

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	8900 e- typical
Dynamic Range	57 dB typical
SNR	39 dB typical
Quantum efficiency η	63 % @ 536 nm, 38 % @ 840 nm, 17 % @ 930 nm typical

Acquisition

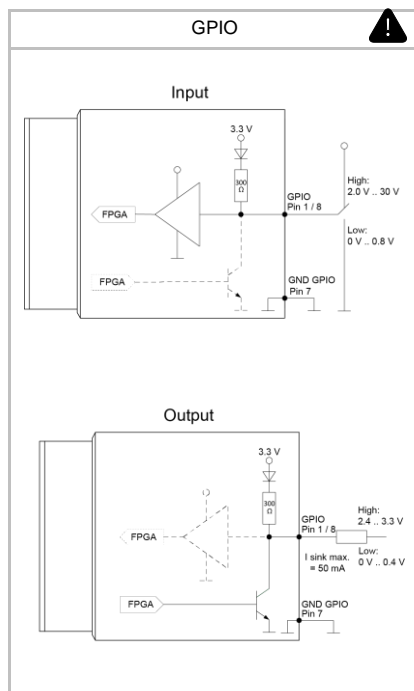
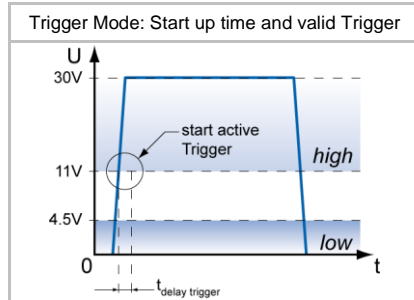
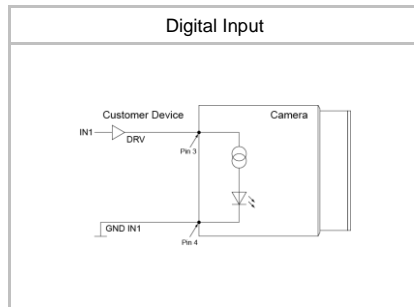
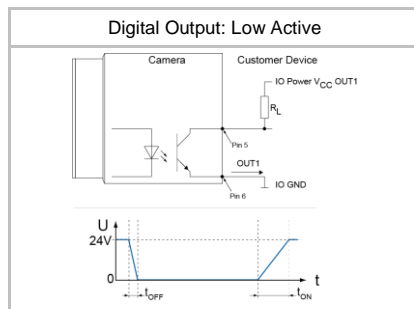
Resolution	2592 px x 2048 px		
Interface Frame Rate	Format	Resolution	max. Frame Rate
(depends on used interface performance)			(@ Trigger Mode) ²⁾
	Full Frame	2592 x 2048	23 fps
	Binning 2x2	1296 x 1024	28 fps
	Binning 2x1	1296 x 2048	28 fps
	Binning 1x2	2592 x 1024	28 fps
Acquisition Frame Rate ¹⁾	28 fps t _{readout} = 35.3 msec (max. Res. Full Frame) @ 10 bit		
(Burst Mode)			
Pixel Formats	Mono8, Mono10		
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 1, increment 1		
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...18 dB), Offset (0 ... 63 LSB 10 bit)
Auto Function	ExposureAuto and GainAuto with BrightnessAutoPriority based on BrightnessAuto ROI
LUT	Luminance (12 bit)
Color Models	Mono
Color Processing	-
Color Adjustment	-
Color Enhancement	-
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 $t_{\text{delay flash}} \leq 3 \mu\text{sec}$, $t_{\text{duration}} = t_{\text{exposure}}$
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

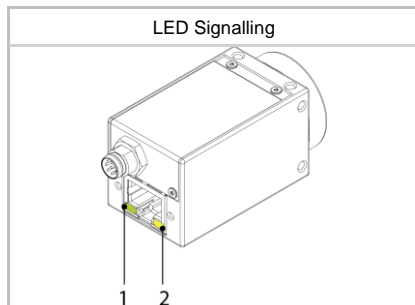
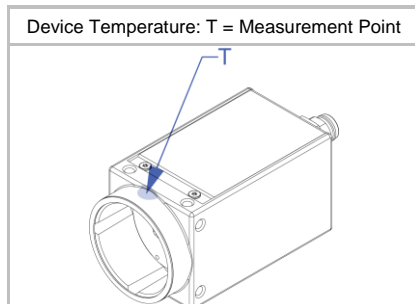
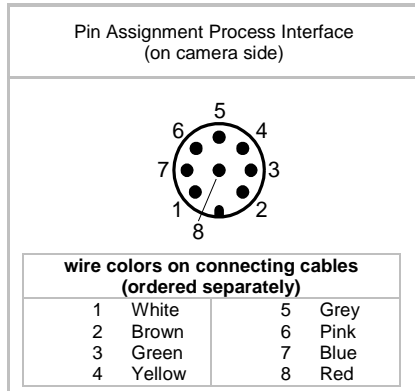
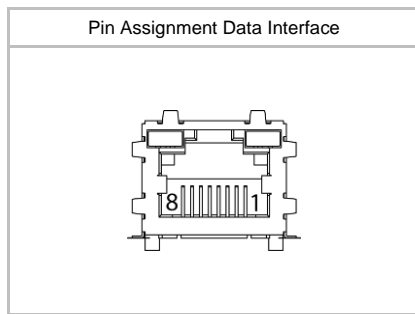
Image Buffer	122 MB 8 Images (Trigger Mode) / 1 Image (Free Running Mode)
Non-volatile Memory	128 kb

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	DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, GigEVisionError, GigEVisionHeartbeatTimeout, 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 ... 10617056 Byte
Timestamp	64 bit, resolution in nsec, increment = 8
Packet Delay	0 .. 2 ³² - 1 nsec
Packet Resend	Resend Buffer: 81 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			
Assignment:	1 - MX1+	2 - MX1-	
	3 - MX2+	4 - MX3+	
Assignment:	5 - MX3-	6 - MX2-	
	7 - MX4+	8 - MX4-	
Process Interface			
Connector: M8/8-pin (SACC-DSI-M8MS-8CON-M8-L180)			
Assignment:	1 - GPIO (Line2)	2 - Power Vcc	
	3 - IN1 (Line0)	4 - GND IN1	
Assignment:	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	-

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 Sensor	yes, accuracy: ±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: 121 ... 243 mA
Power over Ethernet	Class 2 device VCC: 36 ... 57 V DC I: 72 mA @ 48 VDC
Power Consumption	approx. 2.9 W @ 12VDC and 23 fps approx. 3.5 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 Registration No. / Date	-
MTBF	62 years @ T = 45 °C / 40 years @ T = 60 °C T = Measurement Point

GenlCam™ 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
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	Mono8
Partial Scan	Off
Acquisition Frame Rate	Off
Timer/Counter/Sequencer	Off
Defect Pixel Correction	ON
Fixed Pattern Noise	ON
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	65	59
SXGA	1280 x 1024	89	89
HD720	1280 x 720	124	124
XGA	1024 x 768	132	132
SVGA	800 x 600	188	188
VGA	640 x 480	234	234
CIF	352 x 288	365	365
QVGA	320 x 240	424	424
QCIF	176 x 144	625	625
LineScan	2592 x 2048	28	23
	2592 x 1024	55	46
	2592 x 512	108	92
	2592 x 256	207	185
	2592 x 128	378	371
	2592 x 64	645	645
	2592 x 32	997	997
	2592 x 16	1369	1369
	2592 x 8	1683	1683
	2592 x 4	1902	1902
	2592 x 2	2033	2033
	2592 x 1	2106	2106

²⁾ depends on the used interface