



English

VISION:analog™

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

VCC-G20U20A

**Product Specification
& Operation Manual**

CIS Corporation

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1. Scope of Application

This is to describe VCC-G20U20A UXGA analog B/W CCD camera. All specifications contained herein are subject to change without prior notice. Reproduction in whole or in part is prohibited.

2. Notice

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°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.
- The voltage ripple of camera power DC +12V \pm 10% shall be within \pm 50mV. Improper power supply voltage may cause noises on the video signals.

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

3. Product Outline

VCC-G20U20A is a high-resolution industrial B/W analog camera module utilizing a 1/1.8-inch PS IT CCD. 2M pixels CCD image sensor with on-chip micro-lenses realizes high sensitivity and high resolution. Only 29mm cubic in size (excluding projection), light weight 45g, and speed makes it a best match for use in embedded systems.

Key Features

- ☐ HD/VD sync input or Trigger sync input are valid.
- ☐ OFF and 1/120s \sim 1/10,000s , 8 steps shutter speed can be set by rear switch.
10 μ s \sim 250ms shutter speed can be set by trigger pulse width.
- ☐ 1/2 partial scan mode and 1/4 partial scan mode available.
- ☐ Binning mode available.
- ☐ Restart-reset function is also valid to enable long time exposure.
- ☐ Scanning system is switchable by the input level to 9pins circular connector at rear.
- ☐ Only 29mm cubic in size (excluding projection)
- ☐ As an optional function, $\gamma=0.45$, HD/VD 75 Ω impedance can be set as the factory initial setting.
Please ask us for the details.

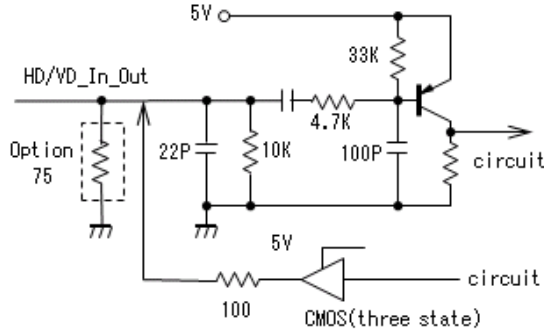
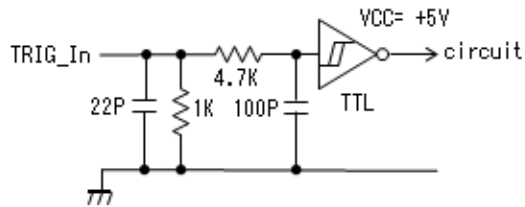
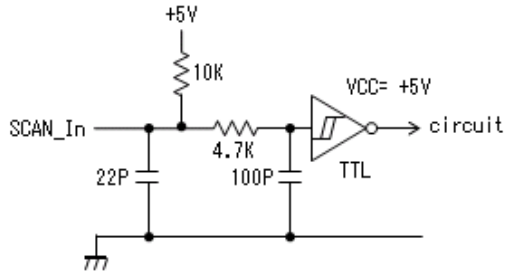
4. Specification

4.1. General Specification

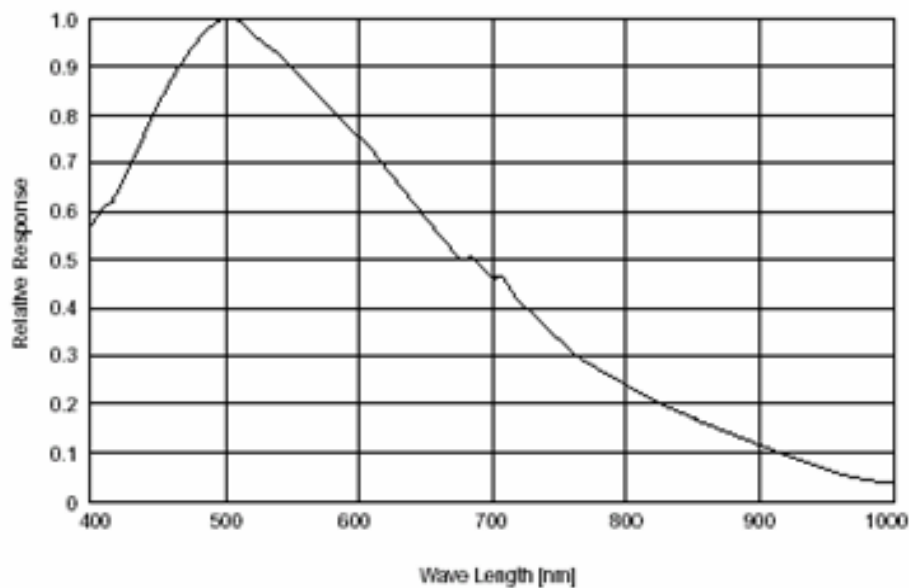
Item	Specification	
Pickup device	Device Type	1/1.8" Interline Transfer B/W CCD, Sony ICX274AL
	Effective Pixel Number	1628(H) x 1236 (V)
	Unit Cell Size	4.4 μ m (H) x 4.4 μ m (V)
	Chip Size	8.5mm (H) x 6.8mm (V)
Video output frequency	Pixel Clock	36 MHz
	Horizontal Frequency	18.75 kHz Pixel Clock: 1920 CLK
	Vertical Frequency	Full Frame Scan Mode: 14.98 Hz, 1252H Binning Mode: 29.95 Hz, 626H
		1/2 Partial Scan Mode: 29.95 Hz, 626H 1/4 Partial Scan Mode: 59.91 Hz, 313H
Sync. system	Internal sync & HD/VD external sync (Internal/External recognized automatically)	
Video output standard	Analog	
Resolution	1200 TV lines	
Sensitivity	F8 400 lx (Shutter 1/15s, Gain 0dB, 3200K)	
Minimum illumination	F1.4 1.0 lx (Shutter 1/15s, max Gain VS 50IRE)	
S/N ratio	52dB	
Dust or stains in optical system	No dust or stain shall be detected on the testing screen with setting the camera aperture at F16.	
Power requirements	DC +12V \pm 10% (Max voltage not to exceed 15V)	
Power consumption	1.9 W (Max. 2.5W) at DC +12V IN	
Dimension	Refer to overall dimension drawing (Clause 9) 29mm x 29mm x 29mm (excluding projection)	
Weight	Approx. 45 g	
Lens mount	C mount (Refer to overall dimension drawing)	
Optical axis accuracy	Refer to drawing for CCD Optical Axis Accuracy (Clause 8)	
Gain variable range	0~12dB (guaranteed range)	
Gamma	1 (fixed)	
Shutter speed variable range	Fixed Switch: OFF (1/15), 1/120, 1/300, 1/600, 1/1,250, 1/2,500, 1/5,000, 1/10,000s Pulse Width: 10 μ s ~ 250ms	
Trigger shutter mode	• Fixed trigger shutter mode • Pulse width trigger shutter mode	

