

# Progressive scan CCD camera KP-F520WCL Specifications

## 1. General

The KP-F520WCL is 2/3-inch single CCD black and white camera which utilized the progressive scan CCD image sensor with square pixel of 5M pixels.

Since the square pixel CCD is adopted, the suitable images can be obtained for image processing.

The output image by Camera Link interface is 2456 (H) x 2058 (V) at 18 frames per second.

## 2. Outstanding features

### (1) High resolution

The 2/3-inch 5,000,000 pixels square lattice progressive scan CCD is adapted.

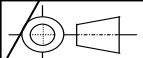
Effective pixels are 2456 (H) x 2058 (V) achieves a high resolution image.

### (2) Small size

The small SDR connector is adapted for digital output which realizes the small body with 29(W) x 29(H) x 29(D) mm.

### (3) Remote control

- Multi-step electronic shutter (1/18 to 1/50000 second in 8 steps)
- Variable shutter (1/100000 second at minimum)
- Frame on demand (the image capture at desired timing using the external trigger signal)

-		Nov.18,2014		(first edition)		K.Kageshita K.Kageshita	
SYMBOL		DATE		DESCRIPTION		(DRAWN) DESIGNED	
MODEL KP-F520WCL				TOLERANCE		Prod. Code - Order No.	
DESIGNED		DATE		APPROVED		DATE	
CHECKED		DATE		STORED		DATE	
				UNIT		TITLE	
				SCALE		KP-F520WCL Specifications	
Hitachi Kokusai Electric						DWG. No. <b>E400466078</b>	
						REV. <b>0</b>	
						SHEET <b>1 / 20</b>	

### 3. Specifications

A	(1) Imaging device	2/3-inch interline CCD
	Total pixels	2530 (H) x 2068(V)
	Effective pixels	2456 (H) x 2058(V)
B	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	18 frames per second (full pixel readout)
	(6) Horizontal drive frequency	72.0000 MHz
	(7) Horizontal scanning frequency	37.422 kHz
	(8) Vertical scanning frequency	18.00 Hz (full pixel readout) 45.046 Hz (vertical 2 pixel addition mode)
	(9) Sync system	Internal
	(10) Lens mount	C mount
C	(11) Flange focal distance	17.526 mm
	(12) Video output	Digital output (Camera Link) Base configuration: 72.0000 MHz x 2TAP 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, F8, 3200 K
	(15) Minimum illumination	1.0 lx (F1.4, MAX GAIN)
D	(16) Signal noise to ratio	50 dB
	(17) Electric shutter	OFF, 1/18, 1/60, 1/100, 1/250, 1/1000, 1/2000, 1/10000, 1/50000 second. OFF is normal exposure (frame rate) or adjustable by variable shutter (Minimum 1/100000second)
	(18) Gamma	OFF ( $\gamma = 1$ ) / ON (The factory setting is OFF.)
E	(19) Knee	OFF / ON (The factory setting is OFF.)
	1. Knee point	Selectable between 0 to 32 steps (The factory setting is 0.) 0 is the lower level for the start point of knee, 32 goes to higher level.
	2. Knee slope	Selectable between 0 to 159 steps (The factory setting is 0.) 0 is the lower effects for knee, 159 goes to the higher effects.
F		

	1	2	3	4
A	(20) Frame on demand			
	Mode		(A) Fixed shutter mode (8 steps or variable) (B) ONE trigger mode (C) VD reset mode	
	Trigger input		Camera Link (CC1) or DCIN/SYNC connector	
	(21) Partial scan		Selectable start position and width of picture grabbing in 1H step.	
	(22) Power supply voltage		DC12V ± 1V	
	(23) Power consumption		Approx. 265 mA (Approx. 3.18W)	
B	(24) Temperature sensor		-40 to 150°C (0.125°C/LSB)	
	(25) Ambient	Performance	0 to +40°C (+32 to +104 F), less than 90 % RH	
		Operation	-10 to +50°C (+14 to 122 F), less than 90 % RH	
		Storage	-20 to +60°C (-4 to 140 F), less than 70 % RH (without dew condensation)	
	(26) Vibration endurance		10 to 55 Hz (2.37 to 71.7 m/s <sup>2</sup> ), sweep: 1 min XYZ 30min	
	(27) Shock endurance		490.3 m/s <sup>2</sup> (once each top, bottom, left and right)	
	(28) External dimensions		29 (W) x 29 (H) x 29 (D) mm (Not including protrusions)	
C	(29) Mass		Approx. 50 g	
	(30) Remote control			
	(a) Communication system			
	Control system		Start-stop synchronization system	
	Transmission rate		115200 bps	
	Data length		8 bits	
D	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)			
E				
F				

	1	2	3	4
A	(c) Control items			
	1. Shutter speed		OFF, 1/18, 1/60, 1/100, 1/250, 1/1000, 1/2000, 1/10000, 1/50000 second	
			Factory setting: OFF	
B	2. Variable shutter		10 to 1/100000 second	
	3. Mode		OFF, Fixed shutter, One trigger, VD reset mode	
			Factory setting: OFF	
C	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	
D	6. VD/FVAL		Factory setting: FVAL	
	7. HD/LVAL/LVAL2		Factory setting: LVAL	
	8. 8bit / 10bit		Factory setting: 8bit	
E	9. Partial scan		Factory setting: OFF	
	10. Offset level		0/1023 to 32/1023	
			Factory setting: 0/1023	
F	11. Trigger pulse polarity		POS/NEGA	
			Factory setting: POS	
	12. Trigger input		CameraLink (CC1) or DCIN/SYNC connector	
A			Factory setting: CC1	
	13. Output signal		OFF, FLASH OUT, VD OUT	
			Factory setting: OFF	
B	14. White spot correction		ON / OFF	
			Factory setting: ON	
	15. Balance adjust (Left/Right)		OFF / MANUAL / AUTO	
C			Factory setting: AUTO	
	16. Test pattern		OFF / H-LAMP / V-LAMP / HV-LAMP	
			Factory setting: OFF	
D	17. Output order substitution		ON/OFF	
			Factory setting: OFF	
	18. Gamma		ON/OFF	
E			Factory setting: OFF	
	19. Knee		ON/OFF	
			Factory setting: OFF	
F	20. Temperature sensor		ON/OFF	
			Factory setting: OFF	
	21. Factory reset		Return to the factory settings.	

#### 4. Composition

- (1) Camera (with AR coated Dummy glass)

#### 5. Optional accessories

- (1) Dummy glass (AR coated)                      ARC1214
- (2) IR cut filter    IRC650
- (3) AC adapter    JC-100 (Junction box integrated)
- In case the power is supplied via DCIN / SYNC connector.
- UD-240A, UD-M1 (with 12-pin connector)
- (4) Junction box    JU-F30
- (5) Tripod adaptor    TA-F500
- (6) 12pin plug    HR10A-10P-12S(01)
- (7) Camera cable (12-pin 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.

- (8) Digital out cable (Camera Link cable)

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 of DCIN/SYNC connector

PIN No.	Signal	PIN No.	Signal
1	GND	7	Trigger IN/ VD IN
2	N.U.	8	GND
3	GND	9	OUTPUT3
4	OUTPUT1	10	FLASH OUT / VD OUT
5	GND	11	N.U.
6	OUTPUT2	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.

