



English

**SXGA B/W Camera  
49MHz Pixel Clock Camera Link**

**VCC-G22S21CL**

**Product Specification  
& Operation Manual**

**CIS Corporation**

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## 1. Scope of Application

This is to describe VCC-G22S21CL Camera Link 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 refer to Clause 13. Handling Precautions.

## 3. Product Outline

VCC-G22S21CL is a high-resolution industrial B/W digital video camera module utilizing a 1/2 inch PS IT CCD. 1450K CCD image sensor with on-chip micro-lenses realizes high sensitivity and high resolution.

### Key Features.

#### Electronic shutter

Electronic shutter speed switchable by serial communications

OFF (1/25s) ~ 1/20,000s : 10 steps

Electronic shutter speed switchable by trigger pulse width

Approx. 1/2s ~ 1/20,000s

#### Video frame rates

The following is for both normal mode and trigger mode.

Progressive Scan: 25 fps

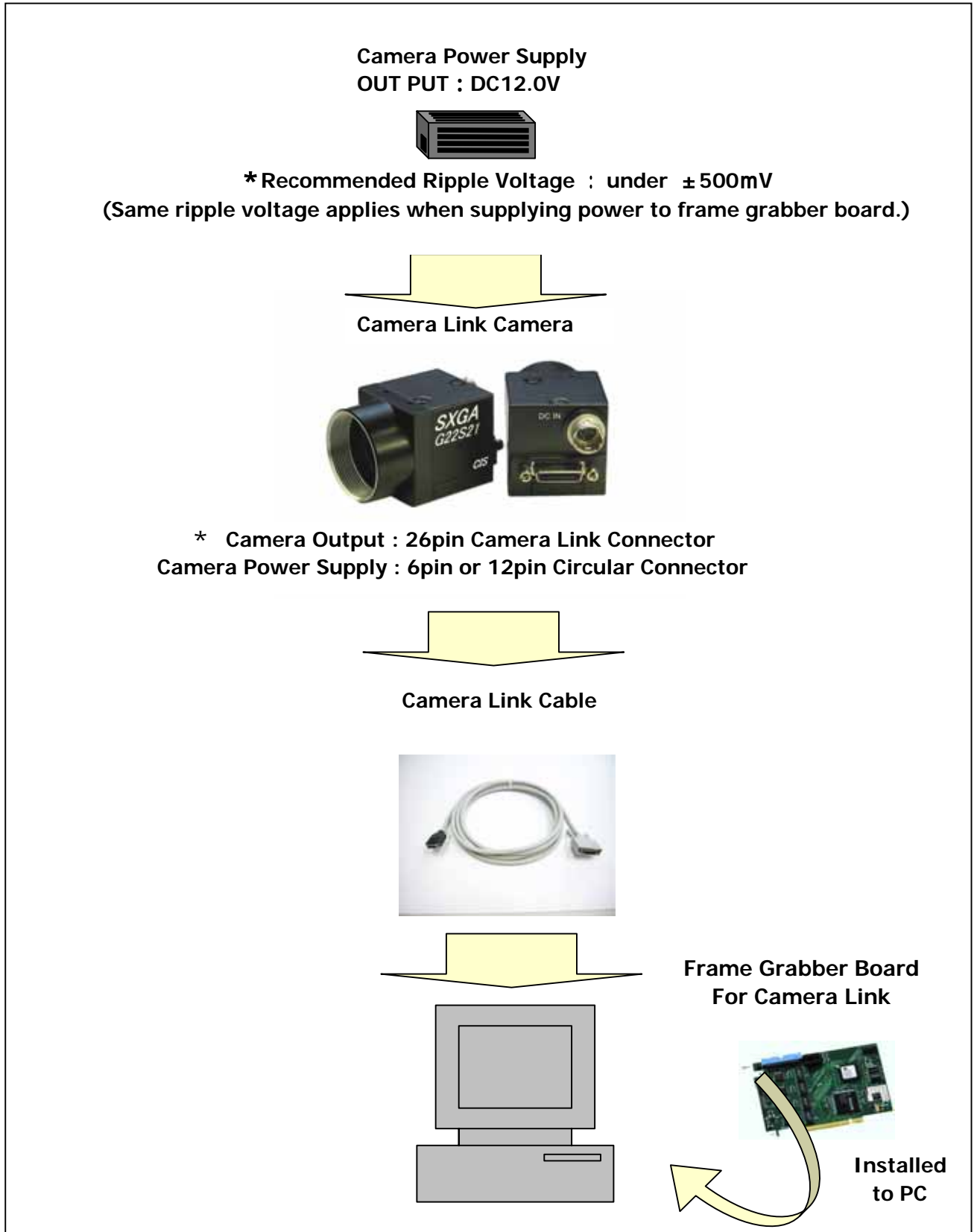
#### Camera Link

By use of dedicated cable, VCC-G22S21CL can be connected to Camera Link capture board.

