Ultra-High-Resolution CMOS Monochrome Camera CSC12M25BMP19 PRODUCT SPECIFICATION

CONTENTS

TOSHIBA TELI CORPORATION

D4163454C

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.
- 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.
- 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.

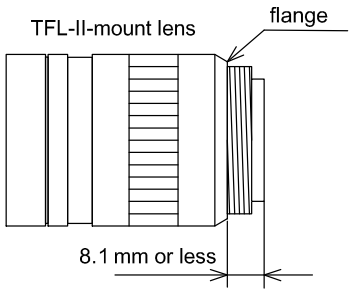
- Environmental operating conditions

  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 8.1 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.

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.

- 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

1. Overview

This CMOS camera is an Ultra-High-resolution monochrome camera employing a 12,580 thousand pixel readout system CMOS sensor.

2. Features

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

The TOSHIBA TELI's proprietary 1.9 type 12,580 thousand pixel Ultra-High-resolution 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.

(7) Binning

Signals can be output in all effective areas in about 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.

(9) New lens mount TFL-II

TOSHIBA TELI's unique TFL-II mount to take advantage of the resolution of a large high-precision sensor is employed for the lens mount. The TFL-II mount is large and has a flange back as short as 17.5mm to support high performance lenses. The lens attaching part is a M48 screw mount with φ50mm positioning engaging mechanism to support high precision. An F mount lens can also be used via an optional FTAR-2 mount conversion adaptor.

3. Configuration

(1) Camera body …… × 1

(2) Accessory

Operation Manual (Japanese) …… × 1

Operation Manual (English) …… × 1

*Application software is not attached to this camera.

4. Option

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

(2) Camera Link cable 14B26-SZLB-***-0LC（Manufactured by 3M）

（Recommended cable length: 5m or less）

(3) Camera adapter CA130C, CA130C-01 (Manufactured by TOSHIBA TELI)

(4) Camera mounting kit CPTC12M (Manufactured by TOSHIBA TELI)

(5) F mount lens adapter FTAR-2 (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

[Electrical specification]

(1)	Imager	CMOS image sensor
	・Number of active pixels	4096 (H) × 3072 (V)
	・pixel size	6 μm (H) × 6 μm (V) (Square-grid array)
	・Scanning area	24.576 mm(H) x 18.432 mm(V)
	・Optical size	Equivalent to 1.9 type
(2)	Scanning system	Progressive
(3)	Aspect ratio	4:3
(4)	Synchronization method	Internal synchronization
(5)	Sensitivity	2000 lx, F5.6, 3000 K
(6)	Minimum object illuminance	30 lx
		(F2.8, GAIN MAX, reading all pixels, image level 50%)
(7)	Image output	Compliant with Camera Link standard
	・Output mode	Switchable between Base and Medium configuration
		(Factory setting: Medium configuration)
	・Data	8 / 10 bit switching (Factory default: 8 bit)
	・Readout mode	
	All pixel readout	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	Depends on the window setting.
(8)	Gain	
	・Digital gain	0 to +18 dB [180step, 1step= Approx. 0.1dB] (Factory default：0 dB)
(9)	Set-up level	0 to Approx.+13% [528step]
		(Factory default：Approx.+3.9%…132)
(10)	Gamma	1.0 (standard)
(11)	Power supply voltage	DC12 V ± 10 % （ripple 50 mV(p-p) or less）
(12)	Power consumption	Approx. 5.4 W

[Electrical shutter specification]

(1)	Shutter Speed	Shutter OFF or 1/20,000 to 2 sec The exposure time at shutter OFF is different 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 pulse width. Minimum pulse width : 50 μsec (Minimum exposure time: 50 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.
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 sync signal specification]

(1) Driving frequency

・Output mode	*Shutter OFF
All pixel readout	Horizontal：Approx.75 kHz
	Vertical：Approx.25 Hz
Binning	Horizontal：Approx.67 kHz
	Vertical：Approx.43.5 Hz
WOI	By window setting

[Input signal specification]

(1)	TRIG	Camera Link I/F and DC IN connector input
	・Signal level（DC IN connector）	TTL level
	・Polarity	Positive/Negative switching (Factory default: Negative)
	・Pulse width	50 μsec or more

[Output signal specification]

None

[Mechanical spec]

