RoHS Compliant
Directive 2002/95/EC

Progressive scan CCD camera
KP-F500PCL/SCL
Specifications

1. General

KP-F500PCL/SCL are a CameraLink output system progressive san black and white CCD camera with a 2/3-inch size CCD and a full frame shutter.

The image of 2456 (H) x 2058 (V) is output at 16 frames per second.

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

2. Outstanding features

(1) High resolution

The 2/3-inch 5,000,000 pixels square lattice progressive scan CCD achieve a high resolution of 2456 (H) x 2058 (V).

(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 1/16 to 1/50000 second in 8 steps)
- Variable shutter (minimum 1/100000 second)
- Frame on demand (the image capture at desired timing using the external trigger signal)

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

(4) Power over CameraLink

Power supply of KP-F500PCL is input via CameraLink cable.

(Note: Power supply of KP-F500SCL is input via DCIN connector.)

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

MODEL KP-F500PCL/SCL		TOLERANCE	Prod. Code - Order No.
DESIGNED DATE	APPROVED DATE	UNIT	TITLE KP-F500PCL/SCL Specifications / REV. 0
CHECKED DATE	STORED DATE	SCALE	
Hitachi Kokusai Electric		DWG. No. E400029791	SHEET 1/20

3. Specifications

(1) Imaging device	2/3-inch interline CCD
Total pixels	2536 (H) x 2068(V)
Effective pixels	2456 (H) x 2058(V)
Pixel size	3.45 um (H) x 3.45 um (V) (square lattice)
(2) Sensing area	8.47 mm (H) x 7.10 mm (V)
(3) Scanning system	Progressive
(4) Aspect ratio	5 : 4
(5) Frame rate	16 frames/second (full pixel readout)
(6) Horizontal drive frequency	64.0000 MHz
(7) Horizontal scanning frequency	33.264 kHz
(8) Vertical scanning frequency	16.00 Hz (full pixel readout) 31.98 Hz (vertical 2 pixel addition mode)
(9) Sync system	Internal
(10) Lens mount	C mount
(11) Flange focal distance	17.526 mm
(12) Video output	Digital output (Camera Link) Base configuration: 64.0000 MHz x 2TAP Medium configuration: 32.0000 MHz x 4TAP Maximum cable length: 10 m Output image size: 2456(H) x 2058(V) (full pixel readout)
(13) Resolution	Horizontal/Vertical: 2000TV lines
(14) Sensitivity	400 lx, F5.6, 3200 K
(15) Minimum illumination	1.0 lx (F1.4, MAX GAIN, without IR cut filter)
(16) Signal noise to ratio	48 dB
(17) Electric shutter	OFF, 1/16, 1/60, 1/100, 1/250, 1/1000, 1/2000, 1/10000, 1/50000 second. OFF is normal exposure (frame rate) or changeable by variable shutter (Minimum 1/100000second)
(18) Gamma	γ = 1
(19) 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
(20) Partial scan	Selectable start position and width of picture grabbing in 1H step.
(21) Power supply voltage	12 ± 1 VDC
(22) Current consumption	Approx. 310 mA (Approx. 3.7W) *When partial scan is ON, Approx. 390 mA (Approx. 4.7W)

(23) 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 (without dew condensation)
(24) Vibration endurance		10 to 55 Hz (2.37 to 71.7 m/s^2), sweep: 1 min XYZ 30min
(25) Shock endurance		490.3 m/s^2 (Drop test, once each top, bottom, left and right)
(26) External dimensions		44 (W) x 44 (H) x 41 (D) mm (Not including protrusions)
(27) Mass		Approx. 110 g

(28) 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
Parity	None
Bit transfer	LSB first

(b) Communications control system

Full control by remote control software, data send/receive by text data transfer to camera microprocessor (BSC system handshake)

(c) Control items

1. Shutter speed	OFF, 1/16, 1/60, 1/100, 1/250, 1/1000, 1/2000, 1/10000, 1/50000 second Factory setting: OFF
2. Variable shutter	10 to 1/100000 second
3. Mode	OFF, Fixed shutter, One trigger and VD reset mode Factory setting: OFF
4. Vertical 2 pixel addition	On / Off Factory setting: OFF
5. Gain	0 to 18 dB (Approx. 0.0358 dB step) Factory setting: 0 dB
6. VD/FVAL	Factory setting: FVAL
7. HD/LVAL/LVAL2	Factory setting: LVAL
8. 12bit / 10bit / 8bit	Factory setting: 8bit
9. Partial scan	Factory setting: OFF
10. Offset level	
11. Trigger pulse polarity	Factory setting: POS
12. Base / Medium configuration	Factory setting: Base
13. Trigger input	CameraLink (CC1) or DCIN/SYNC connector Factory setting: CC1
14. 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) 12pin plug	HR10A-10P-12S(01)

(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-F500SCL) 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-F500PCL)

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-F500PCL)	8	GND
	+12V (KP-F500SCL)		
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

D.OUT 1

Pin No.	Signal	Pin No.	Signal
1	+12V (KP-F500PCL) GND (KP-F500SCL)	14	GND
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	NC [CC2 (+)]	23	NC [CC2 (−)]
11	NC [CC3 (−)]	24	NC [CC3 (+)]
12	NC [CC4 (+)]	25	NC [CC4 (−)]
13	GND	26	+12V (KP-F500PCL) GND (KP-F500SCL)

D.OUT 2

Pin No.	Signal	Pin No.	Signal
1	+12V (KP-F500PCL) GND (KP-F500SCL)	14	GND
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-F500PCL) GND (KP-F500SCL)

