



**VISION:analog™**

**29mm Cubic XGA  
Analog B/W Camera**

**VCC-G20X30T1**

**Product Specification  
& Operational Manual**

**CIS Corporation**

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## 1. Scope of Application

This is to describe VCC-G20X30T1, XGA B/W CCD camera. All specifications contained herein are subject to change without prior notice. Reproduction in whole or in part is prohibited.

## 2. Handling Precautions

The camera must not be used for any nuclear equipments or aerospace equipments with which mechanical failure or malfunction could result in serious bodily injury or loss of human life. Our warranty does not apply to damages or defects caused by irregular and/or abnormal use of the product.

Please observe all warnings and cautions stated below.

Our warranty does not apply to damages or malfunctions caused by neglecting these precautions.

- Do not use or store the camera in the following extreme conditions:
  - Extremely dusty or humid places.
  - Extremely hot or cold places (operating temperature  $-5^{\circ}\text{C}$  to  $+45^{\circ}\text{C}$ )
  - Close to generators of powerful electromagnetic radiation such as radio or TV transmitters.
  - Places subject to fluorescent light reflections.
  - Places subject to unstable (flickering, etc.) lighting conditions.
  - Places subject to strong vibration.
- Remove dust or dirt on the surface of the lens with a blower.
- Do not apply excessive force or static electricity that could damage the camera.
- Do not shoot direct images that are extremely bright (e.g., light source, sun, etc.), and when camera is not in use, put the lens cap on.
- Follow the instructions in Chapter 6, "External connector pin assignment" for connecting the camera. Improper connection may cause damages not only to the camera but also to the connected devices.
- Confirm the mutual ground potential carefully and then connect the camera to monitors or computers. AC leaks from the connected devices may cause damages or destroy the camera.
- Do not apply excessive voltage. (Use only the specified voltage.) Unstable or improper power supply voltage may cause damages or malfunction of the camera.
- Make sure that the camera and peripheral equipments are properly connected before turning the camera on. Especially in INT/EXT sync signal settings, improper connection may cause damages to the camera and the connected devices.
- At least 5 seconds shall be waited to reboot the camera.

In case of abnormal operation, contact the distributor from whom you purchased the product.

### 3. Product Outline

VCC-G20X30T1 is a high-resolution industrial B/W camera module utilizing a 1/3-inch PS IT CCD. 800K pixels CCD image sensor with on-chip micro-lenses realizes high sensitivity and high resolution.

#### Key Features

- Sync. System
  - HD/VD External sync. input
  - Internal sync. output
  
- Electronic shutter
  - Electronic shutter speed switchable by rear panel switch  
1/30s ~ 1/10,000s : 8 steps
  - Electronic shutter switchable by trigger pulse width  
1/4s ~ 1/100,000s
  
- High frame rates
  - The followings are effective at trigger shutter operation.
  - 29.68 fps: Full Frame Scan Mode
  - 59.35 fps: Vertical Binning Mode
  - 89.14 fps: 1/3 Partial Scan Mode
  - 118.7 fps: 1/4 Partial Scan Mode
  
- 29mm Cubic in size
  - Its small size, 29mm cubic, and light weight, 44g, makes it a best match for use in embedded systems for image calibration and microscopic applications.

## 4. Specification

## 4.1. General Specification

Item	Specification	Remarks
Power consumption	2.0 W (with rated supply)	
Power requirements	DC +12V ± 10%	
Pick up device	1/3" Interline Transfer B/W CCD Total pixel number 1034(H) × 779(V) Effective pixel number 1024(H) × 768(V) Unit cell size 4.65 μm(H) × 4.65 μm(V) Square pixel	ICX204AL (Sony)
Spectral response	Refer to 4.4. CCD Spectral response (representative value).	
Synchronization System	Internal Sync. HD/VD External Sync. Input signal level: 2~5Vp-p, TTL Input Automatically switched by HD recognition. Frequency allowance: 28~31MHz Jitter: under 20ns	Jumper resistance of 75 Ω terminal is HR70, 29.5MHz.
Scanning system Non-interlace scan	1/30sec Full Frame Scan (Standard operation)(External sync.) Horizontal frequency 23.622 KHz (23.228 KHz) Vertical frequency 29.676 Hz (29.18 Hz) Pixel clock 30.0 MHz (29.5 MHz)	1270 PCLK 796 HD
	1/60sec Binning Scan Horizontal frequency 23.622 KHz Vertical frequency 59.35 Hz Pixel clock 30.0 MHz	1270 PCLK 398 HD
	1/90sec Partial Scan Horizontal frequency 23.622 KHz Vertical frequency 89.14 Hz Pixel clock 30.0 MHz	1270 PCLK 265 HD
	1/120sec Partial Scan Horizontal frequency 23.622 KHz Vertical frequency 118.7 Hz Pixel clock 30.0 MHz	1270 PCLK 199 HD
Video output signal	Analog output 1.0V(p-p) Sync. negative, 75 Ω unbalanced, DC connect White clip level 820 ± 50mVp-p Setup level 25 ± 10mVp-p Sync level 290 ± 30mVp-p DC level 500 ± 100mV	

Item	Specification	Remarks
Trigger input	Input signal      Trigger Positive, Rising edge. Input signal level      Low 0.5Vmax , High 4Vmin Input trigger width      4 $\mu$ s ~ 250ms	
Normal shutter operation	Setting by the rear switch. OFF, 1/125, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000s	
External trigger shutter operation	Setting by the rear switch. 1/30, 1/125, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000s Setting by trigger pulse width. 10us ~ 250ms (1/100,000s ~ 1/4s)	
Sensitivity	F5.6    400 lx (Exposure time 1/30sec, Gain 0dB, 3200° K)	
Minimum illumination	F1.4    2 lx (Exposure time 1/30sec, Gain Max, VS 50IRE)	
S/N ratio	52 dB (Gain 0dB)	
Horizontal resolution	768 TV line	
Gain	Fix      0 dB Manual    0 ~ +12 dB	
$\gamma$ Gamma	1.0 fixed	
Dimension	Refer to overall dimension drawing (Clause 7) 29mm(H) x 29mm(W) x 29mm(D) (excluding protruding part)	
Mass	44g	
Lens Mount	C Mount	
Flange Back	Flange focal length fixed	
Optical axis accuracy	Within $\phi$ 0.4 from the center	

