CoaXPress

Monochrome / Color CMOS Camera

STC-MBS212CXP6 (2M / Monochrome / high speed / CXP-6x1)
STC-MCS212CXP6 (2M / Color / high speed / CXP-6x1)

Product Specifications and User's Guide

Table of Contents

Precautions for safe use

Please read carefully this “Precautions for safe use” before use the camera. Then the camera uses correctly with agreeing with below notes.

In this “Precautions for safe use”, notes divides into “Warning” and “Caution” to use the camera safety and prevent to harm and damage.

⚠ Warning	This shows, assumption for possibility of serious accident leading death or serious injury if ignore this note and camera uses incorrectly.
⚠ Caution	This shows, assumption for possibility of bear the damage or physical damage if ignore this note and camera uses incorrectly.

About Graphic symbols


This symbol shows general prohibition.


This symbol shows completion or instruction.

[Environment / condition]

⚠ Warning	
Do not use flammable or explosiveness atmospheres. This will cause of personal injury or fire.	Do not use for “safety for human body” related usage. This camera is designed for use “do not harm human body immediately” if by any chance the camera has malfunction.
⚠ Caution	
Use and store under specified environmental conditions (Vibration, shock, temperature, humidity) in the specifications for this camera. This will cause of fire or damage the camera.	

[Installation and cable wiring]

⚠ Warning	
Do not use with out of power voltage range that is specified in the specifications for this camera. This will cause of fire, electrification or malfunction.	Do not wrong wiring. This will cause of fire or malfunction.

⚠ Caution	
Do not grounding DC power (+) of all devices that are connect to the camera. The camera housing is connecting to 0 V line of camera inside circuit. There is a risk of short circuit between camera inside ciurcuit and frame ground. This will cause of malfunction.	It is necessary to wiring and mounting that is specified in the specifications for this camera. This will cause of fire or malfunction.
It is necessary to wiring with turn off the camera. This will cause of electrification or malfunction.	It is necessary to mounting the camera without stress for the cable. This will case of electrification or fire.
Do not use CoaXPress un-supported cable and board. There is a risk of malfunction if the camera connects with wrong environment and turn on the camera.	

[Usage instruction]

⚠ Warning	
Do not touch the terminal and PCB board While turn on the camera. This will cause of electrification or accident caused by malfunction.	Do not put combustibles near the camera. This will cause of fire.
Do not use without usage that is specified in the specifications for this camera. This will cause of personal injury or malfunction.	Do not push metals including screw driver into radiation holes. This will cause of electrification or malfunction.
Do not touch the camera housing while or afterusing the camera. There is a risk of get burned.	
⚠ Caution	
Do not push contamination into opening of the camera. This will cause of electrification or malfunction.	Do not block the radiation holes. This will cause of fire due to increase the camera inside temperature.

[Maintenance]

⚠ Caution	
Do not disassemble or repair the camera. This will cause of fire, electrification or malfunction.	It is turn off the camera when maintaining or inspecting the camera. This will cause of electrification.

[Disposal]

⚠ Caution	
It is necessary to dispose of accordance with WEEE directive.	

1 Product Precautions

- Do not give shock to the camera.
- Do not haul or damage the camera cable.
- Do not wrap the camera with any material while using the camera. This will cause the internal camera temperature to increase.
- When the camera moving or using the place that temperature difference is extreme, countermeasure for dew condensation (heat removal / cold removal) is necessary.
- While the camera is not using, keep the lens cap on the camera to prevent dust or contamination from getting in the sensor or filter and scratching or damaging it.
  Do not keep the camera under the following conditions.
  - In wet, moist, high humidity or dusty place
  - Under direct sunlight
  - In extreme high or low temperature place
  - Near an object that releases a strong magnetic or electric filed
  - Place with strong vibrations
- Apply the power that satisfies the specified in specifications for the camera.
- The defective pixels may appear due to the sensor characteristics.
- Use below recommend materials (or equivalent materials) to clean the surface of glass.
  - Air dust: Non Freon air duster (NAKABAYASHI Co., LTD.)
  - Alcohol: Propan-2-ol (SAN'EI KAKO Co., LTD.)
  - Non-woven: nikowipe clean room (NKB)
- Use a soft cloth to clean the camera.

2 Warranty

■Warranty period

One year after delivery (However, the camera had malfunction with camera uses correctly)

In below case for a fee even within warranty period.

- The malfunction caused by incorrect usage, incorrect modify or repair.
- The malfunction caused by external shock including the camera dropping after delivery the camera.
- The malfunction caused by fire, earthquake, flood disaster, thunderbolt struck, other natural disaster or wrong voltage.

■Warranty coverage

Exchange or repair the malfunction camera if the malfunction is occurred by our responsibility.

"Warranty" mean is warranty for the delivered camera itself. Please accept the induction damage by the camera malfunction is not included.

3 Overview

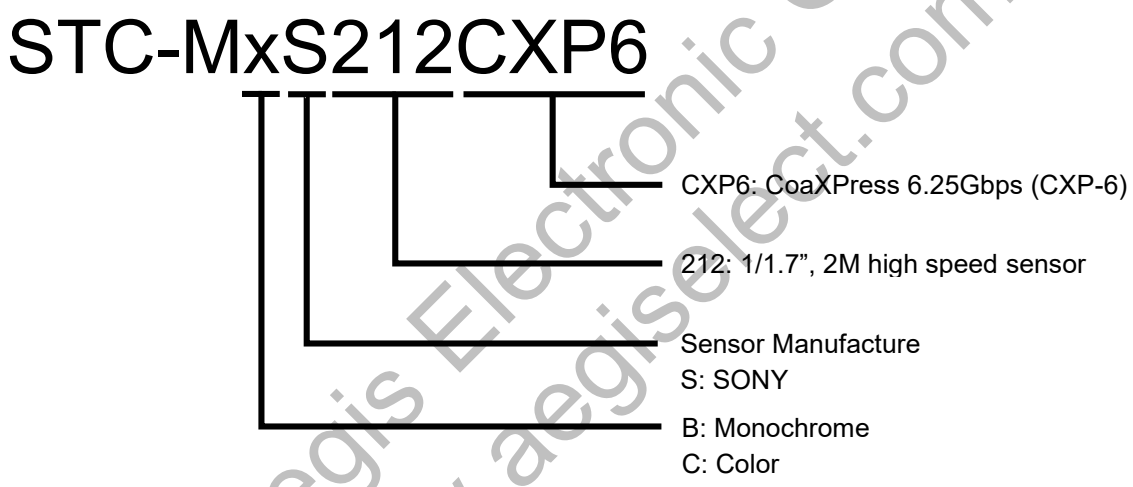
This document describes the specification of the following cameras:

STC-MBS212CXP6 / STC-MCS212CXP6

3.1 Features

- CoaXPress Interface: CXP-6 / CXP-3, 1 lane
- Support PoCXP (Power over CoaXPress)
- Maximum frame rate (Full resolution): 239 fps @ 2M 8bits CXP-6
- CMOS (Global Reset Shutter / Rolling Shutter)
- Up to 512 Defective Pixel Correction (Default: ON)
- 8bits, 10bits, 12bits output

3.2 Product Number Naming Method



4 Specifications

4.1 Electronic Specifications

Model Number		STC-MBS212CXP6	STC-MCS212CXP6
Image Sensor		1/1.7" 2M Progressive Monochrome CMOS (SONY: IMX422)	1/1.7" 2M Progressive Color CMOS (SONY: IMX422)
Shutter Type		Global	
Active Picture Elements		1,632 (H) x 1,240 (V)	
Cell Size		4.5 (H) x 4.5 (V) µm	
Scanning method		Full scanning / ROI	
Maximum Frame Rate (Full scanning)		CXP-6: **8bits: 239 fps** / 10bits: 194 fps / 12bits: 165 fps CXP-3 : 8bits: 136 fps / 10bits: 108 fps / 12bits: 90 fps	
ADC bits width (*1)		**8bits** / 10bits / 12bits	
Image Format (*1) (*2)		**Mono8** / Mono10 / Mono12	**BayerRG8** / BayerRG10 / BayerRG12
CoaXPress Data output		CXP-6 (6.250 Gbps) 1 Lane CXP-3 (3.125 Gbps) 1 Lane	
Noise Level	8bits output	Less than 4 digits (Gain 0 dB)	
	10bits output	Less than 8 digits (Gain 0 dB)	
	12bits output	Less than 32 digits (Gain 0 dB)	
Sensitivity (*3)	8bits output	110 Lux	210 Lux
	10bits output	440 Lux	820 Lux
	12bits output	440 Lux	820 Lux
Exposure time		1 µseconds to 16.777 seconds **(Default: 4,144 µseconds)**	
Gain	Analog Gain	0 to 18 dB **(Default: 0 dB)**	
	Digital Gain	x1 to x7 **(Default: x1)**	
Black Level	8bits output	0 to 31 digits **(Default: 10)**	
	10bits output	0 to 127 digits	
	12bits output	0 to 511 digits	
White Balance Gain		N/A	0 (Black level) to x7.98 **(Default: x1)**
ROI		Size: Horizontal: 256 to 1,632, Vertical: 4 to 1,240 **(Default: 1,632 x 1,240)** Adjustable steps for size: 8 pixels in horizontal direction / 2 lines in vertical direction Adjustable steps for offset: 2 pixels in horizontal direction / 2 lines in vertical direction	
Multi ROI		Eight Regions (Horizontal 1 x Vertical 8 regions) **(Default: One region)**	
Gamma		N/A	
Binning		2 x 2 / **Off**	N/A
Decimation		1/2 x 1/2, **Off**	
Image Flip		Horizontal / Vertical / Horizontal and Vertical / **Off**	
Defective Pixel Correction		Up to 512 points	
Auto Image Control	Auto Exposure	N/A	
	Auto Gain	N/A	
	Auto White Balance	N/A	Disable / Off / Once / Continuous
Operational Mode		Edge preset trigger / Pulse width trigger / CXP trigger packet / **Free run**	
Interface		CoaXPress	
Protocol		CoaXPress Standard Version 1.1.1 and GenICam SFNC 2.4 compliant	

Default: **Bold**

Model Number		STC-MBS212CXP6	STC-MCS212CXP6
Input / Output		Four GPIOs	
Power	Input Voltage	PoCXP (+18.5 to +26 Vdc)	
	Consumption	Maximum: 4.0 W, Typcal: 3.5 W	

Precautions

(*1) When Image Format is changed, ADC bits width also changes.
The ADC bits width cannot be changed.

