

# CAMERA CATALOG AND SENSOR REVIEW

USB  
VISION

GiGE  
VISION

110  
FireWire

CAMERA  
Link

USB  
2.0

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**POINT GREY**  
Innovation in Imaging



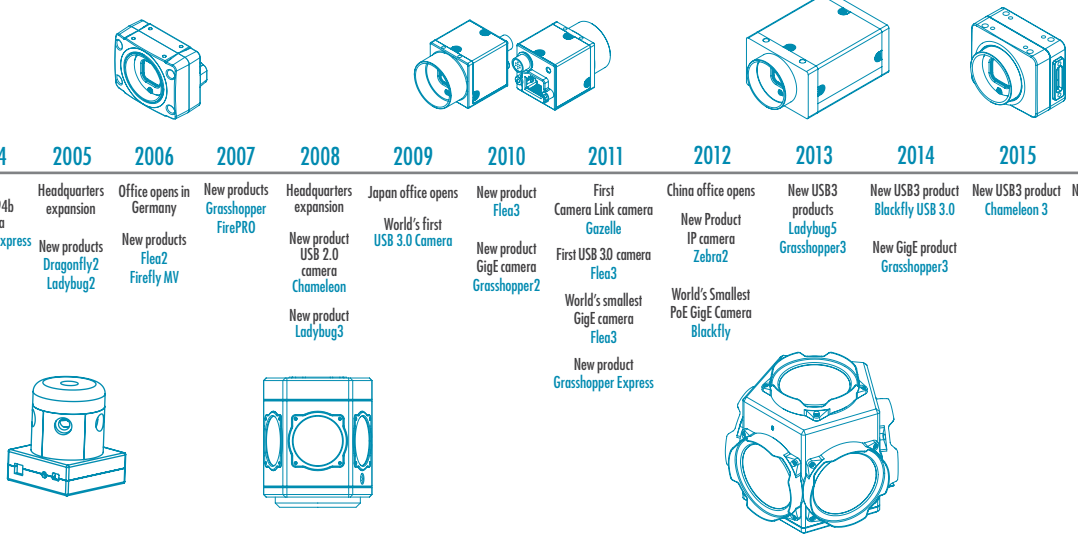
**POINT GREY** is a global leader in the design and manufacturing of innovative, high-performance digital cameras for industrial, scientific, medical, traffic, and security applications. We offer a unique and comprehensive portfolio of USB3 Vision, GigE Vision, FireWire, and USB 2.0 products known for their outstanding quality, ease of use, and unbeatable price-performance.



2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
First IEEE 1394 stereo vision camera <i>Digidops</i>	First IEEE 1394 imaging camera <i>Firefly</i>	First spherical vision camera <i>Ladybug</i>	First <i>Flea</i> camera	First IEEE 1394b camera <i>Dragonfly Express</i>	Headquarters expansion New products <i>Dragonfly2</i> <i>Ladybug2</i>	Office opens in Germany New products <i>Flea2</i> <i>Firefly MV</i>	New products <i>Grasshopper FirePRO</i>	Headquarters expansion New product USB 2.0 camera <i>Chameleon</i> New product <i>Ladybug3</i>	Japan office opens World's first USB 3.0 Camera	New product <i>Flea3</i> New product GigE camera <i>Grasshopper2</i>	First Camera Link camera <i>Gazelle</i> First USB 3.0 camera <i>Flea3</i> World's smallest GigE camera <i>Flea3</i> New product <i>Grasshopper Express</i>	China office opens New Product IP camera <i>Zebra2</i> World's Smallest PoE GigE Camera <i>Blackfly</i>	New USB3 products <i>Ladybug5</i> <i>Grasshopper3</i>	New USB3 product <i>Blackfly USB 3.0</i> New GigE product <i>Grasshopper3</i>	New USB3 product <i>Chameleon 3</i>	New USB3 product <i>Blackfly S</i>

**QUICK FACTS**

- Founded **1997**
- **ISO 9001:2008** registered company
- **250+** staff worldwide
- **200K+** camera/year capacity
- Designed and manufactured in **Canada**
- **3 year warranty** on most products
- **Global offices & distribution network**





Point Grey USB 3.0 Camera Features:

- Largest selection of CCD and CMOS sensors
- FPGA and frame buffer-based architecture for optimal reliability
- Point Grey proprietary USB 3.0 link layer and driver stack
- Industry-standard C- and CS- mount
- Fully tested USB 3.0 accessories: interface cards, hubs, and cables



# BLACKFLY<sup>®</sup>S

TRUE IMAGE CAPTURE



# CHAMELEON<sup>®</sup>3

FLEXIBLE FORM FACTOR



Model#	Sensor Specifications	Shutter	Max Res	Max FPS	Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>BFS-U3-13Y3C/M-C</b>	1.3MP ON Semi PYTHON1300 CMOS	1/2" 4.8µm Global	1280 x 1024	170 fps	<b>CM3-U3-13S2C/M-CS</b>	1.3MP Sony ICX445 CCD**	1/3" 3.75µm Global	1288 x 964	30 fps
<b>BFS-U3-32S4C/M-C</b>	3.2MP Sony IMX252 CMOS*	1/1.8" 3.45µm Global	2048 x 1536	121 fps	<b>CM3-U3-13S2C/M-CS-BD</b>	1.3MP Sony ICX445 CCD**	1/3" 3.75µm Global	1288 x 964	30 fps
<b>BFS-U3-51S5C/M-C</b>	5.0MP Sony IMX250 CMOS*	2/3" 3.45µm Global	2464 x 2048	75 fps	<b>CM3-U3-13Y3C/M-CS</b>	1.3MP ON Semi PYTHON 1300 CMOS	1/2" 4.8µm Global	1280 x 1024	149 fps
<small>*Coming Soon</small>	<small>*High performance Sony Pregius™ Global Shutter CMOS</small>				<b>CM3-U3-28S4C/M-CS</b>	2.8MP Sony ICX818 CCD**	1/1.8" 3.69µm Global	1928 x 1448	13 fps
					<b>CM3-U3-31S4C/M-CS<sup>1</sup></b>	3.2MP Sony IMX265 CMOS*	1/1.8" 3.45µm Global	2048 x 1536	55 fps
					<b>CM3-U3-50S5C/M-CS<sup>1</sup></b>	5.0MP Sony IMX264 CMOS*	2/3" 3.45µm Global	2448 x 2048	35 fps
						<small>*High performance Sony Pregius™ Global Shutter CMOS</small>			<small>**High sensitivity Sony EXview HAD CCD*</small>

<b>INTERFACE</b>	USB 3.0 interface with screw locks for camera control, data, and power	USB 3.0 interface with screw locks for camera control, data, and power
<b>GPIO</b>	6-pin Hirose HR10A-7R-6PB GPIO connector for trigger, strobe, and power. 1 opto-isolated input, 1 opto-isolated output. 1 bi-directional I/O pin, 1 input pin.	9-pin JST GPIO connector, 4 pins for trigger and strobe, 1 pin +3.3 V, 1 VEXT pin for external power 1 opto-isolated input, 1 opto-isolated output
<b>ADC</b>	12-bit • 10-bit (BFS-U3-13Y3)	12-bit • 10-bit (CM3-U3-13Y3)
<b>IMAGE DATA FORMATS</b>	Mono8, Mono16, Bayer8, Bayer16, RGB8, YCbCr8, YCbCr411_8, YCbCr422_8	Y8, Y16, Mono8, Mono12, Mono16 (all models) RGB8, YUV411, YUV422, YUV444, Raw8, Raw12, Raw16 (color models)
<b>PARTIAL IMAGE MODES</b>	Pixel binning and region of interest (ROI) modes	Pixel binning and region of interest (ROI) modes
<b>GAIN RANGE</b>	Automatic*/manual/one-push* (*Free running only) up to 24 dB, up to 18 dB (BFS-U3-13Y3)	Automatic*/manual/one-push* (*Free running only) up to 23.99 dB (CM3-U3-13S2, CM3-U3-28S4), up to 18 dB (CM3-U3-13Y3)
<b>EXPOSURE RANGE</b>	6µs to 30s	Automatic/manual/one-push up to 31.9 seconds (CM3-U3-13S2, CM3-U3-28S4), up to 1 second (CM3-U3-13Y3)
<b>GAMMA</b>	0.50 to 4.00, programmable lookup table	0.50 to 4.00, programmable lookup table
<b>TRIGGER MODES</b>	External trigger and software trigger	Standard, bulb, multi-shot, overlapped, low smear mode (CCD models only)
<b>IMAGE BUFFER</b>	240 MB	16 MB frame buffer
<b>USER SETS</b>	2 memory channels for custom camera settings	2 memory channels for custom camera settings
<b>SIZE (WxHxD)</b>	29 x 29 x 30 mm excluding lens holder (metal case)	44 x 35 x 19.5 mm excluding lens holder (metal case)
<b>MASS</b>	36g (Without optics or tripod mounting bracket)	55g (Without optics or tripod mounting bracket)
<b>POWER</b>	5 V, <3 W, via GPIO or USB 3.0 interface	5 V, <3 W, via GPIO or USB 3.0 interface
<b>LENS MOUNT</b>	C-mount	CS-mount
<b>TEMPERATURE</b>	-30° to 60°C (storage) • 0° to 50°C (operating)	-30° to 60°C (storage) • 0° to 45°C (operating)
<b>WARRANTY</b>	3 years	3 years



# BLACKFLY®

PERFORMANCE AND VALUE



# FLEA3

ULTRA-COMPACT, ULTRA-FAST CMOS



Model#	Sensor Specifications	Shutter	Max Res	Max FPS	Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>BFLY-U3-03S2C/M-CS</b>	0.3MP Sony ICX424 CCD 1/3" 7.4 µm Global	648 x 488	84 fps		<b>FL3-U3-13S2C/M-CS</b>	1.3MP Sony IMX035 CMOS* 1/3" 3.63 µm Rolling	1328 x 1048	120 fps	
<b>BFLY-U3-05S2C/M-CS</b>	0.5MP Sony ICX693 CCD 1/3" 6.0 µm Global	808 x 608	50 fps		<b>FL3-U3-13Y3M-C</b>	1.3MP ON Semi VITA 1300 CMOS 1/2" 4.8 µm Global	1280 x 1024	150 fps	
<b>BFLY-U3-13S2C/M-CS</b>	1.3MP Sony ICX445 CCD** 1/3" 3.75 µm Global	1288 x 964	30 fps		<b>FL3-U3-13E4C/M-C</b>	1.3MP e2v EV76C560 CMOS 1/1.8" 5.3 µm Global	1280 x 1024	60 fps	
<b>BFLY-U3-20S4C/M-CS</b>	2.0MP Sony ICX274 CCD** 1/1.8" 4.4 µm Global	1624 x 1224	15 fps		<b>FL3-U3-20E4C/M-C</b>	2.0MP e2v EV76C5706F CMOS 1/1.8" 4.5 µm Global	1600 x 1200	59 fps	
<b>BFLY-U3-23S6C/M-C</b>	2.3MP Sony IMX249 CMOS* 1/1.2" 5.86 µm Global	1920 x 1200	41 fps		<b>FL3-U3-32S2C/M-CS</b>	3.2MP Sony IMX036 CMOS* 1/2.8" 2.5 µm Rolling	2080 x 1552	60 fps	
<b>BFLY-U3-50H5C/M-C</b>	5.0MP Sharp RJ32S4/S3AA00T 2/3" 3.45 µm Global	2448 x 2048	7.5 fps		<b>FL3-U3-120S3C-C*</b>	12MP Sony IMX172 CMOS 1/2.3" 1/2.3" Rolling	4000 x 3000	15 fps	

\*High performance Sony Pregius™ Global Shutter CMOS \*\*High sensitivity Sony ExView HAD CCD\*

\*Coming Soon

\*\*High performance Sony Exmor R CMOS\*

USB 3.0 interface with screw locks for camera control, data, and power

6-pin Hirose HR10A-7R-6PB GPIO connector for trigger, strobe, and power. 1 opto-isolated input, 1 opto-isolated output

12-bit

Y8, Y16, Mono8, Mono12, Mono16 (all models)  
RGB8, YUV411, YUV422, YUV444, Raw8, Raw12, Raw16 (color models)

Pixel binning and region of interest (ROI) modes

Automatic\*/manual/one-push\* (\*Free running only) up to 23.9 dB (BFLY-U3-03S2), up to 23.99 dB (BFLY-U3-05S2, BFLY-U3-20S4, BFLY-U3-50H5), up to 24 dB (BFLY-U3-13S2), up to 29.9 dB (BFLY-U3-23S6)

Automatic\*/manual/one-push  
up to 31.98 seconds (BFLY-U3-03S2), up to 31.9 seconds (BFLY-U3-05S2, BFLY-U3-20S4), up to 32 seconds (BFLY-U3-13S2, BFLY-U3-50H5), up to 3.9 seconds (BFLY-U3-23S6)

0.50 to 4.00, programmable lookup table

Standard, bulb, multi-shot, overlapped, low smear mode (CCD models only)

16 MB frame buffer

2 memory channels for custom camera settings

29 x 29 x 30 mm excluding lens holder (metal case)

36g (Without optics or tripod mounting bracket)

5 V, <3 W, via GPIO or USB 3.0 interface

CS-mount, C-mount

-30° to 60°C (storage) • 0° to 45°C (operating)

3 years

USB 3.0 interface with screw locks for camera control, data, and power

8-pin Hirose HR25 GPIO connector for power, trigger, strobe, PWM, and serial I/O: 1 opto-isolated input, 1 opto-isolated output, 2 bi-directional I/O pins

12-bit (FL3-U3-13S2, FL3-U3-32S2, FL3-U3-88S2) / 10-bit (FL3-U3-13Y3, FL3-U3-13E4, FL3-U3-20E4)

Y8, Y16, Mono8, Mono12, Mono16 (all models)  
RGB8, YUV411, YUV422, YUV444, Raw8, Raw12, Raw16 (color models)

Pixel binning and region of interest (ROI) modes

Automatic\*/manual/one-push\* (\*Free running only) up to 24 dB (FL3-U3-13S2, FL3-U3-32S2, FL3-U3-88S2, FL3-U3-20E4), up to 18 dB (FL3-U3-13Y3, FL3-U3-13E4)

Automatic\*/Manual/One-Push\*/Extended Shutter modes (\*Free running only) (\*\*except FL3-U3-13Y3)  
up to 1 second (FL3-U3-13E4, FL3-U3-13S2, FL3-U3-13Y3, FL3-U3-88S2), up to 898 ms (FL3-U3-20E4), up to 32 seconds (FL3-U3-32S2)

0.50 to 4.00, programmable lookup table

Standard, bulb (except FL3-U3-13E4, FL3-U3-20E4), multi-shot

32 MB frame buffer

2 memory channels for custom camera settings

29 x 29 x 30 mm excluding lens holder (metal case)

41 g (Without optics or tripod mounting bracket)

5-24 V via GPIO or 5 V via USB 3.0, <3 W

CS-mount, C-mount

-30° to 60°C (storage) • 0° to 45°C (operating)

3 years

INTERFACE

GPIO

ADC

IMAGE DATA FORMATS

PARTIAL IMAGE MODES

GAIN RANGE

EXPOSURE RANGE

GAMMA

TRIGGER MODES

IMAGE BUFFER

USER SETS

SIZE (WxHxD)

MASS

POWER

LENS MOUNT

TEMPERATURE

WARRANTY



# GRASSHOPPER<sup>®</sup>3

HIGH PERFORMANCE CCD AND CMOS



Model#	Sensor Specifications	Shutter	Max Res	Max FPS
GS3-U3-14S5C/M-C	1.4MP Sony ICX285 CCD	2/3"	6.45 μm Global 1384 x 1036	30 fps
GS3-U3-15S5C/M-C	1.4MP Sony ICX825 CCD	2/3"	6.45 μm Global 1384 x 1036	45 fps
GS3-U3-23S6C/M-C	2.3MP Sony IMX174 CMOS*	1/1.2"	5.86 μm Global 1920 x 1200	162 fps
GS3-U3-28S4C/M-C	2.8MP Sony ICX687 CCD**	1/1.8"	3.69 μm Global 1928 x 1448	26 fps
GS3-U3-28S5C/M-C	2.8MP Sony ICX674 CCD**	2/3"	4.54 μm Global 1920 x 1440	26 fps
GS3-U3-32S4C/M-C	3.2MP Sony IMX252 CMOS*	1/1.8"	3.45 μm Global 2048 x 1536	121 fps
GS3-U3-41S4C/M-C	4.1MP Sony ICX808 CCD**	1/1.8"	3.1 μm Global 2016 x 2016	18 fps
GS3-U3-41C6NIR-C	4.1MP CMOSIS CMV4000-3E12 CMOS	1"	5.5 μm Global 2048 x 2048	90 fps
GS3-U3-41C6C/M-C	4.1MP CMOSIS CMV4000-3E5 CMOS	1"	5.5 μm Global 2048 x 2048	90 fps
GS3-U3-50S5C/M-C	5.0MP Sony ICX625 CCD	2/3"	3.45 μm Global 2448 x 2048	15 fps
GS3-U3-51S5C/M-C	5.0MP Sony IMX250 CMOS*	2/3"	3.45 μm Global 2448 x 2048	75 fps
GS3-U3-60S6C/M-C	6.0MP Sony ICX694 CCD**	1"	4.54 μm Global 2736 x 2192	13 fps
GS3-U3-60Q56C/M-C	6.0MP Sony ICX694 CCD**	1"	4.54 μm Global 2736 x 2192	25 fps
GS3-U3-91S6C/M-C	9.1MP Sony ICX814 CCD**	1"	3.69 μm Global 3376 x 2704	9 fps
GS3-U3-120S6C/M-C	12 MP Sony ICX834 CCD**	1"	3.1 μm Global 4240 x 2824	7 fps

