

### Sensor Information

Model Name	Sony IMX304
Type	1.1" progressive scan CMOS
Shutter	Global Shutter
Resolution	4096 x 3000 pixels
Scan Area	14.13 mm x 10.35 mm
Pixel Size	3.45 $\mu$ m x 3.45 $\mu$ m

### Data Quality

@ 20 °C, gain = 1, exposure time = 4 msec

Dark Noise ( $\sigma$ )	2 e- typical
Saturation	9500 e- typical
Dynamic Range	71 dB typical
SNR	40 dB typical
Quantum efficiency $\eta$	47 % @ 465 nm, 58 % @ 536 nm, 53 % @ 631 nm typical

### Acquisition

Resolution	4096 px x 3000 px		
Interface Frame Rate (depends on used interface performance)	Format	Resolution	max. Frame Rate (@ Trigger Mode) <sup>2)</sup>
	Full Frame	4096 x 3000	28 fps
	Binning 2x2	2048 x 1500	28 fps
	Binning 2x1	2048 x 3000	28 fps
	Binning 1x2	4096 x 1500	28 fps
Acquisition Frame Rate <sup>1)</sup>	29 fps   $t_{\text{readout}} = 34.5$ msec (max. Res. Full Frame) @ 12 bit		

**Pixel Formats**  
 BayerRG8, BayerRG10, BayerRG12, BayerRG12p  
 Mono8, Mono10, Mono12, Mono12p, RGB8, BGR8

**Partial Scan**  
 True Partial Scan with increasing Frame Rate on Y direction, Region of Interest (ROI) arbitrary  
 Width: minimum 16, increment 16  
 Height: minimum 2, increment 2

Adjustable Acquisition Frame Rate	Off or 0,01 ... 65535 Hz
Acquisition Mode	Continuous, Single Frame and Multi Frame
Acquisition Status	AcquisitionActive, AcquisitionTrigger Wait
Exposure Mode	Timed
Shutter Mode	Global
Readout Mode	Overlapped, Sequential

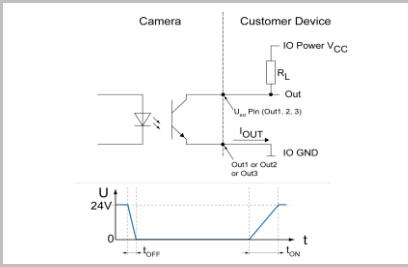
### Image Pre-Processing

Analog Controls	Exposure Time (1 $\mu$ sec ... 60 sec   Step Size 1 $\mu$ sec) Gain (0...48 dB), Offset (0 ... 255 LSB   12 bit)
Auto Function	ExposureAuto and GainAuto with BrightnessAutoPriority based on BrightnessAuto ROI BalanceWhiteAuto and ColorTransformationAuto based on BalanceWhiteAuto ROI
Gamma Correction	Gamma (0.1 ... 2   available if LUT is enabled)
LUT	Luminance (12 bit)
Color Models	Mono, Raw Bayer, RGB and BGR
Color Processing	Integrated color processor for high quality color calculation
Color Enhancement	Color Transformation to sRGB color space by optimized Matrix for 3000 K, 5000 K, 6500 K and 9500 K Lightsource or User defined Matrix

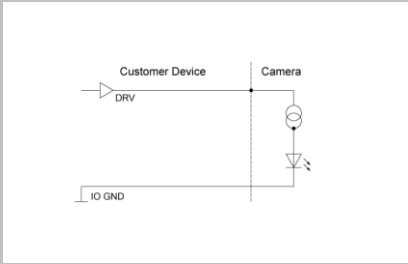
<sup>1)</sup> Sensor readout, different from pixel format