Image Format		ADC bits width
Mono8 / BayerRG8	→	8bits
Mono10 / BayerRG10	→	10bits
Mono12 / BayerRG12	→	12bits

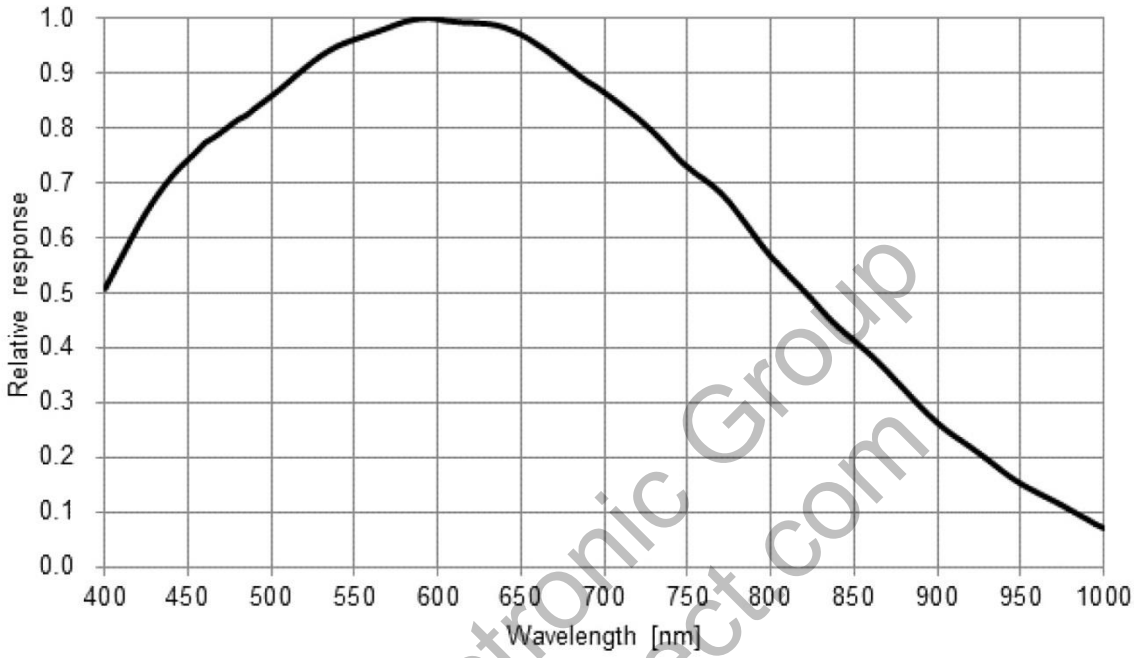
(*2) The pixel format (Bayer pattern) for color model is changed when image is flipping with image flip function.
The Bayer pattern in this document is Bayer pattern of image flip function Off.

(*3) The sensitivity is measured illumination of light source for 100% white under below conditions:

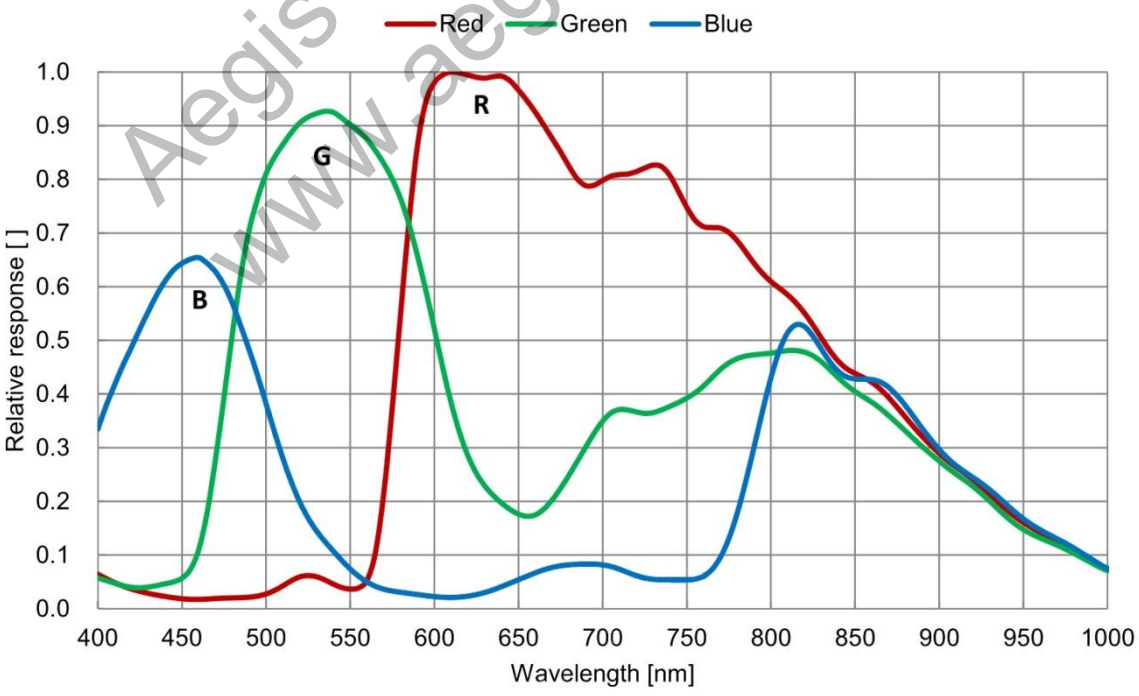
Camera Setting		Environment	
Parameter	Setting	Parameter	Setting
Gain Up	0 dB	Light Source	Light Box (White)
AGC	Off	Color temperature	5,100K
White Balance	Optimum	Lens	
Electrical Shutter	1/30 seconds	F on Lens	F5.6
Black Level	Optimum	Target Luminance	IM-600 (Topcon)
Gamma	Factory Setting		

4.2 Spectral Sensitivity Characteristics

4.2.1 STC-MBS212CXP6 (Monochrome)



4.2.2 STC-MCS212CXP6 (Color)



4.3 Mechanical Specifications

Model Number	STC-MBS212CXP6	STC-MCS212CXP6
Dimensions	28 (W) x 28 (H) x 40 (D) mm (*1)	
Optical Filter	No Optical Filter	
Optical Center Accuracy	Positional accuracy in Horizontal and Vertical directions: +/- 0.3 mm Rotational accuracy of Horizontal and Vertical: +/- 1.5 deg.	
Material	Aluminum alloy (AC)	
Lens Mount (*2)	C Mount	
Interface Connectors	CXP Connector: BNC, 75 ohm IO Connector: HR10A-7R-6PB (Hirose) or equivalent	
Camera Mounting	M2 screw holes (Two on top, three on bottom plate) M4 screws holes (Two on top, four on bottom plate)	
Weight	Approximately 52 g	

(*1) excluding the connectors

4.4 Environmental Specifications

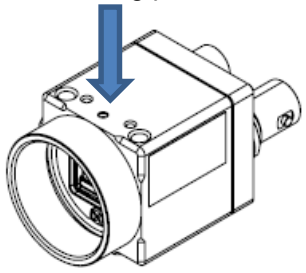
Model Number		STC-MBS212CXP6	STC-MCS212CXP6
Operational Temperature / Humidity	Minimum	Environmental Temperature: 0 deg. C, Environmental Humidity: 20 to 85 %RH (No condensation)	
	Maximum	Environmental Temperature: +39 deg. C, Environmental Humidity: 20 to 85 %RH (No condensation) or housing temperature: not exceeded +65 deg. C	
Storage Temperature / Humidity		Environmental Temperature: -20 to +75 deg. C, Environmental Humidity: 20 to 85 %RH (No condensation)	
Vibration		20 Hz to 200 Hz to 20 Hz (5 min. / cycle), acceleration 10 G, XYZ 3 directions, 30 min. each	
Shock		Acceleration 38 G, half amplitude 6 ms, XYZ 3 directions, 3 times each	
KC		EMS: EN61000-6-2, EMI: EN61000-6-4	
RoHS		RoHS Compliant	

(*1) Please insure the camera is installed with appropriate heat dissipation to keep camera housing temperature (top plate) is less than 65 deg. C when camera using ambient temperature is exceeded 39 deg. C.
If the camera has a mounted lens and a tripod with an aluminum plate, this could decrease camera housing temperature for heat dissipation.

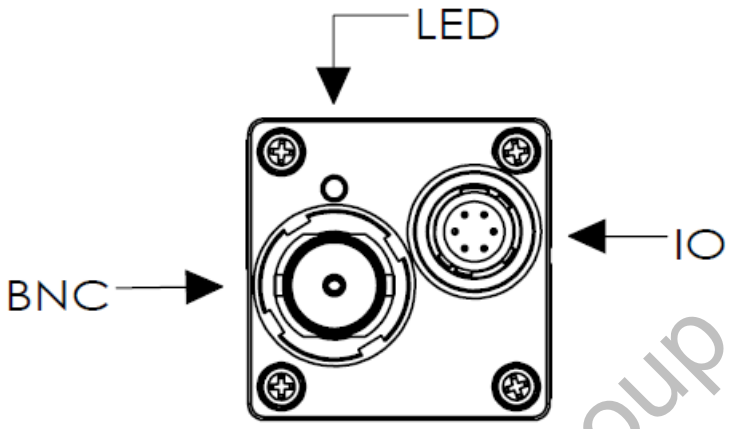
Taking these steps will maintain heat rating of electronic components of camera.

Upper side of camera

Measuring point



4.5 External Connector Specifications



4.5.1 BNC connector

BNC (75 ohm) x 1

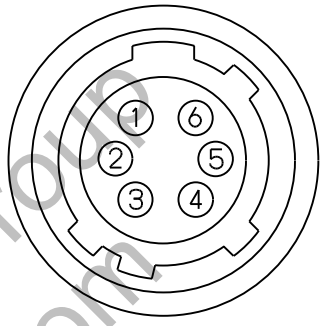
This camera is PoCXP supported camera.
The PoCXP supported CoaXPress frame grabber board is supplied power to camera.
The PoCXP supported CoaXPress frame grabber board is required to use this camera.
(There is NO external power input port on IO connector)

4.5.2 IO Connector

HR10A-7R-6PB (Hirose) or equivalent.
This connector is for input and output signals.
The trigger input and sync input /output signals can be assigned through camera setting communication.
As for the cable part (Female connector), HR10A-7P-6S (Hirose) or equivalent can be used.

