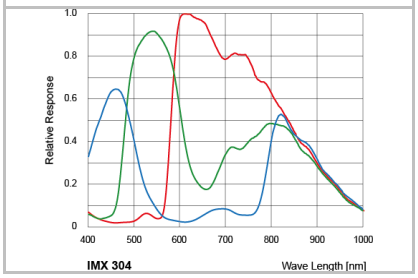
Baumer
Passion for Sensors

# Technical Data
# VCXG-124C

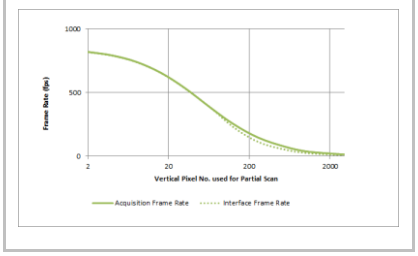
Digital Color Matrix Camera, 12.2 Megapixel, GigE
Article No. 11172609
Firmware Revision 3.3



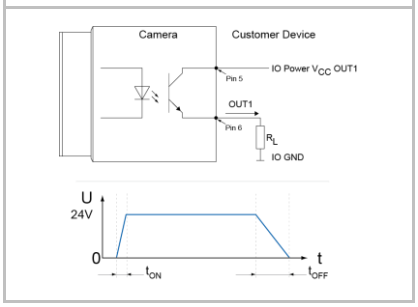
Sensor Graph: Relative Response




Frame Rates / Partial Scan
(Measured at Mono8/BayerRG8-Format)




Digital Output: High Active




## Sensor Information

| | |
|---|---|
| Model Name | Sony IMX304 |
| Type | 1.1″ progressive scan CMOS |
| Shutter | Global Shutter |
| Resolution | 4096 × 3000 pixels |
| Scan Area | 14.13 mm x 10.35 mm |
| Pixel Size | 3.45 µm x 3.45 µm |

## Data Quality

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

| | |
|---|---|
| Dark Noise (σ) | 2 e- typical |
| Saturation | 9500 e- typical |
| Dynamic Range | 71 dB typical |
| SNR | 40 dB typical |
| Quantum efficiency η | 47 % @ 465 nm, 58 % @ 536 nm, 53 % @ 631 nm typical |

## Acquisition

| | | | |
|---|---|---|---|
| Resolution | 4096 px x 3000 px | | |
| Interface Frame Rate (depends on used interface performance) | Format | Resolution | max. Frame Rate (@ Trigger Mode) [2] |
| | Full Frame | 4096 x 3000 | 9 fps |
| | Binning 2x2 | 2048 x 1500 | 15 fps |
| | Binning 2x1 | 2048 x 3000 | 15 fps |
| | Binning 1x2 | 4096 x 1500 | 15 fps |
| Acquisition Frame Rate [1] (Burst Mode) | 15 fps \| $t_{readout}$ = 65.9 msec (max. Res. Full Frame) @ 12 bit | | |
| Pixel Formats | BayerRG8, BayerRG10, BayerRG12, BayerRG12p<br>Mono8, Mono10, Mono12, Mono12p, RGB8, BGR8 | | |
| Partial Scan | True Partial Scan with increasing Frame Rate on Y direction, Region of Interest (ROI) arbitrary<br>Width: minimum 16, increment 16<br>Heigth: 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 | | |

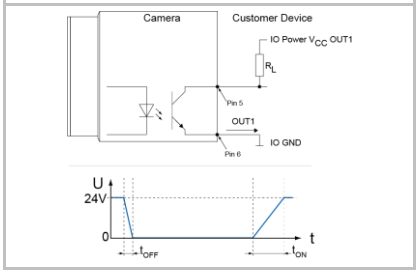
## Image Pre-Processing

| | |
|---|---|
| Analog Controls | Exposure Time (1 µsec … 60 sec \| Step Size 1 µsec)<br>Gain (0…48 dB), Offset (0 ... 255 LSB \| 12 bit) |
| Auto Function | ExposureAuto and GainAuto<br>with BrightnessAutoPriority based on BrightnessAuto ROI<br>BalanceWhiteAuto and ColorTransformationAuto<br>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<br>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 | - |

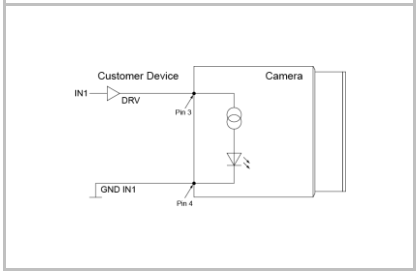
[1] Sensor readout, different from pixel format

