



English

Analog I/F
29mm Cubic SXGA
B/W Analog Camera
VCC-G20S20B

Product Specification
& Operational Manual

CIS Corporation

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1. Scope of Application

This is to describe VCC-G20S20B 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. 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°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 $+12\text{V} \pm 10\%$ shall be within $\pm 50\text{mV}$. 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-G20S20B is a high-resolution industrial B/W analog camera module utilizing a 1/2" inch PS IT CCD. 1.45M pixels CCD image sensor with on-chip micro-lenses realizes high sensitivity and high resolution. Only 29mm cubic in size (excluding projection), light weight 50g, and speed makes it a best match for use in embedded systems.

Key Features

- HD/VD sync input or Trigger input are valid.
- OFF and 1/30s ~ 1/10,000s , 8 steps shutter speed can be set by rear switch.
9 μ s ~ 250ms shutter speed can be set by trigger pulse width.
- Restart-reset function is also valid to enable long time exposure.
- Full frame scan mode and binning mode are available.
- 1/2 partial scan mode and 1/4 partial scan mode available.
- Only 29mm cubic in size (excluding projection)

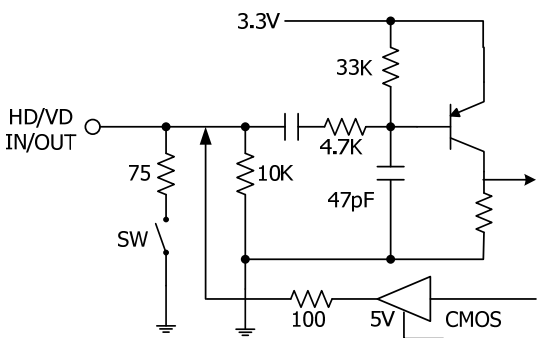
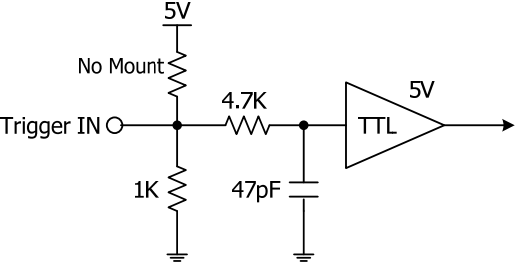
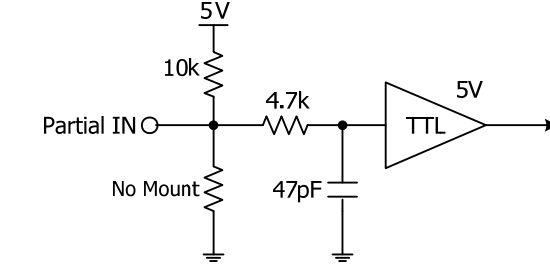
4. Specification

4.1. General Specification

Item	Specification	
Pickup device	Device Type	1/2" Interline Transfer B/W CCD, Sony ICX267AL
	Effective Pixel Number	1392(H) x 1040 (V)
	Recommended Pixels	1360(H) x 1024(V)
	Unit Cell Size	4.65 μ m (H) x 4.65 μ m (V)
	Chip Size	7.60mm (H) x 6.20mm (V)
Video output frequency	Pixel Clock	28.636 MHz
	Horizontal Frequency	16.0 kHz Pixel Clock: 1790 CLK
	Vertical Frequency	Full Frame Scan Mode: 14.98 Hz, 1068H
		Binning Scan Mode: 29.96 Hz, 534H
	1/2 Partial Scan Mode: 29.96 Hz, 534H	
	1/4 Partial Scan Mode: 59.92 Hz, 267H	
Sync. system	Internal sync & HD/VD external sync (Internal/External recognized automatically)	
Video output standard	Analog VS output	
Resolution	1024 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	1.8 W (Max. 2.2W) at DC +12V IN	
Dimension	Refer to overall dimension drawing (Clause 9) 29mm x 29mm x 29mm (excluding projection)	
Mass	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	Over 0~12dB (guaranteed range)	
Gamma	1 (fixed)	

