

CMOS Camera EX Series

**EX670AMG-X / EX670AMCG-X
EX370BMG-X**

Specifications

Toshiba Teli Corporation

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Standard name might be trade mark of each company.

Contents

Contents	1
RESTRICTION FOR USE	2
CASES FOR INDEMNITY (LIMITED WARRANTY)	3
USAGE PRECAUTIONS	4
1. Overview	6
2. Features	6
3. Configuration.....	8
4. Optional part.....	8
5. Functions	9
6. Specifications.....	18
7. Timing chart.....	31
8. Warranty rules.....	35
9. Repair	36
10. Outline Drawing.....	37

RESTRICTION FOR USE

- Should the equipment be used in the following conditions or environments, give consideration to safety measures and inform us of such usage:
 - (1) Use of the equipment in the conditions or environment contrary to those specified, or use outdoors.
 - (2) Use of the equipment in applications expected to cause potential hazard to people or property, which require special safety measures to be adopted.
- This product can be used under diverse operating conditions. Determination of applicability of equipment or devices concerned shall be determined after analysis or testing as necessary by the designer of such equipment or devices, or personnel related to the specifications. Such designer or personnel shall assure the performance and safety of the equipment or devices.
- This product is not designed or manufactured to be used for control of equipment directly concerned with human life (*1) or equipment relating to maintenance of public services/functions involving factors of safety (*2). Therefore, the product shall not be used for such applications.
 - (*1): Equipment directly concerned with human life refers to.
 - Medical equipment such as life-support systems, equipment for operating theaters.
 - Exhaust control equipment for exhaust gases such as toxic fumes or smoke.
 - Equipment mandatory to be installed by various laws and regulations such as the Fire Act or Building Standard Law
 - Equipment related to the above
 - (*2): Equipment relating to maintenance of public services/functions involving factors of safety refers to.
 - Traffic control systems for air transportation, railways, roads, or marine transportation
 - Equipment for nuclear power generation
 - Equipment related to the above

CASES FOR INDEMNITY (LIMITED WARRANTY)

We shall be exempted from taking responsibility and held harmless for damage or losses incurred by the user in the following cases.

- Natural disasters, such as an earthquake and thunder, fire or any other act of God; acts by third parties; misuse by the user, whether intentional or accidental; use under extreme operating conditions.
- In the case of indirect, additional, consequential damages (loss of business interests, suspension of business activities) are incurred as result of malfunction or non-function of the equipment, we shall be exempted from responsibility for such damages.
- In the case damage or losses are caused by failure to observe the information contained in the instructions in this instruction manual and specifications.
- In the case damage or losses are caused by use contrary to the instructions in this instruction manual and specifications.
- In the case damage or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.
- In the case damage or losses are caused by repair or modification conducted by the customer or any unauthorized third party (such as an unauthorized service representative).
- Expenses we bear on this product shall be limited to the individual price of the product.
- The item that is not described in specifications of this product is off the subject of the guarantee.
- The attachment mistake of a cable.

USAGE PRECAUTIONS

- **Handle carefully**

Do not drop the equipment or allow it to be subject to strong impact or vibration, as such action may cause malfunctions. Further, do not damage the connection cable, since this may cause wire breakage.

- **Camera installation**

When handling the camera in moving, operation setting with strong impacts and extreme vibrations may cause malfunctions. Make sure carefully in the camera installation and operation setting.

- **Environmental operating conditions**

Do not use the product in locations where the ambient temperature or humidity exceeds the specifications.

Otherwise, image quality may be degraded or internal components may be adversely affected. In particular, do not use the product in areas exposed to direct sunlight.

- **Combination of lens**

Depending on the lens you use, the performance of the camera may not be brought out fully due to the deterioration in resolution and brightness in the peripheral area, occurrence of a ghost, aberration and others. When you check the combination between the lens and camera, be sure to use the lens you actually use.

When installing a lens in the camera, you can use an optional mount adapter. When attaching a mount adapter or a lens to the camera, make sure carefully that they are not tilted.

- **Mounting to a pedestal**

When mounting this product to a pedestal, make sure carefully that the lens doesn't touch with the pedestal.

- **Do not expose the camera's image-pickup-plane to sunlight or other intense light directly.**

Its inner CMOS sensor might be damaged.

- **Occurrence of moiré**

If you shoot thin stripe patterns, moiré patterns (interference fringes) may appear. This is not a malfunction.

- **Occurrence of noise on the screen**

If an intense magnetic or electromagnetic field is generated near the camera or connection cable, noise may be generated on the screen. If this occurs, move the camera or the cable.

USAGE PRECAUTIONS

- **Handling of the protective cap**

If the camera is not in use, attach the lens cap to the camera to protect the image pickup surface.

- **If the equipment is not to be used for a long duration**

Turn off power to the camera for safety.

- **Maintenance**

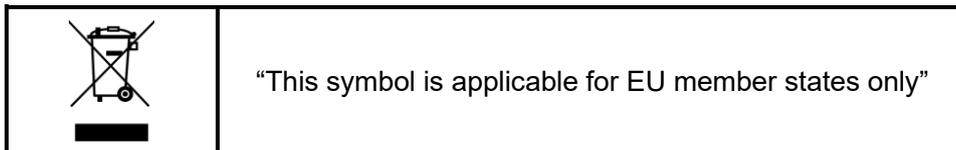
Turn off power to the equipment and wipe it with a dry cloth.

If it becomes severely contaminated, gently wipe the affected areas with a soft cloth dampened with diluted neutral detergent. Never use alcohol, benzene, thinner, or other chemicals because such chemicals may damage or discolor the paint and indications.

If the image pickup surface becomes dusty, contaminated, or scratched, consult your sales representative.

- **Disposal**

When disposing of the camera, it may be necessary to disassemble it into separate parts, in accordance with the laws and regulations of your country and/or municipality concerning environmental contamination.



[Phenomena specific to CMOS sensor]

- **Defective pixels**

A CMOS image sensor is composed of photo sensor pixels in a square grid array. Due to the characteristics of CMOS image sensors, over- or under-driving of the pixels results in temporary white or black areas (as if these are noises) appearing on the screen. This phenomenon, which is not a defect is exacerbated under higher temperatures and long exposure time.

- **Image shading**

The brightness of the upper part of the screen may be different from that of the lower part. Note that this is a characteristic of a CMOS image sensor and is not a fault.

1. Overview

EX670AMG-X, EX670AMCG-X and EX370BMG-X are an integrated-(one-body)-type camera that adopts a global shutter CMOS sensor. EX670AMG-X installs 67M B&W 1.8 type (APS-C format) CMOS sensor, EX370BMG-X installs 37M B&W 4/3 type (Four Thirds format) CMOS sensor. The color model has [C] in the model name. For video output and camera control, CoaXPress standard is adopted for high transfer rate, and it is easy to integrate into industrial equipment.

2. Features

2.1 High frame rate

Supporting high frame rate and high resolution by outputting images with 4 lanes at CXP-12 (12.5Gbps) speeds.

2.2 Global shutter

As it employs a global electronic shutter similar to a CCD image sensor, clear images of even fast-moving object are obtainable with less blur.

2.3 CoaXPress

Video output and camera control are performed via CoaXPress standard version 2.0. Data transfer is up to 50Gbps (12.5Gbps x 4) that enables to output uncompressed video data at high frame rate.

2.4 GenICam

This product is based on GenICam (Generic Interface for Cameras).

2.5 IIDC2 Digital Camera Control Specification Ver.1.1.0

This product is based on IIDC2 Digital Camera Control Specification Ver.1.1.0.

2.6 Random Trigger Shutter

The Random Trigger Shutter function provides images in any timing by input of an external trigger signal, software trigger and link trigger.

2.7 Scalable

Selectable video output area. This mode achieves higher frame rate by reducing vertical output area. And reduces occupied data rate of CoaXPress transmission bandwidth by reducing horizontal output area.

2.8 Binning

Pixel data is combined by vertical and horizontal.

2.9 Dust-proof Glass

Dust-proof Glass is built in default.

3. Configuration

(1) Camera body

* No application software and manuals are attached to this camera.

