

# CAMERA CATALOG AND SENSOR REVIEW

USB  
VISION

GIGE  
VISION

FireWire

CAMERA  
Link

USB 2.0

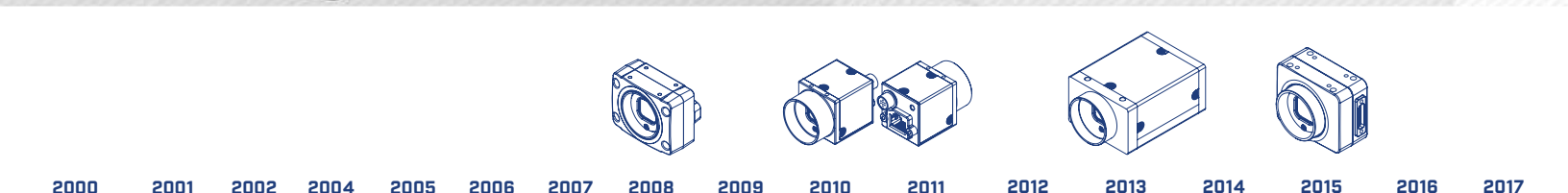
[flir.com/mv](http://flir.com/mv)

 **FLIR**<sup>®</sup>

MACHINE VISION



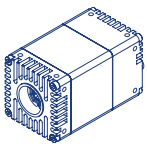
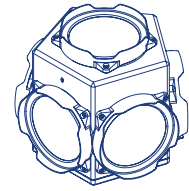
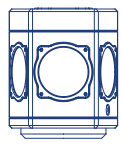
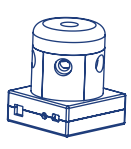
FLIR is a global leader in the design and manufacture of innovative, high-performance digital cameras for industrial, medical and life science, traffic, biometric, GIS, and people counting applications. We offer a unique and comprehensive portfolio of USB 3.1, 10 GigE, GigE, FireWire, and USB 2.0 products known for their outstanding quality, ease of use, and unbeatable price-performance.



2000	2001	2002	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
First IEEE 1394 stereo vision camera Digiclops	First IEEE 1394 imaging camera Firefly	First spherical vision camera Ladybug	First IEEE 1394b camera Dragonfly Express	New products Dragonfly2 Ladybug2	New products Flea2 Firefly MV	New products Grasshopper FirePRO	New product USB 2.0 camera Chameleon  New product Ladybug3	World's first USB 3.0 Camera	New product Flea3  New product GigE camera Grasshopper2	First Camera Link camera Gazelle  First USB 3.0 camera Flea3  World's smallest GigE camera Flea3  New product Grasshopper Express	New Product IP camera Zebra2  World's Smallest PoE GigE Camera Blackfly	New USB3 products Ladybug5 Grasshopper3	New USB3 product Blackfly USB 3.0  New GigE product Grasshopper3	New USB3 product Chameleon 3	New USB3 and GigE Vision product Blackfly S	10 GigE Camera Oryx

**QUICK FACTS**

- FLIR acquired Point Grey in Nov 2016
- **ISO 9001:2008** registered
- **200k/yr** machine vision camera capacity
- Designed and manufactured in **Canada**
- **3 year warranty** on most products
- **Global offices** & distribution network



### USB 3.1 Camera Features:

- Largest selection of CMOS and CCD sensors
- FPGA and frame buffer-based architecture for optimal reliability
- Proprietary USB 3.1 link layer and driver stack
- Industry-standard C- and CS- mount
- Fully tested USB 3.1 Gen 1 accessories: interface cards, hubs, and cables



# BLACKFLY® S

UP TO 20MP CMOS IN AN ICE CUBE



# CHAMELEON® 3

FLEXIBLE FORM FACTOR



Model#	Sensor Specifications	Shutter	Max Res	Max FPS	Model#	Sensor Specifications	Shutter	Max Res	Max FPS		
BFS-U3-04S2C/M-CS <sup>1</sup>	0.4MP Sony IMX287 CMOS*	1/2.9"	6.9µm Global	720 x 540	523 fps	CM3-U3-13S2C/M-CS	1.3MP Sony ICX445 CCD**	1/3"	3.75µm Global	1288 x 964	30 fps
BFS-U3-13Y3C/M-C	1.3MP ON Semi PYTHON 1300 CMOS	1/2"	4.8µm Global	1280 x 1024	170 fps	CM3-U3-13S2C/M-CS-BD	1.3MP Sony ICX445 CCD**	1/3"	3.75µm Global	1288 x 964	30 fps
BFS-U3-16S2C/M-CS	1.6MP Sony IMX273 CMOS*	1/2.9"	3.45µm Global	1440 x 1080	241 fps	CM3-U3-13Y3C/M-CS	1.3MP ON Semi PYTHON 1300 CMOS	1/2"	4.8µm Global	1280 x 1024	149 fps
BFS-U3-32S4C/M-C	3.2MP Sony IMX252 CMOS*	1/1.8"	3.45µm Global	2048 x 1536	118 fps	CM3-U3-13Y3C/M-S-BD	1.3MP ON Semi PYTHON 1300 CMOS	1/2"	4.8µm Global	1280 x 1024	149 fps
BFS-U3-51S5C/M-C	5.0MP Sony IMX250 CMOS*	2/3"	3.45µm Global	2448 x 2048	75 fps	CM3-U3-28S4C/M-CS	2.8MP Sony ICX818 CCD**	1/1.8"	3.69µm Global	1928 x 1448	13 fps
BFS-U3-89S6C/M-C <sup>1</sup>	8.9MP Sony IMX255 CMOS*	1"	3.45µm Global	4096 x 2160	43 fps	CM3-U3-31S4C/M-CS	3.2MP Sony IMX265 CMOS*	1/1.8"	3.45µm Global	2048 x 1536	55 fps
BFS-U3-123S6C/M-C <sup>1</sup>	12.3MP Sony IMX253 CMOS*	1.1"	3.45µm Global	4096 x 3000	30 fps	CM3-U3-50S5C/M-CS	5.0MP Sony IMX264 CMOS*	2/3"	3.45µm Global	2448 x 2048	35 fps
BFS-U3-200S6C/M-C	20MP Sony IMX183 CMOS**	1"	2.4µm Rolling	5472 x 3648	18 fps						

<sup>1</sup>Coming Soon

\*High performance Sony Pregius™ Global Shutter CMOS

\*\*Sony Exmor R™ CMOS

\*\*High performance Sony Pregius™ Global Shutter CMOS

\*\*High sensitivity Sony ExView HAD CCD\*

	BLACKFLY® S	CHAMELEON® 3
<b>INTERFACE</b>	USB 3.1 Gen 1 interface with screw locks for camera control, data, and power	USB 3.1 Gen 1 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>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>	8-24 V via GPIO or 5 V via USB 3.1 interface, <3 W	5 - 24 V via GPIO or 5 V via USB 3.1 interface, <3 W
<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" 1.55 µm Rolling	4000 x 3000	15 fps	

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

\*High performance Sony Exmor CMOS\*\*Low Light Sensitivity Sony STARVIS™ CMOS

USB 3.1 Gen 1 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

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)

5-24 V via GPIO or 5 V via USB 3.1 interface, <2.5W

CS-mount, C-mount

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

3 years

USB 3.1 Gen 1 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-U3-120S3) / 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

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 3.1 interface, <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

## GAMMA

## TRIGGER MODES

## IMAGE BUFFER

## USER SETS

## SIZE (WxHxD)

## MASS

## POWER

## LENS MOUNT

## TEMPERATURE

## WARRANTY



# GRASSHOPPER<sup>3</sup>

HIGH PERFORMANCE CMOS AND CCD



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	163 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-U3-41S6C/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-U3-60S6C/M-C	6.0MP Sony ICX694 CCD**	1"	4.54 μm Global 2736 x 2192	25 fps
GS3-U3-89S6C/M-C	8.9MP Sony IMX255 CMOS*	1"	3.45 μm Global 4096 x 2160	43 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	12MP Sony ICX834 CCD**	1"	3.1 μm Global 4240 x 2824	7 fps
GS3-U3-123S6C/M-C	12.3MP Sony IMX253 CMOS*	1.1"	3.45 μm Global 4096 x 3000	30 fps

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

- INTERFACE** USB 3.1 Gen 1 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, 32S4, 51S5, 89S6, 123S6) • 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
- 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 V via USB 3.1 interface or 8-24 V via GPIO (external power is recommended for this model)
- LENS MOUNT** C-mount
- TEMPERATURE** -30° to 60°C (storage) • 0° to 50°C (operating)
- WARRANTY** 3 years



# FLIR ORYX



## High Speed Interface

Capture global shutter 4K images at 60FPS (12-bit), and minimize cycle times with low latency image transfer

## Reliability and Simplicity

Proven and reliable 10GBASE-T interface supports cable lengths over 50 m using widely available hardware

## Flexibility for Integrators

GiGE Vision compatibility and advanced on-camera features give integrators the tools to quickly develop innovative solutions

# 4K60 and beyond

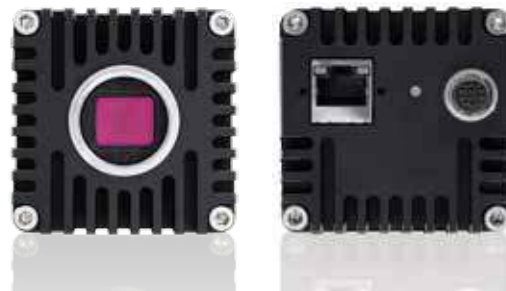


### 10 Gigabit Ethernet Camera Features:

- 4K60 and beyond
- The latest Global shutter CMOS sensors at their maximum frame rates
- High density 12 pin GPIO
- IEEE 1588 Precision Time Protocol
- Designed and tested for continuous operation at 50°C

## ORYX™

10 Gigabit Ethernet Camera



Model#	Sensor Specifications	Shutter	Max Res	Max FPS
ORX-10G-5155M/C-C <sup>1</sup>	5.0MP Sony IMX250 CMOS*	2/3"	3.45 µm Global 2448 x 2048	163 fps
ORX-10G-8956M/C-C <sup>1</sup>	8.9MP Sony IMX255 CMOS*	1"	3.45 µm Global 4096 x 2160	93 fps
ORX-10G-12356M/C-C <sup>2</sup>	12.3MP Sony IMX253 CMOS*	1.1"	3.45 µm Global 4096 x 3000	68 fps

<sup>1</sup>Coming Soon    <sup>2</sup>Coming Q4 2017    \*High performance Sony Pregius™ Global Shutter CMOS

10 Gigabit Ethernet (10GBASE-T)

GiGE Vision

12 Pin Hirose GPIO connector for power, trigger strobe  
2x Opto-isolated input, and output, 2x non-isolated bi-directional, serial port over non-isolated I/O,  
Auxiliary output (3.3V, 120 mA max)

8-bit • 10-bit • 12-bit

Pixel Binning, Decimation, and Region of Interest

Color correction Matrix, gamma, hue, saturation, and sharpness

0.5 to 4, programmable lookup table

External Trigger, Software Trigger

Logic Blocks, Counter and Timers, Sequencer with 8 user sets

IEEE 1588 Precision Time Protocol

240MB

2 memory channels for custom camera settings

60x60x100mm excluding lens holder, without optics (metal case)

Externally Powered over GPIO (12-24V) 12W Max

C-mount

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

3 years

INTERFACE

MACHINE VISION STANDARD

GPIO

ADC

PARTIAL IMAGE MODES

IMAGE PROCESSING

GAMMA

TRIGGER MODES

TRIGGER LOGIC

TIME SYNCHRONIZATION PROTOCOL

IMAGE BUFFER

USER SETS

SIZE (WXHXD)

POWER

LENS MOUNT

TEMPERATURE

WARRANTY





### GigE Camera Features:

- Unique selection of CMOS and CCD 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	Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>BFS-PGE-0452C/M-CS<sup>1</sup></b>	0.4MP Sony IMX287 CMOS <sup>1</sup>	1/2.9" 6.9 μm Global	720 x 540	295 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>BFS-PGE-13Y3C/M-C</b>	1.3MP ON Semi PYTHON 1300 CMOS	1/2" 4.8 μm Global	1280 x 1024	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>BFS-PGE-16S2C/M-CS</b>	1.6MP Sony IMX273 CMOS <sup>1</sup>	1/2.9" 3.45 μm Global	1440 x 1080	73 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>BFS-PGE-31S4C/M-C</b>	3.2MP Sony IMX265 CMOS <sup>1</sup>	1/1.8" 3.45 μm Global	2048 x 1536	35 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>BFS-PGE-50S5C/M-C</b>	5.0MP Sony IMX264 CMOS <sup>1</sup>	2/3" 3.45 μm Global	2448 x 2048	24 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-C<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/S3AA00T 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

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

<sup>\*</sup>High sensitivity Sony EXview HAD CCD<sup>™</sup>    <sup>\*\*</sup>High sensitivity Sony EXview HAD CCD II<sup>™</sup>    <sup>\*\*\*</sup>High performance Sony Pregius<sup>®</sup> Global Shutter CMOS