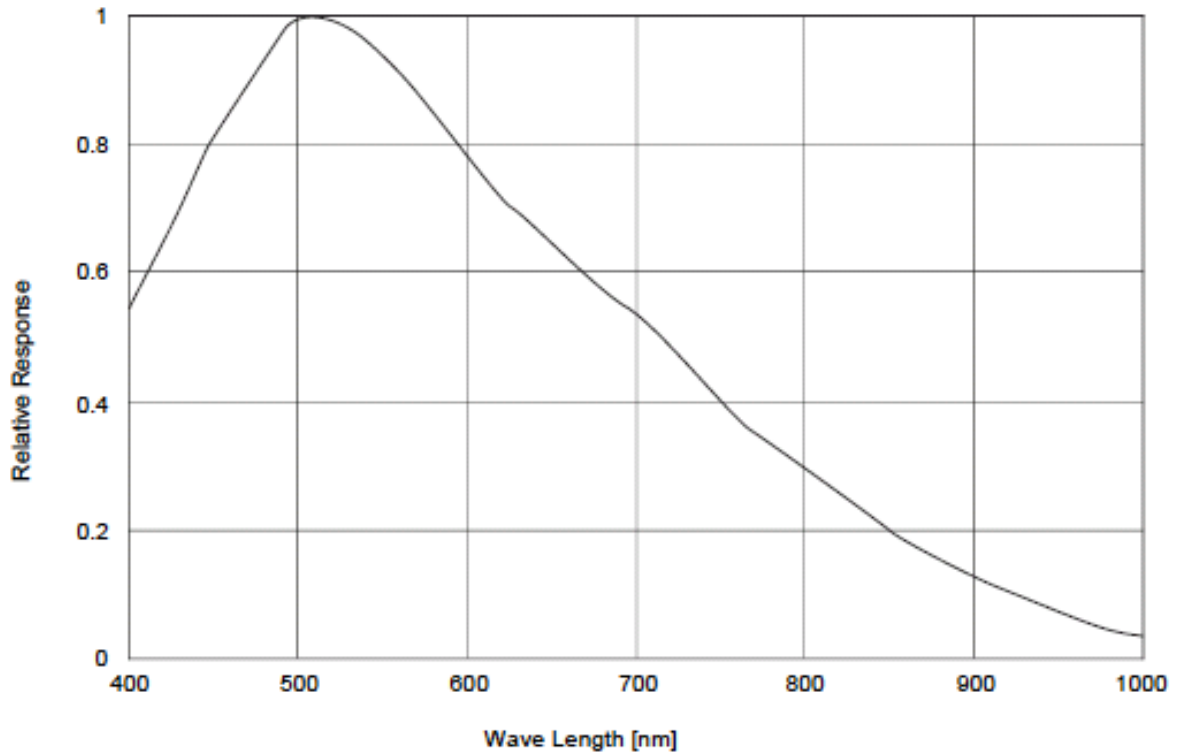
Item	Specification		
Shutter speed variable range	<p><Normal Shutter Mode> OFF (1/15), 1/100, 1/250, 1/500, 1/1,000, 1/2,000, 1/5,000, 1/10,000s</p> <p><Trigger Shutter Mode> 1/30, 1/100, 1/250, 1/500, 1/1,000, 1/2,000, 1/5,000, 1/10,000s</p> <p>Pulse Width: 9 μs ~ 250ms</p>		
Shutter mode	<ul style="list-style-type: none"> • Normal shutter mode • Restart reset mode • Fixed trigger shutter mode • Pulse width trigger shutter mode 		
Safety/Quality standards	<p>UL: Conform to UL Standard including materials and others.</p> <p>RoHS: Conform to RoHS</p> <p>CE: Conform to EN55022:2010 (Class B): Emission Conform to EN61000-6-2:2005: Immunity</p> <p>FCC: To be applied. (Conform to FCC Class A digital Device)</p> <p>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.</p>		
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 \pm X, \pm Y, and \pm Z, total 6 directions. (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: 1360(H) x 1040(V) at full frame scan.	
Sync signals Input /Output	HD/VD Input signal level: 2~5Vp-p, TTL input Input impedance: 10kΩ/75Ω (Refer to the below, SW selection) Allowable frequency deviation: ±3% Phase difference: HD/VD: under 0±5μs Jitter: under 20ns	
	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 with 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	

4.3. CCD Spectral Response (Representative value)

※ Lens characteristics and illuminant characteristics are not considered.



5. Function Settings

Rear panel switch settings

●	1	E2	} ◇ Shutter Speed 3bit, 8step OFF or 1/30 ~ 1/10,000sec
●	2	E1	
●	3	E0	
●	4	MODE 1	◇ Shutter Mode
●	5	MODE 0	Normal shutter mode, Fixed trigger shutter mode, Pulse width trigger shutter mode 1&2
●	6	SCAN 1	◇ Scan Mode 2bit
●	7	SCAN 0	Full frame scan mode, Binning mode, 1/2, 1/4 Partial scan mode
●	8	75ohm	◇ HD/VD input impedance 10kΩ/75Ω
●	9	SCAN EN	◇ Scan Enable (No.9 pin of the circular connector valid/invalid)
●	10	IN/OUT	◇ HD/VD signals input/output settings (No.6 and 7 pins of the circular connector)

↑
OFF

● indicates initial setting position.

Shutter speed settings

E2	E1	E0	Shutter Speed	Actual Time	
SW1	SW2	SW3		Normal shutter mode	Trigger shutter mode
OFF	OFF	OFF	OFF or 1/30s	66.7 ms	33.5 ms
OFF	OFF	ON	1/100 sec	9.74 ms	9.84 ms
OFF	ON	OFF	1/250 sec	3.94 ms	3.95 ms
OFF	ON	ON	1/500 sec	1.94 ms	1.95 ms
ON	OFF	OFF	1/1,000 sec	952 μ s	966 μ s
ON	OFF	ON	1/2,000 sec	455 μ s	468 μ s
ON	ON	OFF	1/5,000 sec	207 μ s	220 μ s
ON	ON	ON	1/10,000 sec	83 μ s	95 μ s

■ Indicates initial setting position

Shutter mode settings

MODE1	MODE0	Setting Mode
SW4	SW5	
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

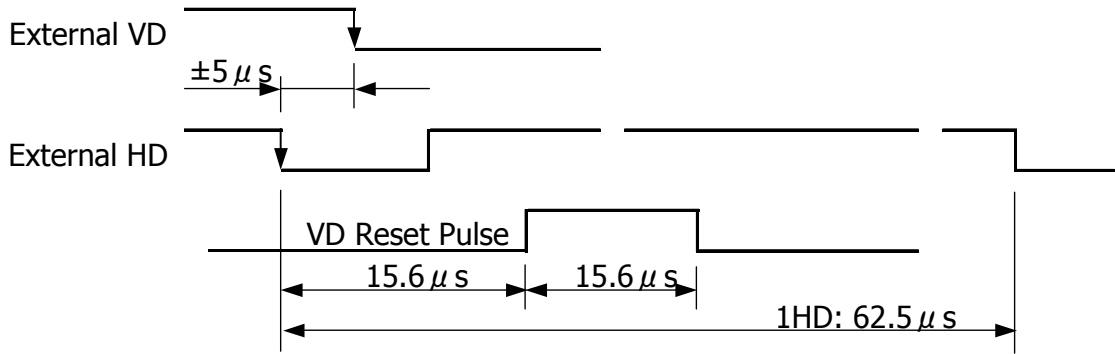
Table of settings

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.

