

Progressive scan CCD color camera KP-FD202PCL/SCL Specifications

1. General

The KP-FD202PCL/SCL is single CCD type RGB color camera which utilized the progressive scan CCD image sensor with square pixel for UXGA format of 1/1.8-inch which adopted the RGB primary color mosaic filter.

The image of 1620 (H) x 1220 (V) is output in RGB at 30 frames per second.

The square lattice pixel format also provides excellent suitability for image processing applications.

2. Outstanding features

(1) High resolution and high color fidelity

The 1/1.8-inch 2,010,000 pixels square lattice progressive scan CCD and the RGB primary color mosaic filter achieve a high resolution and high color fidelity of 1620(H) x 1220(V) (UXGA).

(2) Small sized camera

The camera has small SDR connector for digital outputs.

Therefore, the camera has the realization of small-sized shape of 44 (W) x 44 (H) x 41 (D) mm.

(3) Remote control

- Multi-step electronic shutter (from 1/30 to 1/50000 second in 8 steps)

- Variable shutter (from 10 to 1/100000 second)

- Frame on demand (the image capture at desired timing using the external trigger signal)

- White balance (ATW, Manual and One-push)

- 6 vector independent masking (R, G, B, Cy, Mg, Ye can be independently varied)

and other various functions are set by remote control via CameraLink cable.

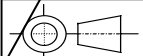
(4) Power over CameraLink

Power supply of KP-FD202PCL is input via CameraLink cable.

*Power supply of KP-FD202SCL is input from DCIN/SYNC connector.

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|--|--|--|--|--|--|--|--|--|--|
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| | | | | | | | | | | |
| - | Sep.14,2007 | (first edition) | | | | | N.Abe | T.Ohsawa | | |
| SYMBOL | DATE | DESCRIPTION | | | | | (DRAWN) | DESIGNED | | |

| | | | | | | | | | | |
|---------------------------------|------|----------|------|-----------|--|--|--|--|---|----------------------------|
| | | | | | | | | | | |
| MODEL KP-FD202PCL/SCL | | | | TOLERANCE | Prod. Code - Order No. | | | | | |
| DESIGNED | DATE | APPROVED | DATE | UNIT | TITLE KP-FD202PCL/SCL Specifications | | | | REV. | |
| CHECKED | DATE | STORED | DATE | | | | | | SCALE | 0 |
| Hitachi Kokusai Electric | | | | | | | | |  | DWG. No. E400029796 |

| | 1 | 2 | 3 | 4 |
|---|-----------------------------------|--|---|---|
| | 3. Specifications | | | |
| A | (1) Imaging device | 1/1.8-inch progressive scan interline CCD | | A |
| | Total pixels | 1688(H) x 1248(V) | | |
| | Effective pixels | 1628(H) x 1236(V) | | |
| | Pixel size | 4.4um (H) x 4.4um (V) (square lattice) | | |
| | Color filter | RGB primary color mosaic filter | | |
| | (2) Sensing area | 7.13 mm (H) x 5.37 mm (V) | | |
| | (3) Scanning system | Progressive | | |
| | (4) Aspect ratio | 4 : 3 | | |
| B | (5) Frame rate | 30 frames per second (full pixel readout) | | B |
| | (6) Horizontal drive frequency | 72.0000 MHz | | |
| | (7) Horizontal scanning frequency | 37.5 kHz | | |
| | (8) Vertical scanning frequency | 29.95 Hz | | |
| | (9) Sync system | Internal | | |
| | (10) Lens mount | C mount | | |
| | (11) Flange focal distance | 17.526 mm | | |
| C | (12) Video output | | | C |
| | Interface | CameraLink 72.0000 MHz | | |
| | | Base configuration (1ch:SDR connector x 1pc) | | |
| | | Medium configuration (2ch:SDR connector x 2pcs) | | |
| | Output format | (a) 24bit (R:8bit G:8bit B:8bit) (Base configuration) | | |
| | | (b) 30bit (R:10bit G:10bit B:10bit) (Medium configuration) | | |
| | | (c) 36bit (R:12bit G:12bit B:12bit) (Medium configuration) | | |
| D | Output image size | 1620(H) x 1220(V) (full pixel readout) | | D |
| | (13) Sensitivity | 2000 lx, F5.6, 3200 K | | |
| | (14) Minimum lamination | 10 lx (F1.4, MAX GAIN) | | |
| | (15) Signal noise to ratio | 48 dB | | |
| | (16) Electric shutter | OFF, 1/30, 1/60, 1/100, 1/250, 1/1000, 1/2000, 1/10000, 1/50000 second. | | |
| | | OFF is normal exposure (frame rate) | | |
| E | | or changeable by variable shutter (from 10 to 1/100000 second) | | E |
| | (17) Frame on demand | | | |
| | Mode | (A) Fixed shutter mode (8 steps or variable) | | |
| | | (B) ONE trigger mode | | |
| | | (C) VD reset mode | | |
| | Trigger input | CameraLink (CC1) or DCIN/SYNC connector | | |
| F | | | | F |

| | 1 | 2 | 3 | 4 |
|-----------|--|--|---|---|
| A | (18) Partial scan | Selectable start position and width of picture grabbing in 1H step. | | |
| | (19) ALC (Auto level control) | Mode (A) AGC (Auto gain control) (B) AES (Auto electric shutter) (C) AGC & AES Video level Adjustable | | |
| B | (20) Gain | Auto/Manual (0 to +18.0dB) (Approx. 0.0358dB step) | | |
| | (21) White balance | ATW / MANUAL / One-push | | |
| | (22) Gamma | OFF (=1) / LUT | | |
| | (23) Color masking | OFF / ON (6 vector independent masking) | | |
| | (24) Paint black | Adjustable | | |
| | (25) Sharpness | Adjustable | | |
| | (26) Brightness | Adjustable | | |
| C | (27) Knee | Adjustable | | |
| | (28) Power supply voltage | 12 ± 1 VDC | | |
| | (29) Current consumption | Approx. 340 mA (Approx. 4.1W) *When partial scan is ON, Approx. 415 mA (Approx. 5.0W) | | |
| | (30) Ambient | | | |
| | Performance | 0 to + 40 (+32 to +104 F), less than 90 % RH | | |
| Operation | -10 to + 50 (+14 to +122 F), less than 90 % RH | | | |
| Storage | -20 to + 60 (-4 to +140 F), less than 70 % RH | | | |
| D | (31) Vibration endurance | 10 to 55Hz (2.37 to 71.7 m/s ²), sweep: 1minute, XYZ,30 min | | |
| | (32) Shock endurance | 490.3 m/s ² (Drop test, once each top, bottom, left and right) | | |
| | (33) External dimensions | 44 (W) x 44 (H) x 41 (D) mm | | |
| E | (34) Mass | (not including mount protrusions) | | |
| | | Approx. 110 g | | |
| F | | | | |

