See3CAM_24CUG

QtCAM Streaming Application User Manual

e-con Systems

Your Product Development Partner

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Contents

Introduction to See3CAM_24CUG

See3CAM_24CUG is a 2.3 MP, color, global shutter, UVC compliant, USB 3.1 Gen1 SuperSpeed camera from e-con Systems, a leading Embedded Product Design Services Company which specializes in the advanced camera solutions. It is the latest member of the See3CAM family of USB 3.1 Gen1 SuperSpeed camera products launched by e-con Systems.

See3CAM_24CUG is a 2.3 MP color camera with the S-mount (also known as M12 board lens) lens holder. The S-mount is one of the most commonly used small form-factor lens mounts for board cameras. See3CAM_24CUG is a single board solution containing the 1/2.6" AR0234 CMOS image sensor from Aptina™ with USB 3.1 Gen1 interface. It is also backward compatible with the USB 2.0 high speed interface, albeit at lower frame rates.

See3CAM_24CUG is an UVC compliant camera and it does not require any drivers to be installed on the PC. The native UVC drivers of Windows and Linux Operating Systems (OS) will be compatible with this camera. e-con Systems also provides the sample application that demonstrates some of the features of this camera. However, this camera can utilize any DirectShow application such as Skype and so on.

e-con Systems provides a sample V4L2 application, called QtCAM, along with the See3CAM_24CUG camera. QtCAM is a V4L2 video viewer and capture software for the Linux UVC driver, but customized to demonstrate some of the features of See3CAM_24CUG.

This document describes about the usage of QtCAM application on Ubuntu [>=14.04 (LTS)] 32-bit and 64-bit Linux OS and the special features of QtCAM camera application when it is used with See3CAM_24CUG.

Prerequisites

The steps to initialize the device with the host computer are as follows:

1. Connect the one end of USB 3.1 Gen1 cable to the USB 3.1 Gen1 connector provided at the back of See3CAM_24CUG.
2. Connect the other end of USB 3.1 Gen1 cable to the USB 3.1 Gen1 host controller on the computer.

Once connected, the LED on the device will glow indicating that the See3CAM_24CUG is powered up and ready to use.

As See3CAM_24CUG is a generic UVC device, Linux will automatically detect and installs the drivers.

To view the preview, the QtCAM application must be installed. Refer to *QtCAM_Streaming_Application_Installation_Manual_See3CAM_24CUG.pdf* to know on how to install QtCAM application.

Description

See3CAM_24CUG is a USB 3.1 Gen1 color camera which can stream the resolution and frame rates as shown in below table.

Table 1: See3CAM_24CUG Resolution and Frame Rate with FOV Crop

Format	Resolution	Frame Rate (fps)		% Crop in FOV	
		USB 3.1 Gen1	USB 2.0	Horizontal	Vertical
UYVY	2.3MP (1920 x 1200)	58	6	0%	0%
	FHD (1920 x 1080)	60	8	0%	10%
	HD (1280 x 720)	120 and 60	15	0%	10%
MJPEG	2.3MP (1920 x 1200)	114 and 60	114 and 60	0%	0%
	FHD (1920 x 1080)	120, 60 and 30	120, 60 and 30	0%	10%
	HD (1280 x 720)	120 and 60	120 and 60	0%	10%

Note:

- The frame rates listed in the above table can be achieved easily in manual exposure.
- When the exposure time is more than the time period of camera frame, the frame rate will drop. In auto exposure, maximum frame rate could be achieved with maximum lighting.

The camera controls of See3CAM_24CUG are as follows:

- Brightness
- Contrast
- Saturation
- White Balance (both manual and automatic)
- Gamma
- Gain
- Sharpness
- Exposure (both manual and automatic)

The Field of View (FOV) of See3CAM_24CUG is shown below.

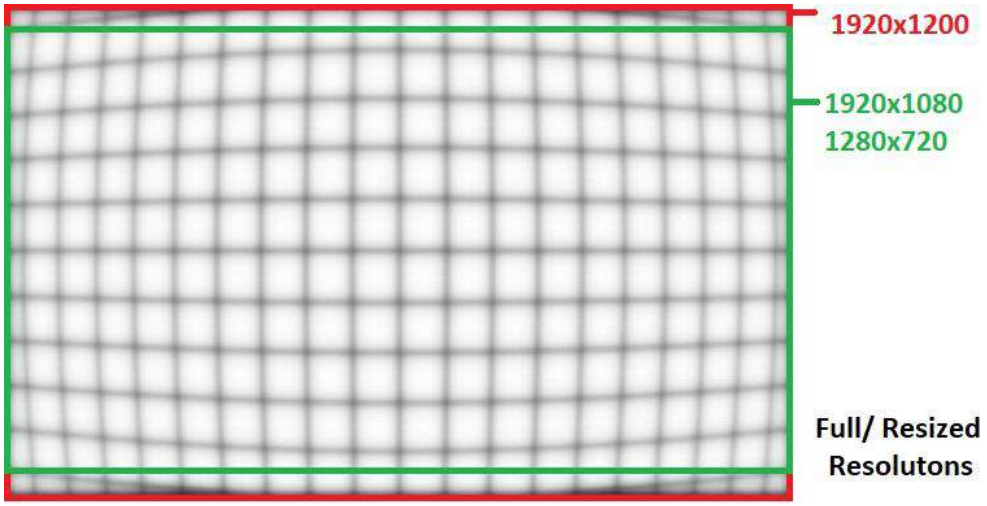


Figure 1: FOV of See3CAM_24CUG

QtCAM Application

The QtCAM application is a simple interface for capturing and viewing video from the devices supported by Linux UVC driver. This tool also supports Extension Unit control of e-con Systems See3CAM USB 3.1 Gen1 webcam products.

Using QtCAM application, you can perform the following:

- Enumerate and list all USB video devices connected.
- Change resolution and color space or compression for video stream if different resolutions are supported by the device.
- Display the currently configured values of preview in status bar.
- Capture the still images and set the path where still images will be saved.
- Configure UVC Extension control, if supported by device.
- Display the current frame rate per second.

All the above listed properties can be configured by attractive and easy to use Graphical User Interface (GUI). The application is tested in Ubuntu [>=14.04 (LTS)] 32-bit and 64-bit Linux distributions.

e-con Systems provides prebuilt binaries of the QtCAM application for the Linux distributions. The Linux distributions are:

- Ubuntu 32-bit (14.04 32-bit and 18.04 32-bit not supported)
- Ubuntu 64-bit

Launching the Application

The See3CAM USB 3.1 Gen1 camera is connected to the Linux Development System. When the application is launched, you can view the home screen as shown below.

