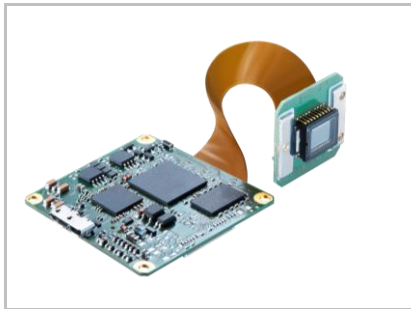


# MXU12

## Technical Data

 Art. No.  
11115787


### Digital Monochrome Matrix Camera Module, USB 3.0

#### Sensor Information

Model Name	SONY ICX445
Type	1/3" progressive scan CCD, EXview HAD technology
Shutter	Global
Native Resolution	1288 x 960 pixels
Scan Area	4.83 mm x 3.60 mm
Pixel Size	3.75 $\mu\text{m}$ x 3.75 $\mu\text{m}$

#### Data Quality

@ 20 °C, gain = 1, exposure time = 32 msec

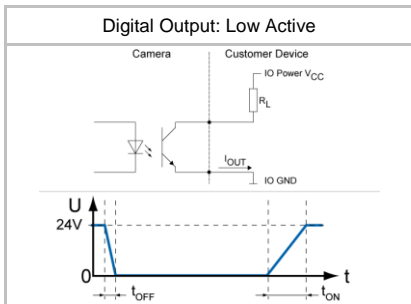
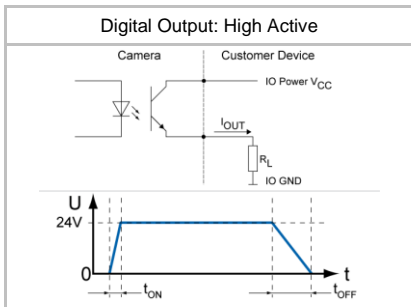
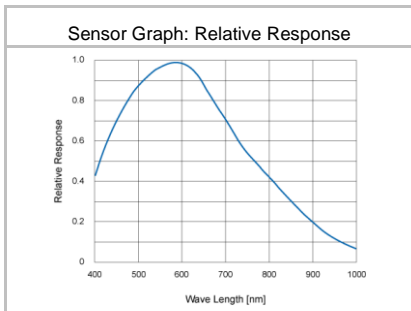
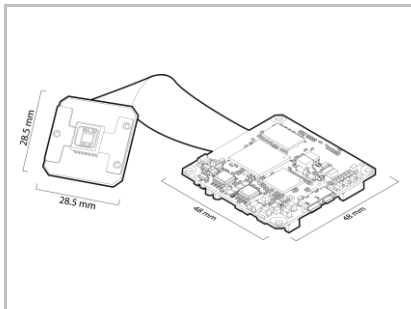
Readout Noise ( $\sigma$ )	0.3 LSB @ 8 bit, 5.0 LSB @ 12 bit (typical)
Dynamic Range	58 dB (typical)

#### Acquisition Formats

Image Formats	Format	Resolution	Frame Rate	$t_{\text{readout}}$
	Full Frame	1288 x 960	42 fps	23.5 msec
Pixel Formats	Mono8, Mono12, Mono12p			
Partial Scan	True Partial Scan, Region of Interest (ROI) arbitrary			

#### Image Pre-Processing

Analog Controls	Exposure Time (4 $\mu\text{sec}$ ... 60 sec   Step Size 1 $\mu\text{sec}$ ) Gain (0 ... 29,5 dB), Offset (0 ... 1023 LSB   14 bit)
Gamma Correction	Gamma (0.1 ... 2   available if LUT is enabled)
LUT	Luminance (12 bit)
Color Models	Mono
Color Tolerance	Only on Color Cameras
Color Processing	Only on Color Cameras
Color Adjustment	Only on Color Cameras
Binning Horizontal	1 or 2
Binning Vertical	1 or 2
Image Flipping	Horizontal
Defect Pixel Correction	via Defect Pixel List with up to 511 Pixel Coordinates



