B/W CCD Camera

CS8581QF series

Specification

Contents

TOSHIBA TELI CORPORATION

This document is a provisional specification, so that the information contained in this document is subject to change without notice.

May. 14. 2008

Documents No. D4143407G

RESTRICTION FOR USE

- Should the equipment be used in the following conditions or environments, give consideration to safety measures and inform us of such usage:
  1. Use of the equipment in the conditions or environment contrary to those specified, or use outdoors.
  2. Use of the equipment in applications expected to cause potential hazard to people or property, which require special safety measures to be adopted.

- This product can be used under diverse operating conditions. Determination of applicability of equipment or devices concerned shall be determined after analysis or testing as necessary by the designer of such equipment or devices, or personnel related to the specifications. Such designer or personnel shall assure the performance and safety of the equipment or devices.

- This product is not designed or manufactured to be used for control of equipment directly concerned with human life (*1) or equipment relating to maintenance of public services/functions involving factors of safety (*2). Therefore, the product shall not be used for such applications.
  (*1): Equipment directly concerned with human life refers to.
  - Medical equipment such as life-support systems, equipment for operating theaters.
  - Exhaust control equipment for exhaust gases such as toxic fumes or smoke.
  - Equipment mandatory to be installed by various laws and regulations such as the Fire Act or Building Standard Law
  - Equipment related to the above

  (*2): Equipment relating to maintenance of public services/functions involving factors of safety refers to.
  - Traffic control systems for air transportation, railways, roads, or marine transportation
  - Equipment for nuclear power generation
  - Equipment related to the above

CASES FOR INDEMNITY (LIMITED WARRANTY)

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

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

NOTES ON USING THIS PRODUCT

● **Handle carefully**

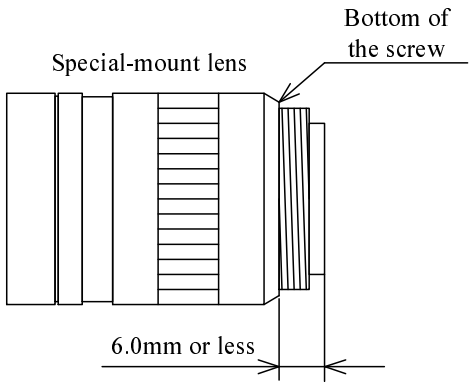
Do not drop the equipment or allow it to be subject to strong impact or vibration, as such action may cause malfunctions. Further, do not damage the connection cable, since this may cause wire breakage.

● **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.

● **About lens mount**

As for the Special-mount lens used combining this camera, the projection distance from bottom of the screw should use 6.0mm 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 camera cable**

The connector of the camera is in “Screw-coupling” lock structure. Improper cramping might cause image noise. Be sure to give it a good cramping to avoid noise. ot 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.

● **Do not shoot under intense light.**

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

● **Occurrence of moiré**

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

● **Occurrence of noise on the screen**

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

● **Handling of the protective cap**

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

● **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.

● **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”

1. Overview

This CCD camera is a remote head type monochrome camera that adopts all-pixel-data-readout inter-line CCD that is compatible with the VGA format. A high-speed output of 133fps was achieved by adopting CCD that a high-speed drive is possible. For video output, the serial digital bus standard "IEEE1394.b" is adopted for high transfer rate.

2. Features

(1) High frame rate

Realizes video output at a high frame rate of 133frames/second.

(2) All pixels readout

All pixel signals (in the effective area) are output in approximately 1/133 second.

(3) High vertical resolution

All pixels can be readout in the random trigger shutter mode.

In the obtained image, there is no deterioration in a vertical resolution.

(4) Square grids

The CCD pixels arrayed in square grids facilitates computation for image processing.

(5) IEEE1394 output

Performs video output via the signal digital bus standard IEEE1394.b interface. Data transfer is at 800Mbps that can output uncompressed video data in the VGA (640 x 480) size at 133 fps.

(6) Control using PC

Allows the user to browse and control basic information of the camera using the PC.

(7) Random trigger shutter

By external trigger signal input, the shot image can be grabbed at an arbitrary timing.

3. Configuration

(1) Camera head (Camera cable : Direct fixing) ····· 1

(a) Cable fixing direction (viewed from rear)

CS8581QFV -** V: Rear

CS8581QFW -** W: Left

CS8581QFX -** X: Down

CS8581QFY -** Y: Right (Standard)

CS8581QFZ -** Z: Up

(b) Camera cable length (Item(a)-**)

01: 1m (Standard)

02: 2m

(2) Camera control unit ····· 1

(3) Accessory

Instruction Manual (Japanese) ····· 1

Instruction Manual (English) ····· 1

[Notice]

The camera cable of this product is not a robot cable.

If you need robot cable, contact your dealer / distributor.

4. Optional parts

(1) Dedicated lens (12-phi) f = 30mm, 17mm, 12mm, 6mm

*Application software is not supplied as a standard item.

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

5. Functions

(1) Gain and Pedestal level control

When shipping it, the gain is set to 0dB. By adjusting the setting value of the command status register of the camera via the IEEE1394 serial bus, you can set the gain in 121 steps in the range between 0 and +12dB.

When shipping it, the pedestal is set to 10LSB. By adjusting the setting value of the command status register of the camera via the IEEE1394 serial bus, you can set the pedestal in 256 steps in the range between 0 and 63.75LSB.

(2) Shutter mode switching

You can switch the shutter modes by adjusting the setting value of the command status register of the camera via the IEEE1394 serial bus.

Normal electronic shutter: Performs exposure control via the internal synchronization signal.

Random trigger shutter: Random trigger shutter can capture images at any timing using the external trigger signal and soft trigger input. It is effective for image input of moving objects and obtaining images of the same timing using multiple cameras. But there is an exposure delay time.

(3) Normal electronic shutter and Random trigger shutter exposure switching

You can switch the exposure mode of the electronic shutter by adjusting the setting value of the command status register. You can switch the exposure mode of the random trigger shutter by adjusting the setting value of the command status register. *See CS8581QF Application Manual

PRESET mode: The following exposure time can be set via the IEEE1394 serial bus; 1/133s, 1/250s, 1/500s, 1/1,000s, 1/2,000s, 1/4,000s, 1/10,000s, and 1/20,000s

32bit Floating-point format mode: The following exposure time can be set via the IEEE1394 serial bus;

Exposure time: 20μs ~ 2s

Exposure time = (-1)** S * (M+1) * 2** (E-127) [sec]

(4) Frame rate switching

For example, the camera is set full screen 640 x 480 output mode, 133fps, 100fps, 66fps and 50fps non-interlace mode are selectable. And, other frame rates can be set. Initial factory setting: 60fps

