



English

UXGA B/W Camera
49MHz Pixel Clock Camera Link

VCC-G22U21CL

Product Specification
& Operation Manual

CIS Corporation

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1. Scope of Application

This is to describe VCC-G22U21CL 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-G22U21CL is a high-resolution industrial B/W digital video 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.

Key Features.

Electronic shutter

Electronic shutter speed switchable by serial communications

OFF (1/20s) ~ 1/18,000s : 10 steps

Electronic shutter speed switchable by trigger pulse width

Approx. 1/2s ~ 1/18,000s

Video frame rates

The following is for both normal mode and trigger mode.

Progressive Scan: 20 fps

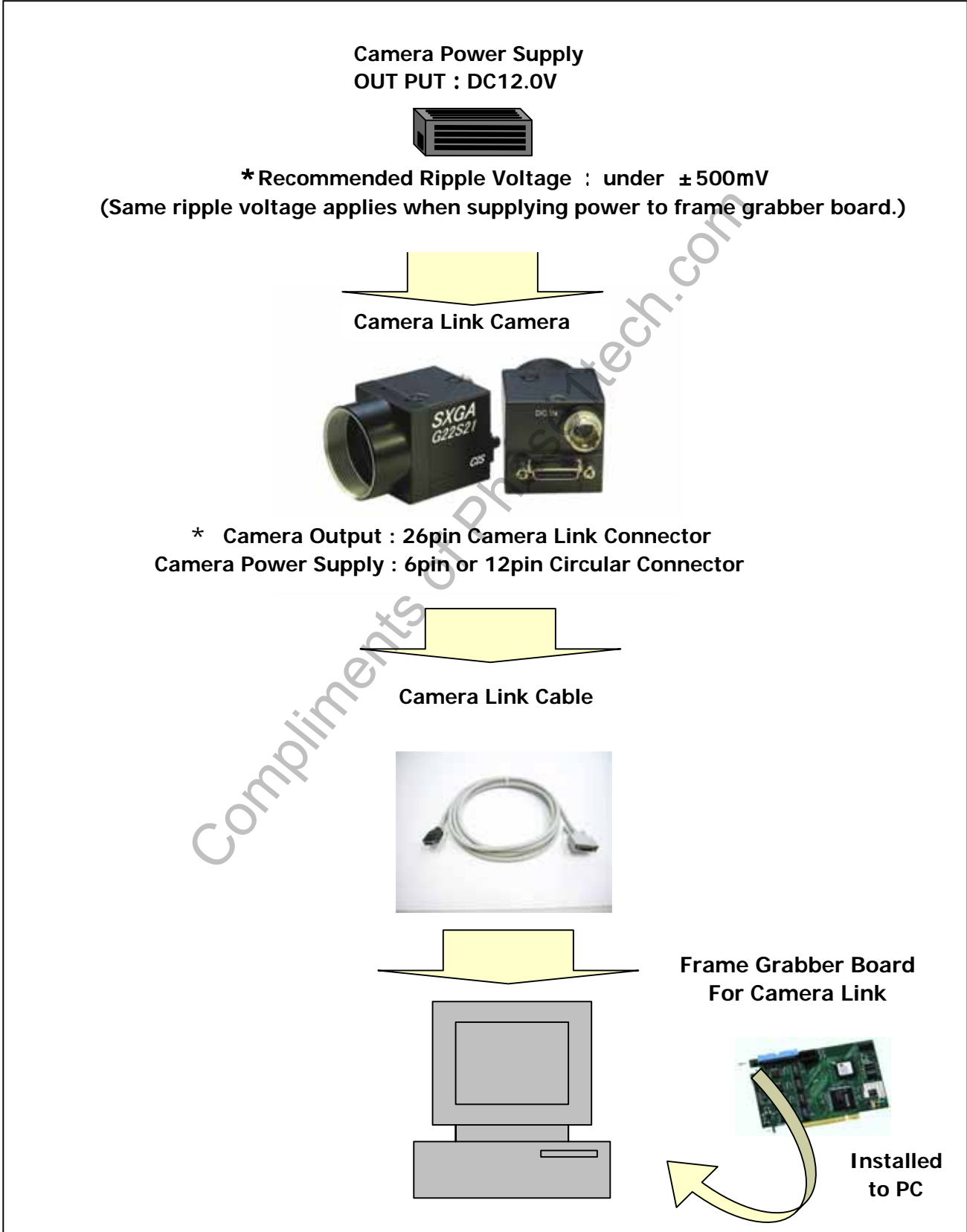
Camera Link

By use of dedicated cable, VCC-G22U21CL can be connected to Camera Link capture board.