Connector (camera side) Sumitomo 3M 1226-1100-00PL or equivalent

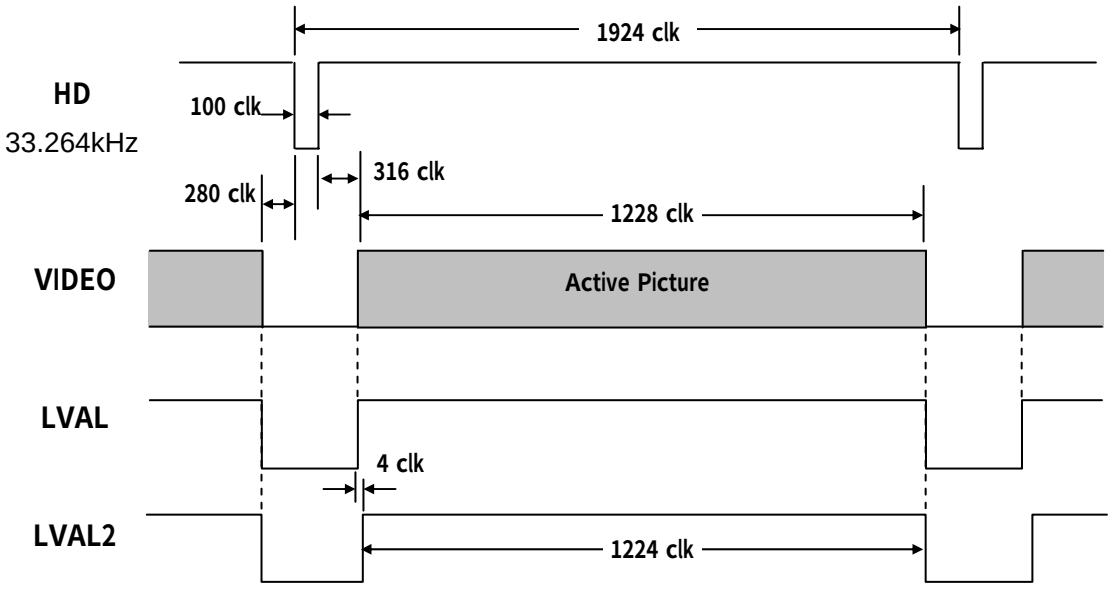
N.U.: Not used

- 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.

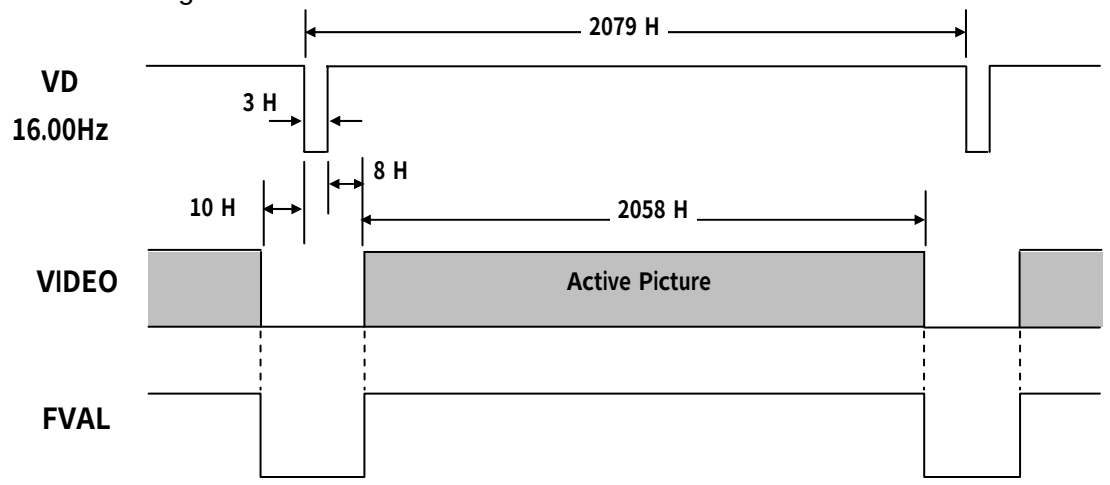
7. CameraLink output

7-1. Horizontal timing



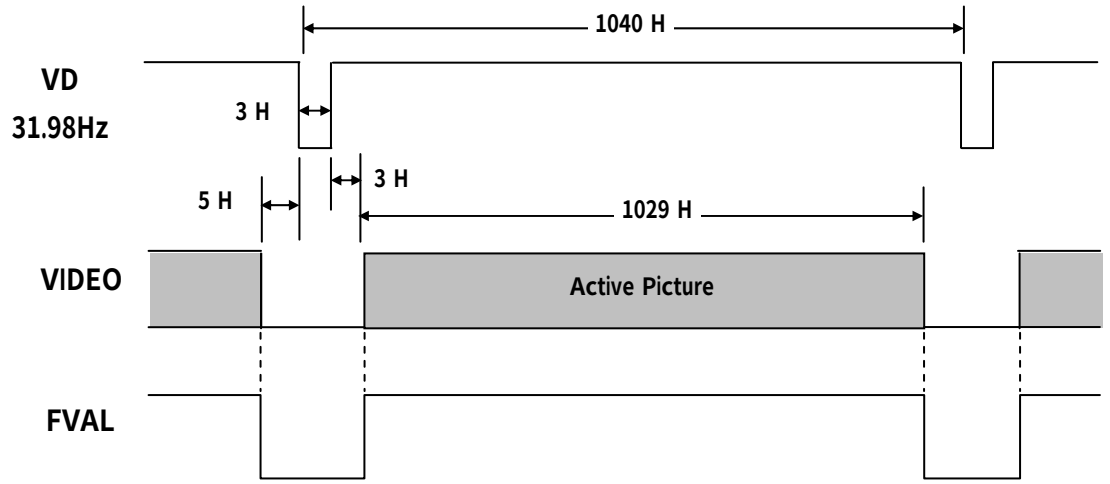
1clk = 15.625ns (64.0000MHz)