Item	Specification		
Safety/Quality standards	UL: Conform to UL Standard including materials and others. RoHS: Conform to RoHS CE: Conform to EN55022:2006 (Class B): Emission Conform to EN61000-6-2:2005: Immunity FCC: 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.		
Durability	Vibration	Acceleration	98 m/s ² (10.0G)
		Frequency	20~200 Hz
		Direction	X, Y, and Z 3 directions
		Testing time	120 min for each direction
	Shock	No malfunction shall be occurred with 980m/s ² (100G) for 6 directions, $\pm X$, $\pm Y$, and $\pm Z$ direction. (without package)	
Operation environment	Temperature	Operation guaranteed: -5°C~+45°C Performance guaranteed: 0°C~+40°C	
	Humidity	RH 20~80% with no condensation	
Storage environment	Temperature	-25°C ~ +60°C	
	Humidity	RH 20~80% with no condensation	

4.2. Camera Output Signal Specification

Video output	Effective output	1620(H) × 1220(V)	at full frame scan mode
Sync signals Input /Output	HD/VD Input signal level: 2~5Vp-p, TTL input Input impedance: 10kΩ Allowable frequency deviation: ±1% Phase difference: HD/VD: under 0±5μs Jitter: under 15ns (Referential Drawing) 	HD/VD/WEN output CMOS(74VHC04 equivalent) Output impedance: 100Ω HD/VD/WEN output signal level Low 0.5V (max), High 4V (Min)	
Trigger input	Polarity: Positive Input signal level: Low 0.5V (Max), High 2.5~5V Input impedance: 1kΩ Trigger input width: 4μs ~ 250ms (Referential Drawing) 		
Scan IN input Scan switching at No.9 pin.	Input signal level: Low 0.5V (Max), High 2.5~5V Input impedance: 10kΩ (Pull Up) (Referential Drawing) 		
Video signals	VS output 1.0V (p-p), Sync. Negative, 75Ω unbalanced, DC connect White clip level: 840 ± 70 mVp-p Setup level: 25 ± 15 mVp-p (Gain 0dB) SYNC level: 290 ± 50 mVp-p VS DC level: 0 ± 100 mV		

4.3. CCD Spectral Response (Representative Value)



5. Function Settings

Rear panel switch			
1	<input checked="" type="radio"/>	E2	◇ Shutter speed 3bit 8steps OFF(1/15s) ~ 1/10,000s
2	<input checked="" type="radio"/>	E1	
3	<input checked="" type="radio"/>	E0	
4	<input checked="" type="radio"/>	Mode1	◇ Trigger shutter mode 3bit Normal shutter mode, Fixed trigger shutter mode, Pulse width trigger shutter mode
5	<input checked="" type="radio"/>	Mode0	
6	<input checked="" type="radio"/>	Scan1	◇ Scan mode 3bit Full frame scan mode, Binning mode, 1/2, 1/4 partial scan mode
7	<input checked="" type="radio"/>	Scan0	
8	<input checked="" type="radio"/>	Gain	◇ 0dB fixed / Manual gain
9	<input checked="" type="radio"/>	Scan Enable	◇ Scan Enable (No.9 pin of the circular connector valid/invalid)
10	<input type="radio"/>	IN/OUT	◇ HD/VD signals input/output settings (No.6 and 7 pins of the circular connector)

↑
OFF

● indicates initial setting position.

Other Optional Functions (optional settings as the factory settings)

- ◇ HD/VD75Ω impedance
- ◇ AGC Gain
- ◇ $\gamma = 0.45$

Please ask for the details.

Shutter speed settings

E2 SW1	E1 SW2	E0 SW3	Shutter Speed	Normal shutter mode	Actual Time Fixed trigger shutter mode
OFF	OFF	OFF	OFF (1/15s)	66.7 ms	33.5 ms
OFF	OFF	ON	1/120 sec	9.74 ms	9.84 ms
OFF	ON	OFF	1/300 sec	3.94 ms	3.95 ms
OFF	ON	ON	1/600 sec	1.94 ms	1.95 ms
ON	OFF	OFF	1/1,250 sec	952μs	966μs
ON	OFF	ON	1/2,500 sec	455μs	468μs
ON	ON	OFF	1/5,000 sec	207μs	220μs
ON	ON	ON	1/10,000 sec	83μs	95μs

■ Indicates initial setting position

Shutter mode settings

MODE1 SW4	MODE0 SW5	Setting Mode
OFF	OFF	Normal shutter mode (including Restart-Reset mode)
OFF	ON	Fixed trigger shutter mode (Sync Reset Mode)
ON	OFF	Pulse width trigger shutter mode 1 (Sync Reset Mode)
ON	ON	Pulse width trigger shutter mode 2 (Sync Non-Reset Mode)

■ Indicates initial setting position

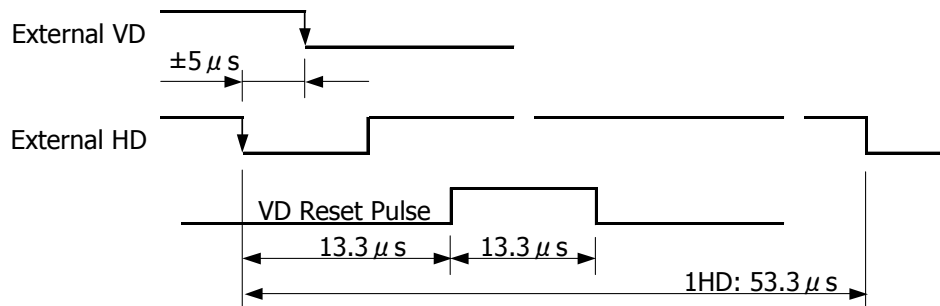
Table of settings

Function	Normal Shutter mode	Fixed trigger shutter mode (Sync Reset)	Pulse width trigger shutter mode 1 (SYNC Reset)	Pulse width trigger shutter mode 2 (SYNC Non-Reset)
Shutter settings by fixed switch	○※1	○	×	×
Shutter settings by trigger pulse width	×	×	○	○
Full Frame Scan mode	○	○	○	○
Binning Scan mode	○	○	○	○
Partial Scan mode	○	○	○	○
HD/VD Input	○	○HD	○HD	○
HD/VD Output	○	○	○	×

※1 When using the camera at Restart-Reset mode, shutter speed settings shall be OFF.

