English

Analog I/F

29mm Cubic VGA
B/W Analog Camera

VCC-G20V30B

Product Specification & Operational Manual

CIS Corporation

Table of Contents

1. Scope of Application

This is to describe VCC-G20V30B 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℃ to +45℃)
  - 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.
- 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.
- The voltage ripple of camera power DC +12V±10% shall be within ±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-G20V30B is a high-resolution industrial B/W analog camera module utilizing a 1/3" inch PS IT CCD. 330K pixels CCD image sensor with on-chip micro-lenses realizes high sensitivity and high resolution.

Key Features

- ☐ HD/VD sync input or Trigger input are valid.
- ☐ 1/120s ～ 1/20,000s , 8 steps fixed shutter speed can be set by rear switch.
  9 μ s ～ 250ms shutter speed can be set by trigger pulse width.
- ☐ Frame rates, 60fps and 30fps, are selectable.
- ☐ Restart Rest mode to enable long time exposure can be set.
- ☐ Full Frame Scan Mode and Binning Scan Mode available.
- ☐ 1/2 Partial scan mode, 1/4 Partial scan mode are available.
- ☐ Frame rates can be changed by the input level to 9pins circular connector at rear.
- ☐ Only 29mm cubic in size (excluding projection), light weight 45g, and speed makes it a best match for use in embedded systems.

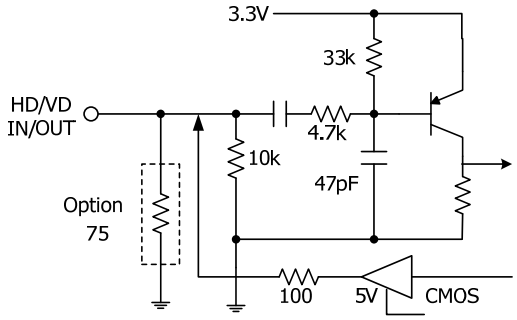
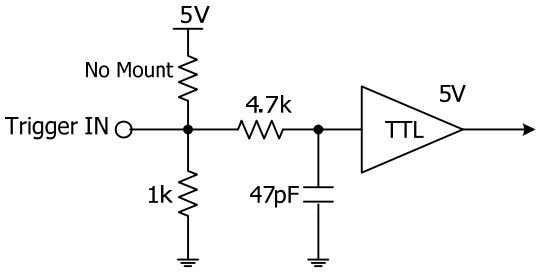
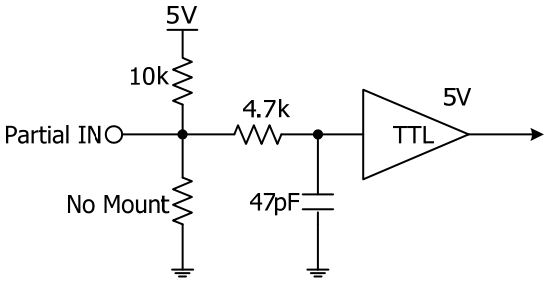
4. Specification

4.1. General Specification

Item	Specification					
Pickup device	Device Type		1/3" Interline Transfer B/W CCD, Sony ICX424AL			
	Effective Pixel Number		659(H) x 494 (V)			
	Unit Cell Size		7.4 μ m (H) x 7.4 μ m (V)			
	Chip Size		5.79mm (H) x 4.89mm (V)			
Video output frequency	60fps Mode	Pixel Clock	24.5454 MHz			
		Horizontal Frequency	31.468 kHz	Pixel Clock	780 CLK	
		Vertical Frequency	Full Frame Scan Mode			
				Scanning lines	525 H	59.94 Hz
			Binning Scan Mode *1			
				Scanning lines	262.5 H	119.9 Hz
			1/2 Partial Scan Mode			
				Scanning lines	262 H	120.1 Hz
			1/4 Partial Scan Mode			
				Scanning lines	131 H	240.2 Hz
	30fps Mode	Pixel Clock	12.2727 MHz			
		Horizontal Frequency	15.734kHz	Pixel Clock	780 CLK	
		Vertical Frequency	Full Frame Scan Mode			
				Scanning lines	525 H	29.97 Hz
			Binning Scan Mode *1			
				Scanning lines	262.5 H	59.94 Hz
			1/2 Partial Scan Mode			
				Scanning lines	262 H	60.05 Hz
			1/4 Partial Scan Mode			
				Scanning lines	131 H	120.1 Hz
	*1 At normal operation, the camera functions as 2:1 interlaced (Field Storage).					
Sync. system	Internal sync & HD/VD external sync (Internal/External recognized automatically)					
Video output standard	Analog VS output					
Resolution	480 TV lines					
Sensitivity	F5.6 400 lx (Shutter speed 1/60s, Gain 0dB, 3200K)					
Minimum illumination	F1.4 1.0 lx (Shutter speed 1/60s, max Gain VS 50IRE)					
S/N ratio	56dB					
Dust or stains in optical system	No dust or stain shall be detected on the testing screen with setting the camera aperture at F16.					