Pin assignment

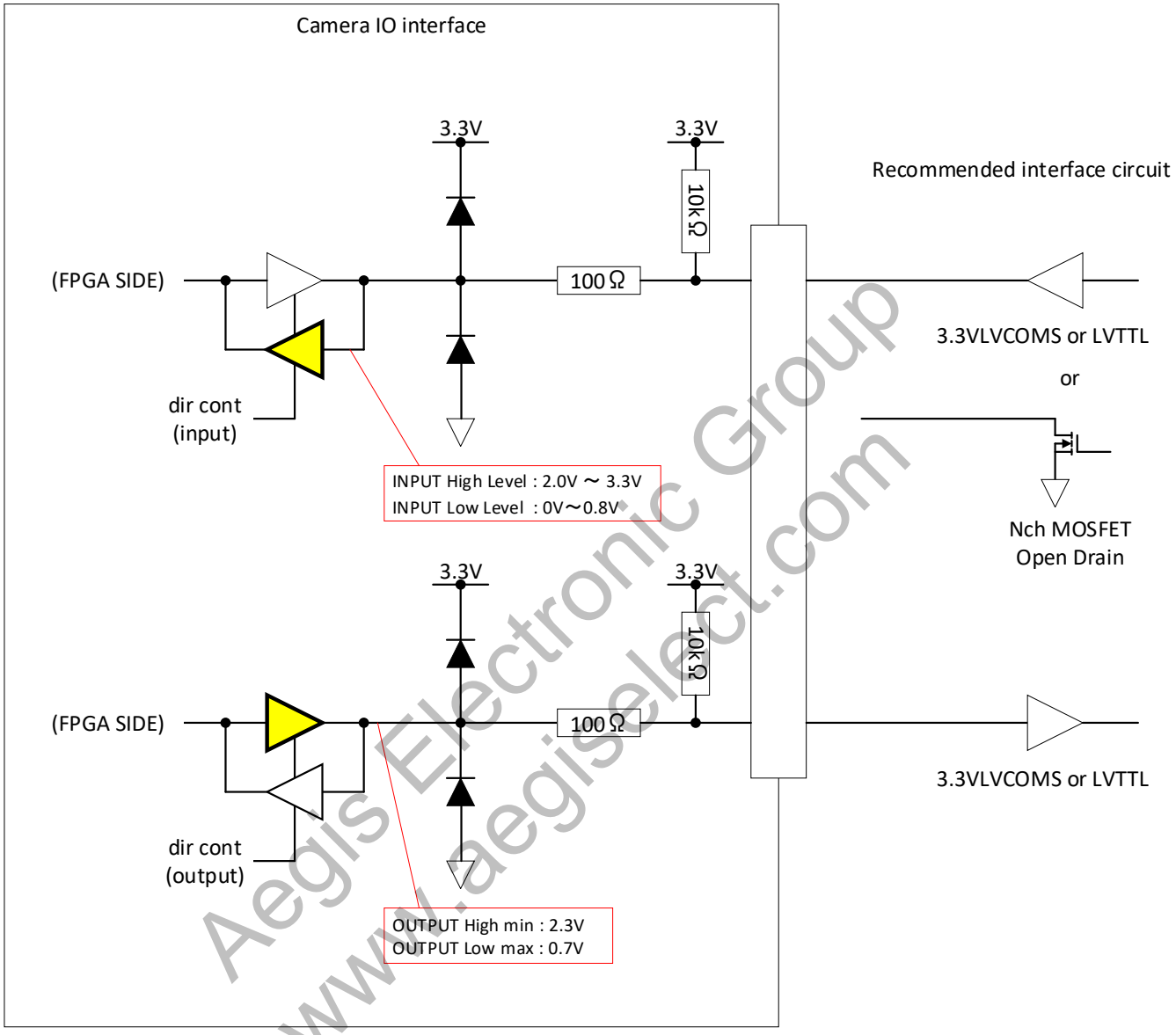
Pin No.	Signal Name	IN/OUT	Signal Voltage
1	GND	-	0 V
2	Line3	IN/OUT	+3.3 V
3	Line2	IN/OUT	+3.3 V
4	Line1	IN/OUT	+3.3 V
5	Line0	IN/OUT	+3.3 V
6	-	-	-



Output signal selection for Line0 to Line3
The output signal can be select through GenICam Command.

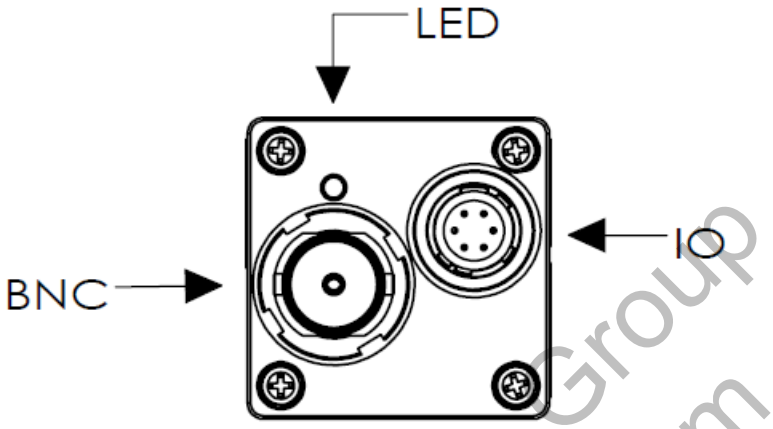
GenICam command
Off
User Output
Trigger Out
Trigger Through Out
Exposure End Out
Frame End Out
Frame Trigger Wait
Transfer End Out
Sensor Read Out
Strobe Out
Exposure Active

● Block diagram of IO connector



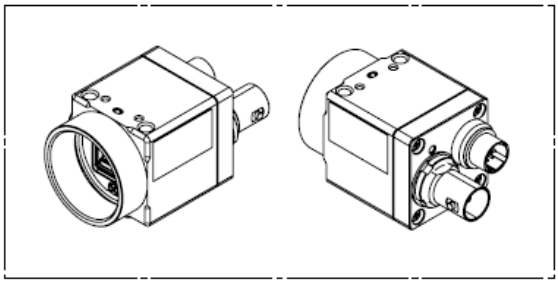
4.6 Connector Indicator LED

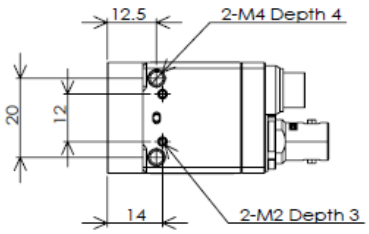
The connector indicator LED exist near BNC connector.
LED informs status of communication. The details of status is as following table.

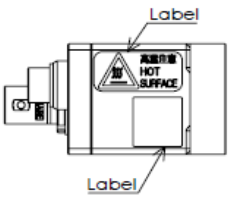


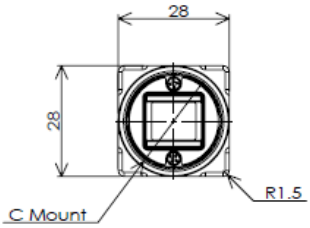
Status	LED Blinking Pattern
No connection	Off
System booting	Solid orange
Detecting Device / Host connection	Fast flash alternating green / orange
Device / Host connecting Error	Slow flash alternating red / green
Device / Host connected, but no data being transferred	Solid green
Device / Host connected, waiting for trigger	Slow flash orange
Device / Host connected, data being transferred	Fast flash green
Data Transfer Error	Solid red (500 mseconds)
Device / Host connected, Test Packet transferring	Slow flash alternating green / orange
System Error	Red fast blinking

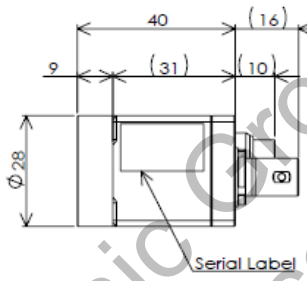
5 Dimensions

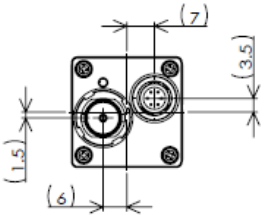


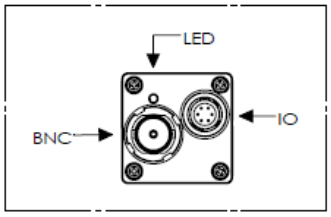


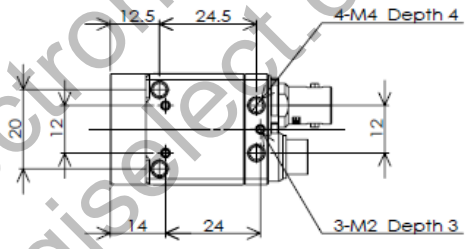










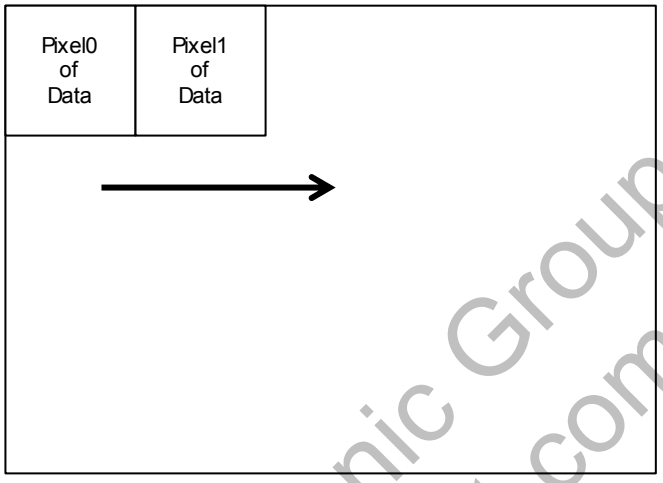


Unit: mm

6 Sensor Information

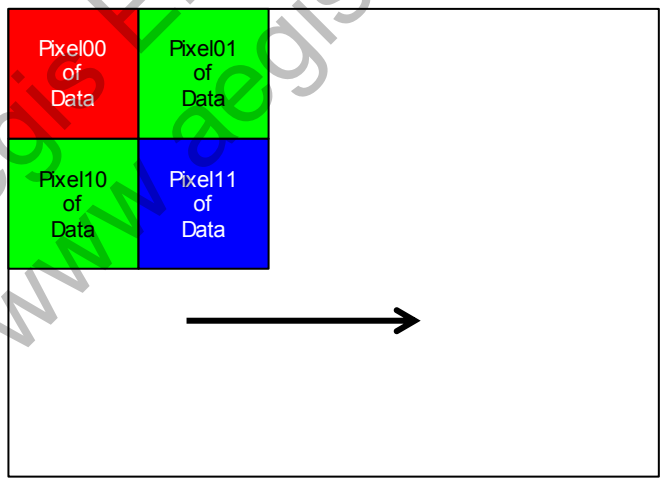
6.1 Pixel Transferring Image

STC-MBS212CXP6 (Monochrome)



Pixel (n) of Data: nth pixel being transferred

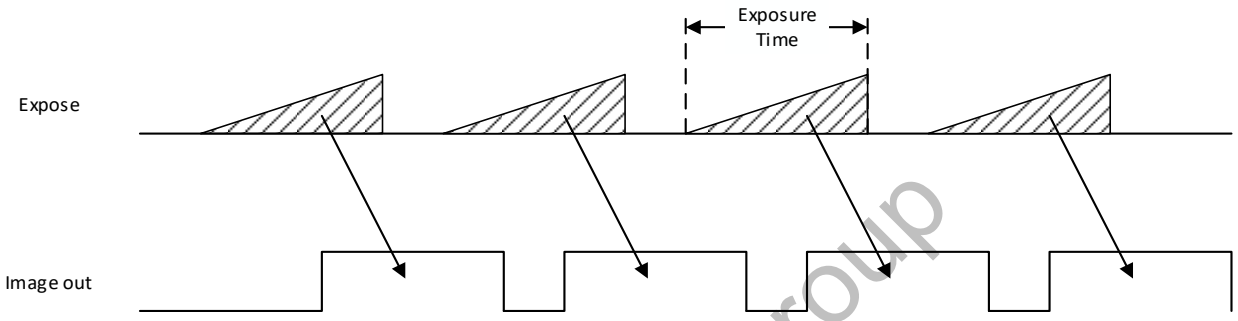
STC-MCS212CXP6 (Color)