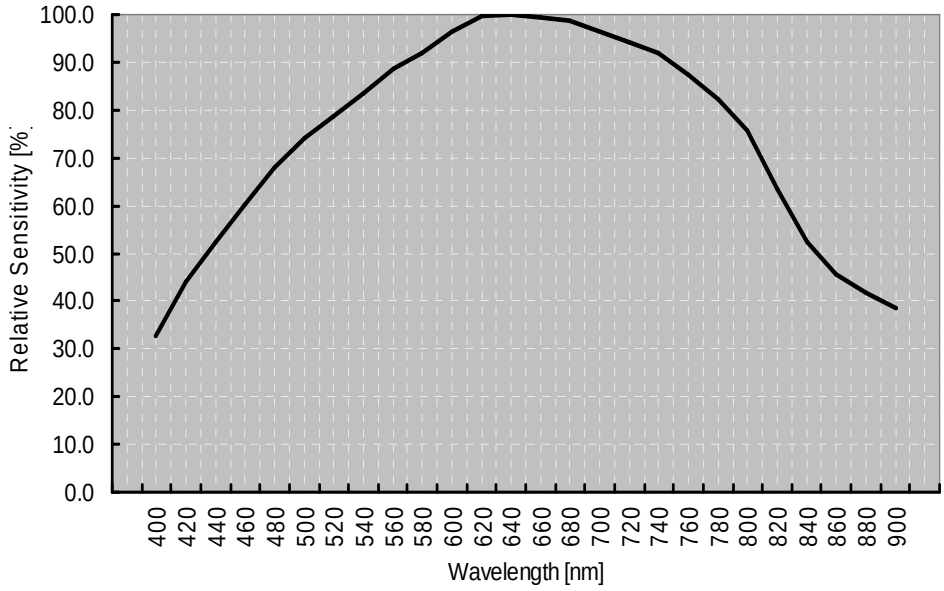
(1)	Lens mount	TOSHIBA TELI's unique TFL-II mount
	・Mount screw	M48mm P=0.75
	・Positioning engagement part	Φ50mm H7
	・Flange back	17.5 mm
(2)	Dimensions	75 mm (W) × 75 mm (H) × 69.5 mm (D) （Not including protrusion）
(3)	Weight	Approx.450 g
(4)	Camera body grounding: insulation status	Conductive between circuit GND and camera body

[Operating ambient conditions]

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

[Typical ambient conditions]

Spectral Sensitivity Specification for CSC12M25BMP19



（*The lens characteristics and light source characteristics are not reflected in table.）

[Various safety standards]

(1) 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 switching
(2)	Start bit	1bit
(3)	Data bit	8bit
(4)	Stop bit	1bit
(5)	Parity	None
(6)	Handshake	None

[Connector pin assignment]

(1) Video output/controlling（Camera Link Medium Configuration） CAMERA LINK1・2

・Connector type: MDR 26-PIN connector 10226-2210PE（Manufactured by 3M）

●Connector name： CAMERALINK1

Pin No.	I/O	Signal name	Pin No.	I/O	Signal name
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 name： CAMERALINK2

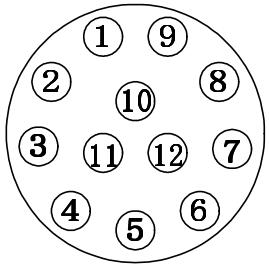
Pin No.	I/O	Signal name	Pin No.	I/O	Signal name
1	-	GND	14	-	GND
2	O	Y0-	15	O	Y0+
3	O	Y1-	16	O	Y1+
4	O	Y2-	17	O	Y2+
5	O	Y CLK OUT-	18	O	Y CLK OUT+
6	O	Y3-	19	O	Y3+
7	-	100Ω terminated(20)	20	-	100Ω terminated(7)
8	-	N.C.	21	-	N.C.
9	-	N.C.	22	-	N.C.
10	-	N.C.	23	-	N.C.
11	-	N.C.	24	-	N.C.
12	-	N.C.	25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

(2) Power supply 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

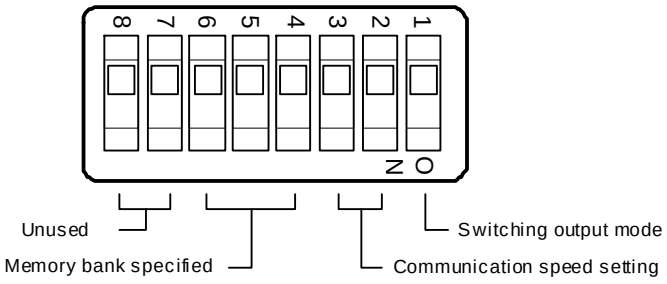
Pin No.	I/O	Signal name
1	-	GND
2	I	+12V
3	-	GND
4	-	N.C.
5	-	GND
6	-	N.C.
7	-	N.C.
8	-	GND
9	-	N.C.
10	-	N.C.
11	I	TRIG
12	-	GND