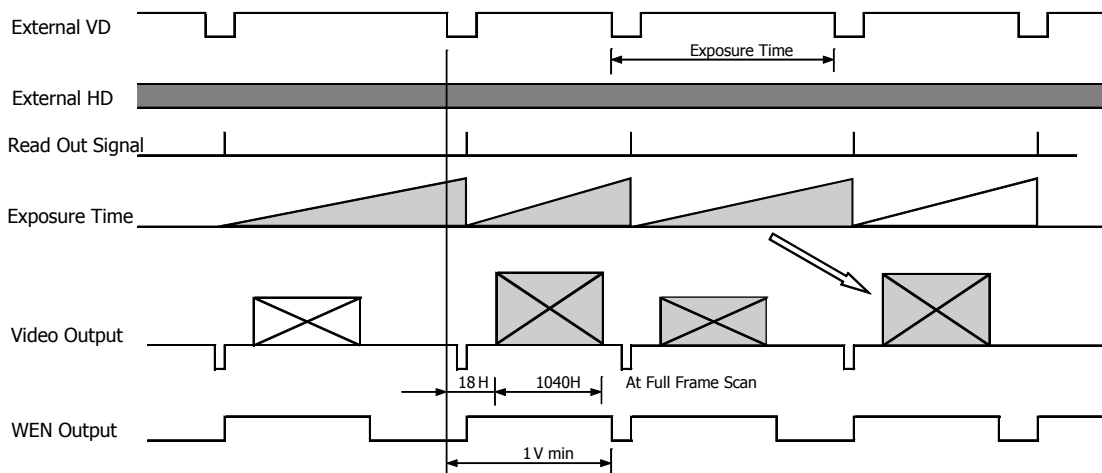
Normal shutter mode

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)

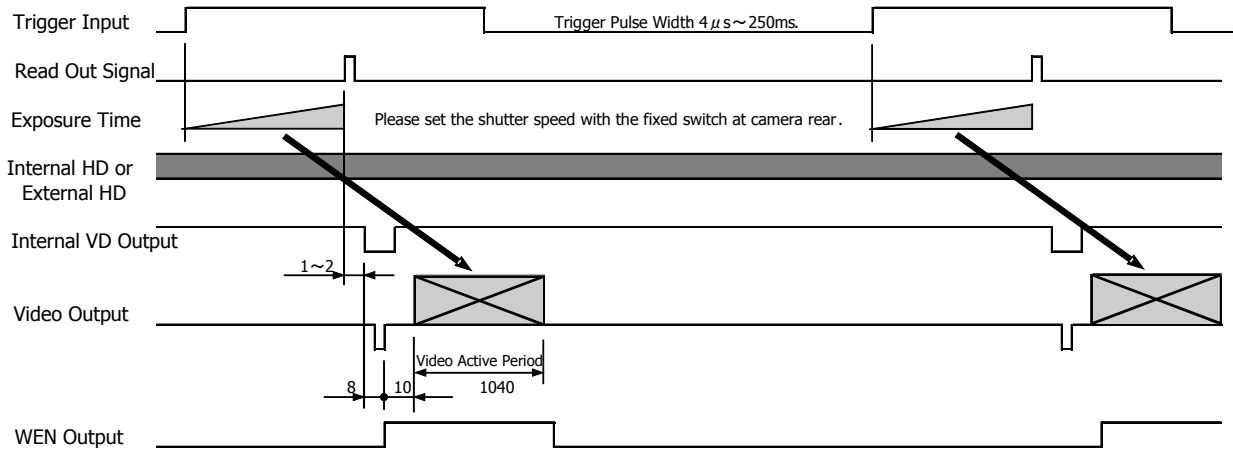
Restart-reset mode (Long time exposure mode) is valid at normal shutter mode, with setting the shutter to OFF, HD/VD sync input ON, and adding external EXT HD input. With adding EXT VD at random timing with over 1VD, data for one screen image is read out. This function is useful when sensitivity with 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.

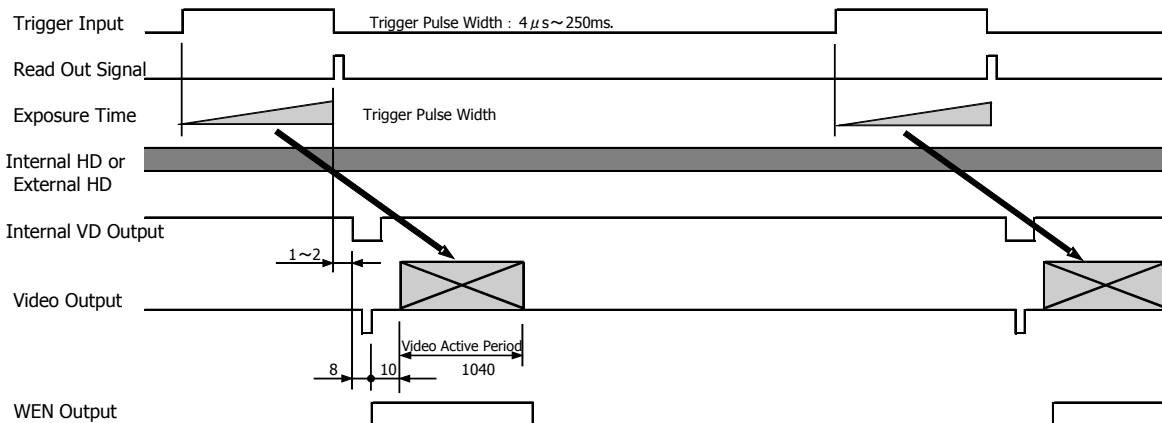
Exposure time = Value set with rear switch SW1 ~ SW3: 1/30 ~ 1/10,000s
 Conditions: Trigger input pulse width shall be 4 μs ~ 250ms, Positive Logic



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.