7-2. Vertical timing



1H = 1924clk = 30.06 μs

* Vertical timing for vertical 2 pixel addition mode

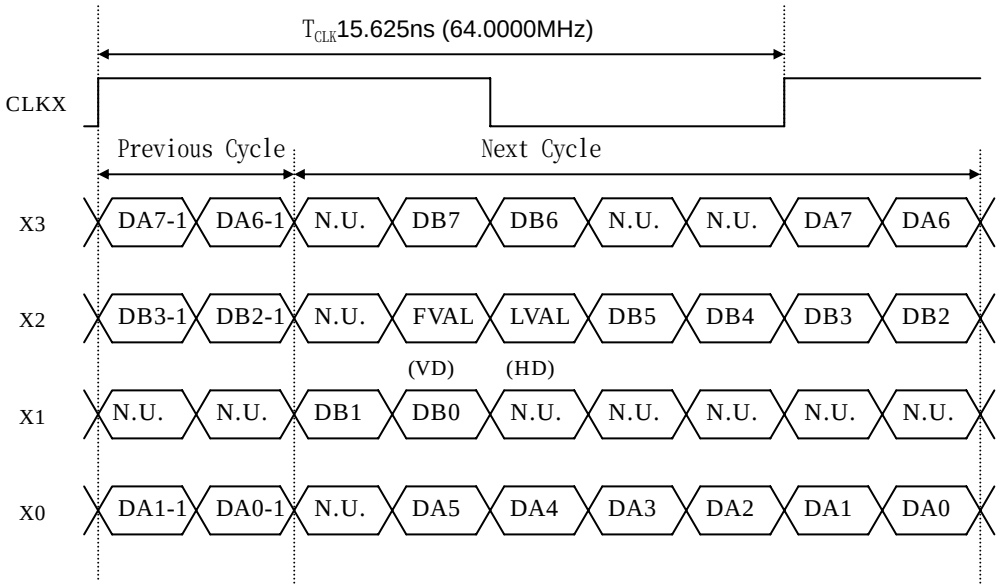


7-3. Transmitter LVDS output pulse position measurement

(1) Base configuration

(a) 8bit

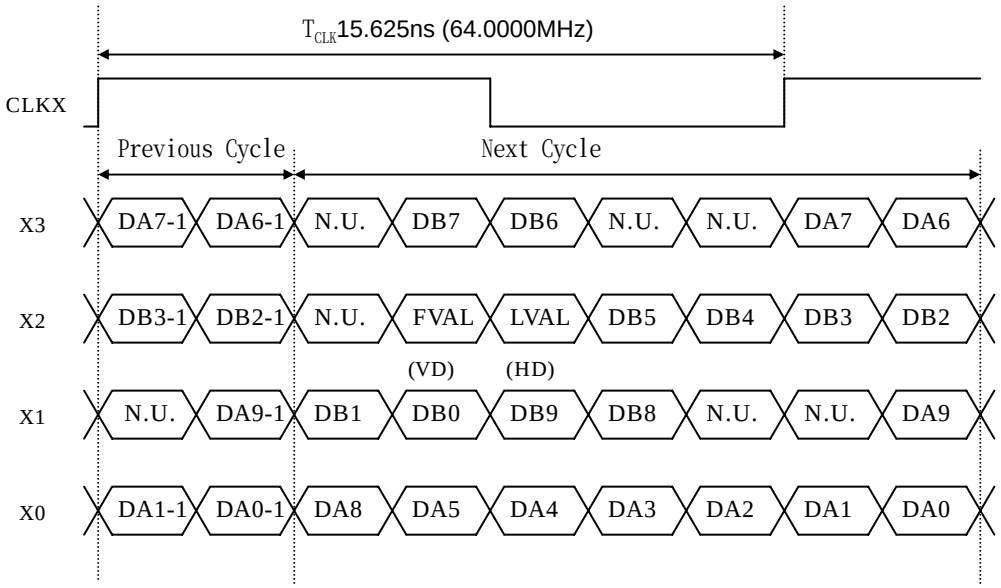
D.OUT 1



N.U.: Not used

(b) 10bit

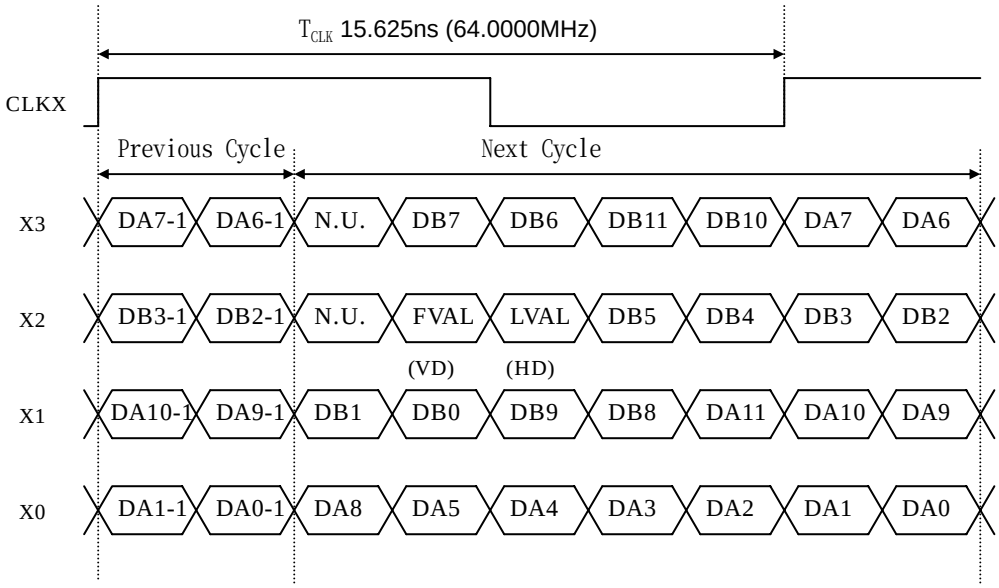
D.OUT 2



N.U.: Not used

(c) 12bit

D.OUT 1



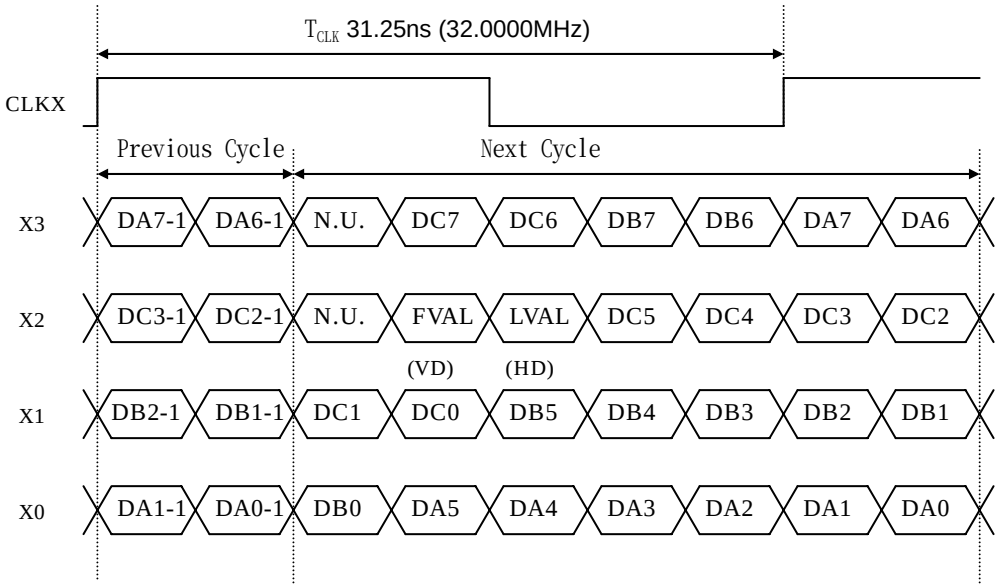
