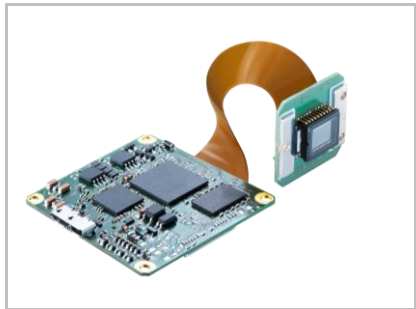




MXU12c

Technical Data Art. No.
11115788



Digital Color 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 μm x 3.75 μm |

Data Quality

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

| | |
|----------------------------|---------------------------------------------|
| Readout Noise (σ) | 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_{readout} |
|---------------|----------------------------------------------------------------------------------|------------|------------|----------------------|
| | Full Frame | 1288 x 960 | 42 fps | 23.5 msec |
| Pixel Formats | Mono8, BayerRG8, BayerRG12, RGB8, BGR8, YUV411_8_UYYVYY, YUV422_8_UYVY, YUV8_UYV | | | |
| Partial Scan | True Partial Scan, Region of Interest (ROI) arbitrary | | | |

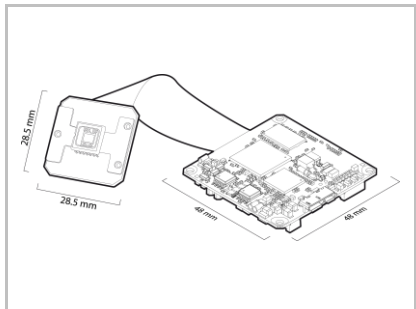
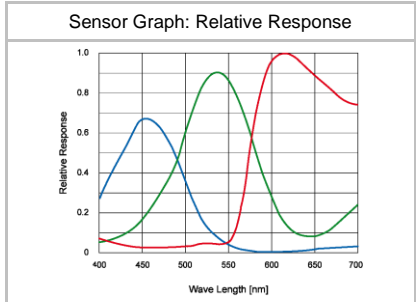


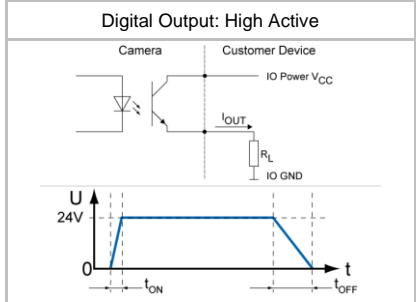
Image Pre-Processing

| | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Analog Controls | Exposure Time (4 μsec ... 60 sec Step Size 1 μsec) 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 | RGB, YUV, Mono |
| Color Processing | Integrated color processor for high quality color calculation |
| Color Adjustment | White Balance (manual & one push) |
| Binning Horizontal | 1 or 2 (color binning) |
| Binning Vertical | 1 or 2 (color binning) |
| Image Flipping | Horizontal |
| Defect Pixel Correction | via Defect Pixel List with up to 511 Pixel Coordinates |



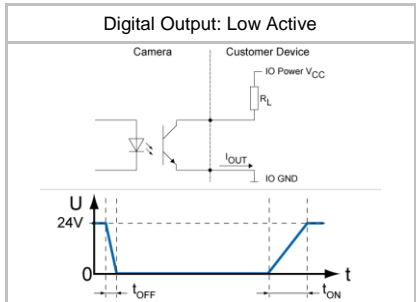
Process Synchronization

| | |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Modes | Free Running, Trigger |
| Free Running | Continuous or Adjustable Acquisition Frame Rate ¹ (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

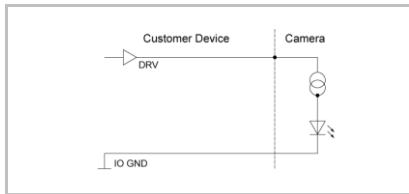
| | |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lines | Input: Line 0, Output: Line3, GPIO: Line 1, Line 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 μsec |



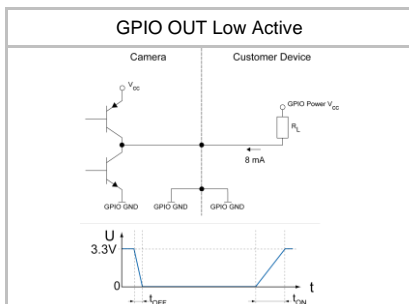
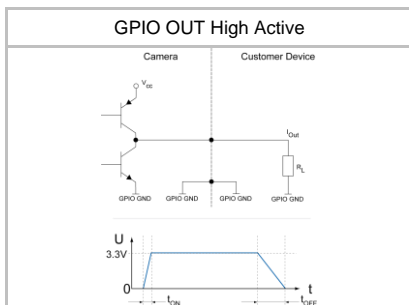
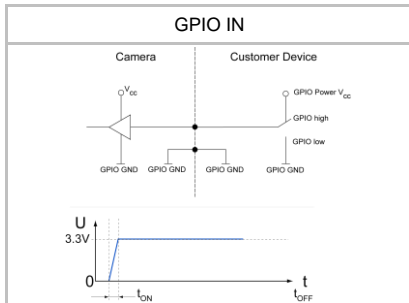
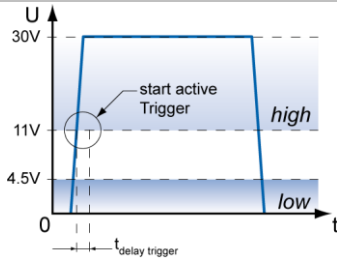
Digital Input

