



Ultra-High-Resolution CMOS Monochrome Camera CSC12M25BMP19 Operation manual

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TOSHIBA TELI CORPORATION

BEFORE USE - GENERAL SAFETY INSTRUCTIONS



This instruction manual contains important information for the operator (user) and/or people in the vicinity to avoid personal injury, or property damage.

- Prior to use, read this operation manual carefully to fully understand its instructions for correct use.
- After reading, keep this manual near the equipment for future reference.



WARNINGS & CAUTIONS

[Definition of markings]

The meaning of each mark used in this instruction manual is given below.

 WARNING	This mark warns the user that improper use may cause death or severe personal injury of the user or people in the vicinity.
 CAUTION	This mark warns the user that improper use may cause personal injuries (*1) or material damages (*2) against the user or people in the vicinity.

- Notes
- *1: Personal injury means wounds, burns, electric shocks, and others for which hospitalization or long term care are not required.
 - *2: Material damage means any direct or consequential damage related to property or material loss.

	This mark indicates what the user SHOULD NOT DO . The details are given adjacent the mark.
	This mark indicates what the user MUST DO . The details are given adjacent the mark.

WARNING



unplug

- **Immediately cease use of the equipment in the event of abnormality or malfunction.**

If abnormal conditions are present, such as smoke, a burning smell, ingress of water or foreign matter, or if the equipment is dropped or malfunctions, fire or electric shock may result.

If such abnormalities occur, disconnect the power plug from the outlet and contact your sales representative.



Do not get wet

- **Do not use the equipment in locations subject to water splashes.**

Otherwise, fire or electric shock may result.



Never pull apart

- **Do not disassemble, repair, or modify the equipment.**

Otherwise, fire or electric shock may result.

For internal repair, inspection, or cleaning, contact your sales representative.



Avoid

- **Do not place anything on the equipment.**

If metallic objects, liquid, or other foreign matter enters the equipment, fire or electric shock may result.



Avoid

- **Do not install the equipment in an unstable or inclined location or locations subject to vibration or impact.**

Otherwise, the equipment may topple over and cause personal injury.



Do not touch

- **During an electrical storm, do not touch the power cord or connection cable.**

Otherwise, an electric shock may result.



Instruction

- **Use the specified power supply.**

Use of an unspecified power supply may result in fire or electric shock.

CAUTION



Instruction

- **Observe the following when installing the equipment:**

- Do not cover the equipment with a cloth, etc.
- Do not place the equipment in a narrow location where heat is likely to accumulate. Otherwise, heat will accumulate inside the equipment, possibly resulting in a fire.



Avoid

- **Do not place the equipment in locations subject to high moisture, oil fumes, steam, or dust.** Otherwise, fire or electric shock may result.



Avoid

- **Do not install the equipment in locations exposed to direct sunlight or humidity.** Otherwise, the internal temperature of the equipment will rise, which may cause a fire.



Avoid

- **Use only specified DC power cables and connection cables.** Otherwise, fire or electric shock may result.



Avoid

- **When performing connection, turn off power.** When connecting the power cable or connection cable, turn off the equipment power. Otherwise, fire or electric shock may result.



Instruction

- **Contact your sales representative to request periodic inspection and cleaning (every approx. five years).**

- Accumulation of dust inside the equipment may result in fire or electric shock. For inspection and cleaning costs, contact your sales representative.

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.

- In the case damage or losses are caused by fire, earthquake, or other acts of God, acts by a third party, deliberate or accidental misuse by the user, or 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.

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

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.

- 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. Moreover, during shooting under high temperatures, vertical stripes or white spots (noise) may be produced, depending on the subject or camera conditions (such as increased gain). However, such phenomena are not malfunctions.

- Do not shoot under intense light.

Avoid intense light such as spot lights on part of the screen because it may cause blooming or smears. If intense light falls on the screen, vertical stripes may appear on the screen, but this is not a malfunction.

- 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.

- 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.

Following information is only for EU-member states:

The use of the symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information Approx. the take-back and recycling of this product, please contact your supplier where you purchased the product.



”This symbol is applicable for EU member states only”

[Phenomena specific to CMOS sensor]

■ Defective pixel

Photo sensor elements are arranged in a matrix in a plane for a CMOS image sensor. If any of those photo sensor elements is defective, the image of the area including the element is not displayed, which generates a white or black flaw on the monitor screen. The quantity and the brightness of the flaw increase in a higher temperature condition than the normal temperature condition.


It also increases when the exposure time is longer. The flaw may look like a noise. Note that this is a characteristic of a CMOS image sensor and is not a fault.

■ 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.

This phenomenon is generated when the shutter speed is fast.

We recommend that the shutter speed of the camera should be slower than 1/100s to reduce the effect by this phenomenon.

 中华人民共和国 环保使用期限	<p>环保使用期限标识，是根据电子信息产品污染控制管理办法以及，电子信息产品污染控制标识要求(SJ/T11364-2006)、电子信息产品环保使用期限通则，制定的适用于中国境内销售的电子信息产品的标识。</p> <p>电子信息产品只要按照安全及使用说明内容，正常使用情况下，从生产月期算起，在此期限内，产品中含有的有毒有害物质不致发生外泄或突变，不致对环境造成严重污染或对其人身、财产造成严重损害。</p> <p>产品正常使用后，要废弃在环保使用年限内或者刚到年限的产品时，请根据国家标准采取适当的方法进行处置。</p> <p>另外，此期限不同于质量/功能的保证期限。</p> <p>The Mark and Information are applicable for People's Republic of China only.</p>
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<产品中有毒有害物质或元素的名称及含量>



部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
相机本体	×	○	○	○	○	○

○：表示该有毒有害物质在该部件所有均质材料中的含量均在电子信息产品中有毒有害物质的限量要求标准规定的限量要求(SJ/T11363-2006)以下
 ×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出电子信息产品中有毒有害物质的限量要求标准规定的限量要求(SJ/T11363-2006)
 This information is applicable for People's Republic of China only.

リサイクルに関する情報 (包装物)

有关再利用的信息(包装物)

Information on recycling of wrapping composition

箱/箱子/Box  段ボール 瓦楞纸板 Corrugated cardboard	内部緩衝材料・袋 内部缓冲材料・袋 Internal buffer materials・Bag  LDPE
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1. Outline

This CMOS camera is an ultra-precision black-and white camera employing a 12,580 thousand pixel readout system CMOS sensor.

2. Characteristic

(1) High-speed output of an ultra-high-resolution image

The TOSHIBA TELI's proprietary 1.9 type 12,580 thousand pixel ultra-precision CMOS sensor outputs the entire 12,580 thousand pixels in a speed as high as 25fps. A high amount of information in 320M Byte/Sec. output data rate is obtainable in 8bit mode and 640M Byte/Sec. output data rate is obtainable in 10bit mode.

(2) WOI (Window Of Interest)

WOI (Window Of Interest) of a partial readout function optimum to diversifying high-speed image processing is available.

It supports a variable frame rate to increase the frame rate by reading an arbitrary area by specifying an address in horizontal and vertical directions.

(3) 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.

(4) Random trigger shutter

Photo images can be imported in any timing by inputting external trigger signals.

(5) Camera link interface

Image output and camera control interfaces employ the camera link standard.

