



3 Layers CMOS Color Camera CSF5M7C3L18NR

Specifications

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TOSHIBA TELI CORPORATION

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- Memo -

CASES FOR INDEMNITY (LIMITED WARRANTY)

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

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

RESTRICTION FOR USE

- Should the equipment be used in the following conditions or environments, give consideration to safety measures and inform us of such usage:
 1. Use of the equipment in the conditions or environment contrary to those specified, or use outdoors.
 2. Use of the equipment in applications expected to cause potential hazard to people or property, which require special safety measures to be adopted.
- This product can be used under diverse operating conditions. Determination of applicability of equipment or devices concerned shall be determined after analysis or testing as necessary by the designer of such equipment or devices, or personnel related to the specifications. Such designer or personnel shall assure the performance and safety of the equipment or devices.
- This product is not designed or manufactured to be used for control of equipment directly concerned with human life (*1) or equipment relating to maintenance of public services/functions involving factors of safety (*2). Therefore, the product shall not be used for such applications.
 - (*1): Equipment directly concerned with human life refers to.
 - Medical equipment such as life-support systems, equipment for operating theaters.
 - Exhaust control equipment for exhaust gases such as toxic fumes or smoke.
 - Equipment mandatory to be installed by various laws and regulations such as the Fire Act or Building Standard Law
 - Equipment related to the above
 - (*2): Equipment relating to maintenance of public services/functions involving factors of safety refers to.
 - Traffic control systems for air transportation, railways, roads, or marine transportation
 - Equipment for nuclear power generation
 - Equipment related to the above

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.

- **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.

- **Camera cable**

It is very important to securing tighten the camera cable with using the screw lock. Failure to properly tighten the cable will deteriorate the performance of the camera.

- **Occurrence of moiré**

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

- **Occurrence of noise on the screen**

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

- **Handling of the protective cap**

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

- **If the equipment is not to be used for a long duration**

Turn off power to the camera for safety.

- **Maintenance**

Turn off power to the equipment and wipe it with a dry cloth.

If it becomes severely contaminated, gently wipe the affected areas with a soft cloth dampened with diluted neutral detergent. Never use alcohol, benzene, thinner, or other chemicals because such chemicals may damage or discolor the paint and indications.

If the image pickup surface becomes dusty, contaminated, or scratched, consult your sales representative.

- **Disposal**

When disposing of the camera, it may be necessary to disassemble it into separate parts, in accordance with the laws and regulations of your country and/or municipality concerning environmental contamination.

1. Overview

This CMOS color camera is a high performance, high-resolution color camera which utilizes a sophisticated three layers of 1/1.8 type sensor mounted on a special single chip CMOS sensor.

2. Features

- **High frame rate and high resolution**

Special CMOS technology of 1,500,000 pixels stacked on three layers of special single chip CMOS provide the high resolution. (150*3 Mega pixel equivalency). The special design of the 3 layers CMOS sensor allows an output a signal from each RGB (one pixel by three layers of structure of a photo detector) which sharpens the image with little interference and moiré.

- **Camera Head Separate Type**

Advanced engineering of this camera allows for a small, lightweight of a camera head by separating the camera head from the controller.

Normal camera cable length is 3.0m.

- **IEEE1394 interface**

Performs video output and camera control via the signal digital bus standard IEEE1394.b interface.

Data transfer is at 800Mbps that can output video data of high frame rate.

It is bilingual standard.

- **IIDC 1394-based Digital Camera Specification Ver1.31**

It can perform camera control easily to be based on IIDC 1394-based Digital Camera Specification Ver.1.31 which is an industrial camera standard of international.

- **Random trigger shutter**

The random trigger shutter function provides images in any timing by input of an external trigger signal.

Trigger control from PC is possible.

- **Scalable**

Selectable video output area. It can be higher frame rate by reducing vertical output area. And can be reduce occupied data rate of IEEE1394 by reducing horizontal output area.

- **Binning readout mode**

Fast retrieval of all pixels fast by I group 2*2 four pixels.

3. Configuration

- (1) Camera Head 1
 - (2) Camera Control Unit 1
 - (3) Camera Cable (3m) 1
 - (4) Accessories
 - Instruction Manual (Japanese) 1
 - Instruction Manual (English) 1
- * No application software is attached to this camera.

4. Optional part

- (1) Camera mounting kit CPT3130
 - * Contact your dealer / distributor for details of option units.

5. Functions

(1) Setup-level setting

You can set a setup level. Setting of 0LSB - 32LSB is possible.

