

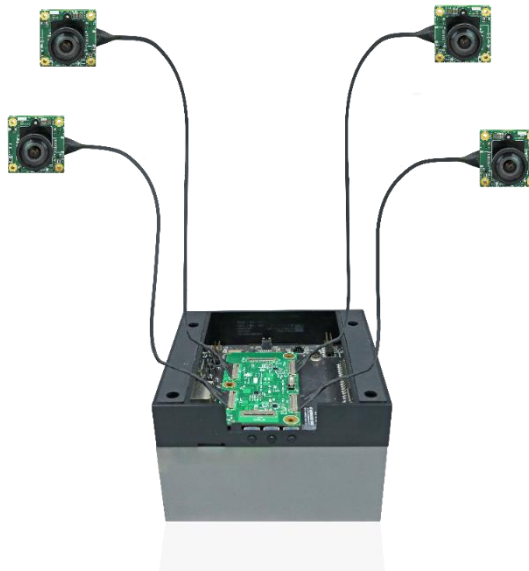


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### e-CAM56\_CUOAGX



## Product Datasheet

Revision 1.5

27<sup>th</sup> March 2024



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## 1 Introduction

The e-CAM56\_CUOAGX is a 5 MP, MIPI, global shutter color camera from e-con Systems, a company with over two decades of experience in designing, developing, and manufacturing OEM cameras. This camera board targets the NVIDIA® Jetson AGX Orin™ development kit.

e-CAM56\_CUOAGX camera contains diagonal 8.8mm (1/1.8) IMX568 sensor from Pregius S family of CMOS image sensor from Sony® and can be interfaced to the camera connector of the Jetson AGX Orin™ development kit. This MIPI camera is provided with S-mount lens holder. e-con Systems provides the sample applications that demonstrates the features of this camera.

This document describes about the features of e-CAM56\_CUOAGX and the pinouts of the connectors including the mechanical diagram.

## 2 Disclaimer

The specifications and features of e-CAM56\_CUOAGX camera board are provided here as reference only and e-con Systems reserves the right to edit/modify this document without any prior intimation of whatsoever.

## 3 Description

e-CAM56\_CUOAGX connects up to four 5 MP camera modules using 4-lane MIPI CSI camera connections supported by Jetson AGX Orin™ development kit. The Jetson AGX Orin™ is a small size, low power, AI system-based evaluation kit developed by NVIDIA®.

e-CAM56\_CUOAGX is a multi-board solution, which has three boards as follows:

- Camera module (e-CAM521\_CUMI568C\_MOD\_H01R1)
- Adaptor board (e-CAM80\_CUMI334\_ADP)
- Base board (e-CAM30\_HEXCUXVR\_BASE\_BRD)

The camera module is a small, low-power, high performance 5 MP camera module based on diagonal 8.8mm IMX568 sensor. The IMX568 is a diagonal 8.8mm optical form-factor, CMOS image sensor.

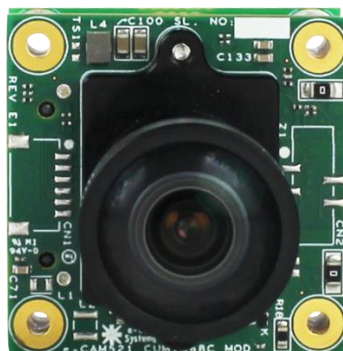


Figure 1: Front View of e-CAM56\_CUOAGX



e-CAM56\_CUOAGX Base board has 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)) among which only four connectors (CN2 (CAM A), CN4 (CAM C), CN5 (CAM E), CN7 (CAM F)) are used for interfacing with camera modules through the 30 cm micro-coaxial cable. The camera connector positions in e-CAM56\_CUOAGX Base board is shown below.

