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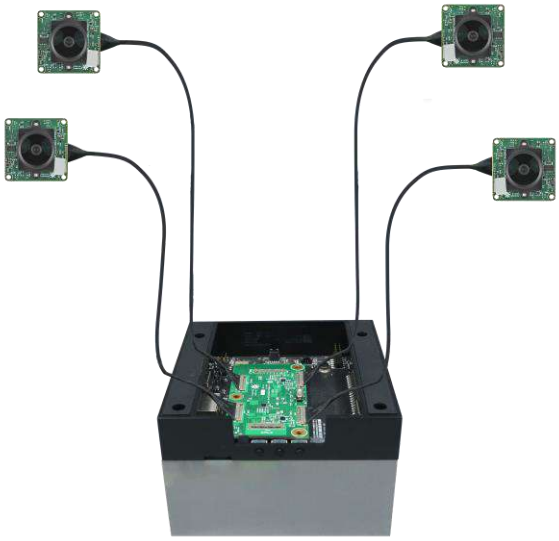
e-CAM200_CUOAGX



Datasheet

Revision 1.2
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Contents

1 Introduction

e-CAM200_CUOAGX is 20 MP MIPI CSI-2 camera from e-con Systems, a company with over two decades of experience in designing, developing, and manufacturing OEM cameras. This multi-camera board can be directly interfaced with NVIDIA® Jetson AGX Orin™ development kit.

The e-CAM200_CUOAGX board interconnects four 20 MP custom lens camera modules. It features a 1/1.8" AR2020 CMOS image sensor from onsemi™, supporting the GRBG image format. Each of the four 20 MP color cameras is equipped with a small form factor S-mount lens holder, also known as an M12 board lens.

This document describes the features of e-CAM200_CUOAGX board and the pin-outs of the connectors including the mechanical diagram.

2 Disclaimer

The specifications and features of e-CAM200_CUOAGX camera board are provided here as reference only and e-con Systems reserves the right to edit or modify this document without any prior intimation of whatsoever.

3 Description

e-CAM200_CUOAGX uses four 4-Lane MIPI CSI interfaces of Jetson AGX Orin™ development kit for connecting four 20 MP camera modules. Jetson AGX Orin™ development kit is a high-performance evaluation kit developed by NVIDIA®.

e-CAM200_CUOAGX is a multi-board solution, which has three boards as follows:

- Camera base board (e-CAM30_HEXCUXVR_BASE_BRD)
- Adaptor board (e-CAM130_TRICUTX2_ADAPTOR)
- Module board (e-CAM200_CUMI2020C_MOD)

The following figures show the camera base board, adaptor board and module board.

Figure 1: Base Board e-CAM30_HEXCUXVR_BASE_BRD

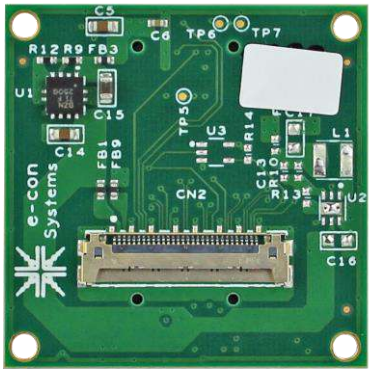

Figure 2: Adaptor Board e-CAM130_TRICUTX2_ADAPTOR

Figure 3: Module Board e-CAM200_CUMI2020C_MOD

The module board is based on AR2020 CMOS image sensor from onsemi™ and an on-board image signal processor (ISP). These 4-Lane MIPI camera modules can be streamed in 20Mp high resolution, which will be best fit for high end multi-camera solution.

e-CAM200_CUOAGX has three different variants, which are listed in the below table.

Part Number	Base Board	Adaptor Board	Module Board	Micro Coaxial Cable (IPEX)	Lens
e-CAM200_CUOAGX_CHLC_1H01R1	1	1	1	1	1
e-CAM200_CUOAGX_CHLC_2H01R1	1	2	2	2	2
e-CAM200_CUOAGX_CHLC_4H01R1	1	4	4	4	4

Table 1: e-CAM200_CUOAGX Variants

Note: The number of adaptor board, module board, lens and micro-coaxial cable differs for e-CAM200_CUOAGX variants and remains the same for base board.