Normal shutter mode

Each scan operation, HD/VD external sync input, and sync output is valid. When adding external sync input, please follow HD/VD input conditions shown below.



Restart-Reset mode (Long time exposure mode)

Restart-reset mode (Long time exposure mode) is valid at normal shutter mode, with setting the shutter to OFF, HD/VD sync input ON, and adding external EXT HD input. With adding EXT VD at random timing with over 1VD, data for one screen image is read out. This function is useful when sensitivity with regular exposure time is not sufficient or when indicating the locus of moving object. Restart-reset mode corresponds to all scanning modes.

Fixed trigger shutter mode (Sync Reset Mode)

With trigger input, images at any timing can be captured with setting exposure time by the shutter value of switch at camera rear. Internal SYNC and VD are reset right after completion of exposure time so that the video output signals are read out right away. HD external input is valid but VD external input invalid.

Exposure time = Value of switch at rear

Conditions: Trigger input pulse width shall be $4 \mu s \sim 250ms$, Positive Logic

The shortest trigger cycle = 1 frame + 5H

Pulse width trigger shutter mode 1 (Sync Reset Mode)

With trigger input, images at any timing can be captured with setting exposure time by trigger pulse width. Internal SYNC and VD are reset right after completion of exposure time so that the video output signals are read out right away. HD external input is valid but VD external input invalid.

Exposure time = Trigger pulse width (μs) + $4.7 \mu s$ typical

Conditions: Trigger input pulse width shall be $4 \mu s \sim 250ms$, Positive Logic

The shortest trigger cycle = 1 frame + 5H

Pulse width trigger shutter mode 2 (Sync Non-Reset Type)

With trigger input, images at any timing can be captured with setting exposure time by trigger pulse width. Signals are read out after waiting for the external VD (single) input so that the video output signals are read out at the controlled timing. The down edge phase of external HD/VD signals should be matched. The time frame to input an external single VD after trigger input is fallen, should be set between $150\ \mu\text{s}$ to 100ms .

Exposure time = Trigger width (μs) + $4.7\ \mu\text{s}$ typical

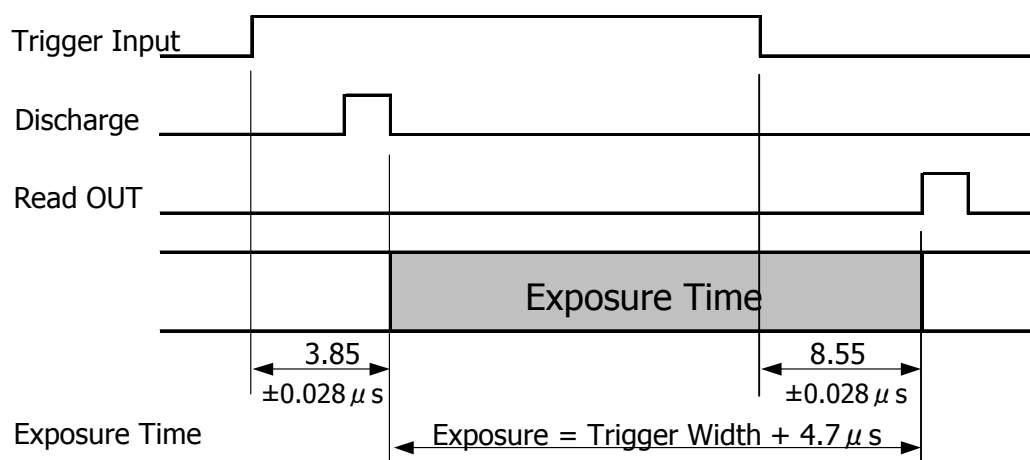
Conditions: Trigger input pulse width shall be $4\ \mu\text{s} \sim 250\text{ms}$, Positive Logic

The shortest trigger cycle = Trigger width + VD input time + 1 frame + 2H

Caution 1: When the next trigger is input before the completion of video signals output for the prior trigger, the image could be improper.

Caution 2: Smear or blooming could occur when strong incident light is extensively illuminated, with setting the electric shutter at high speed. To avoid this smear or blooming, lower the volume of incident light or use a stroboscopic light source to adjust the light volume.

Caution 3: Please refer to the timing chart below for the actual time when exposure starts after trigger is input, and the actual time when exposure completes at pulse width trigger shutter mode.



Scan mode setting

MODE1	MODE0	Setting Mode
SW6	SW7	
OFF	OFF	Full frame scan mode
OFF	ON	Binning mode
ON	OFF	1/2 Partial scan mode
ON	ON	1/4 Partial scan mode
		Indicates initial setting position

Enable scan mode settings via No.9 pin of 12pins circular connector

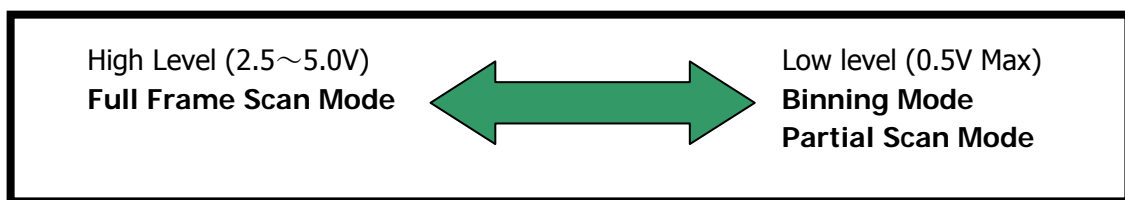
SW9	
OFF	Invalid No.9 pin input (Pull up 10kΩ)
ON	Valid No.9 pin input
	Indicates initial setting position

Scan mode	Frame rate (fps)	Scanning (lines)	Blanking (lines)	Video output lines (lines)
Full Frame scan mode	14.98	1252	32	1220
Binning mode	29.95	626	24	602
1/2 Partial scan mode	29.95	626	49	550
1/4 Partial scan mode	59.91	313	62	211

Changing the scan settings

Scanning can be changed basically by the settings of camera switch at rear, but it can be also changed by the input level of No. 9pins of the circular connector at both normal shutter mode and trigger shutter mode.

- 1 Set SW 9 ON at camera rear to enable No. 9 pins input of the circular connector.
- 2 Select Binning mode or Partial scan mode with SW 6 and 7 at camera rear.
- 3 Select input level, High Level/Low Level, of No. 9 pins of the circular connector.

