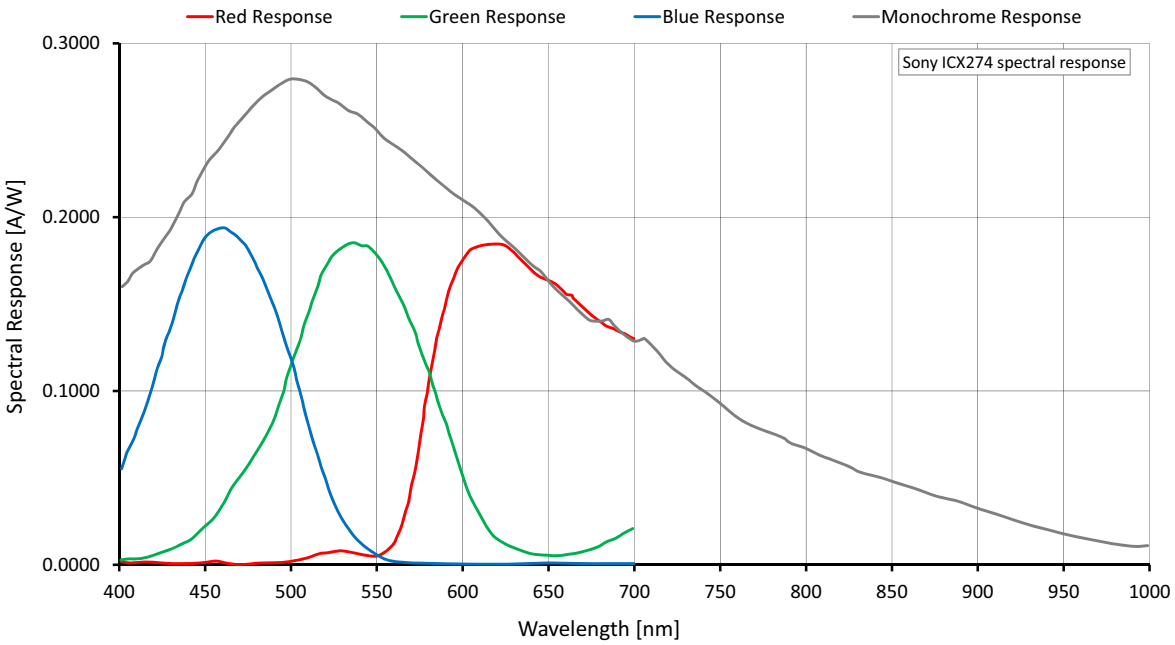


Figure 11: Prosilica GC1600H, GC1600CH (Sony ICX274) spectral response

ROI frame rate

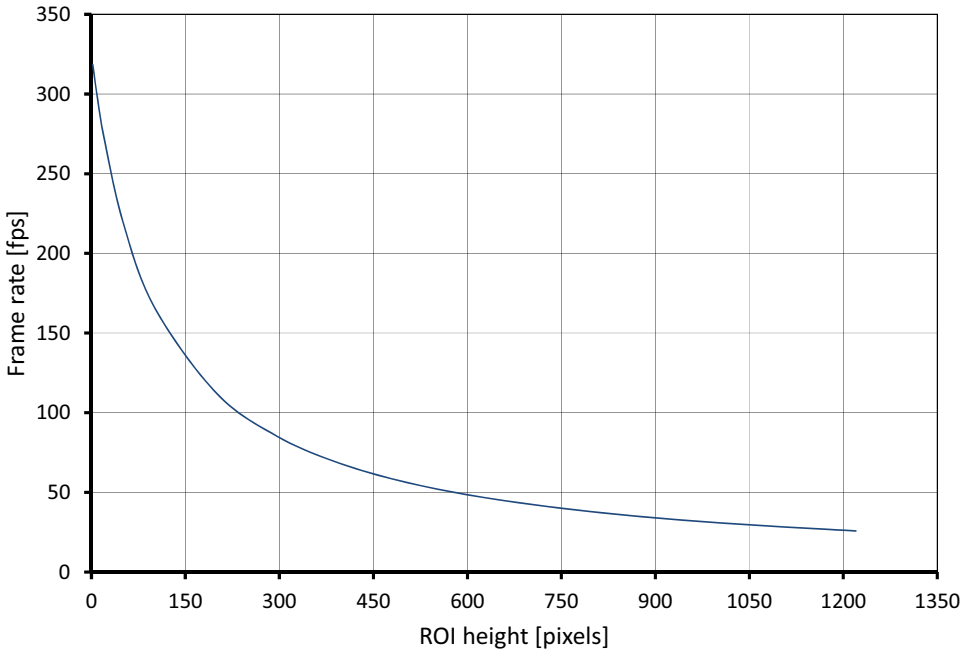


Figure 12: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)
1220	25.82
1100	28.39
1000	30.96
900	34.04
800	37.8
700	42.49
600	48.52
500	56.53
400	67.72
300	84.42
200	112.06
100	166.62
50	220.22
20	272.89
10	296.53
2	318.62

Width=1620 pixels

Table 13: Frame rate as a function of ROI height

Prosilica GC2450, GC2450C

Feature	Specification	
	Prosilica GC2450	**Prosilica GC2450C**
Resolution;	2448 (H) × 2050 (V) 5 MP	
Sensor	Sony ICX625ALA with Super HAD CCD™ technology	Sony ICX625AQA with Super HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 2/3	
Sensor size	11.016 mm diagonal	
Pixel size	3.45 µm × 3.45 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	15 fps	
A/D	12-bit	
Image buffer	64 MB	
StreamHoldCapacity	Up to 12 frames at full resolution	
Bit depth	8-bit, 12-bit	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerRG12Packed
Exposure time control	10 µs to 48.0 s; 1 µs increments	
Gain control	0 to 24 dB; 1 dB increments	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to 14 rows	
Power consumption	3.8 W at 12 VDC	
Trigger latency	0.8 µs for non-isolated I/O; 0.8 µs for isolated I/O	
Trigger jitter	±50 ns for non-isolated I/O; ±50 ns for isolated I/O	
Propagation delay (t_{pd})	20 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	106 g	

Table 14: Prosilica GC2450, GC2450C model specifications

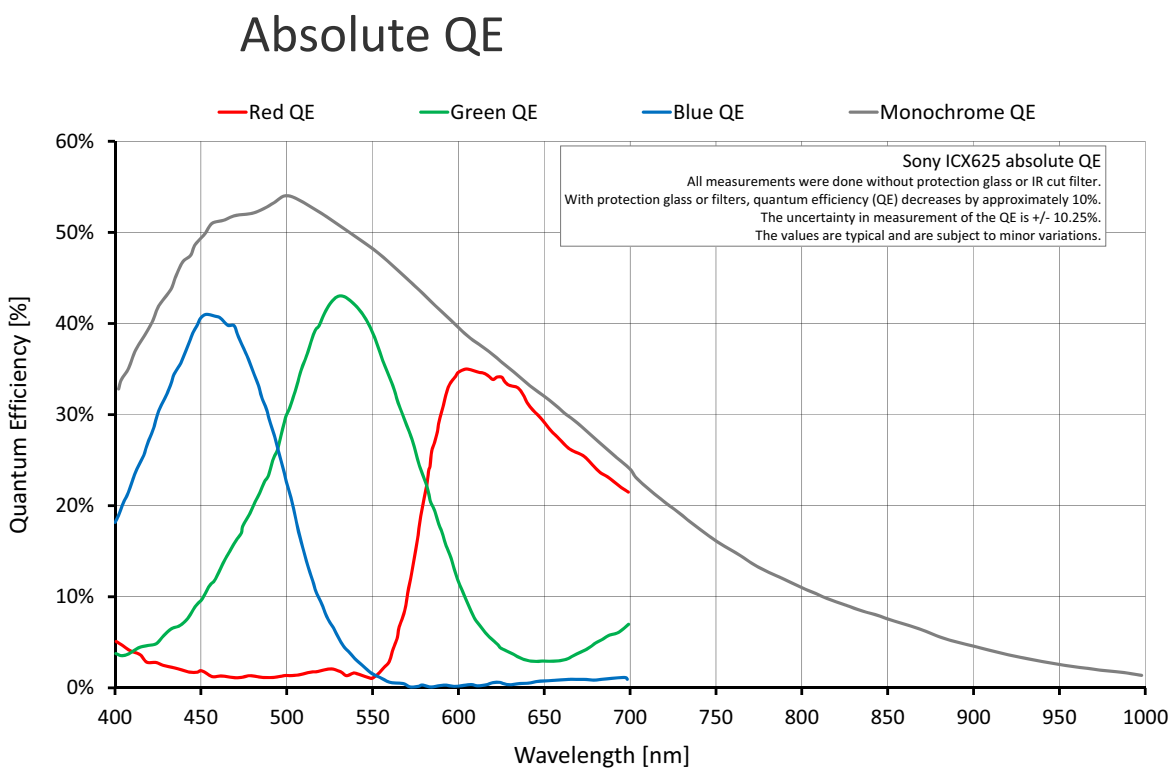


Figure 13: Prosilica GC2450, GC2450C (Sony ICX625) absolute QE

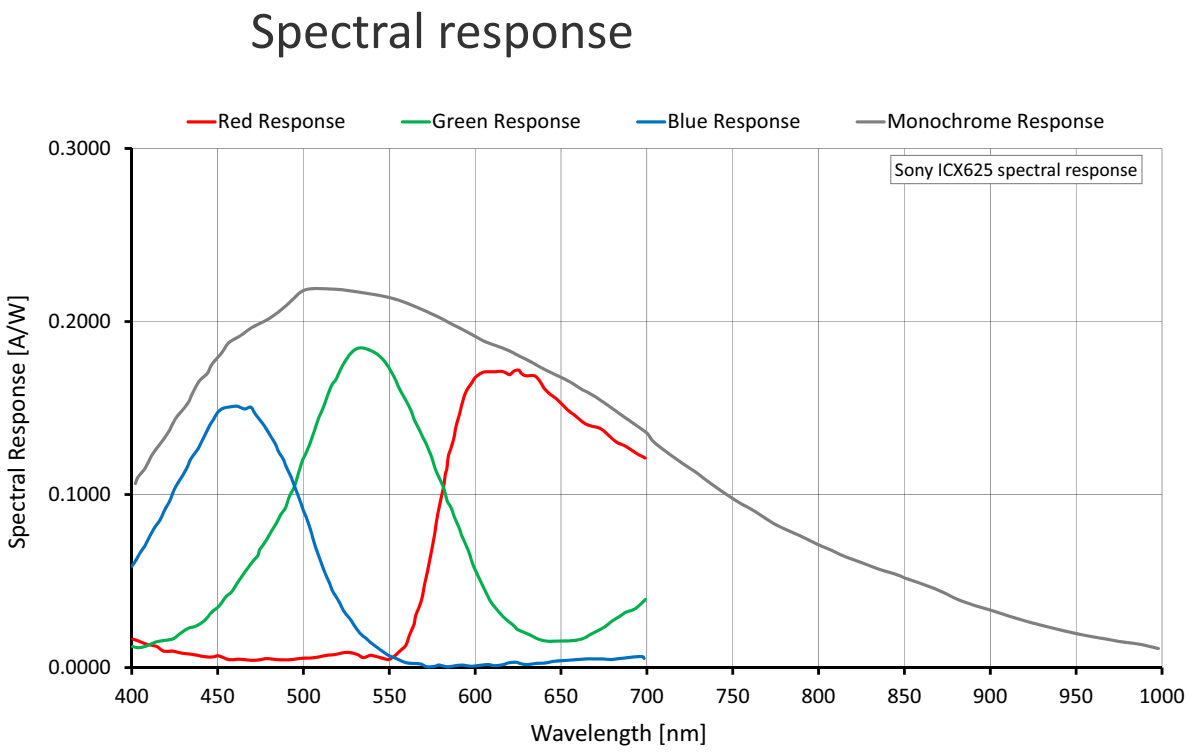


Figure 14: Prosilica GC2450, GC2450C (Sony ICX625) absolute QE

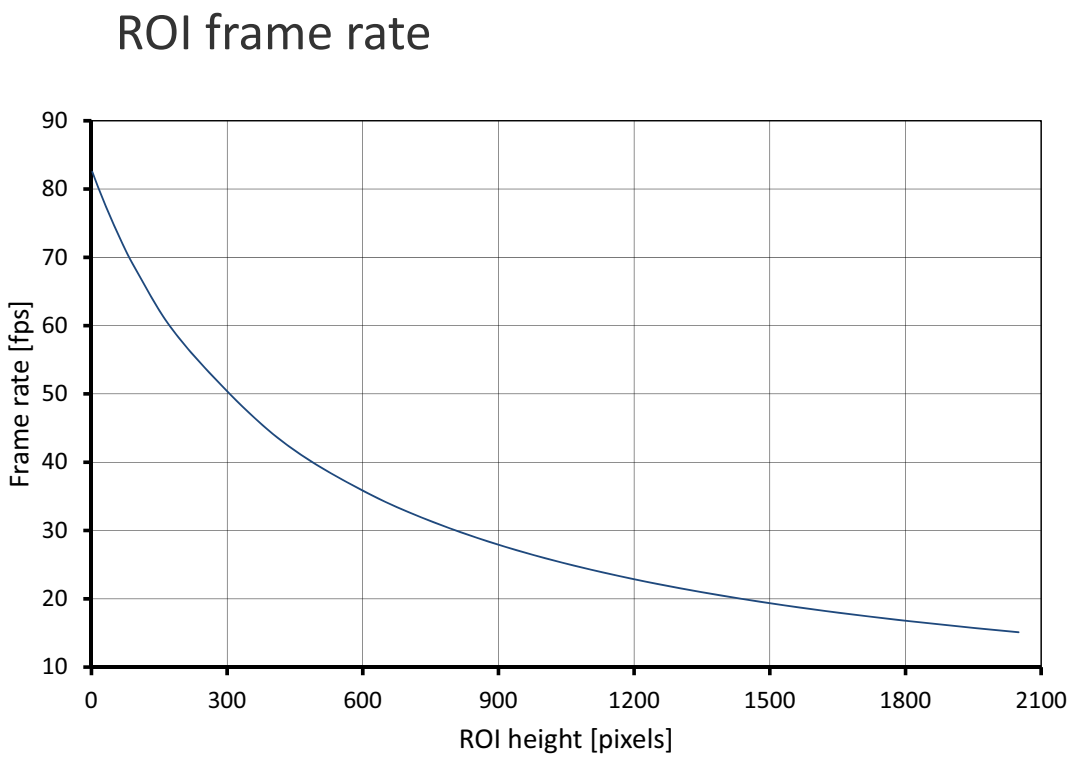


Figure 15: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)	Height (pixels)	Frame rate (fps)
2050	15.11	600	35.84
2000	15.42	400	44.21
1800	16.79	200	57.66
1600	18.42	100	68
1400	20.4	50	74.7
1200	22.87	20	79.4
1000	26.01	10	81.1
800	30.14	2	82.51

Width=2448 pixels

Table 15: Frame rate as a function of ROI height

Prosilica GC model frame rate comparison

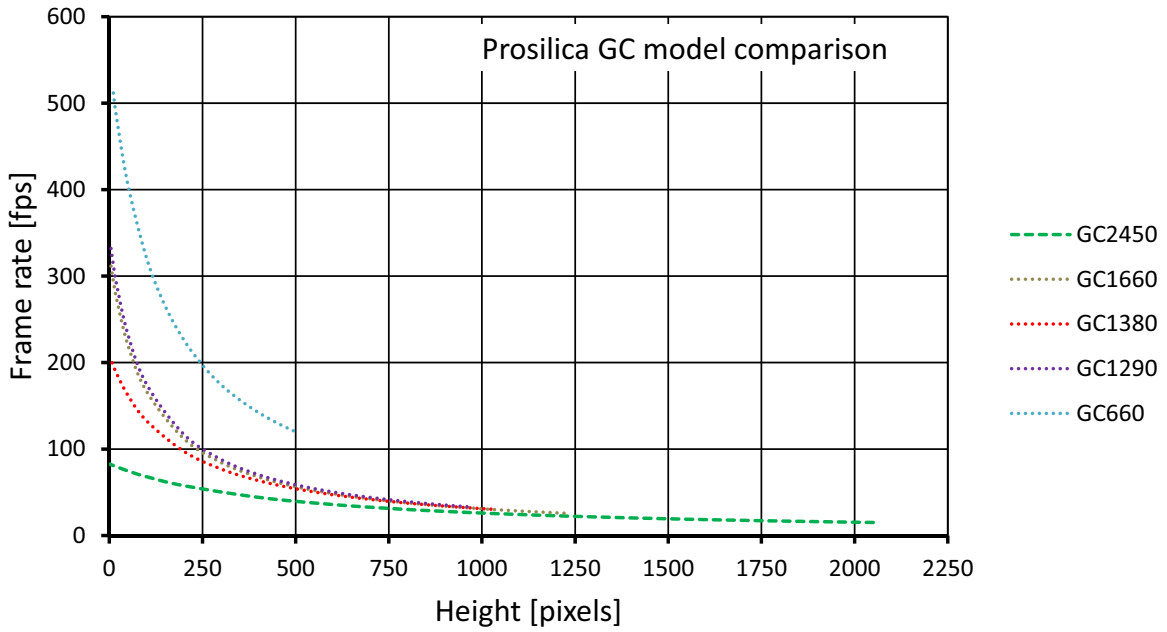


Figure 16: Maximum frame rate comparison for select models

Prosilica GC model comparison

Model	Sensor	Sensor type	Sensor format	Resolution	Frame rate	StreamHold Capacity
GC660, GC660C	Sony ICX618	CCD	Type 1/4	658 × 494	121 fps	≤ 194 frames
GC1290, GC1290C	Sony ICX445	CCD	Type 1/3	1280 × 960	33 fps	≤ 52 frames
GC1380, GC1380C	Sony ICX285	CCD	Type 2/3	1360 × 1024	30 fps	≤ 46 frames
GC1600H, GC1600CH	Sony ICX274	CCD	Type 1/1.8	1620 × 1220	25 fps	≤ 33 frames
GC2450, GC2450C	Sony ICX625	CCD	Type 2/3	2448 × 2050	15 fps	≤ 12 frames

Table 16: Prosilica GC model overview

Camera feature highlights

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

Camera feature reference

A complete listing of camera features, including definitions can be found on the Allied Vision Technical Documentation web page, go to https://www.alliedvision.com/en/support/technical-documentation.html.

- Vimba and third-party users: *GigE Features Reference*
- PvAPI users: *GigE Camera and Driver Attributes* document

Feature	Description
Gain control	Manual and auto
Exposure time 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
ROI	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 broadcast to the host computer
Image chunk data	Captured images are bundled with feature information such as exposure and gain value
Color matrix	Correct color rendering for specific color temperature
Gamma, hue, and saturation	Adjust image gamma, hue, and saturation
IEEE 1588 Precision Time Protocol (PTP)	Synchronize clocks of multiple cameras using multicast messaging
*May vary depending on the camera model	

Figure 17: Prosilica GC camera and driver feature highlights

Camera feature comparison

Allied Vision cameras support a number of standard and extended features. The following table identifies a selection of capabilities and compares the availability of features in Prosilica GC camera models.

Camera feature reference

A complete listing of camera features, including definitions can be found on the Allied Vision Technical Documentation web page, go to https://www.alliedvision.com/en/support/technical-documentation.html.