Rearview

[Dip switch setting]

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



"＊" is Factory default

(1) Output mode switching

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

(3) Baud rate 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	Baud rate
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 0
ON	OFF	OFF	Bank 1
OFF	ON	OFF	Bank 2
ON	ON	OFF	Bank 3
OFF	OFF	ON	Bank 4
ON	OFF	ON	Bank 5
OFF	ON	ON	Bank 6
ON	ON	ON	Bank 7

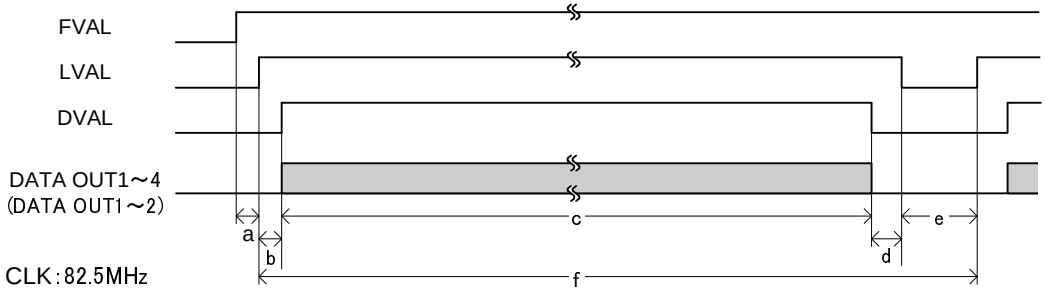
SW7 and SW8 are not used. (Fixed to OFF)

[Timing Chart]

(1) Horizontal Timing

* For Medium configuration Figures in parentheses are for Base configuration

1) Reading all pixels



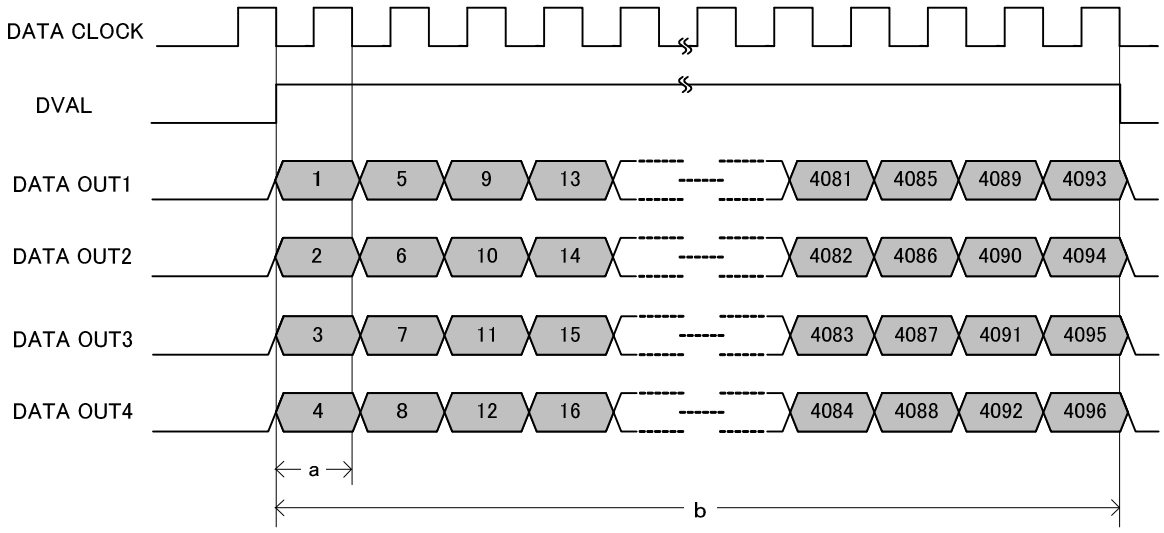
a = 4 (8) CLK b = 4 (8) CLK c = 1024 (2048) CLK

*d = 8 (16) CLK e = 16 (32) CLK f = 1052 (2104) CLK

("*" The sign is that the number of CLKs might change.)