\*High performance Sony Pregius™ Global Shutter CMOS \*\*High sensitivity Sony EXview HAD CCD II\*



- INTERFACE** USB 3.0 interface with screw locks for camera control, data, and power
- GPIO** 8-pin Hirose HR25 GPIO connector for power, trigger, strobe, PWM, and serial I/O: 1 opto-isolated input, 1 opto-isolated output, 2 bi-directional I/O pins
- ADC** 14-bit • 10/12-bit (GS3-U3-23S6, GS3-U3-32S4, GS3-U3-51S5) • 10-bit (GS3-U3-41C6)
- IMAGE DATA FORMATS** Mono8, Mono12, Mono16 (all models) RGB, YUV411, YUV422, YUV444, Raw8, Raw12, Raw16 (color models)
- PARTIAL IMAGE MODES** Pixel binning and region of interest (ROI) modes
- GAIN RANGE** Automatic/manual/one-push modes
- EXPOSURE RANGE** Automatic/manual/one-push/extended shutter modes
- GAMMA** 0.50 to 4.00, programmable lookup table
- TRIGGER MODES** Standard, bulb, multi-shot, overlapped, low smear mode (CCD models only)
- IMAGE BUFFER** 128 MB frame buffer
- USER SETS** 2 memory channels for custom camera settings
- SIZE (WxHxD)** 44 x 29 x 58 mm excluding lens holder (metal case)
- MASS** 90 g (Without optics or tripod mounting bracket)
- POWER** 5-24 V via GPIO or 5 V via USB 3.0 interface, maximum 4.5 W
- LENS MOUNT** C-mount
- TEMPERATURE** -30° to 60°C (storage) • 0° to 50°C (operating)
- WARRANTY** 3 years





- Point Grey GigE Camera Features:
- Unique selection of CCD and CMOS sensors
  - Supports GigE Vision 1.2
  - Industry's most compact sizes
  - GigE image filter driver for reduced latency and maximized bandwidth
  - Firmware versions updatable in the field
  - On-board temperature, power sensors, and status LED



# BLACKFLY<sup>®</sup>S

TRUE IMAGE CAPTURE



# BLACKFLY<sup>®</sup>

WORLD'S SMALLEST POE CAMERA



Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>BFS-PGE-31S4C/M-C<sup>1</sup></b>	3.2MP Sony IMX265 CMOS***	1/1.8" 3.45 µm Global	2048 x 1536	35 fps
<b>BFS-PGE-50S5C/M-C<sup>1</sup></b>	5.0MP Sony IMX264 CMOS***	2/3" 3.45 µm Global	2464 x 2048	22 fps

<sup>1</sup>Coming Soon      \*\*\*High performance Sony Pregius™ Global Shutter CMOS

Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>BFLY-PGE-03S2C/M-CS</b>	0.3MP Sony ICX424 CCD	1/3" 7.4 µm Global	648 x 488	84 fps
<b>BFLY-PGE-03S3C/M-CS</b>	0.3MP Sony ICX414 CCD	1/2" 9.9 µm Global	648 x 488	90 fps
<b>BFLY-PGE-05S2C/M-CS</b>	0.5MP Sony ICX693 CCD	1/3" 6.0 µm Global	808 x 608	50 fps
<b>BFLY-PGE-09S2C/M-CS</b>	0.9MP Sony ICX692 CCD**	1/3" 4.08 µm Global	1288 x 728	30 fps
<b>BFLY-PGE-12A2C/M-CS</b>	1.2MP Aptina AR0134 CMOS	1/3" 3.75 µm Global	1280 x 960	52 fps
<b>BFLY-PGE-13S2C/M-CS</b>	1.3MP Sony ICX445 CCD*	1/3" 3.75 µm Global	1288 x 964	30 fps
<b>BFLY-PGE-13H2C/M-CS</b>	1.3MP Sharp RJ33J3/RJ33J4 CCD	1/3" 3.75 µm Global	1288 x 964	30 fps
<b>BFLY-PGE-13E4C/M-CS</b>	1.3MP e2v EV76C560 CMOS	1/1.8" 5.3 µm Global	1280 x 1024	60 fps
<b>BFLY-PGE-14S2C-CS</b>	1.4MP Sony IMX104 CMOS	1/3" 3.75 µm Rolling	1296 x 1032	60 fps
<b>BFLY-PGE-20E4C/M-CS</b>	2.0MP e2v EV76C570 CMOS	1/1.8" 4.5 µm Global	1600 x 1200	50 fps
<b>BFLY-PGE-23S2C-CS</b>	2.3MP Sony IMX136 CMOS	1/2.8" 2.8 µm Rolling	1920 x 1200	27 fps
<b>BFLY-PGE-23S6C/M-C</b>	2.3MP Sony IMX249 CMOS***	1/1.2" 5.86 µm Global	1920 x 1200	41 fps
<b>BFLY-PGE-31S4M/C-CS<sup>1</sup></b>	3.2MP Sony IMX265 CMOS***	1/1.8" 3.45 µm Global	2048 x 1536	35 fps
<b>BFLY-PGE-50A2C/M-CS</b>	5.0MP Aptina MT9P006/031 CMOS	1/2.5" 2.2 µm Rolling	2592 x 1944	13 fps
<b>BFLY-PGE-50H5C/M-C</b>	5.0MP Sharp RJ32S4/S3AA0DT CCD	2/3" 3.45 µm Global	2448 x 2048	7.5 fps
<b>BFLY-PGE-50S5M/C-C<sup>1</sup></b>	5.0MP Sony IMX264 CMOS***	2/3" 3.45 µm Global	2448 x 2048	22 fps

\*High sensitivity Sony EXview HAD CCD \*\*High sensitivity Sony EXview HAD CCD II \*\*\*High performance Sony Pregius™ Global Shutter CMOS

Gigabit Ethernet interface with screw locks for camera control and data; Power over Ethernet

6-pin Hirose HR10A-7R-6PB GPIO connector for trigger, strobe, and power. 1 opto-isolated input, 1 opto-isolated output. 1 bi-directional I/O pin, 1 input pin.

12-bit

Mono8, Mono16, Bayer8, Bayer16, RGB8, YCbCr8, YCbCr411\_8, YCbCr422\_8

Pixel binning and region of interest (ROI) modes

Automatic\*/manual/one-push\* (\*Free running only) up to 24 dB

6µs to 30s

0.50 to 4.00, programmable lookup table

External trigger and software trigger

240 MB

2 memory channels for custom camera settings

29 x 29 x 30 mm excluding lens holder (metal case)

36g (Without optics or tripod mounting bracket)

Standard voltage via Power over Ethernet (PoE) or 5 - 16 V via GPIO interface, < 2.5 W

C-mount

-30° to 60°C (storage) • 0° to 50°C (operating)

3 years

Gigabit Ethernet interface with screw locks for camera control and data; Power over Ethernet

6-pin Hirose HR10A-7R-6PB GPIO connector for trigger, strobe, and power. 1 opto-isolated input, 1 opto-isolated output

10-bit (BFLY-PGE-13E4, BFLY-PGE-20E4) • 12-bit

Mono8, Mono12, Mono16, Raw8, Raw12, Raw16 (all models) / RGB, YUV411, YUV422, YUV 444 (color models)

Pixel binning and region of interest (ROI) modes

Automatic\*/manual/one-push Up to 48 dB (BFLY-PGE-31S4, BFLY-PGE-50S5), up to 29.9 dB (BFLY-PGE-23S2, BFLY-PGE-23S6), up to 24 dB (BFLY-PGE-03S3, BFLY-PGE-05S2, BFLY-PGE-09S2, BFLY-PGE-13S2, BFLY-PGE-13H2, BFLY-PGE-20E4), up to 23.9 dB (BFLY-PGE-03S2S, BFLY-PGE-50H5), up to 18 dB (BFLY-PGE-13E4, BFLY-PGE-50A2), up to 13 dB (BFLY-PGE-12A2)

Automatic\*/manual/one-push Up to 32 seconds (BFLY-PGE-03S2, BFLY-PGE-03S3, BFLY-PGE-05S2, BFLY-PGE-09S2, BFLY-PGE-13S2, BFLY-PGE-13H2, BFLY-PGE-14S2, BFLY-PGE-50A2, BFLY-PGE-50H5), up to 11.9 seconds (BFLY-PGE-31S4, BFLY-PGE-50S5), up to 3.9 seconds (BFLY-PGE-23S2, BFLY-PGE-23S6), up to 1 second (BFLY-PGE-12A2, BFLY-PGE-13E4, BFLY-PGE-20E4)

0.50 to 4.00, programmable lookup table

Standard, bulb (except BFLY-PGE-05S2, BFLY-PGE-09S2, BFLY-PGE-12A2, BFLY-PGE-13E4, BFLY-PGE-20E4) overlapped (except BFLY-PGE-12A2, BFLY-PGE-13E4, BFLY-PGE-14S2, BFLY-PGE-20E4, BFLY-PGE-50A2), multi-shot, low smear mode (CCD models only)

16 MB frame buffer

2 memory channels for custom camera settings

29x29x30 mm excluding lens holder, without optics (metal case)

36 grams (without optics or tripod mounting bracket)

Standard voltage via Power over Ethernet (PoE) or 5 - 16 V via GPIO interface, < 2.5 W

CS-mount (5 mm C-mount adapter sold separately) / C-mount

-30° to 60°C (storage) • 0° to 45°C (operating)

3 years

**INTERFACE**

**GPIO**

**ADC**

**IMAGE DATA FORMATS**

**PARTIAL IMAGE MODES**

**GAIN RANGE**

**EXPOSURE RANGE**

**GAMMA**

**TRIGGER MODES**

**IMAGE BUFFER**

**USER SETS**

**SIZE (WxHxD)**

**MASS**

**POWER**

**LENS MOUNT**

**TEMPERATURE**

**WARRANTY**



# FLEA<sup>3</sup>

WORLD'S SMALLEST GIGE CAMERA



# GRASSHOPPER<sup>3</sup>

POE, FAST, HIGH-RESOLUTION IMAGING



Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>FL3-GE-03S1C/M-C</b>	0.3MP Sony ICX618 CCD* 1/4" 5.6 μm Global	648 x 488	120 fps	
<b>FL3-GE-03S2C/M-C</b>	0.3MP Sony ICX424 CCD 1/3" 7.4 μm Global	648 x 488	82 fps	
<b>FL3-GE-08S2C/M-C</b>	0.8MP Sony ICX204 CCD 1/3" 4.65 μm Global	1032 x 776	31 fps	
<b>FL3-GE-13S2C/M-C/CS</b>	1.3MP Sony ICX445 CCD* 1/3" 3.75 μm Global	1288 x 964	31 fps	
<b>FL3-GE-14S3C/M-C</b>	1.4MP Sony ICX267 CCD 1/2" 4.65 μm Global	1384 x 1032	18 fps	
<b>FL3-GE-20S4C/M-C</b>	2.0MP Sony ICX274 CCD 1/1.8" 4.4 μm Global	1624 x 1224	15 fps	
<b>FL3-GE-28S4C/M-C</b>	2.8MP Sony ICX687 CCD** 1/1.8" 3.69 μm Global	1928 x 1448	14 fps	
<b>FL3-GE-50S5C/M-C</b>	5.0MP Sony ICX655 CCD 2/3" 3.45 μm Global	2448 x 2048	8 fps	

\*High sensitivity Sony EXview HAD CCD™ \*\*High sensitivity Sony EXview HAD CCD II™

Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>GS3-PGE-23S6C/M-C</b>	2.3MP Sony IMX174 CMOS* 1/1.2" 5.86 μm Global	1920 x 1200	45 fps	
<b>GS3-PGE-50S5C/M-C</b>	5.0MP Sony ICX625 CCD 2/3" 3.45 μm Global	2448 x 2048	15 fps	
<b>GS3-PGE-60S6C/M-C</b>	6.0MP Sony ICX694 CCD** 1" 4.54 μm Global	2736 x 2192	13 fps	
<b>GS3-PGE-91S6C/M-C</b>	9.1MP Sony ICX814 CCD** 1" 3.69 μm Global	3376 x 2704	9 fps	

\*High performance Sony Exmor CMOS\*\* High sensitivity Sony EXview HAD CCD II™

	FLEA <sup>3</sup>	GRASSHOPPER <sup>3</sup>
<b>INTERFACE</b>	Gigabit Ethernet interface with screw locks for camera control and data	Gigabit Ethernet interface with screw locks for camera control and data; Power over Ethernet
<b>GPIO</b>	8-pin Hirose HR25 GPIO connector for power, trigger, strobe, PWM, and serial I/O, 1 opto-isolated input, 1 opto-isolated output, 2 bi-directional I/O pins	8-pin Hirose HR25 GPIO connector for power, trigger, strobe, PWM, and serial I/O 1 opto-isolated input, 1 opto-isolated output, 2 bi-directional I/O pins
<b>ADC</b>	12-bit	10/12-bit (GS3-PGE-23S6) • 14-bit
<b>IMAGE DATA FORMATS</b>	Y8, Y16, Mono8, Mono12, Mono16 (all models) / RGB, YUV411, YUV422, YUV 444, Raw8, Raw12, Raw16 (color models)	Mono8, Mono12, Mono16 (all models) RGB, YUV411, YUV422, YUV444, Raw8, Raw12, Raw16 (color models)
<b>PARTIAL IMAGE MODES</b>	Pixel binning and region of interest (ROI) modes	Pixel binning and region of interest (ROI) modes
<b>GAIN RANGE</b>	Automatic/manual/one-push/ 0 dB to 24 dB	Automatic/manual/one-push/ Up to 24 dB
<b>EXPOSURE RANGE</b>	Automatic/manual/one-push/extended shutter modes 0.03 ms to 32 sec	Automatic/manual/one-push/extended shutter modes Up to 32 seconds (GS3-PGE-50S5, GS3-PGE-60S6), up to 4 seconds (GS3-PGE-91S6) up to 3.2 seconds (GS3-PGE-23S6)
<b>GAMMA</b>	0.50 to 4.00, programmable lookup table	0.50 to 4.00, programmable lookup table
<b>TRIGGER MODES</b>	Standard, bulb, skip frames, multi-exposure preset, multi-exposure pulse width, overlapped, multi-shot	Standard, bulb, overlapped, multi-shot, low smear mode (CCD models only)
<b>IMAGE BUFFER</b>	32 MB frame buffer	128 MB frame buffer
<b>USER SETS</b>	2 memory channels for custom camera settings	2 memory channels for custom camera settings
<b>SIZE (WxHxD)</b>	29x29x30 mm excluding lens holder, without optics (metal case)	44x29x58 mm excluding lens holder and connectors (metal case)
<b>MASS</b>	38 grams (without optics or tripod mounting bracket)	90 grams (without optics or tripod mounting bracket)
<b>POWER</b>	12-24 V, <2.5 W, via GPIO	Power over Ethernet (PoE); or 12 V nominal (5 - 16 V)
<b>LENS MOUNT</b>	C-mount (FL3-GE-13S2 also available with CS-mount)	C-mount
<b>TEMPERATURE</b>	-30° to 60°C (storage) • 0° to 45°C (operating)	-30° to 60°C (storage) • 0° to 50°C (operating)
<b>WARRANTY</b>	3 years	3 years







**Point Grey USB 2.0 Camera Features:**

- Cost effective
- Industry-standard CS-mount
- Includes CS-C 5 mm adapter
- Firmware versions updatable in the field
- On-board temperature, power sensors, and status LED
- Board-level and custom options available for OEMs

# CHAMELEON®

COMPACT, COST EFFECTIVE, CCD QUALITY



# FIREFLY® MV

SMALL, AFFORDABLE, VERSATILE CMOS



Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>MLN-13S2C/M-CS</b>	1.3MP Sony ICX445 CCD	1/3"	3.75 µm Global	1296 x 964 18 fps

\*High sensitivity Sony EXview HAD CCD™

Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>FMVU-03MTC/M-CS</b>	0.3MP Micron MT9V022 CMOS	1/3"	6.0 µm Global	752 x 480 60 fps
<b>FMVU-13S2C-CS</b>	1.3MP Sony IMX035 CMOS*	1/3"	3.63 µm Rolling	1328 x 1048 23 fps