- Vimba and third-party users: *GigE Features Reference*
- PvAPI users: *GigE Camera and Driver Attributes* document

		GC660	GC1290	GC1380H	GC1600H	GC2450
Image optimization features	Auto gain	✓	✓	✓	✓	✓
	Auto exposure	✓	✓	✓	✓	✓
	Auto white balance (color models only)	✓	✓	✓	✓	✓
	Binning (Sum)	✓	✓	✓	✓	✓
	Black level (Offset)	✓	✓	✓	✓	✓
	Gamma correction	✓	✓	✓	✓	✓
	Hue, saturation, color transformation (color models only)	✓	✓	✓	✓	✓
	Three look-up tables (LUTs)	✓	✓	✓	✓	✓
	ROI	✓	✓	✓	✓	✓
Camera control features	Event channel	✓	✓	✓	✓	✓
	Image chunk data	✓	✓	✓	✓	✓
	IEEE 1588 Precision Time Protocol (PTP)	✓	✓	✓	✓	✓
	RS232	✓	✓	✓	✓	✓
	Three storable user sets (config files)	✓	✓	✓	✓	✓
	StreamHold	✓	✓	✓	✓	✓
	Sync out modes	✓	✓	✓	✓	✓
	Temperature monitoring (main board only)	✓	✓	✓	✓	✓

Table 17: Prosilica GC feature comparison

Image data flow

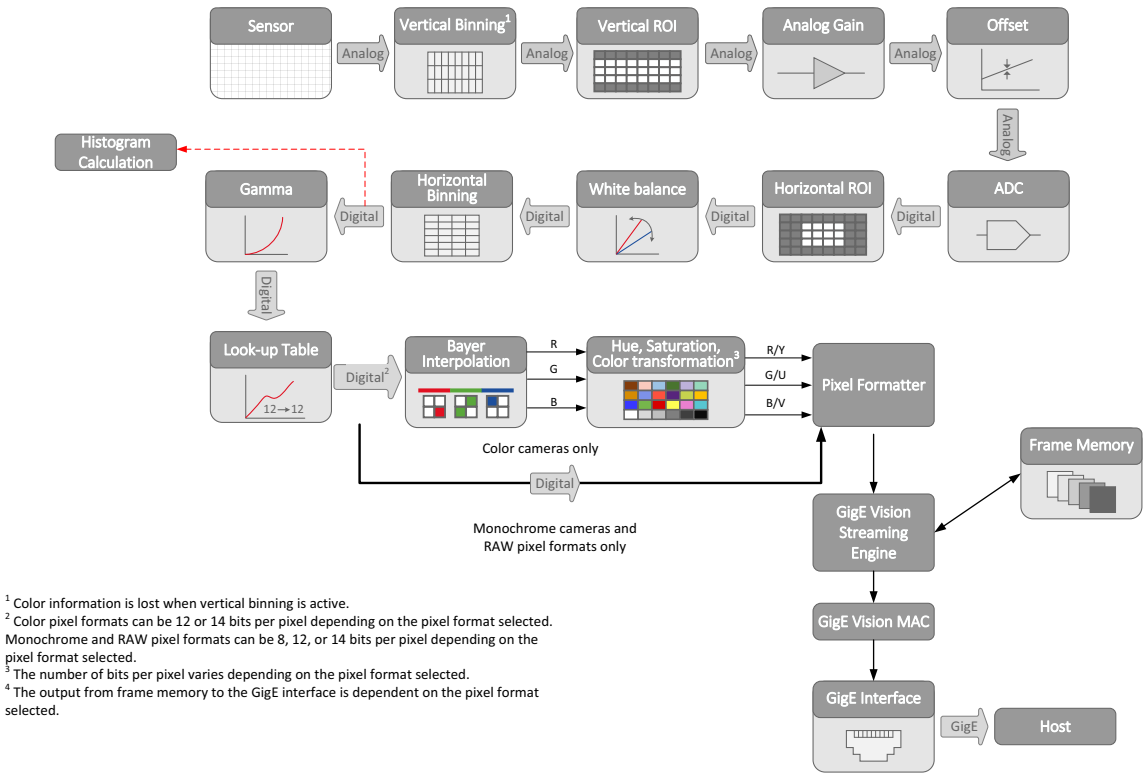
The following diagram illustrates the data flow image data.

Camera feature reference

A complete listing of camera features, including definitions can be found on the Allied Vision Technical Documentation web page, go to https://www.alliedvision.com/en/support/technical-documentation.html.

- Vimba and third-party users: *GigE Features Reference*
- PvAPI users: *GigE Camera and Driver Attributes* document

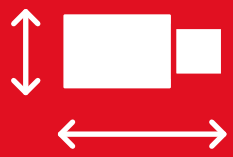
Prosilica GC hardware revision D models



[1] Color information is lost when vertical binning is active.
[2] Color pixel formats can be 12 or 14 bits per pixel depending on the pixel format selected. Monochrome and RAW pixel formats can be 8, 12, or 14 bits per pixel depending on the pixel format selected.
[3] The number of bits per pixel varies depending on the pixel format selected.
[4] The output from frame memory to the GigE interface is dependent on the pixel format selected.

Figure 18: Image flow diagram for Prosilica GC (hardware revision D) models

Mechanical dimensions



This chapter includes:

- CAD drawings and dimensions of standard housing models
- Sensor position accuracy
- Maximum protrusion distance and filter diameter for C-Mount and CS-Mount

Prosilica GC cameras are available with different lens mount options. For more information, see the *Modular Concept* document at:

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

Prosilica GC model housing (C-Mount)

Prosilica GC660, GC1290, GC1380H, C1600H, GC2450

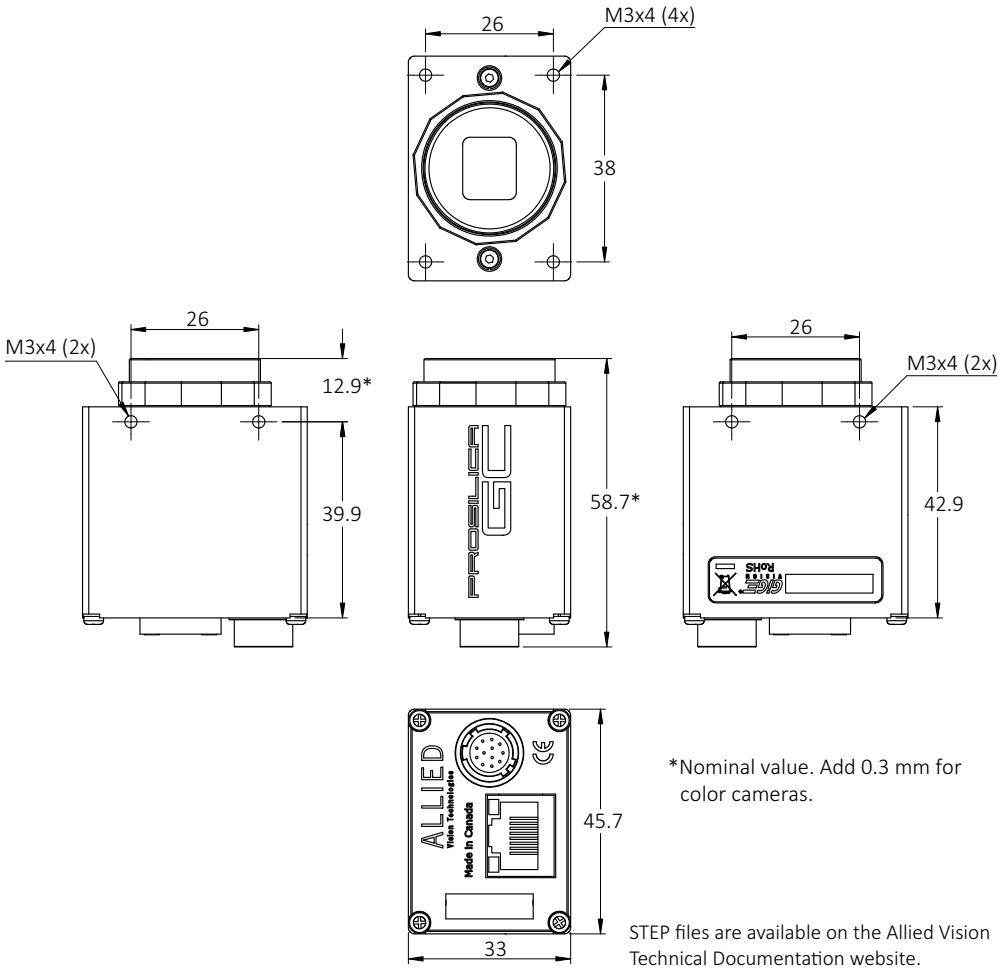


Figure 19: Prosilica GC model housing dimensions

Tripod adapter

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

Prosilica GC tripod adapter

Contact your Allied Vision Sales representative or your local Allied Vision distribution partner to purchase the Prosilica GC tripod adapter (Allied Vision order code 02-5002A).

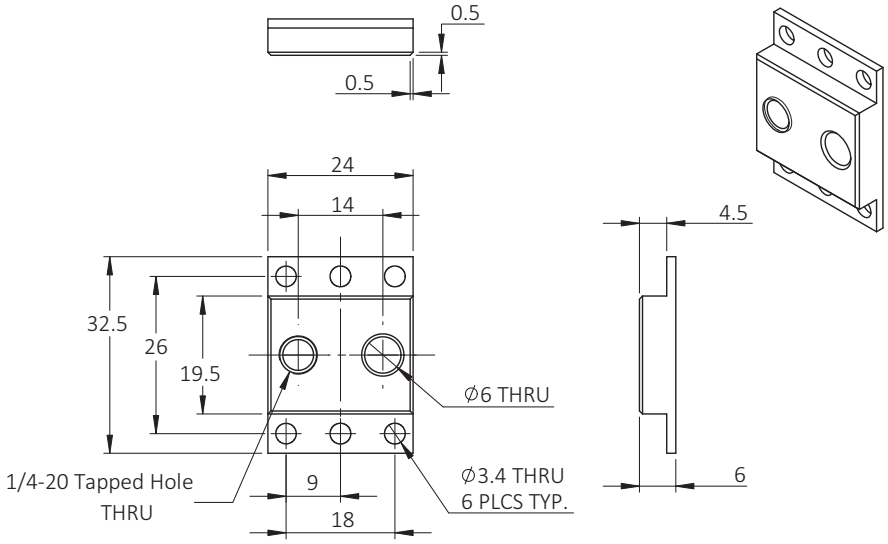


Figure 20: Tripod adapter for Prosilica GC series

Flange focal distance

C-Mount

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

C-Mount

Prosilica GC cameras are shipped with adjustable C-Mount. The camera can also be built with a CS-Mount with a standard 12.50 mm optical flange focal distance and a ± 10 µm tolerance.

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.

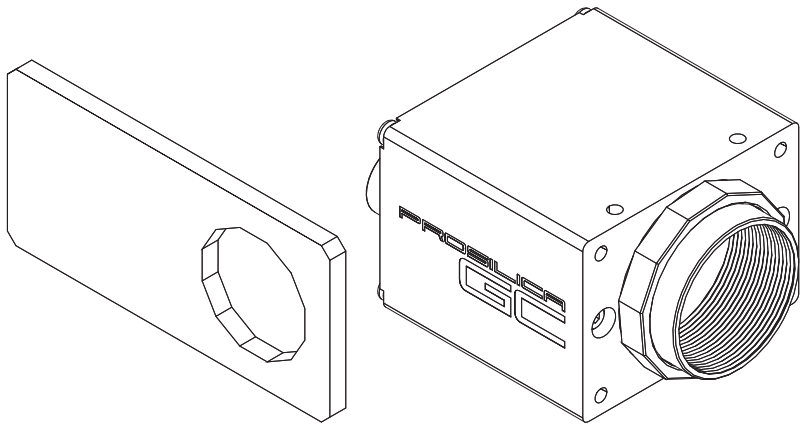


Figure 21: Prosilica GC camera and locking wrench

Loosen the 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.

Locking wrench

Contact the Allied Vision Sales team or your local Allied Vision distribution partner to purchase the hexagonal lens adjustment wrench for Prosilica GC cameras with C or CS locking ring (Allied Vision order code 02-5003A).

Adjusting the lens to infinity

Precondition: Use a C-Mount compatible lens that allows an infinity focus

1. Set the lens to infinity and image a distant object (10 m to 15 m). Make sure the lens is firmly threaded onto the C-Mount ring.
2. Rotate the lens and C-Mount ring until the image is focused.
3. 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 models this surface is the IR-filter holder, and for monochrome models this surface is the internal camera front plate (see figure 22). Table 18 presents lens protrusion values for Prosilica GC models with C-Mount.

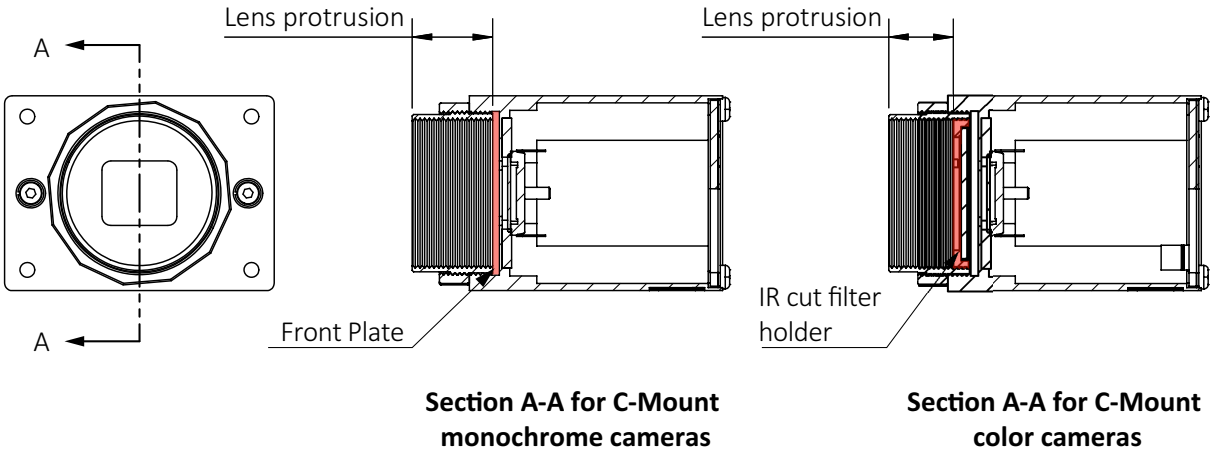


Figure 22: Cross section of typical Prosilica GC assembly with C-Mount

Model	Lens protrusion [mm]
GC660	13.64
GC660C	11.01
GC1290	13.64
GC1290C	12.20
GC1380H	13.64

Model	Lens protrusion [mm]
GC1380CH	8.31
GC1600CH	6.98
GC1600H	13.64
GC2450	13.64
GC2450C	10.93

Table 18: Lens protrusion for Prosilica GC models with C-Mount

Sensor position accuracy

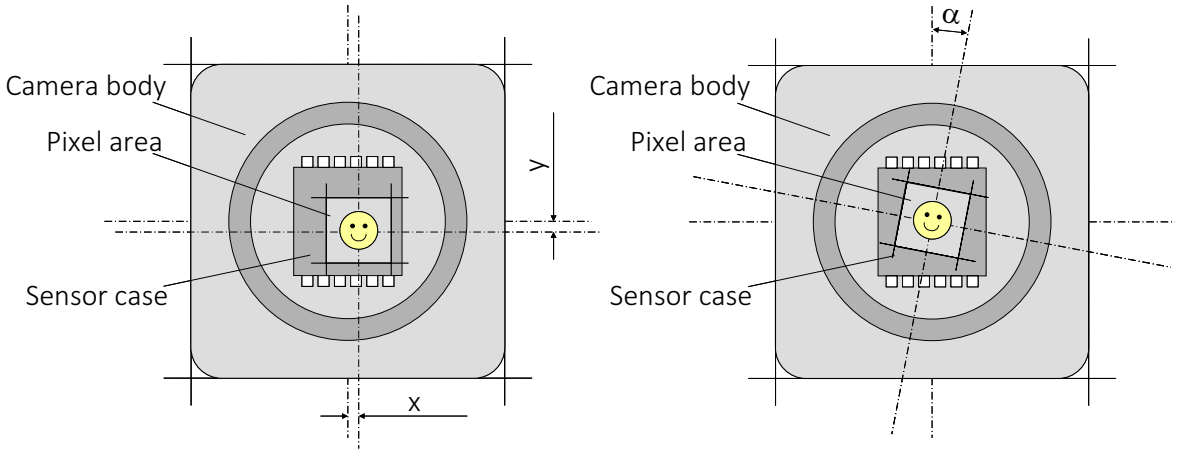


Figure 23: Sensor position accuracy

The following table defines the manufacturing accuracy of fitting sensors into Prosilica GC cameras.

Criteria	Subject	Properties
Reference Point	Sensor	Center of pixel area (photo sensitive cells)
	Camera	Center of camera front flange (outer case edges)
Accuracy	x-axis y-axis	±400 µm (sensor shift)
	z-axis	±10 µm (optical back focal distance)
	α	± 1° (sensor rotation)
Alignment		Optical alignment of photo sensitive sensor area into camera front module (lens mount front flange).

Table 19: Sensor position accuracy criteria

IR cut filter

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

Figure *24* shows the filter transmission response for the IRC30 filter employed in the Prosilica GC cameras.

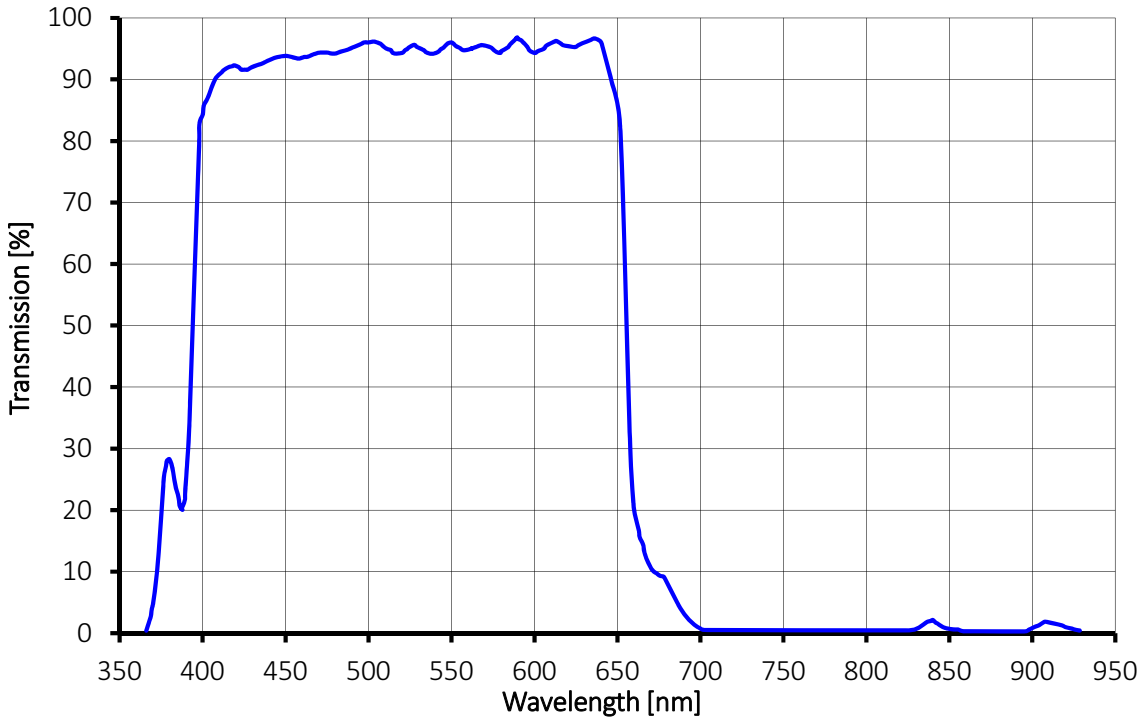
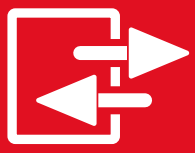


Figure 24: IR cut filter transmission response

Camera interfaces



This chapter includes:

- A general description of the inputs and outputs (including trigger features)
- I/O connector pin assignments
- I/O block diagrams
- A general description of trigger rules such as timing diagram and definitions

Back panel

This section provides information on GigE interface, inputs and outputs, and trigger features.

Accessories

Contact your Allied Vision Sales representative or your local Allied Vision distribution partner for information on accessories, go to:

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

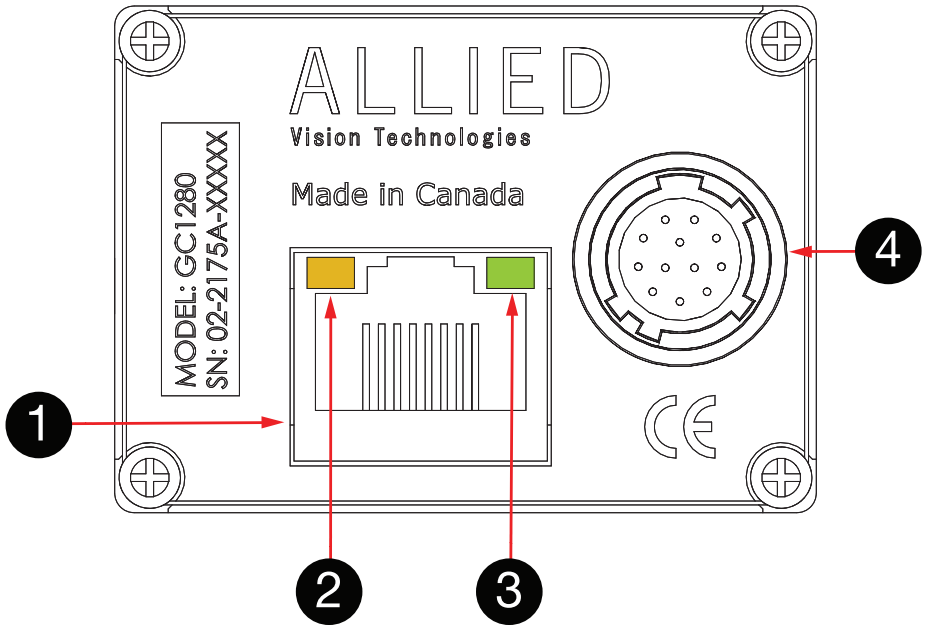


Figure 25: Prosilica GC GigE port, Hirose I/O port, and LEDs

1	GigE port
2	LED1
3	LED2
4	Hirose I/O port

Status LEDs

The color of the LEDs has the following meaning.

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

Table 20: Status of LEDs

LED2

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

GigE port

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

Ethernet adapters

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

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

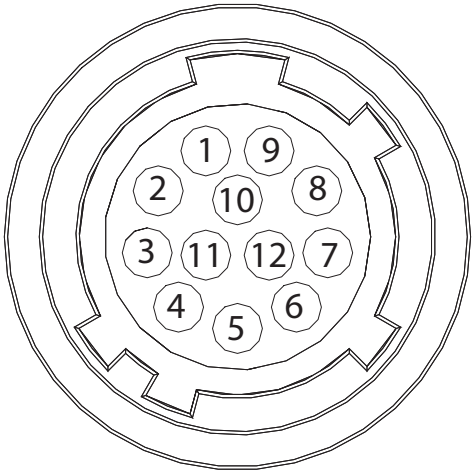
Ethernet cables

Cable lengths up to 100 meters are supported.