#### Dimensions

Only 29mm<sup>3</sup> in size (excluding projection), light weight 50g, and speed makes it a best match for use in embedded systems.

4. System Connection Diagram

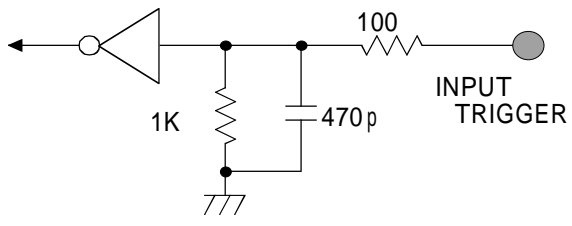
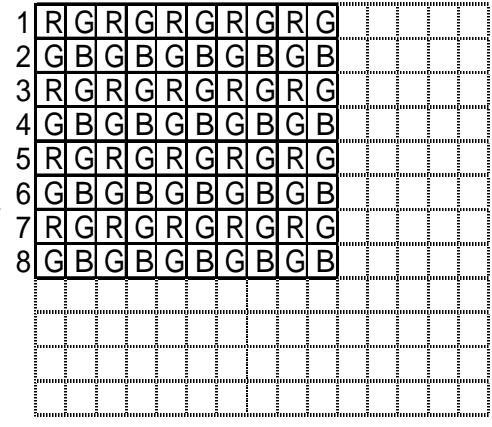


## 5. Specification

### 5.1. General Specification

Item	Specification	Remarks
Power consumption	2.7W	
Power requirements	DC +12V $\pm$ 10% (Max voltage not to exceed 15V)	
Operation environment	(Performance Guaranteed) 0 ~ +40 with RH 20 ~ 80% (Operation Guaranteed) -5 ~ +45 with RH 20 ~ 80% Note: No condensation	
Storage environment	-25 ~ +60 with RH 20 ~ 80% Note: No condensation	
Mass	Approx. 50 g	
Dimension	Refer to overall dimension drawing (Clause 11) 29mm x 29mm x 29mm (excluding projection)	
Lens mount	C mount (Flange back: 17.526mm) fixed.	
Optical axis accuracy	Refer to Clause 10. CCD Optical Axis Accuracy	
Video output signal	Digital RAW data 8 bit/10bit Camera Link output Base Configuration 8 bit: Output Port A 10 bit: Output Port A & B 8bit/10bit can be selected at address 013.	
Pick up device	1/2" Interline Transfer B/W CCD Total Pixel number 1392 (H) x 1040 (V) Effective Pixel number 1392 (H) x 1040 (V) Recommended Pixel number 1360 (H) x 1024 (V) Unit cell size 4.65 $\mu$ m (H) x 4.65 $\mu$ m (V)	ICX267AL (Sony) Progressive Scan
Scanning system	1/20sec Non-interlaced Horizontal frequency 25.568 KHz Vertical frequency 20.421 Hz Pixel clock 49.090 MHz	
Sensitivity	F5.6 400 lx (at 1/25 sec exposure, Gain 0dB)	
Min. illumination	F1.4 2.0 lx (at 1/25 sec exposure, Gain 12dB)	

## 5.2. Camera Output Signal Specification

Item		Specification		Remarks
Horizontal resolution		1024 TV lines		
Sync. Signal I/O	LVAL output	LVDS (Camera Link)		Camera Link connector
	FVAL output	LVDS (Camera Link)		
	DVAL output	LVDS (Camera Link)		
	HD/VD input	None		Option
Trigger input	Polarity	POSI/NEGA Selectable		
	Input signal level	LVDS (Camera Link) CC 1 Input		Camera Link connector HR10A-7R-6PA
		TTL Input VHI Min 2.0V VIL Min 0.8V 		
Min. Trigger Pulse width	Over 2 HD			
Video output signal		Digital 8bit	Digital 10bit	
	White Clip Level	FF h	3FF h	
	Setup Level	08 ± 03 h	020 ± 00C h	
	Dark Shading	Under 10h for both horizontal and vertical.		Under 1ch for both horizontal and vertical.
	RAW Data Output in detail.	ドット数 Dot number 1 2 3 4 5 6 7 8 9 10 ライ数 Line number 1 RGRGRGRGRG 2 GBGBGBGBGB 3 RGRGRGRGRG 4 GBGBGBGBGB 5 RGRGRGRGRG 6 GBGBGBGBGB 7 RGRGRGRGRG 8 GBGBGBGBGB 		