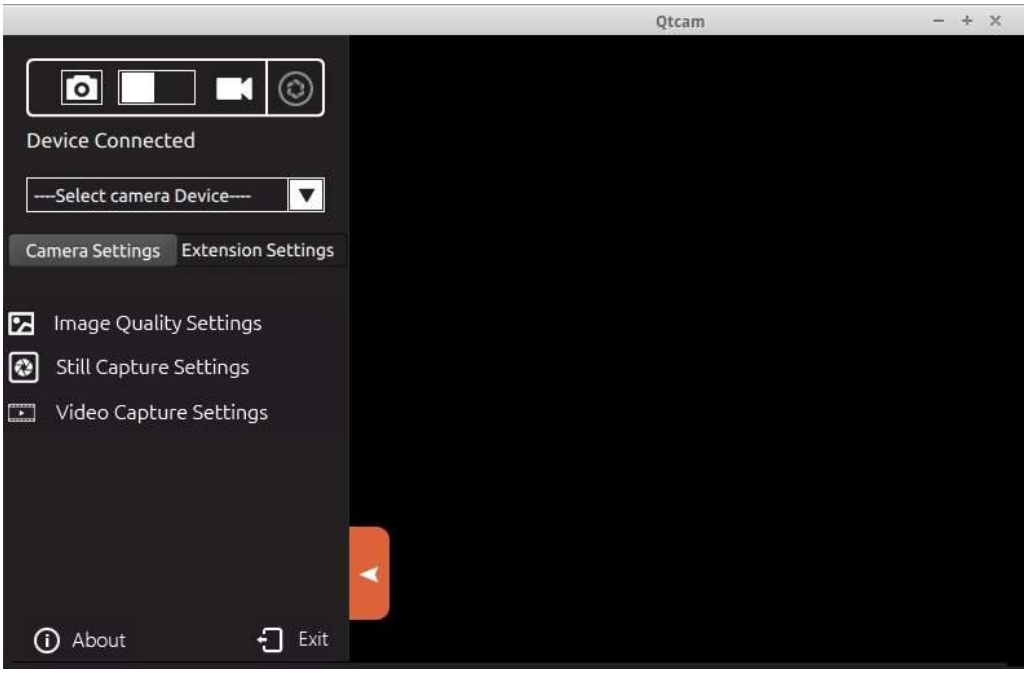


Figure 2: Home Screen

Application Features

This section describes the features that are supported in the current version of QtCAM application. The features supported in QtCAM application are as follows:

Enumeration and Selection of Camera Device

The application will emulate only the USB cameras connected to the system. You can select any one of the cameras from the drop-down list box and the corresponding preview is displayed in the right-hand side of the side bar. The device name is displayed in the **Device Connected** drop-down list box as shown below.

Figure 3: Selection of Camera Device

Note: The preview will not be displayed for the device if the camera is busy that is, the camera is opened by another application such as cheese and so on. Also, if there are two instances of QtCAM application and both have the same camera selected then no preview will be displayed in the second instance of QtCAM application.

Still Capture

By default, this application will begin in still capture mode. If the application is in video mode, you can click the **Camera** icon to switch back to still capture mode. To capture the still image, you can either click the **Preview** or the **Capture Image** icon available in the side bar as shown below.

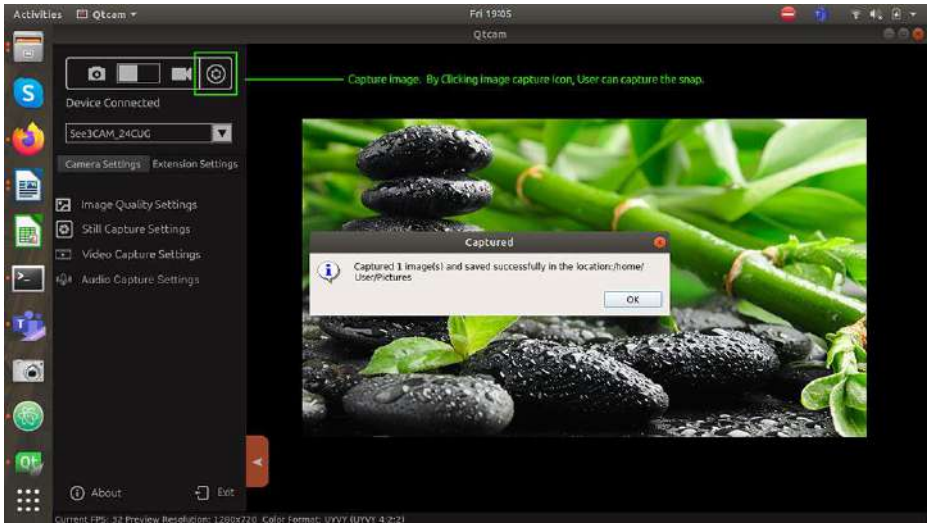


Figure 4: Image Captured Dialog Box

The image will be saved in the directory path which is selected in the image location available under the Still Capture Settings. The file name for captured image file is **Qtcam-YY_MM_dd:hh_mm_ss**, with the selected image extension format. If the extension format is jpg, the filename will be **Qtcam-YY_MM_dd:hh_mm_ss.jpg** [Where YY-Year, MM-Month, dd-day, hh-hour, mm-min, ss-x denotes image number updated when multiple images are taken within a second].

Note: Using Image Capture option in Extension Settings tab, you can decide the number of shots to be captured in a single click.

Video Recording

To record a video, you can click the **Video Record** icon to switch the application from capture mode to video mode. Then you can record a video by selecting the red color button available in the side bar as shown below.

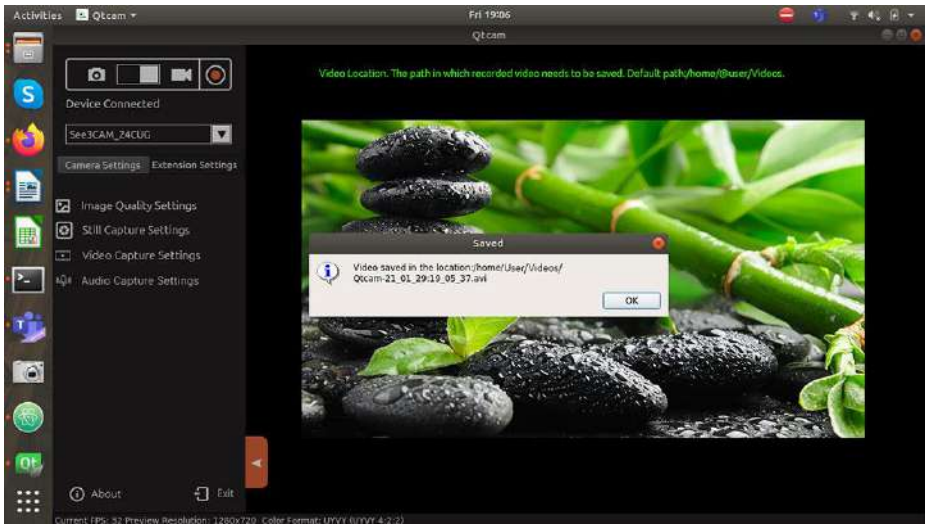


Figure 5: Video Recording

The video will be saved in the directory path which is selected in the video location path. The default name for recorded video file is **Qtcam-YY_MM_dd:hh_mm_ss**, with the video record extension format. If the extension format is avi, the file name will be **Qtcam-YY_MM_dd:hh_mm_ss.avi**.

