BOPIXEL JAPAN ボゾンジャパン株式会社

CoaXPress Camera

Monochrome / Color CMOS 65Mpixel

BC-GM65M12X4 (65M, Monochrome)
BC-GC65M12X4 (65M, Color)

Product Specifications

BOPIXEL Corporation

Safety precautions

- This product is not designed and manufactured for applications that may cause damage to the human body, so do not use it for that purpose.
- This product is not waterproof. Do not use this product in an environment where it will be directly exposed to liquid or in a humid place.
- Do not use the camera in an environment with flammable liquids or gases. It may cause a fire or an explosion.
- In environments where the temperature changes drastically, use the camera and lens after taking measures to prevent condensation. Condensation inside the camera may cause a malfunction.
- Use the camera in the environment described in the specifications. It may cause malfunction or malfunction.
- The housing temperature is high while the camera is in use. In particular, the camera labeled  may have a housing temperature of more than 60°C depending on the environment in which it is used. Do not touch the camera during use or immediately after use. Doing so may cause burns or injuries.
- Use the supply voltage and the I/O signal to the camera within the range described in the specifications. It may cause malfunction or malfunction.
- When wiring to the camera connector, follow the pin assignments described in the specifications and be careful not to stress the wiring or camera connection. It may cause malfunction or malfunction.
- Do not disassemble the camera.

Precautions for use

- Do not subject the camera to shock or static electricity.
- When not using the camera, use a lens mount cap or protective sheet to prevent dust from adhering to the CMOS sensor imaging surface.
- Blow off any dirt on the glass surface with an air duster or similar tool, and be careful not to scratch the glass surface.
- If there is a noise source such as a motor near the camera or wiring cable, the image may be distorted or communication failure may occur. Keep the camera and wiring cables away from noise sources.
- Due to the inherent characteristics of CMOS sensors, pixel defects may occur during transportation and storage.

Table of Contents

1 Specifications

1.1 Electronic Specifications

Model Number		BC-GM65M12X4	BC-GC65M12X4
Image Sensor		Gpixel: GMAX3265 Monochrome CMOS	Gpixel: GMAX3265 Color CMOS
Shutter Type		Global	
Active Pixel		9344 (H) x 7000 (V) : 65MPixel	
Pixel Size		3.2 (H) x 3.2 (V) μm	
Sync System		Free run / External trigger (Hardware / Software) / LinkTrigger(use of coax cable)	
Maximum Frame Rate		71fps (8bit CXP12_X4) 57fps (8bit CXP10_X4) 35.5 fps (8bit CXP12_X2,CXP6_X4) 28.5fps (8bit CXP10_X2) 17.7 fps (8bit CXP12_X1,CXP6_X2,CXP3_X4) 14.2fps (8bit CXP10_X1) 8.8 fps (8bit CXP6_X1,CXP3_X2) 4.4 fps (8bit CXP3_X1)	
Video Output Format		CXP12 (_X4, _X2, _X1), CXP10 (_X4, _X2, _X1), CXP6 (_X4, _X2, _X1), CXP3 (_X4, _X2, _X1) 4 / 2 / 1 lane	
Video Format		8 bits (Mono8)	8 bit (BayerGB8)
Noise Level		T.B.D.	
Sensitivity (*1)		T.B.D.	T.B.D.
Exposure time		24 μseconds to 2 seconds	
Gain	Analog Gain	1.25 Times (fixed)	
	Digital Gain	1.0 to 3.0 Times	
Black Level		0 to 80 DN 8bit	
White Balance Gain		N/A	Formula1 : 1 to 5 Times Formula2 : 1 to 8 Times
ROI		Width (Horizontal): 64 to 9344 / Height (Vertical): 4 to 7000 Adjustable Steps for size: 16 pixels in width direction / 2 lines in height direction Adjustable Steps for offset: 2 pixels in width direction / 2 lines in height direction	
Image Flip		ReverseX / ReverseY (Default: OFF)	
Shading Correction		Support	
Pixel Defect Correction		Up to 1024 points	
Operational Mode		Free-run(TriggerMode:Off) / Edge-preset Trigger(TriggerMode:On , ExposureMode:Timed) / Pulse width Trigger (TriggerMode:On , ExposureMode:TriggerWidth)	
User Setting Storage		Support	
Communication		CoaXPress Standard Ver1.1	
Protocol		GenICam Standard Version (SFNC 2.5) compliant	
Input / Output		GPIO x 2, Isolated Input x 1	
Power	Input Voltage	PoCXP or External24V	
	Consumption	T.B.D.	

(*1) Sensitivity is measured under below conditions.
F5.6 of Lens, Gain:0dB, Exposure time:1/30sec., Light source: Light box(5100K)
(*2) The effective range of pixel defect correction is as follows.
Monochrome : Same as active pixel.
Color : 9284(H) x 6940(V) (30(H) x 30(V) from four corners of the active pixel is out of the pixel defect correction guarantee range)

1.2 Mechanical Specifications

Model Number	BC-GM65M12X4-F (-AN) BC-GM65M12X4-M42 (-AN)	BC-GC65M12X4-F (-AN) BC-GC65M12X4-M42 (-AN)
Dimensions	80 (W) x 80 (H) x 92.5 (D) mm: F Mount Straight Type (-F) (*1) 80 (W) x 80 (H) x 63.5 (D) mm: M42 Mount Straight Type (-M42) (*1) 80 (W) x 80 (H) x 85.5 (D) mm: F Mount Angle Type (-F-AN) (*1) 80 (W) x 80 (H) x 56.5 (D) mm: M42 Mount Angle Type (-M42-AN) (*1)	
Material	Aluminum alloy	
Lens Mount	F Mount / M42 Mount / Custom Mount	
Interface Connectors	DIN1.0/2.3 Connector I/O Connector: HR10A-7R-6PB (Hirose) or equivalent	
Camera Mounting	M4 screws holes Straight Type : Four on front, Four on top and bottom, Two on both side plate Angle Type : Four on front, Two on top and bottom and both side plate	
Weight	T.B.D. : F MOUNT type (Straight and Angle Type) T.B.D. : M42 MOUNT type (Straight and Angle Type)	