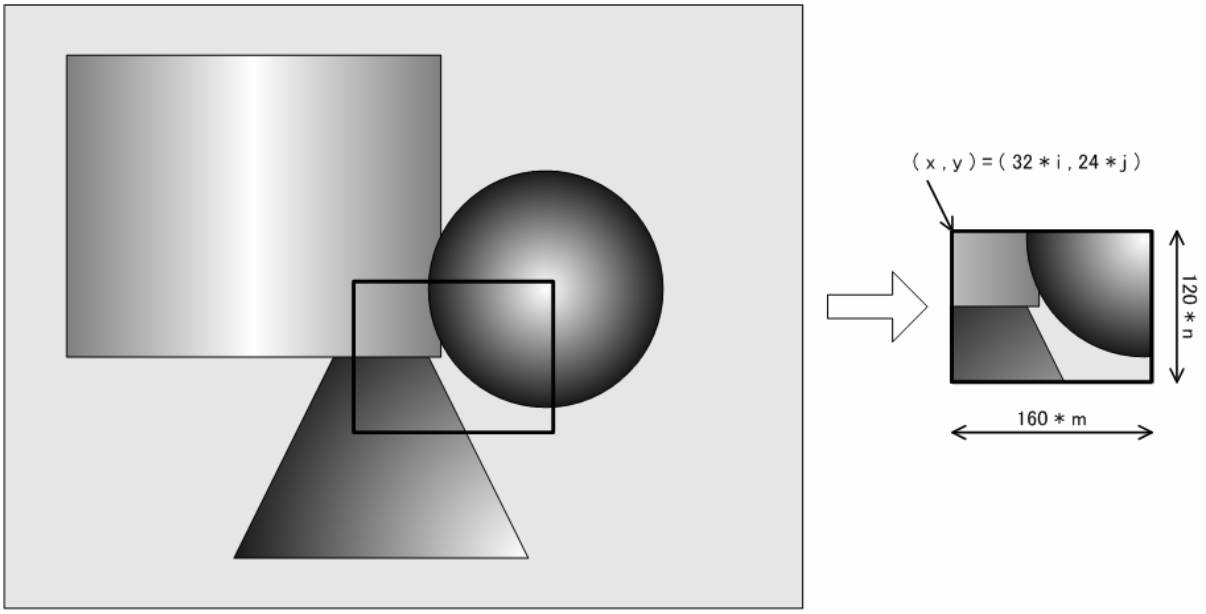
(5) 1/2 Binning mode

Two vertical lines are added and one frame is output at 1/240 seconds, so image can be output at high speed or more.

(6) Scalable mode

This camera has the scalable mode that can read out defined area of the screen. The horizontal and vertical minimum unit sizes, at 160 × 120 pixels, both represent a 4-part split of total screen horizontal and vertical sizes. A read out area can be designed by start address (x, y). However, specify an address by every 32(horizontal) and 24(vertical) pixels. Only continuous rectangle units can be selected, concave or convex shape cannot be selected.

Window of 160×120 units:	4*m (H) ×4*n (V)	m = integer: 1,2,3,4
		n = integer: 1,2,3,4
		The image of 640×480 or less can be selected.
		Only one window can be selected.
Start address:	32*i (H) ×24*j (V)	i = integer: 0, 1, 2, 3 …15
		j = integer: 0, 1, 2, 3 …15
		A window is in the screen.



In the scalable mode, this camera reads out only the necessary portions at the standard speed while it scans through other unnecessary portions at high speed, so the trigger interval can be shorter if the vertical cutout width is small. However, the trigger interval cannot be short in the horizontal direction even if the cutout width is small due to the operation mechanism of the CCD sensor.

Notice

White lines may occur in the upper portions of the screen when strong light exists in a wide area during the scalable mode. This is not a malfunction. If white lines occur, adjust the amount of incident light using the lens.

(7) Camera mode table

This camera can set the following modes.

Shutter mode		Video mode	Exposure time
Normal shutter	FIX (Depend on exposure time setting)	Scalable	PRESET
			Floating-point format
		Binning	PRESET
			Floating-point format
Random trigger shutter (Hardware)	FIX (Depend on exposure time setting)	Scalable	PRESET
			Floating-point format
		Binning	PRESET
			Floating-point format
	Pulse	Scalable	Depend on pulse width
		Binning	
Random trigger shutter (Software)	FIX (Depend on exposure time setting)	Scalable	PRESET
			Floating-point format
		Binning	PRESET
			Floating-point format

6. Specifications

[Electrical specification]

(1) Image sensor	1/3 type all-pixel-data-readout interline transfer CCD	
·Total pixels	696 (H) x 492 (V)	(Approx. 340,000 pixels)
·Video output effective pixels	640 (H) x 480 (V)	
·Scanning area	4.74 mm (H) x 3.55 mm (V)	(= Equivalent to 1/3" type CCD size)
·Unit sell size	7.4μm (H) x 7.4μm (V)	(Square grid)
(2) TV system	this camera original system	
(3) Scanning line	492 lines	
(4) Scanning system	Progressive scan	
(5) Sync system	internal sync	
(6) Aspect ratio	4:3	
(7) Video output	Digital video output 8bit Mono (IEEE1394 interface)	
(8) Resolution	485 TV lines or more (H), 480 TV lines or more (V)	
(9) Standard Illumination	2000 lx (F5.6) 3100K (Exposure time: 7.5ms)	
(10) Minimum Illumination	16 lx (F1.4)	
	(Exposure time: 7.5ms, Gain: +12dB (max), Video level: 50%)	
(11) Gain	following gain setting is possible using communication commands.	
	0 to +12dB (0 to 120 step) (initial factory setting: 0 [dB])	
(12) Gamma	1.0 (FIX)	
(13) White clip level	255LSB (8bit) FIX	
(14) Pedestal level	Following pedestal setting is possible using communication commands. (Initial factory setting: 10LSB)	
	0 to 63.75 LSB (0 to 255 step)	

(15) Power source DC+8 to +30V (Power is supplied from IEEE1394 cable)

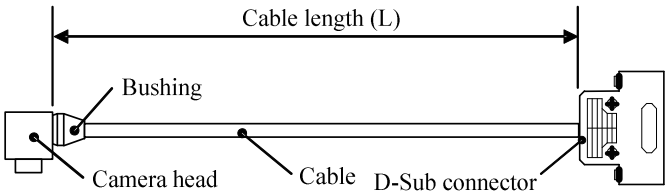
Ripple voltage: 50 mV (p-p) or less

(16) Power consumption Approx. 4W (at +12VDC)

(17) Camera cable length

1000mm +50mm / -0mm

2000mm +100mm / -0mm



Information

Do NOT use in combination with camera head and CCU having the different serial number.
To do so might cause not to make full use of the essential function of this camera

[Internal sync signal specification]

(1) Base clock frequency 49.152MHz +/-100ppm (Included temperature characteristic)

(2) H sync frequency 63 kHz

(3) V sync frequency 133 Hz

[Trigger signal specification]

(1) Input level LOW level: 0~0.5V (p-p) / HIGH level: 2~5V (p-p)

(2) Input impedance High impedance (100kΩ)

(3) Polarity Negative (Falling edge detection)/ Positive (Rising edge detection)

(4) Pulse width 2us (min) / 2s (max)

- The minimum at the exposure in the camera time is 16us through the pulse width that can be input is 2us.
- The external trigger signal polarity when the factory is shipped is a negative polarity.

