AVT Prosilica GX

Technical Manual

AVT GigE Vision Cameras

V2.0.1
70-0067

6 Dec 2011

Allied Vision Technologies Canada Inc.
101-3750 North Fraser Way
V5J 5E9, Burnaby, BC / Canada

ALLIED Vision Technologies

Legal notice

For customers in the U.S.A.
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 residential 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. However there is no guarantee that interferences will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and the receiver.
- Use a different line outlet for the receiver.
- Consult a radio or TV technician for help.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment. The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a computing device pursuant to Subpart A of Part 15 of FCC Rules.

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

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

Life support applications
These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Allied Vision Technologies customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Allied for any damages resulting from such improper use or sale.

Trademarks
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Warranty
The information provided by Allied Vision Technologies is supplied without any guarantees or warranty whatsoever, be it specific or implicit. Also excluded are all implicit warranties concerning the negotiability, the suitability for specific applications or the non-breaking of laws and patents. Even if we assume that the information supplied to us is accurate, errors and inaccuracy may still occur.

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Allied Vision Technologies Canada Inc. 12/2011

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Introduction

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

For information on software installation read the **AVT GigE Installation Manual**.

For detailed information on camera features and controls specific to the Prosilica GX, GE, GS, GB and GC refer to the **AVT Prosilica GigE Camera and Driver Attributes** document.

www

AVT Prosilica GX literature:

http://www.alliedvisiontec.com/us/support/downloads/product-literature/prosilica-gx.html

Info

Please read through this manual carefully.

Document history

Version	Date	Remarks
V2.0.0	14.07.11	New Manual – SERIAL Status
V2.0.1	06.12.11	Added GX2750 model information • Specifications on page 21 • Mechanicals on page 29 • Region of interest performance on page 51

Table 1: Document History

Symbols used in this manual

Note

This symbol highlights important information

Caution

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

www

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

Example:

http://www.alliedvisiontec.com

Warranty

Info

Allied Vision Technologies Canada provides a 2-year warranty which covers the replacement and repair of all AVT parts that are found to be defective in the normal use of this product. AVT will not warranty parts that have been damaged through the obvious misuse of this product.

Precautions

Caution

DO NOT OPEN THE CAMERA. WARRANTY IS VOID IF CAMERA IS OPENED.

This camera contains sensitive components which can be damaged if handled incorrectly.

Caution

KEEP SHIPPING MATERIAL.

Poor packaging of this product can cause damage during shipping.

Caution

VERIFY ALL EXTERNAL CONNECTIONS.

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

Caution

CLEANING.

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

Caution

DO NOT EXCEED ENVIRONMENTAL SPECIFICATIONS.

See environmental specifications limits in the Specifications section of this document. Special care is required to maintain a reasonable operating temperature. If the camera is to be operated in a warm environment, it is suggested that the camera be mounted on a heat sink such as a metal bracket and that there is sufficient air flow.

Cleaning the sensor

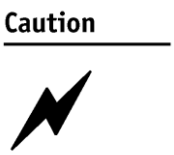
DO NOT CONTACT CLEAN SENSOR UNLESS ABSOLUTELY NECESSARY

Identifying Debris

Debris on the image sensor or optical components will appear as a darkened area or smudge on the image that does not move as the camera is moved. Do not confuse this with a pixel defect which will appear as a distinct point.

Locating Debris

Before attempting to clean the image sensor, it is important to first determine that the problem is due to debris on the sensor window. To do this you, should be viewing a uniform image, such as a piece of paper, with the camera. Debris will appear as a dark spot or dark region that does not move as the camera is moved. To determine that the debris is not on the camera lens, rotate the lens independent of the camera. If the spot moves as the lens moves, then the object is on the lens not on the image sensor and therefore cleaning is not required. If the camera has an IR filter, then rotate the IR filter. If the object moves, then the particle is on the IR filter not the sensor. If this is the case, remove the IR filter carefully using a small flat head screw driver. Clean both sides of the IR filter using the same techniques as explained below for the sensor window.



DO NOT TOUCH ANY OPTICS WITH FINGERS. OIL FROM FINGERS CAN DAMAGE FRAGILE OPTICAL COATINGS.

Cleaning with Air

If it is determined that debris is on the sensor window, then remove the camera lens, and blow the sensor window directly with clean compressed air. If canned air is used, do not shake or tilt the can prior to blowing the sensor. View a live image with the camera after blowing. If the debris is still there, repeat this process. Repeat the process a number of times with increased intensity until it is determined that the particulate cannot be dislodged. If this is the case, then proceed to the contact cleaning technique.

Contact Cleaning

Only use this method as a last resort. Use 99% laboratory quality isopropyl alcohol and clean cotton swabs. Dampen the swab in the alcohol and gently wipe the sensor in a single stroke. Do not reuse the same swab. Do not wipe the sensor if the sensor and swab are both dry. You must wipe the sensor quickly after immersion in the alcohol, or glue from the swab will contaminate the sensor window. Repeat this process until the debris is gone. If this process fails to remove the debris, then contact AVT.

Conformity

Allied Vision Technologies declares under its sole responsibility that all standard cameras of the **AVT Prosilica GX** family to which this declaration relates are in conformity with the following standard(s) or other normative document(s):

- CE, following the provisions of 2004/108/EG directive
- FCC Part 15 Class A
- RoHS (2002/95/EC)

We declare, under our sole responsibility, that the previously described **AVT Prosilica GX** cameras conform to the directives of the CE.

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 in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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. You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

Specifications

Prosilica GX	1050/1050C
Resolution	1024 x 1024
Sensor	Kodak KAI-01050
Type	CCD Progressive
Sensor size	Type 1/2
Cell size	5.5µm
Lens mount	C
Max frame rate at full resolution	109 fps (1 port) - 112 fps (2 ports)
A/D	14 bit
On-board FIFO	128 MB
Bit depth	8/14 (mono) – 8/12 (color) bit
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	10 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
Opto-coupled I/Os	2 inputs, 4 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	5.4W (1 port) – 6.7W (2 ports)
Mass	269 g
Body dimensions (L x W x H in mm)	107.2 x 53.3 x 33 (including connectors, w/o tripod and lens)
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	1.5 µs
Trigger jitter	±0.5 µs
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 2: Prosilica GX1050 camera specification

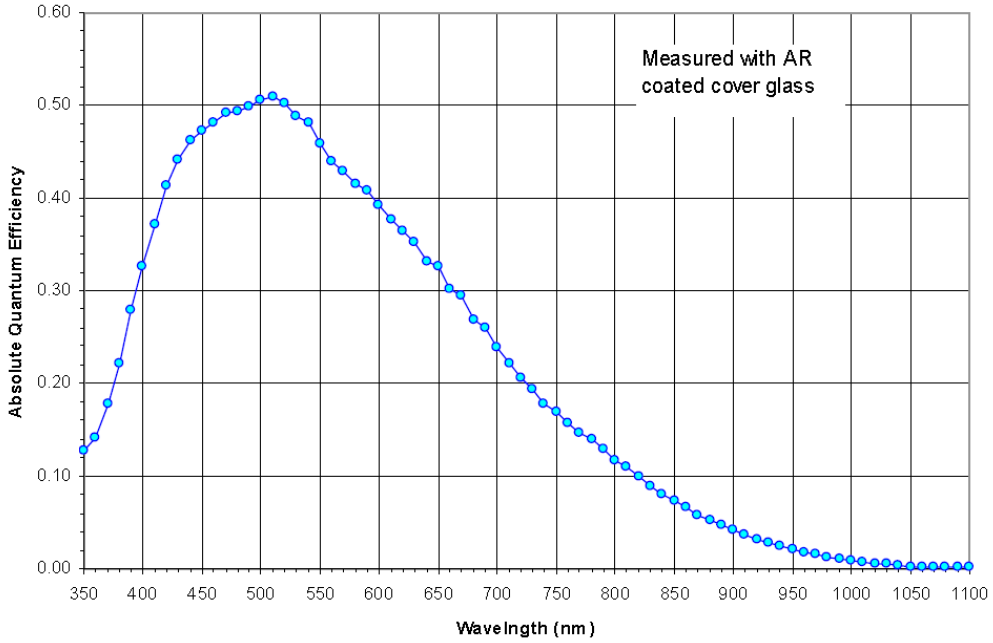


Figure 1 – Prosilica GX1050 monochrome spectral response

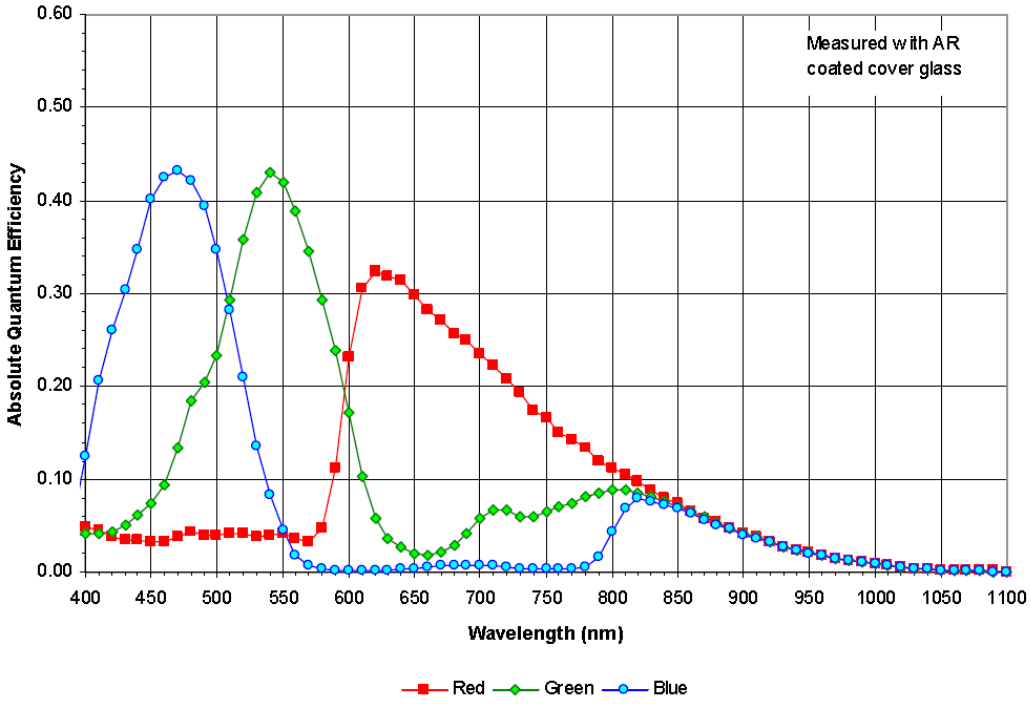


Figure 2 – Prosilica GX1050C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica GX	1660/1660C
Resolution	1600 x 1200
Sensor	Kodak KAI-02050
Type	CCD Progressive
Sensor size	Type 2/3
Cell size	5.5µm
Lens mount	C
Max frame rate at full resolution	60 fps (1 port) - 66 fps (2 ports)
A/D	14 bit
On-board FIFO	128 MB
Bit depth	8/14 (mono) – 8/12 (color) bit
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	10 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
Opto-coupled I/Os	2 inputs, 4 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	5.6W (1port) – 6.7W (2 ports)
Mass	269 g
Body dimensions (L x W x H in mm)	107.2 x 53.3 x 33 (including connectors, w/o tripod and lens)
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	1.5 µs
Trigger jitter	±0.5 µs
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 3: Prosilica GX1660 camera specification

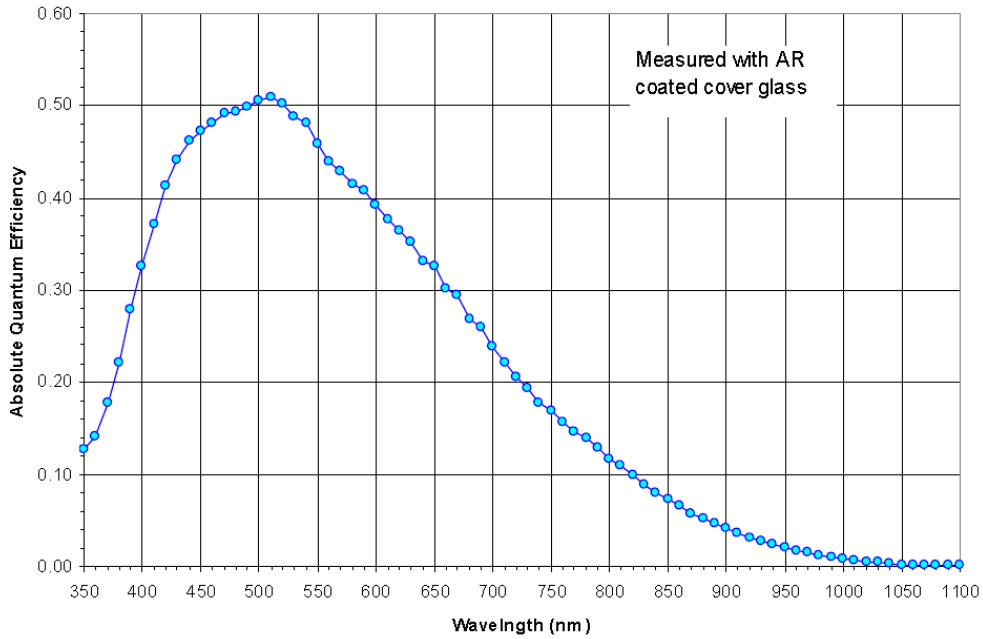


Figure 3 – Prosilica GX1660 monochrome spectral response

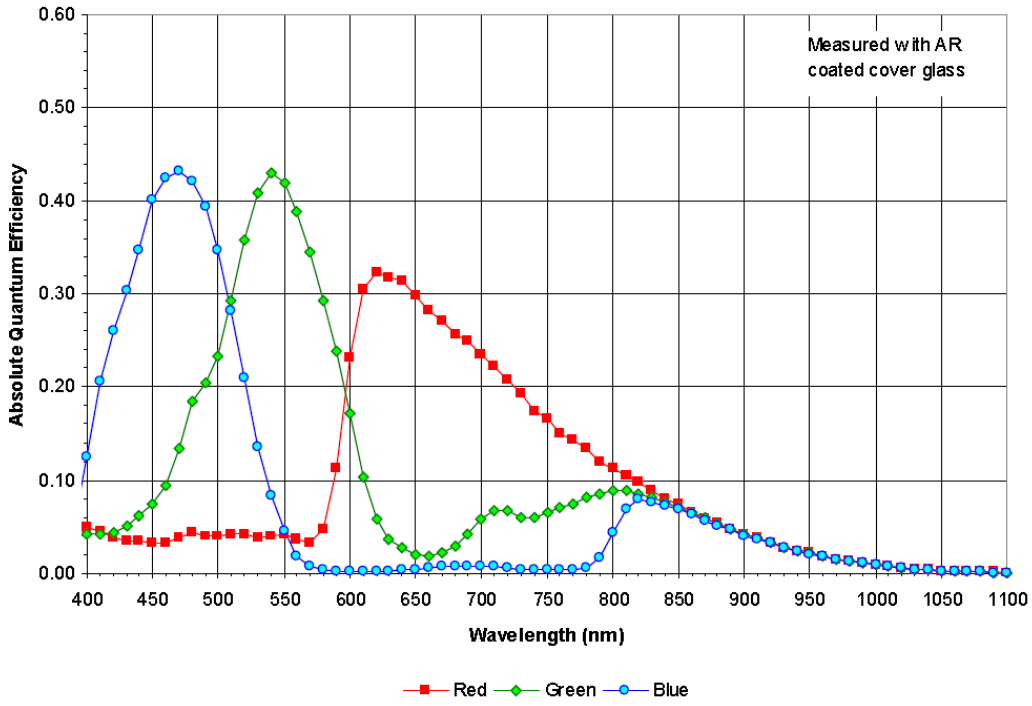


Figure 4 – Prosilica GX1660C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica GX	1910/1910C
Resolution	1920 x 1080
Sensor	Kodak KAI-02150
Type	CCD Progressive
Sensor size	Type 2/3
Cell size	5.5µm
Lens mount	C
Max frame rate at full resolution	55 fps (1 port), 63 fps (2 ports)
A/D	14 bit
On-board FIFO	128 MB
Bit depth	8/14 (mono) – 8/12 (color) bit
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	10 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
Opto-coupled I/Os	2 inputs, 4 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	5.6W (1port) – 6.7W (2 ports)
Mass	269 g
Body dimensions (L x W x H in mm)	107.2 x 53.3 x 33 (including connectors, w/o tripod and lens)
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	1.5 µs
Trigger jitter	±0.5 µs
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 4: Prosilica GX1910 camera specification