(*1) excluding the connectors

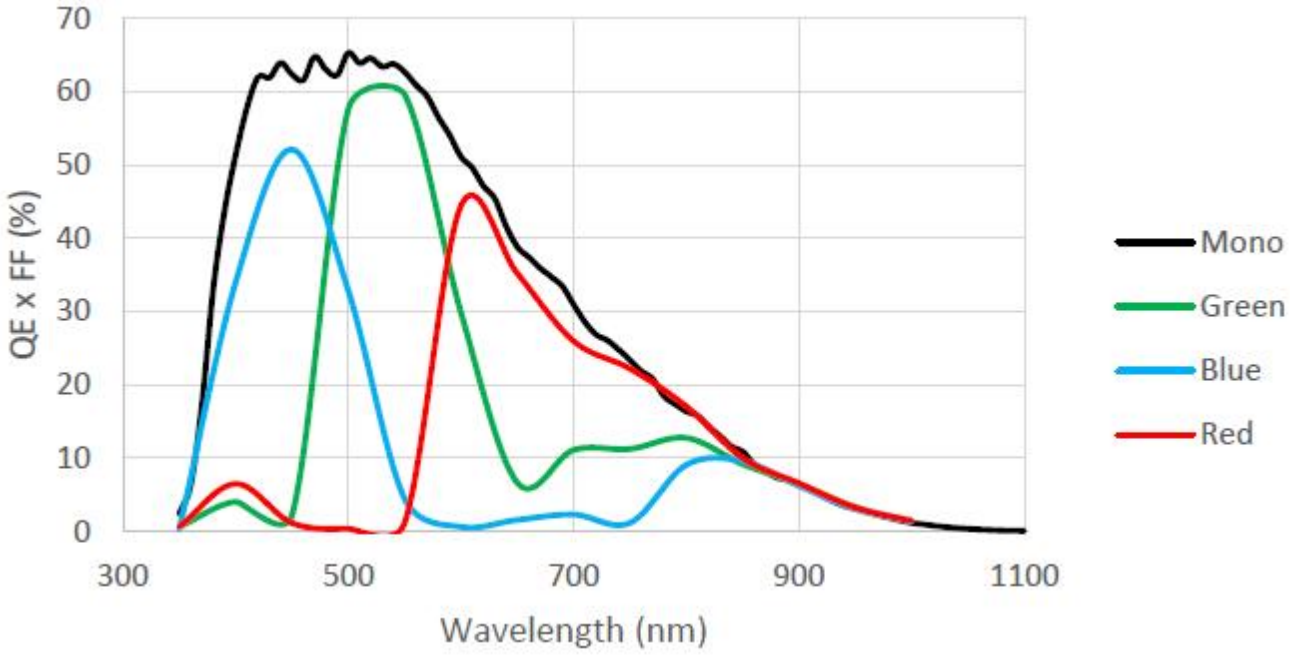
1.3 Environmental Specifications

Model Number	BC-GM65M12X4-F (-AN) / BC-GC65M12X4-F (-AN) BC-GM65M12X4-M42 (-AN) / BC-GC65M12X4-M42 (-AN)
Operational Temperature / Humidity (*1)	T.B.D.
Storage Temperature / Humidity	T.B.D.
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 6ms, XYZ 3 directions 3 times each
Standard Compliancy	EMI: EN55032:2015+A1:2020, EN61000-3-2:2019+A1:2021, EN61000-3-3:2013+A1:2019 (Scheduled) EMS: EN55035:2017+A11:2020, EN61000-4-2:2009, EN61000-4-3:2020, EN61000-4-4:2012 (Scheduled)
RoHS	RoHS Compliant

(*1) Use in an installation environment where the [Device Temperature] (CMOS temperature sensor inside the camera) read by communication is 60℃ or less.

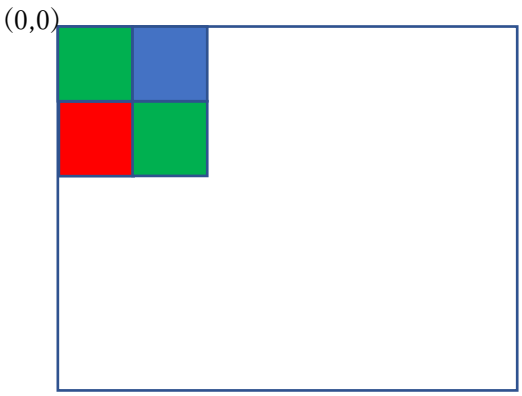
2 CMOS Informaiton

Relative response



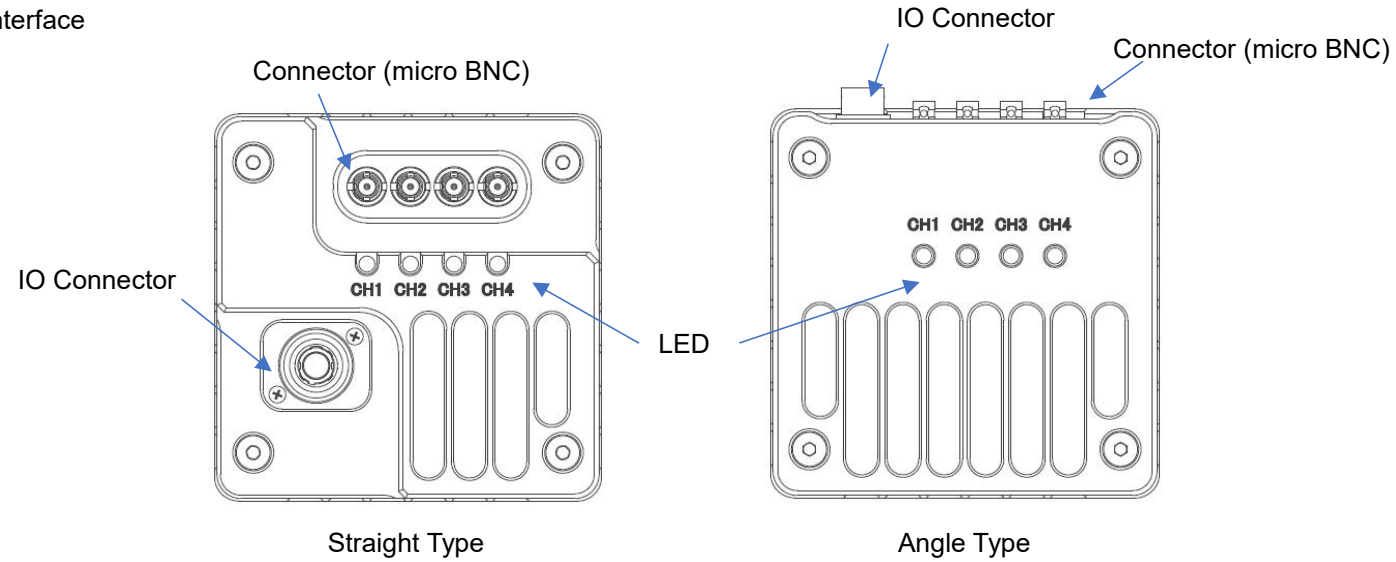
Color Filter Array

BC-GC65M12X4 (Color)