Once you click the **Video Record** icon, the video recording will begin. To stop recording, click the **Video Stop** icon which is available in the side bar. During video recording, you cannot change the preview resolution and camera device.

For more details of video record format, video encoder format in video recording please refer the *Video Capture Settings* section.

Once you click the **Video Stop** icon while recording, the recording will be stopped, and the video file will be saved in the path specified in video location of Video Capture Settings.

Note: While recording, frame drop may occur in some PC's due to the low performance of the PC, please reduce the FPS while recording in the UYVY format or reduce the Q-factor in MJPEG format.

Camera Settings

The camera settings of See3CAM_24CUG are as follows:

- Image Quality Settings
- Still Capture Settings
- Video Capture Settings

Image Quality Settings

On selecting the Image Quality Settings, a **Control** menu will display the camera control settings. You can adjust the video preview settings in the Menu tab. The sliders whose labels are not greyed can only be configured.

You can move the slider and configure the preview settings according to your needs. The value being set will be displayed in the text box based on the position of the slider marker. As soon as the slider is moved to configure the values, the previews property will change at that instance.

The controls available in Image Quality Settings are as follows:

- Brightness
- Contrast
- Saturation
- White Balance
- Gamma
- Gain
- Sharpness

- Powerline Frequency
- Exposure
- Hardware Default

The values of See3CAM_24CUG controls are shown in below table.

Table 2: Values of See3CAM_24CUG Controls

Controls	Minimum Value	Maximum Value	Default Value	Step Size	Manual Control	Auto Control
Brightness	-15	15	0	1	YES	NO
Contrast	0	30	9	1	YES	NO
Saturation	0	60	16	1	YES	NO
Sharpness	0	127	16	1	YES	NO
Gamma	40	500	220	1	YES	NO
White Balance	1000	10000	4500	1	YES	YES
Gain	1	40	1	1	YES	NO
Exposure	50 µs	1 second	31.2 ms	Factor of 2 for each step value	YES	YES

Brightness

You can change the brightness values from a minimum value of -15 to 15 by moving the slider, and the exact changes will be reflected immediately in the preview.

The brightness control increases the low light performance of See3CAM_24CUG. The default value is 0.

Contrast

You can change the contrast values from a minimum value of 0 to 30 by moving the slider, and the exact changes will be reflected immediately in the preview.

Increasing the contrast control value increases the luminance of See3CAM_24CUG. The default value is 9.

Saturation

You can change the saturation values from a minimum value of 0 to 60 by moving the slider, and the exact changes will be reflected immediately in the preview.

Increasing the saturation control value increases the intensity of the color of See3CAM_24CUG. The default value is 16.

White Balance

You can change the manual white balance values from a minimum value of 1000 to 10000 by moving the slider, and the exact changes will be reflected immediately in the preview.

The manual white balance can be selected by deselecting the check box near the White Balance control. The default value is 4500.

Gamma

You can change the gamma values from a minimum value of 40 to 500 with default value being 220 by moving the slider. The exact changes will be reflected immediately in the preview.

Gain

You can change the gain values from a minimum value of 1 to 40 by moving the slider, and the exact changes are updated in the preview immediately.

The default value is 1. This control takes effect only if the Exposure control is in manual mode.

Sharpness

You can change the sharpness values from a minimum value of 0 to 127 by moving the slider, and the exact changes will be reflected immediately in the preview.

The sharpness control increases the clarity of See3CAM_24CUG. The default value is 16.

Exposure Control

See3CAM_24CUG supports both auto and manual Exposure control which can be controlled using the Exposure (Absolute) slider of the Image Quality Settings of QtCAM. To use the manual exposure slider, you must select the **Manual Mode** from the **Exposure, Auto** drop-down list box, and the exposure value could be manually changed by moving the slider.

See3CAM_24CUG supports exposure values ranging from 100 µs to 1 second represented from 1 to 10000 in the slider. The exposure values are configured inside the CMOS image sensor based on the sensor configuration and clock configuration details.

To obtain a good low light performance, it is essential to change the exposure according to the change in lighting conditions. To support this feature, the See3CAM_24CUG has an auto exposure feature, by which the exposure of the camera will be changed according to the lighting conditions giving the best low light performance. To select this auto exposure control, you must select the check box.

The exposure value applied in the sensor in ms is 1/10 of the value shown in the slider.

The slider values are computed according to the USB Video Class standards, and hence the exposure time that is applied is shown in below table.

Table 3: See3CAM_24CUG Slider Value-Exposure Time Mapping

Slider Value	Exposure Time
0	0.05 ms
1	0.1 ms
2	0.2 ms
3	0.3 ms
. .	. .
10	1 ms
11	1.1 ms
12	1.2 ms
. .	. .
100	10 ms
. .	
1000	100 ms
. .	. .
10000	1 second

When you are in a specific range of exposure value, the same value will persist in the exposure setting of See3CAM_24CUG. While switching to a new value, you must increase the value to the next range by moving the slider. This is performed to ensure compliance with the UVC standard.

Note:

- When the exposure time is more than the time period of camera frame, the frame rate will reduce.
- The controls are global across all resolutions and formats, and hence changing the control values will reflect the changes in both the formats and resolutions.

Hardware Default

The **Hardware Default** button is used to reset the Image Quality Settings values to the hardware default state. Once you click the **Hardware Default** button, all the control values and preview are set to the default mode. You can view the screen similar to the screen shown below.

Figure 6: Hardware Default

Still Capture Settings

On selecting the Still Capture Settings, you can select still color space, still image resolution, capture image location path and image save format type.

The controls available in Still Capture Settings are as follows:

- Color Space or Compression
- Output Size
- Image Location
- Image Format

Color Space or Compression

To save the color space or compression format, you can select the still color space format from the **Color Space/Compression** drop-down list box as shown below.

Figure 7: Still Color Space Format

The color space formats available are as follows:

- UYVY (UYVY 4:2:2)
- MJPG (Motion-JPEG)

By default (while camera is selected), the preview color space will be selected, but you can change this any time.

Output Size

To change the output size, you can select the image resolution from the **Output Size** drop-down list box as shown below.

Figure 8: Still Image Resolution

The supported resolution list will be displayed based on still color space selection. It will be varied based on USB 3.1 Gen1 or USB 2.0 and color space or compression formats.