The dual MDR connector supporting Camera Link Medium Configuration outputs the entire 12,580 thousand pixels in a speed as fast as 25fps. As it also supports Camera Link Base Configuration to output the entire 12,580 thousand pixels in a speed as high as 12.5fps by a single one-sided MDR connector, it can support a wide variety of image processors.

(6) Wide dynamic range

A wide dynamic range can be achieved by compressing brightness information of an object by employing a multi-slope multiple storage method (to be implemented).

(7) Binning

Signals can be output in all effective areas in Approx. 43.5fps by reading 2(H)x2(V) pixels as one pixel.

(8) Sub sampling

The frame rate can be increased by skipping effective pixels.

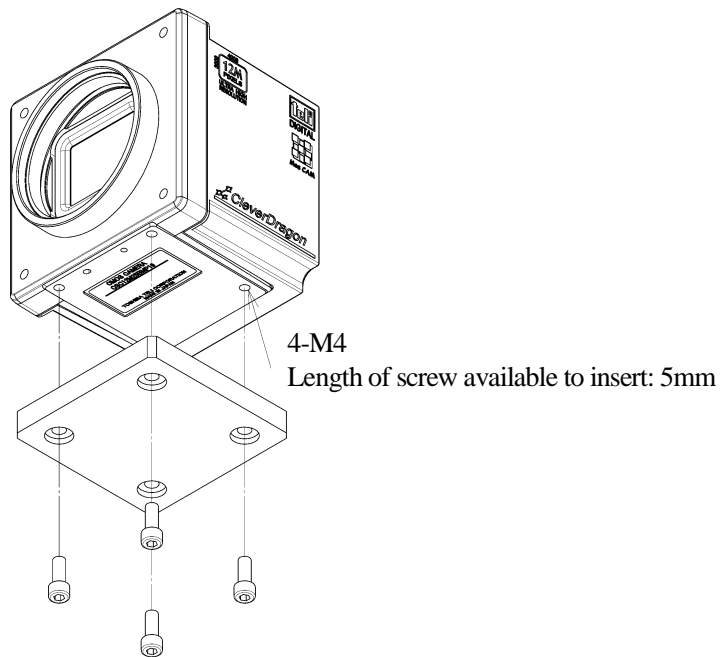
5. Installation

This camera has four mounting holes on the bottom and the front each and can be mounted on the equipment with either face.

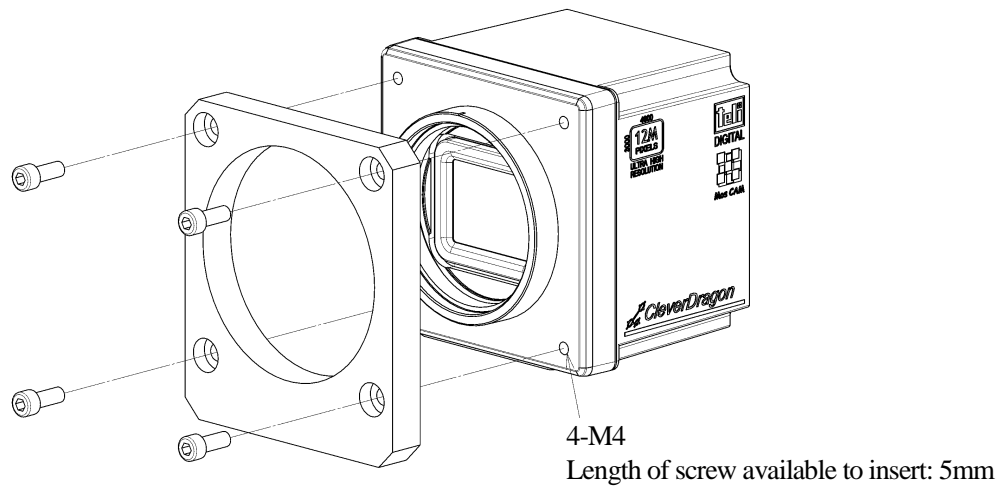
Pay attention to the following points to install it.

- (1) The length of a screw inserted into a camera shall be 5mm or less.
- (2) Tighten all four screws on the installation surface.

5-1. Example of installation with mounting holes on the bottom



5-2. Example of installation with mounting holes on the front



6. Cabling

The camera link cable and the power cable to connect this camera with the equipment are required. Lock the connector firmly and fix the cable near the camera to prevent damage on the equipment due to vibration and shock. Do not bend the cable in smaller radius than the minimum bending radius described below. Otherwise, it may break the cable. Check with the cable maker for handling the minimum bending radius if other cables than options shown below are used.

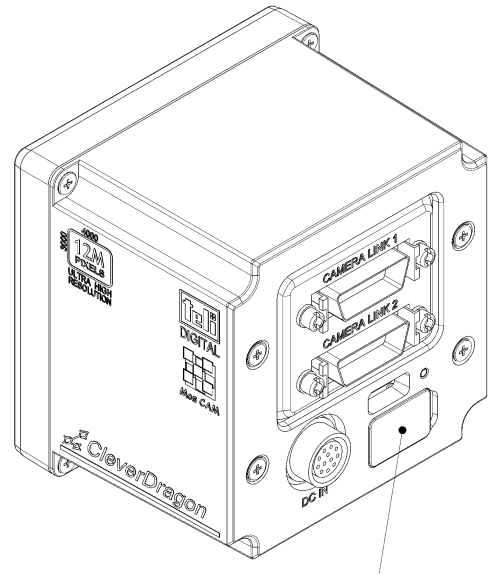
■Option cable

Cable	Model	Maker	Static minimum bending radius (recommended value)
Camera link cable	14B26-SZLB-***-0LC	Sumitomo 3M Ltd.	90mm
Power cable	CPRC3700-**	TOSHIBA TELI CORPORATION	60mm

“***” indicates cable length.

7. Maintenance port

A rubber cap on the back of the camera is attached to protect the connector for the maintenance of the camera. If the connector is damaged, the camera may not be maintained. Do not press the rubber cap firmly. Do not remove the rubber cap to prevent foreign body from getting mixed.



Maintenance port

8. Specification

[Electric specification]

(1) Imager	CMOS image sensor
▪ Effective number of output pixels	4096 (H) × 3072 (V)
▪ Pixel size	6μm (H) × 6μm (V) Square grid array
▪ Optical size	Equivalent to 1.9 type
(2) Scan mode	Progressive
(3) Aspect ratio	4:3
(4) Synchronization system	Internal synchronization
(5) Standard object illuminance	2000 lx, F value 5.6, 3000 K
(6) Minimum object illuminance	30 lx (F2.8, GAIN MAX, reading all pixels, image level 50%)
(7) Image output	Compliant to the camera link standard
▪ Output mode	Switchable between Base and Medium configuration (Factory setting: Medium configuration)
▪ Data	Switch between 8 and 10 bits (Factory setting: 8 bit)
▪ Reading mode	
Reading all pixels	Approx. 25 fps / 4096(H) × 3072(V)
Binning	Approx. 43.5 fps / 2048(H) × 1536(V)
Sub sampling	2x2 : Approx. 50fps / 2048(H) × 1536(V) 4x4 : Approx. 100fps / 1024(H) × 768(V) 8x8 : Approx. 200 fps / 512(H) × 384(V)
WOI	By window setting

