Hardware specifications of VC MIPI Camera Modules

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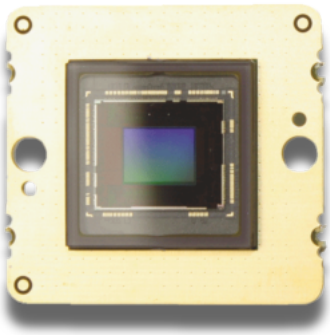
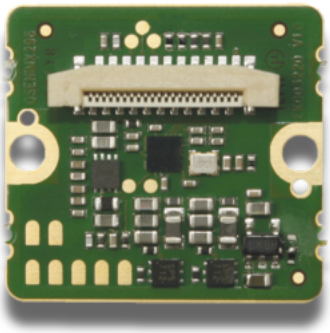
Hint

A more generic overview page can be found at:
https://www.vision-components.com/en/products/mipi/





Foreword and Disclaimer

This documentation has been prepared with most possible care. However Vision Components GmbH does not take any liability for possible errors. In the interest of progress, Vision Components GmbH reserves the right to perform technical changes without further notice.

Please notify support@vision-components.com if you become aware of any errors in this manual or if a certain topic requires more detailed documentation.

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Image symbols used in this document

Symbol	Meaning
	The Light bulb highlights hints and ideas that may be helpful for a development.
	This warning sign alerts of possible pitfalls to avoid. Please pay careful attention to sections marked with this sign.
?!	This is a sign for an example.

Trademarks

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ESD sensitivity

Warning

The components are very sensitive to electrostatic discharge (ESD)! Please take all the precautions necessary to avoid ESD!

ESD

The electronic components and circuits are sensitive to ElectroStatic Discharge (ESD). When handling any circuit board assemblies, it is necessary that ESD safety precautions be observed.

ESD safe best practices include, but are not limited to:

- Leaving circuit boards in their antistatic packaging until they are ready to be installed.
- Using a grounded wrist strap when handling circuit boards.
- Working on a grounded ESD table mat.
- Only handling circuit boards in ESD safe areas, which may include ESD floor and table mats, wrist strap stations and ESD safe lab coats.
- Avoiding handling circuit boards in carpeted areas.
- Try to handle the board by the edges, avoiding contact with components.

This note is not an exhaustive information about the protection against electrostatic discharge (ESD).

Table of Contents

1 General Information

1.1 Hardware Compatibility

The VC MIPI Modules can be connected to a number of different hardware platforms like

- Raspberry Pi
- Nvidia Jetson
- NXP i.MX8
- AMD Kria
- FPGAs

Note

VC performs compatibility tests for a number of boards on a regular basis and publishes the results. However, no guarantee for the sensor hardware compatibility for any third party board can be given.

1.2 Technical Specification

Please note that the achievable frame and data transmission rates depend on the number of lanes and/or the capabilities of the receiving endpoint. The fps shown at the table are the maximum possible values for the MIPI modules.

Hint

Unsure about the **best suited sensor**? Let us help you decide:
Call us: +49 7243 2167 0 or *Write us*: support@vision-components.com

Technical Data: VC MIPI OV7251, VC MIPI OV9281

Component / Feature	Module Name	Module Name
	VC MIPI OV7251	**VC MIPI OV9281**
CMOS Sensor	1/4" Omnivision OV7251, Monochrome, 0.3 Mpixel	1/4" Omnivision OV9281, Monochrome, 1.02 Mpixel
Active pixels	640(H) x 480(V)	1280(H) x 800(V)
Pixel size	3.00(H) x 3.00(V) µm	3.00(H) x 3.00(V) µm
Active sensor size	1.92(H) x 1.44(V) mm	3.840(H) x 2.400(V) mm
Shutter type	Global shutter	Global shutter
ADC Resolution	8 bit / 10 bit	8 bit / 10 bit
CSI-2 output	1 lane / RAW 8 or RAW 10	2 lane / RAW 8 or RAW 10
CSI-2 maximum speed	800 Mbps/lane max.	800 Mbps/lane max.
CSI-2 default speed	800 Mbps/lane	800 Mbps/lane
Max fps (full resolution)	104 fps	120 fps / 60 fps externally triggered
Output modes	streaming mode	streaming mode, trigger mode
Shutter resolution	in streaming mode: 1 horizontal unit	in streaming mode: 1 horizontal unit, in trigger mode: 1 horizontal unit
Gain	analog and digital gain	analog and digital gain
S/N ratio	38dB	38dB
dynamic range	68dB	68dB
HDR	No	No
CRA	29 degrees	9 degrees
ROI / cropping support	Yes, but no speed increase	Yes, but no speed increase
Binning / subsampling support	No	2x2 Binning [R]
Reverse modes	No	for vertical or horizontal: normal or inverted readout
Trigger input	No	Yes in trigger mode
Flash output	Yes	Yes
Power consumption	90mA(@3.3V) typical, 100mA(@3.3V) max. when active	80mA(@3.3V) typical, 100mA(@3.3V) max. when active
Standby current	35mA Hardware	20mA Hardware, 30mA Software
Operating temperature	-30 ... +70 deg C, non-condensing	-30 ... +85 deg C, non-condensing
Storage temperature	-30 ... +70 deg C	-40 ... +85 deg C
Performance guarantee temperature	0 ... +50 deg C	0 ... +50 deg C
Supply voltage	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)
Mass	2.6g	2.6g

Technical Data: VC MIPI IMX178, VC MIPI IMX183/VC MIPI IMX183 C, VC MIPI IMX226/VC MIPI IMX226 C

Component / Feature	Module Name	Module Name	Module Name
	VC MIPI IMX178	**VC MIPI IMX183/VC MIPI IMX183 C**	**VC MIPI IMX226/VC MIPI IMX226 C**
CMOS Sensor	1/1.8" Sony IMX178, Monochrome, 6.3 Mpixel	1" Sony IMX183, Mono/Color, 20.2 Mpixel	1/1.7" Sony IMX226, Mono/Color, 12.4 Mpixel
Active pixels	3072(H) x 2076(V)	5440(H) x 3648(V)	3840(H) x 3046(V)

Component / Feature	Module Name	Module Name	Module Name
	VC MIPI IMX178	**VC MIPI IMX183/VC MIPI IMX183 C**	**VC MIPI IMX226/VC MIPI IMX226 C**
Pixel size	2.40(H) x 2.40(V) µm	2.40(H) x 2.40(V) µm	1.85(H) x 1.85(V) µm
Active sensor size	7.430(H) x 4.992(V) mm	13.305(H) x 8.865(V) mm	7.533(H) x 5.635(V) mm
Shutter type	Rolling Shutter with Global Reset	Rolling Shutter with Global Reset	Rolling Shutter with Global Reset
ADC Resolution	8 Bit / 10 Bit / 12 Bit / 14 Bit	10 Bit / 12 Bit	10 Bit / 12 Bit
CSI-2 output	2 lanes / 4 lanes (not 15pin connector) / RAW 8, 10, 12 or 14	2 lanes / 4 lanes (not 15pin connector) / RAW 8, 10 or 12	2 lanes / 4 lanes (not 15pin connector) / RAW 8, 10 or 12
CSI-2 maximum speed	1.5 Gbps/lane max.	1.5 Gbps/lane max.	1.5 Gbps/lane max.
CSI-2 default speed	1.5 Gbps/lane	1.5 Gbps/lane	1.5 Gbps/lane
Max fps (full res., 4 lanes)	58.2 fps at 8/10 Bit, 51.3 fps at 12 Bit, 30.2 fps at 14 Bit	26.9 fps at 8 and 10 Bit / 22.5 fps at 12 Bit	43.6 fps at 8 and 10 Bit / 36.3 fps at 12 Bit
Output modes	streaming mode, fast trigger mode	streaming mode, fast trigger mode	streaming mode, fast trigger mode
Shutter resolution	1 horizontal unit	1 horizontal unit	1 horizontal unit
Gain	0–24dB analog gain + 0–24dB digital gain	0–27dB analog gain + 0–18dB digital gain	0–27dB analog gain + 0–18dB digital gain
S/N ratio	n/a	n/a	n/a
dynamic range	n/a	n/a	n/a
HDR	Yes	No	No
CRA	n/a	3 degrees	9 degrees
ROI / cropping support	Yes	Yes	Yes
Binning / subsampling support	No	No	No
Reverse modes	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout
Trigger input	Yes	Yes	Yes
Flash output	Yes	Yes	Yes
Power consumption	250mA(@3.3V) max. when active	320mA(@3.3V) max. when active	250mA(@3.3V) max. when active
Standby current	110mA	80mA	75mA
Operating temperature	-30 to +85 deg C, non-condensing	-30 to +75 deg C, non-condensing	-30 to +85 deg C, non-condensing
Storage temperature	-40 to +85 deg C	-30 to +80 deg C	-40 to +85 deg C
Performance guarantee temperature	-10 to +60 deg C	-10 to +60 deg C	-10 to +60 deg C
Supply voltage	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)
Mass	5.3g	7.4g	5.7g

