High-Resolution CMOS Monochrome Camera CSC6M85BMP11 PRODUCT SPECIFICATION

CONTENTS

TOSHIBA TELI CORPORATION

D4211964C

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 personal related to the specifications. Such designer or personal 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 refer 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 service/functions involving factors of safety refer to:

      Traffic control systems for air transportation, railways, roads, or marine transportation.

      Equipment for nuclear power generation.

      Equipment related to the above.

      Although sufficient check is performed about translation of these specifications, we will apply a Japanese sentence, if a doubt should occur.

Exemption Clauses

- TELI assumes no responsibility or liability for damage arising from fire, earthquake, an act by a third party or other accidents, or intentional or careless error or misuse by the user, or use under abnormal conditions.
- TELI assumes no responsibility or liability for incidental damages (e.g., loss of business profits or interruption of business) arising from use of or inability to use the camera equipment.
- TELI assumes no responsibility or liability in the case damages or losses are caused by failure to observe the information contained in the operation manual and specifications and interface specifications.
- TELI assumes no responsibility or liability in the case damages or losses are caused by use contrary to the instructions in this operation manual and specifications and interface specifications.
- TELI assumes no responsibility or liability in the case damages or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.
- TELI assumes no responsibility or liability in the case damages 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.
- TELI does NOT guarantee the items that are not described in the specification.

Notes on using this product

- 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.

- Regarding a lens mount

  Install a next lens; Dimension of protrusion from flange is equal to or less than 8.0 mm. If a lens does not stand to this condition, it might not be installed to this camera.
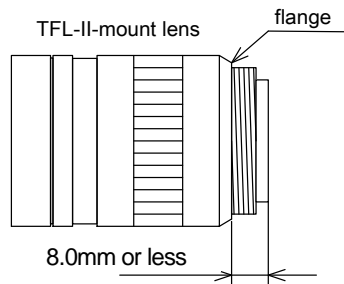
- Check a combination with the lens

  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 of 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 lightning 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.

D4211964C

Notes on using this product

- Avoid intensive light

  Do NOT expose the camera's image-pickup-plane to sunlight or other intense light directly. If the part of CMOS sensor is exposed to spot-intensive light, you might get a picture problem like blooming and/or smear. Under the comparison at the same video output level, the shorter the exposure time setting, the more smear is generated.

- 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 moire

  If you shoot thin stripe patterns, moire 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.

D4211964C

- When disposing of the camera

Wastes of this product should be separated and discarded in compliance with the various national and local ordinances.

This camera is showing the following symbol to body due to EU environmental regulation (Waste Electrical and Electronic Equipment (WEEE)). However this symbol is applied to only an EU member state.

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 times.

- 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

- Shutter artifact

Although the level difference of several lines of an image arises in the upper part of a screen at the time of shutter-off mode, note that this is a characteristic of a CMOS image sensor and is not a fault.

D4211964C

1. Overview

This CMOS camera is a High-resolution monochrome camera employing 6.55Mega pixels readout system CMOS sensor.

2. Features

(1) High speed output at High-resolution pixel.

The TOSHIBA TELI's proprietary 1.1 type 6.55Mega pixels High-resolution CMOS sensor outputs the entire 6.55Mega pixels in a speed as high as 85fps. Output data rate is obtainable in 8bit mode and 576M Byte/sec.

(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 SDR connector supporting Camera Link Full Configuration outputs the entire 6.55Mega pixels in a speed as fast as 85fps.

(6) Binning

Signals can be output in all effective areas in about 170fps or 340fps by reading 2(H) x 2(V) (Output resolution: 1,280(H) x 1,280(V) pixels) or 4(H) x 4(V) (Output resolution: 640(H) x 640(V) pixels) pixels as one pixel.

3. Configuration

(1) Camera body ···················· 1

(2) Accessory ··························· Nothing

*Manual and Application software is not attached to this camera.

*Please download the interface specifications from our website.

4. Option

(1) Power cable   CPRC3700-**:1m-9m (Manufactured by TOSHIBA TELI)

(2) Camera Link cable   1MD26-3560-00C-***(Manufactured by 3M)

                                      CL-H-MS-***(Manufactured by Oki Electric Cable)

                                      (Recommended cable length: 5m or less)

(3) Camera adapter   CA130D (Manufactured by TOSHIBA TELI)

(4) Camera mounting kit   CPT**** (Manufactured by TOSHIBA TELI)

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

---

*Conformity of optional peripherals and EMC regulations

The adaptability of the safety standard of this camera is guaranteed in the condition of combination with the above-mentioned option parts. The customer must execute the confirmation of a final safety conformance with the machine and the entire device when it combines with parts other than our specification and it is used.

---

5. Specification

5.1. Electrical specification

(1) Imager   CMOS image sensor

       ・Number of active pixels   2560 (H) × 2560 (V)

       ・pixel size   5 µm (H) × 5 µm (V) (Square-grid array)

       ・Scanning area   12.8 mm(H) x 12.8 mm(V)

       ・Optical size   Equivalent to 1.1 type

(2) Scanning system   Progressive

(3) Aspect ratio   1:1

(4) Synchronization method   Internal synchronization

(5) Sensitivity   380 lx, F5.6, 3000 K (Shutter speed: 1/60sec)

(6) Minimum object illuminance   12 lx

                               (F2.8, GAIN MAX, Shutter speed: 1/60 sec, reading all

                               pixels, gamma function: 16, image level: 50%)

(7) Image output   Compliant with Camera Link standard

・Output mode	Full configuration	8 tap	72 MHz
	Medium configuration	4 tap	72 MHz
	Base configuration	2 tap	72 MHz

                            (Factory setting: Full configuration)

     ・Data   8 / 10 bit switching (Factory setting: 8 bit)

     ・Readout mode (Full configuration, 8tap, 8bit, Shutter OFF)

        All pixel readout   Approx. 85 fps   / 2560(H) x 2560(V)

        Binning(2x2)   Approx. 170 fps / 1280(H) x 1280(V)

        Binning(4x4)   Approx. 340 fps / 640(H) x 640(V)

        WOI / Binning WOI   Depends on the window setting.

(8) Gain

 ・Digital gain   0 to +18 dB   [180 step, 1step =   Approx. 0.1dB]

                             (Factory setting: 0 => 0 dB)

(9) Set-up level   0 to Approx.+12.5%   [528 step]

                             (Factory setting: 0 => Approx. 0%)

(10) Gamma   1.0 (standard)

(11) Power supply voltage   DC12 V ± 10 % (ripple 50 mV(p-p) or less)

                             The power supply standing up must increase up to the

                             stipulated voltage monotonously.

(12) Power consumption   Approx. 3.36 W

D4211964C

5.2. Electrical shutter specification

(1) Shutter Speed		Shutter OFF or 1/100,000 to 1/5 sec
		The exposure time at shutter OFF is different depending on the reading mode.(Factory default : Shutter OFF)
(2) Random Trigger Shutter		Setting by the switching of shutter mode.
	・Fixed mode	The exposure time depends on the shutter speed setting
	・Pulse width mode	The exposure time depends on the pulse width.
		Minimum pulse width: 10 µsec
		(Minimum exposure time: 10 µsec

> ・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.