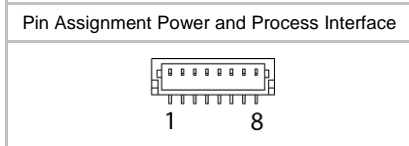
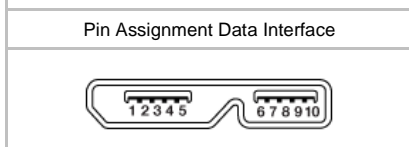
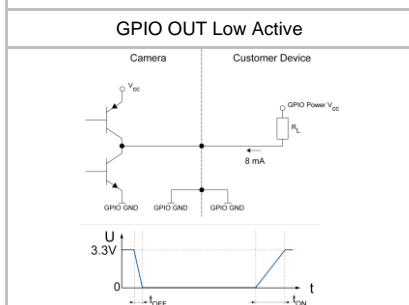
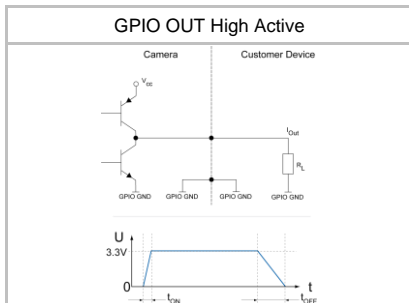
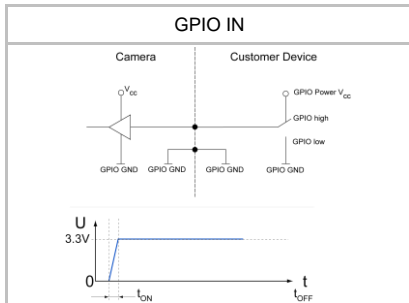
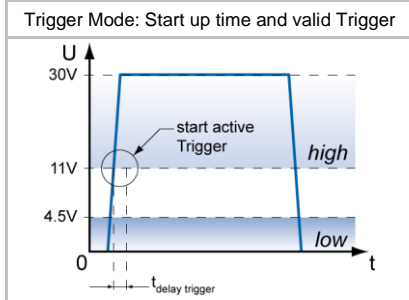
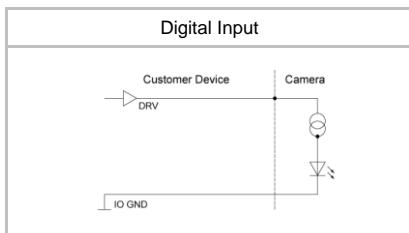
#### Process Synchronization

Modes	Free Running, Trigger
Free Running	Continuous or Adjustable Acquisition Frame Rate <sup>1</sup> (0 ... 286 Hz)
Trigger Sources	Hardware, Software, All or Off
Trigger Delay	0 ... 2 sec, Tracking and buffering of up to 256 triggers
Sequencer Characteristics	up to 128 sets of parameters, up to 65536 loop passes, up to 65536 repetitions of sets of parameters, up to 65536 images per trigger event
Sequencer Parameters	Exposure Time, Gain Factor, Output Line, ROI Offset x, ROI Offset y
External Flash Sync	via Exposure Active $t_{\text{delay flash}} \leq 3 \mu\text{sec}$ , $t_{\text{duration}} = t_{\text{exposure}}$

#### Digital I/Os

Lines	Input: Line 0, Output: Line3, GPIO: Line 1, Line 2
Circuit Times	Digital Output: $t_{\text{ON}} = \text{typ. } 3 \mu\text{sec}$ $t_{\text{OFF}} = \text{typ. } 40 \mu\text{sec}$ GPIO: $t_{\text{ON}} = \text{typ. } 1.6 \text{ nsec}$ $t_{\text{OFF}} = \text{typ. } 3 \text{ nsec}$
Output Sources	Off, ExposureActive, Line 0, Timer1 ... 3, ReadoutActive, User0 ... 2, TriggerReady, TriggerOverlapped, TriggerSkipped, Sequencer Output 0 ... 2
Line Debouncer	Low and high signal separately selectable Debouncing Time 0 ... 5 msec, Step Size: 1 $\mu\text{sec}$