Pixel (m, n) of Data: nth pixel of mth line being transferred

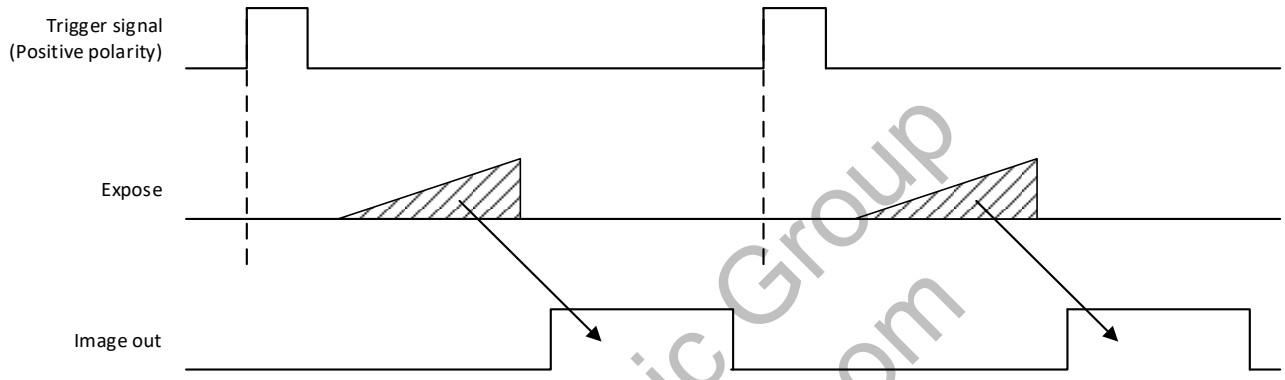
7 Camera Operational Modes

7.1 Normal Mode



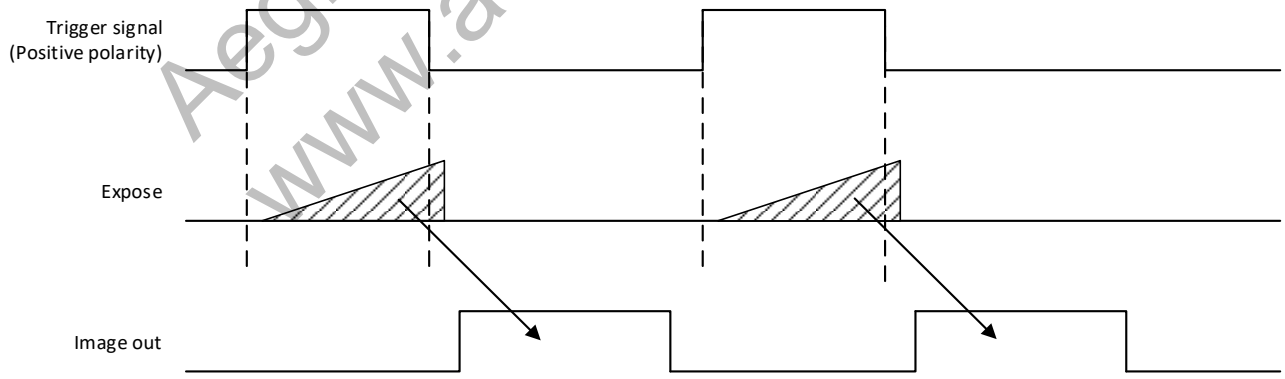
7.2 Edge Preset Trigger Mode

In this trigger mode with positive polarity, the expose starts at rising edge of trigger signal. The exposure duration time is based on preset exposure setting stored by camera setting communication.
In this trigger mode with negative polarity, the expose starts at falling edge of trigger signal. The exposure duration time is based on preset exposure setting stored by camera setting communication.



7.3 Pulse width trigger mode

In this trigger mode with positive polarity, the expose starts at rising edge of trigger signal and stops at falling edge of trigger signal. The expose period is high states of trigger signal.
In this trigger mode with negative polarity, the expose starts at falling edge of trigger signal and stops at rising edge of trigger signal. The expose period is low states of trigger signal.



7.4 Frame rate

The frame rate of camera calculates with below formula with ROI and exposure time settings.

● Formula of frame rate

Frame rate [fps] = 1,000,000 / (Number of lines for one frame x 1 H time [usec.])

1 H time [usec] = “Hnum” value / 74.25

Hnum value

	CXP-6			CXP-3		
	8bit	10bit	12bit	8bit	10bit	12bit
Full resolution	236	290	342	414	518	622
Decimation	134	162	208	207	259	311
Binning	134	162	208	207	259	311

* Number of lines for one frame is one of great value of below two values:
  (a) Number of lines for one frame = Number of lines of sensor frame + “Fofl1” value
  (b) Number of lines for one frame = Number of lines for exposing + “Fofl2” value

* Please refers next page for “Number of lines of sensor frame”
* Number of lines for exposing = ((Exposure time [usec.] - 4.997) / 1 H time [usec])
  * Integer value (round down)

Fofl1 value

	CXP-6 / CXP-3		
	8bit	10bit	12bit
Full resolution	68	68	64
Decimation	76	72	64
Binning	72	68	60

Fofl2 value

	CXP-6 / CXP-3		
	8bit	10bit	12bit
Full resolution	12	12	12
Decimation	24	20	16
Binning	24	20	16

● Number of lines of sensor frame

"Number of lines of camera frame" based on ROI setting, and "Number of lines of sensor frame" are different.
"Number of lines of sensor frame" is total number of lines of sensor region as below formula.

Number of lines of camera frame = Height setting of camera (total MultiHeight for multi ROI operation)
Number of lines of sensor frame = Total "Number of lines of sensor region"

Number of lines of sensor region = "End position of sensor region" - "Start position of sensor region"

For one ROI region:

Start position of sensor region = (OffsetY setting + 4) / 8
* Integer value (round down)
End position of sensor region = (OffsetY setting + Height setting + 11) / 8
* Integer value (round down)

For multi ROI regions0

Start position of sensor region = (MultiOffsetY setting + 4) / 8
* Integer value (round down)
End position of sensor region = (MultiOffsetY setting + MultiHeight setting + 11) / 8
* Integer value (round down)

● ROI setting for maximum frame rate operation

The maximum frame rate operation based on ROI setting is required,
ROI setting is "Number of lines of camera frame" = "Number of lines of sensor frame".
The camera operates maximum frame rate operation when all regions achieving below ROI setting condition.

- MultiOffsetY setting for multi ROI operation (OffsetY setting for one ROI operation)
  The multiples of 8 + 4
- MultiHeight setting for multi ROI operation (Height setting for one ROI operation)
  The multiples of 8

7.5 The interval of trigger input

The minimum interval of trigger input is changed based on trigger overlap setting (TriggerOverlap).
The trigger input that does not match minimum interval condition, is invalid.
Please refer “7.4 Frame rate” section for “Number of sensor frame line” and “1 H time” in this section.

The minimum interval of trigger input is possible to check with “Frame Trigger Wait” signal through IO port.
When “Frame Trigger Wait” signal is Low status, input trigger signal is invalid.

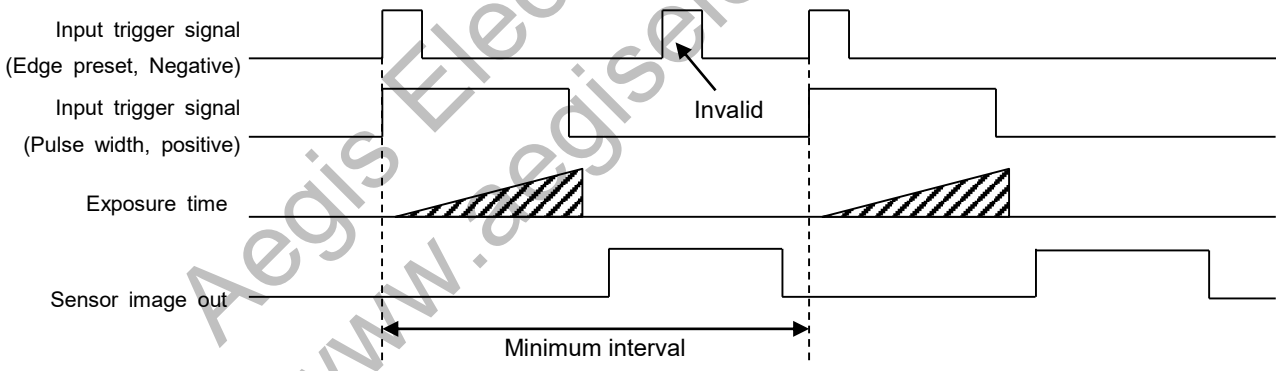
7.5.1 The interval of trigger input when trigger overlap is disabling

The minimum interval of trigger input when trigger overlap is disabling:

Minimum interval [usec] = Exposure time [usec] +
(([Number of lines of sensor frame] + “Tplf” value) x 1 H time [usec])

Tplf value

	CXP-6 / CXP-3		
	8bit	10bit	12bit
Full resolution	85	85	81
Decimation	93	89	81
Binning	89	85	77



7.5.2 The interval of trigger input when trigger overlap is enabling

The minimum interval of trigger input when trigger overlap is enabling:

Minimum interval [usec] = Longer one of below two time:

(a) Exposure time [usec] + (“Tplo” value x 1 H time [usec])

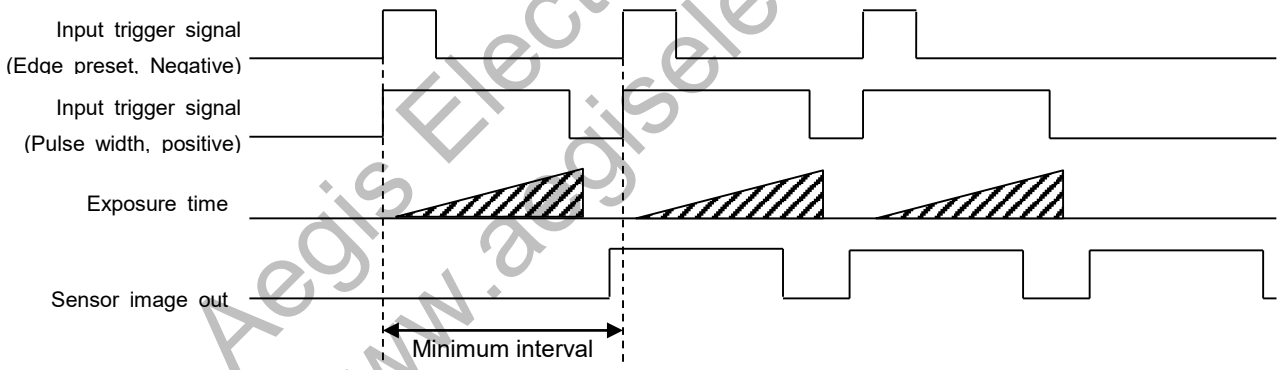
(b) ([Number of lines of sensor frame] + “Fofl1” value) x 1 H time [usec]

Tplo value

	CXP-6 / CXP-3		
	8bit	10bit	12bit
Full resolution	18	18	18
Decimation	30	26	22
Binning	30	26	22

Fofl1 value

	CXP-6 / CXP-3		
	8bit	10bit	12bit
Full resolution	68	68	64
Decimation	76	72	64
Binning	72	68	60



8 Camera Functions

This chapter describes the camera functions.