- (8) Gain
 - Digital gain 0 to +18 dB [180 steps] (Factory setting: 0 dB)
- (9) Setup 0 to Approx. 13% [528 steps]
(Factory setting: Approx. 3.9%...132)
- (10) Dynamic range Approx. 58 dB (standard)
- (11) Gamma 1.0 (standard)
- (12) Power voltage DC12 V \pm 10 % (Ripple 50 mV(p-p) or less)
- (13) Power consumption Approx. 5 W

[Electronic shutter specification]

- (1) Shutter speed Shutter off or 1/20,000 sec to 2 sec
The exposure time during shutter off varies depending on the reading mode.
(Factory default: Shutter OFF)
- (2) Random trigger shutter ON / OFF switching (Factory default: OFF)
 - Fixed mode The exposure time depends on the shutter speed setting.
 - Pulse width mode The exposure time depends on the external trigger pulse width.
Minimum pulse width: 50 μ sec (Minimum exposure time: 50 μ sec)

Note: 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.
This phenomenon is generated when the shutter speed is fast.
We recommend that the shutter speed of the camera should be slower than 1/100s to reduce the effect by this phenomenon.

[Internal synchronous signal specification]

- (1) Scan frequency
 - Reading mode *When the shutter is OFF
 - Reading all pixels Horizontal: Approx. 75 kHz
Vertical: Approx. 25 Hz
 - Binning Horizontal: Approx. 67 kHz
Vertical: Approx. 43.5 Hz
 - Sub sampling Horizontal: Approx. 75 kHz
Vertical: Approx. 50 to 200 Hz
 - WOI By window setting

[Input signal specification]

- | | |
|------------------------------|---|
| (2) TRIG | Camera Link I/F and DC IN connector input |
| ▪ Signal level (DC IN input) | TTL level |
| ▪ Polarity | Positive/negative Polarity switchable (Factory default: Negative) |
| ▪ Pulse width | 50 μsec or more |

[Output signal specification]

None

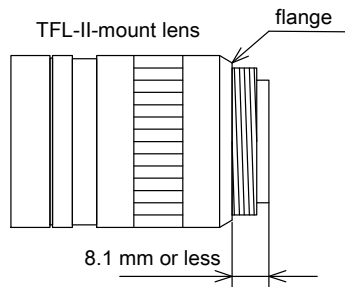
[Machine dimension]

- | | |
|--------------------------|------------------------------------|
| (1) Lens mount | TOSHIBA TELI's unique TFL-II mount |
| ▪ Mount screw | M48mm P=0.75 |
| ▪ Positioning engagement | Φ50mm H7 |
| ▪ Flange back | 17.5 mm |

Request: Combinational lens

Some lenses may not exert full performance of a camera including the decline in the peripheral resolution, the decline in the reduction of brightness, generation of ghost and aberration. Please check the combination with this camera for the lens being used.

Use a TFL-II mount lens whose projecting part from the seating face is 8.1mm or less to be used combined with this camera.



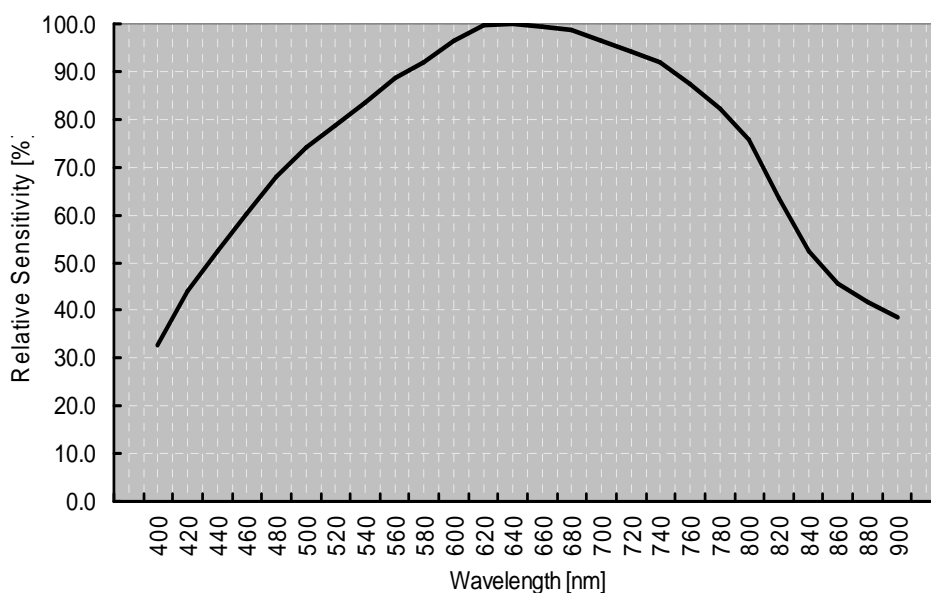
- | | |
|--|--|
| (2) Dimension | 75 mm (W) × 75 mm (H) × 69.5 mm (D)
(Protruding portions such as screws and connectors are not included.) |
| (3) Weight | Approx. 450g |
| (4) Camera body grounding: insulation status | Conductive between circuit GND and camera body |

[Usage environment condition]

- | | | | |
|---------------------------|--------------|-------------|--------------------|
| (1) Performance assurance | Temperature: | 0 to 40°C | |
| | Humidity: | 10 to 90% | (No dew formation) |
| (2) Operation assurance | Temperature: | -5 to 50°C | |
| | Humidity: | 10 to 0% | (No dew formation) |
| (3) Storage temperature | Temperature: | -20 to 60°C | |
| | Humidity: | 90% or less | (No dew formation) |

[Representative spectral sensitivity characteristic]

Spectral Sensitivity Specification for CSC12M25BMP19



(Note that the lens characteristic and the light source characteristic are excluded.)

[Various safety standards]

- | | |
|--|--|
| (1) EMC condition (Electro-Magnetic Compatibility) | |
| EMI (Electro-Magnetic Interference): | EN61000-6-4 / 2001 to be acquired |
| EMS (Electro-Magnetic Susceptibility): | EN61000-6-2 / 2001 to be acquired |
| (2) FCC: | FCC Part 15 Subpart B class A to be acquired |

[Communication specification]

- | | |
|-------------------------|---|
| (1) Communication speed | 9600 / 19200 / 38400 / 57600 bps change |
| (2) Start bit | 1bit |
| (3) Data bit | 8bit |
| (4) Stop bit | 1bit |
| (5) Parity bit | None |
| (6) Handshake | None |

[Connector pin arrangement]

(1) Image output/control connector (Camera Link Medium Configuration) CAMERA LINK1-2

• Connector type: MDR 26-PIN connector 10226-2210PE (3M)

●Connector: CAMERALINK1

Pin No.	I/O	Signal	Pin No.	I/O	Signal
1	-	GND	14	-	GND
2	O	X0-	15	O	X0+
3	O	X1-	16	O	X1+
4	O	X2-	17	O	X2+
5	O	X CLK OUT-	18	O	X CLK OUT+
6	O	X3-	19	O	X3+
7	I	Ser TC (RxD) +	20	I	Ser TC (RxD) -
8	O	Ser TFG (TxD) -	21	O	Ser TFG (TxD) +
9	I	CC1 (TRIG) -	22	I	CC1 (TRIG) +
10	I	CC2 (MULTI) +	23	I	CC2 (MULTI) -
11	I	CC3-	24	I	CC3+
12	I	CC4+	25	I	CC4-
13	-	GND	26	-	GND