By default (while camera is selected), the preview output size will be selected, but you can change this any time.

Image Location

To change the image location, you must click the **Folder** icon or the text box. The **Select a folder** dialog box will open to select the new location. You must click the **Choose** button to change the path. The default path is **/home/@user/Pictures** as shown below.

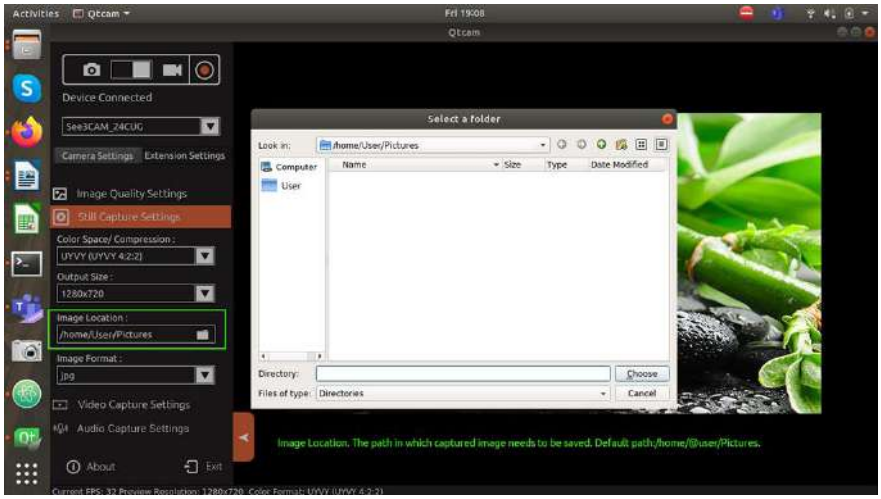


Figure 9: Image Location

Image Format

You can select the image format from the **Image Format** drop-down list box and the captured images are saved as per the selected image format. The default format is jpg as shown below.

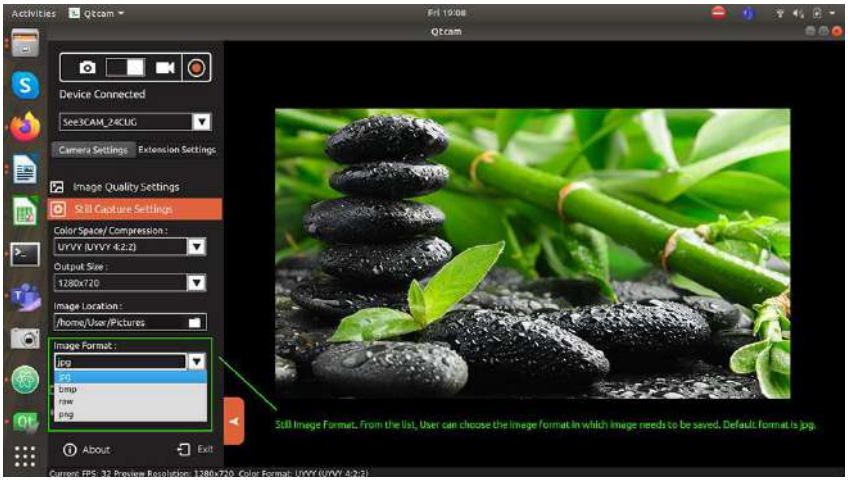


Figure 10: Still Image Format

The image formats available are as follows:

- jpg
- bmp
- raw
- png

Video Capture Settings

On selecting the Video Capture Settings, you can select their video color space, preview resolution, video encoder format, video container (Extension) and video location.

The controls available in Video Capture Settings are as follows:

Frame Rate

To make changes in preview, you can select the frame rate from the **Frame Rate** drop-down list box as shown below.

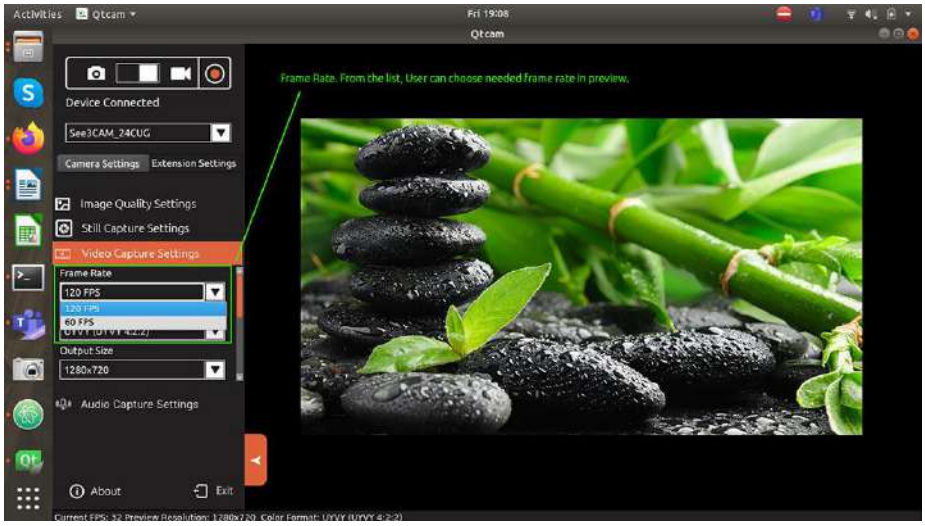


Figure 11: Frame Rate

The frame rate displayed is the maximum expected fps for the current resolution (output size).

Color Space or Compression

To make changes in video color format, you can select the color space from the **Color Space/Compression** drop-down list box as shown below.

Figure 12: Video Color Space Format

The video color space formats available are as follows:

- UYVY (UYVY 4:2:2)
- MJPG (Motion-JPEG)

By default (while camera is selected), the preview color space will be selected, but you can change this any time. The preview will be updated as per the selected color space.

Output Size

To change the preview size, you can select the preview resolution from the **Output Size** drop-down list box as shown below.