Dimensions

Only 29mm³ in size (excluding projection), light weight 50g, and speed makes it a best match for use in embedded systems.

4. System Connection Diagram

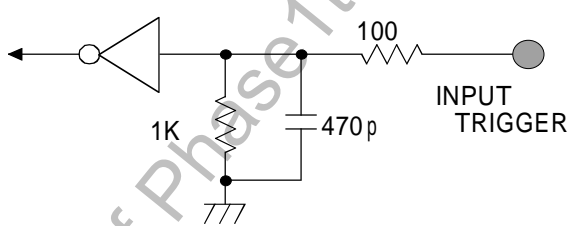


5. Specification

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. | |
| Back Focus | 10.99mm | |
| Optical axis accuracy | Refer to Clause 11. 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 | 1/1.8" Interline Transfer B/W CCD Effective Pixel number 1628 (H) x 1236 (V) Recommended Pixel number 1600 (H) x 1200 (V) Chip size 8.50mm (H) x 6.80mm (V) Unit cell size 4.40 μ m (H) x 4.40 μ m (V) | ICX274AL (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 1/20 sec exposure, Gain 0dB) | |
| Min. illumination | F1.4 1.0 lx (at 1/20 sec exposure, Gain 12dB) | |

5.2. Camera Output Signal Specification

| Item | Specification | | Remarks |
|-----------------------|---|--|---|
| Horizontal resolution | 1200 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 TTL Input VHI Min 2.0V VIL Min 0.8V  | Camera Link connector HR10A-7R-6PB |
| | 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. |
| Shutter | (1) Normal Operation Mode OFF(1/20), 1/50, 1/100, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000, 1/18000 sec (2) Normal Trigger Operation Mode OFF(1/20), 1/50, 1/100, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000, 1/18000 sec (3) Trigger Pulse Width Operation Mode Approx. 1/2 ~ 1/10000 sec (Trigger pulse width control by 1HD.) | | |
| Gain | -1dB, 0dB, +6dB, +12dB, Manual (-1dB ~ +12dB according to address 008 value.) | | |
| Remote Control | Camera can be remote controlled via camera link connector input or 6pin circular connector. | | |

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: 1/20 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: 1/18000 s 4: 1/500 s 10 ~ 15: 1/20 s (OFF) 5: 1/1000 s 16: Manual Shutter (Refer to address 009&010.) | |
| 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 | |
| Manual Gain Control | 008 | 0 ~ 255: -1dB ~ +12dB Set the data of address 001 to 004. | |
| Manual Shutter Control | 009 & 010 | 0 ~ 1250: 1/20 s ~ 1/18000s Set the data of address 002 to 016. Address 009 MSB and address 010 LSB make 10 bits in total. Shutter Speed = $1 / ((1251.6 - \text{Data}) 39.11 \mu s)$ MAX Data = 4E2h = 1250 | |
| 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 11th ~ 13th, 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.

