FEATURES

- High-performance sCMOS sensor from Fairchild Imaging (Div. of BAE)
  - Sensitivity: 55% QE @ 600 nm
  - Wide dynamic range: 15,000:1
  - Low noise: < 1.2 e^-
  - High speed: 75 fps
  - 2.1M Pixel: 1920(H) x 1080(V)
  - Monochrome / Color
  - Rolling / Global Shutter
- Altera Cyclone V SoC standard processing includes:
  - 1x1, 2x2, 4x4, and 8x8 binning
  - Noise reduction
  - Can be customized for application
- Interface Options
  - Camera Link
  - Gigabit Ethernet
  - USB 2.0
- Programmable General Purpose I/O
  - 4 External GPIO Pins Available
  - Support trigger input or drive as expose / frame strobes

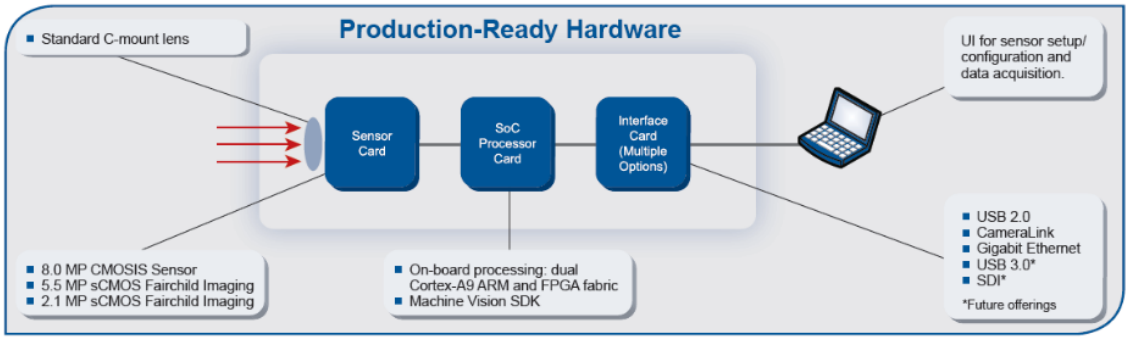
Figure 1: **MityCAM-B1910F (Camera Body)**

APPLICATIONS

- Low-light Imaging
- Machine Vision
- Embedded Instrumentation
- Scientific Imaging
- Surveillance Imaging

DESCRIPTION

The MityCAM Vision Solution from Critical Link features a high performance sCMOS image sensor from Fairchild Imaging (a division of BAE Systems). The kit is available with a 2.1MP CIS-1910F sensor, USB 2.0 interface and your choice of either Dual Camera Link or Gigabit Ethernet interfaces.



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Combined with Critical Link's Machine Vision SDK software tools designed for our Altera Cyclone V SoC based processor card, the MityCAM makes sensor evaluation and integration quick and easy. The MityCAM features a standard C mount lens, with an optional F mount lens available upon request. Critical Link also supports a board set version of the camera for customers designing their own mechanicals or managing other integrations; contact us for more details.

Detailed datasheets regarding the sensor performance curves for sensitivity, well depth, quantum efficiency and dark current, etc. are located on the manufacturer's website [1] and within the CIS-1910F datasheet [2].

The block diagram in Figure 2 shows the structure of the MityCAM-B1910F.

