

### Sensor Information

Model Name	Sony IMX226
Type	1/1.7" progressive scan CMOS
Shutter	Rolling Shutter, Global Reset Shutter
Resolution	4000 x 3000 pixels
Scan Area	7.4 mm x 5.55 mm
Pixel Size	1.85 $\mu\text{m}$ x 1.85 $\mu\text{m}$

### Data Quality

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

Dark Noise ( $\sigma$ )	3 e- typical
Saturation	10000 e- typical
Dynamic Range	70 dB typical
SNR	40 dB typical
Quantum efficiency $\eta$	75 % @ 536 nm typical

### Acquisition

Resolution	4000 px x 3000 px		
Interface Frame Rate (depends on used interface performance)	Format	Resolution	max. Frame Rate (@ Trigger Mode) <sup>2)</sup>
	Full Frame	4000 x 3000	29 fps
	Binning 2x2	2000 x 1500	31 fps
	Binning 2x1	2000 x 3000	29 fps
	Binning 1x2	4000 x 1500	31 fps

Acquisition Frame Rate<sup>1)</sup> 31 fps |  $t_{\text{readout}} = 31.6 \text{ msec}$  (max. Res. Full Frame) @ 12 bit

Pixel Formats	Mono8, Mono10, Mono12, Mono12p
Partial Scan	True Partial Scan without increasing Frame Rate, Region of Interest (ROI) arbitrary Width: minimum 16, increment 16 Height: minimum 2, increment 2

Adjustable Acquisition Frame Rate	Off or 1.48 ... 65535 Hz
Acquisition Mode	Continuous, Single Frame and Multi Frame
Acquisition Status	AcquisitionActive, AcquisitionTrigger Wait
Exposure Mode	Timed
Shutter Mode	Rolling, Global Reset
Readout Mode	not available

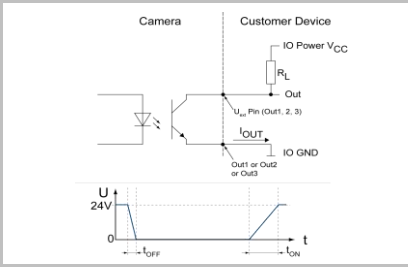
### Image Pre-Processing

Analog Controls	Exposure Time (44 $\mu\text{sec}$ ... 60 sec   Step Size 1 $\mu\text{sec}$ ) Gain (0...20 dB), Offset (0 ... 255 LSB   12 bit)
Auto Function	ExposureAuto and GainAuto with BrightnessAutoPriority based on BrightnessAuto ROI
Gamma Correction	Gamma (0.1 ... 2   available if LUT is enabled)
LUT	Luminance (12 bit)
Color Models	Mono
Color Processing	-
Color Enhancement	-

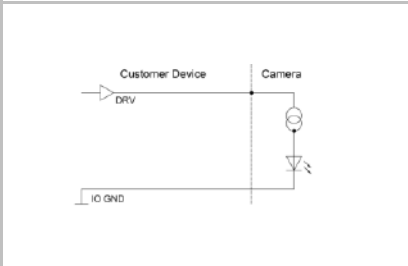
<sup>1)</sup> Sensor readout, different from pixel format

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

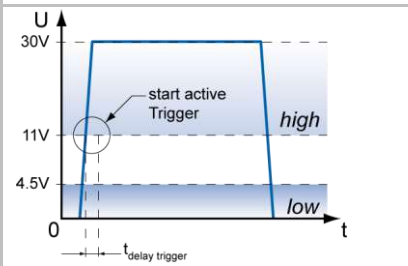
### Digital Output: Low Active



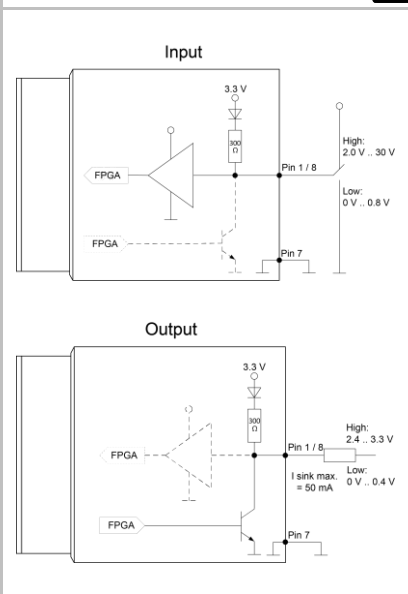
### Digital Input



### 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	Trigger Mode On: Off Trigger Mode Off: Not available
Trigger Sources	Hardware (Line0, 1, 2), Software, Counter 1, 2 End, All or Off max. Trigger Delay out of $t_{readout}$ : <sup>1)</sup> 31520 $\mu$ sec / 76 $\mu$ sec @ 12 bit (Rolling / Global Reset) max. Trigger Delay during $t_{readout}$ : <sup>1)</sup> -
Trigger Delay	0 ... 2 sec, Tracking and buffering of up to 256 triggers
External Flash Sync	via Exposure Active $t_{delay flash} \leq 3 \mu$ sec, $t_{duration} = t_{exposure}$
Encoder Function	-
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 $\mu$ sec

## Memory

Image Buffer	481 MB 14 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 / 0x155