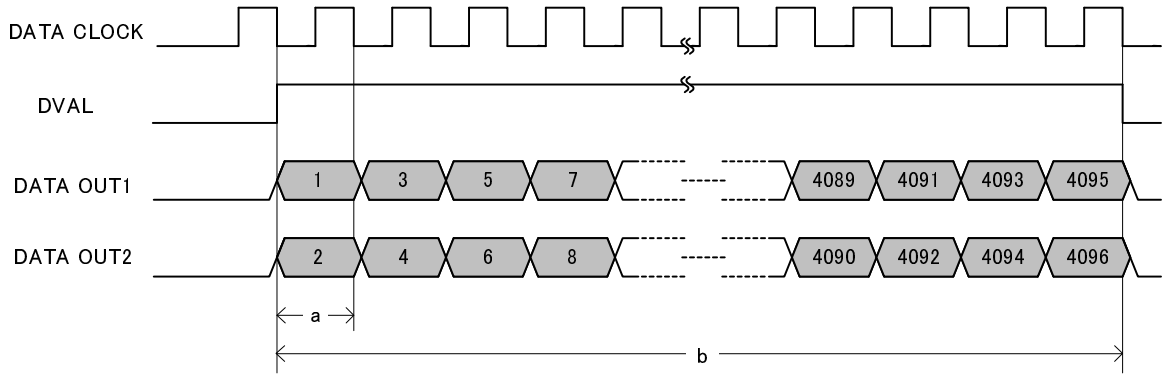
2) CLK rate

●Medium Configuration



a = 12.12ns (82.500MHz) b = 12.41 μs (80.566kHz)

●Base Configuration

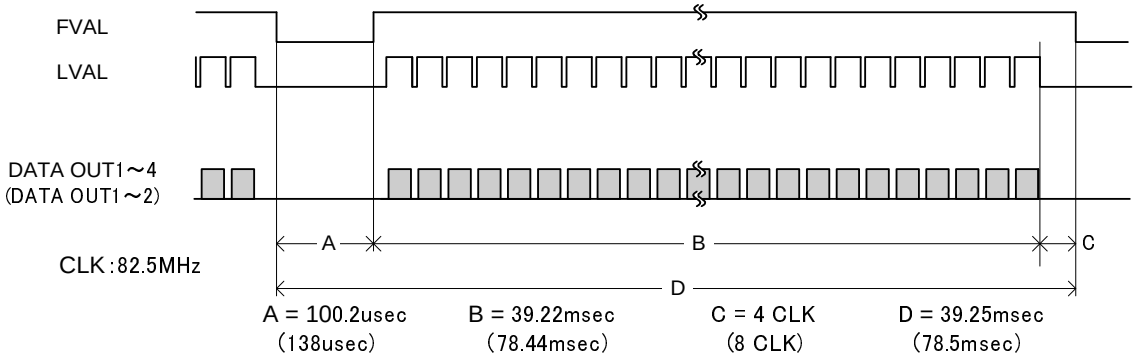


a = 12.12ns (82.500MHz)　　b = 24.82 μs (40.283kHz)

(2) Vertical Timing

*For Medium configuration　Figures in parentheses are for Base configuration

1) All pixel readout



A = 100.2usec (138usec)　B = 39.22msec (78.44msec)　C = 4 CLK (8 CLK)　D = 39.25msec (78.5msec)

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.)

6. Command Communication Protocol

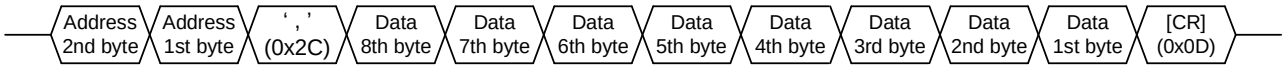
The command communication protocol is the TELI standard method (method in which parameters are set in the registers in the camera).

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

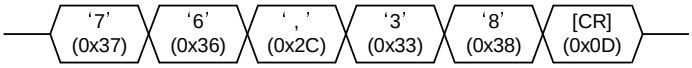
All ASCII alphabetic characters used are uppercase characters.

(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)

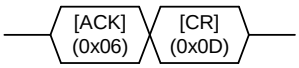


For example, to write data 0x38 to address 0x76, send a command, as follows:

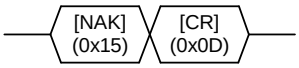


The camera responds to the write command with No Error (ACK) or Error (NAK), as follows:

No Error (ACK):



Error (NAK):



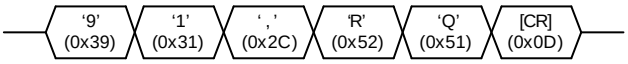
*Because two kinds of data is needed for the setting about the Partial Scan, the register writing for "Set value application" is separately needed.

*The response to the command might become about three seconds by the internal processing of camera.

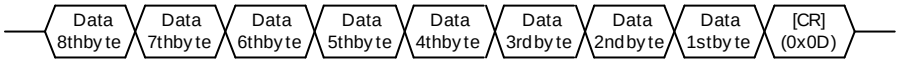
*It is not possible to communicate for the exposure period at the random trigger shutter.