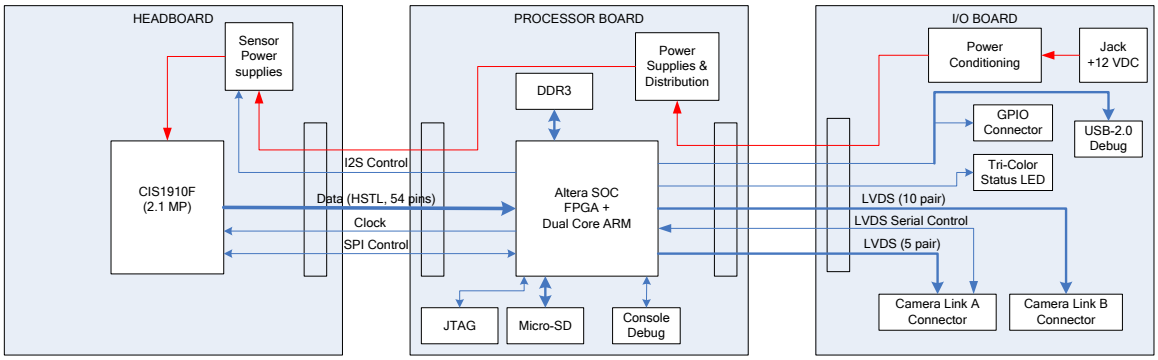

Figure 2: MityCAM-B1910F System Diagram

TECHNICAL SPECIFICATIONS

A summary of the imaging performance of the MityCAM-B1910F family is included below.

PERFORMANCE

	Min	Typical	Max	Units
Active Pixels (CIS-1910F)	-	1920 x 1080	-	H x V
Pixel Size	-	6.5 x 6.5	-	W x H ; µm
Imaging Area (CIS-1910F)	-	12.5 x 7.1	-	W x H ; mm
Dark current @20C		< 35		e-/pixel/sec
ADC resolution (low gain: 1X) (high gain: 30X) (combined gain: 30X)	- - -	11 11 16	- - -	bits
Read-out Noise (@30 fps rolling shutter)	-	< 1.2		e^-
Peak Quantum efficiency @ 600nm	-	> 55%	-	%
Dynamic Range		15,000:1		
Conversion Gain (Rolling Shutter) (Global Shutter)		1.7 0.57		counts / e^-
Full Well Capacity	30,000	-	-	e^-
Cooling Method	Forced Air / Single Stage TEC			
Full Frame Rate (Rolling Shutter)	-	-	75	Frames / s
Full Frame Rate (Global Shutter)	-	-	37	Frames / s
Power Utilization	7.8	9.2	13.5	Watts
Power Input	10.8	12	13.2	V DC

Table 1: MityCAM-B1910F Performance

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WEIGHT

Configuration	Typical	Units
Gigabit Ethernet with Mechanicals	612 (21.55)	grams (ounces)
Camera Link with Mechanicals	589 (20.75)	grams (ounces)
Gigabit Ethernet Board Stack	95 (3.35)	grams (ounces)
Camera Link Board Stack	106 (3.70)	Grams (ounces)

Table 2: MityCAM-B1910F Weight

QUANTUM EFFICIENCY

A typical monochromatic QE curve is shown below in Figure 3.

