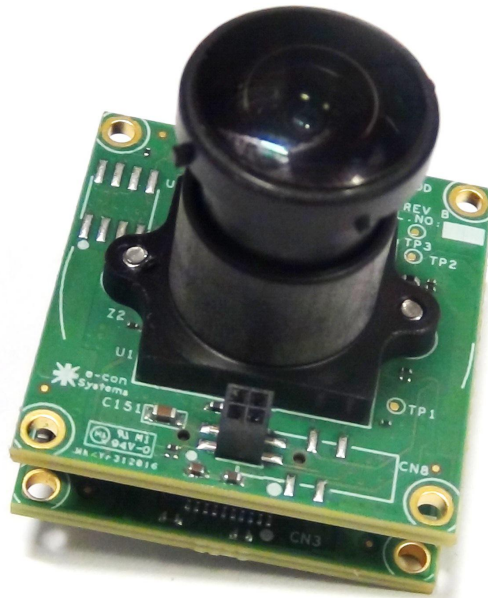




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### See3CAM\_CU30\_CHL\_TC



## Datasheet

**Revision 1.3**  
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## See3CAM\_CU30\_CHL\_TC

### 1 Revision History

Rev	Date	Description	Author
1.0	22-Sep-2016	Initial Draft	Camera Team
1.1	24-May-2017	Added updates	Camera Team
1.2	08-June-2017	Added updates	Camera Team
1.3	20-June-2017	Added updates	Camera Team



## 2 Introduction

The See3CAM\_CU30\_CHL\_TC is a 3.4 Mega pixel, colour, UVC Compliant, USB3.0 SuperSpeed camera with Type C connector from e-con Systems, a leading embedded Product Design Services Company which specializes in the advanced camera solutions. The See3CAM\_CU30\_CHL\_TC is a USB3.0 SuperSpeed camera product with reversible plug and play Type C connector interface.

The See3CAM\_CU30\_CHL\_TC is a 3.4 MP colour 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. The See3CAM\_CU30\_CHL\_TC is a two-board solution containing the camera sensor module board containing 1/3" AR0330 CMOS image sensor from Aptina™ and the USB3.0 interface board. With USB3.0 interface to the host PC, this See3CAM\_CU30\_CHL\_TC can stream uncompressed VGA (640&480) @ 30 & 60 fps, HD (1280 x 720) @ 30 & 60 fps, FHD (1920 x 1080) @ 15, 30 & 60 fps, 3MP (2304 x 1296) @ 15 & 30 fps, 3.4MP (2304 x 1536) @ 12 & 24 fps, 1920 x 1280 @ 25 & 50 fps, 1152 x 768 @ 30 & 60 fps, 1280 x 960 @ 30 & 58 fps and 2048 x 1536 @ 21 & 42 fps in UYVY formats.

It also streams compressed MJPEG VGA (640&480) @ 30 & 60 fps, HD (1280 x 720) @ 60 fps, FHD (1920 x 1080) @ 60 fps, 3MP (2304 x 1296 @ 60 fps), 3.4MP (2304 x 1536) @ 48 fps, 1920 x 1280 @ 50 fps, 1152 x 768 @ 60 fps, 1280 x 960 @ 58 fps and 2048 x 1536 @ 50 fps. This See3CAM\_CU30\_CHL\_TC is a UVC-compliant USB3.0 SuperSpeed Camera that is also backward compatible with USB2.0 host ports and does not require any special camera drivers to be installed in the host PC. When connected to USB2.0 host ports, the See3CAM\_CU30\_CHL\_TC supports VGA (640&480) @ 15 & 30 fps, HD (1280 x 720) @ 8 & 16 fps, FHD (1920 x 1080) @ 4 & 8 fps, 3MP (2304 x 1296) @ 3 & 6 fps, 3.4MP (2304 x 1536) @ 2.5 & 5 fps, 1920 x 1280 @ 3 & 6 fps, 1152 x 768 @ 9.5 & 19 fps, 1280 x 960 @ 7 & 14 fps and 2048 x 1536 @ 2.5 & 5 fps in UYVY format and MJPEG resolutions and frame rates are equivalent to USB 3.0.