In the CE marking region, please install clamp filter (ZCAT 2035-0930A: TDK) at both ends (camera and video processor ends).

## (2) Signal connection of DIGITAL OUT connector

## D.OUT 1

Pin No.	Signal	Pin No.	Signal
1	+12V	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	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

N.U. : Not used

Connector (camera side)

SDR connector (Sumitomo 3M) or equivalent

- 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.

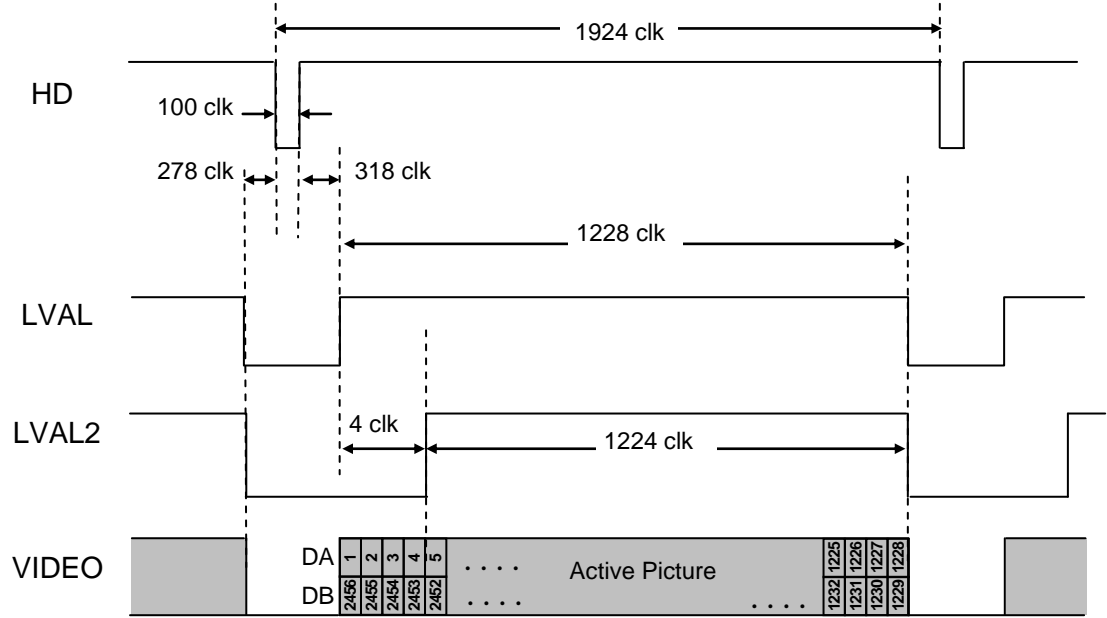
### 7. Camera Link output

A

#### 7-1. Horizontal timing

(1) Base configuration (1 clk = 13.888 ns)