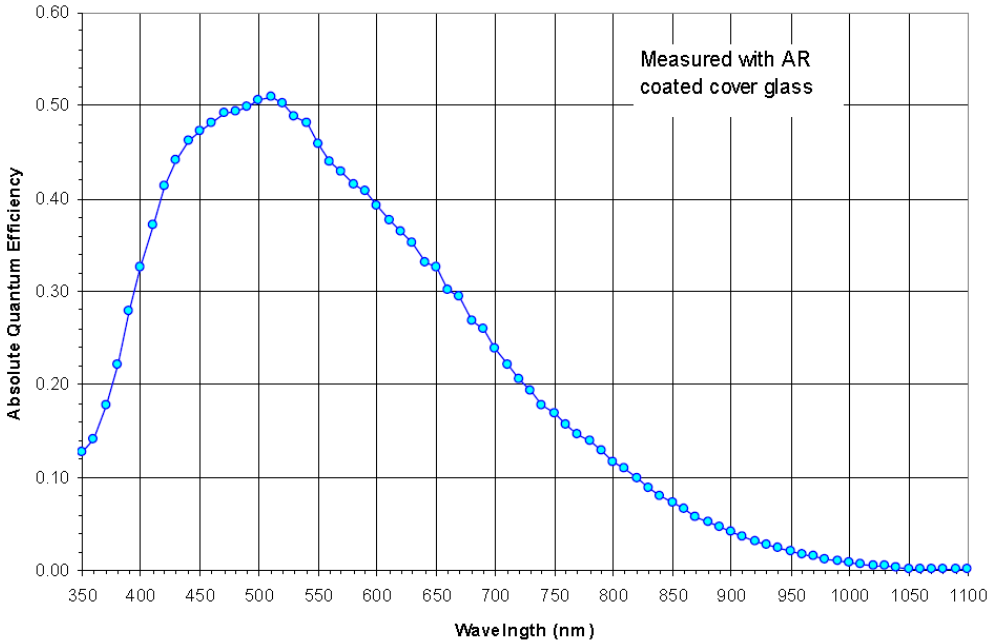


Figure 5 – Prosilica GX1910 monochrome spectral response

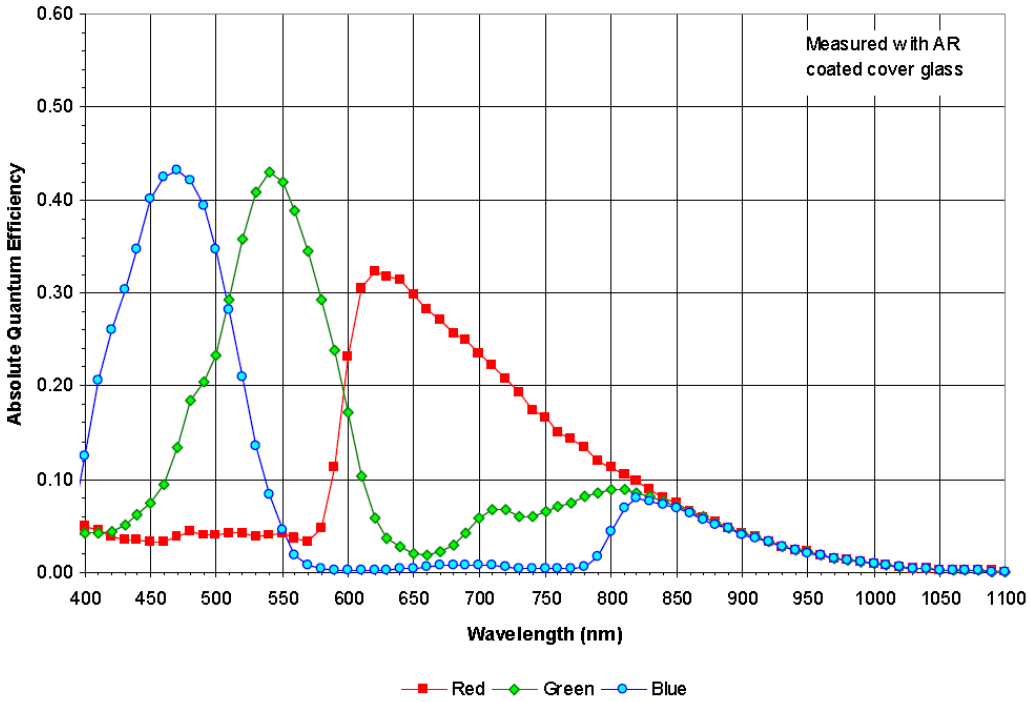


Figure 6 – Prosilica GX1910C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica GX	1920/1920C
Resolution	1936 x 1456
Sensor	Sony ICX674
Type	CCD Progressive
Sensor size	Type 2/3
Cell size	4.54 µm
Lens mount	C
Max frame rate at full resolution	40 fps
A/D	14 bit
On-board FIFO	128 MB
Bit depth	8/14 (mono) – 8/12 (color) bit
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	10 µs to 60 seconds; 1 µs increments
Gain control	0 to 24 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
Opto-coupled I/Os	2 inputs, 4 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	5.3W (1port) – 6.2W (2 ports)
Mass	269 g
Body dimensions (L x W x H in mm)	108.1 x 53.3 x 33 (including connectors, w/o tripod and lens)
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	1.5 µs
Trigger jitter	±0.5 µs
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 5: Prosilica GX1920 camera specification

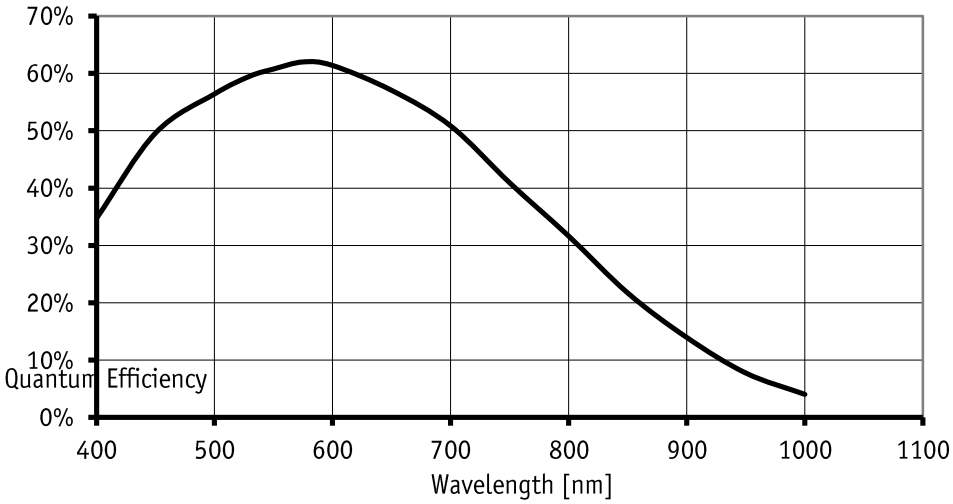


Figure 7 – Prosilica GX1920 monochrome spectral response

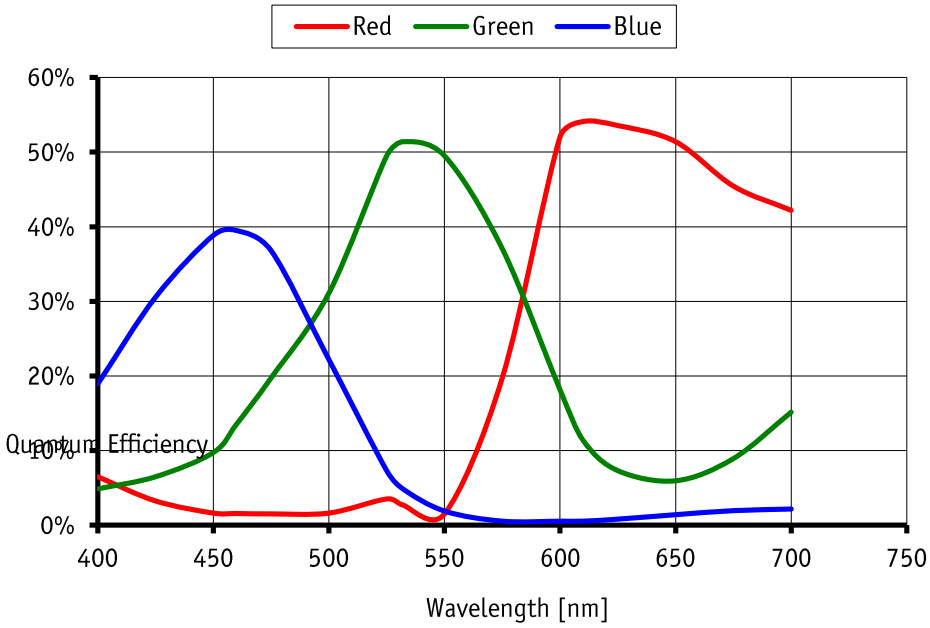


Figure 8 – Prosilica GX1920C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica GX	2300/2300C
Resolution	2336 x 1752
Sensor	Kodak KAI-04050
Type	CCD Progressive
Sensor size	Type 1
Cell size	5.5µm
Lens mount	C/F
Max frame rate at full resolution	28 fps (1 port) - 32 fps (2 ports)
A/D	14 bit
On-board FIFO	128 MB
Bit depth	8/14 (mono) – 8/12 (color) bit
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	10 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
Opto-coupled I/Os	2 inputs, 4 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	5.8W (1 port) – 6.9W (2 ports)
Mass	269 g
Body dimensions (L x W x H in mm)	107.2 x 53.3 x 33 (including connectors, w/o tripod and lens)
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	1.5 µs
Trigger jitter	±0.5 µs
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 6: Prosilica GX2300 camera specification

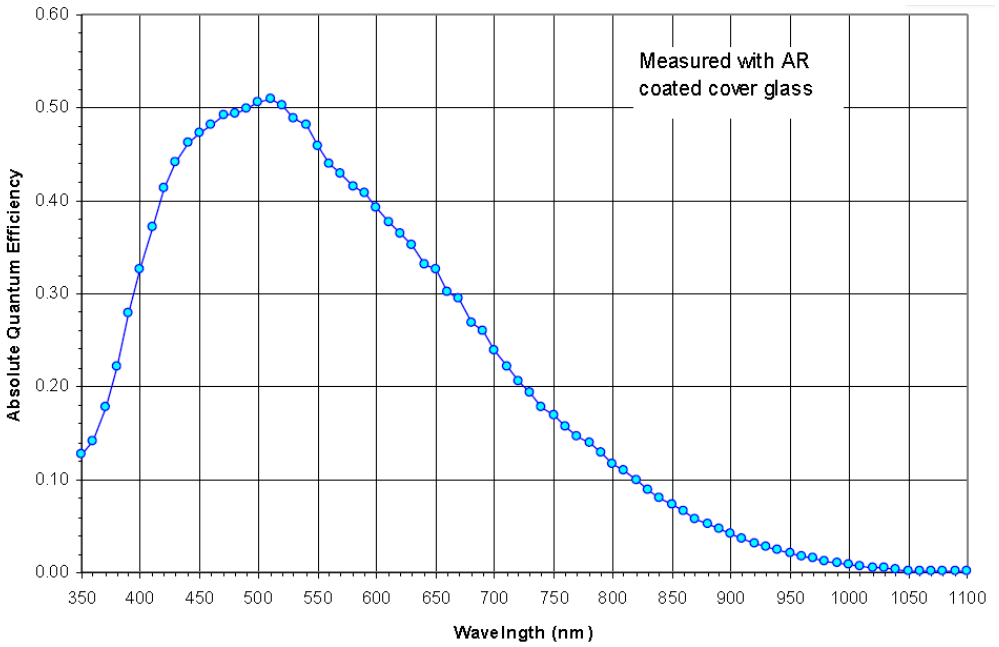


Figure 9 – Prosilica GX2300 monochrome spectral response

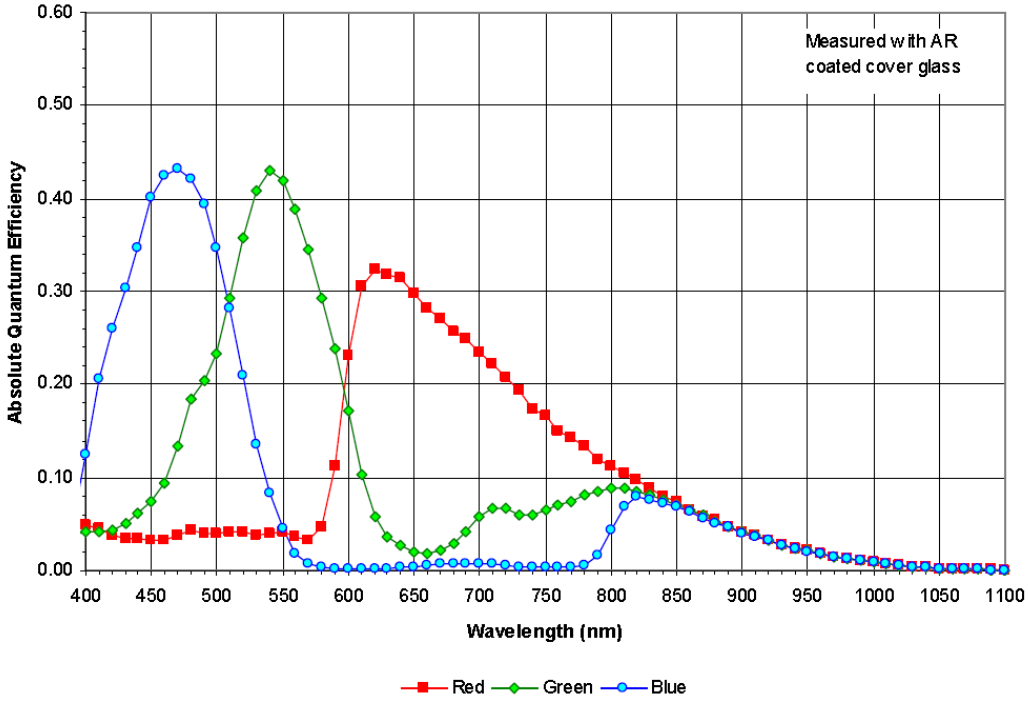


Figure 10 – Prosilica GX2300C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica GX	2750/2750C
Resolution	2750 x 2200
Sensor	Sony ICX694
Type	CCD Progressive
Sensor size	Type 1
Cell size	4.54 µm
Lens mount	C
Max frame rate at full resolution	19 fps (1 port) – 20 fps (2 ports)
A/D	14 bit
On-board FIFO	128 MB
Bit depth	8/14 (mono) – 8/12 (color) bit
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	10 µs to 60 seconds; 1 µs increments
Gain control	0 to 33 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
Opto-coupled I/Os	2 inputs, 4 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	6.1W (1 port) – 7.1W (2 ports)
Mass	269 g
Body dimensions (L x W x H in mm)	108.1 x 53.3 x 33 (including connectors, w/o tripod and lens)
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	1.5 µs
Trigger jitter	±0.5 µs
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 7: Prosilica GX2750 camera specification