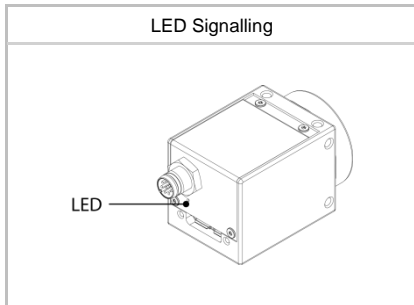
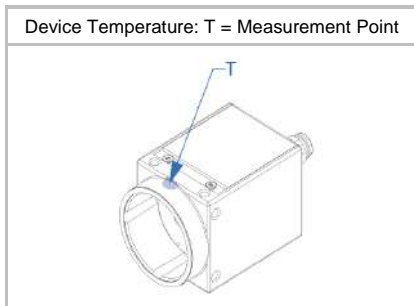
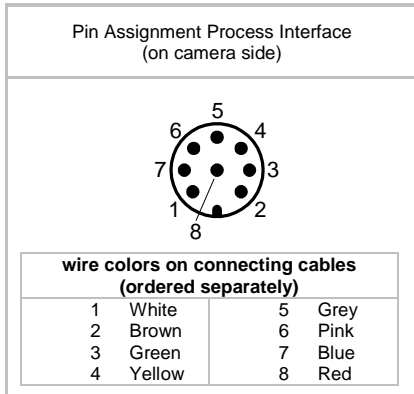
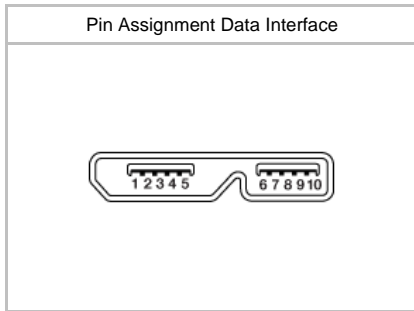
## USB 3 Vision® Features

Events	DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, Line0..2 FallingEdge, Line0..2 RisingEdge, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped
Transmission via Asynchronous Message Channel	
Frame Counter	up to 2 <sup>32</sup>
Payload Size	0 ... 24000212 Byte
Timestamp	64 bit, resolution in nsec, increment = 8
USB Vision	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



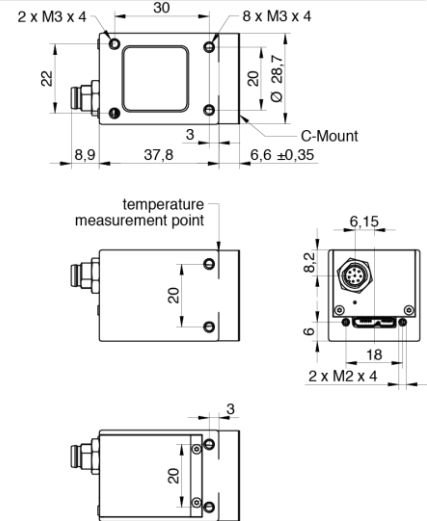
\* Note GPIOs: Ground loops are to be avoided and can lead to destruction of the device.

## Optical Data

Lens Mount	C-Mount
Optical Filter	-

## 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 ... +60 °C @ T = Measurement Point or 0 °C ... +75 °C @ internal Temperature Sensor Ambient temperature above 30 °C requires heat dissipation measures.
Int. Temperature Sensor	yes, accuracy: ±2 °C (typ) -40 °C ... 0 °C ±1 °C (typ) 0 °C ... +85 °C
Humidity	10 % ... 90 % non-condensing

<sup>7)</sup> 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. 3.3 W @ 29 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	82 years @ T = 45 °C / 51 years @ T = 60 °C T = Measurement Point

## GeniCam™ Features

Short Exposure Range	-
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 and Off
Sequencer	no

## GenICam™ Features

User Sets	Factory Settings: UserSet0 (read only) Freely Programmable: UserSet1, UserSet2, UserSet3 Parameters: any user definable Parameter
Acquisition Abort	Delay up to 31.6 msec
Chunk Data	yes, Chunk Selector: Binning, BlackLevel, CounterValue, DeviceTemperature, ExposureTime, FrameID, Gain, Height, Image, ImageControl, LineStatusAll, OffsetX, OffsetY, PixelFormat, , 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	Mono8
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	31,7	31,7
Full HD	1920 x 1080	31,6	31,6
SXGA	1280 x 1024	31,6	31,6
HD720	1280 x 720	31,6	31,6
XGA	1024 x 768	31,6	31,6
SVGA	800 x 600	31,6	31,6
VGA	640 x 480	31,6	31,6
CIF	352 x 288	31,6	31,6
QVGA	320 x 240	31,6	31,6
QCIF	176 x 144	31,6	31,6
LineScan	4000 x 2048	31,6	31,6
	4000 x 1024	31,6	31,6
	4000 x 512	31,6	31,6
	4000 x 256	31,6	31,6
	4000 x 128	31,6	31,6
	4000 x 64	31,6	31,6
	4000 x 32	31,6	31,6
	4000 x 16	31,6	31,6
	4000 x 8	31,7	31,7
	4000 x 4	31,6	31,6
	4000 x 2	31,7	31,7
	4000 x 1	-	-

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