

## FEATURES

- High-performance CMOSIS sensors
  - Sensitivity: 5.56 V/lux.s
  - Dynamic range: 60 dB
  - Dark Noise: 8.6 e<sup>-</sup>
  - High speed: 95\* fps
  - 8M Pixel: 3360(H) x 2496(V)
  - Monochrome / Color
  - Global Shutter
  - 10/12 Bit Pixel Output
  - Multi-ROI support
- Altera Cyclone V SoC Processing
  - Customized Sensor Evaluation
  - Smart Camera Platform
  - Can be customized for application
- Interface Options
  - Camera Link
  - Gigabit Ethernet / GigE Vision
  - USB 2.0
- Programmable General Purpose I/O
  - 4 External GPIO Pins Available
  - Use as trigger / exposure inputs



Figure 1: MityCAM-C8000

## APPLICATIONS

- Machine Vision
- Embedded Instrumentation
- Motion Control
- Traffic Monitoring
- Security

## DESCRIPTION

The MityCAM-C8000 from Critical Link features a high performance CMOS image sensor from CMOSIS. The camera is available with an 8MP CMV8000 sensor, USB 2.0 interface and your choice of either Dual Camera Link or Gigabit Ethernet / GigE Vision interfaces.

Combined with Critical Link's software tools designed for our Altera Cyclone V SoC based processor card, the MityCAM-C8000 makes sensor evaluation and product 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. may be located on the manufacturer's website [1] and within the CMV8000 datasheet [2].

\*continuous output rates limited to Camera Link capacity (10-tap mode at 85 MHz clock rates), bursting to RAM is supported. Frame rates can be increase using reduced or multi-ROI features of the sensor.

*MityCAM is a trademark of Critical Link, LLC.*

The MityCAM-C8000 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-C8000 utilizing the Dual Camera Link option.

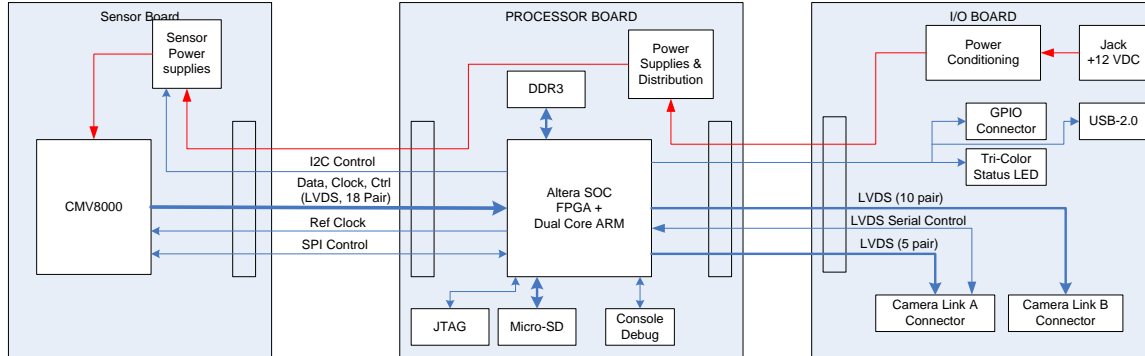


Figure 2: MityCAM-C8000 System Block Diagram, Dual Camera Link Option

## TECHNICAL SPECIFICATIONS

A summary of the imaging performance of the MityCAM-C8000 family is included below.

### PERFORMANCE

	Min	Typical	Max	Units
Active Pixels	-	3360 x 2496	-	H x V
Pixel Size	-	5.5 x 5.5	-	W x H ; $\mu\text{m}$
Imaging Area	-	18.48 x 13.73	-	W x H ; mm
Dark current @ (25C die temp)		41.2		e <sup>-</sup> /pixel/sec
ADC resolution (10-bit mode)	-	10	-	bits
ADC resolution (12-bit mode)	-	12	-	bits
Read-out Noise (@104 fps)	-	8.6		e <sup>-</sup>
Peak Quantum efficiency @ 550nm	-	5.56	-	V/lux-s
Conversion Gain (10-bit mode)	-	0.77	-	DN / e <sup>-</sup>
Dynamic Range		61 dB		
Full Well Capacity	11,700	-	-	e <sup>-</sup>
Cooling Method		Forced Air		
Full Frame Rate	-	-	97.6*	Frames / s
Power Utilization	-	8.2	8.5	Watts
Compact Body Weight		19		oz.
		538		g
Power Input	10.8	12	24.5	V DC

