## Sensor Information

| | |
|---|---|
| Model Name | Sony IMX250MZR |
| Type | 2/3″ progressive scan CMOS |
| Shutter | Global Shutter |
| Resolution | 2448 x 2048 pixels |
| Scan Area | 8.44 mm x 7.06 mm |
| Pixel Size | 3.45 µm x 3.45 µm |

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

| | |
|---|---|
| Dark Noise ($\sigma$) | 2 e- typical |
| Saturation | 9500 e- typical |
| Dynamic Range | 71 dB typical |
| SNR | 40 dB typical |
| Quantum efficiency η | 25% @ 536 nm typical |

## Acquisition

| | |
|---|---|
| Resolution | 2448 px x 2048 px |

Interface Frame Rate (depends on used interface performance)

| Format | Resolution | max. Frame Rate (@ Trigger Mode) [2] |
|---|---|---|
| Full Frame | 2448 x 2048 | 73 fps |
| Binning 2x2 | 1224 x 1024 | 77 fps |
| Binning 2x1 | 1224 x 2048 | 77 fps |
| Binning 1x2 | 2448 x 1024 | 77 fps |

| | |
|---|---|
| Acquisition Frame Rate [1] | 77 fps \| $t_{readout}$ = 13 msec (max. Res. Full Frame) @ 10 bit<br>68 fps \| $t_{readout}$ = 14.6 msec (max. Res. Full Frame) @ 12 bit<br>77 fps \| $t_{readout}$ = 13 msec (max. Res. Binning 2x2) @ 10 bit<br>68 fps \| $t_{readout}$ = 14.6 msec (max. Res. Binning 2x2) @ 12 bit |
| Pixel Formats | Mono8, Mono10, Mono12, Mono12p |
| Partial Scan | True Partial Scan with increasing Frame Rate on Y direction, Region of Interest (ROI) arbitrary<br><br>Width: minimum 16, increment 16<br>Heigth: minimum 2, increment 2 |
| Adjustable Acquisition Frame Rate | Off or 0.01 … 4016 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 (1 µsec … 60 sec \| Step Size 1 µsec)<br>Gain (0…48 dB), Offset (0 ... 255 LSB \| 12 bit) |
| Gamma Correction | Gamma (0.1 … 2 \| available if LUT is enabled) |
| LUT | Luminance (12 bit) |
| Color Models | Mono |
| Color Processing | - |
| Color Adjustment | - |
| Color Enhancement | - |
| 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 | - |

Sensor Graph: Relative Response



IMX 255MZR-C

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

**Digital Output: Low Active**
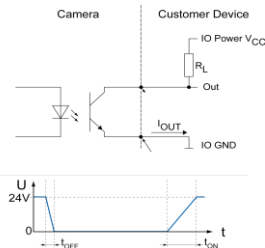
**Digital Input**
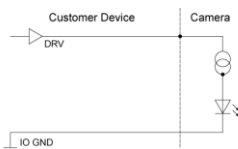
**Trigger Mode: Start up time and valid Trigger**

**GPIO**

Input

Output
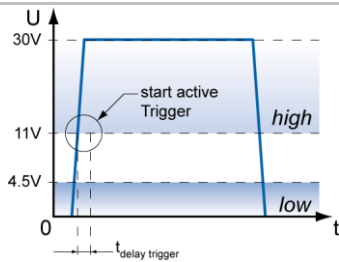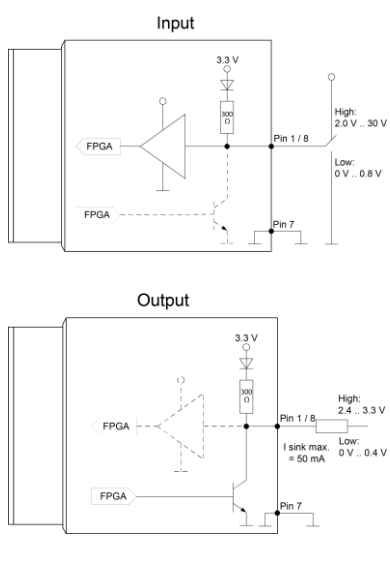
## Process Synchronization