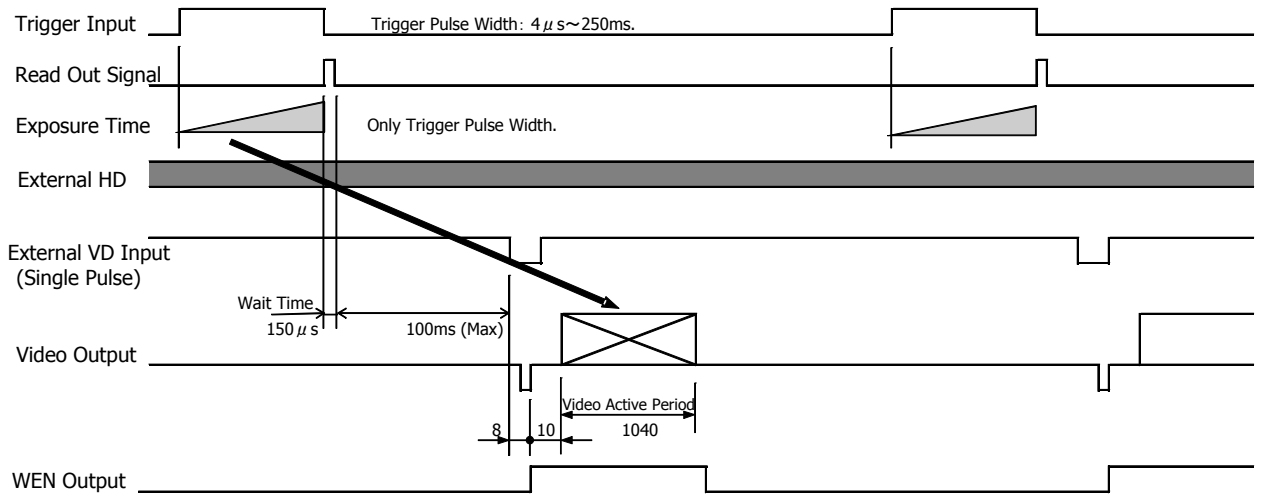
Exposure time = 9 μs ~ 250ms (Actual Time= Trigger pulse width + 5 μs.)
 Conditions: Trigger input pulse width shall be 4 μs ~ 250ms, Positive Logic



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 μ s to 100ms.

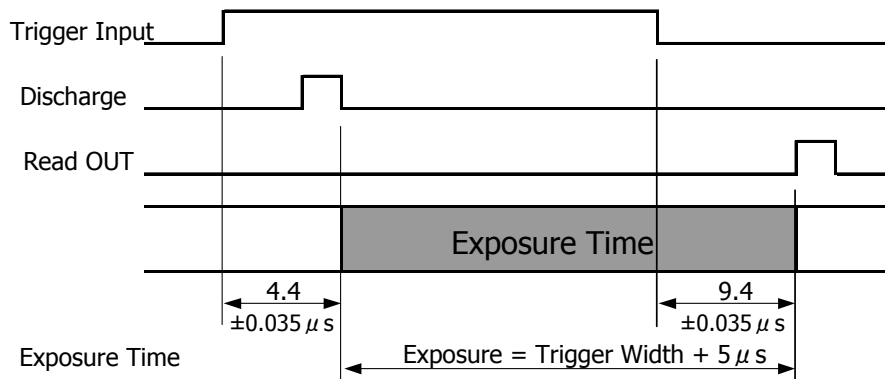
Exposure time = 9 μ s ~ 250ms (Actual Time= Trigger pulse width + 5 μ s.)
 Conditions: Trigger input pulse width = 4 μ s~250ms, Positive Logic



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

Scan 1	Scan 2	Setting Mode
SW6	SW7	
<input checked="" type="checkbox"/> OFF	<input checked="" type="checkbox"/> OFF	Full frame scan
<input type="checkbox"/> OFF	<input type="checkbox"/> ON	Binning scan
<input type="checkbox"/> ON	<input type="checkbox"/> OFF	1/2 Partial scan
<input type="checkbox"/> ON	<input type="checkbox"/> ON	1/4 Partial scan

To control scan mode via No. 9pin of 12pins circular connector

SW9	<input checked="" type="checkbox"/> OFF	No. 9 pin input invalid (Pull Up 10k Ω)
	<input type="checkbox"/> ON	No. 9 pin input valid

Indicates initial setting position

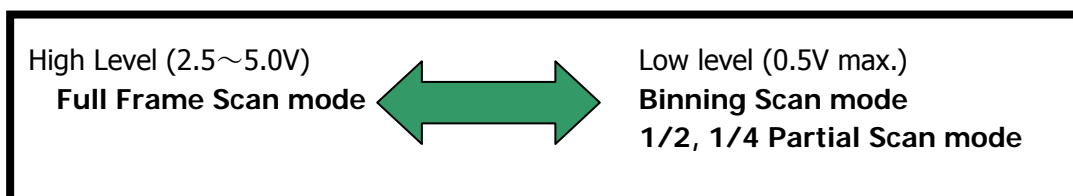
Scan mode chart

Scan mode	Frame rate (fps)	Scanning lines (lines)	Blanking lines (lines)	Video output lines (lines)
Full Frame Scan Mode	14.98	1068	18	1040
Binning Scan Mode	29.96	534	18	512
1/2 Partial Scan Mode	29.96	534	38	465
1/4 Partial Scan Mode	59.92	267	54	169

Changing the scan settings

Scanning shall 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 scan mode or Partial scan mode with SW 6 and 7 at camera rear.
- ③ Change High/Low input level of No. 9 pins of the circular connector.