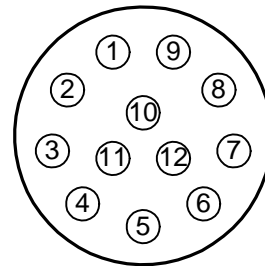
●Connector: CAMERALINK2

Pin No.	I/O	Signal	Pin No.	I/O	Signal
1	-	GND	14	-	GND
2	O	Y0-	15	O	Y0+
3	O	Y1-	16	O	Y1+
4	O	Y2-	17	O	Y2+
5	O	Y CLK OUT-	18	O	Y CLK OUT+
6	O	Y3-	19	O	Y3+
7	-	100Ω terminated(20)	20	-	100Ω terminated(7)
8	-	N.C.	21	-	N.C.
9	-	N.C.	22	-	N.C.
10	-	N.C.	23	-	N.C.
11	-	N.C.	24	-	N.C.
12	-	N.C.	25	-	N.C.
13	-	GND	26	-	GND

(2) Power/synchronous signal input connector DC IN

- Connector (camera side) : HR10A-10R-12PB(71) (HIROSE ELECTRIC)
- Compatible plug (cable side): Equivalent to HR10A-10P-12S(73) (HIROSE ELECTRIC) or equivalent

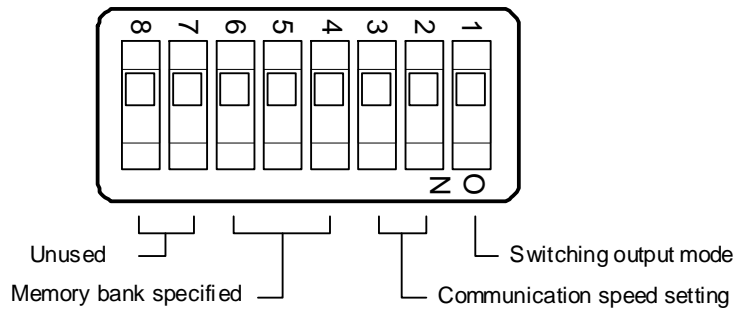
Pin No.	I/O	Signal
1	-	GND
2	I	+12V
3	-	GND
4	-	N.C.
5	-	GND
6	-	N.C.
7	-	N.C.
8	-	GND
9	-	N.C.
10	-	N.C.
11	I	TRIG
12	-	GND



View from the back

[Switch setting]

Various settings are available with the dip switch on the back.



“*” indicates default setting at shipment.

(1) Switching output mode

Switch between Medium Configuration and Base Configuration.

The power of the camera needs be turned on again to switch modes.

SW1	Output mode
OFF	* Medium Configuration
ON	Base Configuration

(2) Communication speed setting

The speed of the serial communication can be set by the camera link.

The power of the camera needs be turned on again to switch modes.

SW2	SW3	Communication speed
OFF	OFF	* 9600 bps
ON	OFF	19200 bps
OFF	ON	38400 bps
ON	ON	57600 bps

(3) Specifying a memory bank before starting

Specify a memory bank to be referenced before turning on the power of the camera for SW4 through SW6.

The power of the camera needs be turned on again to switch modes.

SW4	SW5	SW6	Memory bank
OFF	OFF	OFF	* Bank 1
ON	OFF	OFF	Bank 2
OFF	ON	OFF	Bank 3
ON	ON	OFF	Bank 4
OFF	OFF	ON	Bank 5
ON	OFF	ON	Bank 6
OFF	ON	ON	Bank 7
ON	ON	ON	Bank 8

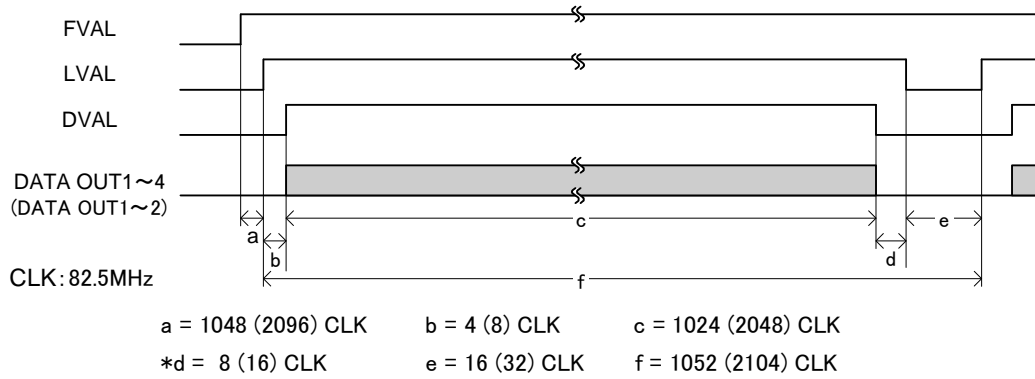
Fix SW7 and SW8 to OFF.

[Timing chart]

(1) Horizontal timing

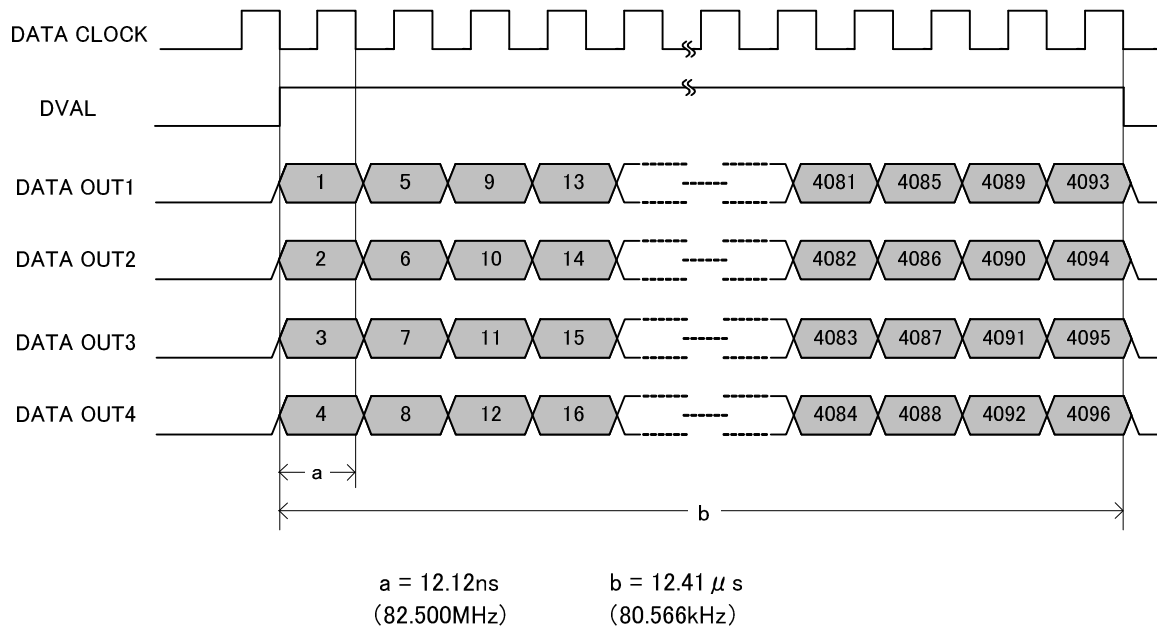
*For Medium configuration The figure in parentheses indicates that for Base configuration.