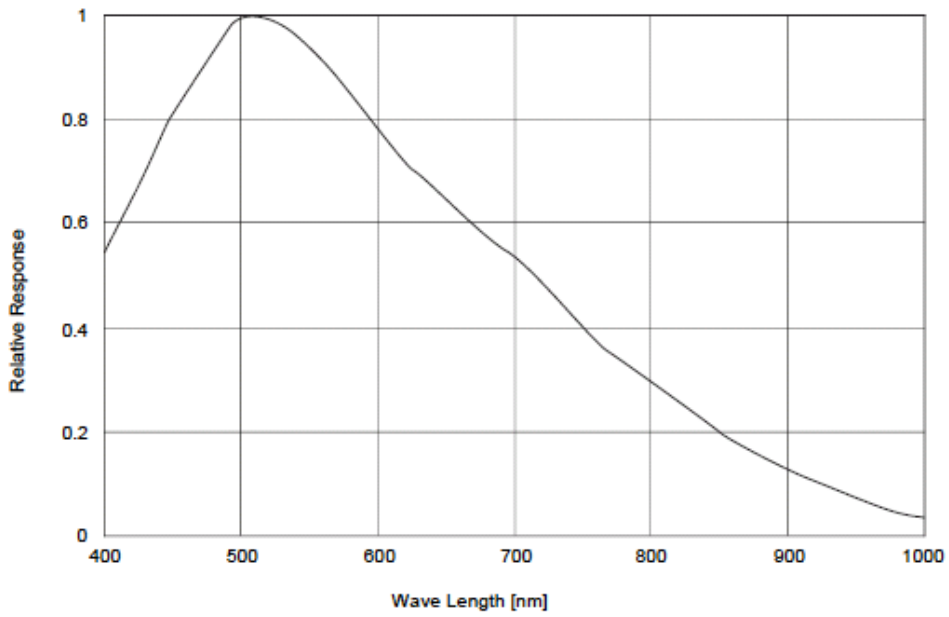
## 4.2. Durability

Item	Specification	Remarks
Operation temperature	Specifications guaranteed: $-0^{\circ}\text{C} \sim + 40^{\circ}\text{C}$ with RH 20~80% Operation guaranteed: $-5^{\circ}\text{C} \sim + 45^{\circ}\text{C}$ with RH 20~80% With no condensation	
Storage temperature	$-25^{\circ}\text{C} \sim + 60^{\circ}\text{C}$ with RH 20~90% With no condensation	
Vibration resistance	Acceleration $98\text{m/S}^2$ (10G) Vibration frequency 20~200Hz Direction X Y Z 3 directions Testing time 120min for each direction  No malfunction shall occur after testing the above.	
Shock resistance	Acceleration $490\text{m/S}^2$ (50G) Direction 6 directions	
Grounded mechanical chassis/Insulation	Mechanical chassis of VCC-G20X30T1 is grounded, therefore, use an insulated tripod adaptor when the camera shall be isolated.	

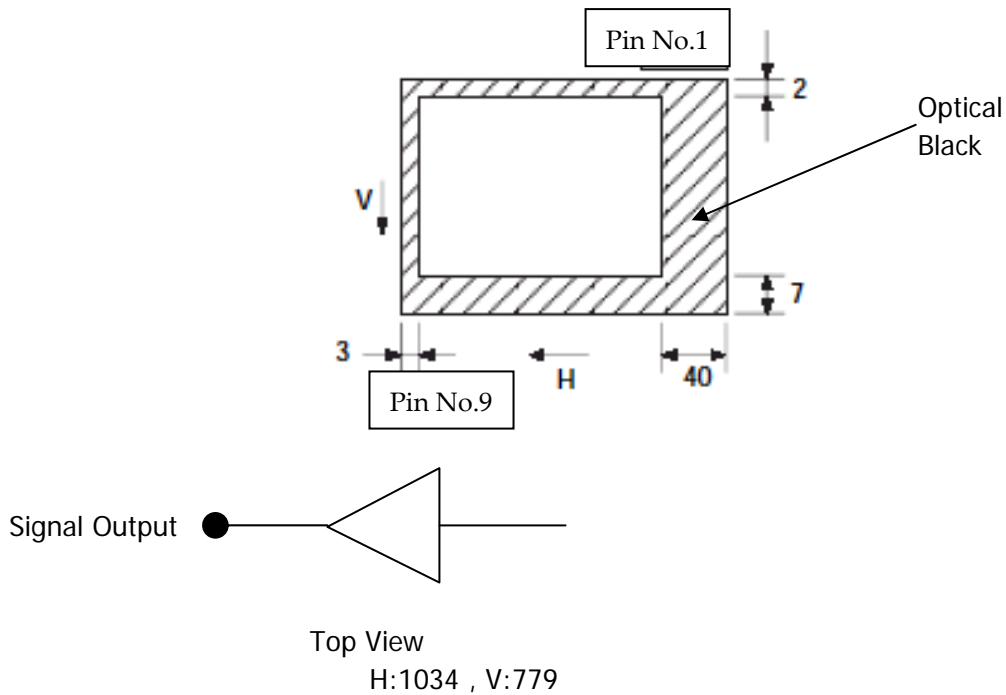
## 4.3. Safety/Quality Standards

- UL Standard  
Conform to UL standard including materials and others.
- CE Standard  
Conform to EN55022:2006 Class B  
Conform to EN61000-6-2: 2005
- RoHS  
Conform to RoHS.
- FCC Compliance Conform to FCC Class A Digital Device  
This device 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.