**Changing the settings of 75ohm HD/VD input impedance**

SW8	<input checked="" type="checkbox"/> OFF	HD/VD input impedance 10k Ω
	<input type="checkbox"/> ON	HD/VD input impedance 75 Ω

Changing HD/VD input and output

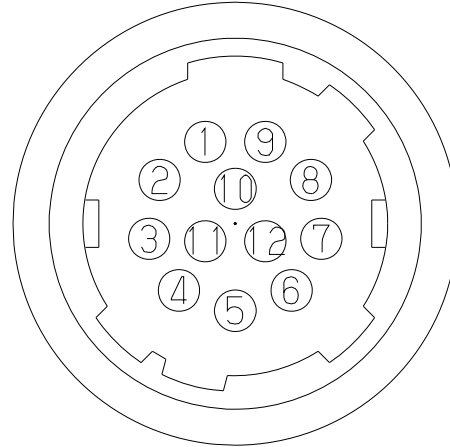
SW10	<input type="checkbox"/> OFF	HD/VD output
	<input checked="" type="checkbox"/> ON	HD/VD input

Indicates initial setting position

6. External Connector Pin Assignment

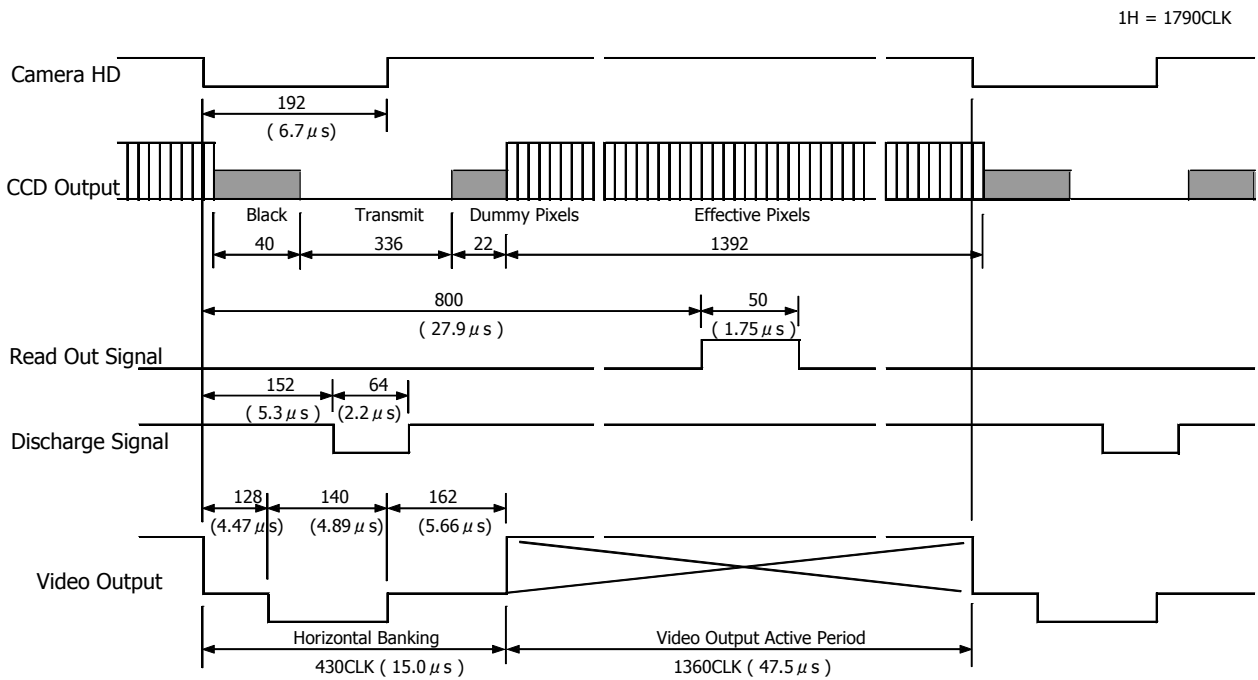
12 pins Circular Connector SNH-10-12 (RPCB) (SAMWOO)

Pin No.	
1	GND
2	Power In DC+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	Trig In
12	GND