| | |
|---|---|
| Trigger Mode | Off (Free Running), On (Trigger) |
| Trigger Overlap Type | Readout |
| Trigger Sources | Hardware (Line0,1,2), Software, All or Off<br>fixed Trigger Delay out of $t_{readout}$: [1]<br>51.8 µsec @ 10 bit<br>53.9 µsec @ 12 bit<br>max. Trigger Delay during $t_{readout}$: [1]<br>52.8 µsec @ 10 bit<br>55.9 µsec @ 12 bit |
| Trigger Delay | 0 ... 2 sec, Tracking and buffering of up to 256 triggers |
| External Flash Sync | via Exposure Active<br>$t_{delay\ flash} \leq 3$ µsec, $t_{duration} = t_{exposure}$ |

## 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<br>Debouncing Time 0 … 5 msec, Step Size: 1 µsec |

## Memory

| | |
|---|---|
| Image Buffer | 445 MB<br>31 Images (Trigger Mode) / 1 Image (Free Running Mode) |
| Non-volatile Memory | 128 kb |

## Interface Data

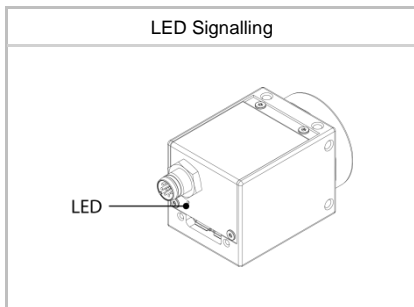| | |
|---|---|
| Interface | USB3.0 (5000 Mbits/sec) |
| USB Vendor ID / Product ID | 0x2825 / 0x12A |

## USB 3 Vision® Features

| | |
|---|---|
| Events<br>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 … 10027208 Byte |
| Timestamp | 64 bit |
| USB Vision | v1.0.1 |

[1] Sensor readout, different from pixel format

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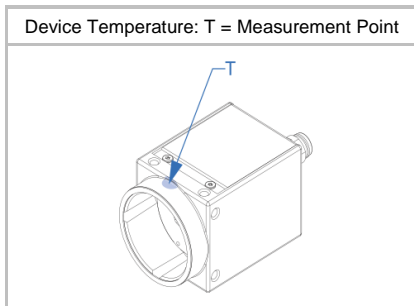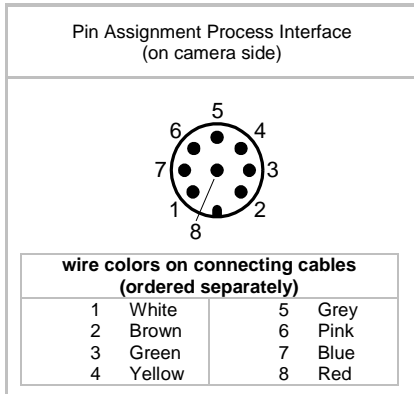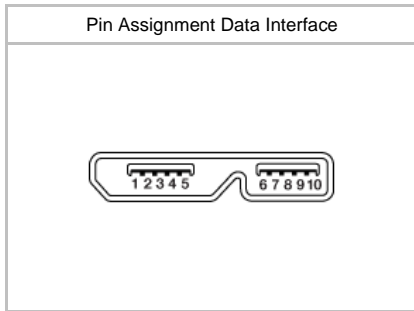
## Interfaces and Connectors

| Data and Power Interface | USB 3.0 | Transfer Rate 5000 Mbits/sec |
|---|---|---|
| | USB 2.0 | Transfer Rate 480 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     MicB_SSRX- |
| | | 5 - GND     MicB_SSRX+ |
| Process Interface | Connector: | M8/8-pin (SACC-DSI-M8MS-8CON-M8-L180) |
| | Assignment: | 1 - GPIO (Line2)    5 - Power VCC |
| | | 2 - not connected    OUT1 |
| | | 3 - IN1 (Line0)    6 - OUT1 (Line3) |
| | | 4 - GND IN1    7 - GND GPIO |
| | |    8 - GPIO (Line1) |

