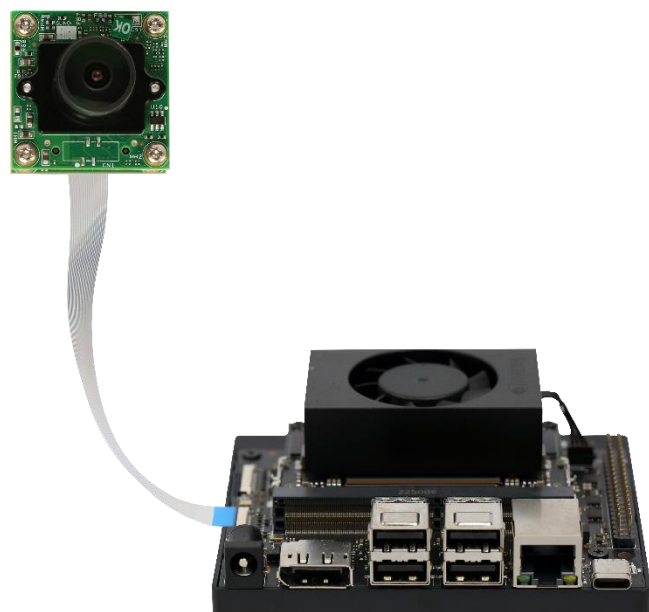


e-CAM25_CUONX

Getting Started Manual



Version 1.4

e-con Systems

3/20/2025

Disclaimer

The specifications of e-CAM25_CUONX board and instructions on how to use this board with Jetson Orin Nano™ and Orin NX™ development kits are provided as reference only and e-con Systems reserves the right to edit/modify this document without any prior intimation of whatsoever.

Contents

INTRODUCTION TO E-CAM25_CUONX	3
PARTS SUPPLIED	3
DESCRIPTION	4
E-CAM25_CUONX BOARD HANDLING PROCEDURE	6
CAMERA BOARD CONNECTION	6
INTERFACING WITH JETSON ORIN NX DEVELOPMENT KIT	8
INTERFACING WITH JETSON ORIN NANO DEVELOPMENT KIT	13
SOFTWARE QUICK SETUP	19
STEPS FOR EXTRACTING AND FLASHING BINARIES	19
STEPS FOR LAUNCHING APPLICATION IN DEVELOPMENT KIT	20
REFERENCE DOCUMENTS	22
SOFTWARE DOCUMENTS	22
HARDWARE DOCUMENTS	22
TROUBLESHOOTING	24
FAQ	25
WHAT'S NEXT?	26
GLOSSARY	27
SUPPORT	28

Introduction to e-CAM25_CUONX

e-CAM25_CUONX is a 2.3 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 camera module targets the NVIDIA® Jetson Orin Nano™/Orin NX™ development kit. It can be directly interfaced with Jetson Orin Nano™/Orin NX™ development kit through CAM1 and CAM0 connectors.

e-CAM25_CUONX is provided with S-mount (also known as M12 board lens) lens holder. The S-mount is one of the most used small form factor lens mounts for board cameras. e-CAM25_CUONX is a color camera that supports uncompressed UYVY format in both still capture and video recording. The supported resolutions and frame rates are listed in following table.

Table 1: Supported Resolutions and Frame Rates in 2 Lane

S. NO	Resolution	Frame Rate (fps)
1	640 x 480	120
2	1280 x 720	120
3	1920 x 1080	65
4	1920 x 1200	60

Table 2: Supported Resolutions and Frame Rates in 4 Lane


S. NO	Resolution	Frame Rate (fps)
1	1280 x 720	120
2	1920 x 1080	70
3	1920 x 1200	60



This document describes how to interface the e-CAM25_CUONX board on Jetson Orin Nano™/Orin NX™ development kit and how to use the e-CAM25_CUONX board.

Parts Supplied

The following table lists the parts supplied with the kit.

Table 3: Parts Supplied and its Quantity

Parts Supplied	Images	Quantity
e-CAM25_CUONX Camera Module		1

15cm FPC Cable		1
Lens		1

Description

Jetson Orin Nano™ and Jetson Orin NX™ are newly launched small size, low power, artificial intelligence (AI) system-based evaluation kits, developed by NVIDIA®. Orin Nano™/Orin NX™ development kit supports 4-lane/2-lane in CAM1 and 2-lane in CAM0 MIPI CSI connector. e-CAM25_CUONX uses this 4-lane and 2-lane MIPI CSI-2 interface for connecting 2.3 MP camera module.

e-CAM25_CUONX is a multi-board solution, which has two boards as follows:

- Camera module (e-CAM217_CUMI0234_MOD)
- Adaptor board (ACC-RB-WTB-ADP)

The camera module is a small, low-power, high performance 2.3 MP camera with a built-in Image Signal Processor (ISP), which supports uncompressed UYVY format. This camera module is based on AR0234CS CMOS image sensor from onsemi™. The AR0234CS is a 1/2.6" optical form factor, CMOS image sensor with global shutter.

The front and rear views of e-CAM25_CUONX module are shown in following figures.



Figure 1: Front View of e-CAM25_CUONX Module



Figure 2: Rear View of e-CAM25_CUONX Module

e-CAM25_CUONX camera module has 26-pin Samtec connector (CN2) for mating with e-CAM25_CUONX adaptor board. e-CAM25_CUONX adaptor board acts as a bridge between the camera module and the Jetson Orin Nano™/Orin NX™ development kit. The adaptor board provides the voltages required for the camera module. e-CAM25_CUONX adaptor board consists of 22-pin FFC connector (CN1), through which e-CAM25_CUONX is connected to Orin Nano™/Orin NX™ development kits over FPC cable of maximum 15 cm length.

e-CAM25_CUONX Board Handling Procedure

This section describes the handling procedure of e-CAM25_CUONX board.

The procedure to assemble camera board to Jetson Orin Nano™/Orin NX™ development kit is described in the following section.

- [Camera Board Connection](#)
- [Interfacing with Orin NX Development Kit](#)
- [Interfacing with Orin Nano Development Kit](#)

Camera Board Connection

e-CAM25_CUONX is provided with 15cm FPC cable for connecting with Jetson Orin Nano™/Orin NX™ development kit.

The conductive and insulation side location of the FPC cable is shown in following figure.

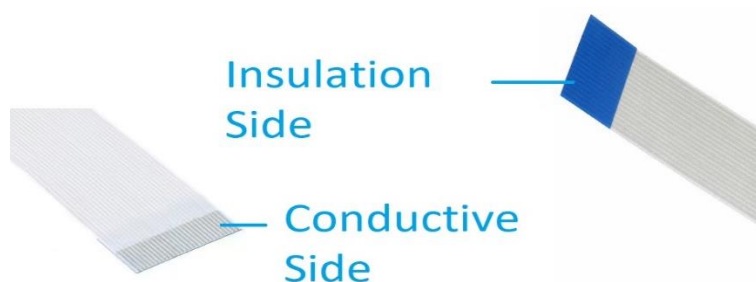


Figure 3: FPC Cable Conductive and Insulation Side Location

The procedure to assemble camera board is as follows:

1. Unlock the CN1 connector in adapter board for inserting the FPC cable.

The CN1 connector has a lock actuator which is used for locking and unlocking the cable as shown in following figure.