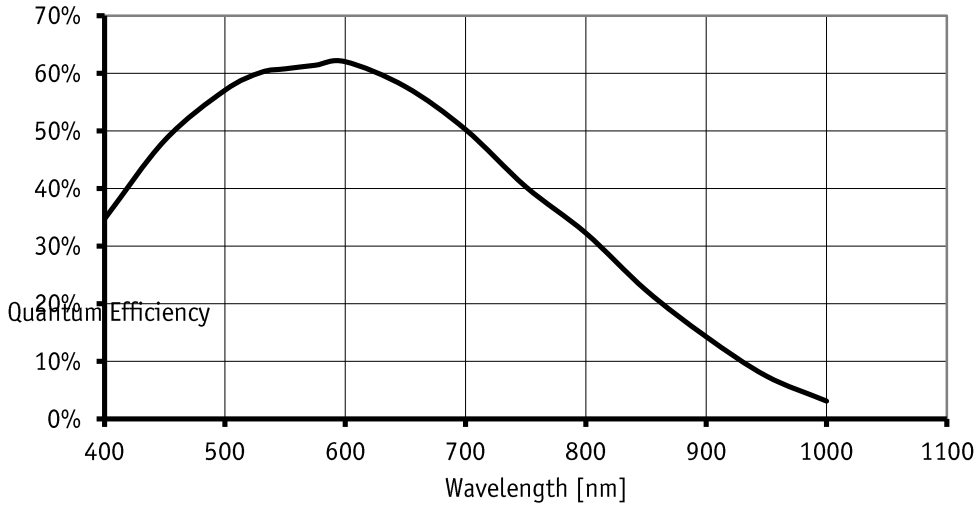


Figure 11 – Prosilica GX2750 monochrome spectral response

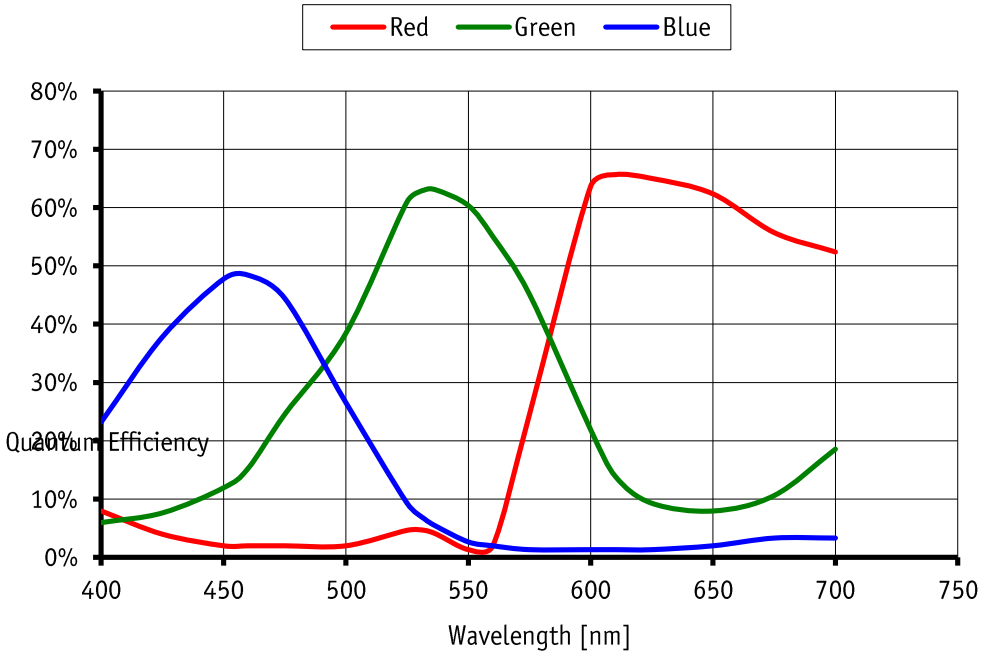


Figure 12 – Prosilica GC2750C color spectral response

Note

The design and specifications for the products described above may change without notice.

Specifications

Prosilica GX	3300/3300C
Resolution	3296 x 2472
Sensor	Kodak KAI-08050
Type	CCD Progressive
Sensor size	Type 4/3
Cell size	5.5µm
Lens mount	F
Max frame rate at full resolution	14 fps (1 port), 17 fps (2 ports)
A/D	14 bit
On-board FIFO	128 MB
Bit depth	8/14 (mono) – 8/12 (color) bit
Mono formats	Mono8, Mono16 (monochrome models only)
Color formats	Bayer8, Bayer16, YUV411, YUV422, YUV444, RGB24, BGR24, RGBA24, BGRA24
Exposure control	10 µs to 60 seconds; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 8 rows
Opto-coupled I/Os	2 inputs, 4 outputs
RS-232	1
Power requirements	5-24 VDC
Power consumption	6.1W (1port) – 7.2W (2 ports)
Mass	365 g
Body dimensions (L x W x H in mm)	136.7 x 59.7 x 59.7 (including connectors, w/o tripod and lens)
Operating temperature	0 ^{0}C ... +50 ^{0}C ambient temperature (without condensation)
Storage temperature	-10 ^{0}C ... +70 ^{0}C ambient temperature (without condensation)
Trigger latency	1.5 µs
Trigger jitter	±0.5 µs
Operating humidity	20 to 80% non-condensing
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.0
Regulatory	CE, FCC Class A, RoHS (2002/95/EC)

Table 8: Prosilica GX3300 camera specification

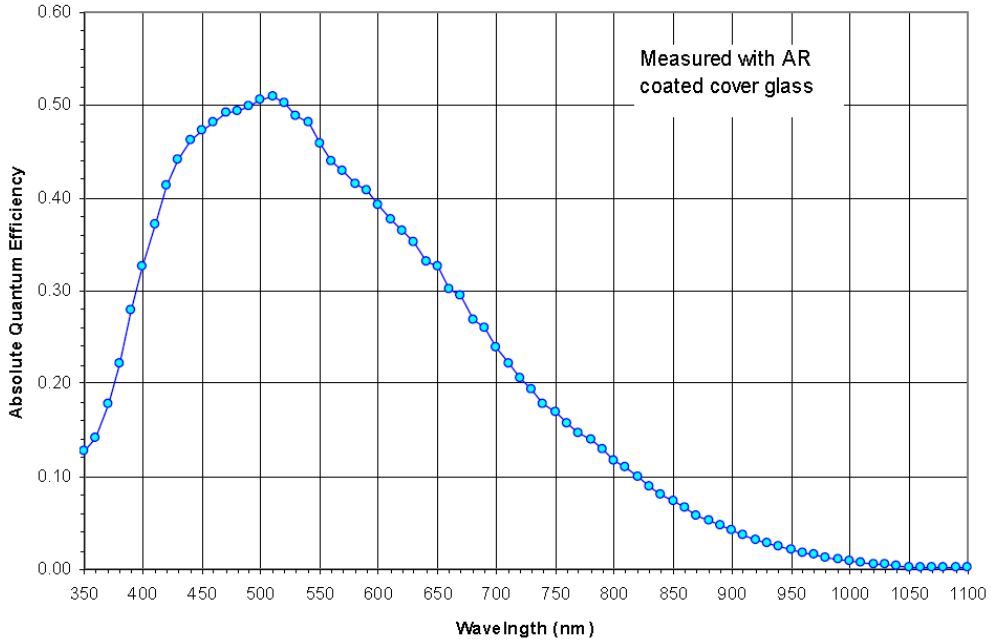


Figure 13 – Prosilica GX3300 monochrome spectral response

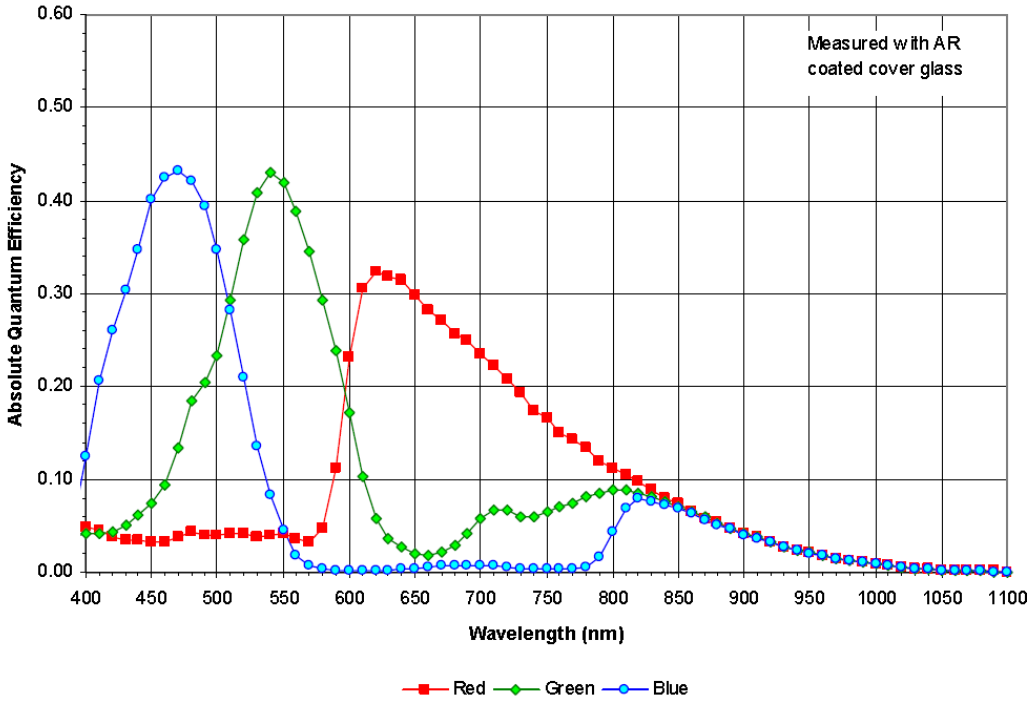


Figure 14 – Prosilica GX3300C color spectral response

Note

The design and specifications for the products described above may change without notice.

Camera attribute highlights

AVT cameras support a number of standard and extended features. The table below identifies the most interesting capabilities of this camera family. A complete listing of camera controls, including control definitions can be found in the **AVT Prosilica GigE Camera and Driver Attributes** document.

AVT Prosilica GigE Camera and Driver Attributes document online:

http://www.alliedvisiontec.com/fileadmin/content/PDF/Software/Prosilica_software/Prosilica_firmware/AVT_Camera_and_Driver_Attributes.pdf

Control	Specification
Gain control	Manual and auto
Exposure control	Manual and auto
Whitebalance	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 seconds; 1 us increments
Fixed rate control	0.001 fps to maximum frame rate
Imaging modes	Free-running, external trigger, fixed rate, software trigger
Sync out modes	Trigger ready, trigger input, exposing, readout, imaging, strobe, GPO
Region of interest (ROI)	Independent x and y control with 1 pixel resolution
Multicast	Streaming to multiple PC
Event channel	In-camera events including exposure start and trigger are asynchronously broadcasted to the host PC
Chunk data	Captured images are bundled with attribute information such as exposure and gain value

Table 9: Prosilica GX camera and driver attribute highlights

IR cut filter: spectral transmission

Note

All Prosilica GX color models are equipped with an infrared block filter (IR filter). This filter is employed to stop infrared wavelength photons from passing to the imaging device. If the filter is removed, images will be dominated by red and cannot be properly color balanced.

Monochrome cameras do not employ an IR filter.

The figure below shows the filter transmission response for the IRC filter family from Sunex. Prosilica GX cameras utilize the IRC30 filter.

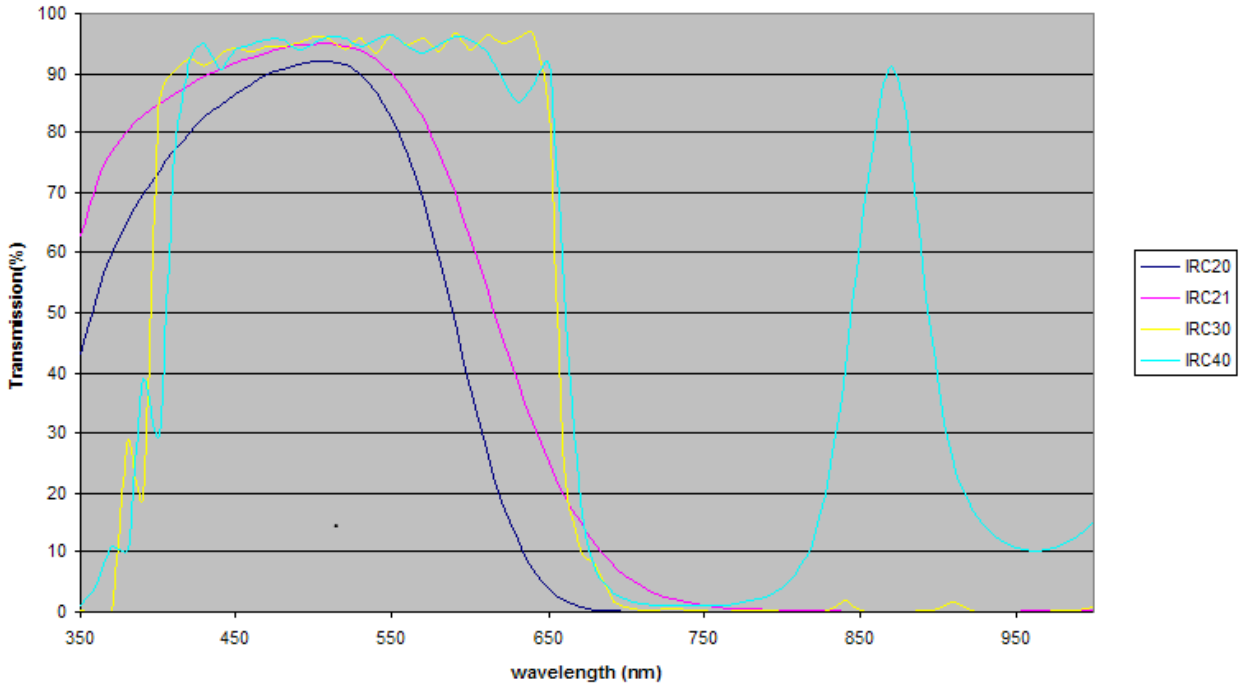


Figure 15: Sunex IRC filter transmission values

Camera dimensions

The **Prosilica GX** family supports a range of sensor sizes. The mechanical drawings in this section reflect the following configurations:

- C-mount
- F mount
- GX1920 and GX2750

Prosilica GX C-mount

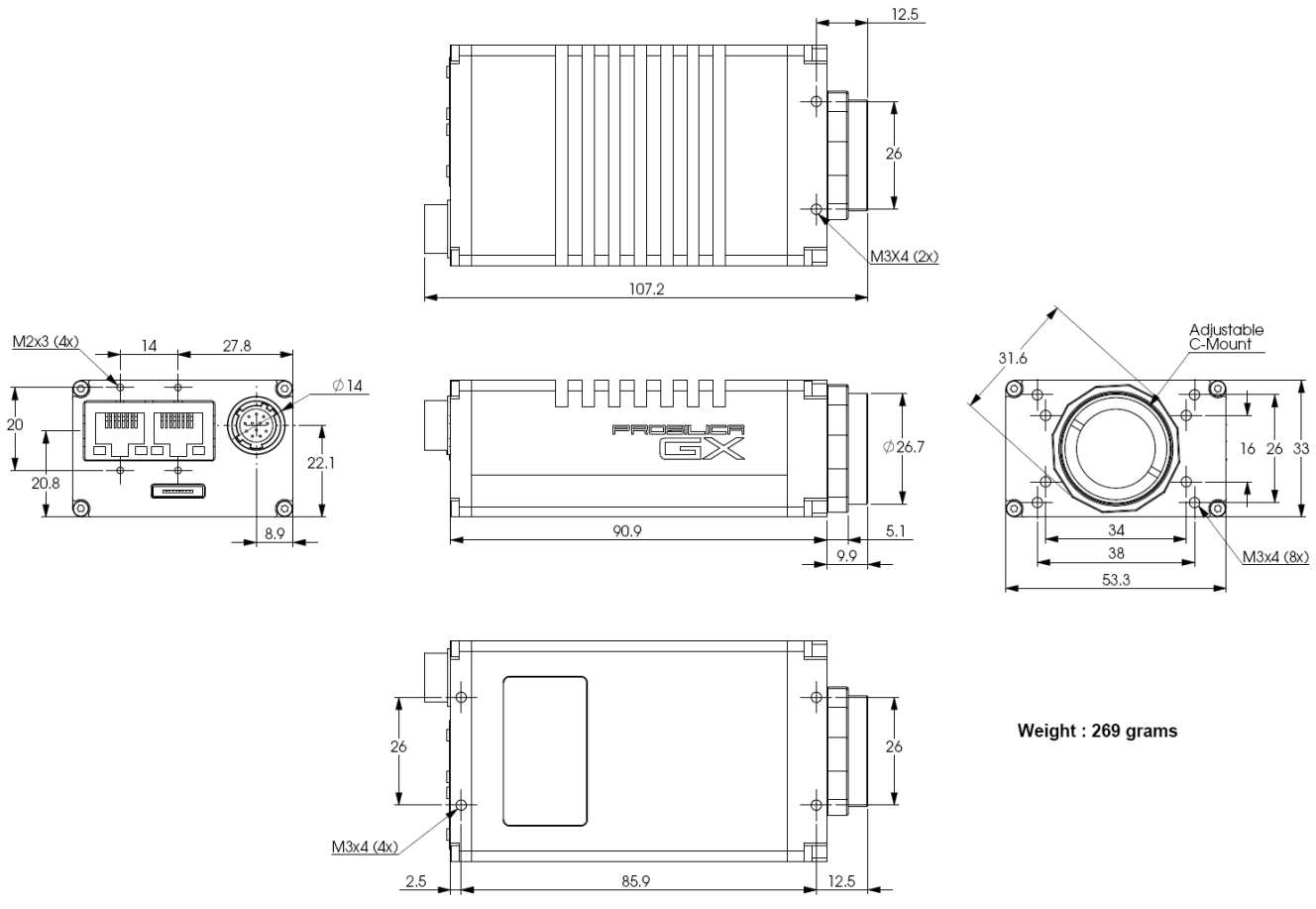


Figure 16: Prosilica GX C-mount mechanical dimensions

Prosilica GX F-mount

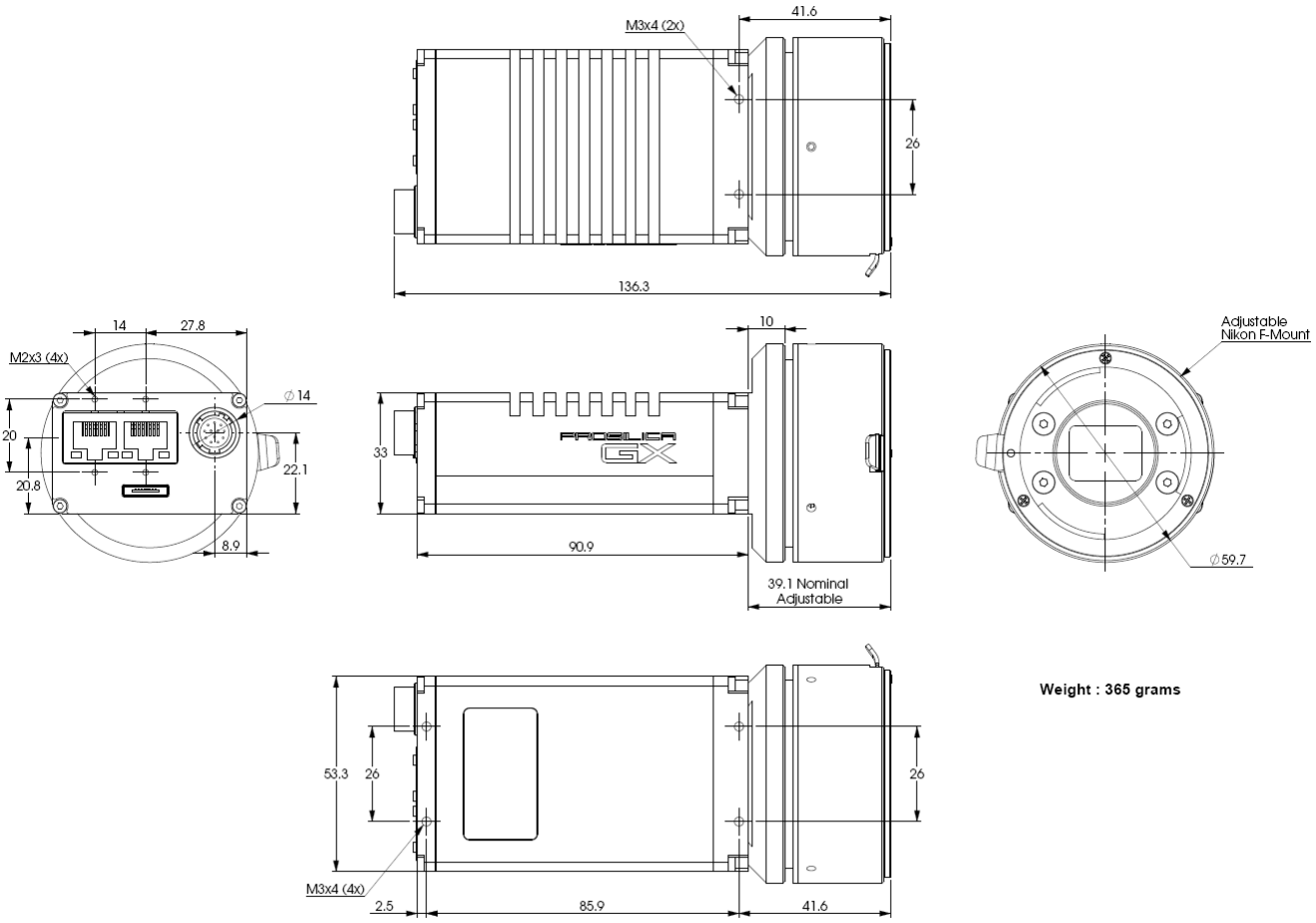


Figure 17: Prosilica GX F-mount mechanical dimensions

Note

Prosilica GX cameras are shipped with C-mount or F-mount. The camera can also be built with a CS-mount on request.

Prosilica GX1920 and GX2750

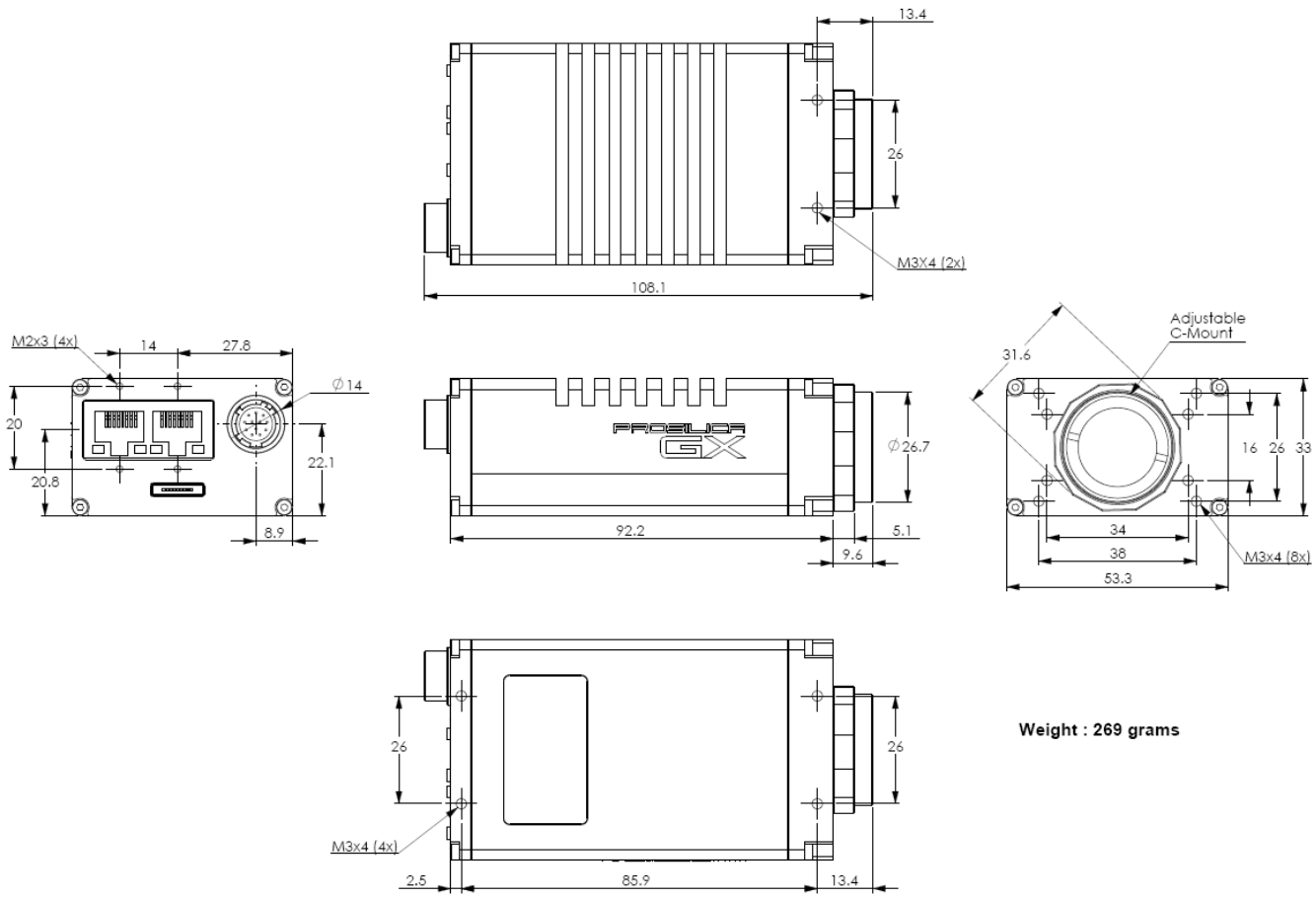


Figure 18: Prosilica GX1920 and GX2750 models mechanical dimensions

Note

Prosilica GX1920 and GX2750 is 1.3 mm longer than the remaining GX C-mount models. The same tripod adapter can be used with all GX cameras.

Tripod adapter

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

Note

The Prosilica GX tripod mount can be provided by AVT.
AVT P/N: 02-5030A

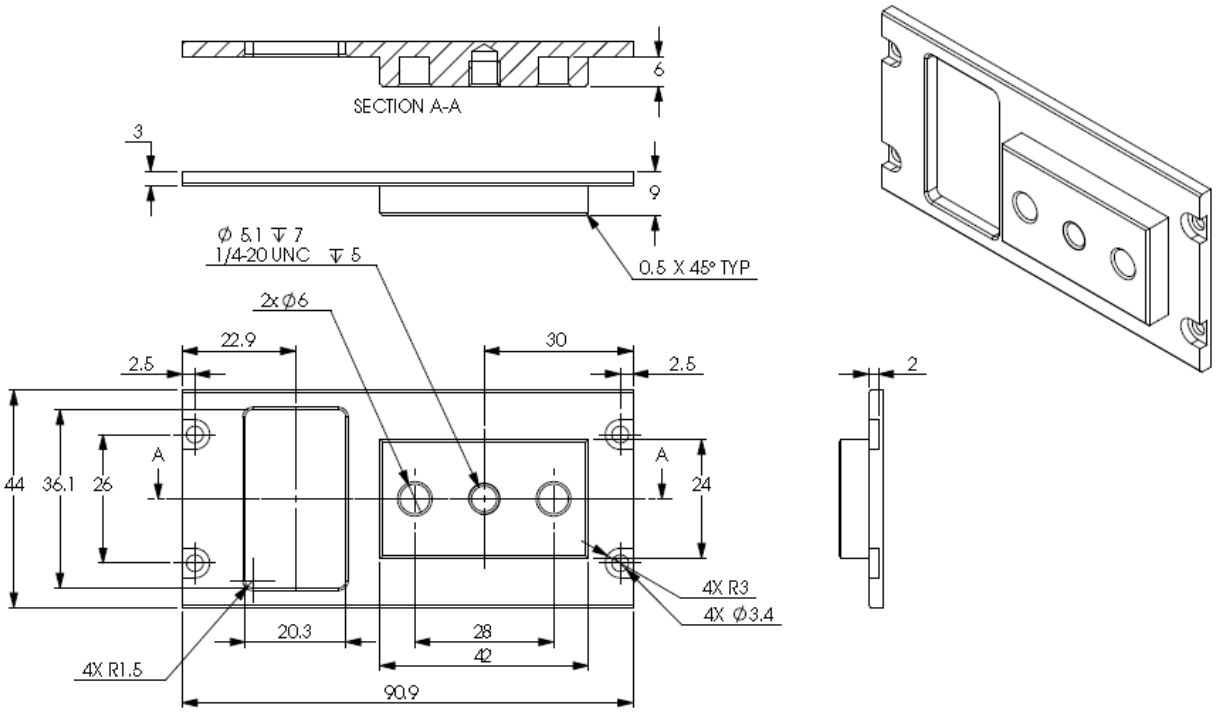


Figure 19: Prosilica GX tripod mount mechanical drawing

Adjustment of C-mount

Caution

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

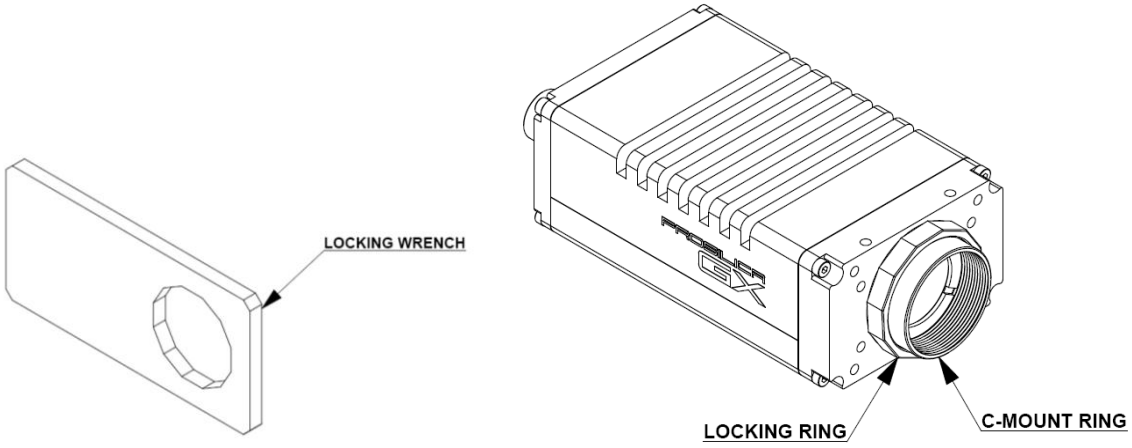


Figure 20: Prosilica GX camera and locking wrench

Loosen Locking Ring

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

Note

A wrench suitable for this procedure can be provided by AVT.
AVT P/N: 02-5003A

Prosilica GX cameras are shipped with C-mount or F-mount. The camera can also be built with a CS-mount on request.