(2) Ferrite core

Model name: E04SRXA301334

EX series accessory

Ferrite core is included in products with the following serial numbers:

EX670AMG-X S/N: 1100035~

EX370BMG-X S/N: 1100001~

EX670AMCG-X S/N: 1100011~

4. Optional part

- Mount adapter

Model name: EXA-F

F-mount adapter for EX series

Model name: EXA-M42**

M42-mount adapter for EX series

Suffix [**] represents flange back in millimeters

- Mounting plate

Model name: CPTEx

Camera mounting kit for EX series

* Contact your dealer / distributor for details of option units.

5. Functions

5.1 Gain

Manual gain is provided. Gain is adjustable from 0 to +36dB.

Notes on gain setting:

Setting the gain value too high increases noises. When you adjust the brightness of the image, I ask you to have final image quality checked with your environment.

5.2 Black Level

Black level is adjustable from -25% to +25% as white saturation level is 100%.

5.3 LUT (Look up Table)

Arbitrary curve and binarization are possible by using 12 bit input and 12 bit output LUT.

5.4 Exposure Time

Manual exposure time is available.

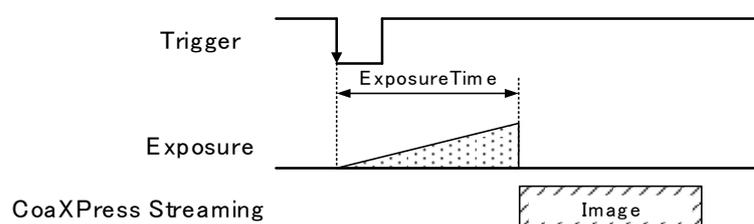
5.5 Random Trigger Shutter

An image is captured at the desired timing using trigger signal input. External trigger signal from I/O connector, software trigger with control command and link trigger with low speed connection trigger packet via CoaXPress are available (Edge mode / Bulk mode). Trigger polarity is selectable (High active / Low active).

Note that Random Trigger Shutter will cause a delay between trigger signal and start of exposure. See 7. Timing Chart for detail.

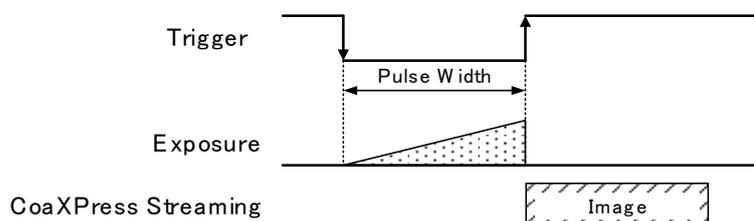
- Edge mode (TriggerSequence0)

The exposure time is determined by Exposure Time setting.



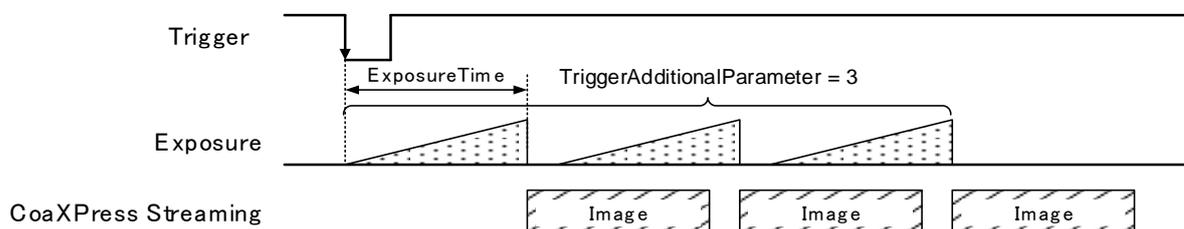
- Level mode (TriggerSequence1)

The exposure time is determined by the pulse width of the trigger signal.



- Bulk mode (TriggerSequence6)

Camera exposes and transfers multiple frames by a single trigger.

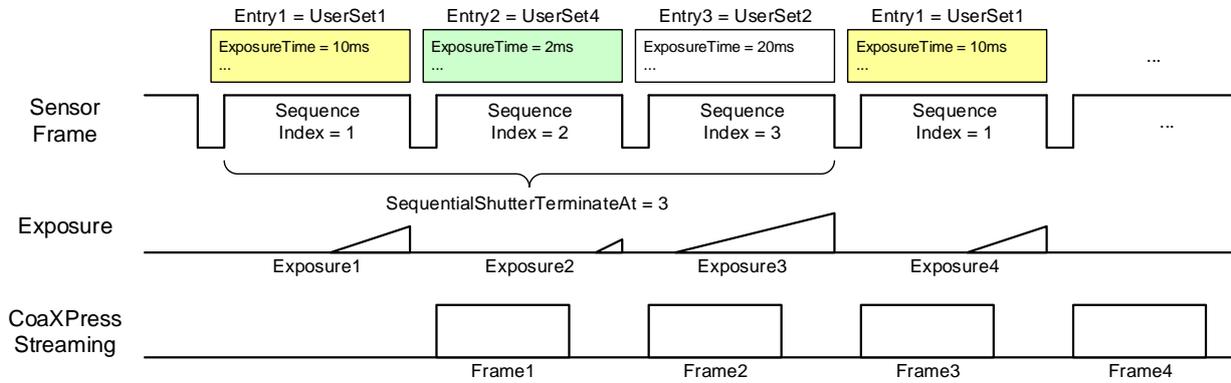


Notes on Random Trigger Shutter :

- In the period when FRAME_TRIGGER_WAIT signal is inactive, user must not input external trigger signal to this camera.
- When the interval of the input trigger signal is extremely short, or when the trigger signal is noisy, there is a possibility of causing the malfunction. In this case, please input a proper trigger signal.

5.6 Sequential Shutter

Sequential Shutter function performs sequential capturing with applying the settings of UserSet that have been made entry in advance.

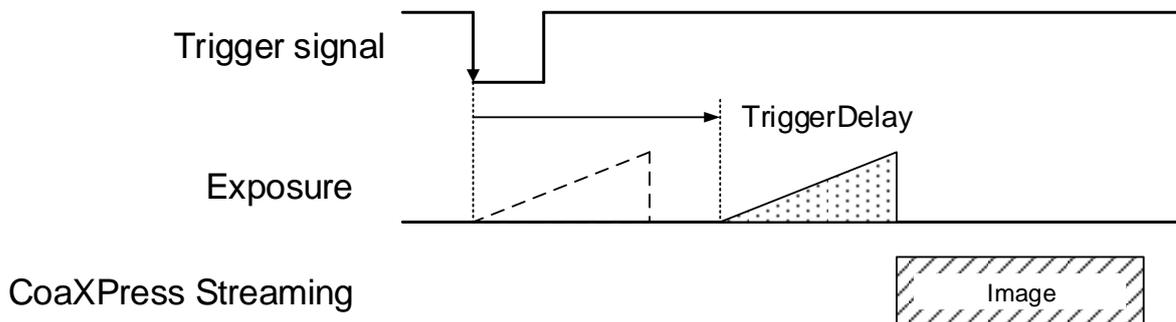


Note on Sequential Shutter:

- In Sequential Shutter mode, window size is unchangeable.