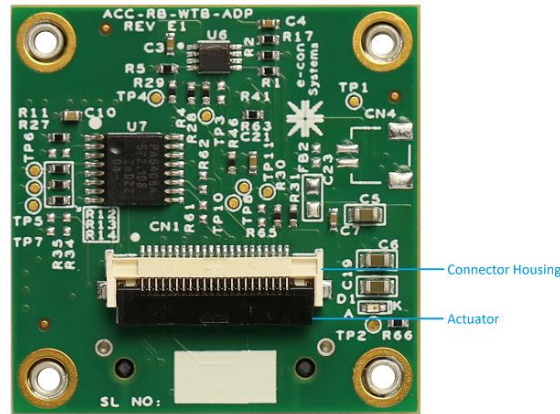


Figure 4: CN1 Connector Location

2. Lift the lock actuator at centre with slight force for unlocking the connector as shown in following figures.

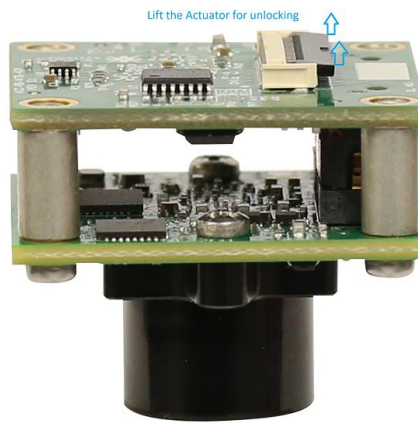


Figure 5: Unlocking CN1 Connector

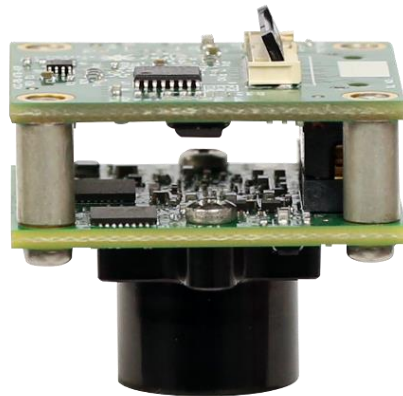


Figure 6: CN1 Unlocked Connector Position

3. Insert the FPC cable to CN1 connector in adapter board.
4. Lock the CN1 connector by pressing the lock actuator from top to bottom.

The conductive side of the cable must face the board as shown in following figure.

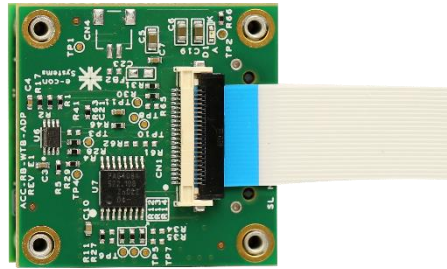


Figure 7: Cable Locked to CN1 Connector of e-CAM25_CUONX

Note: Care must be taken, while connecting cable to e-CAM25_CUONX connector.

Warning: If FPC cable is connected in reverse direction to CN1 connector of e-CAM25_CUONX, it might damage e-CAM25_CUONX as well as Jetson Orin Nano™/Orin NX™ development kit.

Interfacing with Jetson Orin NX Development Kit

Jetson Orin NX™ development kit has a connector CAM1 interface with camera module.

The procedure for interfacing with the camera module is as follows:

1. Insert the FPC cable on CAM1 connector of the Jetson Orin NX™ development kit before powering ON the Jetson Orin NX™ development kit.

The CAM1 connector location in the Jetson Orin NX™ development kit is shown in following figure.

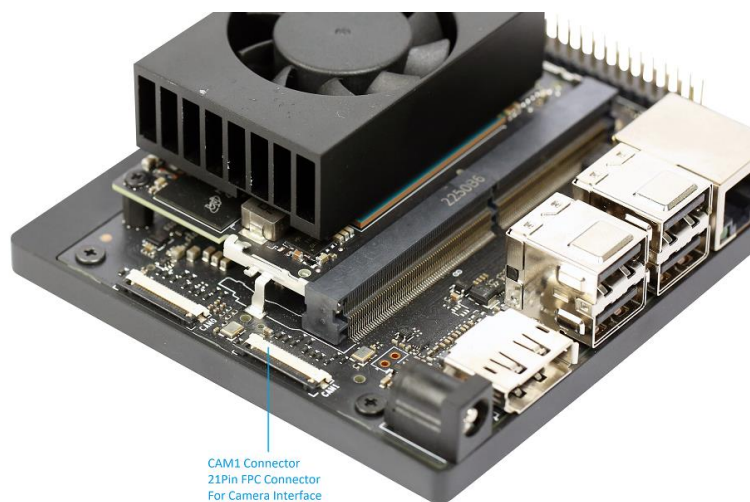


Figure 8: Camera Connector Location in Jetson Orin NX Development Kit

2. Unlock the CAM1 connector for inserting the FPC cable.

The location of actuator in Jetson Orin NX™ development kit is shown in following figure.