### 5.3. Camera Link Connector Bit Assignment (Base Configuration)

#### 8 bit Data output

Port/bit	Data bit	Port/bit	Data bit	Port/bit	Data bit
Port A0	D0	Port B0	No Data	Port C0	No Data
Port A1	D1	Port B1	No Data	Port C1	No Data
Port A2	D2	Port B2	No Data	Port C2	No Data
Port A3	D3	Port B3	No Data	Port C3	No Data
Port A4	D4	Port B4	No Data	Port C4	No Data
Port A5	D5	Port B5	No Data	Port C5	No Data
Port A6	D6	Port B6	No Data	Port C6	No Data
Port A7	D7	Port B7	No Data	Port C7	No Data

#### 10 bit Data output

Port/bit	Data bit	Port/bit	Data bit	Port/bit	Data bit
Port A0	D0	Port B0	D8	Port C0	No Data
Port A1	D1	Port B1	D9	Port C1	No Data
Port A2	D2	Port B2	No Data	Port C2	No Data
Port A3	D3	Port B3	No Data	Port C3	No Data
Port A4	D4	Port B4	No Data	Port C4	No Data
Port A5	D5	Port B5	No Data	Port C5	No Data
Port A6	D6	Port B6	No Data	Port C6	No Data
Port A7	D7	Port B7	No Data	Port C7	No Data

## 5.4. Function Setting

Camera functions can be set with serial data communications.

Function	Address	Data	Remarks
No Function	000	No Function	
Gain	001	0: - 1 dB 1: 0 dB 2: + 6 dB 3: +12 dB 4: Manual Gain (Refer to address 008.)	
E-Shutter Position	002	0: 1/25 s ( OFF )                      6: 1/2000 s 1: 1/50 s                                      7: 1/4000s 2: 1/100 s                                    8: 1/10000s 3: 1/250 s                                    9: 1/20000 s 4: 1/500 s                                    10 ~ 15: 1/25 s ( OFF ) 5: 1/1000 s    16: Manual Shutter (Refer to address 009&010.)	
No Function	003	No Function	
Trigger Mode	004	0: Standard Mode (Trigger Mode OFF) 1: Standard Trigger Mode (Shutter speed can be set at address 002.) 2: Pulse Width Trigger Mode (Shutter speed can be set by pulse width.) 3: No function	
No Function	005-007	No Function	
Manual Gain Control	008	0 ~ 255: -1dB ~ +12dB      Set the data of address 001 to 004.	
Manual Shutter Control	009 & 010	0 ~ 1066: 1/25 s ~ 1/20000s Set the data of address 002 to 016. Address 009 MSB and address 010 LSB make 10 bits in total. $\text{Shutter Speed} = 1 / ( (1067.3 - \text{Data}) 36.46 \mu \text{s} )$ MAX Data = 42A h = 1066	
Trigger Polarity	011	0: Positive Input 1: Negative Input	
Input Trigger Port Select	012	0: 26pin Camera Link (12226-1100-00 PL) 1: 6pin Circular connector (HR10A-7R-6PA)	LVDS TTL
Output Data Serial	013	0: 8bit Output Data 1: 10bit Output Data	
Trigger Reset Type	014	0: V-SYNC Reset 1: HV-SYNC Reset	
Data Save	015	Input "083", and address 000 ~ 014 will be saved to EEP-ROM.	



### Pulse Width Trigger Mode

Shutter value can be set by trigger pulse width.  
 Trigger pulse width shall be within over 1HD to 1/2 sec.  
 When V-Sync reset operation, it can be controlled 1HD basis.

Approximate exposure time

$$\text{Exposure Time} = \text{Trigger Pulse Width (nHD)} + 1.6 \text{ HD} \quad (\text{HD} = 39.11 \mu\text{s})$$

Note: Please note the followings when using trigger shutter mode.  
 Re-triggering at V-Sync reset operation shall be after 2H of CCD read out signal.  
 Re-triggering at HV-Sync reset operation shall be after completion of video output.

### 5.5. Remote Interface Function

Through RS-232C interface via 6 pin of circular connector or 26 pin of camera link connector, the camera can be controlled by external PC.

(1) The settings for RS-232C are as follows.

Baud rate: 9600 bps  
 Data: 8 bits  
 Start bit: 1 bit  
 Stop bit: 1 bit  
 Parity: None  
 XON/XOFF: not controlled

(2) Control code

- The total control code is 14 bits, which conforms to ASCII code.
- The control code consists of camera No. process code, remote controller address, remote controller data, and CR. Execute Read/Write through PC, and the camera will reply the data.

1	2	3	4	5	6	7 th Byte	8	9	10	11	12	13	14
Camera No.						Process code	Remote controller address			Remote controller data			CR
00000: Common to the all cameras. 000001 ~ ZZZZZZ: Camera No. of individual camera.						"R" Read mode "W" Write mode "C" Camera mode	Please refer to the address table of 5.4 function setting.			000 ~ 255			0 Dh

Camera No. shall consist of 6 bytes of characters/numeric strings.

Send the individual camera number code or common number code, "000000".

The reply data from the camera shall contain the registered number for that camera.

Process code

Input any one of R, W, or C to the process code.