[Electronic shutter signal specification]

(1) Normal shutter Set via the IEEE1394 interface

(2) Random shutter Set via the IEEE1394 interface

(3) Exposure time setting

PRESET mode 1/133s, 1/250s, 1/500s, 1/1000s, 1/2000, 1/4000, 1/10000, 1/20000s (8 step selectable)

Manual setting mode following exposure time can be set via the IEEE1394 serial bus;

Exposure time: 20μs ~ 2s

Exposure time = (-1) ** S * (M+1) * 2** (E-127) [sec]

Sign (S)	Exponent (E)	Mantissa (M)
1bit	8bit	23bit

Initial factory setting:

Normal shutter 133fps (Exposure time: 7.5ms)

[Interface specification]

(1) Interface system	1394.b-IEEE Std2002 conformity, Bilingual correspondence
	(Connection with the IEEE1394.a environment is available)
(2) Transmission speed	S800 (800Mbps) / S400 (400Mbps)
(3) Video mode	Format_7 mode 0; scalable mode mono 8 bit
	Format_7 mode 2; binning mode mono 8 bit
(4) Protocol	IIDC1394-based Digital Camera Specification ver.1.31 conformity

[Machine externals specification]

(1) Dimensions	Camera head; Refer to the attached external view drawing
	Camera control unit; Refer to the attached external view drawing
(2) Mass	Camera head; 24g without camera cable
	Camera control unit; 250g
(3) Lens mount	Special mount M10.5 Pitch 0.5mm female screw
(4) Flange focal distance	it is not possible to adjust it.
(5) Camera body grounding -insulation status	Conductive between circuit GND and camera body

[Operating ambient conditions]

(1) Ambient conditions

Performance assurance	Temperature	0 to 40 °C
	Humidity	30 to 90 % (no condensation)
Operating assurance	Temperature	-5 to 45 °C
	Humidity	10 to 90% (no condensation)
Storage assurance	Temperature	-20 to 60 °C
	Humidity	10 to 90% (no condensation)

(2) EMC conditions

EMI (Electro-Magnetic interference)	EN61000-6-4 conformity
	FCC Sub part15 class A conformity
EMS (Electro-Magnetic susceptibility)	EN61000-6-2 conformity

***Conformity of EMC conditions**

When used combining parts other than specification of our company, Please check conformity of EMC with customer's machine and whole equipment.

[Connector pin assignment]

(1) IEEE1394.b connector

Connector model: HSR-BN011 (Manufactured by COMOSS)

Pin assignment:

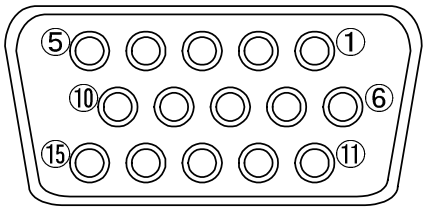
Pin No.	I/O	Signal Name	Function
1	I/O	TPB*	Twisted Pair B(-)
2	I/O	TPB	Twisted Pair B(+)
3	I/O	TPA*	Twisted Pair A(-)
4	I/O	TPA	Twisted Pair A(+)
5	-	TPA(R)	Twisted Pair B (Reference Ground)
6	-	VG	Power (Ground)
7	-	SC	Status Contact (reserved)
8	I	VP	Power (Voltage)
9	-	TPB(R)	Twisted Pair A (Reference Ground)

(2) Trigger connector

Connector model: D02-M15SAG-13L9E (Manufactured by JAE)

Pin assignment:

Pin No.	Signal	I/O
1	N.C	←
2	N.C	←
3	N.C	←
4	N.C	←
5	N.C	←
6	N.C	←
7	N.C	←
8	N.C	←
9	N.C	←
10	N.C	←
11	N.C	←
12	TRIG IN	I
13	TRIG GND	I
14	N.C	←
15	N.C	←



Connector pin assignment
15pin (socket)

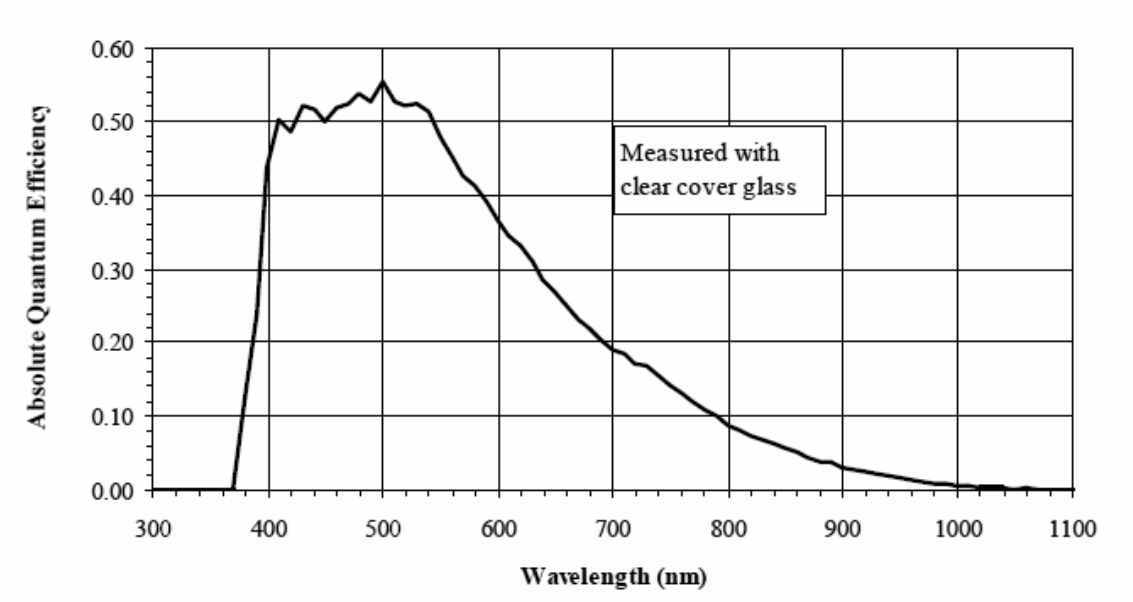
* Above figure is connector view from insert side

[Notice]