| | 1 | 2 | 3 | 4 | |
|----------------------------|--|---------------------------------|--|-----------------------|--|
| A | (35) Remote control | | | | |
| | (a) Signal system | | | | |
| | Control system | | Start-stop synchronization system | | |
| | Transmission rate | | 9600 bps | | |
| | Data length | | 8 bits | | |
| | Start bit | | 1bit | | |
| | Stop bit | | 1bit | | |
| B | Parity | | None | | |
| | Bit transfer | | LSB first | | |
| B | (b) Communications control system | | | | |
| | Full control by remote control software, data send/receive by text data transfer to camera microprocessor (BSC system handshake) | | | | |
| C | (c) Control items | | | | |
| | 1. Shutter speed | | OFF, 1/30, 1/60, 1/100, 1/250, 1/1000, 1/2000, 1/10000, 1/50000 second | | |
| | | | Factory setting: OFF | | |
| | 2. Variable shutter | | Minimum 1/100000 second, Max 10 second | | |
| | 3. Mode | | OFF, Fixed shutter, One trigger and VD reset mode | | |
| | | | Factory setting: OFF | | |
| | 4. Gain | | 0 to 18 dB (Approx. 0.0358 dB step) | | |
| | | | Factory setting: 0 dB | | |
| | 5. Auto Exposure | | | | |
| | 6. White balance | | | | |
| | D | 7. Gamma | | | |
| | | 8. 6 vector independent masking | | | |
| | | 9. Paint black | | | |
| | E | 10. Sharpness | | | |
| | | 11. Brightness | | | |
| | | 12. Knee | | | |
| | | 13. Partial scan mode | | Factory setting: OFF | |
| | | 14. VD/FVAL | | Factory setting: FVAL | |
| | | 15. HD/LVAL | | Factory setting: LVAL | |
| 16. 24bit/30bit/36bit | | | Factory setting: 24bit | | |
| 17. Trigger pulse polarity | | | POS or NEG | | |
| | | | Factory setting: POS | | |
| 18. Trigger input | | | CamreaLink (CC1) or DCIN/SYNC connector | | |
| | | Factory setting: CC1 | | | |
| F | 19. Output signal | | OFF, FLASH OUT and VD OUT | | |
| | | | Factory setting: OFF | | |

4. Composition

- (1) Camera (with IR cut filter)
 (2) CD-ROM (Operation manual / Control software)
 (3) Composition table

5. Optional accessories

- (1) Dummy glass (AR coated) ARC1214
 (2) IR cut filter IRC650
 (3) Junction box JU-F30
 (4) Tripod adaptor TA-F500
 (5) 12 pin plug HR10A-10P-12S(01) or equivalent
 (6) Camera cable

| | Molded type | Shield type |
|------|-------------|-------------|
| 2 m | C-201KSM | C-201KSS |
| 5 m | C-501KSM | C-501KSS |
| 10 m | C-102KSM | C-102KSS |

In the CE Marking region, use the shield type and install clamp filter
 (ZCAT2035-0930A: TDK) at both ends of the cable.

(7) Digital out cable

- Mini CameraLink cable (for KP-FD202SCL) SDR-MDR type

| Cable length | Model name |
|--------------------------|---------------|
| 1m | C-101SCL |
| 2m | C-201SCL |
| 3m | C-301SCL |
| 5m | C-501SCL |
| 10m (for High frequency) | C-102SCL (HF) |

- PoCL cable (for KP-FD202PCL)

| Cable length | Model name | |
|--------------|---------------|---------------|
| | SDR-SDR type | SDR-MDR type |
| 1m | C-101PCL (SS) | C-101PCL (SM) |
| 2m | C-201PCL (SS) | C-201PCL (SM) |
| 3m | C-301PCL (SS) | C-301PCL (SM) |
| 5m | C-501PCL (SS) | C-501PCL (SM) |

SDR: Shrunk Delta Ribbon

MDR: Miniature Delta Ribbon

6. Signal connection to connector

(1) Signal connection to DCIN/SYNC connector

| PIN No. | Internal SYNC mode | PIN No. | Internal SYNC mode |
|---------|--------------------|---------|--------------------|
| 1 | GND | 7 | Trigger IN / VD IN |
| 2 | ---- (KP-FD202PCL) | 8 | GND |
| | +12V (KP-FD202SCL) | | |
| 3 | GND | 9 | ---- |
| 4 | ---- | 10 | FLASH OUT / VD OUT |
| 5 | GND | 11 | ---- |
| 6 | ---- | 12 | GND |

Plug (matching cable plug) Hirose HR10A-10P-12S(01) or equivalent

(Note) Please do not unplug and insert cable (camera cable) with a power supplied to a camera.
Install clamp filter (ZCAT 2035-0930A: TDK) at both ends (camera and video processor ends) in the CE marking region.

(2) Signal connection to DIGITAL OUT connector

(a) Interrelation between Number of DATA bits and Number of used connector

| | Number of DATA bits | D.OUT1 | D.OUT2 |
|---|---------------------------------|--------|--------|
| 1 | 24bit (R:8bit G:8bit B:8bit) | O | - |
| 2 | 30bit (R:10bit G:10bit B:10bit) | O | O |
| 3 | 36bit (R:12bit G:12bit B:12bit) | O | O |

O: Use
-: Not use

(b) Signal connection to DIGITAL OUT connector

D.OUT 1 (24bit / 30bit / 36bit)

| Pin No. | Signal | Pin No. | Signal |
|---------|-------------------------|---------|-------------------------|
| 1 | +12V (KP-FD202PCL) | 14 | GND |
| | GND (KP-FD202SCL) | | |
| 2 | TXOUT 0 (-) | 15 | TXOUT 0 (+) |
| 3 | TXOUT 1 (-) | 16 | TXOUT 1 (+) |
| 4 | TXOUT 2 (-) | 17 | TXOUT 2 (+) |
| 5 | TXCLKOUT (-) | 18 | TXCLKOUT (+) |
| 6 | TXOUT 3 (-) | 19 | TXOUT 3 (+) |
| 7 | RX (+) [SERTC (+)] | 20 | RX (-) [SERTC (-)] |
| 8 | TX (-) [SERTFG (-)] | 21 | TX (+) [SERTFG (+)] |
| 9 | TRIG/VD (-) [CC1 (-)] | 22 | TRIG/VD (+) [CC1 (+)] |
| 10 | N.U. [CC2 (+)] | 23 | N.U. [CC2 (-)] |
| 11 | N.U. [CC3 (-)] | 24 | N.U. [CC3 (+)] |
| 12 | N.U. [CC4 (+)] | 25 | N.U. [CC4 (-)] |
| 13 | GND | 26 | +12V (KP-FD202PCL) |
| | | | GND (KP-FD202SCL) |