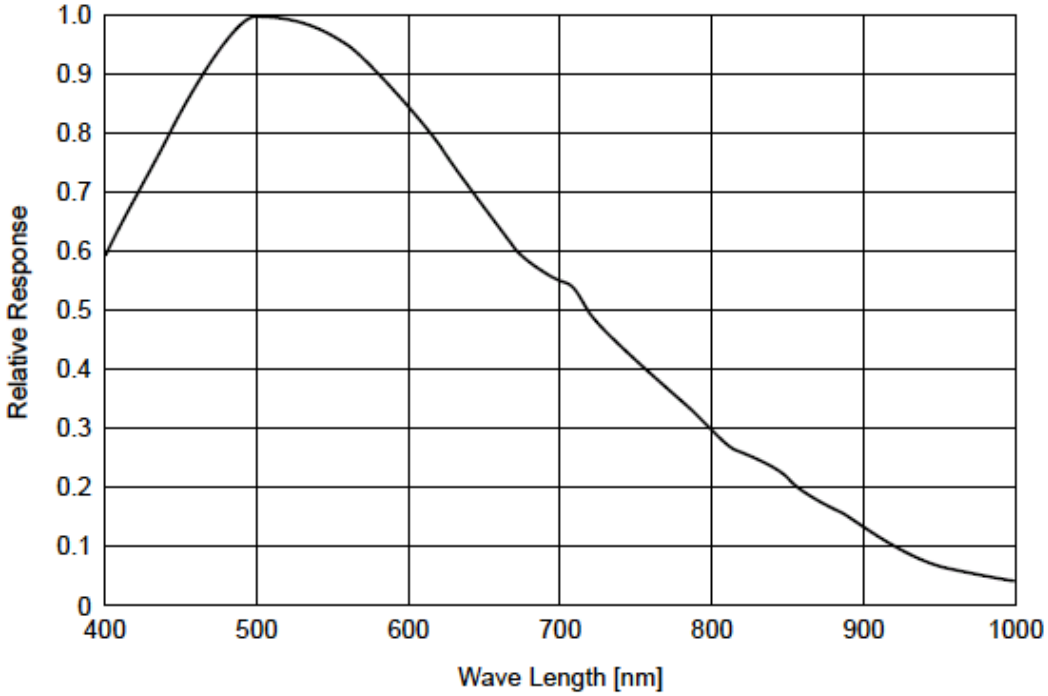
Item	Specification		
Power requirements	DC +12V ± 10%		
Power consumption	1.6 W typ (max. 2W) at DC +12V IN		
Dimension	Refer to overall dimension drawing (Clause 9) 29mm x 29mm x 29mm (excluding projection)		
Mass	Approx. 45 g		
Lens mount	C mount (Refer to overall dimension drawing)		
Optical axis accuracy	Refer to drawing for CCD Optical Axis Accuracy (Clause 8)		
Gain variable range	0～12dB (over guaranteed value)		
Gamma	1 (fixed)		
Shutter speed variable range	<Normal Shutter Mode> 60fps Mode: OFF(1/60), 1/200, 1/500, 1/1000, 1/2000, 1/4000, 1/8000, 1/20000s 30fps Mode: OFF(1/30), 1/100, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000s <Trigger Shutter Mode> 60fps Mode: 1/120, 1/500, 1/1000, 1/2000, 1/4000, 1/8000, 1/20000s 30fps Mode: 1/60, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000s Pulse Width: 9μ～250ms		
Shutter Mode	Normal Shutter Mode, Restart/Reset Mode, Fixed Trigger Shutter Mode, and Pulse Width Trigger Shutter Mode		
Safety/Quality standards	UL: Conform to UL Standard including materials and others. RoHS: Conform to RoHS CE: Conform to EN55022:2010 (Class B) for Emission Conform to EN61000-6-2:2005 for Immunity To be applied 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	XYZ 3 directions
		Testing time	120 min for each direction
	Shock	No malfunction shall be occurred with 980m/s^2(100G) for ±X, ±Y, ±Z, 6 directions. (without package)	
Operation environment	Temperature	Operation guaranteed: -5℃～+45℃ Performance guaranteed: 0℃～+40℃	
	Humidity	RH 20～80% with no condensation	
Storage environment	Temperature	-25℃ ～ +60℃	
	Humidity	RH 20～80% with no condensation	

4.2. Camera Input/Output Signal Specification

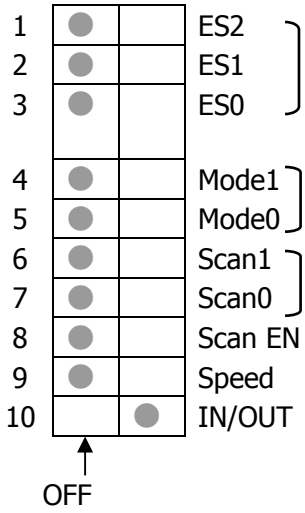
Item	Specification
Video output	Effective output: 648(H) × 494(V) at full frame scan mode
Sync signals Input /Output	Input signal level: 2～5Vp-p TTL Input Input impedance: 10kΩ. 75Ω is an optional function for factory setting. Allowable frequency deviation: ±1% Phase difference: HD/VD: under 0±5μs Jitter: under 20ns  WEN output CMOS (VHC04 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: 1 kΩ Trigger input width: 4μs ～ 250ms 
Partial Input	Input signal level: Low 0.5V (max) High 2.5～5V Input impedance: 10kΩ (Pull Up) 
Video signal	VS output 1.0V (p-p), Sync. Negative, 75Ω unbalanced, DC connect White clip level: 820 ± 70 mVp-p Setup level: 20 ± 15 mVp-p SYNC level: 290 ± 50 mVp-p

4.3. CCD Spectral Response (Representative value)

※ Lens characteristics and illuminant characteristics are not considered.



5. Function Settings



◇Shutter Speed 8 steps
At 60fps : OFF(1/60), 1/120 ～ 1/20000s
at 30fps : OFF(1/30), 1/60 ～ 1/10000s
Trigger Pulse Width 9μs ～ 250ms

◇Shutter Mode
Normal Shutter Mode, Restart/Reset Mode, Trigger Shutter Mode1&2

◇Scan Mode
Full Frame Scan Mode, Binning Scan Mode, Partial Scan Modepins

◇12pins circular connector Pin No. 9 Valid/Invalid

◇60fps CLK=24.5454MHz /30fps CLK=12.2727MHz

◇HD/VD Input/Output

● Indicates initial setting position.