The See3CAM\_CU30\_CHL\_TC is 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 shall be compatible with this camera. e-con also provides the sample application that demonstrates some of the features of this camera. However, this camera can be utilized any DirectShow application such as Skype etc.

This document describes about the features and See3CAM\_CU30\_CHL\_TC board and the pin-outs of the connectors including with mechanical diagram.

## 3 Scope

The scope of this document is limited to a description, features of this board including the mechanical diagram. This document serves as the datasheet for See3CAM\_CU30\_CHL\_TC with electrical, mechanical and software features supported by it.

## 4 Disclaimer

The specifications and features of See3CAM\_CU30\_CHL\_TC 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.

## 5 Description

The See3CAM\_CU30\_CHL\_TC is a two board solution of size 30mm x 30mm. This camera board is based on AR0330HS Image sensor from OnSemi™ and the Image Signal Processor (ISP). The other board, has the USB interface controller and the Type-C connector. This See3CAM\_CU30\_CHL\_TC is a Ready-to-Manufacture camera board with all the necessary firmware built in and compatible with the USB Video Class (UVC) version 1.0 standard.



Customers can integrate this camera in to their products right away and this helps our customers to cut short the Time-to-Market. This camera board is USB Video Class compatible and this will work with the standard drivers available with Windows and Linux. There is no need for any additional driver installation.

This UVC compliant See3CAM\_CU30\_CHL\_TC camera supports Full-HD (1920x1080p) and HD (1280x720) resolutions. So video streaming through UVC is possible without any special drivers on Operating Systems that have built-in support for UVC standards. For example, the See3CAM\_CU30\_CHL\_TC does not require any device drivers to be installed on Windows 7 (both regular PC versions and the embedded versions) as these Operating Systems come with the Microsoft supplied UVC drivers built-in. From Windows XP (with Service Pack2), all the Windows OS releases have built in support for UVC drivers and See3CAM\_CU30\_CHL\_TC works seamlessly with these OSes. The camera is exposed as DirectShow Capture source to the Windows PC and e-con provides sample DirectShow application that demonstrates the features of this camera. Any DirectShow compliant application such as Skype can work with this camera like any other webcam.

In the case of Linux, the built-in UVC driver works very well with this camera and there is no need for any additional driver installation. In Linux this camera is exposed as a V4L2 camera and e-con also provides a sample application for Linux OS as well. Customers can also develop customized applications for the See3CAM\_CU30\_CHL\_TC camera using standard V4L2 APIs.

The See3CAM\_CU30\_CHL\_TC camera board has a 10-pin GPIO header that contains signals which can be used for customization requirements. The See3CAM\_CU30\_CHL\_TC has serial I2C Signals Clock and Data and Trigger.

This functionality is embedded in the UVC firmware that is running on the See3CAM\_CU30\_CHL\_TC camera UVC controller and also on the sample PC application. The description of these signals is given below along with their functionality.

1. Pin No: 1, 2 & 3 Power Supply for external flash circuitry (to be developed by the user). Refer to the [Pin Description Table](#) for maximum current that can be sourced.
2. Pin No: 4,5 Ground
3. Pin No: 6 I2C Serial Clock
4. Pin No: 7 I2C Serial Data (Both Clock and Data pulled up to 1.8V)
5. Pin No: 8 Ground
6. Pin No: 9 NC , Reserved for future use.
7. Pin No: 10 External Trigger Signal to capture a still Image.

Together with these specific purpose signals this See3CAM\_CU30\_CHL\_TC can be customized for any application by our customers and e-con can support them with the necessary technical and programming help.