\*High speed Sony Exmor™ CMOS

Mini-B USB2.0 for camera control, video data, and power

Mini-B USB2.0 for camera control, video data, and power

7-pin JST GPIO connector, 4 pins for trigger and strobe, 1 pin +3.3 V, 1 VEXT pin for external power

7-pin JST GPIO connector, 4 pins for trigger and strobe, 1 pin +3.3 V, 1 VEXT pin for external power

12-bit  
Y8, Y16 (mono)  
8-bit and 16-bit Raw Bayer data (color)  
Pixel binning and region of interest (ROI) modes  
Automatic/manual/one-push/ 0 dB to 24 dB  
Automatic/manual/one-push/extended shutter modes  
0.01 ms to >10 seconds (extended shutter mode)  
0.50 to 4.00, programmable lookup table  
Standard, bulb, skip frames, overlapped  
N/A  
2 memory channels for custom camera settings

10-bit (FMVU-03MT) • 10/12-bit (FMVU-13S2)  
Y8, Y16 (mono)  
8-bit and 16-bit raw Bayer data (color)  
Pixel binning and region of interest (ROI) modes  
Automatic/manual/ 0 dB to 12 dB (03MT) / 0 dB to 24 dB (13S2)  
Automatic/manual modes  
0.12 ms to 512 ms (FMVU-03MT) / 0.03 ms to 8 seconds (FMVU-13S2)  
0 to 1 (FMVU-03MT)/0.50 to 4.00 (FMVU-13S2)  
Standard, skip frames  
N/A  
2 memory channels for custom camera settings

39x31mm (board level) / 25.5x44x41 mm excluding lens holder, without optics (plastic case)  
22 g (board level) / 37 g (plastic case) (without optics or tripod mounting bracket)  
2 W, 4.745 to 5.25 V via USB 2.0 interface or JST 7-pin GPIO connector  
CS-mount (5 mm C-mount adapter included)  
-30° to 60°C (storage) • 0° to 45°C (operating)  
1 year

39x24 mm (board level) / 24.4x44x34 mm excluding lens holder, without optics (plastic case)  
14 g (board level) / 37 g (plastic case) (without optics or tripod mounting bracket)  
8-30 V, 1 W at 12 V via 1394a interface  
CS-mount  
-30° to 60°C (storage) • 0° to 45°C (operating)  
1 year

**INTERFACE**

**GPIO**

**ADC**

**IMAGE DATA FORMATS**

**PARTIAL IMAGE MODES**

**GAIN RANGE**

**EXPOSURE RANGE**

**GAMMA**

**TRIGGER MODES**

**IMAGE BUFFER**

**USER SETS**

**SIZE (WxHxD)**

**MASS**

**POWER**

**LENS MOUNT**

**TEMPERATURE**

**WARRANTY**





- Point Grey IEEE 1394 Camera Features:
- Compact sizes including board level options
  - Supports IIDC v1.32
  - Industry-standard C- mount
  - Firmware versions updatable in the field
  - On-board temperature, power sensors, and status LED
  - Automatic synchronization



- Point Grey Camera Link Camera Features:
- 2 SDR connectors with screw locks
  - Industry-standard C- mount
  - 8- and 10- bit image modes
  - Firmware versions updatable in the field
  - On-board temperature, power sensors, and status LED

# FLEA<sup>3</sup>

ULTRA-COMPACT, CCD FAMILY



Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>FL3-FW-0351C/M-C</b>	0.3MP Sony ICX618 CCD* 1/4" 5.6 µm	Global	648 x 488	120 fps
<b>FL3-FW-0353C/M-C</b>	0.3MP Sony ICX414 CCD 1/2" 9.9 µm	Global	648 x 488	76 fps
<b>FL3-FW-1453C/M-C</b>	1.4MP Sony ICX267 CCD 1/2" 4.65 µm	Global	1384 x 1032	16 fps
<b>FL3-FW-2054C/M-C</b>	2.0MP Sony ICX274 CCD 1/1.8" 4.4 µm	Global	1624 x 1224	15 fps

\*High sensitivity Sony EXview HAD CCD \*

# GAZELLE<sup>®</sup>

HIGH RESOLUTION, FAST FRAME RATES



Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>GZL-CL-22C5M-C</b>	2.2MP CMOSIS CMV2000 CMOS 2/3" 5.5 µm	Global	2048 x 1088	280 fps
<b>GZL-CL-41C6M-C</b>	4.1MP CMOSIS CMV4000-2E5 CMOS 1" 5.5 µm	Global	2048 x 2048	150 fps

<b>INTERFACE</b>	IEEE 1394b interface with screw locks for camera control, data, and power	Camera Link LVDS for camera control and video data transmission. Base (2-tap) and Full (8-tap) configurations
<b>GPIO</b>	8-pin Hirose HR25 GPIO connector for power, trigger, strobe, PWM, and serial I/O, 1 opto-isolated input, 1 opto-isolated output, 2 bi-directional I/O pins	8-pin Hirose HR25 GPIO connector; opto-isolated pins for trigger and strobe
<b>ADC</b>	12-bit	10-bit
<b>IMAGE DATA FORMATS</b>	Y8, Y16 (all models) RGB, YUV411, YUV422, Raw8, Raw16 (color models)	Mono8, Mono10
<b>PARTIAL IMAGE MODES</b>	Pixel binning and region of interest (ROI) modes	Single or multiple region of interest modes
<b>GAIN RANGE</b>	Automatic/manual/one-push/ 0 dB to 24 dB	Analog and digital programmable via software. Range: 32 - 64 (analog), 1 - 63 (digital)
<b>EXPOSURE RANGE</b>	Automatic/manual/one-push/extended shutter modes 0.03 ms to >25 seconds (extended shutter mode)	Full 8-tap mode 0.07 ms to 54 seconds
<b>GAMMA</b>	0.50 to 4.00, programmable lookup table	N/A
<b>TRIGGER MODES</b>	Standard, bulb, skip frames, overlapped, multiple exposure, multi-shot	Single-shot, bulb, software trigger
<b>IMAGE BUFFER</b>	32 MB frame buffer	N/A
<b>USER SETS</b>	2 memory channels for custom camera settings	2 memory channels for custom camera settings
<b>SIZE (WxHxD)</b>	29x29x30 mm excluding lens holder, without optics (metal case)	44x29x59.5 mm excluding lens holder, without optics (metal case)
<b>MASS</b>	58 g (without optics or tripod mounting bracket)	90 g (without optics or tripod mounting bracket)
<b>POWER</b>	8-30 V, <2.5 W via GPIO or 1394b interface	12 V, 6 W at 12 V
<b>LENS MOUNT</b>	C-mount	C-mount
<b>TEMPERATURE</b>	-30° to 60°C (storage) • 0° to 45°C (operating)	-30° to 60°C (storage) • -10° to 50°C (operating)
<b>WARRANTY</b>	3 years	3 years



# FLYCAPTURE SDK

THE FLYCAPTURE SOFTWARE DEVELOPMENT KIT (SDK) that comes free with every Point Grey camera provides a common software interface to control and acquire images from Point Grey USB 3.0\*, GigE, FireWire, and USB 2.0 cameras using the same API under 32- or 64-bit Windows or Linux. FlyCapture supports ActiveX and DirectShow interfaces, and includes the FirePRO low-level 1394b interface driver, enhanced USB 3.0 interface driver, and the GigE image filter driver. A complete software API library, ready-to-use demo programs, and comprehensive source code examples enable users to easily build custom imaging applications.


\*Excluding Blackfly S camera



## KEY FEATURES

- Proprietary USB 3.0 and FireWire driver stacks for robust diagnostics and, with complete end-to-end control, faster issue resolution
- GigE image filter driver for reduced latency and dropped frames, and maximized bandwidth
- Support for IIDC 1.32 features such as frame buffering and lookup table functionality
- OpenGL and Direct 2D support for better display performance and CPU usage
- Managed interface to decrease development time
- Simple (API) - only 3 function calls required to grab an image
- Example programs and source code

## MULTIPLE PLATFORMS

- **WINDOWS**® 32/64-bit  
XP, 7, 8, 10 
- **LINUX**®  
Ubuntu® 32/64-bit  
Arm 32/64 bit 

## MULTIPLE INTERFACES



The SDK provides the same programming interface across USB 3.0\*, USB 2.0, GigE and FireWire products.

## MULTIPLE LANGUAGES

- C, C++, C#
- Visual Basic .NET
- ActiveX
- DirectShow

# SPINNAKER SDK

SPINNAKER SDK\*\* IS A GENICAM3 API LIBRARY BUILT FOR MACHINE VISION DEVELOPERS. It features an intuitive SpinView GUI, rich example codes, and comprehensive documentation designed to help you build your application faster.

\*\*For Blackfly S camera models only.

## BUILD FASTER

Engineered for faster development into your application and better forward compatibility.

## ACCELERATED INTEGRATION

Unlock the power of GenICam3. Quickly build your own software and have UI customizations. Minimize future development time with Spinnaker's API forward compatibility.



## DYNAMIC FEATURES

Simplify and improve performance by enabling camera events, imaging sequencer and programmable logic. Use chunk data to gather image metadata and validate system performance.

## TRANSMISSION RELIABILITY

Superior image transfer control and bandwidth management offers greater flexibility and insight into all transmission pipeline layers. Review detailed diagnostics and take command of our advanced logging functionality.

## MULTIPLE PLATFORM

- **WINDOWS**® 32/64-bit  
XP, 7, 8, 10 
- **LINUX**®\*  
Ubuntu® 32/64-bit  
ARM  
\*Coming Soon 

## MULTIPLE INTERFACES



The SDK provides the same programming interface across USB 3.0 and GigE.

## MULTIPLE LANGUAGES

- C, C++, C#
- Visual Basic .NET
- ActiveX\*
- DirectShow\*
- \*Coming Soon

The compact, cost-effective Cricket IP camera uses high resolution Sony CMOS Exmor sensors for exceptional sensitivity and excellent dynamic range. Designed and manufactured in Canada.

# CRICKET® IP CAMERA

HD WDR, 60 FPS, IP SECURITY CAMERA\*



Model#	Sensor Specifications	Shutter	Max Res	Max FPS
CR-POE-13S2C-CS	1.3MP Sony IMX139 CMOS 1/3"	Rolling	1280 x 1024	60 fps
CR-POE-20S2C-CS	2.0MP Sony IMX140 CMOS 1/2.8"	Rolling	1920 x 1080	60 fps
CR-POE-20S3C-CS	2.0MP Sony IMX185 CMOS 1/2"	Rolling	1920 x 1080	60 fps

<b>INTERFACE</b>	RJ45 100Base-TX for data and power (PoE), 4-pin DC auto-iris connector
<b>LIGHT SENSITIVITY/ MINIMUM ILLUMINATION</b>	0.1 lux, F1.2 at 30 FPS, 1/30 second shutter
<b>DYNAMIC RANGE</b>	120 dB (CR-POE-13S2), 90 dB (CR-POE-20S2) in 4 image WDR mode
<b>GAIN RANGE</b>	0 dB to 24 dB
<b>EXPOSURE RANGE</b>	1/10,000 second to 1 second
<b>LENS TYPE</b>	CS-mount, DC Auto Iris (optional)
<b>COMPRESSION FORMAT</b>	MJPEG; H.264 Base/Main/High Profile
<b>STREAM RESOLUTIONS</b>	CR-POE-13S2: ranging from 1280 x 1024 to 160 x 120, including SXGA, 720p, XGA, VGA CR-POE-20S2: ranging from 1920 x 1080 to 160 x 120, including 1080p, SXGA, 720p, XGA, VGA CR-POE-20S3: ranging from 1920 x 1080 to 160 x 120, including 1080p, SXGA, 720p, XGA, VGA
<b>MULTI-STREAMING</b>	2 streams, individually configurable frame rate, resolution and compression (H.264 or MJPEG)
<b>PAN/TILT/ZOOM</b>	Digital
<b>IMAGE SETTINGS</b>	Auto exposure, auto white balance, gain, shutter, contrast, sharpness, gamma
<b>IMAGE ENHANCEMENTS</b>	WDR, 2D noise reduction, 3D noise reduction, image flip
<b>SECURITY</b>	Password protection, HTTPS encryption
<b>SUPPORTED PROTOCOLS</b>	ONVIF Profile S, RTSP, RTP, IPv4, TCP, UDP, HTTP, HTTPS, DHCP, NTP
<b>MULTICASTING</b>	Yes
<b>CASING</b>	Plastic and aluminum, white or black, integrated tripod mount (1/4-20 thread)
<b>POWER CONSUMPTION</b>	~4 W, via PoE 802.3af, at full frame rate and resolution with a single stream
<b>TEMPERATURE</b>	0°-45°C, 20-80% relative humidity (operating) • -30° to 60°C, 20-95% relative humidity (storage)
<b>APPROVALS</b>	CE, FCC, RoHS, TUV
<b>SIZE (WxHxD)</b>	88.1 mm x 44 mm x 32 mm
<b>MASS</b>	~75 grams (without lens)
<b>WARRANTY</b>	1 year



## Wide Dynamic Range for challenging lighting conditions



## Excellent sensitivity with Sony Exmor CMOS sensors



Images taken at less than 0.1 lux

## Ultra-compact and lightweight



## Available in a black enclosure



\*Note: Cricket is recommended for customers familiar with the use of standard security IP cameras. Key differences between the Cricket IP security camera and other Point Grey cameras include:

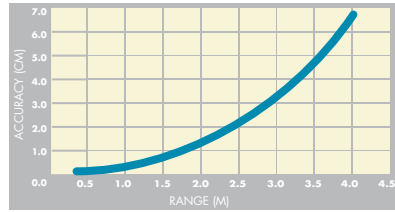
- Cricket produces compressed images only;
- Cricket requires a 3rd party Video Management Software (VMS) and does not support FlyCapture SDK;
- Cricket does not support external triggering or strobe capabilities.

## BUMBLEBEE FAMILY KEY FEATURES

- Highly accurate, passive 3D sensing – no lasers or projectors required
- Over one mil 3D points per second
- Full featured Triclops® SDK provides access to all levels of the stereo processing pipeline
- Pre-calibration for lens distortion and misalignments

## RANGE VS ACCURACY

This chart shows the accuracy of 3D point calculations versus the range to the point. Results are dependent on image resolution, lens focal length and calibration accuracy.



# BUMBLEBEE® XB3

3-SENSOR AND MULTI-BASELINE



# BUMBLEBEE® 2

COMPACT SIZE



Model#	Sensor Specifications	Shutter	Max Res	Max FPS	Focal Length	Model#	Sensor Specifications	Shutter	Max Res	Max FPS	Focal Length
BBX3-1352C/M-38	1.3MP Sony ICX445 CCD	1/3" 3.75 μm Global	1280 x 960	16 fps	3.8 mm	BB2-0352C/M-25	0.3MP Sony ICX424 CCD	1/3" 7.4 μm Global	648 x 488	48 fps	2.5 mm
BBX3-1352C/M-60	1.3MP Sony ICX445 CCD	1/3" 3.75 μm Global	1280 x 960	16 fps	6 mm	BB2-0352C/M-38	0.3MP Sony ICX424 CCD	1/3" 7.4 μm Global	648 x 488	48 fps	3.8 mm
						BB2-0352C/M-60	0.3MP Sony ICX424 CCD	1/3" 7.4 μm Global	648 x 488	48 fps	6 mm
						BB2-0852C/M-25	0.8MP Sony ICX204 CCD	1/3" 4.65 μm Global	1032 x 776	20 fps	2.5 mm
						BB2-0852C/M-38	0.8MP Sony ICX204 CCD	1/3" 4.65 μm Global	1032 x 776	20 fps	3.8 mm
						BB2-0852C/M-60	0.8MP Sony ICX204 CCD	1/3" 4.65 μm Global	1032 x 776	20 fps	6 mm

Two IEEE-1394b interfaces for camera control, data, and power  
4 general-purpose digital input/output pins

IEEE-1394a interfaces for camera control, data, and power  
4 general-purpose digital input/output pins

INTERFACE  
GPIO

12-bit  
YUV411, YUV422, and RGB formats  
8, 12, 16 and 24-bit digital data  
Automatic/Manual/One-Push Gain modes, 0 dB to 24 dB  
12 cm and 24 cm  
3.8 mm with 66° HFOV, 6 mm with 43° HFOV  
f/2.0 (2.5 mm and 3.8 mm focal length), f/2.5 (6.0 mm focal length)  
54 dB  
Standard, bulb, skip frames, overlapped  
Automatic/Manual 0.03 ms to 66.63 ms at 15 FPS

12-bit  
YUV411, YUV422, and RGB formats  
8, 12, 16 and 24-bit digital data  
Automatic/Manual/One-Push Gain modes, 0 dB to 24 dB  
12 cm  
2.5 mm with 97° HFOV, 3.8 mm with 66° HFOV, 6 mm with 43° HFOV  
f/2.0 (2.5 mm and 3.8 mm focal length), f/2.5 (6.0 mm focal length)  
60 dB  
Standard, bulb, skip frames, overlapped  
Automatic/Manual 0.03 ms to 66.63 ms at 15 FPS