5.3. Internal sync signal specification

(1) Driving frequency

・Output mode		*Full configuration, Shutter OFF	
All pixel readout	Horizontal:	Approx. 217.6 kHz	
	Vertical:	Approx. 85 Hz	
Binning (2x2)	Horizontal:	Approx. 217.6 kHz	
	Vertical:	Approx. 170 Hz	
Binning (4x4)	Horizontal:	Approx. 217.6 kHz	
	Vertical:	Approx. 340 Hz	
WOI / Binning WOI	By window setting		

5.4. Input signal specification

(1) TRIG		Camera Link I/F or I/O connector input	
	・Signal level (I/O connector)	LVTTL level (Low Voltage TTL = 3.3V)	1ch
	・Polarity	Positive/Negative switching (Factory default: Negative)	
	・Pulse width	10 µsec or more	

5.5. Output signal specification

|			
(1) GPO		I/O connector	
	・Signal type	Open collector	1ch

D4211964C

· Signal type

Signal	Explanation
Exposure active	This signal is a period from an exposure start to the end of exposure.
Frame active	This signal is a period from an exposure start to the completion of image transmission.
Strobe	This is a signal for strobe control. The delaying amount and width from an exposure start can be set up.
Frame trigger wait	This signal is that it is a waiting period for a trigger at the time of a random trigger shutter. Exposure is started without restrictions of a previous frame when an external trigger is inputted in this period.

· Polarity

Positive/Negative switching (Factory default: Negative)

*The following figure becomes an output of each signal at the time of negative.
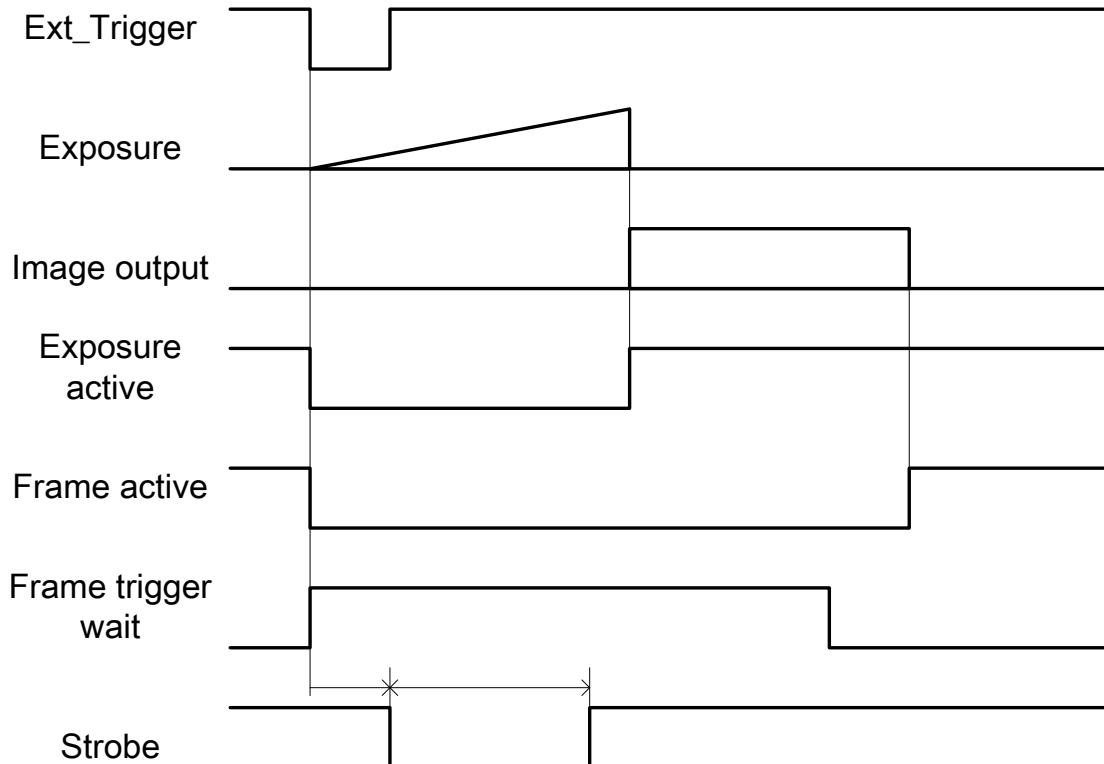
5.6. Mechanical spec

(1) Lens mount   C-mount

   · Flange back   17.526 mm

(2) Dimensions   40 mm (W) × 40 mm (H) × 35 mm (D)

                                     (Not including protrusion)

(3) Weight   Approx.100 g

(4) Camera body grounding: insulation status

   Conductive between circuit GND and camera body

5.7. Optical axis accuracy

	Position accuracy of effective pixels		Rotation accuracy of effective pixels(θ)	Flange focal distances (Flange back) (For 17.526mm)
	(X)	(Y)		
Optical axis accuracy	±25 μm	±25 μm	±0.07 °	±50 μm or less

5.8. Operating ambient conditions

(1) Performance assurance   Temperature: 0 to +40 °C

                                   Humidity: 10% to 90%   (No dew formation)

(2) Operation guaranteed   Temperature: -5 to +45 °C

                                   Humidity: 10% to 90%   (No dew formation)

(3) Storage   Temperature: -20 to +60 °C

                                   Humidity: 90% or less   (No dew formation)

5.9. Typical ambient conditions
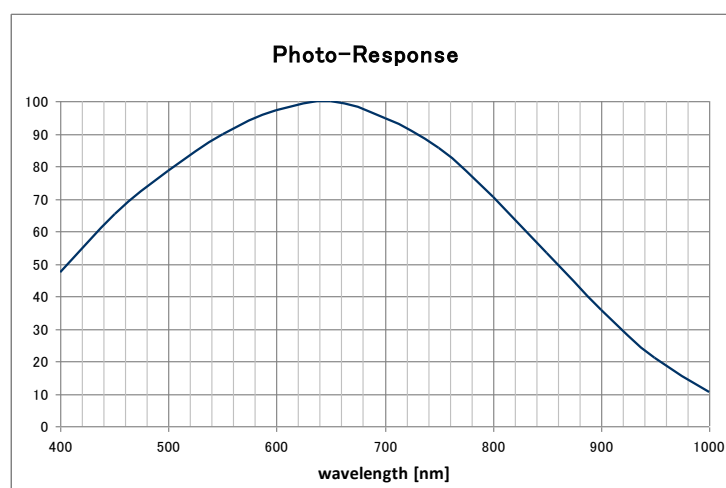
(*The lens characteristics and light source characteristics are not reflected in table.)

5.10. Various safety standards

(1) Electro-Magnetic Compatibility

      EMI(Electro-Magnetic Interference)   EN61000-6-4

      EMS(Electro-Magnetic Susceptibility)   EN61000-6-2

(2) FCC   FCC Part 15 Subpart B class A

(3) KC   (scheduled)

THIS DEVICE HAS 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.

5.11. Communication specification

(1) Communication speed   9600 / 19200 / 38400 / 57600 / 115200 bps switching

                                          (Factory default: 9600 bps)

(2) Start bit   1bit

(3) Data bit   8bit

(4) Stop bit   1bit

(5) Parity   None

(6) Handshake   None

5.12. Environmental Correspondence

It complies with the following instruction.