**Gain settings**

SW8	
OFF	0dB Fixed
ON	Manual gain (MGC volume at rear)

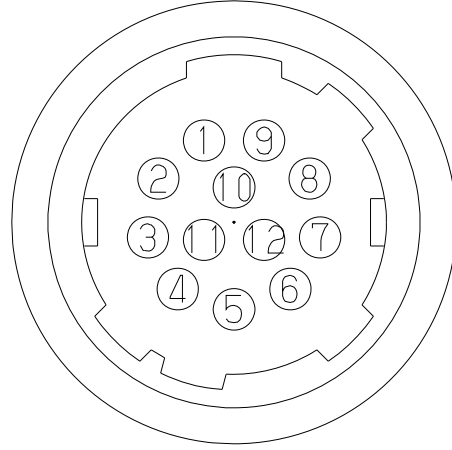
HD/VD input and output settings

SW10	
OFF	HD/VD output
ON	HD/VD input
	Indicates initial setting position

6. External Connector Pin Assignment

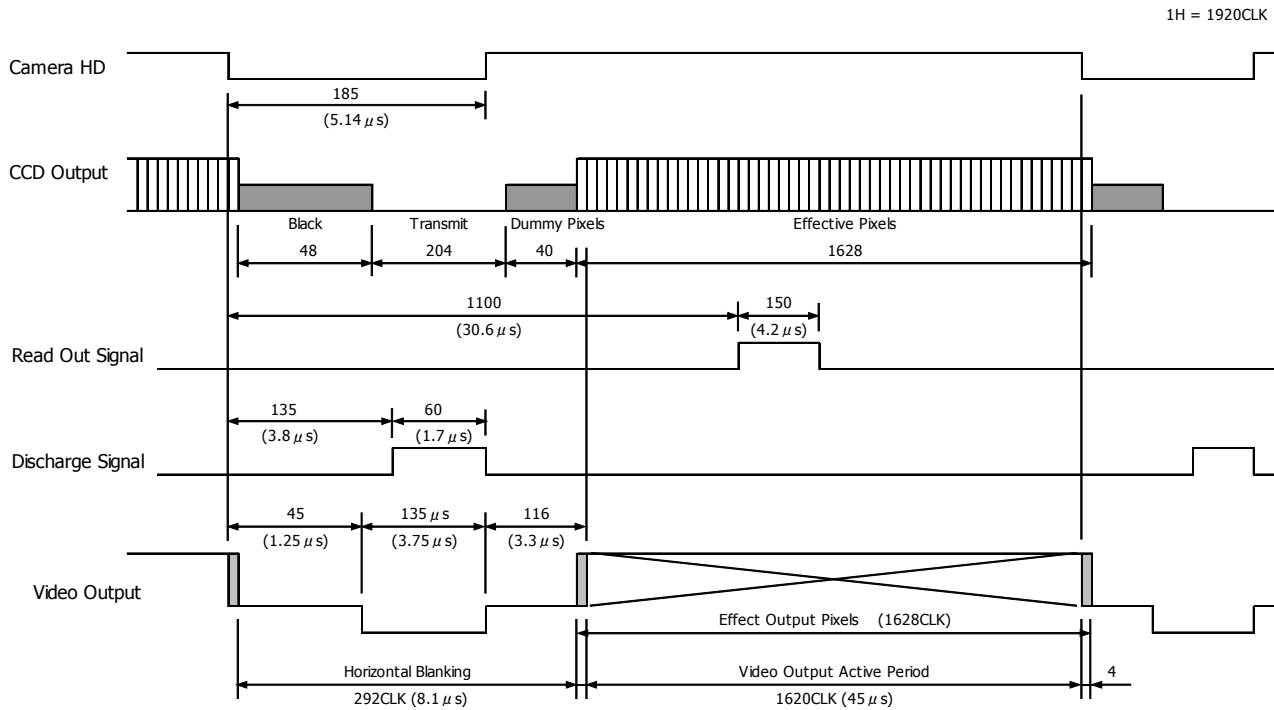
12pins Circular Connector SNH-10-12(RPCB) (SAMWOO)

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	SCAN In
10	WEN Out
11	Trigger In
12	GND