3 Camera Hardware Information

Interface



Straight Type　　Angle Type

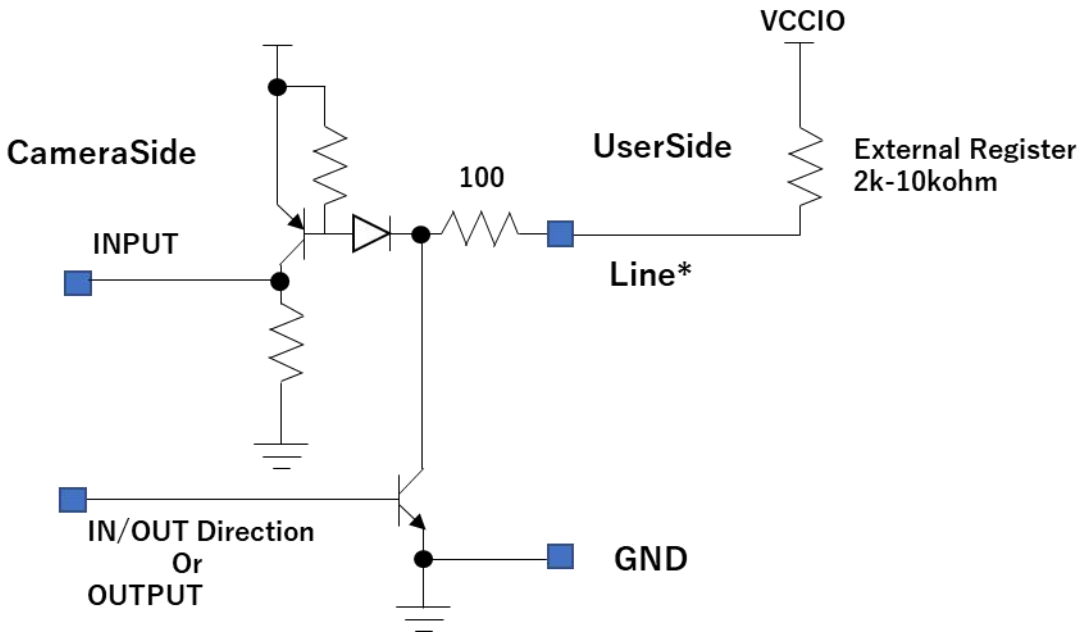
IO Connector

- HR10A-7P-6S (Hirose) or equivalent can be used.
- GPIO can select input and output by camera setting.

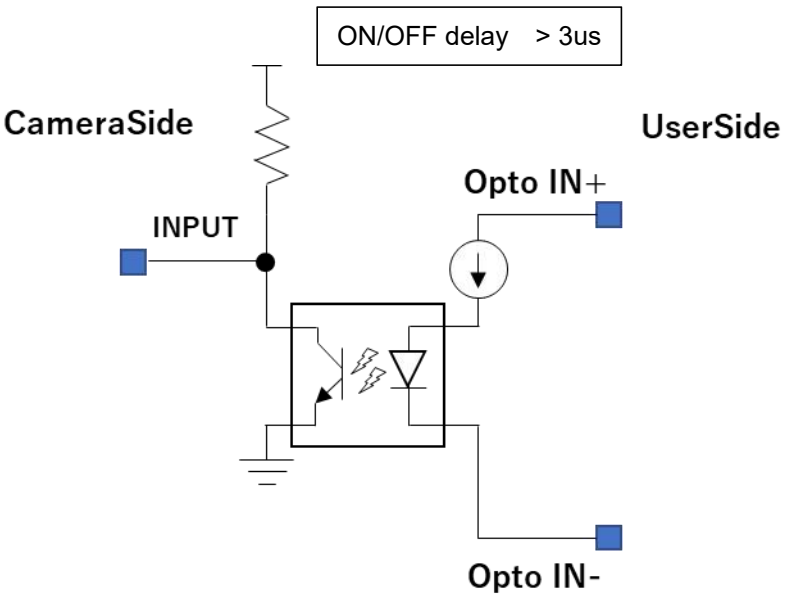
Pin assignment And DC characteristics

Pin No.	Signal Name	Function	DIR	電圧	
				Low Voltage	High Voltage
1	DC24V	POWER	IN	DC24V±10%	
2	Line0	GPIO	IN	≦1.0V	Open or External Pull Up (3.0 to 26.4V)
			OUT	≦1.0V	Open or External Pull Up (3.0 to 26.4V)
3	Line1	GPIO	IN	≦1.0V	Open or External Pull Up (3.0 to 26.4V)
			OUT	≦1.0V	Open or External Pull Up (3.0 to 26.4V)
4	Opto IN+	IN	(Opto IN+) – (Opto IN-)	≦1.0V	3.0 to 26.4V
5	Opto IN-	IN			
6	GND	GND	-		

