



# High-Resolution CCD Color Camera CleverDragon Series **CSCQS15CC23**

## Specification

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**TOSHIBA TELI CORPORATION**

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## **RESTRICTION FOR USE**

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- **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.
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- **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.**
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- **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
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## CASES FOR INDEMNITY (LIMITED WARRANTY)

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

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- 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.

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- **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.**

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- **In the case damage or losses are caused by failure to observe the information contained in the instructions in this instruction manual and specifications.**

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- In the case damage or losses are caused by use contrary to the instructions in this instruction manual and specifications.

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- **In the case damage or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.**

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- **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).**

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- Expenses we bear on this product shall be limited to the individual price of the product.

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- About the item which does not have a publication in the specifications and manual of this product, it considers as the outside for a guarantee.

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## NOTES ON USING THIS PRODUCT

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### ● Handle carefully

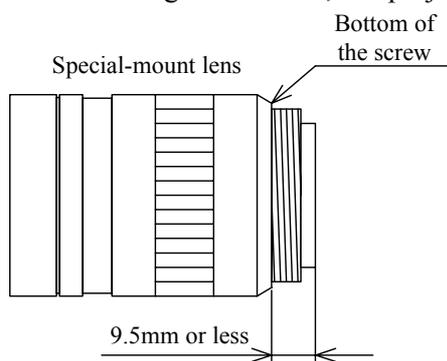
Do not drop the equipment or allow it to be subject to strong impact or vibration, as such action may cause malfunctions. Further, do not damage the connection cable, since this may cause wire breakage.

### ● 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.

### ● About lens mount

As for the Special-mount lens used combining this camera, the projection distance from bottom of the screw should use 9.5mm or less.



### ● Check a combination with the lens

Depending on the lens and lighting you use, an image is reflected as a ghost in the imaging area. However, this is not because of a fault the camera.

In addition, depending on the lens you use, the performance of the camera may not be brought out fully due to deterioration in resolution and brightness in the peripheral area, aberration and others.

Be sure to check a combination with the camera by using the lens and lighting you actually use.

When installing a lens in the camera, make sure carefully that it is not tilted.

In addition, use a mounting screw free from defects and dirt. Otherwise, the camera may be unable to be removed.

### ● About the difference between the right and on the left of an image output screen

As for CCD used with this camera, the left half and the right half of the screen are independently output (2ch output method). Therefore, It is not failure, although a level difference may be visible to an image on either side or a boundary line may be visible to middle of the screen bordering on middle of the screen with the setting mode of a camera.

### ● Defect of CCD

In transportation and keeping, it is not a breakdown though the defect might occur by accident in CCD.

### ● 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.

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- **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.

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- **Turn OFF the power in the case of connection**

Turn OFF the power in the case of connection of connection camera cable.

Otherwise, an electric shock or a malfunction may occur.

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- **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.

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 about 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”



## 5. Specifications

### [Electrical specification]

(1) Imager	Interline CCD
•Number of total pixels	2536 (H) x 2068 (V)
•Number of effective pixels	2456 (H) x 2058 (V)
•Number of picture output effective pixels	2448 (H) x 2058 (V)
•Pixel size	3.45 $\mu$ m (H) x 3.45 $\mu$ m (V)
•Optical size	2/3 type
(2) Scan method	Progressive
(3) Aspect ratio	6:5
(4) Synchronization method	Internal synchronization
(5) Standard subject illuminance	1800 lx, F8, 5100 K
(6) Minimum subject illuminance	14 lx (F1.4, GAIN MAX, all pixel readout, video level 50 %, $\gamma=0.65$ equivalent)
(7) Video output	Compliant with the camera link standard. Base configuration 1tap
•Data	RGB 24bit / RAW 12bit / RAW 10bit / RAW 8bit switching (initial factory setting: RGB)
•Readout mode	
All pixel readout	Approximately 15.1 fps / 2448 (H) x 2058 (V)
High-speed draft readout	Approximately 37.2 fps / RGB 2448(H) $\times$ 253(V), RAW 2448(H) $\times$ 254(V)
Partial scan	Approximately 15.1 fps to 52.3fps / 2448(H) x 100 to 2058(V)

\* About an image output:

As for CCD used with this camera, the left half and the right half of the screen are independently output (2ch output method). Therefore, it is not failure, although a level difference may be visible to an image on either side or a boundary line may be visible to middle of the screen boarding on middle of the screen with the setting mode of a camera.

\* About a right and left level difference between TAP of the image output

In the test environment of the Teli standard, we measure the level difference by using the gray scale chart of ITE- type. We measure a center white part of the chart.

- Shipment standard (difference of the right part and left part ): 105 [digit] or less (12bit)

In the following cases, the camera might not be able to correct the level difference automatically.

- When the image level of a right and left center part is low
- When the image level of a right and left center part is high
- When the level difference of each pixel (right and left part of center) is large

When you cannot correct the level difference, please correct the level difference by the following method.

- After the source of light and object are changed, one push correction is done.
- The level difference is corrected with manual.

In the shipment setting, the calibration mode is AUTO.

(8) Gain	0 to +6dB (61 levels) (initial factory setting: 0 dB)
(9) Setup	0 to 33(528) LSB (RAW 12bit) (529 levels) (initial factory setting: 16(264) LSB (calculated value) )
(10) White balance	OPWB/MANUAL switching (initial factory setting: MANUAL)
Effective range	2400 K to 9000 K
•OPWB	
Effective area	Full screen

•MANUAL	
Preset value	3000 K, 3700 K, 4000 K, 4500 K, 5500 K, 6500 K
User setting	R-gain and B-gain can be set independently.
(11) Gamma correction	OFF( $\gamma=1.0$ ) / PRESET( $\gamma=0.65$ ) / USER(LUT) switching (initial factory setting: PRESET)
(12) Masking correction	ON(Six points can be corrected)/OFF switching (initial factory setting: OFF)
(13) Calibration	MANUAL / AUTO / ONEPUSH switching (initial factory setting: AUTO)
(14) Power supply voltage	DC12 V (DC10V to DC13.2V) (ripple 50 mV(p-p) or less)
(15) Power consumption	Approximately 4.8 W

**[Electronic shutter specification]**

(1) Shutter speed	
•Readout mode	
All pixel readout	2 to 1/20,000 s
Partial scan	2 to 1/20,000 s
High-speed draft readout	2 to 1/20,000 s
(2) Random trigger shutter	ON/OFF switching (initial factory setting: OFF)
•Fixed mode	The exposure time depends on the shutter speed setting.
•Pulse width mode	The exposure time depends on the pulse width.
(3) Multiple-shutter	ON/OFF switching (initial factory setting: OFF)
	Exposure by TRIG input, readout by MULTI input
	* Enabled when random trigger shutter is ON.

