

FEATURES

- High-performance Canon 35MMFHDXS or LI3030 sensor
 - Resolution: 2.76 MP
 - Mono or RGB Filters
 - Pixel Size: 19 x 19 μm
 - Rolling Shutter
 - Effective Pixels: 2160(H) x 1280(V)
 - Maximum Framerate: 98fps*
 - Dark Noise: 2.2e- rms @ gain x16 (35MMFHDXS) / 3.4e- rms @ gain x16 (LI3030)
 - Quantum Efficiency: 82% (35MMFHDXSMA @510nm)
 - Full Well Capacity: 61,000 e @ gain x1
 - Analog Gain: x1, x2, x4, x8, x16
 - Aspect Ratio: 16:9

- Integrated Analog to Digital Converters
 - 16 14-bit ADC channels
 - correlated double sampling
 - Programmable gain
 - USB output supports 8, 12, or 16 bpp

- Programmable Sensor Board Max 10 FPGA
 - generates timing strobes for sensor

- Intel Arria 10 FPGA w/SoC for Processing
 - Dual Core A9 ARM
 - FPGA Fabric up to 480K LE
 - Open architecture

- Interface Options
 - AIA U3V (USB3 Vision)

- Programmable General Purpose I/O
 - 4 External FPGA GPIO Pins
 - 3 Opto-Isolated Input Pins



Figure 1: MityCAM-35MMFHDXS

APPLICATIONS

- Night Vision
- Machine Vision
- Surveillance
- Neuroscience
- Fluorescence imaging/Microscopy

*continuous output rates limited to USB 3.1 Gen 1 capacity, bursting to RAM is supported. Frame rates can be increased using reduced ROI features of the sensor.

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DESCRIPTION

The MityCAM-35MMFHDXS Evaluation Kit from Critical Link features a high-performance Canon CMOS image sensor. The kit is available with a 35MMFHDXSMA (mono), 35MMFHDXSCA (color), LI3030SAM (mono), or LI3030SAI (RGB-NIR) sensor and supports the AIA USB3 Vision Interface (U3V).

Combined with Critical Link's software tools designed for our Arria 10 based processor card, the MityCAM-35MMFHDXS EVK makes sensor evaluation and product integration quick and easy. The MityCAM-35MMFHDXS EVK features a standard F-mount lens mount. Critical Link also supports a



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MityCAM-35MMFHDXS Evaluation Kit
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board set version of the kit for customers designing their own mechanicals or managing other integrations; contact us via info@criticallink.com for more details.

Datasheets containing the sensor performance curves for sensitivity, well depth, quantum efficiency and dark current, etc. are located on the manufacturer's [website](#) [1] (please contact Canon directly for the datasheet, NDA required [2]).



The MityCAM-35MMFHDXS electronics leverage a modular design that allows Critical Link to quickly develop support for custom interface designs. The block diagram in Figure 2 shows the structure of the MityCAM-35MMFHDXS.

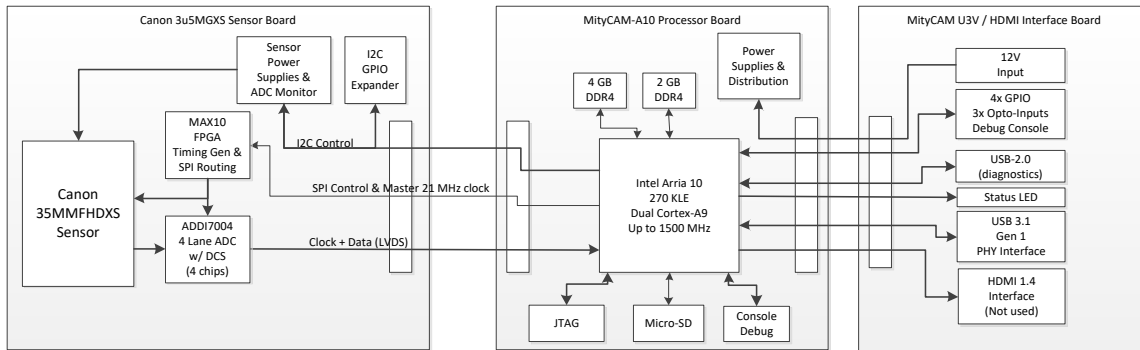


Figure 2: MityCAM-35MMFHDXS Electronics Block Diagram

TECHNICAL SPECIFICATIONS

A summary of the imaging performance of the MityCAM-35MMFHDXS EVK family is included below. For complete details of the imager, see the datasheet from Canon.