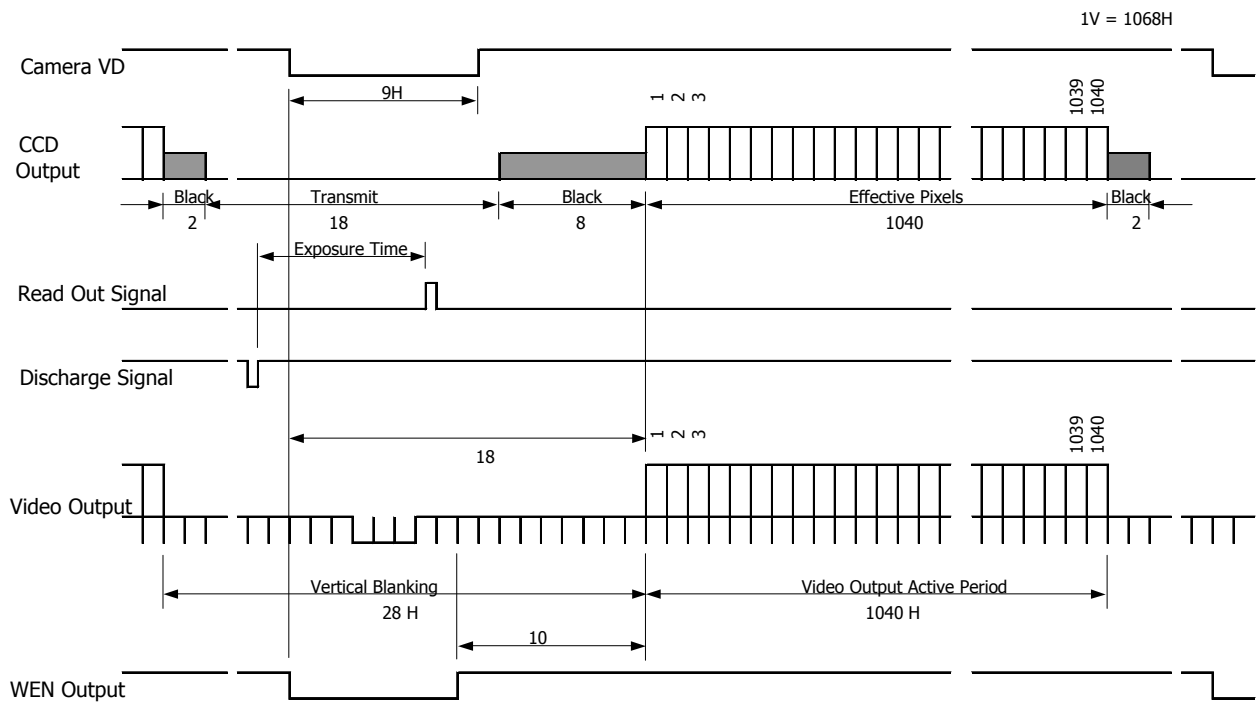
7. Timing Chart

7.1. Horizontal Timing

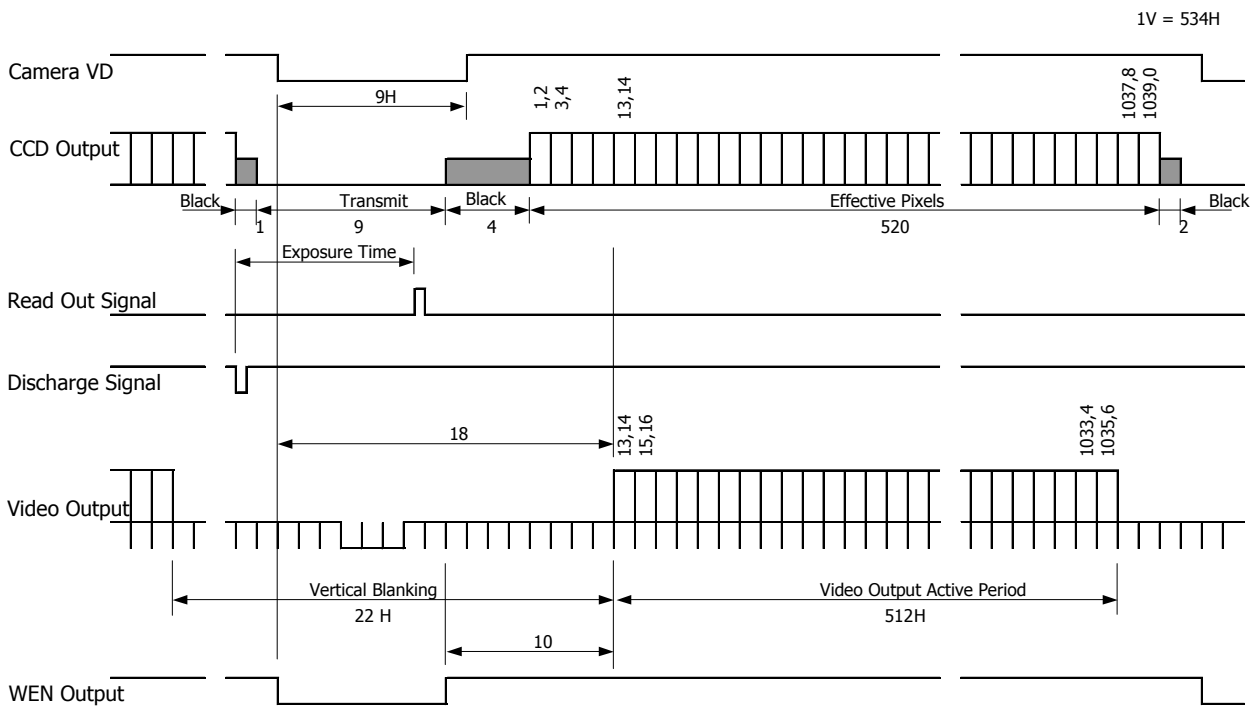


7.2. Vertical Timing

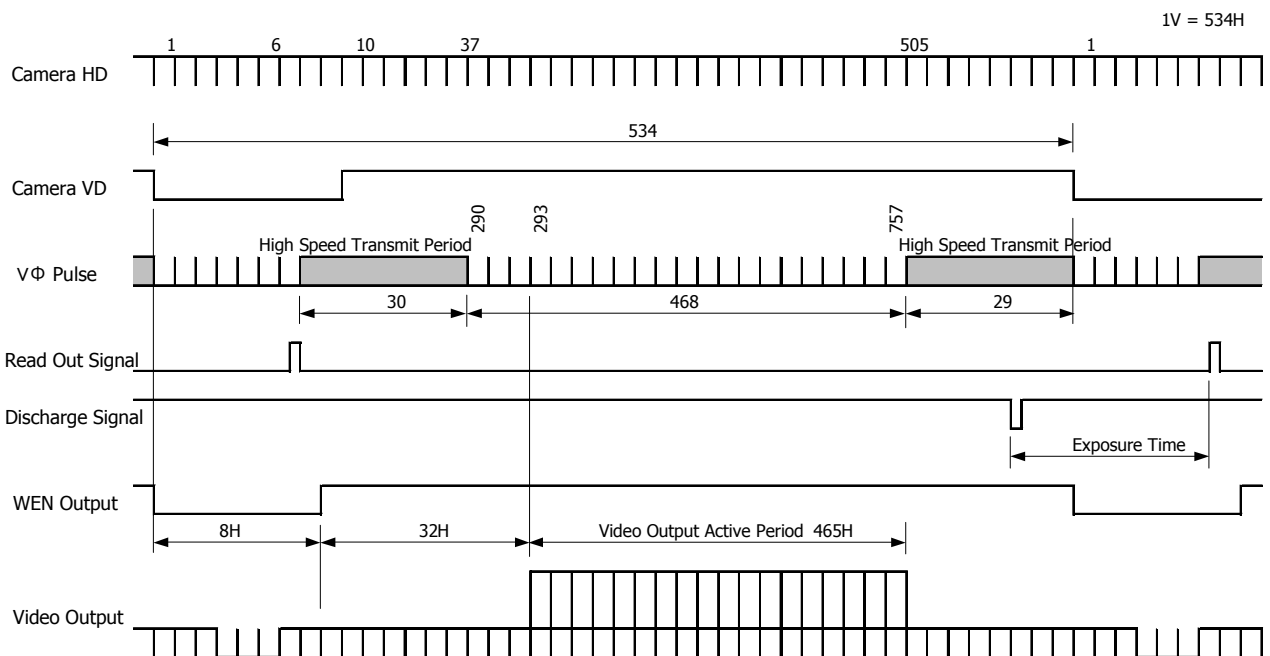
7.2.1. Full Frame Scan Timing



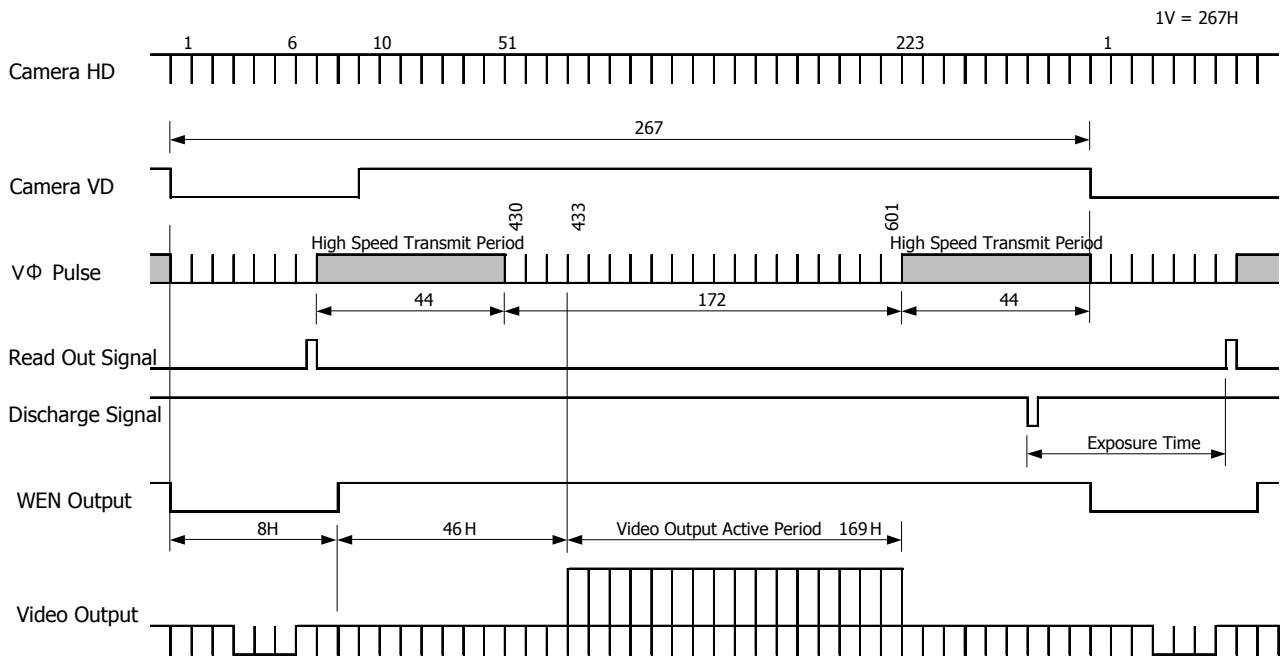
7.2.2. Binning Scan Mode



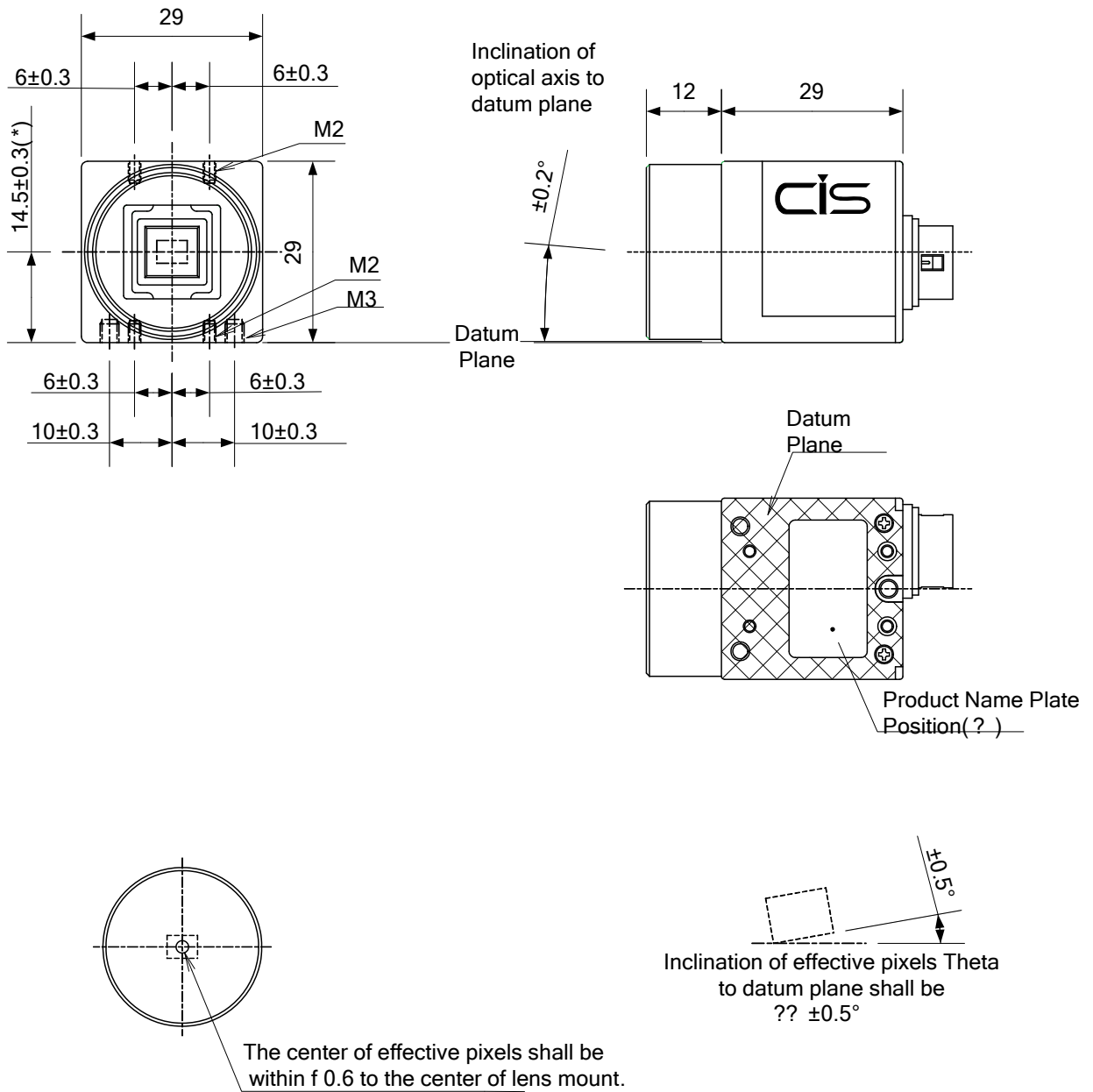
7.2.3. 1/2 Partial Scan Mode



7.2.4. 1/4 Partial Scan Mode