**[Internal sync signal specification]**

(1) Driving frequency	80.000 MHz
(2) Scanning frequency	
•Readout mode	
All pixel readout	Horizontal   31.18 kHz Vertical      15.09 Hz
High-speed draft readout	Horizontal   9.82 kHz Vertical      37.16 Hz
Programmable partial scan	Horizontal   31.18 kHz Vertical      Arbitrariness

**[Input signal specification]**

(1) TRIG	Camera link I/F and I/O connector input
•Signal level (I/O input)	TTL level
•Polarity	Positive/Negative polarity switching possible (initial factory setting: Negative)
•Pulse width	52.1 $\mu$ s or more
(2) MULTI	Camera link I/F input
•Polarity	Negative polarity
•Pulse width	52.1 $\mu$ s to 10 ms

**[Output signal specification]**

(1) VD	I/O connector output
•Signal level	4 V (p-p)
•Polarity	Negative polarity
(2) EXPOSURE (Exposure period)	I/O connector output
•Signal level	4 V (p-p)
•Polarity	Negative polarity

**[Dimensions]**

- (1) Lens mount C-mount

**Notes on combination of C-mount 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.

As for the C-mount lens used combining this camera, the projection distance from bottom of the screw should use 9.5mm or less.

The diagram shows a cross-section of a C-mount lens assembly. It consists of several cylindrical elements. A dimension line at the bottom indicates a distance of '9.5mm or less' from the 'Bottom of the screw' (indicated by a line pointing to the base of the lens) to the front surface of the lens. The lens is labeled 'C-mount lens'.

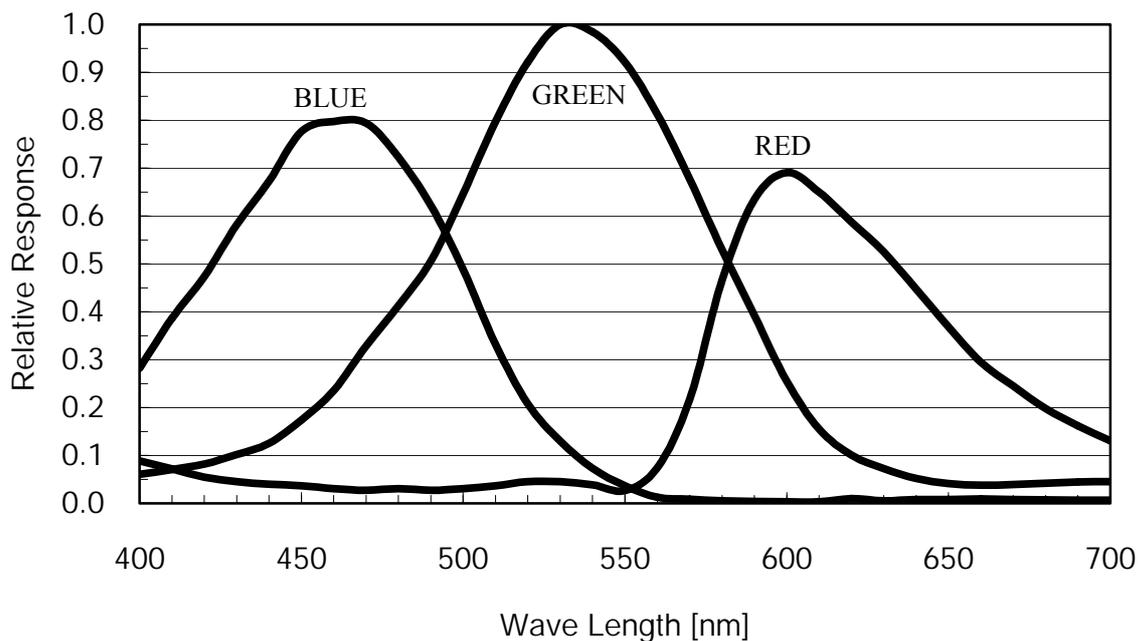
- (2) Flange back 17.526 mm
- (3) Dimensions 54 mm (W) x 43 mm (H) x 69 mm (D)
- (4) Mass Approximately 190 g
- (5) Camera body grounding: insulation status  
Conductive between circuit GND and camera body

**[Operating ambient conditions]**

- (1) Performance assurance
  - Temperature : 0 to 40°C
  - Humidity : 10 to 90% (no condensation)
- (2) Operating assurance
  - Temperature : -5 to 45°C
  - Humidity : 10 to 90% (no condensation)
- (3) Storage environment
  - Temperature : -20 to 60°C
  - Humidity : 10 to 90% (no condensation)

**[Typical spectral response]**

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



**[Applicable safety standards]**

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

**[Communication specification]**

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

**[Connector pin assignment]****(1) Video output/controlling connector (Camera Link Base Configuration) CAMERA LINK**

Outputs video signals and VALID, based on the camera link standard LVDS.

This connector is connected to the frame grabber board, image processing device and others.

- Connector model: DR 26-PIN connector 10226-2210PE (manufactured by 3M).