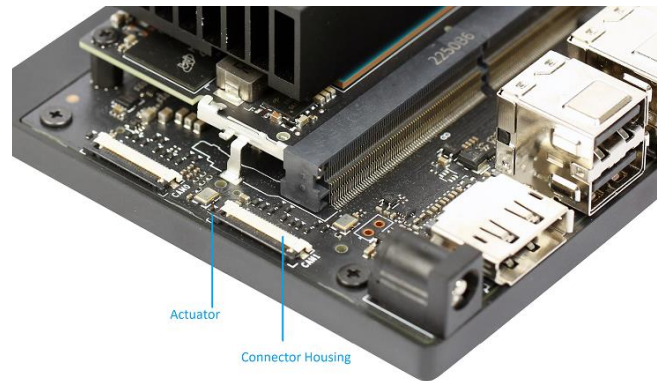


Figure 9: Camera Connector Actuator Location in Orin NX Development Kit

3. Pull out the actuator at centre with slight force for unlocking the connector as shown in following figures.

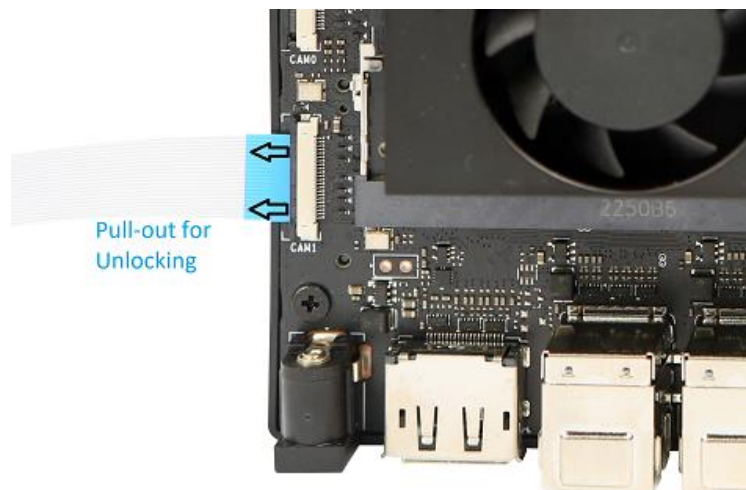


Figure 10: Unlocking Jetson Orin NX Development Kit Camera Connector

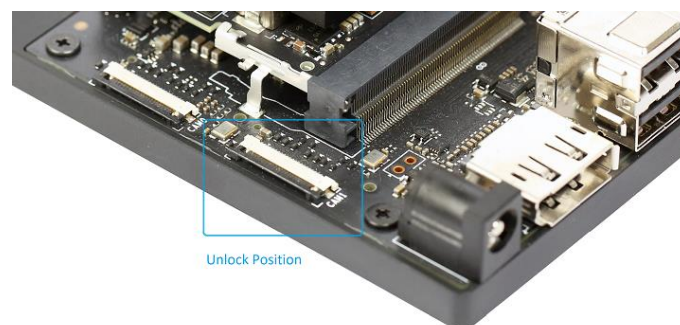


Figure 11: Unlocked Position of Jetson Orin NX Development Kit Camera Connector

4. Insert the FPC cable to the CAM1 connector of Jetson Orin NX™ development kit as shown in following figure.

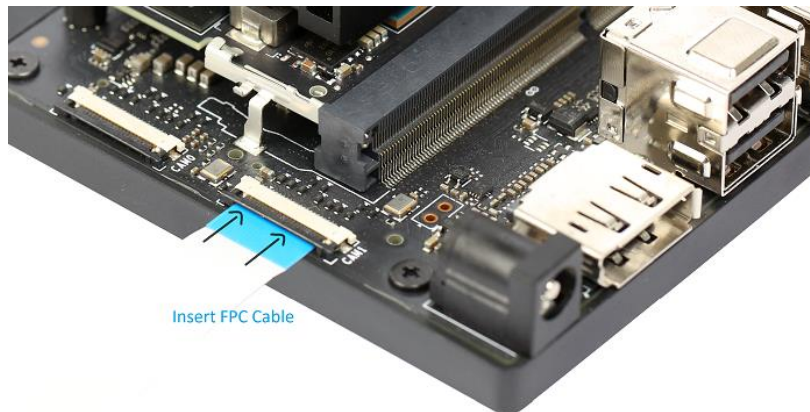


Figure 12: FPC Cable Insertion to CAM1 Connector of Jetson Orin NX Development Kit

5. Lock the CAM1 connector by pressing both ends of actuator with same equal force as shown in following figures.

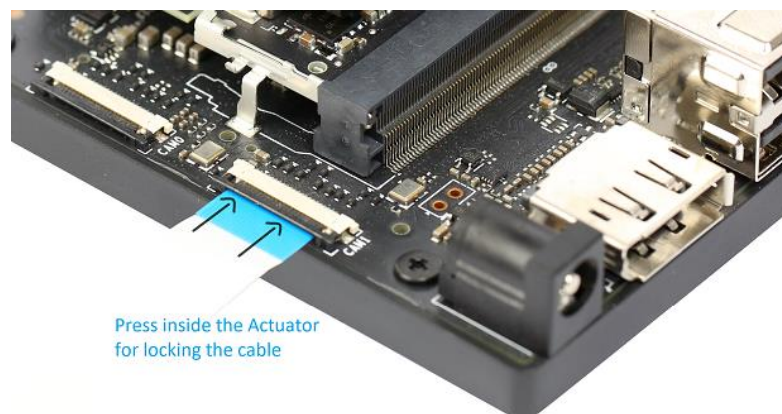


Figure 13: Locking FPC Cable

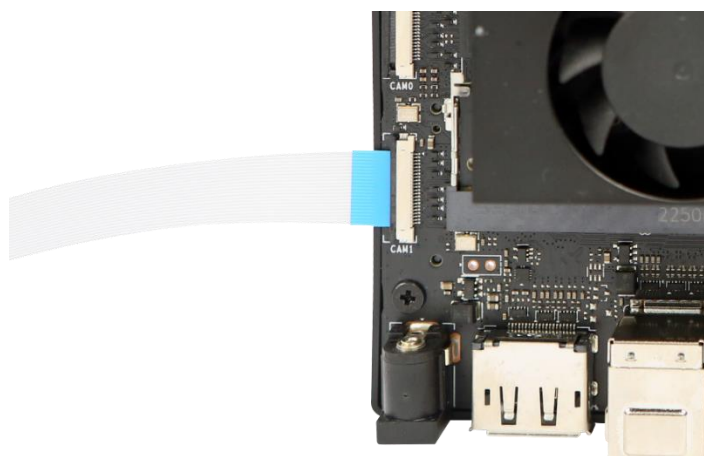


Figure 14: FPC Cable Locked Position on Jetson Orin NX Development Kit

Note: Care must be taken, while connecting cable to camera connector of Jetson Orin NX™ development kit.

Warning: If FPC cable is connected in reverse direction to CAM1 connector of Jetson Orin NX™ development kit, it might damage e-CAM25_CUONX as well as Jetson Orin NX™ development kits.

Now, e-CAM25_CUONX is connected to Jetson Orin NX™ development kit as shown in following figure.

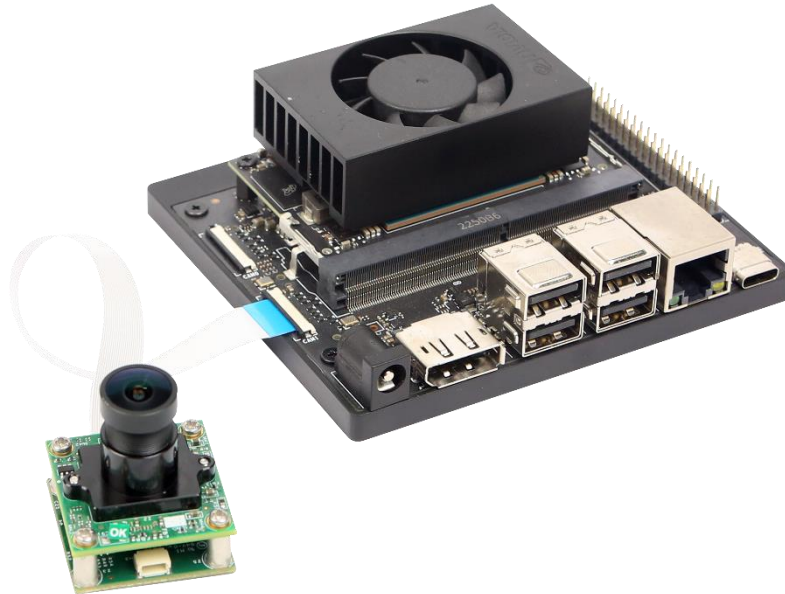


Figure 15: e-CAM25_CUNX Setup Interfaced to Jetson Orin NX Development Kit

Jetson Orin NX™ development kit can be powered either from USB Type-C connector or DC power jack connector. Since USB Type-C is used for low power applications, e-CAM25_CUONX supports only low resolutions in this power supply. Connecting 19V power supply to DC jack will be the ideal solution, when using e-CAM25_CUONX with Jetson Orin NX™ development kit to use its full listed resolutions.