ADC  
IMAGE DATA FORMATS  
IMAGE DATA OUTPUT  
GAIN  
BASELINE  
FIELD OF VIEW  
APERTURE  
SIGNAL TO NOISE RATIO  
TRIGGER MODES  
EXPOSURE RANGE

277 x 37 x 41.8 mm  
505 g  
4 W at 12 V via IEEE-1394 interface or GPIO connector  
3 x M12 microlens mount  
-30° to 60°C (storage) • 0° to 45°C (operating)  
2 years

157 x 36 x 47.4 mm  
342 g  
2.5 W at 12 V via IEEE-1394 interface or GPIO connector  
2 x M12 microlens mount  
-30° to 60°C (storage) • 0° to 45°C (operating)  
2 years

SIZE (WXHXD)  
MASS  
POWER  
LENS MOUNT  
TEMPERATURE  
WARRANTY



## LADYBUG FAMILY KEY FEATURES

- 360° degree video streaming
- Covers 90% of visual sphere; 6 sensors each camera
- Full featured SDK including dynamic stitching & image stabilization
- Independent imaging control CCD settings controlled individually or in unison
- Pre-calibrated for ease of use
- High dynamic range mode continuously cycles through a series of camera shutter and gain settings

- Complete Development Accessory Kit included:



## LADYBUG<sup>®</sup> 5

30 MP AND 12-BIT CAMERA RAW



## LADYBUG<sup>®</sup> 3

HIGH RESOLUTION, WATER RESISTANT



Model#	Sensor Specifications	Shutter	Max Res Per Sensor	Max FPS	Model#	Sensor Specifications	Shutter	Max Res Per Sensor	Max FPS
<b>LD5-U3-51SSC-44</b>	<b>30MP</b> Sony ICX655 CCD	2/3" 3.45 µm Global	2048 x 2448	10 FPS Compressed, 5 FPS Uncompressed	<b>LD3-20S4C-33</b>	<b>12MP</b> Sony ICX274 CCD	1/1.8" 4.4 µm Global	1600 x 1200	16 FPS Compressed, 6.5 FPS Uncompressed

**INTERFACE** USB 3.0 interface with screw locks for camera control and data

IEEE 1394b interface with screw locks for camera control, data, and power

**GPIO** 12-pin GPIO connector for external trigger input, strobe output, and camera power

8-pin GPIO connector for external trigger, strobe, serial port, or external power

**OPTICS** Six high quality 4.4 mm focal length lenses

Six high quality 3.3 mm focal length lenses

**SPHERICAL DISTANCE** Calibrated from 2 m to infinity

Calibrated at 20 m

**FOCUS DISTANCE** ~200 cm. Objects have an acceptable sharpness from ~60 cm to infinity

~200 cm. Objects have an acceptable sharpness from ~60 cm to infinity

**ADC** 12-bit

12-bit

**IMAGE DATA FORMATS** Raw8, Raw12, Raw16 in uncompressed and JPEG

Raw8, Mono8

**IMAGE DATA OUTPUT** 8-, 12-, or 16-bit, Raw or JPEG compressed

8-bit raw Bayer (color) digital data

**PARTIAL IMAGE MODES** Pixel binning and region of interest (ROI) modes

Pixel binning and region of interest (ROI) modes

**GAIN RANGE** Automatic/manual/one-push/ 0dB to 18dB

Automatic/manual/one-push/ 0dB to 24dB

**GAMMA** 0.50 to 4.00

0.50 to 4.00

**TRIGGER MODES** Standard, bulb, skip frames, overlapped, multi-shot

Standard, bulb, skip frames, overlapped, multi-shot

**HIGH DYNAMIC RANGE** Cycle 4 gain and exposure presets

Cycle 4 gain and exposure presets

**EXPOSURE RANGE** Global shutter; Automatic/manual/one-push/extended shutter modes  
0.02 ms to 2 seconds (extended shutter)

Global shutter; Automatic/manual/one-push/extended shutter modes  
0.01 ms to 4.2 s (extended shutter mode)

**IMAGE PROCESSING** Shutter, gain, white balance, gamma & JPEG compression, programmable via software

Shutter, gain, white balance, gamma & JPEG compression, programmable via software

**CASE TYPE** Single unit, water resistant

Single unit, water resistant

**CASE MATERIAL** Machined aluminum housing, anodized red or black

Machined aluminum housing, anodized red or black

**ENVIRONMENTAL SENSORS** Temperature, Barometer, Humidity, Accelerometer, Compass

N/A

**SIZE (WXHxD)** 197 mm diameter, 160 mm height (with lens hoods)

122 x 141 x 133 mm

**MASS** 3000 g

2414 g

**POWER** 12-24 V, 13 W via GPIO

8-30 V, 7.2 W at 12 V via IEEE 1394b

**TEMPERATURE** -30° to 60°C (storage) • 0° to 45°C (operating)

-30° to 60°C (storage) • 0° to 45°C (operating)

**WARRANTY** 2 years

1 year

# FREQUENTLY ASKED QUESTIONS

## What is included with my camera?

During your camera selection please be mindful of which accessories are included and which accessories are not included with the camera.

Here is a quick table guide for your reference:



USB VISION CAMERAS	Tripod Adapter	5mm C-Mount Adapter	Cables	Lens
Blackfly USB3	No	No	No	No
Chameleon3 USB3	No	No	No	No
Flea3 USB3	Yes	Yes for CS-mount models	No	No
Grasshopper3 USB3	Yes	N/A (no CS-mount models)	No	No



GIG VISION CAMERAS	Tripod Adapter	5mm C-Mount Adapter	Cables	Lens
Blackfly GigE	No	No	No	No
Flea3 GigE	Yes	Yes for CS-mount models	No	No
Grasshopper2 GigE	Yes	N/A (no CS-mount models)	No	No
Grasshopper3 GigE	Yes	N/A (no CS-mount models)	No	No
Zebra2 GigE Vision/HD-SDI	No	No	No	No
Cricket IP Security Camera	Yes	No	No	No

## What do your model numbers mean?

Here is one example of our model numbers and what each section means.

Understanding this will give you a quick explanation of the model's specifications and help you when comparing models.

**GS3-U3-23S6M-C**

### Camera Family

GS3=Grasshopper3

BFLY=Blackfly  
FL3=Flea3  
FFMV=FireflyMV FireWire  
GS2=Grasshopper2  
GX=Grasshopper Express

### Interface

U3=USB 3.0

FW=FireWire  
GE=GigE  
PGE=PoE GigE

### Megapixels

23=2.3 MP

03=0.3 MP  
08=0.8 MP  
13=1.3 MP  
20=2.0 MP  
50=5.0 MP  
etc

### Sensor Brand

S=Sony

A=Aptina  
M=Micron  
K=Kodak  
C=CMOSIS  
Y=Cypress  
E=E2V  
H=Sharp

### Sensor Size

6=1"

0=Unassigned  
1=1/4"  
2=1/3"  
1/2.8"  
1/2.5"  
3=1/2"  
4=1/1.8"  
5=2/3"

### Color/Mono

M=Mono

C=Color

### Lens Mount

C=C-Mount

CS=CS-Mount

## Where can I get more technical support?

You can search our online Knowledge Base for answers to camera issues here [www.ptgrey.com/support/knowledge-base](http://www.ptgrey.com/support/knowledge-base).




You can contact our support team directly and email them your issue. We have support teams staffed at our North American, Germany, China and Japan offices ready to assist with your Point Grey cameras.

## Where can I get more sales assistance?

Product pricing is available online after you've registered on our website. To register visit: [www.ptgrey.com/register](http://www.ptgrey.com/register)

For online price quotes visit: [www.ptgrey.com/sales/request-for-quote](http://www.ptgrey.com/sales/request-for-quote)



	MODEL NUMBER	INTERFACE	SENSOR TYPE	OPTICAL FORMAT	PIXEL SIZE	MAX RES	MAX FPS	
<b>BLACKFLY S</b> Page 3	BFS-U3-13Y3C/M-C	USB 3.0	ON Semi PYTHON 1300 CMOS	1/2"	4.8μm	1280 x 1024	170 fps	
	BFS-U3-32S4C/M-C	USB 3.0	Sony IMX252 CMOS	1/1.8"	3.45 μm	2048 x 1536	121 fps	
	BFS-U3-51S5C/M-C	USB 3.0	Sony IMX250 CMOS	2/3"	3.45 μm	2464 x 2048	75 fps	
<b>CHAMELEON3</b> Page 3	CM3-U3-13S2C/M-CS	USB 3.0	Sony ICX445 CCD	1/3"	3.75μm	1288 x 964	30 fps	
	CM3-U3-13Y3C/M-CS	USB 3.0	ON Semi PYTHON 1300 CMOS	1/2"	4.8μm	1280 x 1024	150 fps	
	CM3-U3-28S4C/M-CS	USB 3.0	Sony ICX818 CCD	1/1.8"	3.69μm	1928 x 1448	13 fps	
	CM3-U3-31S4C/M-CS	USB 3.0	Sony IMX265	1/1.8"	3.45 μm	2048 x 1536	55 fps	
	CM3-U3-50S5C/M-CS	USB 3.0	Sony IMX264	2/3"	3.45 μm	2448 x 2048	35 fps	
<b>BLACKFLY</b> Page 4	BFLY-U3-03S2C/M-CS	USB 3.0	Sony ICX424 CCD	1/3"	7.4μm	648 x 488	84 fps	
	BFLY-U3-05S2C/M-CS	USB 3.0	Sony ICX693 CCD	1/3"	6.0μm	808 x 608	50 fps	
	BFLY-U3-13S2C/M-CS	USB 3.0	Sony ICX445 CCD	1/3"	3.75μm	1288 x 964	30 fps	
	BFLY-U3-20S4C/M-CS	USB 3.0	Sony ICX274 CCD	1/1.8"	4.4 μm	1624 x 1224	15 fps	
	BFLY-U3-23S6C/M-C	USB 3.0	Sony IMX249 CMOS	1/1.2"	5.86 μm	1920 x 1200	41 fps	
	BFLY-U3-50H5C/M-C	USB 3.0	Sharp RJ3253AAODT CCD	2/3"	3.45 μm	2448 x 2048	7.5 fps	
<b>FLEA3</b> Page 4	FL3-U3-120S3	USB 3.0	Sony IMX172 CMOS	1/2.3"	1.55μm	4000 x 3000	15 fps	
	FL3-U3-13S2C/M-CS	USB 3.0	Sony IMX035 CMOS	1/3"	3.63μm	1328 x 1048	120 fps	
	FL3-U3-13Y3M-C	USB 3.0	ON Semi VITA1300 CMOS	1/2"	4.8μm	1280 x 1024	149 fps	
	FL3-U3-13E4C/M-C	USB 3.0	e2v EV76C560 CMOS	1/1.8"	5.3μm	1280 x 1024	60 fps	
	FL3-U3-20E4C/M-C	USB 3.0	e2v EV76C5706F CMOS	1/1.8"	4.5μm	1600 x 1200	59 fps	
	FL3-U3-32S2C/M-CS	USB 3.0	Sony IMX036 CMOS	1/2.8"	2.5μm	2080 x 1552	60 fps	
<b>GRASSHOPPER3</b> Page 5	GS3-U3-14S5C/M-C	USB 3.0	Sony ICX285 CCD	2/3"	6.45μm	1384 x 1036	30 fps	
	GS3-U3-15S5C/M-C	USB 3.0	Sony ICX825 CCD	2/3"	6.45μm	1384 x 1032	45 fps	
	GS3-U3-23S6C/M-C	USB 3.0	Sony IMX174 CMOS	1/1.2"	5.86μm	1920 x 1200	162 fps	
	GS3-U3-28S4C/M-C	USB 3.0	Sony ICX687 CCD	1/1.8"	3.69μm	1928 x 1448	26 fps	
	GS3-U3-28S5C/M-C	USB 3.0	Sony ICX674 CCD	2/3"	4.54μm	1920 x 1440	26 fps	
	GS3-U3-32S4C/M-C	USB 3.0	Sony IMX252 CMOS	1/1.8"	3.45μm	2048 x 1536	121 fps	
	GS3-U3-41S4C/M-C	USB 3.0	Sony ICX808 CCD	1/1.8"	3.1μm	2016 x 2016	18 fps	
	GS3-U3-41C6NIR-C	USB 3.0	CMOSIS CMV4000-3E12 CMOS	1"	5.5μm	2048 x 2048	90 fps	
	GS3-U3-41C6C/M-C	USB 3.0	CMOSIS CMV4000-3E5 CMOS	1"	5.5μm	2048 x 2048	90 fps	
	GS3-U3-50S5C/M-C	USB 3.0	Sony ICX625 CCD	2/3"	3.45μm	2448 x 2048	15 fps	
	GS3-U3-51S5C/M-C	USB 3.0	Sony IMX250 CMOS	2/3"	3.45μm	2448 x 2048	75 fps	
	GS3-U3-60S6C/M-C	USB 3.0	Sony ICX694 CCD	1"	4.54μm	2736 x 2192	13 fps	
	GS3-U3-60Q6C/M-C	USB 3.0	Sony ICX694 CCD	1"	4.54μm	2736 x 2192	25 fps	
	GS3-U3-91S6C/M-C	USB 3.0	Sony ICX814 CCD	1"	3.69μm	3376 x 2704	9 fps	
	GS3-U3-120S6C/M-C	USB 3.0	Sony ICX834 CCD	1"	3.1μm	4240 x 2824	7 fps	
	<b>BLACKFLY S</b> Page 6	BFS-PGE-31S4C/M-C	GigE PoE	Sony IMX265 CMOS	1/1.8"	3.45 μm	2048 x 1536	35 fps
		BFS-PGE-50S5C/M-C	GigE PoE	Sony IMX264 CMOS	2/3"	3.45 μm	2464 x 2048	22 fps
	<b>BLACKFLY</b> Page 6	BFLY-PGE-03S2C/M-CS	GigE PoE	Sony ICX424 CCD	1/3"	7.4μm	648 x 488	84 fps
		BFLY-PGE-03S3C/M-CS	GigE PoE	Sony ICX414 CCD	1/2"	9.9μm	648 x 488	90 fps
		BFLY-PGE-05S2C/M-CS	GigE PoE	Sony ICX693 CCD	1/3"	6.0μm	808 x 608	50 fps
		BFLY-PGE-09S2C/M-CS	GigE PoE	Sony ICX692 CCD	1/3"	4.08μm	1288 x 728	30 fps
BFLY-PGE-12A2C/M-CS		GigE PoE	Aptina ARO134 CMOS	1/3"	3.75μm	1280 x 960	52 fps	
BFLY-PGE-13S2C/M-CS		GigE PoE	Sony ICX445 CCD	1/3"	3.75μm	1288 x 964	30 fps	
BFLY-PGE-13H2C/M-CS		GigE PoE	Sharp RJ3J34/RJ3J33 CCD	1/3"	3.75μm	1288 x 964	30 fps	
BFLY-PGE-13E4C/M-CS		GigE PoE	e2v EV76C560 CMOS	1/1.8"	5.3μm	1280 x 1024	60 fps	
BFLY-PGE-14S2C/M-C		GigE PoE	Sony IMX104 CMOS	1/3"	3.75μm	1296 x 1032	60 fps	
BFLY-PGE-20E4C/M-CS		GigE PoE	e2v EV76C570 CMOS	1/1.8"	4.5μm	1600 x 1200	50 fps	
BFLY-PGE-23S2C-CS		GigE PoE	Sony IMX136 CMOS	1/2.8"	2.8μm	1920 x 1200	27 fps	
BFLY-PGE-23S6C/M-C		GigE PoE	Sony IMX249 CMOS	1/1.2"	5.86μm	1920 x 1200	41 fps	
BFLY-PGE-31S4M/C-CS		GigE PoE	Sony IMX265 CMOS	1/1.8"	3.45 μm	2048 x 1536	35 fps	
BFLY-PGE-50A2C/M-CS		GigE PoE	Aptina MT9P006/031 CMOS	1/2.5"	2.2μm	2592 x 1944	13 fps	
BFLY-PGE-50H5C/M-C		GigE PoE	Sharp RJ3254/S3AAODT CCD	2/3"	3.45μm	2448 x 2048	7.5 fps	
BFLY-PGE-50S5M/C-C		GigE PoE	Sony IMX264 CMOS	2/3"	3.45 μm	2448 x 2048	22 fps	
<b>FLEA3</b> Page 7	FL3-GE-03S1C/M-C	GigE	Sony ICX618 CCD	1/4"	5.6μm	648 x 488	120 fps	
	FL3-GE-03S2C/M-C	GigE	Sony ICX424 CCD	1/3"	7.4μm	648 x 488	82 fps	
	FL3-GE-08S2C/M-C	GigE	Sony ICX204 CCD	1/3"	4.65μm	1032 x 776	31 fps	
	FL3-GE-13S2C/M-C/CS	GigE	Sony ICX445 CCD	1/3"	3.75μm	1288 x 964	31 fps	
	FL3-GE-14S3C/M-C	GigE	Sony ICX267 CCD	1/2"	4.65μm	1384 x 1032	18 fps	
	FL3-GE-20S4C/M-C	GigE	Sony ICX274 CCD	1/1.8"	4.4μm	1624 x 1224	15 fps	
	FL3-GE-28S4C/M-C	GigE	Sony ICX687 CCD	1/1.8"	3.69μm	1928 x 1448	15 fps	
	FL3-GE-50S5C/M-C	GigE	Sony ICX655 CCD	2/3"	3.45μm	2448 x 2048	8 fps	
<b>GRASSHOPPER3</b> Page 7	GS3-PGE-23S6C/M-C	GigE-PoE	Sony IMX174 CMOS	1/1.2"	5.86μm	1920 x 1200	45 fps	
	GS3-PGE-50S5C/M-C	GigE-PoE	Sony ICX625 CCD	2/3"	3.45 μm	2448 x 2048	15 fps	
	GS3-PGE-60S6C/M-C	GigE-PoE	Sony ICX694 CCD	1"	4.54μm	2736 x 2192	13 fps	
	GS3-PGE-91S6C/M-C	GigE-PoE	Sony ICX814 CCD	1"	3.69μm	3376 x 2704	9 fps	
 Page 8 <b>CHAMELEON</b>	CMLN-13S2C/M-CS	USB 2.0	Sony ICX445 CCD	1/3"	3.75μm	1296x964	18 fps	
	<b>FIREFLY MV</b> Page 8	FMVU-03MTC/M-CS	USB 2.0	Micron MT9V022 CMOS	1/3"	6.0μm	752x480	60 fps
FMVU-13S2C-CS		USB 2.0	Sony IMX035 CMOS	1/3"	3.63μm	1328x1048	23 fps	
 Page 9 <b>FLEA3</b>	FL3-FW-03S1C/M-C	IEEE 1394b	Sony ICX618 CCD	1/4"	5.6μm	648x488	120 fps	
	FL3-FW-03S3C/M-C	IEEE 1394b	Sony ICX414 CCD	1/2"	9.9μm	648x488	76 fps	
	FL3-FW-14S3C/M-C	IEEE 1394b	Sony ICX267 CCD	1/2"	4.65μm	1384x1032	16 fps	
	FL3-FW-20S4C/M-C	IEEE 1394b	Sony ICX274 CCD	1/1.8"	4.4μm	1624x1224	15 fps	
 Page 9 <b>GAZELLE</b>	GZL-CL-22CS-C	Camera Link Base/Full	CMOSIS CMV2000 CMOS	2/3"	5.5μm	2048x1088	280 fps	
	GZL-CL-41C6-C	Camera Link Base/Full	CMOSIS CMV4000-2E5 CMOS	1"	5.5μm	2048x2048	150 fps	
<b>CRICKET IP CAMERA</b> Page 11	CR-POE-13S2C-CS	100Mbit PoE	Sony IMX139 CMOS	1/3"	3.75μm	1280x1024	60 fps	
	CR-POE-20S2C-CS	100Mbit PoE	Sony IMX140 CMOS	1/2.8"	2.8μm	1920x1080	60 fps	
	CR-POE-20S3C-CS	100Mbit PoE	Sony IMX185 CMOS	1/2"	3.75μm	1920x1080	60 fps	
<b>BUMBLEBEE2 &amp; XB3</b> Page 12	BB2-03S2C/M (25/38/60)	IEEE 1394a	Sony ICX424 CCD	1/3"	7.4μm	648x488	48 fps	
	BB2-08S2C/M (25/38/60)	IEEE 1394a	Sony ICX204 CCD	1/3"	4.65μm	1032x776	20 fps	
	BBX3-13S2C/M (38/60)	IEEE 1394b	Sony ICX445 CCD	1/3"	3.75μm	1280x960	16 fps	
<b>LADYBUG3</b> Page 13 <b>LADYBUGS</b>	LD3-20S4C-33	IEEE 1394b	Sony ICX274 CCD	1/1.8"	4.4μm	1600x1200 (x6)	16 fps	
	LD5-U3-51S5C-44	USB 3.0	Sony ICX655 CCD	2/3"	3.45μm	2048x2448 (x6)	10 fps	