35MMFHDXS PERFORMANCE

	Min	Typical	Max	Units
Active Pixels	-	2160 x 1280	-	H x V
Pixel Size	-	19 x 19	-	W x H μm
Imaging Area	-	41.04 x 24.32	-	W x H mm
Dark current (@ room temperature)		60		e/sec
ADC resolution	-	14	-	bits
Normal Mode Read-out Noise @ room temp.	-	2.2		e^-
Mono QE @ 510nm	-	82	-	%
Color QE @ 525nm	-	62	-	%
Sensitivity (Mono)	-	2,100,000	-	$e^- / \text{lx} / \text{sec}$
Sensitivity (Color)	-	1,100,000	-	$e^- / \text{lx} / \text{sec}$
Conversion Gain:	-	5.6	-	$\mu\text{V}/e$
Analog Gain:	0		12	dB
Full Well Capacity:	-	61,000	-	e
Full Frame Rate:	-	-	98*	Frames / s
1080-row readout Frame Rate:	-	-	115*	Frames / s
Cooling Method		Forced Air		
Power Utilization	-	13.6	-	Watts
Mass (Body, no lens)		1245		g
Power Input	10.8	12	13.2	V DC

* continuous frame rate limited by USB 3.1 output rate, see Readout Rates

Table 1: MityCAM-35MMFHDXSEVK performance with 35MMFHDXS Sensor



LI3030 PERFORMANCE

	Min	Typical	Max	Units
Active Pixels	-	2160 x 1280	-	H x V
Pixel Size	-	19 x 19	-	W x H μ m
Imaging Area	-	41.04 x 24.32	-	W x H mm
Dark current (@ 0C)		0.04		e/sec
ADC resolution	-	14	-	bits
Normal Mode Read-out Noise	-	3.4	-	e ⁻
LI3030SAM QE @ 560nm	-	85	-	%
LI3030SAI QE @ 530nm, 825 nm	-	67, 54	-	%
Sensitivity (LI3030SAM)	-	2,900,000	-	e / lx / sec
Sensitivity (LI3030SAI)	-	1,100,000	-	e / lx / sec
Conversion Gain:	-	5.6	-	uV/e
Analog Gain:	0		12	dB
Full Well Capacity:	-	70,000	-	e ⁻
Full Frame Rate:	-	-	98*	Frames / s
1080-row readout Frame Rate:	-	-	115*	Frames / s
Cooling Method		Forced Air		
Power Utilization	-	13.6	-	Watts
Mass (Body, no lens)		1245		g
Power Input	10.8	12	13.2	V DC

* continuous frame rate limited by USB 3.1 output rate, see Readout Rates

Table 2: MityCAM-35MMFHDXSEVK performance with LI3030 Sensor

OPERATING AND STORAGE CONDITIONS

Ambient Operating Temperature Range	0 °C to 40 °C (Sensor is -20 to 85 C)
Humidity	<80%, Non-Condensing
Storage Temperature Range	-40 °C to 85 °C (Sensor is -20 to 105 C)

Table 3: MityCAM-35MMFHDXS Operating and Storage Conditions



ELECTRICAL CONNECTIONS

The MityCAM–35MMFHDXS EVK back panel is shown in Figure 3.