The power supply connectors in Jetson Orin NX™ development kit is shown in following figure.

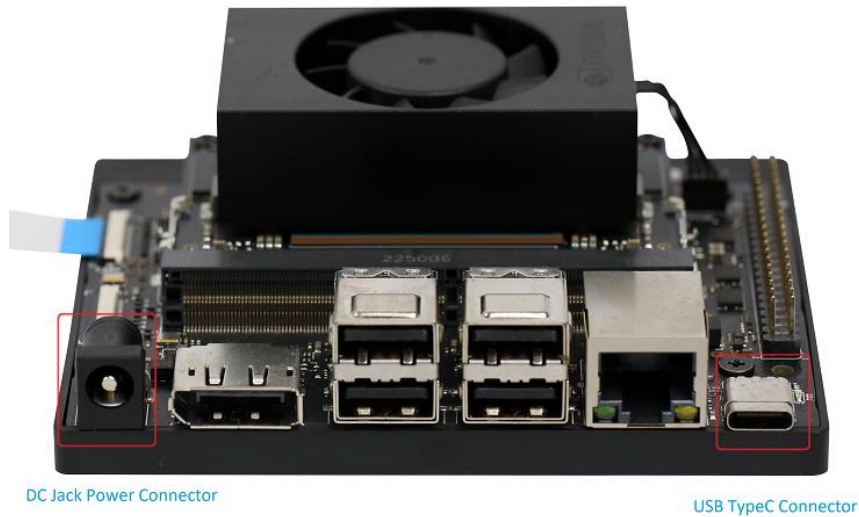


Figure 16: Power Supply Connectors in Jetson Orin NX Development Kit

6. Connect 19V power supply to DC jack to power ON the Jetson Orin NX™ development kit as shown in following figure.

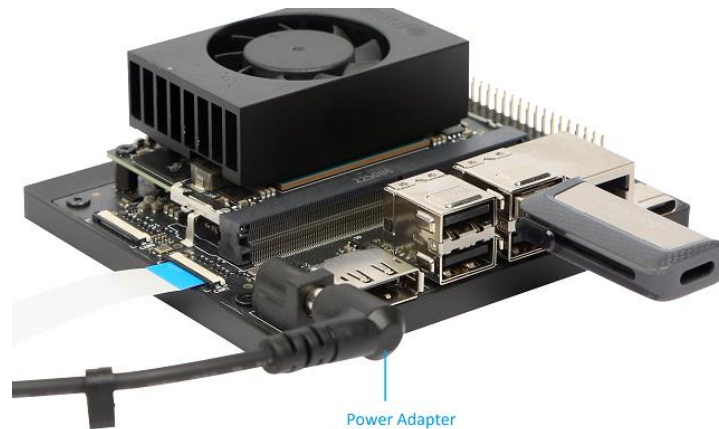


Figure 17: Power Supply Connected to Jetson Orin NX Development Kit

After powering ON the Jetson Orin NX™ development kit, the greenish yellow color LED on Orin NX™ development kit will glow. This serves as an indication for power-up of base board. The LED location is shown in following figure.

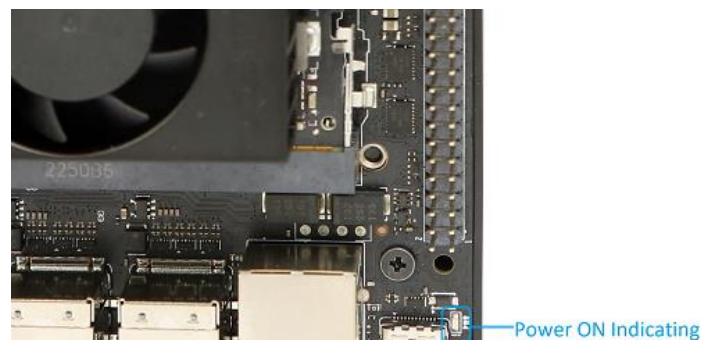


Figure 18: Status LED Indicating Jetson Orin NX Development Kit Powered ON

After powering ON the Jetson Orin NX™ development kit, the greenish yellow color LED on e-CAM25_CUONX adapter board will glow. This serves as an indication for power-up of e-CAM25_CUONX camera module. LED location is shown in following figure.

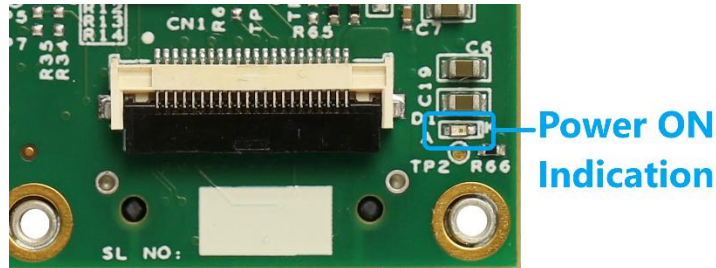


Figure 19: Status LED Indicating e-CAM25_CUONX Module Powered ON

Interfacing with Jetson Orin Nano Development Kit

Jetson Orin Nano™ development kit has CAM1 connector to interface with camera module.

The procedure for interfacing with the camera module is as follows:

1. Insert the FPC cable on the CAM1 connector of the Jetson Orin Nano™ development kit before powering ON the Jetson Orin Nano™ development kit.

The CAM1 connector location in the Jetson Orin Nano™ development kit is shown in following figure.

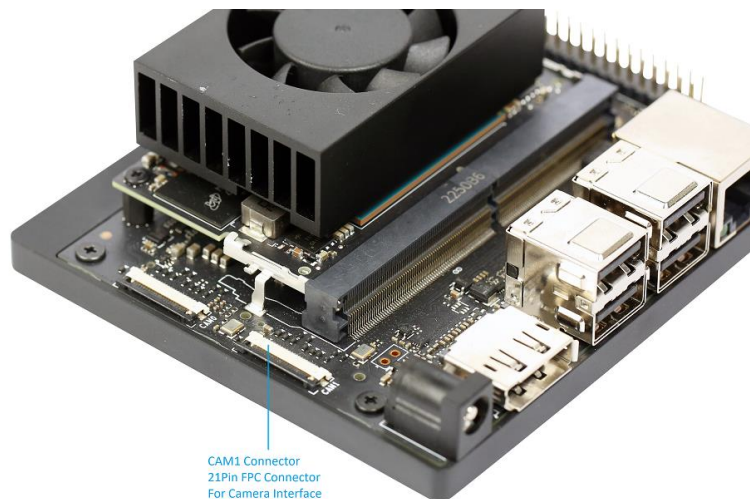


Figure 20: Camera Connector Location in Jetson Orin Nano Development Kit

2. Unlock the CAM1 connector for inserting the FPC cable.

The location of actuator in the Jetson Orin Nano™ development kit is shown in following figure.