8.1 CXP Configuration

This parameter sets the CoaXPress configuration mode.

GenICam Parameters

CxpLink Configuration	IEnumeration Type	Sets CXP configuration mode. CXP6_X1: CXP-6 (6.250Gbps) 1lane (Default) CXP3_X1: CXP-3 (3.125Gbps) 1lane

CXP configuration setting when power on camera

CXP configuration setting can be save as “default CXP configuration” in to “UserSet data” to use default settings of power on camera.

1. Selects CXP configuration mode when power on camera.
2. Selects UserSet (0 to 7) at UserSetSelector.
3. Executes UserSetSave.
4. Selects UserSet (0 to 7), which is selected above “2.” at UserSetDefault.

* The CXP configuration mode does not change when loading saved UserSet data using by “UserSetLoad”.

8.2 Pixel Format

This parameter sets the image format from camera can be set on Pixel Format.

GenICam Parameters

PixelFormat	IEnumeration Type	Sets Pixel Format.

The following chart shows available Pixel Formats on camera:

Output Bit	Pixel Format	
	Monochrome	Color
8bit	Mono8	BayerRG8
10bit	Mono10	BayerRG10
12bit	Mono12	BayerRG12

The format specified on GenICam PFNC (Pixel Format Naming Convention).

8.3 Frame rate

This parameter sets the frame rare (fps) of output image from camera.

GenICam Parameters

AcquisitionFrameRate	IFloat Type	Sets frame rate in Hz unit (*1) Range is changed with exposure time and pixel format settings Default: 239.071918 (at CXP-6, 8bit)

(*1) The approximate value of set value, sets to camera and display it.

8.4 Exposure Time

This parameter sets variable exposure time.

GenICam Parameters

ExposureMode	IEnumeration Type	Exposure control selection Selection: “Off”, “Timed” and “TriggerWidth” Off: Exposure time is “1 / Frame rate” Timed: Exposure time is “ExposureTime” TriggerWidth: Exposure time is active pulse duration of trigger signal
ExposureTime [ExposureTime Selector]	IFloat Type	Exposure time (in μsecond) (*1) Range: 1.000000 to 16,777,215.000000 Default: 4,144.0

(*1) The approximate value of set value, sets to camera and display it.

8.5 Trigger

These parameters set operational mode (trigger mode) and trigger type.
The selectable trigger types are listed in below table

GenICam Parameters

TriggerMode	IEnumeration Type	Operational mode (trigger mode) selection Off: Free run operation (Default) On: Trigger operation
TriggerSource	IEnumeration Type	Trigger type selection * Please refers below table for details of trigger type
TriggerOverlap	IEnumeration Type	Trigger Overlap function selection Off: Trigger overlap function is disabled (Default) ReadOut: Trigger overlap function is enabled

<TriggerSource selection>

Software	Software trigger signal that generates by TriggerSoftware (Default)
Line0	External hardware trigger through Line0
Line1	External hardware trigger through Line1
Line2	External hardware trigger through Line2
Line3	External hardware trigger through Line3
LinkTrigger0	CXP trigger packet trigger

8.6 Image Flip

Flip the image through ReverseX and ReverseY.

GenICam Parameters

ReverseX	IBoolean Type	Switch ON / OFF at Horizontal False: Horizontal Flip Off, True: Horizontal Flip On. Default: False
ReverseY	IBoolean Type	Switch ON / OFF at Vertical False: Vertical Flip Off, True: Vertical Flip On. Default: False

8.7 Black Level

This parameter sets the black level (clamp level for black signal).

The lower limit of signal is clamped at this setting level. The signal does not lower than this.

GenICam Parameters

BlackLevel [BlackLevelSelector]	IFloat Type	Black Level Range: 8bits output: 0 to 31 10bits output: 0 to 127 12bits output: 0 to 511 Default: 10

8.8 Gain

The gain has Analog Gain and Digital Gain.

8.8.1 Analog Gain

This parameter sets analog gain.

GenICam Parameters

GainSelector	IEnumeration Type	AnalogAll
Gain [GainSelector]	IFloat Type	Analog Gain Range: 0 to 180 Default: 0

Analog Gain Formula

Gain (dB) = Analog Gain / 10

8.8.2 Digital Gain

This parameter sets digital gain.

GenICam Parameters

GainSelector	IEnumeration Type	DigitalAll
Gain [GainSelector]	IFloat Type	Digital Gain Range: 0 to 1,536 Default: 0

Digital Gain Formula

Gain (x times) = 1 + (Digital Gain / 256)

8.9 White Balance (Only available for color model)

The color compensates by gain adjustment for each individual color.
The gain for each color has to adjust to same brightness with flat white target.
The white balance control methods are listed in below:

- Disable
- Manual (Off)
- Auto White Balance (Continuous)
- Push to set white balance (Once)

8.9.1 White balance control methods

GenICam Parameters

BalanceWhiteAuto	IEnumeration Type	White balance control method selection. Default: Off (Manual)
BalanceRatioSelector	IEnumeration Type	White balance control target color selection.
BalanceRatio	IFloat Type	Color gain setting for selected color selects at “BalanceRatioSelector”. Range: 0 to 511

8.9.2 Disable

Disabled white balance gain and each color gain set as x1.

Setting Procedure

1. Sets “Disable” at “BalanceWhiteAuto”

8.9.3 Manual (Off)

The optimized BalanceRatio (Red, Green or Blue) for white balance.

Setting Procedure

1. Sets “Red” (when Red gain set) at “BalanceWhiteSelector”
2. Sets value at “BalanceRatio”
3. Sets “Green” at “BalanceWhiteSelector”
4. Sets value at “BalanceRatio”
5. Sets “Blue” (when Blue gain set) at “BalanceWhiteSelector”
6. Sets value at “BalanceRatio”
7. Sets “Off” at “BalanceWhit Auto”

8.9.4 Auto White Balance (Continuous)

Optimizes white balance gain each frame automatically.

Setting Procedure

1. Sets “Continuous” at “BalanceWhiteAuto”

8.9.5 Push to Set White Balance (Once)

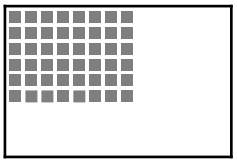
The white balance gain adjusts once after selecting this white balance method. Then each gain set to "BalanceWhite (Red, Green and Blue)".
Sets "Off" at "BalanceWhiteAuto" automatically after set "WhiteBalanceGain".

Setting Procedure

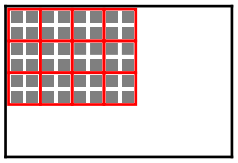
1. Sets the flat white target (To process white balance correctly)
2. Sets "Once" on "BalanceWhiteAuto"

8.10 Binning (Only available for monochrome model)

Binning is summing and averaging beside pixels into one pixel.
The pixel data inside of red square add or average as one pixel.



Binning X (OFF: 1), Y (OFF: 1)



Binning X (ON: 2), Y (ON: 2)

GenICam Parameters

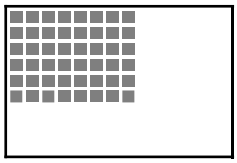
BinningHorizontalMode	IEnumeration Type	Sets Binning mode on horizontal direction Sum: Summing mode (Default) Average: Average mode
BinningHorizontal	IInteger Type	Sets Binning on horizontal direction 1: Disable Binning 2: Binning 2 Pixel Default: 1
BinningVerticalMode	IEnumeration Type	Sets Binning mode on vertical direction Sum: Summing mode (Default) * Does not support Average for vertical direction
BinningVertical	IInteger Type	Sets Binning on vertical direction 1: Disable Binning 2: Binning 2 Pixel Default: 1

* Note.1: It is necessary to set setting for “BinningHorizontal” and “BinningVertical”.
* Note.2: It is necessary to set less than “1 frame period time” exposure time to increase frame rate.
* Note.3: Binning and Decimation function cannot be use simultaneously.

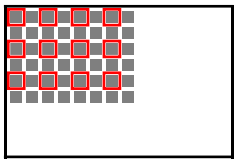
8.11 Decimation

When using Decimation mode, decimated image can be output.
The images below show decimated pixels (red squares) where they are output.

<Monochrome>

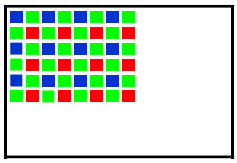


Decimation X (OFF), Y (OFF)

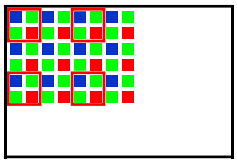


Decimation X (ON), Y (ON)

<Color>



Decimation X (OFF), Y (OFF)



Decimation X (ON), Y (ON)

GenICam Parameters

DecimationHorizontal	IInteger Type	Sets decimation on horizontal direction 1: Disable Decimation, 2: Decimate one of two pixels Default: 1
DecimationVertical	IInteger Type	Sets decimation on vertical direction 1: Disable Decimation, 2: Decimate one of two pixels Default: 1

* Note.1: It is necessary to set setting for “DecimationHorizontal” and “DecimationVertical”.
* Note.2: It is necessary to set less than “1 frame period time” exposure time to increase frame rate.
* Note.3: Binning and Decimation function cannot be use simultaneously.。

8.12 ROI (Region of Interest)

This sets the ROI in order to output selected area of image.

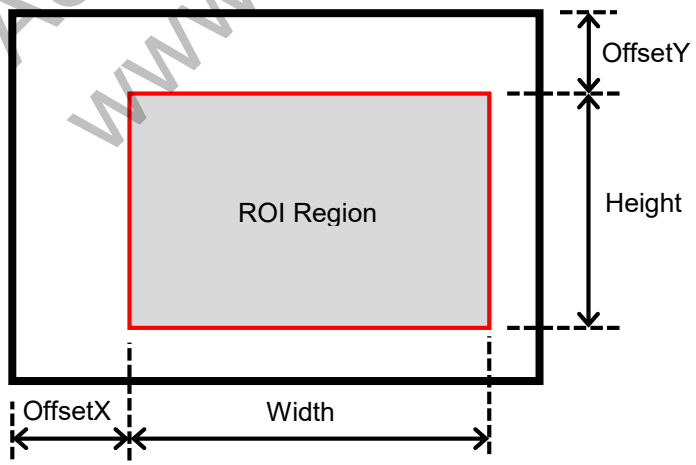
The frame rate increases when reducing height of image. The frame rate does not change when reducing width of image.