Pin No.	I/O	Signal Name	Pin No.	I/O	Signal Name
1	-	GND	14	-	GND
2	O	Tx OUT0-	15	O	Tx OUT0+
3	O	Tx OUT1-	16	O	Tx OUT1+
4	O	Tx OUT2-	17	O	Tx OUT2+
5	O	Tx CLK OUT-	18	O	Tx CLK OUT+
6	O	Tx OUT3-	19	O	Tx OUT3+
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

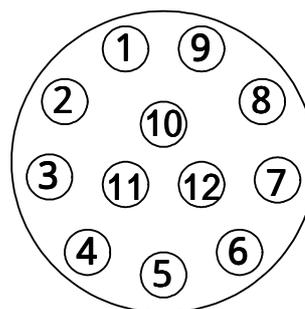
**(2) Connector for power supply and sync signal input/output I/O**

This is a terminal used for power supply to the camera. This connector is connected to the power supply unit.

In addition, this connector is used for sync signal (VD, Exposure signal) output and external trigger signal input.

- Connector (Camera side) : HR10A-10R-12PB(71) (Manufactured by HIROSE DENKI)
- Plug (Cable side) : HR10A-10P-12S(73) (Manufactured by HIROSE DENKI) or equivalents

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

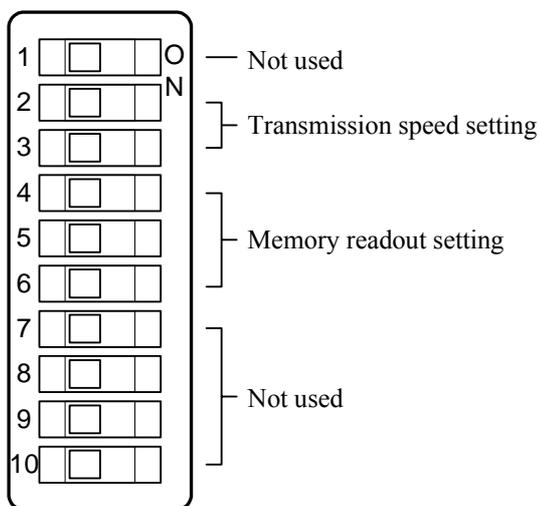


Rearview

**[Switch setting]**

By using the DIP switches on the back surface of the camera body, you can set serial transmission speed and memory readout for when the power supply is turned on.

If you change the switch setting after the power supply is turned on, the change is not reflected.



(1) Transmission speed setting

You can set the speed of serial transmission by camera link.

SW2	SW3	Transmission speed
OFF	OFF	9600 bps
ON	OFF	19200 bps
OFF	ON	38400 bps
ON	ON	57600 bps

(2) Memory readout setting

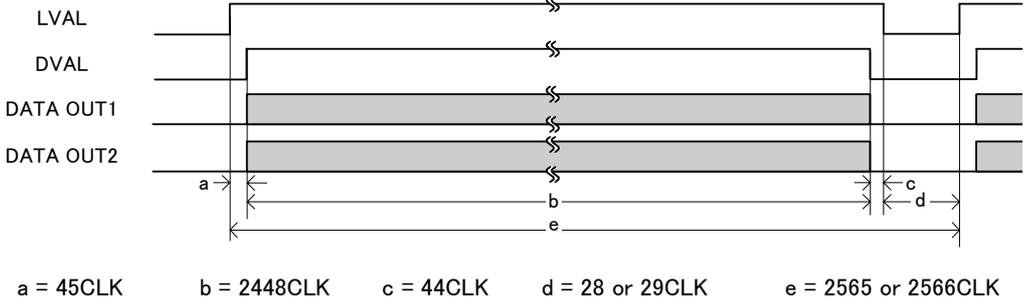
You can set the number of the setting value saving memory bank to be called when the power supply is turned on. The memory consists of 8 banks.

SW4	SW5	SW6	Memory number
OFF	OFF	OFF	1
ON	OFF	OFF	2
OFF	ON	OFF	3
ON	ON	OFF	4
OFF	OFF	ON	5
ON	OFF	ON	6
OFF	ON	ON	7
ON	ON	ON	8