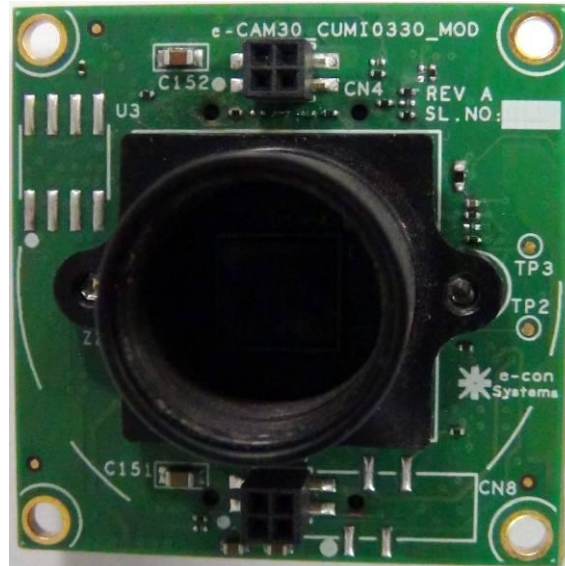


Figure 1: Front View of See3CAM\_CU30\_CHL\_TC

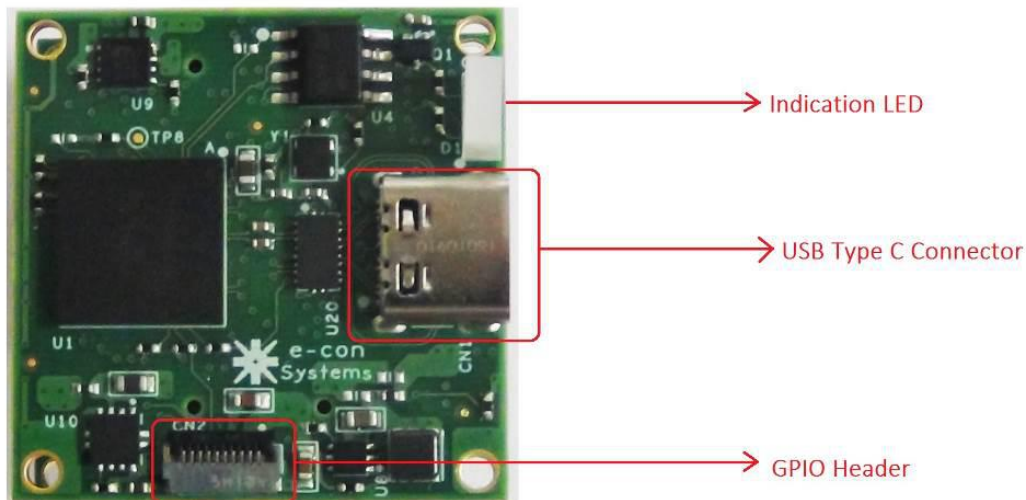


Figure 2: Rear View of See3CAM\_CU30\_CHL\_TC

## 5.1 Features

- Two Board Solution of size 30mm x 30mm
- 3.0 Megapixel colour camera sensor
- Uncompressed UYVY format and Compressed MJPEG format
- Standard M12 lens holder for use with customized optics or lenses for various applications
- USB3.0 device with Type C reversible interface connector.
- Lightweight, versatile, and portable design
- 10 pin GPIO header for standard and custom operations. GPIO pins accessible from the PC host application
- Plug-and-Play setup (UVC compliant) for Windows 7, Windows 8/8.1, Windows 10 and Linux
- Imaging applications



- Preview format UYVY – VGA, HD(720p), Full-HD(1080p), 3 MP(2304x1296), 3.4MP(2304x1536), 1920x1280, 1152x768, 1280x960 and 2048x1536.
- Preview format MJPEG – VGA, HD(720p), Full-HD(1080p), 3 MP (2304x1296), 3.4MP (2304x1536), 1920x1280, 1152x768, 1280x960 and 2048x1536.
- Still capture support - All preview resolutions.
- Field of View – 120 deg diagonal for the maximum resolution.
- Output Video format – UYVY, MJPEG
- Digital Zoom control – 1x to 8x with a resolution of 0.01x (800 steps).
- Exposure control both Manual and Auto exposure controls
- Operating Voltage - 5V +/- 5%, Current – 313mA
- RoHS compliant

## 6 Key Specification

Description	Specification
Size (L X W X H)	30 x 30 x 30.2 mm (without lens)
Video format	UYVY and MJPEG
USB	3.0 and 2.0
Image Resolution	2304 x 1536 (3.4 MP)
	2048 x 1536
	2304 x 1296 (3 MP)
	1920 x 1280
	1920 x 1080 (FHD)
	1280 x 960
	1280 x 720 (HD)
	1152 x 768
	640 x 480 (VGA)
Supported OS	Windows7 (both 32bit and 64bit)
	Windows 8, Windows 8.1, Windows 10 and Linux
USB Video Class (UVC) Compliant	Yes. Compliant with UVC Version 1.0
PID (Product ID)	0xC130
VID (Vendor ID)	0x2560