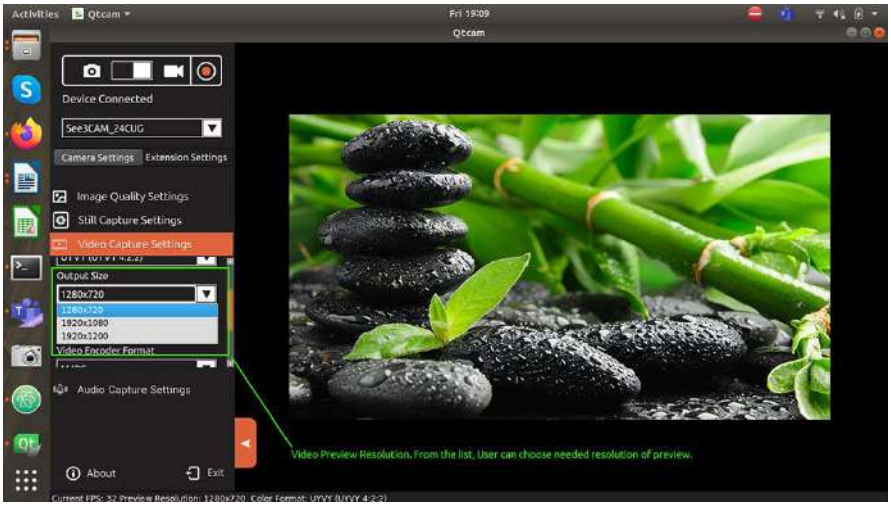


Figure 13: Video Preview Resolution

Refer to *Table 1* for the supported resolution list and frame rates. By default (while camera is selected), the preview output size will be selected, but you can change this any time. The preview will be updated as per the selected output size once you select from the list.

Video Record Format

To record the video in avi format, you can select the record format in the **Video record format** drop-down list box as shown below.

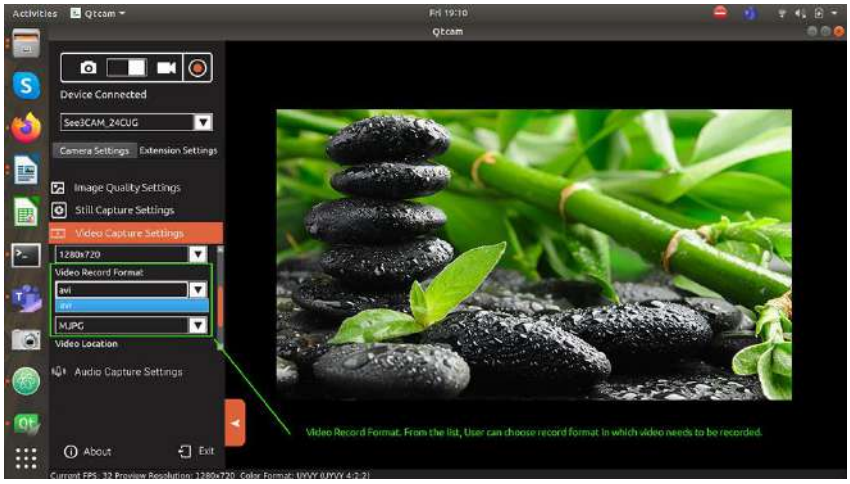


Figure 14: Video Record Format

By default, the available video format is avi.

Video Encoder Format

To record the video in MJPG format, you can select the encoder format in the **Video Encoder format** drop-down list box as shown below.

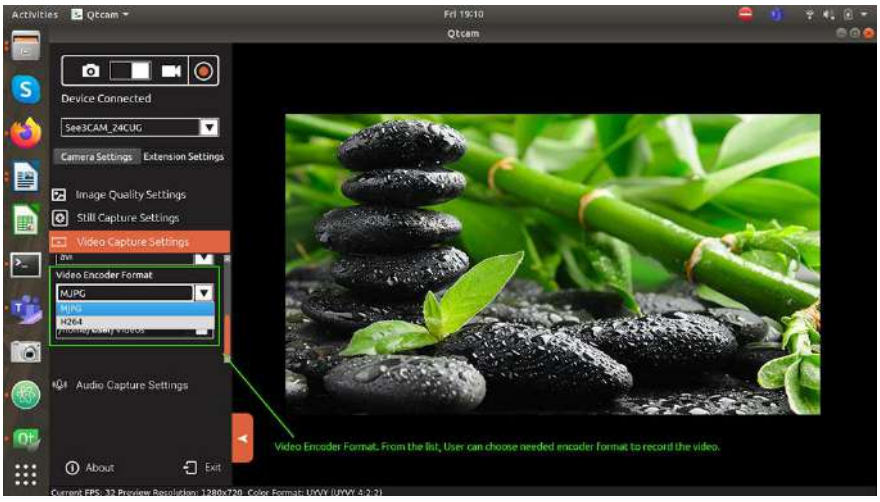


Figure 15: Video Encoder Format

The video encoder formats available are as follows:

- MJPG
- H264

Video Location

To change the video location, you must click the **Folder** icon or the text box. The **Select a folder** dialog box will open to select the new location. You must click the

Choose button to change the path. The default path is */home/@user/Videos* as shown below.

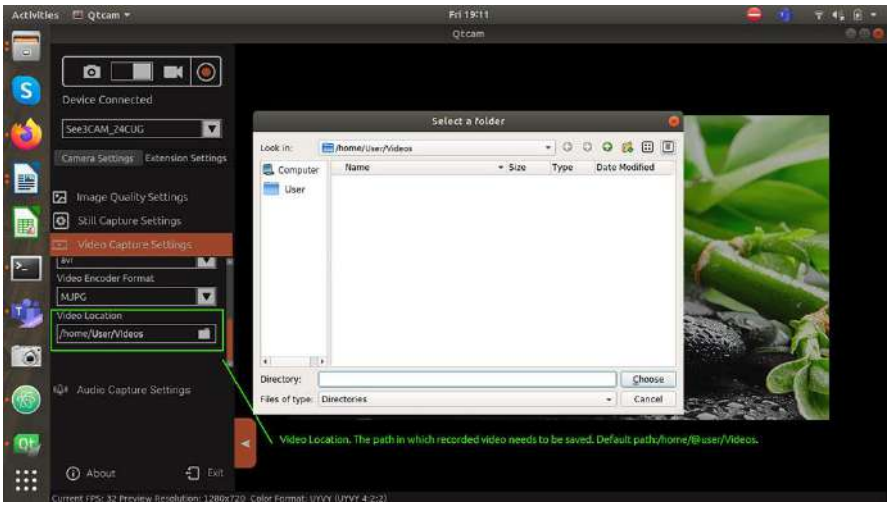


Figure 16: Video Location

Display Current Frame Rate Achieved

The frame rate will be affected by various environmental parameters. The current frame rate achieved is displayed all the time in status bar as shown below.

Figure 17: Current Frame Rate Achieved

Extension Settings

If the device supports extension unit, the Extension Settings control will appear on the See3CAM controls tab. The See3CAM_24CUG cameras has some additional controls and features and are listed as Extension Settings controls, hence they are not included in the standard UVC controls.

The Extension Settings control is used to select the extended HID controls of See3CAM_24CUG. These control settings can be done by modifying the appropriate settings of Extension Settings control.

The controls available in Extension Settings are as follows:

- Stream Modes
- Special Effects
- Auto Exposure Region of Interest (ROI) Mode
- Exposure Compensation
- De-Noise
- Image Capture
- Quality-Factor (Q-Factor)

- Frame Rate Control
- Flip Control
- Face Detection
- Smile Detection
- Flash Control
- Flicker Detection Control

Stream Modes

The stream mode allows you to switch between master and trigger modes.