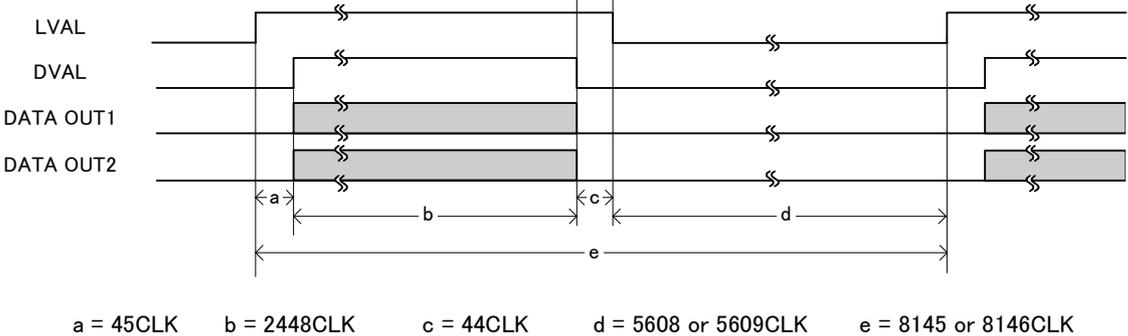
**[Timing chart]**

(1) Horizontal timing

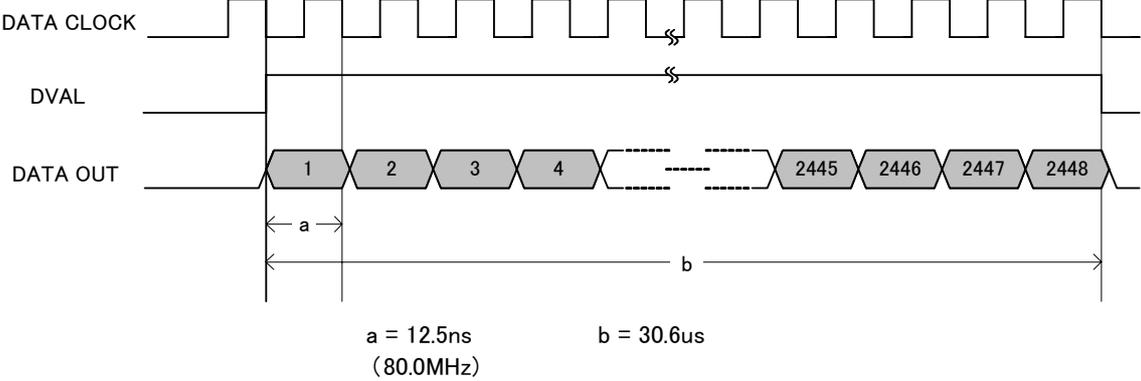
1) All pixel readout, Partial scan



2) High-speed draft readout



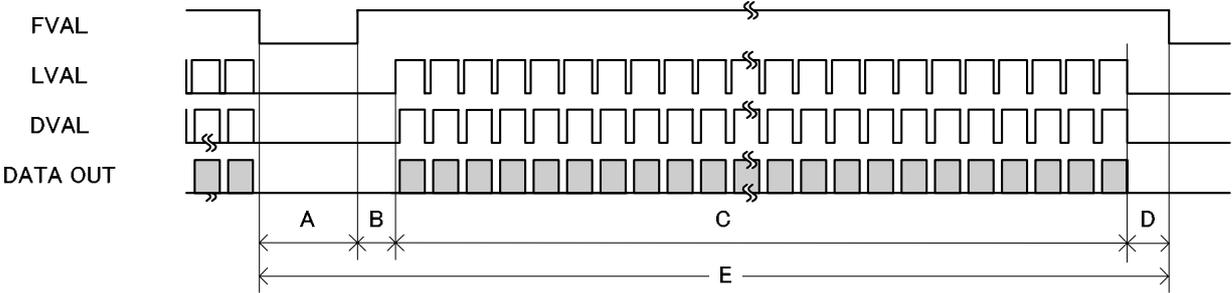
3) CLK rate



(2) Vertical timing

1) All pixel readout \* ex) shutter mode: Shutter off

The period of A/C depend on the shutter speed.

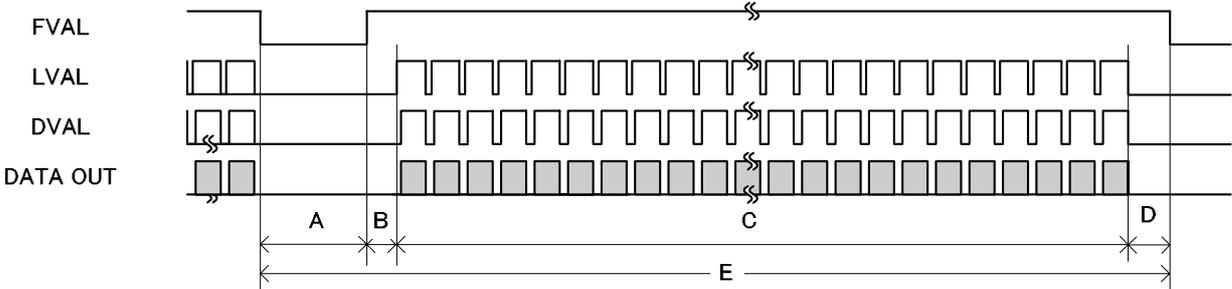


A = approx. 205us (RAW) or approx. 189us(RGB)    B = 1H (RAW) or 2H (RGB)    C = 2058H-29CLK  
 D = approx. 17.0us (RAW) or 0.0us(RGB)    E = A+B+C+D

(1H: 2565CLK ; The period of A becomes long for 1/15.1s shutter speed or more. )

2) High-speed draft readout \* ex) shutter mode: Shutter off

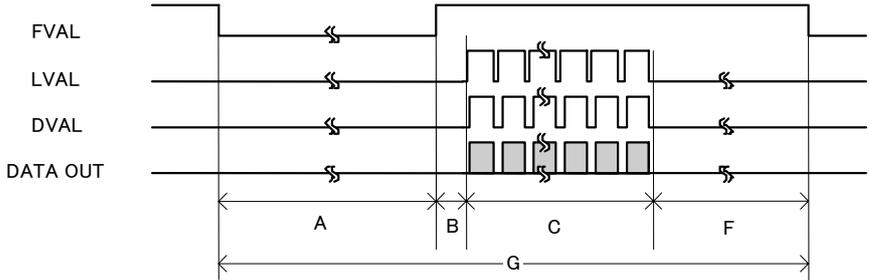
The period of A/C depend on the shutter speed.



A = approx. 0.97ms    B=1H(RAW) or 2H (RGB)    C = [254H(RAW) or 253H(RGB)]-5609CLK    D = approx. 48.8us  
 E = A+B+C+D    (1H: 8146CLK ; The period of A becomes long for 1/37.1s shutter speed or more. )

3) Partial scan

·One step partial scanning



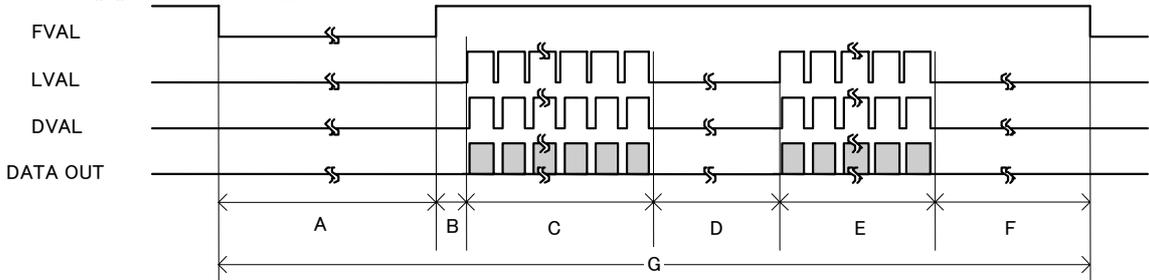
$$A = 480 \times (\text{Partial V Start} + 7) + 7616 \quad B = 1924 \text{ (RAW) or } 3848 \text{ (RGB)}$$

$$C = 1924 \times \text{Partial Height} - 615$$

$$F = 480 \times \{ 2060 - (\text{Partial V Start} + \text{Partial Height}) \} + [1924 \text{ (RAW)}]$$

When 1.33 is multiplied respectively of A to F, the number of CLK is calculated.