R (read mode) is to read the data of remote controller address.

Please be noted to set any dummy data (000 ~ 255) to 11<sup>th</sup> ~ 13<sup>th</sup>, since a command shall consists of 14 bytes.

W (write mode) is to write the data to the remote controller address.

Please be noted that the data cannot be saved into EEPROM of the camera.

(Reboot the camera, and the data is reset to the initial setting.)

To save the data into EEPROM, please refer to Clause 5.4. Function Setting.

**Note: Once the data was saved into EEPROM, it may not be reset to the initial settings.**

C is the code to send the data back from the camera.

**Note: Do not set code C when sending the data from PC side.**

Remote controller address

**Note: Do not save the data into the address other than specified, since it may cause the damages or malfunction of the camera.**

Remote controller data

Set the decimal number (000 ~ 255) for the remote controller data. Please be noted to set any dummy data at read control mode.

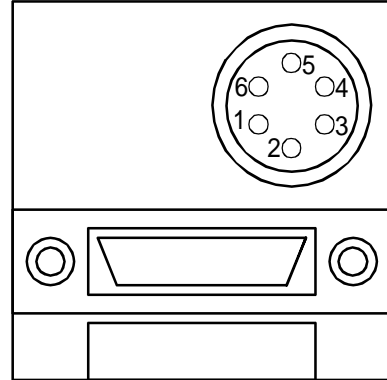
CR

Be sure to input "CR" to confirm the end of the command.

## 6. External Connector Pin Assignment

### 6.1. 6 pins Circular Connector HR10-7R-6PA (HIROSE)

Pin No.	
1	Power IN +12V
2	TTL Trigger IN
3	RS-232C RXD
4	RS-232C TXD
5	Do not connect
6	GND



Be sure not to connect pin no. 5. This pin will be assigned to successor models.

### 6.2. 26 pins Compact Camera Link Connector 12226-1100-00 PL (3M)

Pin No.		Pin No.	
1	GND	14	GND
2	X0-	15	X0+
3	X1-	16	X1+
4	X2-	17	X2+
5	Xclk-	18	Xclk+
6	X3-	19	X3+
7	SerTC+	20	SerTC-
8	SerTFC-	21	SerTFC+
9	CC1-	22	CC1+
10	CC2+	23	CC2-
11	CC3-	24	CC3+
12	CC4+	25	CC4-
13	GND	26	GND

## 7. Safety/Quality Standards

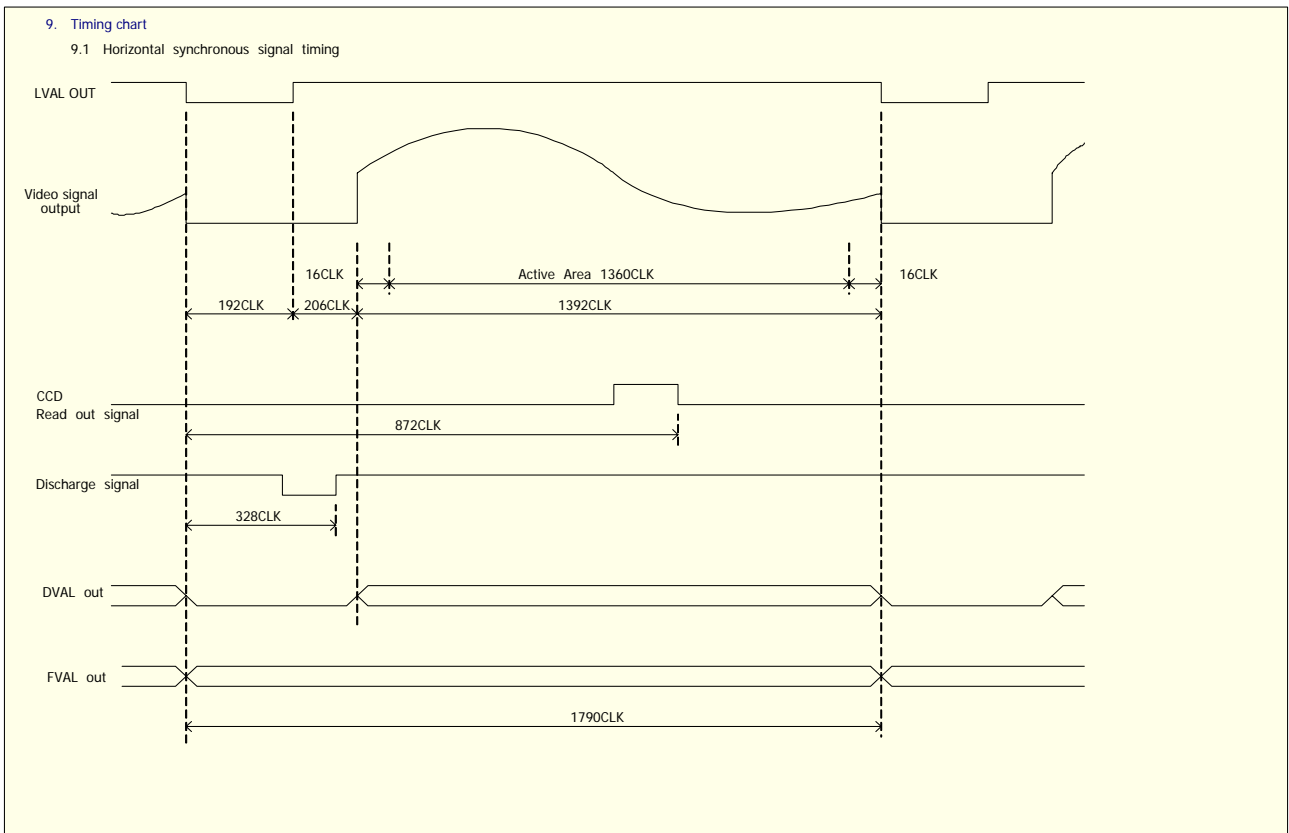
- UL Standard  
Conform to UL Standard including materials and others.
  