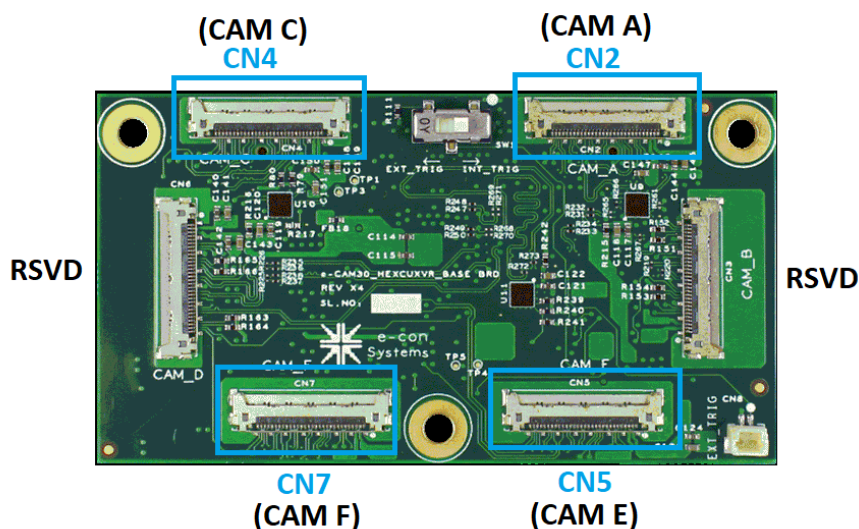


Figure 2: e-CAM56\_CUOAGX Base board connector position

The following table lists the supported frame rates by e-CAM56\_CUOAGX camera module with NVIDIA® Jetson AGX Orin™ development kit are listed below

Resolution	Frame Rate(fps) in 10-bit Output	Frame Rate(fps) in 12-bit Output
2432 x 2048 (5MP)	79	67
1920 x 1080 (FHD)	142	121
1280 x 720 (HD)	202	172
640 x 480 (VGA)	280	240

Table 1: Supported Resolution and Frame Rates

### 3.1 Features

The features of camera module are as follows:

- 1/1.8" optical form-factor, 5 MP camera module
- Manual focus lens
- Global shutter camera sensor
- MIPI CSI-2 4Lane video output
- Trigger mode (both external and internal) supported.
- Small form factor with lens
- PCB Size: 30 mm x 30 mm
- Restriction of Hazardous Substances (RoHS) compliant
- Operating Voltage: 3.3V  $\pm$ 5%, Power consumption: ~1.3W (for one camera module)



## 4 Key Specifications

The following table lists the key specifications of e-CAM56\_CUOAGX.

Description	Specification
Size (L x W)	30 mm x 30 mm
Video format	RAW
Maximum image resolution	2432(H) x 2048(V)
Supported OS	Linux (Ubuntu) - 20.04 (aarch64)

Table 2: Key Specifications of e-CAM56\_CUOAGX

### 4.1 CMOS Image Sensor Specifications

The following table lists the specifications of the CMOS image sensor used in this e-CAM56\_CUOAGX camera board.

Sensor Specification	
Type/Optical size	1/1.8" CMOS Solid-State image sensor
Resolution	5 MP
Sensor Type	RGB RAW 10/12-bit
Pixel size	2.74 $\mu\text{m}$ x 2.74 $\mu\text{m}$
Number of effective or active pixels	2472 (H) x 2064 (V)
Number of supported pixels	2432 (H) x 2048 (V)

Table 3: CMOS Image Sensor Specification

**Note:**

1. To avoid stride issue in the RAW image, currently supported resolution is 2432 x 2048.
2. For more information about the IMX568 sensor Datasheet, please contact SONY® corporation.

## 5 Pin Description

e-CAM56\_CUOAGX product has 30-pin single row IPEX connectors on both adaptor board and Base board for interfacing with each other through IPEX cable. e-CAM56\_CUOAGX base board also have one 120pin board to board connector for mating with Jetson AGX Orin™ development kit.