·Two step partial scanning



$$A = 480 \times (\text{Partial V Start1} + 7) + 7616 \quad B = 1924 \text{ (RAW) or } 3848 \text{ (RGB)}$$

$$C = 1924 \times \text{Partial Height1} - 615$$

$$D = 480 \times \{ \text{Partial V Start2} - (\text{Partial V Start1} + \text{Partial Height1} + 3) \} + 7831$$

$$E = 1924 \times \text{Partial Height2} - 615$$

$$F = 480 \times \{ 2060 - (\text{Partial V Start2} + \text{Partial Height2}) \} + [1924 \text{ (RAW)}]$$

When 1.33 is multiplied respectively of A to F, the number of CLK is calculated.

## **6. Serial communication**

By Camera link serial communication interface, it is possible to control the following functions.

- |  |   |
|--|---|
| (1) Memory control   |   |
| - Store  |   |
| - Readout  |   |
| - Reset  |   |
| (2) Video output mode                                      | RGB 24bit / RAW 12bit / RAW 10bit / RAW 8bit      |
| (3) Setup  | 0 - 33LSB (528LSB:RAW12Bit)                       |
| (4) Gain   | 0 - +6 dB   |
| (5) Shutter speed  | 2 - 1/20,000 s                                    |
| (6) Random shutter trigger ON / OFF                        |   |
| - Trigger polarity   | Positive / Negative                               |
| - Random trigger mode                                      | Pulse width mode / FIX mode                       |
| (7) Multiple shutter                                       | ON / OFF  |
| (8) High-speed draft readout                               | ON / OFF  |
| (9) Programmable partial scan                              | ON / OFF  |
|  | * High-speed draft readout mode must be disabled. |
| - Start position of effective line                         | 0 – 1958 line (1line / 1step)                     |
| - Number of effective line                                 | 100 – 2058 line (1line / 1step)                   |
| (10) White balance   | OPWB/MANUAL                                       |
| - MANU   | Preset (6 data) / User manual (R / B gain)        |
| (11) Gamma   | ON / OFF  |
| (12) Masking correction                                    | ON / OFF (6 Parameter correction)                 |
| (13) TAP correction of<br>the left half and the right half | AUTO / ONE PUSH / MANUAL                          |

## **7. Functions**

By accessing the camera register published on the camera link I/F, you can control/set each function.

Since access to the camera register is performed via the frame grabber board, the controlling and setting methods differ depending on the frame grabber board you use. For details, refer to the instruction manual of the relevant frame grabber board or contact our sales representative.

### **7.1 Explanation of Each Function**

#### (1) Readout mode

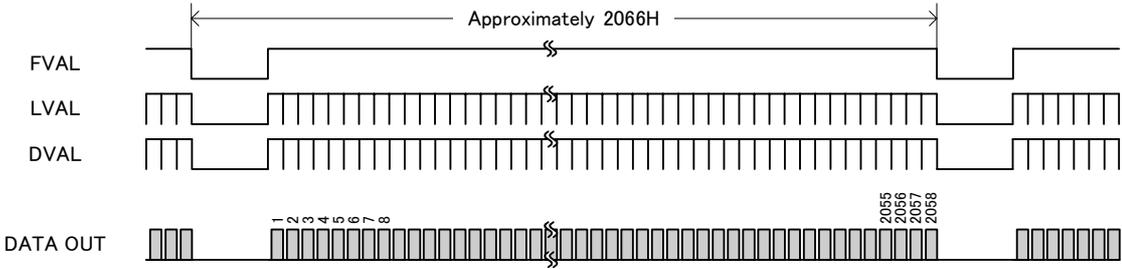
Video is output from the camera link connector. The output video can be grabbed by the frame grabber board.

The frame rate and resolution of output images that this model supports are as follows:

- |                             |   |
|-----------------------------|---|
| 1) All pixel readout        | : Approximately 15.1 fps / 2448(H) x 2058(V)                      |
| 2) High-speed draft readout | : Approximately 37.2 fps / RGB 2448(H)×253(V), RAW 2448(H)×254(V) |
| 3) Partial scan             | : Approximately 52.3 to 15.1 fps / 2448(H) x 100(V) to 2058(V)    |

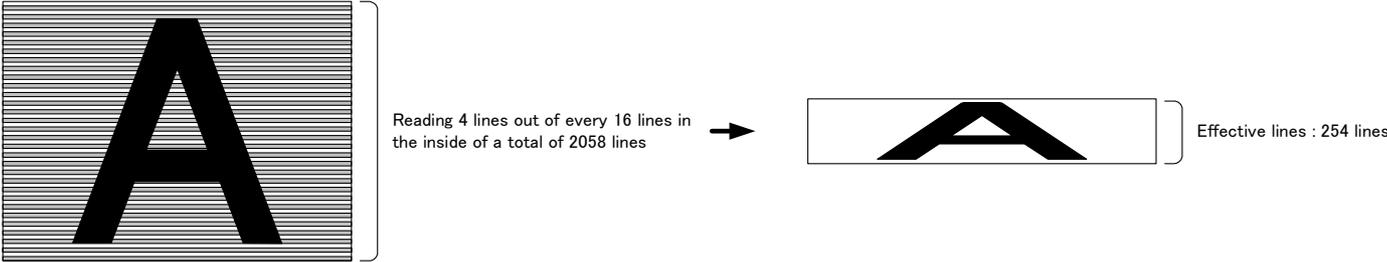
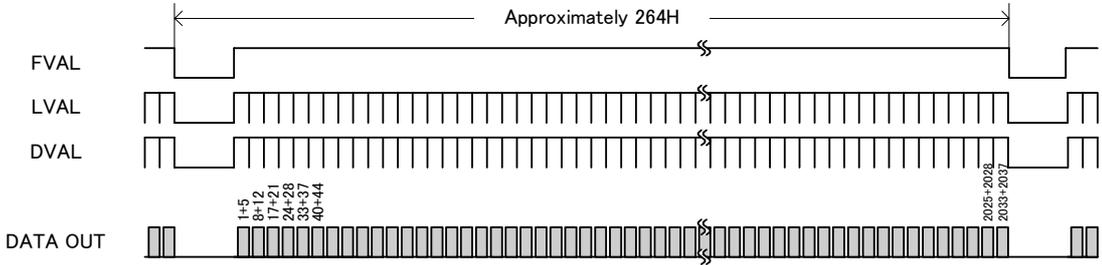
#### 1) All pixel readout

Reads out all pixels in about 1/15 second.