D.OUT 2 (30bit / 36bit)

| Pin No. | Signal | Pin No. | Signal |
|---------|--------------------|---------|--------------------|
| 1 | +12V (KP-FD202PCL) | 14 | GND |
| | GND (KP-FD202SCL) | | |
| 2 | TYOUT 0 (-) | 15 | TYOUT 0 (+) |
| 3 | TYOUT 1 (-) | 16 | TYOUT 1 (+) |
| 4 | TYOUT 2 (-) | 17 | TYOUT 2 (+) |
| 5 | TYCLKOUT (-) | 18 | TYCLKOUT (+) |
| 6 | TYOUT 3 (-) | 19 | TYOUT 3 (+) |
| 7 | N.U. | 20 | N.U. |
| 8 | N.U. | 21 | N.U. |
| 9 | N.U. | 22 | N.U. |
| 10 | N.U. | 23 | N.U. |
| 11 | N.U. | 24 | N.U. |
| 12 | N.U. | 25 | N.U. |
| 13 | GND | 26 | +12V (KP-FD202PCL) |
| | | | GND (KP-FD202SCL) |

Connector (camera side)

Sumitomo 3M 1226-1100-00PL or equivalent

- D.OUT2 is used for Medium configuration.
 - The digital out cable should be comprised of a twisted pair of wires having 100 ohm characteristic impedance and an outer sheath shield type conductor.
 - Connect the shield (ground) of the digital out cable to the ground terminal of the video equipment, frame grabber, etc.
 - Install clamp filter (ZCAT2035-0930A: TDK) at both ends (camera and video processor ends) in the CE marking region.
 - TX: Transmit data from camera to machine
 - RX: Transmit data from machine to camera
- (Note)

Please do not unplug and insert cable(digital out cable) with a power supplied to a camera.

1

2

3

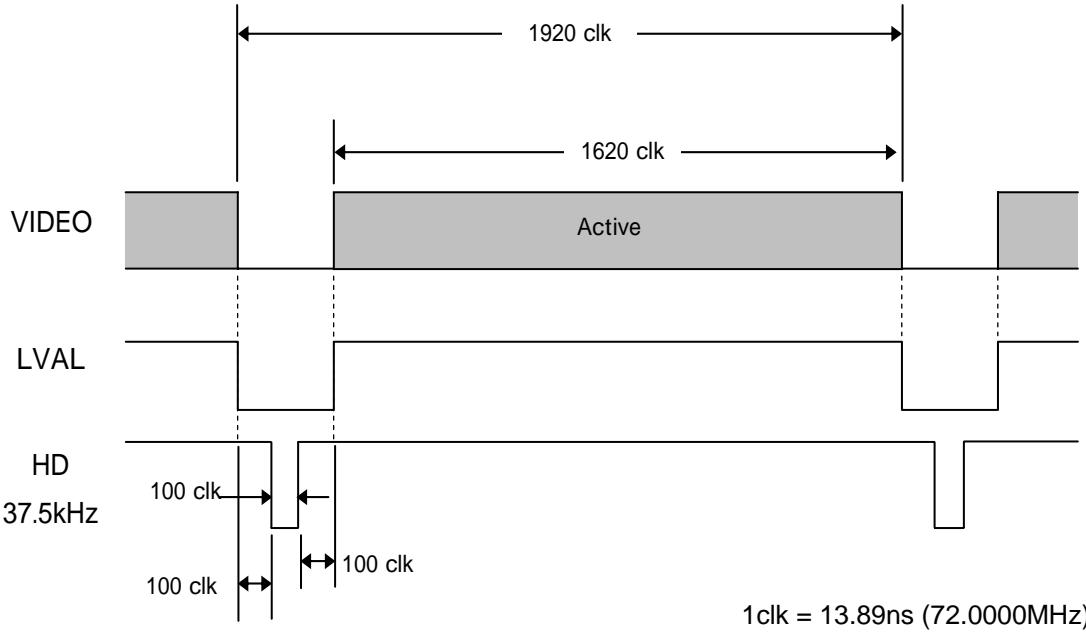
4

7. CameraLink output

A

7-1. Horizontal timing

A



B

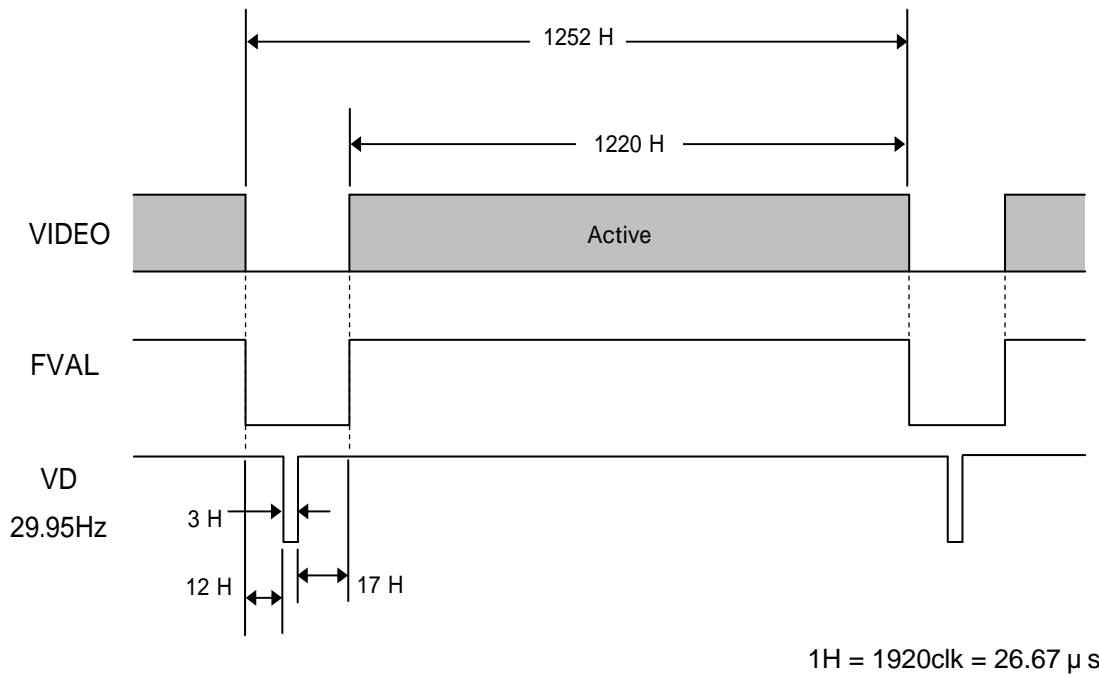
C

7-2. Vertical timing

C

D

E



D

E

F

F

DWG. No.