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

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-12PB connector					I/O cable color code
Pin	**Signal**	**Direction**	**Level**	**Description**	
1	Camera GND	In	---	Ground for external camera power supply	Blue
2	Camera Power	In	5 to 16* VDC	Camera power supply	Red
3	In 1	In	U_{in}(high) = 5 to 24 V U_{in}(low) = 0 to 0.8 V	Input 1 opto-isolated (SyncIn1)	Pink
4	Out 1	Out	Open emitter max. 20 mA	Output 1 opto-isolated (SyncOut1)	Gray
5	Isolated IO GND	In/Out	---	Isolated input and output signal ground (Common GND)	Yellow
6	Video iris	Out	---	PWM signal for iris control	Green
7	Reserved	---	---	---	Brown
8	TxD RS232	Out	RS232	Terminal transmit data	White
9	RxD RS232	In	RS232	Terminal receive data	Black
10	Signal GND	---	---	Ground for RS232 and non-isolated IO	Orange
11	In 2	In	LVTTL maximum 3.3 V	Input 2 non-isolated (SyncIn2)	White and Black
12	Out 2	Out	LVTTL maximum 3.3 V	Output 2 non-isolated (SyncOut2)	White and Brown

*Some models offer 5 to 25 VDC. See Camera power for details.

Table 21: I/O connector pin assignment and I/O cable color coding

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

Hirose connector

The cable side Hirose connector is available for purchase from Allied Vision (Allied Vision order code K7600040).

Cable color and pin out

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

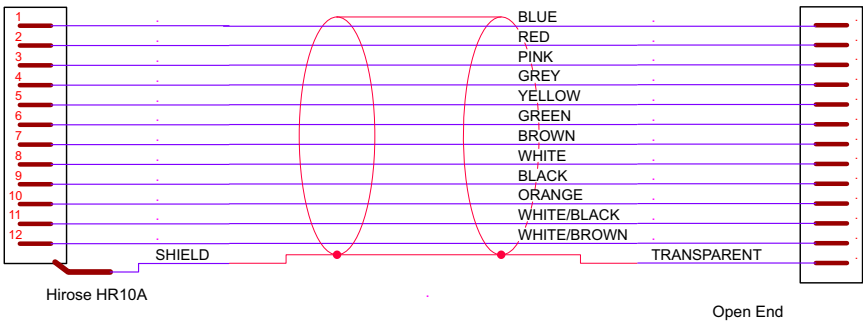


Figure 26: Prosilica GC cable color coding

I/O definition

Camera power

The Prosilica GC camera family has recently been updated to offer an expanded input power voltage range. The camera serial number is used to differentiate between cameras that offer 5 to 16 VDC and those that offer 5 to 25 VDC.

Input power voltage range

- SN 02-XXXXX-06000 to 02-XXXXX-07999: 5 to 16 V. 12 V nominal.
- SN ≥ 02-XXXXX-08XXX: 5 to 25 V. 12 V nominal

Further information available online

For more information on the power voltage range update for the Prosilica GC family, see the *Prosilica GC Power Voltage Specification Update* application note:

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

12V power adapter with Hirose connector

A 12 V power adapter with Hirose connector is available for purchase from Allied Vision:

- Order code 02-8003D North America Supply.
- Order code 02-8004D Universal Supply.

Isolated IO ground

The Isolated IO GND connection provides the user ground reference and return path for In 1, and Out 1. It is recommended that the ground wiring be physically close to the I/O wiring to prevent parasitic coupling. For example, a good cable design connects In 1 to one conductor of a twisted pair, Isolated IO GND to the second conductor of the same twisted pair.

RxD RS232 and TxD RS232

These signals are RS232 compatible. These signals are not optically isolated. Tie RS232 ground to Signal GND to complete the RS232 circuit.

Further information available online

For complete RS232 description and usage, see the *RS232 Port GigE Cameras* application note:

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

Input triggers

Input triggers allow 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 the signal. The camera can also be programmed to capture an image at some programmable delay time after the trigger event.

In 1 (opto-isolated)

In 1 is optically isolated and can be used in electrically noisy environments to prevent false trigger events. Tie trigger ground to Isolated IO GND to complete the trigger circuit. Compared to the non-isolated trigger, In 1 has a longer propagation time. It can be driven from 5 to 24 V with a minimum current source of 10 mA. See Camera I/O opto-isolated user circuit example for wiring information.

In 2 (non-isolated)

In 2 is not electrically isolated and can be used when environmental noise is inconsequential and faster trigger response is required. The required trigger signal is low voltage TTL 3.3 V. Tie trigger ground to Signal GND to complete the trigger circuit. See Camera I/O non-isolated user circuit example for wiring information.

Input voltage limit

Exceeding 5.1 V on In 2 can permanently damage the camera.

Output signals

Output signals can be assigned to a variety of internal camera signals via software. They 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 is ready to 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 previously listed events.
GPO	User programmable binary output.

Out 1 (opto-isolated)

Out 1 signal is optically isolated and requires a user voltage with a suitable pull up resistor. Tie signal ground to Isolated IO GND to complete the external circuit. See the Camera I/O opto-isolated user circuit example for wiring information.

Out 2 (non-isolated)

Out 2 signal is not electrically isolated and can be used when environmental electrical noise is inconsequential and faster trigger response is required. Use Signal GND to complete the external circuit. The output signal is a low voltage TTL, maximum 3.3 V. Not suitable for driving loads in excess of 24 mA. See the Camera I/O opto-isolated user circuit example for wiring information.

Signal ground

Signal Ground must be connected to the user's external circuit ground if In 2 or Out 2 is to be used, or if the RS232 port is to be used. Note that Signal Ground is common with Camera GND; however, it is good practice to provide a separate ground connection for power and signal.

Video iris

This signal can be used to drive the video input of a video iris lens. See the Video iris output section for wiring information.

Reserved

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

Video iris output

Prosilica GC cameras provide built-in auto iris controls for controlling video-type auto-iris lenses. These lenses are available from many popular security lens companies including Pentax, Fujinon, Tamron, and Schneider.

Remote iris lens control allows the camera to be more adaptable to changing light conditions. It allows the user to manually control the exposure and gain values and rely solely on the auto iris for adjustment to ambient lighting.

Camera power

The following schematic uses CAMERA POWER to power the video iris lens, and assumes CAMERA POWER = 12 V. Most video iris lenses operate at a 8 to 16 V input voltage. Therefore, this circuit is not appropriate if using a 24 V camera power supply. Doing so may irreparably damage your lens. Consult your video iris lens specifications for the appropriate drive voltage.

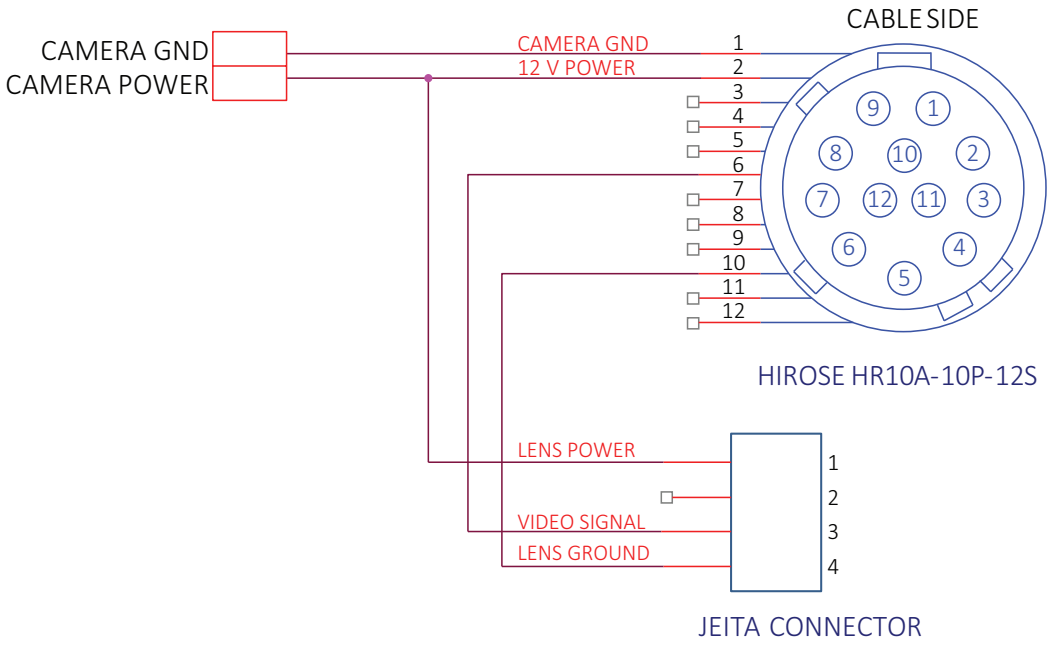
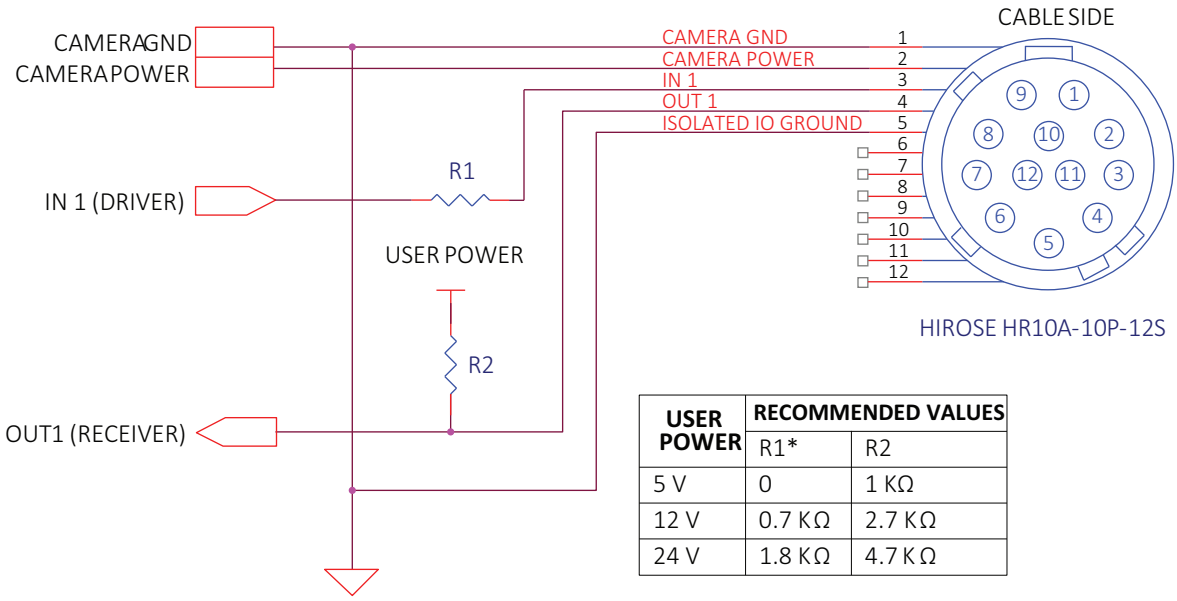


Figure 27: Prosilica GC video iris schematic

Camera trigger

Camera I/O opto-isolated user circuit example



USER POWER	RECOMMENDED VALUES	
	R1*	R2
5 V	0	1 KΩ
12 V	0.7 KΩ	2.7 KΩ
24 V	1.8 KΩ	4.7 KΩ

Figure 28: Prosilica GC opto-isolated user circuit

*Cameras with SN: 02-XXXXX-0XXXX, R1 necessary for input greater than 5 V.
Cameras with SN: 02-XXXXX-1XXXX, no R1 necessary, 5 to 24 V.

Input/Output

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

Output: User power, with pull-up resistor R2 is required.

Isolated output is connected to the open collector of Fairchild MOCD207. The corresponding transistor emitter is connected to isolated ground. See the Fairchild MOCD207 data sheet for more detailed information.

Camera I/O non-isolated user circuit example

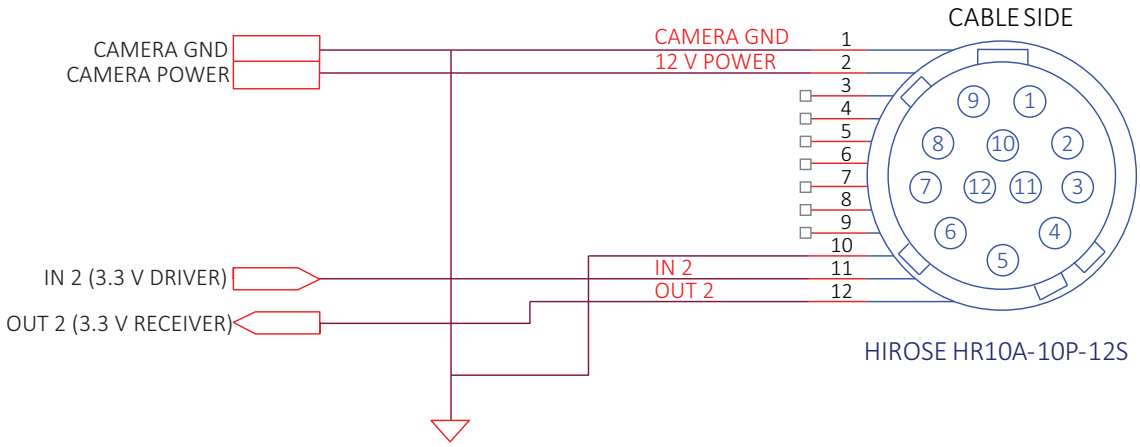


Figure 29: Prosilica GC non-isolated user circuit

Input/Output

Input: Incoming trigger must be able to source 10 µA, at 3.3 V. Input trigger voltage greater than 5.5 V will damage the camera.

Output: The maximum sync output current is 24 mA, at 3.3 V.

The non-isolated trigger circuit is connected to a Texas Instruments SN74LVC2G241 buffer and driver inside the camera. See the Texas Instruments SN74LVC2G241 for more detailed information.

Trigger timing diagram

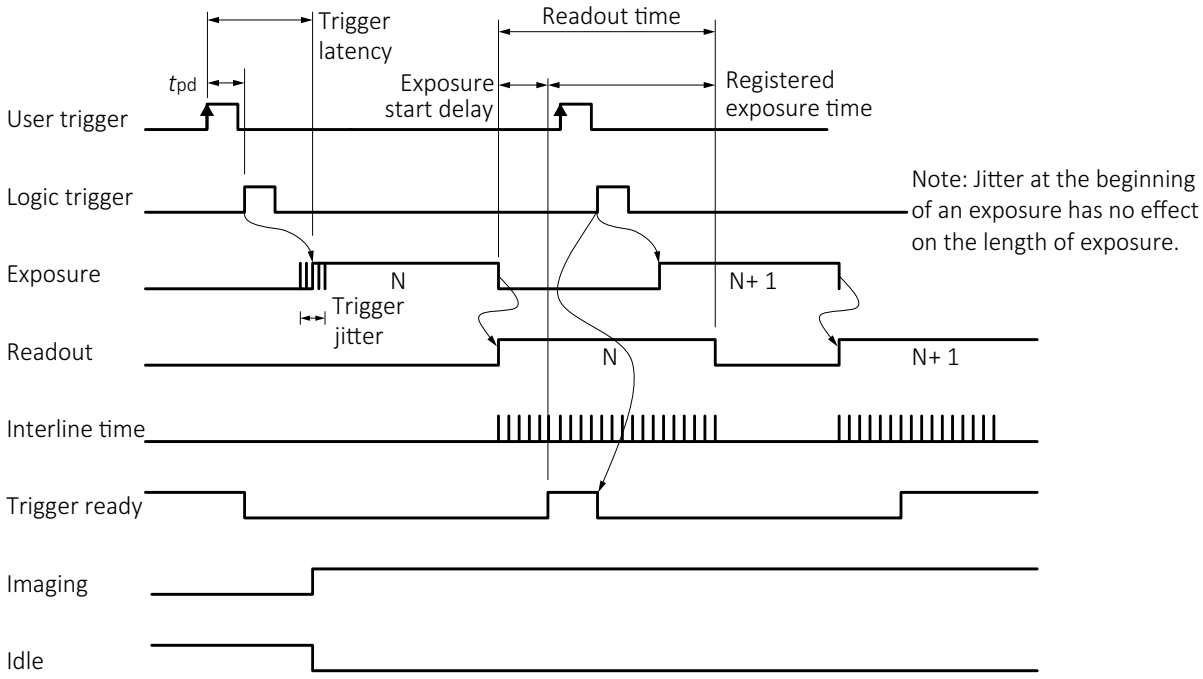


Figure 30: Prosilica GC internal signal timing waveform

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)
Propagation delay (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	Deviation from the trigger latency time
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 22: Explanation of signals in timing diagram

Trigger rules

User trigger pulse

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

- 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 section.

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.

For a more detailed description of the trigger concept for advanced users and special scenarios, see the *Triggering Concept* application note:

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

Cleaning optical components

This chapter describes safety instructions and cautions for cleaning lenses, optical filters, protection glass, or sensors.

Important instructions to be read first

Read these instructions before you contact Allied Vision or your Allied Vision distribution partner for assistance.

Contact Allied Vision or your Allied Vision distribution partner if you are not familiar with the procedures described in this chapter.

Warranty

Warranty information available online

For details about camera warranty duration and sensor warranty terms, go to:

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

Warranty precaution

To ensure your warranty remains in effect:

- Do not open the camera housing.
- Follow instructions described in this chapter.
- Use only optical quality tissue or cloth if you must clean a lens or filter.
- Use only optics cleaner. Do not use aggressive cleaners like benzine or spirit. Such cleaners may destroy the optical component's surface.
- Do not use compressed air which can push dust into camera and lens unless you are trained to clean a camera using this method.

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

Warranty precaution

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

Keep optical components clean

The best way to ensure the camera remains clean is to avoid penetration of foreign substances into the camera.

When screwing or unscrewing the camera lens or dust cap, hold the camera with the mount opening towards the floor. This minimizes the possibility of any contaminants falling on the glass surface. Always store cameras and lenses with dust-caps on.

Identifying impurities

If you observe any image artifacts in your video preview of your Prosilica GC camera you may have impurities either on the lens, filter or protection glass, or on the sensor protection glass. Every Prosilica GC camera is cleaned prior to sealing and shipment; however, impurities may develop due to handling or unclean environments.

As shown in figure 31, impurities (dust, particles or fluids) on the sensor or optical components appear as a dark area, patch or spot on the image and remain fixed in the preview window while you rotate the camera over the target.

Do not confuse this with a pixel defect which appears as a distinct point. Particles can either rest loosely or can be more or less stuck to the optical surface.

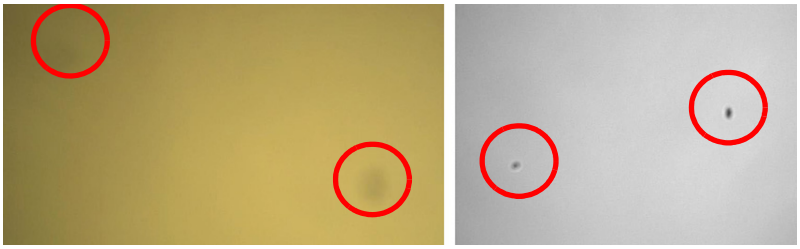


Figure 31: Image with tiny dust on the filter (left) and dust on the sensor (right)

Locating impurities

Before you dismount the lens you should find out if the impurity is on the filter, lens, or sensor.

1. Start acquiring a uniform image (for example, a white sheet of paper) with the camera.
2. To identify the affected surface, move the suspected optical component and see if the contamination follows this movement.
   a. If you move only the lens (not the camera) and the impurity moves as well, the impurity is on the lens.
   b. If you move the IR cut filter or protection glass window and the impurity moves as well, the impurity is on the filter or protection glass. Carefully remove the filter or protection glass and clean it on both sides using the techniques explained in the next section. If the impurity is neither on the lens nor the IR cut filter or protection glass, it is probably on the sensor.

Removing IR cut filter

A pin spanner wrench (Allied Vision order code: E9020001) suitable for IR filter removal is available for purchase from Allied Vision for all Prosilica GC cameras.

Materials for cleaning optical components

Use only these cleaning materials for optical components

- Optic approved lens cotton, cloth, or tissue that is chemically pure and free from silicones and other additives.
- Optic approved low residue cleaning liquid.

Never use these cleaning materials for optical components

- Dry swabs or tissue may cause scratches.
- Metal tools may cause scratches.
- Disposable cotton cosmetic swabs may contain contaminants harmful to optical glass.
- Cosmetic cotton my cause scratches or get caught in small gaps.
- Consumer eyeglass cleaning cloths may be pretreated with silicone harmful to optical glass.
- Aggressive cleaners like benzine, acetone, or spirits may damage the surface.

Optical cleaning liquid material safety data sheets

Read the MSDS for the optical cleaning liquid before cleaning your camera and optics. The MSDS provides important information including hazard identification, first aid measures, handling and storage, and PPE.

