e-con Systems India Pvt Ltd

7th Floor, RR Tower – IV,
RISHABH INFO PARK,
Super A-16 & A-17, Thiru-Vi-Ka Industrial Estate,
Guindy, Chennai - 600 032.
www.e-consystems.com

e-CAM50_CUiMX8

Datasheet

Revision 1.0
17th Dec 2020

Contents

1 Revision History

Rev	Date	Major Changes	Author
1.0	17-Dec-2020	Initial draft	Application engineering Team

2 Introduction

The e-CAM50_CUiMX8 board is a camera board which is designed and developed by e-con Systems, a leading Embedded Product Design Services Company which specializes in the advanced camera solutions. This camera board targets Toradex® development kit. e-CAM50_CUiMX8 can be directly interfaced with Toradex using FPC connector.

e-CAM50_CUiMX8 is 5 MP custom lens camera module based on 1/2.5" AR0521 CMOS image sensor from ON Semiconductor®. It is a color camera which supports UYVY image format and provided with S-mount (also known as M12 board lens) lens holder. The S-mount is small form-factor lens mounts for board cameras. This camera can be utilized by any V4L2 application.

This document describes about the features of e-CAM50_CUiMX8 board and the pin-outs of the connectors including the mechanical diagram.

The supported platforms for e-CAM50_CUiMX8 are given below

camera	Platforms
e-CAM50_CUiMX8	Apalis iMX8QM SoM with Ixora carrier board
	Verdin iMX8M-Mini SoM with verdin carrier board

Table 1: Supported Platforms of e-CAM50_CUiMX8

3 Disclaimer

The specifications and features of e-CAM50_CUiMX8 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.

4 Description

e-CAM50_CUiMX8 uses 4-Lane MIPI CSI for connecting 5 MP camera modules.

e-CAM50_CUiMX8 is a multi-board solution, which has three boards as follows:

        Camera module (e-CAM55_CUMI0521_MOD)
        Camera adaptor board (e-CAM130_TRICUTX2_ADAPTOR)
        Ixora adaptor board (ACC-IXORA-WTB-ADP)

The camera module is a small, low-power, high performance 5 MP camera with a built-in ISP. This module is based on AR0521 CMOS image sensor from ON Semiconductor®. The AR0521 is a 1/2.5" optical form-factor, CMOS image sensor with an electronic rolling shutter.

The following table lists the supported frame rates of e-CAM55_CUiMX8 camera module at exposure setting value 166.

Resolution	Frame Rate (fps)
640 x 480	58
1280 x 720	70
1280 x 960	58
1920 x 1080	65
2560 x 1440	38
2592 x 1944	28

Table 1: Supported Resolution and Frame Rates

The e-CAM55_CU0521_MOD camera module has two 20-pin Samtec connectors (CN1 and CN2) for mating with e-CAM130_TRICUTX2_ADAPTOR adaptor board. The camera adaptor board is connected with ACC-IXORA-WTB-ADP adaptor board though micro coaxial cable. This Ixora adaptor board acts as a bridge between the camera module and the Toradex development kit. The adaptor board supplies the voltages required by camera module.

4.1 Features

The features of e-CAM50_CUiMX8 are as follows:

Multi-board solution

5 MP camera sensor with uncompressed UYVY format

Compatible with Toradex® development kit

Standard M12 lens holder for use with customized optics or lenses for various applications

Light weight, versatile, and portable design

Imaging applications

5 MP CMOS image sensor with 1/2.5" optical form-factor

Still capture supported resolution: 640 x 480, 1280 x 720, 1280 x 960, 1920 x 1080, 2560 x 1440, 2592 x 1944

Video streaming supported resolution: 640 x 480, 1280 x 720, 1280 x 960, 1920 x 1080, 2560 x 1440, 2592 x 1944

Field of View (FOV) angle is not the same for all preview resolutions

Linux camera driver (V4L2) for 5 MP MIPI CSI-2 camera module is supported

Maximum power consumed: 1.62 W

Operating temperature range: -30°C to 70°C

RoHS compliant

5 Key Specifications

The following table lists the key specifications of e-CAM50_CUiMX8.

Description	Specification
Size (L x W x H)	30 mm × 30 mm
Video format	UYVY
Maximum image resolution	2592 x 1944(5 MP)
Supported OS	Linux

Table 2: Key Specifications of e-CAM50_CUiMX8

5.1 CMOS Image Sensor Specifications

The following table lists the specifications of the CMOS image sensor used in this e-CAM50_CUiMX8 camera board.