E400029796

SHEET

8

18

1

2

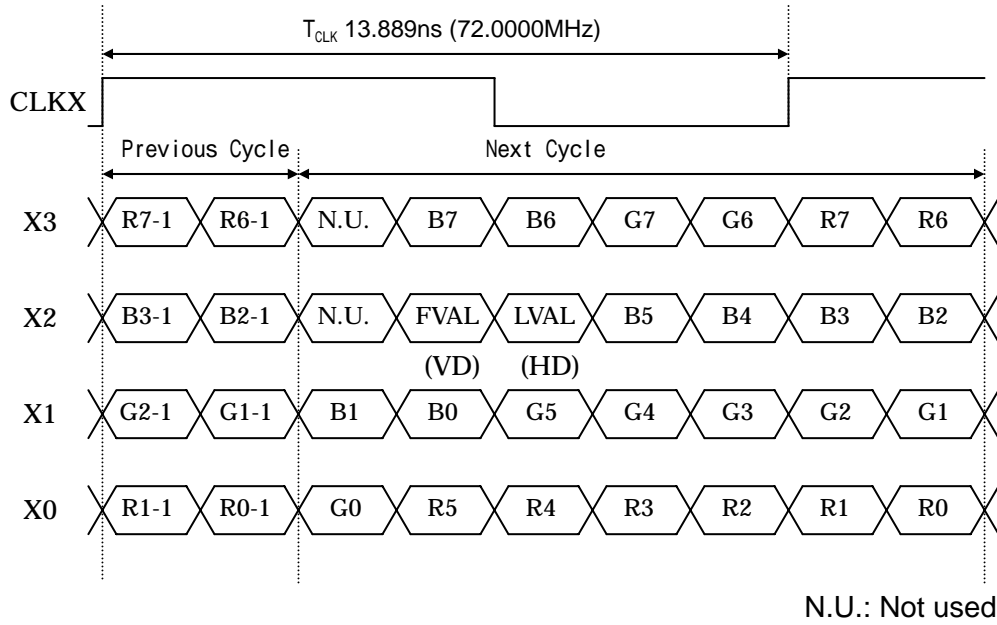
3

DF022-4PE-SI 4

7-3. Transmitter LVDS output pulse position measurement

(1) Base configuration

D.OUT 1

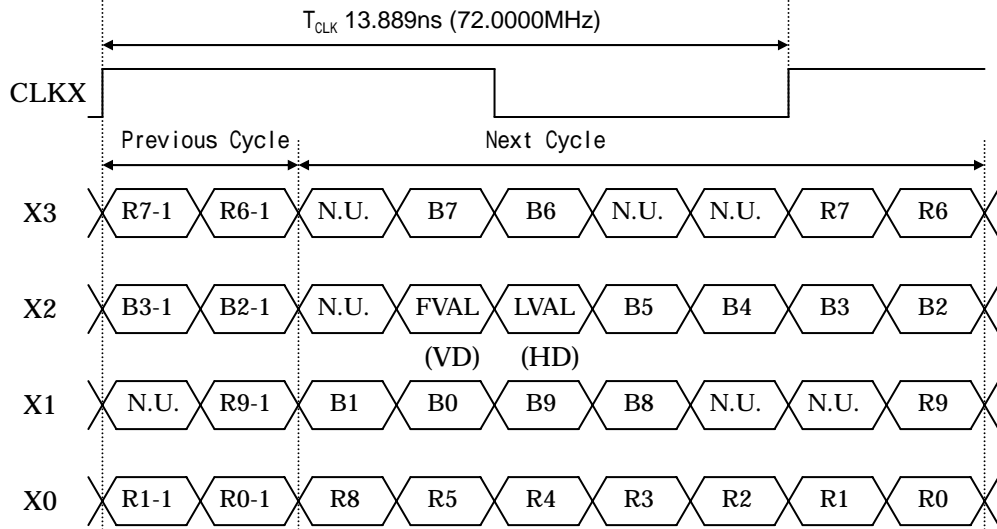


* When using at Base configuration, please be sure to connect to CameaLink cable to D.OUT1.
If the cable is connected to D.OUT2, the machine may break down.