Master

The master mode can be considered as a free-running mode of the camera. In this mode, the camera is configured for a preview resolution and still resolution. This is a simple mode of operation for the camera without any external trigger capability.

Trigger

In trigger mode, See3CAM_24CUG camera can synchronize the exposure (or integration) of the camera pixels to an external trigger pulse that can be given through the GPIO connector of the camera. Since this is a global shutter camera, all the pixels start and stop integrating at the same time, avoiding rolling skew during the capture of fast-moving scenes.

In trigger mode of See3CAM_24CUG, the preview will not be available, and the camera will be kept in standby waiting for a trigger pulse to start the integration of pixels and provide a global shutter image.

You can configure the camera settings such as White balance, exposure, still image resolution, still image storage location and so on in Manual mode and then enter the Trigger mode. The Auto function lock option can be used to lock the auto functions such as exposure, White balance and so on in Auto mode. In the Trigger mode, the camera settings will be retained, but preview will not be available. The camera shall be waiting for an external event on the GPIO connector and the camera will start exposing on the trigger signal. The external trigger pulse on the GPIO connector must be of certain duration for the camera to recognize this event. The requirements for this external trigger signal are given in the *See3CAM_24CUG_Trigger_Mode_Application_Note.pdf*.

All the images captured will be stored in the default location, that is, the desktop or can be stored in any user specified path, in the format selected in the **Still Capture settings** option and the resolution in the **Video Capture Settings** option.

Note: *The Auto Function Lock control will be work only in auto exposure and auto white balance mode. The change in manual exposure and manual white balance will reflect in preview even when the auto function lock is enabled.*

You can view the screen similar to the screen shown below.

Figure 18: Stream Mode

Special Effects

See3CAM_24CUG supports five special effects. Only one effects can be active at a time. The required effect can be set on the camera by selecting the appropriate radio button. The special effects available are as follows:

- **Normal**: In this mode, the normal unprocessed UYVY or MJPEG image stream from the camera as shown below.

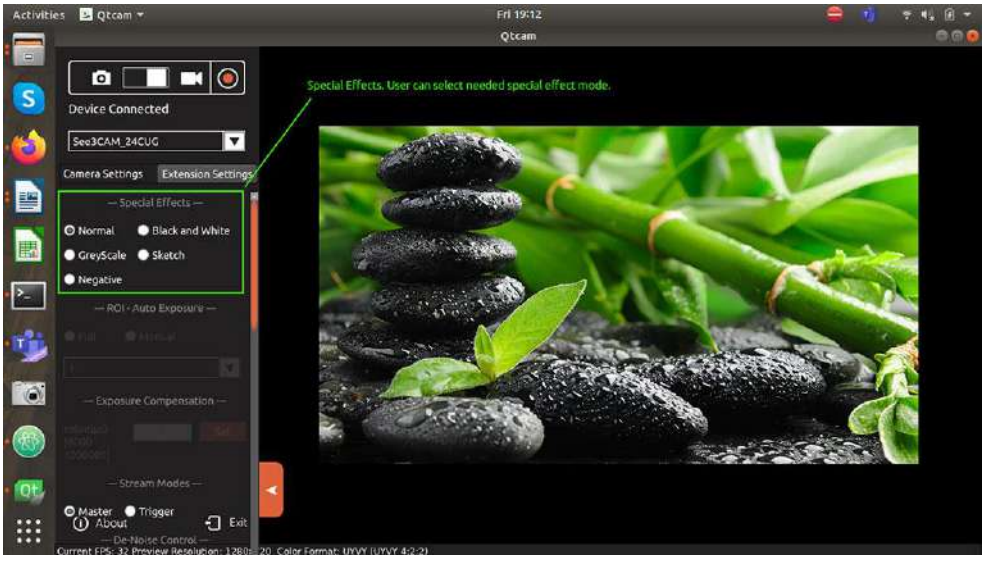


Figure 19: Normal Effect

- **GreyScale**: In this mode, the image stream is composed of grey shades.
- **Sketch**: In this mode, an effect of edge dominant image stream useful for edge-detection is produced.
- **Black and White**: In this mode, the image stream is composed of black and white pixels.
- **Negative**: In this mode, the normal preview is color inversed.

Auto Exposure ROI Mode

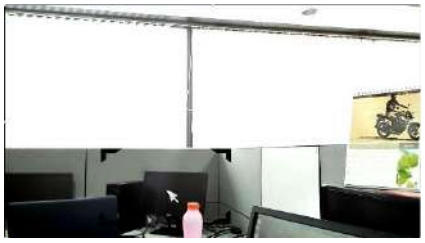
The auto exposure ROI modes available are as follows:

- **Full ROI**: In this mode, the full region-based exposure value will be applied to the frame.
- **Manual ROI**: In this mode, you can select the ROI and at that region, the exposure value will be applied to the entire frame.

  Note: The right-click button of Mouse is used for selecting auto exposure area in preview. When auto exposure in Camera Control tab of the Image Quality Settings is not selected, these controls will be disabled.

The images of manual ROI mode are shown in below table.

Table 4: Images of Manual ROI Mode

Note: The exposure window size can also be selected from the **Extension Settings** tab. The mouse pointer and the surrounding rectangle is just for representative purpose and will not be present in the actual image.

Exposure Compensation

The exposure compensation allows you to adjust the automatically calculated exposure. The resolution and default exposure compensation value of See3CAM_24CUG is shown in below table.

Table 5: See3CAM_24CUG Resolution and Default Exposure Compensation Values

Format	Resolution	Frame Rate	Default Exposure Compensation (µs)	
			USB 3.1 Gen1	USB 2.0
UYVY	720P (1280 x 720)	60	66666	NA
		15	NA	66666
	1080P (1920 x 1080)	60	66666	NA
		8	NA	125000
	1200P (1920 x 1200)	58	66666	NA
		6	NA	166666
MJPEG	720P (1280 x 720)	120	66666	
		60		
	1080P (1920 x 1080)	120		
		60		
		30		

	1200P (1920 x 1200)	114	
		60	

Note: The exposure compensation value will not have any effect in manual exposure mode. The exposure compensation value will update to its default value when you change the resolution. There will be a change in frame rate when you change the exposure compensation value.

De-Noise

You can select the De-Noise option to blur the effect of noise in the image preview. The values can be varied from 0 to 15 with default value being 8 by moving the **De-Noise Control** slider as shown below.