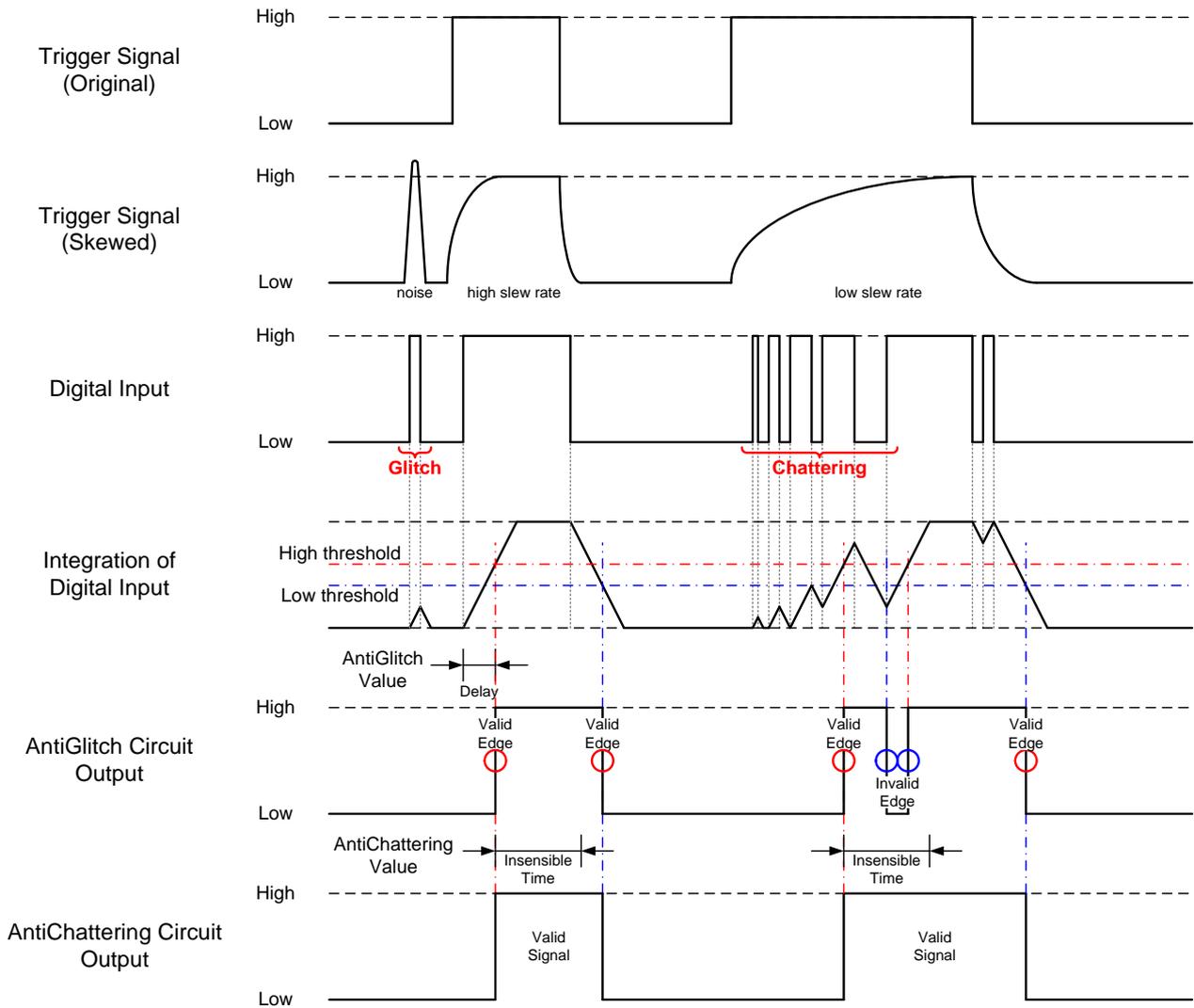
5.7 Trigger Delay

You can add the delay between trigger signal input and the start of exposure.



5.8 AntiGlitch – AntiChattering

AntiGlitch and AntiChattering functions filter noise and unstable state of the digital input (trigger signal).



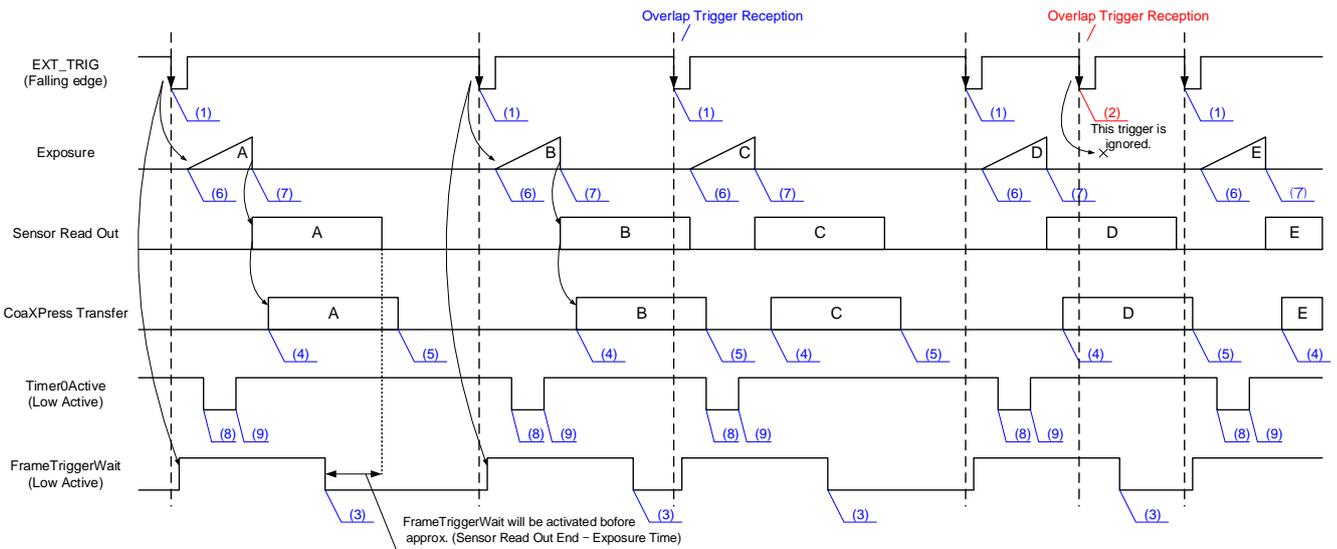
5.9 Event

Event will be implemented at a newer firmware version

Camera notifies FrameTrigger status and other information by CoaXPress Event Packet.

- FrameTrigger : Reception of Frame Start Trigger
- FrameTriggerError : Rejection of Frame Start Trigger
- FrameTriggerWait : Start of waiting for Frame Start Trigger
- FrameTransferStart : Start of transferring streaming data
- FrameTransferEnd : End of transferring streaming data
- ExposureStart : Start of Exposure
- ExposureEnd : End of Exposure
- Timer0Start : Start of Timer0
- Timer0End : End of Timer0

Events timing are as following chart.