### 6.1 When Connected to USB3.0

This table lists the maximum frame rate supported when connected to the USB3.0 host controller and on the assumption that there are no other active USB devices connected to the same USB host controller. These frame rates are achieved under the ambient brightness level of 500 Lux

Mode / Resolution	Uncompressed UYVY (fps)	Compressed MJPEG (fps)
2304 x 1536	24 & 12	48





2304 x 1296	30 & 15	60
2048 x 1536	42 & 21	50
1920 x 1280	50 & 25	50
1920 x 1080	60, 30 & 15	60
1280 x 960	58 & 30	58
1280 x 720	60 & 30	60
1152 x 768	60 & 30	60
640 x 480	60 & 30	60

## 6.2 When Connected to USB2.0

This table lists the maximum frame rate supported when connected to the USB2.0 host controller and on the assumption that there are no other active USB devices connected to the same USB host controller.

Mode / Resolution	Uncompressed UYVY (fps)	Compressed MJPEG (fps)
2304 x 1536	5 & 2.5	48
2304 x 1296	6 & 3	60
2048 x 1536	5 & 2.5	50
1920 x 1280	6 & 3	50
1920 x 1080	8 & 4	60
1280 x 960	14 & 7	58
1280 x 720	16 & 8	60
1152 x 768	19 & 9.5	60
640 x 480	30 & 15	60

## 6.3 CMOS Image Sensor specification

The following table describes the specifications of the CMOS Image sensor used in this See3CAM\_CU30\_CHL\_TC camera board. For more information about the AR0330 sensor or for datasheet, please contact OnSemi™. The sensor AR0330 is a 3MP CMOS image sensor.

Sensor Specification	
Type / Optical Size	1/3" Optical format CMOS Image sensor
Resolution	3.4MP
Sensor type	10-Bit RAW format
Pixel size	2.2 $\mu\text{m}$ x 2.2 $\mu\text{m}$
Sensor Active Area	2304H x 1536V
Responsitivity	2 V/lux-sec
SNR	39 dB
Dynamic Range	69.5 dB

## 6.4 Zoom Control

See3CAM\_CU30\_CHL\_TC supports Digital zoom control from 1x to 8x with a resolution of 0.01x (800 steps)

## 7 Pin Description

See3CAM\_CU30\_CHL\_TC has two connectors namely USB Type-C connector and one GPIO Header.





## 7.1 General Purpose Pin description

General Purpose pins are used for specific camera image processing and LED control. The description is as follows

CN2 Pin no	Signal name	Pin Type	Description	Remarks
1	VCC_5V <sup>(1)</sup>	Power	Supply voltage for external Flash circuit	It can source up to 300mA in USB 3.0 only. Don't connect any load when See3CAM_CU30_CHL_TC connected with USB2.0. Any surge current drawn from this voltage source will affect the camera.
2	VCC_5V			
3	VCC_5V			
4	GND	Power	Ground	
5	GND			
6	I2C_SCL	Output (PU)	Serial Clock of I2C signal	Operating frequency is 400 kHz
7	I2C_SDA	Input / Output (PU)	Serial Data of I2C Signal	
8	GND	Power	Ground	
9	NC	-	-	-
10	TRIG <sup>(2)</sup>	Input(PU)	External trigger signal to USB Controller by Default.	Connect to Ground through push button switch with necessary de-bouncing circuitry.

PU - Internally Pulled-up

PD - Internally Pulled-down

NC – Not Connected

<sup>(1)</sup> **NOTE ON VCC\_5V PIN:** 5V can be derived from this pin. This comes directly from the USB VBUS and there is no any internal current control circuit provided. Only when interfaced to USB3.0 port, this can source maximum current of 300mA. Please don't connect any load to VCC\_5V when connected to USB2.0 port. Consuming beyond the maximum current will lead to drop in voltage and affect the performance of sensor. Thus the performances are not guaranteed.

<sup>(2)</sup> **NOTE ON TRIG PIN:** The TRIG pin implements a Hardware snapshot trigger function. This is done with a still pin that is exposed as DirectShow filter object in WINDOWS OS. The DirectShow application should be developed to access this still pin of the camera to capture still image.