SHUTTER	GPIO	LENS MOUNT	A/D CONVERTER	IMAGE DATA OUTPUT	ON-BOARD MEMORY	SIZE	OPERATING TEMP	WARRANTY
Global Global Global	6-pin Hirose HR10A-7R-6PB	C C C	12-bit ADC 12-bit ADC 12-bit ADC	8, 12, 16, 24-bit	240 MB frame buffer 6 MB flash memory	29 x 29 x 30 mm	0° to 50° C	3 years
Global Global Global Global Global	9-pin JST	CS CS CS CS CS	12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC	8, 12, 16, 24-bit	16 MB frame buffer 1 MB flash memory	44 x 35 x 19.5 mm	0° to 45° C	3 years
Global Global Global Global Global Global	6-pin Hirose HR10A-7R-6PB	CS CS CS CS C C	12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC 10/12-bit ADC 12-bit ADC	8, 12, 16, 24-bit	16 MB frame buffer 1 MB flash memory	29 x 29 x 30 mm	0° to 45° C	3 years
Rolling Rolling Global Global Global Rolling/Global Reset	8-pin Hirose HR25	C CS C C C CS	12-bit ADC 12-bit ADC 10-bit ADC 10-bit ADC 10-bit ADC 12-bit ADC	8, 12, 16, 24-bit	32 MB frame buffer 1 MB flash memory	29 x 29 x 30 mm	0° to 45° C	3 years
Global Global Global Global Global Global Global Global Global Global Global Global Global Global Global Global	8-pin Hirose HR25	C C C C C C C C C C C C C C C C	14-bit ADC 14-bit ADC 10/12-bit ADC 14-bit ADC 14-bit ADC 10/12-bit ADC 14-bit ADC 10-bit ADC 10-bit ADC 14-bit ADC 10/12-bit ADC 14-bit ADC 14-bit ADC 14-bit ADC 14-bit ADC 14-bit ADC	8, 12, 16, 24-bit	128 MB frame buffer 2 MB flash memory	44 x 29 x 58 mm	0° to 50° C	3 years
Global Global	6-pin Hirose HR10A-7R-6PB	C C	12-bit ADC 12-bit ADC	8, 12, 16, 24-bit	240 MB frame buffer 6 MB flash memory	29 x 29 x 30 mm	0° to 50° C	3 years
Global Global Global Global Global Global Global Global Global Rolling Global Rolling Global Global Global Global	6-pin Hirose HR10A-7R-6PB	CS CS CS CS CS CS CS CS CS CS CS C CS CS C C	12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC 10-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC 10/12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC	8, 12, 16, 24-bit	16 MB frame buffer 512 KB flash memory	29 x 29 x 30 mm	0° to 45° C	3 years
Global Global Global Global Global Global Global	8-pin Hirose HR25	C C C C/CS C C C C	12-bit ADC	8, 12, 16, 24-bit	32 MB frame buffer 1 MB flash memory	29 x 29 x 30 mm	0° to 45° C	3 years
Global Global Global	8-pin Hirose HR25	C C C	10/12-bit ADC 14-bit ADC 14-bit ADC	8, 12, 16, 24-bit	128 MB frame buffer 2 MB flash memory	44 x 29 x 58 mm	0° to 50° C	3 years
Global	7-pin JST	CS	12-bit ADC	8, 16-bit	256 KB flash memory	44 x 41 x 25.5 mm	0° to 45° C	1 year
Global Rolling	7-pin JST	CS CS	10-bit ADC 12-bit ADC	8, 16-bit	N/A	44 x 34 x 24.4 mm	0° to 45° C	1 year
Global Global Global Global	8-pin Hirose HR25	C C C C	12-bit ADC	8, 12, 16, 24-bit	32 MB frame buffer 1 MB flash memory	29 x 29 x 30 mm	0° to 45° C	3 years
Global Global	8-pin Hirose HR25	C C	10-bit ADC	8, 10-bit	4 MB flash memory	44 x 29 x 59.5 mm	-10° to 50° C	3 years
Rolling Rolling Rolling	N/A	CS CS CS	N/A	N/A	N/A	88.1 x 44 x 32 mm	0° to 45° C	1 year
Global Global Global	4-pin GPIO	2 x M12 2 x M12 3 x M12	12-bit ADC	8, 16-bit	N/A	157x 36 x 47.4 mm 157 x 36 x 47.4 mm 277 x 37 x 41.8 mm	0° to 45° C	2 years
Global Global	8-pin GPIO 12-pin GPIO	N/A N/A	12-bit ADC	8-bit 8, 12, 16-bit	N/A	122 x 141 mm 139.5 x 160 mm	0° to 45° C	1 year 2 years

# MONO CAMERA SENSOR REVIEW SORTED BY SENSOR TYPE (CCD/CMOS) AND RESOLUTION

MODEL ID	SENSOR	SENSOR SIZE	INTERFACE	SENSOR TYPE	SHUTTER	MAX RESOLUTION	MAX FRAME RATE	PIXEL SIZE
BFLY-PGE-03S2M-CS	<b>Sony ICX424</b>	1/3"	PoE GigE	CCD	Global	648 x 488	84	7.4 µm
BFLY-U3-03S2M-CS	<b>Sony ICX424</b>	1/3"	USB 3.0	CCD	Global	648 x 488	84	7.4 µm
BFLY-PGE-03S3M-CS	<b>Sony ICX414</b>	1/2"	PoE GigE	CCD	Global	648 x 488	90	9.9 µm
FL3-GE-03S1M-C	<b>Sony ICX618</b>	1/4"	GigE	CCD	Global	648 x 488	120	5.6 µm
BFLY-PGE-05S2M-CS	<b>Sony ICX693</b>	1/3"	PoE GigE	CCD	Global	808 x 608	50	6.0 µm
FL3-GE-08S2M-C	<b>Sony ICX204</b>	1/3"	GigE	CCD	Global	1032 x 776	31	4.65 µm
BFLY-PGE-09S2M-CS	<b>Sony ICX692</b>	1/3"	PoE GigE	CCD	Global	1288 x 728	30	4.08 µm
BFLY-U3-13S2M-CS	<b>Sony ICX445</b>	1/3"	USB 3.0	CCD	Global	1288 x 964	30	3.75 µm
BFLY-PGE-13S2M-CS	<b>Sony ICX445</b>	1/3"	PoE GigE	CCD	Global	1288 x 964	30	3.75 µm
BFLY-PGE-13H2M-CS	<b>Sharp RJ33J4CA3DE</b>	1/3"	PoE GigE	CCD	Global	1288 x 964	30	3.75 µm
CM3-U3-13S2M-CS	<b>Sony ICX445</b>	1/3"	USB 3.0	CCD	Global	1288 X 964	30	3.75 µm
FL3-GE-13S2M-C	<b>Sony ICX445</b>	1/3"	PoE GigE	CCD	Global	1288 x 964	31	3.75 µm
FL3-GE-14S3M-C	<b>Sony ICX267</b>	1/2"	GigE	CCD	Global	1384 x 1032	18	4.65 µm
GS3-U3-15S5M-C	<b>Sony ICX825</b>	2/3"	USB 3.0	CCD	Global	1384 x 1032	45	6.45 µm
GS3-U3-14S5M-C	<b>Sony ICX285</b>	2/3"	USB 3.0	CCD	Global	1384 x 1036	30	6.45 µm
FL3-GE-20S4M-C	<b>Sony ICX274</b>	1/1.8"	GigE	CCD	Global	1624 x 1224	15	4.4 µm
GS3-U3-28S5M-C	<b>Sony ICX674</b>	2/3"	USB 3.0	CCD	Global	1920 x 1440	26	4.54 µm
CM3-U3-28S4M-CS	<b>Sony ICX818</b>	1/1.8"	USB 3.0	CCD	Global	1928 X 1448	13	3.69 µm
FL3-GE-28S4M-C	<b>Sony ICX687</b>	1/1.8"	GigE	CCD	Global	1928 x 1448	15	3.69 µm
GS3-U3-28S4M-C	<b>Sony ICX687</b>	1/1.8"	USB 3.0	CCD	Global	1928 x 1448	26	3.69 µm
GS3-U3-41S4M-C	<b>Sony ICX808</b>	1/1.8"	USB 3.0	CCD	Global	2024 x 2024	18	3.1 µm
FL3-GE-50S5M-C	<b>Sony ICX655</b>	2/3"	GigE	CCD	Global	2448 x 2048	8	3.45 µm
GS3-U3-50S5M-C	<b>Sony ICX625</b>	2/3"	USB 3.0	CCD	Global	2448 x 2048	15	3.45 µm
GS3-PGE-50S5M-C	<b>Sony ICX625</b>	2/3"	PoE GigE	CCD	Global	2448 x 2048	15	3.45 µm
BFLY-PGE-50H5M-C	<b>Sharp RJ32S4AA0DT</b>	2/3"	PoE GigE	CCD	Global	2448 x 2048	7.5	3.45 µm
GS3-U3-60S6M-C	<b>Sony ICX694</b>	1"	USB 3.0	CCD	Global	2736 x 2192	13	4.54 µm
GS3-U3-60QS6M-C	<b>Sony ICX694</b>	1"	USB 3.0	CCD	Global	2736 x 2192	25	4.54 µm
GS3-PGE-60S6M-C	<b>Sony ICX694</b>	1"	PoE GigE	CCD	Global	2736 x 2192	13	4.54 µm
GS3-U3-91S6M-C	<b>Sony ICX814</b>	1"	USB 3.0	CCD	Global	3376 x 2704	9	3.69 µm
GS3-U3-120S6M-C	<b>Sony ICX834</b>	1"	USB 3.0	CCD	Global	4240 x 2824	7	3.1 µm
FFMV-03M2M-CS	<b>Micron MT9V022177ATC</b>	1/3"	FireWire	CMOS	Global	752 x 480	60	6.0 µm
BFLY-PGE-12A2M-CS	<b>Aptina AR0134</b>	1/3"	PoE GigE	CMOS	Global	1280 x 960	52	3.75 µm
FL3-U3-13E4M-C	<b>e2v EV76C560</b>	1/1.8"	USB 3.0	CMOS	Global	1280 x 1024	60	5.3 µm
BFLY-PGE-13E4M-CS	<b>e2v EV76C560</b>	1/1.8"	PoE GigE	CMOS	Global	1280 x 1024	60	5.3 µm
FL3-U3-13Y3M-C	<b>ON Semi VITA1300</b>	1/2"	USB 3.0	CMOS	Global	1280 x 1024	150	4.8 µm
CM3-U3-13Y3M-CS	<b>ON Semi PYTHON 1300</b>	1/2"	USB 3.0	CMOS	Global	1280 x 1024	149	4.8 µm
FL3-U3-13S2M-CS	<b>Sony IMX035</b>	1/3"	USB 3.0	CMOS	Rolling	1328 x 1048	120	3.63 µm
BFLY-PGE-20E4M-CS	<b>e2v EV76C570</b>	1/1.8"	PoE GigE	CMOS	Global	1600 x 1200	50	4.5 µm
FL3-U3-20E4M-C	<b>e2v EV76C570</b>	1/1.8"	USB 3.0	CMOS	Global	1600 x 1200	60	4.5 µm
GS3-U3-23S6M-C	<b>Sony IMX174</b>	1/1.2"	USB 3.0	CMOS	Global	1920 x 1200	162	5.86 µm
GS3-PGE-23S6M-C	<b>Sony IMX174</b>	1/1.2"	PoE GigE	CMOS	Global	1920 x 1200	46	5.86 µm
BFLY-PGE-23S6M-C	<b>Sony IMX249</b>	1/1.2"	PoE GigE	CMOS	Global	1920 x 1200	41	5.86 µm
FL3-U3-32S2M-CS	<b>Sony IMX036</b>	1/2.8"	USB 3.0	CMOS	Rolling	2080 x 1552	60	2.5 µm
GS3-U3-32S3M-C	<b>Sony IMX252</b>	1/1.8"	USB 3.0	CMOS	Global	2038 x 1536	121	3.45 µm
BFLY-PGE-31S4M-C	<b>Sony IMX265</b>	1/1.8"	PoE GigE	CMOS	Global	2048 X 1536	35	3.45 µm
CM3-U3-31S4M-CS	<b>Sony IMX265</b>	1/1.8"	USB 3.0	CMOS	Global	2048 X 1536	55	3.45 µm
GS3-U3-41C6M-C	<b>CMOSIS CMV4000</b>	1"	USB 3.0	CMOS	Global	2048 x 2048	90	5.5 µm
GS3-U3-41C6NIR-C	<b>CMOSIS CMV4000 NIR</b>	1"	USB 3.0	CMOS	Global	2048 x 2048	90	5.5 µm
BFLY-PGE-50S5M-C	<b>Sony IMX264</b>	2/3"	PoE GigE	CMOS	Global	2448 X 2048	22	3.45 µm
CM3-U3-50S5M-CS	<b>Sony IMX264</b>	2/3"	USB 3.0	CMOS	Global	2448 X 2048	35	3.45 µm
GS3-U3-51S5M-C	<b>Sony IMX250</b>	2/3"	USB 3.0	CMOS	Global	2448 x 2048	75	3.45 µm
BFLY-PGE-50A2M-CS	<b>Aptina MT9P031</b>	1/2.5"	PoE GigE	CMOS	Rolling	2592 x 1944	13	2.2 µm