INTERFACE	Gigabit Ethernet interface with screw locks for camera control and data; Power over Ethernet	Gigabit Ethernet interface with screw locks for camera control and data; Power over Ethernet
<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.	6-pin Hirose HR10A-7R-6PB GPIO connector for trigger, strobe, and power. 1 opto-isolated input, 1 opto-isolated output
<b>ADC</b>	12-bit • 10-bit (BFS-PGE-13Y3)	10-bit (BFLY-PGE-13E4, BFLY-PGE-20E4) • 12-bit
<b>IMAGE DATA FORMATS</b>	Mono8, Mono16, Bayer8, Bayer16, RGB8, YCbCr8, YCbCr411_8, YCbCr422_8	Mono8, Mono12, Mono16, Raw8, Raw12, Raw16 (all models) / RGB, YUV411, YUV422, YUV 444 (color models)
<b>PARTIAL IMAGE MODES</b>	Pixel binning and region of interest (ROI) modes	Pixel binning and region of interest (ROI) modes
<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 (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)
<b>TIME SYNCHRONIZATION PROTOCOL</b>	IEEE 1588 Precision Time Protocol	
<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)	29x29x30 mm excluding lens holder, without optics (metal case)
<b>MASS</b>	36g (Without optics or tripod mounting bracket)	36 grams (without optics or tripod mounting bracket)
<b>POWER</b>	Standard voltage via Power over Ethernet (PoE) or 8 - 24 V via GPIO interface, < 2.5 W	Standard voltage via Power over Ethernet (PoE) or 5 - 16 V via GPIO interface, < 2.5 W
<b>LENS MOUNT</b>	C-mount	CS-mount (5 mm C-mount adapter sold separately) / C-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







# 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 <sup>1</sup>	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 <sup>1</sup>	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 <sup>2</sup>	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

<sup>1</sup>High sensitivity Sony EXview HAD CCD™    <sup>2</sup>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 <sup>1</sup>	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 <sup>2</sup>	1" 4.54 μm Global	2736 x 2192	13 fps
<b>GS3-PGE-91S6C/M-C</b>	9.1MP Sony ICX814 CCD <sup>2</sup>	1" 3.69 μm Global	3376 x 2704	9 fps

<sup>1</sup>High performance Sony Exmor CMOS™    <sup>2</sup>High sensitivity Sony EXview HAD CCD II™

Gigabit Ethernet interface with screw locks for camera control and data

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

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

Pixel binning and region of interest (ROI) modes

0.50 to 4.00, programmable lookup table

Standard, bulb, skip frames, multi-exposure preset, multi-exposure pulse width, overlapped, multi-shot

32 MB frame buffer

2 memory channels for custom camera settings

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

38 grams (without optics or tripod mounting bracket)

Standard voltage via Power over Ethernet (PoE) or 5 - 24 V via GPIO interface, < 2.5 W

C-mount (FL3-GE-13S2 also available with CS-mount)

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

3 years



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

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

10/12-bit (GS3-PGE-23S6) • 14-bit

Mono8, Mono12, Mono16 (all models) RGB, YUV411, YUV422, YUV444, Raw8, Raw12, Raw16 (color models)

Pixel binning and region of interest (ROI) modes

0.50 to 4.00, programmable lookup table

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

128 MB frame buffer

2 memory channels for custom camera settings

44x29x58 mm excluding lens holder and connectors (metal case)

90 grams (without optics or tripod mounting bracket)

Standard voltage via Power over Ethernet (PoE) or 5 - 24 V via GPIO interface, < 2.5 W

C-mount

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

3 years



## INTERFACE

## GPIO

## ADC

## IMAGE DATA FORMATS

## PARTIAL IMAGE MODES

## GAMMA

## TRIGGER MODES

## IMAGE BUFFER

## USER SETS

## SIZE (WxHxD)

## MASS

## POWER

## LENS MOUNT

## TEMPERATURE

## WARRANTY

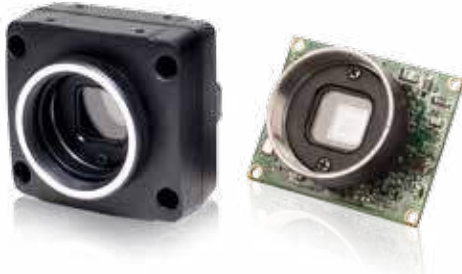


**USB 2.0 Camera Features:**

- 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	Model#	Sensor Specifications	Shutter	Max Res	Max FPS
<b>CMLN-13S2C/M-CS</b>	1.3MP Sony ICX445 CCD* 1/3" 3.75 µm Global		1296 x 964	18 fps	<b>FMVU-03MTC/M-CS</b>	0.3MP Micron MT9V022 CMOS 1/3" 6.0 µm Global		752 x 480	60 fps
	<small>*High sensitivity Sony EXView HAD CCD™</small>				<b>FMVU-13S2C-CS</b>	1.3MP Sony IMX035 CMOS* 1/3" 3.63 µm Rolling		1328 x 1048	23 fps
						<small>*High speed Sony Exmor™ CMOS</small>			

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

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

**GPIO** 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

**ADC** 12-bit

10-bit (FMVU-03MT) • 10/12-bit (FMVU-13S2)

**IMAGE DATA FORMATS** Y8, Y16 (mono)  
8-bit and 16-bit Raw Bayer data (color)

Y8, Y16 (mono)  
8-bit and 16-bit raw Bayer data (color)

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

Pixel binning and region of interest (ROI) modes

**GAMMA** 0.50 to 4.00, programmable lookup table

0 to 1 (FMVU-03MT)/0.50 to 4.00 (FMVU-13S2)

**TRIGGER MODES** Standard, bulb, skip frames, overlapped

Standard, skip frames

**IMAGE BUFFER** N/A

N/A

**USER SETS** 2 memory channels for custom camera settings

2 memory channels for custom camera settings

**SIZE (WxHxD)** 39x31mm (board level) / 25.5x44x41 mm excluding lens holder, without optics (plastic case)

39x24 mm (board level) / 24.4x44x34 mm excluding lens holder, without optics (plastic case)

**MASS** 22 g (board level) / 37 g (plastic case) (without optics or tripod mounting bracket)

14 g (board level) / 37 g (plastic case) (without optics or tripod mounting bracket)

**POWER** 2 W, 4.745 to 5.25 V via USB 2.0 interface or JST 7-pin GPIO connector

8-30 V, 1 W at 12 V via 1394a interface

**LENS MOUNT** CS-mount (5 mm C-mount adapter included)

CS-mount

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

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

**WARRANTY** 1 year

1 year





**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



**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
FL3-FW-03S1C/M-C	0.3MP Sony ICX618 CCD* 1/4" 5.6 µm	Global	648 x 488	120 fps
FL3-FW-03S3C/M-C	0.3MP Sony ICX414 CCD 1/2" 9.9 µm	Global	648 x 488	76 fps
FL3-FW-14S3C/M-C	1.4MP Sony ICX267 CCD 1/2" 4.65 µm	Global	1384 x 1032	16 fps
FL3-FW-20S4C/M-C	2.0MP Sony ICX274 CCD 1/1.8" 4.4 µm	Global	1624 x 1224	15 fps

\*High sensitivity Sony EVview HAD CCD \*

# GAZELLE<sup>®</sup>

HIGH RESOLUTION, FAST FRAME RATES



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

IEEE 1394b 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

Camera Link LVDS for camera control and video data transmission. Base (2-tap) and Full (8-tap) configurations

8-pin Hirose HR25 GPIO connector; opto-isolated pins for trigger and strobe

**INTERFACE  
GPIO**

12-bit  
Y8, Y16 (all models)  
RGB, YUV411, YUV422, Raw8, Raw16 (color models)  
Pixel binning and region of interest (ROI) modes  
0.50 to 4.00, programmable lookup table  
Standard, bulb, skip frames, overlapped, multiple exposure, multi-shot  
32 MB frame buffer  
2 memory channels for custom camera settings

10-bit  
Mono8, Mono10  
Single or multiple region of interest modes  
N/A  
Single-shot, bulb, software trigger  
N/A  
2 memory channels for custom camera settings

**ADC  
IMAGE DATA FORMATS  
PARTIAL IMAGE MODES  
GAMMA  
TRIGGER MODES  
IMAGE BUFFER  
USER SETS**

29x29x30 mm excluding lens holder, without optics (metal case)  
58 g (without optics or tripod mounting bracket)  
8-30 V, <2.5 W via GPIO or 1394b interface  
C-mount  
-30° to 60°C (storage) • 0° to 45°C (operating)  
3 years

44x29x59.5 mm excluding lens holder, without optics (metal case)  
90 g (without optics or tripod mounting bracket)  
12 V, 6 W at 12 V  
C-mount  
-30° to 60°C (storage) • -10° to 50°C (operating)  
3 years

**SIZE (WxHxD)  
MASS  
POWER  
LENS MOUNT  
TEMPERATURE  
WARRANTY**



# SPINNAKER SDK

## SPINNAKER SDK IS A GENICAM3 API LIBRARY BUILT FOR MACHINE VISION DEVELOPERS.

It features an intuitive SpinView GUI, rich example code, and comprehensive documentation designed to help you build your application faster. Spinnaker is recommended for new projects.

### 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



- **Mac OS\***  
\*Coming Soon

### MULTIPLE INTERFACES



This SDK provides the same programming interface across USB3 Vision and GigE Vision cameras.

### MULTIPLE LANGUAGES

- **C, C++, C#**
- **Visual Basic .NET**
- **DirectShow**
- **Cognex**
- **Python**

# FLYCAPTURE SDK

**THE FLYCAPTURE SOFTWARE DEVELOPMENT KIT (SDK)** provides a common software interface to control and acquire images from FLIR USB 3.1\*, 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 3.1 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

### MULTIPLE PLATFORMS

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



- **LINUX**®  
Ubuntu® 32/64-bit  
Arm 32/64 bit



- **macOS** (API only)

### MULTIPLE INTERFACES



The SDK provides the same programming interface across USB 3.1\*, USB 2.0, GigE and FireWire products.

### MULTIPLE LANGUAGES

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

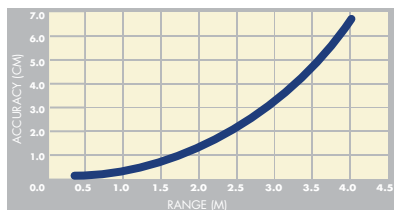
### KEY FEATURES

- Proprietary USB 3.1 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



## 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  
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

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  
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

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

## LADYBUG® 5+

8K30 OR 4K60, 30 MP, GLOBAL SHUTTER



## LADYBUG® 3

12MP, WATER RESISTANT



Model#	Sensor Specifications	Shutter	Max Res Per Sensor	Max FPS	Model#	Sensor Specifications	Shutter	Max Res Per Sensor	Max FPS
LD5P-U3-5155C-R	30MP Sony IMX264 CMOS	2/3" 3.45 µm Global	2448 x 2048	2448 x 2048 @ 30 FPS 2448 x 1024 @ 60 FPS	LD3-2054C-33	12MP Sony ICX274 CCD	1/1.8" 4.4 µm Global	1600 x 1200	16 FPS Compressed, 6.5 FPS Uncompressed
LD5P-U3-5155C-B								1600 x 800	32 FPS

**INTERFACE** USB 3.1 Gen 1 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 f2.5, 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 in uncompressed and JPEG

Raw8, Mono8, JPEG8

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

8-bit raw Bayer (color) digital data

**GAIN RANGE** Automatic/manual/one-push modes for 8-bit formats; manual mode for 12-bit formats; 0 - 18 dB

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 and JPEG compression, are 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 (external power required)

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

**TEMPERATURE** -30° to 60°C (storage) • -20° to 50°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:



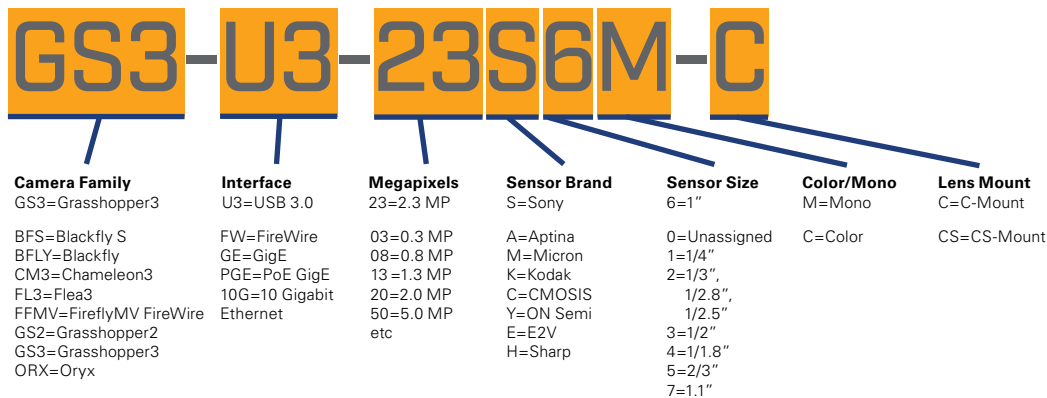
USB3 VISION CAMERAS	Tripod Adapter	5mm C-Mount Adapter	Cables	Lens
Blackfly S USB3	No	No	No	No
Blackfly USB3	No	No	No	No
Chameleon3 USB3	No	No	No	No
Flea3 USB3	Yes	Yes for CS-mount models	No	No
Grasshopper3 USB3	Yes	N/A (no CS-mount models)	No	No



GIGE VISION CAMERAS	Tripod Adapter	5mm C-Mount Adapter	Cables	Lens
Blackfly GigE	No	No	No	No
Blackfly S 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

## 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.



## Where can I get more technical support?

You can search our online Knowledge Base for answers to camera issues here: [www.flir.com/knowledgebase](http://www.flir.com/knowledgebase)  
You can contact our support team directly and email them your issue. We have support teams staffed at our North America, Germany, China and Japan offices ready to assist with your cameras. You can contact our support team directly at [mv-support@flir.com](mailto:mv-support@flir.com).