Sensor Specification	
Type / Optical size	1/2.5" Optical format CMOS image sensor
Resolution	5 MP
Image Format	UYVY
Pixel size	2.2 µm x 2.2 µm
Sensor active area	2592 (H) x 1944 (V)
Responsivity	18.8 ke−/lux-sec
SNR	40 dB
Dynamic range	74.3 dB

Table 3: CMOS Image Sensor Specification

For more information about the AR0521 sensor or for Datasheet, please contact ON Semiconductor®.

6 Pin Description

e-CAM50_CUiMX8 has four connectors CN1, CN2 of e-CAM55_CU0521_MOD, CN2 of e-CAM130_TRICUTX2_ADAPTOR and CN1 of ACC-IXORA-WTB-ADP. The CN1 and CN2 are dual row 20-pin Samtec connectors, used for direct mating with the camera adaptor board, whereas CN2 of camera adapter board is a single row 49-pin connector, used for connecting with Ixora adaptor board through the micro-coaxial cable. The CN1 of Ixora adaptor board is a single row connector, used for connecting e-CAM50_CUiMX8 with the Toradex. The dual row connector is 1 to 2 mating type connectors. You must note the given pin numbers and direction with respect to the adaptor board.

The pin descriptions of connectors are explained in the following sections.

6.1 Pin-out Details of Camera Module Dual Row Connector (CN1, CN2)

The following table lists the pin-out details of CN1 connector.

CN1 Pin No	Signal Name	Pin Type	Description
1	MIPI_DN2	INPUT	MIPI Data Lane 2 Differential Pair -
2	MIPI_DN0	INPUT	MIPI Data Lane 0 Differential Pair -
3	MIPI_DP2	INPUT	MIPI Data Lane 2 Differential Pair +
4	MIPI_DP0	INPUT	MIPI Data Lane 0 Differential Pair +
5	GND	POWER	Ground signal for digital and analog
6	GND	POWER	Ground signal for digital and analog
7	VCC_5V	POWER	5V Power supply for camera board
8	VCC_3P3	POWER	3.3V Power supply for camera board
9	VCC_5V	POWER	5V Power supply for camera board
10	VCC_3P3	POWER	3.3V Power supply for camera board
11	GND	POWER	Ground signal for digital and analog
12	GND	POWER	Ground signal for digital and analog
13	MIPI_DN3	INPUT	MIPI Data Lane 3 Differential Pair -
14	MIPI_CLKN	INPUT	MIPI Clock Lane Differential Pair -
15	MIPI_DP3	INPUT	MIPI Data Lane 3 Differential Pair +
16	MIPI_CLKP	INPUT	MIPI Clock Lane Differential Pair +
17	GND	POWER	Ground signal for digital and analog
18	VCC_1P8	POWER	1.8V Power supply for camera board
19	VCC_1P8	POWER	1.8V Power supply for camera board
20	VCC_1P8	POWER	1.8V Power supply for camera board

Table 4: Adaptor Board CN1 Connector Pin Description Details

The following table lists the pin-out details of CN2 connector.

CN2 Pin No	Signal Name	Pin Type	Description
1	VCC_2P8	POWER	2.8V Power supply for camera board
2	MIPI_DN1	INPUT	MIPI Data Lane 1 Differential Pair -
3	VCC_2P8	POWER	2.8V Power supply for camera board
4	MIPI_DP1	INPUT	MIPI Data Lane 1 Differential Pair +
5	GND	POWER	Ground signal for digital and analog
6	GND	POWER	Ground signal for digital and analog
7	CAM_I2C_SCL	OUTPUT	1.8V IO Camera I^{2}C SCL signal (Internally pulled-up to 1.8V using 4.7KΩ)
8	RSVD	--	Reserved
9	CAM_I2C_SDA	I/O	1.8V IO Camera I^{2}C SDA signal (Internally pulled-up to 1.8V using 4.7KΩ)
10	RSVD	--	Reserved
11	nCAM_RST	OUTPUT	1.8V IO camera reset signal (Active low signal)
12	RSVD	--	Reserved
13	CAM_PWDN	OUTPUT	1.8V IO camera power down signal (Active high signal)
14	RSVD	--	Reserved
15	RSVD	--	Reserved
16	GND	POWER	Ground signal for digital and analog
17	RSVD	--	Reserved
18	CAM_TRIGGER	OUTPUT	1.8V IO Trigger signal for camera
19	GPIO	I/O	1.8V IO GPIO signal for camera
20	CAM_STROBE	INPUT	1.8V IO Strobe signal from camera

Table 5: Adaptor Board CN2 Connector Pin Description Details

6.2 Pin-out Details of Camera Adaptor Board IPEX Connector (CN2)

The following table lists the pin-out details of CN2 connector.