Technical Data: VC MIPI IMX250/VC MIPI IMX250 C, VC MIPI IMX252/VC MIPI IMX252 C, VC MIPI IMX264/VC MIPI IMX264C

Component / Feature	Module Name	Module Name	Module Name
	VC MIPI IMX250/VC MIPI IMX250 C	**VC MIPI IMX252/VC MIPI IMX252 C**	**VC MIPI IMX264/VC MIPI IMX264C**
CMOS Sensor	2/3" Sony IMX250, Mono/Color, 5.01 Mpixel	1/1.8" Sony IMX252, Mono/Color, 3.15 Mpixel	2/3" Sony IMX264, Mono/Color, 5.1 Mpixel
Active pixels	2448(H) x 2048(V)	2048(H) x 1536(V)	2432(H) x 2048(V)
Pixel size	3.45(H) x 3.45(V) µm	3.45(H) x 3.45(V) µm	3.45(H) x 3.45(V) µm
Active sensor size	8.446(H) x 7.066(V) mm	7.066(H) x 5.299(V) mm	8.390(H) x 7.066(V) mm
Shutter type	Global Shutter	Global Shutter	Global Shutter
ADC Resolution	8 Bit / 10 Bit / 12 Bit	8 Bit / 10 Bit / 12 Bit	8 Bit / 10 Bit / 12 Bit
CSI-2 output	2 lanes / 4 lanes (not 15pin connector) / RAW 8, 10 or 12	2 lanes / 4 lanes (not 15pin connector) / RAW 8, 10 or 12	2 lanes / RAW 8, 10 or 12
CSI-2 maximum speed	1.5 Gbps/lane max.	1.5 Gbps/lane max.	1.5 Gbps/lane max.
CSI-2 default speed	1.5 Gbps/lane	1.5 Gbps/lane	1.5 Gbps/lane
Max fps (full res., 4 lanes)	101.3 fps at 8 Bit / 82.5 fps at 10 Bit / 69.5 fps at 12 Bit	151.4 fps at 8 Bit / 123.5 fps at 10 Bit / 99.4 fps at 12 Bit	35.5 fps at 8, 10 and 12 Bit
Output modes	streaming mode, fast trigger mode	streaming mode, fast trigger mode	streaming mode, fast trigger mode
Shutter resolution	1 horizontal unit	1 horizontal unit	1 horizontal unit
Gain	0–24dB analog gain + 0–24dB digital gain	0–24dB analog gain + 0–24dB digital gain	0–24dB analog gain + 0–24dB digital gain
S/N ratio	n/a	n/a	n/a
dynamic range	n/a	n/a	n/a
HDR	No	No	No
CRA	3 degrees	3 degrees	n/a
ROI / cropping support	Yes	Yes	Yes
Binning / subsampling support	2x2 Binning [R]	2x2 Binning [R]	2x2 Binning [R]
Reverse modes	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout
Trigger input	Yes	Yes	Yes
Flash output	Yes	Yes	Yes
Power consumption	450mA(@3.3V) max. when active	450mA(@3.3V) max. when active	400mA(@3.3V) max. when active
Standby current	85mA	85mA	85mA
Operating temperature	-30 to +85 deg C, non-condensing	-30 to +75 deg C, non-condensing	-30 to +75 deg C, non-condensing
Storage temperature	-40 to +85 deg C	-30 to +80 deg C	-30 to +80 deg C
Performance guarantee temperature	-10 to +60 deg C	-10 to +60 deg C	-10 to +60 deg C
Supply voltage	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)
Mass	7.5g	7.5g	7.5g

Technical Data: VC MIPI IMX265/VC MIPI IMX265C, VC MIPI IMX273/VC MIPI IMX273 C, VC MIPI IMX290

Component / Feature	Module Name	Module Name	Module Name
	VC MIPI IMX265/VC MIPI IMX265C	**VC MIPI IMX273/VC MIPI IMX273 C**	**VC MIPI IMX290**
CMOS Sensor	1/1.8" Sony IMX265, Mono/Color, 3.2 Mpixel	1/2.9" Sony IMX273, Mono/Color, 1.56 Mpixel	1/2.8" Sony IMX290, monochrome, 2.0 Mpixel
Active pixels	2048(H) x 1536(V)	1440(H) x 1080(V)	1920(H) x 1080(V) (full HD)

Component / Feature	Module Name	Module Name	Module Name
	VC MIPI IMX265/VC MIPI IMX265C	VC MIPI IMX273/VC MIPI IMX273 C	VC MIPI IMX290
Pixel size	3.45(H) x 3.45(V) µm	3.45(H) x 3.45(V) µm	2.90(H) x 2.90(V) µm
Active sensor size	7.065(H) x 5.299(V) mm	4.970(H) x 3.726(V) mm	5.617(H) x 3.181(V) mm
Shutter type	Global Shutter	Global Shutter	Rolling Shutter
ADC Resolution	8 Bit / 10 Bit / 12 Bit	8 Bit / 10 Bit / 12 Bit	10 Bit
CSI-2 output	2 lanes / RAW 8, 10 or 12	2 lanes / 4 lanes (not 15pin connector) / RAW 10 or RAW 12	2 lanes / 4 lanes (not 15pin connector) / RAW 10
CSI-2 maximum speed	1.5 Gbps/lane max.	1.5 Gbps/lane max.	891 Mbps/lane max.
CSI-2 default speed	1.5 Gbps/lane	1.5 Gbps/lane	891 Mbps/lane
Max fps (full res., 4 lanes)	55.3 fps at 8, 10 and 12 Bit	276.0 fps at 8 Bit / 226.5 fps at 10 Bit / 165.9 fps at 12 Bit	120 fps at 10 Bit
Output modes	streaming mode, fast trigger mode	streaming mode, fast trigger mode	streaming mode
Shutter resolution	1 horizontal unit	1 horizontal unit	1 horizontal unit
Gain	0–24dB analog gain + 0–24dB digital gain	0–24dB analog gain + 0–24dB digital gain	0–30dB analog gain + 0–42dB digital gain
S/N ratio	n/a	n/a	n/a
dynamic range	n/a	n/a	n/a
HDR	No	No	Yes: digital overlap HDR + multiple exposure HDR
CRA	n/a	1.8 degrees	6.14 degrees
ROI / cropping support	Yes	Yes	Yes
Binning / subsampling support	2x2 Binning [R]	2x2 Binning	No
Reverse modes	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout
Trigger input	Yes	Yes	No
Flash output	Yes	Yes	No
Power consumption	330mA(@3.3V) max. when active	360mA(@3.3V) max. when active	200mA(@3.3V) max. when active
Standby current	85mA	85mA	30mA
Operating temperature	-30 to +75 deg C, non-condensing	-30 to +75 deg C, non-condensing	-30 to +75 deg C, non-condensing
Storage temperature	-30 to +80 deg C	-30 to +80 deg C	-30 to +80 deg C
Performance guarantee temperature	-10 to +60 deg C	-10 to +60 deg C	-10 to +60 deg C
Supply voltage	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)
Mass	7.5g	5.5g	3.1g

Technical Data: VC MIPI IMX296/VC MIPI IMX296 C, VC MIPI IMX297, VC MIPI IMX327 C

Component / Feature	Module Name	Module Name	Module Name
	VC MIPI IMX296/VC MIPI IMX296 C	VC MIPI IMX297	VC MIPI IMX327 C
CMOS Sensor	1/2.9" Sony IMX296, Mono/Color, 1.56 Mpixel	1/2.9" Sony IMX297, Mono, 0.39 Mpixel	1/2.8" Sony IMX327 (better ver. of IMX290), color, 2.0 Mpixel
Active pixels	1440(H) x 1080(V)	720(H) x 540(V)	1920(H) x 1080(V) (full HD)
Pixel size	3.45(H) x 3.45(V) µm	6.90(H) x 6.90(V) µm	2.90(H) x 2.90(V) µm
Active sensor size	4.968(H) x 3.726(V) mm	4.968(H) x 3.726(V) mm	5.617(H) x 3.181(V) mm
Shutter type	Global shutter	Global shutter	Rolling Shutter
ADC Resolution	10 Bit	10 Bit	10 Bit
CSI-2 output	1 lane / RAW 10	1 lane / RAW 10	2 lanes / 4 lanes (not 15pin connector) / RAW 10
CSI-2 maximum speed	1.2 Gbps/lane max.	1.2 Gbps/lane max.	891 Mbps/lane max.
CSI-2 default speed	1.2 Gbps/lane	1.2 Gbps/lane	891 Mbps/lane
Max fps (full resolution)	60.3 fps	120 fps	60 fps at 10 Bit
Output modes	streaming mode, fast trigger mode	streaming mode, fast trigger mode	streaming mode
Shutter resolution	in streaming mode: 1 horizontal unit, in fast trigger mode: 18.5nsec	in streaming mode: 1 horizontal unit, in fast trigger mode: 18.5nsec	1 horizontal unit
Gain	0–24dB analog gain + 0–24dB digital gain	0–24dB analog gain + 0–24dB digital gain	0–30dB analog gain + 0–42dB digital gain
S/N ratio	n/a	n/a	n/a
dynamic range	n/a	n/a	n/a
HDR	No	No	Yes: digital overlap HDR + multiple exposure HDR
CRA	1.8 degrees	1.8 degrees	6.14 degrees
ROI / cropping support	Yes	Yes	Yes
Binning / subsampling support	2x2 Binning (simultaneous ROI-mode not supported)	No	No
Reverse modes	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout
Trigger input	Yes in fast trigger mode	Yes in fast trigger mode	No
Flash output	Yes in fast trigger mode	Yes in fast trigger mode	No
Power consumption	230mA(@3.3V) max. when active	230mA(@3.3V) max. when active	200mA(@3.3V) max. when active
Standby current	25mA	25mA	30mA
Operating temperature	-30 to +75 deg C, non-condensing	-30 to +75 deg C, non-condensing	-30 to +85 deg C, non-condensing
Storage temperature	-40 to +85 deg C	-40 to +85 deg C	-40 to +85 deg C
Performance guarantee temperature	-10 to +60 deg C	-10 to +60 deg C	-10 to +60 deg C
Supply voltage	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)
Mass	3.9g	3.9g	3.1g