(1) RoHS   conformity

(2) Administrative Measure on the Control of Pollution Caused by Electronic Information

    Products (Popular name: China RoHS)

    a) Environmental usage period   refer to 9.2

    b) Poisonous substance content table   refer to 9.2

    c) Toxic substance content table   refer to 9.2

5.13. Connector pin assignment

(1) Video output/controlling(Camera Link Medium Configuration) B, M/F

　・Connector type:　　SDR 26-PIN connector HDR-EC26FDTG2+(Manufactured by HTK)

●Connector name: B

Pin No.	I/O	Signal name	Pin No.	I/O	Signal name
1	-	DC+12V(PoCL)	14	-	GND
2	O	X0-	15	O	X0+
3	O	X1-	16	O	X1+
4	O	X2-	17	O	X2+
5	O	X CLK-	18	O	X CLK+
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+	23	I	CC2-
11	I	CC3-	24	I	CC3+
12	I	CC4+	25	I	CC4-
13	-	GND	26	-	DC+12V(PoCL)

●Connector name: M/F

Pin No.	I/O	Signal name	Pin No.	I/O	Signal name
1	-	10kΩ Pull-down (connected 26pin)	14	-	GND
2	O	Y0-	15	O	Y0+
3	O	Y1-	16	O	Y1+
4	O	Y2-	17	O	Y2+
5	O	Y CLK-	18	O	Y CLK+
6	O	Y3-	19	O	Y3+
7	-	100Ω terminated(20)	20	-	100Ω terminated(7)
8	O	Z0-	21	O	Z0+
9	O	Z1-	22	O	Z1+
10	O	Z2-	23	O	Z2+
11	O	ZCLK-	24	O	ZCLK+
12	O	Z3-	25	O	Z3+
13	-	GND	26	-	10kΩ Pull-down (connected 1pin)

D4211964C

(2) Power supply connector I/O

    ・Connector (camera side) :   HR10A-7R-6PB(73) (HIROSE ELECTRIC)

    ・Compatible plug (cable side):   HR10A-7P-6S(73) (HIROSE ELECTRIC) or equivalent

Pin No.	I/O	Signal name
1	O	GPO
2	-	GND
3	-	GND
4	I	TRIG
5	-	N.C.
6	-	DC+12V (option)

5.14. Camera bit assignment

Full Configuration

8 tap

Camera Out	8bit
DATA OUT1 =	A[7:0]
DATA OUT2 =	B[7:0]
DATA OUT3 =	C[7:0]
DATA OUT4 =	D[7:0]
DATA OUT5 =	E[7:0]
DATA OUT6 =	F[7:0]
DATA OUT7 =	G[7:0]
DATA OUT8 =	H[7:0]

80 bit Configuration

Camera Out	10bit
DATA OUT1 =	A[9:0]
DATA OUT2 =	B[9:0]
DATA OUT3 =	C[9:0]
DATA OUT4 =	D[9:0]
DATA OUT5 =	E[9:0]
DATA OUT6 =	F[9:0]
DATA OUT7 =	G[9:0]
DATA OUT8 =	H[9:0]

Port/bit	8bit	Port/bit	8bit
Port A0	A[0]	Port E0	E[0]
Port A1	A[1]	Port E1	E[1]
Port A2	A[2]	Port E2	E[2]
Port A3	A[3]	Port E3	E[3]
Port A4	A[4]	Port E4	E[4]
Port A5	A[5]	Port E5	E[5]
Port A6	A[6]	Port E6	E[6]
Port A7	A[7]	Port E7	E[7]
Port B0	B[0]	Port F0	F[0]
Port B1	B[1]	Port F1	F[1]
Port B2	B[2]	Port F2	F[2]
Port B3	B[3]	Port F3	F[3]
Port B4	B[4]	Port F4	F[4]
Port B5	B[5]	Port F5	F[5]
Port B6	B[6]	Port F6	F[6]
Port B7	B[7]	Port F7	F[7]
Port C0	C[0]	Port G0	G[0]
Port C1	C[1]	Port G1	G[1]
Port C2	C[2]	Port G2	G[2]
Port C3	C[3]	Port G3	G[3]
Port C4	C[4]	Port G4	G[4]
Port C5	C[5]	Port G5	G[5]
Port C6	C[6]	Port G6	G[6]
Port C7	C[7]	Port G7	G[7]
Port D0	D[0]	Port H0	H[0]
Port D1	D[1]	Port H1	H[1]
Port D2	D[2]	Port H2	H[2]
Port D3	D[3]	Port H3	H[3]
Port D4	D[4]	Port H4	H[4]
Port D5	D[5]	Port H5	H[5]
Port D6	D[6]	Port H6	H[6]
Port D7	D[7]	Port H7	H[7]

Port/bit	10bit	Port/bit	10bit
Port A0	A[2]	Port F0	F[2]
Port A1	A[3]	Port F1	F[3]
Port A2	A[4]	Port F2	F[4]
Port A3	A[5]	Port F3	F[5]
Port A4	A[6]	Port F4	F[6]
Port A5	A[7]	Port F5	F[7]
Port A6	A[8]	Port F6	F[8]
Port A7	A[9]	Port F7	F[9]
Port B0	B[2]	Port G0	G[2]
Port B1	B[3]	Port G1	G[3]
Port B2	B[4]	Port G2	G[4]
Port B3	B[5]	Port G3	G[5]
Port B4	B[6]	Port G4	G[6]
Port B5	B[7]	Port G5	G[7]
Port B6	B[8]	Port G6	G[8]
Port B7	B[9]	Port G7	G[9]
Port C0	C[2]	Port H0	H[2]
Port C1	C[3]	Port H1	H[3]
Port C2	C[4]	Port H2	H[4]
Port C3	C[5]	Port H3	H[5]
Port C4	C[6]	Port H4	H[6]
Port C5	C[7]	Port H5	H[7]
Port C6	C[8]	Port H6	H[8]
Port C7	C[9]	Port H7	H[9]
Port D0	D[2]	Port I0	A[0]
Port D1	D[3]	Port I1	A[1]
Port D2	D[4]	Port I2	B[0]
Port D3	D[5]	Port I3	B[1]
Port D4	D[6]	Port I4	C[0]
Port D5	D[7]	Port I5	C[1]
Port D6	D[8]	Port I6	D[0]
Port D7	D[9]	Port I7	D[1]
Port E0	E[2]	Port J0	E[0]
Port E1	E[3]	Port J1	E[1]
Port E2	E[4]	Port J2	F[0]
Port E3	E[5]	Port J3	F[1]
Port E4	E[6]	Port J4	G[0]
Port E5	E[7]	Port J5	G[1]
Port E6	E[8]	Port J6	H[0]
Port E7	E[9]	Port J7	H[1]

The allocation of the port conforms to the Camera Link standard.

D4211964C

Medium Configuration

Camera Out	8bit	10bit
DATA OUT1 =	A[7:0]	A[9:0]
DATA OUT2 =	B[7:0]	B[9:0]
DATA OUT3 =	C[7:0]	C[9:0]
DATA OUT4 =	D[7:0]	D[9:0]
DATA OUT5 =	(N/A)	(N/A)
DATA OUT6 =	(N/A)	(N/A)
DATA OUT7 =	(N/A)	(N/A)
DATA OUT8 =	(N/A)	(N/A)