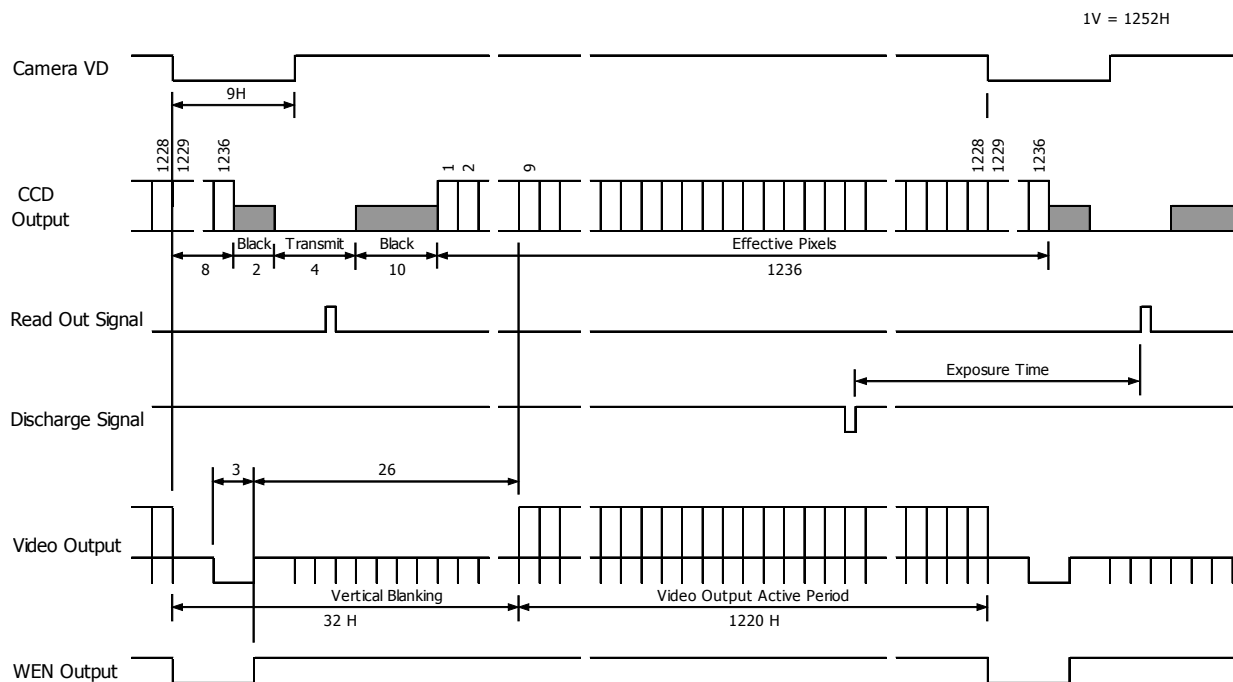
7. Timing Chart

7.1. Horizontal Synchronous Timing

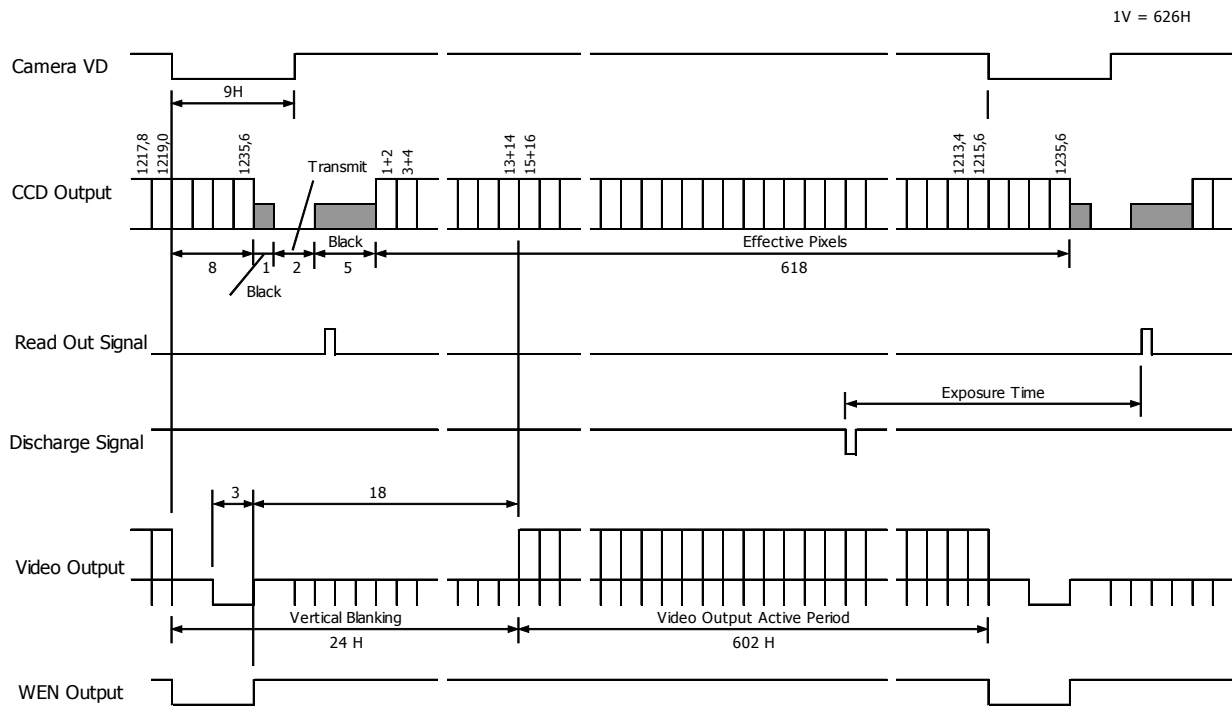


7.2. Vertical Synchronous Timing

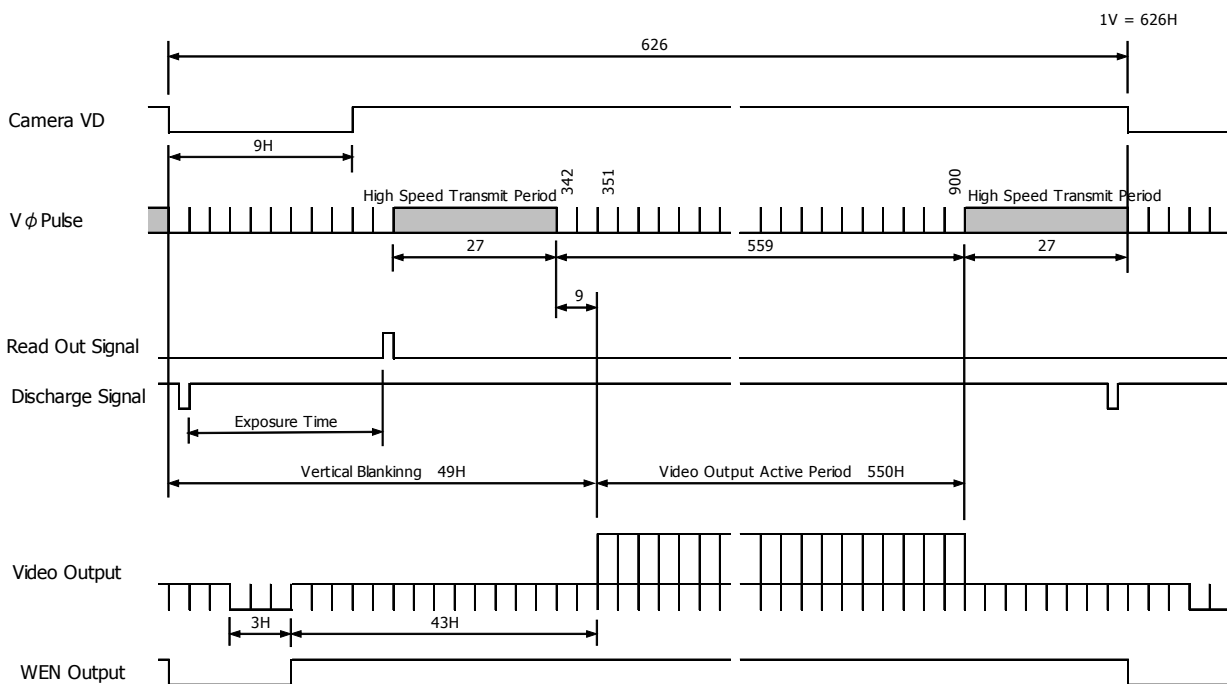
7.2.1. Full Frame Scan Mode