Image to Infinity

Use a C-mount compatible lens that allows an infinity focus. Set the lens to infinity and image a distant object. The distance required will depend on the lens used but typically, 30 to 50 feet should suffice. Make sure the lens is firmly threaded onto the C-mount ring. Rotate the lens and C-mount ring until the image is focused. Carefully tighten locking ring. Recheck focus.

Adjustment of F-mount

Caution

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

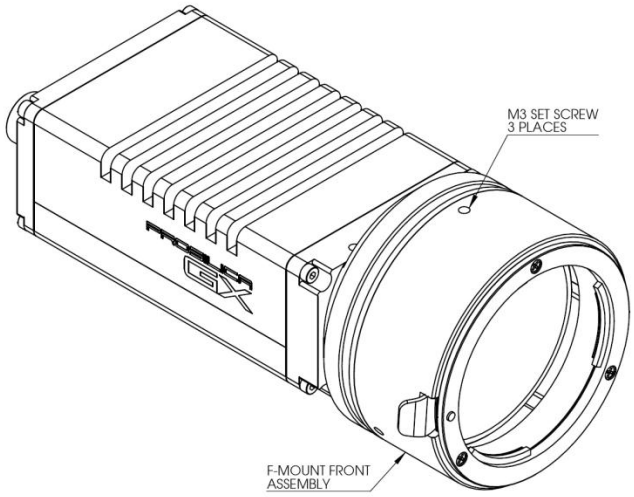


Figure 21: Prosilica GX F-mount iso view

Attach F-mount compatible lens

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

Loosen F-MOUNT FRONT ASSEMBLY

Use a 1.5mm hex wrench to loosen the 3 set screws than hold the F-mount front assembly to the camera body.

Image to Infinity

Set the lens to infinity and image a distant object. The distance required will depend on the lens used, but typically 30 to 50 feet should suffice. Gently move the F-mount front until focused, then lock.

Note

Prosilica GX cameras are shipped with C-mount or F-mount. The camera can also be built with a CS-mount on request.

Camera interfaces

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

WWW

For accessories like cables see:
http://www.alliedvisiontec.com/emea/products/accessories/gige-accessories.html

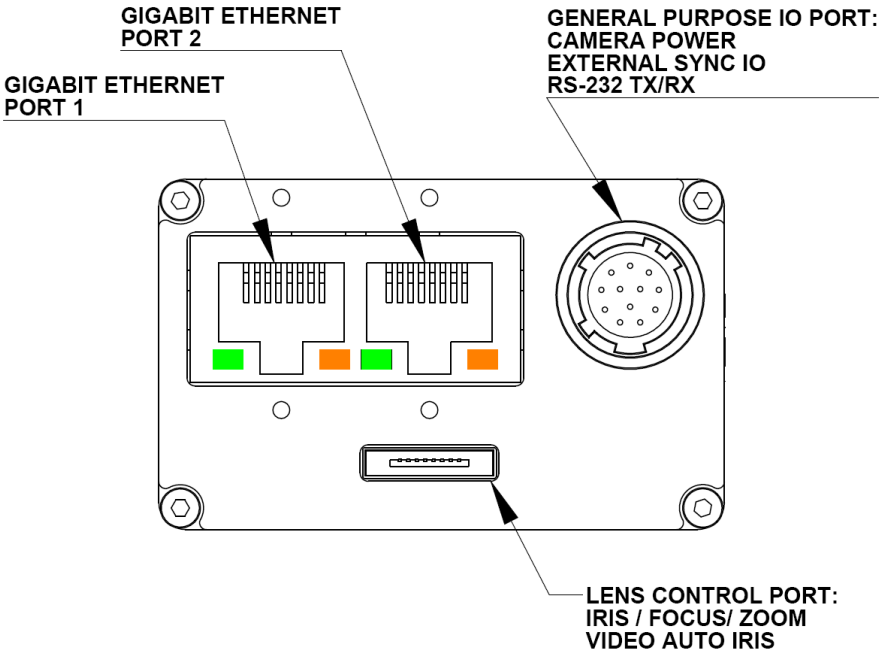
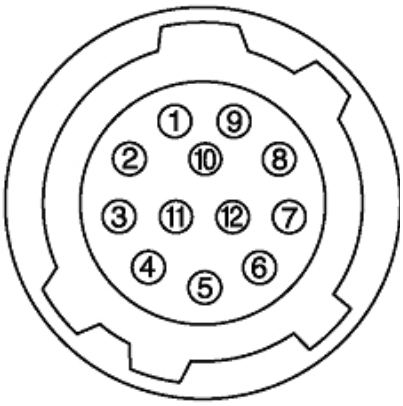


Figure 22: Prosilica GX connection diagram

Camera I/O connector pin assignment



Pin	Signal	Direction	Level	Description
1	External GND	---	GND for RS232 and ext. power	External Ground for RS232 and external power
2	External Power	---	+5...+24 V DC	Power Supply
3	Camera Out 4	Out	Open emitter max. 20mA	Camera Output 4 isolated (GPOut4)
4	Camera In 1	In	U_{in}(high) = 5 V...24 V U_{in}(low) = 0 V...0.8 V	Camera Input 1 isolated (GPIn1)
5	Camera Out 3	Out	Open emitter max. 20mA	Camera Output 3 isolated (GPOut3)
6	Camera Out 1	Out	Open emitter max. 20mA	Camera Output 1 isolated (GPOut1)
7	Camera In GND	In	Common GND for inputs	Camera Common Input Ground (In GND)
8	RxD RS232	In	RS232	Terminal Receive Data
9	TxD RS232	Out	RS232	Terminal Transmit Data
10	Camera Out Power	In	Common VCC for outputs +5...+24 V DC	Camera Output Power for digital outputs (Out VCC)
11	Camera In 2	In	U_{in}(high) = 5 V...24 V U_{in}(low) = 0 V...0.8 V	Camera Input 2 isolated (GPIn2)
12	Camera Out 2	Out	Open emitter max. 20mA	Camera Output 2 isolated (GPOut2)

Table 10: Prosilica GX I/O connector definition

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.

Note

This cable side Hirose connector can be purchased from AVT.
AVT P/N: K7600040 or 02-7002A

External Power

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

Caution

5V - 24V. 12V Nominal.

Note

A 12V power adaptor with Hirose connector can be ordered from AVT:

AVT P/N 02-8003A North America Supply
AVT P/N 02-8004A Universal Supply

Camera In (1 and 2)

The input signals (GPIn) allow the camera to be synchronized to some external event. These signals are optically isolated and require the signal common (In GND). The camera can be programmed to trigger on the rising or falling edge of these signals. The camera can also be programmed to capture an image at some programmable delay time after the trigger event. These signals can be driven from **5V to 24V** with a **minimum current source of 5mA.**

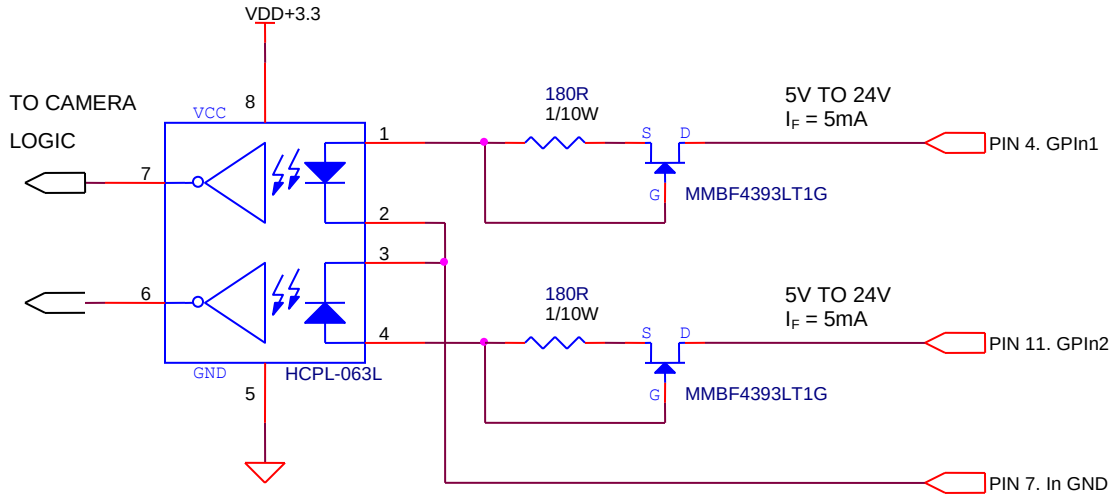


Figure 23: Prosilica GX input trigger. Camera internal circuit.

Camera Out (1 to 4)

These signals are optically isolated and require the user to provide a high voltage level (Out VCC) and signal common (In GND). Out VCC can be from 5V to 24V. ICC is a function of Out VCC and load resistor R. An example of the functional circuit is indicated in the following diagram.

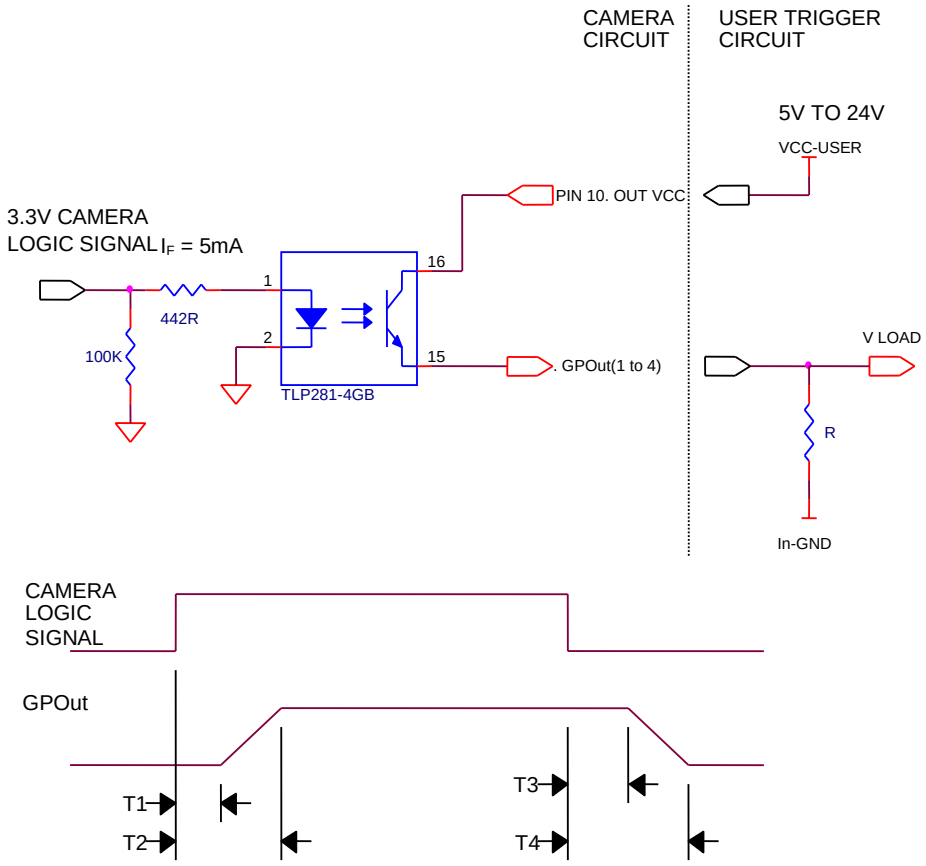


Figure 24: Prosilica GX output trigger circuit

Various Out VCC values and load values for the above circuit are indicated in the following table:

OUT VCC	OUT ICC	R LOAD	V LOAD	R POWER DISSIPATION	T1	T2	T3	T4
5V	8mA	500Ω	4.1V	32mW	1.5µs	6.5µs	2µs	14µs
5V	4.8mA	1KΩ	4.8V	23mW	1.5µs	5µs	17µs	40µs
12V	9.2mA	1.2KΩ	11.2V	101mW	1.5µs	11.2µs	2µs	20µs
12V	4.9mA	2.4KΩ	11.8V	58mW	1.5µs	8.5µs	17µs	55µs
24V	9.5mA	2.4KΩ	23.2V	217mW	1.5µs	22µs	2µs	37µs
24V	5mA	4.8KΩ	23.8V	120mW	1.5µs	12µs	17µs	105µs

Table 11: Prosilica GX trigger circuit values

These signals only function as outputs and can be configured as follows:

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

Any of the above signals can be set for active high or active low.

RxD RS-232 and TxD RS-232

These signals are RS-232 compatible. These signals allow communication from the host system via the Ethernet port to a peripheral device connected to the camera. These signals are not optically isolated and reference power ground. If these signals are used in the system, care must be taken to prevent ground loop problems.

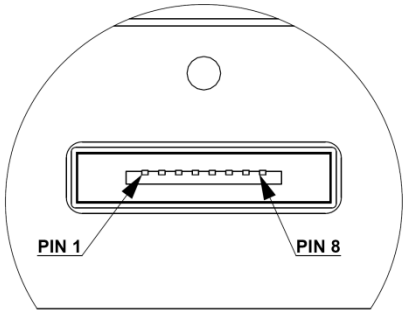
Camera In GND

This connection (In GND) provides the user ground reference and return path for the GPIn and GPOut signals. This connection is necessary if any of the isolated GPIn signals are to be used. It is also recommended that this ground connection be physically close to the used GPIn signals to prevent parasitic coupling. For example, a good cable design would connect the required signal on one conductor of a twisted pair and the isolated ground on the second conductor of the same twisted pair.

CAMERA OUT POWER

This connection (Out VCC) provides the power supply for the isolated GPOut signals. The voltage requirement is from 5V to 24V DC. The current requirement for this supply is a function of the optical isolator collector current and the number of sync outs used in the system. To prevent parasitic coupling this connection should be physically close to the used GPIn and GPOut signals and In GND.

Lens control port



Pin	Signal	Direction	Description
1	Iris +	Out	Open Iris
2	Iris -	Out	Close iris
3	Focus +	Out	Focus far
4	Focus -	Out	Focus close
5	Zoom +	Out	Zoom out
6	Zoom -	Out	Zoom in
7	Video Iris	Out	PWM Signal for Iris Control
8	External GND	---	External Ground for all lens control signals

Table 12: Prosilica GX Lens connector definition

The lens control connector is a Hirose 3260-8S3. This connector provides the signals necessary to control the iris, focus, and zoom of most commercially available TV Zoom and Video-type auto-iris lenses. The cable side connector is Hirose 3240-8P.

The camera can be configured to operate lenses with unipolar voltage requirements of 6V up to 12V or lenses that operate with bipolar voltages from ±6V up to ±12V.

This voltage level can be controlled through software. The default voltage is set to 6V. The current capacity for each axis is 50mA.

Caution

CARE MUST BE TAKEN NOT TO EXCEED THE LENS MANUFACTURERS VOLTAGE SPECIFICATION.

Note

This cable side Hirose connector can be purchased from AVT.
AVT P/N: 02-7004A

Gigabit Ethernet port

The Gigabit Ethernet port conforms to the IEEE 802.3 1000BASE-T standard for Gigabit Ethernet over copper. AVT recommends using Category 5e or Category 6 compatible cabling and connectors for best performance.

Note

Cable lengths up to 100 m are supported.

The 8-pin RJ-45 jack has the pin assignment according to the Ethernet standard (IEEE 802.3 1000BASE-T).