Port/bit	8bit	10bit	Port/bit	8bit	10bit
Port A0	A[0]	A[0]	Port D0	D[0]	D[0]
Port A1	A[1]	A[1]	Port D1	D[1]	D[1]
Port A2	A[2]	A[2]	Port D2	D[2]	D[2]
Port A3	A[3]	A[3]	Port D3	D[3]	D[3]
Port A4	A[4]	A[4]	Port D4	D[4]	D[4]
Port A5	A[5]	A[5]	Port D5	D[5]	D[5]
Port A6	A[6]	A[6]	Port D6	D[6]	D[6]
Port A7	A[7]	A[7]	Port D7	D[7]	D[7]
Port B0	B[0]	A[8]	Port E0	n/a	C[0]
Port B1	B[1]	A[9]	Port E1	n/a	C[1]
Port B2	B[2]	n/a	Port E2	n/a	C[2]
Port B3	B[3]	n/a	Port E3	n/a	C[3]
Port B4	B[4]	B[8]	Port E4	n/a	C[4]
Port B5	B[5]	B[9]	Port E5	n/a	C[5]
Port B6	B[6]	n/a	Port E6	n/a	C[6]
Port B7	B[7]	n/a	Port E7	n/a	C[7]
Port C0	C[0]	B[0]	Port F0	n/a	C[8]
Port C1	C[1]	B[1]	Port F1	n/a	C[9]
Port C2	C[2]	B[2]	Port F2	n/a	n/a
Port C3	C[3]	B[3]	Port F3	n/a	n/a
Port C4	C[4]	B[4]	Port F4	n/a	D[8]
Port C5	C[5]	B[5]	Port F5	n/a	D[9]
Port C6	C[6]	B[6]	Port F6	n/a	n/a
Port C7	C[7]	B[7]	Port F7	n/a	n/a

Base Configuration

Camera Out	8bit	10bit
DATA OUT1 =	A[7:0]	A[9:0]
DATA OUT2 =	B[7:0]	B[9:0]
DATA OUT3 =	(N/A)	(N/A)
DATA OUT4 =	(N/A)	(N/A)
DATA OUT5 =	(N/A)	(N/A)
DATA OUT6 =	(N/A)	(N/A)
DATA OUT7 =	(N/A)	(N/A)
DATA OUT8 =	(N/A)	(N/A)

Port/bit	8bit	10bit
Port A0	A[0]	A[0]
Port A1	A[1]	A[1]
Port A2	A[2]	A[2]
Port A3	A[3]	A[3]
Port A4	A[4]	A[4]
Port A5	A[5]	A[5]
Port A6	A[6]	A[6]
Port A7	A[7]	A[7]
Port B0	B[0]	A[8]
Port B1	B[1]	A[9]
Port B2	B[2]	n/a
Port B3	B[3]	n/a
Port B4	B[4]	B[8]
Port B5	B[5]	B[9]
Port B6	B[6]	n/a
Port B7	B[7]	n/a
Port C0	n/a	B[0]
Port C1	n/a	B[1]
Port C2	n/a	B[2]
Port C3	n/a	B[3]
Port C4	n/a	B[4]
Port C5	n/a	B[5]
Port C6	n/a	B[6]
Port C7	n/a	B[7]

The allocation of the port conforms to the Camera Link standard.

D4211964C

5.15. Timing Chart

(1) Horizontal Timing

1) Reading all pixels (Full / Medium / Base)

CLK：72MHz

a = 0 CLK   b = 2 / 4 / 8 CLK   c = 320 / 640 / 1280 CLK

d = 2 / 4 / 8 CLK   e = 6 / 12 / 24 CLK   f = 330 / 660 / 1320 CLK

2) CLK rate (ex. Full configuration 8tap)

a＝13.89ns   b＝4.44us
(72.000MHz)

D4211964C

17
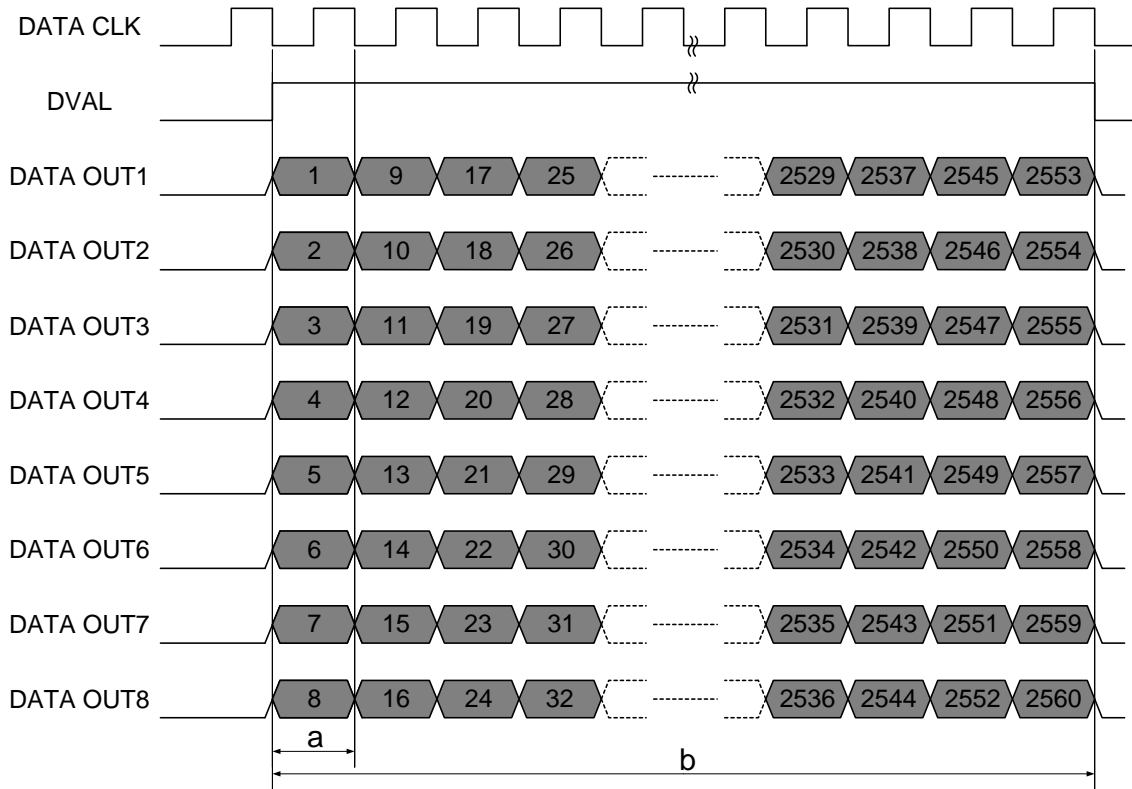
(2) Vertical Timing

1) All pixel readout (Shutter OFF, Full / Medium / Base)


```
FVAL
LVAL
DVAL
DATA OUT1～8
CLK：72MHz
```

A = 1494 / 2976 / 5936 CLK   B = 2 / 4 / 6 CLK   C = 10 / 20 / 40 CLK

D = 844790 / 1689580 / 3379160 CLK   E = 4 / 8 / 16 CLK   F = 846290 / 1692572 / 3385128 CLK
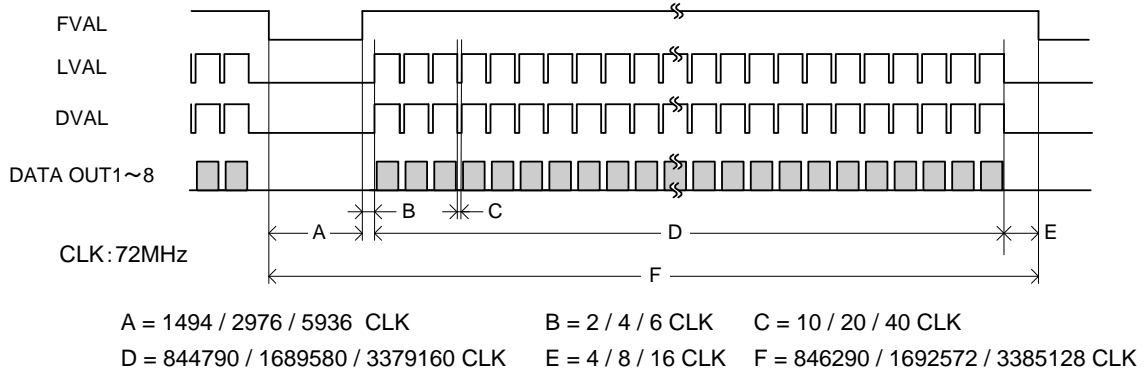
Note: The frame rate changes according to the shutter speed when the shutter is ON.