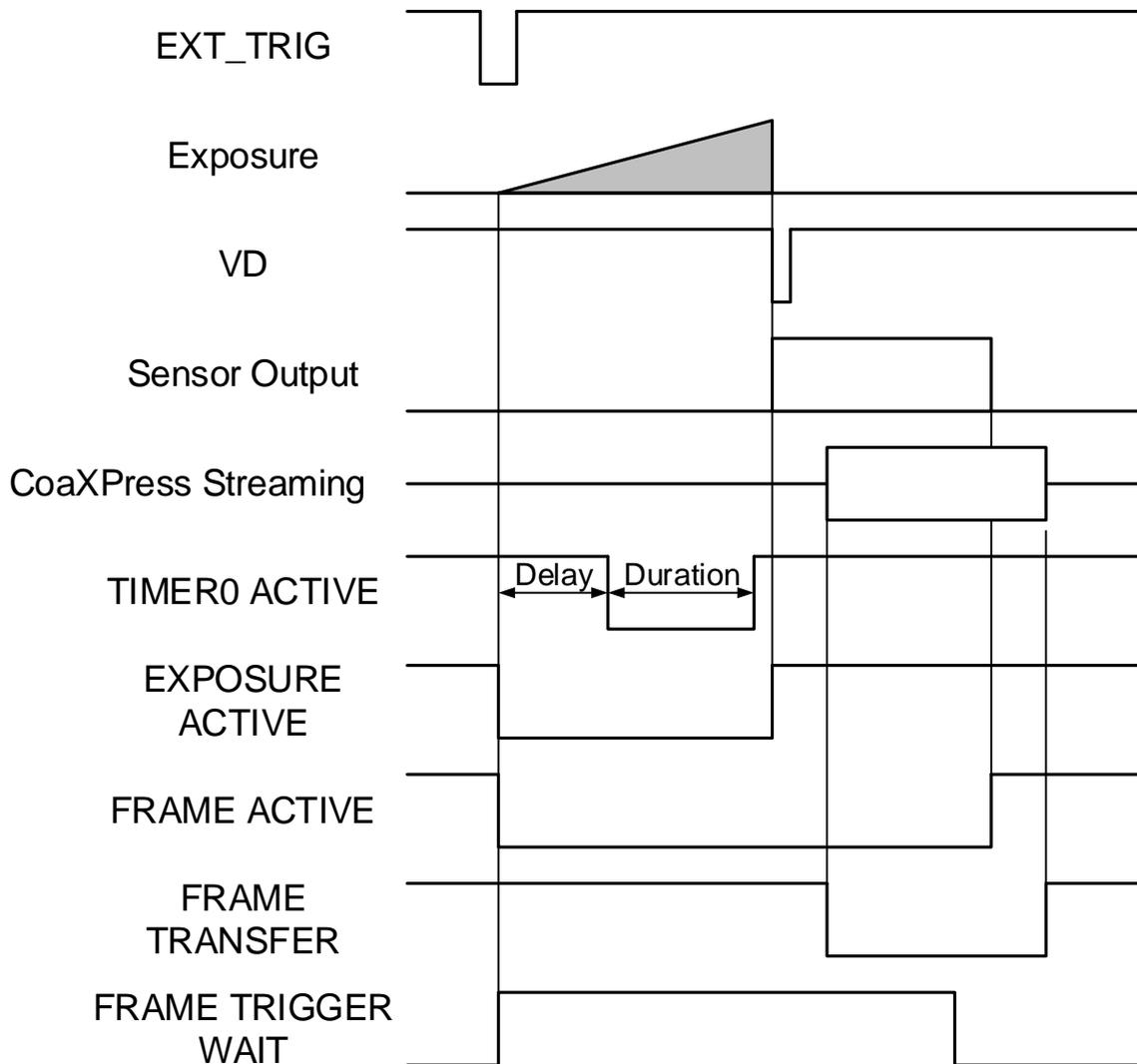
Event Name

- (1) FrameTrigger : Reception of Frame Start Trigger.
- (2) FrameTriggerError : Rejection of Frame Start Trigger.
- (3) FrameTriggerWait : Start of waiting for Frame Start Trigger.
- (4) FrameTransferStart : Start of transferring streaming data.
- (5) FrameTransferEnd : End of transferring streaming data.
- (6) ExposureStart : Start of Exposure.
- (7) ExposureEnd : End of Exposure.
- (8) Timer0Start : Start of Timer0.
- (9) Timer0End : End of Timer0.

5.10 GPIO

Selected signals are output from GPIO pins of I/O connector. Following signals are selectable.
Output signal is 5V CMOS output and open collector output.

- TIMER0 ACTIVE : This signal can be used as strobe control signal.
The delay time and pulse width of this signal are configurable.
- USER OUTPUT : Level selectable user output by register setting.
- EXPOSURE ACTIVE : Period from exposure start to end.
- FRAME ACTIVE : Period from exposure start to the CMOS transfer completion.
- FRAME TRANSFER : Period of transferring image data on CoaXPress transmission.
- FRAME TRIGGER WAIT : Indicating waiting a Random Trigger Shutter.
An External trigger is input during this period,
exposure starts immediately.



* ActiveLow

5.11 Scalable

Scalable is to read out arbitrary area of the image. Only single rectangle is selectable. Concave or convex shape is impossible. The number of selectable window is only one.

To understand limited settings, refer to the following information.

- Window size: $\{A+128(64)*m (H)\} * \{B+4*n (V)\}$

A, B = minimum unit size

m, n = integer

The window size is equal or less than maximum image size.

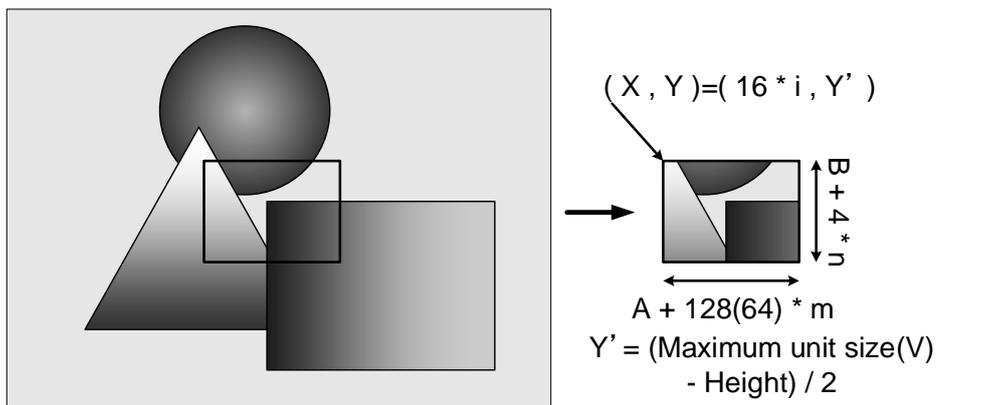
- Start address: $\{16*i (H)\} , \{Y' (V)\}$

i = integer

The window size is equal or less than maximum image size.

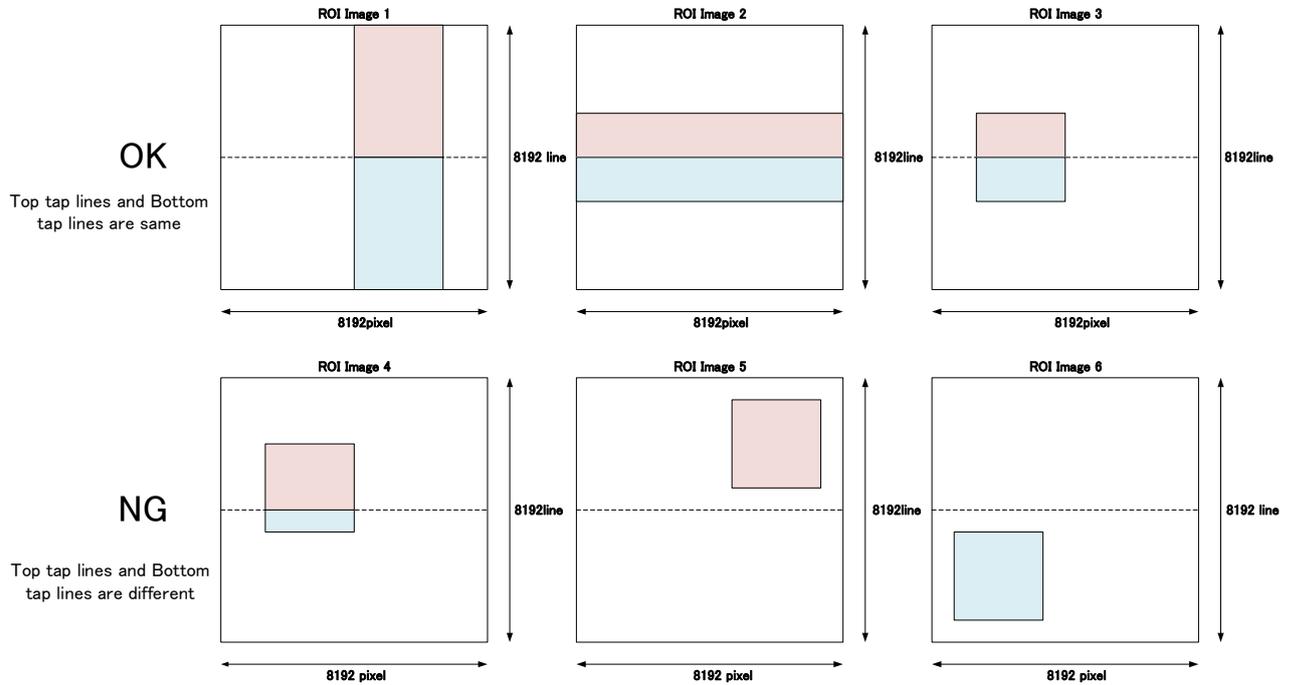
Y' is automatically updated after setting Height.

Model Name	EX670AMG-X EX670AMCG-X	EX370BMG-X
OffsetX unit size	16	
OffsetY unit size	OffsetY is automatically updated	
Width unit size	Ver.1.0.1 or earlier: 128 Ver.1.0.2 or later: 64	
Height unit size	4	
Minimum unit size (H) * (V)	Ver.1.0.1 or earlier: 128 x 64 Ver.1.0.2 or later: 64 x 64	
Maximum unit size (H) * (V)	8192 x 8192	6144 x 6144



- Available settings for scalable

This camera adapts a CMOS sensor which outputs images from two taps (top tap and bottom tap). For that reason, it has limited settings for scalable. Refer to the following figures as an example.