## 1.1 USB Type C connector pin description

The below table describes the pin-outs of USB Type-C connector which is used to connect See3CAM\_CU30\_CHL\_TC board with PC through USB Type-A to Type-C Cable. This is a standard USB Type-C connector.

Pin No	Signal	Description	Pin No	Signal	Description
A1	GND	Ground return	B12	GND	Ground return



A2	SSTXp1	SuperSpeed differential pair1, TX, positive	B11	SSRXp1	SuperSpeed differential pair 2, RX, positive
A3	SSTXn1	SuperSpeed differential pair #1, TX, negative	B10	SSRXn1	SuperSpeed differential pair 2, RX, negative
A4	VBUS	Bus power	B9	VBUS	Bus power
A5	CC1	Configuration channel	B8	SBU2	-
A6	Dp1	Hi-Speed differential pair, position 1, positive	B7	Dn2	Hi-Speed differential pair, position 2, negative
A7	Dn1	Hi-Speed differential pair, position 1, negative	B6	Dp2	Hi-Speed differential pair, position 2, positive
A8	SBU1	-	B5	CC2	Configuration channel
A9	VBUS	Bus power	B4	VBUS	Bus power
A10	SSRXn2	SuperSpeed differential pair 4, RX, negative	B3	SSTXn2	SuperSpeed differential pair 3, TX, negative
A11	SSRXp2	SuperSpeed differential pair 4, RX, positive	B2	SSTXp2	SuperSpeed differential pair 3, TX, positive
A12	GND	Ground return	B1	GND	Ground return

## 8 Connector Part Numbers

This table below describes the connectors used in the See3CAM\_CU30\_CHL\_TC camera board and its compatible mating connectors. The USB connector is the standard USB Type C connector as specified in the USB3.0 standards. Any USB standard compliant USB3.0 Type A to Type C cable will be compatible with this connector.

Connector	Description	Manufacturer	Part Number
USB 3.1 Type C connector	CONN RCPT USB C 3.1 SMT R/A	Molex	105450-0101
GPIO Header (CN2 on See3CAM_CU130_CHL_TC Base Board)	CONN FPC – 0.5mm Shrouded 10Pos SMT	Hirose	FH34SRJ-10S-0.5SH(50)
Flex Cable	0.5mm Pitch 10 position FPC Cable, 29.97mm length	Molex	0152660095
Mating Connector on the other side of flex cable	CONN FPC – 0.5mm Shrouded 10Pos SMT	Hirose	FH34SRJ-10S-0.5SH(50)

## 9 Electrical Specification

The following section lists down the electrical specification and recommended operating conditions.

### 9.1 Recommended Operating Condition

Parameter	Typical Operating	Current (mA)	Typical Power consumption (W)
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	Voltage		
Streaming Maximum Power 1920x1080 at 60 fps	5V $\pm$ 250mV	433	2.165
Streaming Minimum Power 1920x1080 at 15 fps		291	1.455
Power at idle condition		97	0.485

The following table lists down the current consumed by the See3CAM\_CU30\_CHL\_TC under various operating conditions. These values are measured in our 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.

### 9.1.1 UYVY with USB3.0

S. No	Resolution	Frame Rate (FPS)	Supply Voltage (V)	Typical Current (mA)	Power Consumption (W)
1	VGA	30	5	329	1.645
		60	5	311	1.555
2	1280 x 720	30	5	330	1.65
		60	5	402	2.01
3	1920 x 1080	15	5	291	1.455
		30	5	345	1.725
		60	5	433	2.165
4	2304 x 1296	15	5	301	1.505
		30	5	357	1.785
5	2304 x 1536	12	5	301	1.505
		24	5	353	1.765
6	1920 x 1280	25	5	339	1.695
		50	5	421	2.105
7	1152 x 768	30	5	341	1.705
		60	5	322	1.61
8	1280 x 960	30	5	336	1.68
		58	5	388	1.94
9	2048 x 1536	21	5	347	1.735
		42	5	397	1.985