## Where can I get more sales assistance?

Pricing and web purchase are available at [www.flir.com/mv](http://www.flir.com/mv). You can also email us, we're always happy to help: [mv-sales@flir.com](mailto:mv-sales@flir.com)



	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 3.1 Gen 1	ON Semi PYTHON 1300 CMOS	1/2"	4.8µm	1280 x 1024	170 fps	
	BFS-U3-3254C/M-C	USB 3.1 Gen 1	Sony IMX252 CMOS	1/1.8"	3.45 µm	2048 x 1536	118 fps	
	BFS-U3-5155C/M-C	USB 3.1 Gen 1	Sony IMX250 CMOS	2/3"	3.45 µm	2464 x 2048	75 fps	
	BFS-U3-8956C/M-C	USB 3.1 Gen 1	Sony IMX255 CMOS	1"	3.45 µm	4096 x 2160	43 fps	
	BFS-U3-12356C/M-C	USB 3.1 Gen 1	Sony IMX253 CMOS	1.1"	3.45 µm	4096 x 3000	30 fps	
	BFS-U3-20056C/M-C	USB 3.1 Gen 1	Sony IMX183 CMOS	1"	2.4 µm	5472 x 3648	18 fps	
<b>CHAMELEONS</b> Page 3	CM3-U3-13S2C/M-CS	USB 3.1 Gen 1	Sony ICX445 CCD	1/3"	3.75µm	1288 x 964	30 fps	
	CM3-U3-13Y3C/M-CS	USB 3.1 Gen 1	ON Semi PYTHON 1300 CMOS	1/2"	4.8µm	1280 x 1024	149 fps	
	CM3-U3-2854C/M-CS	USB 3.1 Gen 1	Sony ICX818 CCD	1/1.8"	3.69µm	1928 x 1448	13 fps	
	CM3-U3-3154C/M-CS	USB 3.1 Gen 1	Sony IMX265 CMOS	1/1.8"	3.45 µm	2048 x 1536	55 fps	
	CM3-U3-5055C/M-CS	USB 3.1 Gen 1	Sony IMX264 CMOS	2/3"	3.45 µm	2448 x 2048	35 fps	
<b>BLACKFLY</b> Page 4	BFLY-U3-03S2C/M-CS	USB 3.1 Gen 1	Sony ICX424 CCD	1/3"	7.4µm	648 x 488	84 fps	
	BFLY-U3-05S2C/M-CS	USB 3.1 Gen 1	Sony ICX693 CCD	1/3"	6.0µm	808 x 608	50 fps	
	BFLY-U3-13S2C/M-CS	USB 3.1 Gen 1	Sony ICX445 CCD	1/3"	3.75µm	1288 x 964	30 fps	
	BFLY-U3-20S4C/M-CS	USB 3.1 Gen 1	Sony ICX274 CCD	1/1.8"	4.4µm	1624 x 1224	15 fps	
	BFLY-U3-23S6C/M-C	USB 3.1 Gen 1	Sony IMX249 CMOS	1/1.2"	5.86 µm	1920 x 1200	41 fps	
	BFLY-U3-50H5C/M-C	USB 3.1 Gen 1	Sharp RJ3253AAODT CCD	2/3"	3.45 µm	2448 x 2048	7.5 fps	
<b>FLEA3</b> Page 4	FL3-U3-13S2C/M-CS	USB 3.1 Gen 1	Sony IMX035 CMOS	1/3"	3.63µm	1328 x 1048	120 fps	
	FL3-U3-13Y3M-C	USB 3.1 Gen 1	ON Semi VITA1300 CMOS	1/2"	4.8µm	1280 x 1024	150 fps	
	FL3-U3-13E4C/M-C	USB 3.1 Gen 1	e2v EV76C560 CMOS	1/1.8"	5.3µm	1280 x 1024	60 fps	
	FL3-U3-20E4C/M-C	USB 3.1 Gen 1	e2v EV76C5706F CMOS	1/1.8"	4.5µm	1600 x 1200	59 fps	
	FL3-U3-32S2C/M-CS	USB 3.1 Gen 1	Sony IMX036 CMOS	1/2.8"	2.5µm	2080 x 1552	60 fps	
	FL3-U3-120S3C-C	USB 3.1 Gen 1	Sony IMX172 CMOS	1/2.3"	1.55µm	4000 x 3000	15 fps	
<b>GRASSHOPPERS3</b> Page 5	GS3-U3-14S5C/M-C	USB 3.1 Gen 1	Sony ICX285 CCD	2/3"	6.45µm	1384 x 1036	30 fps	
	GS3-U3-15S5C/M-C	USB 3.1 Gen 1	Sony ICX825 CCD	2/3"	6.45µm	1384 x 1032	45 fps	
	GS3-U3-23S6C/M-C	USB 3.1 Gen 1	Sony IMX174 CMOS	1/1.2"	5.86µm	1920 x 1200	163 fps	
	GS3-U3-28S4C/M-C	USB 3.1 Gen 1	Sony ICX687 CCD	1/1.8"	3.69µm	1928 x 1448	26 fps	
	GS3-U3-28S5C/M-C	USB 3.1 Gen 1	Sony ICX674 CCD	2/3"	4.54µm	1920 x 1440	26 fps	
	GS3-U3-32S4C/M-C	USB 3.1 Gen 1	Sony IMX252 CMOS	1/1.8"	3.45µm	2048 x 1536	121 fps	
	GS3-U3-41S4C/M-C	USB 3.1 Gen 1	Sony ICX808 CCD	1/1.8"	3.1µm	2016 x 2016	18 fps	
	GS3-U3-41C6NIR-C	USB 3.1 Gen 1	CMOSIS CMV4000-3E12 CMOS	1"	5.5µm	2048 x 2048	90 fps	
	GS3-U3-41C6C/M-C	USB 3.1 Gen 1	CMOSIS CMV4000-3E5 CMOS	1"	5.5µm	2048 x 2048	90 fps	
	GS3-U3-50S5C/M-C	USB 3.1 Gen 1	Sony ICX625 CCD	2/3"	3.45µm	2448 x 2048	15 fps	
	GS3-U3-51S5C/M-C	USB 3.1 Gen 1	Sony IMX250 CMOS	2/3"	3.45µm	2448 x 2048	75 fps	
	GS3-U3-60S6C/M-C	USB 3.1 Gen 1	Sony ICX694 CCD	1"	4.54µm	2736 x 2192	13 fps	
	GS3-U3-60Q56C/M-C	USB 3.1 Gen 1	Sony ICX694 CCD	1"	4.54µm	2736 x 2192	25 fps	
	GS3-U3-89S6C/M-C	USB 3.1 Gen 1	Sony IMX255 CMOS	1"	3.45µm	4096 x 2160	43 fps	
	GS3-U3-91S6C/M-C	USB 3.1 Gen 1	Sony ICX814 CCD	1"	3.69µm	3376 x 2704	9 fps	
	GS3-U3-120S6C/M-C	USB 3.1 Gen 1	Sony ICX834 CCD	1"	3.1µm	4240 x 2824	7 fps	
	GS3-U3-123S6C/M-C	USB 3.1 Gen 1	Sony IMX253 CMOS	1.1"	3.45µm	4096 x 3000	30 fps	
	<b>ORYX</b> Page 6	ORX-10G-51S5M/C-C	10 Gigabit Ethernet	Sony IMX250 CMOS	2/3"	3.45µm	2448 x 2048	163 fps
		ORX-10G-89S6M/C-C	10 Gigabit Ethernet	Sony IMX255 CMOS	1"	3.45µm	4096 x 2160	93 fps
		ORX-10G-123S6M/C-C	10 Gigabit Ethernet	Sony IMX253 CMOS	1.1"	3.45µm	4096 x 3000	68 fps



<b>BLACKFLY S</b> Page 7	BFS-PGE-13Y3C/M-C	GiGE PoE	ON Semi PYTHON 1300 CMOS	1/2"	4.8 µm	1280 x 1024	84 fps
	BFS-PGE16S2M/C-CS	GiGE PoE	Sony IMX273 CMOS	1/2.9"	3.45 µm	1440 x 1080	73 fps
	BFS-PGE-31S4M/C-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	2448 x 2048	24 fps
<b>BLACKFLY</b> Page 7	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 AR0134 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-C	GiGE PoE	Sharp RJ33J4/RJ33J3 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-CS	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"	5.86 µm	1920 x 1200	41 fps
	BFLY-PGE-31S4M/C-C	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 8	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>GRASSHOPPERS3</b> Page 8	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



<b>CHAMELEON</b> Page 9	CMLN-13S2C/M-CS	USB 2.0	Sony ICX445 CCD	1/3"	3.75µm	1296x964	18 fps
	<b>FIREFLY MV</b> Page 9	FMVU-03MTC/M-CS	USB 2.0	Micron MT9V022 CMOS	1/3"	6.0µm	752x480
FMVU-13S2C-CS		USB 2.0	Sony IMX035 CMOS	1/3"	3.63µm	1328x1048	23 fps



<b>FLEA3</b> Page 10	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
<b>LADYBUG3</b> Page 13	LD3-20S4C-33	IEEE 1394b	Sony ICX274 CCD	1/1.8"	4.4µm	1600x1200 (x6)	16 fps
	LD5P-U3-51SSC-R/B	USB 3	Sony IMX264 CMOS	2/3"	3.45µm	2048x2448 (x6)	30 fps



SHUTTER	GPIO	LENS MOUNT	A/D CONVERTER	IMAGE DATA OUTPUT	ON-BOARD MEMORY	SIZE	OPERATING TEMP	WARRANTY
Global Global Global Global Global Rolling/Global Reset	6-pin Hirose HR10A-7R-6PB	C C C C C C	10-bit ADC 10/12-bit ADC 10/12-bit ADC 10/12-bit ADC 10/12-bit ADC 10/12-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 Global Global Global Rolling/Global Reset Rolling/Global Reset	8-pin Hirose HR25	C CS C C C C C	12-bit ADC 12-bit ADC 10-bit ADC 10-bit ADC 10-bit ADC 12-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 Global Global Global	8-pin Hirose HR25	C C C 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 10/12-bit ADC 14-bit ADC 14-bit ADC 10/12-bit ADC 14-bit ADC 14-bit ADC 10/12-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 Global	12-pin Hirose	C C C	8/10/12-bit ADC 8/10/12-bit ADC 8/10/12-bit ADC	8, 12, 16, 24-bit	256 MB frame buffer 32 MB flash memory	60 x 60 x 100 mm	0° to 50° C	3 years
Global Global Global Global	6-pin Hirose HR10A-7R-6PB	C C C	10-bit ADC 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 Global Global Global Global Global Rolling Global Rolling Global Global Rolling/Global Reset Global Global	6-pin Hirose HR10A-7R-6PB	CS CS CS CS 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 12-bit ADC 10-bit ADC 12-bit ADC 10-bit ADC 12-bit ADC 10/12-bit ADC 12-bit ADC 12-bit ADC 10/12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC 12-bit ADC	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 Global	8-pin Hirose HR25	C C C C	10/12-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	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 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

# ACCESSORY LIST

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Model#	TRIPOD MOUNT / ENCLOSURES	BFLY-PGE	BFS-U3 BFLY-U3	BB2	BBX3	CMLN	CM3-U3	DR2	FL3-FW	FL3-GE	FL3-U3	FL2	FFMV	FMVU	GRAS	GS2-GE	GS3-PGE	GS2-FW	GS3-U3	GZL-CL	LD3	LD5	ORYX	ZBR2
ACC-01-0003	Tripod Mount Adapter-3																							
ACC-01-0005	Tripod Mount Adapter-5																							
ACC-01-0011	Tripod Mount Adapter-11																							
ACC-01-0010	Metal Camera Enclosure for CS-Mount FFMV only																							
ACC-01-0012	Ladybug3 Desktop Mount																							
ACC-01-0013	Ladybug3 Tripod Mount Adapter and Plugs																							
ACC-01-0014	Zebra2 Tripod Mount Adapter																							