Technical Data: VC MIPI IMX335/VC MIPI IMX335C, VC MIPI IMX392/VC MIPI IMX392 C, VC MIPI IMX412 C

Component / Feature	Module Name	Module Name	Module Name
	VC MIPI IMX335/VC MIPI IMX335C	VC MIPI IMX392/VC MIPI IMX392 C	VC MIPI IMX412 C
CMOS Sensor	1/2.8" Sony IMX335, Mono/Color, 5.0 Mpixel	1/2.3" Sony IMX392, Mono/Color, 2.3 Mpixel	1/2.3" Sony IMX412, color, 12.3 Mpixel
Active pixels	2560(H) x 1964(V)	1920(H) x 1200(V)	4056(H) x 3040(V)
Pixel size	2.00(H) x 2.00(V) µm	3.45(H) x 3.45(V) µm	1.55(H) x 1.55(V) µm
Active sensor size	5.120(H) x 3.928(V) mm	6.679(H) x 4.195(V) mm	6.287(H) x 4.712(V) mm
Shutter type	Rolling Shutter	Global Shutter	Rolling Shutter
ADC Resolution	10 Bit / 12 Bit	8 Bit / 10 Bit / 12 Bit	10 Bit / 12 Bit
CSI-2 output	2 lanes / 4 lanes (not 15pin connector) / RAW 10 or RAW 12	2 lanes / 4 lanes (not 15pin connector) / RAW 8, 10 or 12	2 lanes / 4 lanes (not 15pin connector) / RAW 10 or RAW 12
CSI-2 maximum speed	1.35 Mbps/lane max.	1.5 Gbps/lane max.	2.1 Gbps/lane max.
CSI-2 default speed	1.35 Mbps/lane	1.5 Gbps/lane	1.35 Gbps/lane
Max fps (full res., 4 lanes)	60 fps at 10 Bit / 30 fps at 12 Bit (4 lanes)	201.7 fps at 8 Bit / 167.0 fps at 10 Bit / 134.4 fps at 12 Bit	40 fps at 10 Bit / 20 fps at 12 Bit
Output modes	streaming mode	streaming mode, fast trigger mode	streaming mode
Shutter resolution	1 horizontal unit	1 horizontal unit	1 horizontal unit
Gain	0–30dB analog gain + 0–42dB digital gain	0–24dB analog gain + 0–24dB digital gain	0–27dB analog gain + 0–24dB digital gain
S/N ratio	n/a	n/a	n/a
dynamic range	n/a	n/a	n/a
HDR	Yes: digital overlap HDR + multiple exposure HDR	No	Yes: DOL HDR (digital overlap HDR)
CRA	n/a	2.24 degrees	12 degrees
ROI / cropping support	Yes	Yes	Yes, but no speed increase
Binning / subsampling support	No	2x2 Binning [R]	No
Reverse modes	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout
Trigger input	No	Yes	No
Flash output	Yes	Yes	Yes
Power consumption	110mA(@3.3V) max. when active	400mA(@3.3V) max. when active	200mA(@3.3V) max. when active
Standby current	30mA	85mA	30mA
Operating temperature	-30 to +75 deg C, non-condensing	-30 to +75 deg C, non-condensing	-30 to +75 deg C, non-condensing
Storage temperature	-30 to +80 deg C	-30 to +80 deg C	-30 to +80 deg C
Performance guarantee temperature	-10 to +60 deg C	-10 to +60 deg C	-10 to +60 deg C
Supply voltage	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)
Mass	2.6g	7.5g	3.0g

Technical Data: VC MIPI IMX415/VC MIPI IMX415 C, VC MIPI IMX462 C, VC MIPI IMX540/VC MIPI IMX540 C

Component / Feature	Module Name	Module Name	Module Name
	VC MIPI IMX415/VC MIPI IMX415 C	VC MIPI IMX462 C	VC MIPI IMX540/VC MIPI IMX540 C
CMOS Sensor	1/2.8" Sony IMX415, Mono/Color, 8.3 Mpixel	1/2.8" Sony IMX462 (better ver. of IMX327), color, 2.0 Mpixel	1/1.2" Sony IMX540, Mono/Color, 24.55 Mpixel
Active pixels	3840(H) x 2160(V)	1920(H) x 1080(V)	5312(H) x 4600(V)
Pixel size	1.45(H) x 1.45(V) µm	2.90(H) x 2.90(V) µm	2.74(H) x 2.74(V) µm
Active sensor size	5.602(H) x 3.155(V) mm	5.617(H) x 3.181(V) mm	14.555(H) x 12.604(V) mm
Shutter type	Rolling Shutter	Rolling Shutter	Global Shutter
ADC Resolution	10 Bit / 12 Bit	10 Bit	8 Bit / 10 Bit / 12 Bit
CSI-2 output	2 lanes / 4 lanes (not 15pin connector) / RAW 10 or RAW 12	2 lanes / 4 lanes (not 15pin connector) / RAW 10	2 lanes / 4 lanes (not 15pin connector) / RAW 8, 10 or 12
CSI-2 maximum speed	1.5 Gbps/lane max.	891 Mbps/lane max.	1.5 Gbps/lane max.
CSI-2 default speed	1.5 Gbps/lane	891 Mbps/lane	1.5 Gbps/lane
Max fps (full res., 4 lanes)	60 fps at 10 Bit	120 fps at 10 Bit	22 fps at 8 Bit / 17.6 fps at 10 Bit / 14.8 fps at 12 Bit
Output modes	streaming mode	streaming mode	streaming mode, fast trigger mode
Shutter resolution	1 horizontal unit	1 horizontal unit	1 horizontal unit
Gain	0–30dB analog gain + 0–42dB digital gain	0–30dB analog gain + 0–42dB digital gain	0–24dB analog gain + 0–24dB digital gain
S/N ratio	n/a	n/a	n/a
dynamic range	n/a	n/a	n/a
HDR	Yes: DOL HDR (digital overlap HDR) + multiple exposure HDR	Yes: digital overlap HDR + multiple exposure HDR	No
CRA	6.12 degrees	6.14 degrees	0 degrees
ROI / cropping support	Yes	Yes	Yes
Binning / subsampling support	No	No	2x2 Binning [R]
Reverse modes	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout
Trigger input	No	No	Yes
Flash output	Yes	No	Yes
Power consumption	220mA(@3.3V) max. when active	200mA(@3.3V) max. when active	85mA(@3.3V) plus 350mA(@5V) max. when active, see below.
Standby current	30mA	30mA	85mA
Operating temperature	-30 to +75 deg C, non-condensing	-30 to +85 deg C, non-condensing	-30 to +75 deg C, non-condensing
Storage temperature	-30 to +80 deg C	-40 to +85 deg C	-30 to +80 deg C
Performance guarantee temperature	-10 to +60 deg C	-10 to +60 deg C	-10 to +60 deg C
Supply voltage	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable) and 5V +/- 5% at extra socket, see below.
Mass	3.2g	3.1g	9g

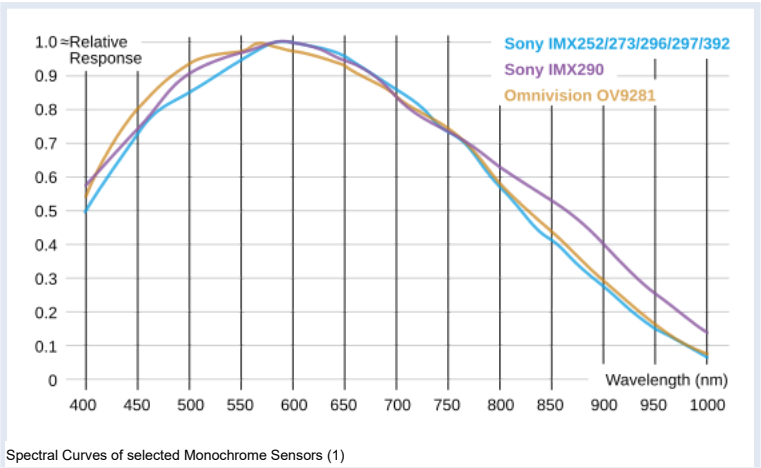
Technical Data: VC MIPI IMX565/VC MIPI IMX565C, VC MIPI IMX566/VC MIPI IMX566C, VC MIPI IMX567/VC MIPI IMX567C