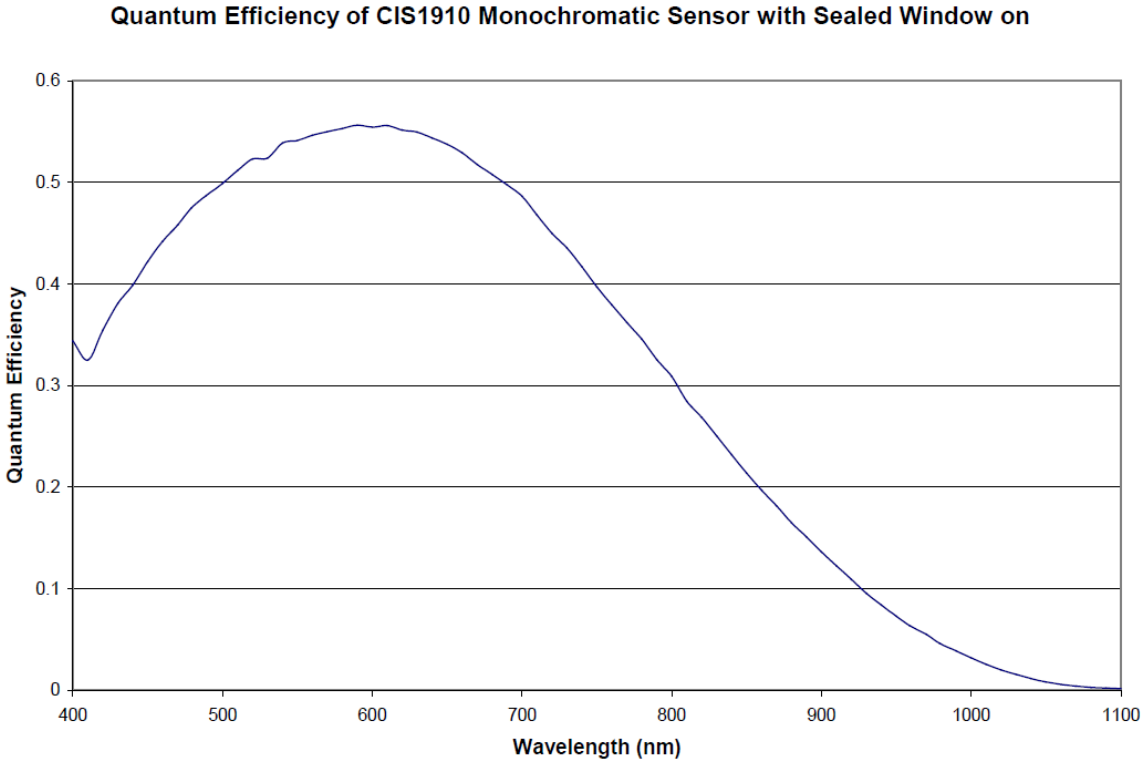

Figure 3: Spectral Response for a CIS1910F Monochromatic Sensor [1]

OPERATING AND STORAGE CONDITIONS

Ambient Operating Temperature Range	0 °C to 50 °C
Humidity	< 80%, Non-Condensing
Storage Temperature Range	-40 °C to 85 °C

Table 3: MityCAM-B1910F Operating and Storage Conditions

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ELECTRICAL CONNECTIONS

The MityCAM-B1910F has the following electrical connections on the back panel:

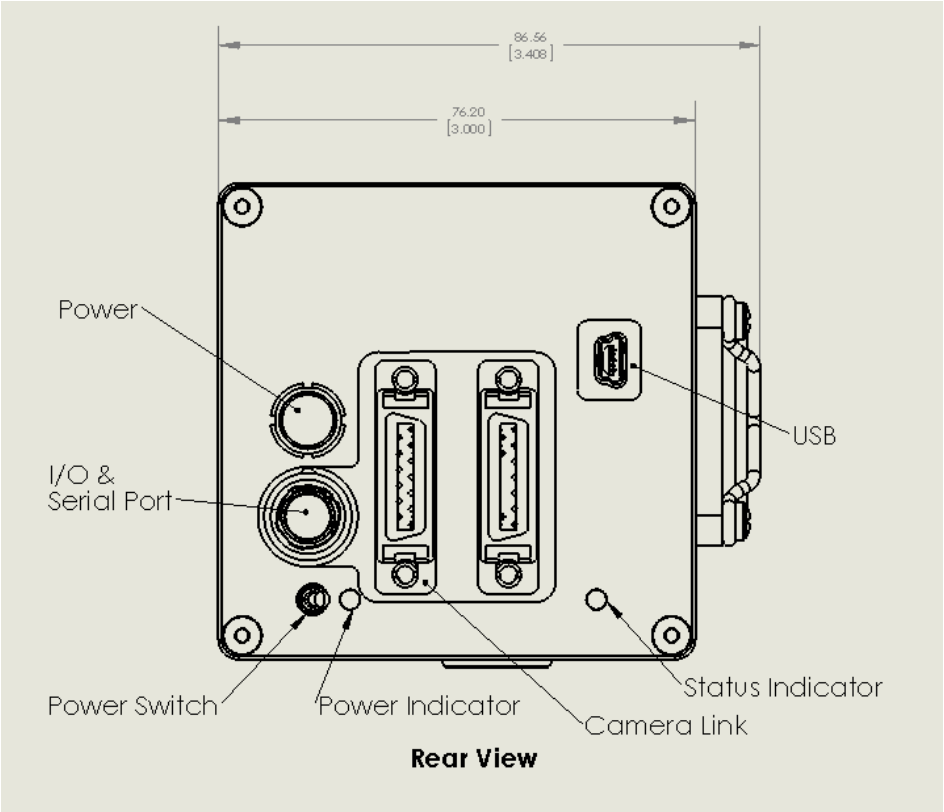

Figure 4: Input / Output Connections on Rear – Dual Camera Link version

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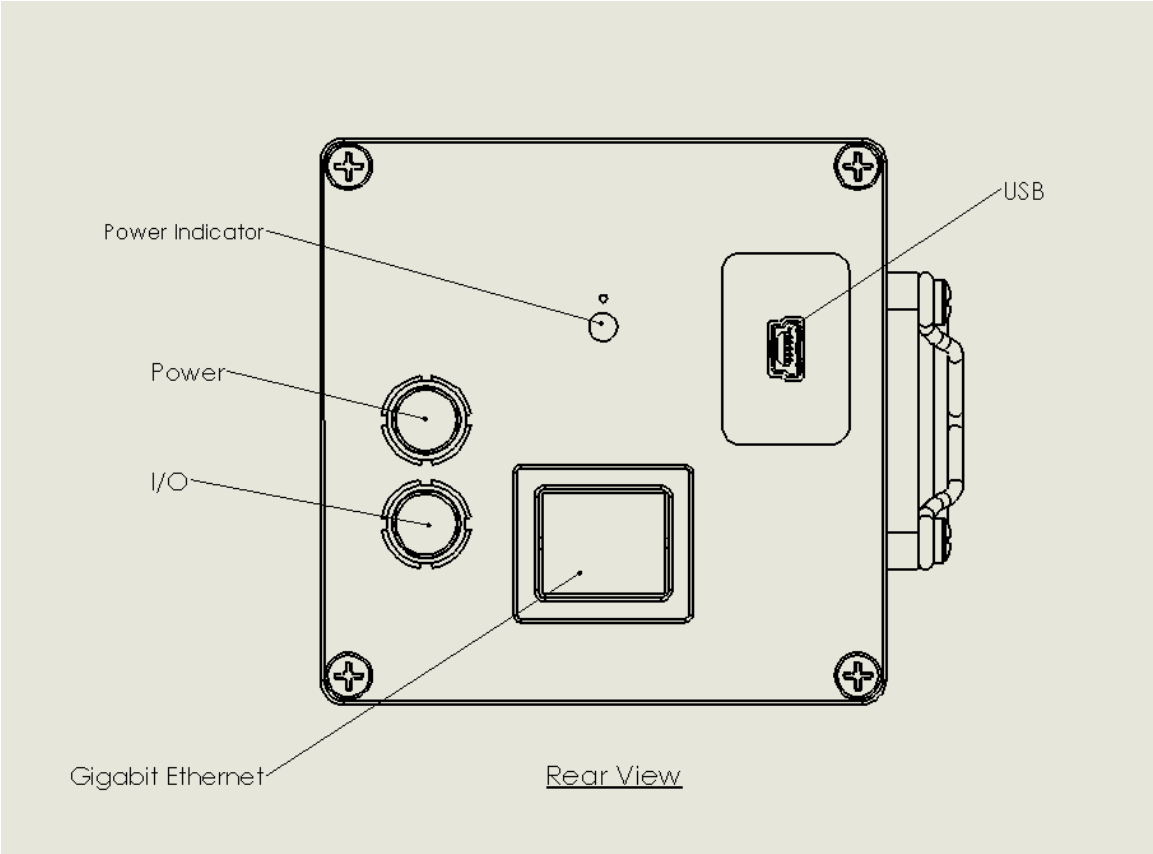

Figure 5: Input / Output Connections on Rear – Gigabit Ethernet version

High-Speed Interface Options

The MityCAM is offered with a number of high-speed interface options.

Camera Link (J201 and J202)

The Camera Link serializer outputs on the camera operate at 85MHz. The camera does not output a DVAL signal. This port is not configurable and requires a frame grabber capable of handling the 85MHz and ignoring DVAL.

When the Dual Camera Link version of the MityCAM-B1910F is utilized both ports, J201 and J202, need to be utilized for maximum frame-rate capabilities. Note that J201 contains the serial data control lines and is the only port required for Base mode operation.