(2) Medium configuration

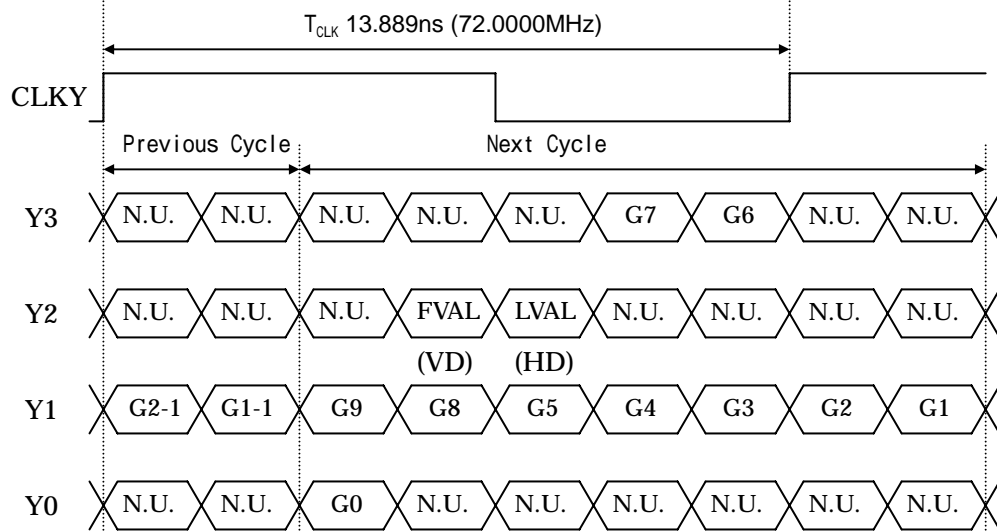
(a) 30bit

D.OUT 1



N.U.: Not used

D.OUT 2

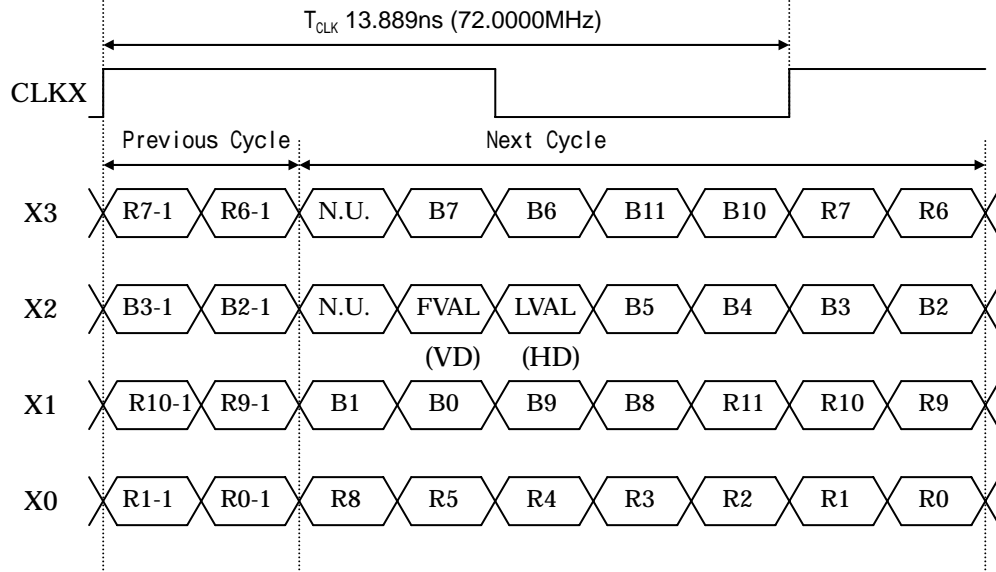


N.U.: Not used

(b) 36bit
D.OUT 1

A

A



N.U.: Not used

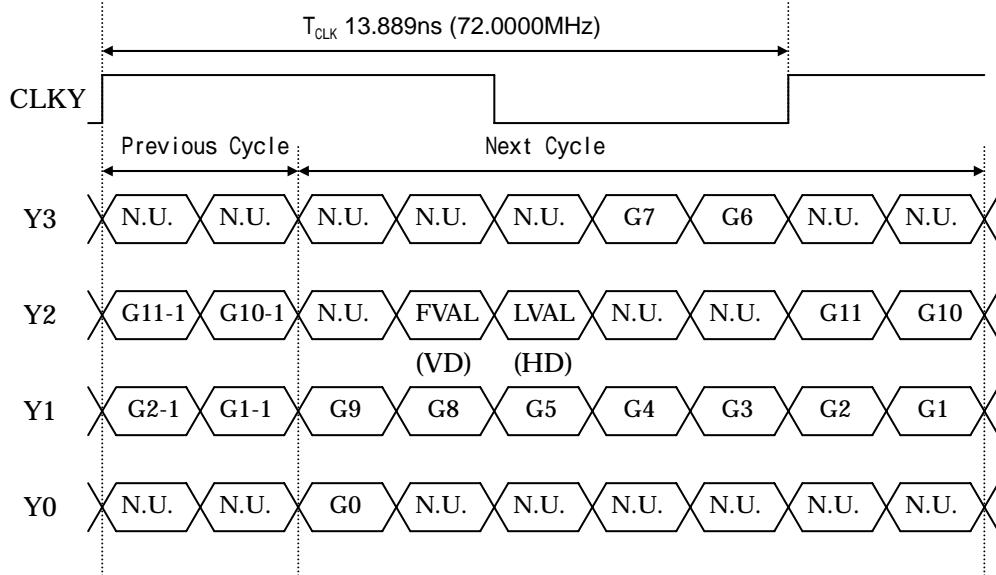
C

C

D.OUT 2

D

D



N.U.: Not used

E

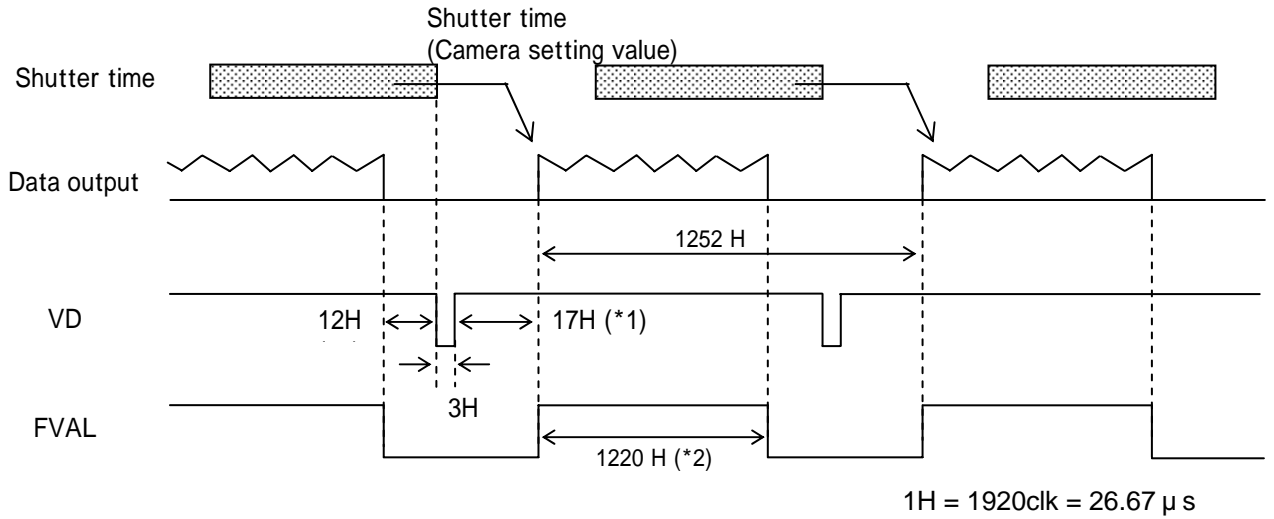
E

F

F

8. Timing chart

8-1. Normal mode



When partial scan is ON, *1 to *4 are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).