Component / Feature	Module Name	Module Name	Module Name
	VC MIPI IMX565/VC MIPI IMX565C	**VC MIPI IMX566/VC MIPI IMX566C**	**VC MIPI IMX567/VC MIPI IMX567C**
CMOS Sensor	1/1.1" Sony IMX565, Mono/Color, 12.4 Mpixel	2/3" Sony IMX566, Mono/Color, 8.3 Mpixel	1/1.8" Sony IMX567, Mono/Color, 5.1 Mpixel
Active pixels	4128(H) x 3008(V)	2856(H) x 2848(V)	2472(H) x 2064(V)
Pixel size	2.74(H) x 2.74(V) µm	2.74(H) x 2.74(V) µm	2.74(H) x 2.74(V) µm
Active sensor size	11.223(H) x 8.220(V) mm	7.825(H) x 7.803 V) mm	6.773(H) x 5.655(V) mm
Shutter type	Global Shutter	Global Shutter	Global Shutter
ADC Resolution	8 Bit / 10 Bit / 12 Bit	8 Bit / 10 Bit / 12 Bit	8 Bit / 10 Bit / 12 Bit
CSI-2 output	2 lanes/ 4 lanes (not 15pin connector) / RAW 8, 10 or 12	2 lanes/ 4 lanes (not 15pin connector) / RAW 8, 10 or 12	2 lanes/ 4 lanes (not 15pin connector) / RAW 8, 10 or 12
CSI-2 maximum speed	1.2 Gbps/lane max.	1.2 Gbps/lane max.	1.2 Gbps/lane max.
CSI-2 default speed	1.2 Gbps/lane	1.2 Gbps/lane	1.2 Gbps/lane
Max fps (full res., 4 lanes)	42.3 fps at 8 Bit / 34.3 fps at 10 Bit / 28.9 fps at 12 Bit	62.7 fps at 8 Bit / 51.2 fps at 10 Bit / 43.2 fps at 12 Bit	97.0 fps at 8 Bit / 79.4 fps at 10 Bit / 67.2 fps at 12 Bit
Output modes	streaming mode, fast trigger mode	streaming mode, fast trigger mode	streaming mode, fast trigger mode
Shutter resolution	1 horizontal unit	1 horizontal unit	1 horizontal unit
Gain	0–24dB analog gain + 24–48dB digital gain	0–24dB analog gain + 24–48dB digital gain	0–24dB analog gain + 24–48dB digital gain
S/N ratio	n/a	n/a	n/a
dynamic range	n/a	n/a	n/a
HDR	No	No	No
CRA	n/a	n/a	n/a
ROI / cropping support	Yes	Yes	Yes
Binning / subsampling support	Yes: 2x2 binning / Yes	Yes: 2x2 binning / Yes	Yes: 2x2 binning / Yes
Reverse modes	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout
Trigger input	Yes	Yes	Yes
Flash output	Yes	Yes	Yes
Power consumption	350mA(@3.3V) max. when active	350mA(@3.3V) max. when active	210mA(@3.3V) max. when active
Standby current	50mA	50mA	50mA
Operating temperature	-30 to +75 deg C, non-condensing	-30 to +75 deg C, non-condensing	-30 to +75 deg C, non-condensing
Storage temperature	-30 to +80 deg C	-30 to +80 deg C	-30 to +80 deg C
Performance guarantee temperature	-10 to +60 deg C	-10 to +60 deg C	-10 to +60 deg C
Supply voltage	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)
Mass	5.8g	5.8g	5.8g

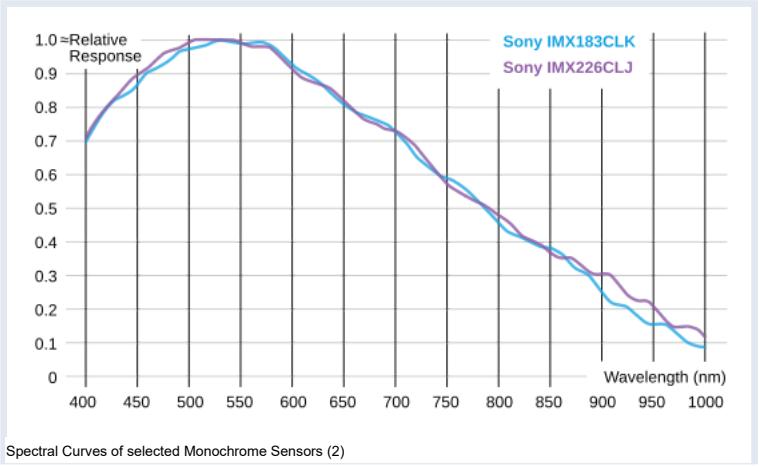
Technical Data: VC MIPI IMX568/VC MIPI IMX568C, VC MIPI IMX585C, VC MIPI IMX900/VC MIPI IMX900C

Component / Feature	Module Name	Module Name	Module Name
	VC MIPI IMX568/VC MIPI IMX568C	**VC MIPI IMX585C**	**VC MIPI IMX900/VC MIPI IMX900C**
CMOS Sensor	1/1.8" Sony IMX568, Mono/Color, 5.1 Mpixel	1/1.2" Sony IMX585, Color, 8.29 Mpixel	1/3.1" Sony IMX900, Mono/Color, 3.2 Mpixel
Active pixels	2472(H) x 2064(V)	3840(H) x 2160(V)	2048(H) x 1536(V)
Pixel size	2.74(H) x 2.74(V) µm	2.9(H) x 2.9(V) µm	2.25(H) x 2.25(V) µm
Active sensor size	6.773(H) x 5.655(V) mm	11.136(H) x 6.264 V) mm	4.608(H) x 3.456 V) mm
Shutter type	Global Shutter	Rolling Shutter	Global Shutter
ADC Resolution	8 Bit / 10 Bit / 12 Bit	10 Bit / 12 Bit / 16 Bit	8 Bit / 10 Bit / 12 Bit
CSI-2 output	2 lanes/ 4 lanes (not 15pin connector) / RAW 8, 10 or 12	2 lanes/ 4 lanes (not 15pin connector) / RAW 10, 12 or 16	2 lanes/ 4 lanes (not 15pin connector) / RAW 8, 10 or 12
CSI-2 maximum speed	1.2 Gbps/lane max.	1.5 Gbps/lane max.	1.5 Gbps/lane max.
CSI-2 default speed	1.2 Gbps/lane	1.5 Gbps/lane	1.5 Gbps/lane
Max fps (full res., 4 lanes)	97.0 fps at 8 Bit / 79.4 fps at 10 Bit / 67.2 fps at 12 Bit	60 fps at 10 Bit / 50 fps at 12 Bit	121 fps at 8 Bit / 112 fps at 10 Bit / 67 fps at 12 Bit
Output modes	streaming mode, fast trigger mode	streaming mode	streaming mode, fast trigger mode
Shutter resolution	1 horizontal unit	1 horizontal unit	1 horizontal unit
Gain	0–24dB analog gain + 24–48dB digital gain	0–30dB analog gain + 30-72dB digital gain	0–24dB analog gain + 24–48dB digital gain
S/N ratio	n/a	n/a	n/a
dynamic range	n/a	n/a	n/a
HDR	No	Yes: digital overlap HDR 2/3 frame	No
CRA	n/a	0 degrees	n/a
ROI / cropping support	Yes	Yes	Yes
Binning / subsampling support	Yes: 2x2 binning / Yes	Yes: 2x2 binning / Yes	Yes: 2x2 binning / Yes
Reverse modes	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout	for vertical or horizontal: normal or inverted readout
Trigger input	Yes	No	Yes
Flash output	Yes	No	Yes
Power consumption	180mA(@3.3V) max. when active	285mA(@3.3V) max. when active	230mA(@3.3V) max. when active
Standby current	45mA	35mA	25mA
Operating temperature	-30 to +75 deg C, non-condensing	-30 to +75 deg C, non-condensing	-30 to +75 deg C, non-condensing
Storage temperature	-30 to +80 deg C	-30 to +80 deg C	-30 to +80 deg C
Performance guarantee temperature	-10 to +60 deg C	-10 to +60 deg C	-10 to +60 deg C
Supply voltage	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)	3.3V +/- 5% at input of module (not including voltage drop on cable)
Mass	3.5g	5.7g	3.9g

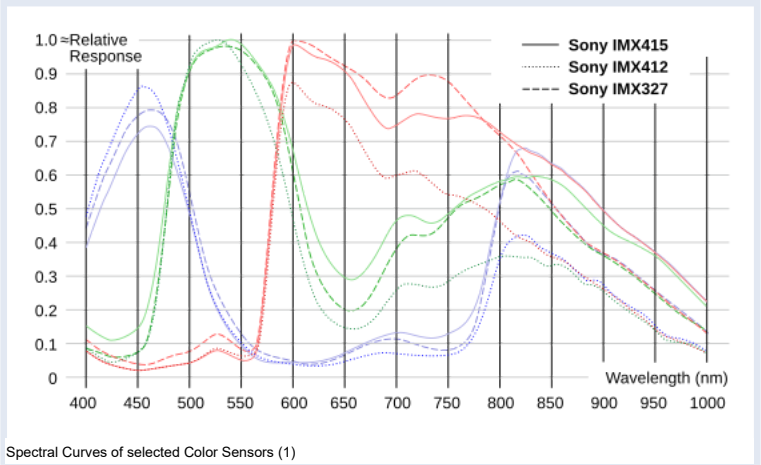
[R] *(1, 2, 3, 4, 5, 6, 7)* upon request.