<sup>1</sup> Max. Acquisition Frame Rate can be achieved by using the following camera settings: min. Exposure + max. Binning + ROI | min. Size Y + Mono8



### Interfaces and Connectors

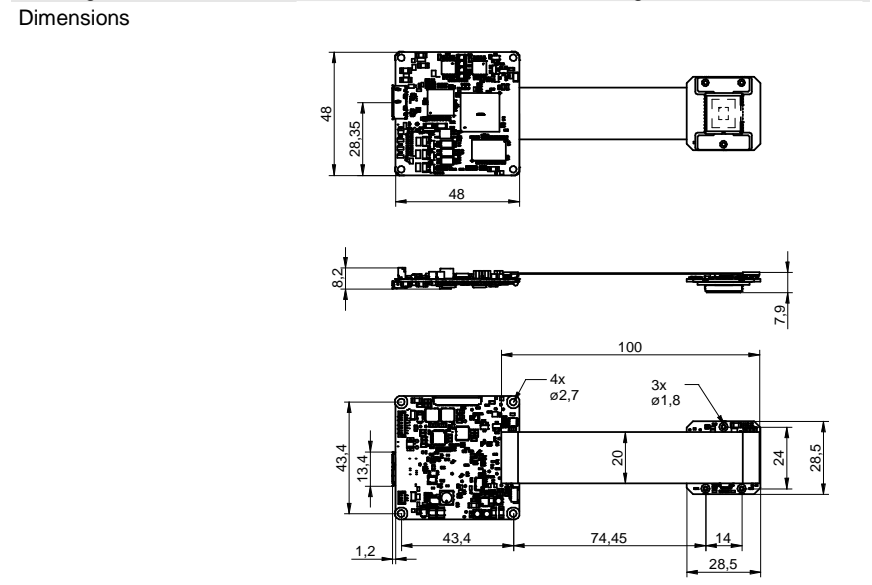
Data Interface	USB 3.0	Transfer Rate	5000 Mbits/sec
	Connector:	USB 3.0 Micro B	
Pin Assignment:	1 – VBUS	6 – MicB_SSTX-	
	2 – D-	7 – MicB_SSTX+	
	3 – D+	8 – GND_DRAIN	
	4 – ID	9 – MicB_SSRX-	
	5 – GND	10 – MicB_SSRX+	

Process Interface	Connector:	JST BM08B-SRSS-TB	
	Assignment:	1 – Shielding	5 – GPIO1*
		2 – IN1	6 – GPIO2*
		3 – IO GND	7 – IO Power VCC
		4 – OUT 1	8 – GPIO_GND

**Caution** \* The GPIO's are configured as input by default camera settings. They must be connected to GPIO\_GND if not used or not configured as output.

### Mechanical Data

Housing	Board Level Module without Housing
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Weight	23 g (without Optics Adapter)
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### Optical Data

Lens Mount	C-Mount (Adapter), S-Mount (Adapter)
Optical Filter	Dust Protection Glass

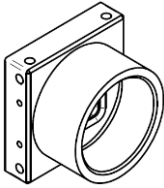
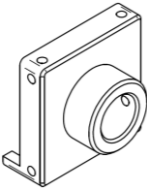
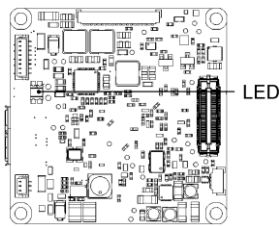
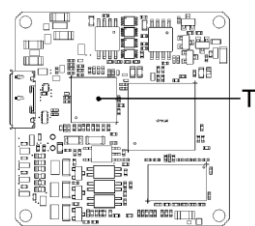
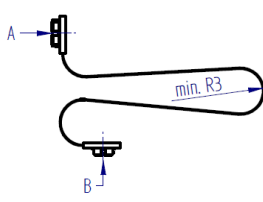