Model#	HOST ADAPTER CARDS	BFLY-PGE	BFS-U3 BFLY-U3	BB2	BBX3	CMLN	CM3-U3	DR2	FL3-FW	FL3-GE	FL3-U3	FL2	FFMV	FMVU	GRAS	GS2-GE	GS3-PGE	GS2-FW	GS3-U3	GZL-CL	LD3	LD5	ORYX	ZBR2
ACC-01-1000	IEEE 1394a OHCI PCI Host Adapter 3 Port																							
ACC-01-1001	IEEE 1394b OHCI PCI Host Adapter 2 Port																							
ACC-01-1100	Intel PRO 1000 CT Gigabit Ethernet PCIe																							
GIGE-PCIE2-2P02	Gigabit Ethernet PCIe PoE, 2 Port, Intel																							
ACC-01-1201	Generic USB 3.1 Gen 1 PCIe 2.0 x1 2 Port Card																							
ACC-01-1202	Generic USB 3.1 Gen 1 PCIe 2.0 x1 4 Port Card																							
U3-PCIE2-2P01X	PGR USB 3.1 PCIe 2.0 x1 Card, Fresco, 2-port																							
ACC-01-1203	USB 3.1 Gen 1 PCIe 2.0 x4 4 Port Card																							
ACC-01-1101	Generic 10GBASE-T PCIe 2.0 x4 1 Port																							

Model#	CABLES	BFLY-PGE	BFS-U3 BFLY-U3	BB2	BBX3	CMLN	CM3-U3	DR2	FL3-FW	FL3-GE	FL3-U3	FL2	FFMV	FMVU	GRAS	GS2-GE	GS3-PGE	GS2-FW	GS3-U3	GZL-CL	LD3	LD5	ORYX	ZBR2
ACC-01-2000	4.5 m, 6-pin to 6-pin, 1394a																							
ACC-01-2004	0.3m, 6-pin to 6-pin, Ultra Thin 1394a (10maq)																							
ACC-01-2003	1.0 m, 6-pin to 6-pin, Ultra Thin 1394a (10maq)																							
ACC-01-2002	2.0 m, 6-pin to 6-pin, Ultra Thin 1394a (10maq)																							
ACC-01-2013	4.5 m, 4-pin to 9-pin, 1394a to 1394b																							
ACC-01-2007	4.5 m, 6-pin to 9-pin, Locking 1394a to 1394b																							
ACC-01-2016	0.3 m, 9-pin to 9-pin, Locking 1394b																							
ACC-01-2015	1.0 m, 9-pin to 9-pin, Locking 1394b																							
ACC-01-2005	4.5 m, 9-pin to 9-pin, 1394b																							
ACC-01-2006	4.5 m, 9-pin to 9-pin, Locking 1394b																							
ACC-01-2012	4.5 m, 9-pin to 9-pin, Locking 1394b High Flex OKI																							
ACC-01-2017	FirePRO 10-m 9-pin to 9-pin, Locking 1394b																							
ACC-01-2008	10 m Ladybug2 Data																							
ACC-01-2010	10 m Ladybug2 Power																							
ACC-01-2011	50 m Ladybug2 Power																							
ACC-01-2100	5 m CAT 5e Ethernet Locking Cable, High Flex																							
ACC-01-2101	4.5 meter CAT 5e Ethernet Cable																							
ACC-01-2200	3 m 85 MHz Camera Link, 1x MDR, 1x SDR mini																							
ACC-01-2300	3 m USB 3.0 Cable, Type-A to Micro-B (Locking)																							
ACC-01-2301	5 m USB 3.0 Cable, Type-A to Micro-B (Locking)																							

Model#	GPIO CONNECTORS	BFLY-PGE	BFS-U3 BFLY-U3	BB2	BBX3	CMLN	CM3-U3	DR2	FL3-FW	FL3-GE	FL3-U3	FL2	FFMV	FMVU	GRAS	GS2-GE	GS3-PGE	GS2-FW	GS3-U3	GZL-CL	LD3	LD5	ORYX	ZBR2
ACC-01-3000	1.0 m, Circular 8-pin Prewired GPIO Hirose Conn.																							
ACC-01-3005	4.5 m, Circular 8-pin Prewired GPIO Hirose Conn.																							
ACC-01-3001	Circular 12PIN Prewired GPIO Hirose Connector																							
ACC-01-3002	7-pin Prewired GPIO JST Connector																							
ACC-01-3013	9-pin Prewired GPIO JST Connector																							
ACC-01-3004	8-pin Phoenix Contact GPIO Connector																							
ACC-01-3006	8-pin Circular Hirose HR25 GPIO Connector																							
ACC-01-3007	4-pin Phoenix Contact Power Connector																							
ACC-01-3008	6-pin Phoenix Contact GPIO Connector																							
ACC-01-3009	1.0m, Circular 6-pin Prewired GPIO Hirose Conn.																							
ACC-01-3010	4.5m, Circular 6-pin Prewired GPIO Hirose Conn.																							
ACC-01-3011	6-pin Circular Hirose HR10 GPIO Connector																							
ACC-01-3012	12-pin Circular Hirose GPIO Cable with Power Jack																							

Model#	GENERIC OPTICS	BFLY-PGE	BFLY-U3	BB2	BBX3	CMLN	CM3-U3	DR2	FL3-FW	FL3-GE	FL3-U3	FL2	FFMV	FMVU	GRAS	GS2-GE	GS3-PGE	GS2-FW	GS3-U3	GZL-CL	LD3	LD5	ORYX	ZBR2
ACC-01-4000	M12 MicroLens 4MM (Boowon BW38BLF)																							
ACC-01-4001	M12 MicroLens 6MM (Boowon BW60BLF)																							
ACC-01-4002	M12 MicroLens 8MM (Boowon BW80H1000)																							
ACC-01-4003	Auto Iris CS-Mount Lens 1/3" 3.5-8MM																							

Model#	OPTIC MOUNTS	BFLY-PGE	BFLY-U3	BB2	BBX3	CMLN	CM3-U3	DR2	FL3-FW	FL3-GE	FL3-U3	FL2	FFMV	FMVU	GRAS	GS2-GE	GS3-PGE	GS2-FW	GS3-U3	GZL-CL	LD3	LD5	ORYX	ZBR2
ACC-01-5004	C to CS-Mount Mount 5mm Spacer Adapter																							
ACC-01-5005	CS- to M12 MicroLens Adapter																							
ACC-01-5006	Cast Metal M12 MicroLens Holder																							
ACC-01-5007	Cast Metal M12 MicroLens Holder with IR Filter																							

Model#	HUBS	BFLY-PGE	BFS-U3 BFLY-U3	BB2	BBX3	CMLN	CM3-U3	DR2	FL3-FW	FL3-GE	FL3-U3	FL2	FFMV	FMVU	GRAS	GS2-GE	GS3-PGE	GS2-FW	GS3-U3	GZL-CL	LD3	LD5	ORYX	ZBR2
ACC-01-6000	4-Port USB 3.0 Hub, Screw Locks, Ext Power Adap.																							
ACC-01-6001	USB 3.1 Gen 1 Hub, VIA VL812, Micro B to Standard A, 1-port with screw locks																							
FWB-HUB-2PORT	FirePRO 1394b 2-Port Repeater																							
FWB-HUB-3PORT	FirePRO 1394b 3-Port Hub																							
FWB-HUB-5PORT	FirePRO 1394b 5-Port Repeater																							

Model#	POWER SUPPLY (PS) / MISC	BFLY-PGE	BFLY-U3	BB2	BBX3	CMLN	CM3-U3	DR2	FL3-FW	FL3-GE	FL3-U3	FL2	FFMV	FMVU	GRAS	GS2-GE	GS3-PGE	GS2-FW	GS3-U3	GZL-CL	LD3	LD5	ORYX	ZBR2
ACC-01-9001	24V 2.5A 60W PS, Standard DC Barrel Connector																							
ACC-01-9007	20V 2A 40W PS, Standard DC Barrel Connector																							
ACC-01-9008	12V 1.5A (18W) Wall Mount PS, 4-Pin Phoenix Contact																							
ACC-01-9009	12V 1.5A Wall-Mount PS, Plug Adapters, HR25 GPIO Harness																							
ACC-01-9010	12V 2.0A Wall Mount PS for FWB-EC2PORT																							
ACC-01-9011	12V 1.5A Wall-Mount PS, Plug Adapters, HR10 GPIO Harness																							
ACC-01-9012	19.6W Single Port PoE Injector with NA power cord																							
ACC-01-9013	12Pin, 18W Power supply																							

Model#	REGULAR LENS
LENS-V130F3C	Fujinon 3.8-13mm Varifocal C-mount lens, for 1/2" sensors (DV3.4x3.8SA-1)
LENS-15F5-125C	Fujinon fixed focal length 12.5mm C-mount lens for 2/3" sensors (HF12.5HA-1B)
LENS-15F5-250C	Fujinon fixed focal length 25mm C-mount lens for 2/3" sensors (HF25HA-1B)
LENS-15F3-60C	Fujinon fixed focal length 6mm C-mount lens for 1/2" sensors (DF6HA-1B)
LENS-V500F2CS	Fujinon vari-focal 15-50mm CS-mount lens, for 1/3" sensors (YV3.3x15SA-2)

Model#	HIGH RESOLUTION LENS
LENS-50F5-125C	Fujinon fixed focal length 12.5mm C-mount lens for 2/3" sensors (HF12.5SA-1)
LENS-160T5C	Tamron fixed focal length 16mm C-mount lens for 2/3" sensors (23FM16SP)
LENS-250T5C	Tamron fixed focal length 25mm C-mount lens for 2/3" sensors (23FM25SP)
LENS-80T4C	Tamron fixed focal length 8mm C-mount lens for 1/1.8" sensors (MF118FM08)
LENS-80T6C	Tamron fixed focal length 8mm C-mount lens for 1.1" sensors (MF111FM08)
LENS-160T4C	Tamron fixed focal length 16mm C-mount lens for 1/1.8" sensors (MF118FM16)
LENS-160E6C	Edmund Optics fixed focal length 16mm C-mount lens for 1" sensors (86-571)
LENS-120T6C	Tamron 12mm fixed focal length C-mount lens, for 1/1.2" and 2/3" sensors (M112FM12)
LENS-160T6C	Tamron 16mm fixed focal length C-mount lens, for 1/1.2" and 2/3" sensors (M112FM16)
LENS-250T6C	Tamron 25mm fixed focal length C-mount lens, for 1/1.2" and 2/3" sensors (M112FM25)
LENS-160T7C	Tamron 16mm fixed focal length C-mount lens, for 1.1" sensors (M111FM16)
LENS-250T7C	Tamron 25mm fixed focal length C-mount lens, for 1.1" sensors (M111FM25)