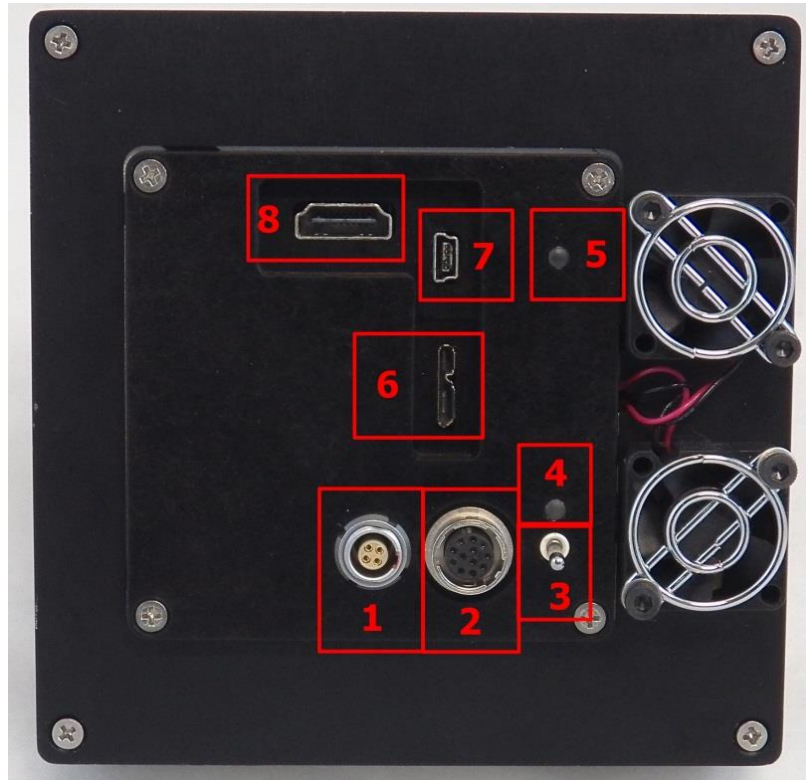


Figure 3: Input / Output Connections on Rear

The numbered connectors are defined in the list below.

1. Power Input Connector – Keyed
2. GPIO and Serial Connector – Keyed
3. Power Switch
4. Power Good Indicator LED
5. Status LED
 - a. Green – Ready to Capture Images
 - b. Blinking Blue – Capturing Images
 - c. Red – Error State
6. USB 3.0 Connector – PC Image Capture Interface
7. USB 2.0 Connector – Network connection
8. Monitor Connector – Not Utilized

Power Input

The MityCAM-35MMFHDXS has a single power input connector on the rear of the units. This 4-pin LEMO ECG.0B.304.CLN connector utilizes 2-positive power input pins and 2-ground connections, as shown in Figure 4 and Table 4. Each kit includes an AC to 12V DC (3A) power adapter.

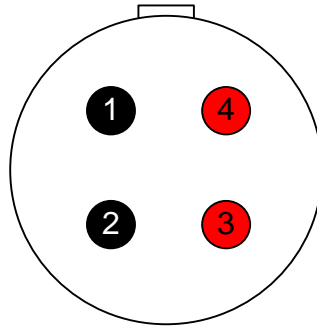


Figure 4: P200 Power Input Connector

Pin	Type	Description
1	GND	Ground
2	GND	Ground
3	PWR	+12 VDC
4	PWR	+12 VDC

Table 4: P200 Input Power Connector Pin-Out (P200)

Note that over voltage, under-voltage and reverse polarity protection is provided within the kit; however care should be taken if a non-standard adapter is used. The mating connector is a LEMO FGG.0B.304.CLAD52 or similar connector.

USB 2.0 Interface

The MityCAM-35MMFHDXS EVK features a standard Mini-B type USB connector on the rear of the unit. This interface is used for development purposes (e.g., software and firmware updates, low level access to camera functions). This interface presents a standard RNDIS Ethernet interface when connected to a host PC.