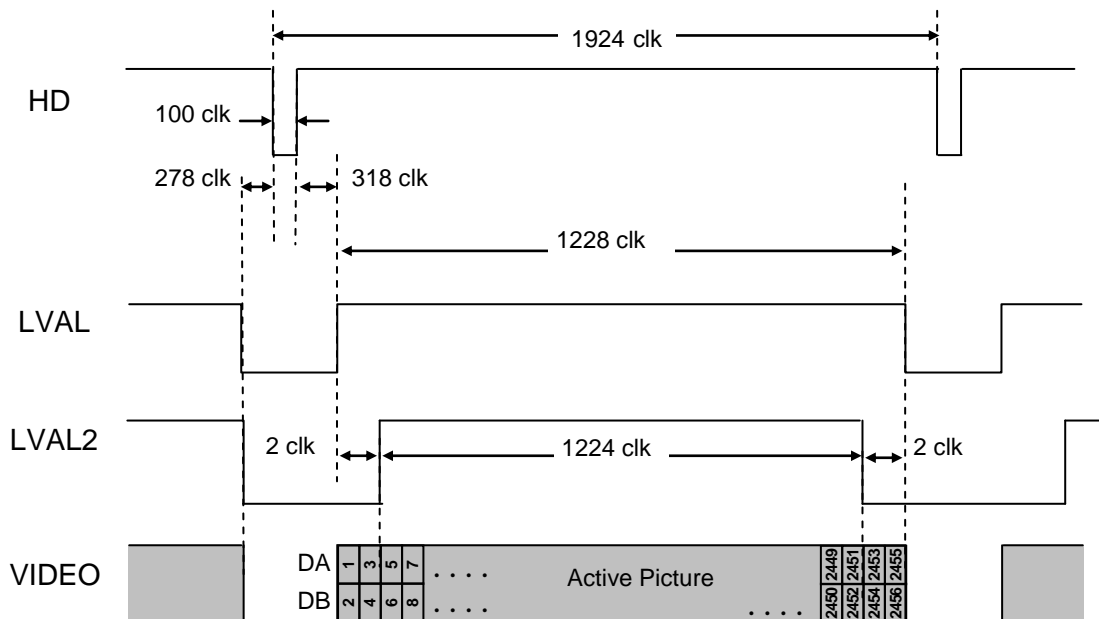
##### (a) SORT OFF



B

C

##### (b) SORT ON



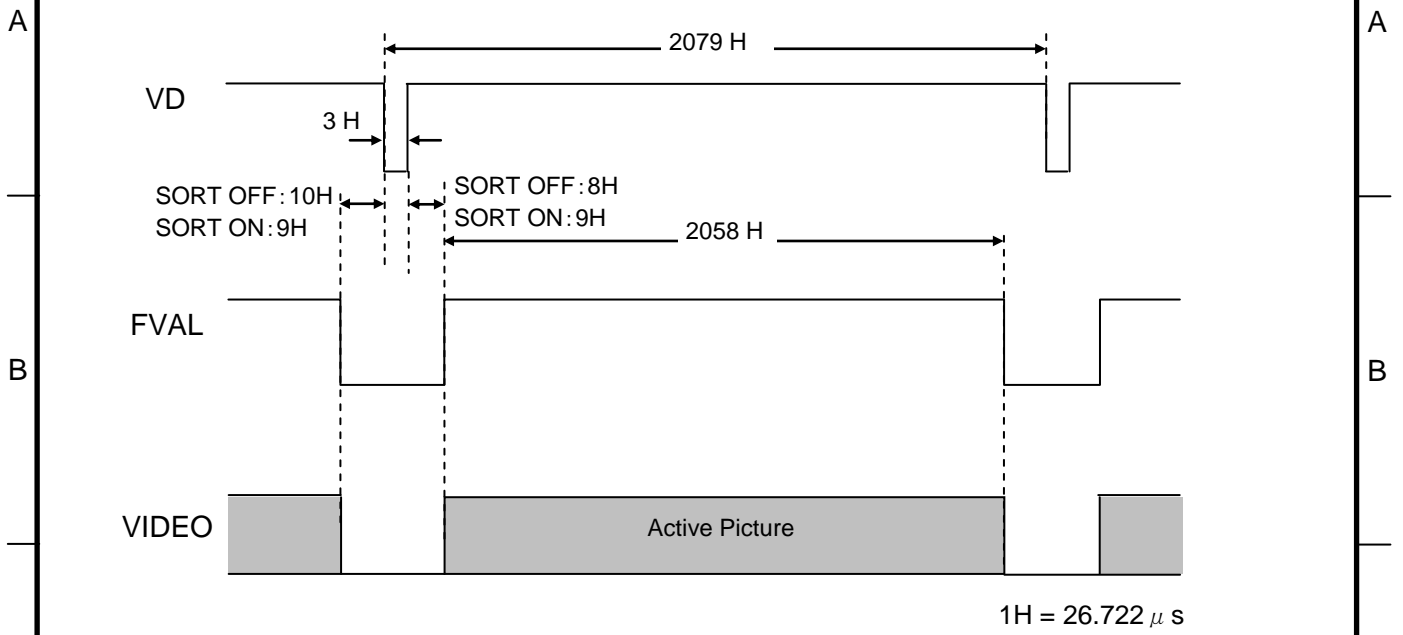
D

E

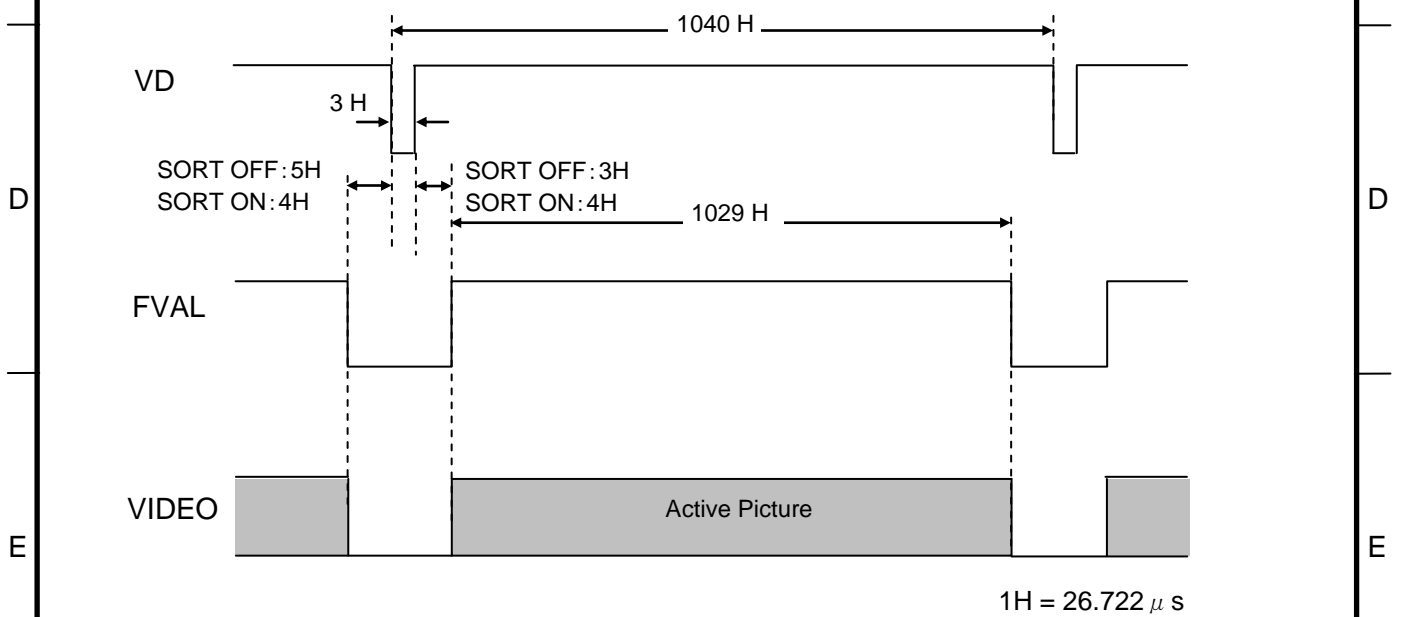
F



7-2. Vertical timing



\* Vertical timing for vertical 2 pixel addition mode

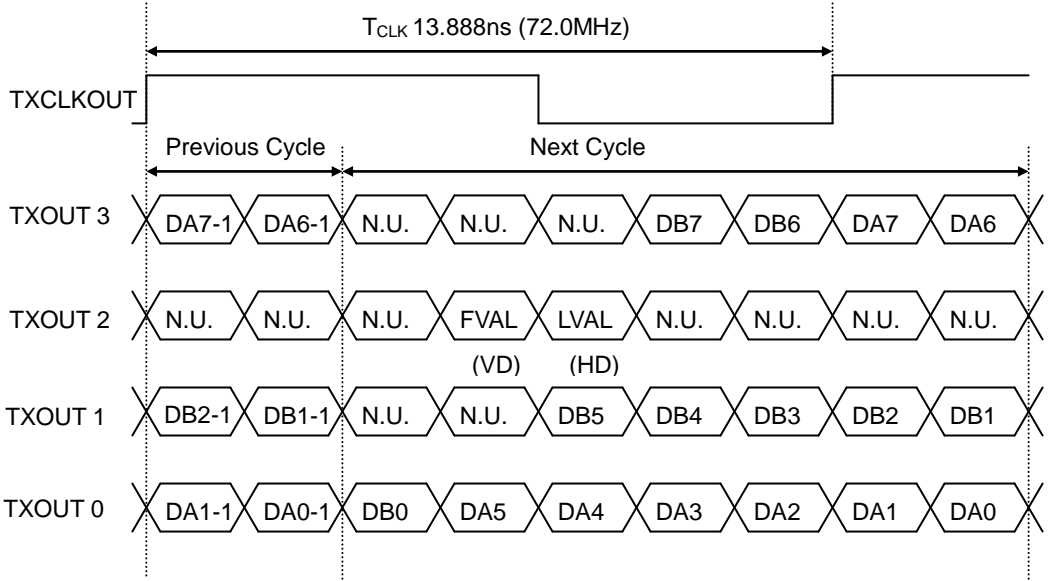


### 7-3. Transmitter LVDS output pulse position

#### (1) Base configuration

##### (a) 8bit

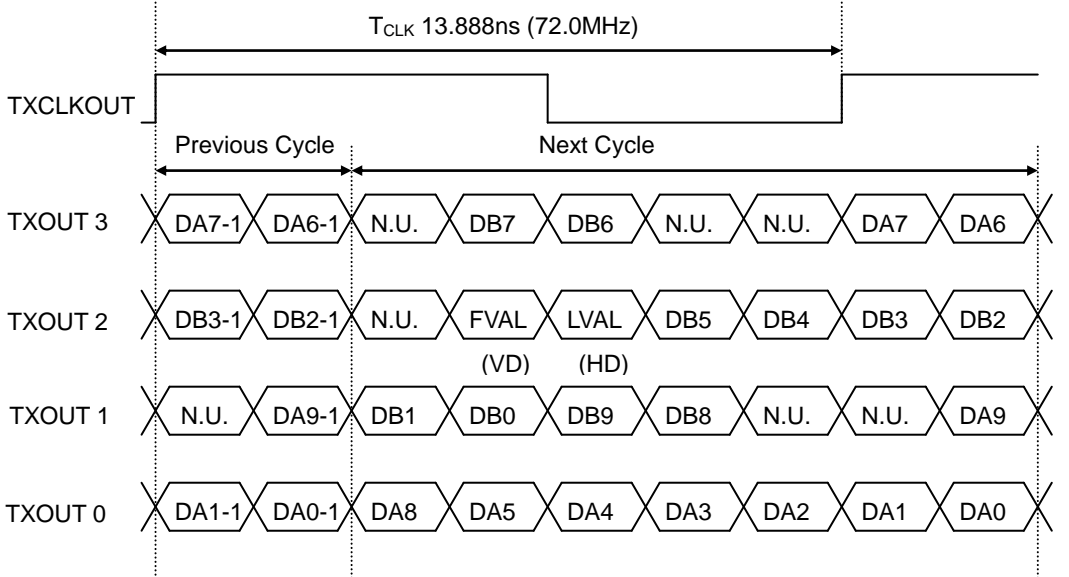
D.OUT1



N.U.: Not used

##### (b) 10bit

D.OUT1



N.U.: Not used

7-4. Output sequence

DA and DB show output TAP of Camera Link.