N.U.: Not used

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

(2) Medium configuration

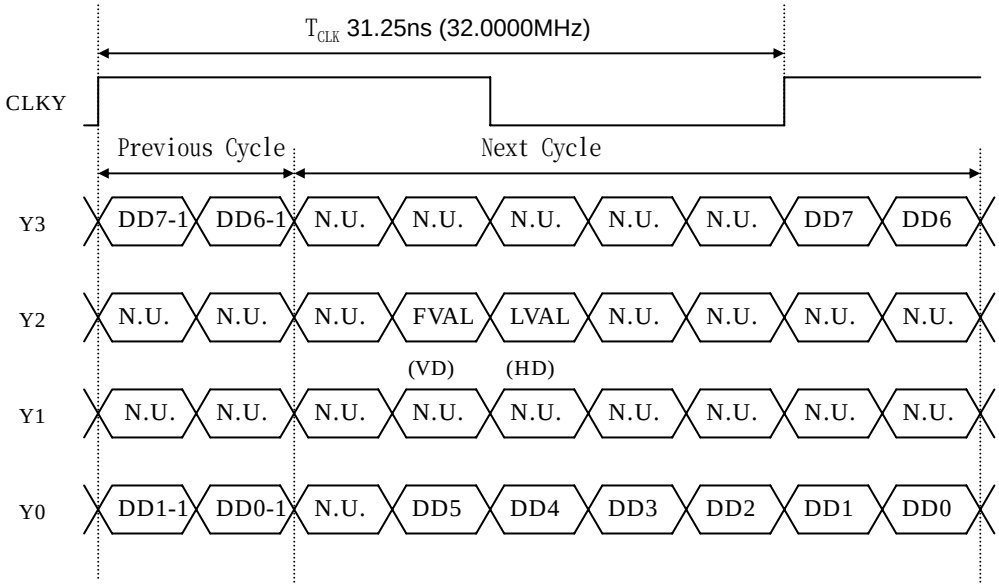
(a) 8bit

D.OUT 1



N.U.: Not used

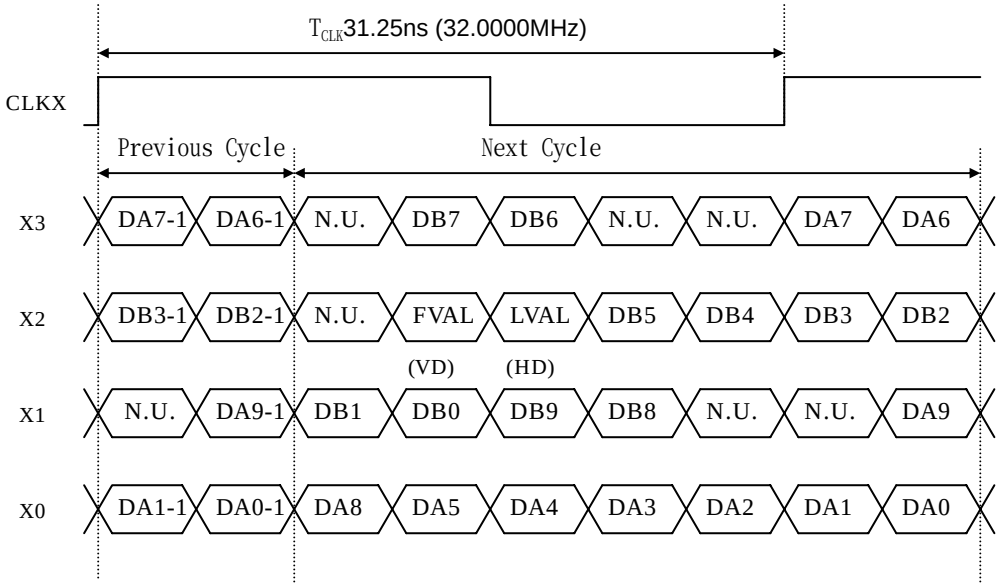
D.OUT 2



N.U.: Not used

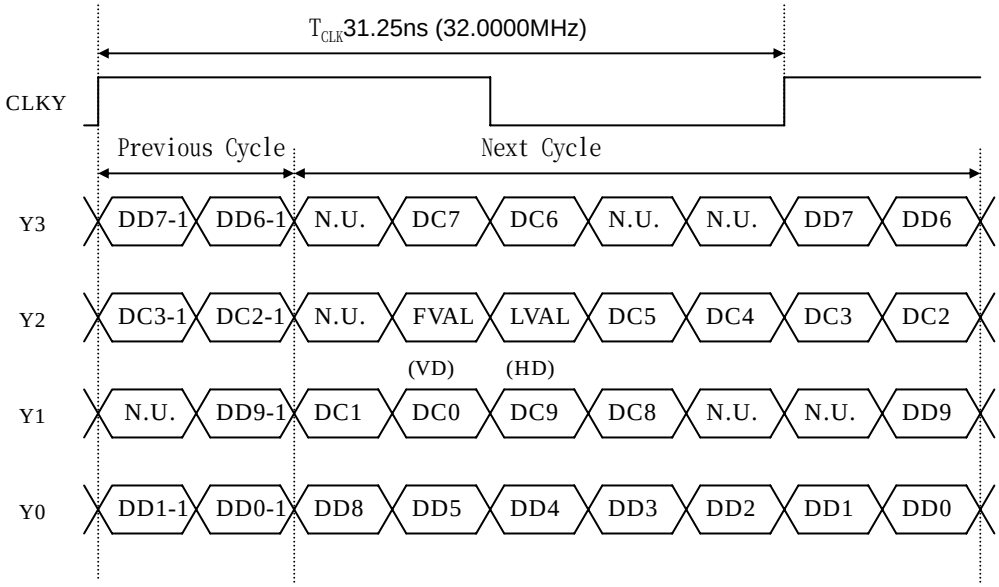
(b) 10bit

D.OUT 1



N.U.: Not used

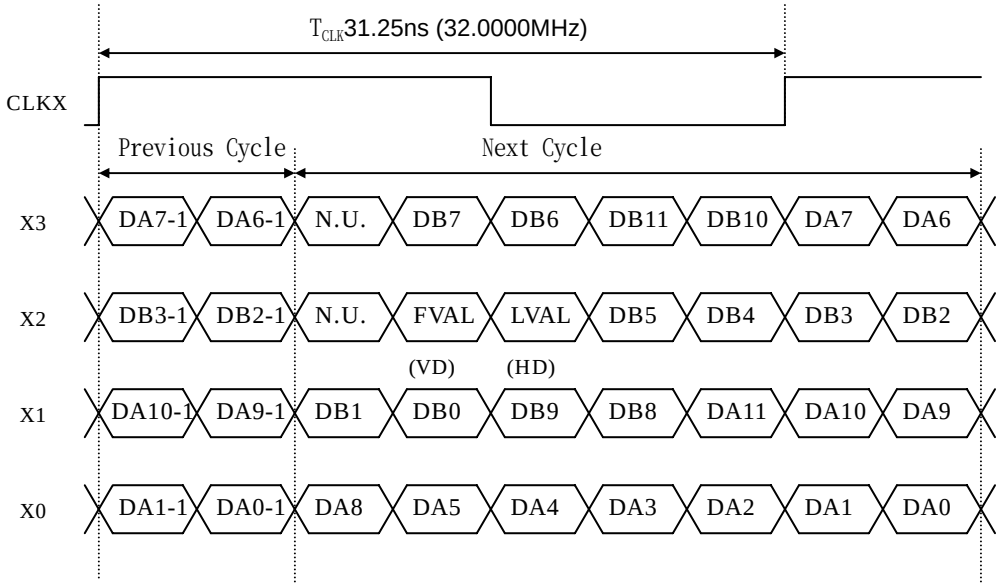
D.OUT 2



N.U.: Not used