Cleaning Instructions

Workplace conditions

- Perform all cleaning operations (lenses, filter or protection glass, and sensor) in a dust-free clean-room.
- Avoid touching the optical components with your fingers or any hard material.
- Nitrile cleanroom gloves or powder free latex gloves are recommended to maintain low particulate levels.
- Use an ESD mat to prevent damage from an electrostatic discharge.

1. Unplug the camera from any power supply before cleaning.

2. Apply a small amount of cleaning liquid to a new lens cleaning cotton, cloth, or tissue. The cotton, cloth, or lens tissue should be moist, but not dripping.

3. Hold the camera sensor diagonally upwards. Ensure that the camera is away from your body to prevent particles like skin flakes from falling on the sensor.
4. Wipe the glass surface with a spiral motion from the center to the rim. Normally, several spiral wipes are recommended. Wipe only on glass avoiding contact to metal surfaces, because microscopic dirt could be released and could cause scratches on the glass.
5. When you have finished cleaning, examine the surface in a strong light. Take an out-of-focus picture of a flat, illuminated surface to see if any dirt or dust remains.
6. If dust spots remain, repeat this procedure using new clean lens tissue (as described).

Cleaning issues

If you notice that the camera lens or sensor is not clean after attempting to clean twice, or if you have any questions regarding cleaning your camera, contact your Allied Vision distribution partner or Allied Vision support.

Cleaning with compressed air

Allied Vision does not recommend cleaning Prosilica GC cameras with compressed air.

Possible material damage

- Compressed air at high pressure and/or shorter operating distances may push dust into the camera or lens and physically damage the camera, sensor, or optical components.
- Propellant from non-optic approved compressed air products may leave a residue on the camera or lens and may physically damage the camera, sensor, or optical components.
- Compressed air may contain oil or moisture that could contaminate or damage the optical components.
- Use an air blower or compressed air only if you are familiar with cleaning a camera using this method.

If you want to clean your camera with compressed air despite of all the warnings:

- Use an optic approved compressed air product or compressor.
- Use an anti-static ionizer attachment to reduce the risk of static-caused damage.
- Use a filter to remove moisture and oil from the air.

Use short directed bursts of air to remove impurities.

Compressed air pressure and operating distance

- Keep the compressed air pressure at a moderate strength only. Pressure at the nozzle should be less than 1 bar (15 psi).
- Operating distance from the camera should be 5 to 30 cm.

Firmware update

This chapter includes instructions on updating the firmware on your Allied Vision Prosilica GC camera.

Download the latest GigE firmware loader from the Allied Vision website:

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

Saved camera user sets

If new firmware contains a new feature or control, saved camera UserSets or ConfigFiles will be invalidated and erased!

Before loading new firmware, backup your current camera settings.

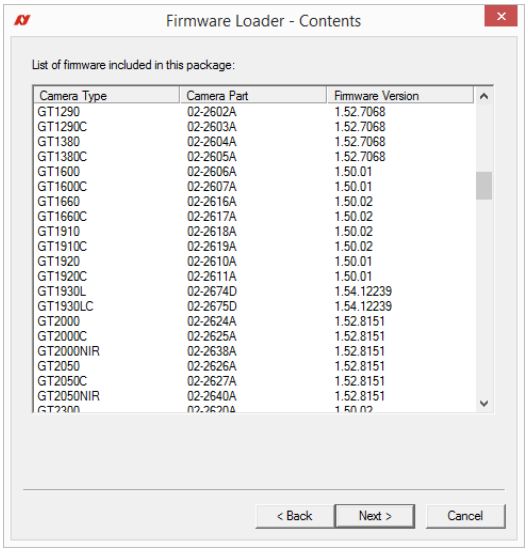
Vimba Viewer: select the **Save Camera Settings** icon from the **Cameras** window to export the camera settings file (XML file) to the host PC.

GigE SampleViewer: select the **Disk** icon from the **Cameras** window to export camera settings file (XML file) to the host PC.

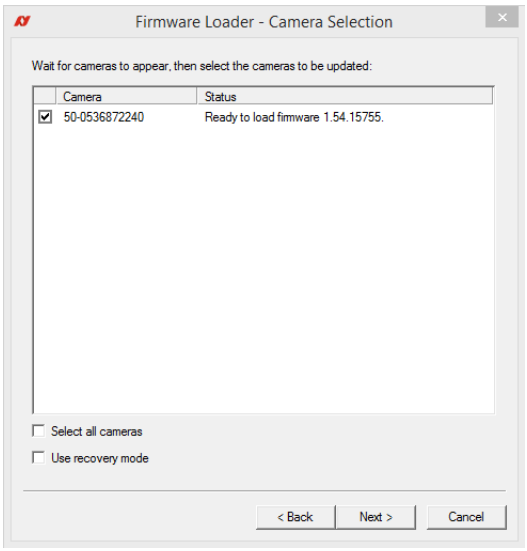
To update the firmware on your Allied Vision GigE camera

1. Launch the *Allied Vision Firmware Loader.*

2. Click **Next**. The *Firmware Loader* displays a list of firmware included in the package.



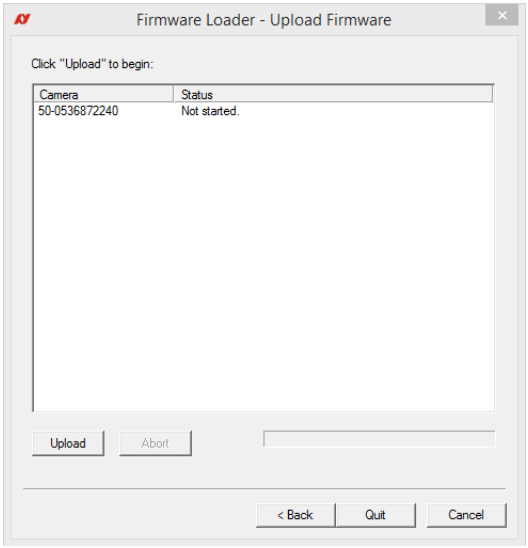
3. Click **Next**. You can select your camera model on this page.



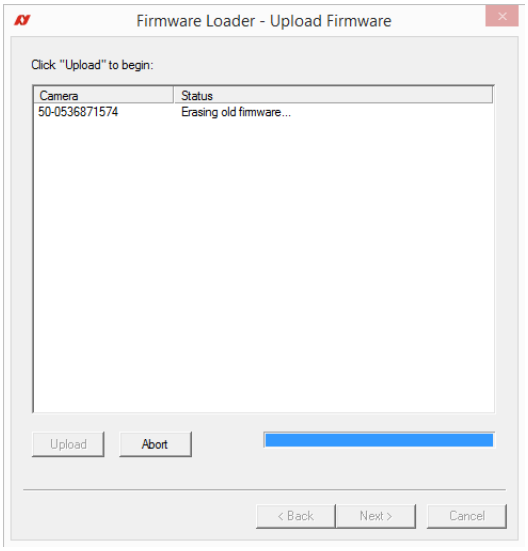
Recovery Mode

Select the **Use recovery mode** checkbox if the connected GigE camera is not found by the firmware loader, or if the GigE camera is listed as unavailable. When selected, power cycle the camera to enter the **Boot Loader** mode.

4. Click **Next**.



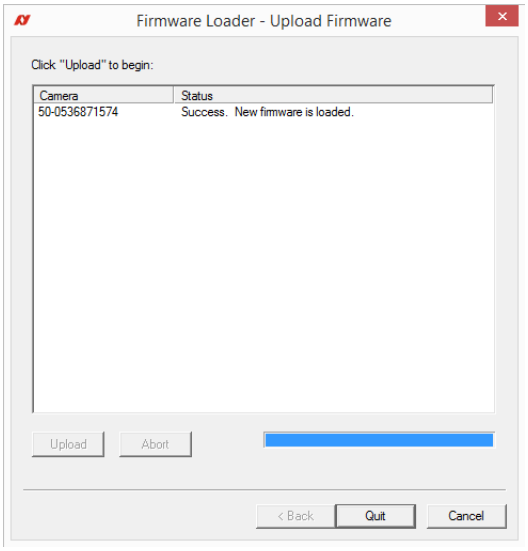
5. Click **Upload** to start the update. The existing firmware will be erased and the new firmware will be updated to the camera.



Possible material damage

Do not unplug the GigE cable or camera power supply during the update procedure.

6. The *Firmware Loader* will display a success status upon completion. Click **Quit** to exit the loader.



Power cycle after upgrade or downgrade

You must always power cycle the camera after a firmware upgrade or downgrade.

Appendix

The appendix includes the following information for older Prosilica GC cameras up to serial number 02-21XXA (hardware revision A):

- Specification tables
- Absolute QE plots
- ROI height vs. frame rate plots
- Camera feature comparison of hardware version A models
- Image data flow diagrams
- Mechanical dimensions

Specifications common to all models

Feature	Specification
Lens mount	Default: C-Mount Optional: CS-Mount
TTL (non-isolated) I/Os	1 input, 1 output
Opto-isolated I/Os	1 input, 1 output
RS232	1
Operating temperature	0 °C to +50 °C ambient temperature (without condensation)
Storage temperature	-10 °C to +70 °C ambient temperature (without condensation)
Operating humidity	20% to 80% non-condensing
Power requirements	5 to 16 VDC: Cameras with SN 02-XXXXX-06000 to 02-XXXXX-07999 5 to 25 VDC: Cameras with SN ≥ 02-XXXXX-08XXX
Interface	IEEE 802.3 1000BASE-T (GigE)
Interface standard	GigE Vision® Standard V1.2
Camera control standard	GenICam SFNC V1.2.1

Table 23: Specifications common to all Prosilica GC models

Prosilica GC650, GC650C (02-2110A, 02-2111A)

Feature	Specification	
	Prosilica GC650	**Prosilica GC650C**
Resolution	659 (H) × 493 (V) 0.3 MP	
Sensor	Sony ICX424AL with HAD CCD™ technology	Sony ICX424AQ with Wfine HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 1/3	
Sensor size	6 mm diagonal	
Pixel size	7.4 µm × 7.4 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	90 fps	
Bit depth	8-bit, 12-bit	
A/D	12-bit	
Image buffer	16 MB	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerGR12Packed
Exposure time control	8 µs to 116.8 s; 1 µs increments	
Gain control	0 to 19 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	3.3 W at 12 VDC	
Trigger latency	1.0 µs for non-isolated I/O; 2.8 µs for isolated I/O	
Trigger jitter	±20 ns for non-isolated I/O; ±0.5 µs for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	104 g	

Table 24: Prosilica GC650, GC650C model specifications

Absolute QE

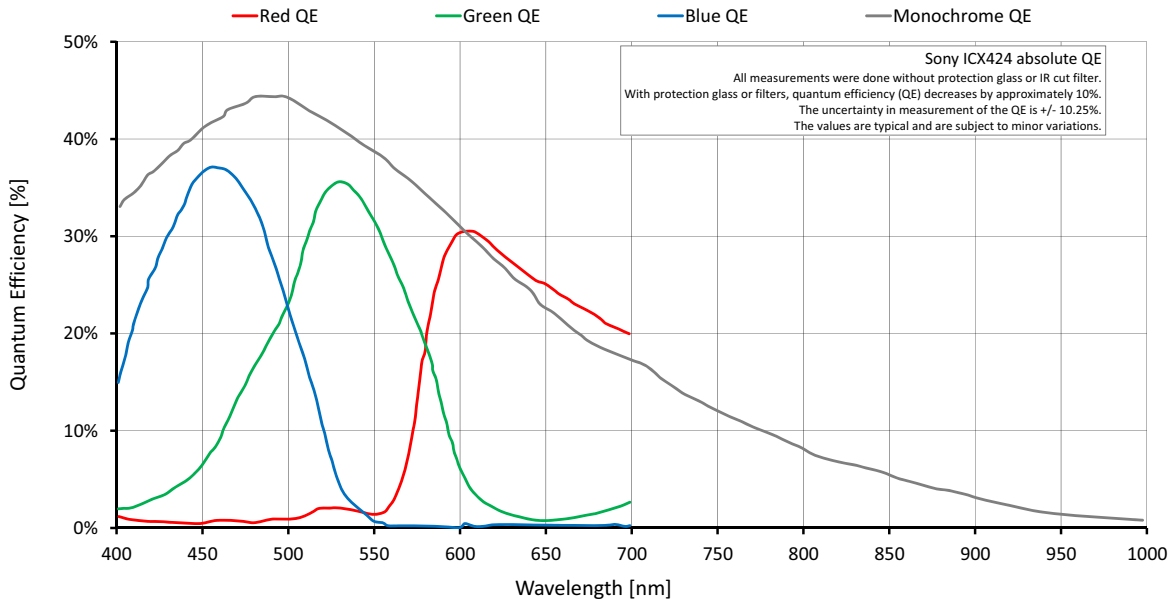


Figure 32: Prosilica GC650, GC650C (Sony ICX424) absolute QE

Spectral response

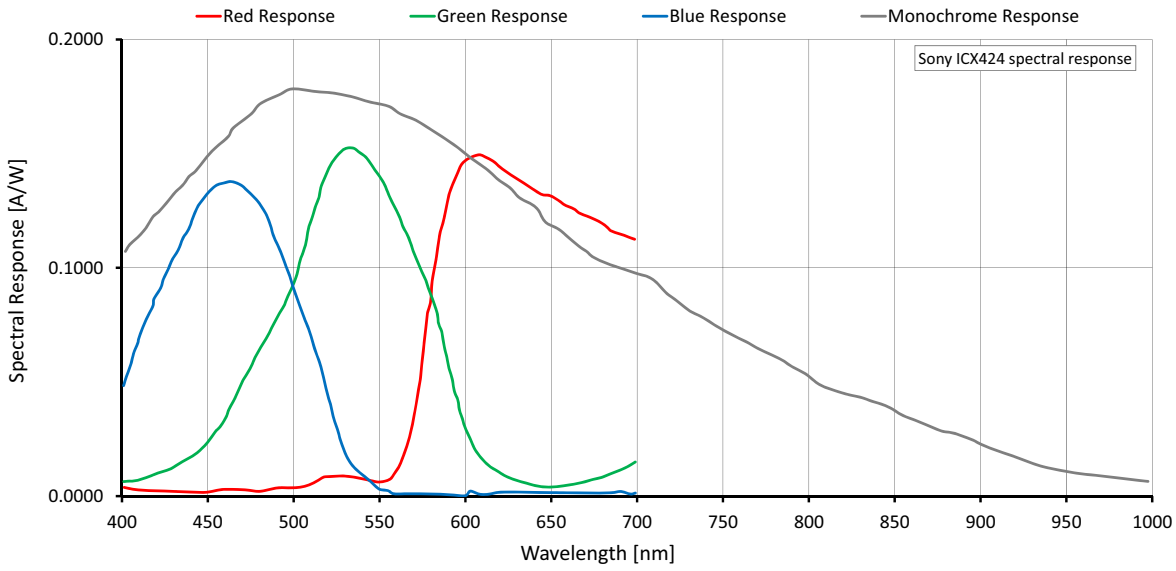


Figure 33: Prosilica GC650, GC650C (Sony ICX424) spectral response

ROI frame rate

$$\text{Frame rate} = \frac{1}{19.94\ \mu s \times \text{Height} + 1224.13\ \mu s}$$

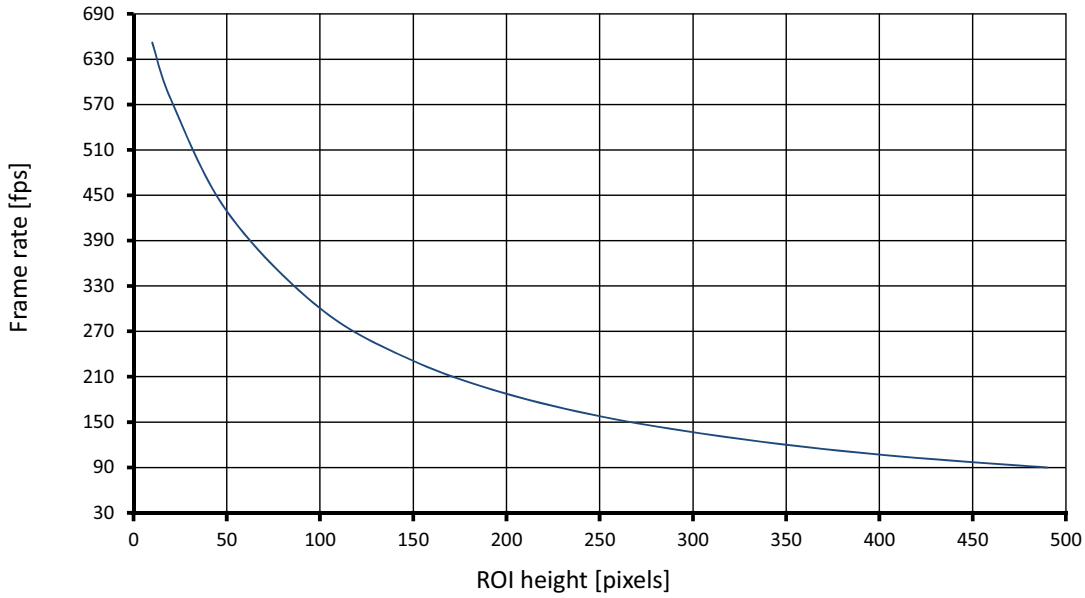


Figure 34: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)	Height (pixels)	Frame rate (fps)
490	90.0	200	187.5
450	97.0	150	231.0
400	107.0	100	300.4
350	120.0	50	428.9
300	136.6	20	577.0
250	157.8	10	652.0

Width=659 pixels

Table 25: Frame rate as a function of ROI height

Prosilica GC655, GC655C (02-2115A, 02-2116A)

Feature	Specification	
	Prosilica GC655	**Prosilica GC655C**
Resolution	659 (H) × 493 (V) 0.3 MP	
Sensor	Sony ICX414AL with HAD technology	Sony ICX414AQ with Wfine HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 1/2	
Sensor size	8.0 mm diagonal	
Pixel size	9.9 µm × 9.9 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	90 fps	
Bit depth	8-bit, 12-bit	
A/D	12-bit	
Image buffer	16 MB	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerGR12Packed
Exposure time control	8 µs to 116.8 s; 1 µs increments	
Gain control	0 to 22 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	3.0 W at 12 VDC	
Trigger latency	1.0 µs for non-isolated I/O; 2.8 µs for isolated I/O	
Trigger jitter	±20 ns for non-isolated I/O; ±0.5 µs for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	105 g	