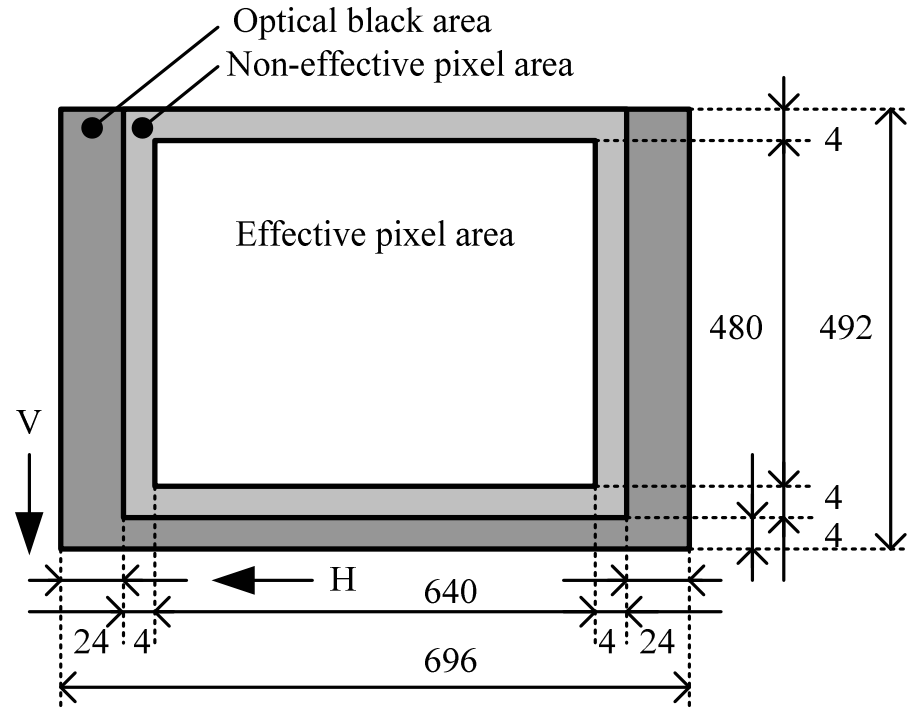
- Before connecting or disconnecting the connector, make sure the camera power is OFF (IEEE1394 cable is not connected).
- When combining with the I/F board and the image processing device of each company, confirm and use the combination of hardware and software.
  Our company doesn't guarantee for the combination of the I/F board and the image processing device of each company.

[Typical spectral response]

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



[Optical black arrangement chart]



[Element structure]

Total pixels: 696 (H) x 492 (V)

Video output effective pixels: 640 (H) x 480 (V)

Optical black: Horizontal Front 24 pixels, Rear 24 pixels

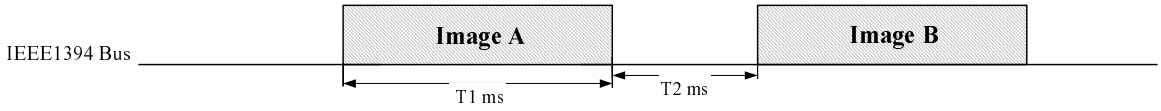
Vertical Front 0 pixels, Rear 4 pixels

7. Timing chart

Using Isochronous transmission of IEEE1394, the image data of this camera are output. It is necessary that this camera can use Isochronous zone without the restriction of other nodes.

When the node, which is performing Isochronous transmission, is on IEEE1394 local bus simultaneously with this camera, it is not as follows.

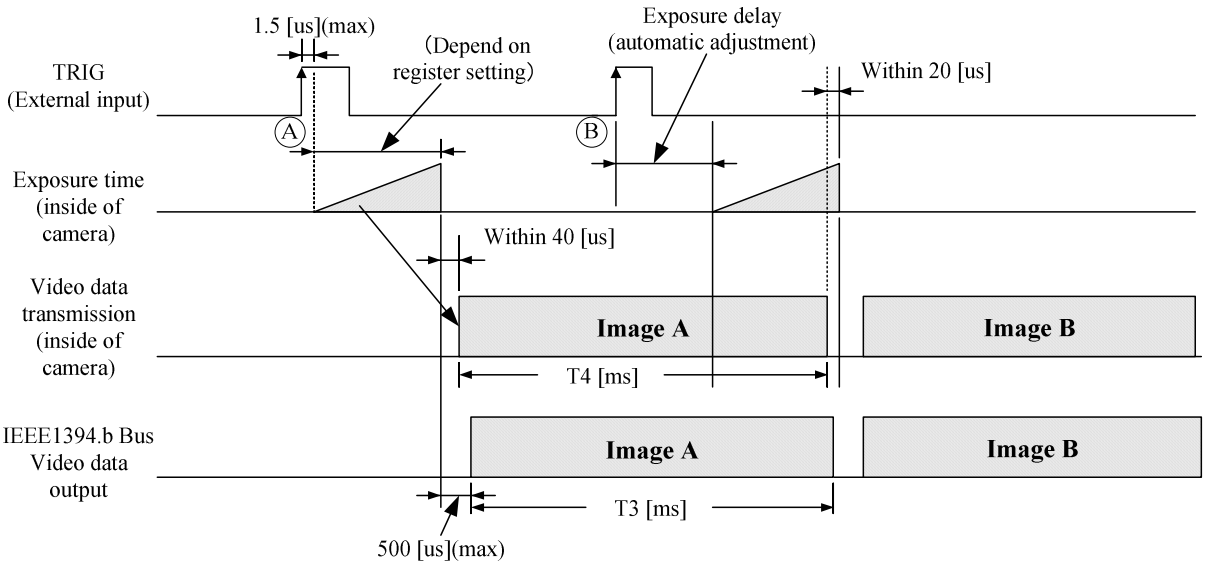
(1) Normal shutter mode



Readout lines	Frame rate	T1 [ms]	T2 [ms]
480H	133	7.1	0.4
	100	9.5	0.5
	66	14.1	0.9
	50	18.9	1.1
360H	170	5.4	0.5
	128	7.1	0.6
	85	10.6	1.1
	64	14.1	1.5
240H (include 1/2 binning mode)	240	3.6	0.5
	180	4.8	0.7
	120	7.1	1.1
	90	9.5	1.5
120H	430	1.9	0.4
	322	2.4	0.6
	215	3.6	1
	161	4.7	1.4

(2) Random trigger shutter mode

FIX mode



[About exposure delay time]

When the next trigger is input while the internal transmission (above figure B) in process, the picture noise might occur. To avoid picture noise the exposure start time will be automatically adjusted.

The exposure time will be relative to the adjustment.

The amount of the adjustment is the same both exposure time and the end time.

The exposure time reaches the register setting value.

Readout lines	Framerate	T3 [ms]	T4 [ms]
480H	133	7.1	7.5
	100	9.5	7.5
	66	14.1	7.5
	50	18.9	7.5
360H	170	5.4	5.7
	128	7.1	5.7
	85	10.6	5.7
	64	14.1	5.7
240H (include 1/2 buinninf mode)	240	3.6	4
	180	4.8	4
	120	7.1	4
	90	9.5	4
120H	430	1.9	2.3
	322	2.4	2.3
	215	3.6	2.3
	161	4.7	2.3

[Random trigger shutter exposure delay time]

In the random trigger shutter mode, there is an exposure delay time as follows.