(2) White balance

There are two types of white balancing mode, MWB (Manual White Balance) and OPWB (One Push White Balance). You can set white balancing mode, according to the subject and purpose.

(3) Gamma correction

You can set gamma correction ON/OFF.

* The user cannot adjust the correction amount.

(4) Electronic shutter mode switching

Switching the shutter modes by selecting the setting value of the command status register of the camera via the IEEE1394 serial bus. There are three kinds of shutter adjustments.

- Normal shutter

Performs exposure control via the internal synchronization signal.

- AE (Auto Exposure) The brightness is adjusted automatically by the average photometry of the entire screen.
- Manual value setting You set an exposure with a manual than a value to pre-set.

- 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.

The random trigger shutter of this camera can be operated in two types of mode. How to determine the exposure time differs depending on the mode.

- A rolling Shutter mode An exposure is decided in a set point of a normal shutter manual.
- A global Reset mode An exposure is decided by pulse width of a trigger signal.

* In the global reset mode, it is necessary for a global reset mode to combine mechanical shutters with every line because exposures are different.

(5) Scalable mode

This camera has the scalable mode that can read out defined area of the screen. Only continuous rectangle units can be selected, concave or convex shape cannot be selected.

- Start address: $\{\text{Unit size width} * m(H)\} * \{\text{Unit size height} * n(V)\}$

m, n = integer

The image of maximum unit size or less can be selected.

- Window size: $\{\text{Unit size width} * i(H)\} * \{\text{Unit size height} * j(V)\}$

i, j = integer

The image of maximum unit size or less can be selected.

Only one window can be selected.

Format	Mode	Start position unit size		Size unit size	
		width(H)	height(V)	width(H)	height(V)
Format7	Mode0	50	50	350	250
	Mode2	25	25	175	125

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.

(6) Binning mode

Binning function is able to retrieve a 2x2 pixel for one pixel. This mode allows for fast retrieval of all pixels.

Format	Mode	Binning Pixel Number	Number of Horizontal pixels	Number of Vertical pixels	Frame rate
Format7	Mode0	1×1	1400	1000	Approx. 6.8fps
	Mode2	2×2	700	500	Approx. 25fps

6. Specifications

[Electrical specification]

- | | |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| (1) Imager | Three layers of special single chip CMOS sensors |
| •Number of total pixels | 1440(H) * 1088(V) * 3(L) |
| •Number of effective pixels | 1420(H) * 1060(V) * 3(L) |
| •Number of Video out pixels | 1400(H) * 1000(V) * 3(L) |
| •Scanning area | 1/1.8 type |
| •Pixel size | 5.00μm(H) * 5.00μm(V) |
| (2) Scan method | Progressive |
| (3) Synchronization method | Internal synchronization |
| (4) Sensitivity | 3000lx, F8, 5000K |
| (5) Minimum subject illuminance | 50lx (F1.4, GAIN Maximum, video level 50 %, Gamma ON) |
| (6) Video Output | IEEE std 1394b-2002 conformity |
| •Output mode | RGB 24bit / YUV422 16bit |
| •Output number of pixels | 350(H) * 250(V) to 1400(H) * 1000(V) [Format7 / mode0]
175(H) * 125(V) to 700(H) * 500(V) [Format7 / mode2] |
| (7) Gain | 0dB fixation |
| (8) Setup-level | 0LSB to 32LSB |
| (9) White balance | MWB/OPWB switching |
| -MWB (Manual White Balance) | |
| •Setting range | 3000 K to 6500 K |
| •Setting method | R-gain and B-gain can be set independently. |
| -OPWB (One Push White Balance) | |
| •Effective range | 3000 K to 6500 K |
| •Effective area | Full screen |
| * When the random shutter is active, OPWB function is disabled. | |
| (10) Gamma correction | ON/OFF switching |
| (11) Power supply | DC +8 to +24 V (ripple 100 mV(p-p) or less) |
| (12) Power consumption | 3.8 W (Maximum) |

* When connecting or changing the camera head cable, it is important that an IEEE1394 cable is not connected (a power supply not being supplied). This will potential harm the camera.

* The camera head and controller are matched and synchronized during the production process. It is essential that the serial numbers on the camera head and controller are matched to achieve optimal performance. Failure to match the serial numbers will result in a drastic loss of image performance.