Table 26: Prosilica GC655, GC655C model specifications

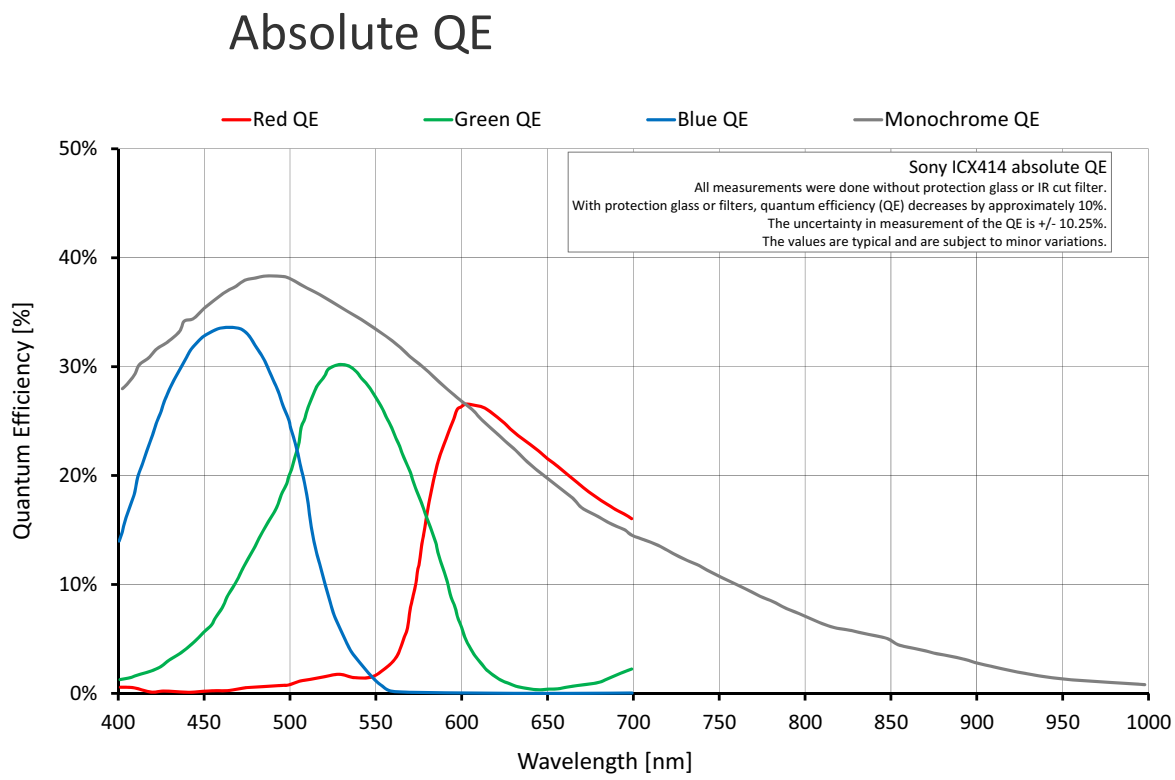


Figure 35: Prosilica GC655, GC655C (Sony ICX414) absolute QE

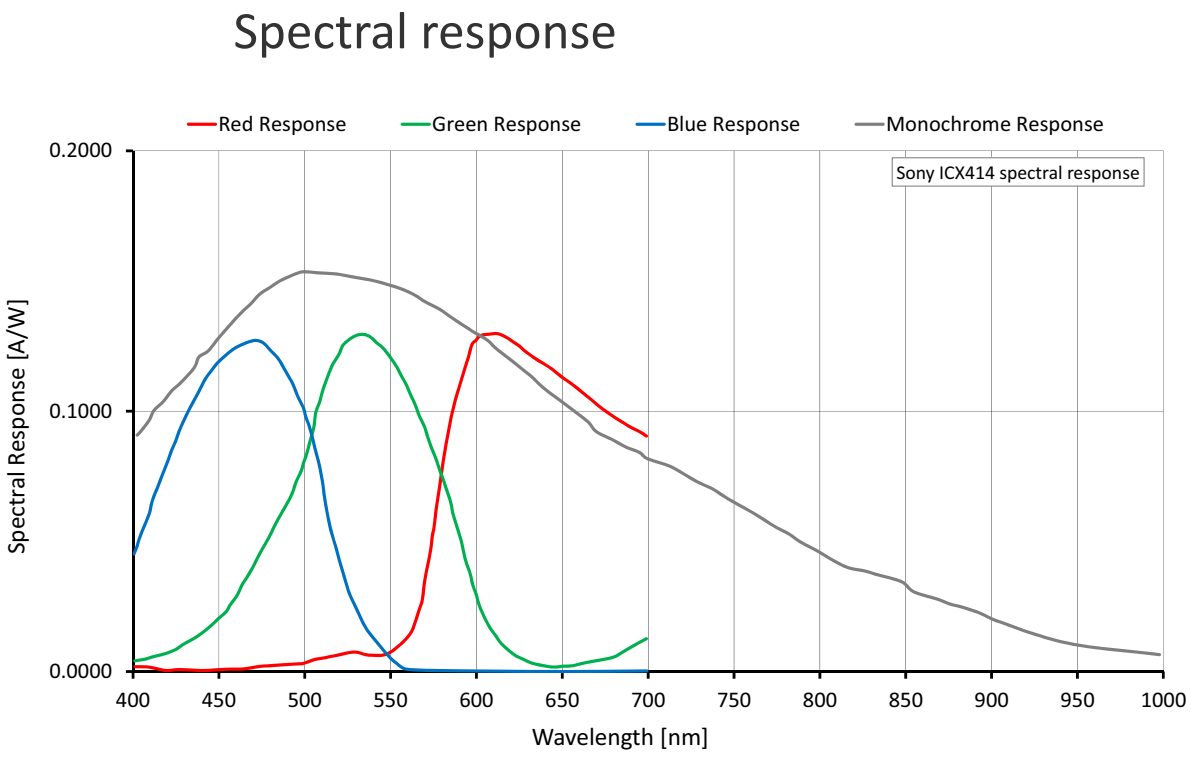


Figure 36: Prosilica GC655, GC655C (Sony ICX414) spectral response

ROI frame rate

$$\text{Frame rate} = \frac{1}{19.94\ \mu s \times \text{Height} + 1224.14\ \mu s}$$

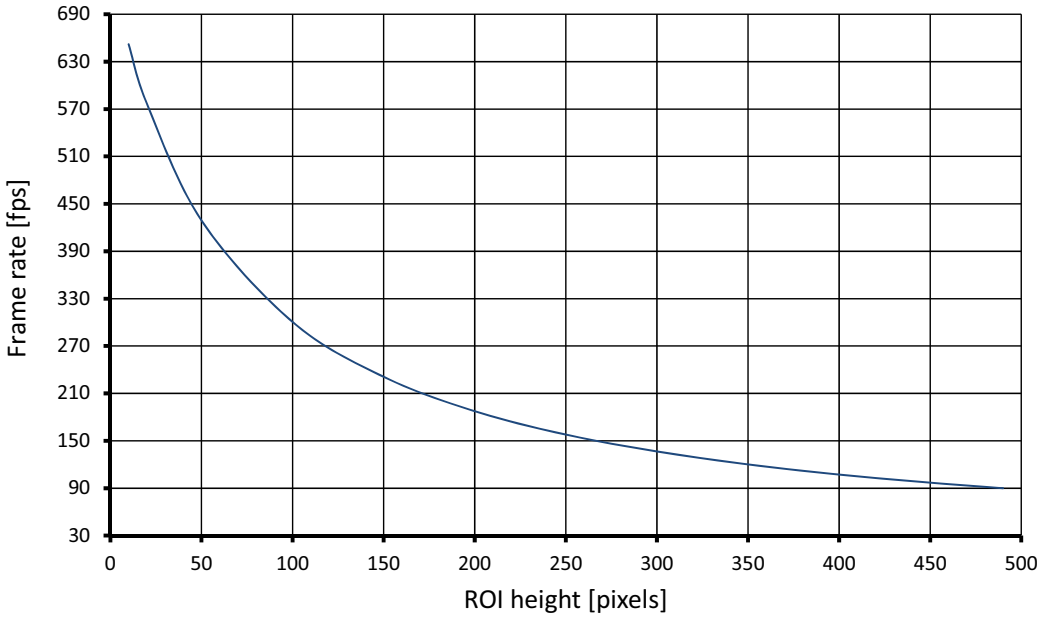


Figure 37: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)	Height (pixels)	Frame rate (fps)
490	90.0	200	187.5
450	97.0	150	231.0
400	107.2	100	300.4
350	120.1	50	428.9
300	136.6	20	577.0
250	157.8	10	652.0

Width=659 pixels

Table 27: Frame rate as a function of ROI height

Prosilica GC750, GC750C (02-2160A, 02-2161A)

Feature	Specification	
	Prosilica GC750	**Prosilica GC750C**
Resolution	752 (H) × 480 (V) 0.4 MP	
Sensor	ON Semi MT9V022	
Sensor type	CMOS	
Shutter type	Global	
Sensor format	Type 1/3	
Sensor size	5.35 mm diagonal	
Pixel size	6 µm × 6 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	67 fps	
Bit depth	8-bit, 10-bit	
A/D	10-bit	
Image buffer	16 MB	
Monochrome pixel formats	Mono8, Mono10	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed, RGBA8Packed, BGRA8Packed
RAW pixel formats		BayerBG8, BayerBG10
Exposure time control	30 µs to 60 s; 1 µs increments	
Gain control	0 to 48 dB	
Power consumption	2.2 W at 12 VDC	
Trigger latency	31 µs for non-isolated I/O; 43 µs for isolated I/O	
Trigger jitter	±20 ns for non-isolated I/O; ±0.5 µs for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	50.6 × 45.7 × 33 mm	50.9 × 45.7 × 33 mm
Mass (typical)	85 g	

Table 28: Prosilica GC750, GC750C model specifications

Absolute QE

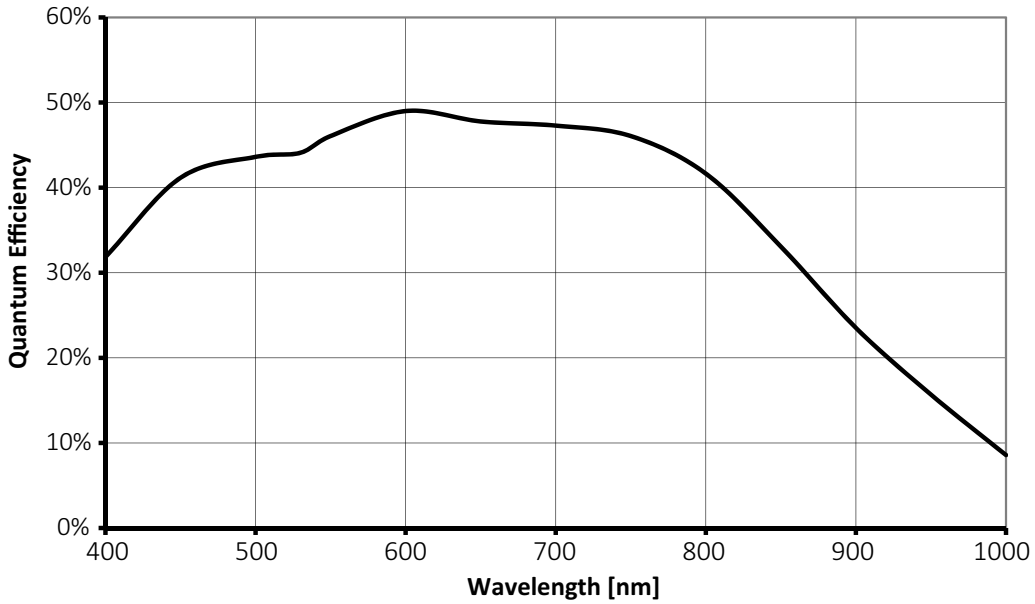


Figure 38: Prosilica GC750 (ON Semi MT9V022) absolute QE

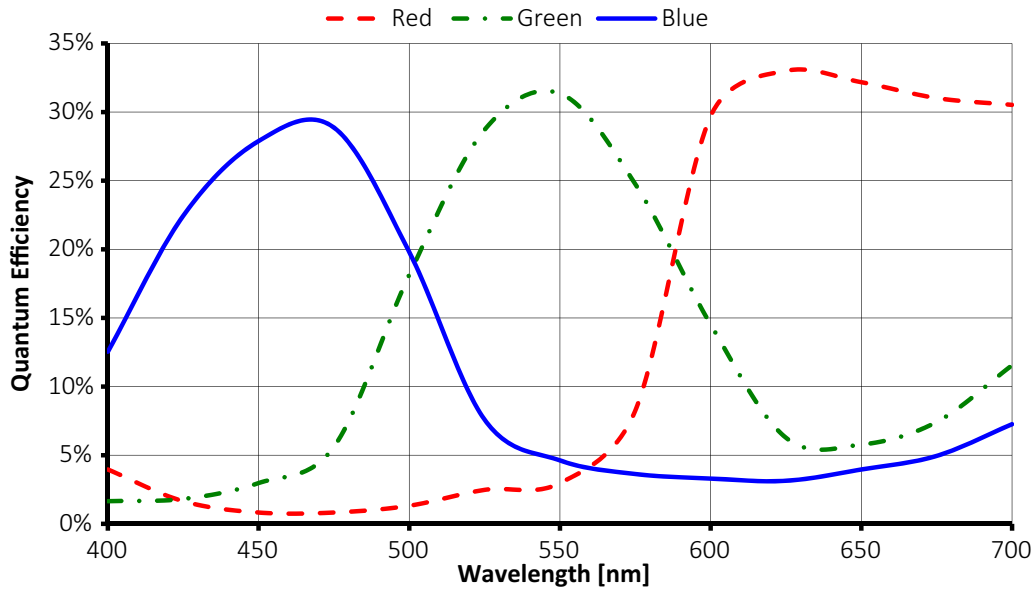


Figure 39: Prosilica GC750C (ON Semi MT9V022) absolute QE

ROI frame rate

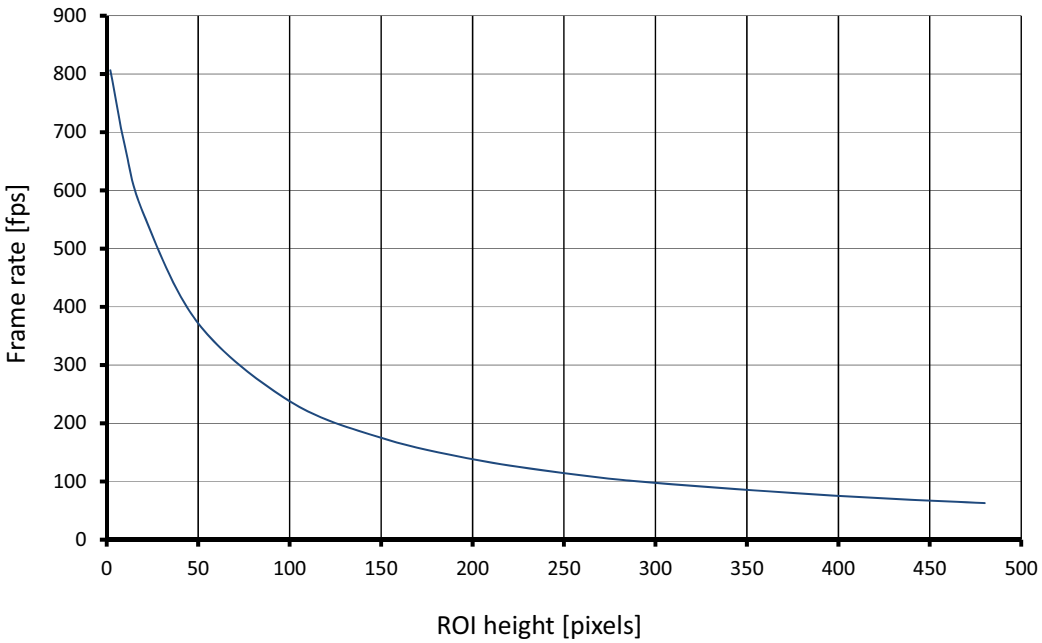


Figure 40: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)
480	62.9
400	75.3
300	97.6
250	114.5
200	138.4
150	175.1
100	238.0
50	371.7
20	560.6
10	674.9
2	806.4

Width=752 pixels

Table 29: Frame rate as a function of ROI height

Prosilica GC780, GC780C (02-2117A, 02-2118A)

Feature	Specification	
	Prosilica GC780	**Prosilica GC780C**
Resolution	782 (H) × 582 (V) 0.5 MP	
Sensor	Sony ICX415AL with HAD technology	Sony ICX415AQ with Wfine HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 1/2	
Sensor size	8.0 mm diagonal	
Pixel size	8.3 µm × 8.3 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	63.9 fps	
Bit depth	8-bit, 12-bit	
A/D	12-bit	
Image buffer	16 MB	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerGR12Packed
Exposure time control	8 µs to 116.8 s; 1 µs increments	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Gain control	0 to 26 dB	0 to 23 dB
Power consumption	2.8 W at 12 VDC	
Trigger latency	1 µs for non-isolated I/O; 2.8 µs for isolated I/O	
Trigger jitter	±20 ns for non-isolated I/O; ±0.5 µs for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	100 g	

Table 30: Prosilica GC780, GC780C model specifications

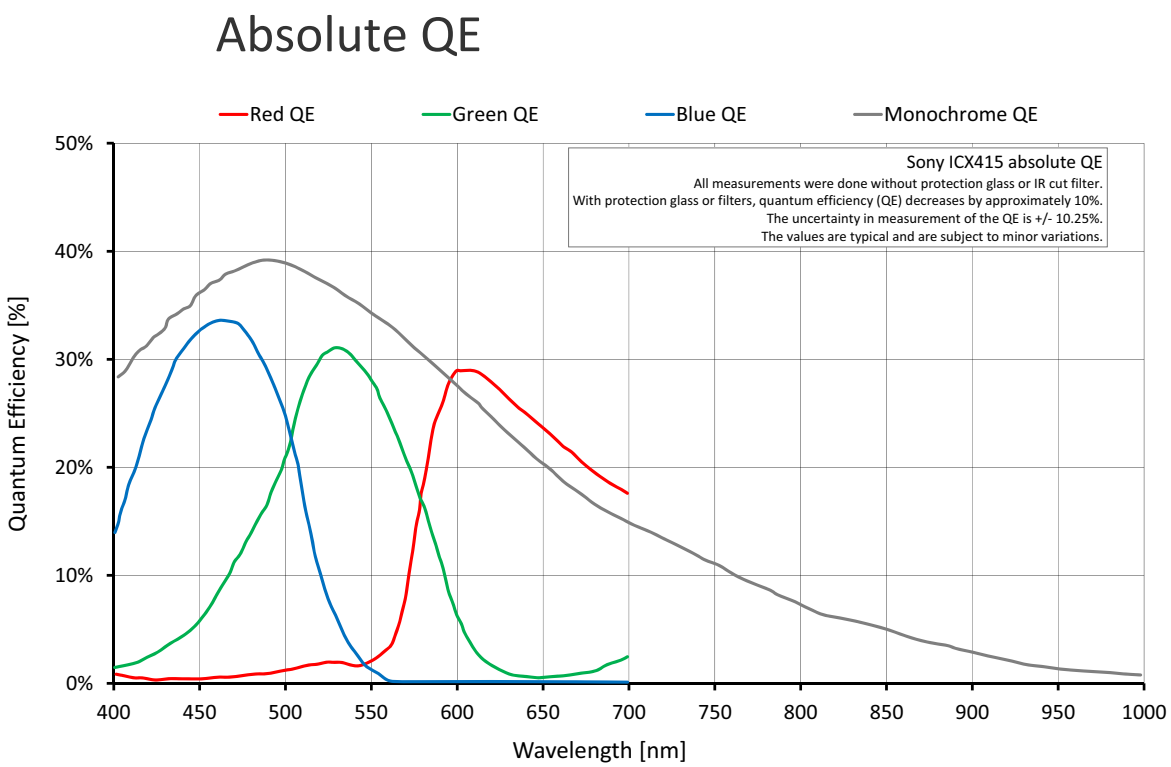


Figure 41: Prosilica GC780, GC780C (Sony ICX415) absolute QE

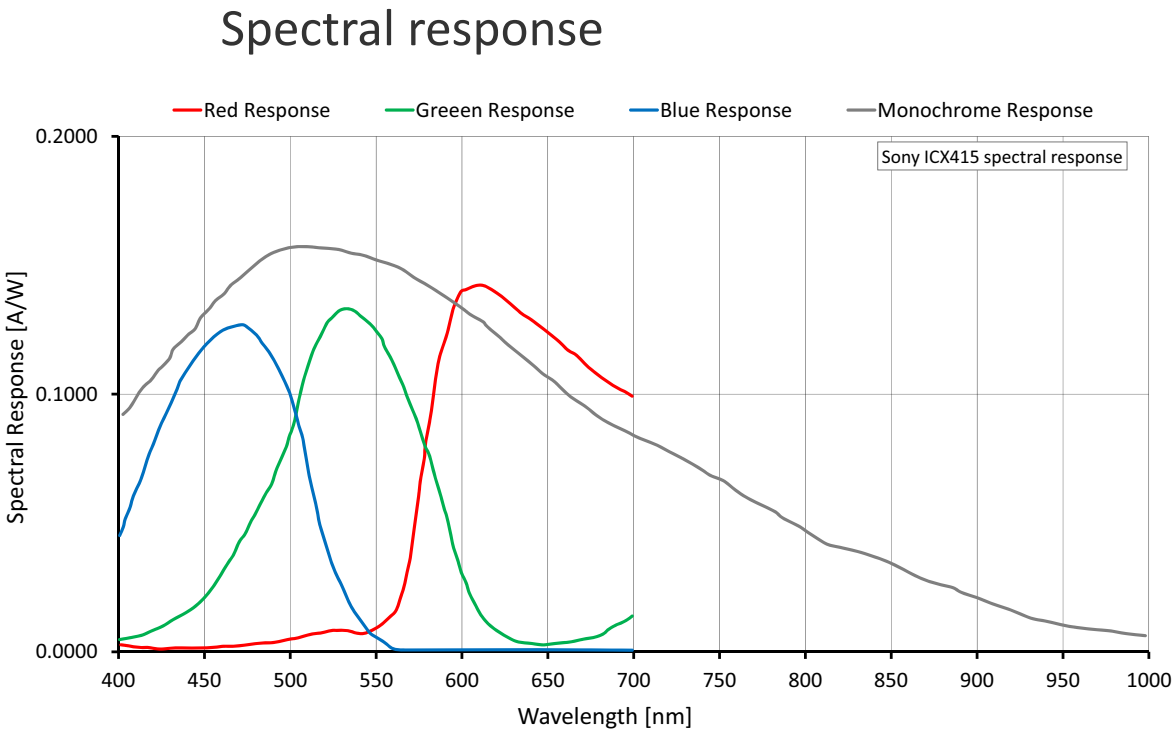


Figure 42: Prosilica GC780, GC780C (Sony ICX415) spectral response

ROI frame rate

$$\text{Frame rate} = \frac{1}{24.70\ \mu s \times \text{Height} + 1139.14\ \mu s}$$