- CE Marking (to be acquired)  
Conform to EN50081-2 (Emission)  
Conform to EN50082-2 (Immunity)
  
- RoHS Conform to RoHS Restricted Items.
  
- FCC Compliance Conform to FCC Class A Digital Device  
This device complies with 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.

## 8. Durability

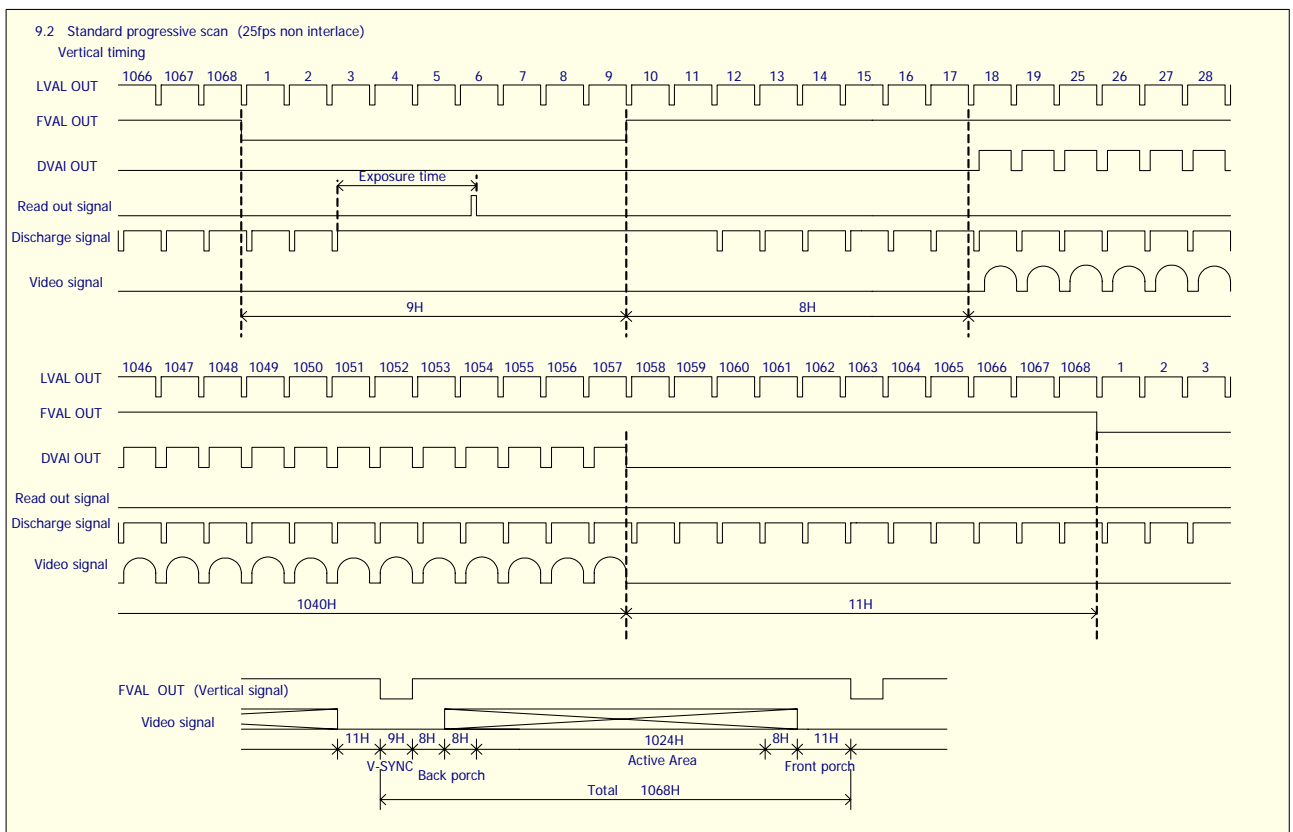
Item	Specification	Remarks
Vibration resistance	Acceleration 98 m/s <sup>2</sup> (10.0G) Vibration frequency 11 ~ 200 Hz Sine wave Sweep interval 300 sec Direction XYZ 3 directions Testing time 10 min for each direction  No malfunction shall occur after testing the above.	
Shock resistance	Acceleration 490 m/s <sup>2</sup> (50G) Direction 6 direction	Without package
Operation temperature	-5 ~ +45 with RH 20 ~ 80% (No condensation) a) Leave the camera for 1 hour at the highest operation temperature (no condensation), turn on the power, and then the camera shall operate and meet the specifications. b) Leave the camera for 1 hour at the lowest operation temperature (no condensation), turn on the power, and then the camera shall operate and meet the specifications.	