Shutter Speed Settings

(At 60fps mode)

ES2	ES1	ES0	Shutter Speed	Actual Time	
SW1	SW2	SW3		Normal Shutter Mode	Trigger Shutter Mode
OFF	OFF	OFF	OFF(1/60s)	16.7 ms	
			Or 1/120s		8.33ms
OFF	OFF	ON	1/200 s	5.0 ms	5.0 ms
OFF	ON	OFF	1/500 s	2.0 ms	2.0 ms
OFF	ON	ON	1/1000 s	1.0 ms	1.0 ms
ON	OFF	OFF	1/2000 s	495μs	502μs
ON	OFF	ON	1/4000 s	241μs	248μs
ON	ON	OFF	1/8000 s	114μs	120μs
ON	ON	ON	1/20000 s	50μs	57μs

(At 30fps mode)

ES2	ES1	ES0	Shutter Speed	Actual Time	
SW1	SW2	SW3		Normal Shutter Mode	Trigger Shutter Mode
OFF	OFF	OFF	OFF (1/30s)	33.4 ms	Pulse Width
			Or 1/60s		16.7ms
OFF	OFF	ON	1/100 s	10.0 ms	10.0 ms
OFF	ON	OFF	1/250 s	4.0 ms	4.0 ms
OFF	ON	ON	1/500 s	2.0 ms	2.0 ms
ON	OFF	OFF	1/1000 s	986μs	982μs
ON	OFF	ON	1/2000 s	478μs	478μs
ON	ON	OFF	1/4000 s	225μs	225μs
ON	ON	ON	1/10000 s	98μs	98μs

※2 At trigger shutter mode, shutter speed can be set by trigger pulse width.
Indicates factory 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 factory setting position.

Table of Settings

Operation Mode / Function	Normal Shutter Mode	Fixed Trigger Shutter Mode (Sync Reset)	Pulse Width Trigger Shutter Mode 1 (SYNC Reset Mode)	Pulse Width Trigger Shutter Mode 2 (SYNC Non Reset Mode)
Shutter speed by switch	○※1	○	×	×
Shutter speed by pulse width	×	×	○	○
Full Frame Scan Mode	○	○	○	○
Binning Scan Mode	○※2	○	○	○
1/2,1/4 Partial Scan Mode	○	○	○	○
HD/VD Input	○	○HD	○HD	○
HD/VD Output	○	○	○	×

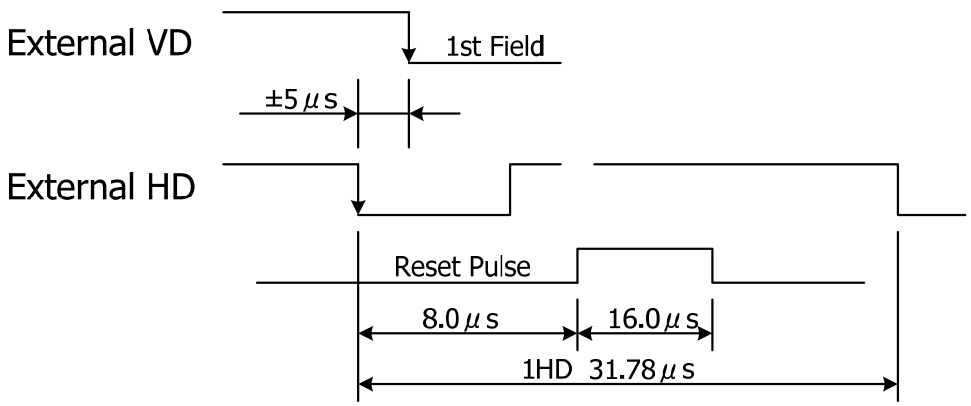
※1. When using as restart reset mode, shutter switch shall be OFF.

※2. When normal shutter mode is used, 2:1 interlaced scan function is operated but restart reset mode function cannot be operated.

Normal Shutter Mode

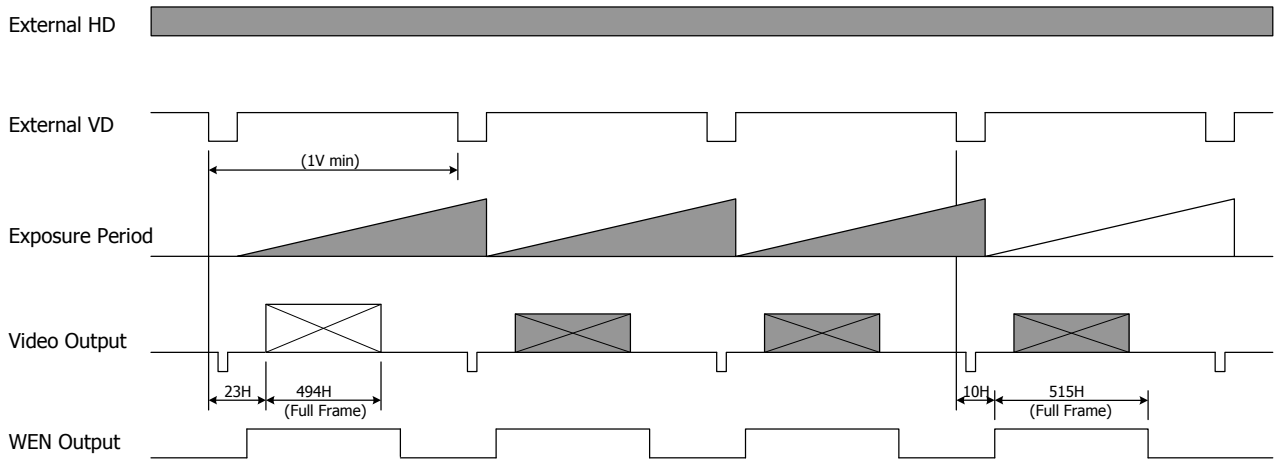
Video outputs are read out consecutively. With shutter function, clear image of the rapidly moving object can be captured. When adding external sync input, please follow the external HD/VD input conditions shown below. (The shown below is for 60fps mode.)

ODD/EVEN field at 2:1 interlaced mode however, shall be determined by the phase of external VD input.