8.12.1 ROI (One Region)

GenICam Parameters

Width	IInteger Type	Horizontal (Pixel) size Range: 256 to 1,632 pixels Default: 1,632 pixels Setting steps: 8 pixels Sets the width of image. “Width + OffsetX” should not exceed maximum width.
Height	IInteger Type	Vertical (Line) size Range: 4 to 1,240 lines Default: 1,240 lines Setting steps: 2 lines Sets the height of image. “Height + OffsetY” should not exceed maximum height. When using multi ROI, please sets total height of multiple ROIs.
OffsetX	IInteger Type	Horizontal (Pixel) offset Range: 0 to 1,376 pixels Default: 0 pixels Setting steps: 2 pixels
OffsetY	IInteger Type	Vertical (Line) offset Range: 0 to 1,236 lines Default: 0 lines Setting steps: 2 lines

The parameters define as following chart.



8.13 Multi ROI

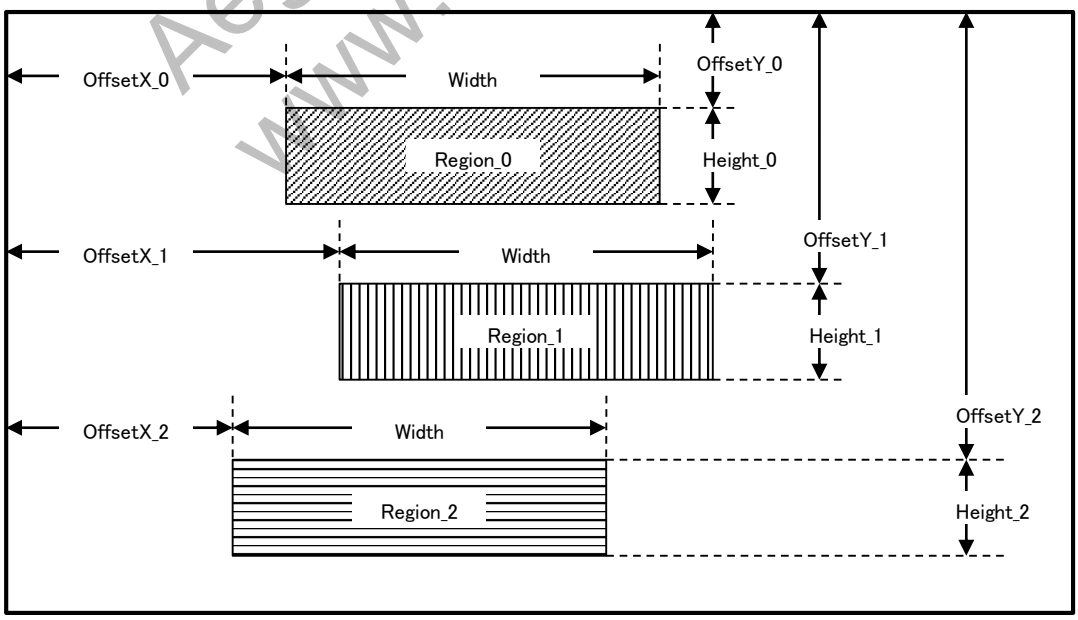
The maximum eight ROI regions (one horizontal region x eight vertical regions) are configurable.
Each region must not overlap other regions.
Please set each region (Region0 to 7) from top of image to bottom of image and must not overlap other regions.
The width of multi ROI sets at “Width” parameter. Same size of width applies for all regions.
The total height of multi ROI sets at “Height” parameter.
The frame rate can be increase when decreasing total image height (total of MultiHeight). The size of image width does not affect frame rate.

GenICam Parameters

MultiRegionSelector	IEnumeration Type	Selects the Multi Region of interest to control. Range: Region 0 to 7 Default: Region 0
MultiRegionMode [MultiRegionSelector]	IBoolean Type	Multi ROI function On / Off selection Off: Off (Default) On: On
MultiHeight [MultiRegionSelector]	IInteger Type	Vertical lines of selected region of multi ROI Range: 4 to 1,240 lines, Default: 1,240 lines Setting steps: 2 lines
MultiOffsetX [MultiRegionSelector]	IInteger Type	Horizontal offset of selected region of multi ROI Range: 0 to 1,376 pixels, Default: 0 pixels Setting steps: 2 pixels
MultiOffsetY [MultiRegionSelector]	IInteger Type	Vertical offset of selected region of multi ROI Range: 0 to 1,236 lines, Default: 0 line Setting steps: 2 lines

*Note.1: (OffsetX + Width) and (OffsetY + Height) should not be smaller than maximum values.
*Note.2: The maximum frame rate will be change depending on setting of OffsetY when using same height of region.

<Example> Three multiple regions:



8.14 Pixel Defect Correction

The defected pixel corrects with horizontally beside pixel information.

GenICam Parameters

PixelCorrectionAllEnabled	IBoolean Type	Switch ON / OFF for Pixel Defect Correction True: On (Default), False: Off
PixelICorrectionEnabled	IBoolean Type	Switch ON / OFF for pixel defect correction for Index was selected at “PixelCorrectionIndex” True: On, False: Off (Default)
PixelCorrectionIndex	IInteger Type	Pixel Correction Index Range: 0 to 511 Default: 0
PixelCorrectionX	IInteger Type	Defect position on X coordinate for Index was selected at “PixelCorrectionIndex” Range: 0 to 1,631 Default: 0
PixelCorrectionY	IInteger Type	Defect position on Y coordinate for Index was selected at “PixelCorrectionIndex” Range: 0 to 1,239 Default: 0

8.15 Save and load camera settings

The camera has camera setting save function, camera setting including factory default loads function.
The camera has below two camera settings.

Default: The factory default settings (This setting cannot change)
UserSetX: Over writeable camera settings (X: 0 to 7)

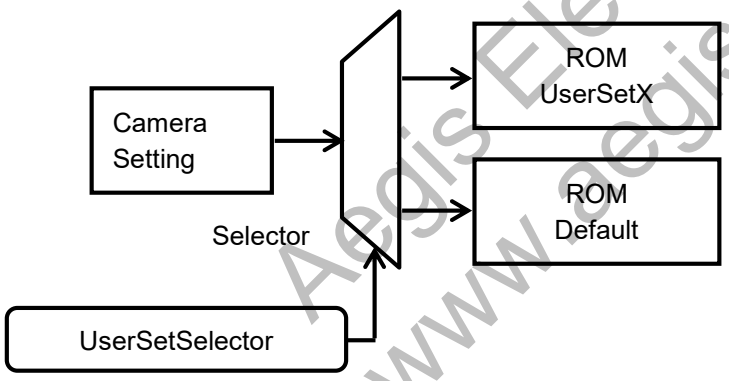
These camera settings load from ROM to register in RAM on camera and camera settings save to ROM.
The camera settings saving and loading is controllable with Parameters (UserSetSelector, UserSetDefault), and commands (UserSetLoad, UserSetSave) in UserSetControl category of GenICam.

The details of parameters and functions are in table below:

GenICam Parameters

UserSetSelector	IEnumeration Type	Select “Default” or ”UserSet1” UserSetLoad or UserSetSave process for selected settings.
UserSetLoad	ICommand Type	The camera settings load from ROM to register in RAM.
UserSetSave	ICommand Type	The camera settings at register in RAM save to ROM.
UserSetDefault	IEnumeration Type	Select which settings (“Default or UserSet X) load automatically when camera power is on. This selection saves automatically.

8.15.1 Saving the Camera Settings

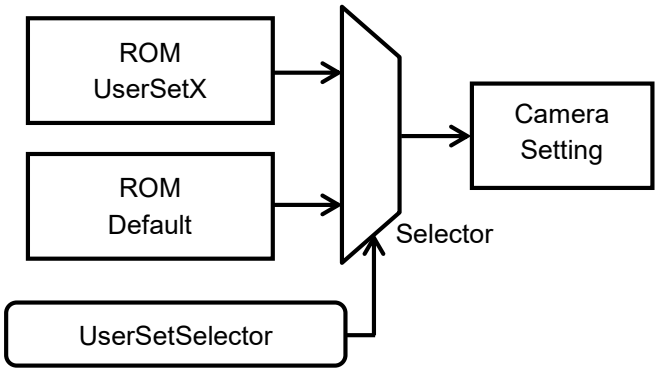


When UserSetSave is executing,
the camera settings at register in RAM
are saved to ROM that is selected at
UserSetSelector.
Caution:
UserSetSave cannot execute when “Default”
was selected at “UserSetSelector”

Setting Procedure

1. Selects “UserSetX” at “UserSetSelector”
2. Execute “UserSetSave”

8.15.2 Loading Camera Settings

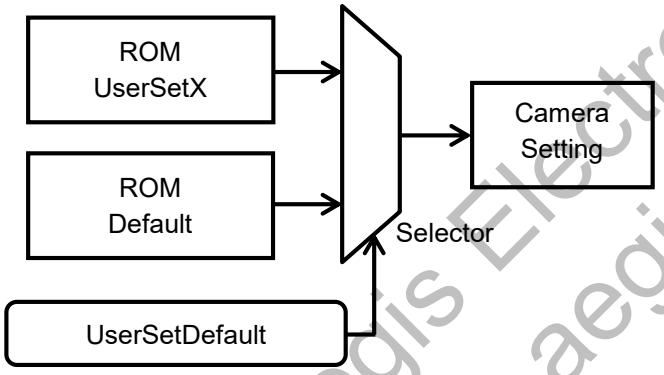


When UserSetLoad is executing,
the camera settings load from selected ROM that was selected at “UserSetSelector” to register at RAM.

Setting Procedure

1. Select “UserSetX” (or Default) at “UserSetSelector”
2. Execute “UserSetLoad”

8.15.3 Loading Camera Settings when the Camera Power is on



When the camera power is on,
the camera settings load from selected ROM that was selected at “UserSetDefault” to register at RAM.

Setting Procedure

1. Set “UserSetX” or “Default” at “UserSetDefault”

8.15.4 Camera Settings Initialization

Please follow the below procedure for camera settings put back to factory default settings.

Setting Procedure

1. Selects “Default” at “UserSetSelector”.
2. Executes “UserSetLoad”.
3. Selects “UserSetX” at “UserSetSelector”
4. Execute “UserSetSave”

9 IO Function

This chapter describes IO functions.
In this chapter, the IO Port places as “Line”. The follow chart details relationship of Line and IO Port.