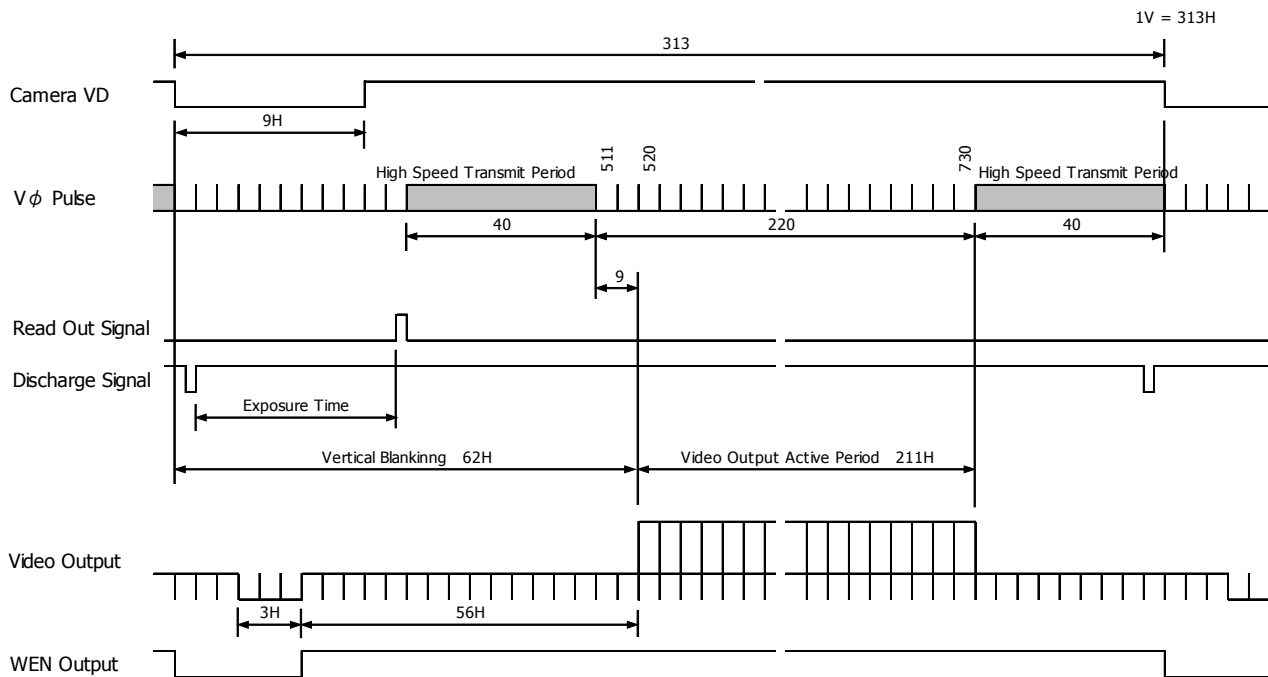
7.2.2. Binning Mode



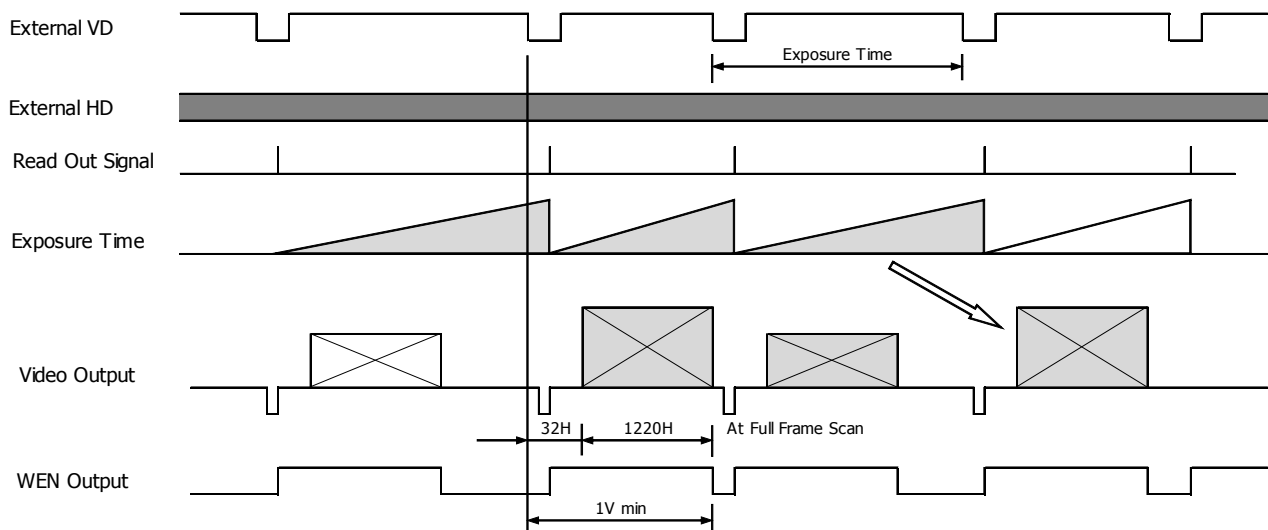
7.2.3. 1/2 Partial Scan Mode



7.2.4. 1/4 Partial Scan Mode

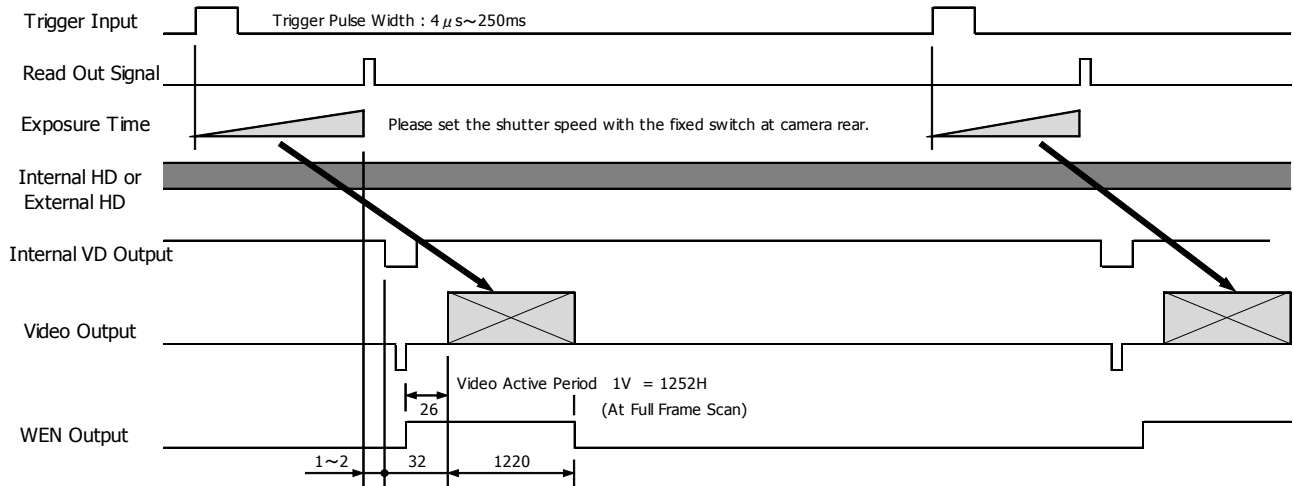


7.3. Restart Rest Mode (Long Time Exposure) Timing