- [Adaptor Board IPEX Connector Position and Pin-out Details](#)
- [Base Board IPEX Connector Position and Pin-out Details](#)
- [Base Board 120pin Board to Board Connector Position Details](#)
- [Base Board I/O Connector Position and Pin-out Details](#)

### 5.1 Adaptor Board IPEX Connector Position and Pin-out Details

e-CAM56\_CUOAGX adaptor board is provided with single row 30pin IPEX connector (CN2) for mating with Micro-coaxial IPEX cable. Position of CN2 connector on e-CAM56\_CUOAGX adaptor is shown below,





**Figure 3: e-CAM56\_CUOAGX adaptor board (CN2) connector position**

The following table lists the pin-out details of adaptor board CN2 connector. You must note that the pin numbers and direction are given with respect to the adaptor board.

Pin No	Signal Name	Pin Type	Description
1	VCC_3P3	POWER	3.3V Input power supply for camera
2	VCC_3P3	POWER	3.3V Input power supply for camera
3	VCC_1P8	POWER	1.8V Input power supply for camera
4	GND	POWER	Ground signal for digital and analog
5	GND	POWER	Ground signal for digital and analog
6	BOOT	INPUT	1.8V I/O camera Boot signal with internal pull down of 470K
7	I2C_SCL	INPUT	1.8V I/O I2C Clock signal with internal pull-up of 4.7k
8	I2C_SDA	BI-DIR	1.8V I/O I2C Data signal with internal pull-up of 4.7k
9	GND	POWER	Ground signal for digital and analog
10	MIPI_DATA2_N	OUTPUT	MIPI Data Lane 2 Differential Pair -
11	MIPI_DATA2_P	OUTPUT	MIPI Data Lane 2 Differential Pair +
12	TRIGGER	INPUT	1.8V I/O Camera trigger signal
13	RESERVED	RSVD	Reserved for future use
14	GND	POWER	Ground signal for digital and analog
15	MIPI_DATA1_N	OUTPUT	MIPI Data Lane 1 Differential Pair -
16	MIPI_DATA1_P	OUTPUT	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_DATA0_N	OUTPUT	MIPI Data Lane 0 Differential Pair -
20	MIPI_DATA0_P	OUTPUT	MIPI Data Lane 0 Differential Pair +
21	nRESET	INPUT	1.8V I/O Active low camera reset signal with internal 4.7K pull-up resistor
22	GND	POWER	Ground signal for digital and analog
23	RESERVED	RSVD	Reserved for future use
24	MIPI_CLK_N	OUTPUT	MIPI Data Lane clock Differential Pair -



25	MIPI_CLK_P	OUTPUT	MIPI Data Lane clock Differential Pair +
26	GND	POWER	Ground signal for digital and analog
27	MIPI_DATA3_N	OUTPUT	MIPI Data Lane 3 Differential Pair -
28	MIPI_DATA3_P	OUTPUT	MIPI Data Lane 3 Differential Pair +
29	RESERVED	RSVD	Reserved for future use
30	RESERVED	RSVD	Reserved for future use
31-49	GND	POWER	Ground signal for digital and analog

Table 4: e-CAM56\_CUOAGX Adaptor Board IPEX Connector CN2 Pin Description Details

## 5.2 Base Board IPEX Connectors Position and Pin-out Details

e-CAM56\_CUOAGX Base board is provided with four IPEX connectors (CN2, CN4, CN5 and CN7) for mating with e-CAM56\_CUOAGX adaptor board through micro-coaxial IPEX cable. Position of CN2, CN4, CN5 and CN7 connectors on e-CAM56\_CUOAGX base board are shown below,