IO Port Pin No.	Line number
2	Line3
3	Line2
4	Line1
5	Line0

GenICam Parameters

LineSelector	IEnumeration Type	Select Line
LineMode	IEnumeration Type	Switch input / output direction for Line that was selected at LineSelector. Input: set as input, Output: set as output
LineInverter	IBoolean Type	Switch polarity inversion ON / OFF for Line that was selected at LineSelector. False: polarity inversion Off (Active-High), True: polarity inversion On (Active-Low)
LineStatus	IBoolean Type	Line status (High / Low)
LineSource	IEnumeration Type	Set function for Line that was selected at LineSelector
UserOutputSelector	IEnumeration Type	Select UserOutput
UserOutputValue	IBoolean Type	Switch voltage level of UserOutput that was selected at UserOutputSelector False: Low voltage level, True: High voltage level

9.1 Input Port Function

This function sets the input on Line Mode, then assigns Line as input.
The following functions can be assigned as input.

9.1.1 Trigger Input

When select “input” assign port at Trigger Source, input signal can be assigned as Trigger.

The input signal can be switched to Active-Low (LineInverter: true) or Active-High (LineInverter: false).

(*) When the Line polarity changing by Line Inverter, active polarity of input trigger signal is changed.

9.1.2 Line Status

This function monitors the signal status on input Line.
The High level (LineStatus: true) or Low level (LineStatus false) status can be seen through software.

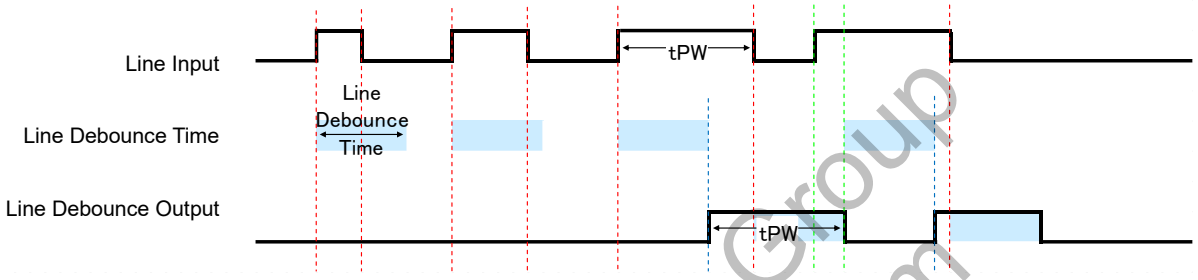
9.1.3 Line Debouncer

Line Debouncer can reduce the wrong input signal detection that is noise on signal or chartering, by filtering input signal.

GenICam Parameters

LineDebounceTime	IInteger Type	Line Debounce Time Range: 0 to 10,000 µseconds, Default: 1 µseconds

Timing



9.1.4 Trigger Delay

As mentioned in the previous chapter, “Image acquisition and Camera Mode”, each trigger can add to duration of input signal

This Trigger Delay can add to duration per µsecond.

GenICam Parameters

TriggerDelay	IInteger Type	Trigger Delay Range: 0 to 262,143 µseconds, Default: 0 µsecond

9.2 Output Port Function

This function sets the Output to Line Mode, and then Line is assigned as output.
The following functions can be assigned when IO port is used as output signal port.

9.2.1 Line Source

The following list shows the configurable functions available through LineSource.
The function that describes as “Enable” on “Changeable Polarity” is configurable polarity on Line Inverter (true, false).

No.	Function Name
1)	Off (Default)
2)	User Output
3)	Trigger Out
4)	Trigger Through Out
5)	Exposure End Out
6)	Frame End Out
7)	Frame Trigger Wait
8)	Transfer End Out
9)	Sensor Read Out
10)	Strobe Out
11)	Exposure Active

1) Off (Disable)
Disable the output signal.

2) User Output (General Output)
High or Low level signal that sets on software is output.

3) Trigger Out (Trigger Output)
The trigger signal that added “Trigger Out Delay (Output pulse delay time)” and “Trigger Out On Time (Output pulse width)” is output.

4) Trigger Through Out (Trigger Output)
The trigger signal that added “Trigger Out Delay (Output pulse delay time)” and “Trigger Out On Time (Output pulse width)” is output.

5) Exposure End Out (Exposure End)
“Trigger Out on Time (Output pulse width)” activation time signal with set “Trigger Out Delay (Output pulse delay time)” is output when expose was finished.

6) Frame End Out (Sensor Readout End)
“Trigger Out on Time (Output pulse width)” activation time signal with set “Trigger Out Delay (Output pulse delay time)” is output when sensor read out was finished.

7) Frame Trigger Wait (Trigger wait Output)
“Frame Trigger Wait” signal to determine whether camera can be receiving and process trigger signal or not.

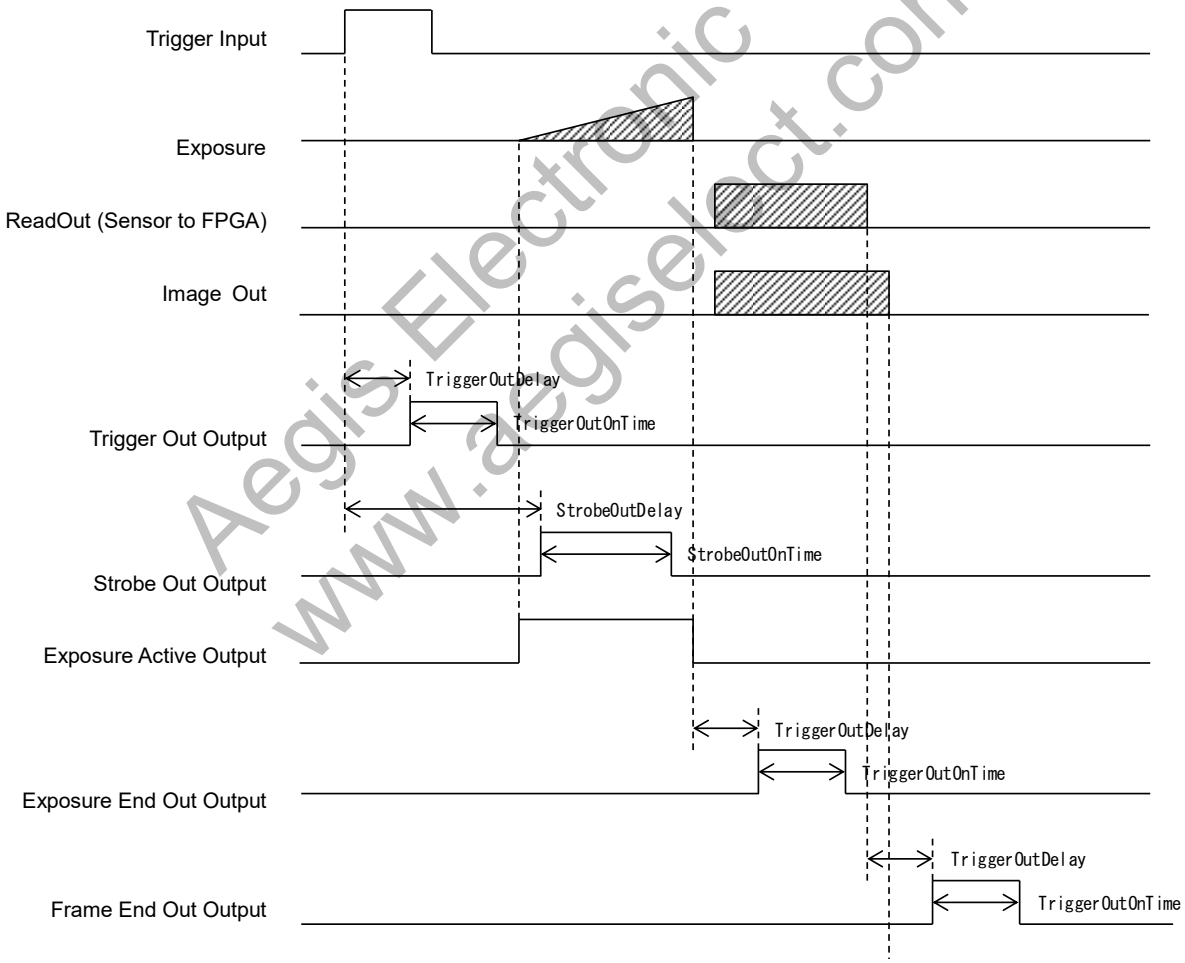
8) Transfer End Out (Transfer end Output)
"Trigger Out on Time (Output pulse width)" activation time signal with set "Trigger Out Delay (Output pulse delay time)" is output when one frame image out from camera was finished.

9) Sensor Read Out (Sensor Readout Output)
"High" state signal is output while image output from image sensor (FVAL period)

10) Strobe Out (Strobe Output)
"Strobe Out on Time (Output pulse width)" activation time signal with set "Strobe Out Delay (Strobe output delay time)" is output when trigger signal is received.

11) Exposure Active (In Exposure Period)
The signal that activation time is exposure time is output.
(*) Actual exposure period = Output signal pulse width + Minimum exposure time 13.73 μseconds

Line Source Timing



(*) This timing chart does not include delay of IO circuit

9.2.2 User Output

High or low level signal that was configured on software is output.

Setting Procedure

Selects LineN (N: any number from 0, 1 or 2)

1) Sets the UserOutputN (N is Line number) as LineSource
2) Selects UserOutputN (N is same as selected Line number on UserOutput) on UserOutputSelector
3) Sets the value (True: High level, False: Low level) on UserOutputValue

9.2.3 Line Status

Monitor the status on output port.

Monitor the output voltage level High (LineStatus: true) or Low (LineStatus: false) through software.

9.2.4 Output signal duration setting and Pulse width setting

Some selectable functions can be modified in order to add to duration or pulse width on Line Source.

The configurable parameters are shown in chart below.

Please refer to LineSource for applicable functions of parameters.

GenICam Parameters

TriggerOutDelay	IInteger Type	Trigger Out Delay Time Range: 0 to 262,143 µseconds, Default: 0 µsecond
TriggerOutOnTime	IInteger Type	Trigger Out On Time Range: 4 to 262,143 µseconds, Default: 32 µseconds
StrobeOutDelay	IInteger Type	Strobe Out Delay Time Range: 0 to 262,143 µseconds, Default: 30 µseconds
StrobeOutOnTime	IInteger Type	Strobe Out On Time Range: 4 to 262,143 µseconds, Default: 32 µseconds

10 GenICam command list

10.1 DeviceControl

Name	Description
DeviceType	Returns the device type.
DeviceScanType	Scan type of the sensor of the device.
DeviceVendorName	Name of the manufacturer of the device.
DeviceModelName	Model of the device.
DeviceManufacturerInfo	Manufacturer information about the device.
DeviceVersion	Version of the device.
DeviceSerialNumber	Device's serial number. This string is a unique identifier of the device.
DeviceUserID	User-programmable device identifier.
DeviceSFNCVersionMajor	Major version of the Standard Features Naming Convention that was used to create the device`s GenICam XML.
DeviceSFNCVersionMinor	Minor version of the Standard Features Naming Convention that was used to create the device`s GenICam XML.
DeviceSFNCVersionSubMinor	Sub minor version of Standard Features Naming Convention that was used to create the device`s GenICam XML.
DeviceManifestEntrySelector	Selects the manifest entry to reference.
DeviceManifestXMLMajorVersion	Indicates the major version number of the GenICam XML file of the selected manifest entry.
DeviceManifestXMLMinorVersion	Indicates the minor version number of the GenICam XML file of the selected manifest entry.
DeviceManifestXMLSubMinorVersion	Indicates the sub minor version number of the GenICam XML file of the selected manifest entry.
DeviceManifestSchemaMajorVersion	Indicates the major version number of the schema file of the selected manifest entry.
DeviceManifestSchemaMinorVersion	Indicates the minor version number of the schema file of the selected manifest entry.
DeviceManifestSchemaSubMinor Version	Indicates the sub minor version number of the schema file of the selected manifest entry.
DeviceTLType	Transport Layer type of the device.
DeviceTLVersionMajor	Major version of the Transport Layer of the device.
DeviceTLVersionMinor	Minor version of the Transport Layer of the device.
DeviceTLVersionSubMinor	Sub minor version of the Transport Layer of the device.
DeviceCharacterSet	Character set used by the strings of the device`s bootstrap registers.
DeviceRegistersEndianness	Endianess of the registers of the device.
DeviceTemperatureSelector	Selects the location within the device, where the temperature will be measured.
DeviceTemperature	Device temperature in degrees Celsius (C). It is measured at the location selected by DeviceTemperatureSelector.
DeviceClockSelector	Selects the clock frequency to access from the device.
DeviceClockFrequency [DeviceClockSelector]	Returns the frequency of the selected device.