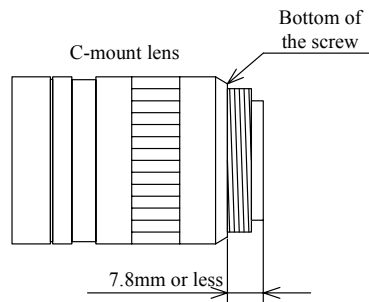
[Machine externals specification]

- (1) Lens mount C-mount

Notes on combination of C-mount lens:

- Depending on the lens you use, the performance of the camera may not be brought out fully due to the deterioration in resolution and brightness in the peripheral area, occurrence of a ghost, aberration and others. When you check the combination between the lens and camera, be sure to use the lens you actually use.

As for the C-mount lens used combining this camera, the projection distance from bottom of the screw should use 7.8mm or less.



- (2) Dimensions

- Camera Head $\phi 29 \text{ mm} * 38.5 \text{ mm (D)}$
- Camera Control Unit $110 \text{ mm (W)} * 28 \text{ mm (H)} * 156 \text{ mm (D)}$

- (3) Mass

- Camera Head Approx. 60 g
- Camera Control Unit Approx. 480 g

- (4) 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 10 to 90% (no condensation)

- Operating assurance

- Temperature -5 to 45°C
- Humidity 90% or less (no condensation)

- Storage assurance

- Temperature -20 to 60°C
- Humidity 95% or less (no condensation)

(2) EMC conditions

- EMI (Electro-Magnetic interference)

- EN61000-6-4 conformity
- FCC part15 Subpart B class A conformity

- EMS (Electro-Magnetic susceptibility)

- EN61000-6-2 conformity

Notes on Conformity of the EMC:

- About the standard of this machine, it has guaranteed in the conditions combined with IEEE1394 Cable "1394C-9B-9B-4500mm (Manufactured by HORIZON CO., LTD)".

When used combining parts other than specification of our company, I ask you to have final EMC conformity checked of a visitor with a machine and the whole equipment.

[Environmental Correspondence]

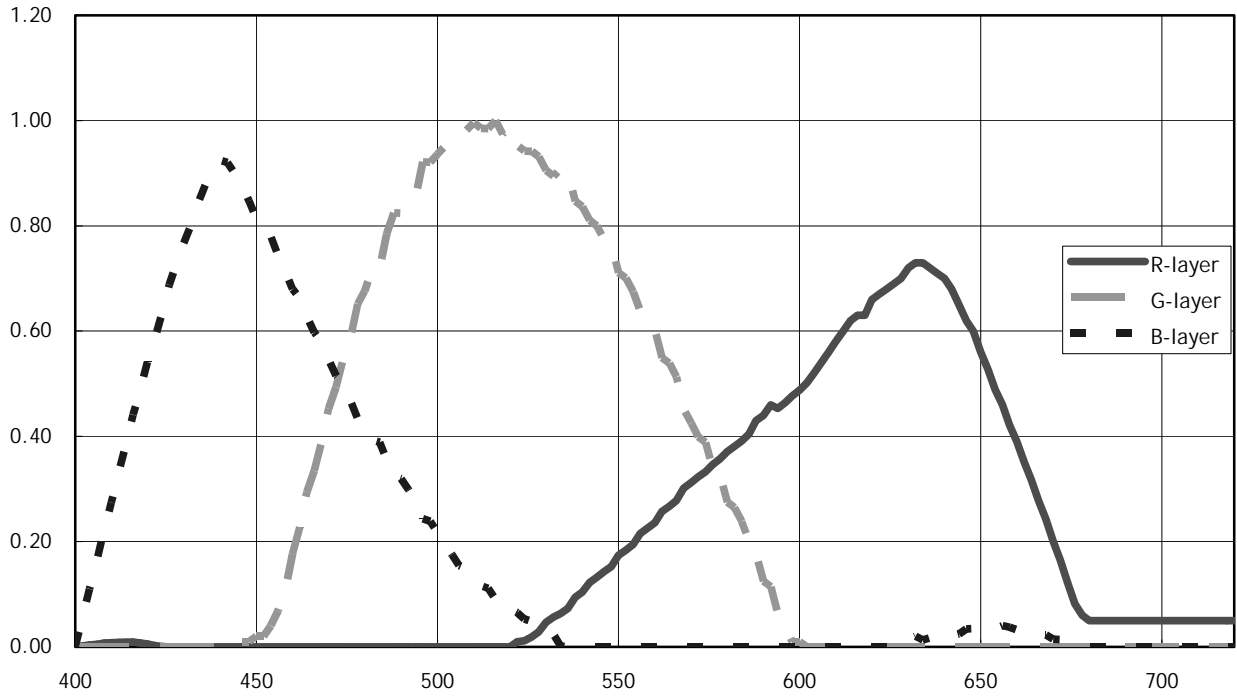
(1) RoHS

Non-conformity

[Typical spectral response]

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

* It includes an IR cut filter characteristic.