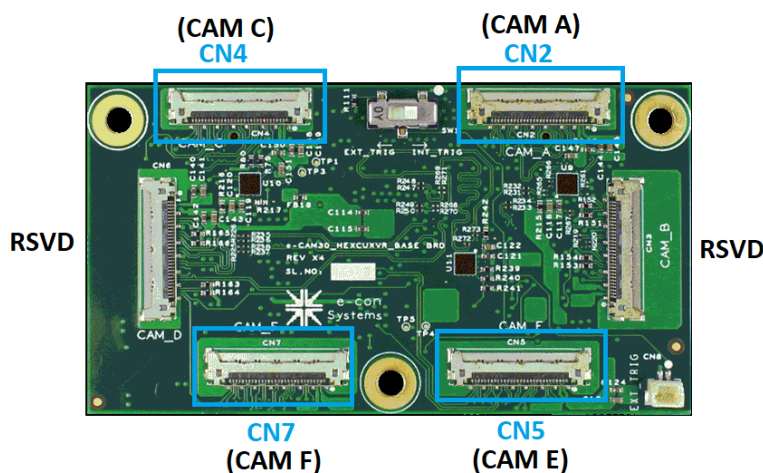


Figure 4: e-CAM56\_CUOAGX Base board CN2, CN4, CN5 &amp; CN7 connectors position

The following table lists the pin-out details of base board (CN2, CN4, CN5 & CN7) connectors. You must note that the pin numbers and direction are given with respect to the base board.

Pin No	Signal Name	Pin Type	Description
1	VCC_3P3	POWER	3.3V Output power supply for camera
2	VCC_3P3	POWER	3.3V Output power supply for camera
3	VCC_1P8	POWER	1.8V Output power supply for camera
4	GND	POWER	Ground signal for digital and analog
5	GND	POWER	Ground signal for digital and analog
6	BOOT	OUTPUT	1.8V I/O Boot signal for camera booting
7	I2C_SCL	OUTPUT	1.8V I/O I2C Clock signal
8	I2C_SDA	BI-DIR	1.8V I/O I2C Data signal
9	GND	POWER	Ground signal for digital and analog





10	MIPI_DATA2_N	INPUT	MIPI Data Lane 2 Differential Pair -
11	MIPI_DATA2_P	INPUT	MIPI Data Lane 2 Differential Pair +
12	TRIGGER	OUTPUT	1.8V I/O Camera trigger signal
13	RESERVED	RSVD	Reserved for future use
14	GND	POWER	Ground signal for digital and analog
15	MIPI_DATA1_N	INPUT	MIPI Data Lane 1 Differential Pair -
16	MIPI_DATA1_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_DATA0_N	INPUT	MIPI Data Lane 0 Differential Pair -
20	MIPI_DATA0_P	INPUT	MIPI Data Lane 0 Differential Pair +
21	nRESET	OUTPUT	1.8V I/O Reset signal for camera
22	GND	POWER	Ground signal for digital and analog
23	RESERVED	RSVD	Reserved for future use
24	MIPI_CLK_N	INPUT	MIPI Data Lane clock Differential Pair -
25	MIPI_CLK_P	INPUT	MIPI Data Lane clock Differential Pair +
26	GND	POWER	Ground signal for digital and analog
27	MIPI_DATA3_N	INPUT	MIPI Data Lane 3 Differential Pair -
28	MIPI_DATA3_P	INPUT	MIPI Data Lane 3 Differential Pair +
29	RESERVED	RSVD	Reserved for future use
30	RESERVED	RSVD	Reserved for future use
31-49	GND	POWER	Ground signal for digital and analog

Table 5: e-CAM56\_CUOAGX Base Board IPEX Connectors Pin Description Details

### 5.3 Base Board 120pin Board to Board Connector Position Details

e-CAM56\_CUOAGX Base board is provided with one 120Pin board to board (CN1) connector for mating with Jetson AGX Orin™ development kit. Position of CN1 connector on e-CAM56\_CUOAGX base board is shown below,