General Purpose IO

Four general purpose FPGA IO pins, 3 optically isolated inputs, the Arria 10 HPS console signals, and a power shutdown request line are made available for the user via the GPIO connector, HR10-10R-12SA(73), on the rear of the unit. The GPIO's and console signals utilize 1.8V CMOS logic levels and are ESD protected to standards supporting IEC61000-4-3 and 61000-4-4. Table 5 and Figure 5 show the pin-out for the GPIO interface connector. The opto-isolated inputs support an "on" state input voltage between 2-24 V and require a minimum of 2 mA of current. The off state voltage must be below 1.5 volts. Note that the opto-isolated input ground/return (pin 9) is not tied to digital ground (pin 6).



Figure 5: GPIO Interface Connector Pin Out (P201)

Pin	Type	Description	Notes
1	I/O	IO 0 – 1.8V CMOS Logic Level (supports external trigger)	Connected to pin E21 on FPGA.
2	I/O	IO 1 – 1.8V CMOS Logic Level	Connected to pin F21 on FPGA.
3	I/O	IO 2 – 1.8V CMOS Logic Level	Connected to pin C22 on FPGA.
4	I/O	IO 3 – 1.8V CMOS Logic Level	Connected to pin G23 on FPGA.
5	I	Camera shutdown, short to GND to turn off camera, otherwise leave unconnected.	
6	GND	Ground	
7	O	1.8V Serial Console Output	Connected to pin XX on FPGA.
8	I	1.8V Serial Console Input	Connected to pin XX on FPGA.
9	ISO_GND	Reference / Return for Isolated input currents.	
10	I	Opto-isolated Input 0	Connected to pin E22 on FPGA.
11	I	Opto-isolated Input 1	Connected to pin F22 on FPGA.
12	I	Opto-isolated Input 2	Connected to pin D22 on FPGA.

Table 5: GPIO Connector Pin-Out (P201)

The mating connector is a HR10A-10P-12P(73) or similar connector.

IO pins can be driven as outputs using software interface commands; they can also be read as inputs. The embedded ARM software on the kit can be customized to capture transitions for asynchronous processing, if desired. In addition, Pin 1 (IO 0) can be used for external exposure triggering and/or exposure width control.

The console port signals on the connector support operation at 115200 Baud, 8 bits, 1 stop bit, no parity, with no flow control. This port may be used to monitor the boot progress and access the Linux console for diagnostics purposes. For basic operation, using this port is not required.

Cooling

The MityCAM-35MMFHDXS EVK features two integrated 25mm fans for the body with an integrated heat sink via the case body. When installed, the fan can be enabled or disabled through the I2C based LED status light and fan controller. It can be accessed on I2C bus 1 at address 1100 010.

If the board set only version is utilized in a custom design, proper cooling measures must be taken to ensure that the imaging sensor does not exceed the specified maximum temperature of Table 3.

Read-out rates

The sensor read-out rates and typical readout rates with a Windows 10 PC are shown in Table 6.

Table 6: Typical Read Out Rates

ROI	1280x2160	1080x2160	720x2160	360x2160
Sensor Rate 16 bpp	98	114	165	298
Max Rate 16 bpp	48	57	85	168
Max Rate 8 bpp	98	114	165	298

Sensor Bit Depth

The MityCAM-35MMFHDXS EVK standard offering configures the sensor to output pixel data using 16 bits per pixel. To support increased output rates, the MityCAM-35MMFHDXS can be configured to truncate the input pixel depth to 8 or 12 bits.

Burst Capture

Due to limitations of U3V, the kit cannot continuously capture at the highest resolution and output at a full bit-depth. The kit can capture using the highest possible sensor clock first into RAM and then stream the data out at a slower rate. In this mode the camera evaluation kit allows the user to capture 460 full-resolution frames at an effective frame-rate of 98 fps.

Monitor / Preview Port

The current firmware for the MityCAM-35MMFHDXS EVK does not support the Video Monitor port. Contact Critical Link if this feature is required.

EXTERNAL DIMENSIONS

For customers desiring a complete camera assembly, Critical Link offers enclosed body models that can be used for final application development, as shown in Figure 6 and Figure 7.