*1: $(22 + \text{Width} + (1232 - \text{Width}) / 10)H$

*2: $(2 + (1232 - \text{Width}) / 10 - \text{Start} / 10)H$

*3: $(17 + \text{Start} / 10)H$

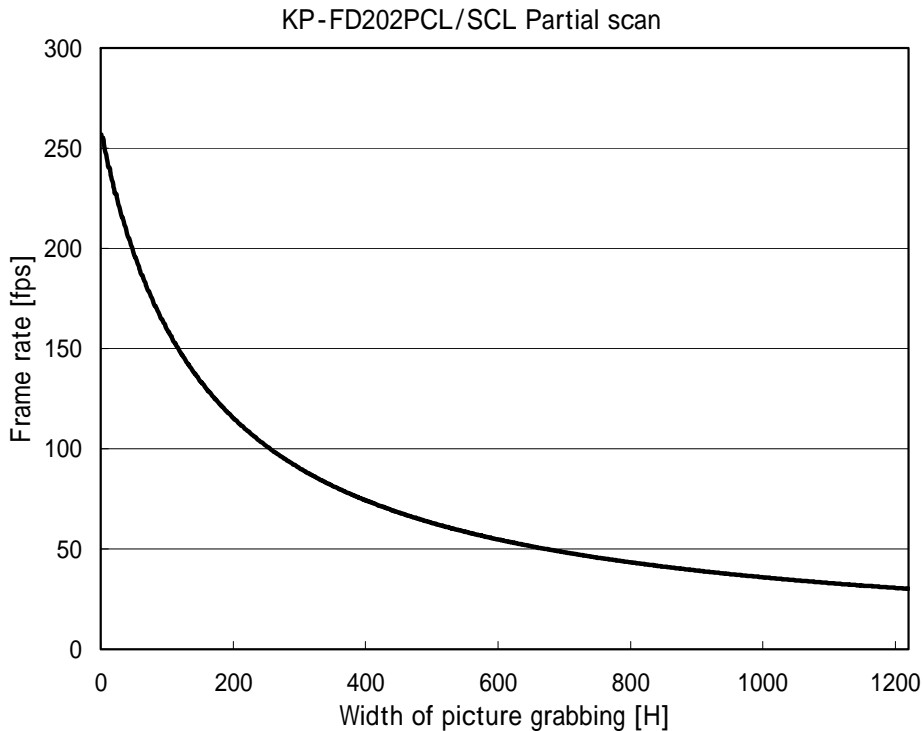
*4: $(\text{Width})H$

Note1: Please use the partial scan in following condition.

Start + Width 1237

Note2: Please use FVAL in the partial scan.

Graph following shows frame rate in each of picture grabbing in the partial scan mode.



Note: Frame rate can be calculated from following equations using width of picture grabbing.

Lines = $22 + \text{Width} + (1232 - \text{Width}) / 10$

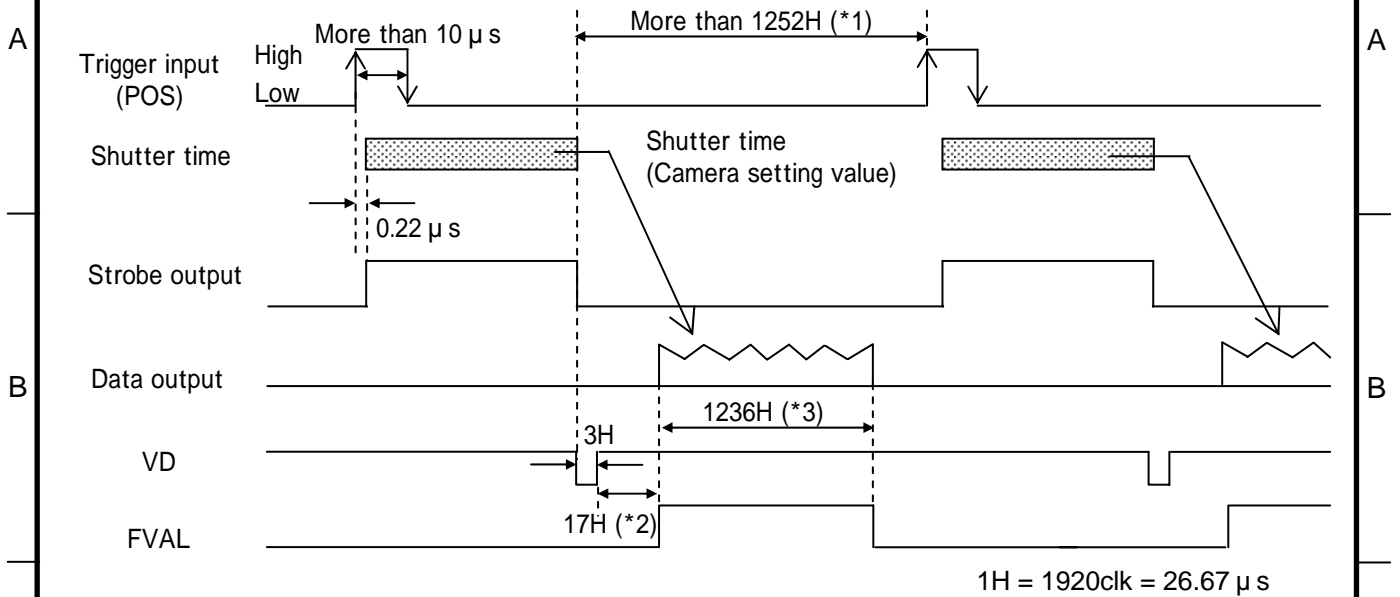
Frame rate = $(72000000 / 1920) / \text{Lines}$

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SHEET
12 / 18

8-2. Fixed shutter mode



When partial scan is ON, *1 to *3 are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).