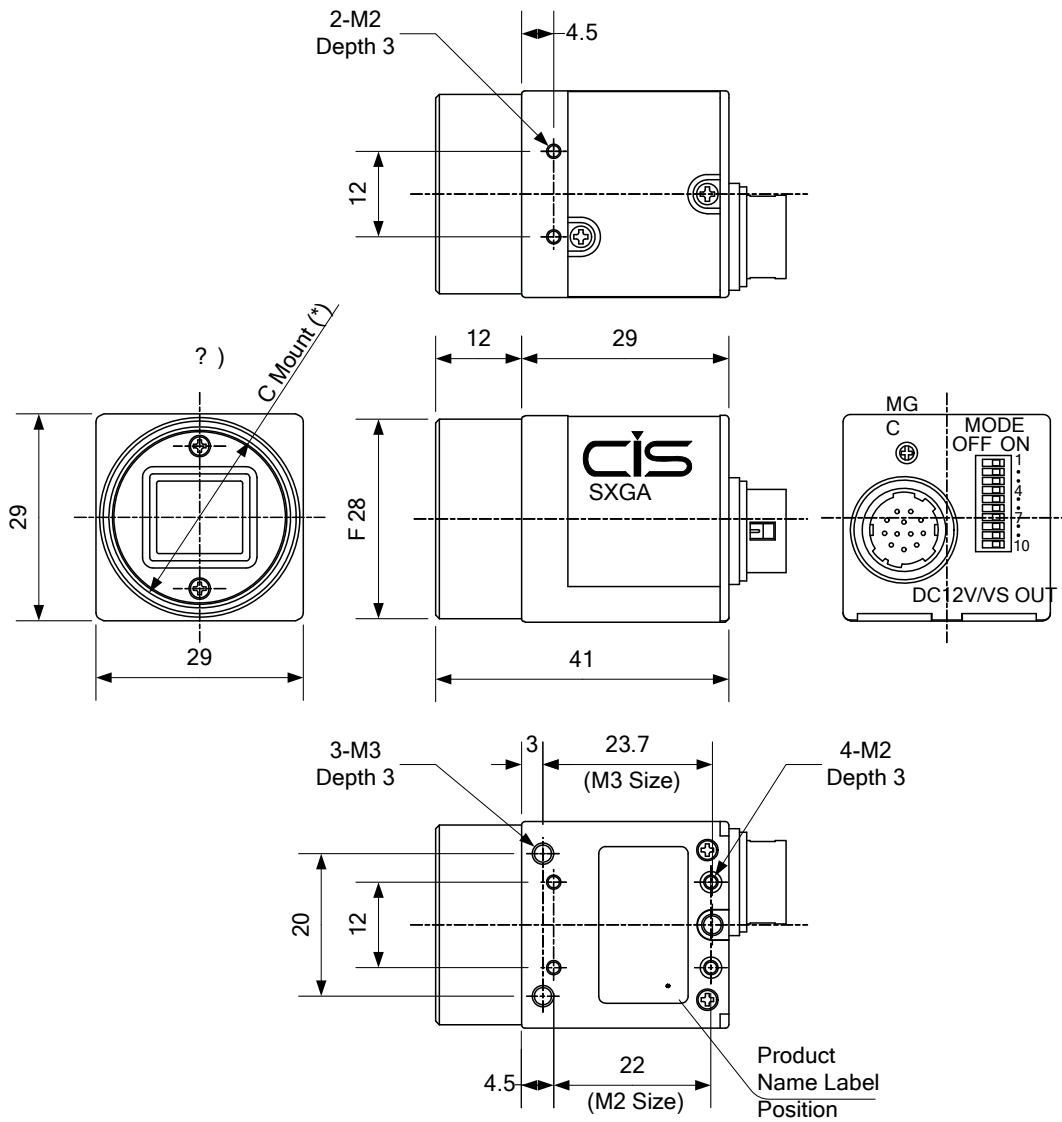
8. CCD Optical Axis Accuracy



(*) 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 C mount lens surface shall be under 6mm.
 And protruding portion shall be less than 10mm.

999-533-00-00
 (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 of 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 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 case of damage or losses are caused by failure to observe the information contained in the instructions in this product specification & operation manual.
- In case of damage or losses are caused by use contrary to the instructions in this product specification & operation manual.
- In case of damage or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.
- In case of 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.