### 9.1.2 MJPEG with USB3.0

S. No	Resolution	Frame Rate (FPS)	Supply Voltage (V)	Typical Current (mA)	Power Consumption (W)
1	VGA	60	5	309	1.545
2	1280 x 720	60	5	386	1.93
3	1920 x 1080	60	5	392	1.96
4	2304 x 1296	60	5	381	1.905
5	2304 x 1536	48	5	390	1.95
6	1920 x 1280	50	5	383	1.915
7	1152 x 768	60	5	309	1.545
8	1280 x 960	58	5	368	1.84



9	2048 x 1536	50	5	377	1.885
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### 9.1.3 UYVY with USB2.0

S. No	Resolution	Frame Rate (FPS)	Supply Voltage (V)	Typical Current (mA)	Power Consumption (W)
1	VGA	30	5	292	1.46
		15	5	244	1.22
2	1280 x 720	16	5	256	1.28
		8	5	222	1.11
3	1920 x 1080	8	5	229	1.145
		4	5	209	1.045
4	2304 x 1296	6	5	227	1.135
		3	5	208	1.04
5	3.4MP	5	5	224	1.12
		2.5	5	207	1.035
6	1920 x 1280	3	5	212	1.06
		6	5	232	1.16
7	1152 x 768	9.5	5	234	1.17
		19	5	269	1.345
8	1280 x 960	7	5	219	1.095
		14	5	247	1.235
9	2048 x 1536	2.5	5	207	1.035
		5	5	224	1.12

### 9.1.4 MJPEG with USB2.0

S. No	Resolution	Frame Rate (FPS)	Supply Voltage (V)	Typical Current (mA)	Power Consumption (W)
1	VGA	60	5	265	1.325
2	1280 x 720	60	5	341	1.705
3	1920 x 1080	60	5	354	1.77
4	2304 x 1296	60	5	361	1.805
5	2304 x 1536	48	5	341	1.705
6	1920 x 1280	50	5	339	1.695
7	1152 x 768	60	5	262	1.31
8	1280 x 960	58	5	322	1.61
9	2048 x 1536	50	5	334	1.67

## 9.2 DC Characteristics

### ABSOLUTE MAXIMUM FOR GPIO PINS

Parameter	Description	Value	Units
Vinput <sup>a</sup>	DC Input voltage to any input pin	2.1	V

<sup>a</sup> Exceeding the maximum value may shorten the life of the device or cause permanent damage to the device



**GPIO VOLTAGE LEVELS (except STROBE)**

Symbol	Parameter	Min	Typ	Max	Unit
<b>Digital Input signals</b>					
V <sub>IL</sub>	Input voltage LOW			0.45	V
V <sub>IH</sub>	Input voltage HIGH	1.4			V
<b>Digital Output signals</b>					
V <sub>OL</sub>	Output voltage LOW			0.18	V
V <sub>OH</sub>	Output voltage HIGH	1.62			V

**GPIO DRIVING STRENGTH**

Symbol	Parameter	Min	Typ	Max	Unit
I <sub>O</sub>	Output current (source current)			9	mA
I <sub>I</sub>	Input current (sink current)			100	uA

**9.3 Operating Temperature range**

Parameter Description	Temperature Range
Operating temperature range <sup>1</sup>	-30°C to 70°C

<sup>1</sup>This is the maximum temperature range up to which the camera sensor can be operated. Value measured at junction.

**NOTE:** *When operating beyond 50°C, the image quality is affected badly with thermal flickering noise all over the image. Continuously operating the camera at 70°C (maximum value) will cause irreparable damage to the camera module. Customers are advised to make necessary arrangements on their products to dissipate the heat generated in the module to maintain the operating temperature below 50°C*

**10 Mechanical Specifications**

See3CAM\_CU30\_CHL\_TC size is 30 mm x 30 mm x 30.2 mm (without Lens). Board drawing and dimensions are given below.