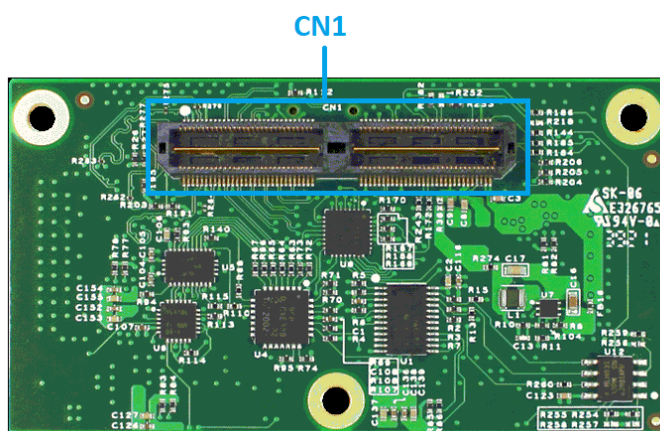


Figure 5: e-CAM56\_CUOAGX Base board CN1 connector position





**Note:** The pin-out details of e-CAM56\_CUOAGX base board CN1 connector is same as the Jetson AGX Orin™ development kit J509 connector. Both connectors are pin one to one mating.

## 5.4 Base Board I/O Connector Position and Pin-out Details

e-CAM56\_CUOAGX Base board is provided with 2-pin I/O connector CN8 for providing external trigger signal for cameras. With SW1 switch position towards external trigger side, the trigger signal provided at CN8 will be connected to all cameras.

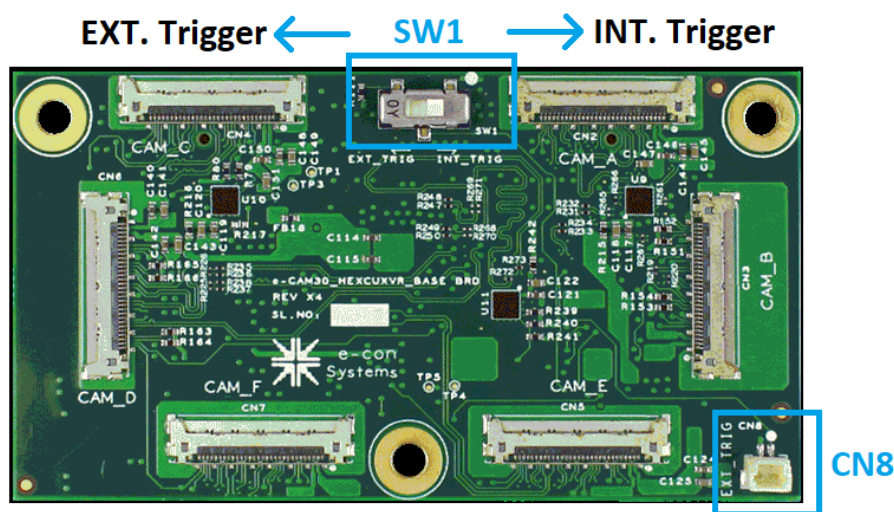


Figure 6: e-CAM56\_CUOAGX Base board CN8 connector position

The following table lists the pin-out details of base board (CN8) connector. You must note that the pin numbers and direction are given with respect to the base board.

Pin No	Signal Name	Pin Type	Description
1	TRIGGER	INPUT	3.3V I/O trigger signal with internal 4.7K pull-up resistor for cameras
2	GND	POWER	Ground signal for digital and analog

Table 6: e-CAM56\_CUOAGX Base Board I/O Connector (CN8) Pin Description Details

## 5.5 Connector Part Numbers

The following table lists the connectors and cables used in e-CAM56\_CUOAGX and its compatible mating connectors.