CN2 Pin No	Signal Name	Pin Type	Description
1	VCC_3P3	POWER	3.3V Power supply for camera board
2	VCC_3P3	POWER	3.3V Power supply for camera board
3	VCC_1P8	POWER	1.8V Power supply for camera board

4	GND	POWER	Ground signal for digital and analog
5	GND	POWER	Ground signal for digital and analog
6	CAM_PWDN	OUTPUT	1.8V IO camera power down signal (Active high signal)
7	CAM_I2C_SCL	OUTPUT	1.8V IO Camera I^{2}C SCL signal (Internally pulled-up to 1.8V using 4.7KΩ)
8	CAM_I2C_SDA	I/O	1.8V IO Camera I^{2}C SDA signal (Internally pulled-up to 1.8V using 4.7KΩ)
9	GND	POWER	Ground signal for digital and analog
10	MIPI_DN2	INPUT	MIPI Data Lane 2 Differential Pair -
11	MIPI_DP2	INPUT	MIPI Data Lane 2 Differential Pair +
12	CAM_TRIGGER	OUTPUT	1.8V IO Trigger signal for camera
13	RSVD	-----	Reserved
14	GND	POWER	Ground signal for digital and analog
15	MIPI_DN1	INPUT	MIPI Data Lane 1 Differential Pair -
16	MIPI_DP1	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_DN0	INPUT	MIPI Data Lane 0 Differential Pair -
20	MIPI_DP0	INPUT	MIPI Data Lane 0 Differential Pair +
21	nCAM_RST	OUTPUT	1.8V IO camera reset signal (Active low signal)
22	GND	POWER	Ground signal for digital and analog
23	RSVD	-----	Reserved
24	MIPI_CLKN	INPUT	MIPI Clock Lane Differential Pair -
25	MIPI_CLKP	INPUT	MIPI Clock Lane Differential Pair +
26	GND	POWER	Ground signal for digital and analog
27	MIPI_DN3	INPUT	MIPI Data Lane 3 Differential Pair -
28	MIPI_DP3	INPUT	MIPI Data Lane 3 Differential Pair -
29	CAM_STROBE	INPUT	1.8V IO Strobe signal from camera
30	RSVD	-----	Reserved

Table 6: Adaptor Board CN3 Connector Pin Description Details

6.3 Pin-out Details of Ixora Adaptor Board FFC Connector (CN1)

The following table lists the pin-out details of CN1 connector.

CN1 Pin No	Signal Name	Pin Type	Description
1	GND	POWER	Ground signal for digital and analog
2	MIPI_DN0	INPUT	MIPI Data Lane 0 Differential Pair -

3	MIPI_DP0	INPUT	MIPI Data Lane 0 Differential Pair +
4	GND	POWER	Ground signal for digital and analog
5	MIPI_DN1	INPUT	MIPI Data Lane 1 Differential Pair -
6	MIPI_DP1	INPUT	MIPI Data Lane 1 Differential Pair +
7	GND	POWER	Ground signal for digital and analog
8	MIPI_CLKN	INPUT	MIPI Clock Lane Differential Pair -
9	MIPI_CLKP	INPUT	MIPI Clock Lane Differential Pair +
10	GND	POWER	Ground signal for digital and analog
11	GPIO0_RST_3P3	OUTPUT	3.3V IO camera reset signal (Active low signal)
12	RSVD	--	Reserved
13	CAM_I2C_SCL	INPUT	3.3V IO Camera I^{2}C SCL signal (Internally pulled-up to 1.8V using 4.7KΩ)
14	CAM_I2C_SDA	I/O	3.3V IO Camera I^{2}C SDA signal (Internally pulled-up to 1.8V using 4.7KΩ)
15	VCC_3P3	POWER	3.3V Power supply for camera board
16	MIPI_DN2	INPUT	MIPI Data Lane 2 Differential Pair -
17	MIPI_DP2	INPUT	MIPI Data Lane 2 Differential Pair +
18	GND	POWER	Ground signal for digital and analog
19	MIPI_DN3	INPUT	MIPI Data Lane 3 Differential Pair -
20	MIPI_DP3	INPUT	MIPI Data Lane 3 Differential Pair +
21	VCC_5V	POWER	5V Power supply for camera board
22	PWDN	OUTPUT	3.3V IO camera power down signal (Active high signal)
23	CAM_STROBE	INPUT	1.8V IO Strobe signal from camera
24	CAM_TRIGGER	OUTPUT	1.8V IO Trigger signal for camera

Table 7: Ixora Adaptor Board CN1 Connector Pin Description Details

6.4 Connector Part Numbers

The following table lists the connectors and cables used in e-CAM50_CUiMX8 and its compatible mating connectors.