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

CMOS

CCD

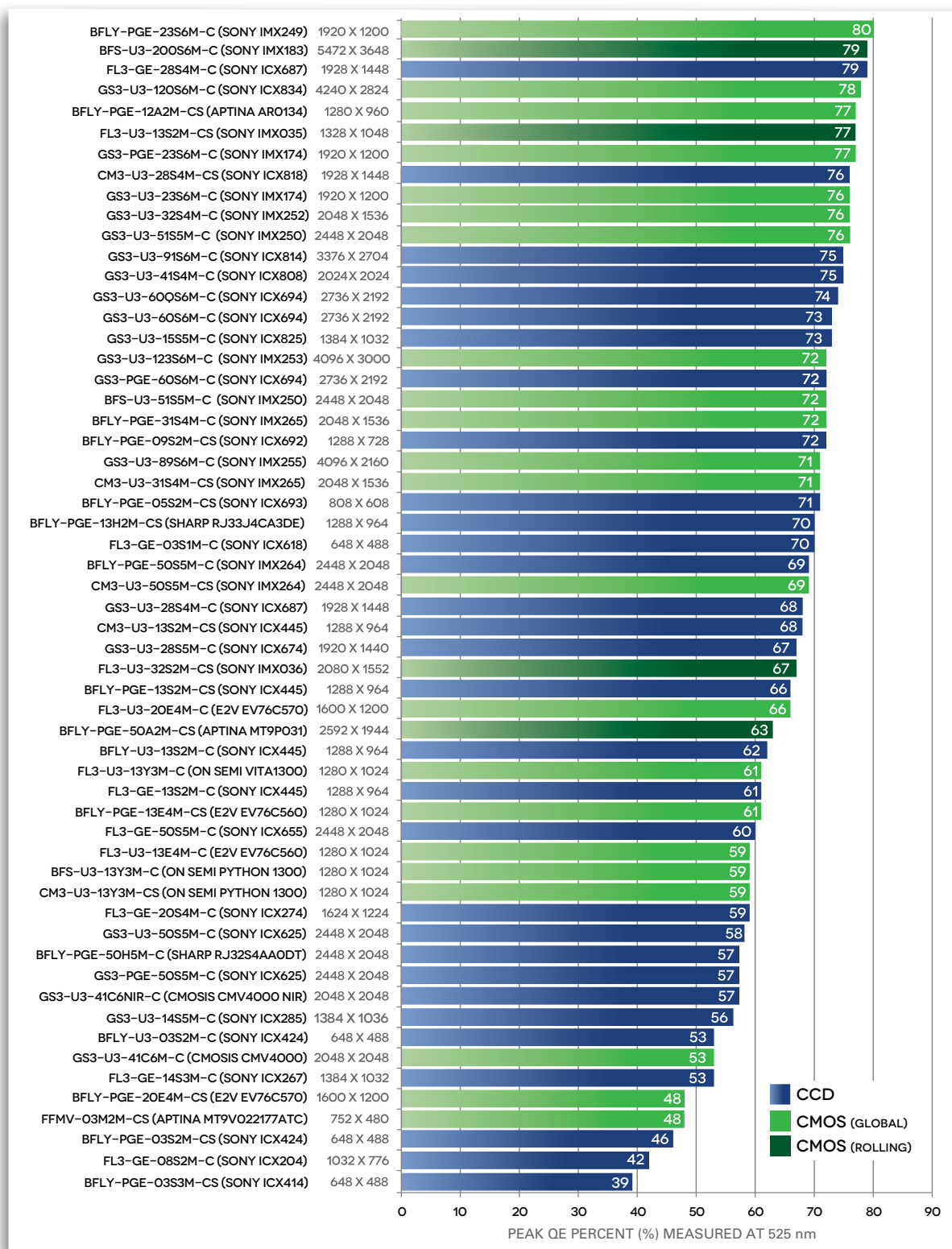
MODEL ID	Sensor	Sensor Size	Interface	Sensor Type	Shutter	Max Resolution	Max Frame Rate	Pixel Size
FL3-U3-13E4M-C	e2v EV76C560	1/1.8"	USB 3.1 Gen 1	CMOS	Global	1280 x 1024	60	5.3 µm
BFLY-PGE-13E4M-CS	e2v EV76C560	1/1.8"	PoE GigE	CMOS	Global	1280 x 1024	60	5.3 µm
FL3-U3-13Y3M-C	ON Semi VITA1300	1/2"	USB 3.1 Gen 1	CMOS	Global	1280 x 1024	150	4.8 µm
CM3-U3-13Y3M-CS	ON Semi PYTHON 1300	1/2"	USB 3.1 Gen 1	CMOS	Global	1280 x 1024	149	4.8 µm
BFS-U3-13Y3M-C	ON Semi PYTHON 1300	1/2"	USB 3.1 Gen 1	CMOS	Global	1280 x 1024	170	4.8 µm
FL3-U3-13S2M-CS	Sony IMX035	1/3"	USB 3.1 Gen 1	CMOS	Rolling	1328 x 1048	120	3.63 µm
BFLY-PGE-20E4M-CS	e2v EV76C570	1/1.8"	PoE GigE	CMOS	Global	1600 x 1200	50	4.5 µm
FL3-U3-20E4M-C	e2v EV76C570	1/1.8"	USB 3.1 Gen 1	CMOS	Global	1600 x 1200	60	4.5 µm
GS3-U3-23S6M-C	Sony IMX174	1/1.2"	USB 3.1 Gen 1	CMOS	Global	1920 x 1200	162	5.86 µm
GS3-PGE-23S6M-C	Sony IMX174	1/1.2"	PoE GigE	CMOS	Global	1920 x 1200	46	5.86 µm
BFLY-PGE-23S6M-C	Sony IMX249	1/1.2"	PoE GigE	CMOS	Global	1920 x 1200	41	5.86 µm
GS3-U3-32S3M-C	Sony IMX252	1/1.8"	USB 3.1 Gen 1	CMOS	Global	2038 x 1536	121	3.45 µm
BFLY-PGE-31S4M-C	Sony IMX265	1/1.8"	PoE GigE	CMOS	Global	2048 X 1536	35	3.45 µm
CM3-U3-31S4M-CS	Sony IMX265	1/1.8"	USB 3.1 Gen 1	CMOS	Global	2048 X 1536	55	3.45 µm
GS3-U3-41C6M-C	CMOSIS CMV4000	1"	USB 3.1 Gen 1	CMOS	Global	2048 x 2048	90	5.5 µm
GS3-U3-41C6NIR-C	CMOSIS CMV4000 NIR	1"	USB 3.1 Gen 1	CMOS	Global	2048 x 2048	90	5.5 µm
BFLY-PGE-50S5M-C	Sony IMX264	2/3"	PoE GigE	CMOS	Global	2448 X 2048	22	3.45 µm
CM3-U3-50S5M-CS	Sony IMX264	2/3"	USB 3.1 Gen 1	CMOS	Global	2448 X 2048	35	3.45 µm
BFS-U3-51S5M-C	Sony IMX250	2/3"	USB 3.1 Gen 1	CMOS	Global	2448 x 2048	75	3.45 µm
GS3-U3-51S5M-C	Sony IMX250	2/3"	USB 3.1 Gen 1	CMOS	Global	2448 x 2048	75	3.45 µm
BFLY-PGE-50A2M-CS	Aptina MT9P031	1/2.5"	PoE GigE	CMOS	Rolling	2592 x 1944	13	2.2 µm
GS3-U3-89S6M-C	Sony IMX255	1"	USB 3.1 Gen 1	CMOS	Global	4096 x 2160	43	3.45 µm
GS3-U3-123S6M-C	Sony IMX253	1.1"	USB 3.1 Gen 1	CMOS	Global	4096 x 3000	30	3.45 µm
BFS-U3-200S6M-C	Sony IMX183	1"	USB 3.1 Gen 1	CMOS	Rolling	5472 X 3648	18	2.4 µm
BFLY-PGE-03S2M-CS	Sony ICX424	1/3"	PoE GigE	CCD	Global	648 x 488	84	7.4 µm
BFLY-U3-03S2M-CS	Sony ICX424	1/3"	USB 3.1 Gen 1	CCD	Global	648 x 488	84	7.4 µm
BFLY-PGE-03S3M-CS	Sony ICX414	1/2"	PoE GigE	CCD	Global	648 x 488	90	9.9 µm
FL3-GE-03S1M-C	Sony ICX618	1/4"	GigE	CCD	Global	648 x 488	120	5.6 µm
BFLY-PGE-05S2M-CS	Sony ICX693	1/3"	PoE GigE	CCD	Global	808 x 608	50	6.0 µm
FL3-GE-08S2M-C	Sony ICX204	1/3"	GigE	CCD	Global	1032 x 776	31	4.65 µm
BFLY-PGE-09S2M-CS	Sony ICX692	1/3"	PoE GigE	CCD	Global	1288 x 728	30	4.08 µm
BFLY-U3-13S2M-CS	Sony ICX445	1/3"	USB 3.1 Gen 1	CCD	Global	1288 x 964	30	3.75 µm
BFLY-PGE-13S2M-CS	Sony ICX445	1/3"	PoE GigE	CCD	Global	1288 x 964	30	3.75 µm
BFLY-PGE-13H2M-CS	Sharp RJ33J4CA3DE	1/3"	PoE GigE	CCD	Global	1288 x 964	30	3.75 µm
CM3-U3-13S2M-CS	Sony ICX445	1/3"	USB 3.1 Gen 1	CCD	Global	1288 X 964	30	3.75 µm
FL3-GE-13S2M-C	Sony ICX445	1/3"	PoE GigE	CCD	Global	1288 x 964	31	3.75 µm
FL3-GE-14S3M-C	Sony ICX267	1/2"	GigE	CCD	Global	1384 x 1032	18	4.65 µm
GS3-U3-15S5M-C	Sony ICX825	2/3"	USB 3.1 Gen 1	CCD	Global	1384 x 1032	45	6.45 µm
GS3-U3-14S5M-C	Sony ICX285	2/3"	USB 3.1 Gen 1	CCD	Global	1384 x 1036	30	6.45 µm
FL3-GE-20S4M-C	Sony ICX274	1/1.8"	GigE	CCD	Global	1624 x 1224	15	4.4 µm
GS3-U3-28S5M-C	Sony ICX674	2/3"	USB 3.1 Gen 1	CCD	Global	1920 x 1440	26	4.54 µm
CM3-U3-28S4M-CS	Sony ICX818	1/1.8"	USB 3.1 Gen 1	CCD	Global	1928 X 1448	13	3.69 µm
FL3-GE-28S4M-C	Sony ICX687	1/1.8"	GigE	CCD	Global	1928 x 1448	15	3.69 µm
GS3-U3-28S4M-C	Sony ICX687	1/1.8"	USB 3.1 Gen 1	CCD	Global	1928 x 1448	26	3.69 µm
GS3-U3-41S4M-C	Sony ICX808	1/1.8"	USB 3.1 Gen 1	CCD	Global	2024 x 2024	18	3.1 µm
FL3-GE-50S5M-C	Sony ICX655	2/3"	GigE	CCD	Global	2448 x 2048	8	3.45 µm
GS3-U3-50S5M-C	Sony ICX625	2/3"	USB 3.1 Gen 1	CCD	Global	2448 x 2048	15	3.45 µm
GS3-PGE-50S5M-C	Sony ICX625	2/3"	PoE GigE	CCD	Global	2448 x 2048	15	3.45 µm
BFLY-PGE-50H5M-C	Sharp RJ32S4AA0DT	2/3"	PoE GigE	CCD	Global	2448 x 2048	7.5	3.45 µm
GS3-U3-60S6M-C	Sony ICX694	1"	USB 3.1 Gen 1	CCD	Global	2736 x 2192	13	4.54 µm
GS3-U3-60QS6M-C	Sony ICX694	1"	USB 3.1 Gen 1	CCD	Global	2736 x 2192	25	4.54 µm
GS3-PGE-60S6M-C	Sony ICX694	1"	PoE GigE	CCD	Global	2736 x 2192	13	4.54 µm
GS3-U3-91S6M-C	Sony ICX814	1"	USB 3.1 Gen 1	CCD	Global	3376 x 2704	9	3.69 µm
GS3-U3-120S6M-C	Sony ICX834	1"	USB 3.1 Gen 1	CCD	Global	4240 x 2824	7	3.1 µm
BFLY-PGE-12A2M-CS	Aptina AR0134	1/3"	PoE GigE	CMOS	Global	1280 x 960	52	3.75 µm

QE 525nm %	QE Near IR 850nm / 950nm %	Temporal Dark Noise	S/N Ratio Max dB	S/N Ratio Max Bits	Absolute Sensitivity Threshold	Saturation Capacity	Dynamic Range dB	Dynamic Range Bits	Gain e-/ADU
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
59	21 / 7	9.24	37.62	6.25	16.54	5779	55.47	9.21	0.14
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
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
72	19 / 6	2.31	40.06	6.65	3.90	10141	71.13	11.82	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
71	20 / 6	2.43*	40.19	6.67	4.13*	10435	71.03*	11.8	0.17
72	20 / 6	2.43*	40.24	6.68	4.12*	10563	71.04*	11.8	0.17
79	17 / 7	3.30	41.74	6.93	4.83	14837	66.3	11.01	0.24
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
77	21 / 7	6.58	37.44	6.22	9.30	5542	57.87	9.61	0.10