Connector	Description	Manufacturer	Part Number
e-CAM56_CUOAGX adaptor board connector	CN2 – Connector Micro Coaxial CABLINE-CA II P-0.40mm 30Pos with Shield Cover Right Angle SMT (CN2)	I-PEX	20682-030E-02
	CN1 connector –	Samtec	QTH-060-02-H-D-A



e-CAM56_CUOAGX base board connector	Board to Board Outer Shroud Contacts P-0.50mm 120Pos Dual Row Vertical SMT		
	CN2 to CN7 connectors - Micro Coaxial CABLINE-CA II P-0.40mm 30Pos with Shield Cover Right Angle SMT	I-PEX	20682-030E-02
	CN8 connector – Header Male P-1mm Shrouded 2Pos Vertical SMT	JST Sales America Inc	BM02B-SRSS-TB(LF)(SN)
	Reference mating cable for CN8 connector	JST Sales America Inc	A02SR02SR30K15 2A

Table 7: e-CAM56\_CUOAGX Connector Part number Details

## 6 Electrical Specification

The following sections list the electrical specification, recommended operating conditions and power consumption details of e-CAM56\_CUOAGX.

- [Recommended Operating Condition](#)
- [Functional Temperature Range](#)

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.

### 6.1 Recommended Operating Condition

The following tables list the recommended operating condition of e-CAM56\_CUOAGX in 4-lane configuration.

Resolution	Bits Per Pixel (bpp)	Voltage (V)	Frame Rate (fps)	Power Consumption (W) for one camera	Power Consumption (W) for four cameras
2432 x 2048	12	3.3	67	0.65	2.59
2432 x 2048	10	3.3	79	0.63	2.53
1920 x 1080	12	3.3	121	0.64	2.55
1920 x 1080	10	3.3	142	0.63	2.51
1280 x 720	12	3.3	172	0.63	2.52
1280 x 720	10	3.3	202	0.62	2.48
640 x 480	12	3.3	240	0.62	2.50
640 x 480	10	3.3	280	0.61	2.46
2432 x 2048	12	1.8	67	0.0014	0.0055
2432 x 2048	10	1.8	79	0.0014	0.0055
1920 x 1080	12	1.8	121	0.0014	0.0055
1920 x 1080	10	1.8	142	0.0014	0.0055
1280 x 720	12	1.8	172	0.0014	0.0055



1280 x 720	10	1.8	202	0.0014	0.0055
640 x 480	12	1.8	240	0.0014	0.0055
640 x 480	10	1.8	280	0.0014	0.0055

Table 8: Recommended Operating Condition for 4-lane configuration

## 6.2 Functional Temperature Range

The following table lists the functional temperature range of e-CAM56\_CUOAGX.

Temperature Range	Parameter Description
-30°C to 70°C	Electrically functional operating range

Table 9: Functional Temperature Range

## 7 Mechanical Specification

The camera module and adaptor boards of e-CAM56\_CUOAGX are 30 mm x 30 mm in dimension (outline tolerance of  $\pm 0.2\text{mm}$ ).

The front and rear views of the e-CAM56\_CUOAGX camera board, adaptor board and base board with its dimensions are shown in the following figures.