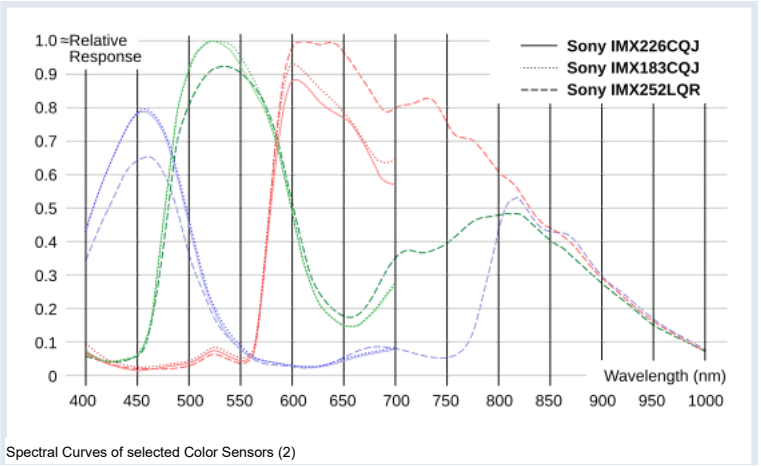
Spectral Curves of selected Monochrome Sensors (1)



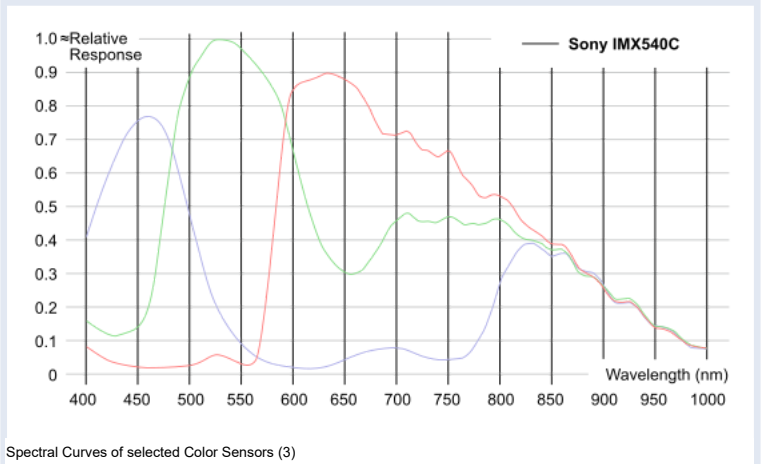
Spectral Curves of selected Monochrome Sensors (2)



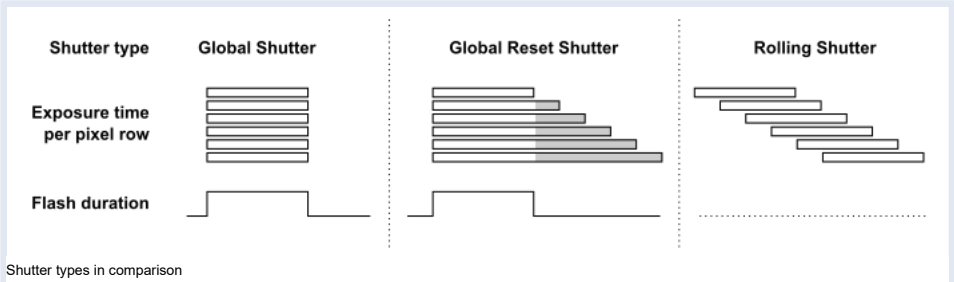
Spectral Curves of selected Color Sensors (1)



Spectral Curves of selected Color Sensors (2)



Spectral Curves of selected Color Sensors (3)

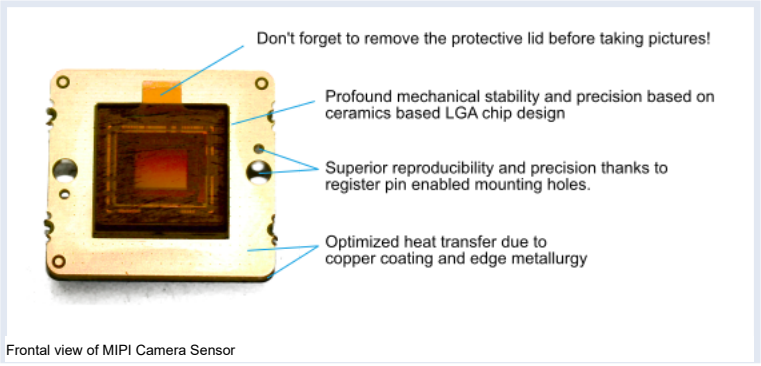


Shutter types in comparison

Note

Implementing a color calibration routine for color sensors is recommended!

1.3 Electrical and Mechanical Prerequisites



Frontal view of MIPI Camera Sensor

Before connecting, make sure that the pinout of the computer board fits the pinout of the MIPI module, especially the power supply (3V3) and GND pins. In 2014 a number of boards for the Compute Module IO (CMIO) have been sold with reverse pinout which may damage the MIPI Module and the Compute Module when connected. If in doubt contact the manufacturer or the dealer of the computer board. Vision Components can not take resposibility for incorrect pin-outs, changes and modifications of third party manufacturers.

Always use the original Vision Components FPC cable for connecting the MIPI Modules! FPC cables are available with 15 pin or 22 pin header on one side. The MIPI module side always has 22 pins. The original FPC cables connect the signal traces on one side and have a GND shield on the other side. Flat cables with only the signal wires without shielding are not suitable for this purpose.

Note

Please be aware that using the FPC cable with 15 pin on one side limits the number of MIPI data lanes to 2 (instead of 4 for the FPC cable with 22 pins on both sides). This may lead to lower frame rates than specified.

Make sure to connect the correct side of the cable with the MIPI Module. The correct side for the MIPI Module is marked "sensor side".

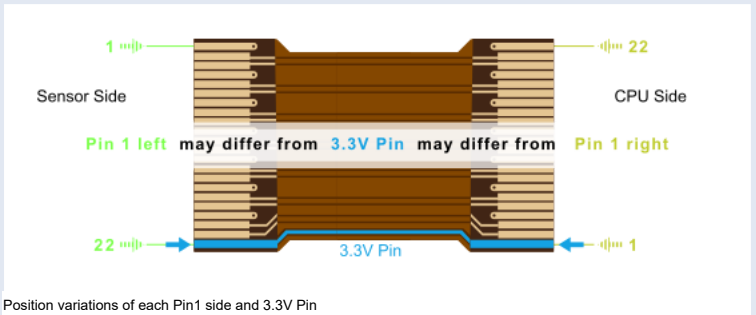
Due to the high transmission rate of about 1.5 Gbit/sec per lane the cable length is limited to 200mm. Using a repeater board the cable length can be doubled to 400mm.

1.4 Pin Cable Connector for Vision Components MIPI CSI camera modules

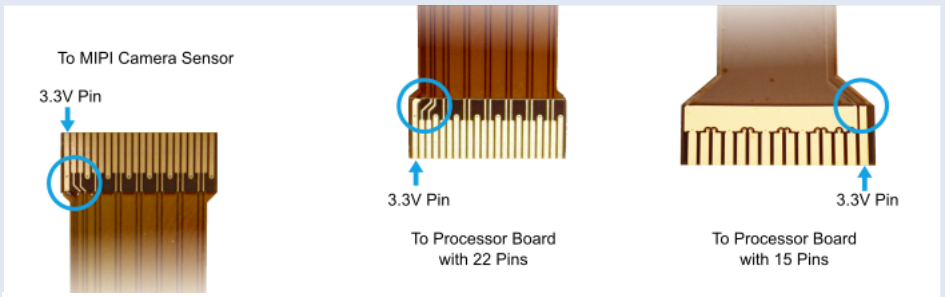
Data signals are compliant to MIPI CSI 2. Not all of the 4 lanes are supported for all sensor modules, e.g.:

- Raspberry Pi Compute Module IO V3.0: CAM0 connector supports 2 lanes only; CAM1 connector supports 4 lanes
- Raspberry Pi Zero V1.3 and Raspberry Pi 3B+ support 2 lanes only

1.4.1 Flexible Printed Circuit (FPC) Cable



Position variations of each Pin1 side and 3.3V Pin



Patch Cable Connectors

Warning

At the time of writing the schematics of the models 'Raspberry Pi CMIO V3.0' and the 'Raspberry Pi Zero V1.3' have the **pin numbering of the MIPI sensor connector in a wrong, inverse order**, so pin 1 would be pin 22, pin 2 would be pin 21, …

- **Always check cable numbering when connecting the sensor boards to hardware not from Vision Components!**
- **Vision Components is not liable to any damages by connecting to incompatible hardware!**

Warning

- **Always use an original Vision Components FPC cable! The correct function is not guaranteed with 3rd party cables.**
- **FPC cable can only be used in one direction!**