[2] depends on the used interface

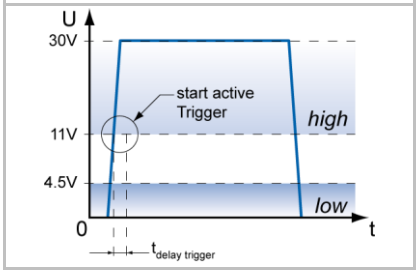
Digital Output: Low Active



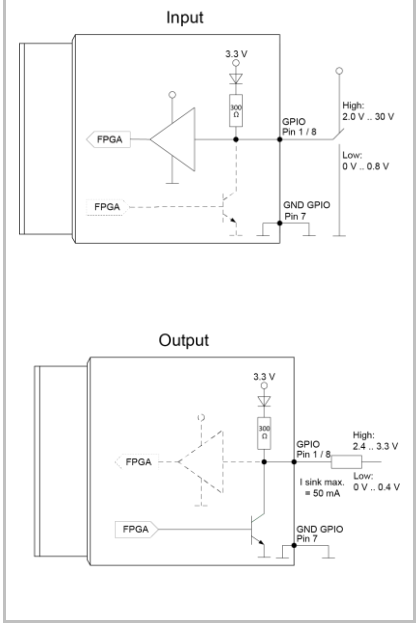

Digital Input




Trigger Mode: Start up time and valid Trigger




GPIO




## 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 | - |

## 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<br>fixed Trigger Delay out of $t_{readout}$: [1]<br>97.7 µsec @ 12 bit<br>max. Trigger Delay during $t_{readout}$: [1]<br>114.1 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, $t_{duration} = t_{exposure}$ |
| 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<br>Debouncing Time 0 … 5 msec, Step Size: 1 µsec |

## Memory

| | |
|---|---|
| Image Buffer | 36 MB<br>1 Images (Trigger Mode) / 1 Image (Free Running Mode) |
| Non-volatile Memory | 128 kb |

## Network Interface Data

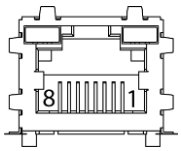
| | |
|---|---|
| Interface | Gigabit Ethernet 1000BASE-T 1000 Mbits/sec<br>Fast Ethernet 100 BASE-T 100 Mbits/sec |
| Ethernet IP Configuration | Persistent IP, DHCP, LLA |
| Packet Size | 576 … 9000 Byte, Jumbo Frames supported |

## GigE Vision® Features

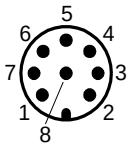
| | |
|---|---|
| Events<br>Transmission via Asynchronous Message Channel | DeviceTemperatureStatusChanged, EventLost, ExposureEnd, ExposureStart, FrameEnd, FrameStart, FrameTransferSkipped, GigEVisionError, GigEVisionHeartbeatTimeOut, PrimaryApplicationSwitch, Line0..2 FallingEdge, Line0..2 RisingEdge, TransferBufferFull, TransferBufferReady, TriggerOverlapped, TriggerReady, TriggerSkipped |
| Action CMD | yes, Action 1 for Trigger |
| Frame Counter | up to $2^{32}$ |
| Payload Size | 0 … 36864224 Byte |
| Timestamp | 64 bit, resolution in nsec, increment = 8 |
| Packet Delay | 0 .. $2^{32}$– 1 nsec |
| Packet Resend | Resend Buffer: 71 MB (2 Images) |
| GigE Vision | v2.0 (v1.2 backward compatible) |

[1] Sensor readout, different from pixel format

Pin Assignment Data Interface

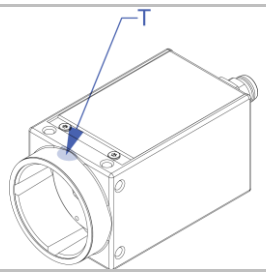



Pin Assignment Process Interface
(on camera side)

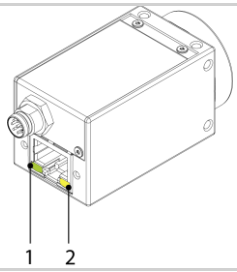



| wire colors on connecting cables (ordered separately) | | | |
|---|---|---|---|
| 1 | White | 5 | Grey |
| 2 | Brown | 6 | Pink |
| 3 | Green | 7 | Blue |
| 4 | Yellow | 8 | Red |