The **Prosilica GX** offers two Gigabit Ethernet ports. This interface is enabled using Link aggregation. A link aggregate group (**LAG**) is automatically configured on the camera when both ports are connected. The host PC requires a dual port, LAG capable Ethernet adapter. The LAG group needs to be configured by the user.

www

The **AVT GigE Installation Manual** offers detailed instructions for using Prosilica GX cameras in a dual port configuration.

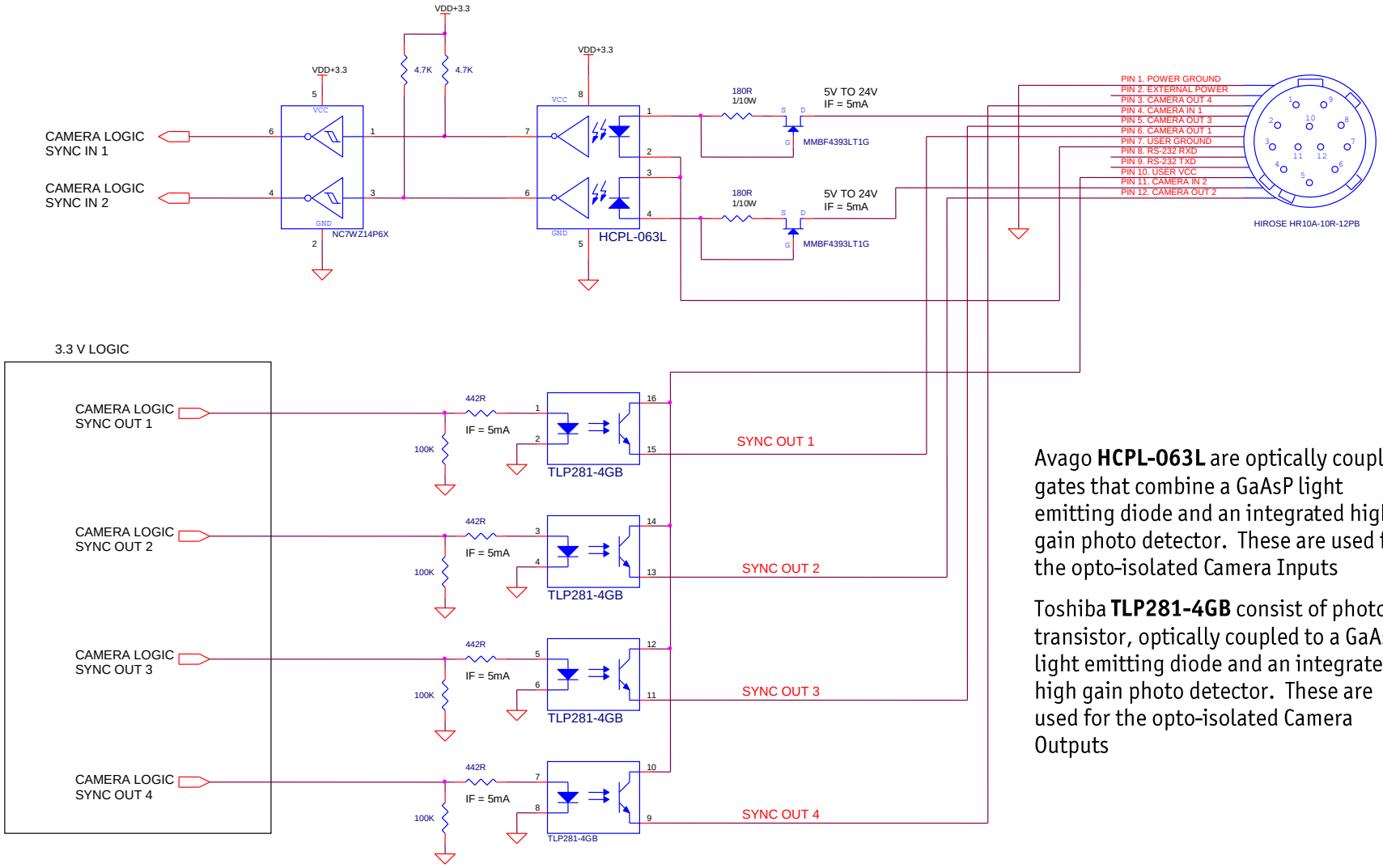
http://www.alliedvisiontec.com/us/support/downloads/product-literature/prosilica-gx.html

Note

A dual port Ethernet adapter is available from AVT.

AVT P/N: 02-3005A
Intel Model: Intel Pro 1000/PT

Camera I/O internal circuit diagram

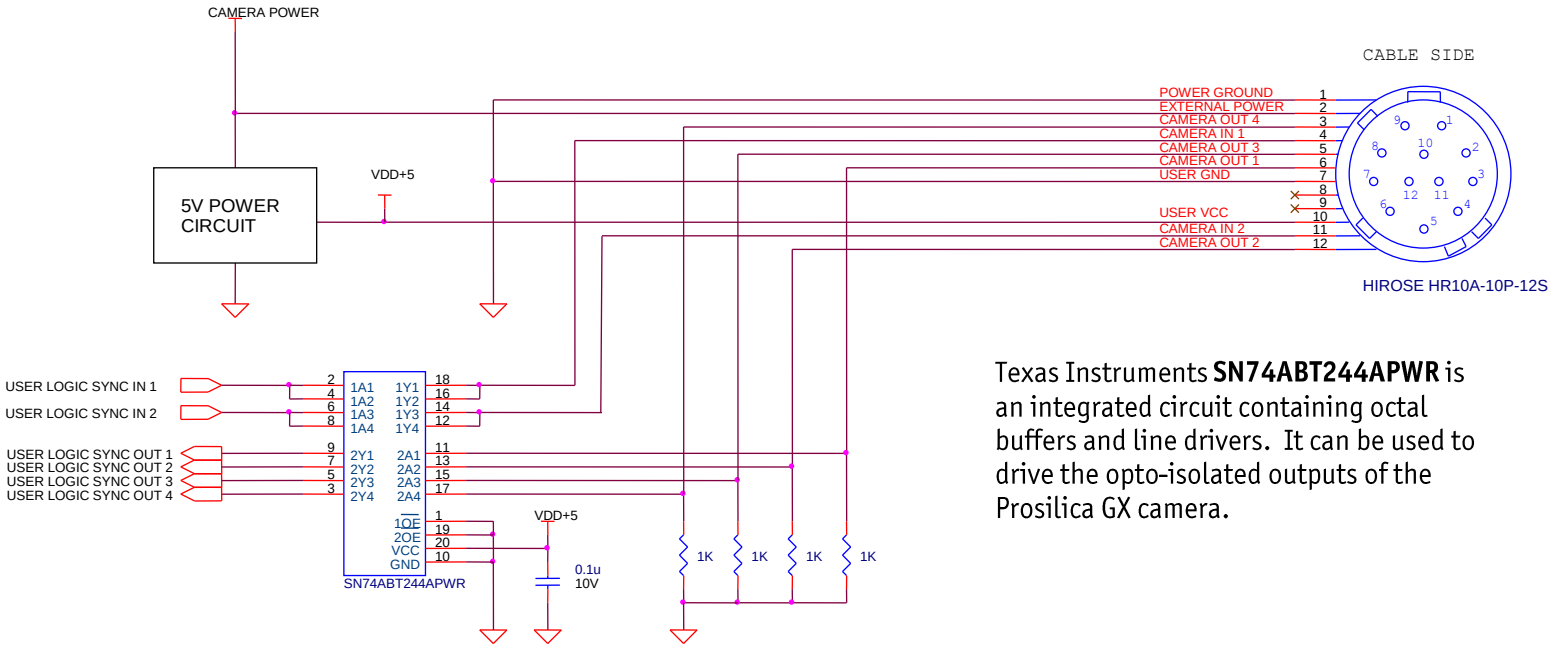


Avago **HCPL-063L** are optically coupled gates that combine a GaAsP light emitting diode and an integrated high gain photo detector. These are used for the opto-isolated Camera Inputs

Toshiba **TLP281-4GB** consist of photo transistor, optically coupled to a GaAsP light emitting diode and an integrated high gain photo detector. These are used for the opto-isolated Camera Outputs

Figure 25: Prosilica GX internal circuit diagram

Camera I/O external circuit example



Texas Instruments **SN74ABT244APWR** is an integrated circuit containing octal buffers and line drivers. It can be used to drive the opto-isolated outputs of the Prosilica GX camera.

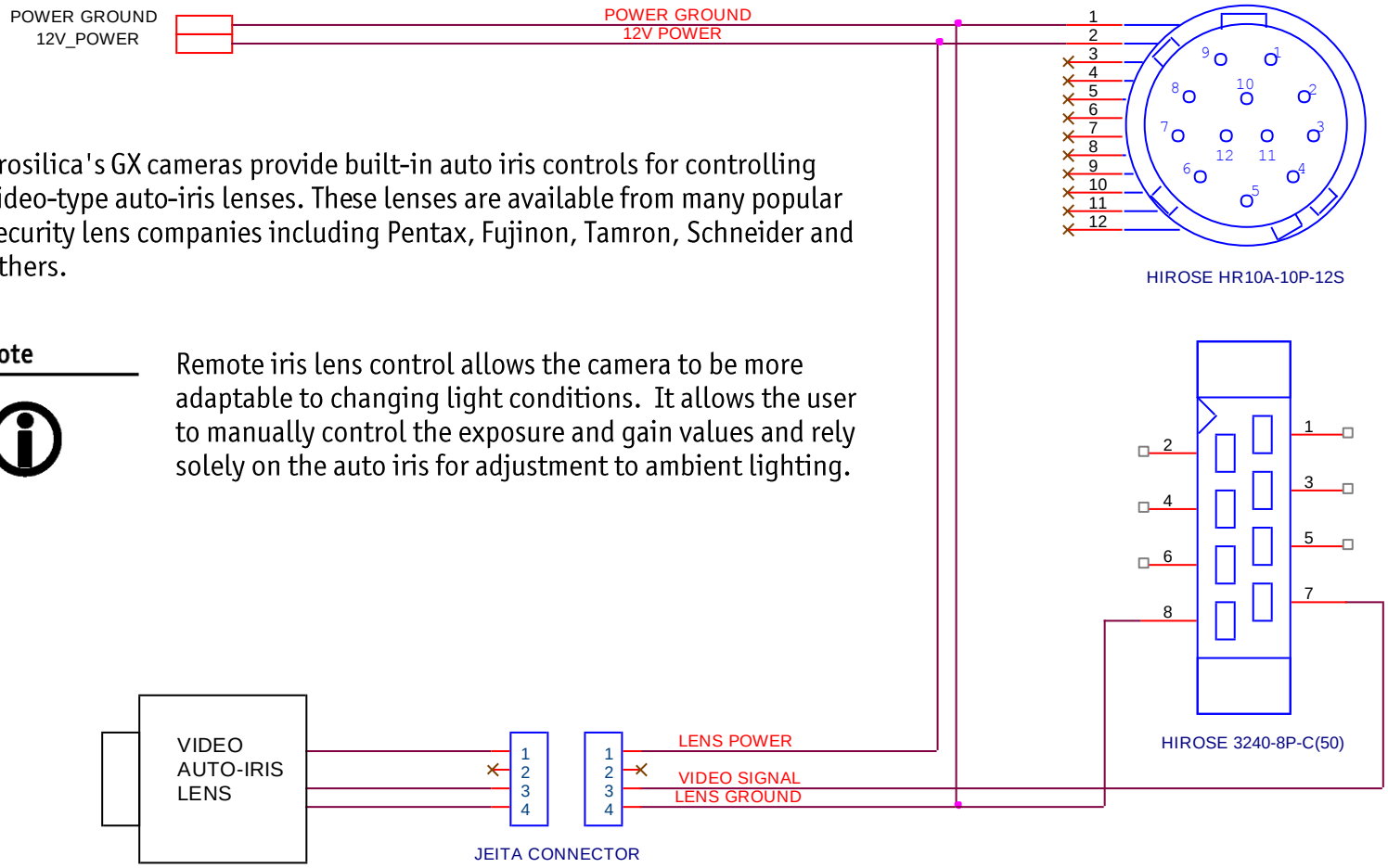
Figure 26: Prosilica GX external circuit

The schematic above is an example of voltages that can be used to provide power to the camera and trigger circuit.

Caution

- Camera power is 5 to 24V
- Camera power does NOT need to be the same as User VCC
- Camera GND does NOT need to connect to User GND
- User VCC must have sufficient current capacity to supply IC current for each sync out (Camera Out) signal.

Video iris connection



Prosilica's GX 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, Schneider and others.

Note

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.

Figure 27: Prosilica GX video iris schematic

Motorized lens connection

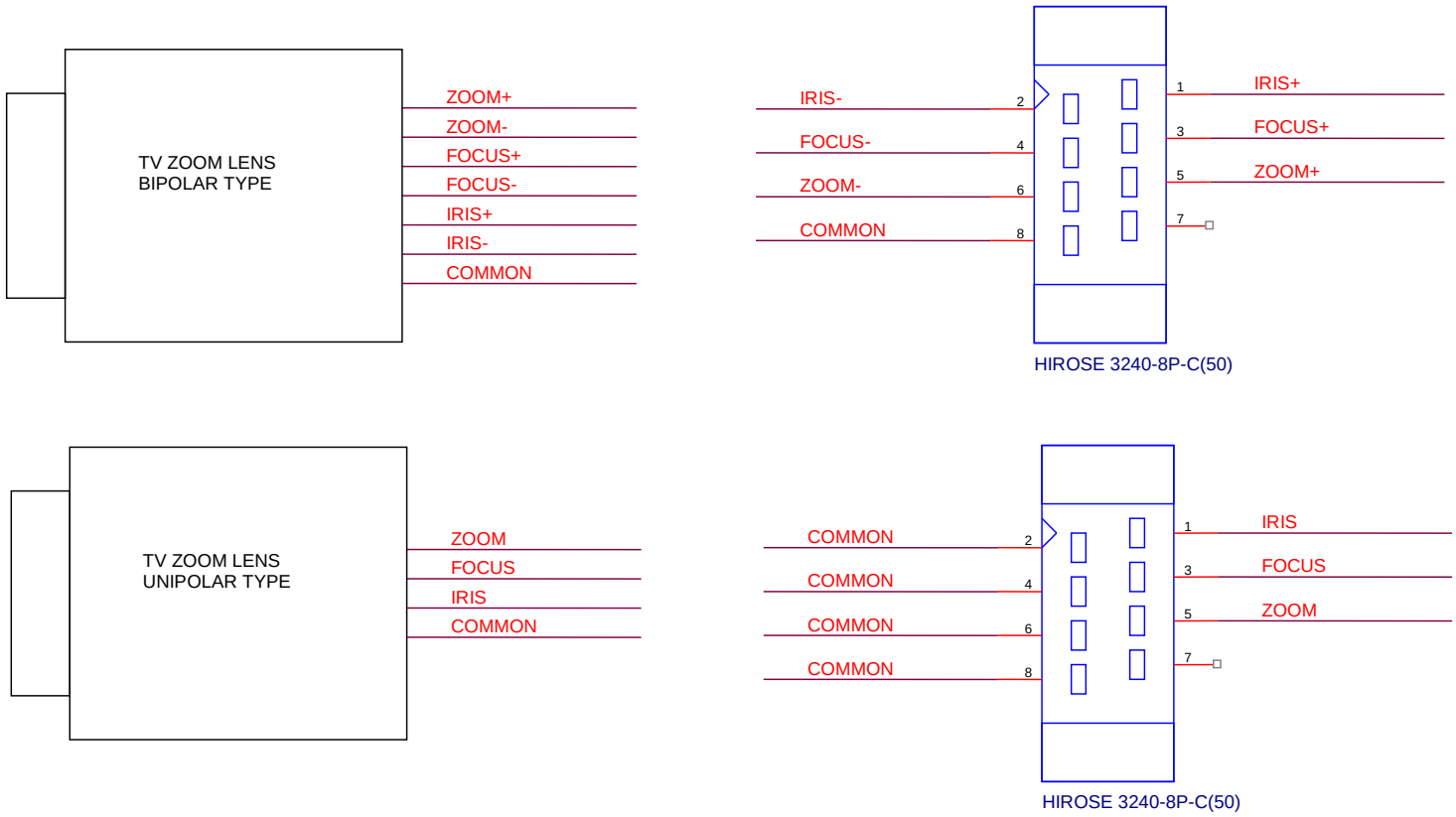


Figure 28: Prosilica GX motorized lens schematic

Caution

WARNING

Verify lens voltage setting on camera does not exceed lens voltage specification. Camera lens voltage is controlled by software. This is set to 6V after power up and cannot be saved to user configuration files.
Current capacity per axis = 50ma.