CCD

CMOS

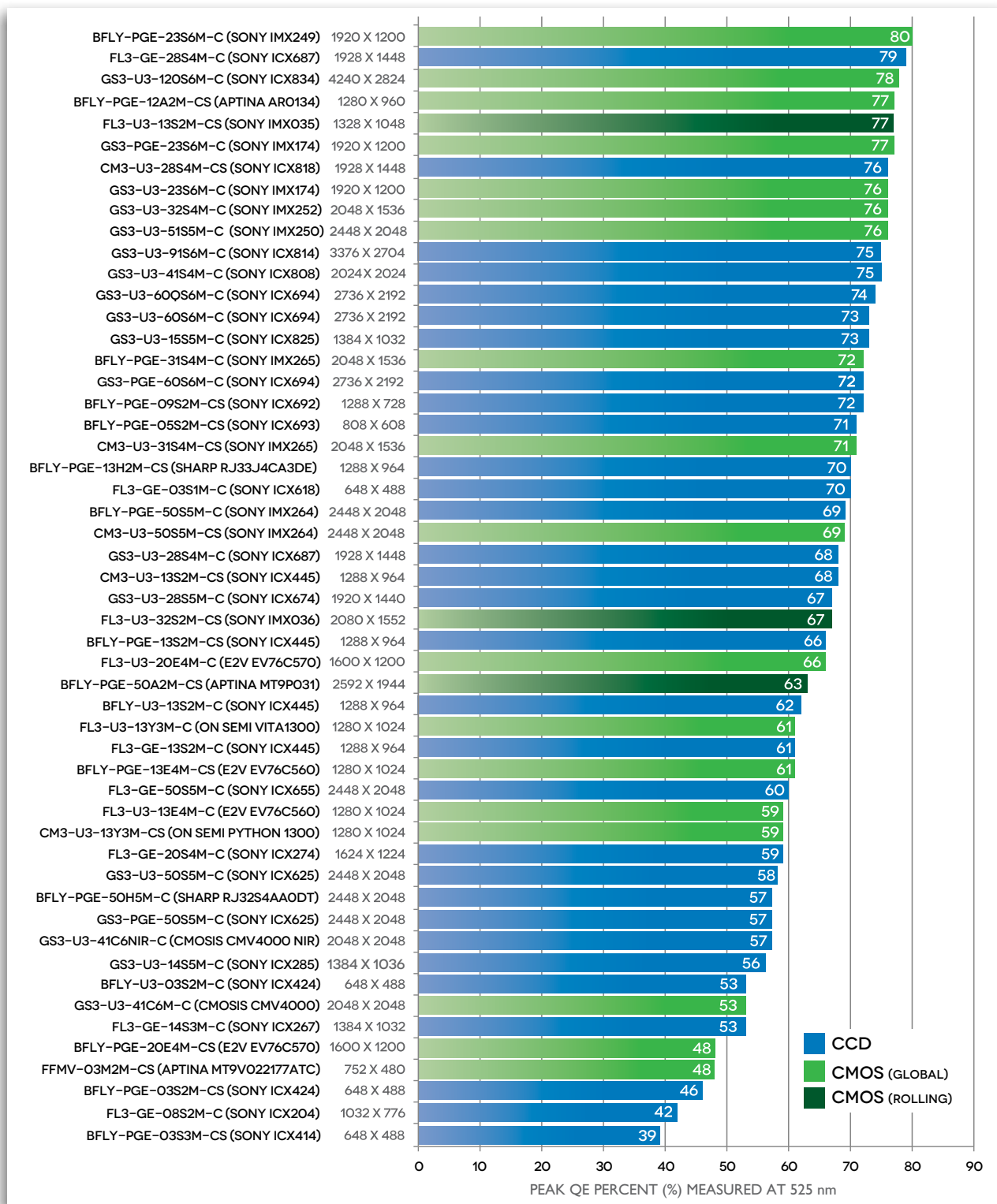
QE 525nm %	QE NEAR IR 850nm / 950nm %	TEMPORAL DARK NOISE (READ NOISE) e <sup>-</sup>	S/N RATIO MAX dB	S/N RATIO MAX Bits	ABSOLUTE SENSITIVITY THRESHOLD $\gamma$	SATURATION CAPACITY (WELL DEPTH) e <sup>-</sup>	DYNAMIC RANGE dB	DYNAMIC RANGE Bits	GAIN e <sup>-</sup> /ADU
46	7/2	12.86	41.44	6.88	29.74	13932	60.37	10.03	0.22
53	8 / 3	12.03	41.37	6.87	24.76	13701	60.78	10.10	0.22
39	7/2	19.43	44.14	7.33	51.72	25949	62.29	10.35	0.41
70	21 / 8	11.73	41.62	6.91	17.57	14508	61.49	10.21	0.22
71	14 / 4	11.22	43.02	7.14	16.97	20024	64.66	10.74	0.36
42	6 / 2	12.13	40.77	6.77	30.70	11944	59.51	9.89	0.19
72	15 / 5	8.56	40.63	6.75	12.76	11551	62.11	10.32	0.24
62	16 / 5	10.30	39.86	6.62	17.78	9686	59.06	9.81	0.15
66	16 / 5	9.23	39.64	6.58	15.00	9196	59.51	9.88	0.15
70	17 / 5	5.37	38.68	6.43	8.55	7384	61.99	10.30	0.12
68	17 / 5	10.09	39.65	6.59	15.67	9231	58.81	9.77	0.15
61	15 / 4	7.61	38.66	6.42	13.63	7347	59.14	9.82	0.12
53	7 / 2	11.48	40.16	6.67	23.63	10366	58.75	9.76	0.18
73	22 / 7	8.31	43.59	7.24	12.15	22856	68.28	11.34	0.37
56	9 / 3	11.9	42.15	7.00	23.19	16408	62.43	10.37	0.28
59	7 / 2	8.35	39.01	6.48	15.77	7969	59.09	9.82	0.13
67	17 / 5	9.39	41.67	6.92	14.86	14693	63.43	10.54	0.24
76	16 / 5	10.48	40.39	6.71	14.67	10936	59.96	9.96	0.18
79	17 / 6	9.68	40.64	6.78	13.13	11586	61.12	10.15	0.19
68	15 / 5	10.17	39.56	6.57	15.78	9039	58.56	9.73	0.15
75	14/4	9.29	38.10	6.33	13.32	6459	56.39	9.37	0.10
60	9 / 4	9.43	37.68	6.26	17.23	5856	55.42	9.20	0.09
58	9 / 3	8.73	37.90	6.30	16.30	6168	56.50	9.38	0.10
57	8 / 3	8.18	37.71	6.26	15.69	5903	56.66	9.41	0.10
57	8 / 2	5.48	39.08	6.49	10.67	8086	62.61	10.4	0.13
73	16 / 5	10.54	41.60	6.91	15.22	14446	62.34	10.35	0.23
74	16 / 5	10.88	41.53	6.90	15.43	14227	61.94	10.29	0.23
72	16 / 5	10.87	41.56	6.93	13.87	14959	63.40	10.53	0.24
75	16 / 4	9.43	40.00	6.64	13.53	9996	60.06	9.98	0.16
78	13 / 4	10.87	37.87	6.29	14.82	6125	54.63	9.07	0.10
48	37 / 15	40.45	41.83	6.75	85.67	15239	51.41	8.53	0.27
77	21 / 7	6.58	37.44	6.22	9.30	5542	57.87	9.61	0.10
59	22 / 4	25.14	39.24	6.52	43.18	8384	50.29	8.35	0.16
61	22 / 8	25.32	38.76	6.44	43.00	7506	49.27	8.18	0.16
61	21 / 8	26.26	40.10	6.66	44.13	10226	51.64	8.58	0.21
59	20 / 8	9.28	37.82	6.28	16.14	6057	55.84	9.28	0.15
77	12 / 4	6.00	41.90	6.96	8.72	15491	67.55	11.22	0.27
48	15 / 6	21.28	38.94	6.47	42.26	7836	51.12	8.49	0.13
66	22 / 9	24.17	38.92	6.46	37.84	7788	49.99	8.30	0.13
76	13 / 4	6.83*	45.12	7.49	9.77*	32513	72.94	12.11	0.52
77	14 / 4	6.83*	45.14	7.50	9.75*	32691	72.99	12.12	0.51
80	15 / 5	7.11*	45.19	7.50	9.45*	33105	72.77	12.08	0.52
67	13 / 4	6.71	40.03	6.65	10.99	10066	62.90	10.45	0.19
76	19 / 6	2.34*	40.20	6.68	3.98*	10482	71.34	11.85	0.17
72	19 / 6	2.31	40.14	6.67	3.93	10326	71.31	11.84	0.17
71	19 / 7	2.89	39.90	6.63	4.80	9777	69.19	11.49	0.17
53	18 / 7	16.81	38.82	6.45	33.38	7620	52.87	8.78	0.15
57	32 / 13	17.99	39.59	6.58	31.01	9094	53.84	8.94	0.15
69	18 / 6	3.36	39.96	6.64	4.10	9909	70.78	11.76	0.17
69	18 / 6	2.29	39.94	6.63	4.03	9869	70.97	11.79	0.17
76	19 / 6	2.37*	40.15	6.67	4.03*	10361	71.15	11.82	0.17
63	14 / 5	7.64	38.26	6.35	13.00	6693	58.30	9.68	0.11

\*Mode 7 (Low Noise Imaging Mode)

# MONO SINGLE LENS CAMERAS

## QUANTUM EFFICIENCY (%) AT 525 nm (HIGHER IS BETTER)

Quantum efficiency (QE) is the ability of the sensor to turn photons into electrons, or in other words, turn incoming light into an electrical signal for imaging. A higher QE % means greater sensitivity for detecting light. A sensor with a measurement of 79% means that for every 100 photons that hit the sensor an average of 79 will be detected. Please note that the results below are taken at the wavelength of 525nm.

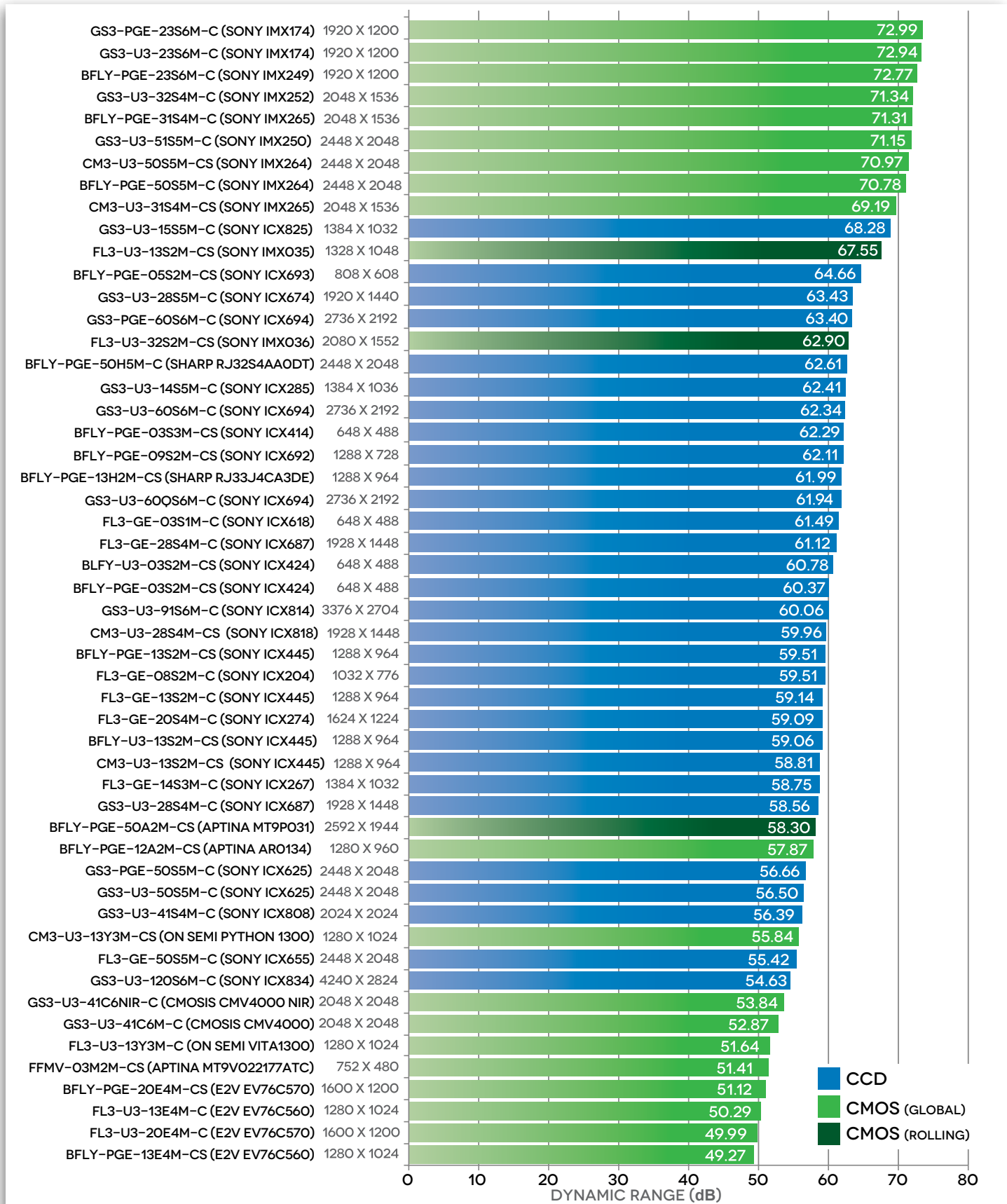


Please note that all measurements are taken based on guidelines in the EMVA 1288 standard. Camera settings are at maximum exposure time and bit depth unless otherwise noted. The pixel format is Mono 16 for mono cameras except for the last two Bandwidth and Throughput graphs which are done at Mono 8. Results are captured at room temperature (20°C). For more information on the EMVA 1288 standard please visit EMVA.org. Thanks for considering Point Grey and please enjoy our mono camera sensor review.

# MONO SINGLE LENS CAMERAS

## DYNAMIC RANGE dB (HIGHER IS BETTER)

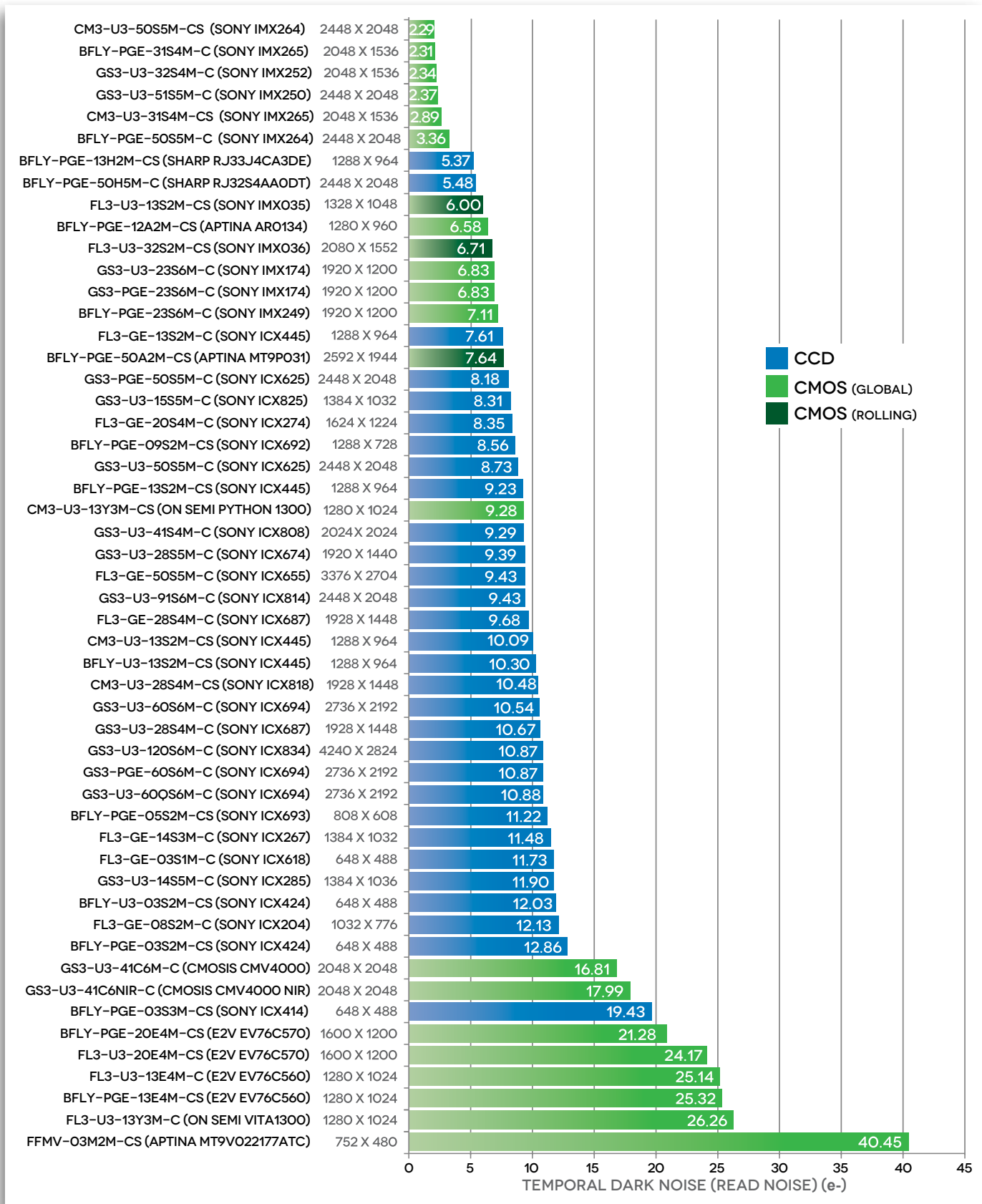
Dynamic range describes the camera model's ability to detect the maximum and minimum of light intensities (shadows and highlights). Models with higher dynamic range can detect more detail in the darks and lights.