2) High-speed draft readout

By reading 4 lines out of every 16 lines, reads out the whole valid area in approximately 1/37.2 seconds. Control and setting of functions can be done by accessing the cam. When the frame rate of a partial scanning exceeds it when the shutter mode is switched from normality (internal synchronization) or the partial scanning mode to the draft mode, more high-speed than the setting of the speed of the shutter it is changed at the speed of the shutter matched to the frame rate.



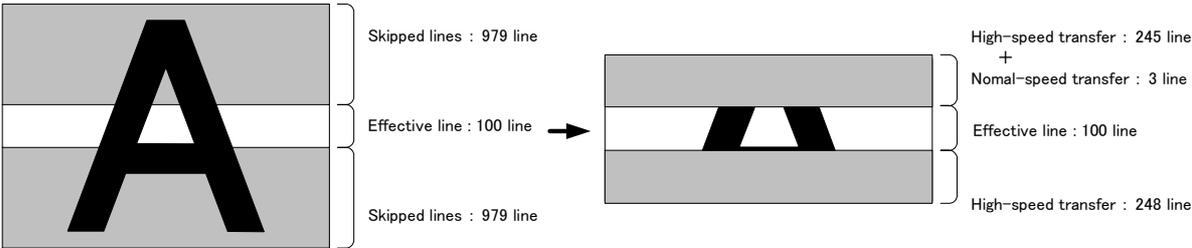
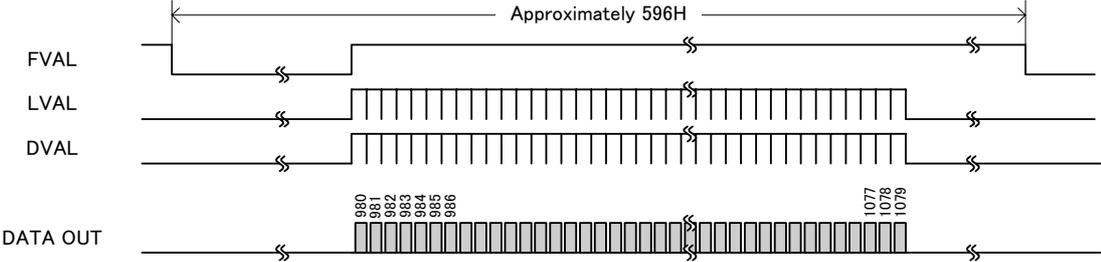
3) Programmable partial scan

A range arbitrary from 100 lines to 2058 lines can be read. The frame rate can be raised to 52 fps or less by skipping it at high speed excluding an effective area.

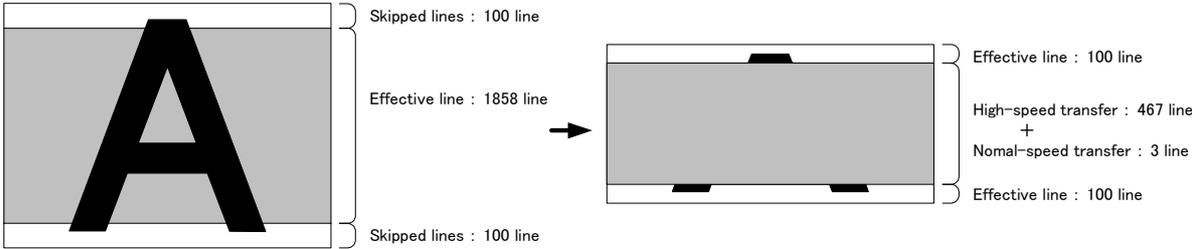
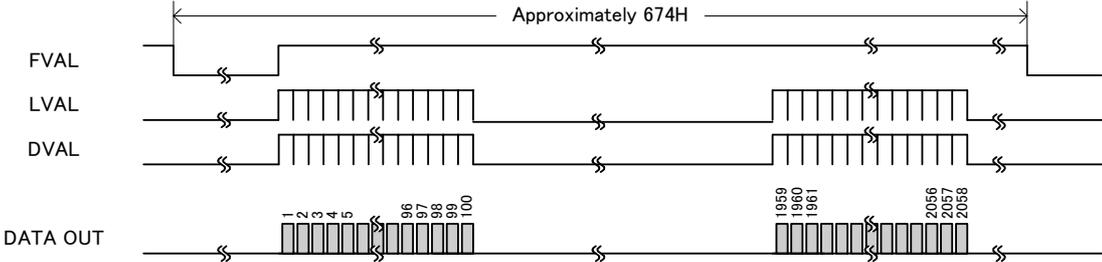
When the frame rate of a partial scanning exceeds it when the shutter mode is switched from normality (internal synchronization) to the partial scanning mode, more high-speed than the setting of the speed of the shutter it is changed at the speed of the shutter matched to the frame rate.

- Starting position (Partial V Start1,2) of an effective line can be set.
- Number (Partial Height1,2) of effective lines can be set.