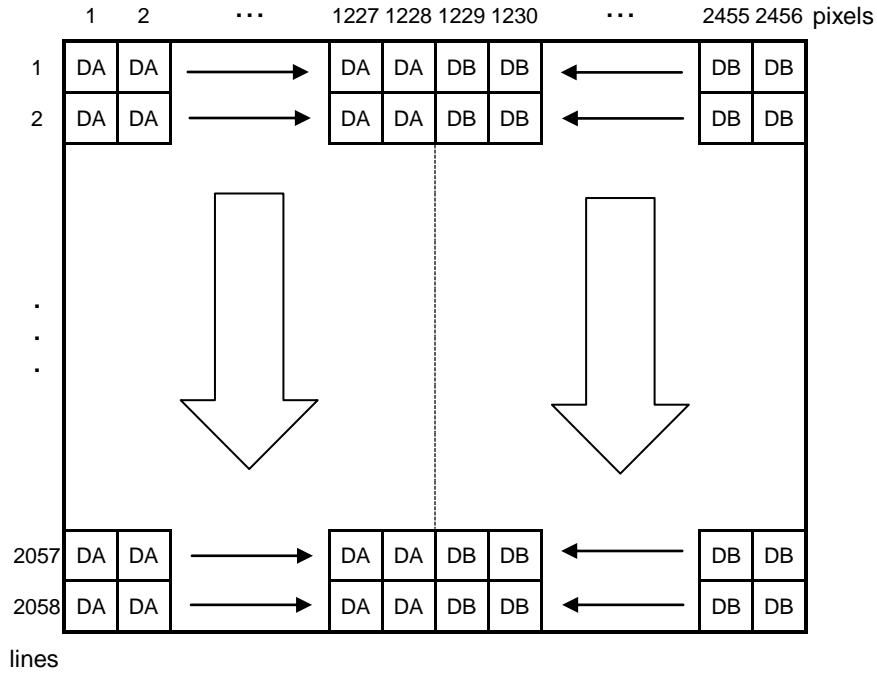
Refer to "Transmitter LVDS output pulse position" for details.