GPIO Line Circuit



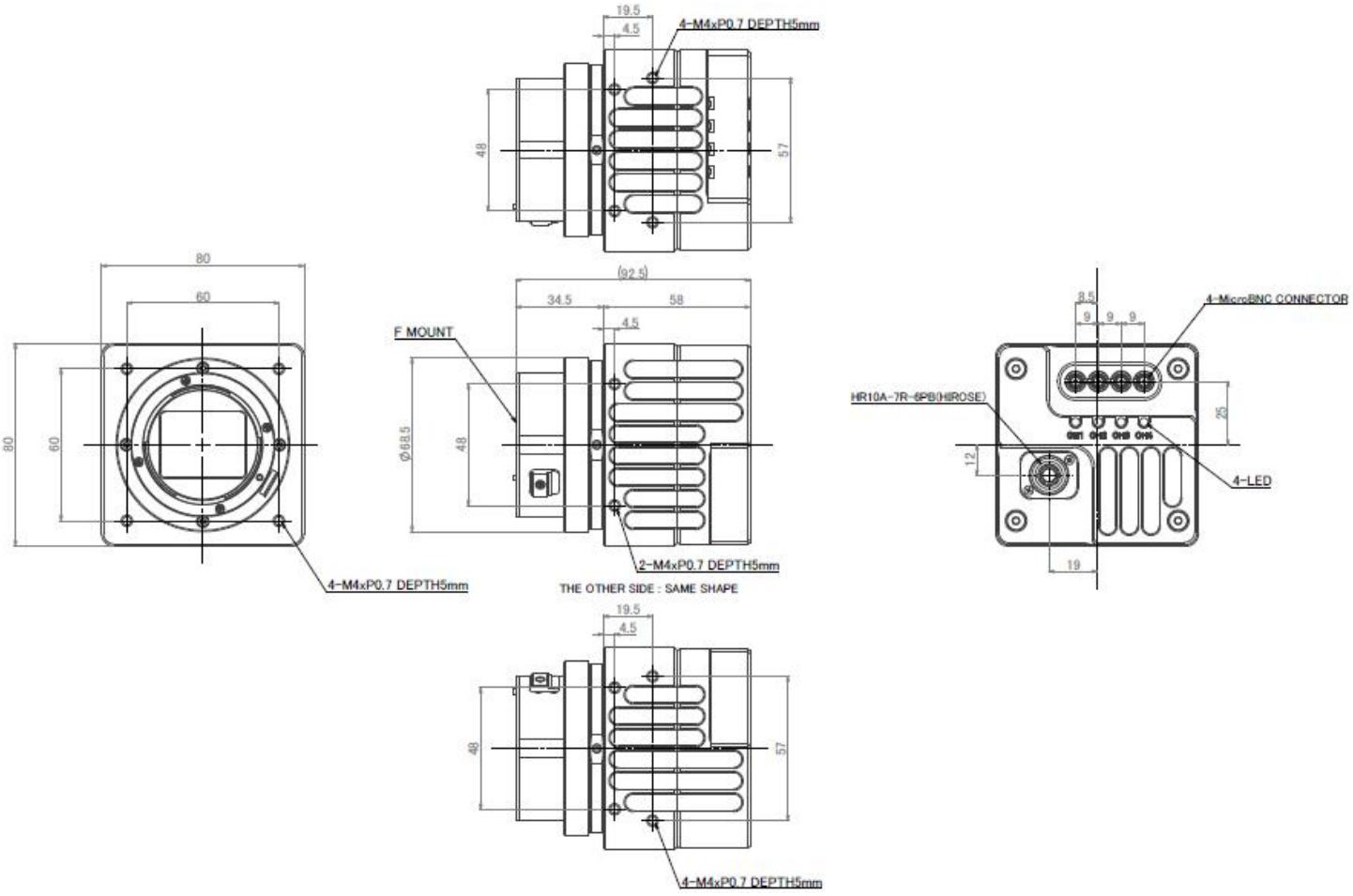
Opto IN Circuit



BOPIXEL JAPAN ボゾンジャパン株式会社

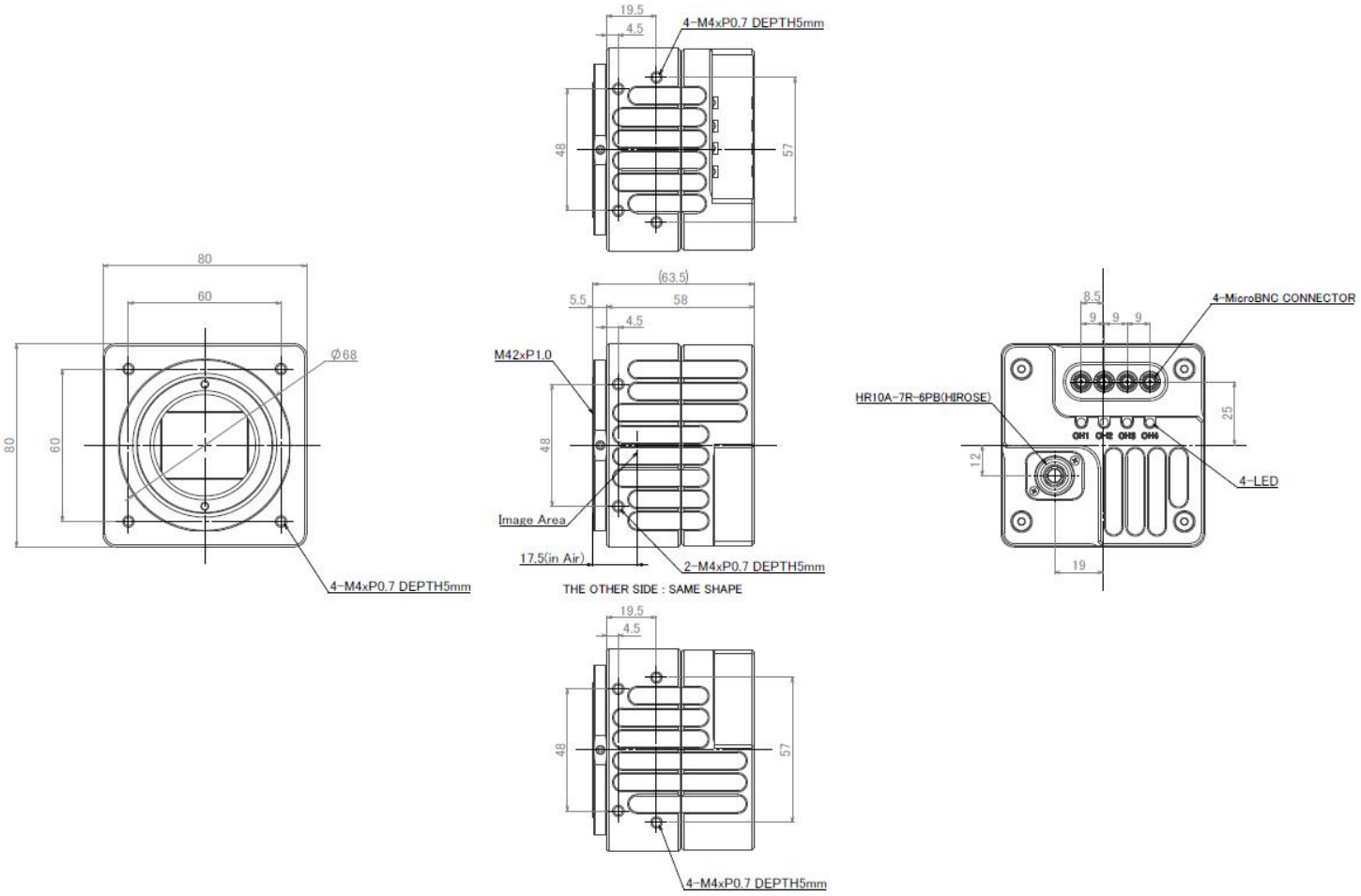
Camera Dimensions (Subject to change)

