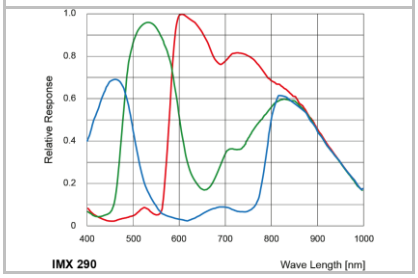
Baumer
Passion for Sensors

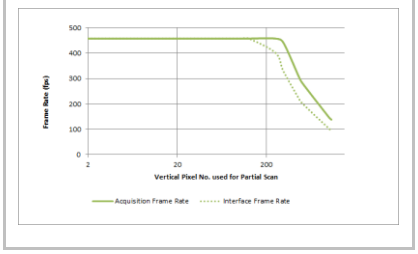
Technical Data
VCXU-22C.R

Digital Color Matrix Camera, 2.1 Megapixel, USB 3.0
Article No. 11184369
Firmware Revision 3.0

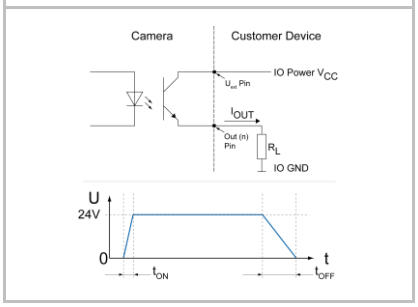
Sensor Graph: Relative Response



Frame Rates / Partial Scan
(Measured at Mono8/BayerRG8-Format)



Digital Output: High Active



Sensor Information

Model Name	Sony IMX290
Type	1/2.8″ progressive scan CMOS
Shutter	Rolling Shutter, Global Reset Shutter
Resolution	1920 x 1080 pixels
Scan Area	5.56 mm x 3.13 mm
Pixel Size	2.9 µm x 2.9 µm

Data Quality

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

Dark Noise (σ)	3 e- typical
Saturation	14000 e- typical
Dynamic Range	71 dB typical
SNR	41 dB typical
Quantum efficiency η	60 % @ 465 nm, 67 @ 536 nm, 61 % @ 631 nm typical

Acquisition

Resolution	1920 px x 1080 px		
Interface Frame Rate (depends on used interface performance)	Format	Resolution	max. Frame Rate (@ Trigger Mode) [2]
	Full Frame	1920 x 1080	138 fps
	Binning 2x2	960 x 540	138 fps
	Binning 2x1	960 x 1080	138 fps
	Binning 1x2	1920 x 540	138 fps
Acquisition Frame Rate [1]	138 fps | $t_{readout}$ = 7.24 msec (max. Res. Full Frame) @ 10 bit 60 fps | $t_{readout}$ = 16.7 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 Heigth: minimum 4, increment 4		
Adjustable Acquisition Frame Rate	Off or 0.59 … 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		

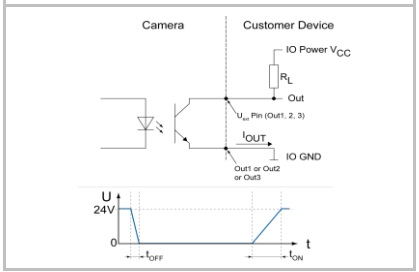
Image Pre-Processing

Analog Controls	Exposure Time (15 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	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

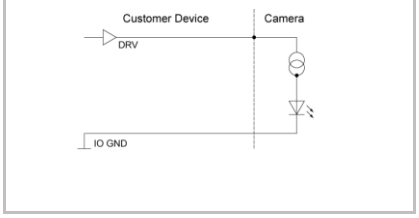
[1] Sensor readout, different from pixel format