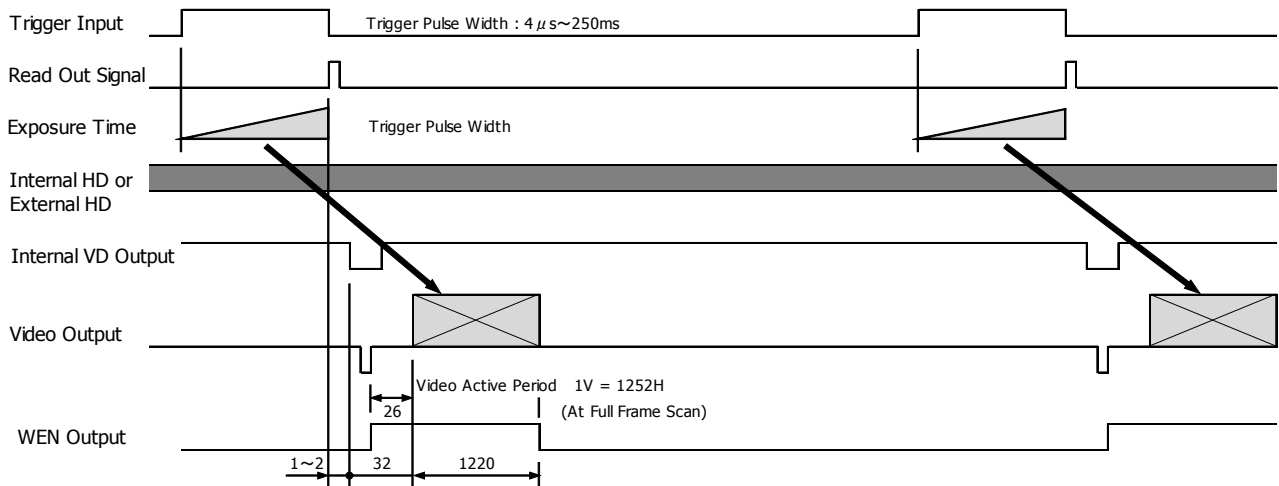


7.4. Trigger Shutter Mode Timing

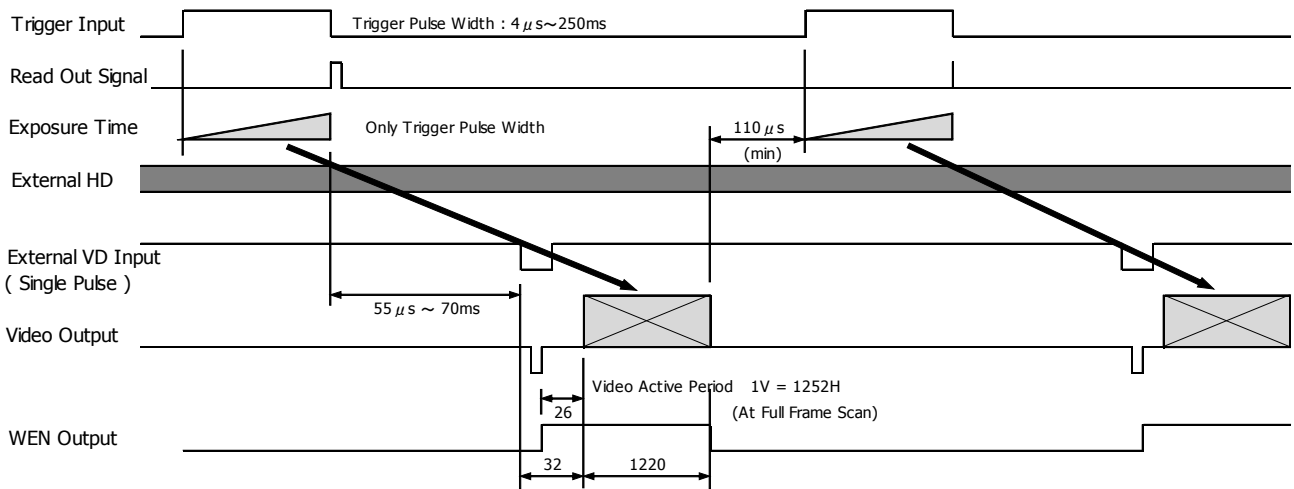
7.4.1. Fixed Trigger Shutter Mode (SYNC Reset)



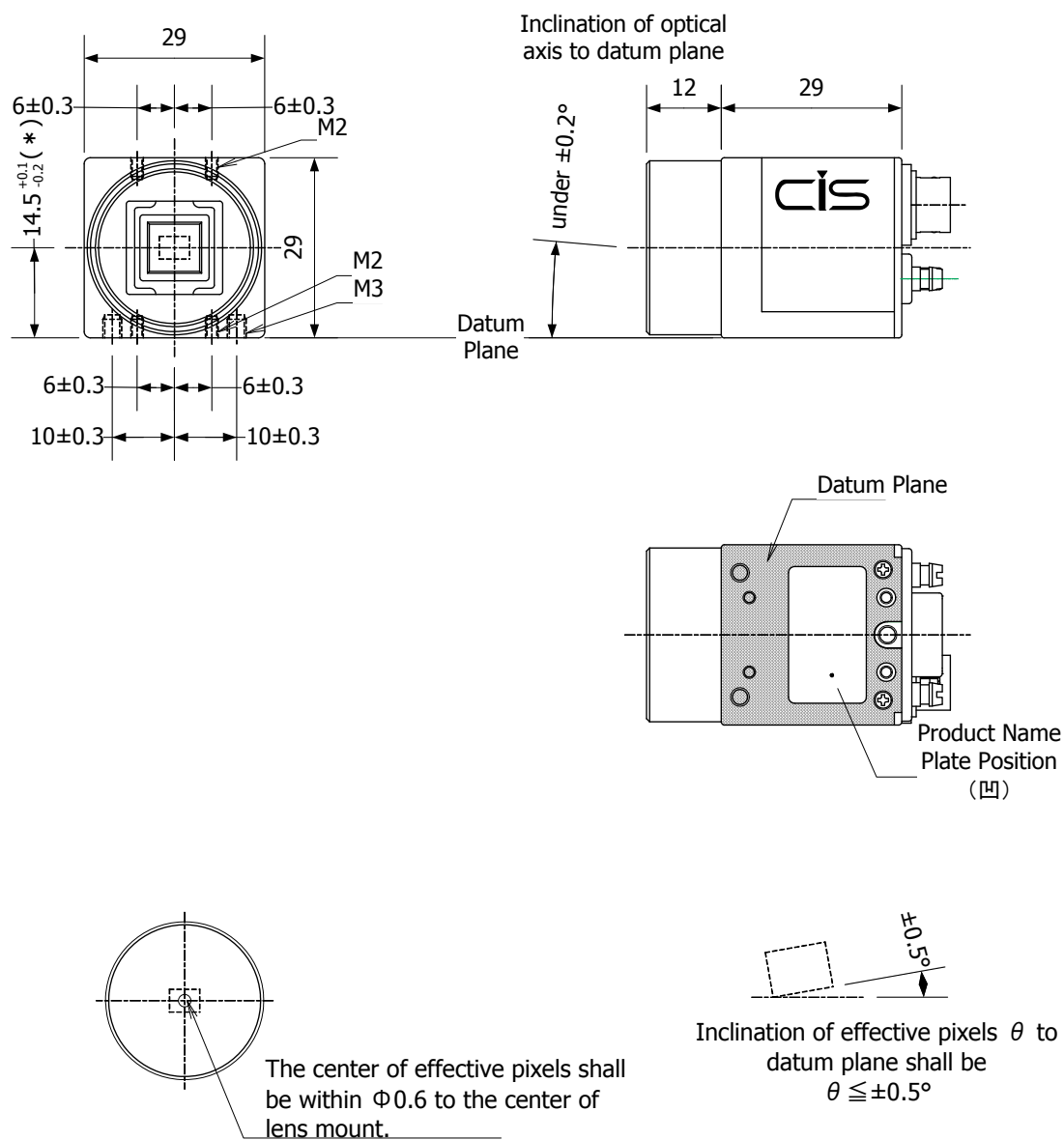
7.4.2. Pulse Width Trigger Shutter Mode 1 (SYNC Reset)