1) Reading all pixels

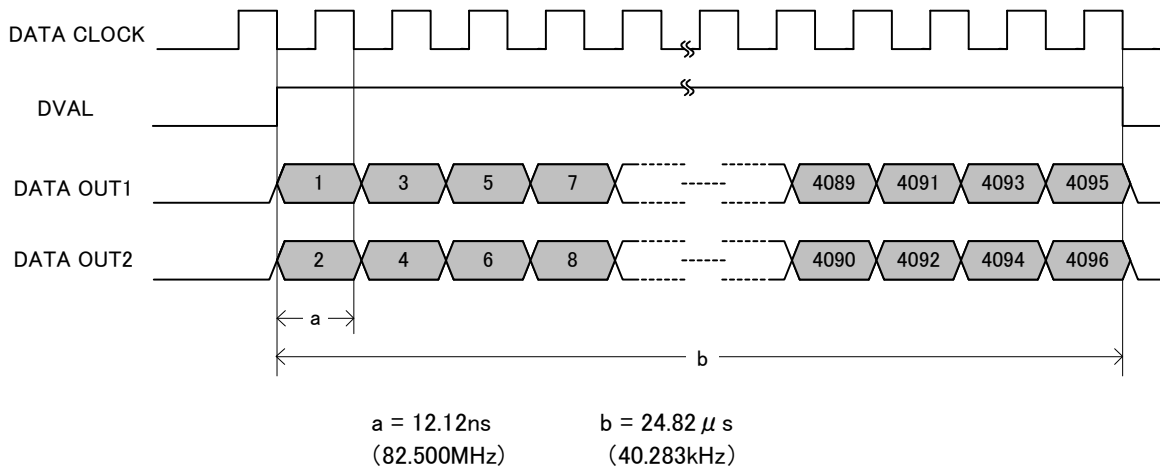


2) CLK rate

●Medium Configuration



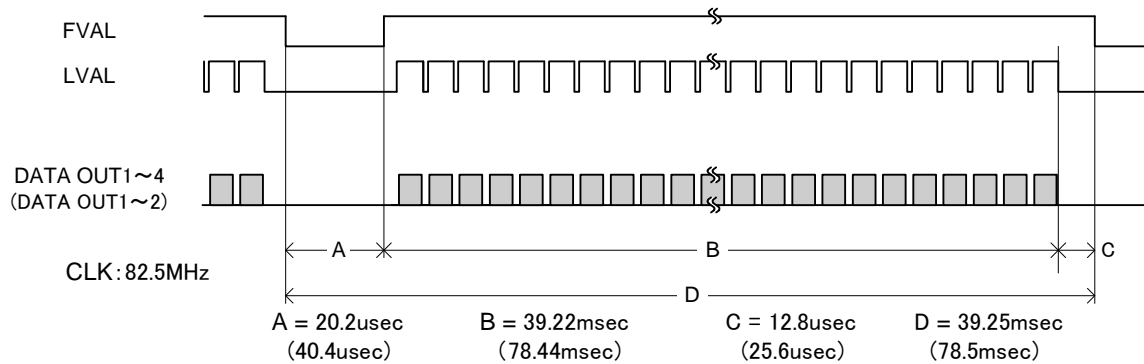
●Base Configuration



(2) Vertical timing

*For Medium configuration Figures in parentheses are for Base configuration.

1) Reading all pixels (when the shutter is OFF)



Note: The frame rate changes according to the shutter speed when the shutter is ON.
 (The period "A" in the chart indicates the period of the shutter speed.)

9. Command Communication Protocol

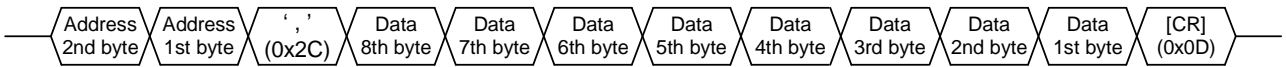
The command communication protocol is the TELL standard method (method in which parameters are set in the registers in the camera).

In command send/receive operation, hexadecimal address and data are converted to ASCII data.

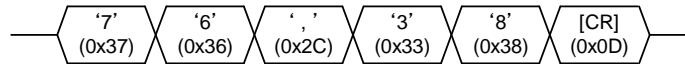
All ASCII alphabetic characters used are uppercase characters.

(1) Write to a register

To write data in a register, send a command, as follows. (Address' max-length is 2 bytes, and Data's max-length is 8 bytes)

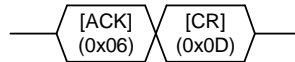


For example, to write data 0x38 to address 0x76, send a command, as follows:

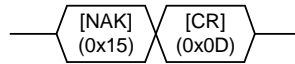


The camera responds to the write command with No Error (ACK) or Error (NAK), as follows:

No Error (ACK):



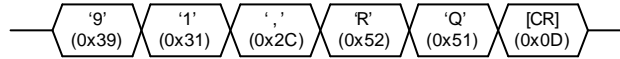
Error (NAK):



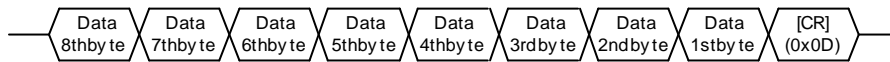
*Because two kinds of data is needed for the setting Approx. the Partial Scan, the register writing for "Set value application" is separately needed.

(2) Reading the register

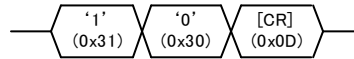
To read data from a register, send ', (comma)', 'R', 'Q' and [CR] code following the address. For example, to read data in address 0x91, send a command, as follows:



The camera responds to the read request, as follows (Data's max-length is 8 bytes):



Actually, the camera responds to the read request as minimum data length: For example, to read data 0x10 to address 0x91, the camera responds as follows:



10. Register map

The following accesses are available via the camera link serial interface.