*1: $(22 + \text{Width} + (1232 - \text{Width}) / 10)H$ or more

*2: $(17 + \text{Start} / 10)H$

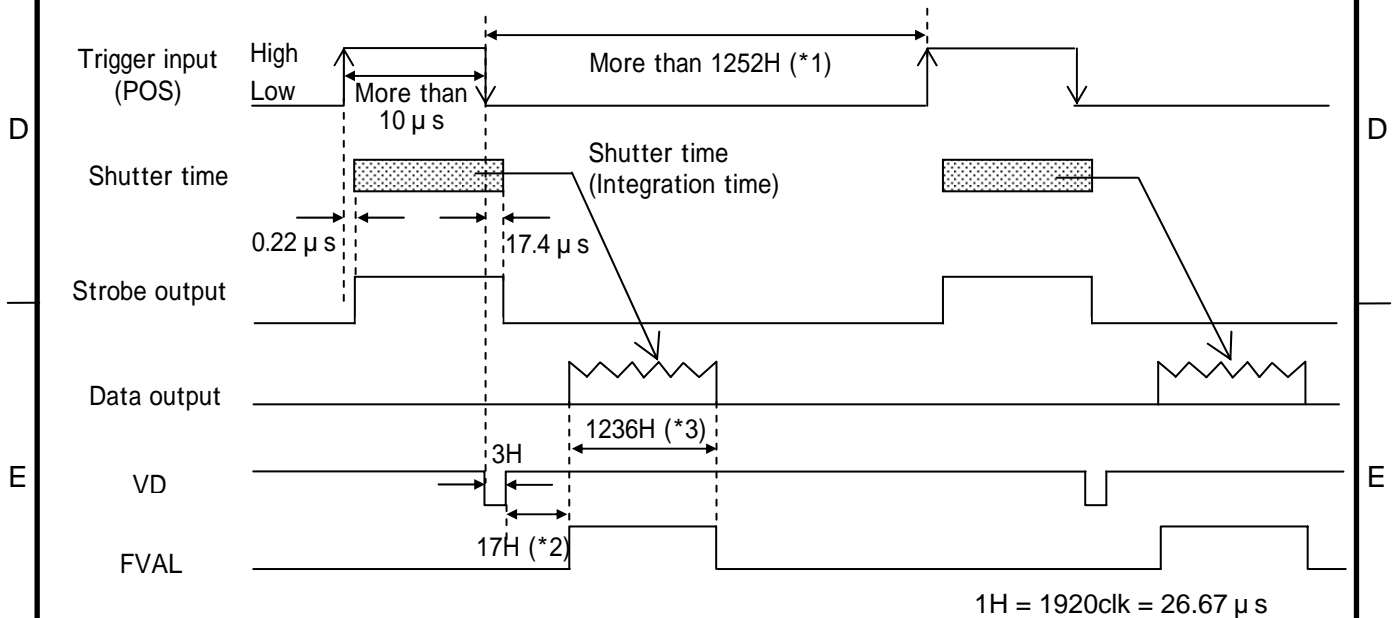
*3: $(\text{Width})H$

Note1: Please use the partial scan in following condition.

Start + Width 1237

Note2: Please use FVAL in the partial scan.

8-3. ONE trigger mode



When partial scan is ON, *1 to *3 are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).

*1: $(22 + \text{Width} + (1232 - \text{Width}) / 10)H$ or more

*2: $(17 + \text{Start} / 10)H$

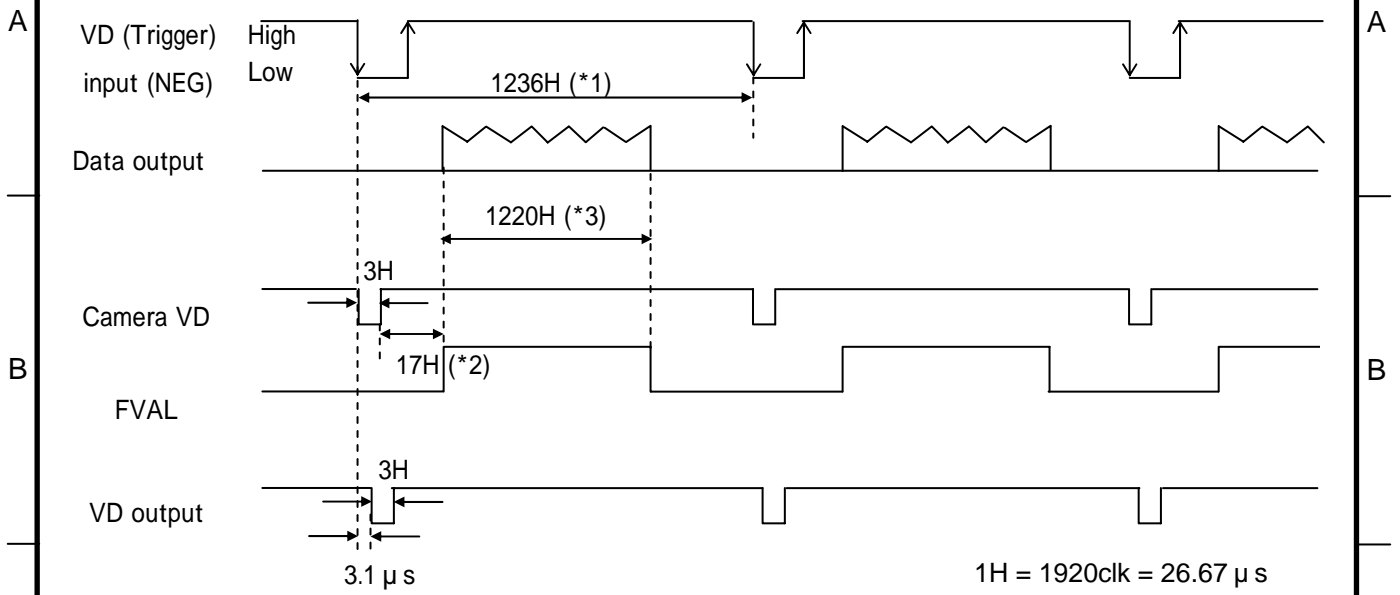
*3: $(\text{Width})H$

Note1: Please use the partial scan in following condition.

Start + Width 1237

Note2: Please use FVAL in the partial scan.

8-4. VD reset mode



When partial scan is ON, *1 to *3 are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).

*1: $(22 + \text{Width} + (1232 - \text{Width}) / 10)H$

*2: $(17 + \text{Start} / 10)H$

*3: $(\text{Width})H$

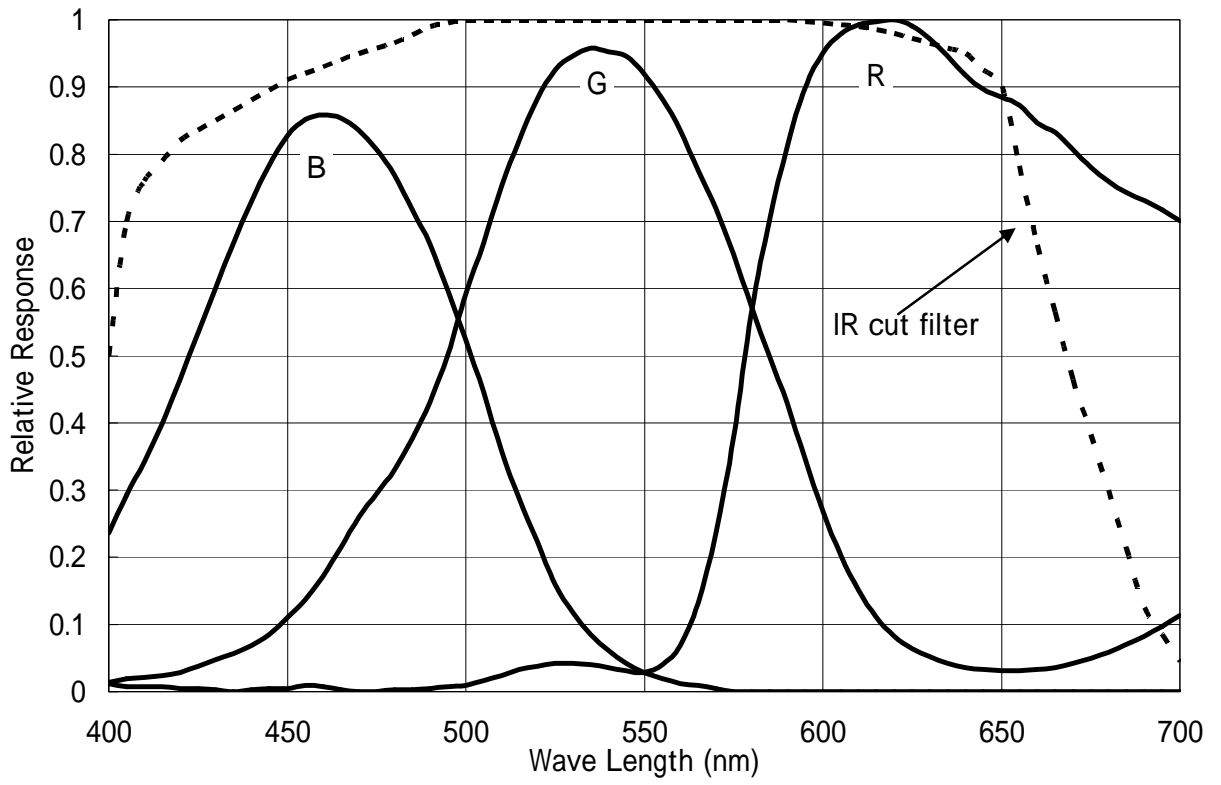
Note1: Please use the partial scan in following condition.