Restart-Reset Mode

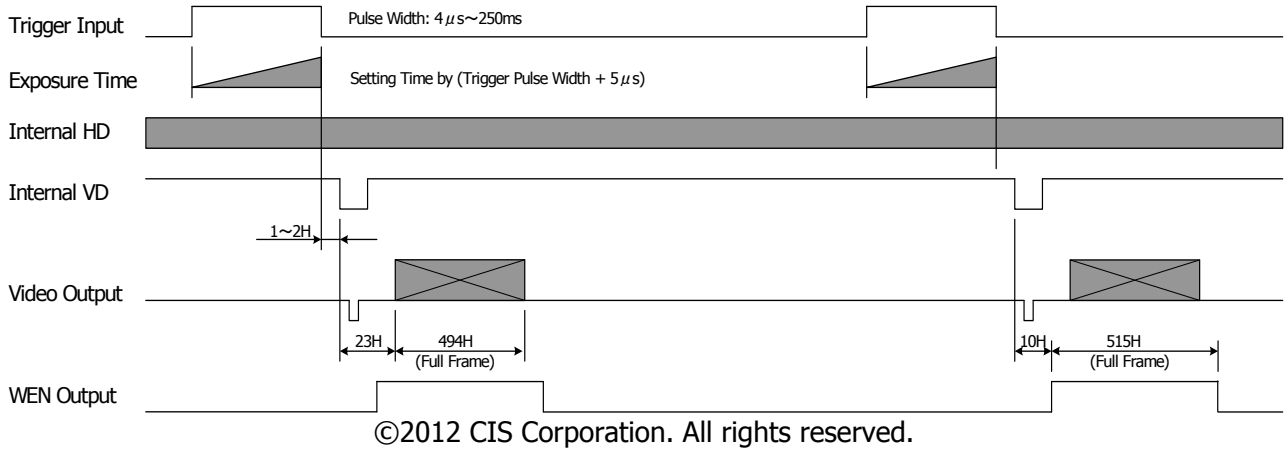
With adding EXT VD input at random timing with over 1 VD, and adding external HD input, data for one screen image is read out. This function is useful when sensitivity with regular exposure time is not sufficient or when indicating the locus of moving object. ODD/EVEN field at 2:1 interlaced mode however, shall be determined by the phase of external VD input.



Fixed Trigger Shutter Mode 1 (Sync Reset Mode)
Pulse Width Trigger Shutter Mode 1 (Sync Reset Mode)

After completion of exposure, internal VD signals are reset and the video will be output 1～2H later.
Internal VD, Composit SYNC, and WEN are output as one-to-one correspondence to the trigger input so that images can be captured by any of those output signals.
Generally, HD/VD sync singals are unncessary but with external HD signals input, the signals can be synchronized with internal HD.

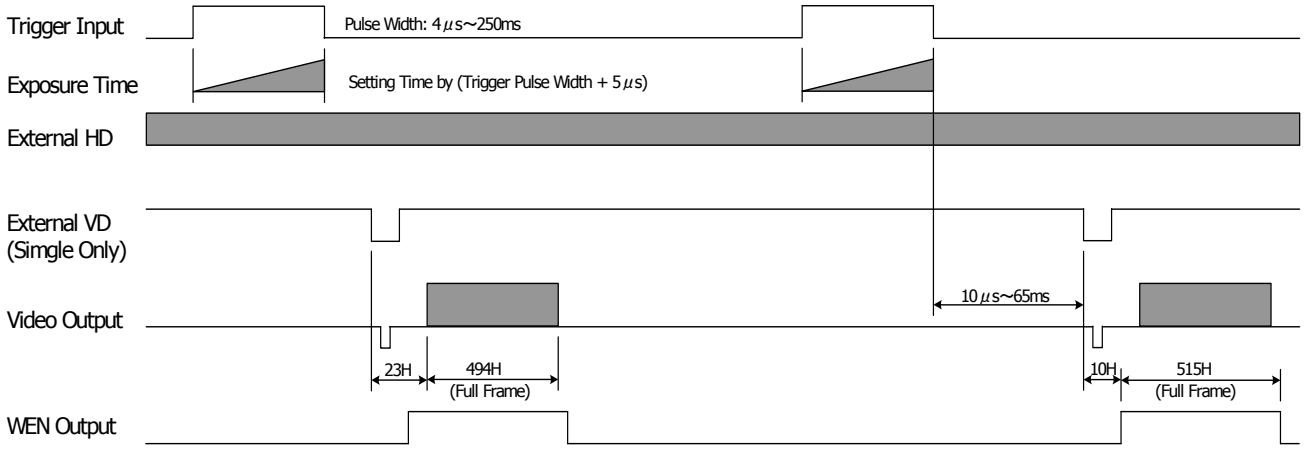
Exposure time at fixed trigger shutter mode =
Set value by switch SW1 ～ SW3: 1/120 ～ 1/20000s at 60fps mode
: 1/100 ～ 1/10000s at 30fps mode
Set value by trigger pulse width: 9μs ～ 250ms (Actual time = trigger pulse width + 5μs)



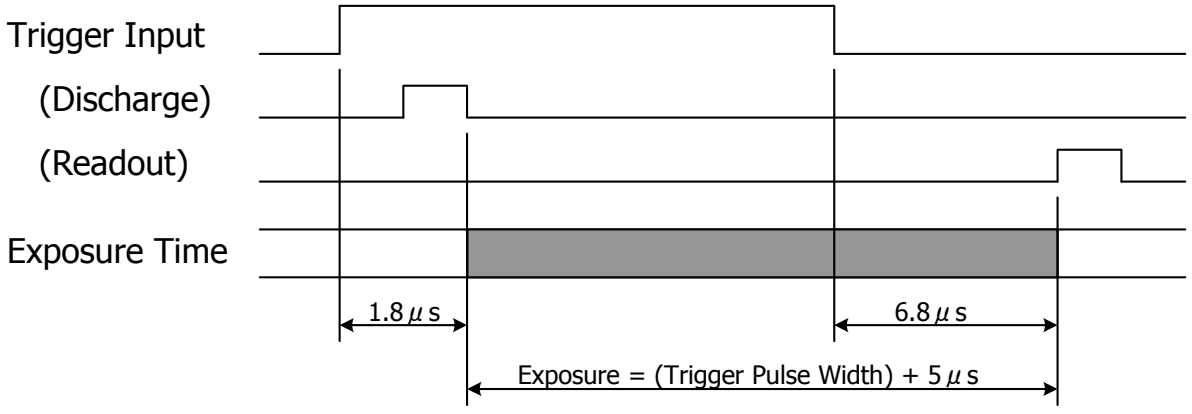
Pulse Width Trigger Shutter Mode 2 (Sync Non-Reset Mode)

After completion of exposure, with single external VD input, video can be output from that position. The single external VD shall be input during the period from 10 μs ~ 65ms after completion of exposure time. External VD input, Composite SYNC output, and WEN output are one-to-one correspondence so that images can be captured with any signals.