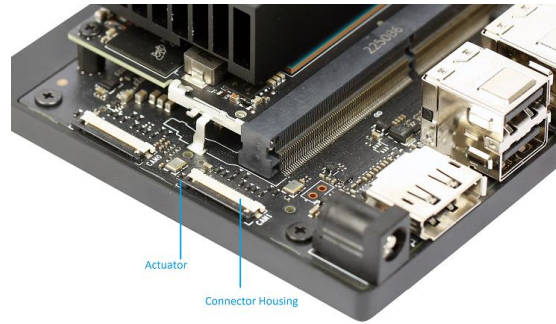


Figure 21: Jetson Orin Nano Kit Camera Connector Actuator Location

3. Pull out the actuator at centre with slight force for unlocking the connector as shown in following figures.

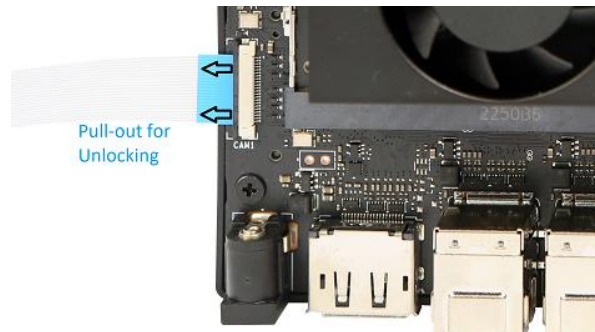


Figure 22: Unlocking Jetson Orin Nano Development Kit Camera Connector

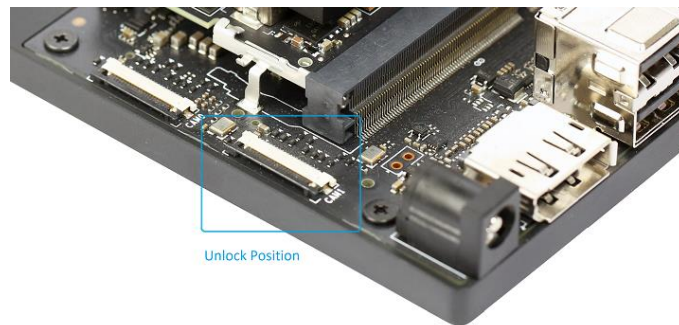


Figure 23: Unlocked Position of Jetson Orin Nano Development Kit Camera Connector

4. Insert the FPC cable to the CAM1 connector of Jetson Orin Nano™ development kit as shown in following figure.

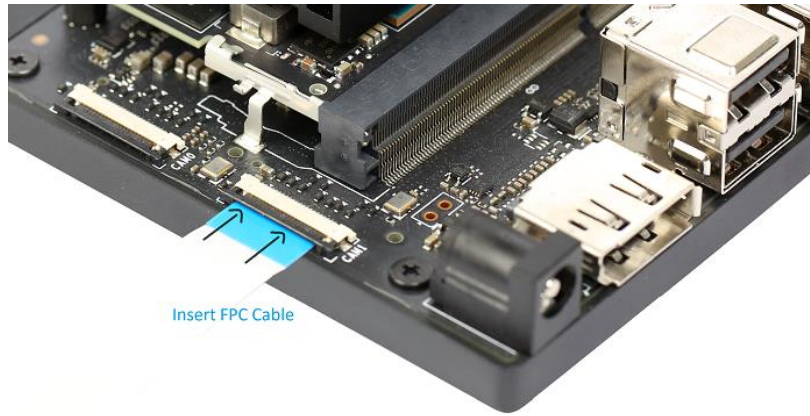


Figure 24: FPC Cable Insertion to CAM1 Connector of Jetson Orin Nano Development Kit

The FPC cable must be inserted in conductive side of the cable to face board side as shown in following figure.