### 4.4. CCD Spectral Response (Representative Value)



### 4.5. Optical Black Layout

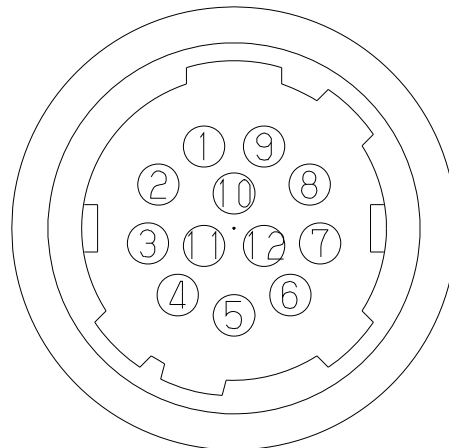




5. External Connector Pin Assignment

5.1. 12pins Circular Connector HR10-10R-12PA (HIROSE)

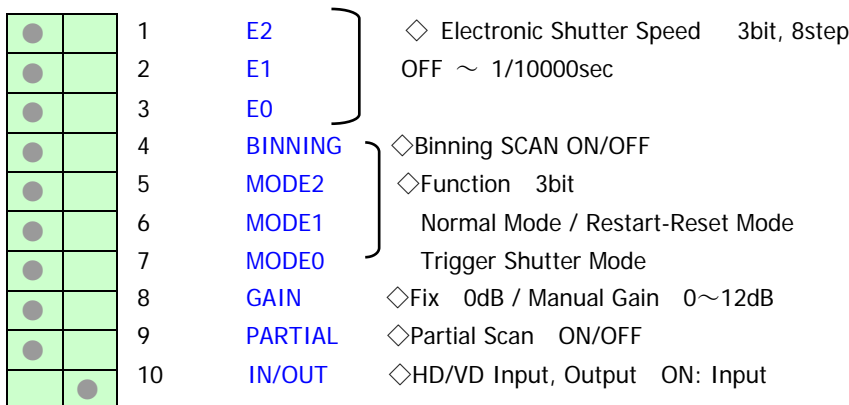
Pin No.	
1	GND
2	Power IN +12V
3	GND
4	Video Out
5	GND
6	HD In/Out
7	VD In/Out
8	GND
9	Partial
10	WEN Out
11	Trigger In
12	GND



Partial input can be done via rear switch No.9. It can be effective either turning switch No.9 on, or make the connector No.9 GND externally. (10KΩ pulls up partial input.)

5.2. Switch Settings

Rear panel switch function 10bit DIP-Switch



↑  
OFF

● indicates initial setting position.

## Rear Fixed Electronic Shutter Switch SW1, SW2, SW3

E2 1	E1 2	E0 3	Shutter Value	Actual Time at Normal Operation	Actual Time at Trigger Operation
<b>OFF</b>	<b>OFF</b>	<b>OFF</b>	OFF	33.3 ms	17.0 ms
OFF	OFF	ON	1/125 sec	8.0 ms	8.0 ms
OFF	ON	OFF	1/250 sec	4.0 ms	4.0 ms
OFF	ON	ON	1/500 sec	2.0 ms	2.0 ms
ON	OFF	OFF	1/1000 sec	1.0 ms	1.0 ms
ON	OFF	ON	1/2000 sec	488 us	504 us
ON	ON	OFF	1/4000 sec	236 us	250 us
ON	ON	ON	1/10000 sec	110 us	120 us

Note: At vertical binning mode and partial scan mode, the shutter speed set by SW will be invalid since the set frame rate will be its shutter speed. At trigger shutter mode, the shutter speed set by SW will be valid.

## Rear Switch for Scanning Mode Change SW4, SW9

Binning Partial Setting Mode

4	9		
<b>OFF</b>	<b>OFF</b>	30 fps	Full Frame Scan
ON	OFF	60 fps	Binning Scan
OFF	ON	60 fps	1/2 Partial Scan
ON	ON	120 fps	1/4 Partial Scan

## Rear Switch for Mode Change SW5, SW6, SW7

Mode2 5	Mode1 6	Mode 7	Scanning Mode
<b>OFF</b>	<b>OFF</b>	<b>OFF</b>	Normal Operation
OFF	ON	ON	Long Time Exposure Operation (Restart, Reset)
ON	OFF	OFF	Trigger Operation by Switch Setting (SYNC Rest)
ON	OFF	ON	Trigger Operation by Switch Setting (SYNC Non-reset)
ON	ON	OFF	Trigger Operation by Pulse Width Setting (SYNC Reset)
ON	ON	ON	Trigger Operation by Pulse Width Setting (SYNC Non-reset)

\* Do not set the mode other than those above.

## Rear Switch for Gain Setting SW8

8		
<b>OFF</b>	Fixed Gain	0 dB
ON	Manual Gain	0~12 dB

## Rear Switch for HD/VD Input Output SW10

10		
OFF	HD/VD Output	Valid at normal operation
<b>ON</b>	HD/VD Input	Valid at normal operation, long time exposure operation, and trigger shutter operation (non-reset)
	HD Input	Trigger shutter operation (reset)

6. Function

Table of Settings

Function	Normal mode	Restart-Reset mode	Trigger mode (Sync Reset type)	Trigger mode (Sync Non-reset)
Fixed Switch Shutter	○	×	○	○
Pulse Width Shutter	×	×	○	○
Vertical Binning Scan	×	○	○	○
Vertical Partial Scan	×	○	○	○
External HD/VD Input	○HD/VD	○HD/VD	○HD	○HD/VD
Internal HD/VD Output	○	×	○	×

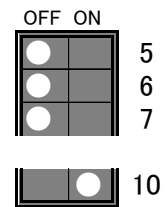
Normal mode

Progressive Scan, 30fps, non-trigger shutter operation is the normal mode setting.