\*continuous frame rate limited by Camera Link output rate, see Readout Rates

Table 1: MityCAM-C8000 Performance

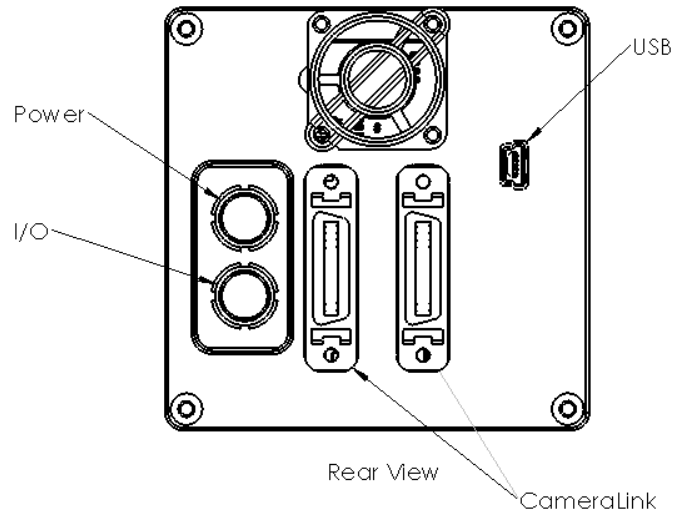
### OPERATING AND STORAGE CONDITIONS

Ambient Operating Temperature Range	-30 °C to 70 °C
Humidity	<80%, Non-Condensing
Storage Temperature Range	-40 °C to 85 °C

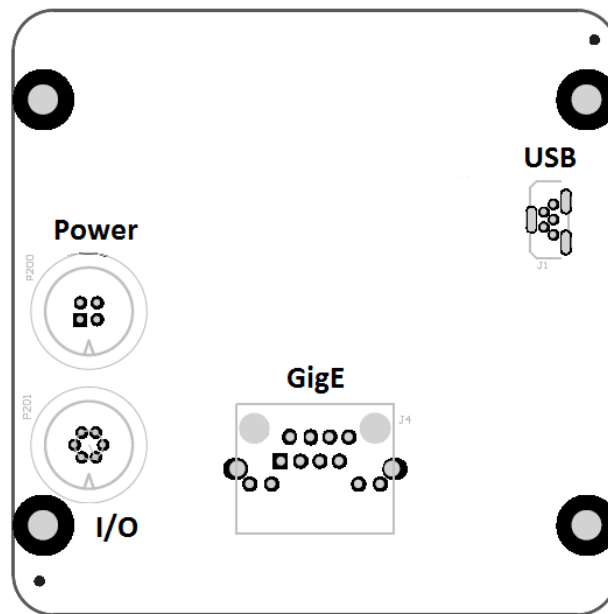
Table 2: MityCAM-C8000 Operating and Storage Conditions

## ELECTRICAL CONNECTIONS

The MityCAM-C8000 Dual Camera Link option and Gigabit Ethernet option have the electrical connections on the back panel as shown in Figure 3 and Figure 4.



**Figure 3: Input / Output Connections on Rear – Dual Camera Link Version.**



**Figure 4: Input / Output Connections on Rear – Gigabit Ethernet Version.**

## High-Speed Interface Options

The MityCAM-C8000 is offered with a number of high-speed interface options.

### Dual Camera Link (J201 and J202) – 10-Tap Mode

The MityCAM-C8000 provides a dual Camera Link I/O adaptor that supports expanded 10-tap mode using an 85 MHz clock to output pixel depths of 8 bits (10 pixels per clock), 16 bits (5 pixels per clock), and 12 bits (6.6 pixels per clock) for full resolution images (3360x2496). Expanded 10-tap mode requires the use of both J201 and J202.

The Dual Camera Link interface can handle a maximum data rate of 6.8Gbps using 10-tap mode.

In addition, the MityCAM-C8000 supports base mode configurations for pixel depths of 16 bits (1 pixel per clock), 12 bits (2 pixels per clock), and 8 bits (2 pixels per clock).

### Gigabit Ethernet (J4)

For the Gigabit Ethernet based MityCAM-C8000 option a standard RJ45 Ethernet connector is used, J4. The MityCAM-C8000 Ethernet interface supports both the AIA GigE interface protocol as well as a Critical Link legacy protocol used by the MityViewer application.

### Power Input (P200)

The MityCAM-C8000 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 in Figure 5 and Table 3 below. Each kit includes an AC to 12V DC (1.25A) power adapter.

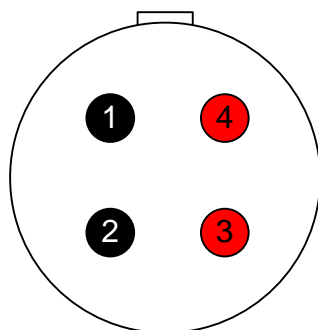


Figure 5: P200 Power Input Connector

Pin	Type	Description
1	GND	Ground
2	GND	Ground
3	PWR	+12 to +24 VDC
4	PWR	+12 to +24 VDC

Table 3: 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-C8000 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 IO are made available for the user via the P201 connector, LEMO ECG.0B.306.CLN, on the rear of the unit. The GPIO's utilize 5V logic levels and are ESD protected to standards exceeding JESD 22. Table 4 and Figure 6 show the pin-out for the GPIO interface connector. The GPIO signals are pulled up to +5V via a 1K Ohm resistor internally on the camera. 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.