## 9. Timing Chart

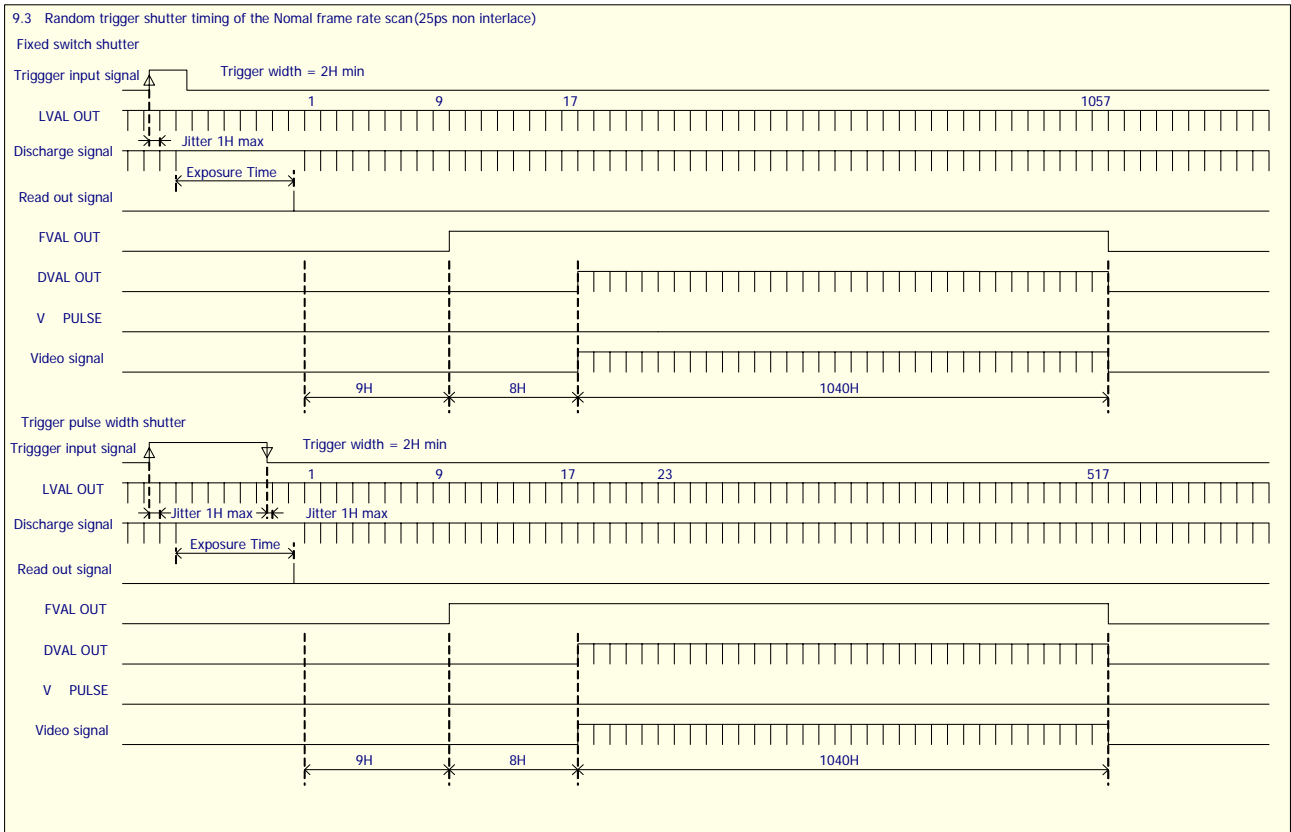
### 9.1. Horizontal Synchronous Signal Timing