A

A

(1) Base configuration

(a) SORT OFF



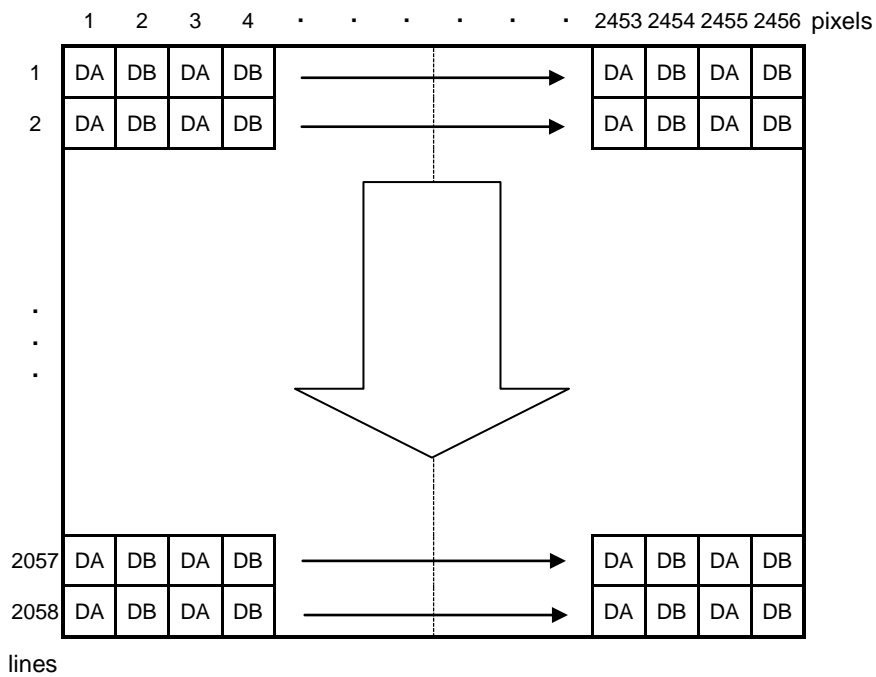
B

B

C

C

(b) SORT ON



D

D

E

E

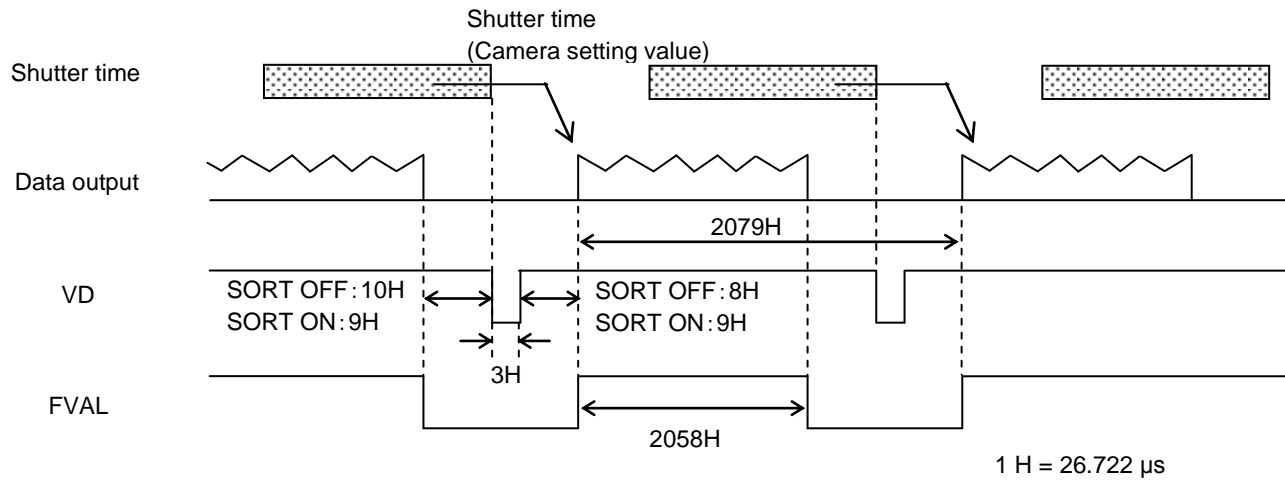
F

F

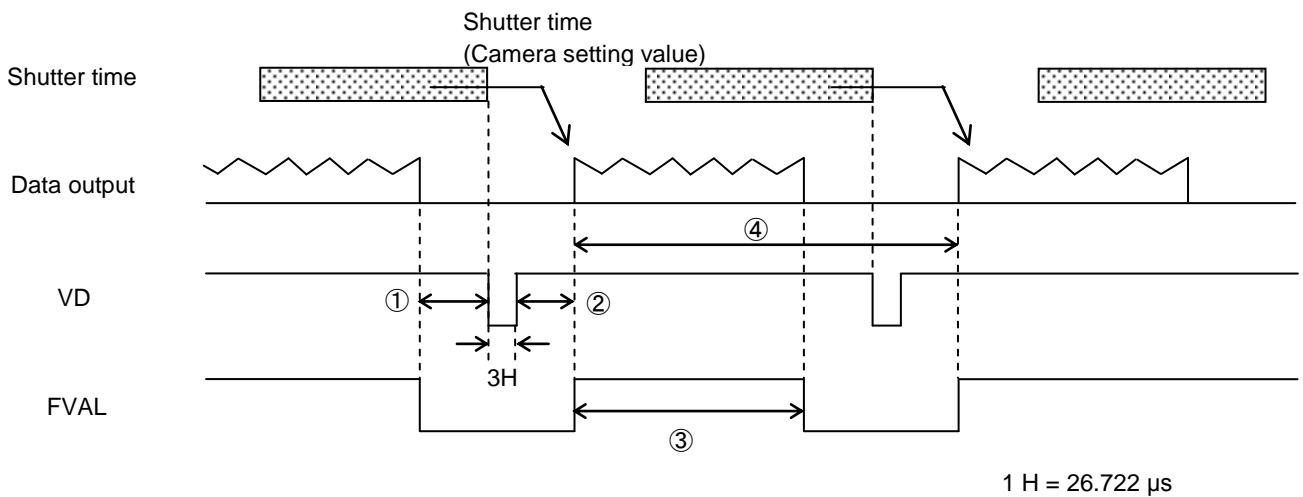
## 8. Timing chart

### 8-1. Normal mode

#### (a) Partial scan OFF



#### (b) Partial scan ON



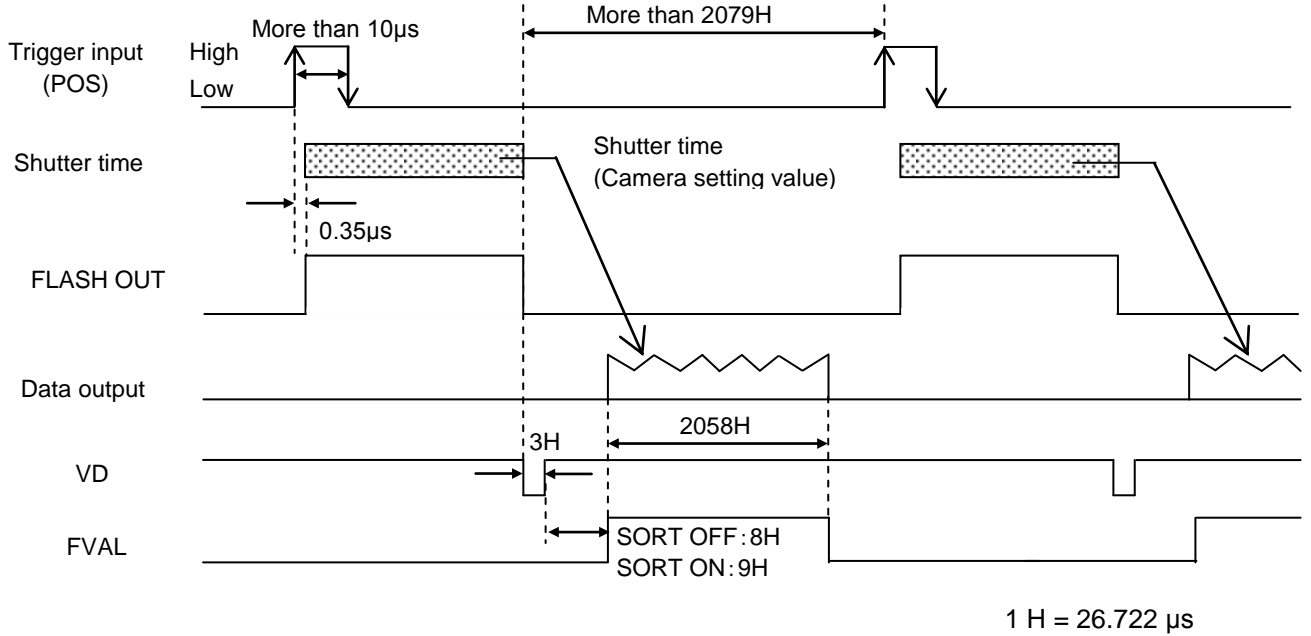
① to ④ are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).

	SORT OFF	SORT ON
①	$(3 + (2067 - \text{Width})/4 - \text{Start}/4)H$	$(2 + (2067 - \text{Width})/4 - \text{Start}/4)H$
②	$(8 + \text{Start}/4)H$	$(9 + \text{Start}/4)H$
③	$(\text{Width})H$	
④	$(14 + \text{Width} + (2067 - \text{Width})/4)H$	

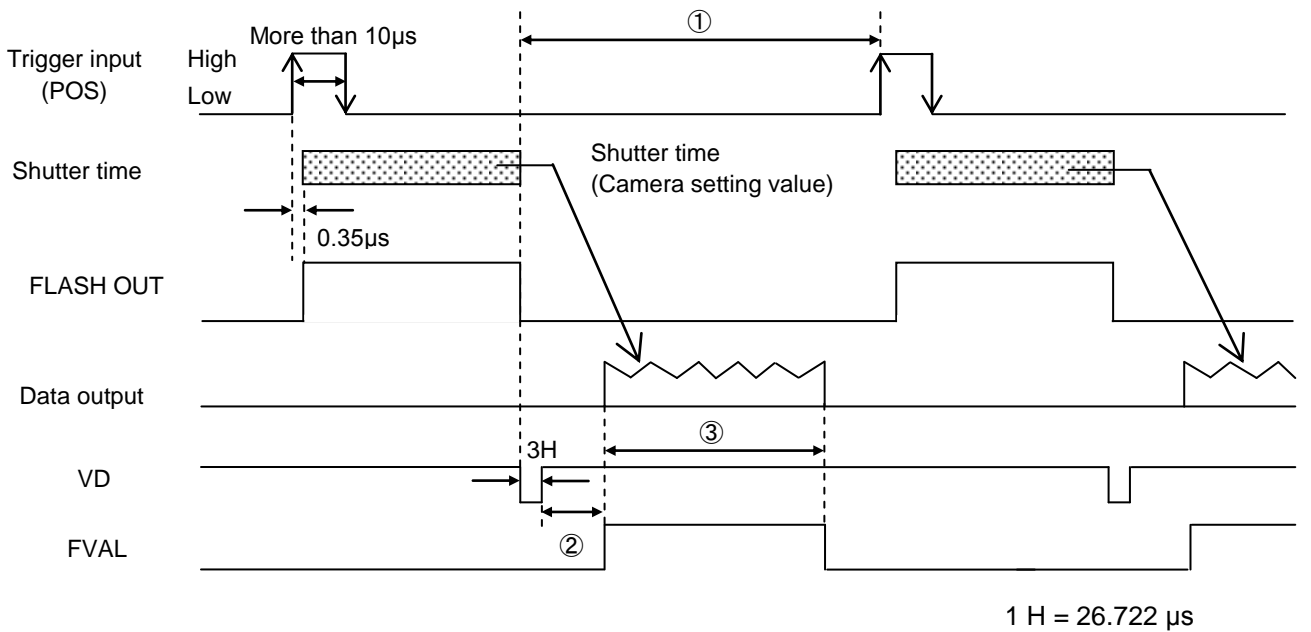
8-2. Fixed shutter mode

When external trigger signal is POSITIVE, after the trigger signal rise, exposure is start. The exposure time is set by the camera electronic shutter speed. The video output is obtained immediately after the end of fixed exposure. The strobe signal start/end can be set to shutter time.