### Electrical Data

Power Supply	via USB3.0 interface	
Power Consumption	approx. 2.9 W @ 42 fps	
Digital Input	$U_{IN(low)}$	0.0 ... 4.5 VDC
	$U_{IN(high)}$	11.0 ... 30.0 VDC
	$I_{IN}$	6.0 ... 10 mA
	min. Impulse Length:	2.0 $\mu$ sec
	Trigger Delay out of $t_{readout}$ :	1.0 $\mu$ sec
max. Trigger Delay during $t_{readout}$ :	25.0 $\mu$ sec	

Digital Output	IO Power $V_{CC}$ :	5 ... 30 V DC
	$I_{OUT}$ :	max. 50 mA

GPIO	GPIO Power $V_{CC}$ :	3.3 V DC*
	$I_{OUT}$ :	max. 8 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.

<p>C-Mount Adapter Kit (optional)</p>  <p>Art. No. 11097369 (mono) Art. No. 11097380 (color)</p>
<p>S-Mount Adapter Kit (optional)</p>  <p>Art. No. 11117913 (mono) Art. No. 11117915 (color)</p>
<p>LED Signalling</p> 
<p>Device Temperature: Measurement Points</p> 
<p>Flexprint Cable</p>  <p>Length from A to B = 94 mm</p>
<p>Conformity</p>  <p>RoHS REACH compliant</p>

### LED Signalling

LED	Green	USB3.0
	Green flash	Receiving
	Yellow	USB2.0

### Environmental Data

Storage Temperature	-10 °C bis +70 °C
Operating Temperature	Depends on the thermal encapsulation
Device Temperature	T <sub>max</sub> = 80 °C @ Measurement Point
Humidity	10 % ... 90 % non-condensing

### Interface Data

Interface	USB3.0	5000 Mbits/sec
Image Buffer	16 Images	
USB Vendor ID / Product ID	0x2825 / 0x0102	

### USB3 Vision® Features

Events Transmission via Asynchronous Message Channel	EventLost, EventDiscarded, Line0RisingEdge, Line0FallingEdge, Line1RisingEdge, Line1FallingEdge, Line2RisingEdge, Line2FallingEdge, Line3RisingEdge, Line3FallingEdge, ExposureStart, ExposureEnd, FrameStart, FrameEnd, TriggerReady, TriggerOverlapped, TriggerSkipped
Frame Counter	up to 2 <sup>32</sup>
Payload Size	0 ... 3.709.712 Byte
Timestamp	64 bit

### GeniCam™ Features

Timer	Timer Selector: Timer 1 ... 3 TimerTriggerSource: Line0, SoftwareTrigger, CommandTrigger, ExposureStart, ExposureEnd, FrameStart, FrameEnd, TriggerSkipped, Off TimerDelay: 0 µsec ... 2 sec, Step Size: 1 µsec TimerDuration: 10 µsec ... 2 sec, Step Size: 1 µsec
User Sets	Factory Settings: UserSet0 (read only) Freely Programmable: UserSet1, UserSet2, UserSet3 Parameters: any user definable Parameter
Acquisition Abort	Delay up to 23.5 msec

### Factory Settings after Start-Up

Operation Mode	Free Running
Analog Controls	Exposure Time: 4 msec, Gain: 0 dB, Offset: 0
Pixel Format	Mono8
Partial Scan	Off
Acquisition Frame Rate	Off
Timer	Off
Defect Pixel Correction	On
Digital Input	Line0, invert = false, trigger source = All
Digital Output	Line3, invert = false, line source = Off