# 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.

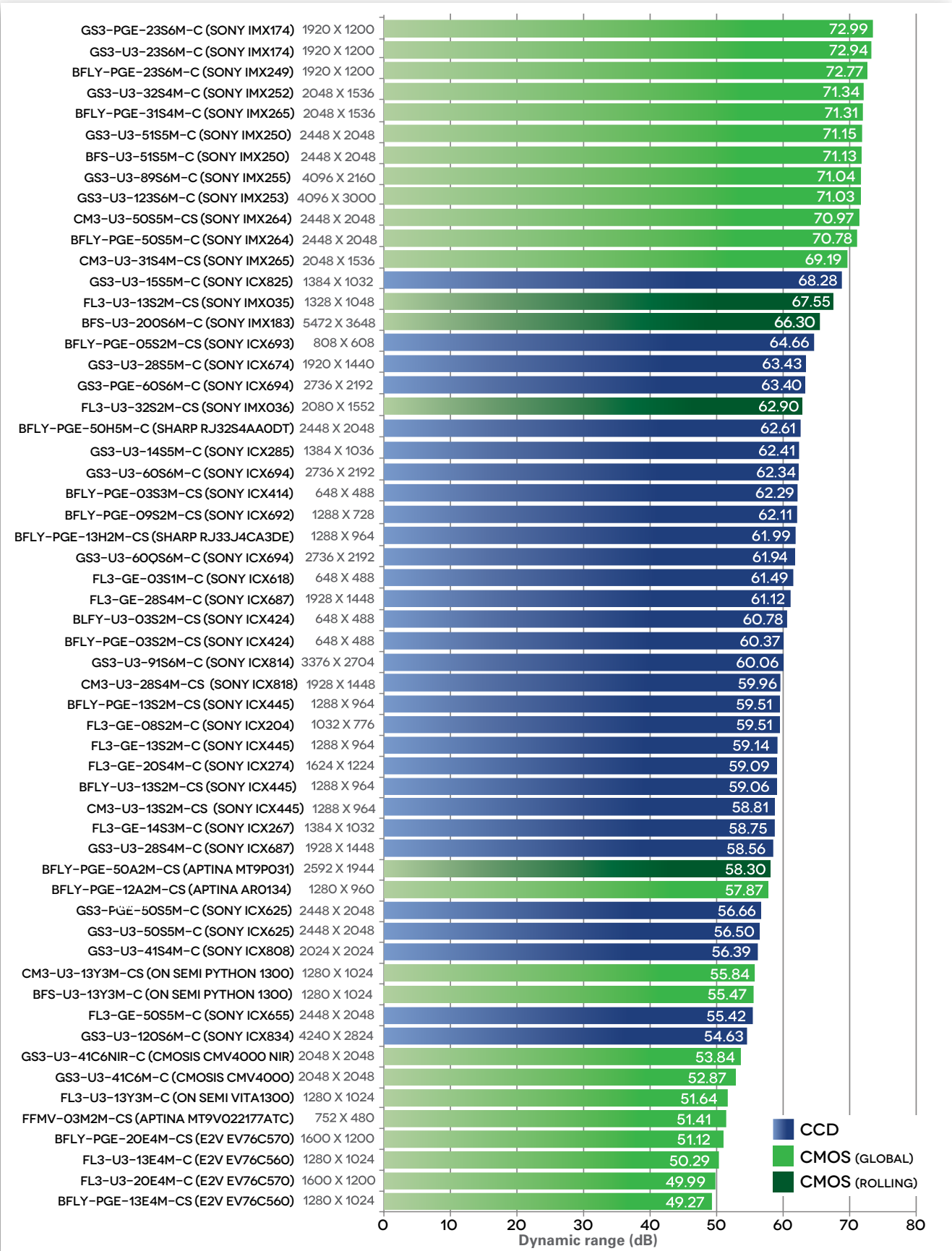


Please note that all measurements are taken based on guidelines in the EMVA 1288 standard. Camera settings are at maximum exposure time and bit depth unless otherwise noted. The pixel format is Mono 16 for mono cameras except for the last two Bandwidth and Throughput graphs which are done at Mono 8.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

# MONO SINGLE LENS CAMERAS

## DYNAMIC RANGE dB (HIGHER IS BETTER)

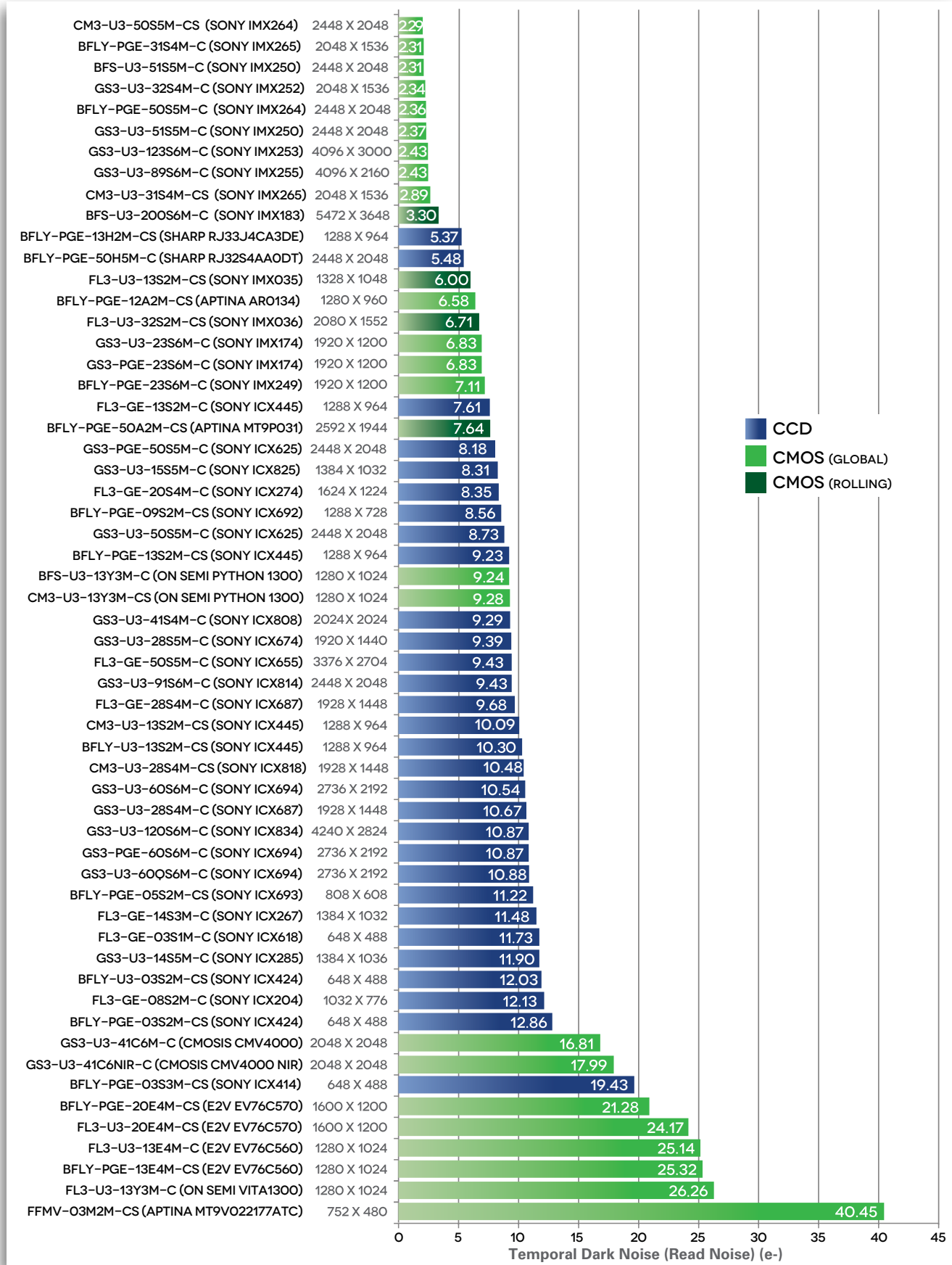
Dynamic range describes the camera model's ability to detect the maximum and minimum of light intensities (shadows and highlights). Models with higher dynamic range can detect more detail in the darks and lights.



# 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.

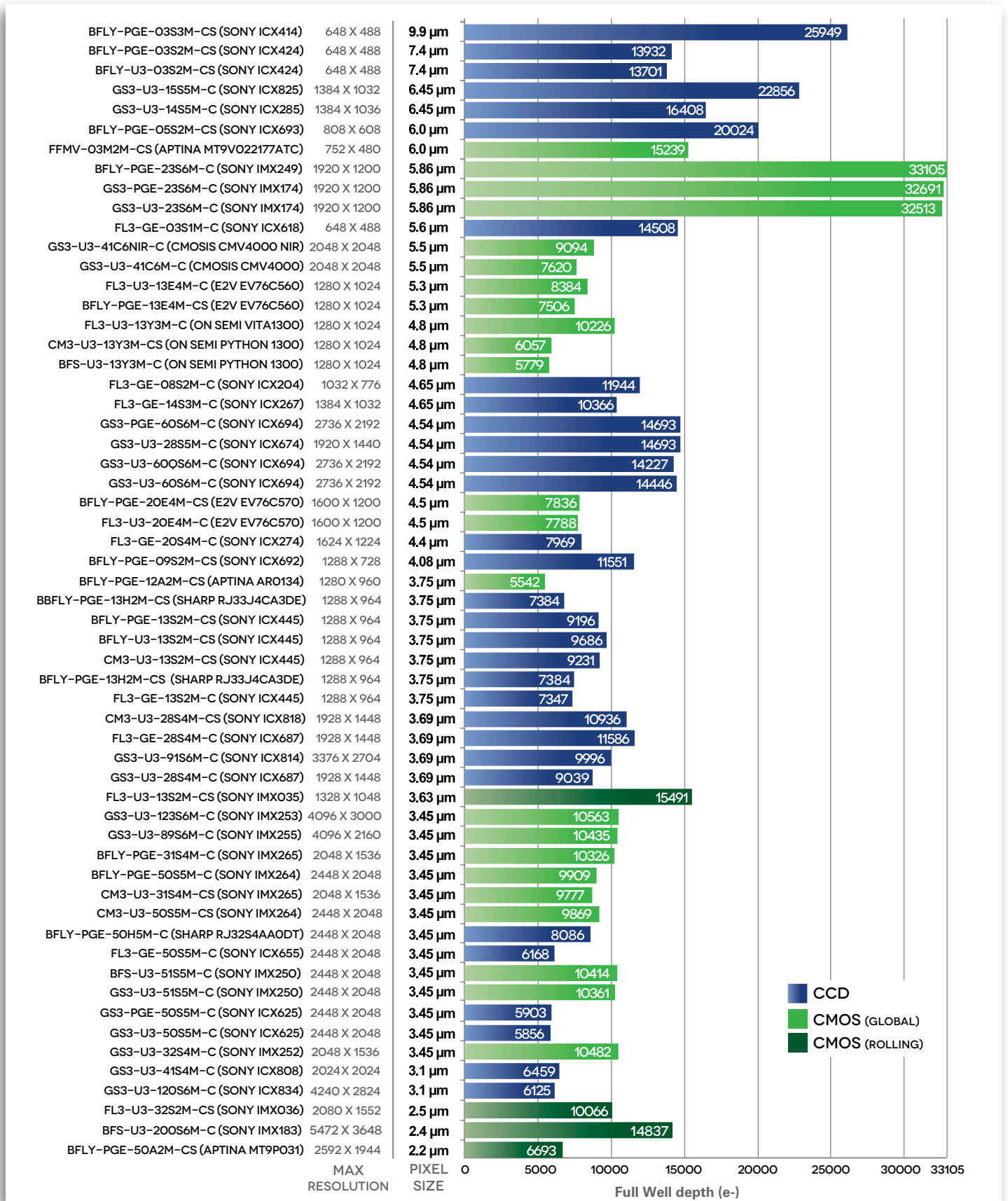




# MONO SINGLE LENS CAMERAS

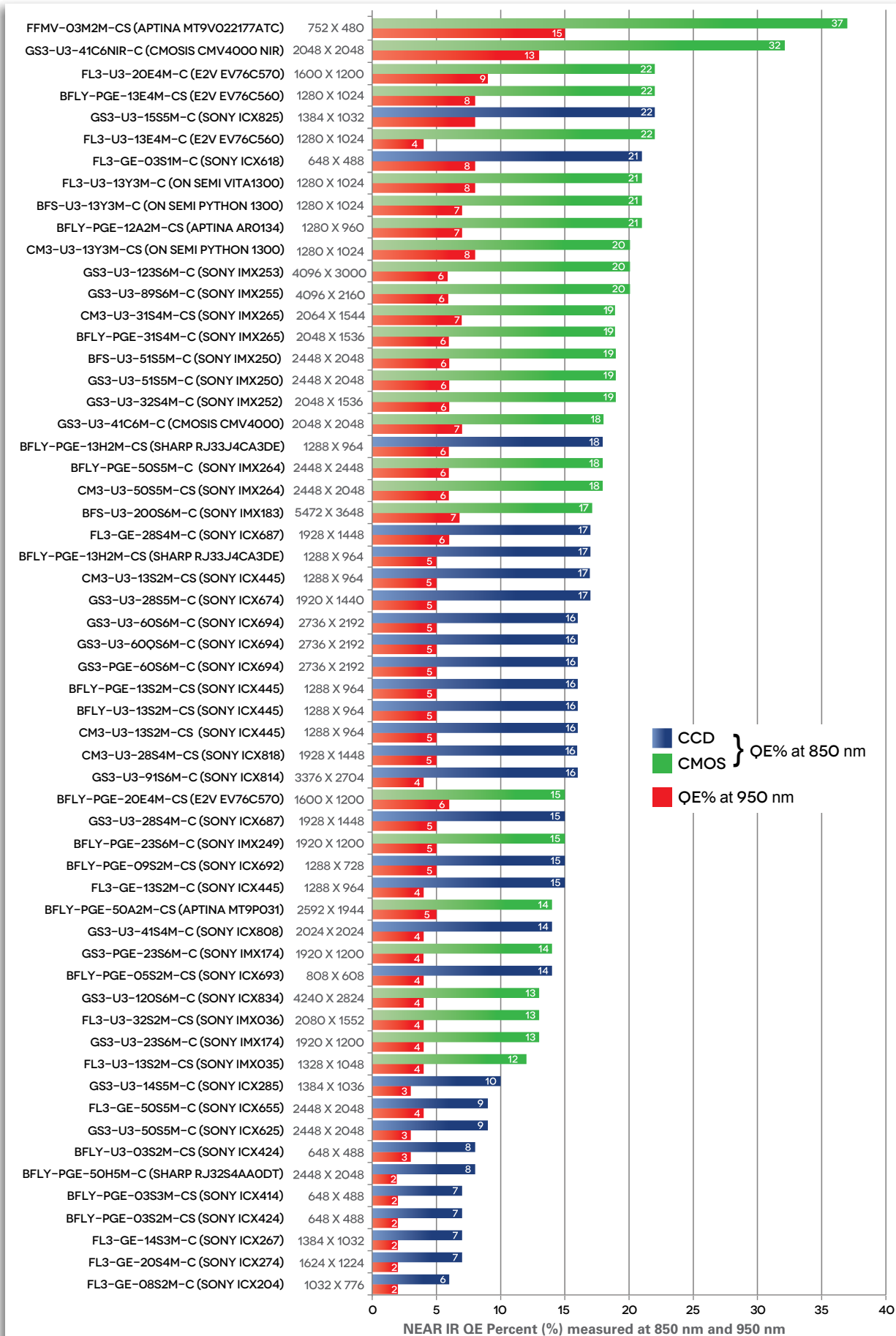
## SATURATION CAPACITY (WELL DEPTH) e- (HIGHER IS BETTER, SORTED BY PIXEL SIZE)