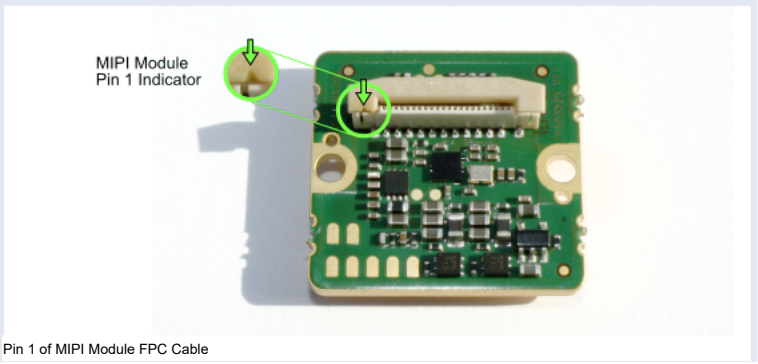
FPC Cable Signals

Signal	Sensor module	Processor board (22 Pin)		Processor board (15 Pin)
Type		regular	inverse	regular
GND	1	22	1	1
CSI_DAT0_N	2	21	2	2
CSI_DAT0_P	3	20	3	3
GND	4	19	4	4
CSI_DAT1_N	5	18	5	5
CSI_DAT1_P	6	17	6	6
GND	7	16	7	7
CSI_CLK_N	8	15	8	8
CSI_CLK_P	9	14	9	9
GND	10	13	10	10
CSI_DAT2_N	11	12	11	—
CSI_DAT2_P	12	11	12	—
GND	13	10	13	—
CSI_DAT3_N	14	9	14	—
CSI_DAT3_P	15	8	15	—
GND	16	7	16	—
trigger_to_sensor [1] [2]	17	6	17	11
flash_from_sensor [1] [2]	18	5	18	12
GND	19	4	19	—
I2C_SCL [2]	20	3	20	13
I2C_SDA [2]	21	2	21	14
Vcc3V3	22	1	22	15

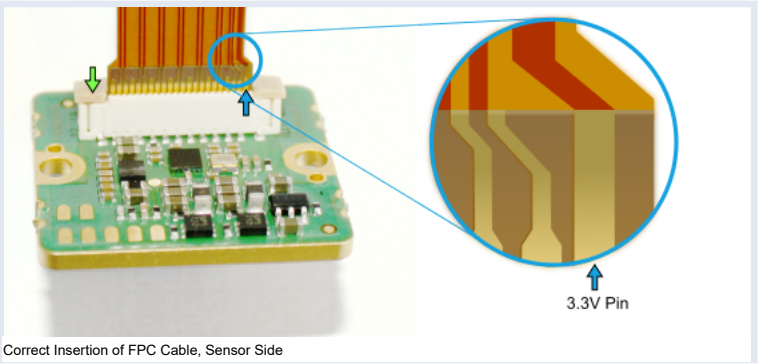
[1] *(1, 2)* not supported for all sensor modules.

[2] *(1, 2, 3, 4)* signals have 3.3V LVTTL/LVCMOS level.

1.4.1.1 FPC Cable End to MIPI Camera Sensor

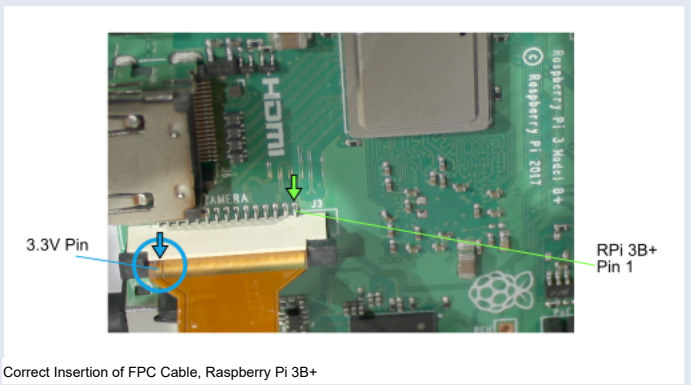


Pin 1 of MIPI Module FPC Cable

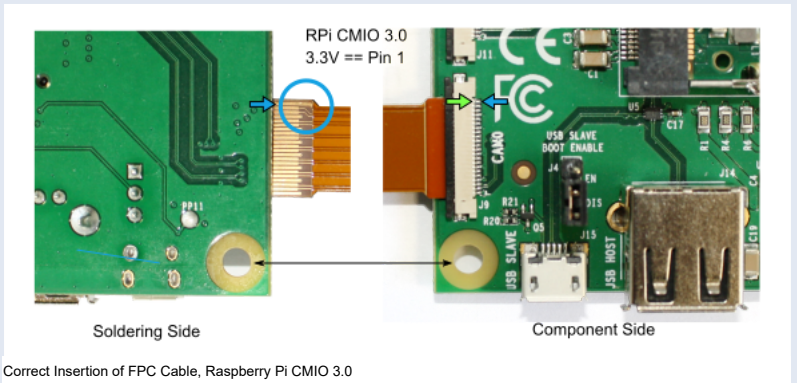


Correct Insertion of FPC Cable, Sensor Side

1.4.1.2 FPC Cable End to Processor Board



Correct Insertion of FPC Cable, Raspberry Pi 3B+

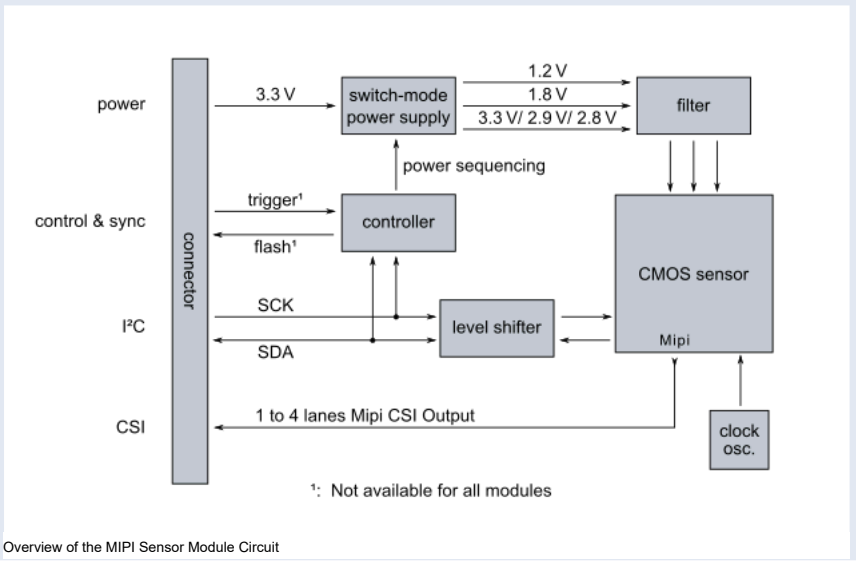


Correct Insertion of FPC Cable, Raspberry Pi CMIO 3.0

Warning

No tension is allowed on the FPC cable, on either side! This can lead to mechanical damage!

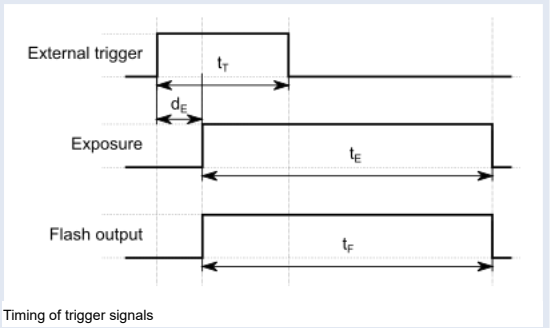
1.5 MIPI Sensor Module Circuit



Overview of the MIPI Sensor Module Circuit

1.6 Trigger Timing

Some sensors have fast trigger input capability and flash output for synchronizing LED flashes. The following figure explains the timing of the signals.

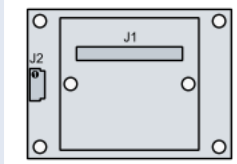


Timing of trigger signals

Trigger timing by sensor type

Time	VC MIPI OV9281	VC MIPI IMX250	VC MIPI IMX296
trigger duration *t_T*	>9 µs	>10 µs	>10 µs
trigger delay *d_E*	0.832 ms	5 us due to debouncing	5 us due to debouncing
trigger delay jitter	42 ns max.	13.5 ns max.	18.5 ns max.
exposure duration *t_E*	programmable	step size 13.5 ns	step size 18.5 ns
flash duration *t_F*	programmable	*t_F* = *t_E*	*t_F* = *t_E*

1.6.1 5V Power Connector for VC MIPI IMX540/VC MIPI IMX540 C



VC MIPI IMX540/VC MIPI IMX540 C Connectors

This connector is the main power source connector for the MIPI module. The 5V supply must be applied before or at the same time as the 3.3V MIPI power.

Connector J2 at VC MIPI IMX540/VC MIPI IMX540 C

	Pin No.	Signal

	Pin No.	Signal
	1	N.C.
	2	5V input +/- 5%
	3	GND return

2 Ordering Information

2.1 MIPI camera module order numbers

VC MIPI camera modules

Order Number	Product ID	Service description
VK000469	VC MIPI OV7251	monochrome
VK000436	VC MIPI OV9281	monochrome
VK004005	VC MIPI IMX178	monochrome
VK000477	VC MIPI IMX183	monochrome
VK000482	VC MIPI IMX183 C	color
VK000478	VC MIPI IMX226	monochrome
VK000499	VC MIPI IMX226 C	color
VK000481	VC MIPI IMX250	monochrome
VK000492	VC MIPI IMX250 C	color
VK004002	VC MIPI IMX252	monochrome
VK000493	VC MIPI IMX252 C	color
VK000511	VC MIPI IMX264	monochrome
VK000512	VC MIPI IMX264C	color
VK000514	VC MIPI IMX265	monochrome
VK000513	VC MIPI IMX265C	color
VK000487	VC MIPI IMX273	monochrome
VK000495	VC MIPI IMX273 C	color
VK000438	VC MIPI IMX290	monochrome
VK000434	VC MIPI IMX296	monochrome
VK003315	VC MIPI IMX296 C	color
VK003316	VC MIPI IMX297	monochrome
VK000435	VC MIPI IMX327 C	color
VK000503	VC MIPI IMX335	monochrome
VK000538	VC MIPI IMX335C	color
VK004003	VC MIPI IMX392	monochrome
VK000494	VC MIPI IMX392 C	color
VK000437	VC MIPI IMX412 C	color
VK000498	VC MIPI IMX415	monochrome
VK000449	VC MIPI IMX415 C	color
VK000532	VC MIPI IMX462 C	color
VK000554	VC MIPI IMX565	monochrome
VK000582	VC MIPI IMX565C	color
VK000553	VC MIPI IMX566C	color
VK000539	VC MIPI IMX567	monochrome
VK000543	VC MIPI IMX568	monochrome
VK000565	VC MIPI IMX568C	color
VK000594	VC MIPI IMX585C	color
VK000601	VC MIPI IMX900	monochrome
VK000609	VC MIPI IMX900C	color