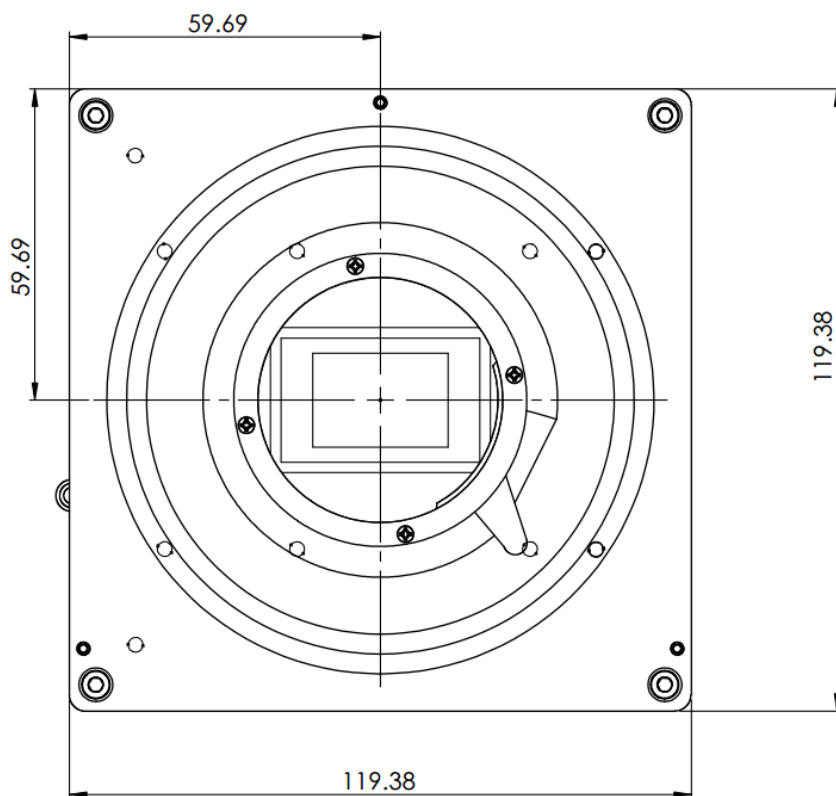


Figure 6: Camera Body with F Mount Lens Mount - Front View (Units in mm)