HD/VD external input is valid only at full frame scan mode.

Note; Shutter function shall not be used at vertical binning mode and partial scan mode, since shutter function will be unstable.

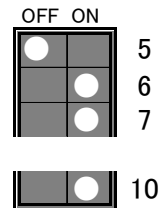
To output internal HD/VD, turn OFF switch 10.



Long time exposure operation, Restart-reset mode

In this mode, one picture image is read-out inputting EXT VD over 1VD at any timing and adding EXT HD externally. This mode is effective when sensitivity is insufficient with normal exposure time, and/or when movement locus of shooting object shall be indicated.

Since exposure time depends on the input frequency of EXT VD, shutter settings with rear switch will be invalid.



Trigger shutter operation, SYNC reset

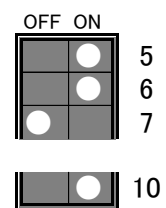
EXT HD can be input but external VD must not be input.

As soon as internal SYNC VD is reset after exposure completion, read-out starts, therefore, video signals are output at the shortest timing.

Exposure time can be set by trigger pulse width (Switch 6 ON) or fixed switch setting (Switch 6 OFF).

When internal HD/VD shall be output, turn off switch 10.

Note; Do not input another trigger before completion of video signal output for prior trigger.



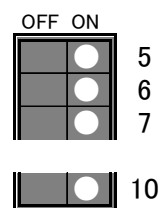
Trigger shutter operation, SYNC non-reset

Falling edge of EXT VD and EXT HD signal phase must be matched.

Signal read-out starts after waiting for EXT VD input, therefore, video signals are output at any timing.

Exposure time can be set by trigger pulse width (Switch 6 ON) or fixed switch setting (Switch 6 OFF).

Note; Do not input another trigger before completion of video signal output for prior trigger.



### Vertical Binning Scan and Partial Scan Function

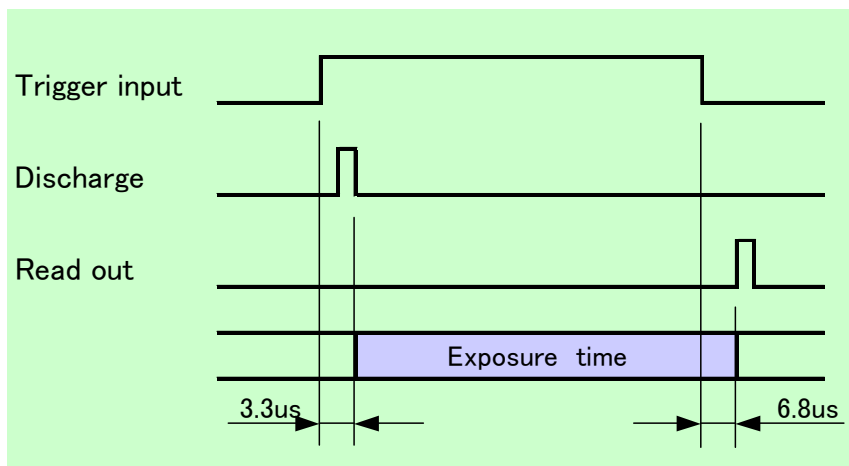
With vertical binning scan function, adjacent pixels for vertical 2 lines are read-out together, so that vertical resolution will be half. However, read-out rate and sensitivity will be double. Please note that this function can be set other than normal operation mode.

With partial scan function, frame rate can be higher sweeping out vertical lines of upper part and lower part. Vertical lines of center part are read-out. Please note that this function can be set other than normal operation mode.

Scanning Method	Frame Rate (f/s)	VD Frequency (Lines)	BLK Period (Lines)	Effective Lines (Lines)
Normal	29.68	796	28	768
Binning	59.35	398	28	370
1/3 Partial	89.14	265	38	227
1/4 Partial	118.7	199	41	158

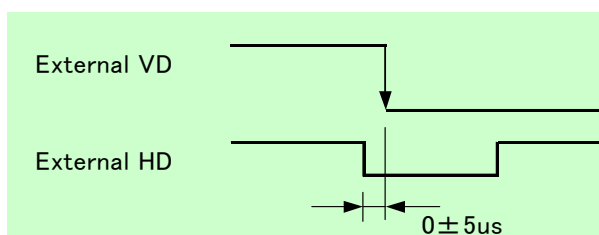
### Trigger signals and exposure time (Pulse width trigger shutter)

Start and completion of exposure time does not correspond to HD synchronization signals.