Connector	Description	Manufacturer	Part Number

e-CAM50_CUiMX8 camera adaptor board dual row connectors (CN1 and CN2) for mating with e-CAM50_CUiMX8 camera module	Board - Board, 20-Pin, 0.635 mm pitch, Vertical SMD connector	Samtec	LSS-110-01-H-DV-A
e-CAM50_CUiMX8 IPEX connector of camera adaptor board (CN2) for mating with e-CAM50_CUiMX8 Ixora adapter board	Micro coaxial board, 30-Pin, 0.400 mm pitch, Horizontal SMD connector	Ipex	20682-030E-02
e-CAM50_CUiMX8 FFC connector (CN1) for connecting with Toradex development kit through FPC cable	FFC board - Cable, 24-pin, 0.5 mm pitch, SMD connector	Molex	5051102491
Micro Co axial cable used for connecting e-CAM50_CUiMX8 camera adapter board with Ixora adapter board	Co axial cable, 30 pins, 0.4 mm pitch, 30 cm length, with lock type	Ipex	81214-530B-300-1
FPC cable used for connecting e-CAM50_CUiMX8 with Toradex	FPC cable, 24 position, 0.5 mm pitch, 10 cm length, with same side connection	Molex	151660255

Table 8: e-CAM50_CUiMX8 Connector Details

7 Electrical Specification

The following sections list the electrical specification, recommended operating conditions and power consumption details of e-CAM50_CUiMX8.

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 following table lists the recommended operating condition of e-CAM50_CUiMX8.

Parameter	Typical Operating Voltage	Typical Power Consumption (W)
Input	3.3V	1.62

voltage		

Table 9: Recommended Operating Condition

e-CAM50_CUiMX8 does not require any power sequence since it required only 3.3V power supply for operation.

For more information, please refer to the *e-CAM55_CUMI0521_MOD Datasheet.*

7.2 Power Consumption

The following table lists the power consumption details of e-CAM50_CUiMX8.

S.NO	Resolution	Current (mA) from 5V	Current (mA) from 3.3V	Power Consumption (W)	
				5V	**3.3V**
1	640 x 480 at 53 fps	28	305	0.14	1.0
2	1280 x 720 at 70 fps	29	305	0.14	1.0
3	1280 x 960 at 53 fps	29	305	0.14	1.0
4	1920 x 1080 at 65 fps	30	290	0.15	0.95
5	2560 x 1440 at 38 fps	27	280	0.13	0.44
6	2592 x 1944 at 28 fps	27	200	0.13	0.44