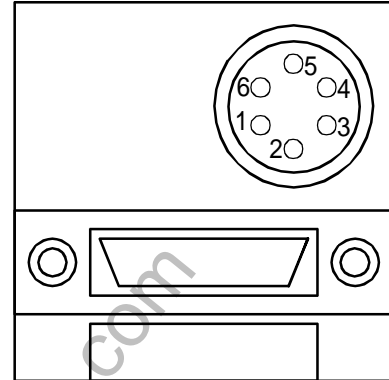
CR

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

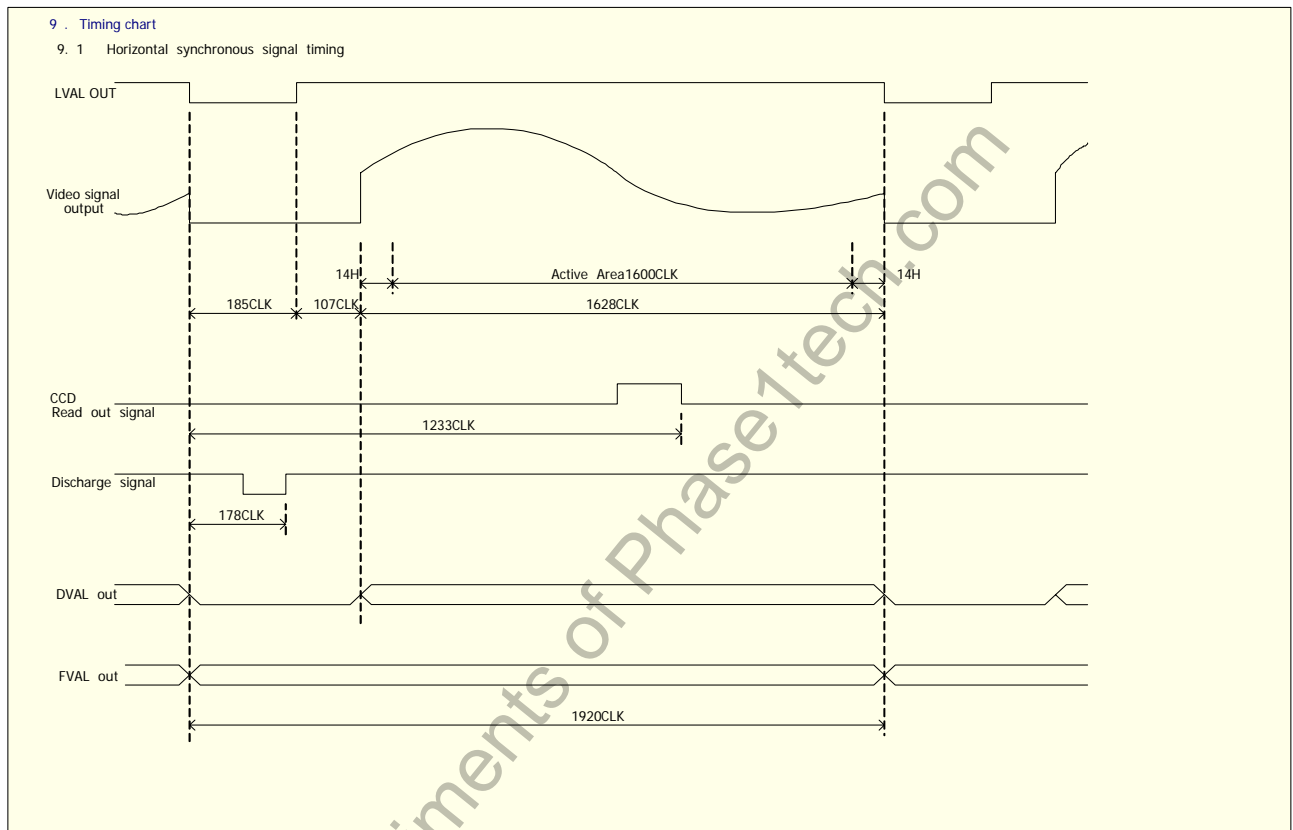
- UL Standard
Conform to UL Standard including materials and others.
- CE Marking (to be acquired)
Conform to EN50081-2 (Emission)
Conform to EN50082-2 (Immunity)
- RoHS
Conform to RoHS Restricted Items.