Notes on triggering

Timing diagram

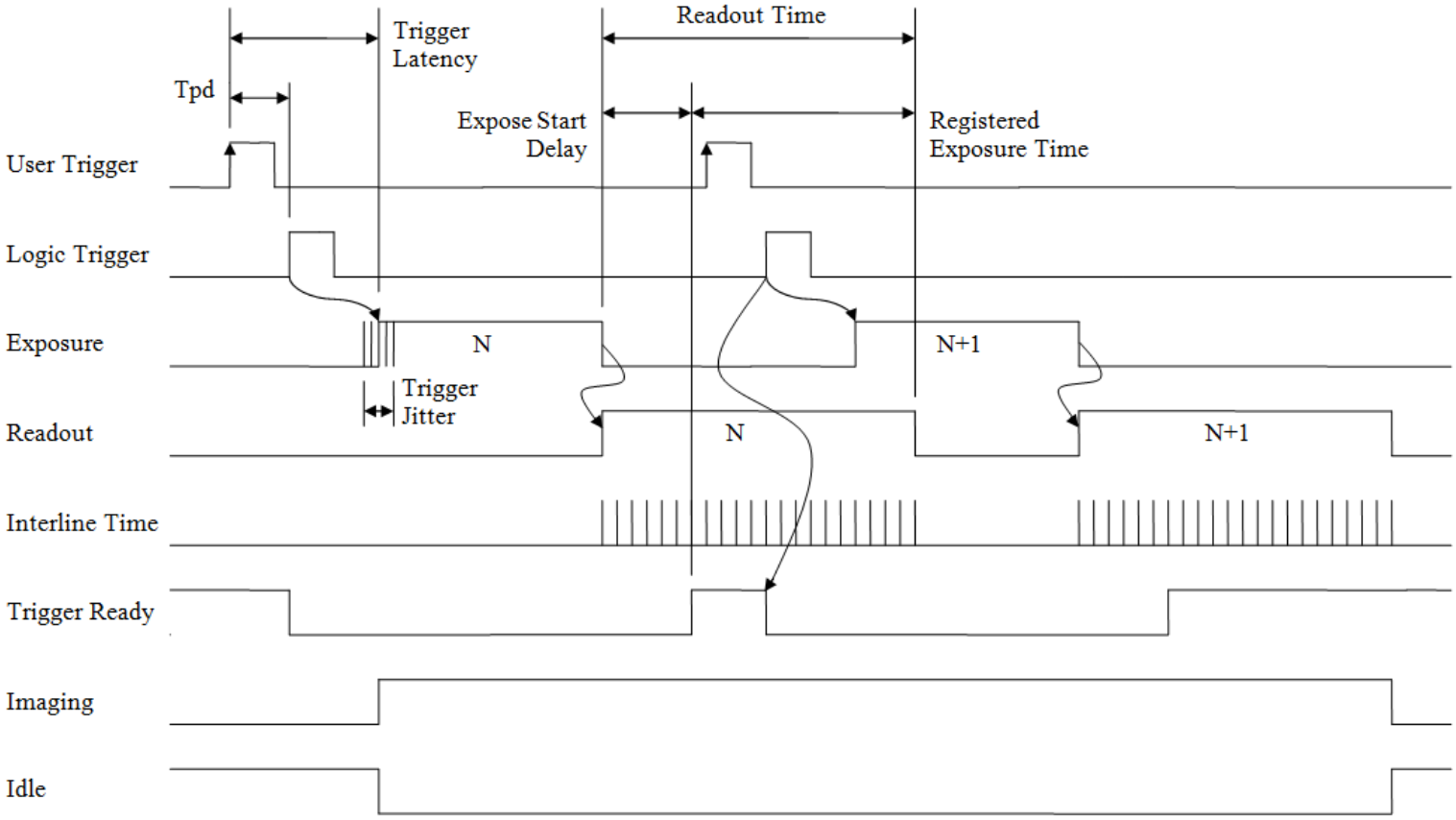


Figure 29: Prosilica GX internal signal timing waveforms

Signal definitions

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)
Tpd	Propagation delay between the User Trigger and the Logic Trigger
Exposure	… is high when the camera image sensor is integrating light.
Readout	… is high when the camera image sensor is reading out data.
Trigger Latency	Time delay between the User Trigger and the start of Exposure
Trigger Jitter	Error in the Trigger Latency Time
Trigger Ready	… indicates to the user that the camera will accept the next trigger.
Registered Exposure Time	… is the Exposure Time value currently stored in the camera memory.
Exposure Start Delay	… is the 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	… is the time between sensor row readout cycles.
Imaging	… is high when the camera image sensor is either exposing and/or reading out data.
Idle	… is high if the camera image sensor is not exposing and/or reading out data.

Table 13: Explanation of signals in timing diagram

Trigger rules

Note

The **User Trigger pulse width** should be at least three times the width of the Trigger Latency as indicated in Chapter **Specifications** on page 11.

- 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.
- **Expose 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 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, then the User Trigger signal should be applied as soon as a valid Trigger Ready is detected.

In this case, Trigger Latency and Trigger Jitter can be up to 1 line time since Exposure must always begin on an Interline boundary.

Firmware update

Firmware updates are carried out via the Ethernet connection. AVT provides an application for all Prosilica GX cameras that loads firmware to the camera using a simple interface.

New feature introductions and product improvements motivate new firmware releases. All users are encouraged to use the newest firmware available and complete the firmware update if necessary.

www

Download the latest GigE firmware loader from the AVT website:
http://www.alliedvisiontec.com/us/support/downloads/firmware.html

Note

To determine the current firmware version loaded onto the camera, read the camera's Device Firmware attribute using the **GigE Sample Viewer** or third party applications such as NI Vision Acquisition Software.

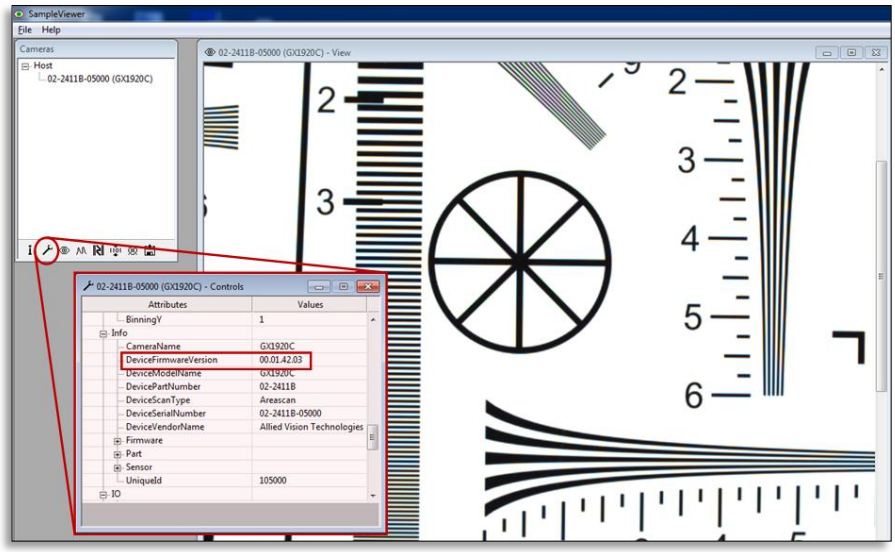


Figure 30: Screenshot of GigE Sample Viewer controls window

Resolution and ROI frame rates

This section provides performance information about the impact of reducing the region of interest on the camera's maximum frame rate. In addition, because the **Prosilica GX** camera offers **Dual GigE LAG**, the impact of using a single Ethernet connection versus dual Ethernet connections with the host is compared.

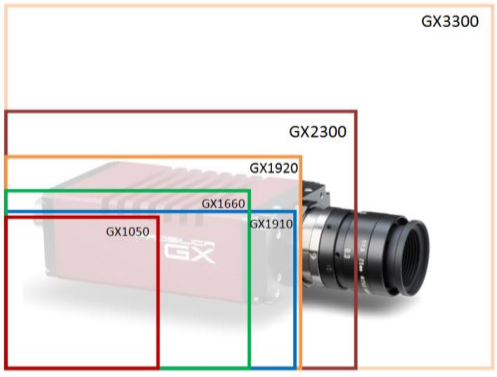
Single port GigE connection with the Prosilica GX

When a Prosilica GX camera is connected to the host computer using a single Ethernet connection, it behaves like a single port GigE Vision camera. The total bandwidth available for the camera is 125 MB or 1 Gb. A Dual GigE LAG connection supported by the Prosilica GX camera offers up to 250 MB or 2 Gb of bandwidth.

The Prosilica GX camera can be operated near peak sensor frame rates even when using a single port connection. The frame rate tables included in this section provide frame rate performance results for both single GigE port and Dual GigE LAG configurations.

Note

- There is no frame rate increase with reduced width.
- ROIs are taken center image for maximum speed advantage on a quad-tap CCD sensor.
- BinningY is horizontal row summing on CCD before readout. The frame rate for an ROI at the same effective height as binning will be slower because the CCD still needs to read out the "fast readout rows" in ROI mode.
- Single GigE port frame rate data was generated using **StreamBytesPerSecond** equal to 120 MB and an 8 bit pixel format such as Mono8 or Bayer8