The e-CAM200_CUOAGX camera base board has one 120-pin connector (CN1) that can be directly mated with J509 connector of Jetson AGX Orin development kit and six 30-pin micro-coaxial connectors (CN2 (CAM A), CN3 (CAM B), CN4 (CAM C), CN5

(CAM E), CN6 (CAM D), and CN7 (CAM F)) for interfacing with camera modules through 30 cm micro-coaxial cable. Among them, CN2 (CAM A), CN4 (CAM C), CN5 (CAM E) and CN7 (CAM F) connector are used for connecting 4-Lane 20 MP camera modules, and other CN3 (CAM B) and CN6 (CAM D) connectors are reserved by econ Systems and left unconnected. The following figure shows the camera connector positions in e-CAM30_HEXCUXVR_BASE_BRD board.

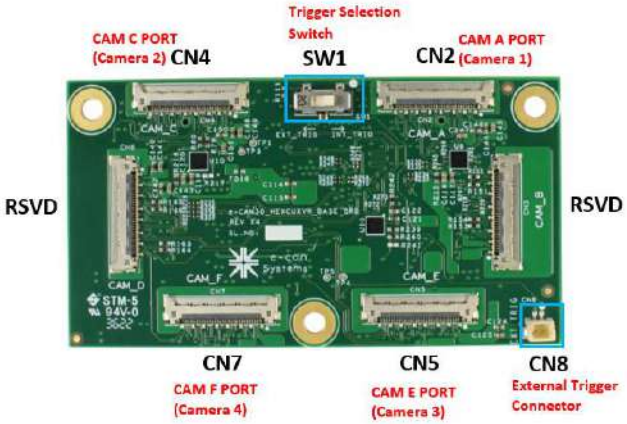

Figure 4: Camera Connector Positions in e-CAM30_HEXCUXVR_BASE_BRD

For detailed interfacing of the e-CAM200_CUOAGX camera board, please refer to the *e-CAM200_CUOAGX_Getting_Started_Manual_Rev_<ver>.pdf*.

e-CAM200_CUOAGX operates in asynchronous mode. The asynchronous mode is the normal streaming mode. In this mode, all four cameras can be controlled individually.

The maximum frame rate supported for in the e-CAM200_CUMI2020C_MOD is listed in the following table. Maximum 2 cameras can stream at Frame rates mentioned below in Table 2.

Resolution	Frame Rate (fps)
5120 x 3840	30fps
3840x 2160	50fps
2560 x 1920	60fps
1920 x 1080	120fps

Table 2: Maximum Frame Rate Supported

For Multicamera streaming, 4 cameras can stream in parallel for Frame rates mentioned below in Table 3.

Resolution	Frame Rate (fps)
5120 x 3840	15fps
3840x 2160	30fps
2560 x 1920	60fps
1920 x 1080	120fps

Table 3: Maximum Frame Rate Supported for four cameras.

3.1 Features

The features of e-CAM200_CUOAGX are as follows:

- Multi-board solution.
- Four 20 MP cameras are supported.
- Standard M12 lens holder for use with customized optics or lenses for various applications.
- Light weight, versatile, and portable design.
- Control for individual cameras and numbers of cameras to be streamed is selectable.
- Imaging applications:
  - 20 MP CMOS image sensor.
  - Still capture supported resolution in all resolutions provided in table 2.
  - Field of View (FOV) angle is not the same for all preview resolutions.
- Operating Voltage - 3.3V +/- 5%, Current – 0.613W (Four cameras streaming condition).
- Restriction of Hazardous Substances (RoHS) compliant.

4 Key Specifications

The below table lists the key specifications of e-CAM200_CUOAGX.

Description	Specification
Base Board Size (L x W)	30 mm × 30 mm
Image Resolution	5120 x 3840 (20MP)
Supported OS	Linux (Ubuntu)

Table 4: Key Specifications of e-CAM200_CUOAGX

4.1 CMOS Image Sensor Specification

The below table lists the specification of CMOS image sensor used in e-CAM200_CUOAGX board.

Sensor Specification	
Type / Optical Size	1/1.8" Optical format RGB image sensor
Resolution	20 MP
Sensor Type	10bit Raw format
Pixel size	1.4 µm Back Side Illuminated (BSI)
Sensor Active Area	5120H x 3840V
Responsivity	8.4 ke−/lux.sec
Signal to Noise Ratio (SNR)	TBD
Dynamic Range	TBD

Table 5: CMOS Image Sensor Specification

Note: For more information about the AR2020 CMOS image sensor or for *Datasheet*, please contact onsemi™.

5 Pin Description

The e-CAM200_CUOAGX base board has six connectors such as interface connector (CN2) CAM A, (CN3) CAM B, (CN4) CAM C, (CN6) CAM D, (CN5) CAM E, (CN7) CAM F connectors. CAM B (CN3) and CAM D (CN6) are reserved by e-con Systems and are not used in e-CAM200_CUOAGX board. The CAM A, CAM C, CAM E and CAM F connectors are interfaced with the adaptor board.