[Connector pin assignment]

(1) IEEE1394 interface connector (Bilingual connector)

- Connector (Camera side) 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 A (Reference Ground)
6	-	V _G	Power (Ground)
7	-	SC	Status Contact (reserved)
8	I	V _P	Power (Voltage)
9	-	TPB(R)	Twisted Pair B (Reference Ground)

(2) Connector for trigger signal input

- Connector (Camera side) HR10A-10R-12PB (Manufactured by HIROSE DENKI)

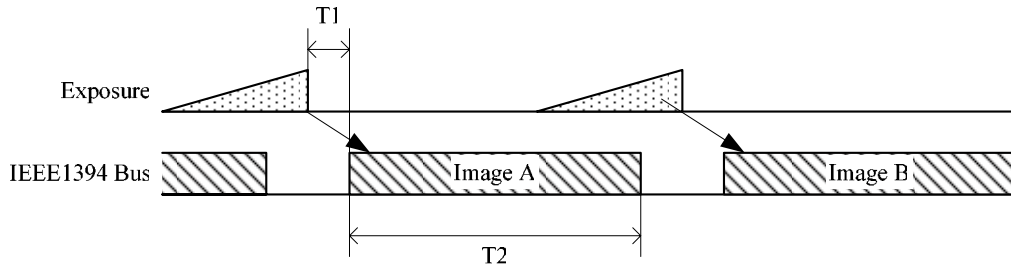
- Plug (Cable side) HR10A-10P-12S (Manufactured by HIROSE DENKI) or equivalents

- Pin assignment

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

7. Timing chart

[Normal Shutter]



Format7 Mode0

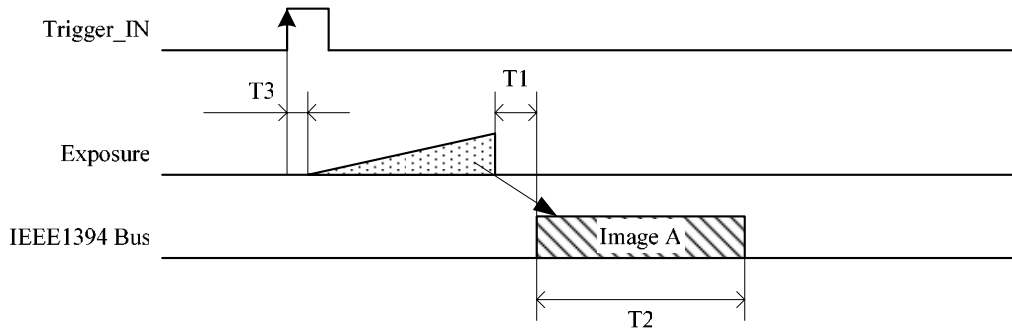
H [Pixel]	V [Line]	Frame rate [fps]	RGB 24bit		YUV422 16bit	
			T1 [ms]	T2 [ms]	T1 [ms]	T2 [ms]
1400	1000	6.87	0.6 (Max)	145.25	1.8 (Max)	145.38
	750	9.16		109.00		109.13
	500	13.72		72.88	72.75	
	250	27.33		36.50	36.50	
1050	1000	6.87		145.25	145.25	
	750	9.16		109.00	109.00	
	500	13.72		72.88	72.63	
	250	27.33		36.50	36.50	
700	1000	6.87		145.25	144.88	
	750	9.16		109.00	108.75	
	500	13.72		72.63	72.50	
	250	27.33		36.50	36.50	
350	1000	6.87		145.25	144.00	
	750	9.16		109.00	108.00	
	500	13.72		72.63	72.00	
	250	27.33		36.38	36.50	