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

Caution ⚠

## Optical Data

| Lens Mount | C-Mount |
|---|---|
| Optical Filter | - |

## Mechanical Data

| Housing | Zinc die casting, nickel-chrome-plated, IP40 (with mounted lens and USB 3.0 cable) |
|---|---|
| Protection Class | IP40 (with mounted lens and USB 3.0 cable) |
| Weight | 90 g |
| Dimensions | |
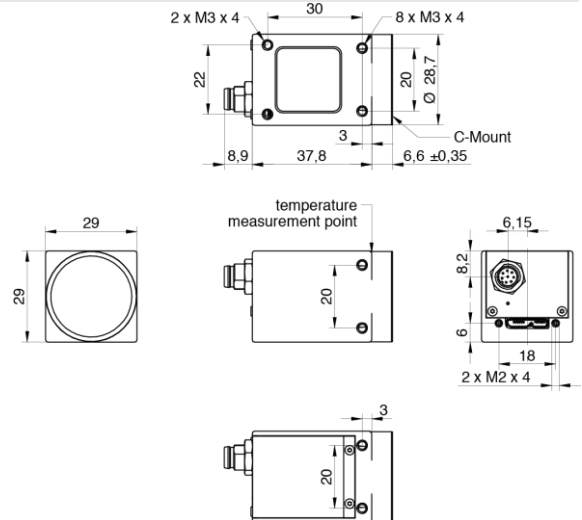


## Environmental Data

| Storage Temperature | -10 °C … + 70 °C |
|---|---|
| Operating Temperature *) | +5 °C … +65 °C @ T = Measurement Point or +5 °C … +72 °C @ internal Temperature Sensor Ambient temperature above 30 °C requires heat dissipation measures. |
| Int. Temperature Sensor | yes, accuracy: ±1 °C (typ) 0 °C ... +85 °C |
| Humidity | 10 % … 90 % non-condensing |

*) the maximum temperature for Sony sensor characteristics (sensor performance) are guaranteed up to 50°C @ Measurement Point or 56°C @ internal temperature sensor

## 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 |

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## Electrical Data

| | |
|---|---|
| Power Supply | bus powered via USB3.0 interface |
| Power Consumption | approx. 3.3 W @ 73 fps<br>(Factory Setting "Default") |
| Digital Input | Optocoupler<br>$U_{IN(low)}$ : 0.0 … 4.5 VDC<br>$U_{IN(high)}$ : 11.0 … 30.0 VDC<br>$I_{IN}$ : 3.0 … 10.0 mA<br>min. Impulse Length: 2.0 µsec |
| Digital Output | Optocoupler<br>$U_{EXT}$:      5 … 30 V DC<br>$I_{OUT}$:      max. 50 mA<br>$t_{ON}$ = typ. 3 µsec          $t_{OFF}$ = typ. 40 µsec |
| GPIO<br>GPIO used as Input: | direct, without optocoupler<br>$U_{IN(low)}$ :  0.0 … 0.8 VDC<br>$U_{IN(high)}$ : 2.0 … 30.0 VDC<br>min. Impulse Length: 2.0 µsec |
| GPIO used as Output:<br><br><br>Caution ⚠ | $U_{Out(low)}$: 0.0 … 0.4 VDC ($I_{sink\ max}$: 50 mA)<br>$U_{Out(high)}$: 2.4 … 3.3VDC ($I_{max}$ : 1 mA)<br>* 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.<br>Ground loops are to be avoided and can lead to destruction of the device. |

