

Sensor Information

Model Name	ON Semiconductor Python 5000
Type	1" progressive scan CMOS
Shutter	Global Shutter
Resolution	2592 x 2048 pixels
Scan Area	12.44 mm x 9.83 mm
Pixel Size	4.8 μm x 4.8 μm

Data Quality

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

Dark Noise (σ)	11 e- typical
Saturation	8400 e- typical
Dynamic Range	57 dB typical
SNR	39 dB typical
Quantum efficiency η	36 % @ 465 nm, 41 % @ 536 nm, 45 % @ 631 nm typical

Acquisition

Resolution	2592 px x 2048 px		
Interface Frame Rate	Format	Resolution	max. Frame Rate
(depends on used interface performance)			(@ Trigger Mode) ²⁾
	Full Frame	2592 x 2048	23 fps
	Binning 2x2	1296 x 1024	28 fps
	Binning 2x1	1296 x 2048	28 fps
	Binning 1x2	2592 x 1024	28 fps

Acquisition Frame Rate ¹⁾ 28 fps | t_{readout} = 35.3 msec (max. Res. Full Frame) @ 10 bit (Burst Mode)

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 48, increment 16
Height: minimum 2, increment 2

Adjustable Acquisition Frame Rate Off or Off or 0.01 ... 65535 Hz
 Acquisition Mode Continuous, Single Frame and Multi Frame
 Acquisition Status AcquisitionActive, AcquisitionTrigger Wait
 Exposure Mode Timed
 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)
 Auto Function ExposureAuto and GainAuto
with BrightnessAutoPriority based on BrightnessAuto ROI
BalanceWhiteAuto and ColorTransformationAuto based on BalanceWhiteAuto ROI

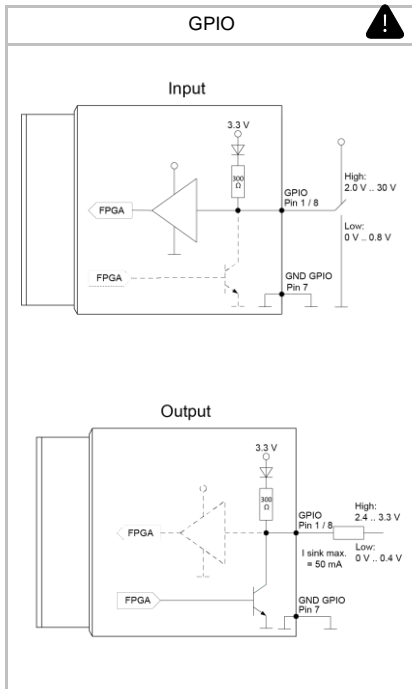
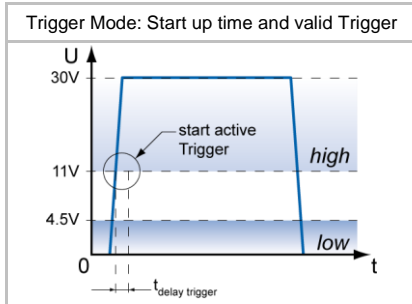
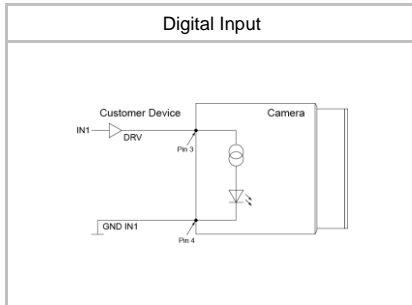
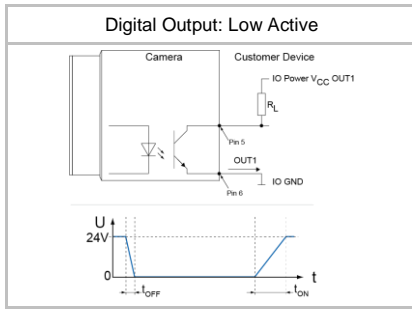
LUT Luminance (12 bit)
 Color Models Mono, Raw Bayer, RGB and BGR
 Color Processing Integrated color processor for high quality color calculation
 Color Adjustment Manual White Balance
Automatic White Balance (Once or Continuous) based on Region of Interest (ROI)