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

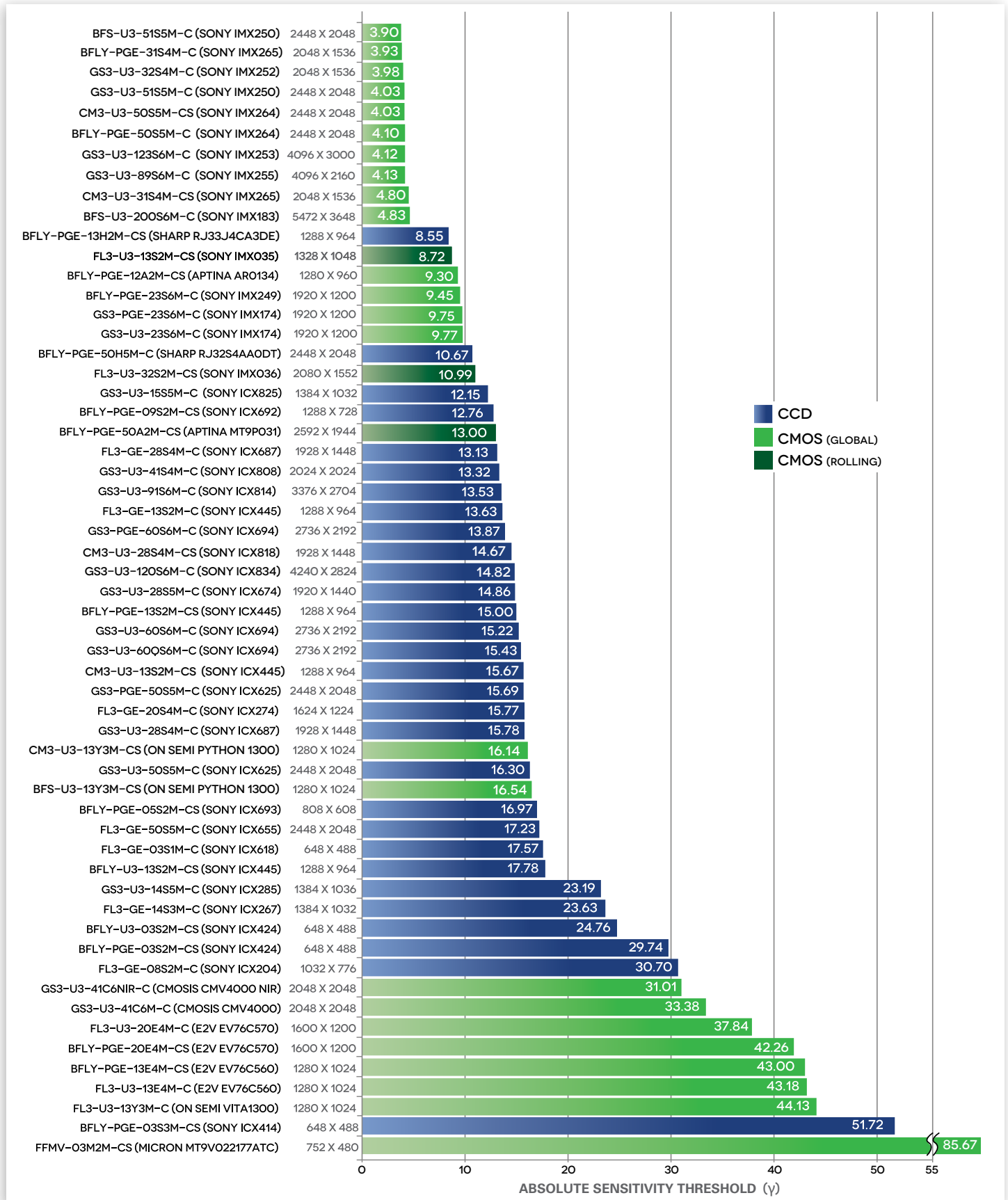
## NEAR IR QE (%) (HIGHER IS BETTER)



# MONO SINGLE LENS CAMERAS

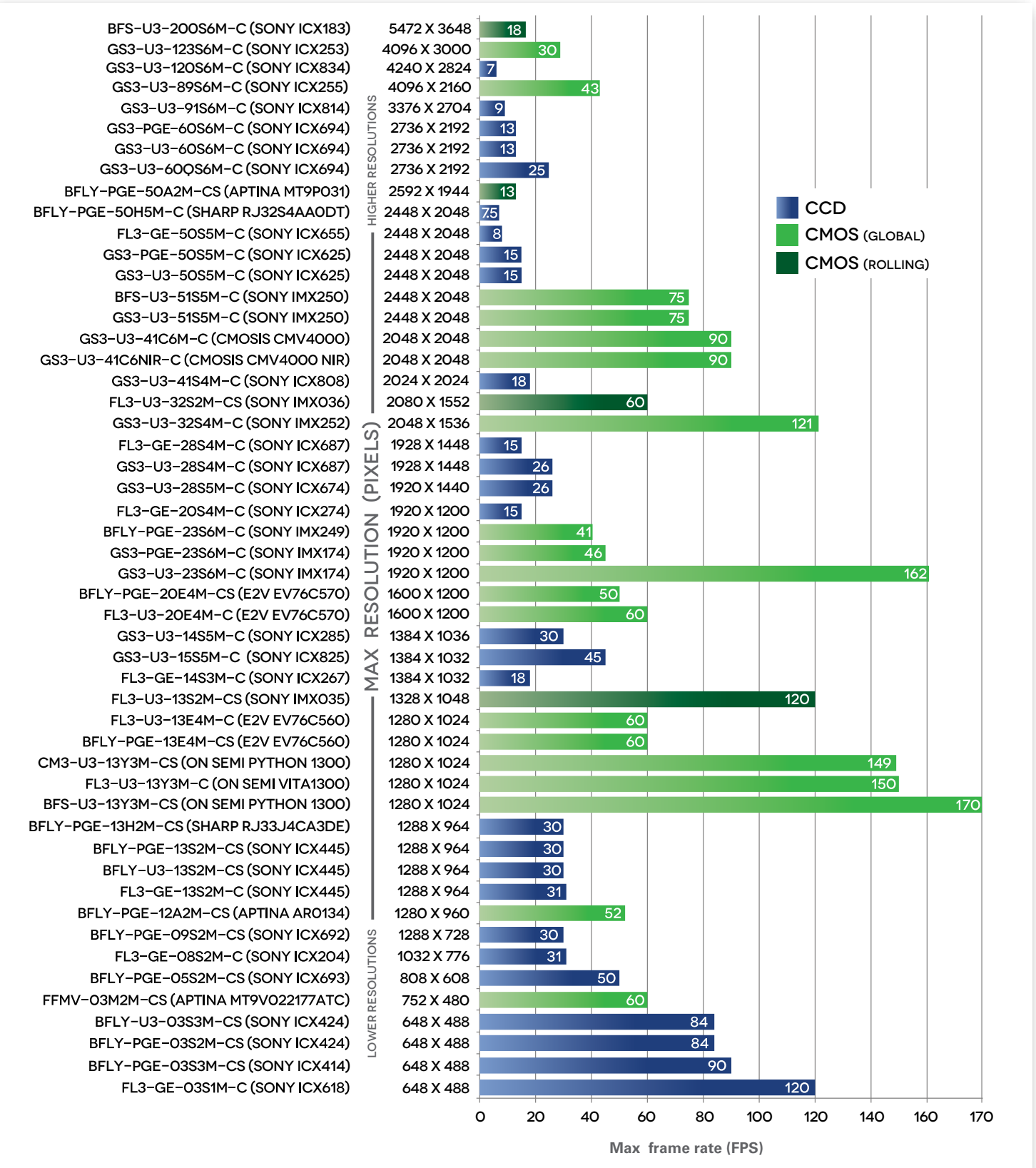
## ABSOLUTE SENSITIVITY THRESHOLD ( $\gamma$ ) (LESS IS BETTER)