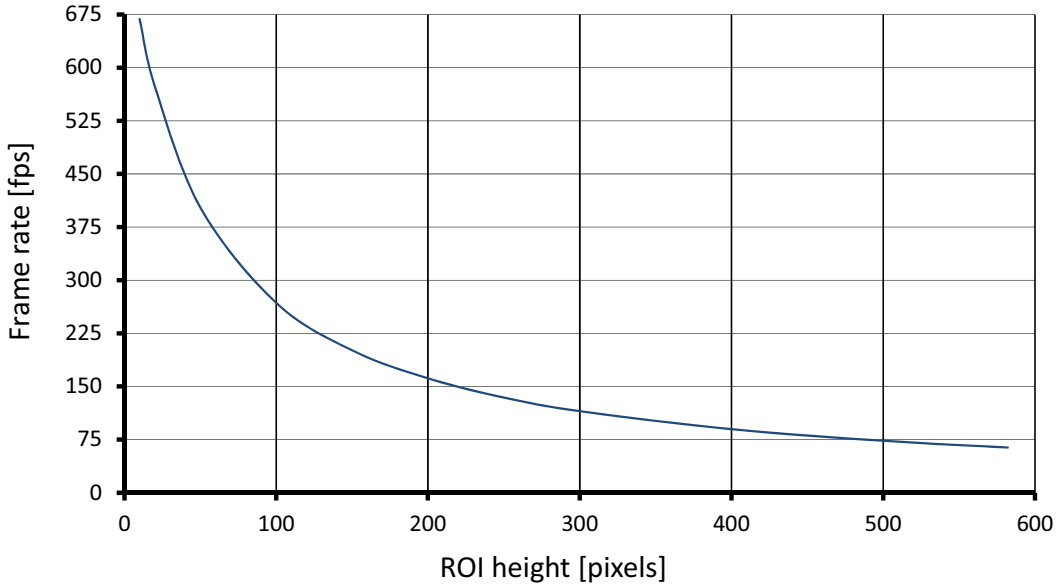


Figure 43: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)
582	63.9
500	73.4
400	89.8
300	115.2
250	134.5
200	161.5
150	201.1
100	268.1
50	402.6
20	573.8
10	668.6

Width=782 pixels

Table 31: Frame rate as a function of ROI height

Prosilica GC1020, GC1020C (02-2165A, 02-2165B, 02-2166A, 02-2166B)

Feature	Specification	
	Prosilica GC1020	**Prosilica GC1020C**
Resolution	1024 (H) × 768 (V) 0.8 MP	
Sensor	Sony ICX204AL with HAD technology	Sony ICX204AK with Wfine HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor size	Type 1/3	
Sensor size	6.0 mm diagonal	
Pixel size	4.65 µm × 4.65 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	33 fps	
Bit depth	8-bit, 12-bit	
A/D	12-bit	
Image buffer	16 MB	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerGR12Packed
Exposure time control	8 µs to 116.8 s; 1 µs increments	
Gain control	0 to 22 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Opto-coupled I/Os	1 input, 1 output	
Power consumption	2.9 W at 12 VDC	
Trigger latency	2.8 µs for non-isolated I/O; 4.5 µs for isolated I/O	
Trigger jitter	±20 ns for non-isolated I/O; ±0.5 µs for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	99 g	

Table 32: Prosilica GC1020, GC1020C model specifications

Absolute QE

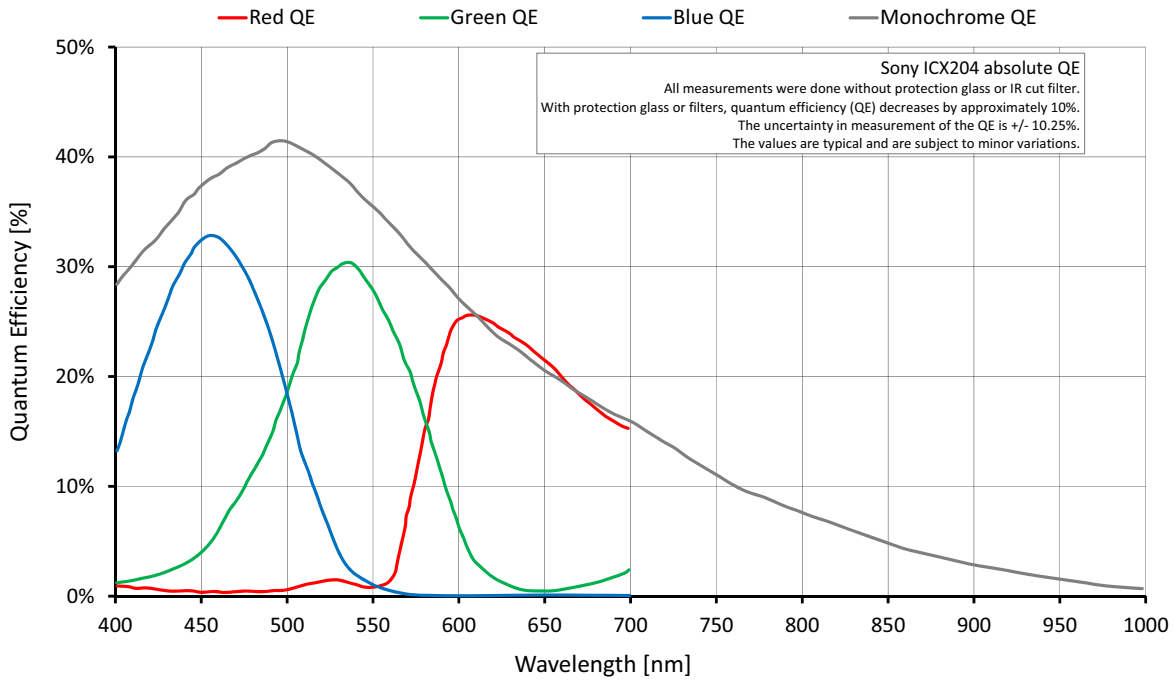


Figure 44: Prosilica GC1020, GC1020C (Sony ICX204) absolute QE

Spectral response

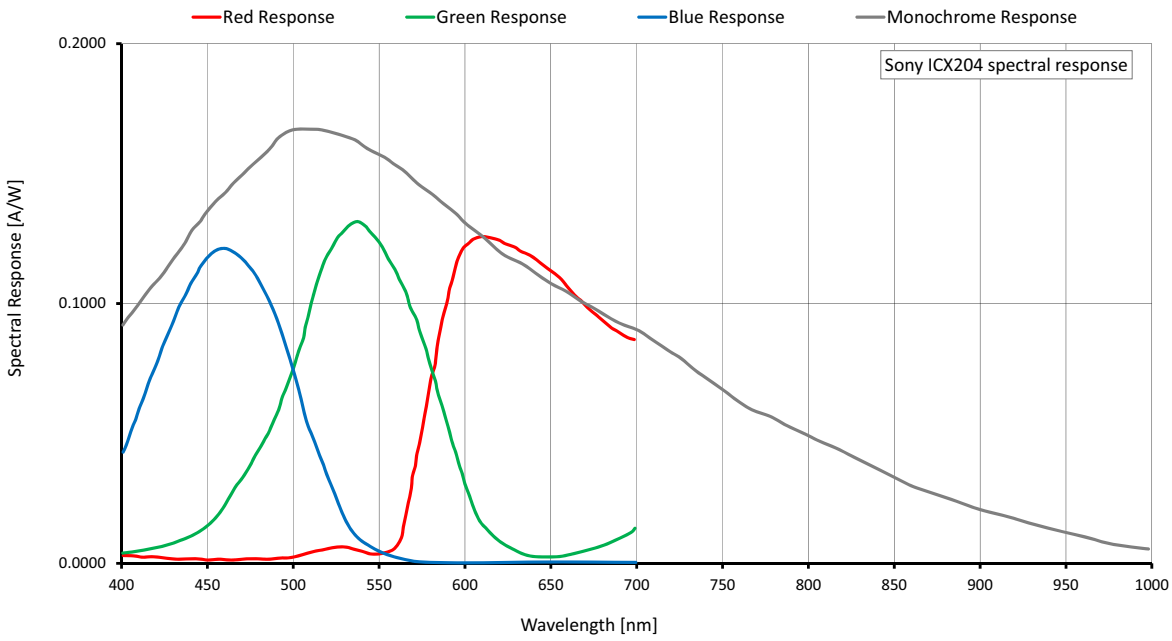


Figure 45: Prosilica GC1020, GC1020C (Sony ICX204) spectral response

ROI frame rate

$$\text{Frame rate} = \frac{1}{33.56\ \mu s \times \text{Height} + 3971.23\ \mu s}$$

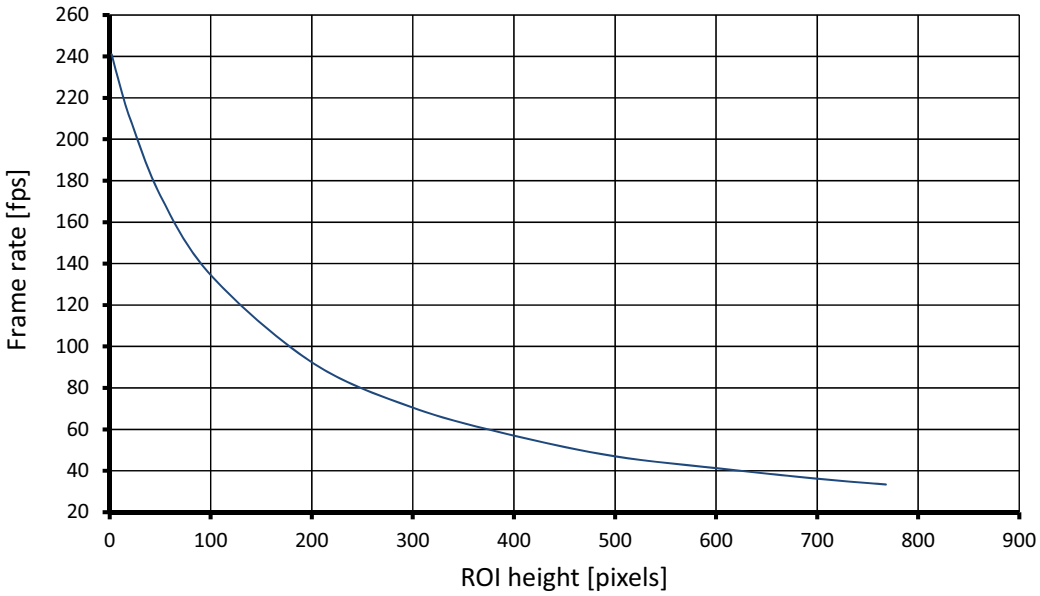


Figure 46: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)
768	33.4
700	36.2
600	41.3
500	47.0
400	57.0
300	70.5
200	92.4
100	134.5
50	173.0
20	210.3
10	226.3
2	241.0

Width=1024 pixels

Table 33: Frame rate as a function of ROI height

Prosilica GC1350, GC1350C (02-2130A, 02-2131A)

Feature	Specification	
	Prosilica GC1350	**Prosilica GC1350C**
Resolution	1360 (H) × 1024 (V) 1.4 MP	
Sensor	Sony ICX205AL with HAD technology	Sony ICX205AK with Wfine HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 1/2	
Sensor size	8.0 mm diagonal	
Pixel size	4.65 µm × 4.65 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	20 fps	
A/D	12-bit	
Image buffer	16 MB	
Bit depth	8-bit, 12-bit	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerGR12Packed
Exposure time control	8 µs to 116.8 s; 1 µs increments	
Gain control	0 to 25 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	3 W at 12 VDC	
Trigger latency	3.5 µs for non-isolated I/O; 5 µs for isolated I/O	
Trigger jitter	±20 ns for non-isolated I/O; ±0.5 µs for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	100 g	

Table 34: Prosilica GC1350, GC1350C model specifications

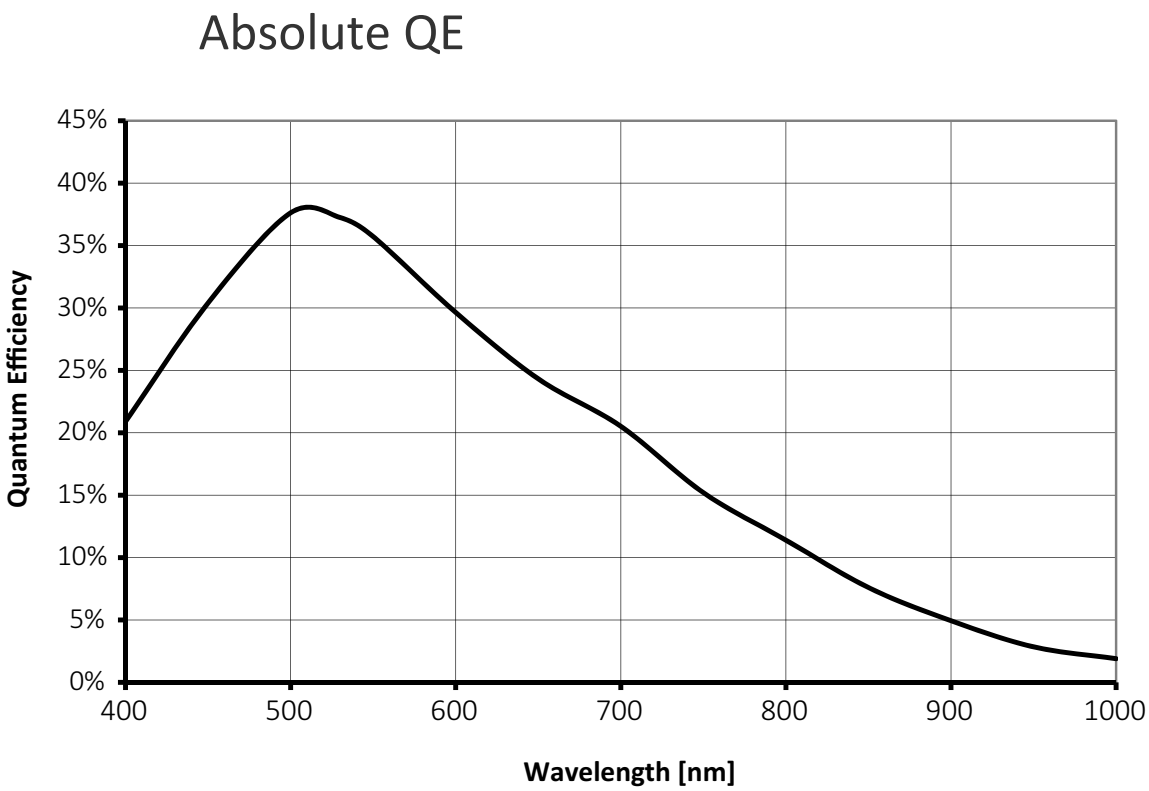


Figure 47: Prosilica GC1350 (Sony ICX205) absolute QE

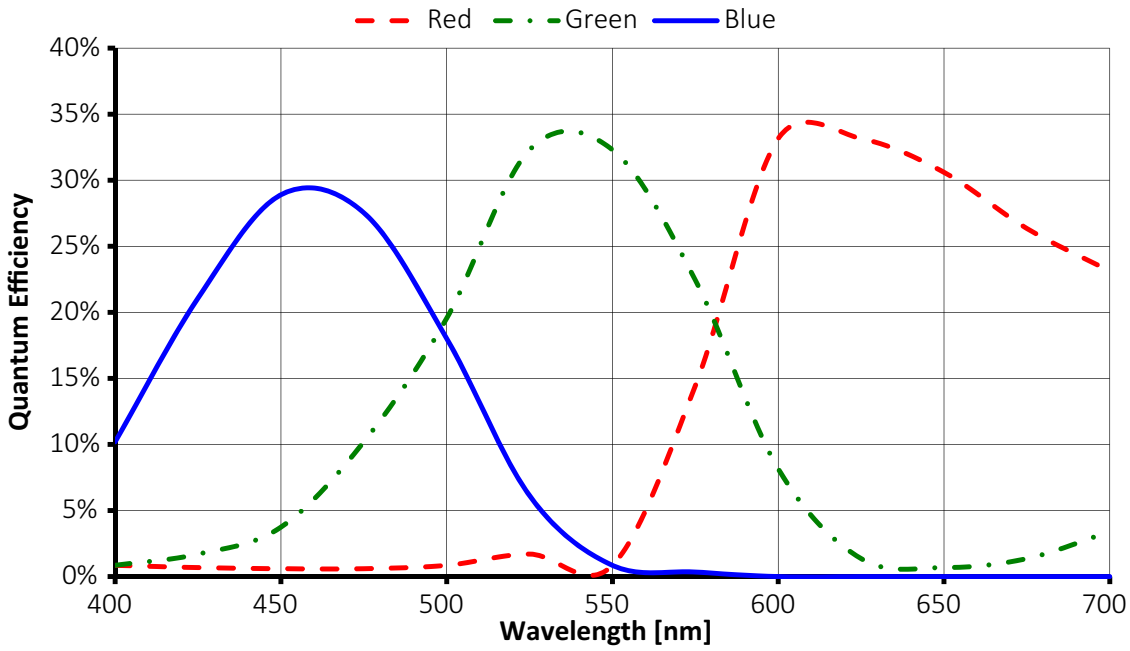


Figure 48: Prosilica GC1350C (Sony ICX205) absolute QE

ROI frame rate

$$\text{Frame rate} = \frac{1}{38.35\ \mu s \times \text{Height} + 10457.12\ \mu s}$$

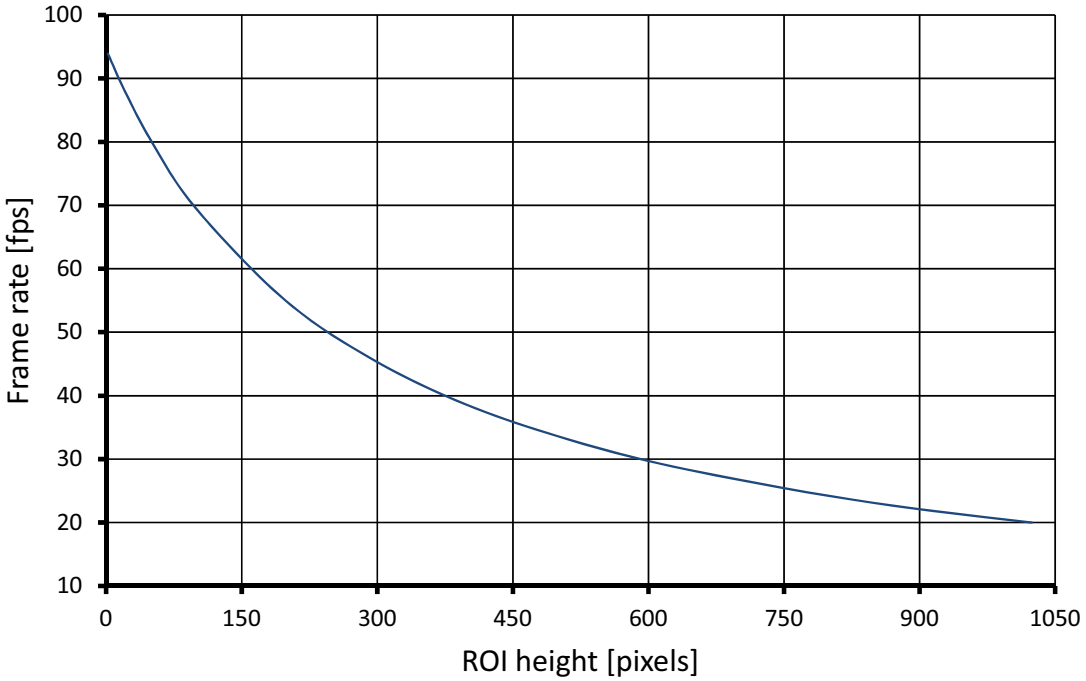


Figure 49: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)
1024	20.0
1000	20.4
900	22.1
800	24.2
700	26.8
600	29.7
500	33.6
400	38.5
300	45.3
200	54.8
100	69.4
50	80.1
20	88.2
10	91.3
2	93.9

Width=1360 pixels

Table 35: Frame rate as a function of ROI height table

Prosilica GC1380, GC1380C (02-2140A, 02-2141A)

Feature	Specification	
	Prosilica GC1380	**Prosilica GC1380C**
Resolution	1360 (H) × 1024 (V) 1.4 MP	
Sensor	Sony ICX285AL with EXview HAD CCD™ technology	Sony ICX285AQ with EXview HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 2/3	
Sensor size	11.0 mm diagonal	
Pixel size	6.45 µm × 6.45 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	20.2 fps	
A/D	12-bit	
Image buffer	16 MB	
Bit depth	8-bit, 12-bit	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerGR12Packed
Exposure time control	8 µs to 116.8 s; 1 µs increments	
Gain control	0 to 27 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to full resolution	
Power consumption	3.3 W at 12 VDC	
Trigger latency	3.7 µs for non-isolated I/O; 5 µs for isolated I/O	
Trigger jitter	±20 ns for non-isolated I/O; ±0.5 µs for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	104 g	