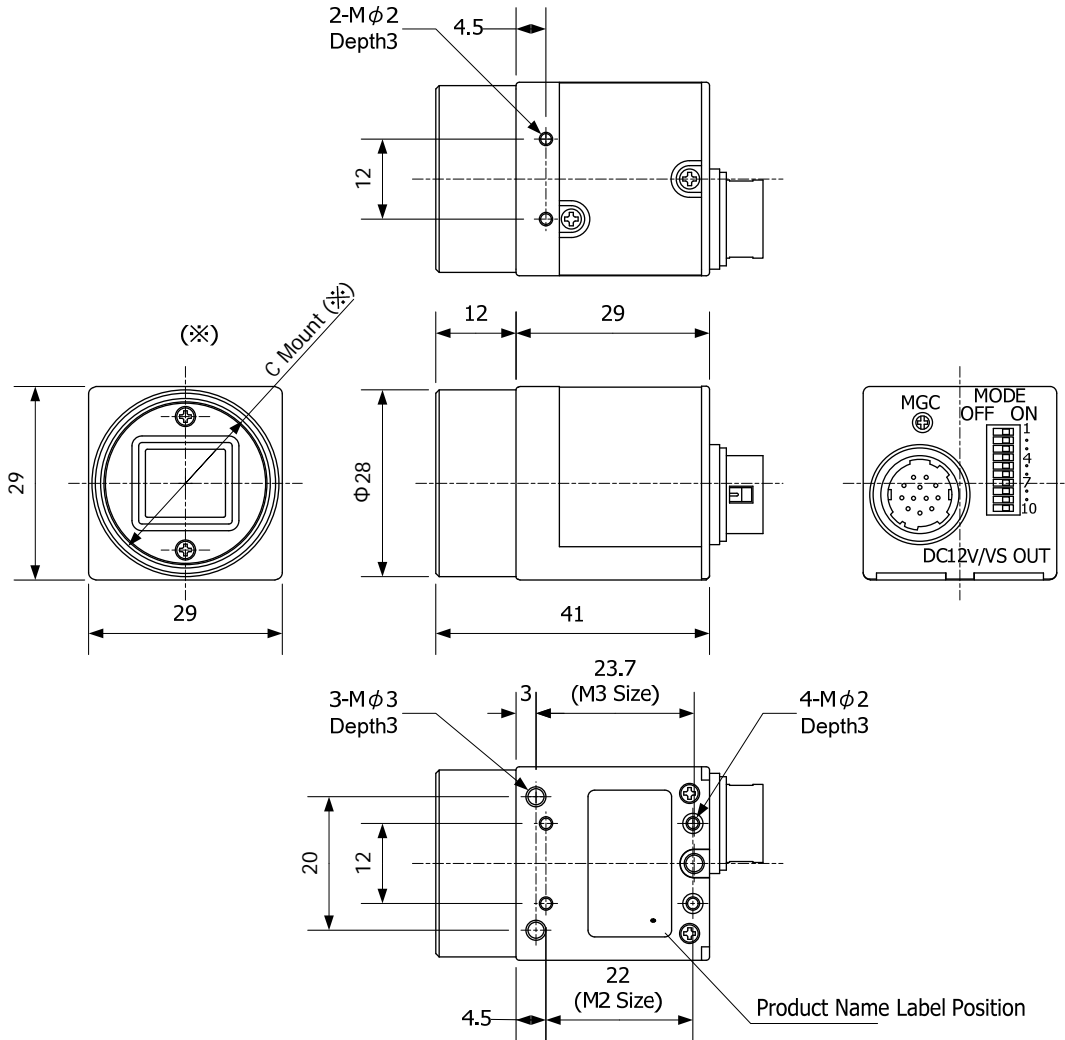


### External HD/VD Input Phase

With full frame scan, the following input condition applies only to the first field.



7. Dimensions



⊗: C mount screws comply with ANSI/ASME B1.1, 1-32UN (2B).

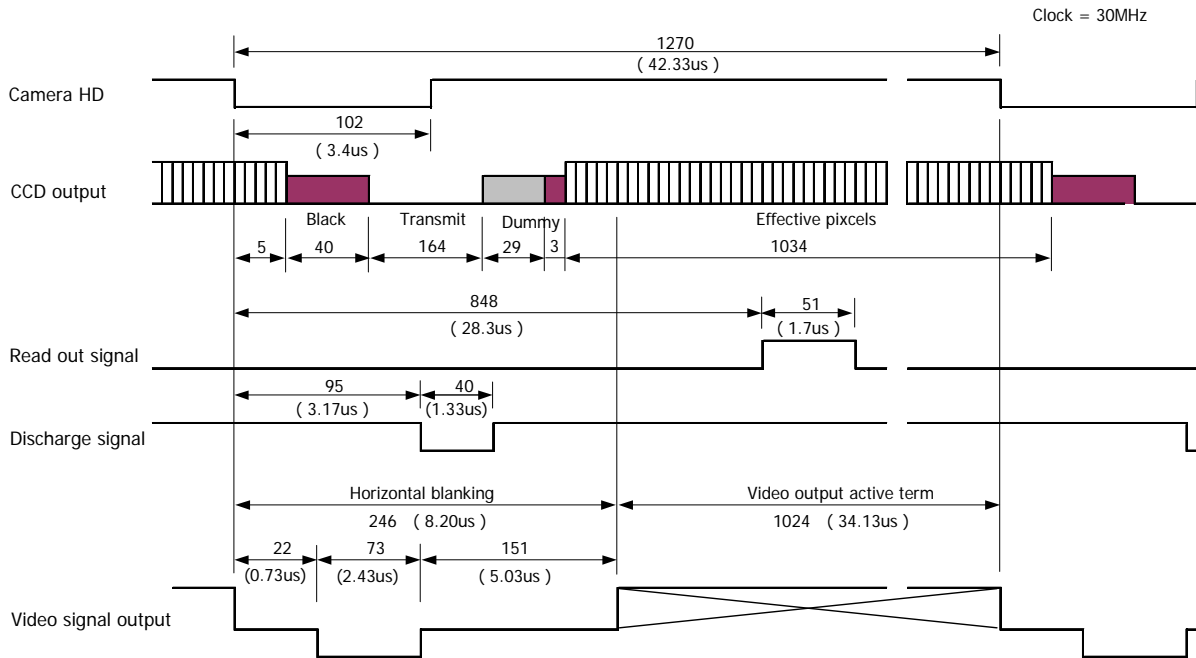
⊗: Screw length from C mount lens surface shall be under 6mm and the protruding portion shall be less than 10mm.