### 9.2. Standard Progressive Scan Vertical Timing

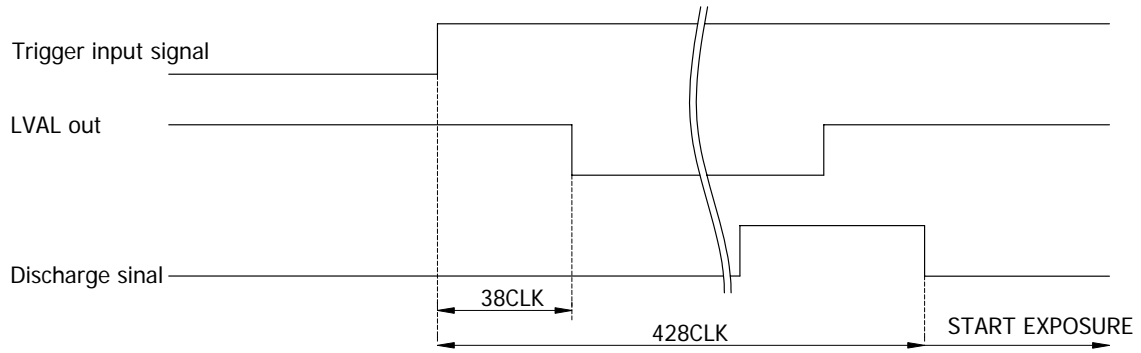


### 9.3. Random Trigger Shutter Timing of the Normal Frame Rate Scan

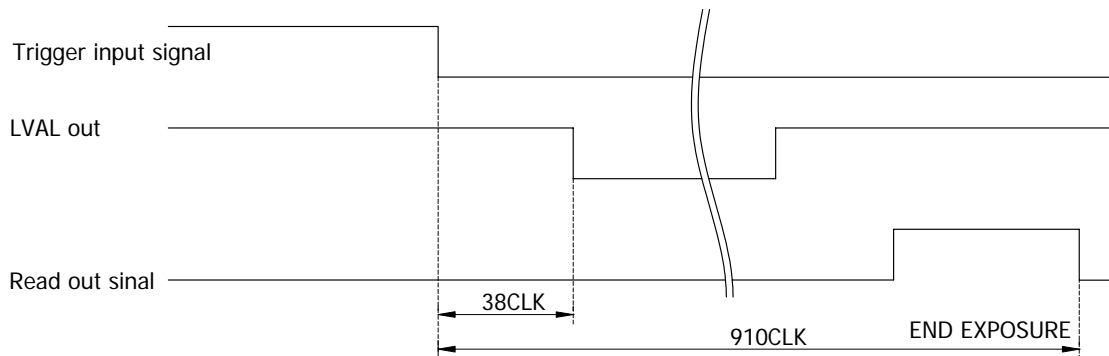


#### 9.4. H & V – SYNC Reset

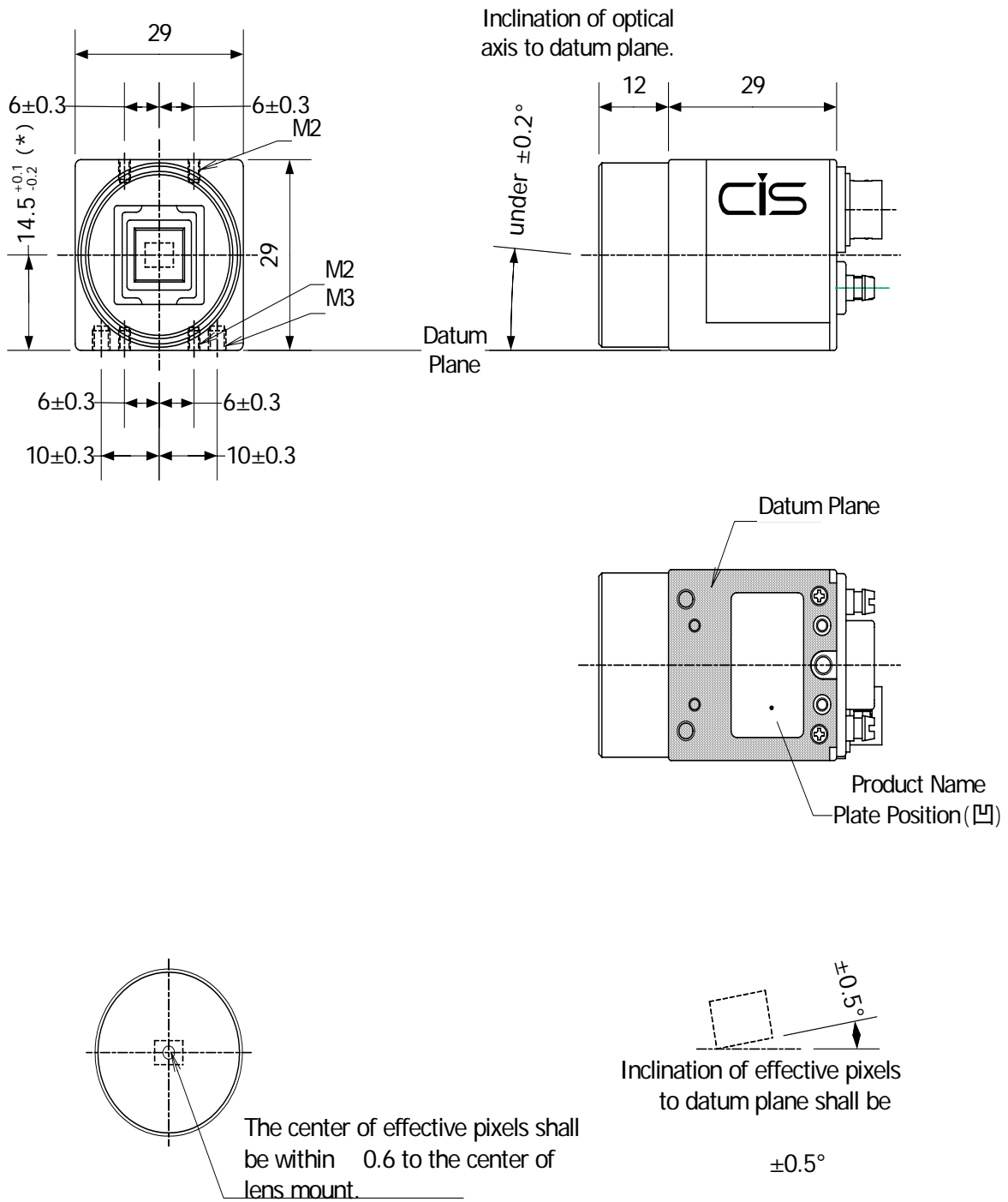
When trigger reset type H&V-Sync reset is selected, horizontal frequency will be reset at the 38<sup>th</sup> CLK after recognizing trigger pulse. Exposure will be started from the 428<sup>th</sup> CLK.