# MONO SINGLE LENS CAMERAS

## TEMPORAL DARK NOISE / READ NOISE e- (LOWER IS BETTER)

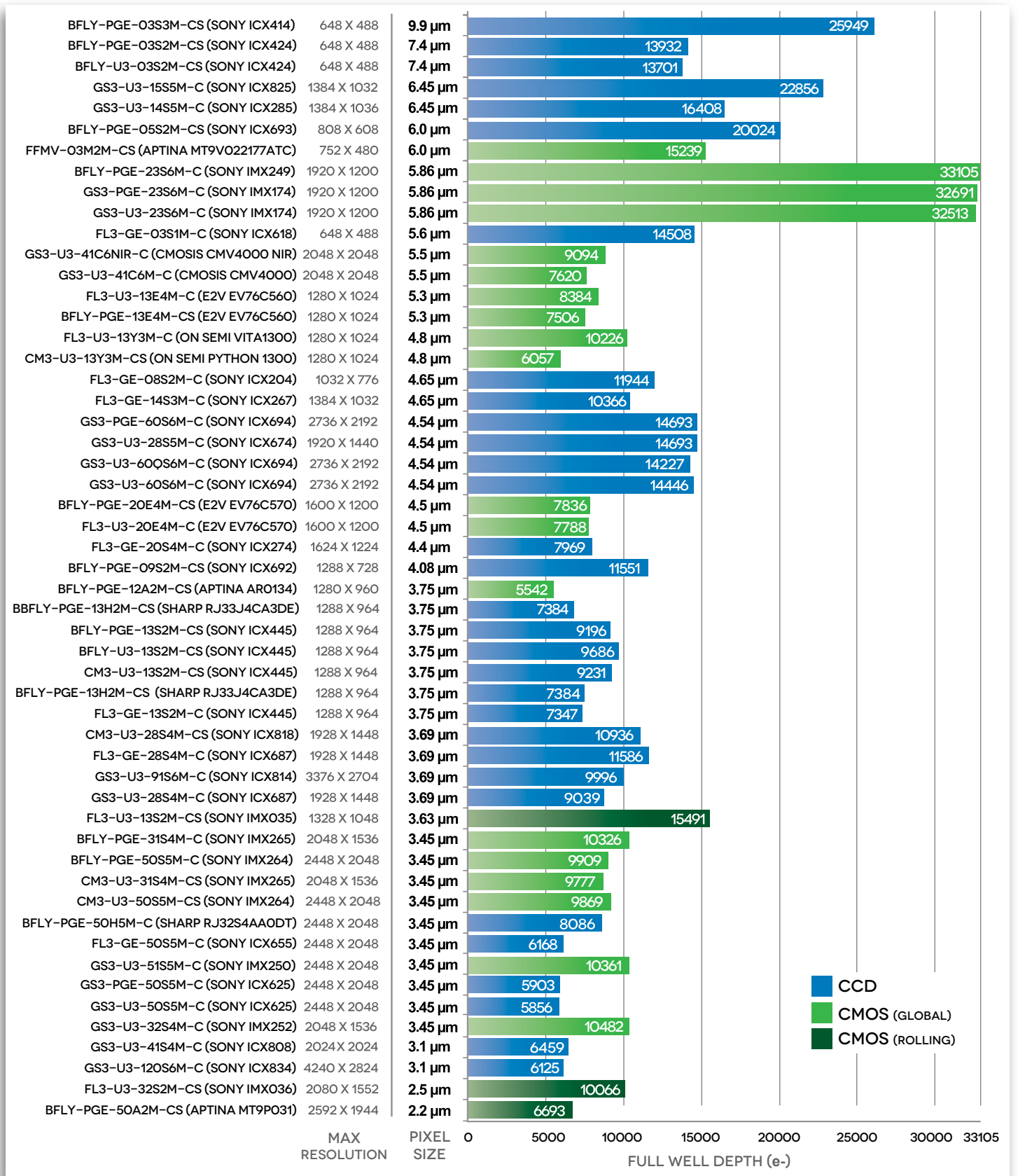
Temporal dark noise (also known as read noise) comes from energy within the sensor and the surrounding sensor electronics. Over time, random electrons are created that fall into the sensor wells and are detected and turned into signal. Models with lower read noise measurements produce cleaner images.



# MONO SINGLE LENS CAMERAS

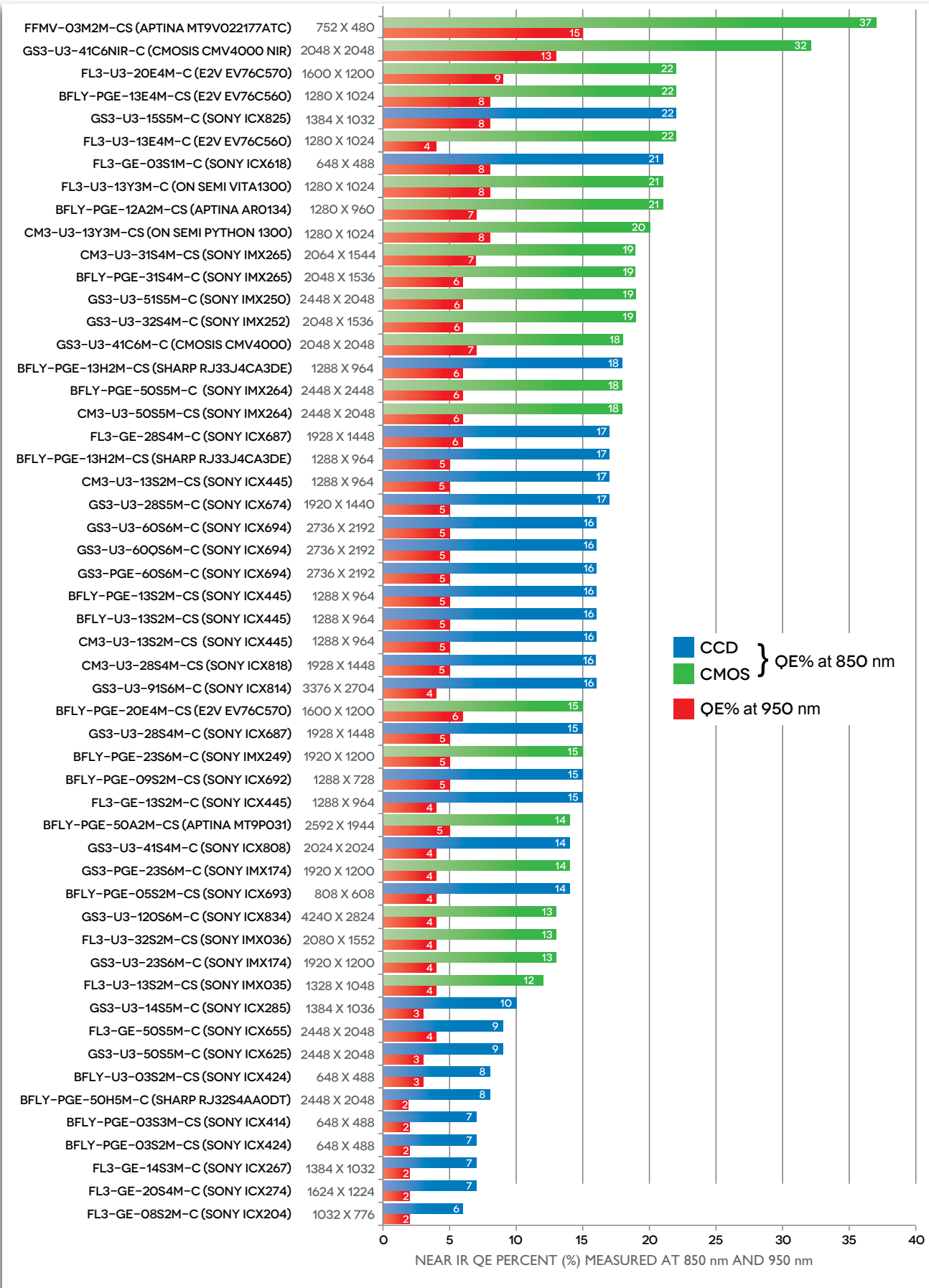
## SATURATION CAPACITY (WELL DEPTH) e- (HIGHER IS BETTER, SORTED BY PIXEL

The saturation capacity (well depth) is the largest charge a pixel can hold before over-saturation occurs and signal degradation begins. Saturation must be avoided because it diminishes the quantitative ability of the sensor and in the case of CCDs produces image smearing due to a phenomenon known as blooming.



# MONO SINGLE LENS CAMERAS

NEAR IR QE (%) (HIGHER IS BETTER)

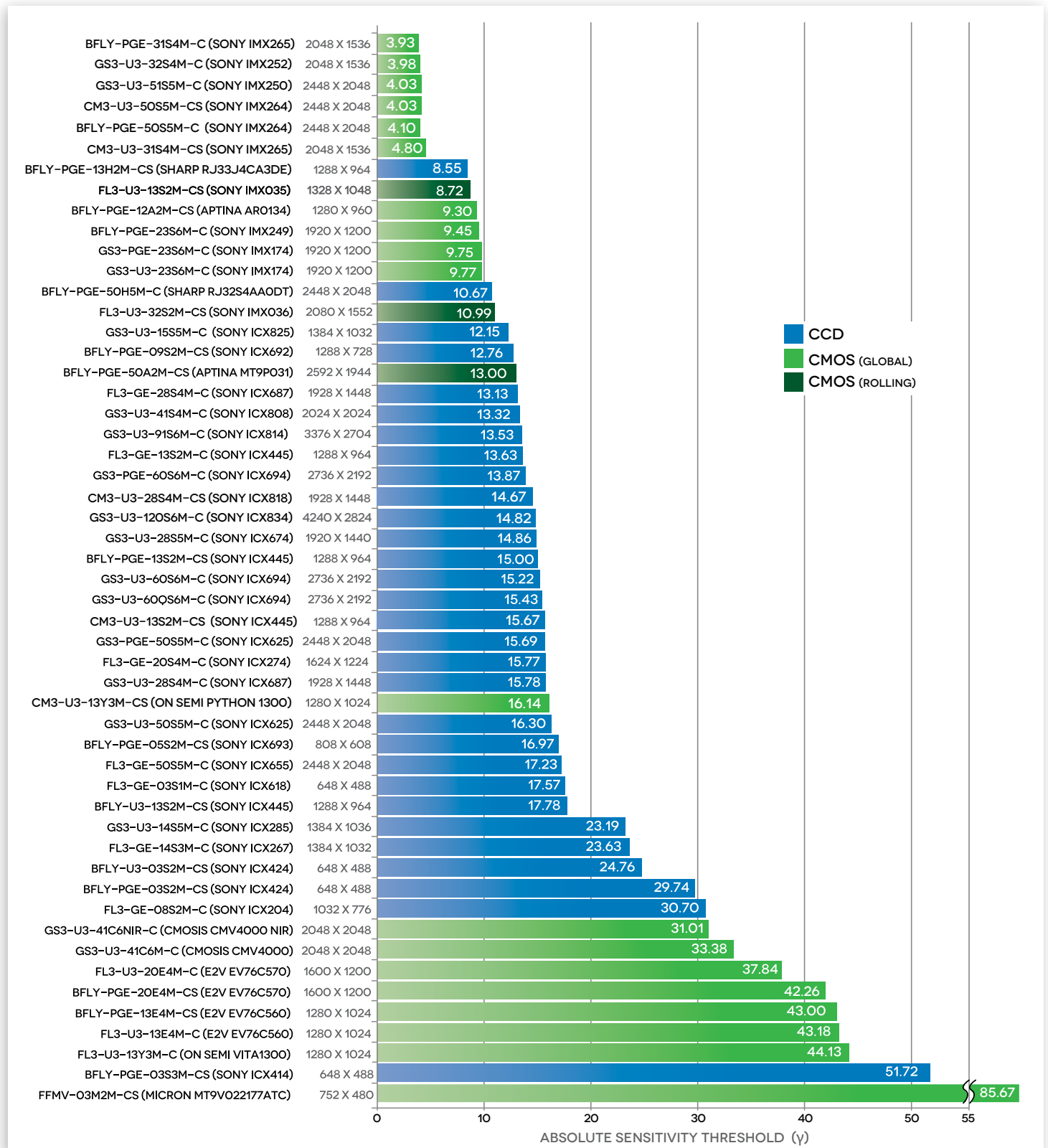




# MONO SINGLE LENS CAMERAS

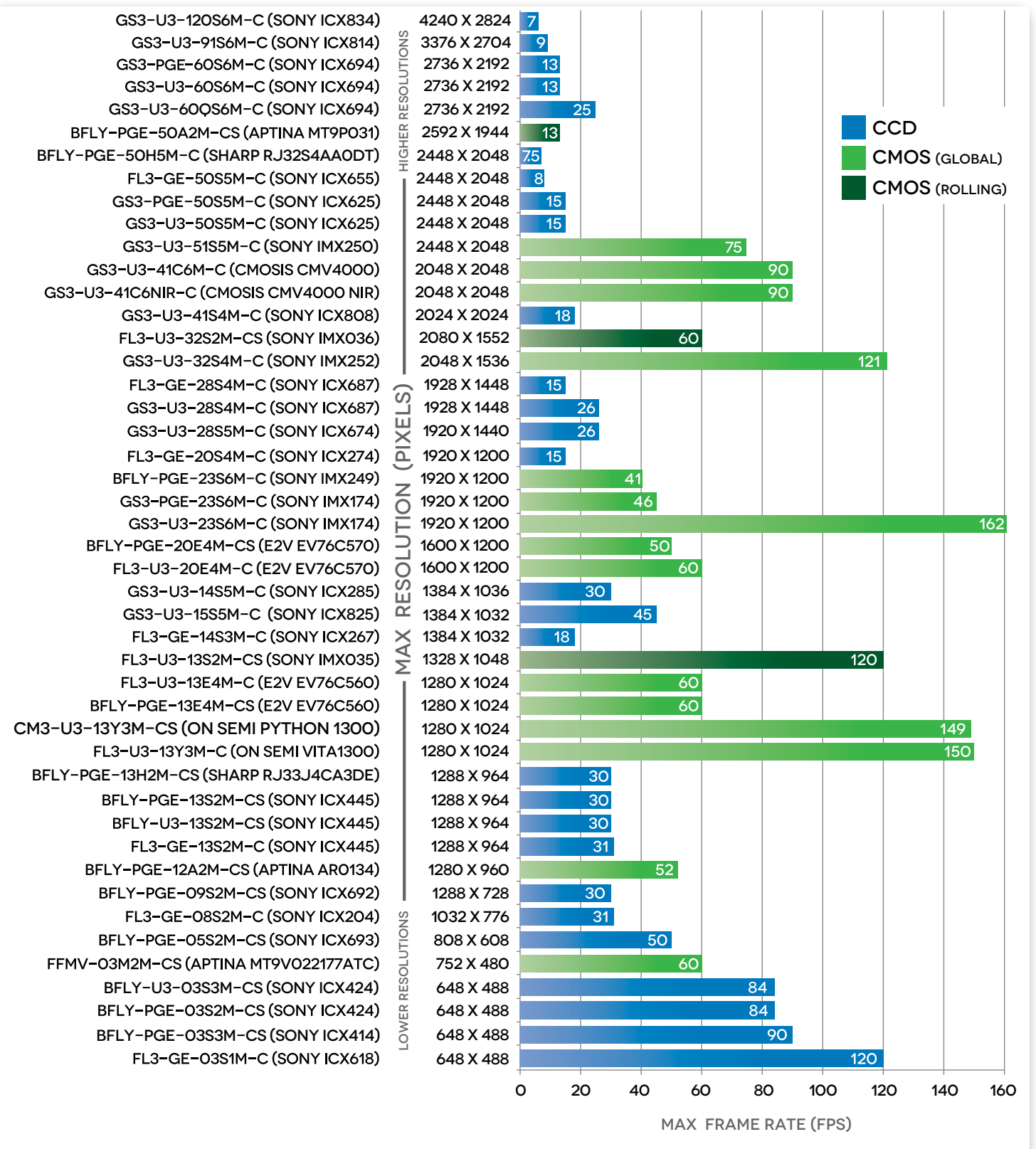
## ABSOLUTE SENSITIVITY THRESHOLD (γ) (LESS IS BETTER)

Absolute sensitivity threshold is the minimum number of photons needed to equal the noise level. The lower the number the less light is needed to detect useful imaging data.