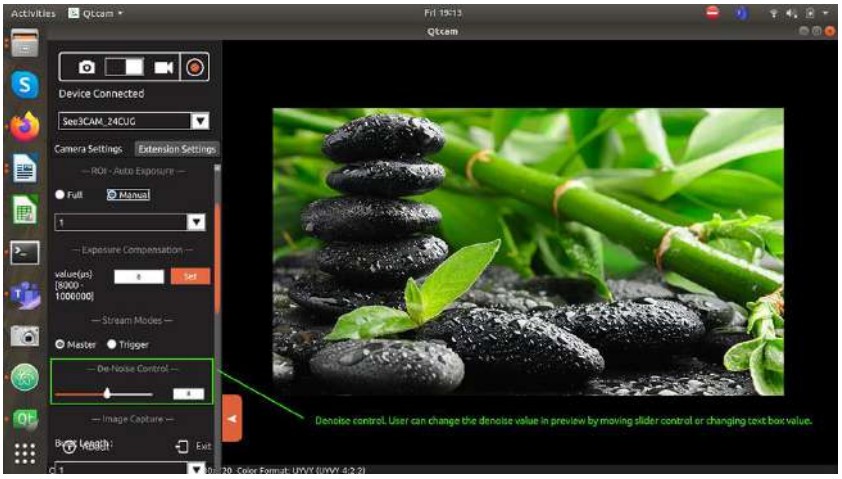


Figure 20: De-Noise

Image Capture

You can select the burst length from a minimum value of 1 to 5 from a **Burst Length** drop-down list box. The exact number of images will be captured and stored in the location you have specified.

Q-Factor

The Q-Factor defines the value that is used as a scale factor for the quantization table. The values can be varied from 10 to 96 with default being 96 in USB 3.0 and 84 in USB 2.0 by moving the **Q Factor** slider as shown below.

Figure 21: Q-Factor

Frame Rate Control

You can select the frame rate control to change the frame rate. The default frame rate control value will be the value that appears in the **Frame Rate** text box of Image Quality Settings. You can select the frame rate value by moving the **Frame Rate Control** slider as shown below.

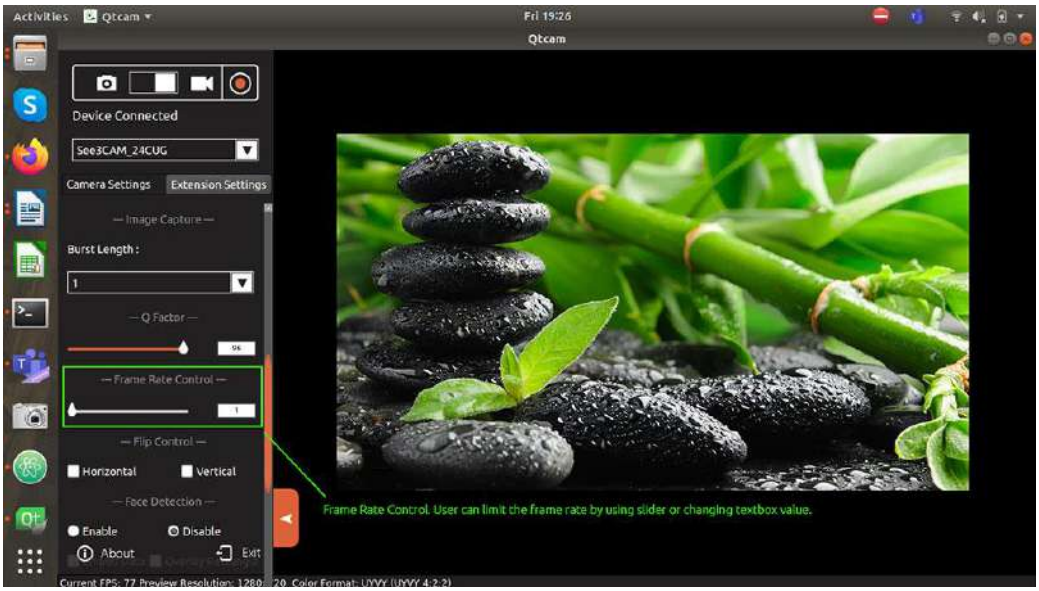


Figure 22: Frame Rate Control

Note: The frame rate control slider value will not have any effect above the default frame rate. The frame rate control value will update to its default value when you change the resolution.

Flip Control

The flip control is used to set the horizontal and vertical flip effects. You can select both the horizontal and vertical flip controls by selecting the respective check box as shown below.

Figure 23: Flip Controls

Face Detection

You can select the face detection to enable and disable the face detection. The Overlay Rectangle option allows you to enable or disable the overlay rectangle around the faces during face detection as shown below.

Figure 24: Face Detection

When Embed Data option is selected, the last part of the frame will be replaced with face details. Refer to *See3CAM_24CUG_Face_and_Smile_Detection_Application_Note.pdf* for more information.

Note: Face detection is only applicable for Normal and GrayScale mode in Special effects.

Smile Detection

You can select the smile detection to enable and disable the smile detection as shown below.

Figure 25: Smile Detection

When Embed Data option is selected, the last part of frame will be replaced with smile details. Refer to *See3CAM_24CUG_Face_and_Smile_Detection_Application_Note.pdf* for more information.

Note:

- When face/smile detection embed data is enabled, there will be a drop-in frame rate.
- When the overlay rectangle control is enabled, the captured images will have overlay rectangle.
- For safe operation, it is advisable to disable the overlay rectangle control during still capture.

Strobe Control

If LED or Xenon Flash is used, it must be connected to pin 5 of CN2 connector in the USB base board. Refer to the *See3CAM_24CUG_Datasheet.pdf* for the connections and pin description details. The two types of strobe controls are as follows:

- **OFF**: It disables the strobe controls.
- **ON**: When this control is enabled, the LED ON time is set based on the current exposure value (integration time).

Flicker Detection Control

Flicker detection is used to avoid flicker in the video preview due to the AC light source. You can select between auto mode, or force 50 Hz and 60 Hz or completely disable flicker avoidance.

Note: In some lighting conditions, the auto flicker mode will take longer time to settle. During those conditions, it is advisable to use manual anti flicker mode.

You can view the screen similar to the screen shown below.

Figure 26: Flicker Control

About

To know about the application name, version and copyrights, you can click the **About** button available in the side bar. When you click the **About** button, you can view the screen similar to the screen shown below.

Figure 27: About Screen

Exit

To close the application, you can click the **Exit** button available in the side bar as shown below.