(a) Partial scan OFF



(b) Partial scan ON



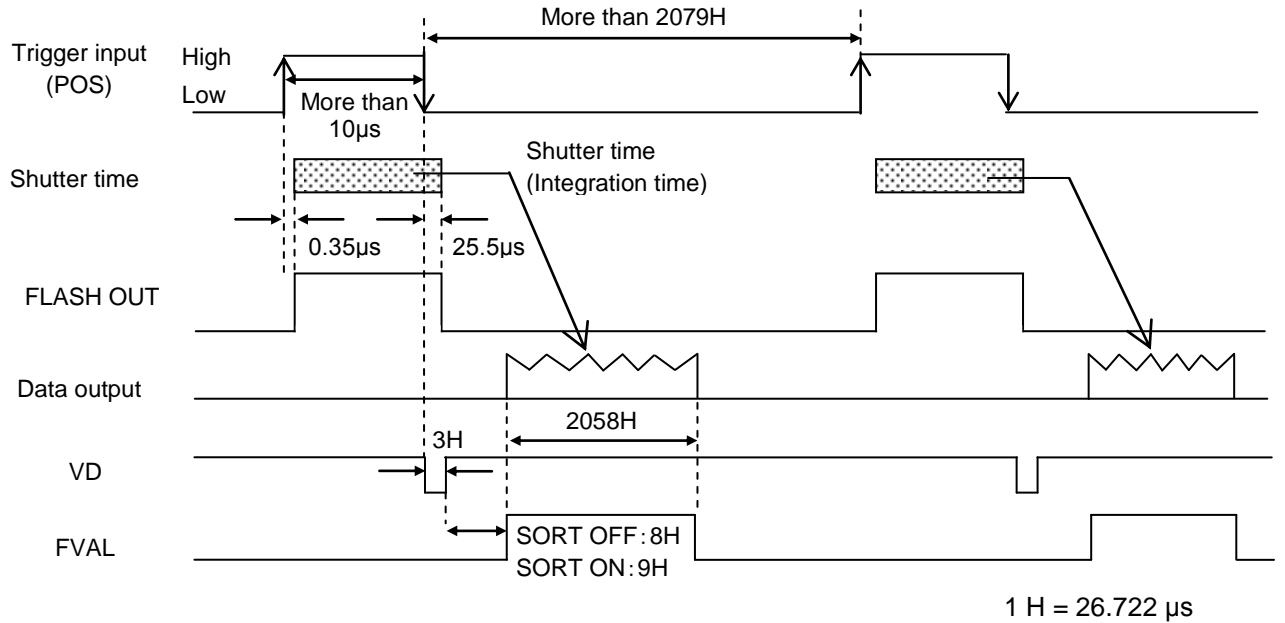
① to ③ are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).

	SORT OFF	SORT ON
①	$( 14 + \text{Width} + ( 2067 - \text{Width}/4 ) ) \text{ H}$ or more	
②	$( 8 + \text{Start}/4 ) \text{ H}$	$( 9 + \text{Start}/4 ) \text{ H}$
③	$( \text{Width} ) \text{ H}$	

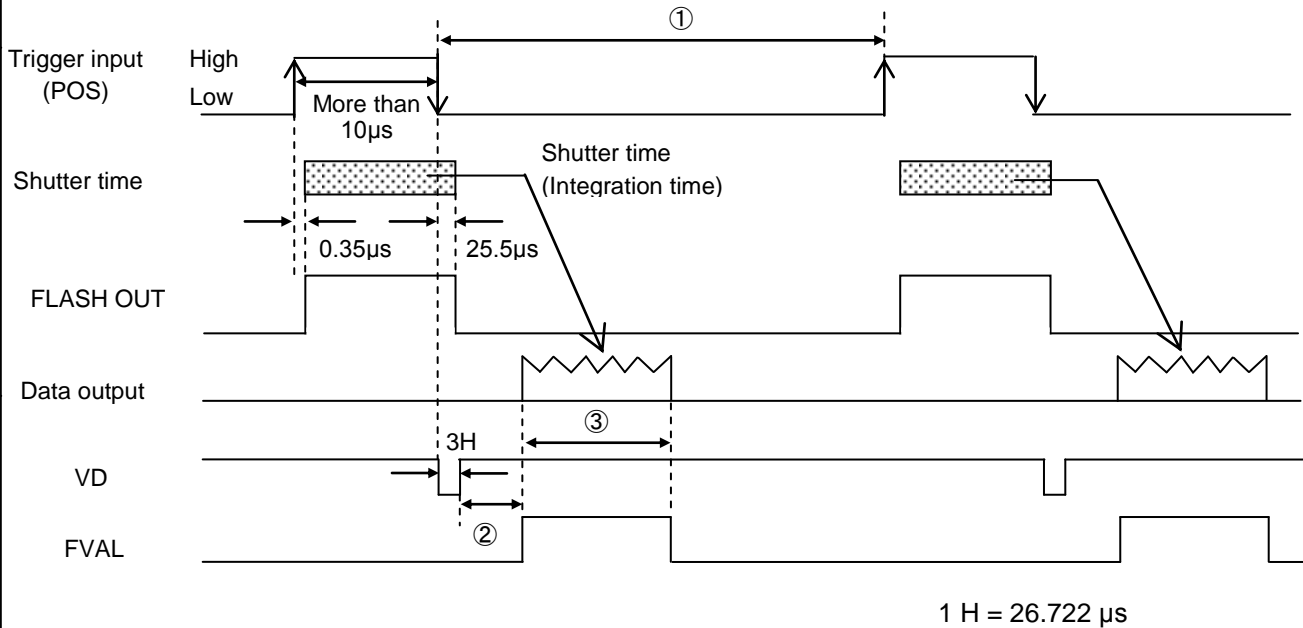
### 8-3. ONE trigger mode

When external trigger signal is POSITIVE, after the trigger signal rise, exposure is start. At the trigger signal falling edge, the internal VD signal is reset and the video data are transmitted. The trigger signal width equals the exposure time.

(a) Partial scan OFF



(b) Partial scan ON



① to ③ are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).

