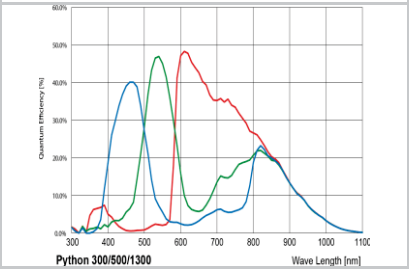
Baumer
Passion for Sensors

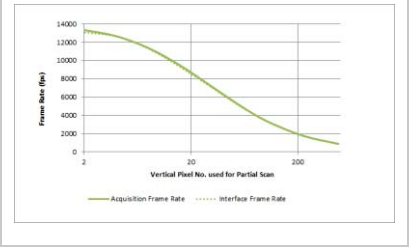
Technical Data
VCXU-02C

Digital Color Matrix Camera, USB 3.0
Article No. 11165913
Firmware Revision 2.0

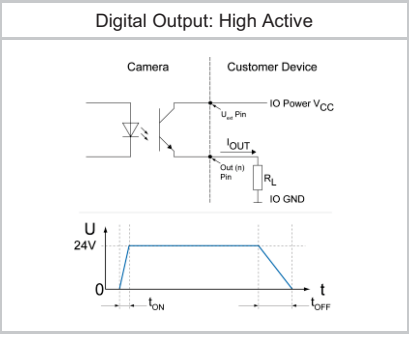
Sensor Graph: Relative Response



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



Digital Output: High Active



[1] Sensor readout, different from pixel format

[2] depends on the used interface

GiGE VISION GEN<i>CAM CE RoHS REACh compliant KC

Sensor Information

Model Name	ON Semiconductor Python 300
Type	1/4″ progressive scan CMOS
Shutter	Global Shutter
Resolution	640 x 480 pixels
Scan Area	3.07 mm x 2.30 mm
Pixel Size	4.8 µm x 4.8 µm

Data Quality

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

Dark Noise (σ)	10 e- typical
Saturation	7000 e- typical
Dynamic Range	56.5 dB typical
SNR	38.5 dB typical
Quantum efficiency η	40 % @ 465 nm, 43 % @ 536 nm, 46 % @ 631 nm typical

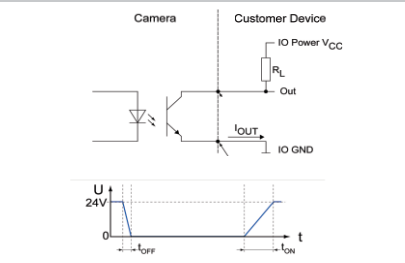
Acquisition

Resolution	640 px x 480 px		
Interface Frame Rate (depends on used interface performance)	Format	Resolution	max. Frame Rate (@ Trigger Mode) [2]
	Full Frame	640 x 480	891 fps
	Binning 2x2	320 x 240	891 fps
	Binning 2x1	320 x 480	891 fps
	Binning 1x2	640 x 240	891 fps
Acquisition Frame Rate [1]	892 fps | $t_{readout}$ = 1.12 msec (max. Res. Full Frame) @ 10 bit		
Pixel Formats	BayerRG8, BayerRG10 Mono8, Mono10, RGB8, BGR8		
Partial Scan	True Partial Scan with increasing Frame Rate on X and Y direction, Region of Interest (ROI) arbitrary Width: minimum 24, increment 8 Heigth: minimum 4, increment 4		
Adjustable Acquisition Frame Rate	Off or 0.01 … 13513 Hz		
Acquisition Mode	Continuous, Single Frame and Multi Frame		
Acquisition Status	AcquisitionActive, AcquisitionTrigger Wait		
Exposure Mode	Timed		
Shutter Mode	-		
Readout Mode	Overlapped, Sequential		

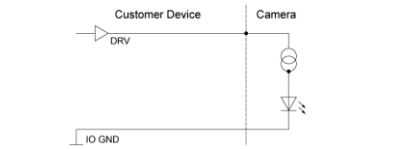
Image Pre-Processing

Analog Controls	Exposure Time (20 µsec … 1 sec | Step Size 1 µsec) Gain (0…12 dB), Offset (0 ... 63 LSB | 10 bit)
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 Adjustment	Manual White Balance Automatic White Balance (Once or Continuous)
Color Enhancement	Color Transformation to sRGB color space by optimized Matrix for 6500 K, 3000 K Lightsource or User defined Matrix
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	yes