The connector pin descriptions are listed in the below table.

5.1 Pin-out Details of Base Board Camera Connector CAM A (CN2)

Pin No	Signal Name	Pin Type	Description
1	VCC_3P3	POWER	3.3V Power supply for camera and adaptor boards
2	VCC_3P3	POWER	3.3V Power supply for camera and adaptor boards
3	RSVD	-	Reserved
4	GND	POWER	Ground signal for digital and analog
5	GND	POWER	Ground signal for digital and analog
6	n_uC_BOOT0	OUTPUT	1.8V IO Boot control signal Low – Boot from internal flash memory High– Reprogram the internal flash memory
7	I2C_SCL	OUTPUT	I2C Clock signal
8	I2C_SDA	I/O	I2C Data Signal
9	GND	POWER	Ground signal for digital and analog
10	MIPI_D2_N	INPUT	MIPI Data Lane 2 Differential Pair -
11	MIPI_D2_P	INPUT	MIPI Data Lane 2 Differential Pair +
12	TRIGGER	OUTPUT	Camera trigger signal
13	RSVD	-	Reserved
14	GND	POWER	Ground signal for digital and analog
15	MIPI_D1_N	INPUT	MIPI Data Lane 1 Differential Pair -
16	MIPI_D1_P	INPUT	MIPI Data Lane 1 Differential Pair +
17	GND	POWER	Ground signal for digital and analog
18	GND	POWER	Ground signal for digital and analog
19	MIPI_D0_N	INPUT	MIPI Data Lane 0 Differential Pair -
20	MIPI_D0_P	INPUT	MIPI Data Lane 0 Differential Pair +
21	RESET	OUTPUT	Camera reset signal (Active low)
22	GND	POWER	Ground signal for digital and analog
23	RSVD	-	Reserved
24	MIPI_CLK_N	INPUT	MIPI Clock Lane Differential Pair -
25	MIPI_CLK_P	INPUT	MIPI Clock Lane Differential Pair +
26	GND	POWER	Ground signal for digital and analog
27	MIPI_D3_N	INPUT	MIPI Data Lane 3 Differential Pair -
28	MIPI_D3_P	INPUT	MIPI Data Lane 3 Differential Pair +
29	RSVD	-	Reserved
30	RSVD	-	Reserved

Table 6: Pin-out Details of Deserializer Board Camera Connector

Jetson AGX Orin™ development kit supports four 4-Lane MIPI interfaces and the above listed pin details are used to interface one 4-Lane camera with CAM A, CAM C, CAM E and CAM F port.

6 Connectors Part Numbers

The below table lists the connectors used in e-CAM200_CUOAGX and its compatible mating connectors.

Connector	Description	Manufacturer	Part Number
e-CAM200_CUOAGX base board mating connector (CN1) with Orin	120-pin SMT Connector with 0.5 mm pitch	Samtec	QTH-060-01-H-D-A-K
e-CAM200_CUOAGX headers (CN2, CN4, CN5, CN7) for mating base board with adaptor boards	30-pin receptacle connector with 0.4 mm pitch fully shielded	I-PEX	20682-030E-02
Micro-coaxial cable assembly to connect base board and adaptor board	30 cm length micro-coaxial cable with pin 1 to 1 compatible	I-PEX	20679-030T-01

Table 7: Connector Part Numbers

7 Electrical Specification

The electrical specifications of e-CAM200_CUOAGX are as follows:

The values described in this section are measured in e-con Systems lab, and this can be used as reference only. The current measurements are typical values and are subject to change for different camera boards under different conditions. However, these values can be taken as a reference for power estimation and power supply design.

7.1 Recommended Operating Condition

The below table lists the recommended operating condition of e-CAM200_CUOAGX.

Platform	Lanes	Resolution	Frame Rate(fps) in 10-bit Output	Power Consumption (W) in 10-bit Output
With Jetson AGX Orin™	4 Lane	5120x3840	30	0.178
		3840x2160	50	0.171
		2560x1920	60	0.173
		1920x1080	120	1.175

Table 8: Recommended Operating Condition

8 Mechanical Specifications

The e-CAM200_CUOAGX base board size is 75.03 mm x 40.69 mm x 1.6 mm. The base and adaptor boards drawing, and its dimensions are described in the following sections.

8.1 e-CAM200_CUOAGX Base Board Mechanical Dimension

The following figure shows the front view of e-CAM200_CUOAGX base board with mechanical dimensions.