At full 1920x1080 resolution the camera is capable of output in the following modes:

Mode	Bits Per Pixel x Pixels Per Clock
Expanded (10 Tap)	16 x 5
Expanded (10 Tap)	8 x 10
Base	16 x 1
Base	12 x 2
Base	8 x 2

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Gigabit Ethernet (J4)
For the Gigabit Ethernet based MityCAM-B1910F a standard RJ45 Ethernet connector is used, J4. The MityCAM-B2521F Ethernet interface supports Critical Link's legacy protocol used by the MityViewer application. Contact Critical Link at info@criticallink.com to inquire about support for the AIA GigE Vision standard.

Power Input (P200)

The MityCAM has a single power input connector on the rear of the units. This 4-pin LEMO ECG.0B.304.CLN connector, P200, utilizes 2-positive power input pins and 2-ground connections as shown below in Figure 6 and Table 4. Each kit includes an AC to 12V DC (3.3A) power adapter. Maximum current draw should be less than 1.4A.

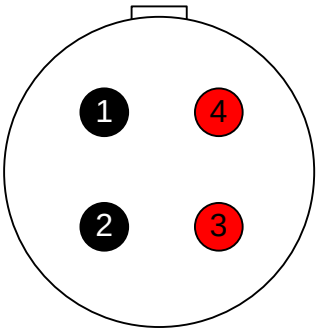

Figure 6: P200 Power Input Connector

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

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 (J1)

The MityCAM 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) and supports lower speed image acquisition via a Windows PC application provided by Critical Link.

General Purpose IO (P201)

A total of 4 general purpose IOs are made available for the user via the P201 connector, LEMO ECG.0B.306.CLN, on the rear of the unit. The GPIOs utilize 5V TTL logic level and are ESD protected to standards exceeding JESD 22. Table 5 and Figure 7 show the pin-out for the GPIO interface connector. The GPIO signals are pulled up in the camera to +5V via a 1k Ohm resistor. A minimum voltage of 4.6V is required to drive the GPIO inputs to logic high, a maximum voltage of 0.15V is required to drive the GPIO inputs to logic low.

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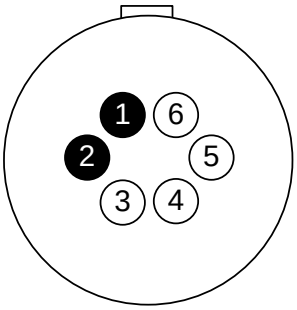

Figure 7: GPIO Interface Connector Pin Out, Mating Side, Gigabit Ethernet (P201)

Pin	Type	Description	Altera SoC Pin
1	GND	Ground	
2	GND	Ground	
3	I/O	IO 3 - 5V TTL Logic Level	B3B_RX_B27_N
4	I/O	IO 2 - 5V TTL Logic Level	B3B_RX_B27_P
5	I/O	IO 1 - 5V TTL Logic Level	B3B_RX_B39_N
6	I/O	IO 0 - 5V TTL Logic Level Supports external trigger	B3B_RX_B39_P

Table 5: GPIO connector pin-out (P201)

The mating connector is a LEMO FGG.0B.306.CLAD52 or similar connector.

Table 6 shows the ESD protection specifications built into the MityCAM-B1910F for the GPIO pins.

ESD Standard	Rating
Human-Body Model (A114-B)	15-kV
Machine Model (A115-A)	200-V
Charged-Device Model (C101)	1000-V

Table 6: GPIO ESD Protection Standards

Cooling

The MityCAM-B1910F features an integrated single stage TEC cooler and low profile 50mm fan for the compact body style units, with an integrated heat sink via the case body. The TEC cooler is capable of holding the temperature to within +/- 0.5 degrees C of a setpoint that is no lower than 10 degrees above the ambient temperature. The fan can be enabled or disabled through the I^2C based LED status light and fan controller. Accessing the fan controls is accomplished via the I^2C bus 1 address 1100 010. The Camera Link serial interface and USB control interface provides a TEC and fan enable control command.

If using the board set only version in your custom design, proper cooling must be considered to ensure that the imaging sensor does not exceed the specified maximum temperature of **Table 3**.