When pulse width trigger mode H&V-Sync reset is selected, exposure will be completed at the 910<sup>th</sup> CLK after completion of trigger pulse.



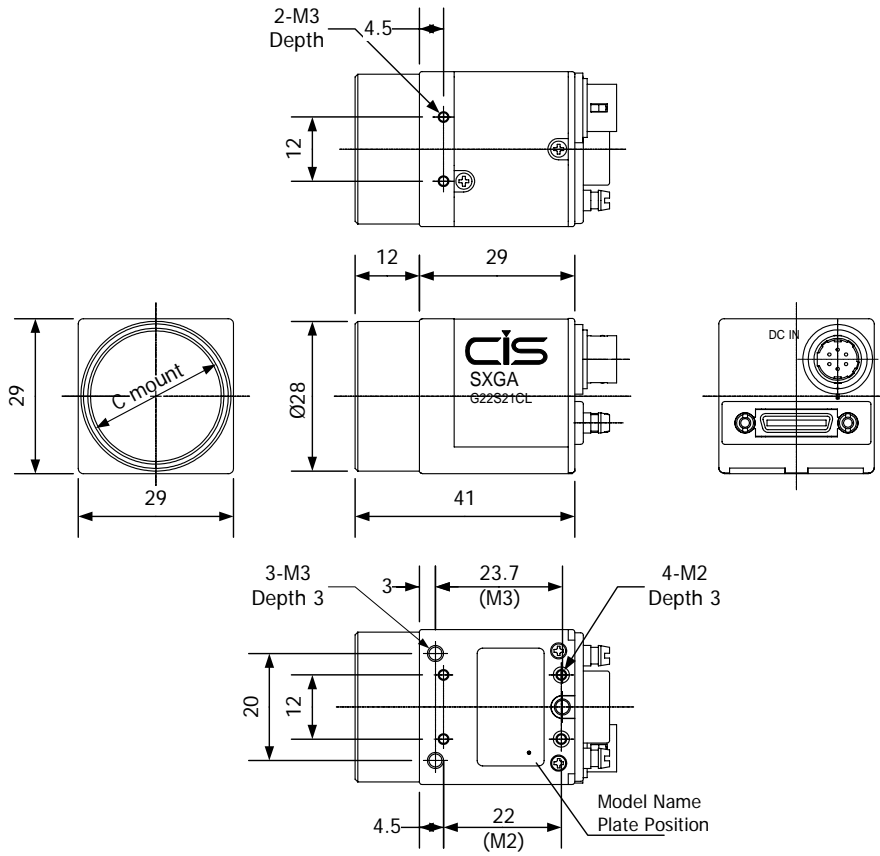
10. CCD Optical Axis Accuracy



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



# 11. Dimensions



999-427-00-00

## 12. 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.

## 13. Handling Precautions

**【Important】** 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.
- 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.
- VCC-G22S21CL can be connected to a capture board for Camera Link by use of dedicated cable.
- In case of abnormal operation, contact the distributor from whom you purchased the product.