Example: (Partial V Start1, Partial Height1) = 100 effective lines and start 980 line eyes(center partial)  
 (Partial V Start2, Partial Height2) = 0 effective lines and start 0 line eyes(center partial)



Example: (Partial V Start1, Partial Height1) = 100 effective lines and start 1 line eyes(top partial)  
 (Partial V Start2, Partial Height2) = 100 effective lines and start 1959 line eyes(bottom partial)



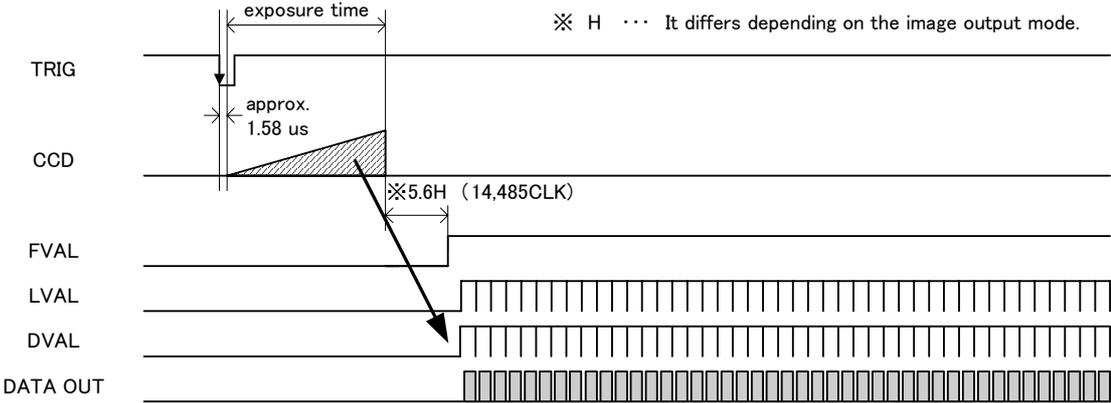
7.2 Rndom trigger shutter

In the random trigger shutter mode, you can shoot and grab an image at an arbitrary timing by trigger signal input from the external.

- External trigger signals can be input either from the camera link I/F CC1 or I/O connector.
- If polarity is set to negative polarity, exposure starts at the falling edge of the trigger.
- The random trigger shutter of this camera can be operated in two types of mode: fixed mode and pulse width mode. How to determine the exposure time differs depending on the mode.

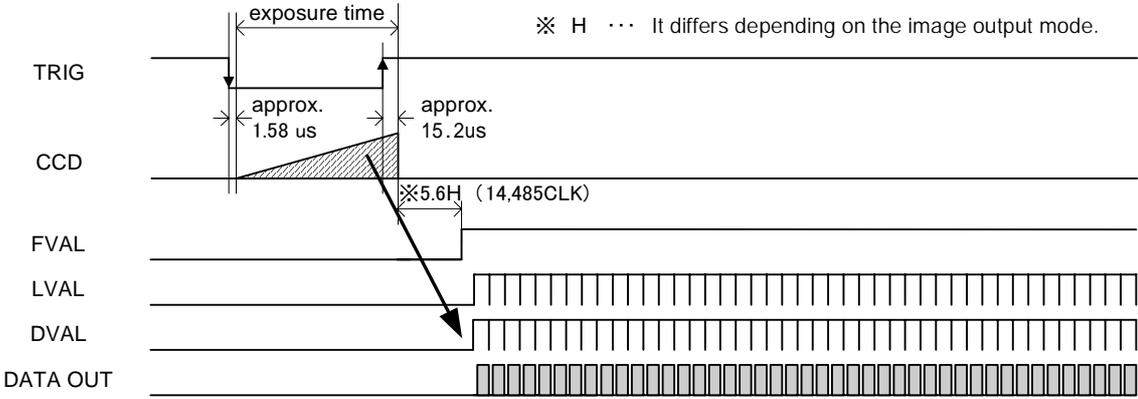
1) Fixed mode

- The exposure time is determined by the setting value for the shutter speed.



2) Pulse width mode

- The exposure time is determined by the pulse width (exposure time = pulse width + approximately 14μs).
- Set a pulse width of 1H (approximately 52.1μs) or more.



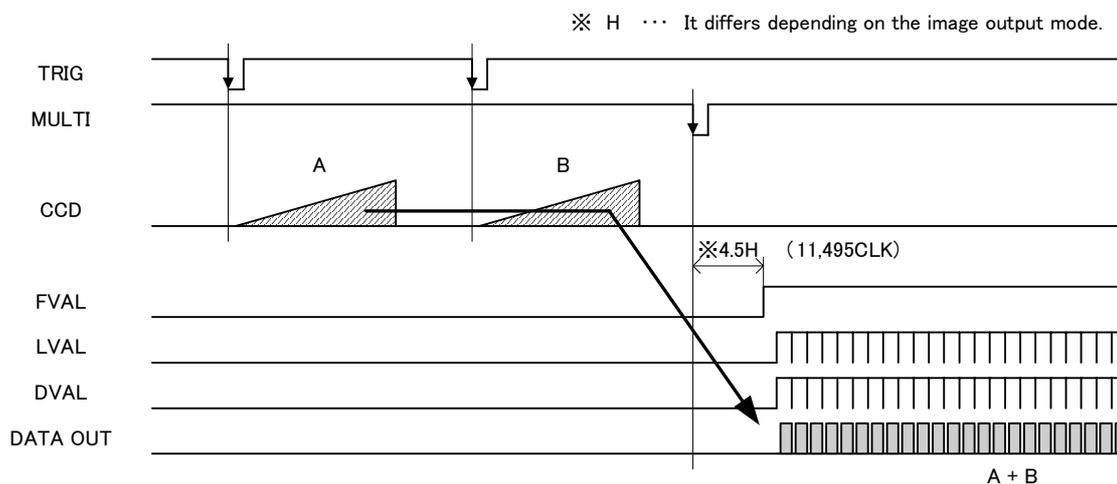
**Notes of trigger mode:**

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.

### 7.3 Multiple-shutter mode

In the multiple-shutter mode, video is output in sync with a MULTI signal from the external after the end of exposure time.

- Valid only when the random trigger shutter mode is ON.
- MULTI signals can be input from the camera link I/F CC2.
- If exposure is executed several times before MULTI signal input, the images are output superposed.
- The exposure time is determined by the random trigger shutter mode setting and its determination method.
- The pulse width must be set to negative polarity and 52.1 $\mu$ s to 10 ms.