In the scalable mode, camera reads out only necessary area at the normal speed and skips other area at high speed. The trigger interval can be shorter when the vertical height size is small.

5.12 Binning

In the binning mode, a pixel is added with the neighboring pixel(s). This increases the sensitivity of the image.

Vertical and Horizontal can be set individually.

5.13 Reverse

Image can be flipped in horizontal and/or vertical direction.

5.14 Defective Pixel Correction

Defective Pixel Correction function can be enabled or disabled.

5.15 User Free Memory

A free memory area is available to read and write arbitrary data for user. Individual numbers can be assigned when multiple cameras are connected.

5.16 Test Pattern

Following test patterns are available.

Black	: Full screen 0 LSB (@ 8-bit)
White	: All pixels 255 LSB (@ 8-bit)
Grey A	: Full screen 170 LSB (10101010 _B) (@ 8-bit)
Grey B	: Full screen 85 LSB (01010101 _B) (@ 8-bit)
Horizontal ramp waveform	
Vertical ramp waveform	
Grey scale (B/W model only)	
Color bar (Color model only)	

6. Specifications

6.1 Electrical specification

Model Name	EX670AMG-X	EX370BMG-X
Optical part	Optical glass	
Imager	CMOS image sensor	
Number of effective pixels (H) x (V)	8192 x 8192	6144 x 6144
Scanning area (diagonal) [mm]	28.96 (APS-C)	21.72 (Four Thirds)
Pixel size (H) x (V) [μm]	2.5 x 2.5	
Scan method	Progressive	
Electronic shutter method	Global shutter	
Aspect ratio	1:1	
Sensitivity	2500lx, F8, 1/66.7s	2350lx, F5.6, 1/125s
Minimum illuminance	1lx (F1.4, Gain +36dB, Video Level 50%)	2lx (F1.4, Gain +36dB, Video Level 50%)
Gain	Digital gain 0 to +36dB (factory setting : 0 dB)	
Black Level	-25 to +25% (factory setting : 0% [0LSB@8bit])	
LUT	Input 12 bit, Output 12 bit	
User Setting Memory	15 channels	
User Free Memory	16 Byte	
Test Pattern	Black, White, Grey A, Grey B Horizontal ramp waveform, Vertical ramp waveform, Grey scale (factory setting : OFF)	
Power supply	PoCXP (Power over CoaXPress) Or DC+24V (DC+18.5 to +26.0V) ripple 50 mV(p-p) or less	
Power consumption(*1)	13W	13.6W(*2)

(*1) Condition: All pixel readout, 4 lanes at CXP-12 (12.5Gbps) speed

(*2) Note: Please supply power to I/O connector or use CoaXPress frame grabber that supports more than 13.6W power supply capability at one channel when using the camera with 4 lanes at CXP-12 (12.5Gbps) speed.

Model Name	EX670AMCG-X
Optical part	Optical glass
Imager	CMOS image sensor
Number of effective pixels (H) x (V)	8192 x 8192
Scanning area (diagonal) [mm]	28.96 (APS-C)
Pixel size (H) x (V) [μm]	2.5 x 2.5
Scan method	Progressive
Electronic shutter method	Global shutter
Aspect ratio	1:1
Sensitivity	2100lx, F5.6, 1/66.7s
Minimum illuminance	2lx (F1.4, Gain +36dB, Video Level 50%)
Gain	Digital gain 0 to +36dB (factory setting : 0 dB)
Black Level	-25 to +25% (factory setting : 0% [0LSB@8bit])
LUT	Input 12 bit, Output 12 bit
User Setting Memory	15 channels
User Free Memory	16 Byte
Test Pattern	Black, White, Grey A, Grey B Horizontal ramp waveform, Vertical ramp waveform, Color bar (factory setting : OFF)
Power supply	PoCXP (Power over CoaXPress) Or DC+24V (DC+18.5 to +26.0V) ripple 50 mV(p-p) or less
Power consumption(*3)	13.3W(*4)

(*3) Condition: All pixel readout, 4 lanes at CXP-12 (12.5Gbps) speed

(*4) Note: Please supply power to I/O connector or use CoaXPress frame grabber that supports more than 13.3W power supply capability at one channel when using the camera with 4 lanes at CXP-12 (12.5Gbps) speed.

6.2 Electronic shutter specification

Exposure time	MANUAL
MANUAL	10 μ s to 1s
Exposure time Accuracy	\pm 0.3 μ s

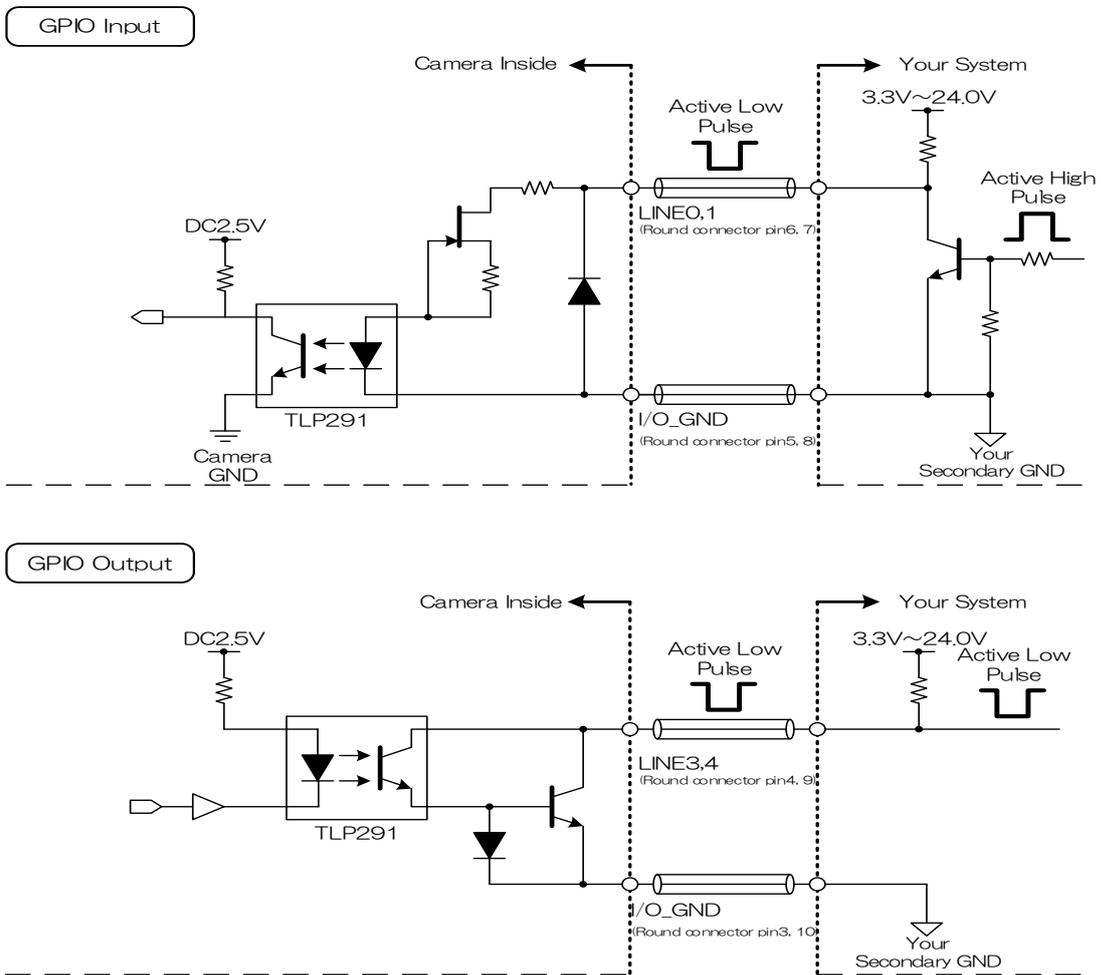
6.3 Random Trigger Shutter specification