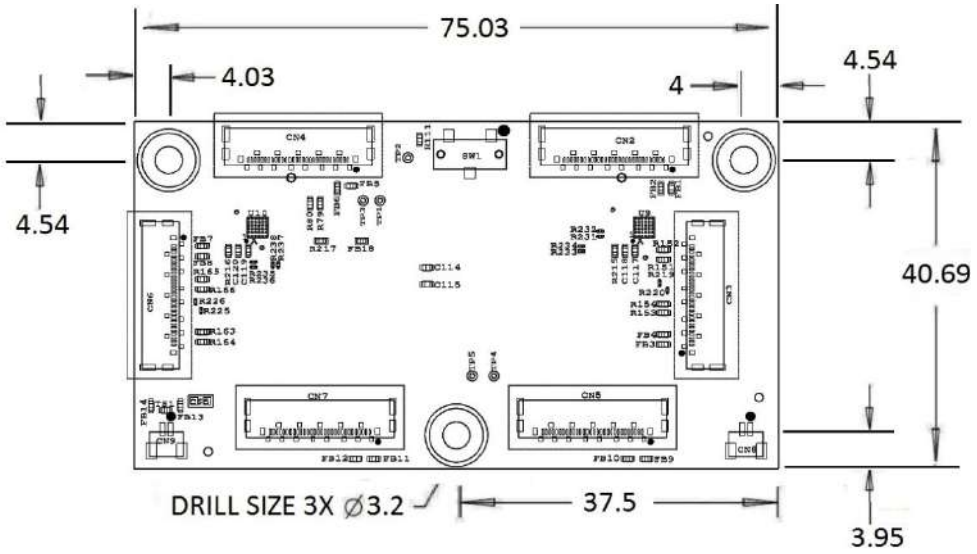

Figure 5: Front Portion of e-CAM200_CUOAGX Base Board Mechanical Dimensions

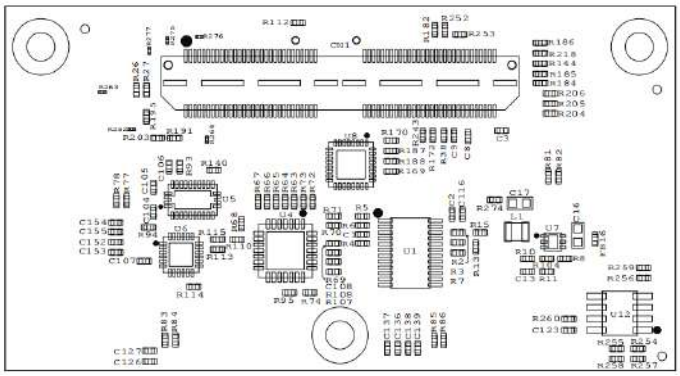

Figure 6: Rear Portion of e-CAM200_CUOAGX Base Board Mechanical Dimensions

8.2 e-CAM200_CUOAGX Mod Board Mechanical Dimension

The following figure shows the front view of e-CAM200_CUOAGX mod board with mechanical dimensions.