(The period "A" in the chart indicates the period of the shutter speed.)

D4211964C

6. Command Communication Protocol

The command communication protocol is the TELI 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)

Address 2nd byte	Address 1st byte	',' (0x2C)	Data 8th byte	Data 7th byte	Data 6th byte	Data 5th byte	Data 4th byte	Data 3rd byte	Data 2nd byte	Data 1st byte	[CR] (0x0D)
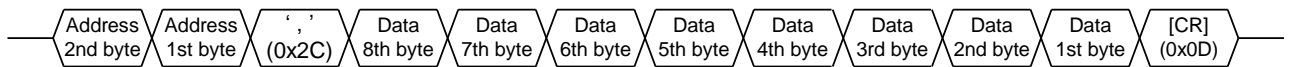
For example, to write data 0x38 to address 0x76, send a command, as follows:

'7' (0x37)	'6' (0x36)	',' (0x2C)	'3' (0x33)	'8' (0x38)	[CR] (0x0D)
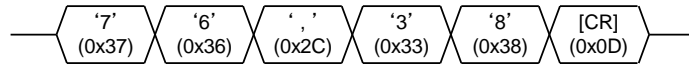
Moreover, because the data size of each address that can be set is decided, the transmission for the width of data to exceed the data size is not accepted.

For instance, five bytes or more cannot be received though it is possible to receive up to four bytes because the data size of address 0xA0 (shutter speed denominator register) is two bytes.
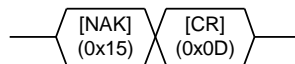
("A0,00001000" cannot be received though "A0,1000" can be received.)

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

No Error (ACK):

[ACK] (0x06)	[CR] (0x0D)

Error (NAK):

[NAK] (0x15)	[CR] (0x0D)
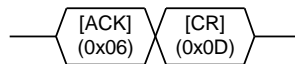
*Because max five kinds of　data is needed for the setting about a part of the register that relates to WOI, the setting is reflected by writing the register for "Set value application".
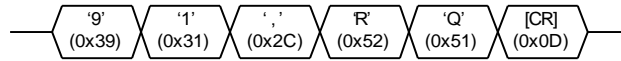
*The response to the command might become about three seconds by the internal processing of camera.

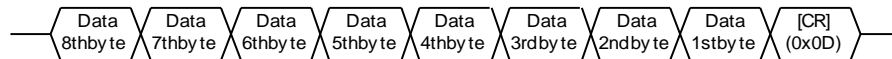*It is not possible to communicate for the exposure period at the random trigger shutter.

D4211964C

(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:

| '9' (0x39) | '1' (0x31) | ',' (0x2C) | 'R' (0x52) | 'Q' (0x51) | [CR] (0x0D) |

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

| Data 8thbyte | Data 7thbyte | Data 6thbyte | Data 5thbyte | Data 4thbyte | Data 3rdbyte | Data 2ndbyte | Data 1stbyte | [CR] (0x0D) |

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:

| '1' (0x31) | '0' (0x30) | [CR] (0x0D) |
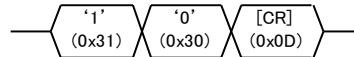
7. Register Map

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

Address	Access	Memory	CMOS Monochrome Camera CSC6M85BMP11
0x00	R.0	–	Manufacturer(Maker) name ASCII format
		–	
0x0F	R.0	–	
0x10	R.0	–	Model name ASCII format
		–	
0x2F	R.0	–	
0x30	R.0	–	Serial number ASCII format
		–	
0x3F	R.0	–	
0x40	R.0	–	Firmware version ASCII format
		–	
0x47	R.0	–	
0x48	R.0	–	FPGA version ASCII format
		–	
0x4F	R.0	–	
0x50	N.A.	–	Reserved
		–	
0x57	N.A.	–	Reserved
0x58	N.A.	–	Reserved
		–	
0x5F	N.A.	–	Reserved
0x60	R.0	–	Register map version ASCII format
		–	
0x67	R.0	–	
0x68	N.A.	–	Reserved
0x69	R.0	–	Status
0x6A	R.0	–	Extended status
0x6B	N.A.	–	Reserved
0x6C	R.0	–	Check memory bank
0x6D	W.0	–	Save memory
0x6E	R/W	–	Call memory
0x6F	W.0	–	Initialize memory
0x70	R/W	O	Setup
0x72	N.A.	–	Reserved
		–	
0x75	N.A.	–	Reserved
0x76	R/W	O	Gain
0x77	N.A.	–	Reserved
		–	
0x85	N.A.	–	Reserved
0x86	R/W	–	Output control
0x87	R/W	O	Number of output bits
0x88	R/W	–	Test pattern
0x89	N.A.	–	Reserved
0x8A	R/W	O	Gamma
0x8B	R/W	O	Defective pixel correction
0x8C	N.A.	–	Reserved
0x8D	N.A.	–	Reserved
0x8E	N.A.	–	Reserved
0x8F	N.A.	–	Reserved
0x90	R/W	O	Scan mode
0x91	R/W	O	Shutter mode
0x92	R/W	O	Random trigger mode
0x93	R/W	O	Trigger polarity
0x94	N.A.	–	Reserved
0x95	N.A.	–	Reserved
0x96	R/W	O	Binning
0x97	N.A.	–	Reserved
0x98	R/W	O	Image mirroring and flipping
0x99	N.A.	–	Reserved
		–	
0x9F	N.A.	–	Reserved

Address	Access	Memory	CMOS Monochrome Camera CSC6M85BMP11
0xA0	R/W	O	Shutter speed denominator
0xA4	R/W	O	Shutter speed numerator
0xA5	N.A.	–	Reserved
		–	
0xBF	N.A.	–	Reserved
0xC0	W.0	–	WOI update
0xC1	R/W	O	WOI area number
0xC2	R/W	O	WOI horizontal start coordinate
0xC4	R/W	O	WOI vertical start coordinate
0xC6	R/W	O	WOI horizontal width
0xC8	R/W	O	WOI vertical height
0xCA	R/W	–	Control of WOI bank
0xCB	R/W	–	Save/call WOI bank
0xCC	R/W	O	WOI area effective
0xD0	R/W	–	Defect pixel correction data /adressing
0xD2	N.A.	–	Reserved
0xD3	W.0	–	Defect pixel correction data/save
0xD4	R/W	–	Defect pixel correction data/data
0xD8	R/W	–	Specify user area/address
0xDA	R/W	–	Specify user area/data
0xDB	W.0	–	Specify user area/data
0xDC	R/W	O	Number of bytes to read user area
0xDD	N.A.	–	Reserved
0xDE		–	Reserved
0xDF	N.A.	–	Reserved
0xE0	W.0	–	Sequential command
0xE1	W.0	–	FPN correction / Calibration
0xE2	R/W	–	Trigger source
0xE3	N.A.	–	Reserved
0xE4		–	Reserved
0xE5		–	Reserved
0xE6		–	Reserved
0xE7	N.A.	–	Reserved
0xE8	R/W	–	Baudrate
0xE9	R/W	–	Output format
0xEA	R/W	O	GPO setting
0xEB	R/W	O	GPO polarity
0xEC	R/W	O	Strobe signal delay
0xEE	R/W	O	Strobe signal time
0xF0	N.A.	–	Reserved
		–	
0xFF	N.A.	–	Reserved

D4211964C

8. Function

8.1. Scan mode

The image output is output from the camera link connector, and can take the output image by Frame grabber board. The frame rate and the resolution of the output image that this camera corresponds are as follows. (At Medium configuration, shutter OFF.)

