

Sensor Information

Model Name	Sony IMX287
Type	1/2.9" progressive scan CMOS
Shutter	Global Shutter
Resolution	720 x 540 pixels
Scan Area	4.96 mm x 3.72 mm
Pixel Size	6.9 μm x 6.9 μm

Data Quality

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

Dark Noise (σ)	3 e- typical
Saturation	9500 e- typical
Dynamic Range	70 dB typical
SNR	40 dB typical
Quantum efficiency η	47 % @ 465 nm, 58 % @ 536 nm, 53 % @ 631 nm typical

Acquisition

Resolution	720 px x 540 px		
Interface Frame Rate (depends on used interface performance)	Format	Resolution	max. Frame Rate (@ Trigger Mode) ²⁾
	Full Frame	720 x 540	430 fps
	Binning 2x2	360 x 270	430 fps
	Binning 2x1	360 x 540	430 fps
	Binning 1x2	720 x 270	430 fps
Acquisition Frame Rate ¹⁾	434 fps $t_{\text{readout}} = 2.31$ msec (max. Res. Full Frame) @ 10 bit		
	318 fps $t_{\text{readout}} = 3.15$ 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 μsec ... 60 sec | Step Size 1 μsec)
 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
 LUT: Gamma (0.1 ... 2 | available if LUT is enabled)
 Luminance (12 bit)

Color Models
 Mono, Raw Bayer, RGB and BGR

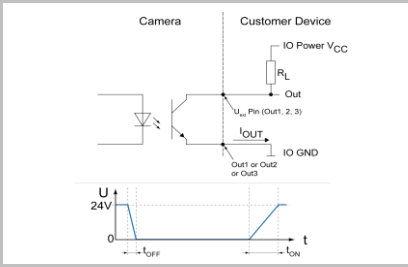
Color Processing
 Integrated color processor for high quality color calculation

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

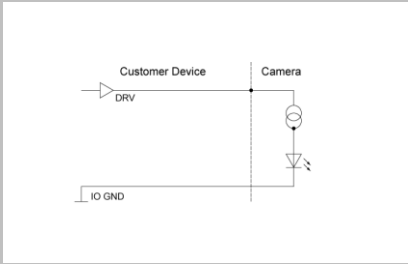
¹⁾ Sensor readout, different from pixel format

²⁾ depends on the used interface

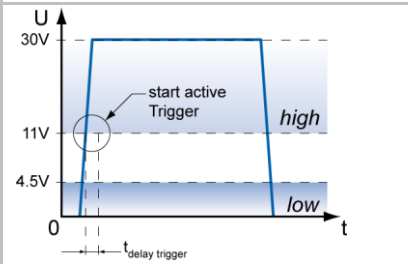
Digital Output: Low Active



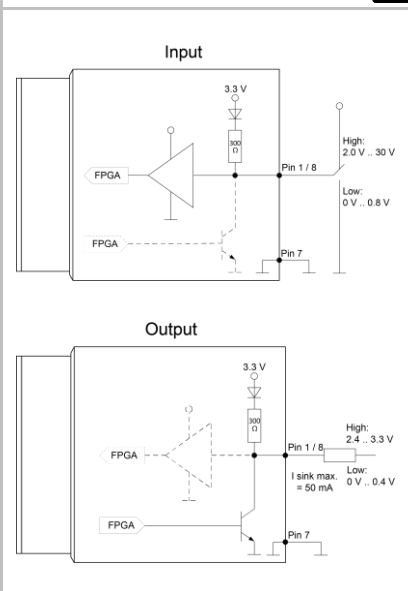
Digital Input



Trigger Mode: Start up time and valid Trigger



GPIO



¹⁾ Sensor readout, different from pixel format

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: ¹⁾ 44,8 µsec @ 10 bit 49 µsec @ 12 bit max. Trigger Delay during treadout: ¹⁾ 43,7 µsec @ 10 bit 49,4 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	356 MB 320 Images (Trigger Mode) / 1 Image (Free Running Mode)
Non-volatile Memory	128 kb