Trigger Mode	External trigger, Software trigger, Link trigger (factory setting : External trigger)
External trigger	Input via I/O connector
Software trigger	CoaXPress command control
Link trigger	Control with CoaXPress trigger packet
Exposure time	Edge mode, Level mode (factory setting : Edge mode)
Edge mode	The exposure time depends on the MANUAL Exposure time setting
Level mode	The exposure time depends on External trigger width
Bulk mode	The exposure time depends on the MANUAL Exposure time setting
Number of Exposures in Bulk mode	255 times (maximum)
Sequential Shutter	16 entries (maximum)
Trigger Delay	0 to 2000000 μ s (factory setting : 0 μ s)
AntiGlitch	90ns to 2ms (factory setting : 90ns)
AntiChattering	2 μ s to 2ms (factory setting : 2 μ s)

6.5 GPIO Output signal specification

I/O Connector Pin No.	Round connector Pin 4 : Line3 Round connector Pin 9 : Line4
Input / Output specification (LineMode)	Output only
Output signal (LineSource)	Off / UserOutput / Timer0Active / AcquisitionActive / FrameTriggerWait FrameActive / FrameTransferActive / ExposureActive (factory setting : Off)
Output Circuit	Open collector
Maximum Current	50mA (input current)
Polarity	High active / Low active (factory setting : Low active)
Timer0 Active	
Delay	0 to 2000000μs (factory setting : 0μs)
Duration	0 to 2000000μs (factory setting : 0μs)
TimerTriggerSource	Line0Active, ExposureStart, FrameTrigger

External trigger input/output recommended circuit:



*Camera GND (Round connector Pin 1, 12) and I/O_GND (Round connector Pin 3, 5, 8, 10) are mutually isolated. It is also possible to connect them to common GND of your system.

6.6 Interface specification

Interface	CoaXPress
Transmission speed	12.5Gbps (CXP-12) x 4 lanes 12.5Gbps (CXP-12) x 1 lane 6.25Gbps (CXP-6) x 4 lanes 6.25Gbps (CXP-6) x 1 lane
Protocol	CoaXPress 2.0

Note: CXP-6 x 1 lane with Mono10p or Mono12p can be set, but these operations are not guaranteed.

Note: CXP-3 x 1 lane and CXP-3 x 4 lanes can be set, but these are to avoid a connection error with a specified CoaXPress frame grabber. Since these settings are unable to output image streaming or not guaranteed for image streaming, don't use these settings.

6.7 LED states

Camera state	Lamp indication
No power	Off
Link detection in progress	Fast flash green (ON:20ms, OFF:60ms)
Connection Error	Flash alternate red / green
Connected, but no data being transferred	Flash green (ON: 200ms, OFF: 800ms)
Connected, waiting for trigger	Flash orange (ON: 200ms, OFF: 800ms)
Data being transferred	Fast flash green (ON:60ms, OFF:20ms)
Error during data transfer	Solid Red (Time period: 500ms)
Stand-by	Super slow flash orange (ON:200ms, OFF: 2800ms)

6.8 Image output format

Model Name		EX670AMG-X	EX370BMG-X	
Image output format		Mono8, Mono10p, Mono12p		
Number of Video out pixels (H) × (V)		8192 × 8192	6144 × 6144	
Maximum frame rate (at the all pixel readout)	CXP-12 x 4 lanes	Mono8	64.5 fps	120.0 fps
		Mono10p	31.6 fps	42.1 fps
		Mono12p	31.6 fps	42.1 fps
	CXP-12 x 1 lanes	Mono8	15.8 fps	21.0 fps
		Mono10p	12.8 fps	17.0 fps
		Mono12p	10.5 fps	14.0 fps
	CXP-6 x 4 lanes	Mono8	31.6 fps	42.1 fps
		Mono10p	24.9 fps	33.2 fps
		Mono12p	20.6 fps	27.4 fps
	CXP-6 x 1 lanes	Mono8	8.0 fps	10.7 fps

Note: CXP-6 x 1 lane with Mono10p or Mono12p can be set, but these operations are not guaranteed.

Note: CXP-3 x 1 lane and CXP-3 x 4 lanes can be set, but these are to avoid a connection error with a specified CoaXPress frame grabber. Since these settings are unable to output image streaming or not guaranteed for image streaming, don't use these settings.

Model Name		EX670AMCG-X	
Image output format		Bayer8	
Number of Video out pixels (H) × (V)		8192 × 8192	
Maximum frame rate (at the all pixel readout)	CXP-12 x 4 lanes	Bayer8	64.5 fps
	CXP-12 x 1 lanes	Bayer8	15.8 fps
	CXP-6 x 4 lanes	Bayer8	31.6 fps
	CXP-6 x 1 lanes	Bayer8	8.0 fps

Note: CXP-3 x 1 lane and CXP-3 x 4 lanes can be set, but these are to avoid a connection error with a specified CoaXPress frame grabber. Since these settings are unable to output image streaming or not guaranteed for image streaming, don't use these settings.

Notes on Dropping Frames:

- Depends on your PC, CoaXPress frame grabber or CoaXPress cable configurations, images may not be captured normally (e.g. dropping frames may occur). In this case, change to frame rate setting lower.

6.9 Event notification

Event will be implemented at a newer firmware version

Event name	FrameTrigger, FrameTriggerError, FrameTriggerWait FrameTransferStart, FrameTransferEnd ExposureStart, ExposureEnd Timer0Start, Timer0End
Event notification delay	approx. 10us later from the event occurs
Time stamp sampling	16.7ns (60.0MHz)

6.10 Machine external specification

Dimensions	60 mm(W) * 60 mm (H) * 80 mm (D) (Not including protrusion)
Mass	approx. 280g
Lens mount	Mount-less (available with optional mount adapter)
Flange back	8mm
Camera body grounding insulation status	Conductive between circuit GND and camera body

6.11 Operation Ambient conditions

Model Name	EX670AMG-X / EX670AMCG-X	EX370BMG-X
Operation assurance	Temperature: 0°C to +40 °C Camera housing temperature: less than 60 °C Humidity: 10% to 90% (no condensation)	Temperature: 0°C to +40 °C Camera housing temperature: less than 60 °C Image Sensor temperature: less than 75 °C (temperature acquisition available) Humidity: 10% to 90% (no condensation)
Storage assurance	Temperature : -20°C to +60°C Humidity : +90% or less (no condensation)	
EMC condition	EMI (Electro-Magnetic interference) : EN61000-6-4, FCC Part 15 Subpart B Class A EMS (Electro-Magnetic susceptibility) : EN61000-6-2	

Notes on Heat Dissipation:

- The temperature of camera housing must be kept less than 60 °C.
 - The temperature of Image Sensor must be kept less than 75 °C when using EX370BMG-X.
- Please provide sufficient heat dissipation depending on your installation.

- Compliance Information

- The identification of the product, model number EX370BMG-X/EX670AMG-X/EX670AMCG-X.
- This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- Company Name: Toshiba Teli Corporation
- Address: 4-7-1, Asahigaoka, Hino-shi, Tokyo 191-0065. Japan
- Telephone number: +81-42-589-8771
- URL: <https://www.toshiba-teli.co.jp/en/>

- Changes or Modifications

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

- Class A Statement

Statement for Class A equipment:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

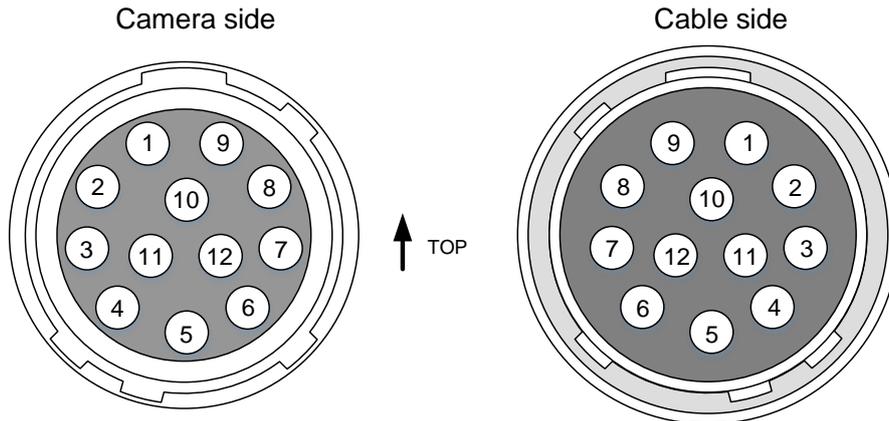
6.12 Connector pin assignment

I/O Connector (Round Connector)

Connector (Camera side) HR10A-10R-12P(73) (HIROSE ELECTRIC CO., LTD.) or equivalent
 Plug (Cable side) HR10A-10P-12S(73) (HIROSE ELECTRIC CO., LTD.) or equivalent

* Matching connector is not an accessory of this product.