Output mode	Setting	Frame rate	Output size
All pixel readout		Approx.85 fps	2560 (H) × 2560 (V)
Binning (2x2)		Approx.170 fps	1280 (H) × 1280 (V)
Binning (4x4)		Approx.340 fps	640 (H) × 640 (V)
WOI		Depends on the window setting	
Binning-WOI		Depends on the window setting	

*As for the frame that switched the mode when continuously operating, the image of the brightness not intended might be output.

8.1.1. All pixel readout

The camera reads all pixels (2560(H) × 2560(V) pixels) in about 85 fps.

8.1.2. Binning

The camera reads all effective areas in about 170 fps by binning (2x2) for all pixels (2560(H) × 2560(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.

8.1.3. WOI

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

8.1.4. Binning-WOI

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

8.2. Shutter mode

8.2.1 Shutter OFF

The shutter speed changes in this mode pending on the frame rate.

Shutter speed is defined by the following calculation.

Shutter speed = Frame rate (msec) – 16.8 (msec)

8.2.2 Shutter ON

In this mode, the shutter speed can be handled by the value in the register.

(From 1/100,000 sec to 1/5 sec : selectable)

Frame rate = Shutter speed + Readout time

8.2.3 Random trigger shutter

Images can be taken and imported at any 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 _CC1_ or the I/O 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.

・The command communication is not available for the exposure period.

8.2.3.1. Fix mode

・The exposure time is determined by the set value of the shutter speed.
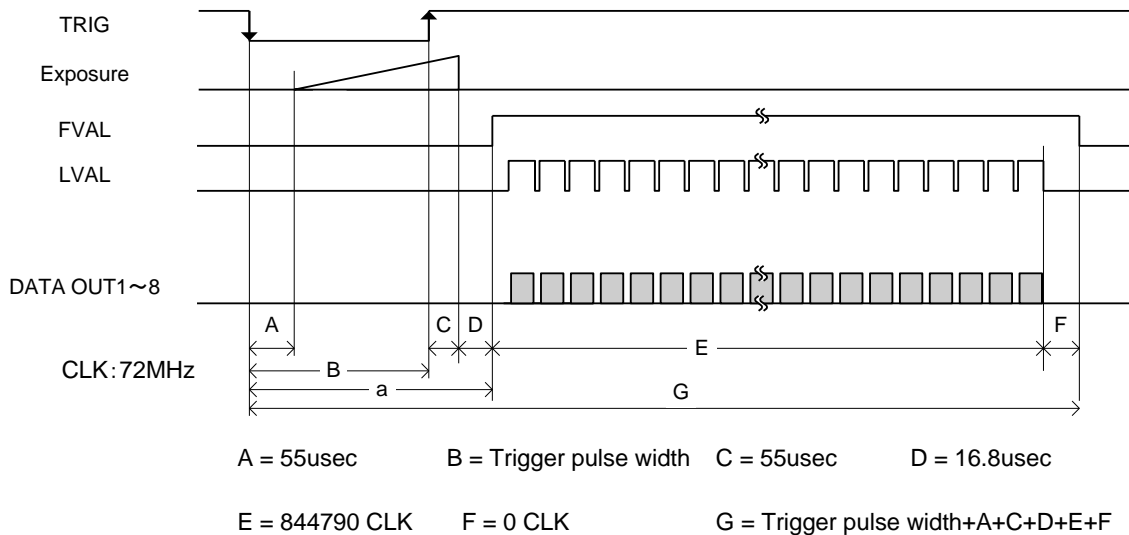
*Example of timing charts to expose all pixels

A = 55usec   B = Shutter speed   C = 16.8 usec   D = 844790 CLK

E = 0 CLK   F = Shutter speed+A+C+D+E
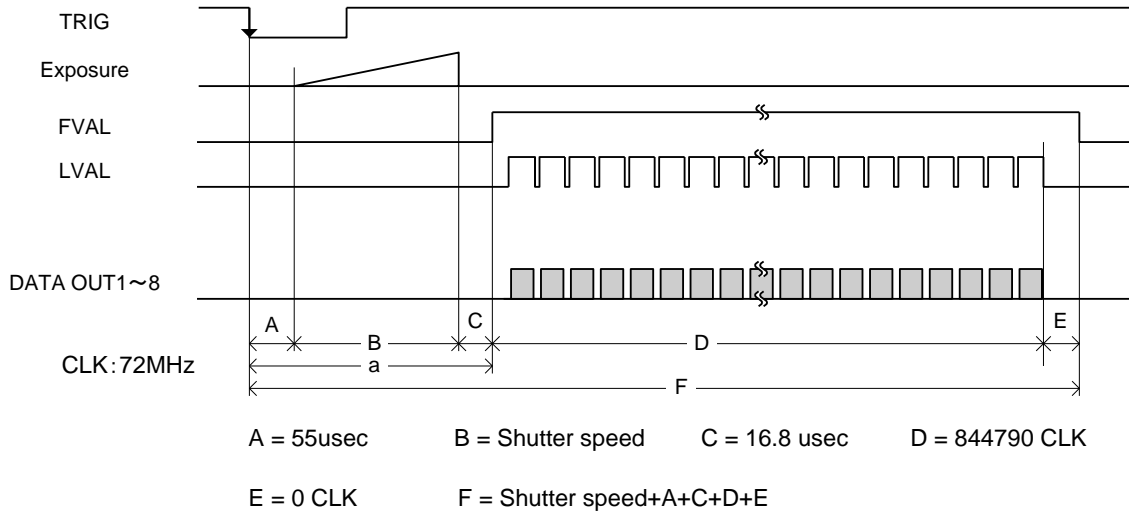
8.2.3.2. Pulse width mode

・The exposure time is determined by the pulse width (exposure time = pulse width).

・The pulse width should be more than 10 μsec.

*Example of timing charts to expose all pixels

A = 55usec   B = Trigger pulse width   C = 55usec   D = 16.8usec

E = 844790 CLK   F = 0 CLK   G = Trigger pulse width+A+C+D+E+F

D4211964C

8.3. 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 32
- ・Setting position: H: Integral multiple of 16 columns

      V: Integral multiple of 2 rows
- ・Window size: H: Integral multiple of 16 columns (minimum size: 16)

      V: Integral multiple of 2 rows (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)Memory   WOI setting can be saved in memory banks 1- 8.

8.3.1   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

Image output

Images are output in the line order. Therefore, when multiple windows are set on the same line, images on the multiple windows are output side by side along with the line.

Images are output keeping a space between the windows.

(2) When multiple windows overlap

Image output

When multiple windows overlap, the overlapped area is output as a common image.