Format7 Mode2

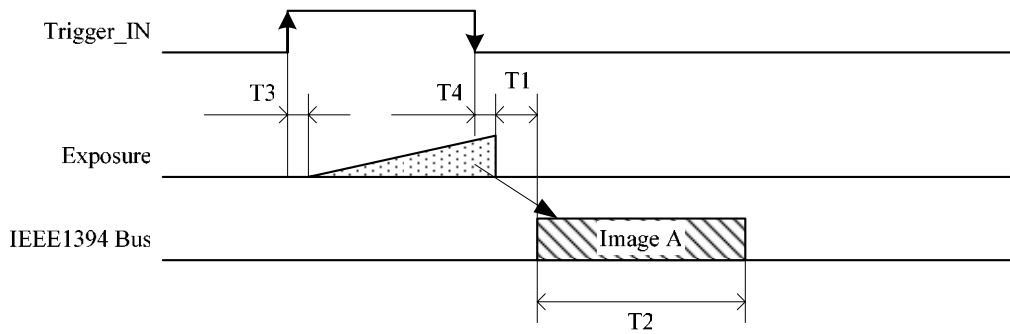
H [Pixel]	V [Line]	Frame rate [fps]	RGB 24bit		YUV422 16bit	
			T1 [ms]	T2 [ms]	T1 [ms]	T2 [ms]
700	500	25.01	0.5 (Max)	39.9	0.6 (Max)	39.9
	375	33.01		30.0		30.0
	250	49.82		20.0		20.0
	125	98.86		10.0		10.0
525	500	25.01		39.9		39.9
	375	33.01		30.0		29.9
	250	49.82		20.0		20.0
	125	98.86		10.0		10.0
300	500	25.01		39.9		39.8
	375	33.01		29.9		30.0
	250	49.82		20.0		20.0
	125	98.86		10.0		10.0
175	500	25.01		39.9		39.8
	375	33.01		29.9		29.8
	250	49.82		20.0		19.9
	125	98.86		10.0		10.0

[Ramdam Trig Shutter]