<sup>2)</sup> depends on the used interface

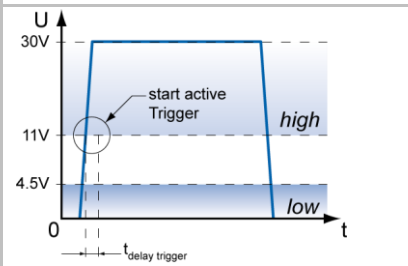
### Digital Output: Low Active



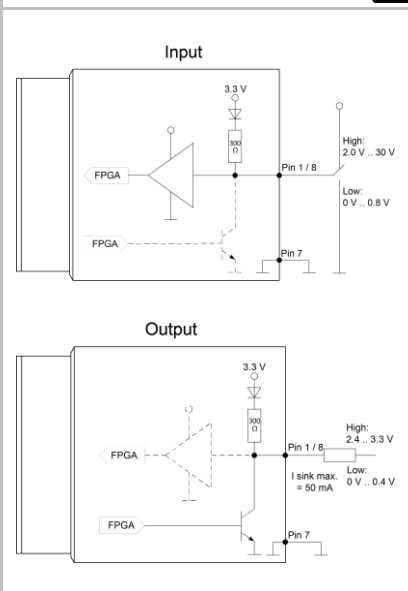
### Digital Input



### Trigger Mode: Start up time and valid Trigger



### GPIO



## Image Pre-Processing

Color Tolerance	-
Binning Horizontal	1 or 2
Binning Vertical	1 or 2
Image Flipping	Horizontal, vertical
Defect Pixel Correction	via Defect Pixel List with up to 512 Pixel Coordinates
Fix Pattern Noise	-
Correction	-

## Process Synchronization

Trigger Mode	Off (Free Running), On (Trigger)
Trigger Overlap Type	Readout
Trigger Sources	Hardware (Line0, 1, 2), Software, Counter 1, 2 End, All or Off fixed Trigger Delay out of treadout: <sup>1)</sup> 66,9 µsec @ 12 bit max. Trigger Delay during treadout: <sup>1)</sup> 73 µsec @ 12 bit
Trigger Delay	0 ... 2 sec, Tracking and buffering of up to 256 triggers
External Flash Sync	via Exposure Active $t_{\text{delay flash}} \leq 3 \mu\text{sec}$ , $t_{\text{duration}} = t_{\text{exposure}}$
Encoder Function	yes, via Counter and Trigger Source
PTP Function	-

## Digital I/Os

Lines	Input: Line 0, Output: Line3, GPIO: Line 1, Line 2
Output Sources	Off, ExposureActive, Timer1, ReadoutActive, UserOutput 1-3 and TriggerReady
Line Debouncer	Low and high signal separately selectable Debouncing Time 0 ... 5 msec, Step Size: 1 µsec

## Memory

Image Buffer	458 MB 13 Images (Trigger Mode) / 1 Image (Free Running Mode)
Non-volatile Memory	128 kb

## Interface Data

Interface	USB3.0 (5000 Mbits/sec)
USB Vendor ID / Product ID	0x2825 / 0x14A

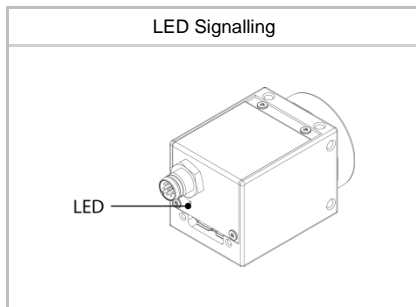
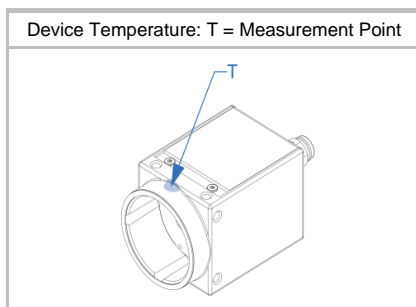
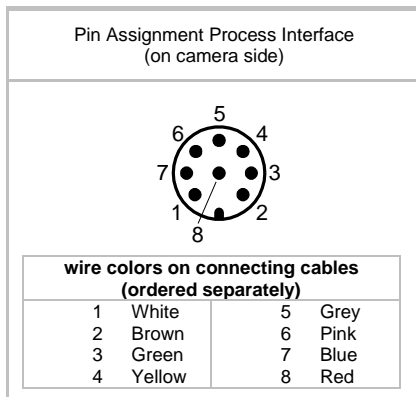
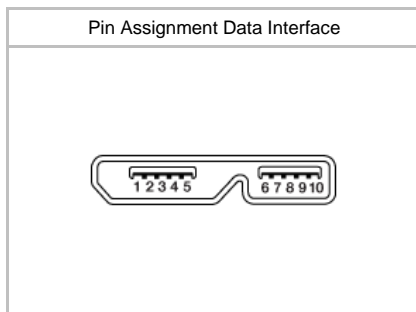
## USB 3 Vision® Features

Events	DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, Line0..2 FallingEdge, Line0..2 RisingEdge, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped
Transmission via Asynchronous Message Channel	up to 2 <sup>32</sup>
Frame Counter	0 ... 36864224 Byte
Payload Size	64 bit, resolution in nsec, increment = 10
Timestamp	v1.0.1