Address	Access	CMOS Monochrome Camera CSC12M25BMP19		
0x00	R. O.	Manufacturer(Maker) name ASCII format	← Manufacturer(Maker) name TOSHIBA TELI	Access R/W : Read/Write possible R. O. : Read Only W. O. : Write Only N. A. : Not Available
0x0F	R. O.			
0x10	R. O.	Model name ASCII format	← Model name CSC12M25BMP19	
0x2F	R. O.			
0x30	R. O.	Serial number ASCII format	← Serial number xxxxxxx	
0x3F	R. O.			
0x40	R. O.	Firmware version ASCII format	← Firmware version e.g. 01.01.01	
0x47	R. O.			
0x48	R. O.	FPGA1 version ASCII format	← FPGA1 version e.g. 01.01.01	
0x4F	R. O.			
0x50	R. O.	FPGA2 version ASCII format	← FPGA2 version e.g. 01.01.01	
0x57	R. O.			
0x58	R. O.	CPLD1 version ASCII format	← CPLD1 version e.g. 01.01.01	
0x5F	R. O.			
0x60	R. O.	Register map version ASCII format	← Register map version e.g. 01.01.01	
0x67	R. O.			
0x68	N. A.	Reserved		
0x69	R. O.	Status	← Status Store the status after performing camera control.	
0x6A	R. O.	Extended status	← Extended status Store detail information corresponding to the status.	
0x6B	N. A.	Reserved		
0x6C	R. O.	Check memory bank	← Check memory bank The bit is set according to the saved setting (memory bank number 1).	
0x6D	W. O.	Save memory	← Save memory Write memory bank number (1-8). Save memory to the specified number.	
0x6E	R/W	Call memory	← Call memory Write memory bank number (0). -> Call default setting. Write memory bank number (1-8). -> Call a setting from the specified number. Read registers. -> Check the memory number used (Use 0 if no memory has been called).	
0x6F	W. O.	Initialize memory	← Initialize memory Write memory bank number (1-8). Initialize the specified number.	
0x70	R/W	Setup	← Setup 0(0LSB) - 528(132LSB@10bit, 33LSB@8bit) Default setting: 264(66LSB@10bit, 16LSB@8bit)	
0x72	N. A.	Reserved		
0x75	N. A.	Reserved		
0x76	R/W	Gain	← Gain 0(0dB) - 180(18dB) Default setting: 0(0dB)	
0x77	N. A.	Reserved		
0x7F	N. A.	Reserved		
0x80	N. A.	Reserved		
0x82	N. A.	Reserved		
0x84	N. A.	Reserved	← Output control 0(OFF) / 1(ON) Default setting: 1(ON)	
0x86	R/W	Output control		
0x87	R/W	Number of output bits	← Number of output bits 8(8bit) / 10(10bit) Default setting: 8(8bit)	
0x88	N. A.	Reserved		
0x89	N. A.	Reserved		
0x8A	N. A.	Reserved		
0x8B	R/W	Defective pixel correction	← Defective pixel correction 0(OFF) / 1(ON) Default setting: 1(ON) Note that it supports only normal scan and WOI scan.	
0x8C	N. A.	Reserved		
0x8D	N. A.	Reserved		
0x8E	N. A.	Reserved		
0x8F	N. A.	Reserved		

Address	Access	CMOS Monochrome Camera CSC12M25BMP19	
0x90	R/W	Scan mode	Scan mode 0(Normal)/1(WOI)/2(Binning)/3(Subsampling) Default setting: 0(Normal)
0x91	R/W	Shutter mode	
0x92	R/W	Random trigger mode	
0x93	R/W	Trigger polarity	
0x94	R/W	Subsampling	
0x95	N. A.	Reserved	Shutter mode 0(Normal shutter OFF)/1(Normal shutter)/2(Random trigger shutter) Default setting: 0(Normal shutter OFF)
0x9F	N. A.	Reserved	
0xA0	R/W	Shutter speed denominator	Random trigger mode 0(FIX mode)/1(Pulse mode) Default setting: 0(FIX mode)
0xA2	N. A.	Reserved	Trigger polarity 0(Negative polarity)/1(Positive polarity) Default setting: 0(Negative polarity)
0xA3	N. A.	Reserved	
0xA4	R/W	Shutter speed numerator	Subsampling 2(x2) / 4(x4) / 8(x8) Default setting: 2(x2)
0xA5	N. A.	Reserved	Shutter speed denominator 1 - 20000 Default setting: 25(1/25s)
0xBF	N. A.	Reserved	
0xC0	W. O.	WOI update	Shutter speed numerator 1 - 255 Default setting: 1(1/25s)
0xC1	R/W	WOI area number	
0xC2	R/W	WOI horizontal start coordinate	Shutter speed 1/20000s - 2s
0xC4	R/W	WOI vertical start coordinate	
0xC6	R/W	WOI horizontal width	WOI update 0x01 write -> Set WOI information to the area specified by the WOI area number register.
0xC8	R/W	WOI vertical height	
0xCA	N. A.	Reserved	WOI area number 0 - 27 Default setting: 0 Select the area to be reflected for WOI update.
0xCB	R/W	Save/call WOI bank	
0xCC	R/W	WOI area effective	WOI horizontal start coordinate 0 - 4080 (Only multiples of 4 to support 4 tap output) Default setting: 0
0xD0	N. A.	Reserved	WOI vertical start coordinate 0 - 3070 Default setting: 0
0xD1	N. A.	Reserved	
0xD2	N. A.	Reserved	WOI horizontal width 16 - 4096 (Only multiples of 4 to support 4 tap output) Default setting: 4096
0xD3	N. A.	Reserved	
0xD4	N. A.	Reserved	WOI vertical height 2 - 3072 Default setting: 3072
0xD5	N. A.	Reserved	
0xD6	N. A.	Reserved	Save/call WOI bank 0x00 - 0x08, 0x81 - 0x88 Default setting: 0 Save or call WOI related registers.
0xD7	N. A.	Reserved	
0xD8	R/W	Specify user area/address	WOI area effective 0x00000001 - 0x0FFFFFFF Default setting: 0x00000001 Enable/disable the area-1 by bit 0, the area 2 by bit 1 . . . and the area 28 by bit 27. Note that disabling all area cannot be accepted.
0xDA	R/W	Specify user area/data	
0xDB	W. O.	Erase user area	Specify user area/address 0x0000 - 0x07FF (2kバイト) Set the address of a user area to write or read data. The value is set to the register specified by the data when the address is set to this register.
0xDC	R/W	Number of bytes to read user area	
0xDD	N. A.	Reserved	Specify user area/data Write or read data to/from the address specified by the user area/data-specified register. When data is set to this register, data is written to the address specified by the address-specified register. The address to which nothing has been written is initialized by "0x00" (EEPROM).
0xDE	N. A.	Reserved	
0xDF	N. A.	Reserved	Erase user area 0x01 write -> Erase the user area
0xE0	N. A.	Reserved	
0xE1	R/W	Multi slope	Number of bytes to read user area When the camera reads data, it reads specified bytes of data and outputs it at the same time. The data can be saved in a memory bank.
0xE2	N. A.	Reserved	
0xFF	N. A.	Reserved	Multi slope 0(OFF)/1(Mode-1)/2(Mode-2)/3(Mode-3)/4(Mode-4) Default setting: 0(OFF)

Access
 R/W : Read/Write possible
 R.O. : Read Only
 W.O. : Write Only
 N.A. : Not Available

- The multi-slope is a function to be implemented.

11. Function

11.1 Reading mode

Images can be output from the camera link connector and imported from the frame grabber board. The frame rate and the resolution of the output image supported by this model are shown below (when the shutter is OFF).

Mode	Setting	Frame rate	Resolution
Reading all pixels		Approx. 25 fps	4096 (H) × 3072 (V)
Binning		Approx. 43.5 fps	2048 (H) × 1536 (V)
Sub sampling	2 x 2	Approx. 50 fps	2048 (H) × 1536 (V)
	4 x 4	Approx. 100 fps	1024 (H) × 768 (V)
	8 x 8	Approx. 200 fps	512 (H) × 384 (V)
WOI		By window setting	

1) Reading all pixels

The camera reads all pixels (4096(H) × 3072(V) pixels) in Approx. 25 fps.

2) Binning

The camera reads all effective areas in Approx. 43.5fps by binning (2x2) for all pixels (4096(H) × 3072(V) pixels). As it reads adjacent 4 pixels as one pixel, the resolution reduces. However, as the pixel noise is averaged, it can output lower noise than that is produced when it reads all pixels.