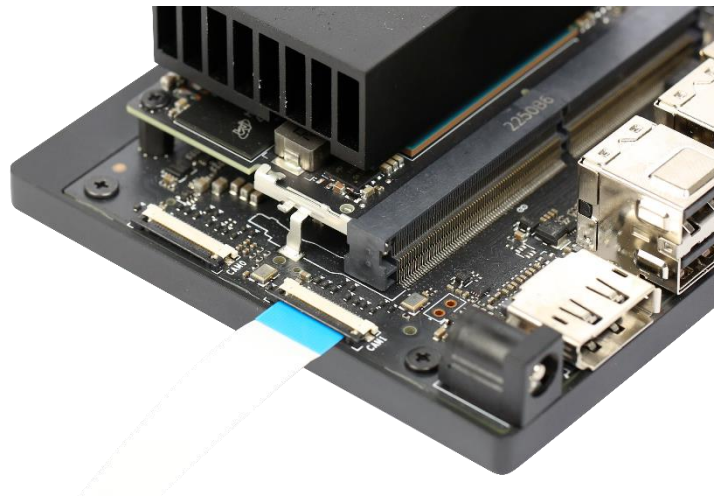


Figure 25: FPC Cable inserted to Jetson Orin Nano Development Kit

5. Lock the CAM1 connector by pressing both ends of actuator with same equal force as shown in following figures.

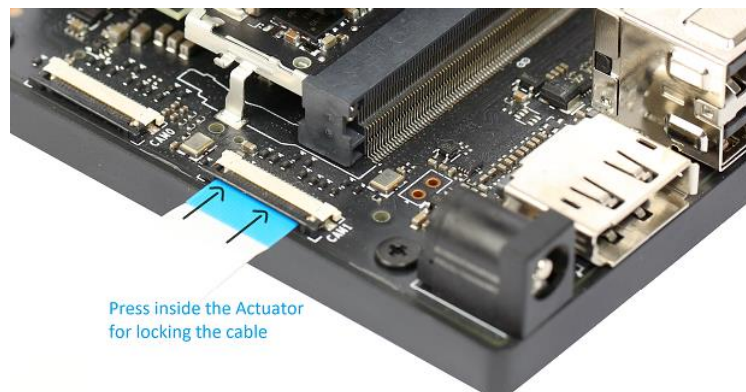


Figure 26: Locking FPC Cable

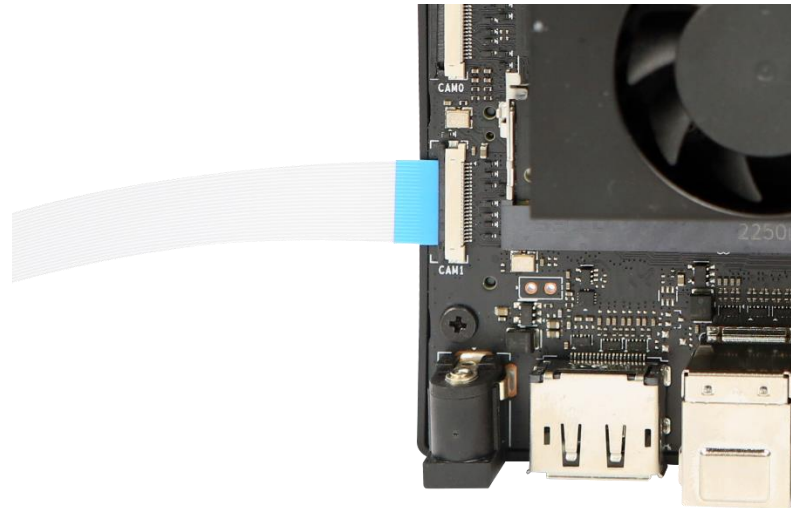


Figure 27: FPC Cable Locked Position on Jetson Orin Nano Development Kit

Note: Care must be taken, while connecting cable to camera connector of Jetson Orin Nano™ development kit.

Now, e-CAM25_CUONX is connected to Jetson Orin Nano™ development kit as shown in following figure.

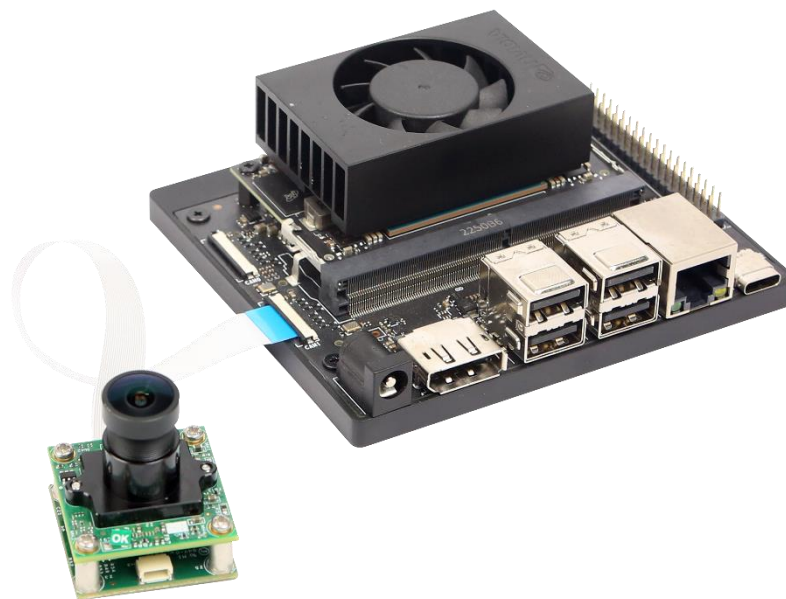


Figure 28: e-CAM25_CUONX Setup Interfaced to Jetson Orin Nano Development Kit

Jetson Orin Nano™ development kit can be powered either from USB Type-C connector or DC power jack connector. Since USB Type-C is used for low power applications, e-CAM25_CUONX supports only low resolutions in this power supply. Connecting 19V power supply to DC jack will be the ideal solution, when using e-CAM25_CUONX with Jetson Orin Nano™ development kit to use its full listed resolutions.

The power supply connectors in the Jetson Orin Nano™ development kit are shown in the following figure.

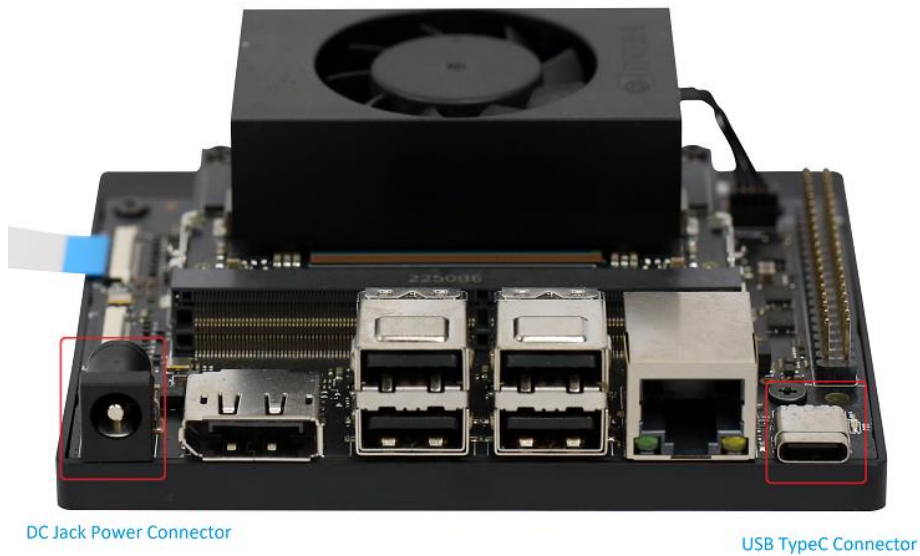


Figure 29: Power Supply Connectors in Orin Nano Development Kit

6. Connect 19V power supply to DC jack to power ON the Jetson Orin Nano™ development kit as shown in the following figure.

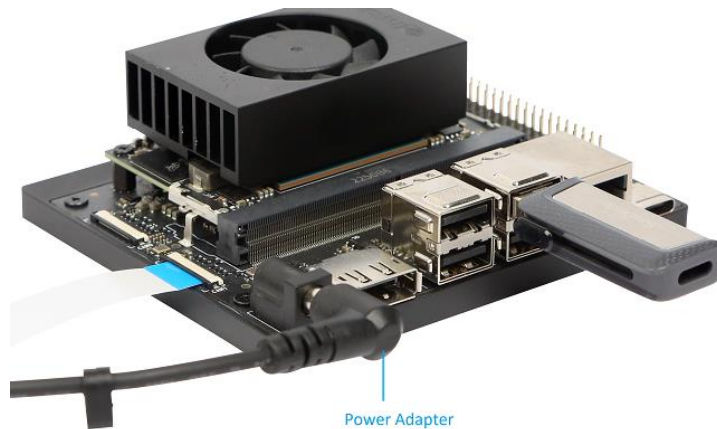


Figure 30: Power Supply Connected to Jetson Orin Nano Development Kit

After powering ON the Jetson Orin Nano™ development kit, the greenish yellow color LED on the Jetson Orin Nano™ development kit will glow. This serves as an indication for power-up of base board as shown in the following figure.