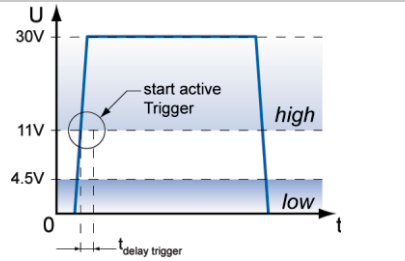
Digital Output: Low Active



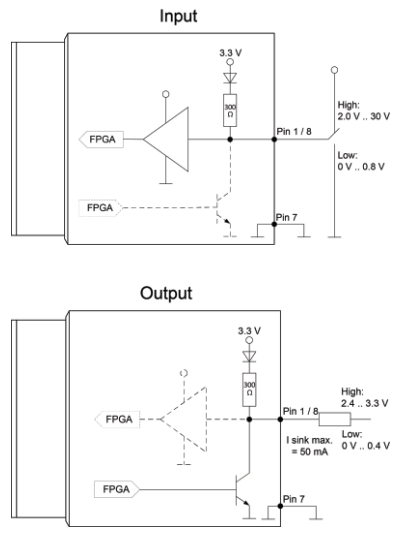
Digital Input



Trigger Mode: Start up time and valid Trigger



GPIO



Process Synchronization

Trigger Mode	Off (Free Running), On (Trigger)
Trigger Overlap Type	Readout
Trigger Sources	Hardware (Line0,1,2), Software, All or Off fixed Trigger Delay out of $t_{readout}$: [1] 3 µsec @ 10 bit max. Trigger Delay during $t_{readout}$: [1] 7 µsec @ 10 bit
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, $t_{duration} = t_{exposure}$

Digital I/Os

Lines Output Sources	Input: Line 0, Output: Line3, GPIO: Line 1, Line 2 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	436 MB 496 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 / 0x136

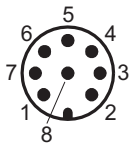
USB 3 Vision® Features

Events Transmission via Asynchronous Message Channel	DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTranferSkipped, Line0..3 FallingEdge, Line0..3 RisingEdge, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped
Frame Counter	up to 2^{32}
Payload Size	0 … 921800 Byte
Timestamp	64 bit, resolution in nsec, increment = 10
USB Vision	v1.0.1

[1] Sensor readout, different from pixel format

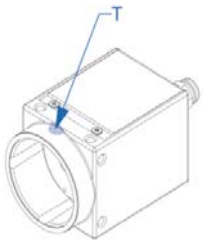
Pin Assignment Data Interface

Pin Assignment Process Interface
(on camera side)

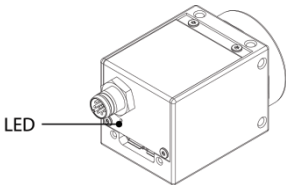


wire colors on connecting cables (ordered separately)			
1	White	5	Grey
2	Brown	6	Pink
3	Green	7	Blue
4	Yellow	8	Red

Device Temperature: T = Measurement Point



LED Signalling



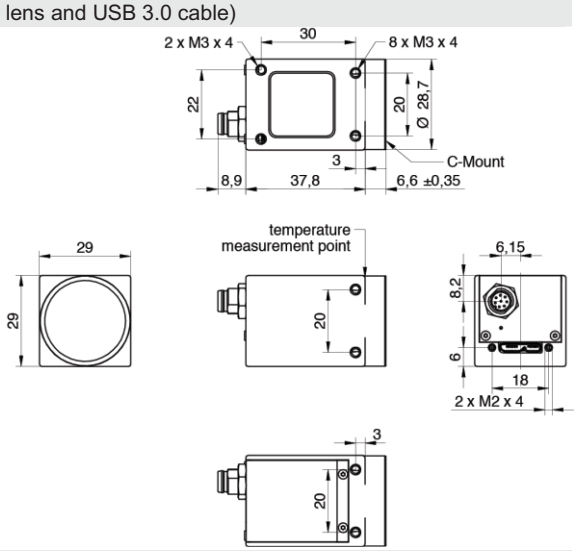
Interfaces and Connectors

Data and Power Interface	USB 3.0 USB 2.0 Connector:	Transfer Rate 5000 Mbits/sec Transfer Rate 480 Mbits/sec 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 MicB_SSRX- MicB_SSRX+
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 OUT1 6 - OUT1 (Line3) 7 - GND GPIO 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)
Dimensions	
Weight	90 g

Environmental Data

Storage Temperature	-10 °C … + 70 °C
Operating Temperature	+5 °C … +65 °C @ T = Measurement Point or +5 °C … +75 °C @ internal Temperature Sensor Ambient temperature above 35 °C requires heat dissipation measures.
Int. Temperature Sensor	yes, accuracy: ±1 °C (typ) 0 °C ... +85 °C
Humidity	10 % … 90 % non-condensing

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. 2.5 W @ 891 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, KC
KC Registration No. / Date	MSIP-REI-BkR-VCXU13M / 18.04.2017
MTBF	68 years @ T = 45 °C / 44 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 and Off Counter Reset Source: Counter1End, Counter2End, Line0 and Off
Sequencer	Sequencer Characteristics: up to 128 sets, up to 4 possible pathes for triggered set transitions, 6 trigger sources: Counter1End, Counter2End, ExposureActive, Line0, 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 1.2 msec
Chunk Data	yes, Chunk Selector: Binning, Black Level, DeviceTemperature, ExposureTime, FrameID, Gain, Height, Image, ImageControl, LineStatusAll
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
SFNC Version	v2.3

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	ON
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 or BayerRG8

	Resolution	max. fps acquisition	max. fps interface [2]
VGA	640 x 480	891	891
CIF	352 x 288	2359	2359
QCIF	176 x 144	4304	4304
LineScan	640 x 256	1584	1581
	640 x 128	2900	2900
	640 x 64	4653	4653
	640 x 32	8250	8220
	640 x 16	9418	9313
	640 x 8	11342	11009
	640 x 4	12627	11296
	640 x 2	13299	10917
	640 x 1	-	-

[2] depends on the used interface