$$\frac{\text{Start} + \text{Width}}{1237}$$

Note2: Please use FVAL in the partial scan.

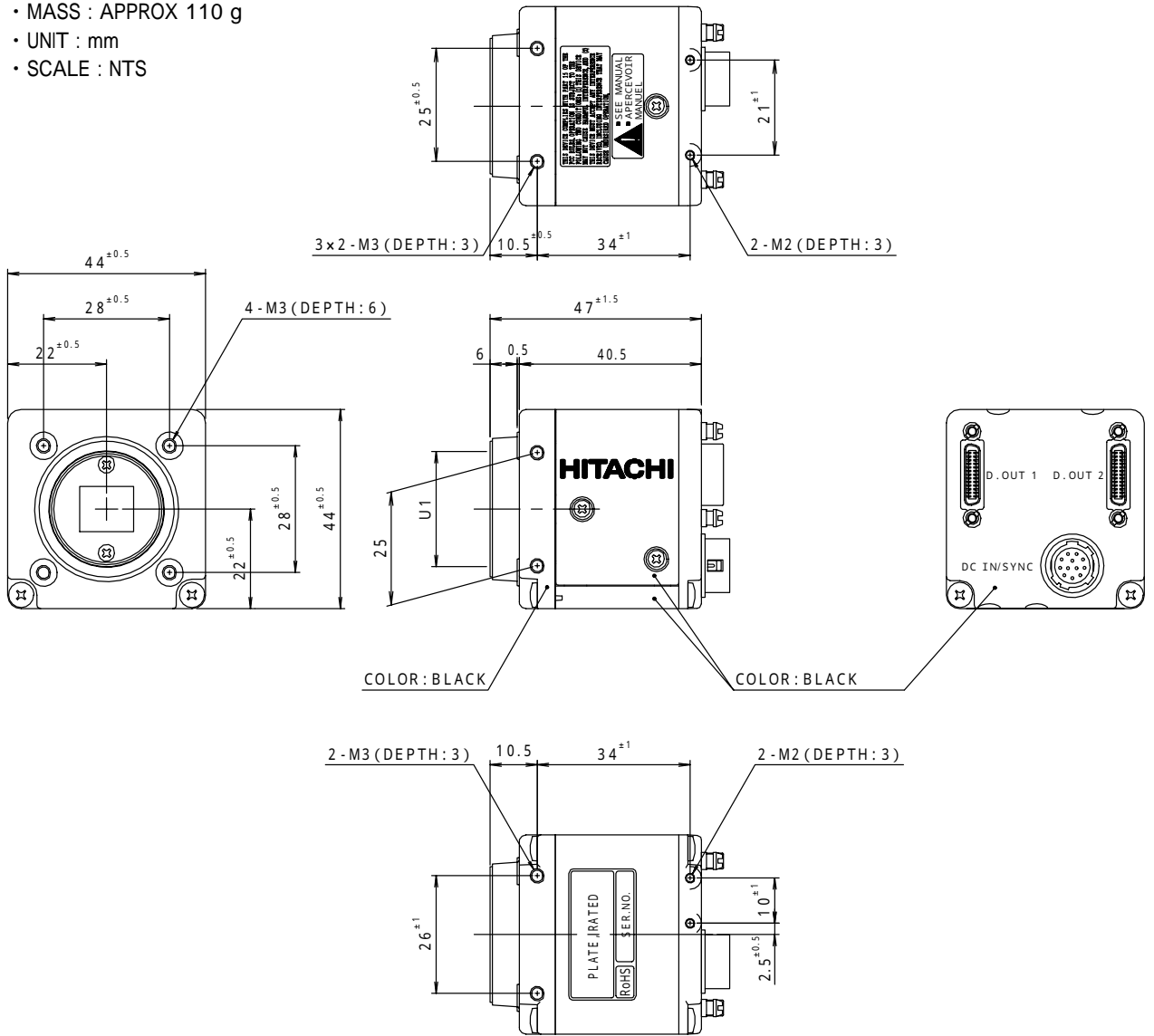
NOTE: If the external VD of cycle which does not match the camera operation mode is input, shutter time has an error.

9. Spectral response



10. External view

- MASS : APPROX 110 g
- UNIT : mm
- SCALE : NTS



Notice:

These specifications are subject to change without prior notice due to product improvement.

Confirm the most recent specifications at time of order.

Hitachi Kokusai certifies this product complies with the standard warranty conditions of Hitachi Kokusai, and that quality control is implemented to the extent required to comply with these conditions.

RoHS Compliant

This product complies with the requirement of the RoHS(Restriction of the use of Certain Hazardous Substances in Electrical and Electronic Equipment) Directive 2002/95/EC

Warranty and service:

(1) The guarantee period is one year after the data purchase.

However, the defects due to erroneous use or intentional act are excluded.

(2) As the defect after expiration of the guarantee period, where product repair is possible, repair will be performed at charge.

(3) The present Warranty pertains only to the camera unit. Secondary malfunctions attributable to camera failure as well as expenses incurred by disassembly and reassembly of the related system, are beyond the scope of this Warranty.

(4) Compensation for loss of business, loss or damage to software, database and other contingent losses are beyond the scope of this Warranty.

(5) Hitachi Kokusai Electric Inc. is not liable for the losses caused when the equipment is used in a system, use for business trades, production process, medical fields, crime prevention applications, etc.

(6) In the case of camera trouble by miss wiring of cable, it will be considered as out of warranty.