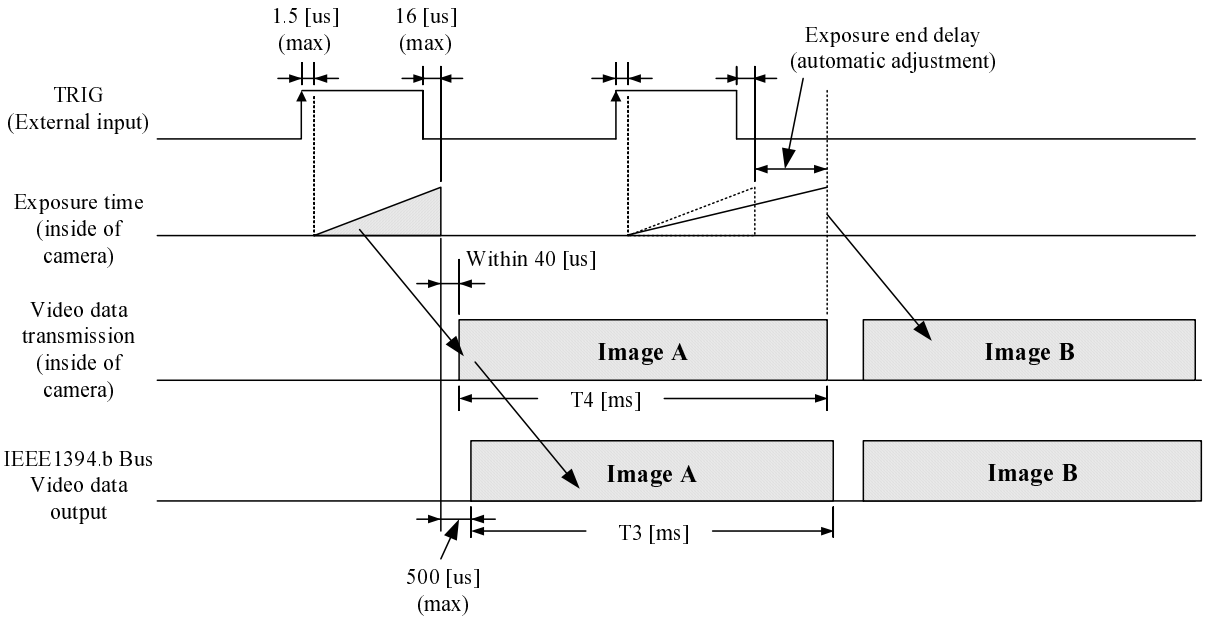
The exposure time depends on a setting value, the end at the exposure time is delayed.

Case1: When the camera accepts a trigger plus, that one output no image, then an exposure delay time is approx. 2.5 us from the rising edge of the TRIG signal to the start of exposure.

Case2: When the camera accepts a trigger plus, that one output an image, to prevent from noises into the outputting image, the camera wait starting exposure until next HD plus (internal).

Case3: If the end of the exposure is faster than the end of outputting current image in case 2, the camera wait for starting exposure until next HD plus(internal) that the end of the exposure is later than the end of outputting current image.

Pulse mode



[About exposure delay time]

When the next trigger is input while the internal transmission (above figure B) in process, the picture noise might occur. To avoid picture noise the exposure start time will be automatically adjusted. The exposure time will be relative to the adjustment.

In this case, the exposure time will be longer than that of the pulse width of trigger signal.

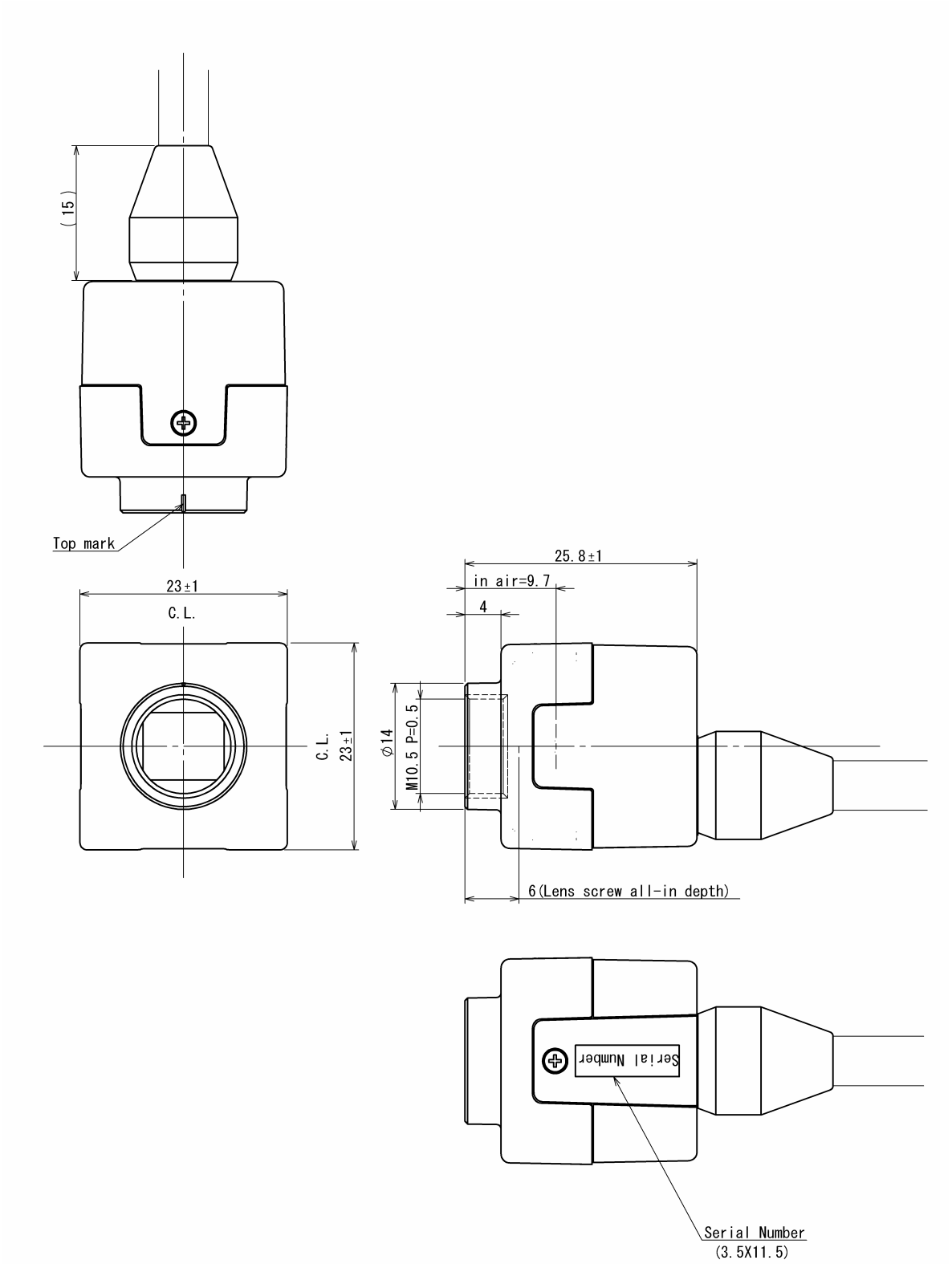
Please input a trigger signal to the timing which serves as an exposure end after the internal image transmission ends.