8. Durability

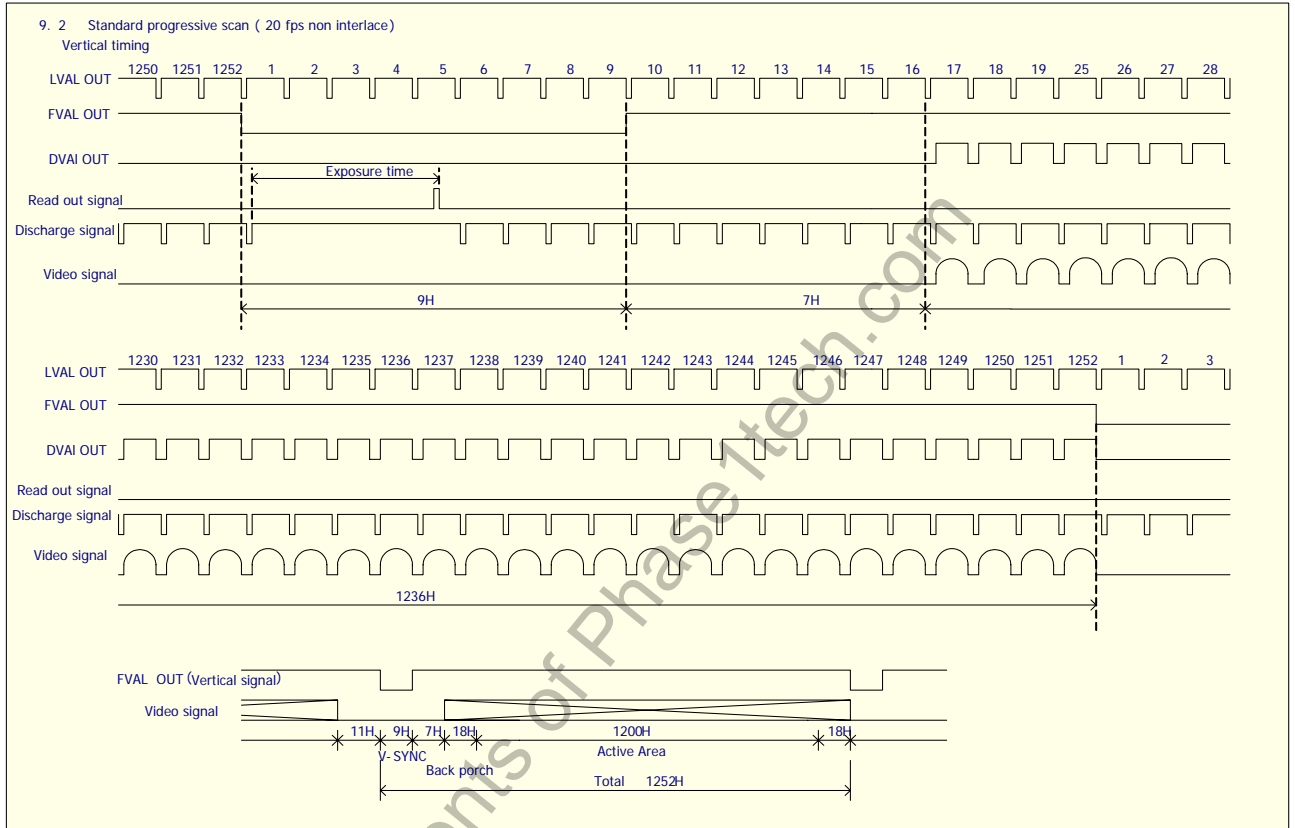
| Item | Specification | Remarks |
|-----------------------|--|-----------------|
| Vibration resistance | Acceleration 98 m/s ² (10.0G) Vibration frequency 11 ~ 200 Hz Sine wave Sweep interval 300 sec Direction XYZ 3 directions Testing time 10 min for each direction No malfunction shall occur after testing the above. | |
| Shock resistance | Acceleration 490 m/s ² (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