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Read-out rates (Rolling Shutter)

Array Size	Camera Link 10-tap	Camera Link Base Mode	Gigabit Ethernet	USB 2.0 (diagnostics)
2.1Mpixels x 16 bits	75.2 fps	30.1 fps	23 fps	1 fps
2.1Mpixels x 12 bits	N/A	75.2 fps	33 fps	--
2.1Mpixels x 8 bits	75.2 fps	75.2 fps	47 fps	--
*75.2 fps is qualified with TEC designs, 100 fps has been demonstrated with board set (no TEC)				

Read-out rates (Global Shutter)

Array Size	Camera Link 10-tap	Camera Link Base Mode	Gigabit Ethernet	USB 2.0 (diagnostics)
2.1Mpixels x 16 bits	37.0 fps	14.8 fps	23 fps	1 fps
2.1Mpixels x 12 bits	N/A	37.0 fps	33 fps	--
2.1Mpixels x 8 bits	37.0 fps	37.0 fps	47 fps	--
*37.0 fps is qualified with TEC designs, 50 fps has been demonstrated with board set (no TEC)				

EXTERNAL DIMENSIONS – BODY

Unless otherwise noted, all dimensions are in mm[inches].

Front Face Dimensions (Figure 8): 76.20[3.000] x 76.20[3.000]
Side Dimensions (Figure 9) Front Face to External Connectors: 72.877[2.865]