Interface Data

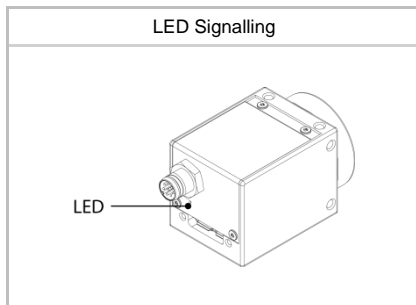
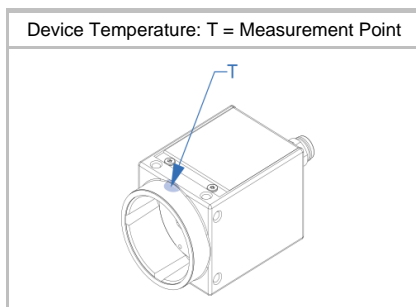
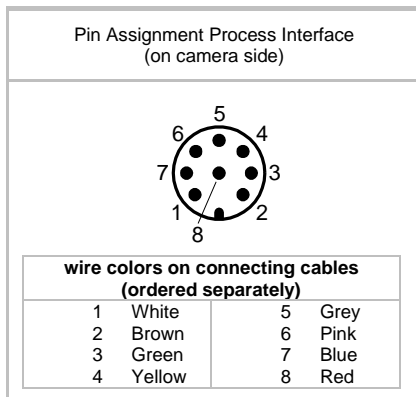
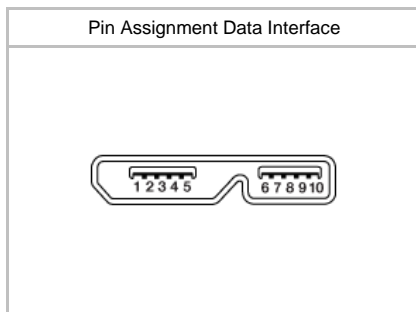
Interface	USB3.0 (5000 Mbits/sec)
USB Vendor ID / Product ID	0x2825 / 0x15A

USB 3 Vision® Features

Events Transmission via Asynchronous Message Channel	DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, Line0..2 FallingEdge, Line0..2 RisingEdge, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped
Frame Counter	up to 2 ³²
Payload Size	0 ... 1166624 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 2 - D- 3 - D+ 4 - ID 5 - GND	6 - MicB_SSTX- 7 - MicB_SSTX+ 8 - GND_DRAIN 9 - MicB_SSRX- 10 - MicB_SSRX+



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



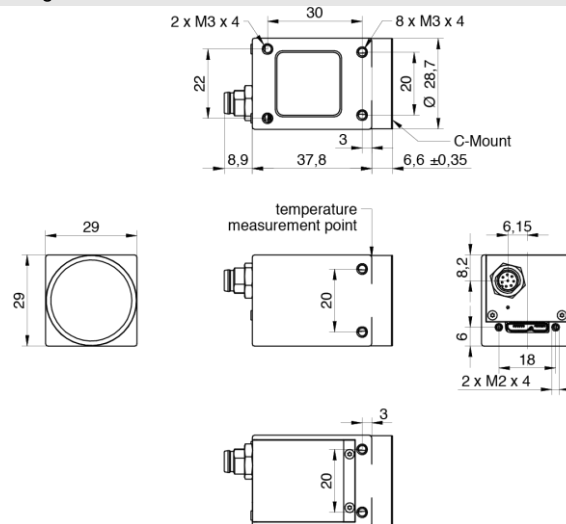
* Note GPIOs: Ground loops are to be avoided and can lead to destruction of the device.

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 50 °C @ Measurement Point or 56 °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. 2.6 W @ 430 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 μ sec
Digital Output	Optocoupler U_{EXT} : 5 ... 30 V DC I_{OUT} : max. 50 mA t_{ON} = typ. 3 μ sec t_{OFF} = typ. 40 μ 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 μ 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	60 years @ T = 45 °C / 39 years @ T = 60 °C T = Measurement Point

GeniCam™ Features

Short Exposure Range	yes, ShortExposureTimeEnable Short Exposure Range 1 μ sec ... 60 sec Default Exposure Range 15 μ sec ... 60 sec
Timer	Timer Selector: Timer Selector: Timer 1 TimerTriggerSource: Line0, SoftwareTrigger, ExposureStart, ExposureEnd, FrameTransferSkipped, TriggerSkipped, Off TimerDelay: 0 μ sec ... 2 sec, Step Size: 1 μ sec TimerDuration: 4 μ sec ... 2 sec, Step Size: 1 μ 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 3.2 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 ²⁾
VGA	640 x 480	479	479
CIF	352 x 288	750	750
QVGA	320 x 240	873	873
QCIF	176 x 144	1300	1300
LineScan	720 x 512	452	452
	720 x 256	828	828
	720 x 128	1415	1415
	720 x 64	2194	2194
	720 x 32	3026	3026
	720 x 16	3735	3735
	720 x 8	4230	4230
	720 x 4	4530	4530
	720 x 2	4697	4697
	720 x 1	-	-

²⁾ depends on the used interface