(1) Preset Mode



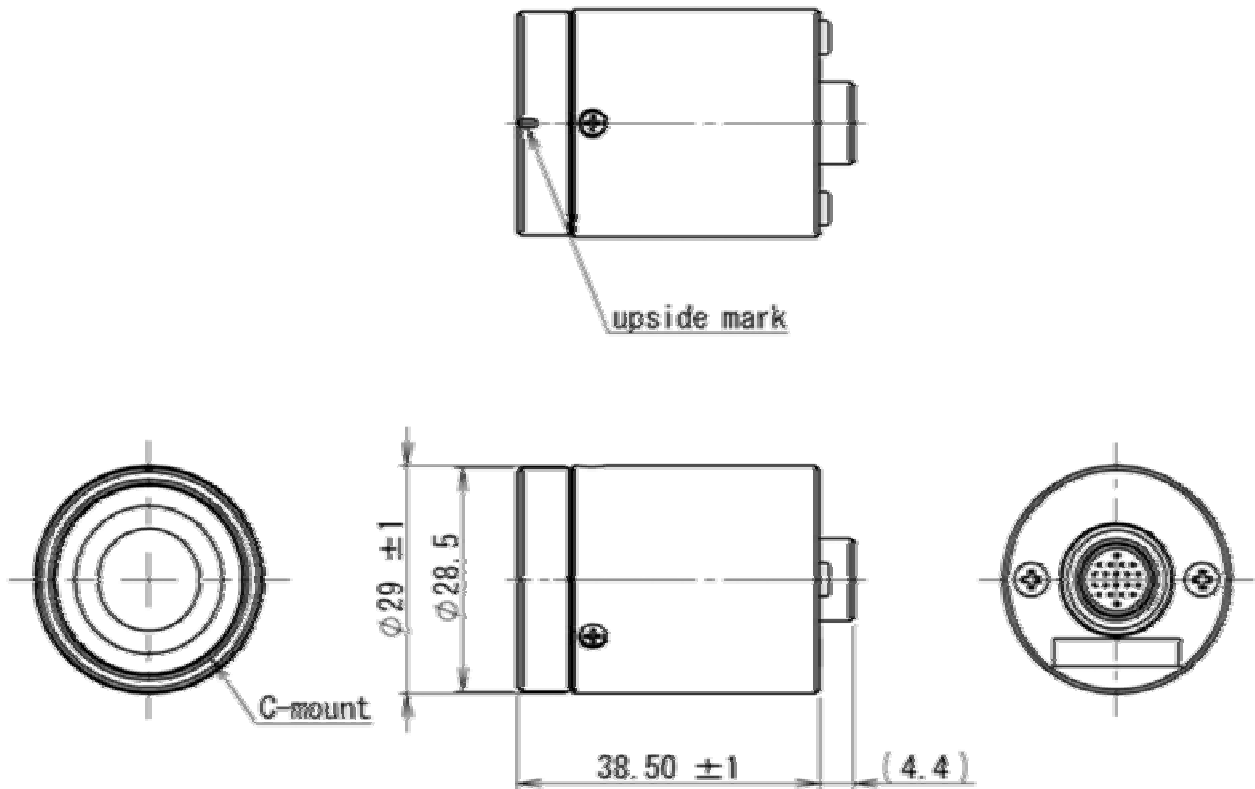
(2) Pulse width Mode



T1	T2	T3	T4
[ms]	[ms]	[us]	[us]
It is same as normal shutter		0.6	0.6

8. Outline Drawing

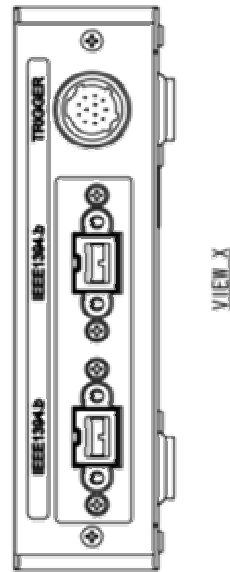
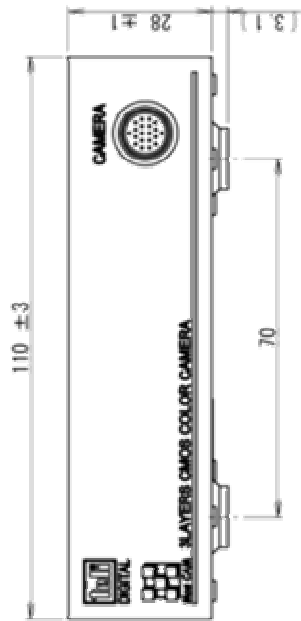
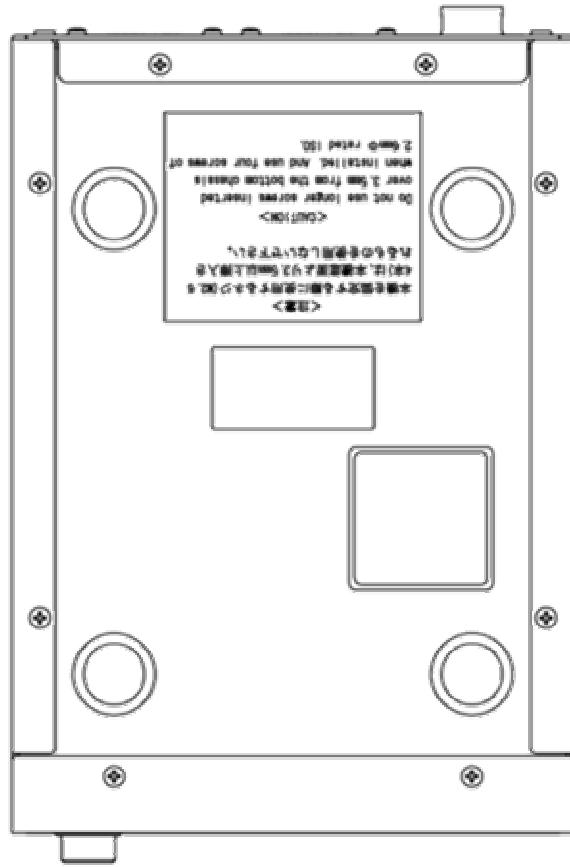
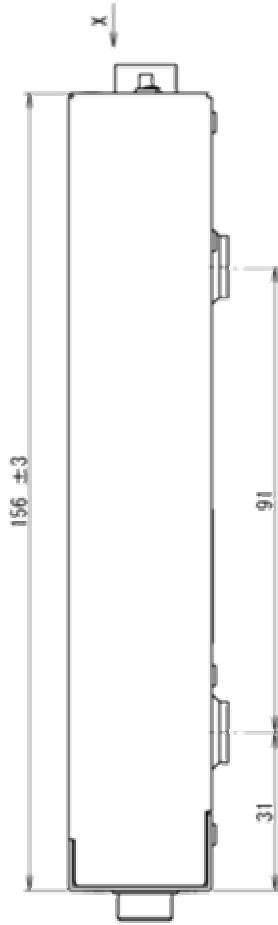
[Camera Head]



* When connecting or changing the camera head cable, it is important that an IEEE1394 cable is not connected (a power supply not being supplied). This will potential harm the camera.

* The camera head and controller are matched and synchronized during the production process. It is essential that the serial numbers on the camera head and controller are matched to achieve optimal performance. Failure to match the serial numbers will result in a drastic loss of image performance.

[Camera Control Unit]





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