Complex operation with WOI and sub sampling is not available.

3) Sub sampling

It reads all effective areas in high speed by scanning in pixel skipping.

Complex operation with binning and WOI is not available.

4) WOI

Only arbitrary area can be read. Areas can be read in high speed by skipping unwanted areas.

Complex operation with binning and sub sampling is not available.

11.2 Random trigger shutter

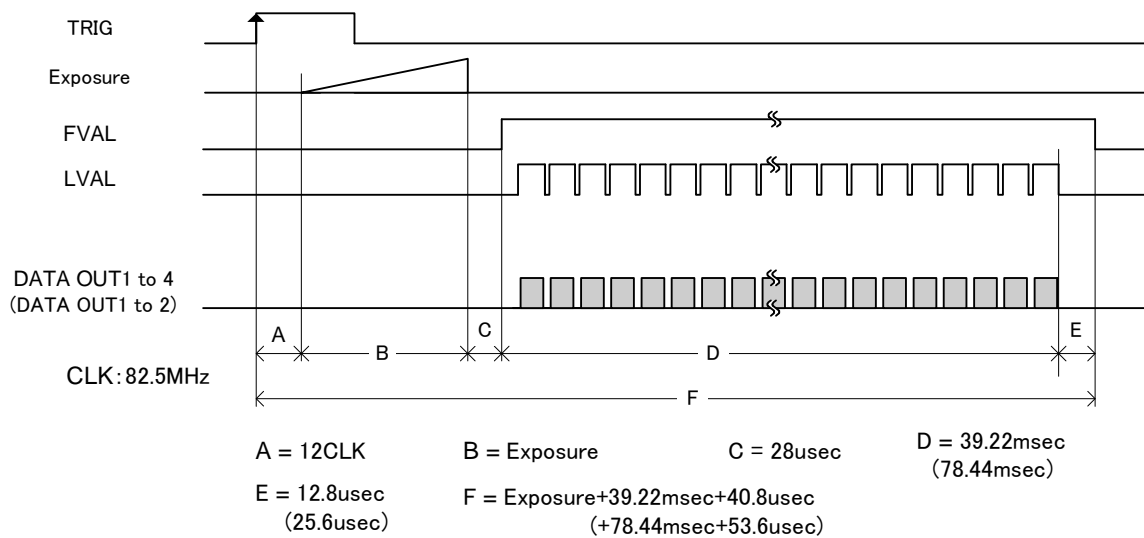
Images can be taken and imported at arbitrary timing by inputting an external trigger signal in a random trigger shutter mode.

- External trigger signals can be input from either the camera link I/F CCI or the DC IN connector. However, signals cannot be input at the same time. Fix an unused input to Low.
- It starts exposure at a rising trigger edge when the polarity is set to positive polarity while it starts exposure at a negative-going trigger edge when the polarity is set to negative polarity.
- Random trigger shutter operates in either the fixed mode and the pulse width mode and has different ways to determine the exposure time depending on the mode.
- Film cannot be exposed during reading images using the random trigger shutter. If inputting triggers is to be continued, input them after finishing image output of the camera.

1) Fixed mode

- The exposure time is determined by the set value of the shutter speed.

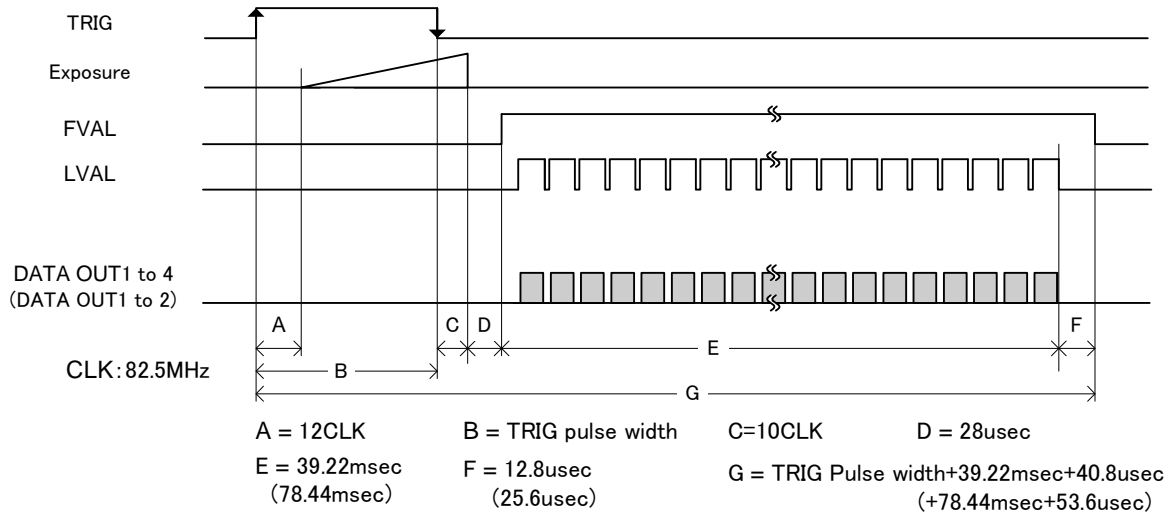
*Example of timing charts to expose all pixels



2) Pulse width mode

- The exposure time is determined by the pulse width (exposure time = pulse width + 2CLK).
- The pulse width should be more than 50 μ sec.

*Example of timing charts to expose all pixels



11.3 WOI (Window Of Interest)

Only arbitrary areas can be read by specifying an address in horizontal and vertical directions.

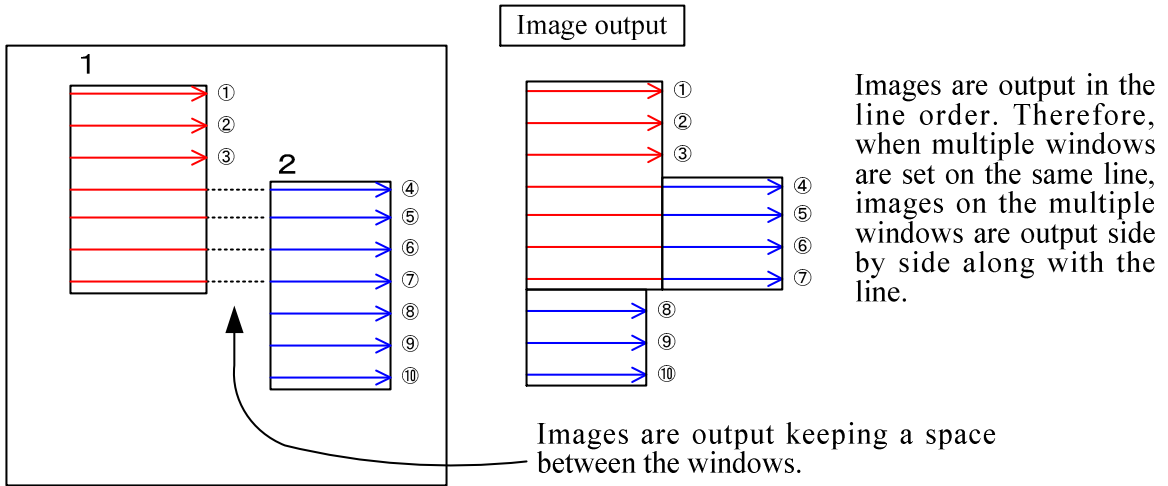
Area setting has the following conditions.