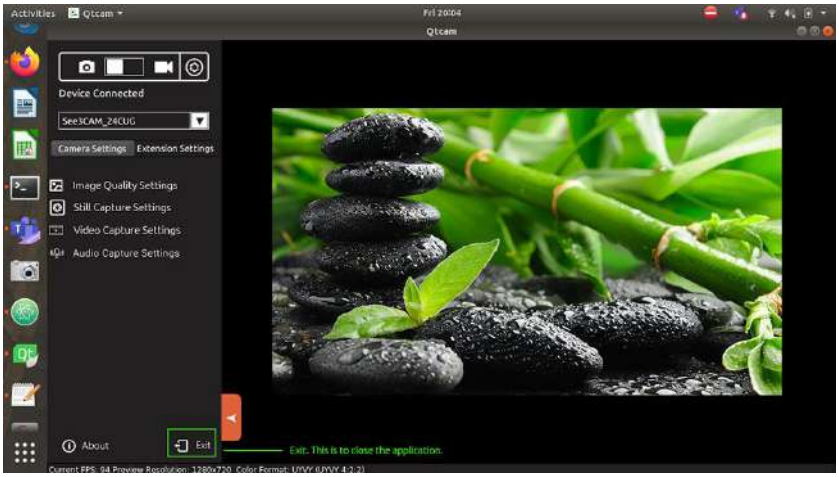


Figure 28: Exit Application Dialog Box

Click **Yes** to exit the application.

Troubleshooting

In this section, you can view the list of commonly occurring issues and their troubleshooting steps.

Device connected, power indication LED is OFF or switching between Red and OFF state.

It seems like there is no proper power input to the device. You need to check the cable or USB connector integrity. If a USB Hub is used, use external power.

Device connected, power indication LED is Red.

The device is powered up and ready to stream image data. You need to use QtCAM or any standard streaming application to start streaming.

In QtCAM sample application, the device is selected but the preview window is White.

You need to install the latest version of QtCAM application from the Developer Resources website.

In QtCAM sample application, the device is selected but the preview window is Black and indication LED blinks between Red and Yellow continuously.

It seems like no image is received from the camera. Contact e-con Systems online support support@e-consystems.com.

The QtCAM application is enabled in Ubuntu 14.04 (64-bit), Ubuntu 18.04 (64-bit), Ubuntu 16.04 (64-bit and 32-bit) Linux Distribution only.

This is a known limitation.

In Ubuntu 16.04, YUY (Raw) video encoder format is not supported.

This is a known issue.

In this version, audio recording is not supported while video recording is supported.

This is a known issue. e-con Systems planned to give support for audio recording in future.

1. **What is See3CAM_24CUG?**

   See3CAM_24CUG is a 2.3 MP, color, global shutter, UVC compliant, USB 3.1 Gen1 camera with the S-mount (also known as M12 board lens) lens holder. It is a single-board solution containing the camera sensor module board with 2.6" AR0234 CMOS image sensor from ON Semiconductor® and the USB 3.1 Gen1 interface board.

2. **What is the lens used in this camera?**

   The lens used in the camera is S-mount (M12) with a focal length of 3.0mm and a diagonal FOV of 128 deg.

3. **What is the minimum distance the lens could focus?**

   The minimum working distance (distance between the camera and the object) of the camera is 10cm.

4. **Can I get access to ISP registers?**

   No. The option is not available by default but will be provided on case-to-case basis with firmware customization.

5. **Can I get access to image sensor registers?**

   No. The sensor registers are directly controlled by the ISP.

6. **The frame rate is not consistent in UYVY format. Can I fix it?**

   Yes, the camera is designed to allow exposure till 66.66 ms in auto exposure mode and hence the frame rates can drop till 15 fps. You can either set the maximum exposure limit using exposure compensation in UVC Extension menu or choose manual exposure to get desired frame rates.

7. **The frame rate is not consistent in MJPEG format. Can I fix it?**

   Yes, but the frame rate may still get reduced due to the scene details or the frame size which in turn affects the rendering capability from PC to PC. Performance improvement can be seen based on graphic card or display adapter capability. To increase the frame rates, you can decrease Q-Factor or increase De-Noise value in UVC Extension menu since both decreases the frame size and hence improves the frame rates.

8. **I can view frame corruption while streaming. Can this be avoided?**

   Yes, this is due to bandwidth limitation in USB host. This may occur when multiple cameras are connected to single USB host or in USB hosts of less

powerful embedded boards. You can visit the blog https://www.e-consystems.com/blog/camera/?p=1720 for more information on USB practical bandwidths.

9. **I need reliable operation when I connect multiple cameras to same host or when I connect to an embedded board. Do I have options?**

   Yes. All resolutions available in UYVY do support multiple frame rates. You can switch it to a lower frame rate to improve stability. For MJPEG, reducing the Q-Factor value will improve stability in case of any issues. If it is still required to reduce the frame rates, contact sales@e-consystems.com.

10. **How to use the external trigger option in See3CAM_24CUG?**

    The external trigger option can be used to capture still images in Master mode and it can be utilized for external synchronization in Trigger mode. Please refer the *See3CAM_24CUG_Hardware_Trigger_Application_note.pdf*.

11. **What sort of support does e-con Systems provide along with the camera?**

    e-con Systems will provide the basic support on the evaluation for all the customers who have purchased the camera. The hardware/software/firmware customization of the kit will be provided by e-con Systems based on your requirements. e-con Systems will also manufacture your custom cameras and will be supplied.

12. **Is there any software available with the camera?**

    Yes, e-con Systems provide the e-CAMView for Windows and QtCAM for Linux sample application demonstrating the capabilities of this camera.

13. **What are the supported OSes?**

    The supported OSes are Windows 8.1 and 10, and Linux Ubuntu 14.04 (64-bit), 16.04 (32-bit and 64-bit) and 18.04 (64-bit).

14. **The camera is not suitable for my requirements. Can I return the camera?**

    No, the kit is non-returnable and non-refundable. However, the kit is under warranty and e-con Systems will replace for any failed kit under warranty terms.

15. **The camera is getting very hot. Is it suitable for usage?**

    Yes, but the camera module needs an external heat sink to dissipate the heat for prolonged usage.

16. I would like to use a different lens. What is the NRE charge?

If your application requires fixed focus custom lens, contact sales@e-consystms.com. Non-recurring engineering (NRE) refers to the one-time cost to research, design, develop and test a new product or product enhancement.

What's Next?

After understanding the usage of QtCAM application, you can refer to *See3CAM_24CUG Face and Smile Detection Application Note* to understand more about See3CAM_24CUG.

Glossary

CMOS: Complementary Metal Oxide Semiconductor.

MJPEG: Motion Joint Photographic Experts Group (A type of frame compression).

ROI: Region of Interest.

USB: Universal Serial Bus.

USB 2.0: Universal Serial Bus High speed.

USB 3.1 Gen1: Universal Serial Bus Super speed.

UVC Compliant: USB Video Class Compliant.

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

V4L2: Video for Linux version 2 is a collection of device drivers and API for supporting real-time video capture on Linux systems.

Q-Factor: Value that is used as a scale factor for the quantization table.

Support

Contact Us

If you need any support on See3CAM_24CUG 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	02-Feb-2021	Initial Draft	Camera Team
1.1	27-Feb-2021	Added Changes	Camera Team
1.2	09-Mar-2021	Added changes	Camera Team