7.4.3. Pulse Width Trigger Shutter Mode 2 (SYNC Non-Reset)



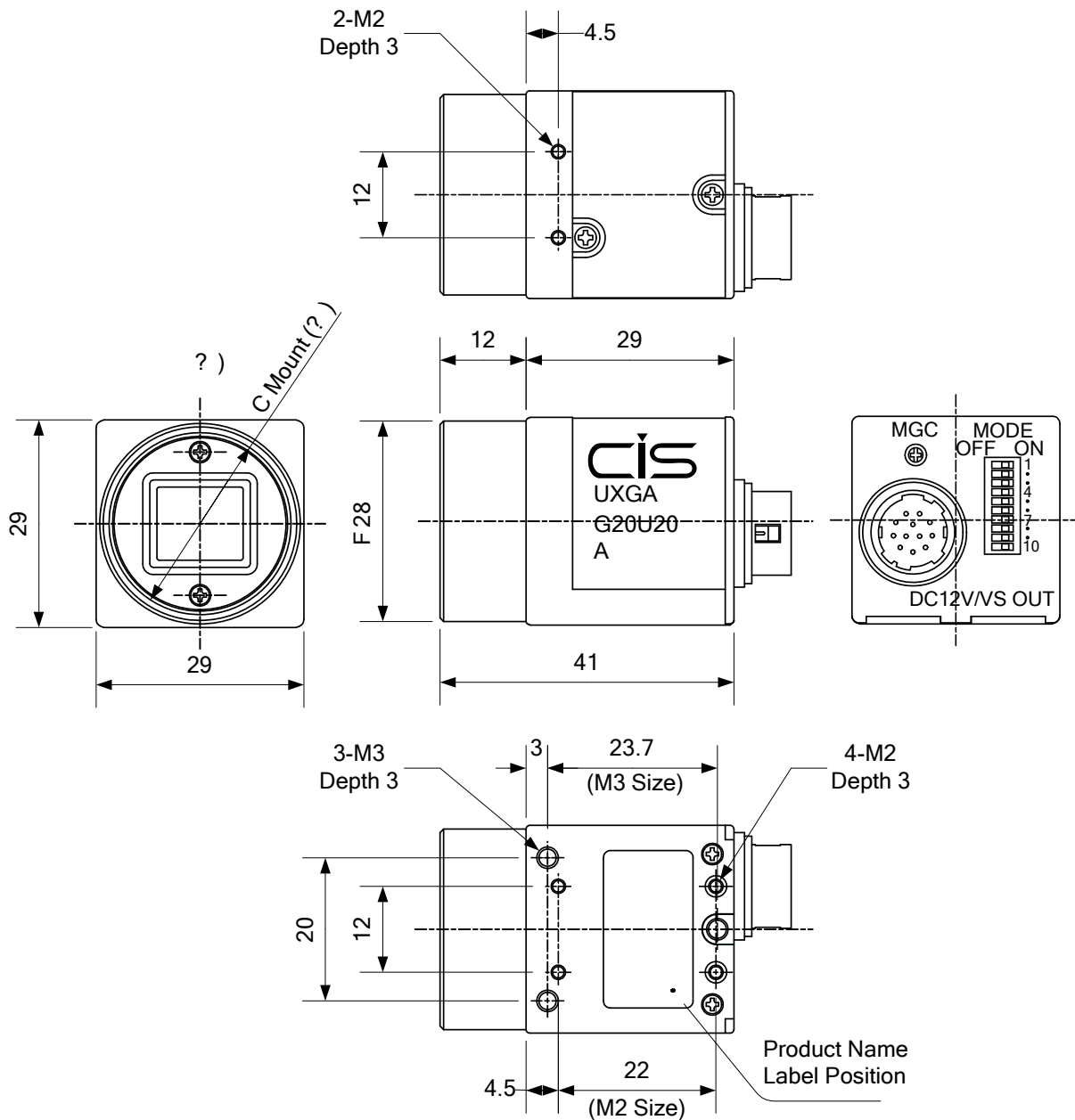
8. CCD Optical Axis Accuracy



(*) Dimension from datum plane to the center of lens mount.

910-005-00-00
(Unit: mm)

9. Dimensions



(?)

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

Screw length from lens mount surface shall be under 6 mm.

Protruding portion shall be under 10 mm

999-487-00-00

(Unit: mm)

10. 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.

11. CCD Pixel Defect

CIS inspects and confirms no unit has CCD pixel defect before shipping out of our factory.

On very rare occasions, however, CCD pixel defects might be noted with time of usage of the products.

Cause of the CCD pixel defects is the characteristic phenomenon of CCD itself and CIS is exempted from taking any responsibilities for them.

12. 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.