【F MOUNT STRAIGHT TYPE】 Unit : mm



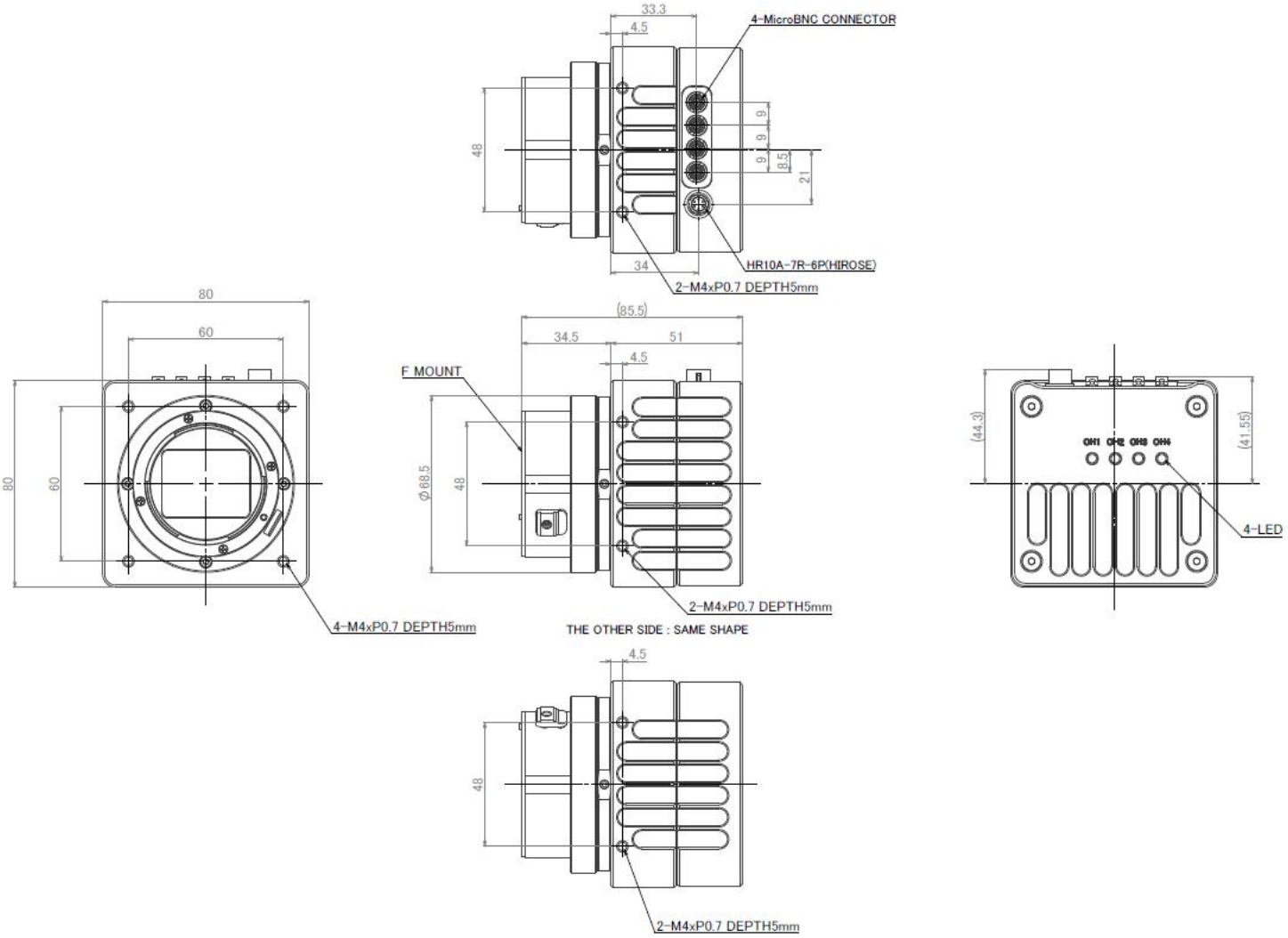
BOPIXEL JAPAN ボゾンジャパン株式会社

【M42 MOUNT STRAIGHT TYPE】 Unit : mm



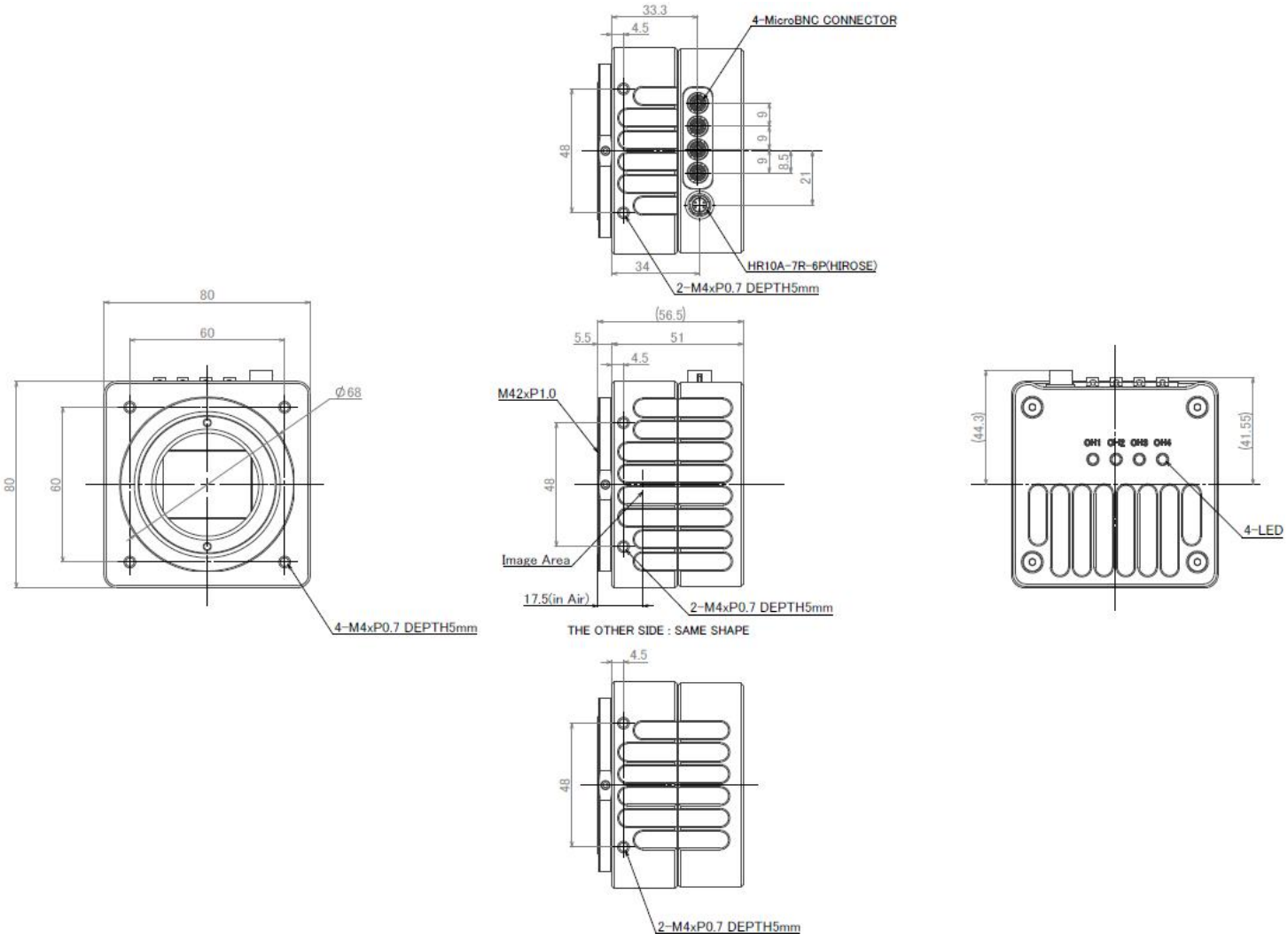
BOPIXEL JAPAN ボゾンジャパン株式会社

【F MOUNT ANGLE TYPE】 Unit : mm



BOPIXEL JAPAN ボゾンジャパン株式会社

【M42 MOUNT ANGLE TYPE】 Unit : mm



4 Camera Operation

4.1 GenICam Command Reference Table

The setting items of the camera conform to SNFC of GenICam Standard Version.
The items implemented in the camera are as follows.
Please refer to SNFC of GenICam for details of the function except the original functions of BOPIXEL.

4.1.1 Standard functions

GenICam command	Default
DeviceVendorName	BOPIXEL
DeviceModelName	BC-GM65M12X4 / BC-GC65M12X4
DeviceManufacturerInfo	www.BOPIXELjapan.com
DeviceVersion	-
DeviceSerialNumber	-
DeviceUserID	00000000
DeviceTemperature	-
SensorWidth	9344
SensorHeight	7000
WidthMax	9344
HeightMax	7000
Width	9344
Height	7000
OffsetX	0
OffsetY	0
ReverseX	False
ReverseY	False
PixelFormat	MonochromeModel: Mono8 / ColorModel: BayerGB8
TestPatternGeneratorSelector	FPGA
TestPattern	Off
AcquisitionFrameRate	Refer to [FrameRate calcurate]
TriggerMode	Off
TriggerSource	Software
TriggerSoftware	-
TriggerDelay	0
ExposureMode	Off
ExposureTime	-
GainSelector	AnalogAll
Gain[AnalogAll]	1 (1.25 Times fixed)

GenICam command	Default
Gain[DigitalAll] (*1)	0
BlackLevelSelector	All
BlackLevel	10
BalanceRatioSelector	0 (ColorMode Only)
BalanceRatio[Red]	0 (ColorMode Only)
BalanceRatio[GreenR]	0 (ColorMode Only)
BalanceRatio[GreenB]	0 (ColorMode Only)
BalanceRatio[Blue]	0 (ColorMode Only)
WhiteBalanceFunctionMode (*2)	Formula1
LineSelector	Line0
LineMode	Input
LineInverter	False
LineSource	UserOutput0
LineStatus	-
UseroutputSelector	UserOutput0
UserOutputValue	False
DeviceTapGeometry	Geometry_1X_1Y
PayLoadSize	65408000
CxpLinkConfiguration	CXP6_X4
CxpLinkConfigurationPreferred	CXP6_X4
CxpLinkConfigurationStatus	-
TestMode	Off
TestErrorCountSelector	0
TestErrorCount	0
UserSetSelector	Default
UserSetLoad	-
UserSetSave	-
UserSetDefault	Default

(*1) Gain[DigitalAll] : OutValue = InValue + (InValue-BlackLevel)*DigitalAllGain / 64 (Set 0 for 0dBGain)

(*2) White Balance Function Mode:
1) Formula1: OutValue = InValue + (InValue-BlackLevel)*BalanceRatio/64 (Set 0 for 0dBGain)
2) Formula2: OutValue = (InValue-BlackLevel)*BalanceRatio/2048+BlackLevel (Set 2048 for 0dBGain)