Exposure time =
Set value by trigger pulse width: 9 μs ~ 250ms (Actual time = trigger pulse width + 5 μs)



Caution 1: When the next trigger is input before the completion of video signals output for the prior trigger, the images 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 control the light volume.
Caution 3: Please refer to the exposure timing chart below for the actual timing to start exposure after adding trigger input, andfor the actual timing to complete exposure at pulse width trigger shutter operation.



Scan Mode Settings

Scan 1 SW6	Scan 0 SW7	Setting Mode
OFF	OFF	Full Frame Scan Mode
OFF	ON	Binning Scan Mode or 2:1 Interlaced Mode
ON	OFF	1/2 Partial Scan Mode
ON	ON	1/4 Partial Scan Mode

Scan Mode Selection (12pins circular connector Partial IN Valid/Invalid)

SW8 OFF No.9pin invalid (Pull Up 10kΩ)
ON No.9pin valid
Indicates initial setting position

Scan modes chart *3

Scan Mode	Frame (fps)	Scanning lines (Lines)	Blanking Lines (Lines)	Video output lines (Lines)
Full Frame Scan Mode	59.94	525	23	494
Binning Scan Mode *4	119.9	262.5	20	242.5
1/2 Partial Scan Mode	120.1	262	32	222
1/4 Partial Scan Mode	240.2	131	38	76

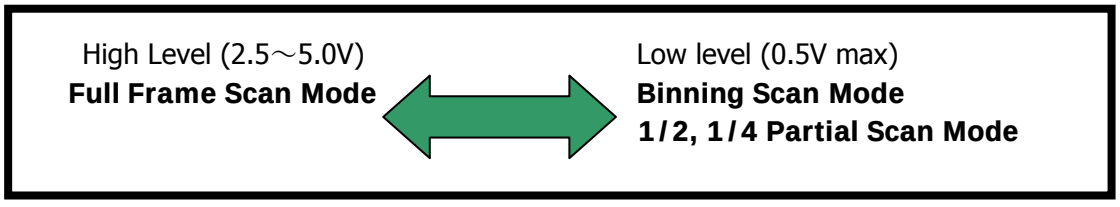
*3 The value above is for 60fps mode (CLK = 24.545 MHz)

*4 At normal shutter mode, it operates as 2:1 interlaced mode (field storage) and at trigger shutter mode, it operates as binning scan mode.

Changing the scan settings

Scan settings shall be changed basically by the settings of camera switch SW6 and SW7 at rear, but it can be also changed by the input level of No. 9pins of the circular connector.

① Set SW 8 ON at camera rear to enable No. 9 pins input of the circular connector.
② With SW6 and SW7 at rear, select scan mode when circular connector No.9pin is set to Low Level.
When circular connector No.9pin is set to High Level, the scan mode shall be fixed to full frame scan.
③ Binning Mode or Partial Scan Mode with SW 6 and 7 at camera rear.
④ Change H/L input level of No. 9 pins of the circular connector.



Changing pixel clock frequency

SW9 OFF 60fps Mode CLK =24.5454MHz
ON 30fps Mode CLK =12.2727MHz

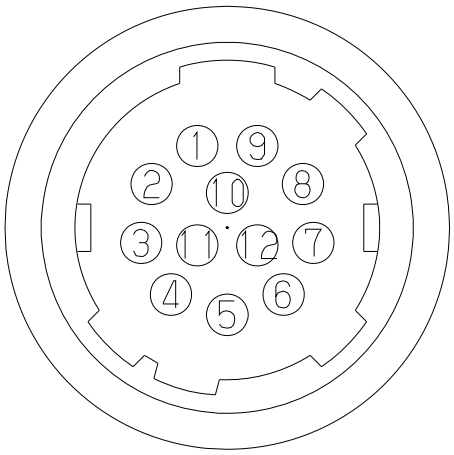
Changing HD/VD input and output

SW10 OFF HD/VD output
ON HD/VD input (Internal/External sync is recognized automatically.)
Indicates the factory setting position

6. External Connector Pin Assignment

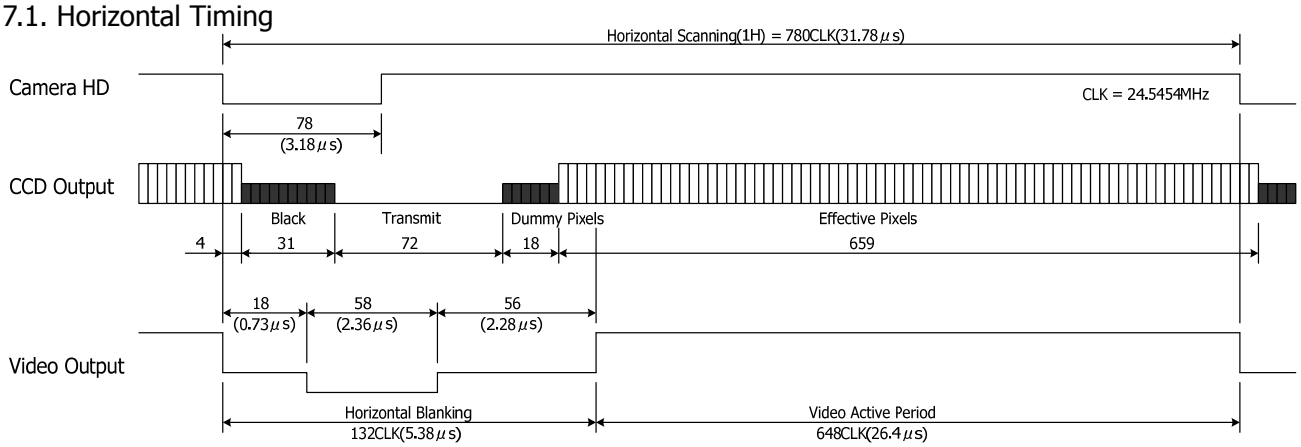
12 pins Circular Connector SNH-10-12 (RPCB) (SAMWOO)