[2] depends on the used interface

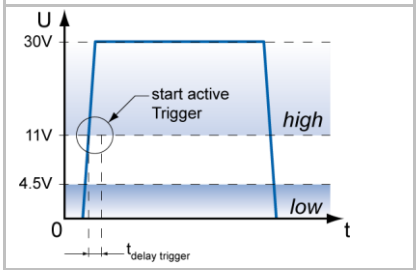
Digital Output: Low Active



Digital Input



Trigger Mode: Start up time and valid Trigger



GPIO

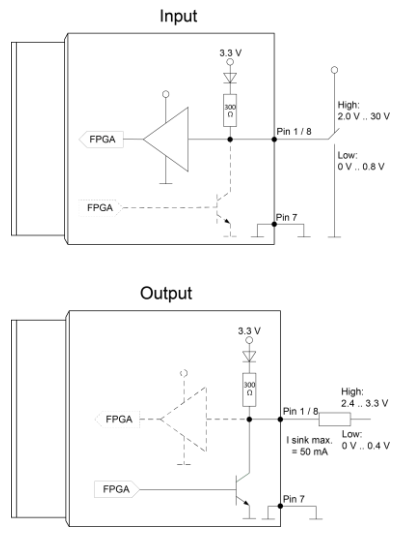


Image Pre-Processing

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 $t_{readout}$: [1] 7224 µsec / 6.5 µsec @ 10 bit (Rolling / Global Reset) 16633 µsec / 14.9 µsec @ 12 bit (Rolling / Global Reset) max. Trigger Delay during $t_{readout}$: [1] -
Trigger Delay	0 ... 2 sec, Tracking and buffering of up to 256 triggers
External Flash Sync	via Exposure Active $t_{delay\ flash} \leq 3$ µsec, $t_{duration} = t_{exposure}$
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 µsec

Memory

Image Buffer	469 MB 79 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 / 0x13E

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 … 6221012 Byte
Timestamp	64 bit, resolution in nsec, increment = 10
USB Vision	v1.0.1

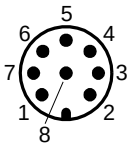
Interfaces and Connectors

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+

[1] Sensor readout, different from pixel format

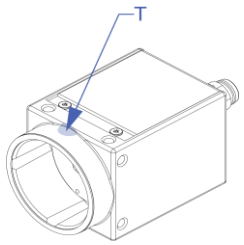
Pin Assignment Data Interface

Pin Assignment Process Interface
(on camera side)

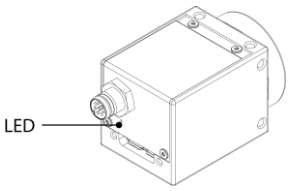


wire colors on connecting cables (ordered separately)			
1	White	5	Grey
2	Brown	6	Pink
3	Green	7	Blue
4	Yellow	8	Red

Device Temperature: T = Measurement Point



LED Signalling



Interfaces and Connectors

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

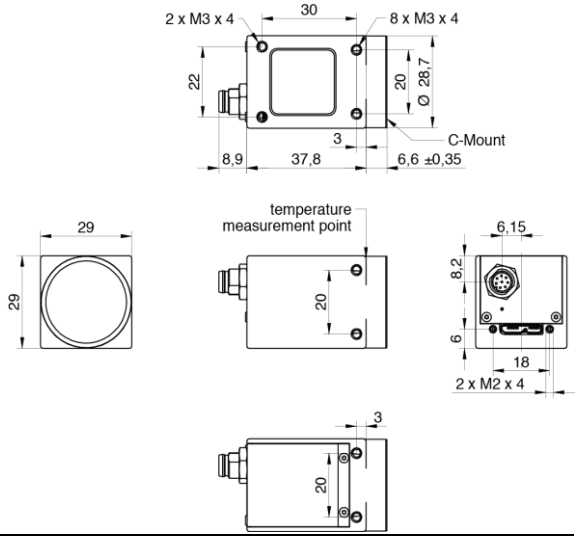
Caution ⚠ * Note GPIOs: Ground loops are to be avoided and can lead to destruction of the device.

Optical Data

Lens Mount	C-Mount
Optical Filter	IR cut filter

Mechanical Data

Housing	Zinc die casting, baked varnish (until 02-2020 nickel-chrome-plated)
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 Ambient temperature above 35 °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

*) the maximum temperature for Sony sensor characteristics (sensor performance) are guaranteed up to 51°C @ Measurement Point or 57°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. 2.8 W @ 138 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 µsec
Digital Output	Optocoupler U_{EXT}: 5 … 30 V DC I_{OUT}: max. 50 mA t_{ON} = typ. 3 µsec t_{OFF} = typ. 40 µsec
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 µsec
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	64 years @ T = 45 °C / 42 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 µsec … 2 sec, Step Size: 1 µsec TimerDuration: 4 µsec … 2 sec, Step Size: 1 µsec
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 16.7 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	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]
Full HD	1920 x 1080	138,0	138,0
SXGA	1280 x 1024	145,4	145,4
HD720	1280 x 720	203,8	203,8
XGA	1024 x 768	191,6	191,6
SVGA	800 x 600	242,2	242,2
VGA	640 x 480	298,4	298,4
CIF	352 x 288	457,8	457,8
QVGA	320 x 240	457,9	457,8
QCIF	176 x 144	457,9	457,8
LineScan	1920 x 1024	145,4	145,4
	1920 x 512	281,1	281,1
	1920 x 256	457,7	457,7
	1920 x 128	457,9	457,8
	1920 x 64	457,8	457,8
	1920 x 32	457,8	457,8
	1920 x 16	457,9	457,8
	1920 x 8	457,8	457,8
	1920 x 4	457,8	457,8
	1920 x 2	-	-
	1920 x 1	-	-

[2] depends on the used interface