Interfaces and Connectors

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



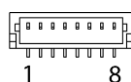
Trigger Mode: Start up time and valid Trigger



Pin Assignment Data Interface



Pin Assignment Power and Process Interface



C-Mount Adapter Kit (optional)

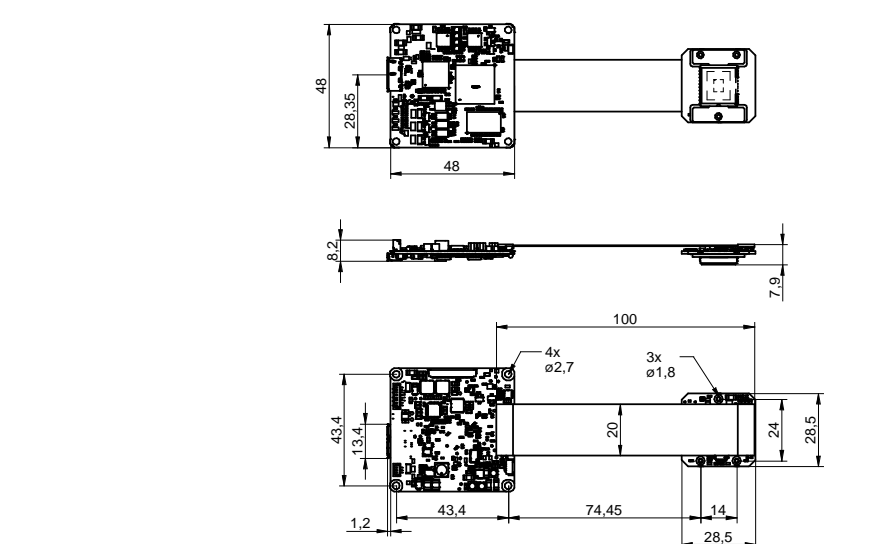
| | | |
|-----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Interface | 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 |
|----------------|------------------------------------|



| | |
|---------------|-------------------------------|
| Weight | 23 g (without Optics Adapter) |
|---------------|-------------------------------|

Optical Data

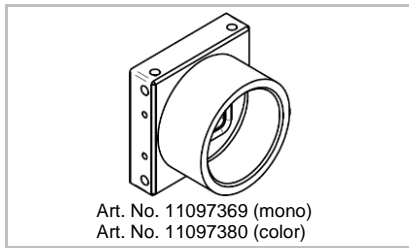
| | |
|----------------|--------------------------------------|
| Lens Mount | C-Mount (Adapter), S-Mount (Adapter) |
| Optical Filter | Dust Protection Glass |

Electrical Data

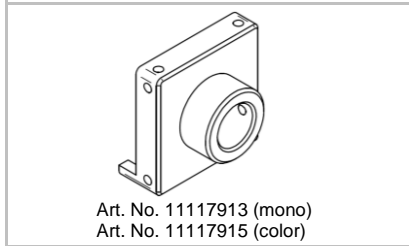
| | |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power Supply | via USB3.0 interface |
| Power 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 µsec Trigger Delay out of treadout: 1.0 µsec max. Trigger Delay during treadout: 25.0 µsec |
| 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.

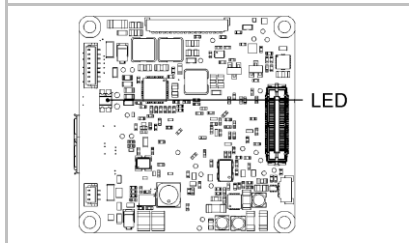
LED Signalling



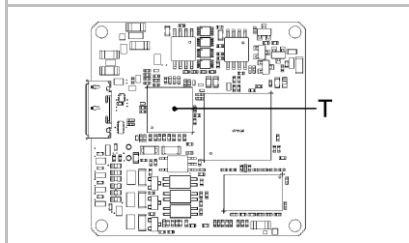
S-Mount Adapter Kit (optional)



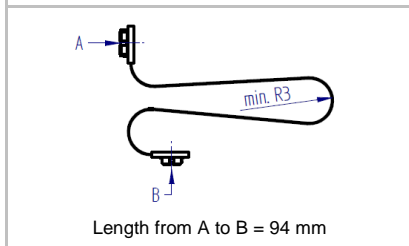
LED Signalling



Device Temperature: Measurement Points



Flexprint Cable



Conformity



| | | |
|-----|-------------|-----------|
| 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 | $T_{max} = 80\text{ °C}$ @ 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 / 0x0103 | |

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 ³² |
| 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 | BayerRG8 |
| 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 |