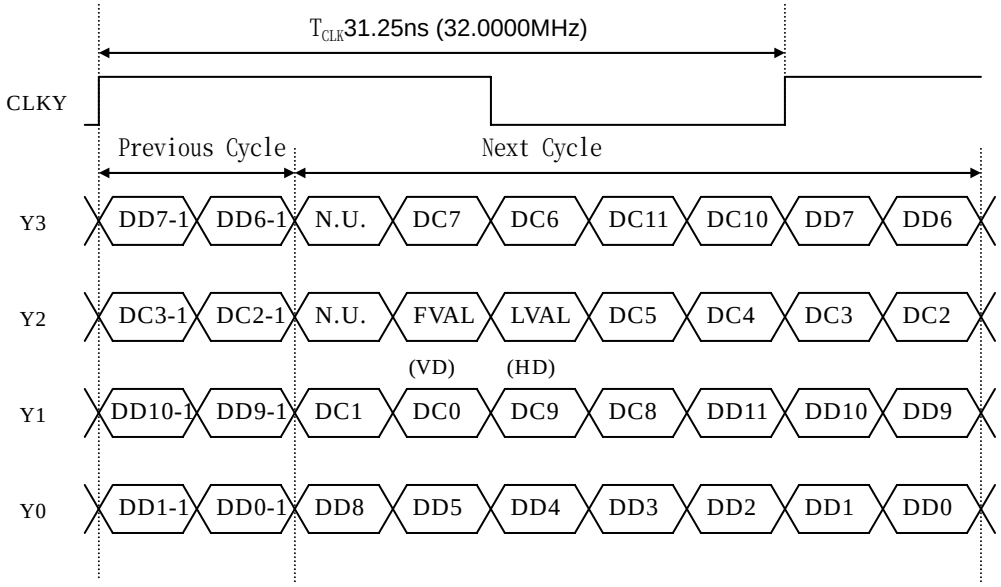
(c) 12bit

D.OUT 1



N.U.: Not used

D.OUT 2



N.U.: Not used

7-4. Output sequence

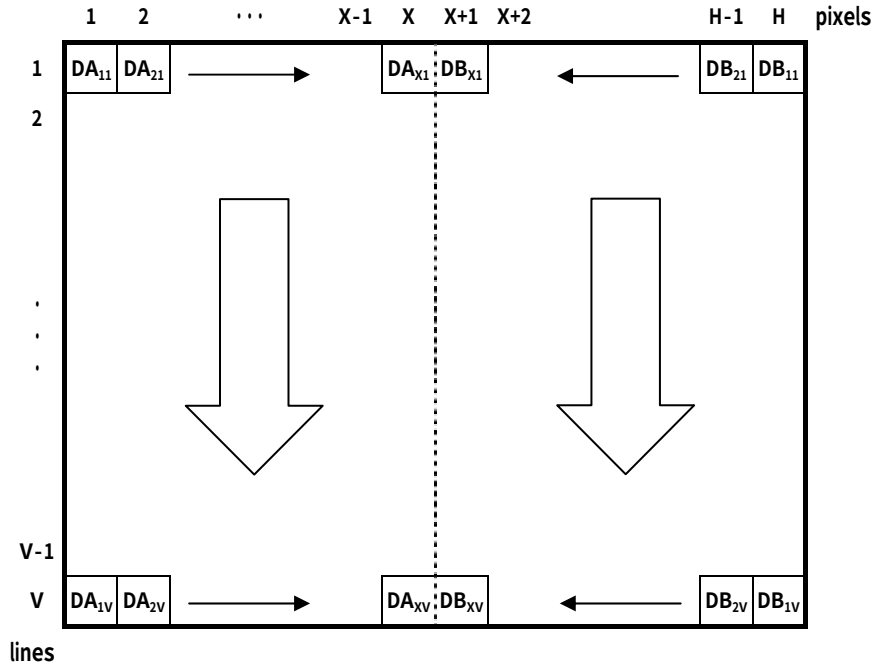
X = H/2

H = 2456

V = 2058

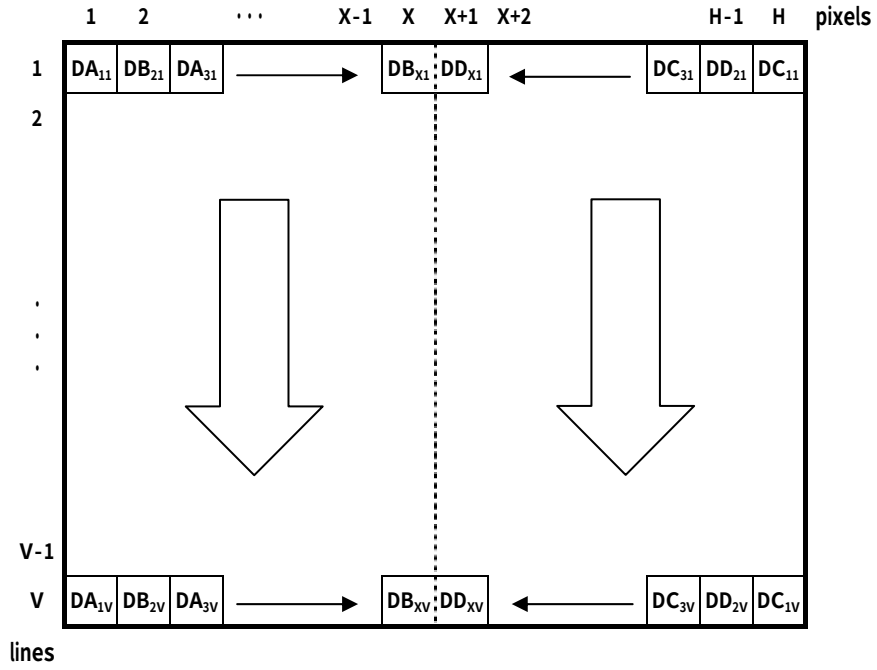
(1) Base configuration

DA_{xy} : Data of screen left half. This means that left to the x-th pixel on y-th line.
DB_{xy} : Data of screen right half. This means that right to the x-th pixel on y-th line.