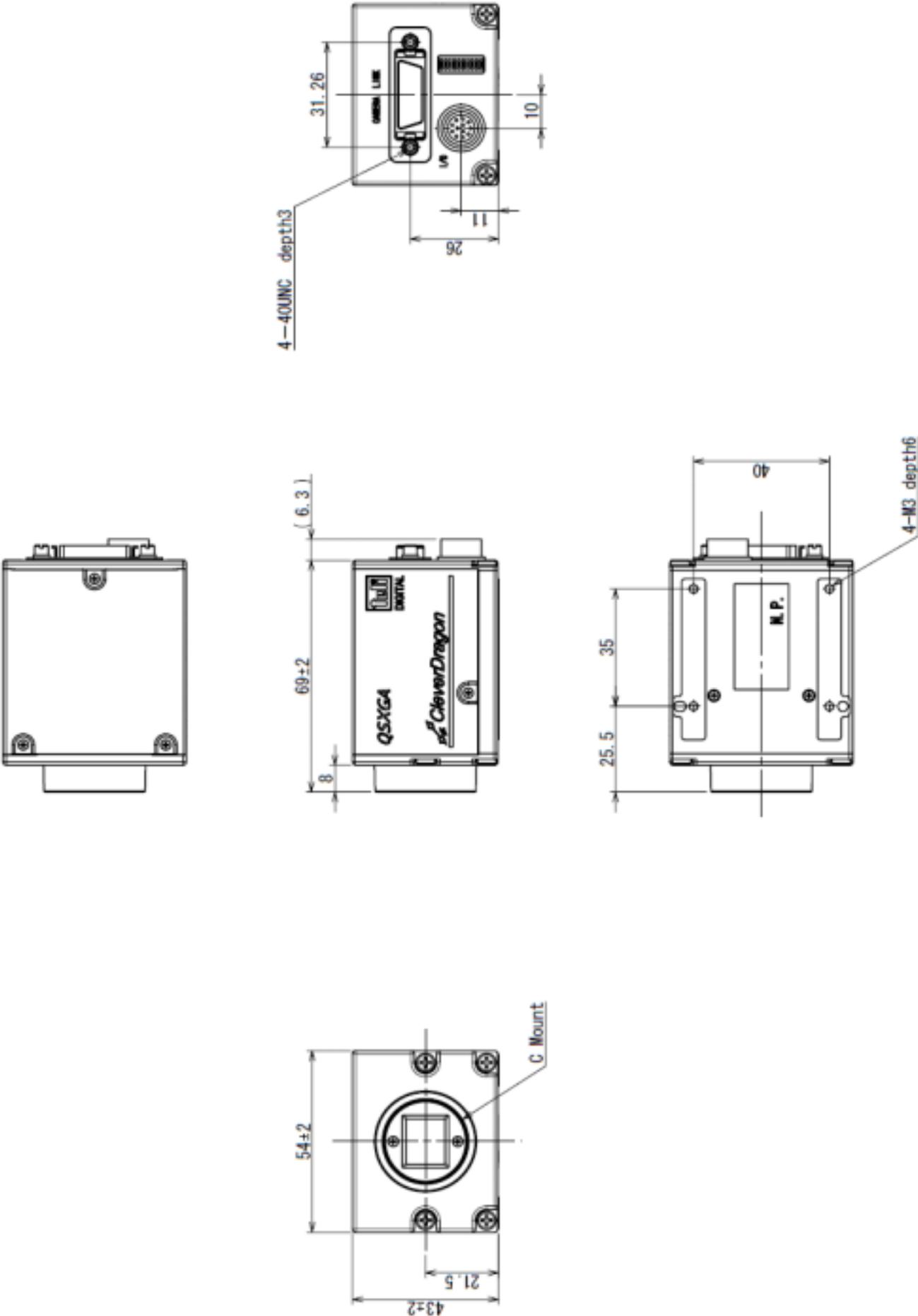


#### **Notes on multiple-shutter:**

An image has been stored to CCD device until a MULTI signal is inputted and it begins to read out image after CCD is exposed. Therefore, an image may degenerate step by step when an image is stored to CCD device for a long time.

And, Electric charge is superimposed in CCD device when the multiplex exposure. Therefore, CCD will flood with electric charge when electric charge is over superimposed in CCD device. Consequently vertical stripes noise will appear. At that time please stop using spotlight and dimmer for example close the iris.

# 8. Outline Drawing



## **9. Guarantee**

The term of a guarantee is one year after the product delivery.

If by any chance trouble by responsibility of our company occurs before an above period, TELI repairs it free of charge.

During terms of a guarantee, when the trouble cause is the case of below, TELI charges the repair costs.

- (1) Troubles and the damages that causes by misuse, unsuitable repair or remodeling.
- (2) Distribution hazards like drops and vibrations after purchase. Troubles and damages by transportation.
- (3) Troubles and damages by fire, natural calamity (earthquake, storm and flood damage, thunderbolt), damages from salty breeze, gas harm, abnormal voltage.

## **10. Repair**

### (1) Condition for repair

Basically, has to return it to our company when the user requests us to repair product.

Beside that, customer should pay these expenses (travel expenses, camera disassembly technology costs) of both customer and end user. Also customer should pay in themselves costs for return camera to us.

### (2) The period of repairing product

- Repair free of charge ... Refer to Clause 9.
- Charged repair ..... Basically, repair period is 7 years after the last production end of products.



## **TOSHIBA TELI CORPORATION**

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**Head Office:** 7-1, 4 chome, Asahigaoka, Hino-shi, Tokyo, 191-0065, Japan  
(International Business Department)

Phone : +81-42-589-8771

Fax : +81-42-589-8774

URL : <http://www.toshiba-teli.co.jp/>

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### **Distributor**

- This product must be classified for disposal according to the laws of each country and municipal laws.
  - Information contained in this document is subject to change without prior notice.
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