2.2 Order numbers of MIPI camera module Accessories

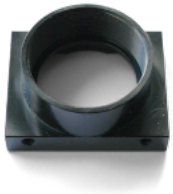
Accessories for VC MIPI camera modules

Order Number	Product / Service description
EK003260	Flexible Printed Circuit (FPC) Cable, 200 mm: 22 to 22 Pin
EK003261	Flexible Printed Circuit (FPC) Cable, 200 mm: 22 to 15 Pin
EK004418	Flexible Printed Circuit (FPC) Cable, 100 mm: 22 to 22 Pin
EK040001	Flexible Printed Circuit (FPC) Cable, 60 mm: 22 to 22 Pin
VK000057	S-Mount Lens Holder for OV7251, OV9281, IMX290, IMX296, IMX297, IMX327, IMX335, IMX412, IMX415, IMX462, IMX900 (no IR filter)
VK000545	S-Mount Lens Holder for IMX183, IMX252, IMX250, IMX392, IMX264, IMX265, IMX565, IMX566, IMX567, IMX585 (with IR-Cut filter 750 nm)

Order Number	Product / Service description
VK000568	S-Mount Lens Holder for IMX183, IMX252, IMX250, IMX392, IMX264, IMX265, IMX565, IMX566, IMX567, IMX585 (no IR filter)
VK000555	S-Mount Lens Holder for IMX178, IMX226, IMX273, IMX568 (no IR filter)
VK000454	CS-/C-Mount Lens Holder for OV7251, OV9281, IMX290, IMX296, IMX297, IMX327, IMX335, IMX412, IMX415, IMX462, IMX900 (no IR filter)
VK000483	C-Mount Lens Holder for IMX183, IMX252, IMX250, IMX392, IMX264, IMX265, IMX565, IMX566, IMX567, IMX585 (no IR filter)
VK000491	CS-/C-Mount Lens Holder for IMX178, IMX226, IMX273, IMX568 (no IR filter)
VK000021	Lens, S-Mount Monochrome, f=8.0
VK000252	Lens, S-Mount Monochrome, f=3.6, F=1.8, 2–3 MPx
EK002697	Lens, S-Mount Monochrome, f=8.0, F=5.6
VK003117	Lens, S-Mount Monochrome, f=8.0, F=2.5, 1:1.8" macro
VK003137	Lens, S-Mount Monochrome, f=6.0, F=2.4, 1:2", 2–3 MPx
VK002066	Lens, S-Mount Monochrome, f=12.0, F=2.8, 1:2.5", 5 MPx
VK001256	Lens, S-Mount Color (IR filter), f=2.4, F=2.0, 1:3"
VK001257	Lens, S-Mount Color (IR filter), f=3.6, 1:3"
VK000537	Lens, S-Mount Color (IR filter), f=6.0, F=2.4, 1:2.7"
VK000536	Lens, S-Mount Color (IR filter), f=12.0, F=2.8, 1:3"
EK000625	Circular IR-Cut Filter Glass 750 nm, d=16 mm, h=1mm (for S-Mount Lens Holder VK000568)
EK004727	Square IR-Cut Filter Glass 750 nm, 15x15x1.1mm (for S-Mount Lens Holder VK000057)
EK003348	VC MIPI 96 Adapter Board for '96' Boards
VK003318	VC MIPI Repeater Board

S-Mount Lens Holder (Plastic)

CS-/C-Mount Lens Holder

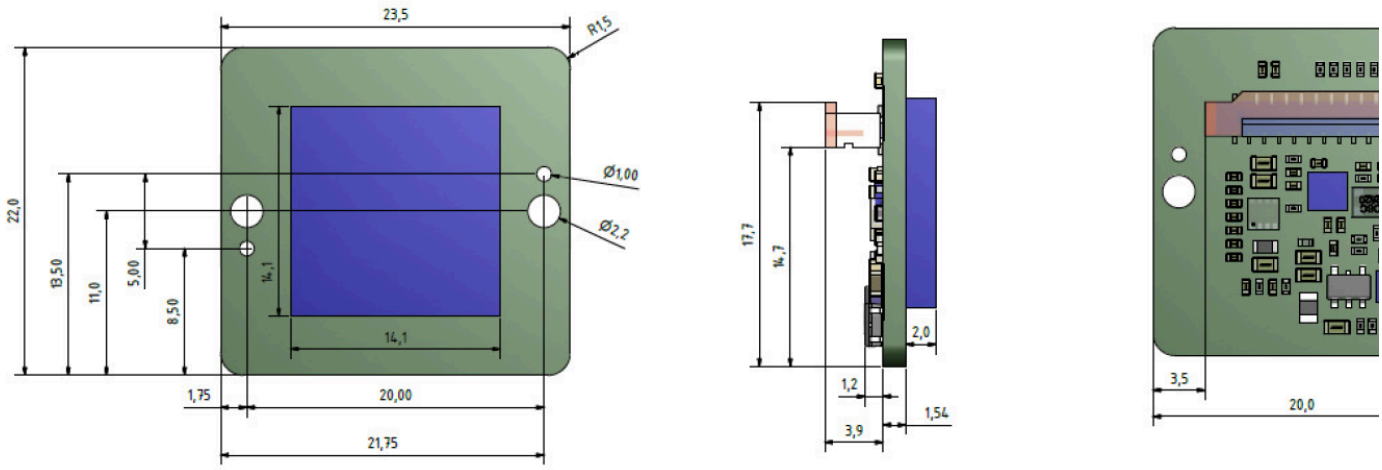


CS-/C-Mount Lens Holder for IMX183 and compatible

3 Appendix A: Dimensions MIPI camera module

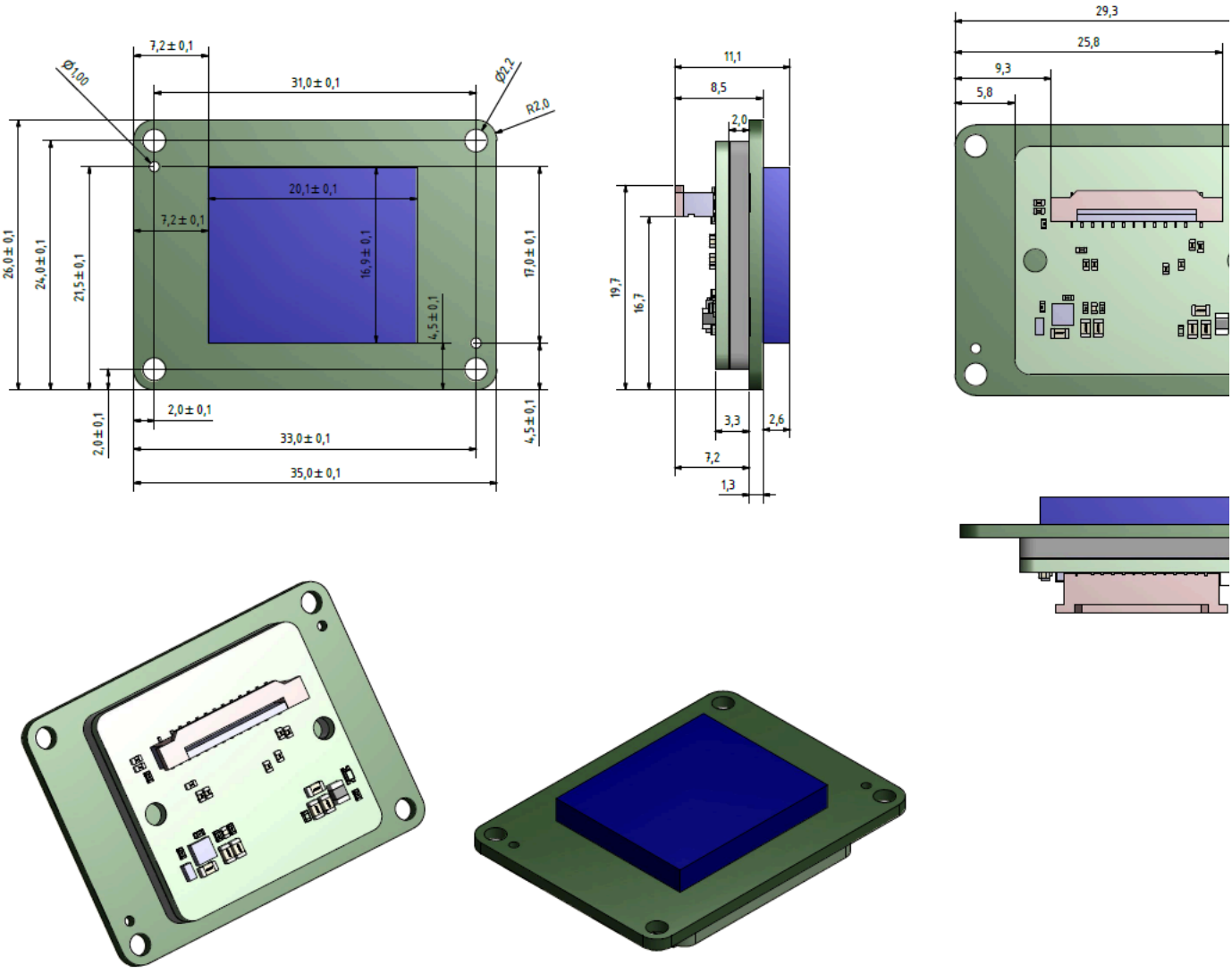
The illustrations below show the general dimensions of the mipi modules but with specific sensors. Please contact our support at support@vision-components.com to get drawings or STEP files for your specific module.