(2) Reading the register

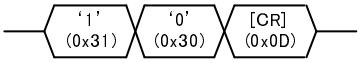
To read data from a register, send ', (comma)', 'R', 'Q' and [CR] code following the address. For example, to read data in address 0x91, send a command, as follows:



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:



7. Register Map

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

Address	Access	Memory	CMOS Monochrome Camera CSC12M25BMP19
0x00	R. O.		Manufacturer(Maker) name ASCII format
｜	｜		
0x0F	R. O.		
0x10	R. O.		Model name ASCII format
｜	｜		
0x2F	R. O.		
0x30	R. O.		Serial number ASCII format
｜	｜		
0x3F	R. O.		
0x40	R. O.		Firmware version ASCII format
｜	｜		
0x47	R. O.		
0x48	R. O.		FPGA1 version ASCII format
｜	｜		
0x4F	R. O.		
0x50	R. O.		FPGA2 version ASCII format
｜	｜		
0x57	R. O.		
0x58	R. O.		CPLD1 version ASCII format
｜	｜		
0x5F	R. O.		
0x60	R. O.		Register map version ASCII format
｜	｜		
0x67	R. O.		
0x68	N. A.		Reserved
0x69	R. O.		Status
0x6A	R. O.		Extended status
0x6B	N. A.		Reserved
0x6C	R. O.		Check memory bank
0x6D	W. O.		Save memory
0x6E	R/W		Call memory
0x6F	W. O.		Initialize memory
0x70	R/W	○	Setup
0x72	N. A.		Reserved
｜	｜	｜	｜
0x75	N. A.		Reserved
0x76	R/W	○	Gain
0x77	N. A.		Reserved
｜	｜	｜	｜
0x7F	N. A.		Reserved
0x80	N. A.		Reserved
｜	｜	｜	｜
0x85	N. A.		Reserved
0x86	R/W	○	Output control
0x87	R/W	○	Number of output bits
0x88	N. A.		Reserved
0x89	N. A.		Reserved
0x8A	N. A.		Reserved
0x8B	R/W	○	Defective pixel correction
0x8C	N. A.		Reserved
0x8D	N. A.		Reserved
0x8E	N. A.		Reserved
0x8F	N. A.		Reserved

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

Address	Access	Memory	CMOS Monochrome Camera CSC12M25BMP19
0x90	R/W	○	Scan mode
0x91	R/W	○	Shutter mode
0x92	R/W	○	Random trigger mode
0x93	R/W	○	Trigger polarity
0x94	R/W	○	Subsampling
0x95	N.A.		Reserved
0x9F	N.A.		Reserved
0xA0	R/W	○	Shutter speed denominator
0xA2	N.A.		Reserved
0xA3	N.A.		Reserved
0xA4	R/W	○	Shutter speed numerator
0xA5	N.A.		Reserved
0xBF	N.A.		Reserved
0xC0	W.O.		WOI update
0xC1	R/W	○	WOI area number
0xC2	R/W	○	WOI horizontal start coordinate
0xC4	R/W	○	WOI vertical start coordinate
0xC6	R/W	○	WOI horizontal width
0xC8	R/W	○	WOI vertical height
0xCA	N.A.		Reserved
0xCB	R/W		Save/call WOI bank
0xCC	R/W	○	WOI area effective
0xD0	N.A.		Reserved
0xD1	N.A.		Reserved
0xD2	N.A.		Reserved
0xD3	N.A.		Reserved
0xD4	N.A.		Reserved
0xD5	N.A.		Reserved
0xD6	N.A.		Reserved
0xD7	N.A.		Reserved
0xD8	R/W		Specify user area/address
0xDA	R/W		Specify user area/data
0xDB	W.O.		Erase user area
0xDC	R/W	○	Number of bytes to read user area
0xDD	N.A.		Reserved
0xDE	N.A.		Reserved
0xDF	N.A.		Reserved
0xE0	N.A.		Reserved
0xE1	R/W	○	Multi slope
0xE2	N.A.		Reserved
0xFF	N.A.		Reserved

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

8. Function

8.1. Reading 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 shutter OFF.)

Output mode	Setting	Frame rate	resolution
All pixel readout		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		Depends on the window setting	

8.1.1. All pixel readout

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

8.1.2. Binning

The camera reads all effective areas in about 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.

8.1.3. Sub sampling

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

Complex operation with binning and WOI is not available.

8.1.4. 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.

8.2. 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 *CC1* 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.