## Interfaces and Connectors

Data and Power Interface	USB 3.0	Transfer Rate	5000 Mbits/sec
	USB 2.0	Transfer Rate	480 Mbits/sec
	Connector:		USB 3.0 Micro B
Pin Assignment:	1 - VBUS	6 - MicB_SSTX-	
	2 - D-	7 - MicB_SSTX+	
	3 - D+	8 - GND_DRAIN	
	4 - ID	9 - MicB_SSRX-	
	5 - GND	10 - MicB_SSRX+	

<sup>1)</sup> Sensor readout, different from pixel format



## Interfaces and Connectors

Process Interface	Connector:	M8/8-pin (SACC-DSI-M8MS-8CON-M8-L180)
	Assignment:	1 - GPIO (Line2)    5 - Power VCC OUT1 2 - not connected    6 - OUT1 (Line3) 3 - IN1 (Line0)    7 - GND GPIO 4 - GND IN1    8 - GPIO (Line1)

Caution



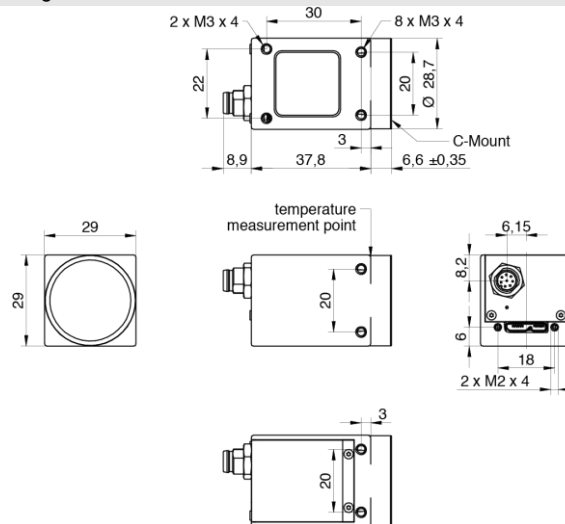
\* Note GPIOs: Ground loops are to be avoided and can lead to destruction of the device.

## Optical Data

Lens Mount	C-Mount
Optical Filter	IR cut filter

## Mechanical Data

Housing	Zinc die casting, nickel-chrome-plated, IP40 (with mounted lens and USB 3.0 cable)
Protection Class	IP40 (with mounted lens and USB 3.0 cable)
Weight	90 g
Dimensions	



## Environmental Data


Storage Temperature	-10 °C ... + 70 °C
Operating Temperature	0 °C ... +65 °C @ T = Measurement Point or 0 °C ... +72 °C @ internal Temperature Sensor )
Int. Temperature Sensor	yes, accuracy: ±2 °C (typ) -40 °C ... 0 °C ±1 °C (typ) 0 °C ... +85 °C
Humidity	10 % ... 90 % non-condensing

) the maximum temperature for Sony sensor characteristics (sensor performance) are guaranteed up to 47°C @ Measurement Point or 58°C @ internal temperature sensor

## LED Signalling

LED	Green flash	Power on, no link active
	Green	Link active USB 3.0
	Red	Error or Link active USB 2.0
	Yellow	Sensor Readout activity
	Red flash	Update

## Electrical Data

Power Supply	bus powered via USB3.0 interface
Power Consumption	approx. 3.7 W @ 28 fps (Factory Setting "Default")
Digital Input	Optocoupler $U_{IN(low)}$ : 0.0 ... 4.5 VDC $U_{IN(high)}$ : 11.0 ... 30.0 VDC $I_{IN}$ : 3.0 ... 10.0 mA min. Impulse Length: 2.0 $\mu$ sec
Digital Output	Optocoupler $U_{EXT}$ : 5 ... 30 V DC $I_{OUT}$ : max. 50 mA $t_{ON}$ = typ. 3 $\mu$ sec $t_{OFF}$ = typ. 40 $\mu$ sec
GPIO	direct, without optocoupler
GPIO used as Input:	$U_{IN(low)}$ : 0.0 ... 0.8 VDC $U_{IN(high)}$ : 2.0 ... 30.0 VDC min. Impulse Length: 2.0 $\mu$ sec
GPIO used as Output:	$U_{Out(low)}$ : 0.0 ... 0.4 VDC ( $I_{sink\ max}$ : 50 mA) $U_{Out(high)}$ : 2.4 ... 3.3VDC ( $I_{max}$ : 1 mA)
Caution 	* The General Purpose I/Os (GPIOs) are not potential-free and do not have an overrun cut-off. Incorrect wiring (overvoltage, undervoltage or voltage reversal) can lead to defects in the electronic system. Ground loops are to be avoided and can lead to destruction of the device.