Pin assignment

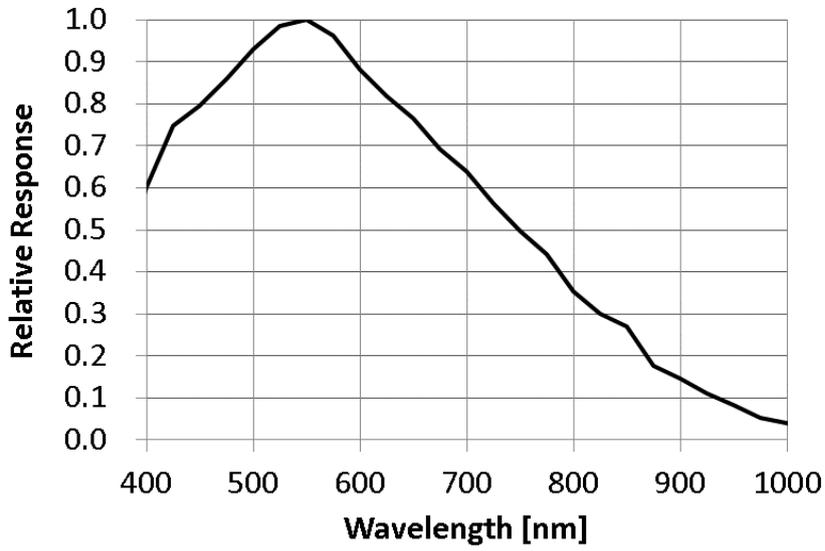


Pin No.	I/O	Signal Name	Function
1	-	GND	Ground
2	I	DC+24V	Power Input
3	-	IO GND	GPIO Ground
4	O	Line3	GPIO Output
5	-	IO GND	GPIO Ground
6	I	Line0	GPIO Input
7	I	Line1	GPIO Input
8	-	IO GND	GPIO Ground
9	O	Line4	GPIO Output
10	-	IO GND	GPIO Ground
11	I	DC+24V	Power Input
12	-	GND	Ground

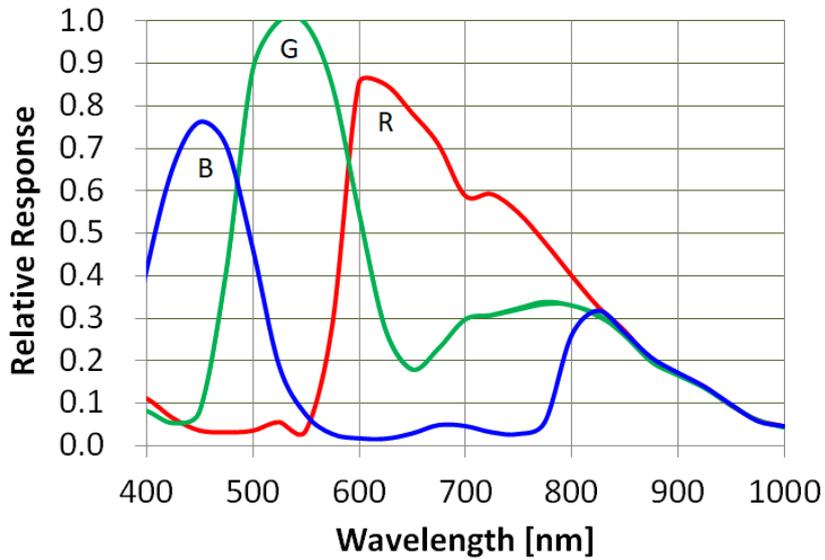
6.13 Typical spectral response

The lens characteristics and light source characteristics is not reflected in table.

<EX670AMG-X / EX370BMG-X>



<EX670AMCG-X>

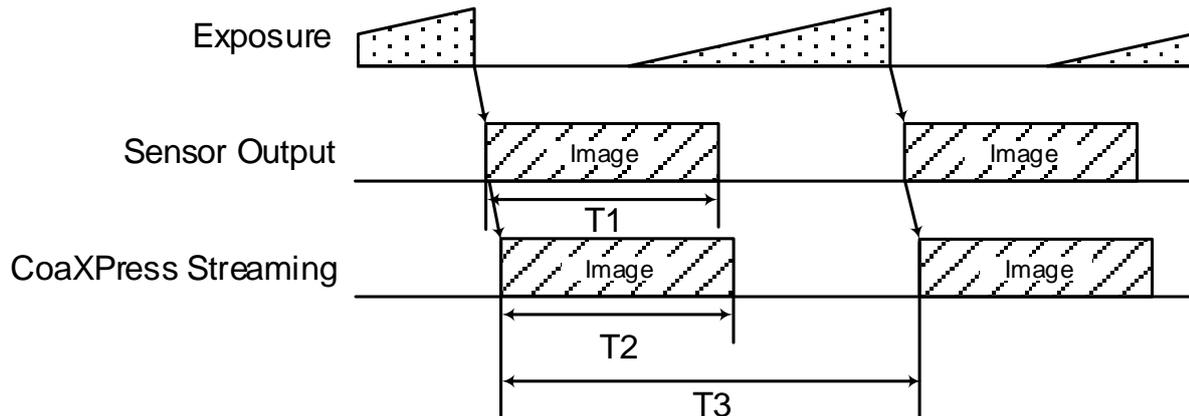


7. Timing chart

Image data outputs are transferred according to CoaXPress standard. Timing numerical value below is described by absolute prerequisite that camera can use transmission band without restriction.

When there is any limitation on the transmission band, the value described below is not guaranteed.

7.1 In Manual shutter mode (at all pixels readout)



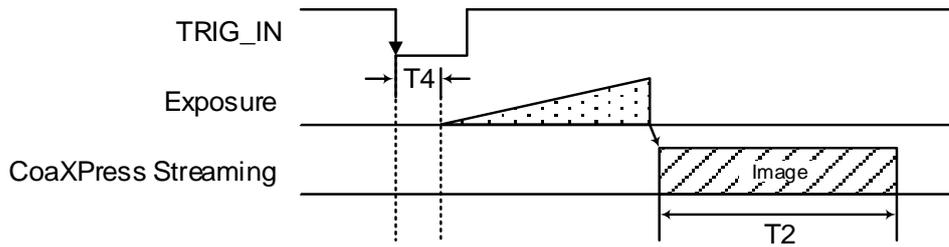
Model Name	Transmission speed	Format	T1 [ms]	T2 [ms]	T3 [s]
EX670AMG-X	CXP-12 x 4 lanes	Mono8	15.4	15.4	1/(Frame Rate setting)
		Mono10p	31.4	31.4	
		Mono12p	31.4	31.4	
	CXP-12 x 1 lane	Mono8	62.6	62.6	
		Mono10p	77.2	77.2	
		Mono12p	94.0	94.0	
	CXP-6 x 4 lanes	Mono8	31.4	31.4	
		Mono10p	39.6	39.6	
		Mono12p	48.0	48.0	
CXP-6 x 1 lane	Mono8	123.0	123.0		

Model Name	Transmission speed	Format	T1 [ms]	T2 [ms]	T3 [s]
EX370BMG-X	CXP-12 x 4 lanes	Mono8	8.3	8.3	1/(Frame Rate setting)
		Mono10p	23.7	23.7	
		Mono12p	23.7	23.7	
	CXP-12 x 1 lane	Mono8	47.4	47.4	
		Mono10p	58.4	58.4	
		Mono12p	71.1	71.1	
	CXP-6 x 4 lanes	Mono8	23.7	23.7	
		Mono10p	30.0	30.0	
		Mono12p	36.3	36.3	
CXP-6 x 1 lane	Mono8	93.2	93.2		