Device Temperature: T = Measurement Point




LED Signalling



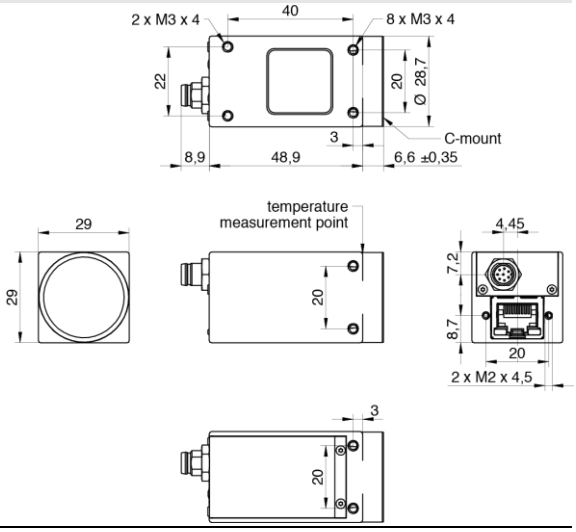

## Interfaces and Connectors

| | | | |
|---|---|---|---|
| Data and Power Interface | Gigabit Ethernet<br>Fast Ethernet<br>Connector: | Transfer Rate 1000 Mbits/sec<br>Transfer Rate 100 Mbits/sec<br>8P8C Modular Jack (RJ45), screw lock type | |
| | Assignment: | 1 - MX1+ | 2 - MX1- |
| | | 3 - MX2+ | 4 - MX3+ |
| | | 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 |
| | | 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<br>(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<br>0 °C … +75 °C @ internal Temperature Sensor<br>Ambient temperature above 30 °C requires heat dissipation measures. |
| Int. Temperature Sensor | yes, accuracy:<br>±2 °C (typ) -40 °C … 0°C<br>±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 53°C @ Measurement Point or 60°C @ internal temperature sensor

## LED Signalling

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

## Electrical Data

| | |
|---|---|
| Power Supply (ext.) | VCC: 12 … 24 V DC ± 20%<br>I: 116 … 234 mA |
| Power over Ethernet | Class 1 device<br>VCC: 36 … 57 V DC<br>I: 77 mA @ 48 VDC |
| Power Consumption | approx. 2.8 W @ 12VDC and 9 fps<br>approx. 3.7 W @ 48 VDC (PoE) and 9 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:<br><br><br>GPIO used as Output:<br><br>Caution | 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<br>$U_{Out(low)}$: 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, EAC |
| KC Registration No. / Date | MSIP-REI-BkR-VCXG-124M / 02.05.2017 |
| MTBF | 51 years @ T = 45 °C / 33 years @ T = 60 °C<br>T = Measurement Point |

## GenICam™ 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 1<br>TimerTriggerSource:<br>Line0, SoftwareTrigger, ExposureStart, ExposureEnd, FrameTransferSkipped, TriggerSkipped, Action 1 and 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, Line0..2 and Off<br>Counter Reset Source: Counter1End, Counter2End, Line0..2 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..2, 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 |

## GenICam™ 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 65.9 msec |
| Chunk Data | yes,<br>Chunk Selector: Binning, BlackLevel, CounterValue, DeviceTemperature, ExposureTime, FrameID, Gain, Height, Image, ImageControl, LineStatusAll,OffsetX, OffsetY, PixelFormat, SequencerSetActive, Timestamp, Width |
| 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 |
| 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 | - |
| 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)] |
|---|---|---|---|
| UHD (4K) | 3840 x 2160 | 20 | 14 |
| Full HD | 1920 x 1080 | 40 | 40 |
| SXGA | 1280 x 1024 | 42 | 42 |
| HD720 | 1280 x 720 | 59 | 59 |
| XGA | 1024 x 768 | 56 | 56 |
| SVGA | 800 x 600 | 70 | 70 |
| VGA | 640 x 480 | 86 | 86 |
| CIF | 352 x 288 | 133 | 133 |
| QVGA | 320 x 240 | 155 | 155 |
| QCIF | 176 x 144 | 229 | 229 |
| LineScan | 4096 x 2048 | 22 | 14 |
| | 4096 x 1024 | 42 | 29 |
| | 4096 x 512 | 81 | 58 |
| | 4096 x 256 | 147 | 117 |
| | 4096 x 128 | 248 | 235 |
| | 4096 x 64 | 378 | 378 |
| | 4096 x 32 | 511 | 511 |
| | 4096 x 16 | 621 | 621 |
| | 4096 x 8 | 695 | 695 |
| | 4096 x 4 | 739 | 739 |
| | 4096 x 2 | 764 | 764 |
| | 4096 x 1 | - | - |

[2)] depends on the used interface