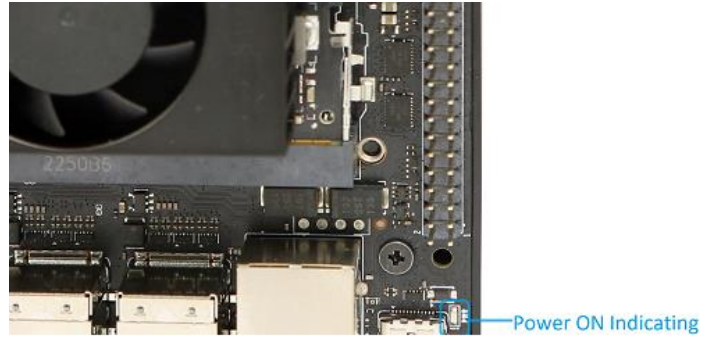


Figure 31: Status LED Indicating Jetson Orin Nano Development Kit Powered ON

After powering ON the Jetson Orin NX™ development kit, the greenish yellow color LED on e-CAM25_CUONX adapter board will glow. This serves as an indication for power-up of e-CAM25_CUONX camera module. LED location is shown in following figure.

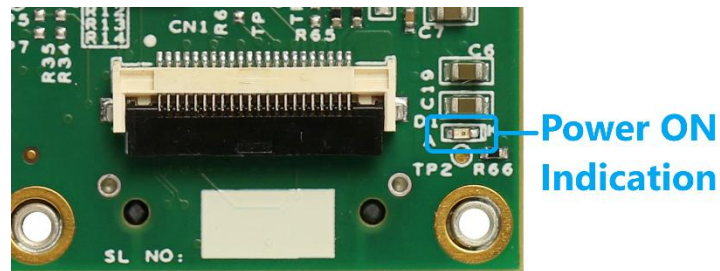


Figure 32: Status LED Indicating e-CAM25_CUONX Module Powered ON

Software Quick Setup

This section describes the extracting and flashing of e-con Systems provided binaries.

The commands and output messages in this manual are represented by different colors as shown in following table.

Table 4: Notation of Colors

Color	Notation
Blue	Commands running in Host PC
Green	Commands running in Development Kit
Orange	Output message in Development Kit

Before extracting and flashing the e-con provided binaries, flash the Jetpack 6.1.0 in Jetson Orin Nano™/Orin NX™ development kit provided by NVIDIA®, using the SDK Manager.

The steps to setup the Jetson Orin Nano™/Orin NX™ development kit for e-CAM25_CUONX camera are as follows:

1. Download the SDK Manager using the link <https://developer.nvidia.com/nvidia-sdk-manager>.
2. Sign up to an account in NVIDIA® developer site to use the SDK Manager.
3. Run the following command to install the SDK Manager in the host PC.

```
sudo apt-get install ./sdk-manager-  
[version].[build#].deb
```

After installing the SDK Manager in the host PC, follow the instructions in the <https://docs.nvidia.com/sdk-manager/index.html> link to flash the Jetson Orin Nano™/Orin NX™ development kit.

4. Copy the release package into the HOME Directory of the flashed Jetson Orin Nano™/Orin NX™ development kit.

Steps for Extracting and Flashing binaries

The steps to extract and flash the binaries are as follows:

1. Run the following commands to extract the release package in the Jetson Orin Nano™/Orin NX™ development kit to obtain the binaries.

```
tar -xaf e-  
CAM25_CUONX_JETSON_ONX_ONANO_<L4T_version>_<release_da  
te>_<release_version>.tar.gz  
cd e-  
CAM25_CUONX_JETSON_ONX_ONANO_<L4T_version>_<release_da  
te>_<release_version>
```

The folder contains the necessary tools to immediately flash the binaries in Jetson Orin Nano™/Orin NX™ development kit with the kernel, camera drivers and applications.

2. Run the following commands in the Jetson Orin Nano™/Orin NX™ development kit to install e-con provided binaries with support for e-CAM25_CUONX.

```
sudo chmod +x ./install_binaries.sh  
sudo -E ./install_binaries.sh
```

This script will reboot the Jetson Orin Nano™/Orin NX™ development kit automatically after installing the binaries successfully.

Steps for Launching Application in Development Kit

The steps to launch the application in the development kit are as follows:

1. Run the following command to confirm whether the camera is initialized.

```
$ sudo dmesg | grep -i "ar0234"
```

The output message appears as shown below.

```
// For Orin development kit  
subdev ar0234 10-0042 bound
```

The output message indicates that the camera is initialized properly.

2. Run the following command to check the presence of camera video node.

```
ls /dev/video*
```

The output message appears as shown below.

```
/dev/video*
```

Where (*) represents the number of cameras connected. The number of times the output message displayed above must be equal to the number of cameras connected to the Jetson Orin Nano™/Orin NX™ development kit.

3. Run the following command to set the power mode to maximum for better performance.

```
$ sudo nvpmode1 -m 0
```

4. Run the following Jetson clocks command before launching the ecam_tk1_guvcview application in the Jetson Orin Nano™/Orin NX™ development kit.

```
$ sudo jetson_clocks
```

5. Run the following command to launch the sample camera application.

```
ecam_tk1_guvcview
```

When the application is launched, you can view the screen similar to the screen shown below.