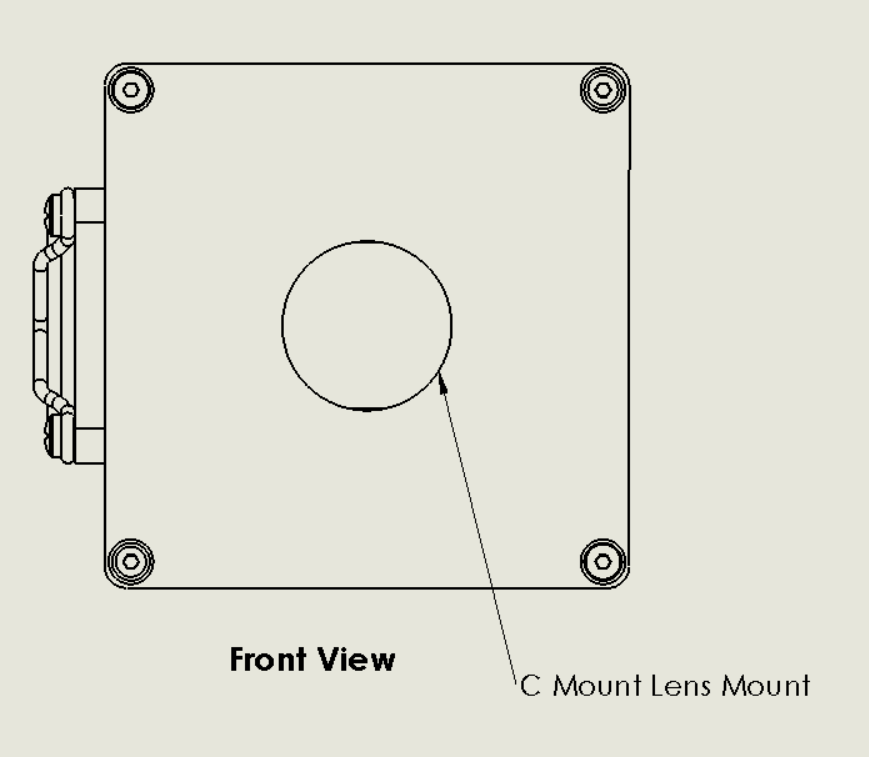

Figure 8: Body with 'C' Mount Lens Mount - Front View

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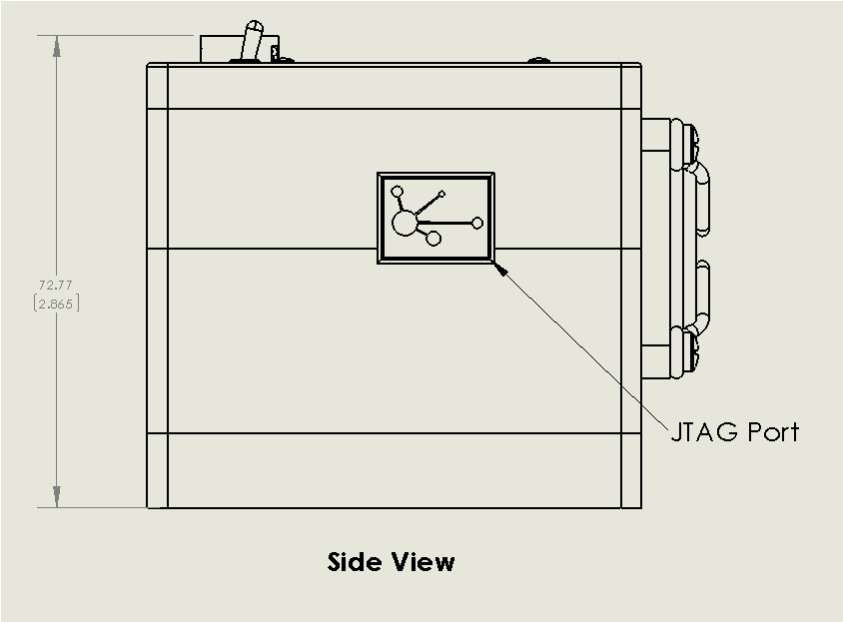

Figure 9: Dual Camera Link Body with 'C' Mount Lens Mount – Side View

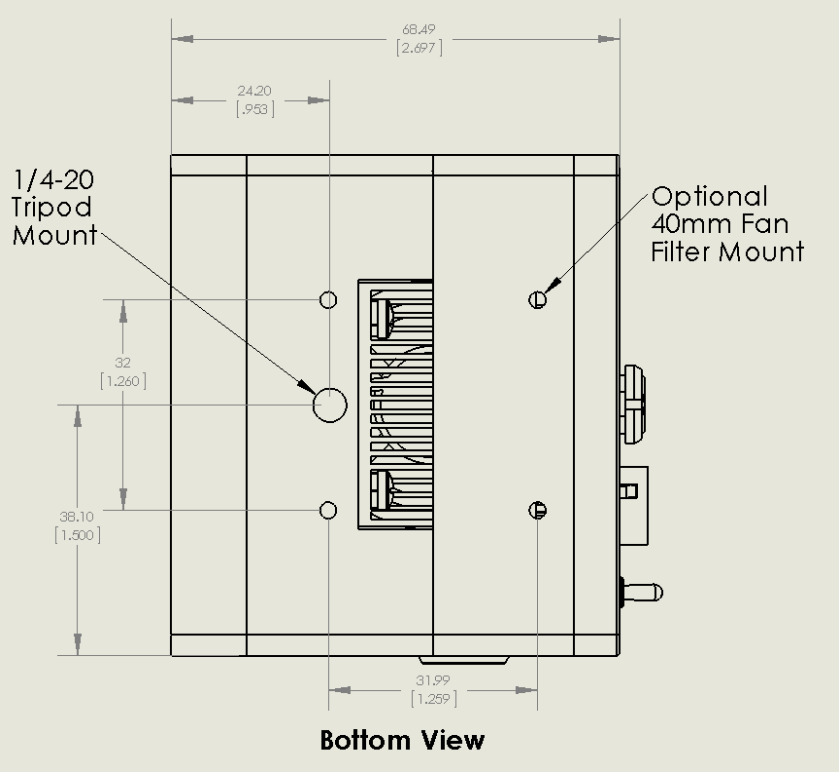

Figure 10: Dual Camera Link Body with Tripod Mount – Bottom View

The exhaust port of the fan should not be obstructed when utilizing the Tripod Mount. The 40 mm Fan filter mount holes support M3 screws and are 2.5 mm deep.

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Figure 11: Camera Body Model

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EXTERNAL DIMENSIONS – BOARD SET ONLY

Critical Link can provide board set solutions if the compact body mechanical arrangement does not meet your application needs. Board sets do not include a TEC device as part of the base offering. Please contact your Critical Link representative for detailed drawings for a particular MityCAM-B1910F board set.