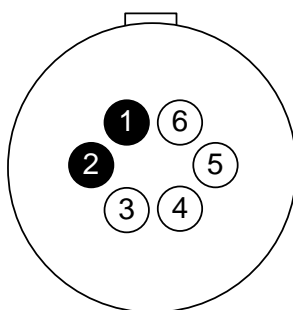


Figure 6: GPIO Interface Connector Pin Out (P201)

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

Table 4: GPIO Connector Pin-Out (P201)

The mating connector is a LEMO FGG.0B.306.CLAD52 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 camera can be customized to capture transitions for asynchronous processing, if desired. In addition, Pin IO 0 can be used for external frame request signaling (hardware frame triggering). Pin IO 1 can be used for external exposure control signaling (hardware exposure control). Table 5 shows the ESD protection specifications built into the MityCAM-C8000 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 5: GPIO ESD Protection Standards

### Cooling

The MityCAM-C8000 features an integrated 25mm fan for the compact body style units 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. The Camera Link serial interface, Gigabit Ethernet interface, and USB control interface provides a fan enable control command.

If the board set only version is utilized in your custom design proper cooling measures must be taken to ensure that the imaging sensor does not exceed the specified maximum temperature of **Table 2**.

### Read-out rates

The maximum continuous read-out rates below are valid when the CMV8000 sensor is configured to output in 10-bit mode with an appropriately configured clock.

**Table 6 Read Out Rates for 10-bit output mode**

Array Size	Camera Link 10-tap	Camera Link Base Mode	GigE	USB
8Mpixels x 16 bits	47.5 fps	10 fps	5 fps	0.7 fps
8Mpixels x 8 bits	95 fps	20 fps*	11 fps	N/A
8Mpixels x 12 bits	N/A	20 fps*	7.5 fps	N/A
*2 pixels per clock base mode configuration				

### Sensor Bit Depth

The MityCAM-C8000 standard offering configures the CMOSIS CMV8000 sensor to output pixel data using 10 bits per pixel. A separate firmware option is available which will support operating the CMV8000 in 12 bits per pixel mode. Contact Critical Link for details.

### Burst Capture

Due to limitations of Camera Link, the camera cannot capture at the highest resolution and output at a full bit-depth. The camera can capture using the highest possible sensor clock first into RAM and then stream the data out an interface (Camera Link, USB, GigE) at a slower rate. In this mode the camera evaluation kit allows the user to capture 42 full-resolution frames at an effective frame-rate of 97.6 fps.

## EXTERNAL DIMENSIONS – COMPACT BODY

For customers desiring a complete camera assembly, Critical Link offers enclosed body models that can be used for final application development as shown in the figure below.