(*3) If using with CXP3_X1, the black level in image unevenness becomes larger than other modes due to the CMOS characteristics.When using with CXP3_X1, please use the camera after pre-evaluation.

4.1.2 Original functions of BOPIXEL

GenICam command	Discription	Default
BlackLevelCorrection	When set to On, Corrects the drift of BLACK LEVEL due to dark current.	Off
EnableDigitalGainOffset	When set to On, Enable factory settting DigitalGainOffset.	On
EnablePixelCorrection	When set to True, Activates pixel correction.	True
PixelCorrectionHighlight	When set to True, the pixel of the coordinate to be corrected is highlighted.	False
PixelCorrectionIndex	Index for Pixel Correction Data.This can be set for 1024 points.	0
PixelCorrectionX	Set the X position. The pixel to be corrected is written at the factory. Users can be added.	65535
PixelCorrectionY	Set the Y position. The pixel to be corrected is written at the factory. Users can be added.	65535
Enable Shading Correction	When set to True, Activates shading correction.	False
Shading Correction Mode(*1)	Auto: Gain and Center PosX/Y is factory setting Manual: Gain and Center PosX/Y is manual setting	Auto
Shading Gain Selector	Select the gain color , Users want to change.	MonochromeModel: Mono ColorModel: Red/GreenR/GreenB/Blue
Shading Gain Manual[Mono]	Set the Shading gain. If maxGain and PosX/Y=1/2Width&HeightMax, The edge pixels have 2 times the gain of the center PosX/Y pixel. If 1/2maxGain and PosX/Y=1/2Width&HeightMax, The edge pixels have 1.5 times the gain of the center PosX/Y pixel.	0(MonochromeModel Only)
Shading Gain Manual [Red]		0 (ColorMode Only)
Shading Gain Manual [GreenR]		0 (ColorMode Only)
Shading Gain Manual [GreenB]		0 (ColorMode Only)
Shading Gain Manual [Blue]		0 (ColorMode Only)
Shading Center PosX Manual		0
Shading Center PosY Manual		0
LineDebounceTime	Specifies the delay in microseconds (us) to apply after receiving IO[Line*] signal and before activating it.	1

(*1) When used with the Manual setting, it is possible to provide an auxiliary tool for calculating Shading Gain and Center PosX/Yfrom the bitmap image.

5 Image Acquisition and Camera Trigger Modes

TriggerMode：When set to ON, it is possible to input a trigger to the camera from an external interface.
TriggerMode：When set to OFF, a trigger is generated inside the camera at the cycle of AcquisitionFrameRate.