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

Color Tolerance -

¹⁾ Sensor readout, different from pixel format

²⁾ depends on the used interface



¹⁾ Sensor readout, different from pixel format

Image Pre-Processing

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

Process Synchronization

Trigger Mode	Off (Free Running), On (Trigger)
Trigger Overlap Type	Readout
Trigger Sources	Hardware (Line0, 1, 2), Software, Counter 1, 2 End, Action CMD (Action 1), All or Off fixed Trigger Delay out of t _{readout} : ¹⁾ 6 μsec @ 10 bit max. Trigger Delay during t _{readout} : ¹⁾ 40 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} ≤ 3 μsec, t _{duration} = t _{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

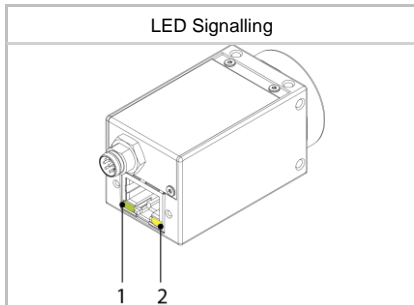
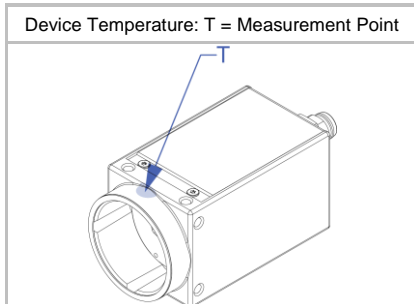
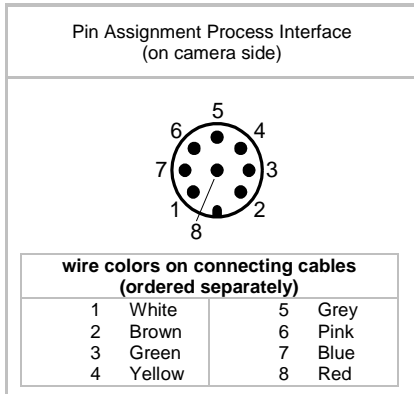
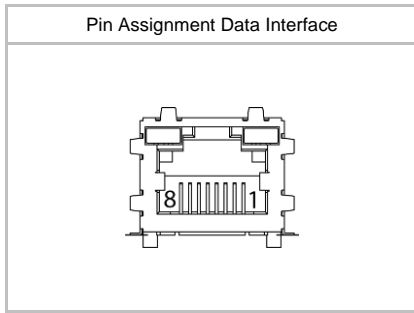
Image Buffer	122 MB 8 Images (Trigger Mode) / 1 Image (Free Running Mode)
Non-volatile Memory	128 kb

Network Interface Data

Interface	Gigabit Ethernet 1000BASE-T 1000 Mbits/sec Fast Ethernet 100 BASE-T 100 Mbits/sec
Ethernet IP Configuration	Persistent IP, DHCP, LLA
Packet Size	576 ... 9000 Byte, Jumbo Frames supported

GigE Vision® Features

Events Transmission via Asynchronous Message Channel	DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, GigE VisionError, GigE VisionHeartbeatTimeout, PrimaryApplicationSwitch, Line0..2 FallingEdge, Line0..2 RisingEdge, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped
Action CMD	yes, Action 1 for Trigger
Frame Counter	up to 2 ³²
Payload Size	0 ... 15925472 Byte
Timestamp	64 bit, resolution in nsec, increment = 8
Packet Delay	0 .. 2 ³² - 1 nsec
Packet Resend	Resend Buffer: 122 MB (8 Images)
GigE Vision	v2.0 (v1.2 backward compatible)



Interfaces and Connectors

Data and Power Interface	Gigabit Ethernet	Transfer Rate	1000 Mbits/sec
	Fast Ethernet	Transfer Rate	100 Mbits/sec
	Connector:	8P8C Modular Jack (RJ45), screw lock type	
Process Interface	Connector:	M8/8-pin (SACC-DSI-M8MS-8CON-M8-L180)	
	Assignment:	1 - MX1+	2 - MX1-
		3 - MX2+	4 - MX3+
		5 - MX3-	6 - MX2-
		7 - MX4+	8 - MX4-
		Assignment:	1 - GPIO (Line2)
		3 - IN1 (Line0)	4 - GND IN1
		5 - Power VCC OUT	6 - OUT1 (Line3)
		7 - GND (Power, GPIO)	8 - GPIO (Line1)