The overlapped parts are read as a common image.
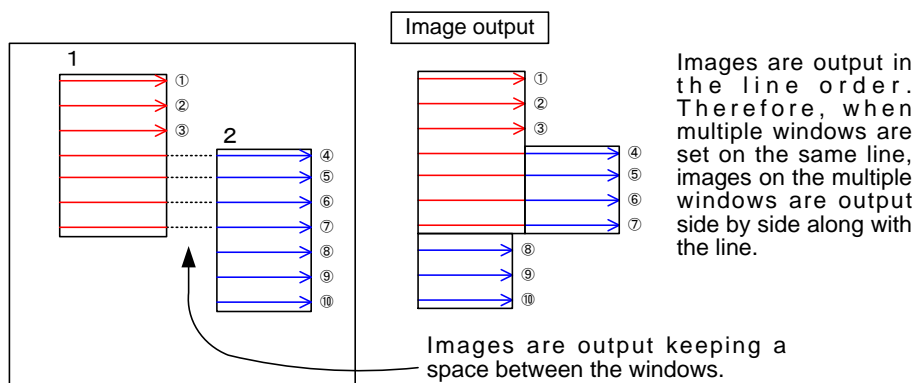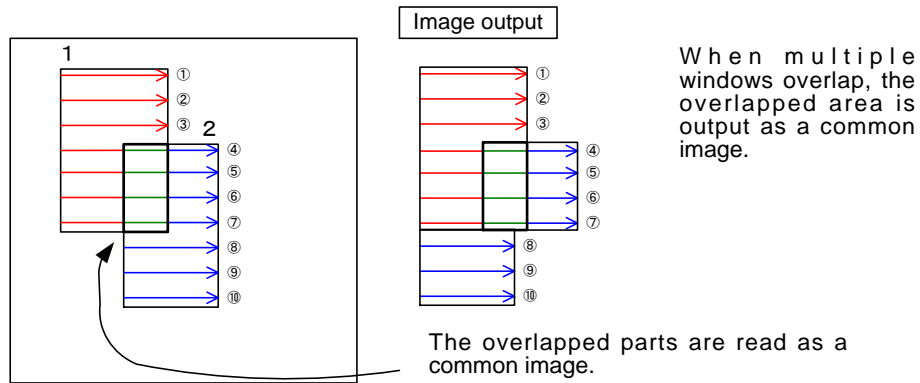
8.3.2. About the frame rate at the WOI

Since output data becomes small by setup of a window, frame rate improves.

However, data volume (window size) is not proportional to a frame rate.

The influence on the frame rate by Horizontal and vertical setup has the following features.

(1) Horizontal direction

Horizontal rate is fixed by 2560 pix (330 CLK). When two or more windows are arranged, the data volume outputted outputs the sum total of the data on the same line. DVAL becomes active only during the period when data is outputted. Even if LVAL changes window size, it does not change.

Window setting

Output signal
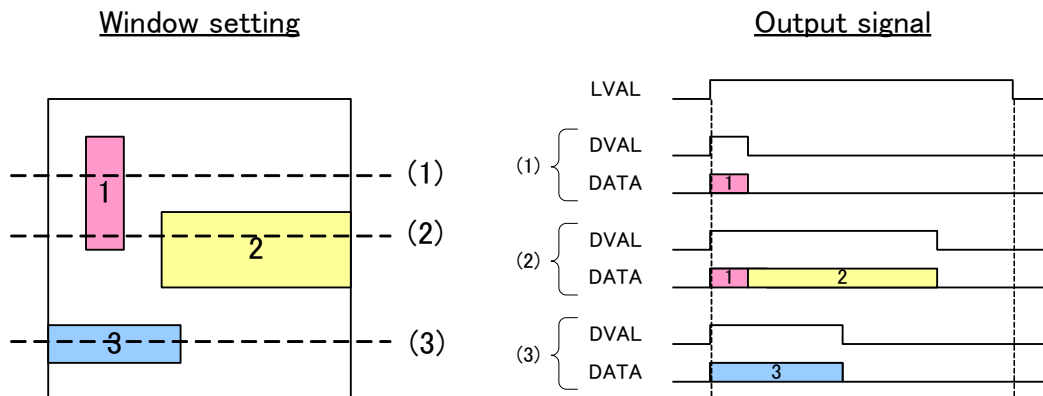
(2) Vertical direction

Vertical direction is output only set width.

D4211964C

8.3.3. WOI bank

WOI setting value can be saved a maximum of eight patterns at RAM (WOI bank) in a camera. The change of the WOI pattern which uses a WOI bank can be performed at high speed than the operation which calls separate setting and a memory bank.

However, the setting value saved on the WOI bank is lost with the power supply OFF.

8.3.4. WOI bank control

How to call a WOI bank can be chosen as either register control or camera link CC control (CC2, 3, 4). In control by camera link CC, a WOI bank can be specified by switching High/Low of CC signal. However, the WOI bank control by CC cannot be used in binning WOI mode.

The relation between CC polarity and a WOI bank is as follows.

CC2	CC3	CC4	WOI bank
L	L	L	1
H	L	L	2
L	H	L	3
H	H	L	4
L	L	H	5
H	L	H	6
L	H	H	7
H	H	H	8

8.4 Binning-WOI mode

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 32
- ・Setting position:　　　　　H: Integral multiple of 32/64 columns
  V: Integral multiple of 4/8 rows
- ・Window size:　　　　　　　H: Integral multiple of 32/64 columns
  (minimum size: 32/64)
  V: Integral multiple of 4/8 rows (minimum size: 4/8)
- ・Overlapping of windows:　Possible
- ・Others
  (1)Frame rate　　　　　　　There is no proportional relation between the window area and the frame rate.

D4211964C

(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)Memory   WOI setting can be saved in memory banks 1- 8.

8.5. Output format change

According to a frame grabber board, the change of an image output format is possible.
The re-injection of a camera power supply is required at the time of the change of an output
format. A shipment setup is set as the Full Configuration 8tap 8bit output.

Configuration	Tap	CLK	bit	Frame rate
Base	2	72 MHz	8 / 10	21.25 fps
Medium	4	72 MHz	8 / 10	42.5 fps
Full	8	72 MHz	8 / 10	85 fps

*Frame rate is the shutter OFF, output at full screen.

8.6 FPN correction

It is a function which rectifies FPN (Fixed Pattern Noise) peculiar to a sensor.
It is possible at the time of setting change to use always optimal image quality by performing
a calibration.

8.7 Defect pixels correction

It is a function which rectifies by transposing the output of arbitrary pixels to the output of the
pixel of the left or the right.
The 16xn-th pixels replace the output of the pixel on the left of a designated pixel. Other
pixels replace the output of the pixel on the right of a designated pixel.
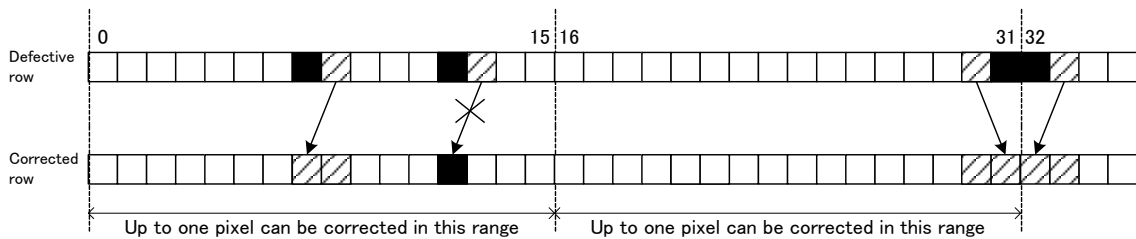
Setting conditions

(1) The pixel count which can be set : 512 pix

(2) The pixel which can be corrected is 1pix, per 16 pix. And, it is set only to 8pix per 1 row.