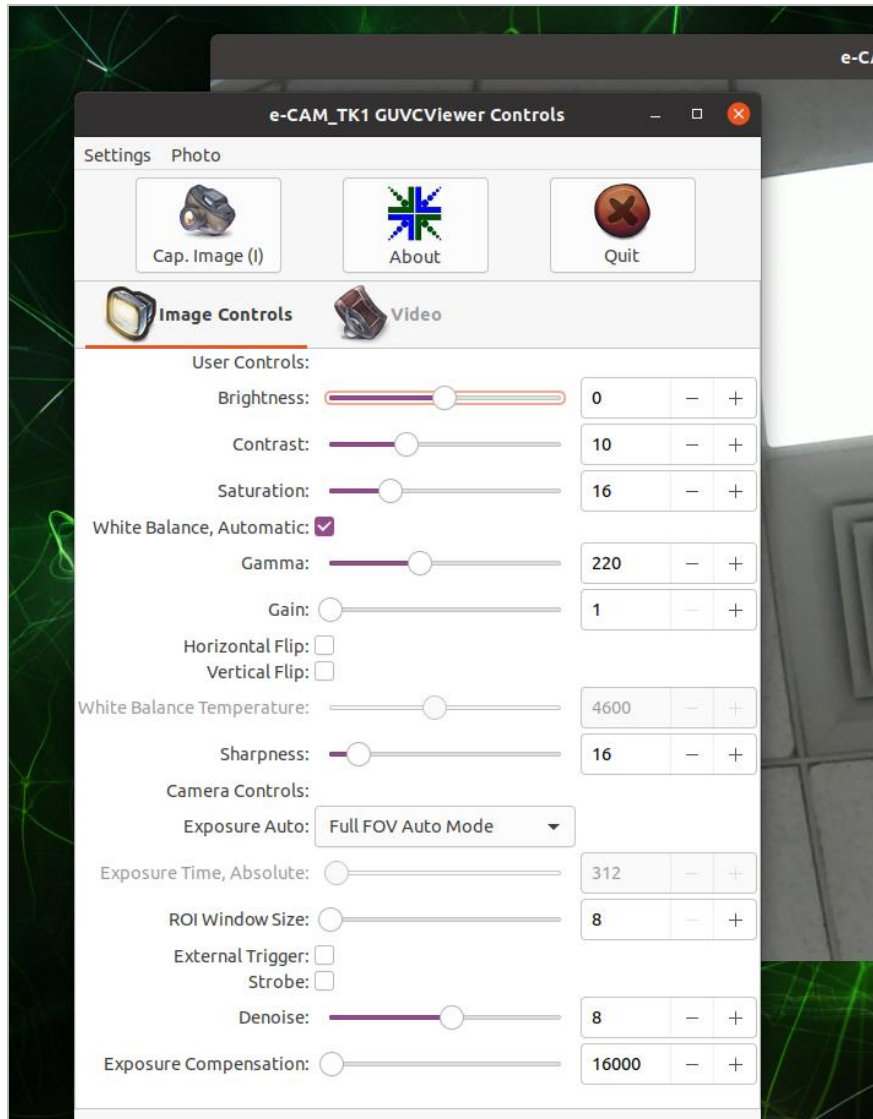


Figure 33: Initial Window when Application is Launched

Note: The login credentials of the Jetson Orin™ development kit are fully configurable on the first boot, and the sample login credentials are listed in below.

Table 5: Sample Login Credentials

Fields	Inputs
Username	nvidia
Password	nvidia

Reference Documents

This section describes the software and hardware documents of e-CAM25_CUONX. You can download the software and hardware documents from [Developer Resources](#) website.

Software Documents

The software documents and its description are listed in following table.

Table 6: Description of Software Documents

S.NO	What I need	Documents to Refer
1	View the camera stream and change the camera controls using GUI.	e-CAM25_CUONX_Linux_App_User_Manual_Rev_<ver>.pdf
2	Build and install the GUI based ecam_tk1_guvcview camera application.	e-CAM_TK1-GUVCView_Build_and_Install_Guide_Rev_<ver>.pdf
3	Use GStreamer to control the e-CAM25_CUONX camera on the Orin Nano™/Orin NX™ development kit.	e-CAM25_CUONX_Gstreamer_Usage_Guide_Rev_<ver>.pdf
4	Build custom kernel with support for using e-CAM25_CUONX.	e-CAM25_CUONX_Developer_Guide_Rev_<ver>.pdf
5	Information about the directory structure and contents of the release package for e-CAM25_CUONX.	e-CAM25_CUONX_Release_Package_Manifest_Rev_<ver>.pdf
6	Integrate e-con's e-CAM217_CUMI0234_MOD with any host system other than what is supported by e-con directly	e-CAM217_CUMI0234_MOD_MCU_Protocol_App_Note_<REV>.pdf
7	Integrates e-con's EXT_TRIGGER support	e-CAM25_CUONX_Trigger_and_Strobe_Mode_Application_Note_<REV>.pdf

Hardware Documents

The hardware documents and its description are listed in following table.

Table 7: Description of Hardware Documents

S.NO	Documents Name	Description
1	e-CAM25_CUONX_Datasheet_Rev_<ver>.pdf	Describes the features, connector pin-out details and mechanical dimensions of e-CAM25_CUONX.
2	e-CAM217_CUMI0234_MOD_Datasheet_Rev_<ver>.pdf	Describes the features and specification of e-CAM217_CUMI0234_MOD camera module.
3	e-CAM25_CUONX_Lens_Datasheet_Rev_<ver>.pdf	Describes the optical specification of lenses used in e-CAM25_CUONX.
4	e-CAM25_CUONX_REV_<ver>.stp	3D drawing file for e-CAM25_CUONX product.
5	e-CAM217_CUMI0234_MOD_REV_<ver>_3D.stp	3D drawing file for the e-CAM217_CUMI0234_MOD
6	ACC-RB-WTB-ADP_REV_<ver>_3D.stp	3D drawing file for adapter board.

Troubleshooting

In this section, you can view the commonly occurring issue and their troubleshooting step.

What could be the issue If the LED given in e-CAM25_CUONX is not glowing?

The LED indicates the power on state of e-CAM25_CUONX camera module.

If the LED is not glowing, please follow the following steps:

1. Check whether the power to the camera module is not properly connected.
2. Check whether the FPC cable connection is given as per the manual. Still the issue is not resolved, kindly write to <https://www.e-consystems.com/support.asp>

1. Do e-con Systems have any plan to support longer length cable?

e-con Systems provide a very flexible 15 cm FPC cable along with this kit. For customization, please write to camerasolutions@e-consystems.com with your requirement.

2. Does e-CAM25_CUONX camera support OpenCV?

e-CAM25_CUONX works using Video for Linux version 2 (V4L2) APIs and is V4L2 compliant. So, any V4L2 based application can be used to access this camera. OpenCV is also compatible since it uses V4L2 to access the camera.

Please refer to https://www.e-consystems.com/Articles/Camera/accessing_cameras_in_opencv_with_high_performance.asp for detailed information about OpenCV support in e-con Systems cameras.

3. How can I get the updated package?

Please login to the [Developer Resources](#) website and download the latest release package.

4. What are the voltage levels of External Trigger Signal?

e-CAM25_CUONX supports 3.3V I/O external trigger input. For more details please refer to *e-CAM25_CUONX_Datasheet_Rev_<ver>.pdf*.

What's Next?

After understanding the specifications of e-CAM25_CUONX camera board and instructions on how to use this camera board with Jetson Orin Nano™/Orin NX™ development kit, you can refer to the following documents to understand more about e-CAM25_CUONX.

- *e-CAM25_CUONX Developer Guide*
- *e-CAM25_CUONX Linux App User Manual*

Glossary

AI: Artificial Intelligence.

API: Application Program Interface.

CMOS: Complementary Metal Oxide Semiconductor.

CSI: Camera Serial Interface.

FFC: Flexible Flat Connector.

FPC: Flexible Printed Circuit.

GUI: Graphical User Interface.

LED: Light-Emitting Diode.

MCU: Micro Controller Unit.

MIPI: Mobile Industry Processor Interface.

USB: Universal Serial Bus.

UYVY: YUV422 16-bit image format with UYVY ordering.

V4L2: Video4Linux2 is a collection of device drivers and API for supporting real-time video capture on Linux systems.

Support

Contact Us

If you need any support on e-CAM25_CUONX 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>

Revision History

Rev	Date	Description	Author
1.0	18-Apr-2023	Initial draft	Camera Dev Team
1.1	10-Nov-2023	Updated to L4T35.4.1 and supported 2 lane configuration	Camera Dev Team
1.2	24-May-2024	Updated jetpack version to 6.0.0	Camera Dev Team
1.3	23-Jan-2025	Updated jetpack version to 6.1.0	Camera Dev Team
1.4	20-Mar-2025	Removed 320x240 resolution	Camera Dev Team