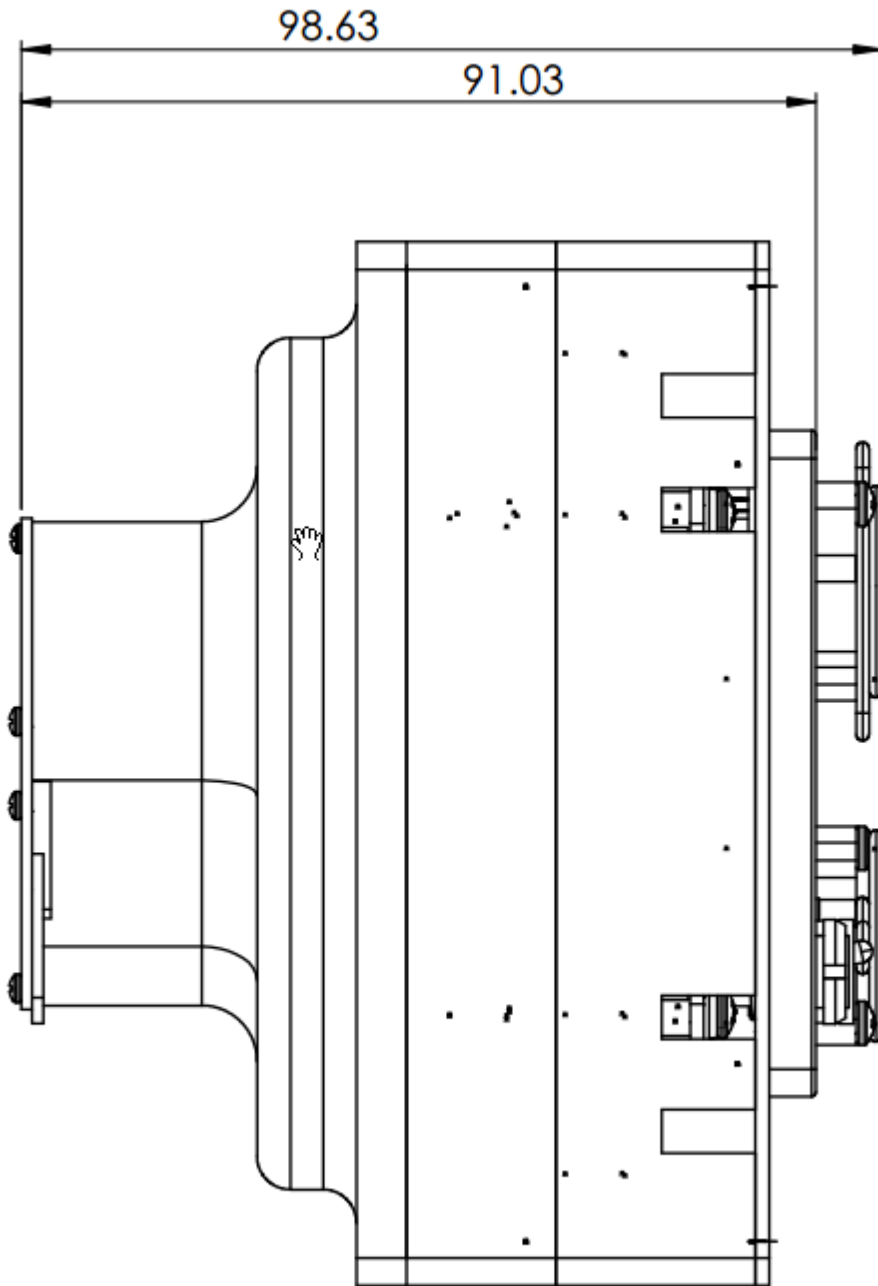


Figure 7: Camera Body with F Mount Lens Mount – Side View (Units in mm)

EXTERNAL DIMENSIONS – BOARD SET

Critical Link can provide board set solutions if the compact body mechanical arrangement does not meet a customer’s application needs. Board sets do not include some features of the base offering. Please contact Critical Link via info@criticallink.com for detailed drawings for a MityCAM-35MMFHDXS Board Set.

ORDERING INFORMATION

Table 6 lists the standard configurations for the MityCAM-35MMFHDXS. For shipping status, availability, and lead time of these or other configurations please contact Canon at <https://canon-cmos-sensors.com/contact-us/>

Table 7 provides an accessory kit part number for the MityCAM-35MMFHDXS EVK. This kit is required when evaluating the sensor or doing development, and is compatible with the models listed in Table 6. It is not required for kits that are being integrated into a working design.

Table 7: Standard Model Numbers

Canon Item Code	Model	Sensor	High Speed Interface Option	Color Filter	Enclosure Type
3622V983	35MMFHDXS-UM-C-S	35MMFHDXSMA	USB 3	Mono	Body
3622V984	35MMFHDXS-UC-C-S	35MMFHDXSCA	USB 3	Color	Body
3889C002	LI3030-UM-C-S	LI3030SAM	USB 3	Mono	Body
3890C002	LI3030-UI-C-S	LI3030SAI	USB 3	RGB-NIR	Body

Table 8: MityCAM-35MMFHDXS Accessory Kit

Part Number	Kit Contents
80-001279	GPIO Cable USB 3 I/O Cable USB 2.0 Cable Power Supply

REVISION HISTORY

Table 9: Revision History

Date	Rev	Change Description
28-Apr-20	A	Initial Release
21-June-22	B	Added reference to LI3030 sensor including associated model numbers.

REFERENCES

- [1] <https://canon-cmos-sensors.com/canon-35mmfhdxsca-19um-cmos-sensor/>
- [2] Contact Canon USA directly for the datasheet: <https://canon-cmos-sensors.com/contact-us>