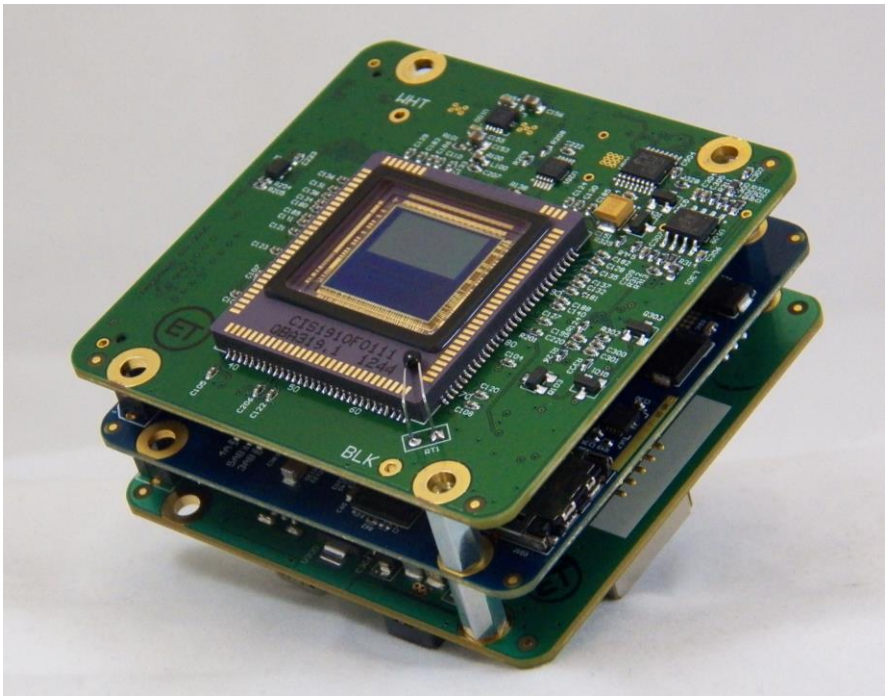

Figure 12: Board set photo

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ORDERING INFORMATION

Table 7 below lists the standard configurations for the MityCAM-B1910F. For shipping status, availability, and lead time of these or other configurations please contact your Critical Link representative.

Table 8 below provides an accessory kit part number for the MityCAM-B1910F. This kit is required when evaluating the sensor or doing development, and is compatible with the camera body models listed in Table 7. It is not required for cameras that are being integrated into a working design.

Table 7: MityCAM-B1910F Standard Model Numbers

Model Number	Sensor Package	Sensor Window	Chroma	High Speed Interface	Body
B1910FTS-CM-C-S	Scientific	Sealed	Mono	Dual Camera Link	Camera
B1910FTS-GM-C-S	Scientific	Sealed	Mono	Gigabit Ethernet	Camera
B1910FTT-CM-C-S	Scientific	Temporary	Mono	Dual Camera Link	Camera

Table 8: MityCAM-B1910F Accessory Kit Part Number

Part Number	MityCAM Compatibility	Kit Contents
80-000783	Compatible with Gigabit Ethernet models	Nikon AF NIKKOR 50mm f/1.8D Lens Lens Mount Adapter Tripod I/O Cable USB Cable Power Supply Ethernet Cable
80-000899	Compatible with Camera Link models	Nikon AF NIKKOR 50mm f/1.8D Lens Lens Mount Adapter Tripod I/O / USB Cable Power Supply Ethernet Cable

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REVISION HISTORY

Revision	Date	Change Description
-1A	27-Jan-14	Initial preliminary revision.
-1B	26-Jan-15	Updated specifications, images and drawings.
-1C	24-Mar-15	Updated standard model numbers, accessory kit part number, read-out rates, and GPIO pin out descriptions.
-1D	31-Oct-15	Added conversion gain to performance tables. Add revision dash numbers to revision history. Incorporated design changes as outlined in PCN20151030000 and PCN20151030001. Clarified that board set solutions do not include a TEC device.
-1E	23-Jan-17	Added Gigabit Ethernet framerates. Updated standard model numbers.
-1F	18-Jul-18	Updated Gigabit Ethernet offering details. Changed Table 7 to Standard package.
-1G	20-Sept-19	Updated lens information in Table 8, Accessory Kit Contents

REFERENCES

[1] Fairchild Imaging, Available: http://www.fairchildimaging.com. [Accessed: January, 2014]

[2] BAE Systems, “MAN 0103 CIS1910F Standard and Scientific Package Datasheet_RevD.PDF”, October 2013.

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