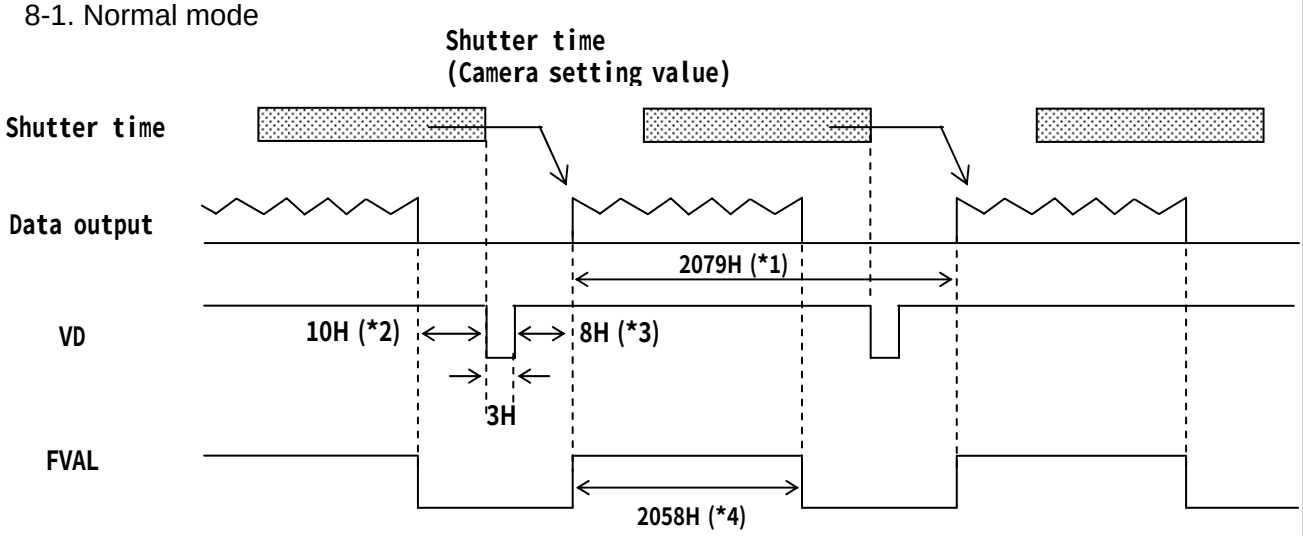
(2) Medium configuration

DA_{xy} DB_{xy} : Data of screen left half. These mean that left to the x-th pixel on y-th line.
DC_{xy} DD_{xy} : Data of screen right half. These mean that right to the x-th pixel on y-th line.



8. Timing chart

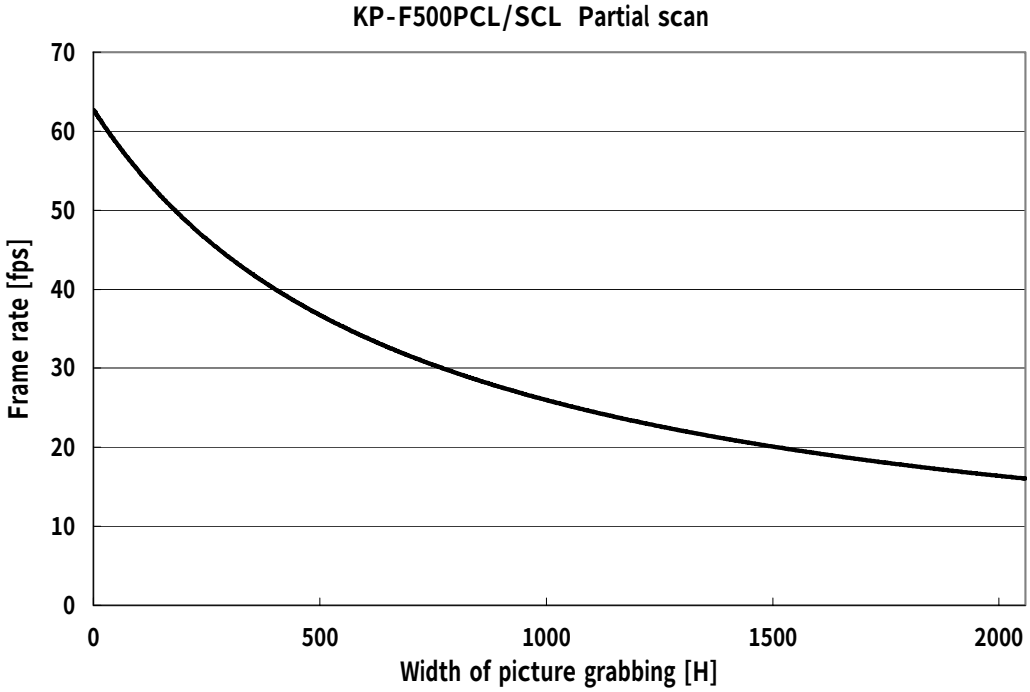
8-1. Normal mode



1H = 1924clk = 30.06 μs

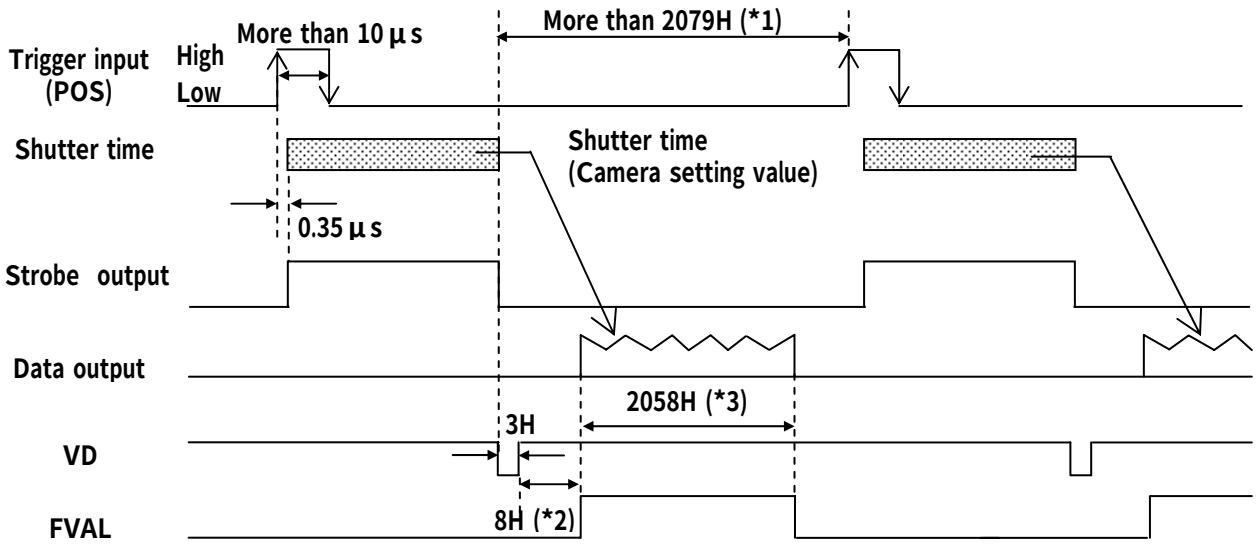
When partial scan is ON, *1 to *4 are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).
*1: (14 + Width + (2067 - Width) / 4)H
*2: (3 + (2067 - Width) / 4 - Start / 4)H
*3: (8 + Start / 4)H
*4: (Width)H
Note1: Please use the partial scan in following condition.
Start + Width ≦ 2059
Note2: Please use FVAL in the partial scan.