Table 10: Power Consumption Details

8 Mechanical Specification

The camera adaptor board and camera module of e-CAM50_CUiMX8 was 30 mm x 30 mm in dimension. The front and rear views of the e-CAM50_CUiMX8 camera adaptor board and Ixora adapter board are shown in the following figures.
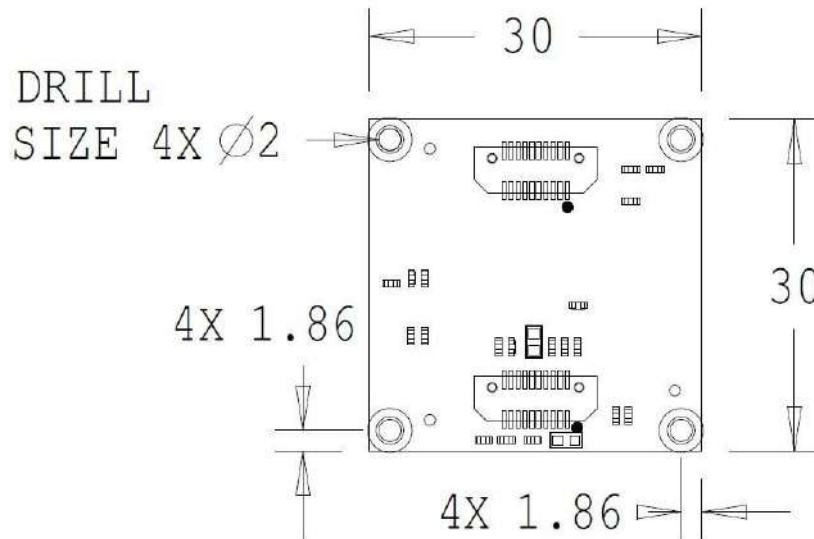
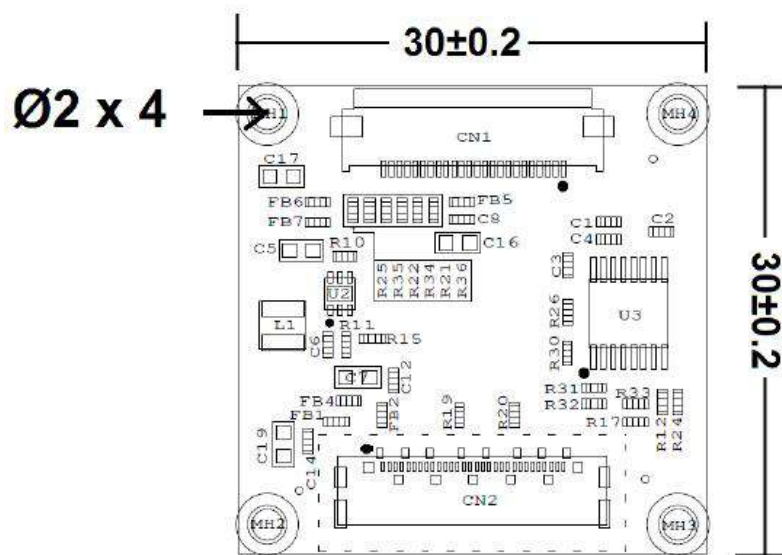**Figure 1: e-CAM50_CUiMX8 Camera Adaptor Board Mechanical Dimensions**

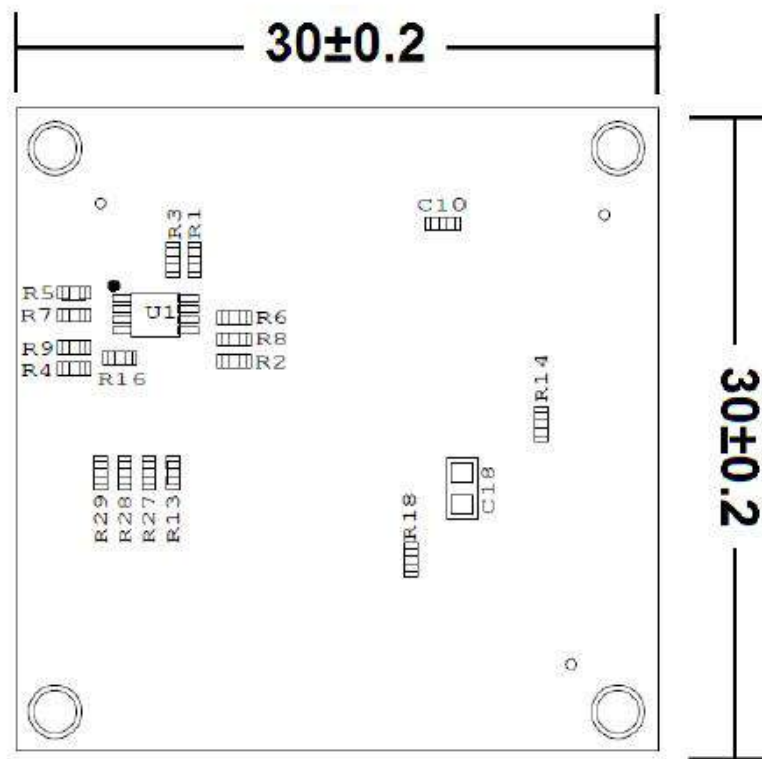**Figure 2: Front View of e-CAM50_CUiMX8 Ixora Adaptor Board Mechanical Dimensions**

Figure 3: Rear View of e-CAM50_CUiMX8 Ixora Adaptor Board Mechanical Dimensions

Note: All dimensions are in mm.

For e-CAM50_CUiMX8 module board mechanical dimension information, please refer to the *e-CAM55_CUMI0521_MOD Datasheet*.

Support

Contact Us

If you need any support on e-CAM50_CUiMX8 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