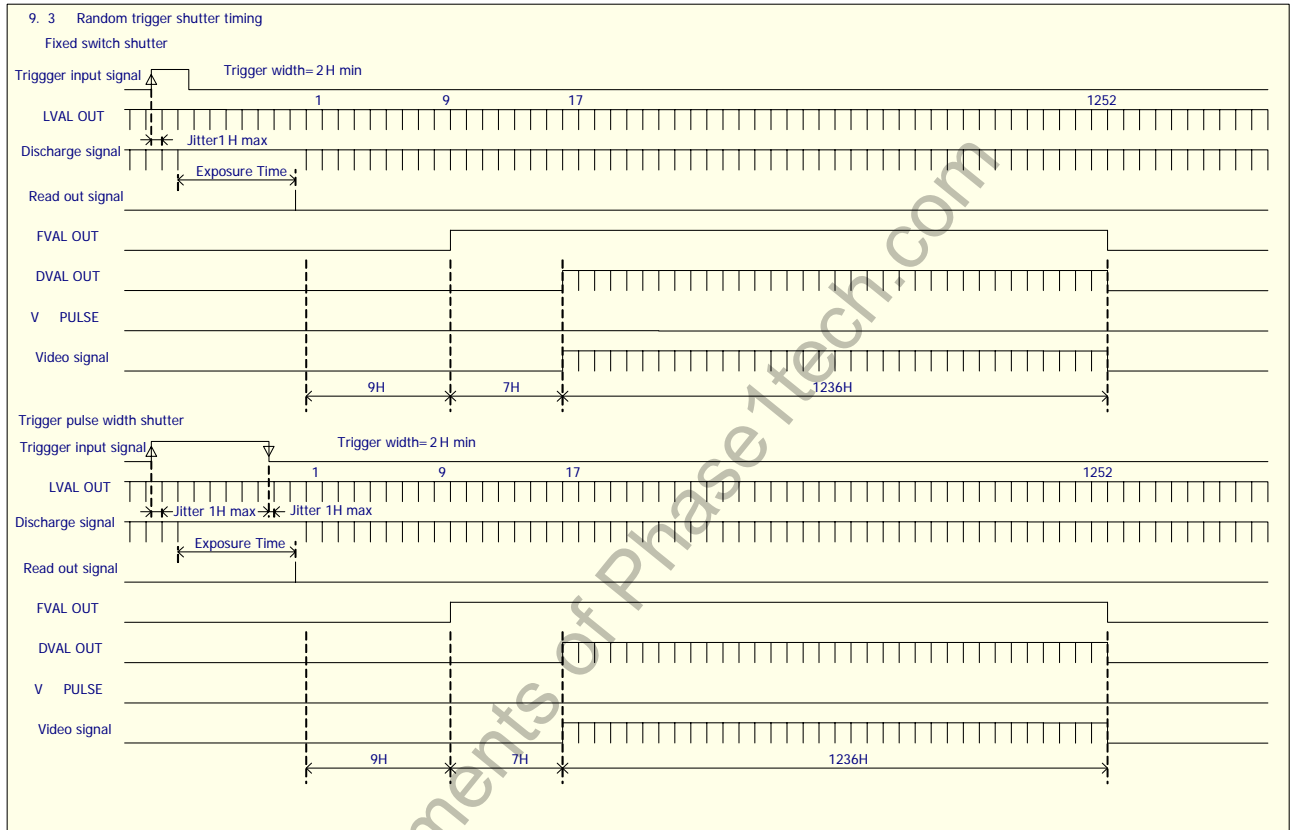
9.1. Horizontal Synchronous Signal Timing