Table 36: Prosilica GC1380, GC1380C model specifications

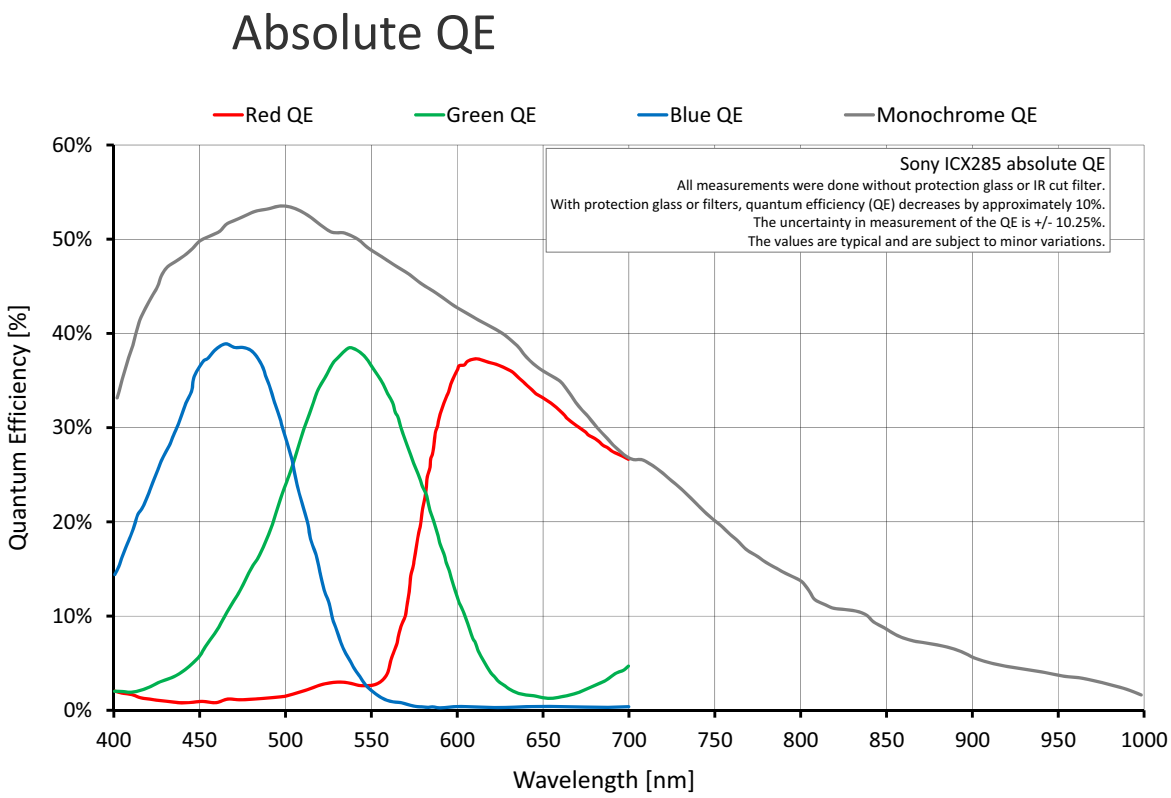


Figure 50: Prosilica GC1380, GC1380C (Sony ICX285) absolute QE

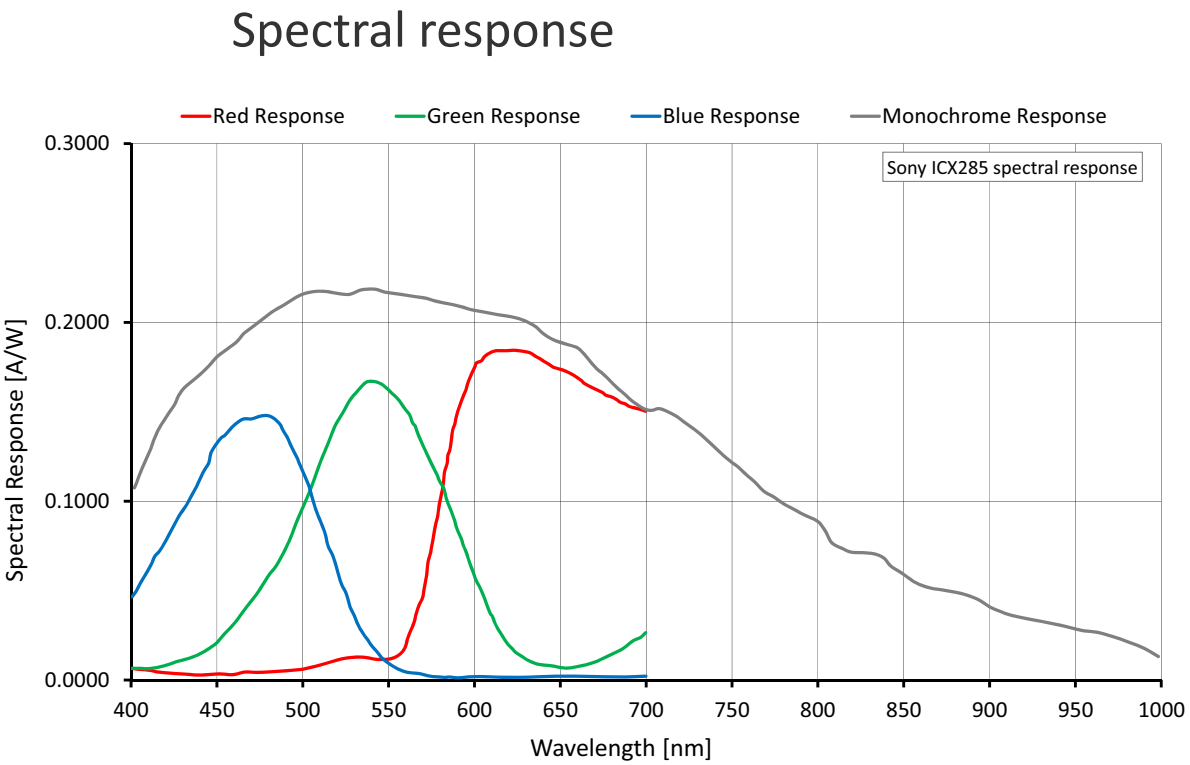


Figure 51: Prosilica GC1380, GC1380C (Sony ICX285) spectral response

ROI frame rate

$$\text{Frame rate} = \frac{1}{41.45\ \mu s \times \text{Height} + 7148.57\ \mu s}$$

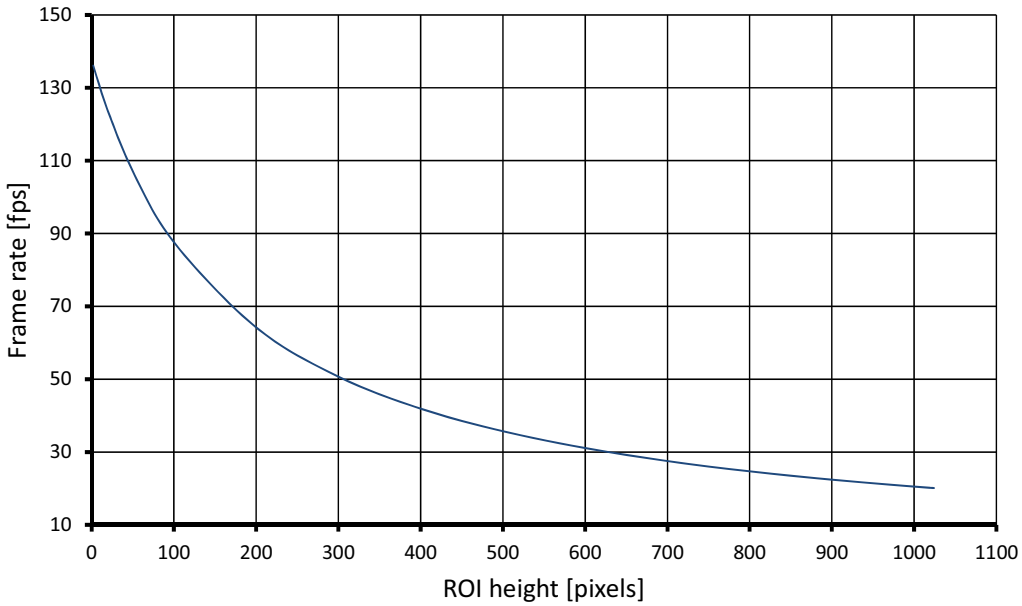


Figure 52: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)
1024	20.1
1000	20.5
900	22.4
800	24.7
700	27.5
600	31.1
500	35.7
400	41.9
300	50.7
200	64.2
100	87.6
50	107.1
20	123.5
10	130.2
2	136.1

Width=1360 pixels

Table 37: Frame rate as a function of ROI height table

Prosilica GC1600, GC1600C (02-2150A, 02-2151A)

Feature	Specification	
	Prosilica GC1600	**Prosilica GC1600C**
Resolution	1620 (H) × 1220 (V) 2 MP	
Sensor	Sony ICX274AL with Super HAD CCD™ technology	Sony ICX274AQ with Wfine Super HAD CCD™ technology
Sensor type	Interline CCD, Progressive Scan	
Shutter type	Global	
Sensor format	Type 1/1.8	
Sensor size	8.923 mm diagonal	
Pixel size	4.4 µm × 4.4 µm	
Optical filter	Default: No filter Optional: See the *Modular Concept*	Default: IRC30 IR cut filter Optional: See the *Modular Concept*
Maximum frame rate at full resolution	15 fps	
A/D	12-bit	
Image buffer	16 MB	
Bit depth	8-bit, 12-bit	
Monochrome pixel formats	Mono8, Mono12, Mono12Packed	Mono8
YUV color pixels formats		YUV411Packed, YUV422Packed, YUV444Packed
RGB color pixel formats		RGB8Packed, BGR8Packed
RAW pixel formats		BayerRG8, BayerRG12, BayerGR12Packed
Exposure time control	10 µs to 116.8 s; 1 µs increments	
Gain control	0 to 21 dB	
Binning (Sum)	Horizontal: 1 to 8 columns Vertical: 1 to 14 rows	
Power consumption	3.3 W at 12 VDC	
Trigger latency	2.3 µs for non-isolated I/O; 4 µs for isolated I/O	
Trigger jitter	±20 ns for non-isolated I/O; ±0.5 µs for isolated I/O	
Propagation delay (t_{pd})	10 ns for non-isolated I/O; 1.3 µs for isolated I/O	
Body dimensions (L × W × H)	58.7 × 45.7 × 33 mm	59 × 45.7 × 33 mm
Mass (typical)	97 g	

Table 38: Prosilica GC1600, GC1600C model specifications

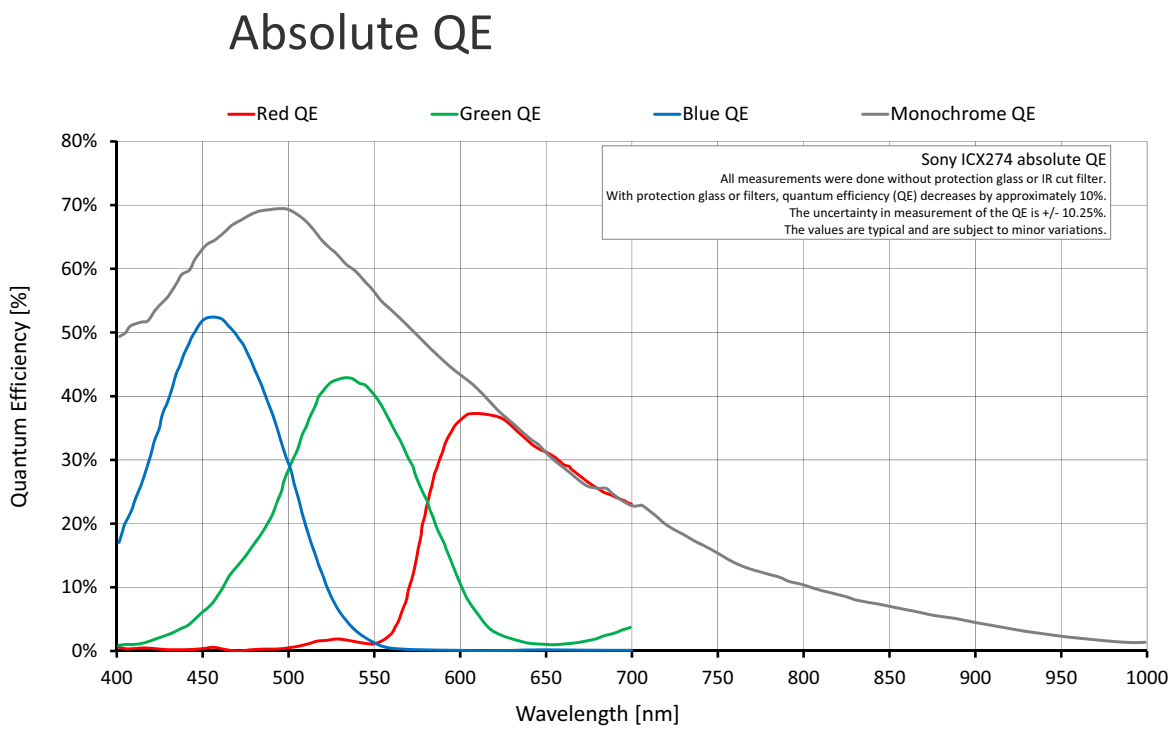


Figure 53: Prosilica GC1600, GC1600C (Sony ICX274) absolute QE

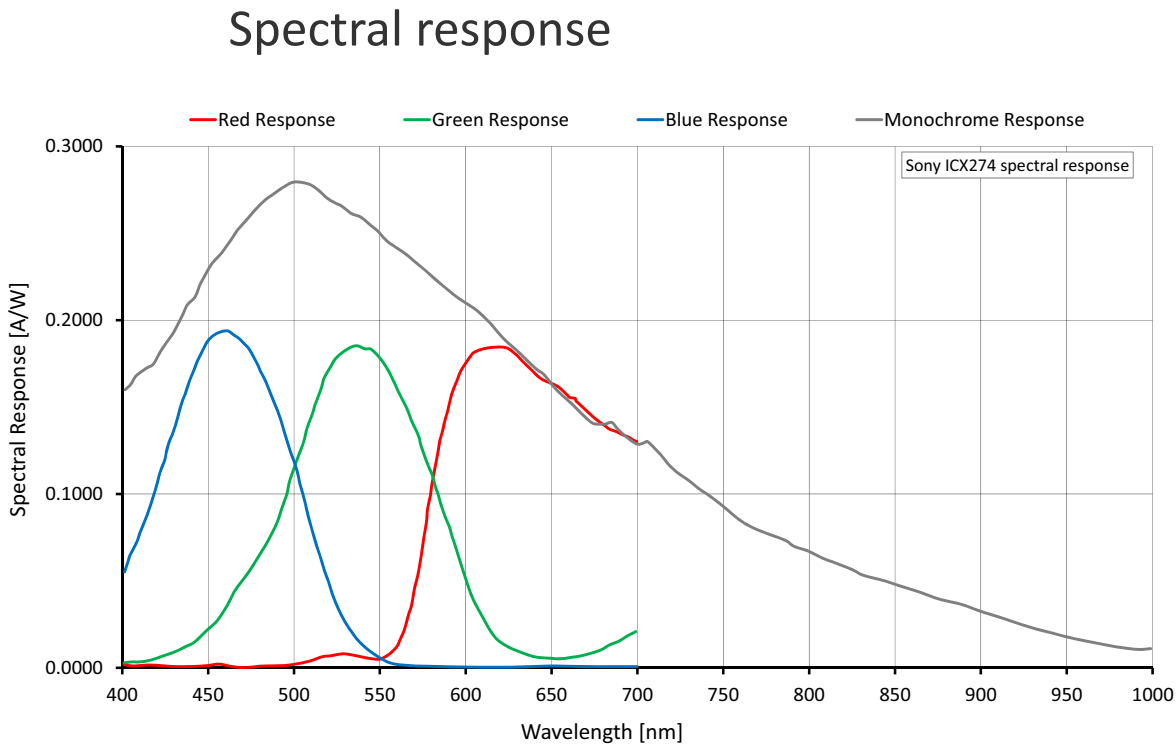


Figure 54: Prosilica GC1600, GC1600C (Sony ICX274) spectral response

ROI frame rate

$$\text{Frame rate} = \frac{1}{48.80\ \mu s \times \text{Height} + 6431.90\ \mu s}$$

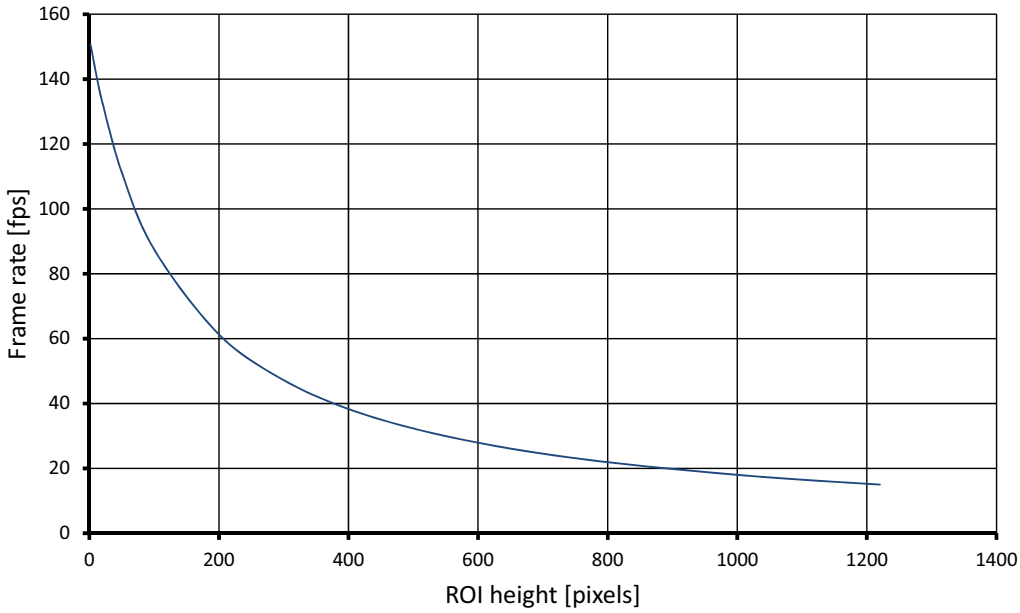


Figure 55: Frame rate as a function of ROI height

Height (pixels)	Frame rate (fps)
1220	15.0
1100	16.5
1000	18.0
900	19.8
800	21.9
700	24.5
600	27.9
500	32.3
400	38.3
300	47.2
200	61.3
100	87.5
50	111.3
20	132.9
10	142.2
2	150.6

Width=1620 pixels

Table 39: Frame rate as a function of ROI height

Prosilica GC model comparison

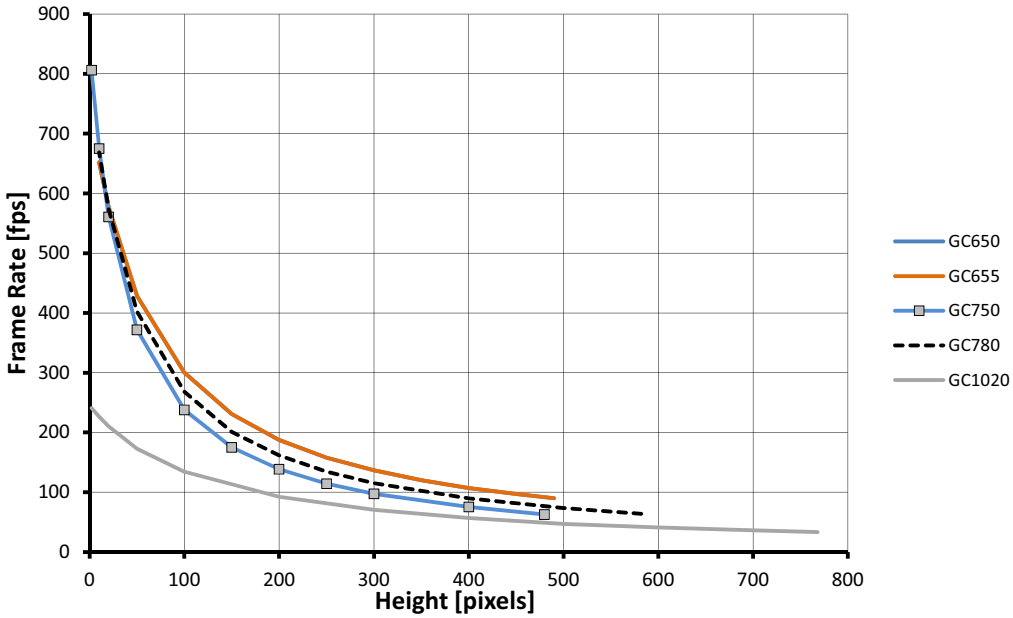


Figure 56: Maximum frame rate comparison for select models

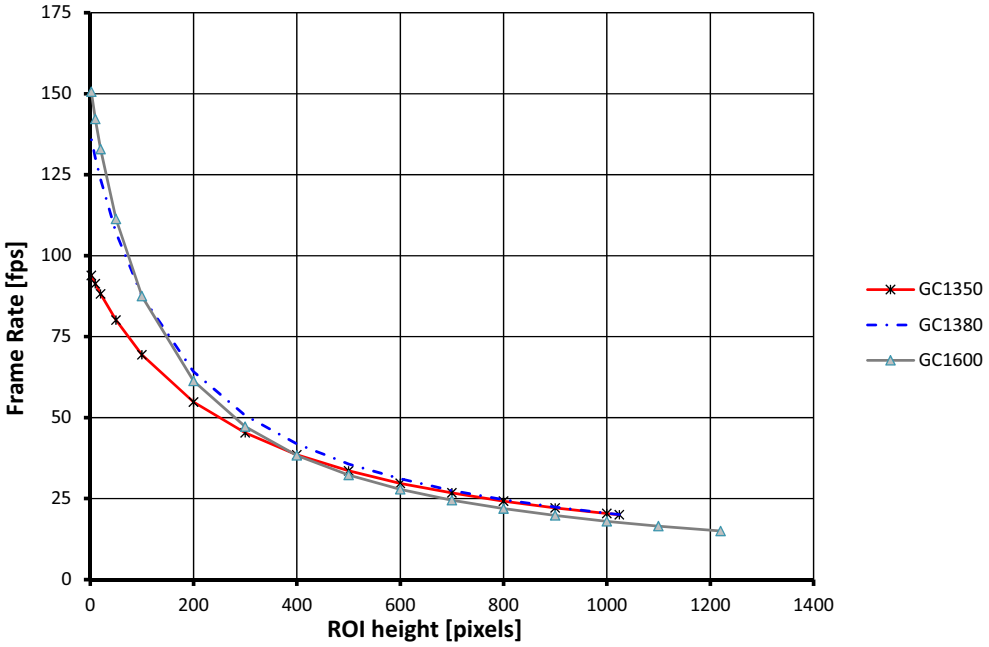


Figure 57: Maximum frame rate comparison for select models

Camera feature comparison

Allied Vision cameras support a number of standard and extended features. The following table identifies a selection of capabilities and compares the availability of features in Prosilica GC camera models.