[Notes of trigger mode]

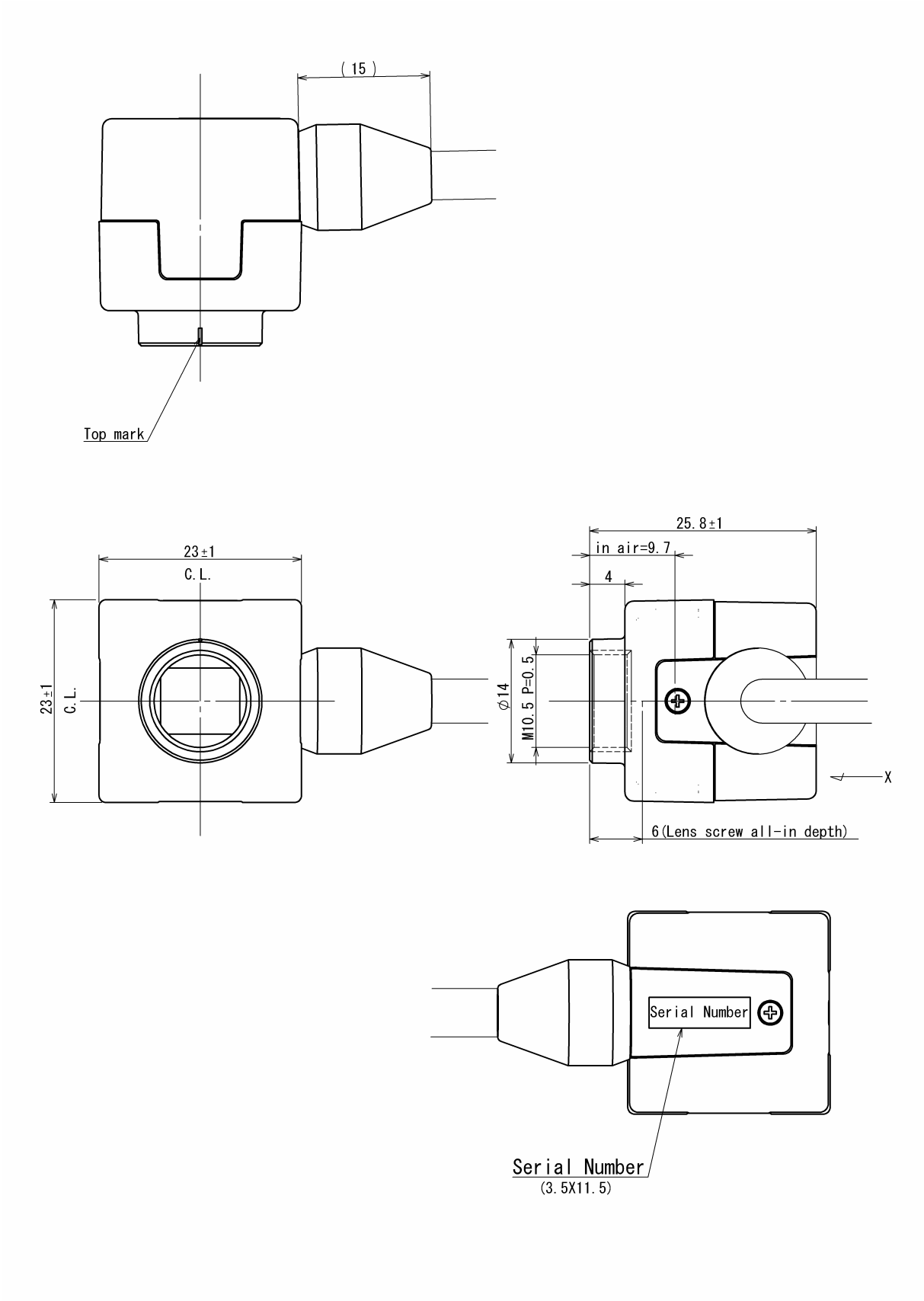
When the interval of the input trigger signal is extremely short, or when the trigger signal is noisy, there is a possibility of causing the malfunction. In this case, please input a proper trigger signal.