### 10.1 See3CAM\_CU30\_CHL\_TC Dimension

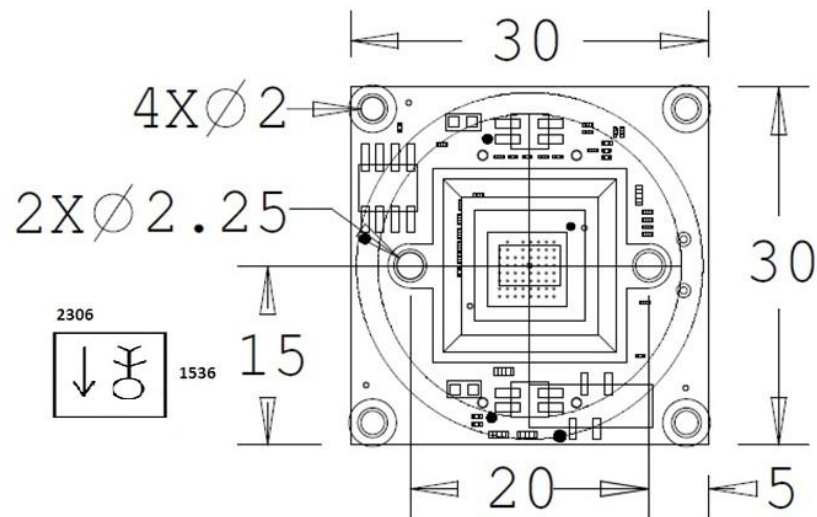


Figure 3: Front Portion of See3CAM\_CU30\_CHL\_TC Module Board mechanical dimensions – the image will be upside down when the board is placed as shown above

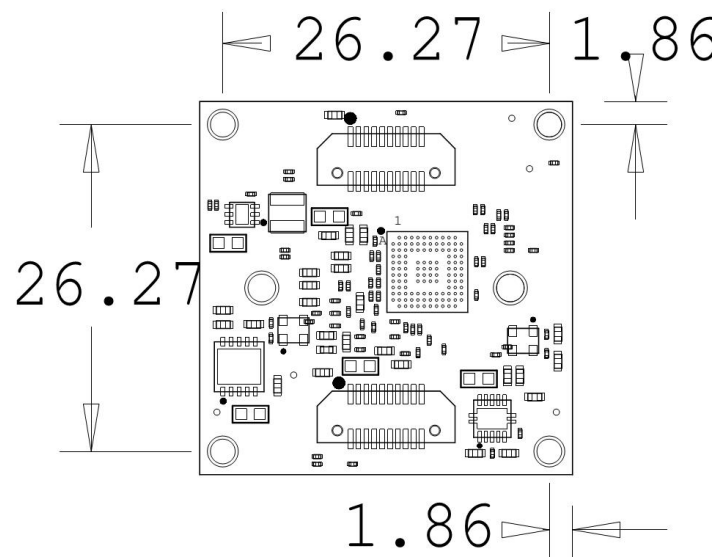


Figure 4: Rear Portion of See3CAM\_CU30\_CHL\_TC Module Board mechanical dimensions



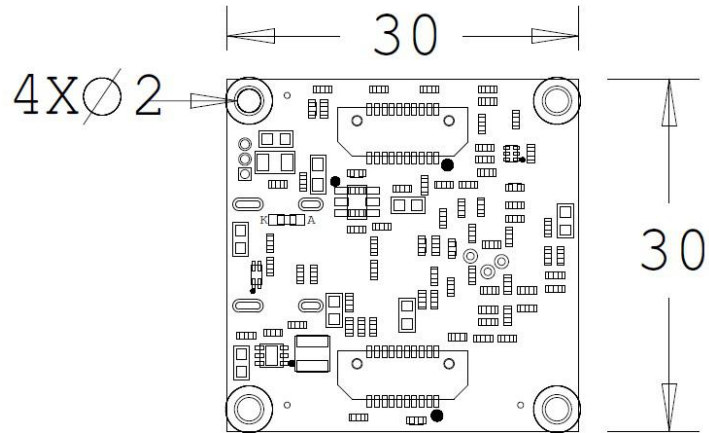


Figure 5: Front Portion of See3CAM\_CU30\_CHL\_TC Base Board mechanical dimensions