Graph following shows frame rate in each width of picture grabbing when partial scan is ON.



Note: Frame rate can be calculated from following equations using width of picture grabbing.
Lines = 14 + Width + (2067 - Width) / 4
Frame rate = (64000000 / 1924) / Lines

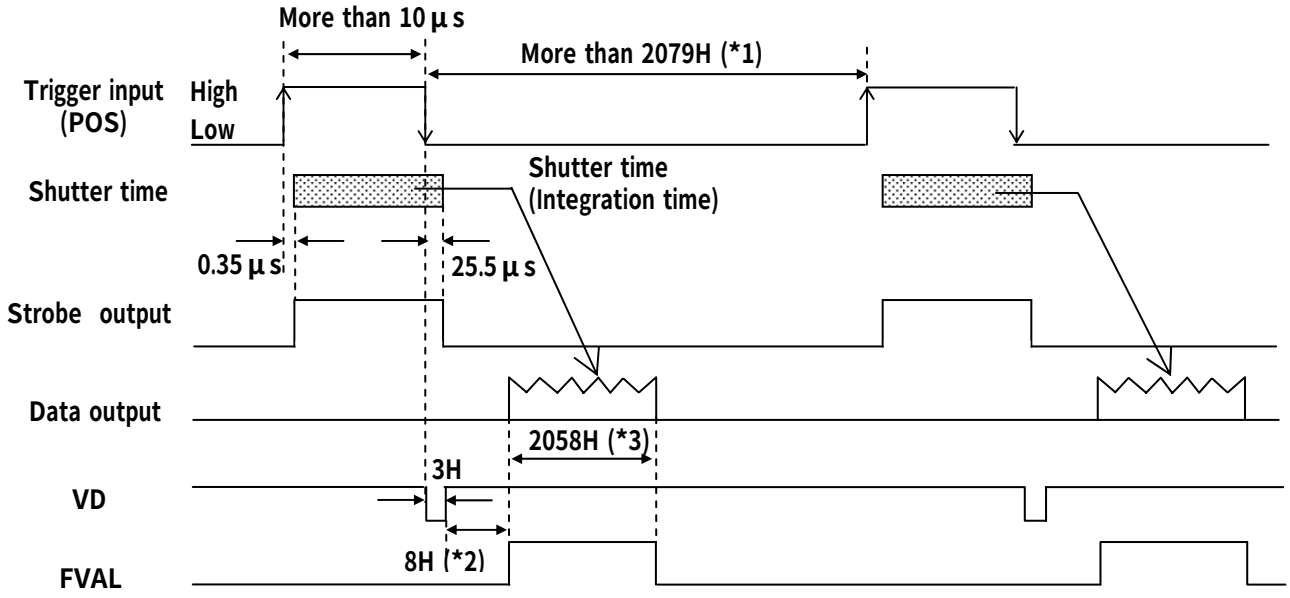
8-2. Fixed shutter mode



1H = 1924clk = 30.06 µs

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: (14 + Width + (2067 - Width) / 4)H or more
*2: (8 + Start / 4)H
*3: (Width)H
Note1: Please use the partial scan in following condition.
Start + Width ≦ 2059
Note2: Please use FVAL in the partial scan.

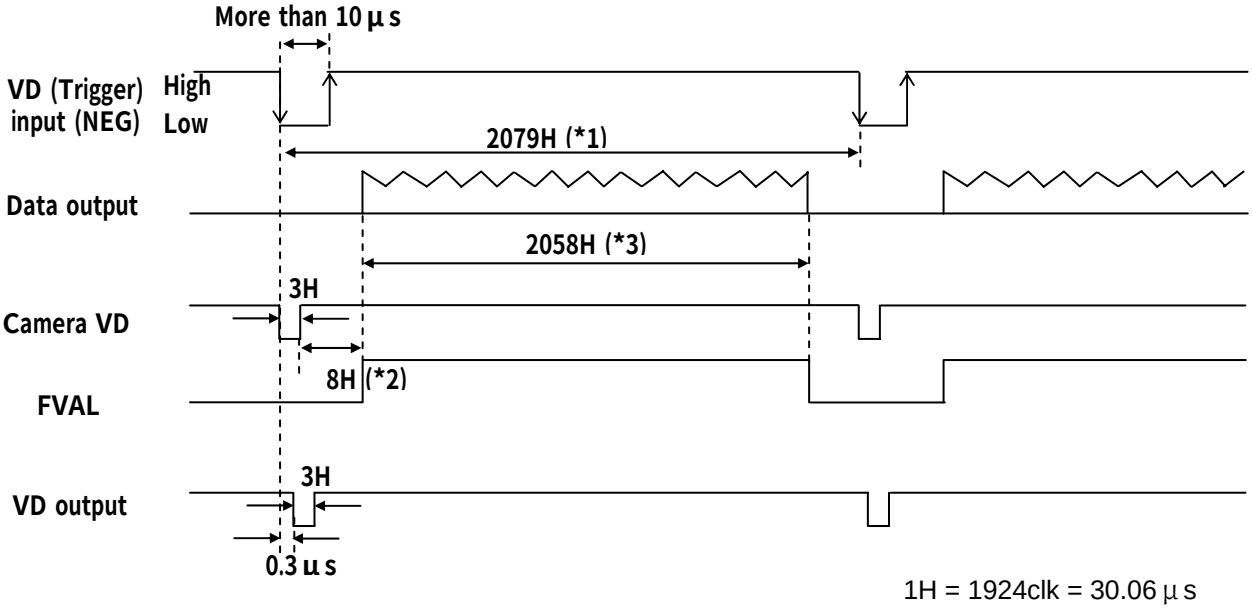
8-3. ONE trigger mode



1H = 1924clk = 30.06 µs

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: (14 + Width + (2067 - Width) / 4)H or more
*2: (8 + Start / 4)H
*3: (Width)H
Note1: Please use the partial scan in following condition.
Start + Width ≦ 2059
Note2: Please use FVAL in the partial scan.