8. Outline Drawing

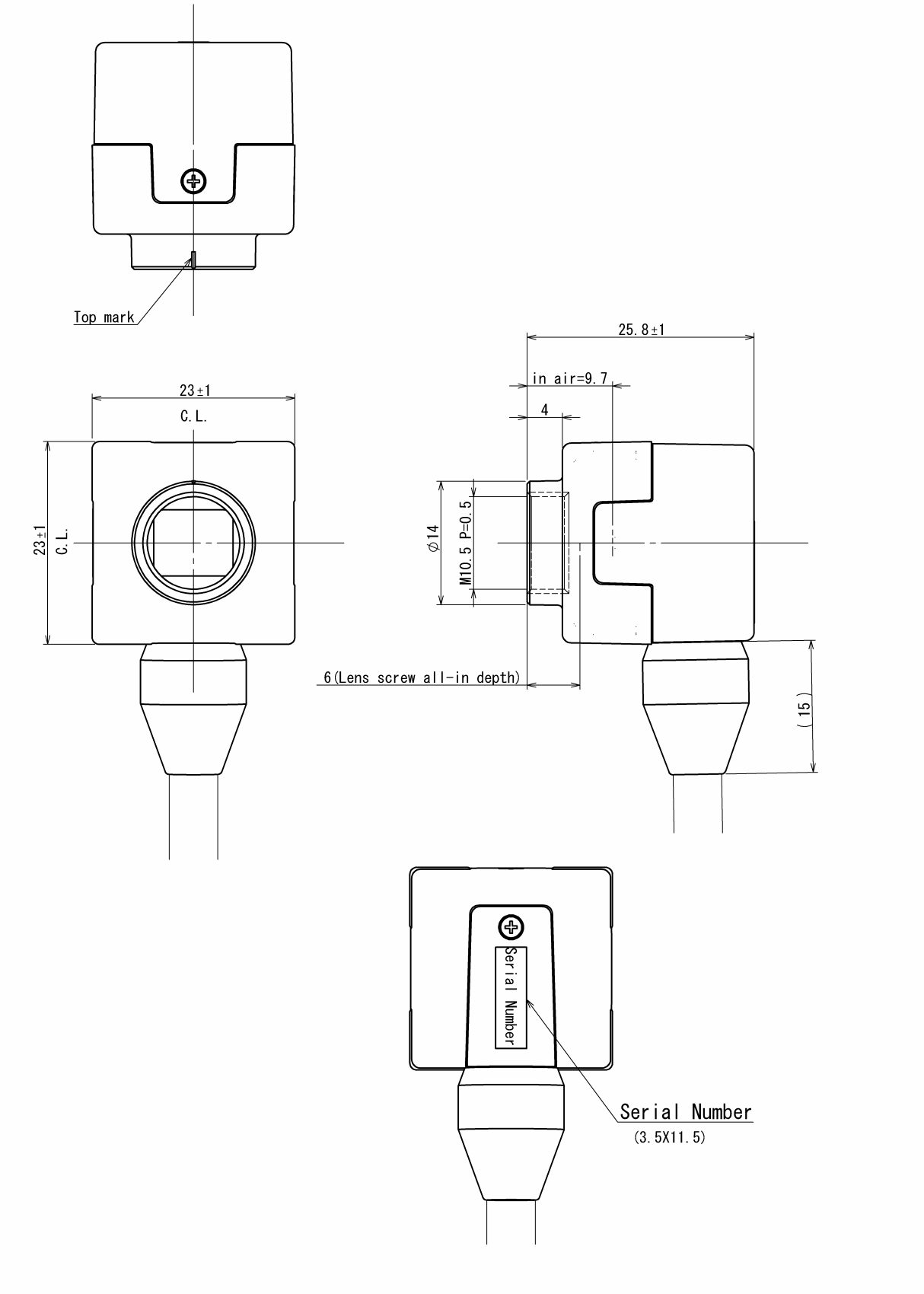
Outline drawing of CS8581QFV-**



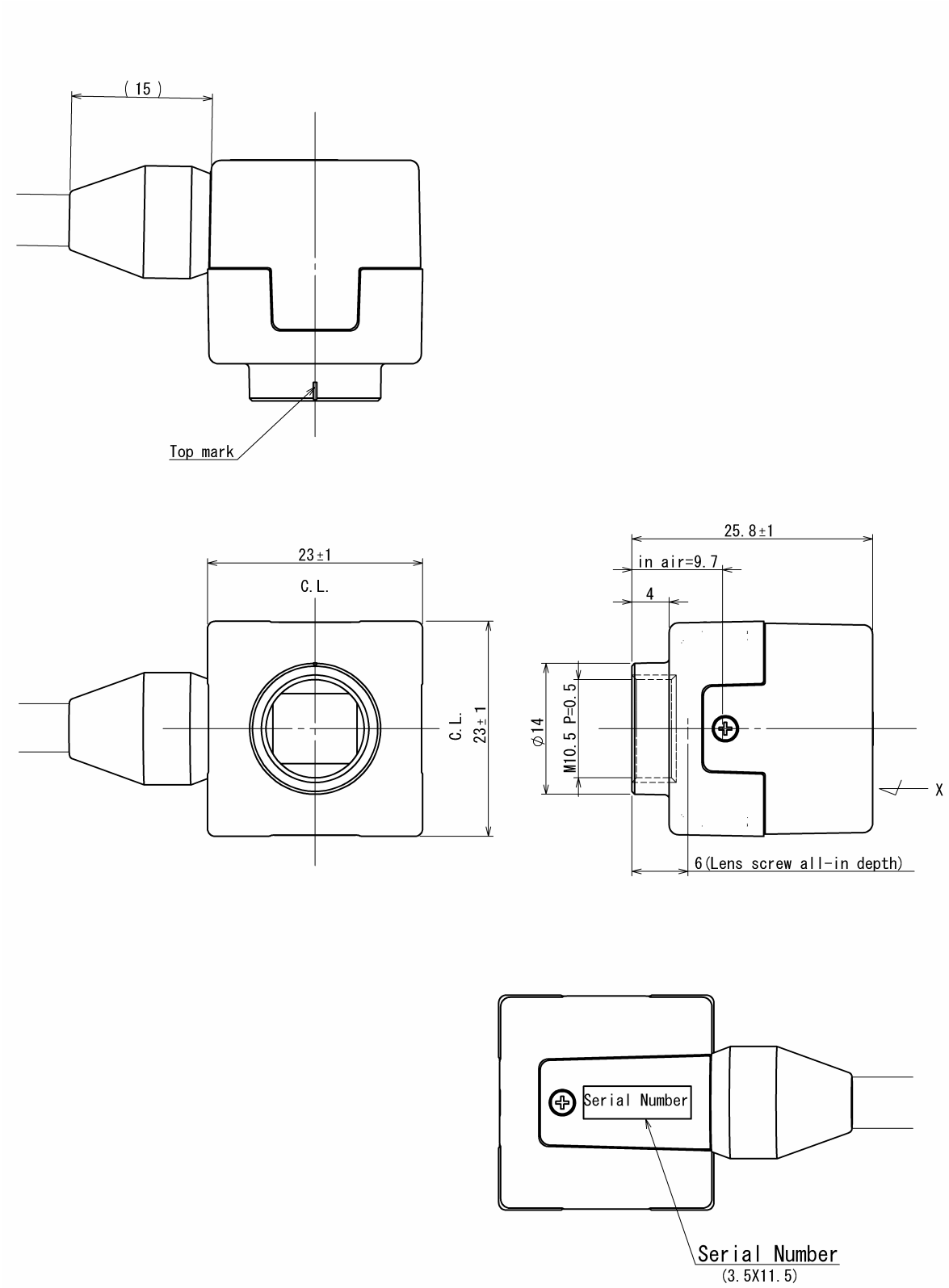
Outline drawing of CS8581QFW-**



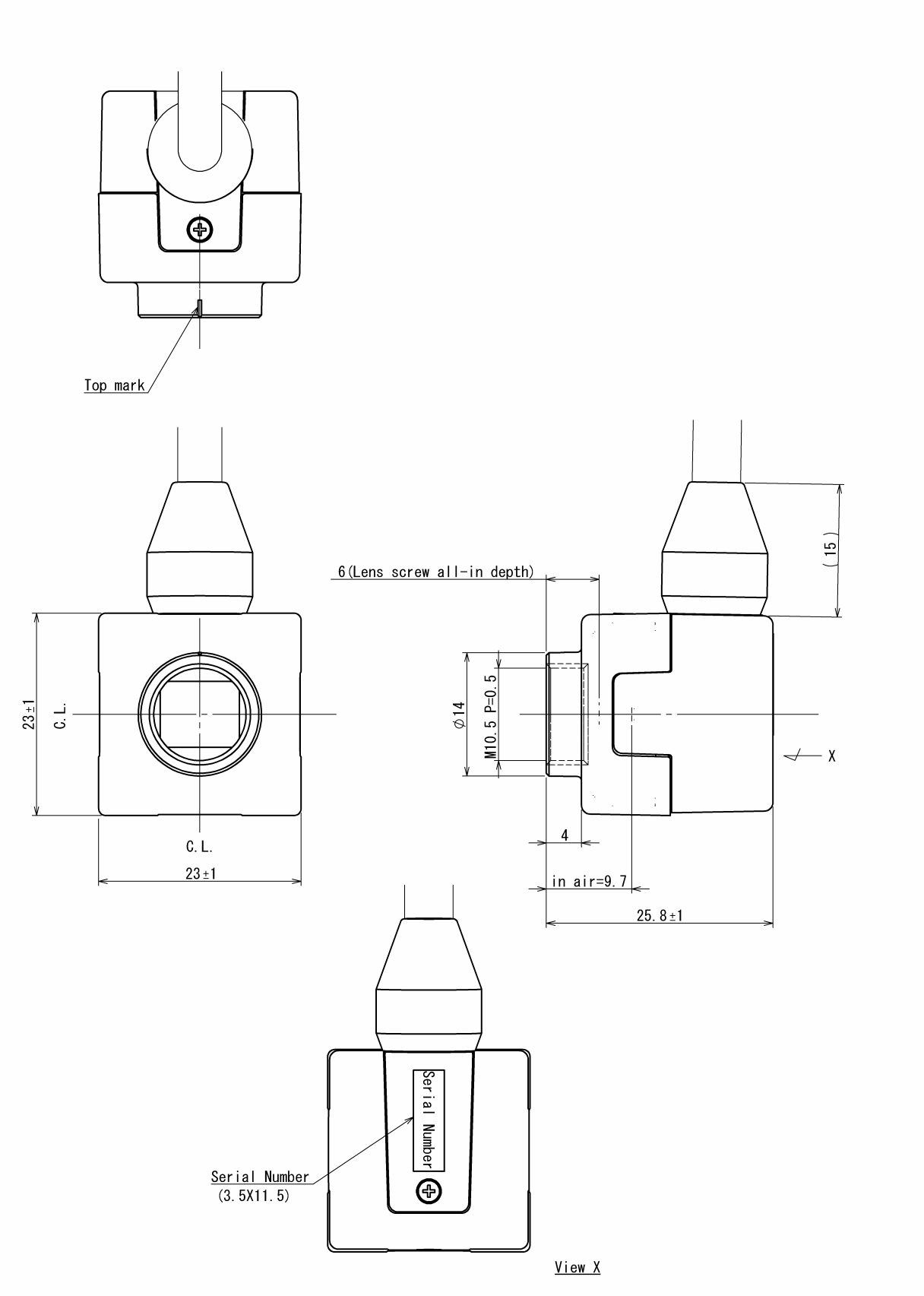
Outline drawing of CS8581QFX-**



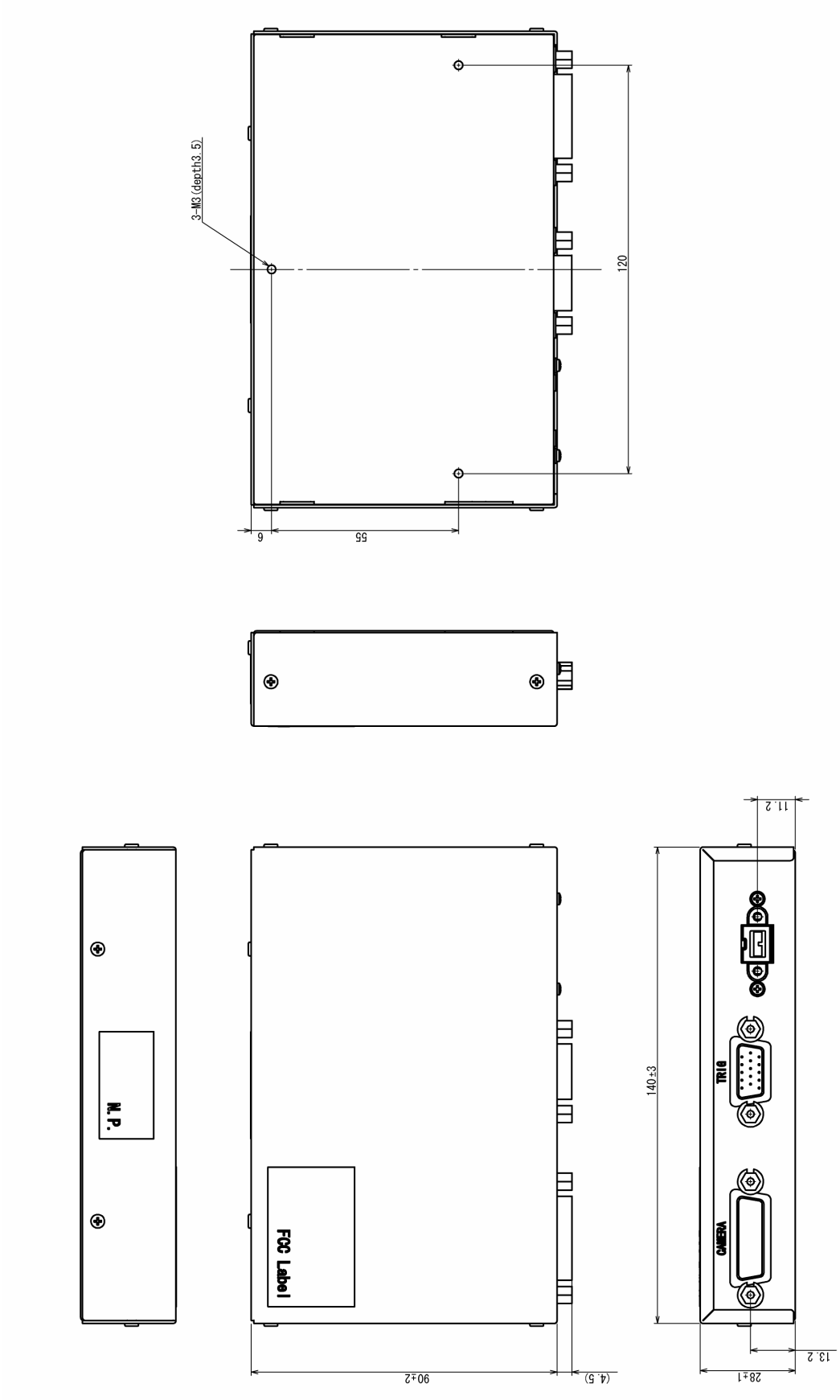
Outline drawing of CS8581QFY-**



Outline drawing of CS8581QFZ-**



Camera control unit



TOSHIBA TELI CORPORATION

Head Office : 7-1-4, Asahigaoka, Hino-shi, Tokyo, 191-0065, Japan
(Overseas Sales Department)
Phone : +81-42-589-8771
Fax : +81-42-589-8774

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

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.

This document is a provisional specification, so that the information contained in this document is subject to change without notice.
May. 14. 2008

Documents No. D4143407G