5.1 Trigger Source

5.1.1 Software

A trigger is input by a communication command from the camera.
When software trigger is used, the timing of trigger input to the camera may not be guaranteed because it depends on the operating status of the host PC.

5.1.2 Line0-Line2

A trigger is input from the 6-pin connector (GPIO) of the camera.
When using the Line trigger, it is necessary to keep the voltage input range to the IO pin.

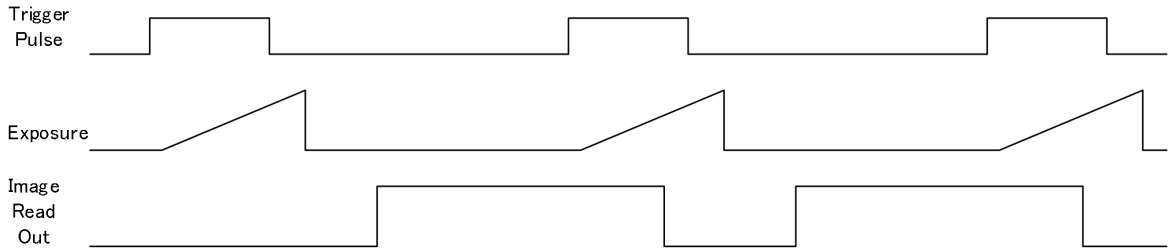
5.1.3 LinkTrigger

A trigger is input from the Cable line of the grabber board.
The trigger input method from LinkTrigger depends on the grabber board specifications.

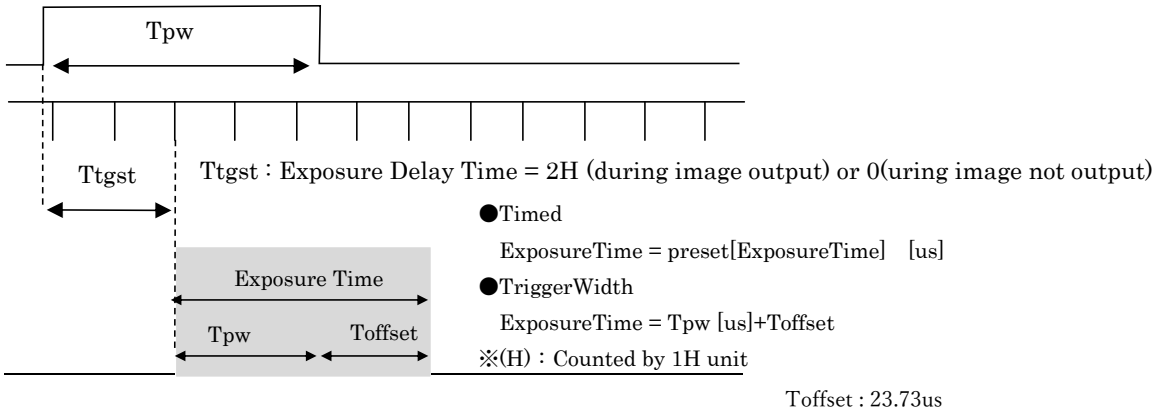
5.2 Trigger Acquisition Mode

5.2.1 Exposure Control

Next trigger can be input during the sensor image read out.
In this case, exposure start timing is delayed 2 horizontal sensor drive term.



- **The Detail Timing**



Ttgst : Exposure Delay Time = 2H (during image output) or 0(uring image not output)

●Timed
ExposureTime = preset[ExposureTime] [us]

●TriggerWidth
ExposureTime = Tpw [us]+Toffset

※(H) : Counted by 1H unit

Toffset : 23.73us

When used with TriggerWidth, Toffset is added inside the CMOS.

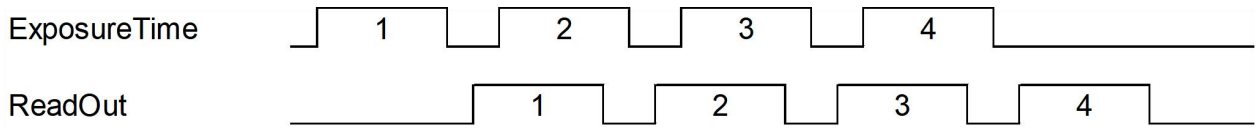
The Horizontal Period depends on the camera settings.
Refer to [Horizontal Period depending on camera settings]

5.2.2 Horizontal Period depending on camera setting.

CXP Link Configuration	Horizontal Period(usec)
CXP12X4	2.00
CXP6X4 / CXP12X2	4.00
CXP3X4 / CXP6X2 / CXP12X1	8.00
CXP3X2 / CXP6X1	16.00
CXP3X1	32.00

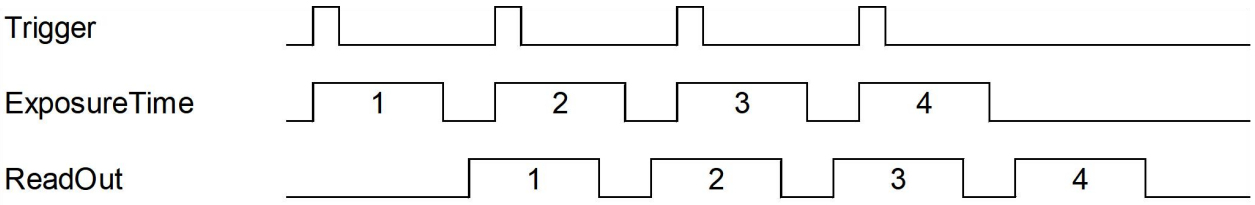
5.3 Exposure Mode

5.3.1 Exposure Mode : OFF(Free-Run)



When this mode is set, camera outputs video image continuously.
The camera is exposed and outputs video image at the set [Acquisition framerate].
The exposure time is set to a maximum value within a preset [Acquisition framerate].

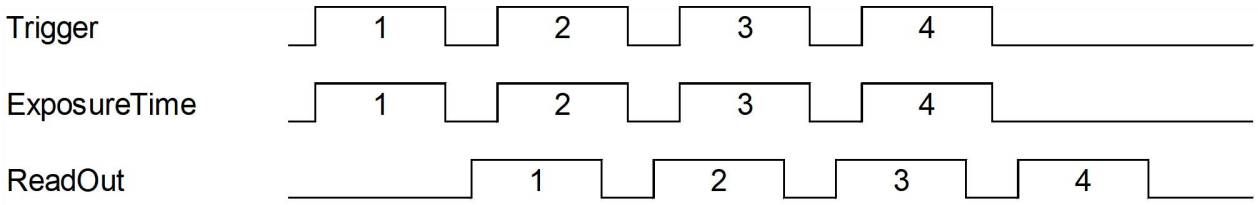
5.3.2 Exposure Mode : Timed



The camera is exposed within a preset [ExposureTime] and outputs video image from an external trigger.
There is an upper limit to the timing at which a trigger can be input.
Refer to [Trigger prohibition time] and [FrameRate calcurate].