	SORT OFF	SORT ON
①	$( 14 + \text{Width} + ( 2067 - \text{Width}/4 ) ) \text{ H}$ or more	
②	$( 8 + \text{Start}/4 ) \text{ H}$	$( 9 + \text{Start}/4 ) \text{ H}$
③	$( \text{Width} ) \text{ H}$	

8-4. VD reset mode

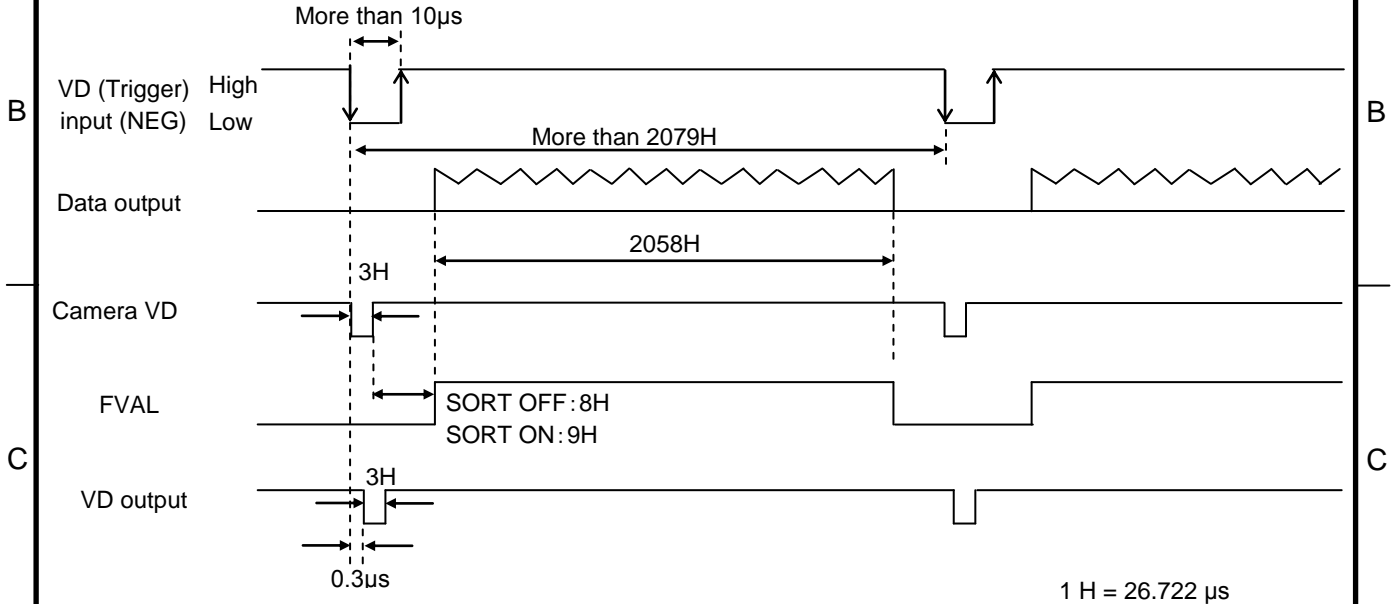
When external VD pulse is inputted, internal VD is reset.

Exposure time is the shutter speed which is set.

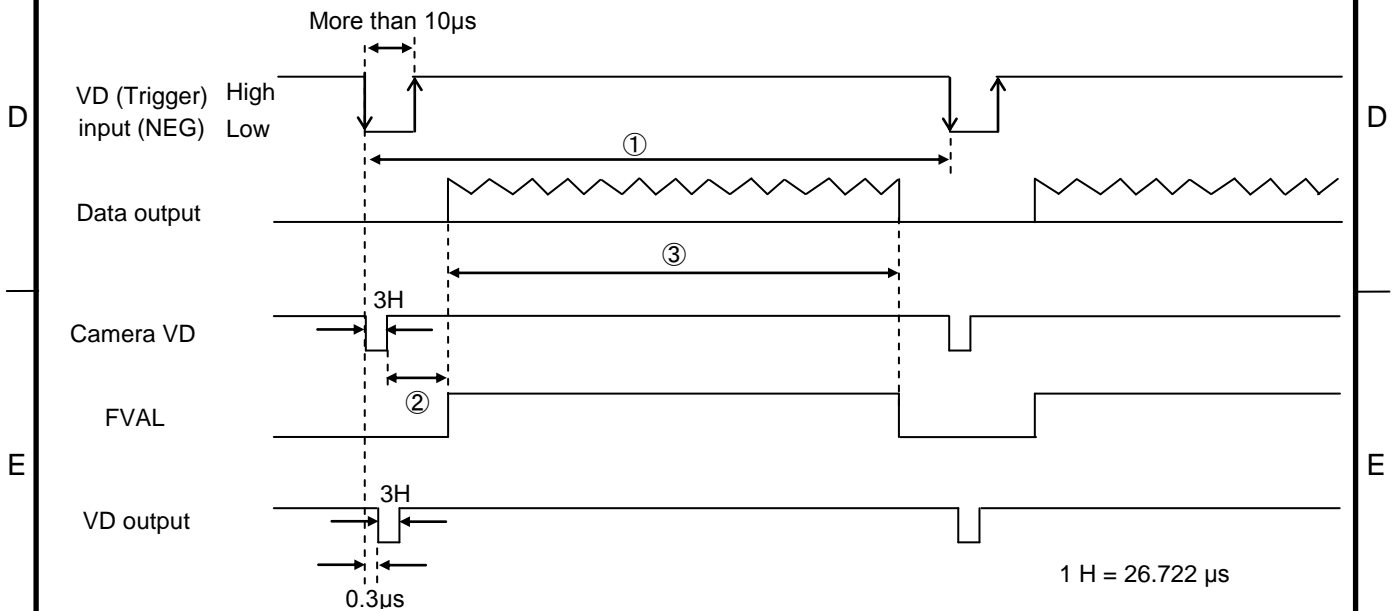
\*Note: If input the external VD of cycle that does not fit the camera operation mode error occurs to the shutter time.

(a) Partial scan OFF

External VD specification: 18.00 Hz or less



(b) Partial scan ON



① to ③ are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).