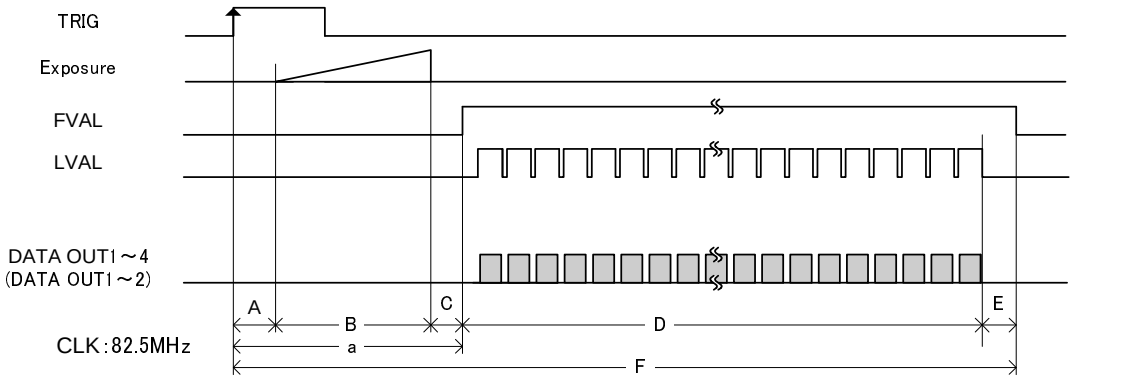
・Film cannot be exposed during reading images using the random trigger shutter. If inputting triggers is to be continued, input them after finishing image output of the camera.

・It is not possible to communicate for the exposure period.

8.2.1. Fix mode

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

*Example of timing charts to expose all pixels



*A = 12CLK　　B = Exposure　　C = approx. 36usec　　D = approx. 39.22msec (approx. 78.44msec)

*E = 4 CLK (8 CLK)　　F = Exposure+39.22msec+40.8usec (+78.44msec+53.6usec)

a : Command communication prohibition period

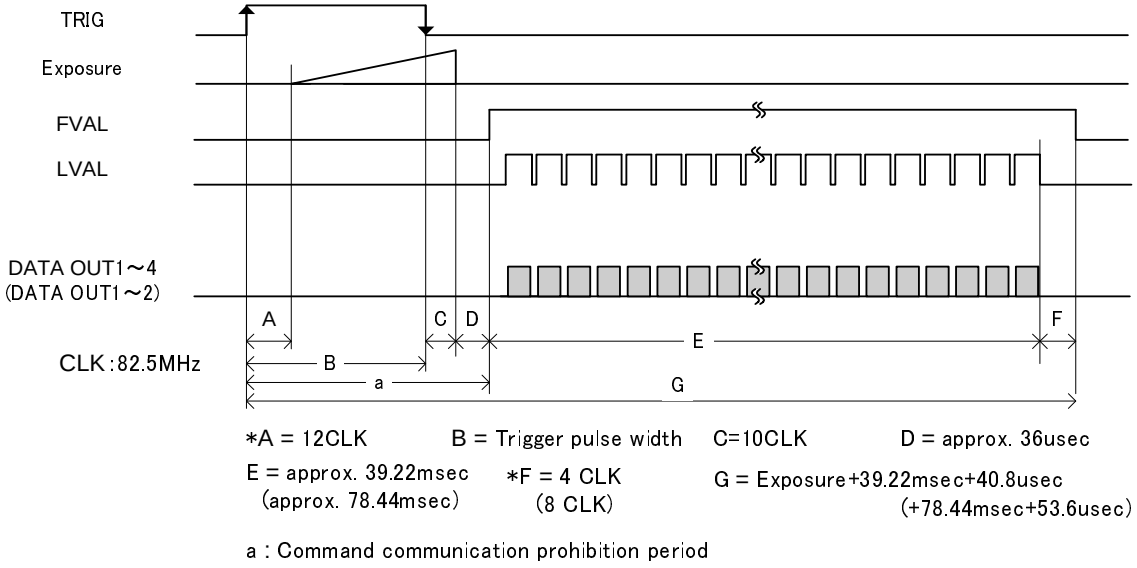
("*" The sign is that the number of CLKs might change.)

8.2.2. 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 μsec.

*Example of timing charts to expose all pixels



("*" The sign is that the number of CLKs might change.)

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 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.