3.1 VC MIPI IMX296 (same board dimensions for OV9281, OV7251, IMX290, IMX297, IMX327, IMX335, IMX412, IMX415, IMX462, IMX568, IMX900)



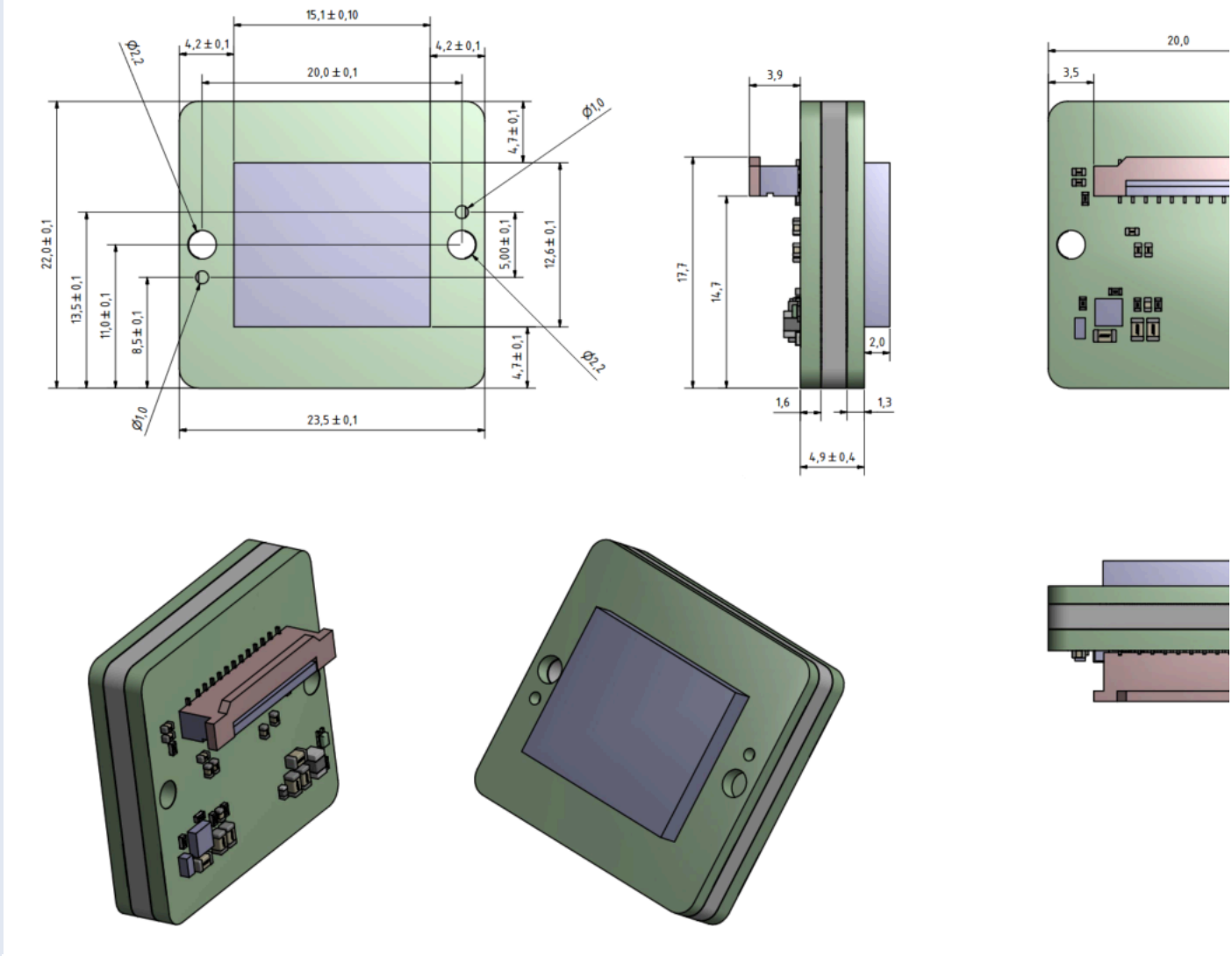
Dimensions of the VC MIPI IMX296

3.2 VC MIPI IMX183 (same board dimensions for IMX250, IMX252, IMX264, IMX265, IMX392, IMX540)



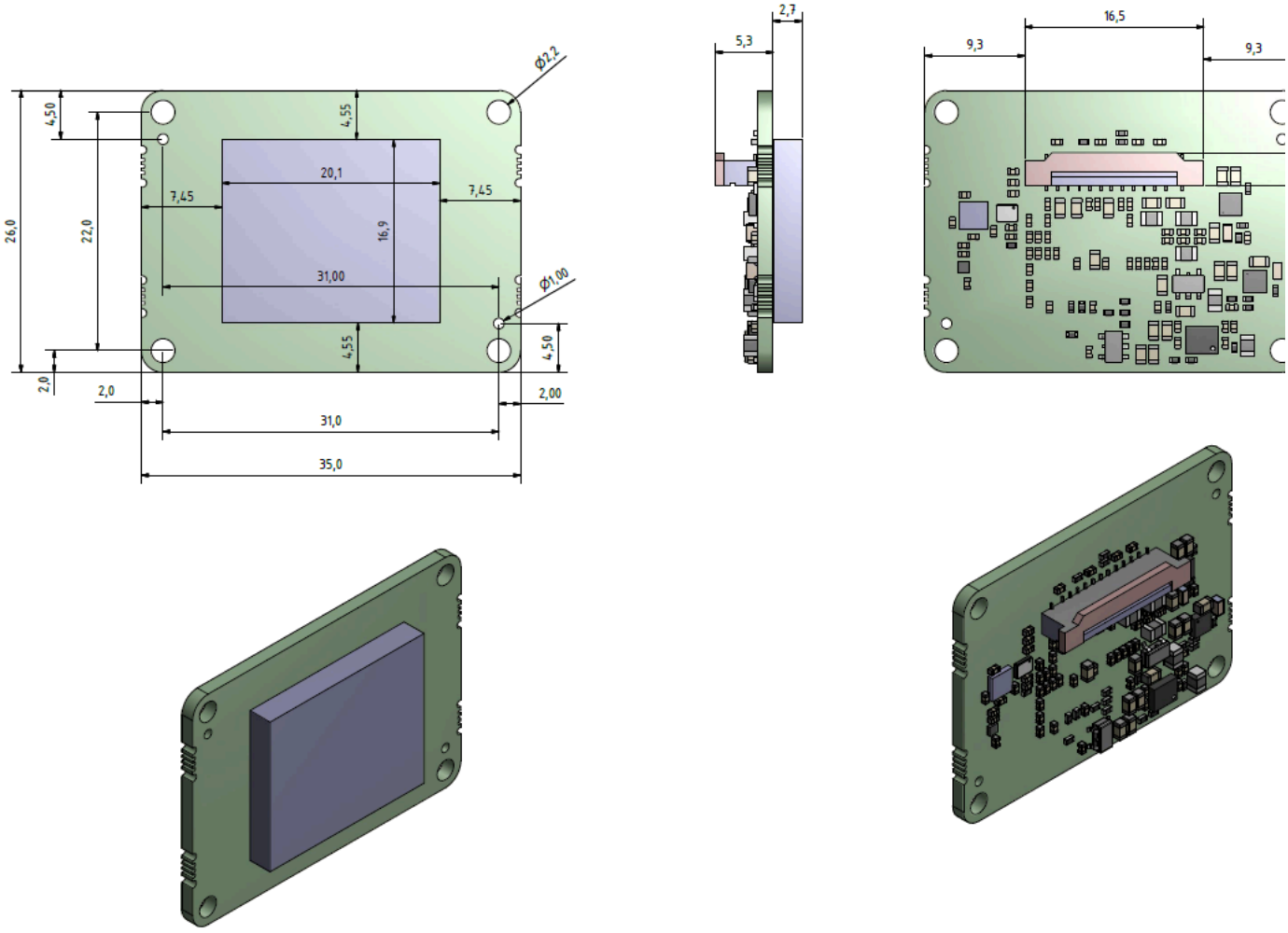
Dimensions of the VC MIPI IMX183

3.3 VC MIPI IMX226 (same board dimensions for IMX178, IMX273)



Dimensions of the VC MIPI IMX226

3.4 VC MIPI IMX565 (same board dimensions for IMX566, IMX567, IMX585)



Dimensions of the VC MIPI IMX565

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