CAMERA: Prosilica GX1050

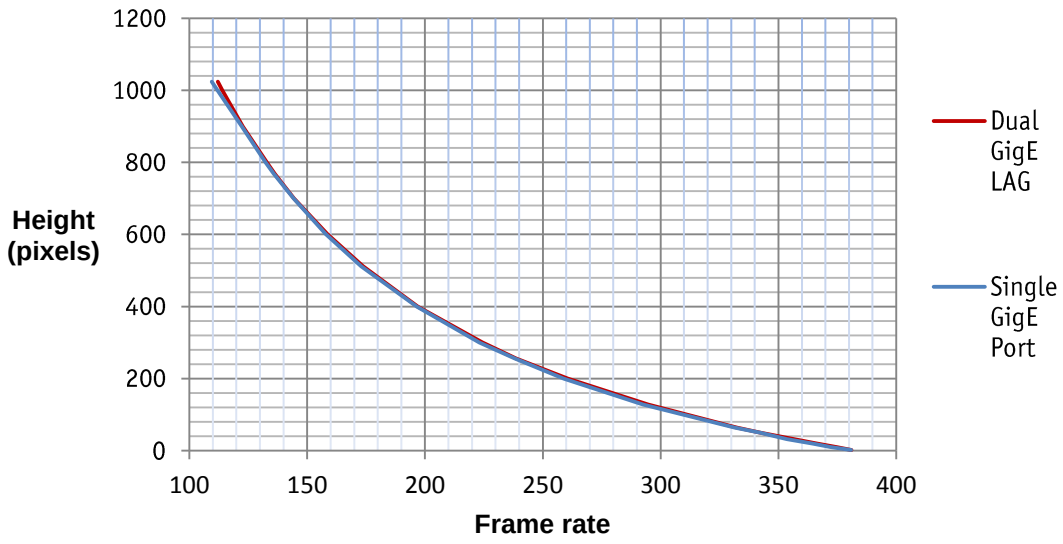


Figure 31: Maximum frame rate versus region height for GX1050

CAMERA: Prosilica GX1660

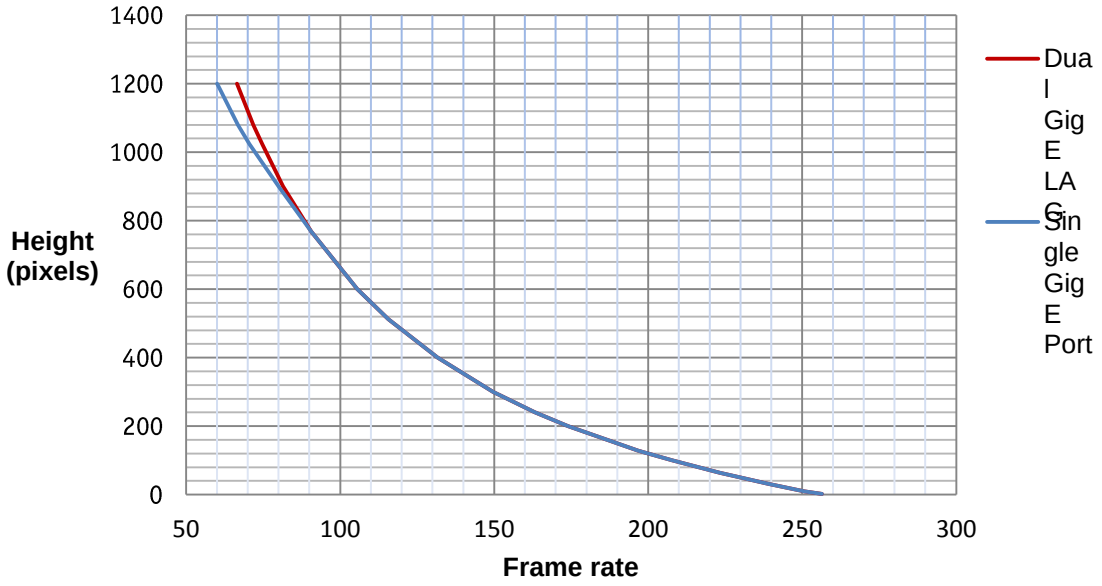


Figure 32: Maximum frame rate versus region height for GX1660

CAMERA: Prosilica GX1910

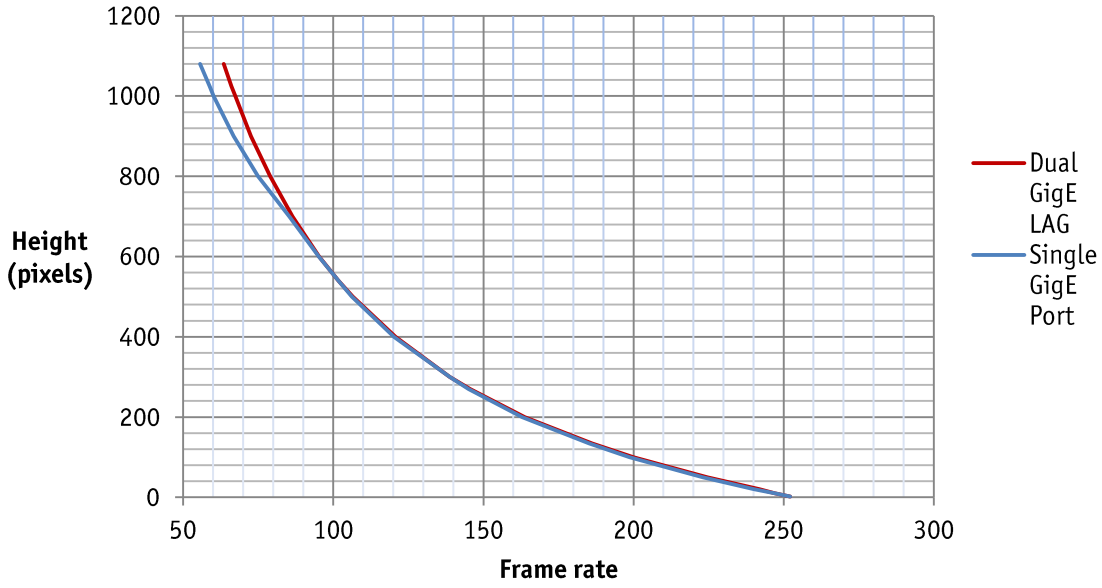


Figure 33: Maximum frame rate versus region height for GX1910

CAMERA: Prosilica GX1920

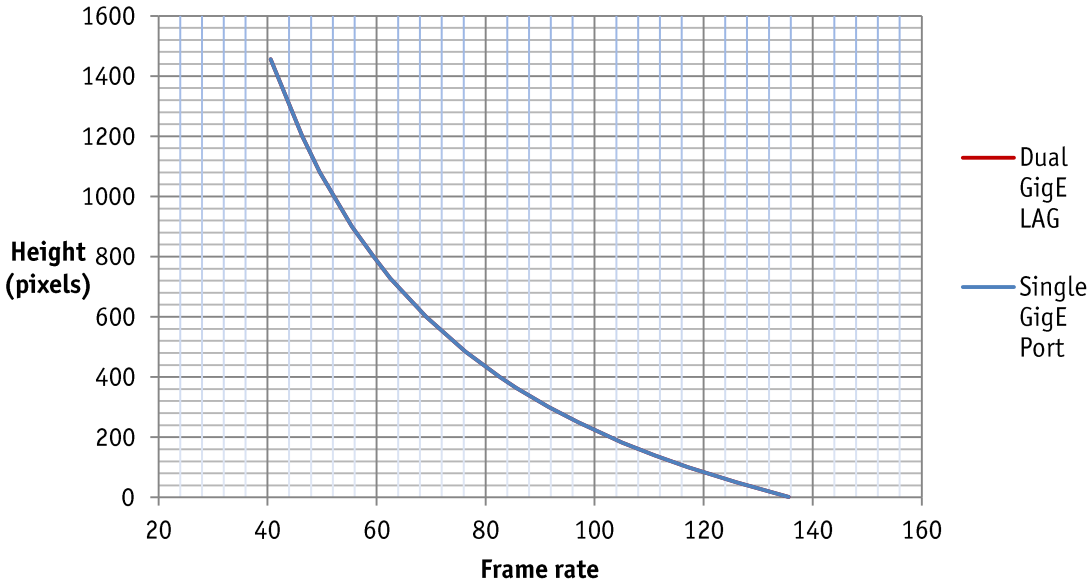


Figure 34: Maximum frame rate versus region height for GX1920

CAMERA: Prosilica GX2300

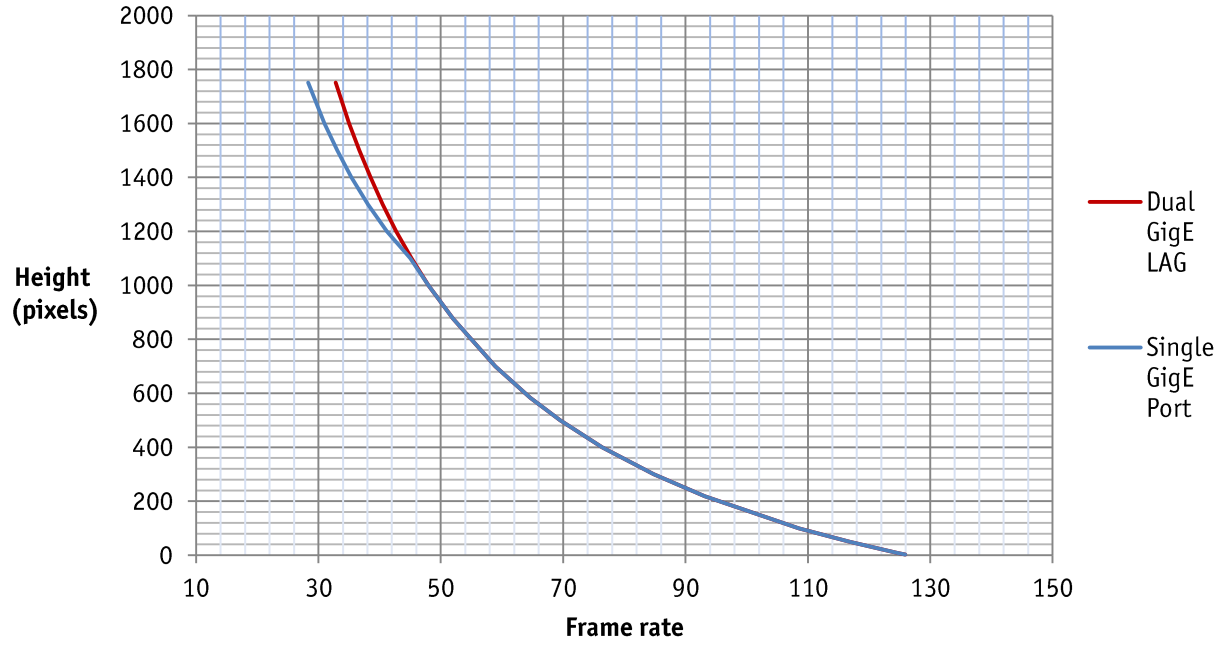


Figure 35: Maximum frame rate versus region height for GX2300

CAMERA: Prosilica GX2750

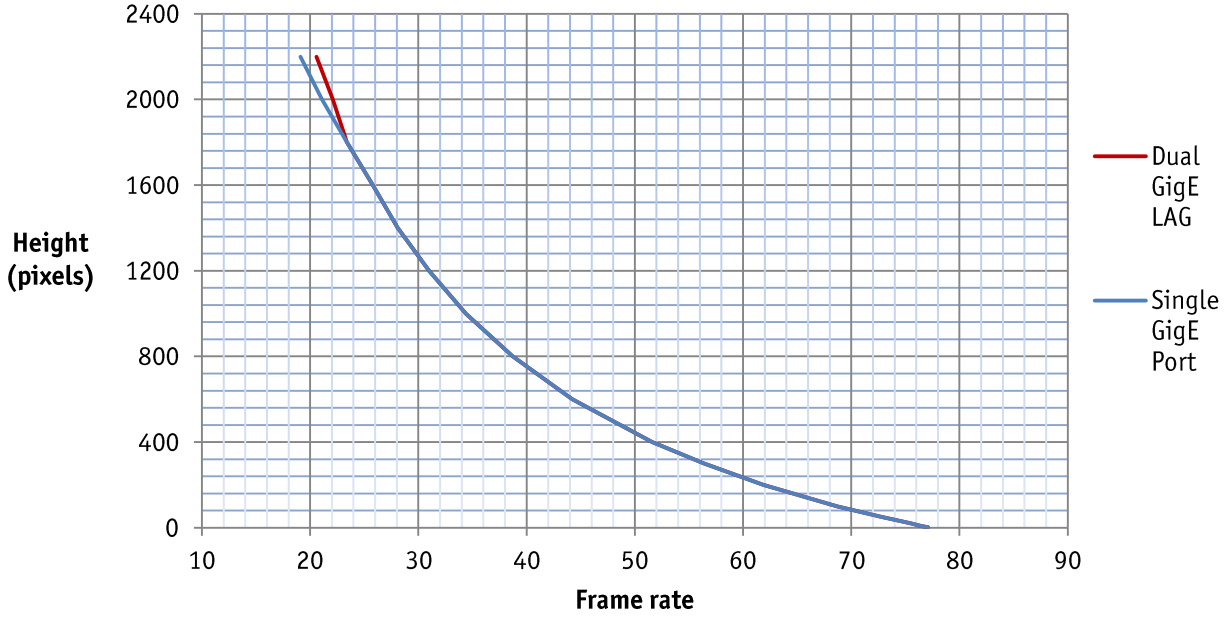


Figure 36: Maximum frame rate versus region height for GX2750

CAMERA: Prosilica GX3300

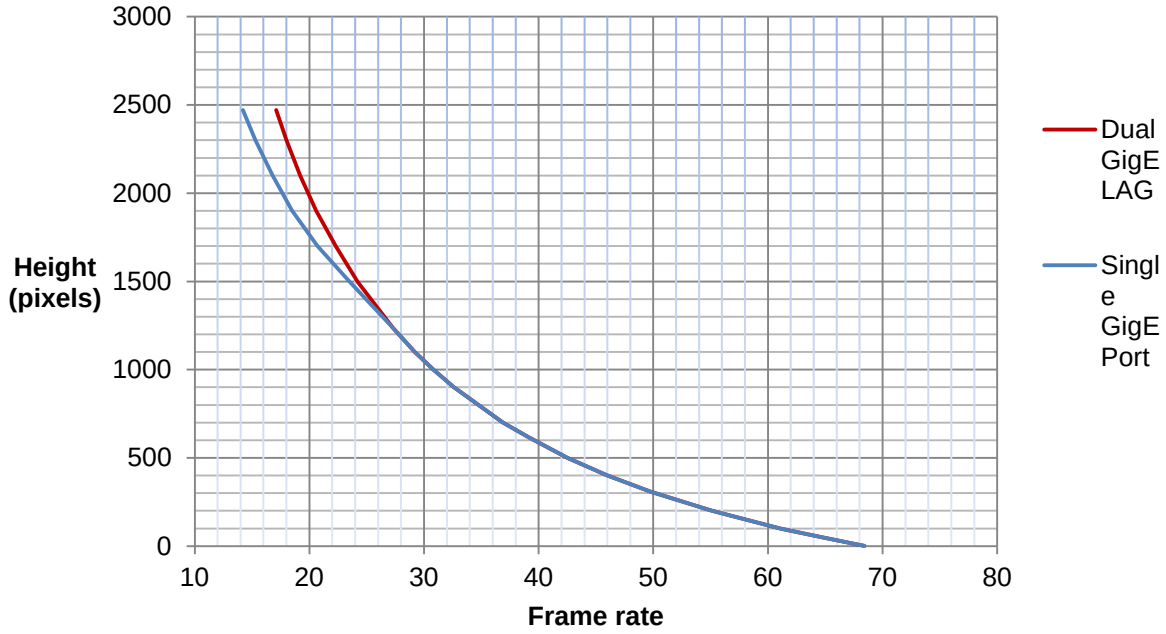


Figure 37: Maximum frame rate versus region height for GX3300

Prosilica GX frame rate performance comparison

Single GigE port operation

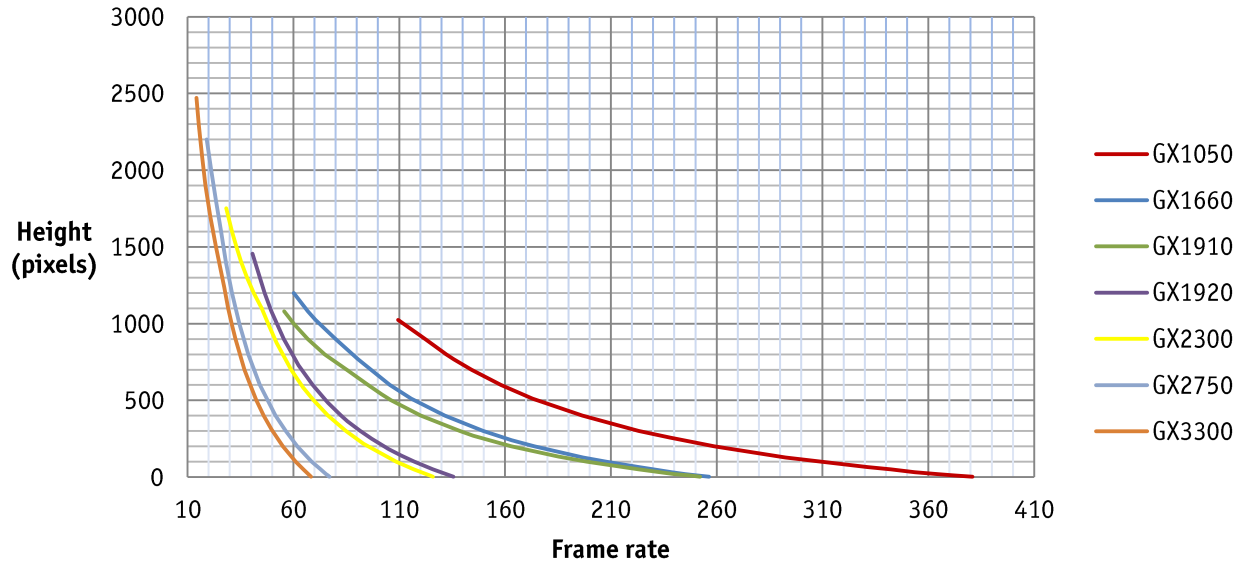


Figure 38: Maximum frame rate model comparison using single Ethernet port

Dual GigE LAG operation

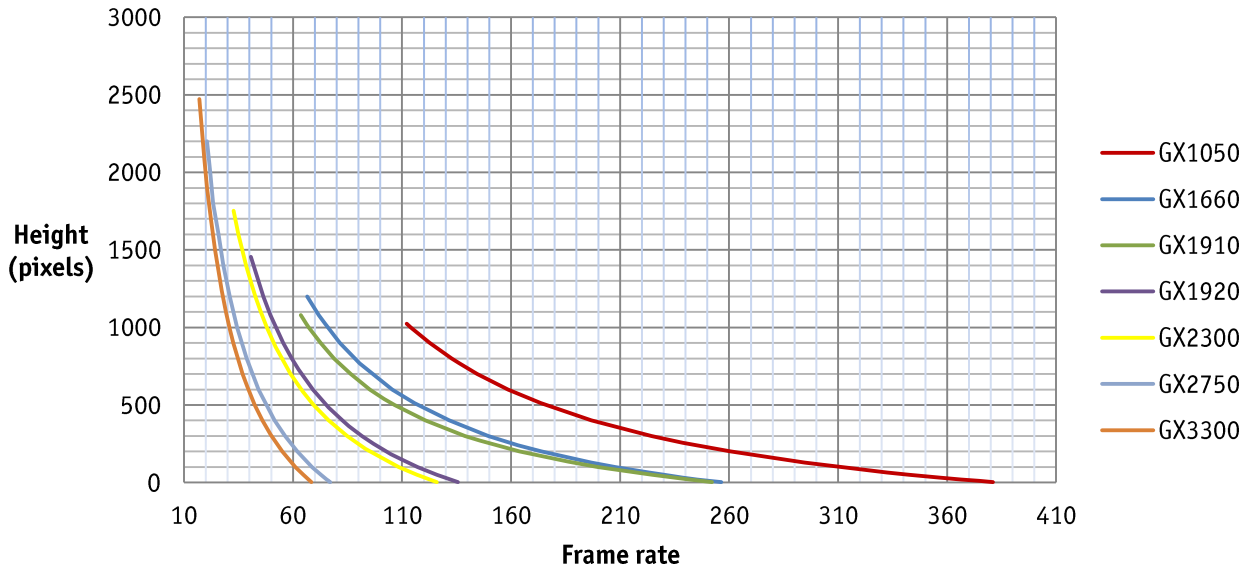


Figure 39: Maximum frame rate model comparison using two Ethernet ports

Additional references

Prosilica GX webpage
http://www.alliedvisiontec.com/us/products/cameras/gigabit-ethernet/prosilica-gx.html
Prosilica GX Documentation
http://www.alliedvisiontec.com/us/support/downloads/product-literature/prosilica-gx.html
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