9.2. Standard Progressive Scan

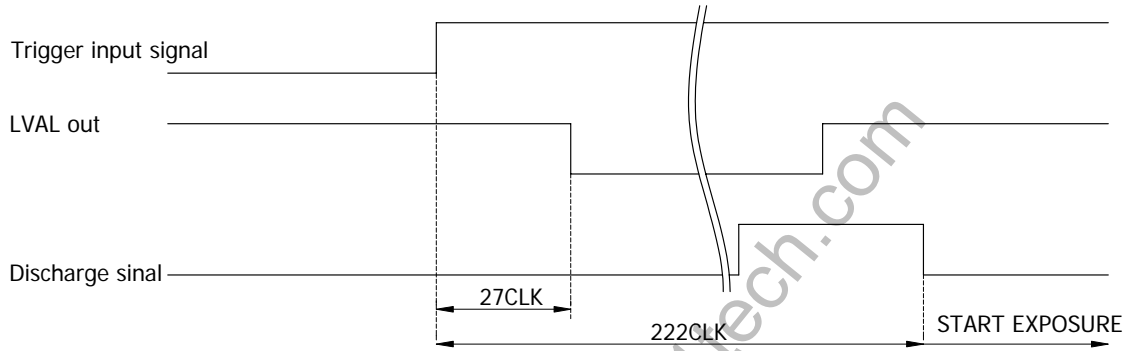


9.3. Random Trigger Shutter Timing

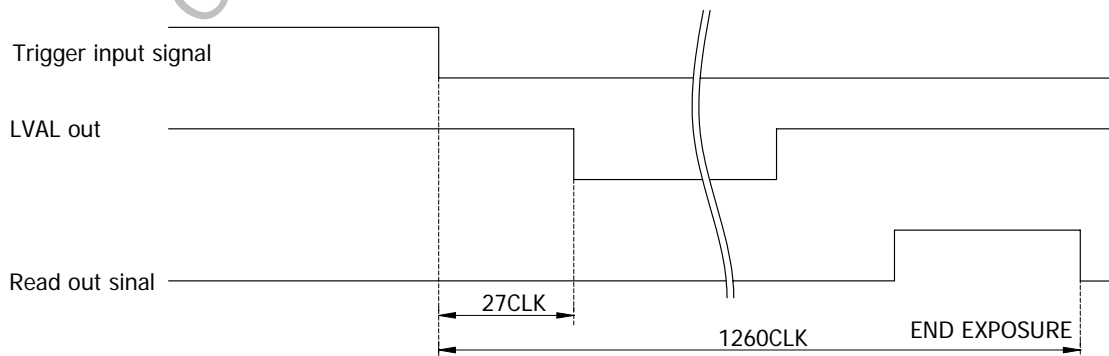


9.4. H & V – SYNC Reset

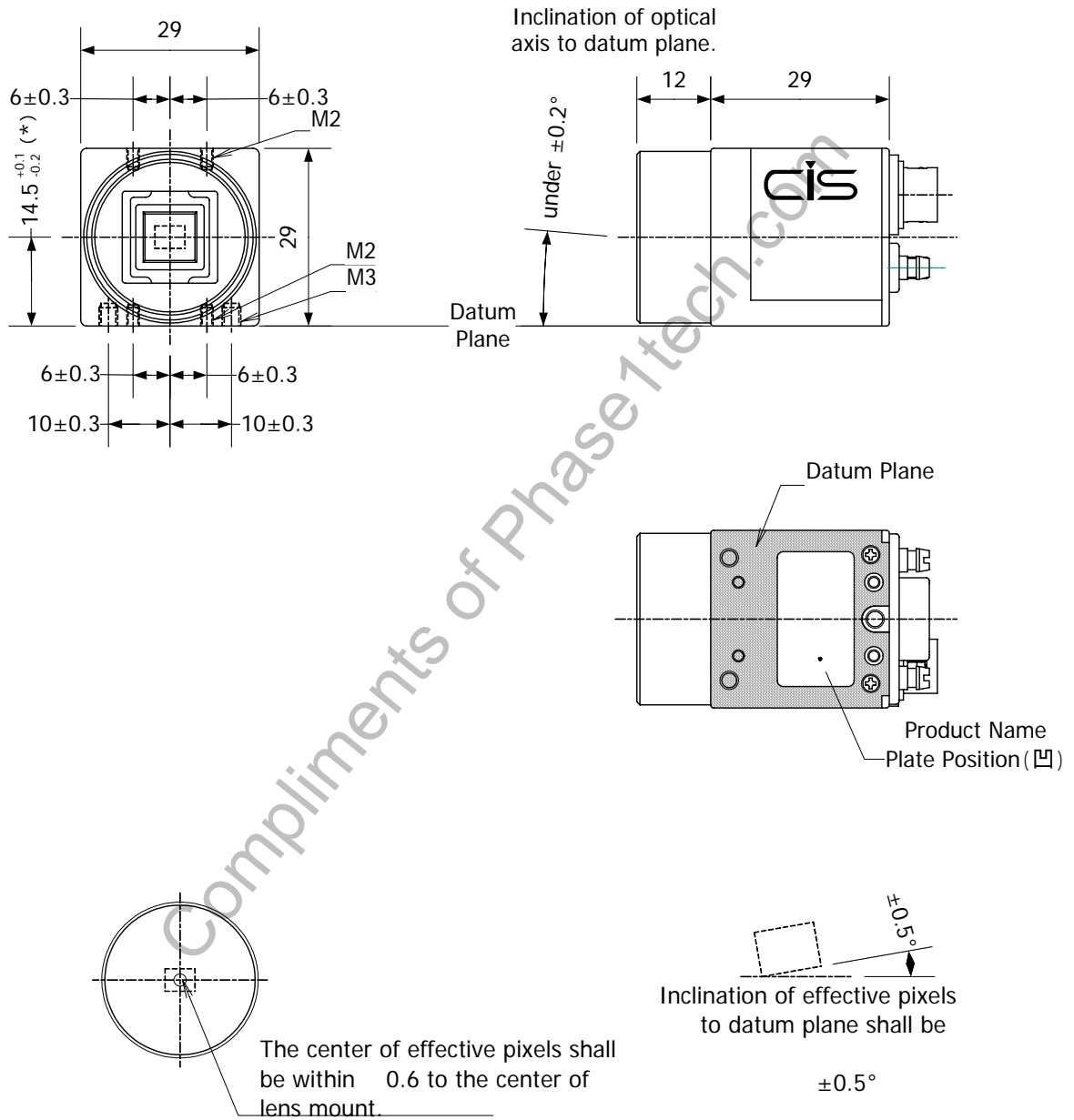
When trigger reset type H&V-Sync reset is selected, horizontal frequency will be reset at the 27th CLK after recognizing trigger pulse. Exposure will be started from the 222nd CLK.