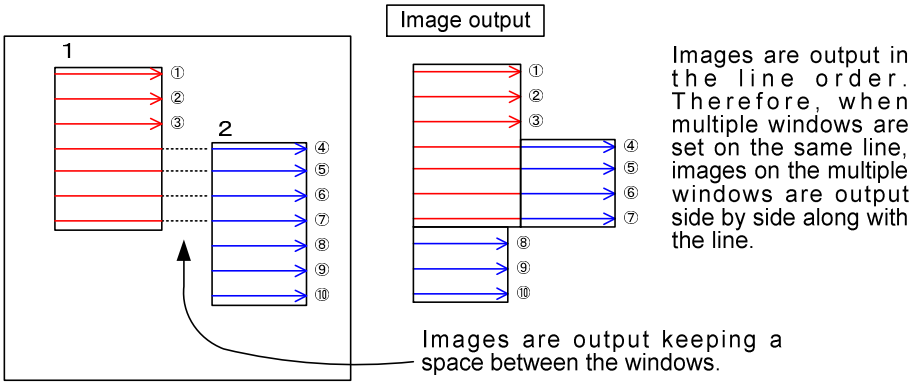
(3)Complex operation　　Complex operation with binning and sub sampling is not available.

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

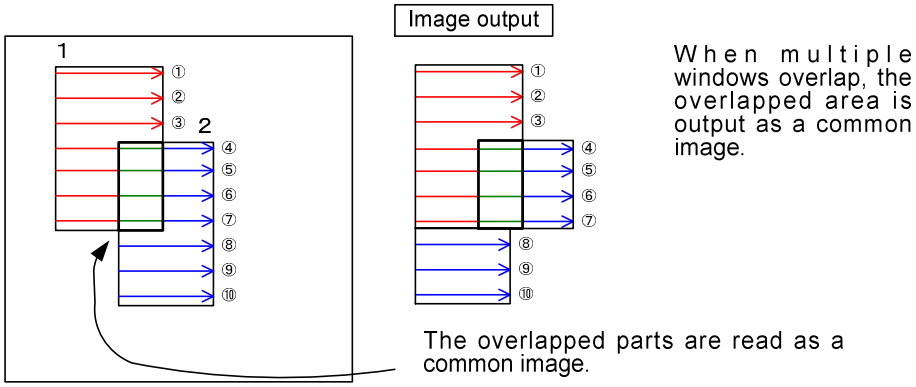
8.3.1　Image output for WOI

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



(2) When multiple windows overlap



8.4 Multi-slope (to be implemented)

A wide dynamic range is obtainable through exposure up to two times.

Note that the tone may not be correctly represented for the point where the slope switches.

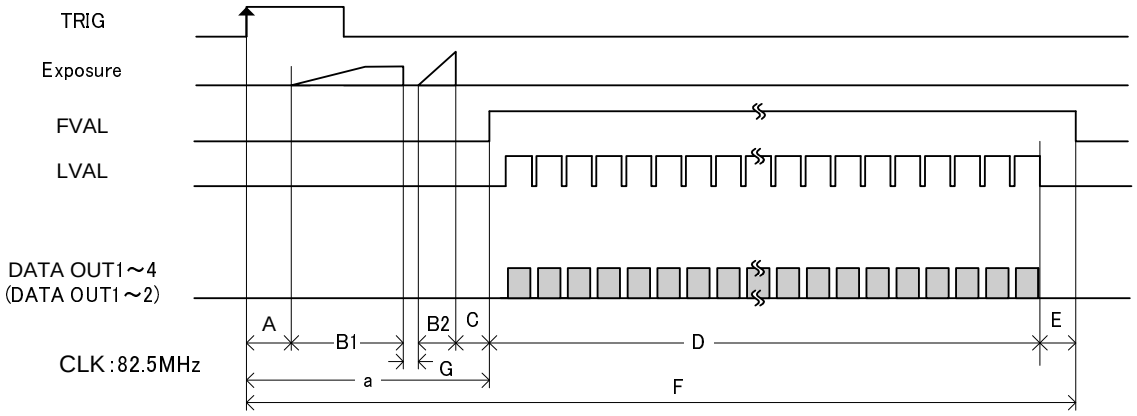
Fixed pattern noise may increase depending on the setting.

With this camera, three modes from which the shutter speed of 2nd slope differs by shutter speed setup of 1st slope can be chosen. However, the shutter speed of 2nd slope does not become shorter than 50microsec.

It cannot be used in the time of Shutter OFF, and random trigger shutter pulse width mode.

Mode	Reset level of 1st slope	Exposure time of 2nd slope
1	Approx. 75%	1/4 of 1st slope
2	Approx. 75%	1/16 of 1st slope
3	Approx. 75%	1/64 of 1st slope

*Example of timing charts to random trigger shutter fix mode.