# MONO SINGLE LENS CAMERAS

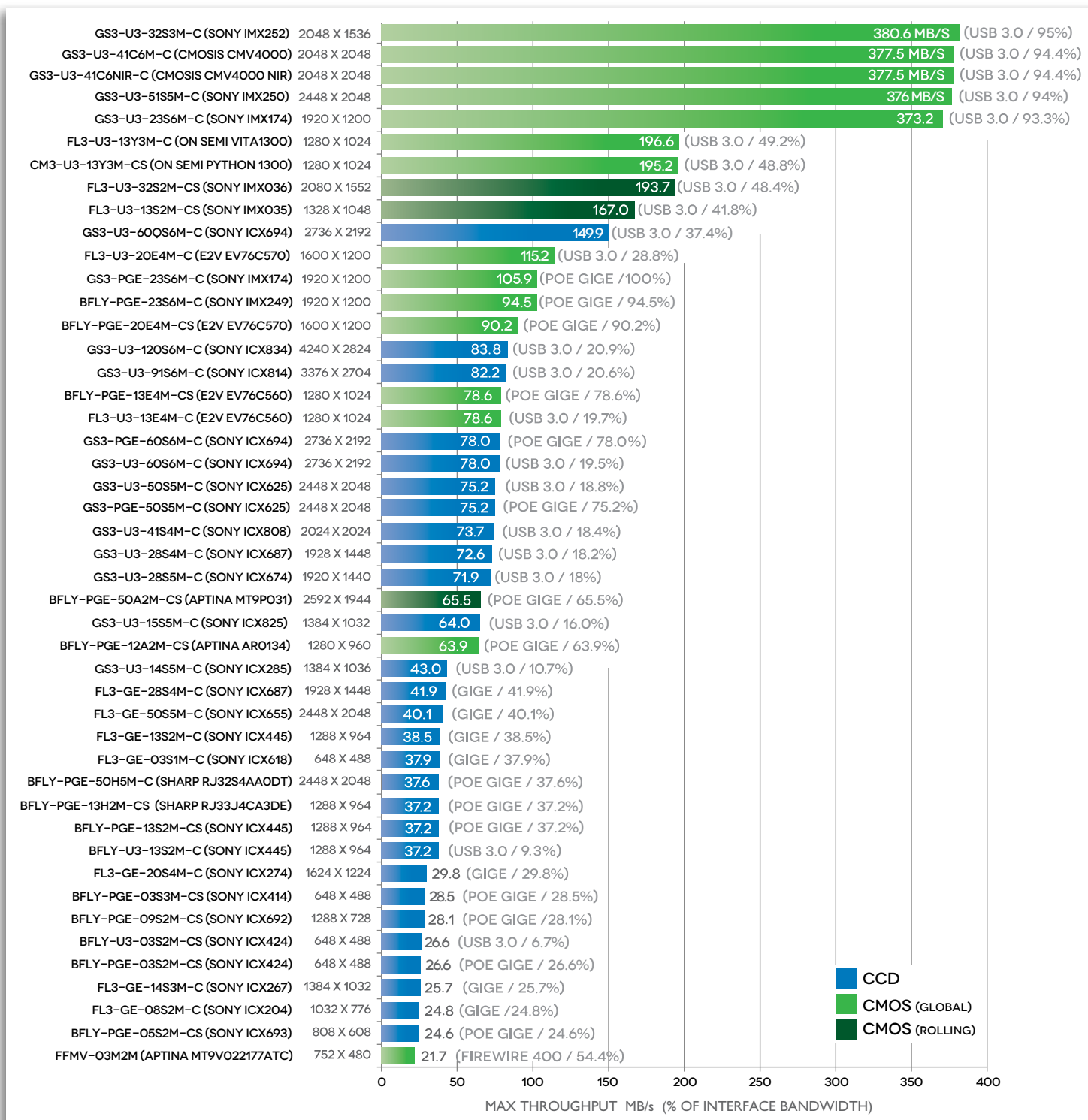
## MAX RESOLUTION TO MAX FRAME RATE

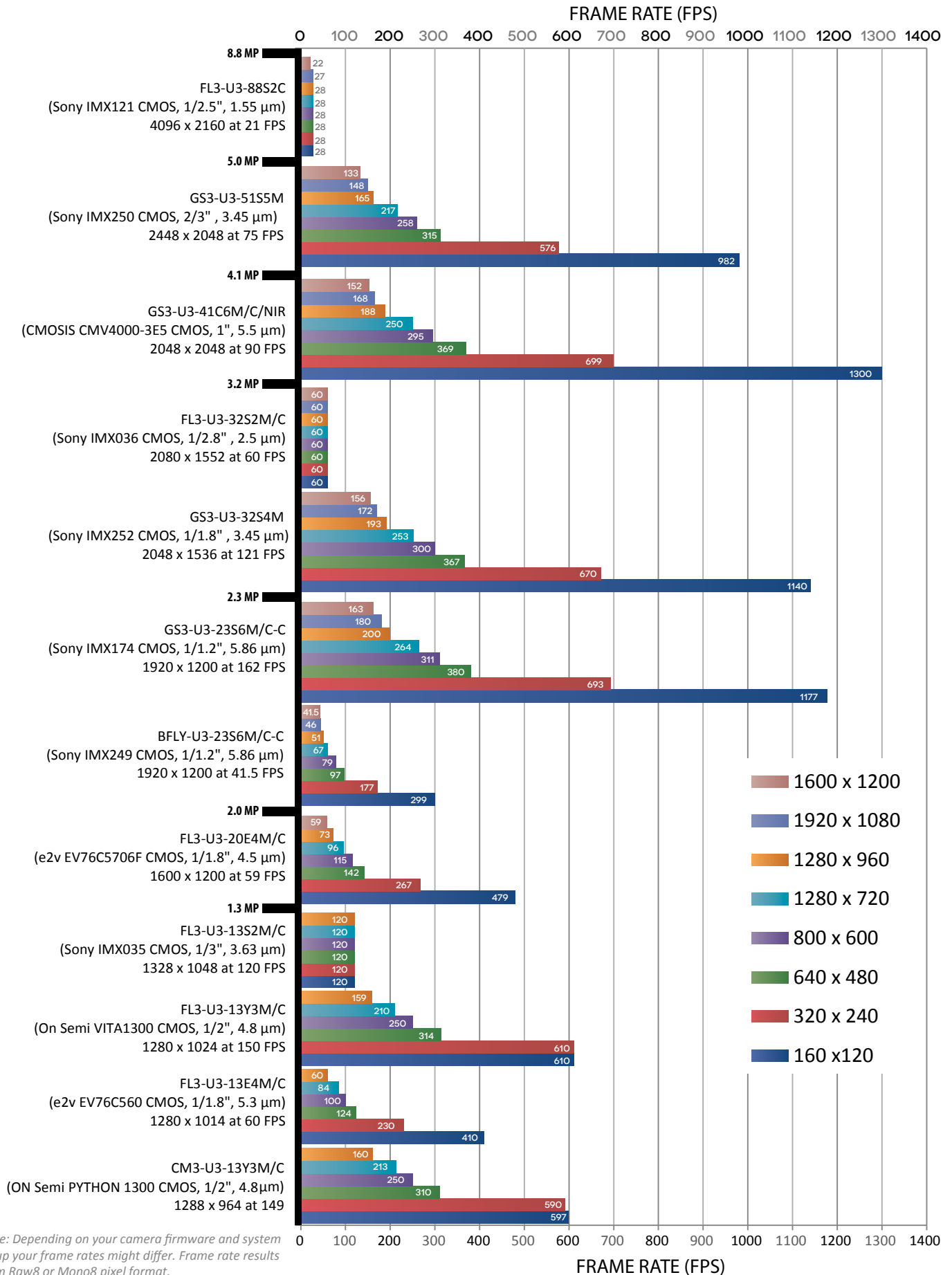


# MONO SINGLE LENS CAMERAS

## CAMERA THROUGHPUT (MB/s) AND % OF INTERFACE BANDWIDTH

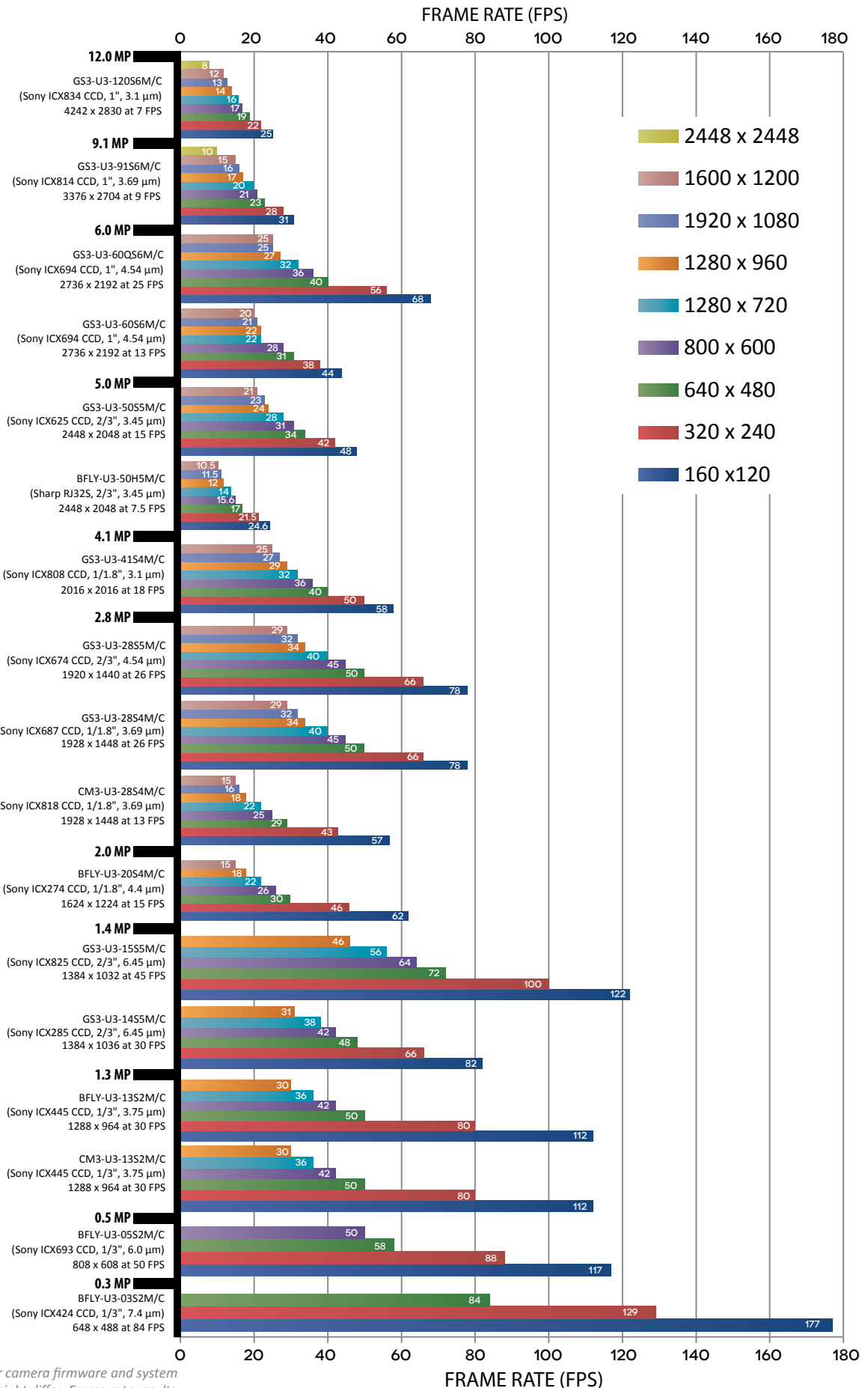
When considering multi-camera setups bandwidth considerations are a must. We calculated the maximum throughput (MB/s) by multiplying the maximum resolution by the maximum frame rate (note: to simplify these calculations an image data format of Mono8 was used). In addition we added the percentage of interface bandwidth which the camera model pumped out. For those calculations we used 400 MB/s for USB 3.0, 100 MB/s for GigE, 80 MB/s for FireWire 800, and 40 MB/s for both FireWire 400 and USB 2.0.





Note: Depending on your camera firmware and system setup your frame rates might differ. Frame rate results from Raw8 or Mono8 pixel format.

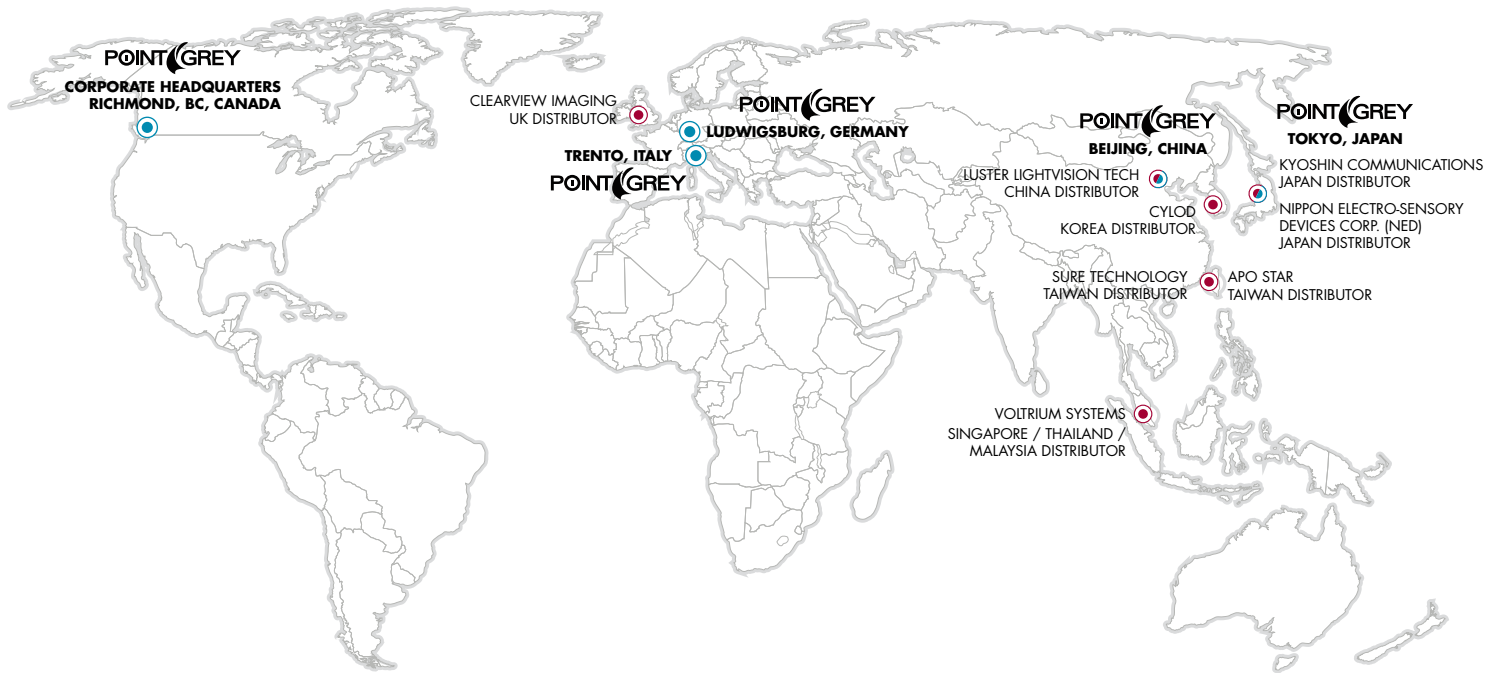
# USB 3.0 CCD Resolution vs Frame Rate Chart



Note: Depending on your camera firmware and system setup your frame rates might differ. Frame rate results from Raw8 or Mono8 pixel format.







# POINT GREY

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