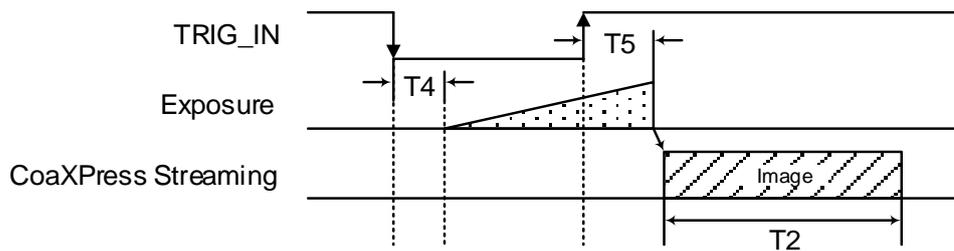
Model Name	Transmission speed	Format	T1 [ms]	T2 [ms]	T3 [s]
EX670AMCG-X	CXP-12 x 4 lanes	Bayer8	15.4	15.4	1/(Frame Rate setting)
	CXP-12 x 1 lane	Bayer8	62.6	62.6	
	CXP-6 x 4 lanes	Bayer8	31.4	31.4	
	CXP-6 x 1 lane	Bayer8	123.0	123.0	

7.2 In Random Trigger Shutter mode

- Edge mode / Bulk mode (at all pixels readout)



- Level mode (at all pixels readout)



Model Name	TRIG IN	Polarity	Transmission speed	Format	T4 [μs]	T5 [μs]
EX670AMG-X	Line0 Line1	Active Low Active High	CXP-12 x 4 lanes	Mono8	10.2	14.8
				Mono10p	10.4	15.0
				Mono12p	10.4	15.0
			CXP-12 x 1 lane	Mono8	18.0	22.6
				Mono10p	21.6	26.2
				Mono12p	25.7	30.3
			CXP-6 x 4 lanes	Mono8	10.4	15.0
				Mono10p	12.4	17.0
				Mono12p	14.5	19.1
			CXP-6 x 1 lane	Mono8	32.8	37.4

* The value of T2 is the same as the value of manual shutter mode. T4 and T5 are typical value.

* In case that the Trigger mode is Level mode, exposure time is longer than trigger signal width due to the CMOS sensor specifications.

Model Name	TRIG IN	Polarity	Transmission speed	Format	T4 [μs]	T5 [μs]
EX370BMG-X	Line0 Line1	Active Low Active High	CXP-12 x 4 lanes	Mono8	8.0	12.6
				Mono10p	10.4	15.0
				Mono12p	10.4	15.0
			CXP-12 x 1 lane	Mono8	18.0	22.6
				Mono10p	21.6	26.2
				Mono12p	25.7	30.3
			CXP-6 x 4 lanes	Mono8	10.4	15.0
				Mono10p	12.4	17.0
				Mono12p	14.5	19.1
			CXP-6 x 1 lane	Mono8	32.8	37.4

* The value of T2 is the same as the value of manual shutter mode. T4 and T5 are typical value.

* In case that the Trigger mode is Level mode, exposure time is longer than trigger signal width due to the CMOS sensor specifications.

Model Name	TRIG IN	Polarity	Transmission speed	Format	T4 [μs]	T5 [μs]
EX670AMCG-X	Line0 Line1	Active Low Active High	CXP-12 x 4 lanes	Bayer8	10.2	14.8
			CXP-12 x 1 lane	Bayer8	18.0	22.6
			CXP-6 x 4 lanes	Bayer8	10.4	15.0
			CXP-6 x 1 lane	Bayer8	32.8	37.4

* The value of T2 is the same as the value of manual shutter mode. T4 and T5 are typical value.

* In case that the Trigger mode is Level mode, exposure time is longer than trigger signal width due to the CMOS sensor specifications.

Notes of Random Trigger Shutter :

- In the period when FRAME_TRIGGER_WAIT (refer to GPIO output signals) signal is inactive, user must not input external trigger signal to this camera.
- Starting exposure during cmos sensor readout is possible in random trigger shutter mode, but completion of the exposure is not possible. In this case, its trigger operation will be ignored.
- When the interval of the input trigger signal is extremely short, or when the trigger signal is noisy, there is a possibility of causing the malfunction. In this case, please input a proper trigger signal.

8. Warranty rules

8.1 Warranty term

Warranty term is 36 months after your purchase. We may assume the date of the purchase from our shipping date when the date is unidentified.

8.2 Limited Warranty

Free warranty is not applicable for the troubles, damages or losses caused by the cases of the followings, even if it is during the warranty term.

1. Natural exhaust, wear or degradation of a component parts
2. Handling against the instructions and conditions described in the instruction manual
3. Remodeling, adjustment and the part exchange. (including the opening of the enclosure box and the alteration)
4. Using the accessories not included with the product or our non-designated optional articles
5. Damages caused during the transportation or deficiency of the handling such as drop or fall of the products after the products having been transferred to customers, leaving the products to corrosive environment such as sunlight, fire, sand, soil, heat, moisture, or an inappropriate storing method
6. A fire, an earthquake, a flood, a lightning, or other natural disasters, pollution and a short circuit, abnormal voltage, excessive physical pressure, theft, other accident
7. When connected to a product which is not recommended
8. When connected to the power supply which is not suitable
9. Forgery product, products which does not have proper serial number, products of which serial number is forged, damaged or deleted
10. All defects that happened after the expiration for a warranty term

9. Repair

9.1 Repair Methods

Basically, has to return it to our company when the user requests us to repair product.
In the case, exchange to a replacement or an equal function product.

9.2 Repair request methods

On the occasion of a repair request, please download the "Failure situation report sheet" from our website, fill in the necessary items and return it together with the defective product.

Repair Request Methods

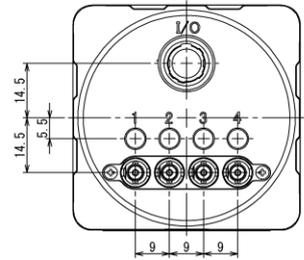
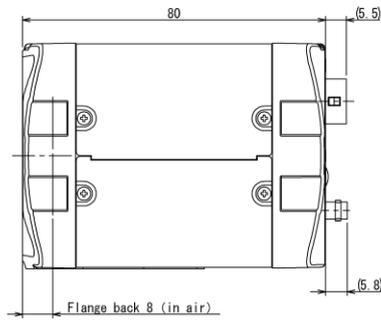
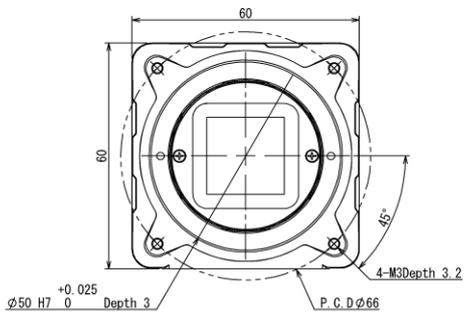
<https://www.toshiba-teli.co.jp/en/support/failure-situation.htm>

Please read the following instructions carefully.

1. Please return our product alone, taking out of your equipment in case that our product is installed to an equipment
2. We are unable to return the information such as your own serial numbers, control number, the identification seal, if it is attached to the returned products. Please keep record before you return the product.
3. As the data saved in the camera will not be kept after the repair, please take out data before return.
4. We are unable to accept the cancellation after the repair request by the customer's reason.
5. About the repair product shipping expenses, please bear the charges when you return the product to us. We bear the charges to you from us only for a warranty period.
6. We are unable to accept your request of a delivery date and time of the product return, or the delivery method.
7. We are unable to accept a trouble factor investigation, the request of the repair report.
8. We accept a repair of out of warranty product, if it is reparable.
9. The proprietary rights of the repair request products after the exchange repair belong to us.
10. The immunity from responsibility of the product is applied in the repair completion products.

* Please refer for the inquiry about the software to our homepage or sales personnel.

10. Outline Drawing



Specification
 Main material
 Mount, Rear panel: Aluminum die-cast
 Cover: Aluminum alloy
 Processing
 Mount, Rear panel: Painting (Black)
 Cover: Anodic oxide coating (Gray)