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

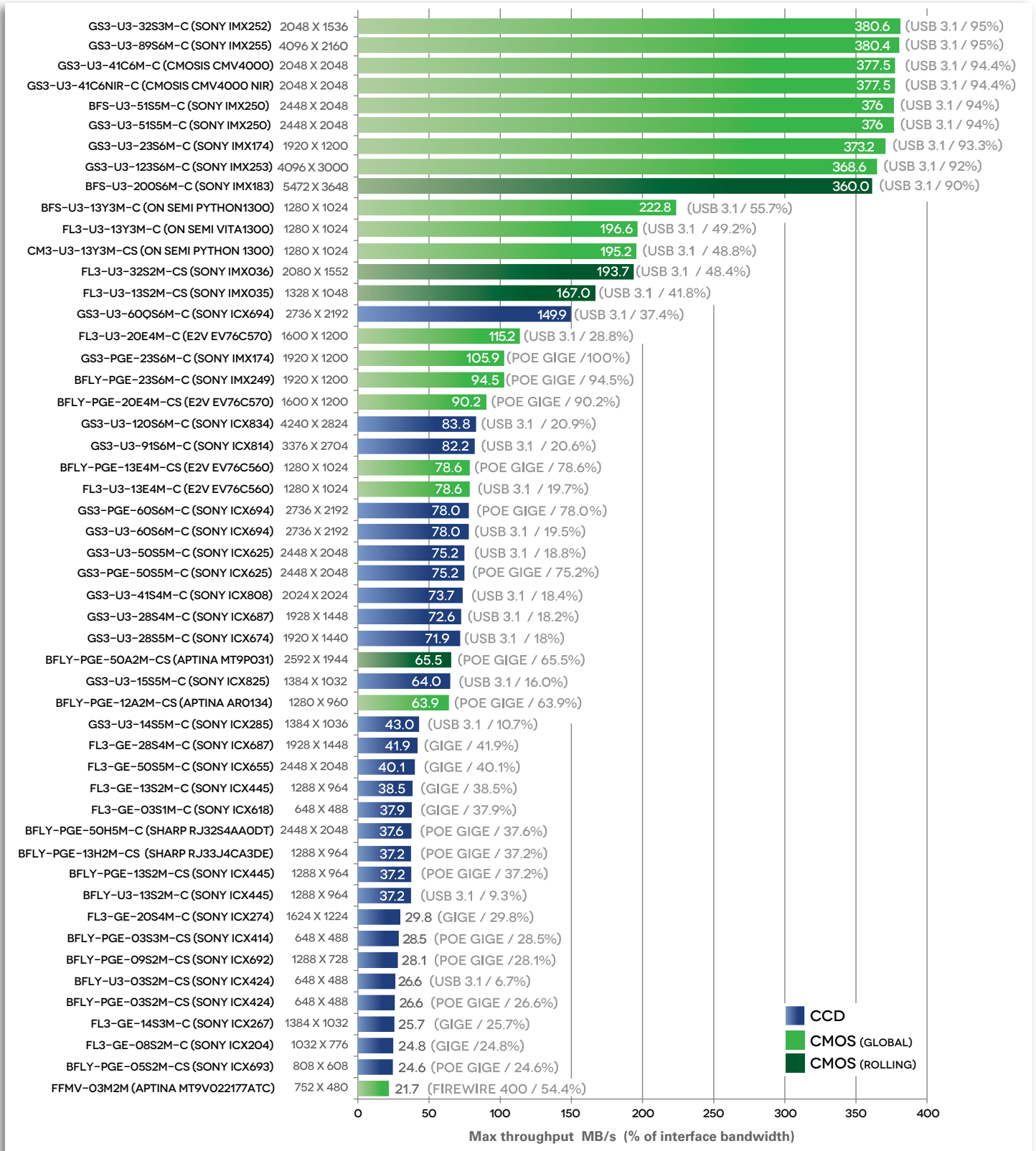
## MAX RESOLUTION TO MAX FRAME RATE



# MONO SINGLE LENS CAMERAS

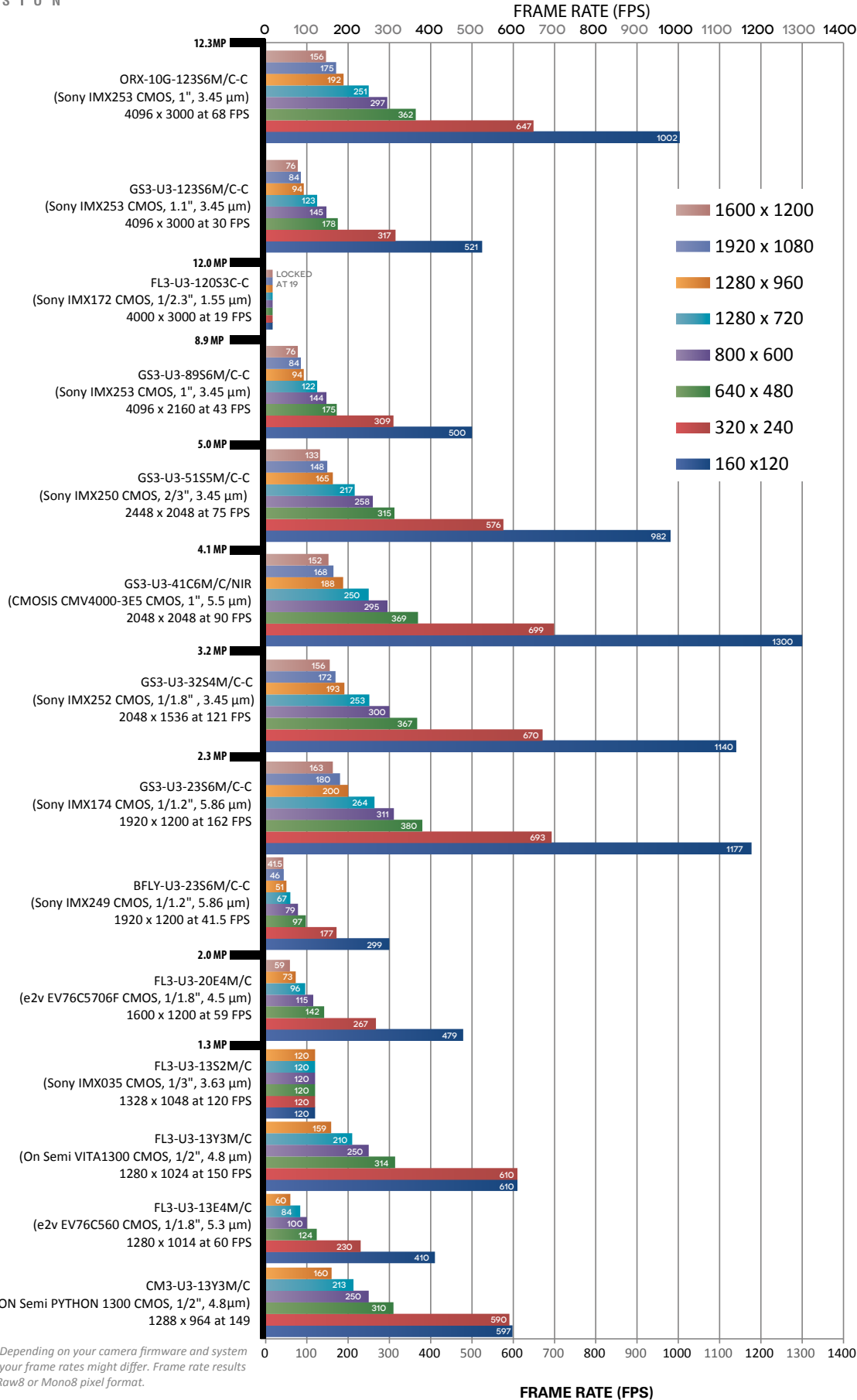
## CAMERA THROUGHPUT (MB/s) AND % OF INTERFACE BANDWIDTH

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 3.1 Gen 1, 100 MB/s for GigE, 80 MB/s for FireWire 800, and 40 MB/s for both FireWire 400 and USB 2.0.





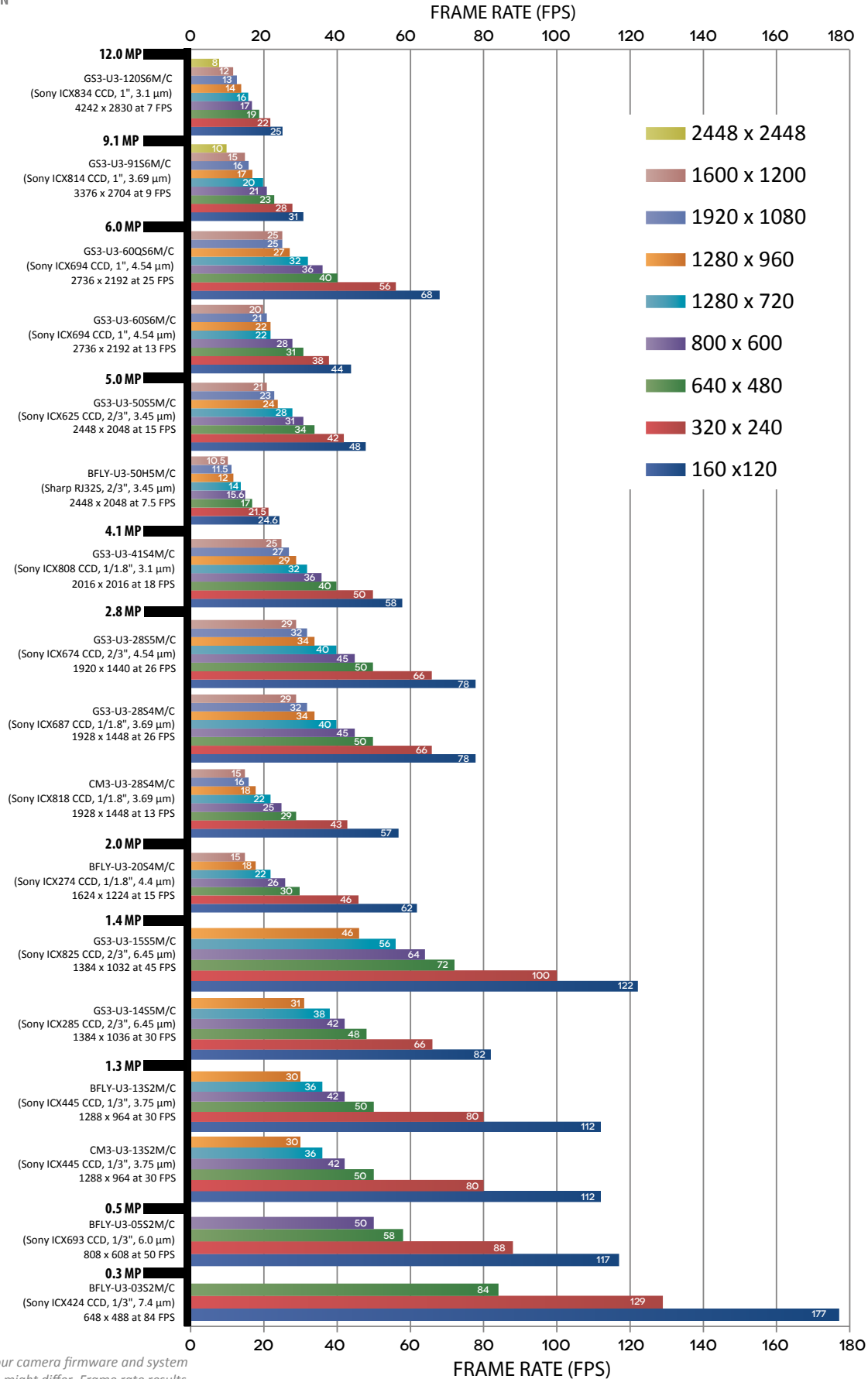
# USB 3.1 Gen 1 CMOS Resolution vs Frame Rate Chart



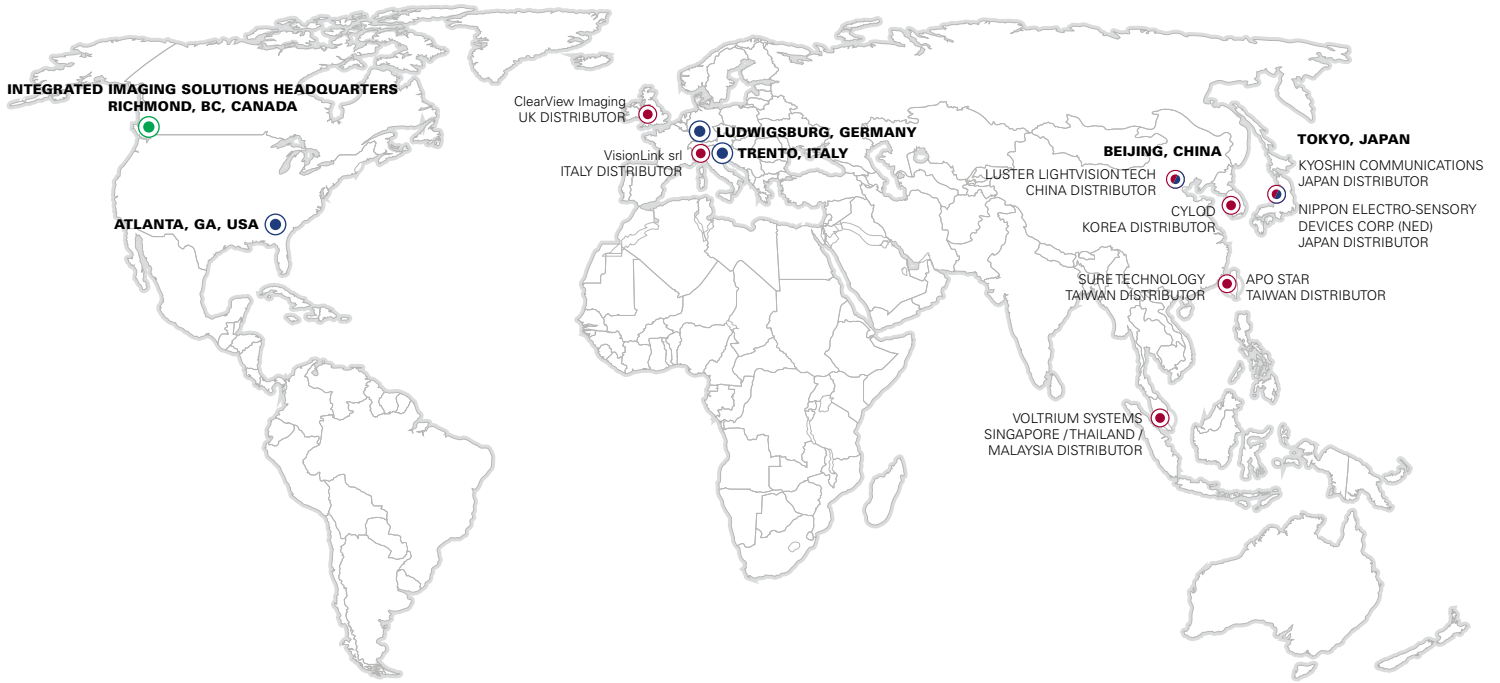
Note: Depending on your camera firmware and system setup your frame rates might differ. Frame rate results from Raw8 or Mono8 pixel format.



# USB 3.1 Gen 1 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.



#### CANADA

T: +1 866.765.0827 (toll free)  
 T: +1 604.242.9937  
 F: +1 604.242.9938  
 E: mv-sales@flir.com  
[www.flir.com/mv](http://www.flir.com/mv)

#### EUROPE, MIDDLE EAST, RUSSIA and AFRICA

T: +49 7141 488817-0  
 F: +49 7141 488817-99  
 E: mv-eusales@flir.com

#### CHINA

T: +86 10 8215 9938  
 F: +86 10 8215 9936  
 E: mv-chinasales@flir.com  
 E: mv-taiwansales@flir.com

#### JAPAN and ASIA PACIFIC

T: +81-3-5204-2338  
 E: mv-japansales@flir.com  
 E: mv-asiasales@flir.com

#### DISTRIBUTORS

##### CHINA

LUSTER LightVision [www.lusterinc.com](http://www.lusterinc.com)

##### ITALY

VisionLink srl [www.visionlink.it](http://www.visionlink.it)

##### JAPAN

Kyoshin Communications Inc. [www.kycom.co.jp](http://www.kycom.co.jp)  
 Nippon Electro-Sensory Devices Corp. (NED)  
[www.ned-sensor.co.jp](http://www.ned-sensor.co.jp)

##### KOREA

CYLOD Co., Ltd. [www.cylod.com](http://www.cylod.com)

##### SINGAPORE, THAILAND, MALAYSIA

Voltrium Systems [www.voltrium.com.sg](http://www.voltrium.com.sg)

##### TAIWAN

Apo Star Co., Ltd. [www.apostar.com.tw](http://www.apostar.com.tw)  
 SURE Technology Corporation [www.surevision.com.tw](http://www.surevision.com.tw)

##### UNITED KINGDOM and IRELAND

ClearView Imaging [www.clearviewimaging.co.uk](http://www.clearviewimaging.co.uk)