Caution



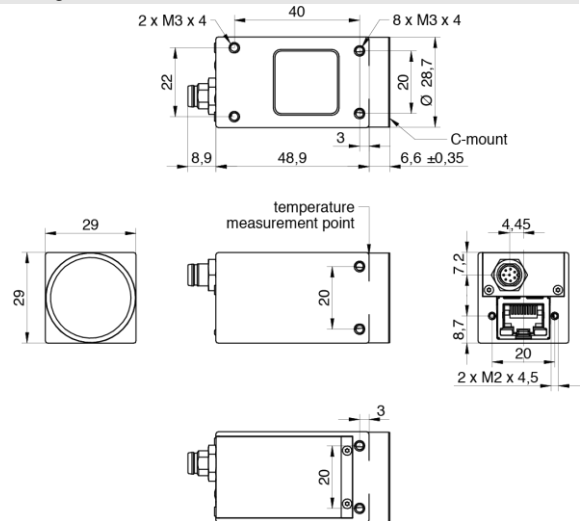
* Note GPIOs: Ground loops are to be avoided and can lead to destruction of the device.

Optical Data

Lens Mount	C-Mount
Optical Filter	IR cut filter

Mechanical Data

Housing	Zinc die casting, baked varnish (until 02-2020 nickel-chrome-plated)
Protection Class	IP40 (with mounted lens and GigE cable)
Weight	120 g
Dimensions	




Environmental Data

Storage Temperature	-10 °C ... +70 °C
Operating Temperature	0 °C ... +65 °C @ T = Measurement Point or 0 °C ... +75 °C @ internal Temperature Sensor Ambient temperature above 30 °C requires heat dissipation measures.
Int. Temperature	yes, accuracy:
Sensor	±2 °C (typ) -40 °C ... 0 °C ±1 °C (typ) 0 °C ... +85 °C
Humidity	10 % ... 90 % non-condensing

LED Signalling

LED	LED 1	Green static	Link ON
		Green flash	RX active
LED 2	LED 2	Yellow static	Error
		Yellow flash	TX active

Electrical Data

Power Supply (ext.)	VCC: 12 ... 24 V DC \pm 20% I: 127 ... 255 mA
Power over Ethernet	Class 2 device VCC: 36 ... 57 V DC I: 75 mA @ 48 VDC
Power Consumption	approx. 3.1 W @ 12VDC and 23 fps approx. 3.6 W @ 48 VDC (PoE) and 23 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, KC, EAC
KC Registration No. / Date	MSIP-REI-BkR-VCXG-53M / 02.05.2017
MTBF	62 years @ T = 45 °C / 40 years @ T = 60 °C T = Measurement Point

GenICam™ Features

Short Exposure Range	-
Timer	Timer Selector: Timer 1 TimerTriggerSource: Line0, SoftwareTrigger, ExposureStart, ExposureEnd, FrameTransferSkipped, TriggerSkipped, Action 1 and 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 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..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 35.3 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 with CustomDataKonfiguration Mode
SFNC Version	v2.4

Factory Settings after Start-Up

Ethernet IP Configuration	
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 (monochrome camera) or BayerRG8 (color camera)

	Resolution	max. fps acquisition	max. fps interface ²⁾
Full HD	1920 x 1080	65	59
SXGA	1280 x 1024	89	89
HD720	1280 x 720	125	125
XGA	1024 x 768	133	133
SVGA	800 x 600	188	188
VGA	640 x 480	235	235
CIF	352 x 288	365	365
QVGA	320 x 240	424	424
QCIF	176 x 144	626	626
LineScan	2592 x 2048	28	23
	2592 x 1024	55	46
	2592 x 512	108	92
	2592 x 256	207	185
	2592 x 128	379	371
	2592 x 64	646	646
	2592 x 32	997	997
	2592 x 16	1370	1370
	2592 x 8	1684	1684
	2592 x 4	1903	1903
	2592 x 2	2035	2035
	2592 x 1	-	-

²⁾ depends on the used interface