Camera feature reference

A complete listing of camera features, including definitions can be found on the Allied Vision Technical Documentation web page, go to https://www.alliedvision.com/en/support/technical-documentation.html.

- Vimba and third-party users: *GigE Features Reference*
- PvAPI users: *GigE Camera and Driver Attributes* document

		GC650	GC655	GC750	GC780	GC1020	GC1350	GC1380	GC1600
Image optimization features	Auto gain	✓	✓	✓	✓	✓	✓	✓	✓
	Auto exposure	✓	✓	✓	✓	✓	✓	✓	✓
	Auto white balance	✓	✓	✓	✓	✓	✓	✓	✓
	Binning	✓	✓		✓	✓	✓	✓	✓
	Decimation X/Y								
	Black level (Offset)								
	ROI	✓	✓	✓	✓	✓	✓	✓	✓
Camera control features	Event channel	✓	✓	✓	✓	✓	✓	✓	✓
	Image chunk data	✓	✓	✓	✓	✓	✓	✓	✓
	Five storable user sets (config files)	✓	✓	✓	✓	✓	✓	✓	✓
	RS232	✓	✓	✓	✓	✓	✓	✓	✓
	IEEE 1588 Precision Time Protocol (PTP)	✓	✓	✓	✓	✓	✓	✓	✓
	StreamHold	✓	✓	✓	✓	✓	✓	✓	✓
	Sync out modes	✓	✓	✓	✓	✓	✓	✓	✓

Table 40: Prosilica GC feature comparison

Image data flow

The following diagrams illustrate the data flow and the bit resolution of image data.

Camera feature reference

A complete listing of camera features, including definitions can be found on the Allied Vision Technical Documentation web page, go to https://www.alliedvision.com/en/support/technical-documentation.html.

- Vimba and third-party users: *GigE Features Reference*
- PvAPI users: *GigE Camera and Driver Attributes* document

Prosilica GC monochrome models

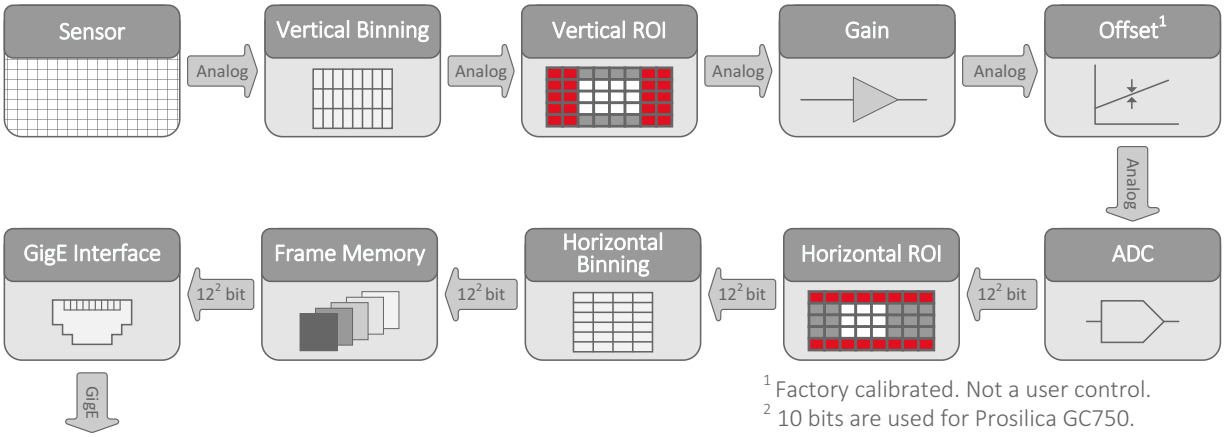


Figure 58: Image data flow of monochrome Prosilica GC models

Prosilica GC color models

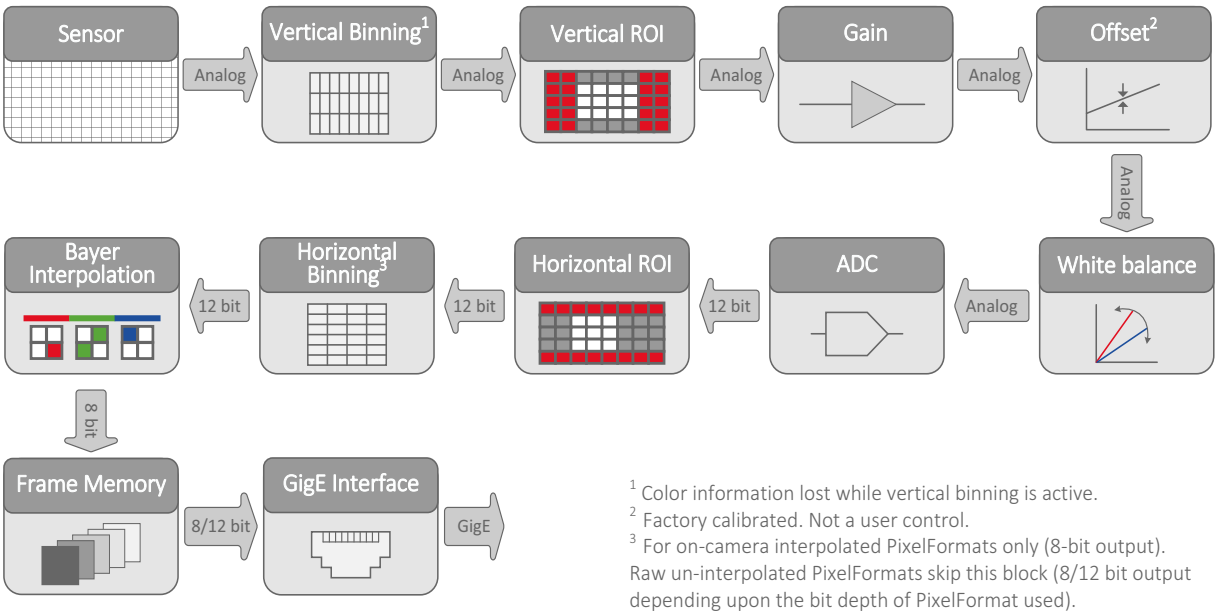


Figure 59: Image data flow diagram of color Prosilica GC models (except GC750C)

Prosilica GC750C

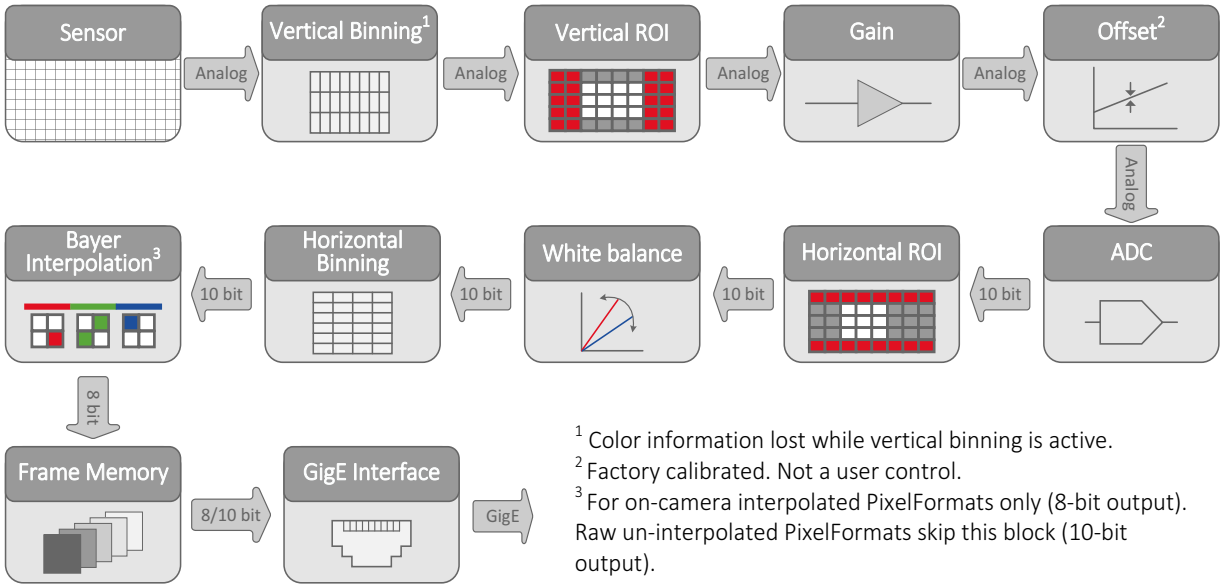


Figure 60: Image data flow diagram for Prosilica GC750C

Mechanical dimensions

The Prosilica GC family offers both CCD and CMOS sensor models. CCD cameras utilize additional circuitry required for A/D conversion. As a result, CMOS models offer a shorter mechanical package than CCD models.

Prosilica GC CCD model housing (C-Mount)

Models: Prosilica GC650, GC655, GC780, GC1020, GC1350, GC1380, GC1600

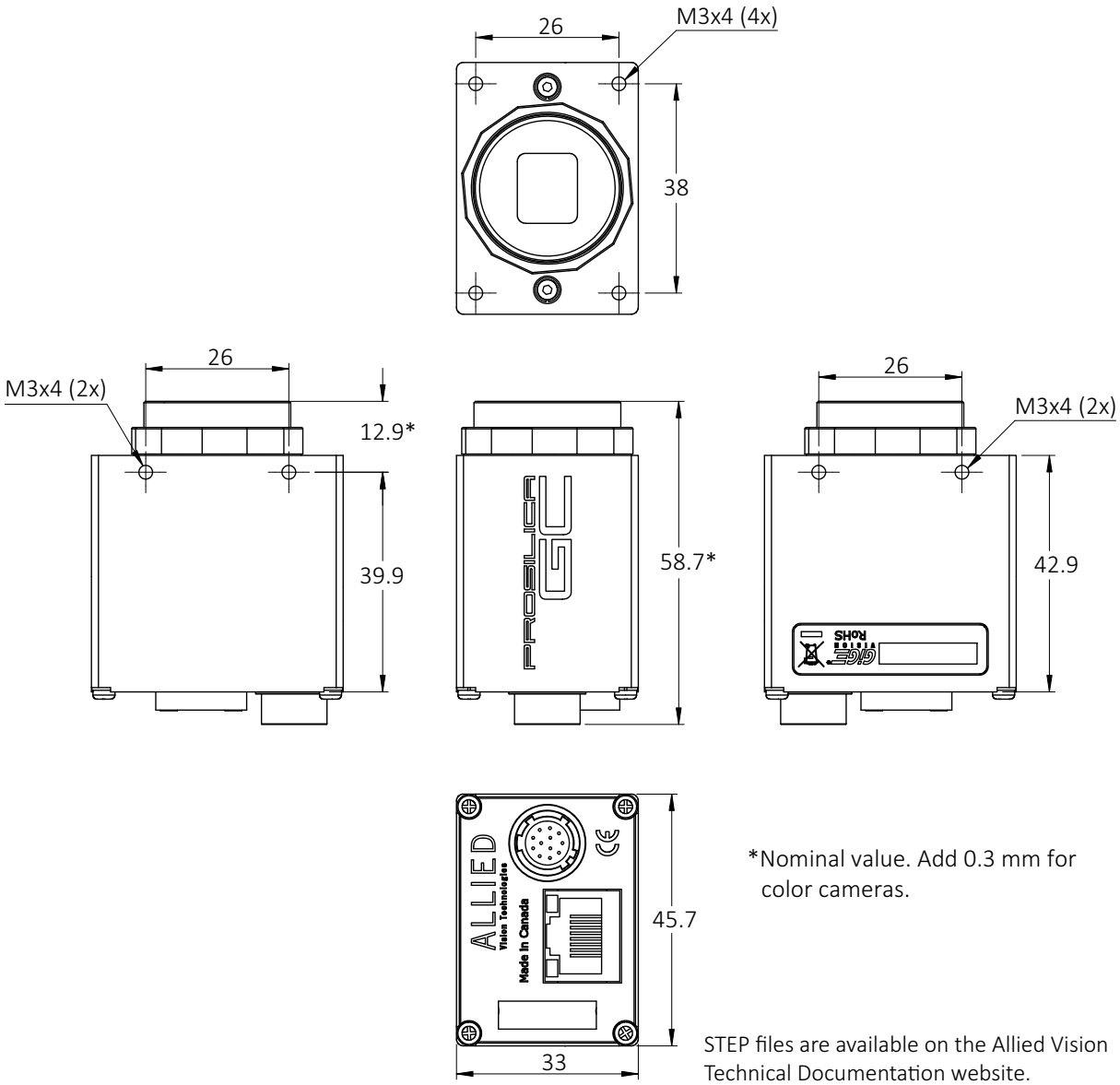


Figure 61: Prosilica GC CCD model housing dimensions

Prosilica GC CMOS model housing (C-Mount)

Model: Prosilica GC750

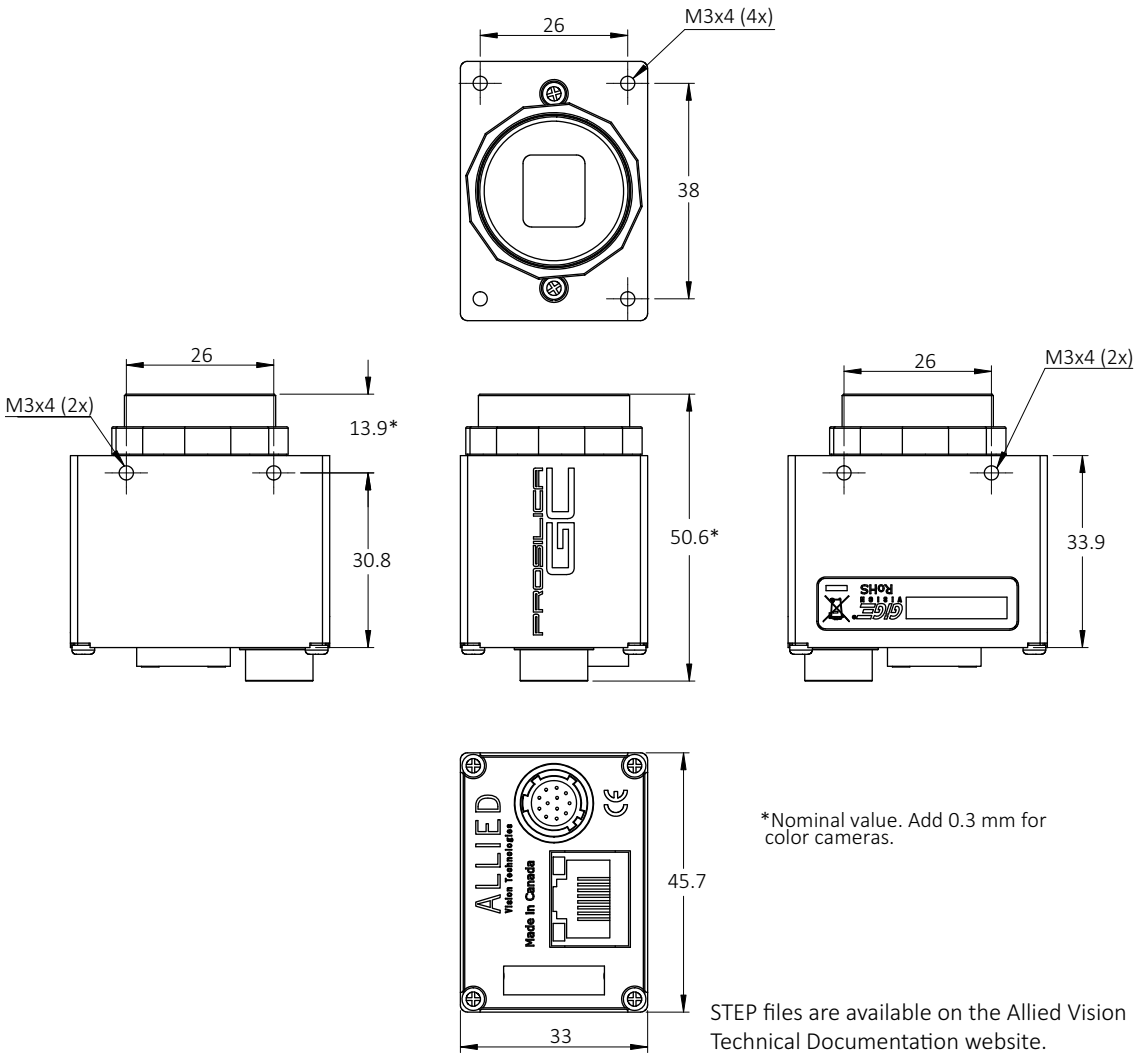


Figure 62: Prosilica GC CMOS model housing dimensions

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 models this surface is the IR-filter holder, and for monochrome models this surface is the internal camera front plate (see figure 63). Table 41 presents lens protrusion values for Prosilica GC models with C-Mount.

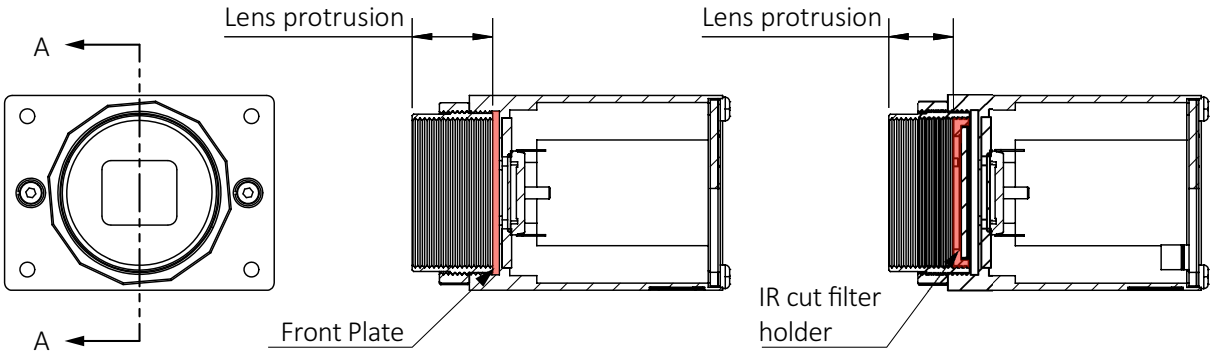


Figure 63: Cross section of typical Prosilica GC assembly with C-Mount

Model	Lens protrusion [mm]
GC650	13.64
GC650C	9.01
GC655	13.64
GC655C	8.29
GC750	9.12
GC750C	3.84
GC780	13.64
GC780	8.29

Model	Lens protrusion [mm]
GC1020	13.64
GC1020C	9.01
GC1350	13.64
GC1350C	8.90
GC1380	13.65
GC1380C	8.95
GC1600	13.64
GC1600C	8.93

Table 41: Lens protrusion for Prosilica GC models with C-Mount

Index

A

Adjustment
- C-Mount 52

C

Camera GND 59, 62
Camera interfaces 56
Camera Power 59
Category 6 23
Cleaning
- Compressed air 74
- Instructions 72
- Locating impurities 71
- Materials 72

C-Mount flange focal distance 51
Copyright 17

D

Document history 9

E

Environmental specifications 19
Exposing (trigger) 67
Exposure (definition) 67
Exposure cycle (trigger) 67
Exposure start delay (signal) 67

F

Firmware
- Recovery mode 77
- Update 76

Frame rate
- CCD sensors 28

G

General safety notes 19
GenICam 2
Gigabit Ethernet interface 2
GigE Vision 2
GND for ext. power 59

I

Idle (signal) 67
Image flow diagram
- Prosilica GC color cameras 109
- Prosilica GC monochrome cameras 108
- Prosilica GC750C 110

Imaging (signal) 67
Input triggers
- In 1 ..... 59, 61
- In 2 ..... 59, 62

Integrating light (trigger) 67
Interline boundary 68
Interline time (signal) 67
Isolated IO GND 59, 61, 62
Isolated IO ground 61

L

Lens protrusion 53, 113
Logic trigger (definition) 67

M

Multicast 46

O

Output signals
- Out 1 ..... 59, 61, 62
- Out 2 ..... 60, 62

P

Power
DC 24
Propagation delay (trigger) 67

R

Reading out data (trigger) 67
Readout (definition) 67
Readout data (trigger) 67
Region of interest 46
Registered exposure time (signal) 67
RS-232 59

S

Sensor row readout cycles 67
Signal GND 59, 61, 62
Status LEDs 58
Styles 11
Symbols 12

T

Time delay (trigger) 67
Tpd (definition) 67
Trigger jitter (definition) 67
Trigger latency (definition) 67
Trigger latency time 67
Trigger ready (signal) 67
Trigger rules 67
Trigger timing diagram 66

U

User trigger (definition) 67

V

Video Iris 59, 62

W

Warranty 70