- Number of windows: 1 to 28
- Setting position:
 - H: Integral multiple of 4 columns
 - V: Integral multiple of one row
- Window size:
 - H: Integral multiple of 4 columns (minimum size: 16)
 - V: Integral multiple of one row (minimum size: 2)
- Overlapping of windows: Possible
- Others
 - (1)Frame rate: There is no proportional relation between the window area and the frame rate.
 - (2)Set values of the coordinate and the size: Set the coordinate and the size to fit the effective pixel area. Values cannot set beyond the effective pixel area.
 - (3)Complex operation: Complex operation with binning and sub sampling is not available.
 - (4)Memory: WOI setting can be saved in memory banks 1- 8.

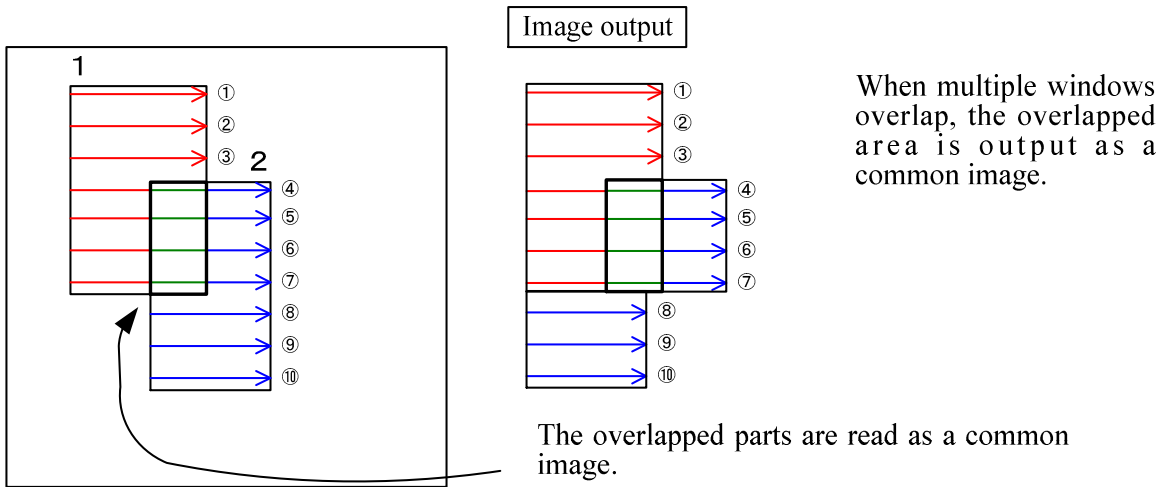
11.3.1 Image output for WOI

Images are outputted per line. Therefore, when multiple windows are set on the same line, images of multiple windows are included in the image output of the line.

(1) When multiple windows are set on the same line



(2) When multiple windows overlap

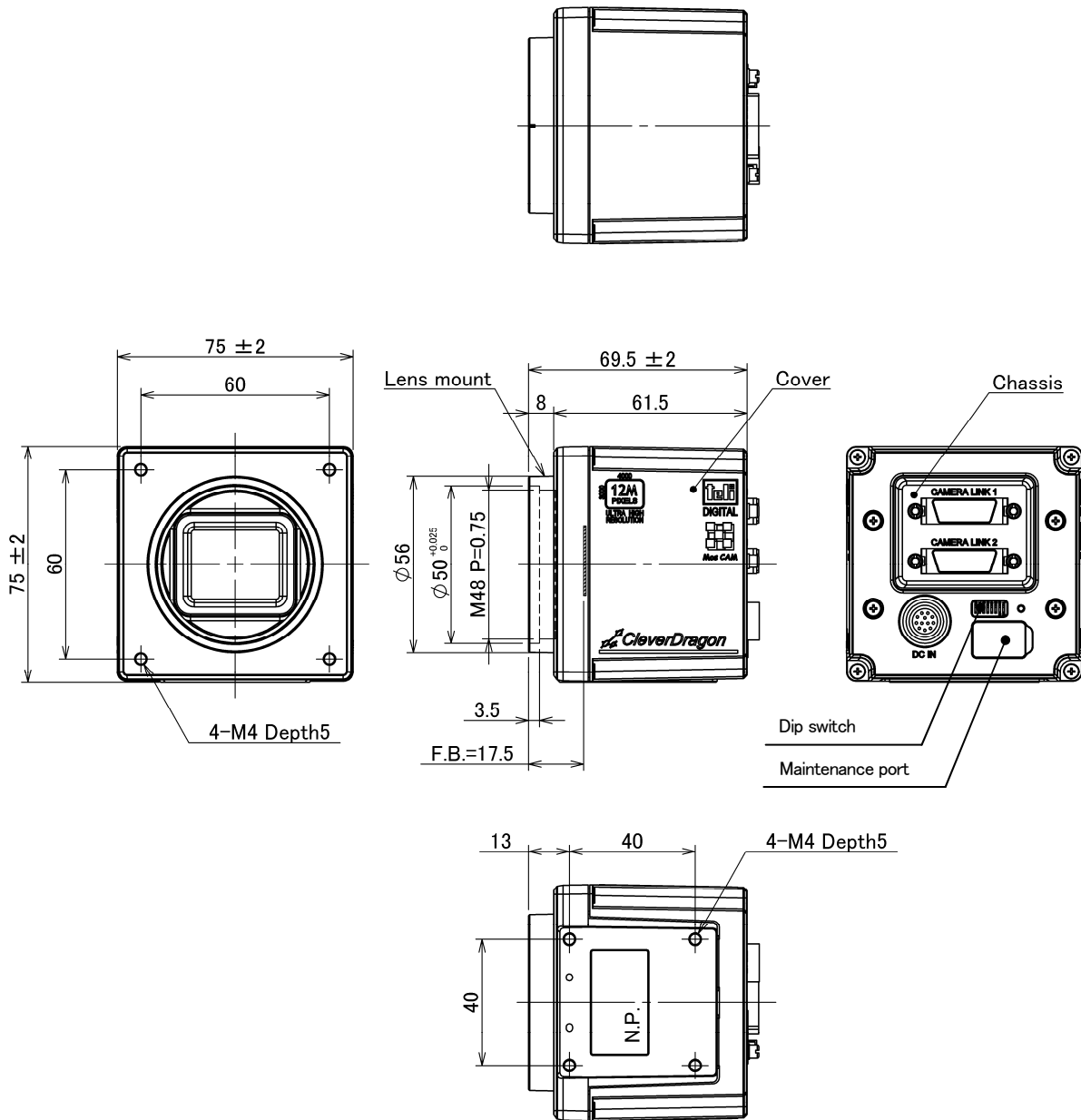


11.4 Multi-slope (to be implemented)

An apparently wide dynamic range is obtainable through exposure up to four times.

Note that the tone may not be correctly represented for the point where the slope switches. Fixed pattern noise may increase depending on the setting.

12. External-view Drawing



Design specification

Material

Lens mount, Cover : Aluminum die cast

Chassis : Cold rolled steel

Processing

Lens mount, Cover : Cation-resistant aluminum alloy

Chassis : Nickel plating

Note.



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