When pulse width trigger mode H&V-Sync reset is selected, exposure will be completed at the 1260th CLK after completion of trigger pulse.

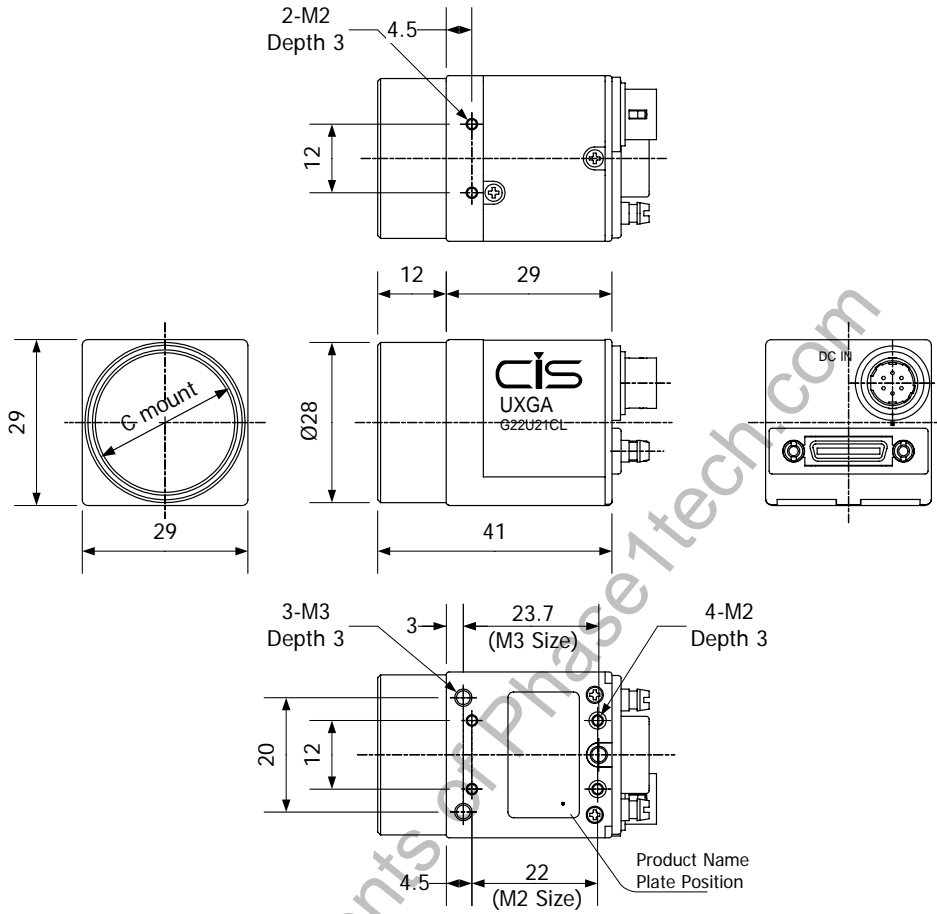


10. CCD Optical Axis Accuracy



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

11. Dimensions



999-428-00-00

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-G22U21CL 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.