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	Partial In
10	WEN Out
11	Trig In
12	GND



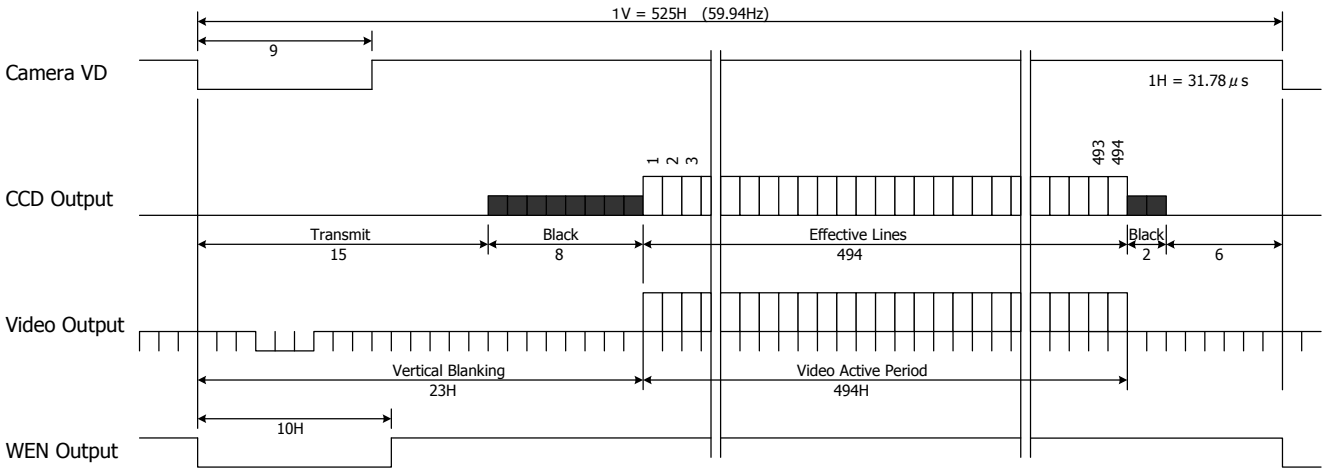
7. Timing Chart

7.1. Horizontal Timing

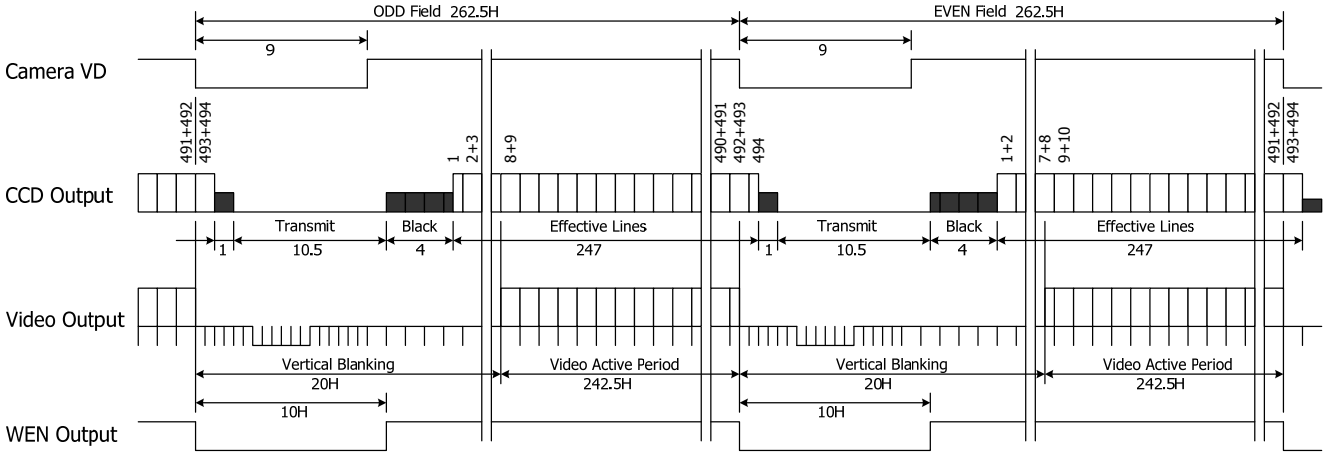


7.2. Vertical Timing