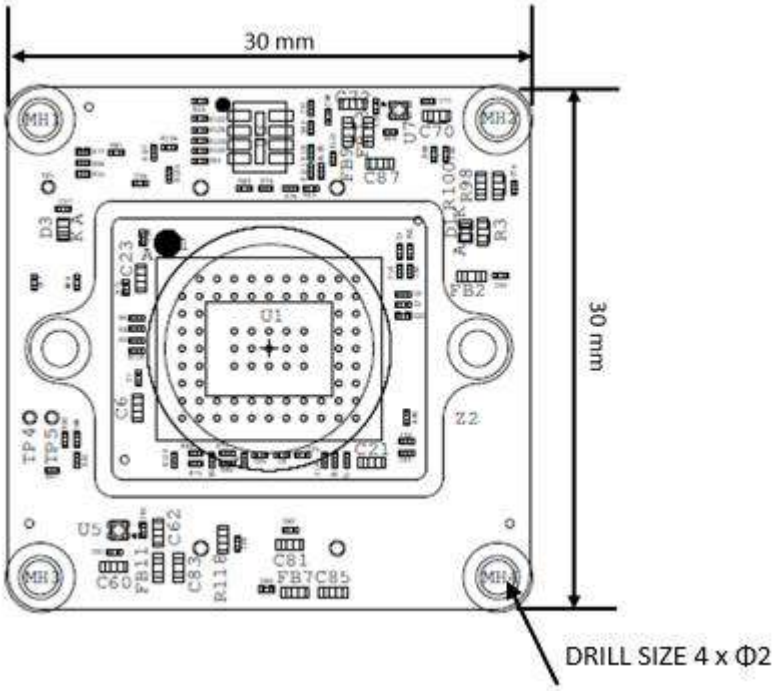

Figure 7: e-CAM200_CUOAGX Mod Board Front View Mechanical Dimensions

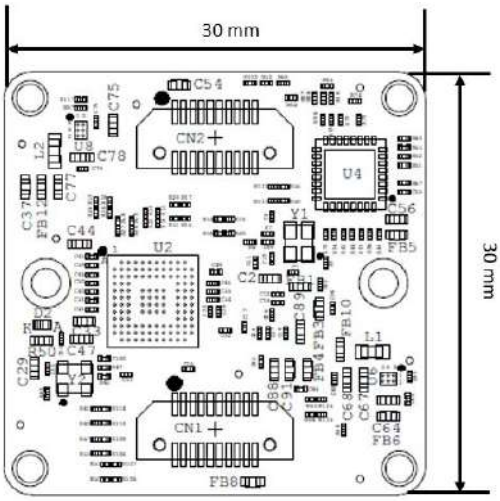

Figure 8: e-CAM200_CUOAGX Mod Board Rear View Mechanical Dimensions

8.3 e-CAM200_CUOAGX Adaptor Board Mechanical Dimension

The following figure shows the front view of e-CAM200_CUOAGX adaptor board with mechanical dimensions.

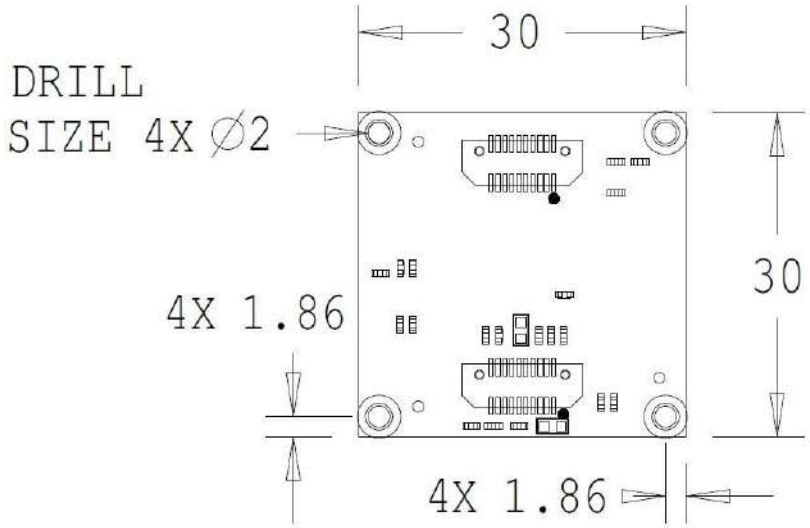

Figure 9: e-CAM200_CUOAGX Adaptor Board Front View Mechanical Dimensions

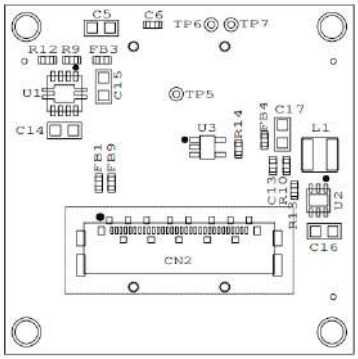

Figure 10: e-CAM200_CUOAGX Adaptor Board Rear View Mechanical Dimensions

Note: All dimensions are in mm.

For e-CAM200_CUOAGX module board mechanical dimension information, please refer to the e-CAM200_CUMI2020C_MOD_*Datasheet_Rev_<ver>.pdf*.

Revision History

Rev	Date	Description	Author
1.0	06-Oct-2023	Initial Release	Camera Team
1.1	05-Jan-2024	Updated Frame Rate	Camera Team
1.2	10-Jan-2024	In section 8 Mod board mechanical dimensions added In table 1 Product code updated Updated Table 6	Camera team

Support

Contact Us

If you need any support on e-CAM200_CUOAGX product, please contact us using the Live Chat option available on our website - https://www.e-consystems.com/

Creating a Ticket

If you need to create a ticket for any type of issue, please visit the ticketing page on our website - https://www.e-consystems.com/create-ticket.asp

RMA

To know about our Return Material Authorization (RMA) policy, please visit the RMA Policy page on our website - https://www.e-consystems.com/RMA-Policy.asp

General Product Warranty Terms

To know about our General Product Warranty Terms, please visit the General Warranty Terms page on our website - https://www.e-consystems.com/warranty.asp