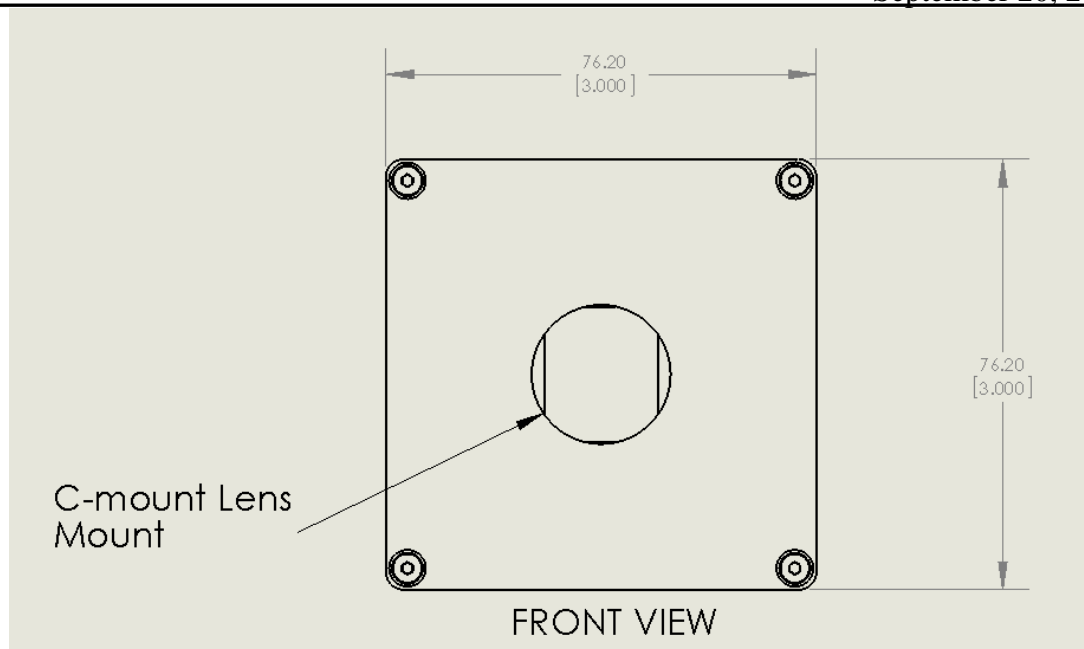


**Figure 7 Compact Body Camera Option Shown with Example Lens and Small Tripod, Side View**

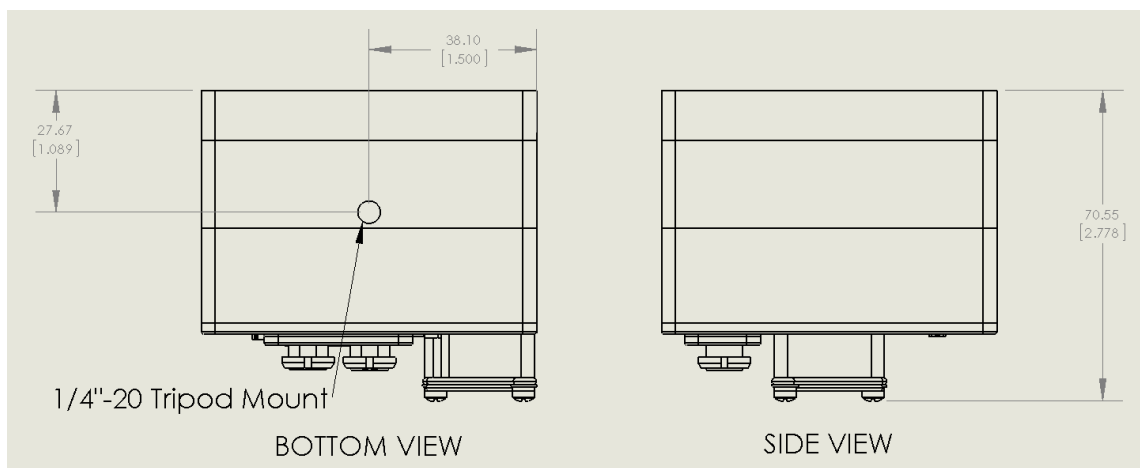


**Figure 8 Compact Body Camera Option Shown with Example Lens and Small Tripod, Rear View**

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



**Figure 9: Compact Body with 'C' Mount Lens Mount - Front View**



**Figure 10: Compact Body with 'C' Mount Lens Mount – Bottom and Side View**

## EXTERNAL DIMENSIONS – BOARD SET

Critical Link can provide board set solutions if the compact body mechanical arrangement does not meet your application needs. Board sets do not include some features of the base offering. Please contact your Critical Link representative for detailed drawings for a particular MityCAM-C8000 board set.



## ORDERING INFORMATION

Table 7 below lists the standard configurations for the MityCAM-C8000. 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-C8000. This kit is required when evaluating the sensor or doing development, and is compatible with the models listed in Table 7. It is not required for cameras that are being integrated into a working design.

**Table 7: Standard Model Numbers**

Model	Sensor	High Speed Interface Option	Color/ Mono	Enclosure Type
C8000-GM-C-S	CMV8000	Gigabit Ethernet / GigE Vision	Mono	Compact Body
C8000-CC-C-S	CMV8000	Dual Camera Link	Color	Compact Body
C8000-GC-C-S	CMV8000	Gigabit Ethernet / GigE Vision	Color	Compact Body

**Table 8: MityCAM-C8000 Accessory Kit**

Part Number	Kit Contents
80-000784	Nikon AF NIKKOR 50mm f/1.8D Lens Lens Mount Adapter Tripod I/O Cable USB Cable Power Supply Ethernet Cable

## REVISION HISTORY

**Table 9: Revision History**

Date	Rev	Change Description
24-Jul-14	A	Initial preliminary revision.
18-Sep-14	B	Updated power supply requirements. Updated model numbers. Prep for general consumption.
24-Oct-14	C	Sensor spec updates
26-Aug-16	D	Add conversion gain & GigE framerates. Clarified 10 bit and 12 bit sensor readout options. Various formatting updates. Added document number. Updated Environmental Specifications per new CMOSIS sensor specs.
23-Jan-17	E	Updated standard configurations
10-Feb-17	F	Corrected GigE read out rates in Table 6.
20-Sep-19	G	Updated Table 9, Accessory Kit Contents

## REFERENCES

- [1] [www.cmosis.com](http://www.cmosis.com)
- [2] CMV8000, "datasheet\_cmv8000\_v1.2", Jan 5 2014.

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