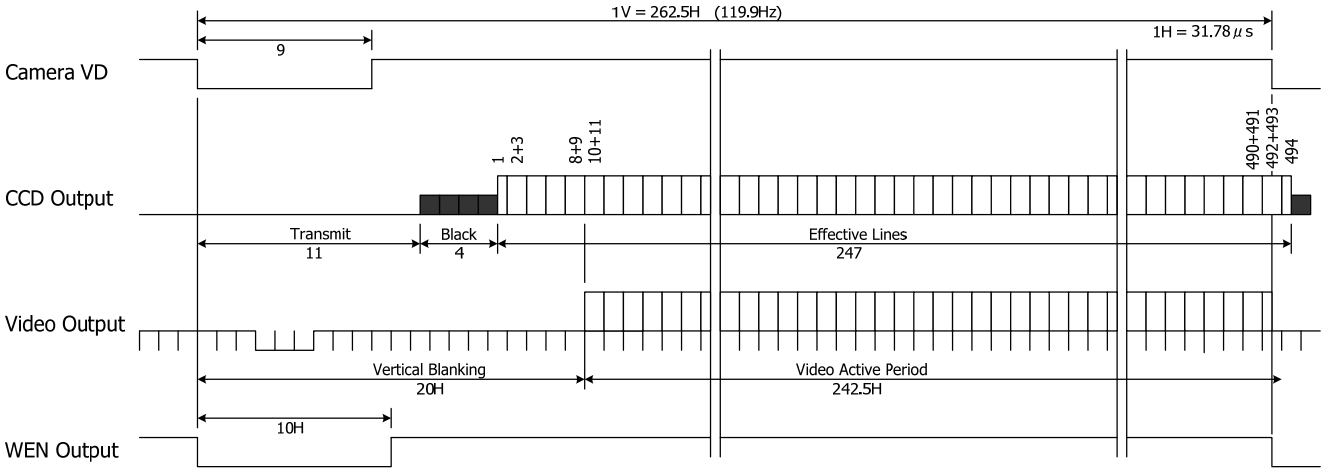
7.2.1. Full Frame Scan Mode



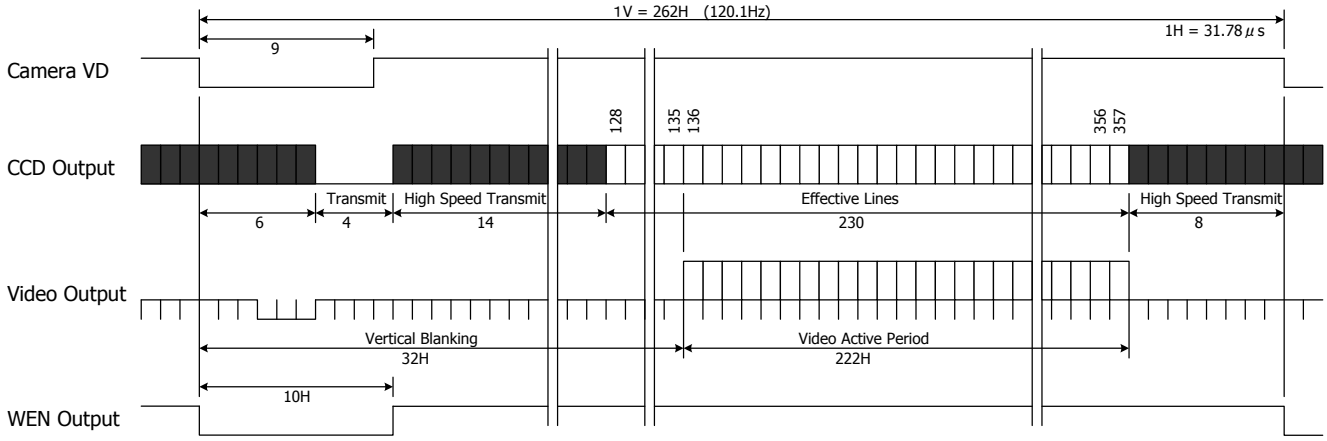
7.2.2. 2:1 Interlaced Mode at Normal Shutter Mode



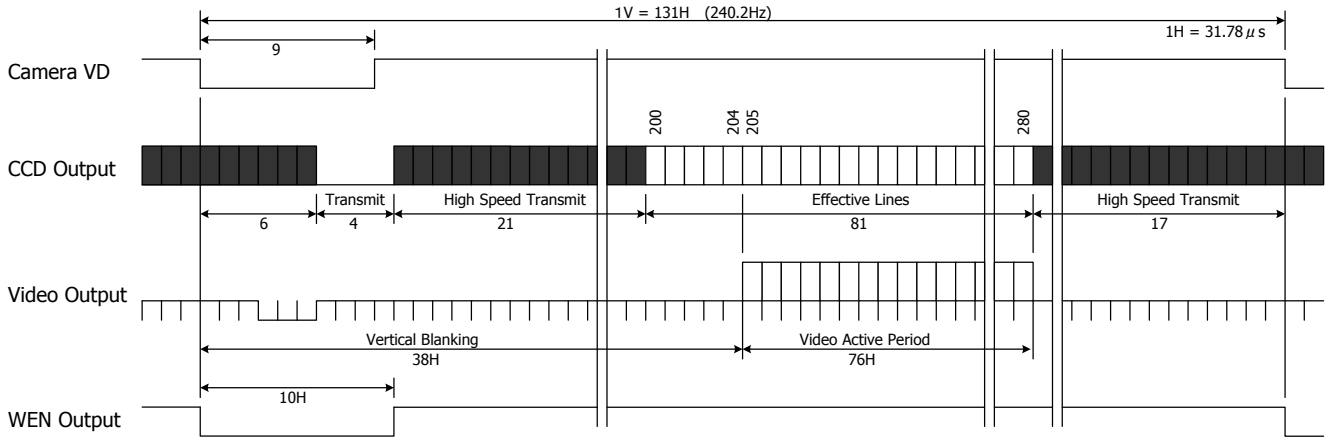
7.2.3. Binning Scan Mode at Trigger Shutter Mode