## Conformity

| | |
|---|---|
| Conformity | CE, RoHS, REACH |
| KC Registration No. / Date | - / - |
| MTBF | 56 years @ T = 45 °C / 36 years @ T = 60 °C<br>T = Measurement Point |

## GenICam<sup>TM</sup> Features

| | |
|---|---|
| Short Exposure Range | yes, ShortExposureTimeEnable<br>Short Exposure Range 1 µsec … 60 sec<br>Default Exposure Range 15 µsec … 60 sec |
| Timer | Timer Selector: Timer Selector: Timer 1<br>TimerTriggerSource:<br>Line0, SoftwareTrigger, ExposureStart, ExposureEnd, FrameTransferSkipped, TriggerSkipped, Off<br>TimerDelay:    0 µsec … 2 sec, Step Size: 1 µsec<br>TimerDuration: 4 µsec … 2 sec, Step Size: 1 µsec |
| Counter | Counter Selector: Counter 1, Counter 2<br>CounterValue: 0 … 65535<br>Counter Event Source: Counter1End or Counter2End, ExposureActive, FrameTransferSkipped, FrameTrigger, TriggerSkipped and Off<br>Counter Reset Source: Counter1End, Counter2End, Line0 and Off |
| Sequencer | Sequencer Characteristics:<br>up to 128 sets,<br>up to 4 possible pathes for triggered set transitions,<br>6 trigger sources: Counter1End, Counter2End, ExposureActive, Line0, ReadoutActive, Timer1End<br>Sequencer Parameters for Exposure, Gain, Trigger, ROI and Output:<br>ExposureTime, CounterDuration, CounterEventActivation, CounterEventSource, CounterResetSource, ExposureMode, ExposureTime, Gain, Height, OffsetX, OffsetY, TriggerMode, UserOutputValue, UserOutputValueAll, Width |

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## GenICam<sup>TM</sup> Features

| | |
|---|---|
| User Sets | Factory Settings: UserSet0 (read only)<br>Freely Programmable: UserSet1, UserSet2, UserSet3<br>Parameters: any user definable Parameter |
| Acquisition Abort | Delay up to 14.6 msec |
| Chunk Data | yes,<br>Chunk Selector: Binning, Black Level, DeviceTemperature, ExposureTime, FrameID, Gain, Height, Image, ImageControl, LineStatusAll |
| Device Temperature | InHouse<br>Event generation for Normal to High, High to Exceeded and Exceeded to Normal<br>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 | Mono8 |
| Partial Scan | Off |
| Acquisition Frame Rate | Off |
| Timer/Counter/Sequencer | Off |
| Defect Pixel Correction | ON |
| Fixed Pattern Noise 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 or BayerRG8

| | Resolution | max. fps acquisition | max. fps interface [2] |
|---|---|---|---|
| Full HD | 1920 x 1080 | 143 | 143 |
| SXGA | 1280 x 1024 | 150 | 150 |
| XGA | 1024 x 768 | 198 | 198 |
| SVGA | 800 x 600 | 250 | 250 |
| VGA | 640 x 480 | 307 | 307 |
| CIF | 352 x 288 | 486 | 486 |
| QCIF | 176 x 144 | 860 | 859 |
| LineScan | 2448 x 2048 | 76 | 73 |
| | 2448 x 1024 | 150 | 146 |
| | 2448 x 512 | 290 | 290 |
| | 2448 x 256 | 538 | 538 |
| | 2448 x 128 | 940 | 940 |
| | 2448 x 64 | 1502 | 1490 |
| | 2448 x 32 | 2143 | 2058 |
| | 2448 x 16 | 2719 | 2638 |
| | 2448 x 8 | 3147 | 3030 |
| | 2448 x 4 | 3417 | 3389 |
| | 2448 x 2 | 3562 | 3405 |
| | 2448 x 1 | - | - |

[2] depends on the used interface

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