## Conformity

Conformity	CE, RoHS, REACH, EAC
KC Registration No. / Date	- / -
MTBF	56 years @ T = 45 °C / 36 years @ T = 60 °C T = Measurement Point

## GeniCam™ Features

Short Exposure Range	yes, ShortExposureTimeEnable Short Exposure Range 1 $\mu$ sec ... 60 sec Default Exposure Range 15 $\mu$ sec ... 60 sec
Timer	Timer Selector: Timer Selector: Timer 1 TimerTriggerSource: Line0, SoftwareTrigger, ExposureStart, ExposureEnd, FrameTransferSkipped, TriggerSkipped, Off TimerDelay: 0 $\mu$ sec ... 2 sec, Step Size: 1 $\mu$ sec TimerDuration: 4 $\mu$ sec ... 2 sec, Step Size: 1 $\mu$ sec
Counter	Counter Selector: Counter 1, Counter 2 CounterValue: 0 ... 65535 Counter Event Source: Counter1End or Counter2End, ExposureActive, FrameTransferSkipped, FrameTrigger, TriggerSkipped, Line0..2 and Off Counter Reset Source: Counter1End, Counter2End, Line0..2
Sequencer	Sequencer Characteristics: up to 128 sets, up to 4 possible pathes for triggered set transitions, 6 trigger sources: Counter1End, Counter2End, ExposureActive, Line0..2, ReadoutActive, Timer1End Sequencer Parameters for Exposure, Gain, Trigger, ROI and Output: ExposureTime, CounterDuration, CounterEventActivation, CounterEventSource, CounterResetSource, ExposureMode, ExposureTime, Gain, Height, OffsetX, OffsetY, TriggerMode, UserOutputValue, UserOutputValueAll, Width

## GenICam™ Features

User Sets	Factory Settings: UserSet0 (read only) Freely Programmable: UserSet1, UserSet2, UserSet3 Parameters: any user definable Parameter
Acquisition Abort	Delay up to 34.5 msec
Chunk Data	yes, Chunk Selector: Binning, BlackLevel, CounterValue, DeviceTemperature, ExposureTime, FrameID, Gain, Height, Image, ImageControl, LineStatusAll, OffsetX, OffsetY, PixelFormat, SequencerSetActive, Timestamp, Width
Device Temperature	InHouse Event generation for Normal to High, High to Exceeded and Exceeded to Normal Exceeded (no image transfer) = max. internal temperature sensor + 1 °C
Device Link Throughput Limit	yes, up to max. Device Link Speed
Custom Data	yes, 128 Byte
SFNC Version	v2.4

## Factory Settings after Start-Up

Trigger Mode	Off (Free Running)
Analog Controls	Exposure Time: 4 msec, Gain: 0 dB, Offset: 0
Pixel Format	BayerRG8
Partial Scan	Off
Acquisition Frame Rate	Off
Timer/Counter/Sequencer	Off
Defect Pixel Correction	ON
Fixed Pattern Noise Correction	-
Digital Input	Line0, invert = false
Digital Output	Line3, invert = false, line source = Off
GPIO 1/2	Line1, Line2, invert = false, LineMode = Input
TriggerSource	All

## Partial Scan @ FullFrame, min Exposure, Mono8 (monochrome camera) or BayerRG8 (color camera)

	Resolution	max. fps acquisition	max. fps interface <sup>2)</sup>
UHD (4K)	3840 x 2160	40	40
Full HD	1920 x 1080	77	77
SXGA	1280 x 1024	81	81
HD720	1280 x 720	113	113
XGA	1024 x 768	107	107
SVGA	800 x 600	134	134
VGA	640 x 480	164	164
CIF	352 x 288	255	255
QVGA	320 x 240	296	296
QCIF	176 x 144	436	436
LineScan	4096 x 2048	42	42
	4096 x 1024	81	81
	4096 x 512	155	155
	4096 x 256	281	281
	4096 x 128	473	473
	4096 x 64	718	718
	4096 x 32	970	970
	4096 x 16	1175	1175
	4096 x 8	1315	1315
	4096 x 4	1397	1397
	4096 x 2	1443	1443
	4096 x 1	-	-

<sup>2)</sup> depends on the used interface