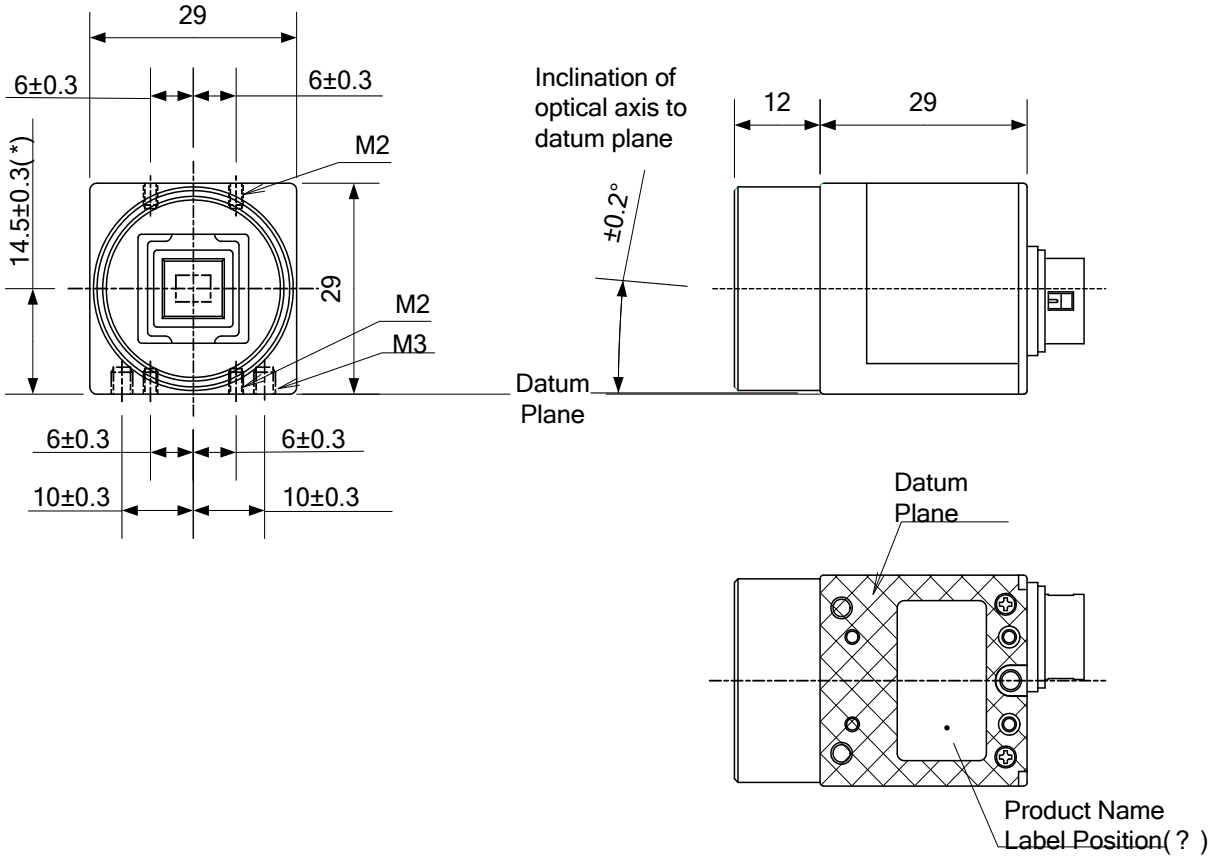
7.2.4. 1/2 Partial Scan Mode



7.2.5. 1/4 Partial Scan Mode



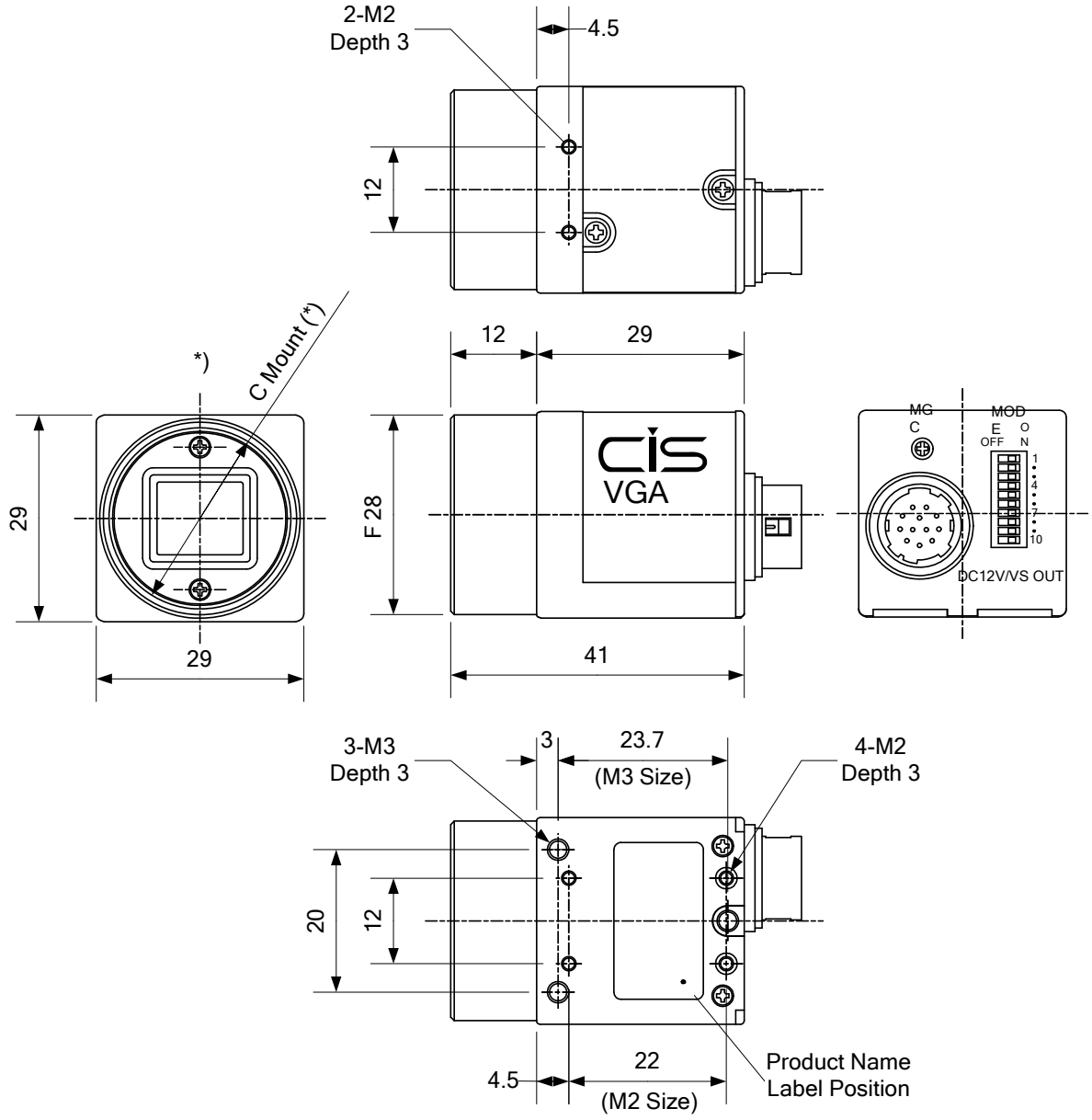
8. CCD Optical Axis Accuracy



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

910-015-00-00
(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.

999-541-00-00

(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

After delivery, 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.

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.