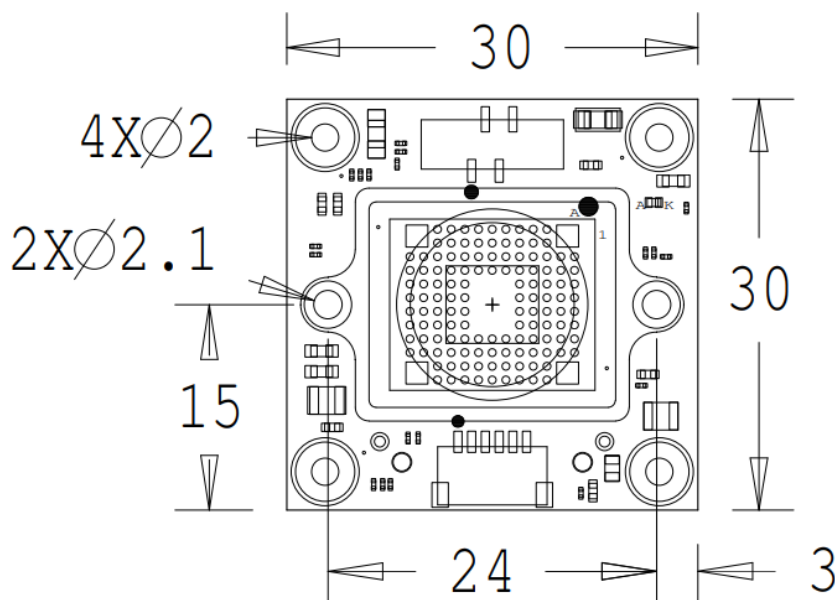


Figure 7: Front View of e-CAM56\_CUOAGX Camera Mechanical Dimensions



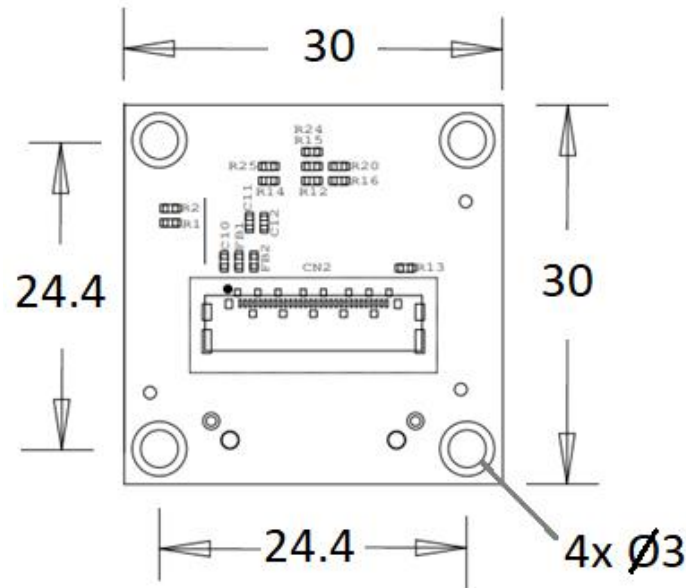


Figure 8: Rear View of e-CAM56\_CUOAGX Camera Mechanical Drawing

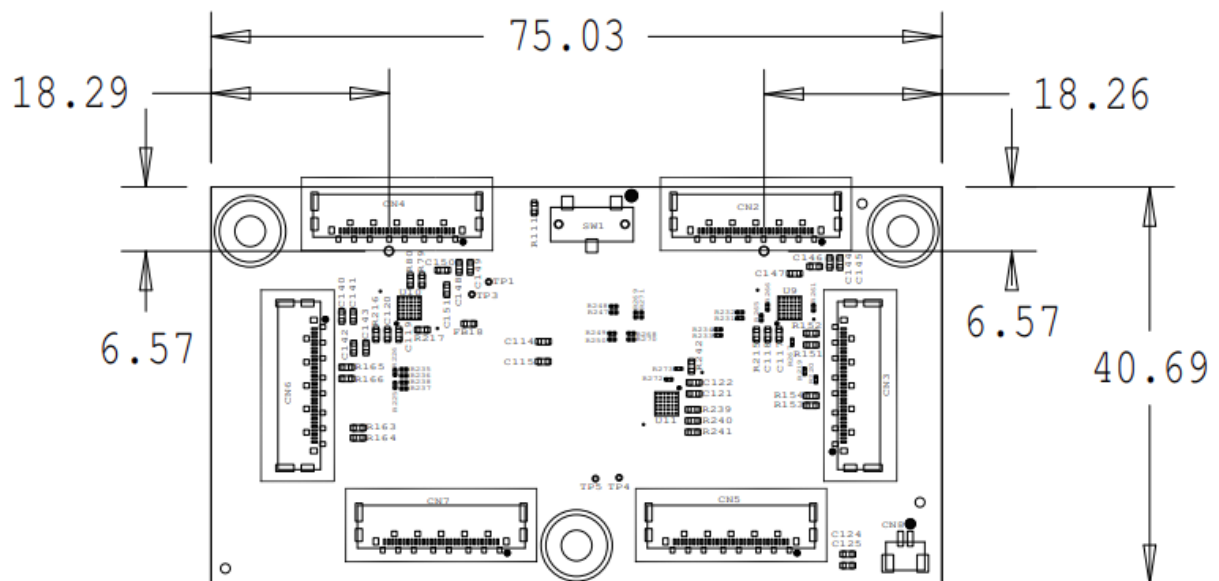


Figure 9: Top View of e-CAM56\_CUOAGX Base Board Mechanical Drawing

**Note:**

1. All dimensions are in mm.
2. Board outline dimension tolerance should be within  $\pm 0.2\text{mm}$ .
3. Further mechanical details will be provided based on your request.



## 7.1 Lens Holder Dimensions

The dimension details of S-Mount metal lens holder are shown in the following figure.

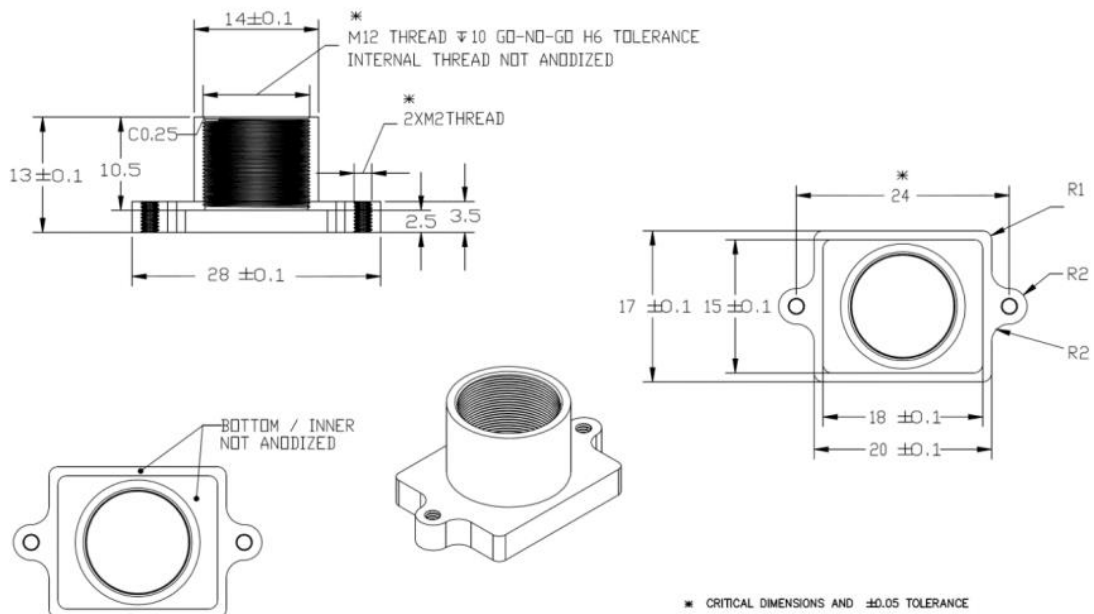


Figure 10: Mechanical Drawing of Lens Holder

**Note:** All dimensions are in mm.



## Revision History

Rev	Date	Major Changes	Author
1.0	07-September-2023	Initial draft	Camera Products - Hardware Team
1.1	19-October-2023	Updated with 2-lane configuration with six cameras	Camera Products - Hardware Team
1.2	31-October-2023	Updated resolution to 5 MP and image format	Camera Products - Hardware Team
1.3	16-November-2023	Updated the supported resolutions and added power consumption details for the same	Camera Products - Hardware Team
1.4	10-March-2024	2-Lane MIPI supported removed. Added connector details	Camera Products - Hardware Team
1.5	27-March-2024	Updated product image in the home page and Top View of e-CAM56_CUOAGX Base Board Mechanical Drawing	Camera Products - Hardware Team





## Support

### Contact Us

If you need any support on e-CAM56\_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>