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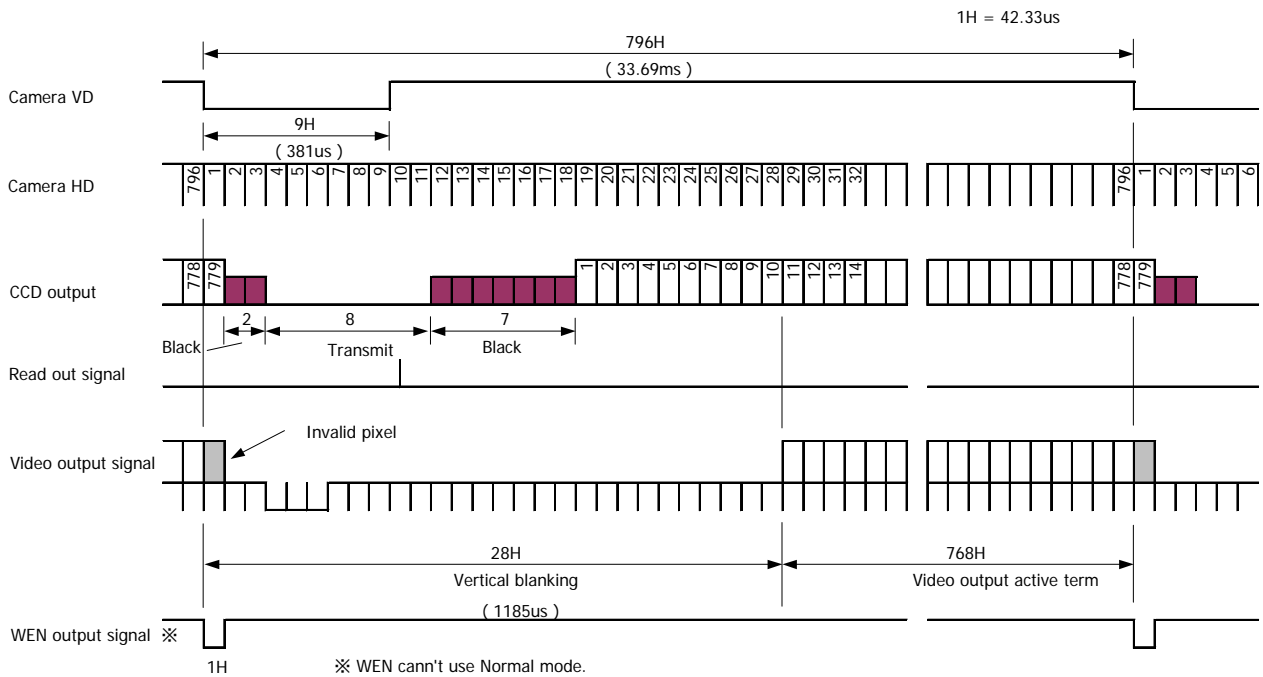
(Unit:mm)