When inputting a trigger from [LinTrigger] , the camera recognizes at the rising edge of the trigger signal.
When inputting a trigger from [Line*], user can select whether the trigger signal is recognized as a rising or a falling edge using the [LineInverter] setting.

5.3.3 Exposure Mode : Trigger Width



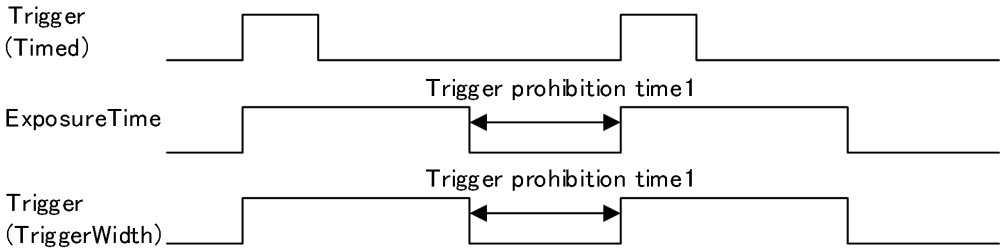
The camera is exposed for the same period as the external trigger and outputs the video image.
There is an upper limit to the timing at which a trigger can be input.

5.3.4 Trigger prohibition Time

When inputting triggers with [Timed] or [TriggerWidth], there is a trigger prohibition time.
Do not enter the next trigger to camera during this period.

5.3.4.1 Trigger prohibition Time1

If a trigger is input during this prohibition Time, the trigger is ignored inside the camera and the next trigger is enabled.

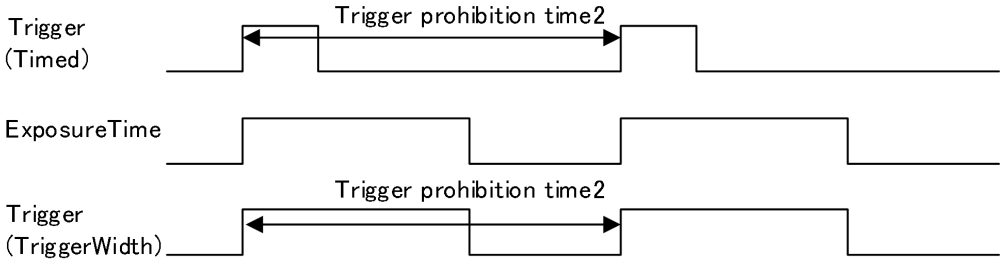


Trigger prohibition time1

CXP Link Configuration	Trigger Prohibition Time1(usec)
CXP12X4	60.0
CXP6X4 / CXP12X2	120.0
CXP3X4 / CXP6X2 / CXP12X1	240.0
CXP3X2 / CXP6X1	480.0
CXP3X1	960.0

5.3.4.2 Trigger prohibition Time2

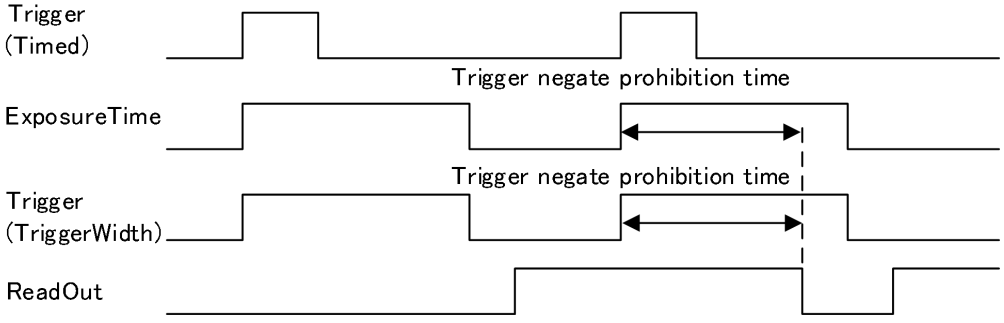
If a trigger is input during this prohibition Time, the trigger is ignored inside the camera and the next trigger is enabled.



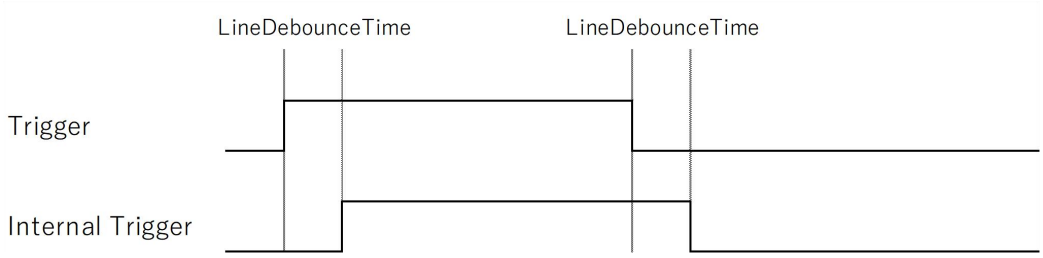
Trigger prohibition Time2 = 1/(Acquisition framerate setting value)

5.3.4.3 Trigger negate prohibition Time

Do not negate the trigger during image output.If negated, it will be as follows depending on the mode.
「Timed」: the trigger in this condition is ignored inside the camera and the next trigger is enabled.
「TriggerWidth」: Image output becomes abnormal, and in the worst case, it is necessary to turn off/on the power of the camera.



5.3.5 Trigger LineDebounce Time



Generates an internal trigger after the time set in LineDebounceTime elapses after the trigger is detected.
LineDebounceTime is added to the internal trigger.
It can be used as a trigger signal filtering function.

6 Frame Rate calcuration

1000000 / Horizontal Period / (Height + 42) [fps] (*1)

Horizontal Period：Refer to 5.2.2 Horizontal Perioddepending on camera settings.

(*1) Round down to the third decimal place.

7 Revision Information

Rev	Date	Changes
0.0	2021/11/25	Draft

BOPIXEL JAPAN

Must Building 7F E3&W3, 17-1 Daimachi,
Kanagawa-ku, Yokohama-shi, Kanagawa,
221-0834, Japan
TEL.045-548-3566 FAX.045-548-3711