D4211964C

*Although it is not based on this condition but a data setup is possible, the pixel which becomes the outside of a condition is not corrected.

(3) At the time of Binning functional use, since image quality changes, we recommend you a re-setup of coordinates.

8.8. Gamma

Image linearity is rectified by turning ON a gamma correction. 16 steps of setup are possible.

8.9 Output control

8.9.1. Output ON

The image which entered into the sensor is outputted.

8.9.2. Output OFF

The black image of output level "0" is outputted.
In the case of a random trigger shutter, a trigger input is needed although various VALID signals are outputted as they are.

8.9.3. Output of test pattern (Only Full Configuration)

Some test patterns can be output by cutting the output of the sensor.
It is output by the frame rate matched to each shutter mode and the scanning mode.
However, the test pattern cannot be output in the WOI mode and Binning-WOI mode.
It is output for the random trigger shutter by the external trigger signal input.
The shutter speed, the setup, and the gain become invalid.
The FPN correction and pixel defect correction function, etc. become invalid.

The kind of the test pattern that can be output is as follows.
(1) Black
(2) White
(3) Gray (25%) / Gray (75%)
(4) Gray (50%)
(5) Stripe
(6) 16-Step
(7) Ramp
(8) Mix (factory setting)

The test pattern can reverse the brightness and change direction of the pattern (horizontal and vertical) (Part is excluded).

Moreover, it is possible to display it by superimposing the following enhancing patterns.
    (1) Line
    (2) Center marker
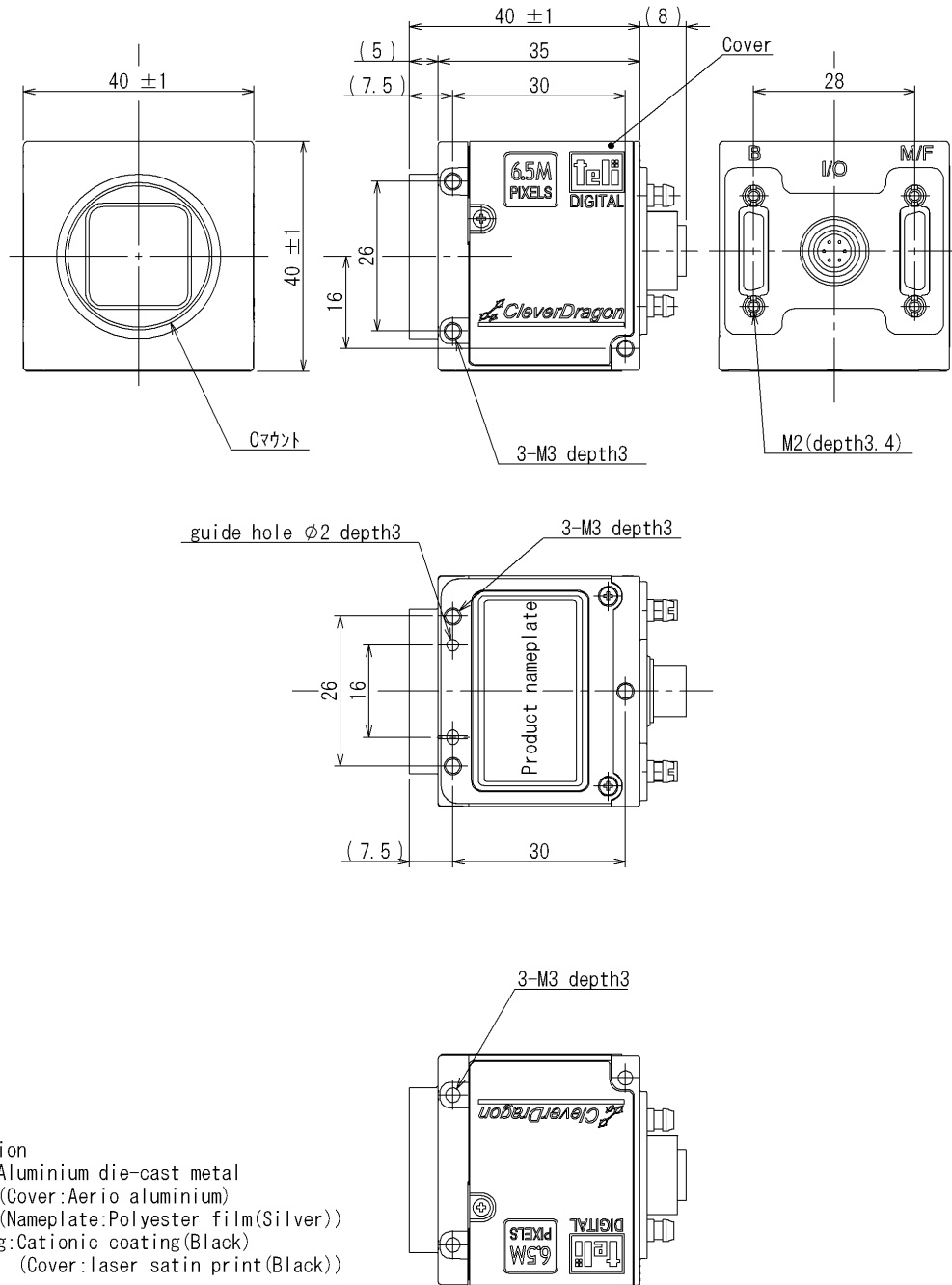   (3) Character

8.10. Image mirroring and flipping

An image output is changed into a flip horizontal, flip vertical, or 180-degree rotation, and can be outputted.

8.11. Sequential command

The time which a response takes can be shortened by transmitting two or more commands at once.

9. Appended figure

9.1 Dimensional outline drawing

Specification
 Material:Aluminium die-cast metal
        (Cover:Aerio aluminium)
        (Nameplate:Polyester film(Silver))
 Processing:Cationic coating(Black)
        (Cover:laser satin print(Black))

D4211964C

9.2 Administrative Measure on the Control of Pollution Caused by Electronic Information Products (Popular name: China RoHS)　Related information
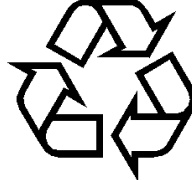
 中华人民共和国 环保使用期限	环保使用期限标识，是根据电子信息产品污染控制管理办法以及，电子信息产品污染控制标识要求(SJ/T11364-2014)、电子信息产品环保使用期限通则，制定的适用于中国境内销售的电子信息产品的标识。 电子信息产品只要按照安全及使用说明内容，正常使用情况下，从生产月期算起，在此期限内，产品中含有的有毒有害物质不致发生外泄或突变，不致对环境造成严重污染或对其人身、财产造成严重损害。 产品正常使用后，要废弃在环保使用年限内或者刚到年限的产品时，请根据国家标准采取适当的方法进行处置。 另外，此期限不同于质量/功能的保证期限。 The Mark and Information are applicable for People's Republic of China only.

＜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	×	○	○	○	○	○

「本表格依据SJ/T 11364的规定编制」
○：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(GB/T26572)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(GB/T26572)
　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
ペーパーボード
纸板
Paper board

内部緩衝材料・袋
内部缓冲材料・袋
Internal buffer materials・Bag
04
PE-LD

D4211964C

10. Warranty

The term of a warranty is 3 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.

11. Repair

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.

The period of repairing product

(1) Repair free of charge ...   Refer to Clause 10.

(2) Charged repair ....   We accept a repair of out of guaranty product, if it is reparable.

D4211964C

TOSHIBA TELI CORPORATION

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/en/

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.

D4211964C