## 8. Timing Chart

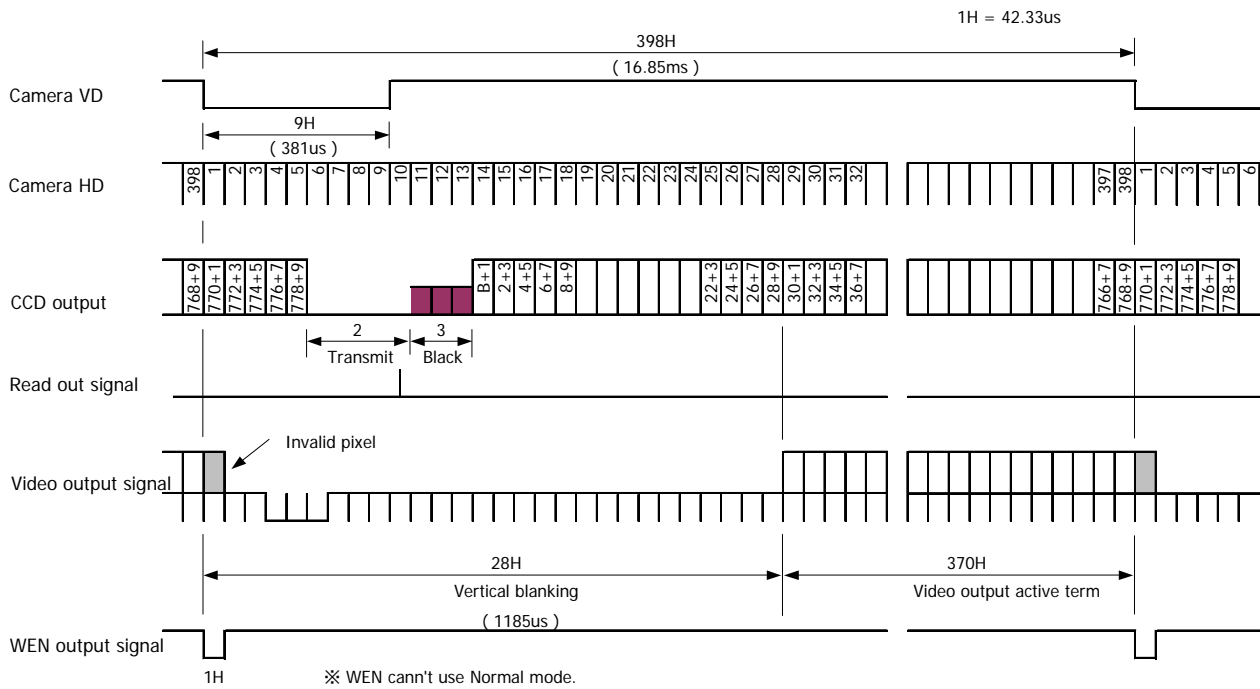
### 8.1. Horizontal synchronous timing



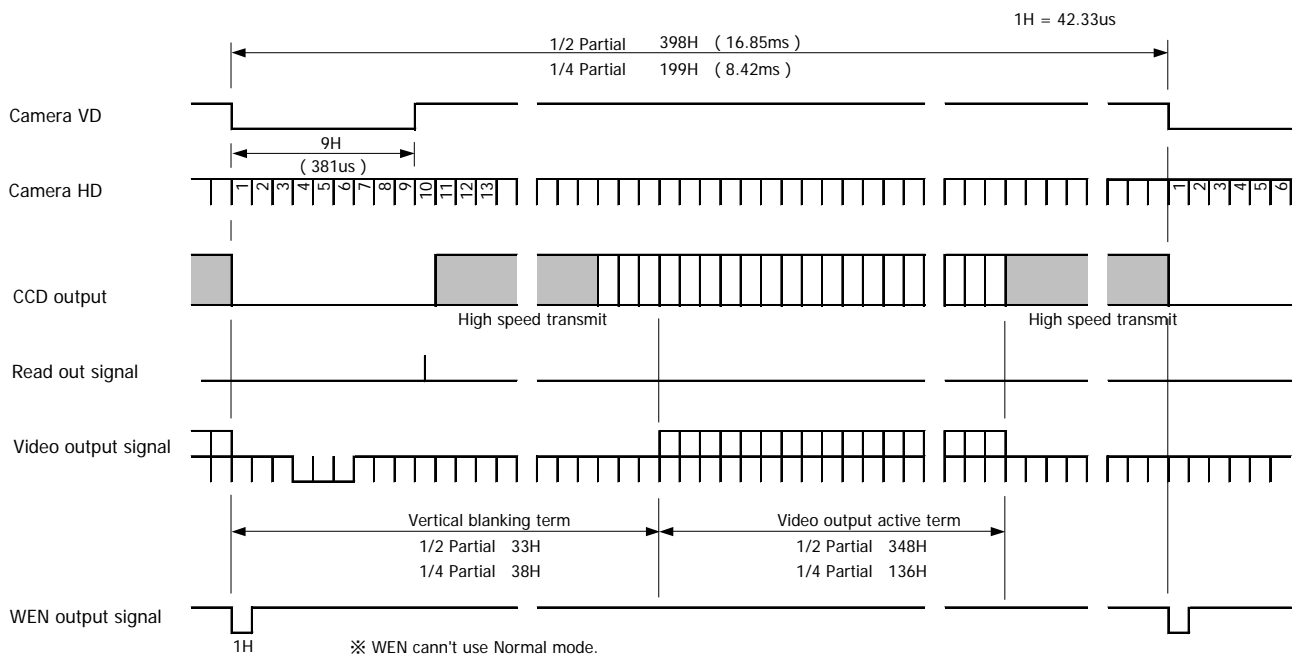
### 8.2. Vertical synchronous timing of Progressive scan



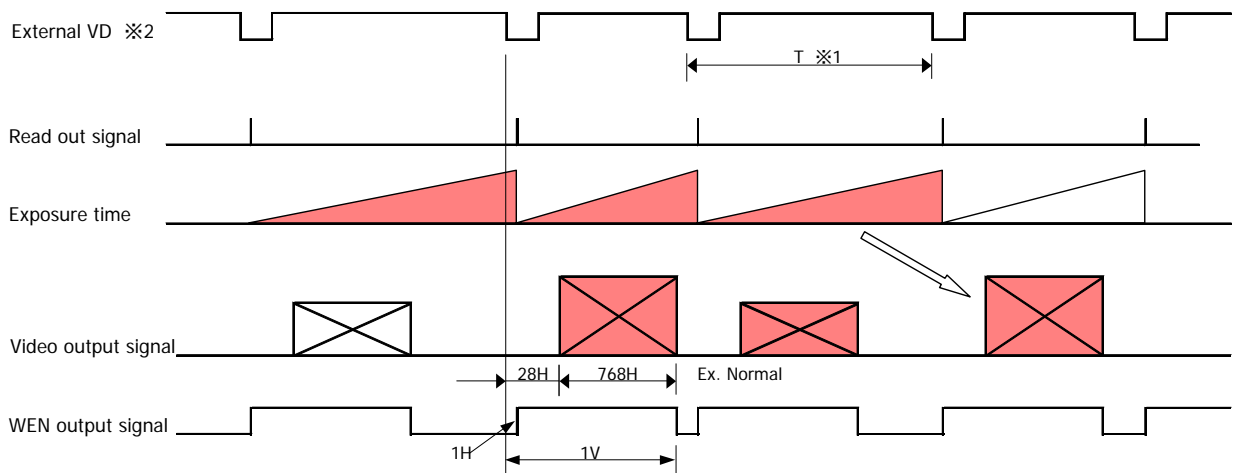
### 8.3. Vertical synchronous timing of Binning scan