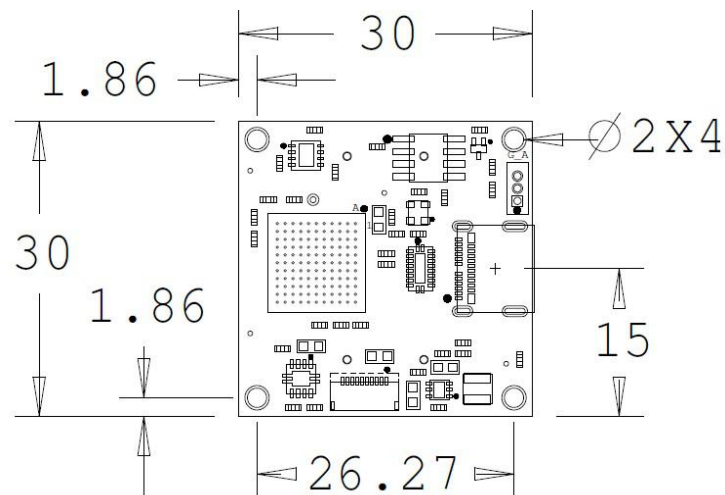


Figure 6: Rear Portion of See3CAM\_CU30\_CHL\_TC Base Board mechanical dimensions

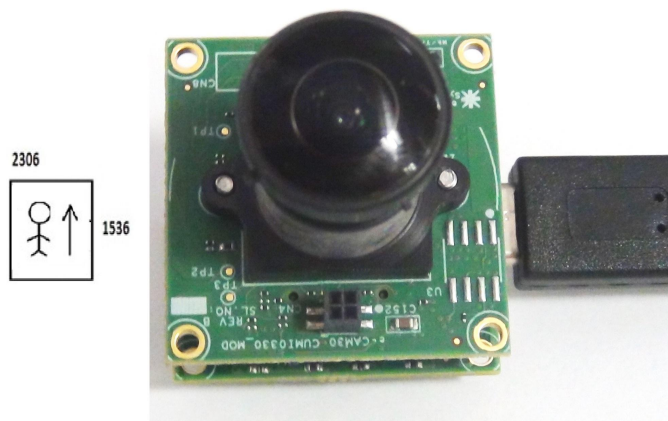


Figure 7: Camera Image orientation with respect to USB Cable





## 10.2 Lens Holder Dimension

### Lens Mount Mechanical Dimension

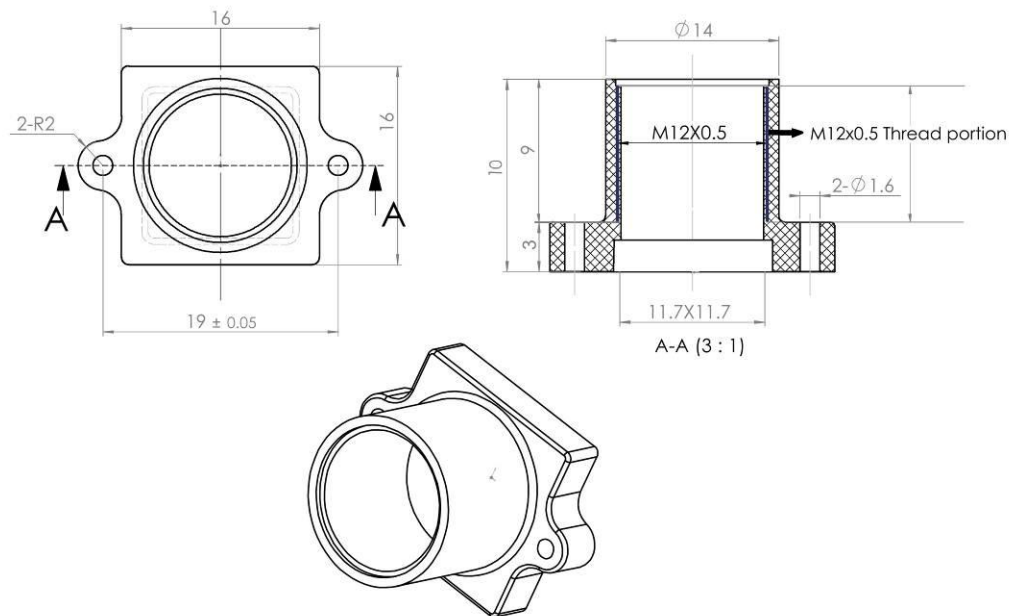


Figure 8: Lens Holder mechanical dimensions

## 11 Conclusion

This document describes about the features and See3CAM\_CU30\_CHL\_TC board and the pin-outs of the connectors including mechanical specifications.