10.2 ImageFormatControl

Name	Description
SensorWidth	Effective width of the sensor in pixels.
SensorHeight	Effective height of the sensor in pixels.
SensorShutterMode	Sets the shutter mode of the device.
WidthMax	Maximum width of the image (in pixels). The dimension is calculated after horizontal binning, decimation or any other function changing the horizontal dimension of the image.
HeightMax	Maximum height of the image (in pixels). This dimension is calculated after vertical binning, decimation or any other function changing the vertical dimension of the image
RegionSelector	Selects the Region of interest to control. The RegionSelector feature allows devices that are able to extract multiple regions out of an image, to configure the features of those individual regions independently.
ComponentSelector	Selects a component to activate data streaming from.
ComponentEnable [ComponentSelector]	Controls if the selected component streaming is active.
Width	Width of the image provided by the device (in pixels).
Height	Height of the image provided by the device (in pixels).
OffsetX	Horizontal offset from the origin to the region of interest (in pixels).
OffsetY	Vertical offset from the origin to the region of interest (in pixels).
MultiRegionSelector	Selects the Multi Region of interest to control. The MultiRegionSelector feature allows devices that are able to extract multiple regions out of an image, to configure the features of those individual regions independently.
MultiRegionMode [MultiRegionSelector]	Controls if the selected Multi Region of interest is active and streaming.
MultiHeight [MultiRegionSelector]	Multi Height of the image provided by the device (in pixels).
MultiOffsetX [MultiRegionSelector]	Horizontal offset from the origin to the multi region of interest (in pixels).
MultiOffsetY [MultiRegionSelector]	Vertical offset from the origin to the multi region of interest (in pixels).
BinningSelector	Selects which binning engine is controlled by the BinningHorizontal and BinningVertical features.
BinningHorizontalMode [BinningSelector]	Sets the mode to use to combine horizontal photo-sensitive cells together when BinningHorizontal is used.
BinningHorizontal [BinningSelector]	Number of horizontal photo-sensitive cells to combine together. This increases the intensity (or signal to noise ratio) of the pixels and reduces the horizontal resolution (width) of the image.
BinningVerticalMode [BinningSelector]	Sets the mode used to combine vertical photo-sensitive cells together when BinningVertical is used.
BinningVertical [BinningSelector]	Number of vertical photo-sensitive cells to combine together. This increases the intensity (or signal to noise ratio) of the pixels and reduces the vertical resolution (height) of the image.
DecimationHorizontalMode	Sets the mode used to reduce the horizontal resolution when DecimationHorizontal is used.
DecimationHorizontal	Horizontal sub-sampling of the image. This reduces the horizontal resolution (width) of the image by the specified horizontal decimation factor.
DecimationVerticalMode	Sets the mode used to reduce the vertical resolution when DecimationVertical is used.
DecimationVertical	Vertical sub-sampling of the image. This reduces the vertical resolution (height) of the image by the specified vertical decimation factor.

Name	Description
ReverseX	This feature is used to flip horizontally the image sent by the device. The AOI is applied after the flipping.
ReverseY	This feature is used to flip vertically the image sent by the device. The AOI is applied after the flipping.
PixelFormat [ComponentSelector]	Format of the pixels provided by the device. It represents all the information provided by PixelCoding, PixelSize, PixelColorFilter combined in a single feature.
PixelFormatInfoSelector	Select the pixel format for which the information will be returned.
PixelFormatInfoID [PixelFormatInfoSelector]	Returns the value used by the streaming channels to identify the selected pixel format.
PixelSize [PixelFormatInfoSelector]	Total size in bits of a pixel of the image.
PixelColorFilter [PixelFormatInfoSelector]	Type of color filter that is applied to the image.
TestPatternGeneratorSelector	Selects wich test pattern generator is controlled by the TestPattern feature.
TestPattern [TestPatternGeneratorSelector]	Selects the type of test pattern that is generated by the device as image source.
TestPatternInputValue [TestPatternGeneratorSelector]	Test Pattern Input Value

10.3 AcquisitionControl

Name	Description
AcquisitionMode	Sets the acquisition mode of the device. It defines mainly the number of frames to capture during an acquisition and the way the acquisition stops.
AcquisitionStart	Starts the Acquisition of the device. The number of frames captured is specified by AcquisitionMode.
AcquisitionStop	Stops the Acquisition of the device at the end of the current Frame. It is mainly used when AcquisitionMode is Continuous but can be used in any acquisition mode.
AcquisitionFrameRate	Controls the acquisition rate (in Hertz) at which the frames are captured.
TriggerSelector	Selects the type of trigger to configure.
TriggerMode [TriggerSelector]	Controls if the selected trigger is active.
TriggerSoftware [TriggerSelector]	Generates an internal trigger. TriggerSource must be set to Software.
TriggerSource [TriggerSelector]	Specifies the internal signal or physical input Line to use as the trigger source. The selected trigger must have its TriggerMode set to On.
TriggerOverlap [TriggerSelector]	Specifies the type trigger overlap permitted with the previous frame or line. This defines when a valid trigger will be accepted (or latched) for a new frame or a new line.
TriggerDelay [TriggerSelector]	Specifies the delay in microseconds (us) to apply after the trigger reception before activating it.
ExposureMode	Sets the operation mode of the Exposure (or shutter).
ExposureTimeSelector	Selects which exposure time is controlled by the ExposureTime feature. This allows for independent control over the exposure components.
ExposureTime [ExposureTimeSelector]	Sets the Exposure time when ExposureMode is Timed and ExposureAuto is Off. This controls the duration where the photosensitive cells are exposed to light.

10.4 TransportLayerControl

Name	Description
PayloadSize	Provides the number of bytes transferred for each image or chunk on the stream channel. This includes any end-of-line, end-of-frame statistics or other stamp data. This is the total size of data payload for a data block.
CxpLinkConfigurationStatus	This feature indicates the current and active link configuration used by the device.
CxpLinkConfigurationPreferred	Provides the link configuration that allows the Transmitter device to operate in this defaut mode.
CxpLinkConfiguration	This feature allows specifying the link configuration for the communication between the Receiver and Transmitter device.
CxpConnectionSelector	Selects the CoaXPress physical connection to control.
CxpConnectionTestMode [CxpConnectionSelector]	Enalbes the test mode for and individual physical connection of the device.
CxpConnectionTestErrorCount [CxpConnectionSelector]	Reports the current connection error count for test packets received by the device on the connection selected by CxpConnectionSelector.
CxpConnectionTestPacketCount [CxpConnectionSelector]	Reports the current count for test packets received by the device on the connection selected by CxpConnectionSelector.
Image1StreamID	Gives the ID for the 1st stream.

10.5 DigitalIOControl

Name	Description
LineSelector	Selects the physical line (or pin) of the external device connector to configure.
LineMode [LineSelector]	Controls if the physical Line is used to Input or Output a signal.
LineInverter [LineSelector]	Controls the inversion of the signal of the selected input or output Line.
LineStatus [LineSelector]	Returns the current status of the selected input or output Line.
LineSource [LineSelector]	Selects which internal acquisition or I/O source signal to output on the selected Line. LineMode must be Output.
UserOutputSelector	Selects which bit of the User Output register will be set by UserOutputValue.
UserOutputValue [UserOutputSelector]	Sets the value of the bit selected by UserOutputSelector.
StrobeOutDelay	Delay of StrobeOut signal when LineSource is set to StrobeOut (us).
StrobeOutOnTime	Duration of StrobeOut signal when LineSource is set to StrobeOut (us).
TriggerOutDelay	Delay of TriggerOut signal when LineSource is set to TriggerOut (us).
TriggerOutOnTime	Duration of TriggerOut signal when LineSource is set to TriggerOut (us).
LineDebounceTime	Sets the value of the input line debouncer time.

10.6 AnalogControl

Name	Description
GainSelector	Selects which Gain is controlled by the various Gain features.
Gain [GainSelector]	Controls the selected gain as an absolute physical value. This is an amplification factor applied to the video signal.
BlackLevelSelector	Selects which Black Level is controlled by the various Black Level features.
BlackLevel [BlackLevelSelector]	Controls the black level as an absolute physical value. This represents a DC offset applied to the video signal.
BalanceRatioSelector	Selects which Balance ratio to control.
BalanceRatio [BalanceRatioSelector]	Controls ratio of the selected color component to a reference color component. It is used for white balancing.
BalanceWhiteAuto	Controls the mode for automatic white balancing between the color channels. The white balancing ratios are automatically adjusted.

10.7 LUTControl

Name	Description
PixelCorrectionAllEnabled	Enable pixel correction for all pixels.
PixelCorrectionEnabled	Determine if targeted pixel is enabled for pixel correction.
PixelCorrectionIndex	Determine index of targeted pixel for pixel correction.
PixelCorrectionX	Determine x-coordinate of targeted pixel for pixel correction.
PixelCorrectionY	Determine y-coordinate of targeted pixel for pixel correction.

10.8 UserSetControl

Name	Description
UserSetSelector	Selects the feature User Set to load, save or configure.
UserSetLoad [UserSetSelector]	Loads the User Set specified by UserSetSelector to the device and makes it active.
UserSetSave [UserSetSelector]	Save the User Set specified by UserSetSelector to the non-volatile memory of the device.
UserSetDefault	Selects the feature User Set to load and make active by default when the device is reset.

11 Revision History

Rev	Date	Changes	Note
00	2020/10/27	● New Document	
01	2020/12/24	● Revised Changed Default value on Black Level Revised Image Format, Pixel Format	
02	2021/02/04	● Revised Revised ADC bits width	

Note: Product specifications would be changed without notification.