### 8.4. Vertical synchronous timing of Partial scan



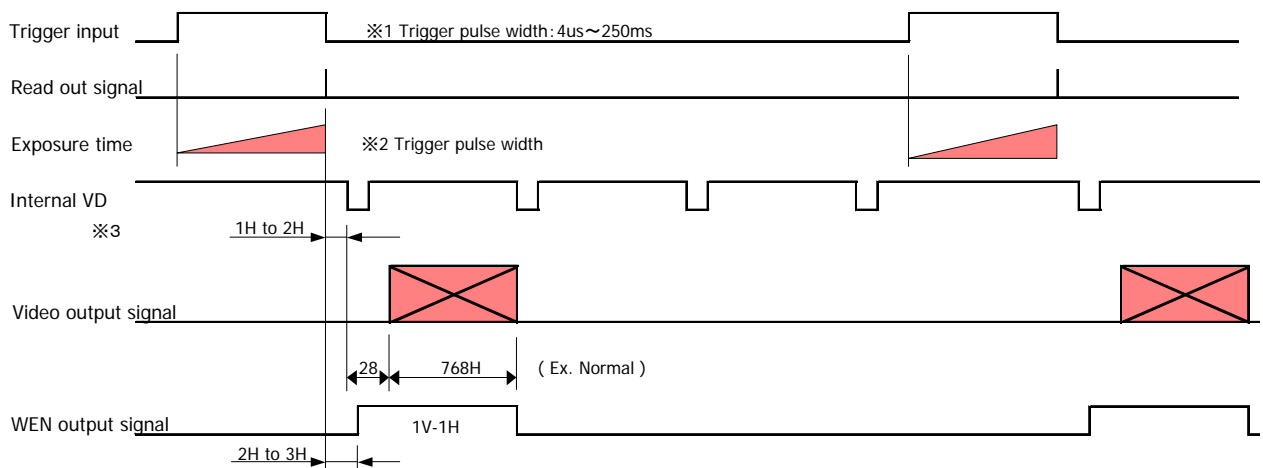
### 8.5. Long time exposure mode timing (Restart Reset operation)



- ※1 Setting cycle of exposure time, "T" shall be within 1V~0.5s.
  - Normal scan 796H minimum
  - Binning scan 398H minimum
  - 1/3 Partial scan 309H minimum
  - 1/4 Partial scan 250H minimum
- ※2 External HD/VD signals must be input since this operation is valid only for camera slave side.

### 8.6. External trigger operation timing by pulse width setup (SYNC Reset type)

Trigger operation which does not use External VD input.

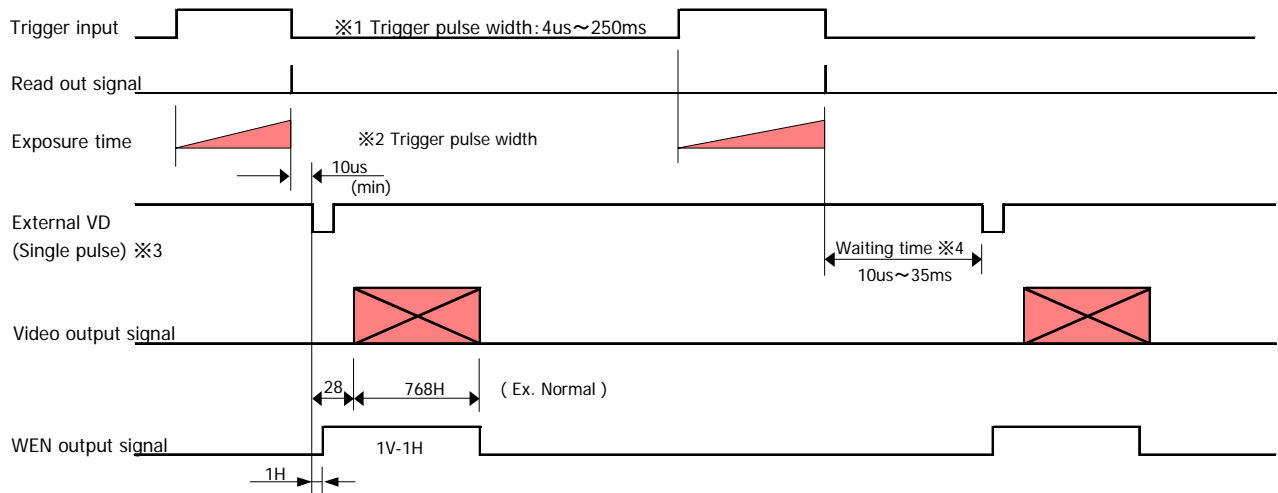


- ※1 Input interval shall be over (1V+5H) with trigger input width 4µs~250ms.  
If another trigger pulse is input before completion of the prior trigger, the camera operation would be unstable.
- ※2 Exposure time is determined by pulse width.  
Exposure time = Trigger Pulse Width + 3.5µs
- ※3 When used as camera slave, HD input is valid but VD input is invalid.  
When used as camera master, single VD, CSYNC signal will be output with setting SW 10 at rear to OFF.



### 8.7. External trigger operation timing by pulse width setup (SYNC Non-Reset type)

Trigger operation which uses the VD/HD input other than a Trigger input.



- ※1 Input interval shall be over  $(1V+5H)$  with trigger input width  $4\mu s\sim 250ms$ .  
If another trigger pulse is input before completion of the prior trigger, the camera operation would be unstable.
- ※2 Exposure time is determined by pulse width.  
Exposure time = Trigger Pulse Width +  $3.5\mu s$
- ※3 External HD/VD signals must be input because only camera slave side is operated.
- ※4 Waiting time from trigger input down edge to external VD input down edge should be set within  $10\mu s\sim 35ms$ .

## 9. 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 case damage or losses are caused by fire, earthquake, or other acts of God, acts by third party, deliberate or accidental misuse by the user, or use under extreme operating conditions.
- In case 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 case damage or losses are caused by failure to observe the information contained in the instructions in this product specification & operation manual.
- In case damage or losses are caused by use contrary to the instructions in this product specification & operation manual.
- In case damage or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.
- In 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.

## 10. CCD Pixel Defect

After delivery, on the rare occasion, CCD pixel defects might be noted with time of usage of the products. The cause of the CCD pixel defects is the characteristic phenomenon of CCD itself and CIS shall be exempted from taking responsibility on it.

## 11. Product Support

When defects or malfunction of our products occur, and if you would like us to investigate on the cause and repair, please contact your distributors you purchased from to consult and coordinate.