*A = 12CLK B1 = 1st slope of exposure B2 = 2nd slope of exposure

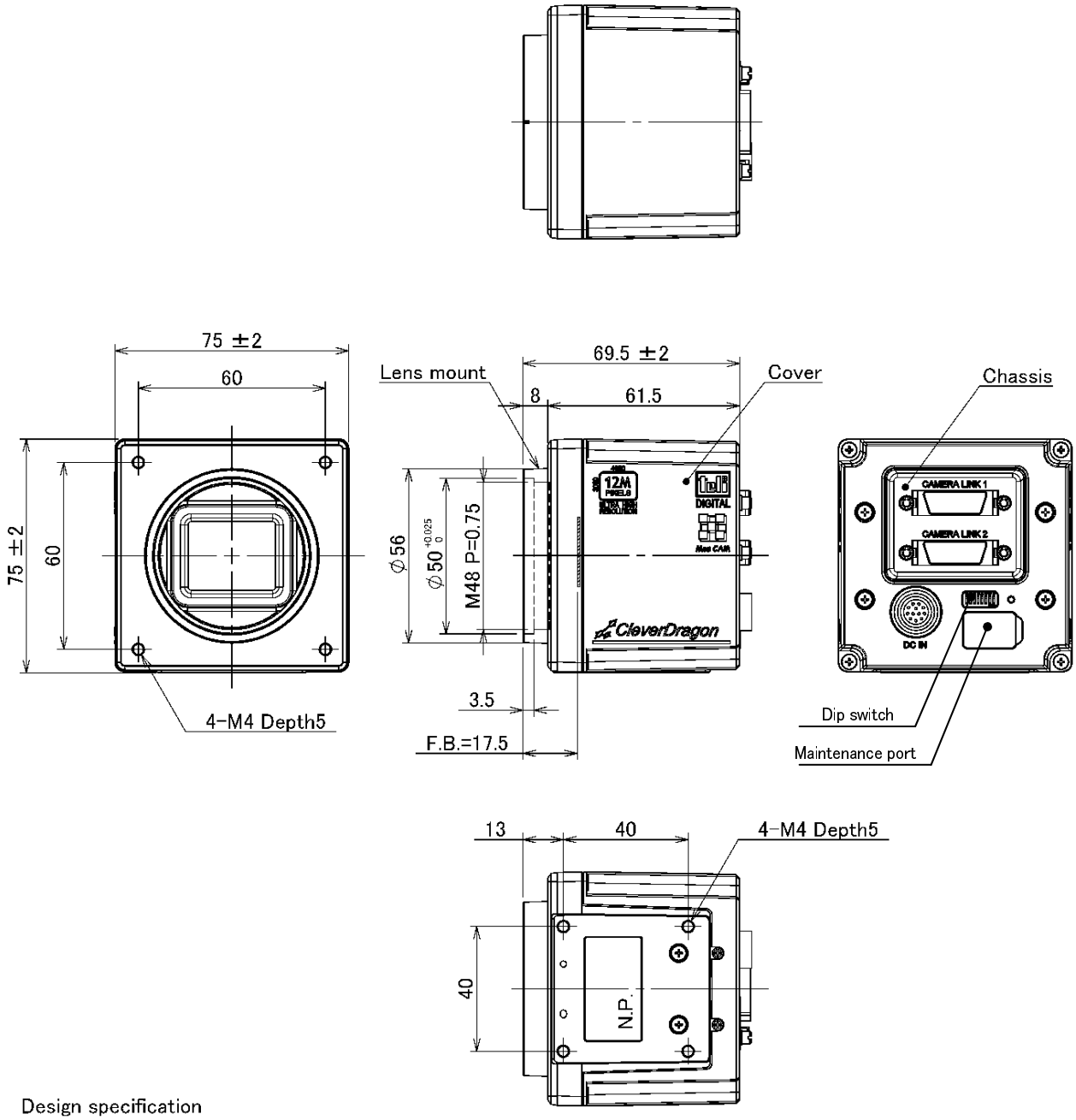
C = approx. 36usec D = approx. 39.22msec (approx. 78.44msec) *E = 4 CLK (8 CLK)

G = 12CLK F = Exposure+39.22msec+40.8usec (+78.44msec+53.6usec)

a : Command communication prohibition period

("*" The sign is that the number of CLKs might change.)

9. External-view Drawing



Design specification

Material

Lens mount,Cover : Aluminum die cast

Chassis : Cold-rolled steel sheet

Processing

Lens mount,Cover : Cation electro-painting(black)

Chassis : Nickel plating

10. 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.

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 ..... Basically, repair period is 7 years after the last production end of products.

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