8-4. VD reset mode

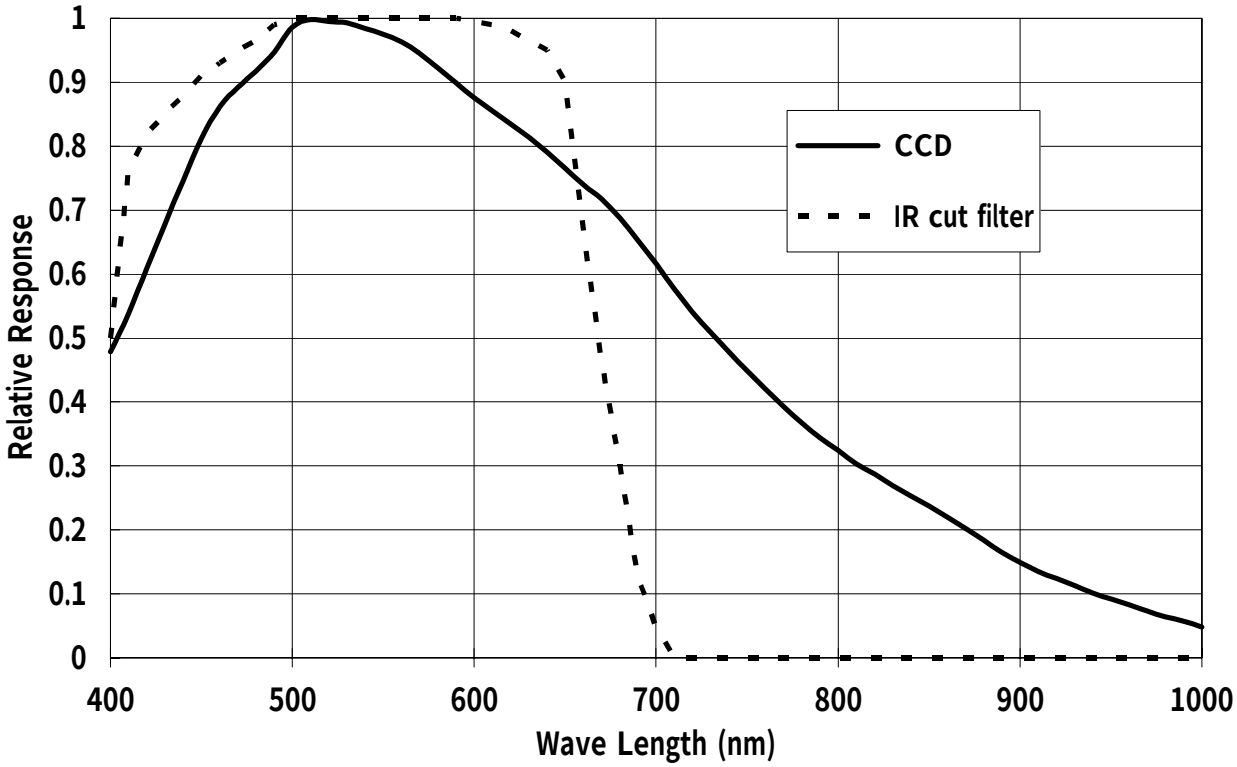


1H = 1924clk = 30.06 µ s

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: (14 + Width + (2067 - Width) / 4)H**
***2: (8 + Start / 4)H**
***3: (Width)H**
Note1: Please use the partial scan in following condition.
Start + Width ≦ 2059
Note2: Please use FVAL in the partial scan.

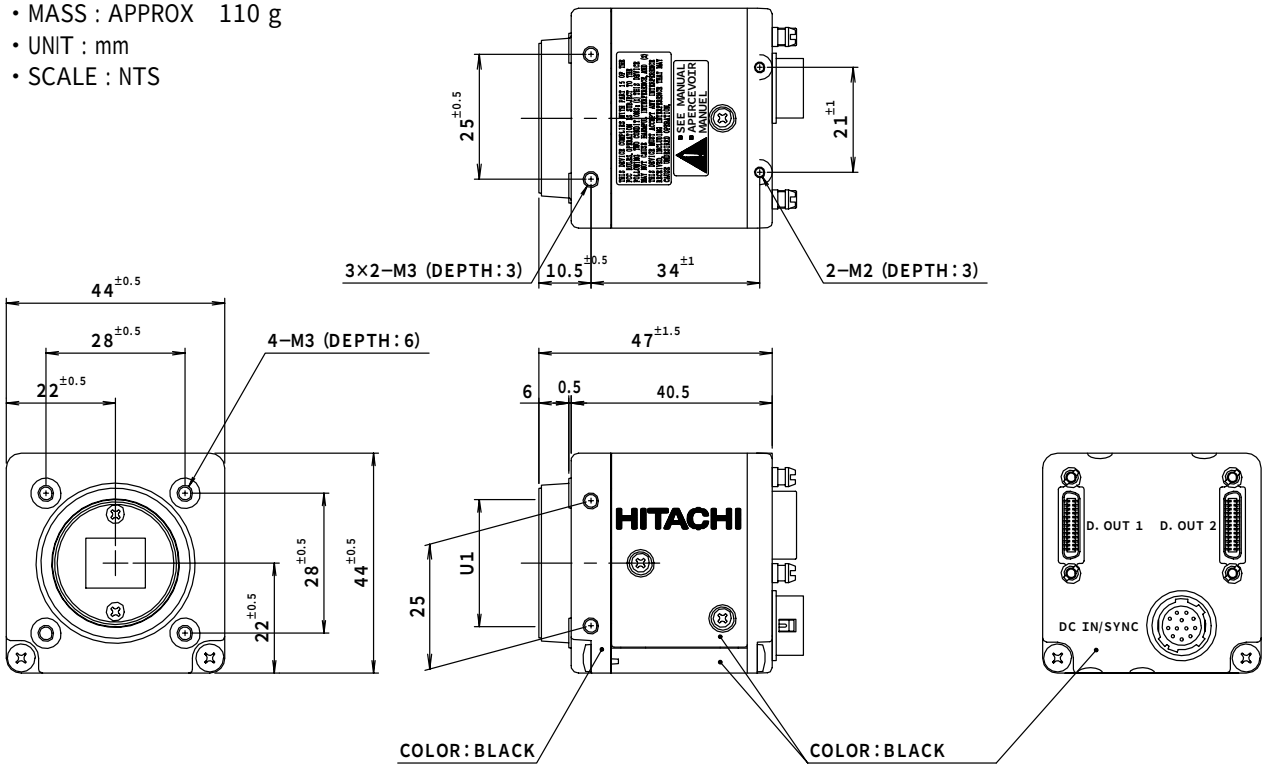
NOTE: If the external VD of cycle which does not match the camera operation mode is input, shutter time has an error.

9. Spectral response



10. External view

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



DWG. No.	E400029791	SHEET 18/20

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.

Modification history

SIMBLE	DATE	CORRECTION AND REASONS		DESIGNED

DWG. No.	E400029791	SHEET 20/20