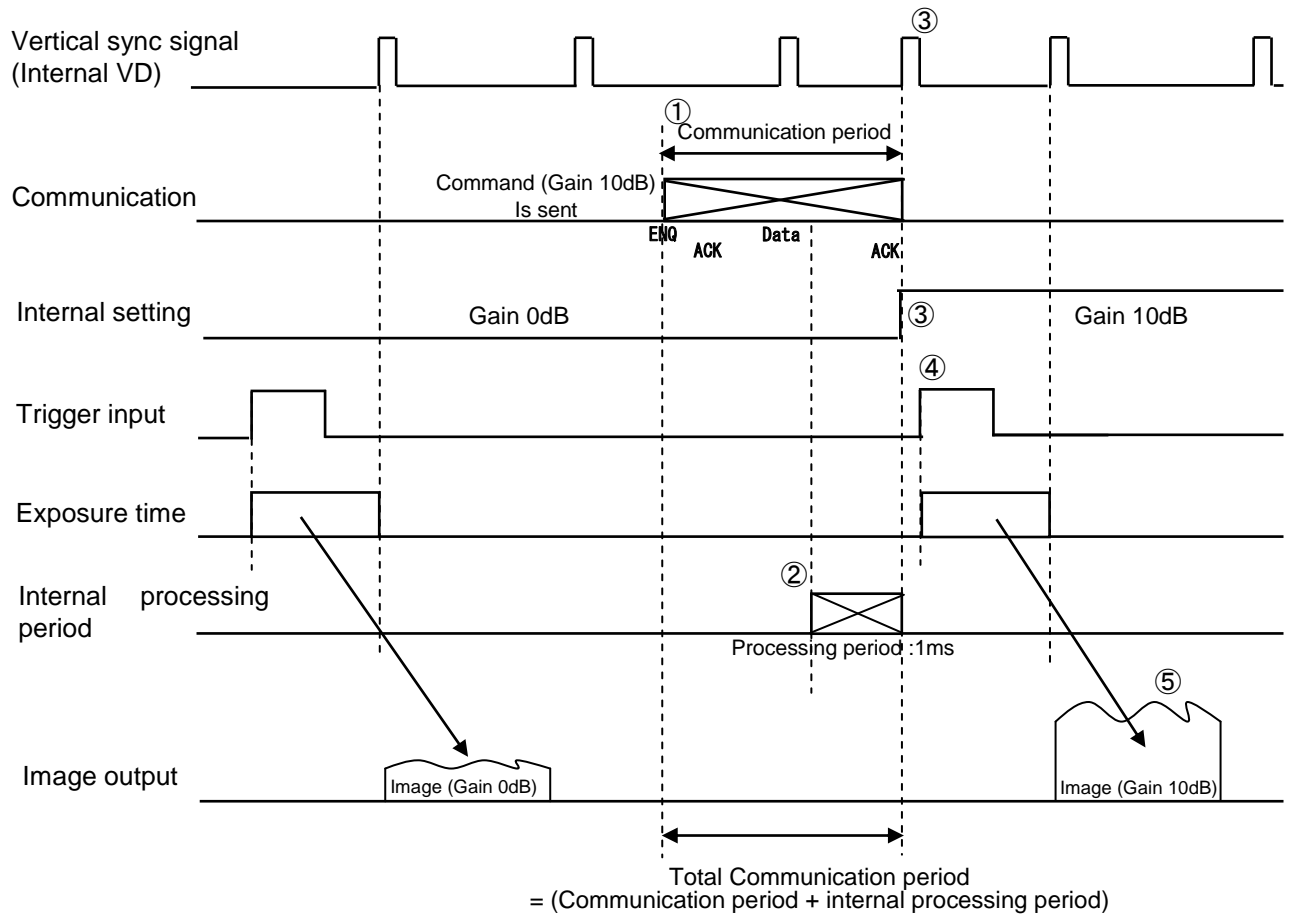
	SORT OFF	SORT ON
①	$( 14 + \text{Width} + ( 2067 - \text{Width}/4 ) ) \text{ H}$ or more	
②	$( 8 + \text{Start}/4 ) \text{ H}$	$( 9 + \text{Start}/4 ) \text{ H}$
③	$( \text{Width} ) \text{ H}$	

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## 9. Communication Timing

Example: In case that transmitting the data for changing Gain (changing to 10dB from 0dB)



① Send a command of gain 10dB.

② After the command is received (last ACK after receiving), and performs the camera internal processing, such as the vertical synchronization signal reset.

③ After the camera internal processing, outputs a vertical sync signal, and change immediately the gain setting to 10dB.

Communication processing period = (communication period + internal processing period)

\* Communication period is depending on communication method.

④ Input the trigger signal, and start exposure.

\* The trigger signal can be input after the total communication period.

⑤ Output the image which is Gain 10dB.

<Use conditions>

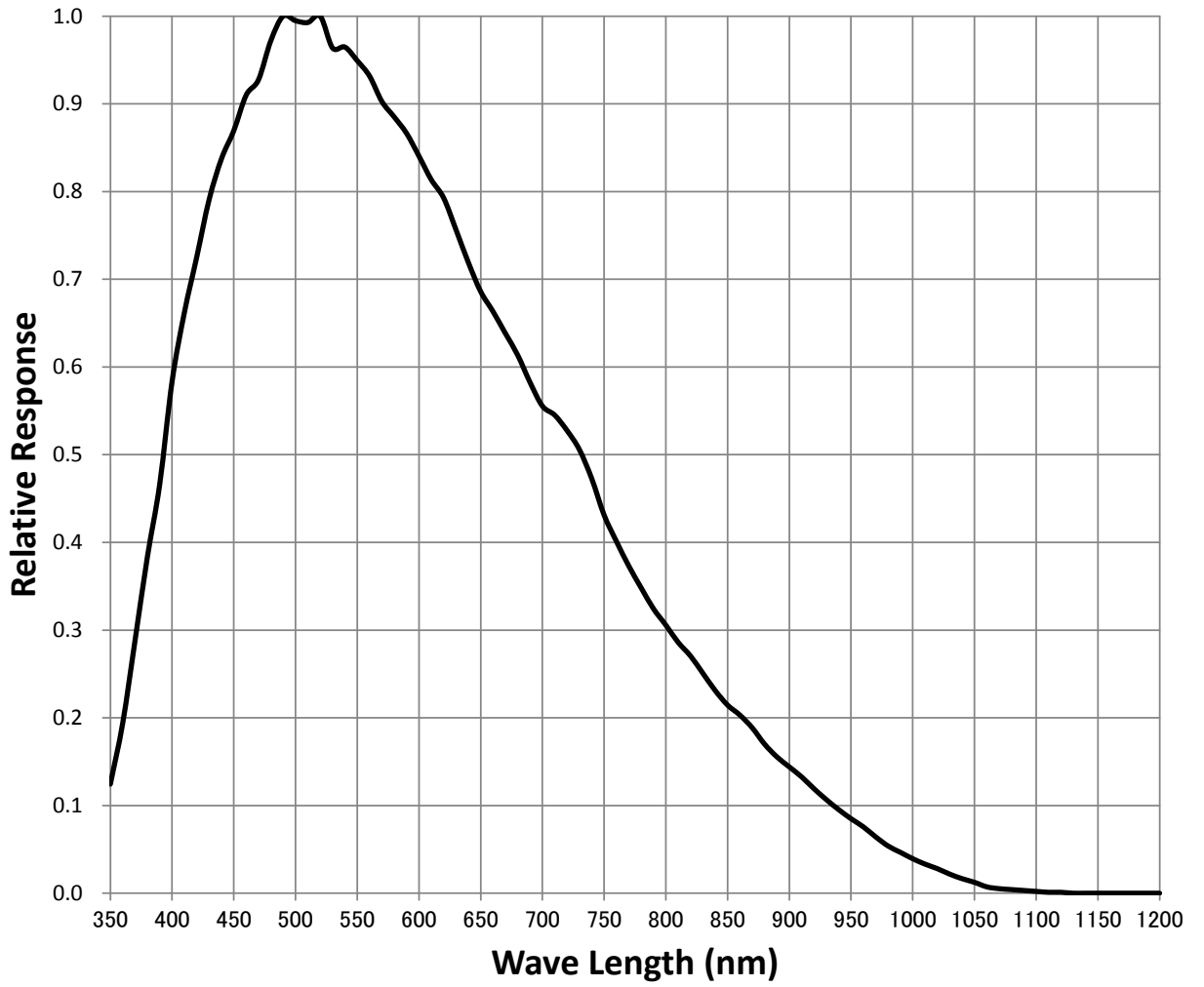
a) Camera operation mode: Fixed shutter mode

b) Communication control items: Gain, Partial scan (START, WIDTH), Shutter speed and Trigger source only

\* Communication control is not performed during the exposure period or image transfer period.



10. Spectral response



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11. External view

A

B

C

D

E

F

A

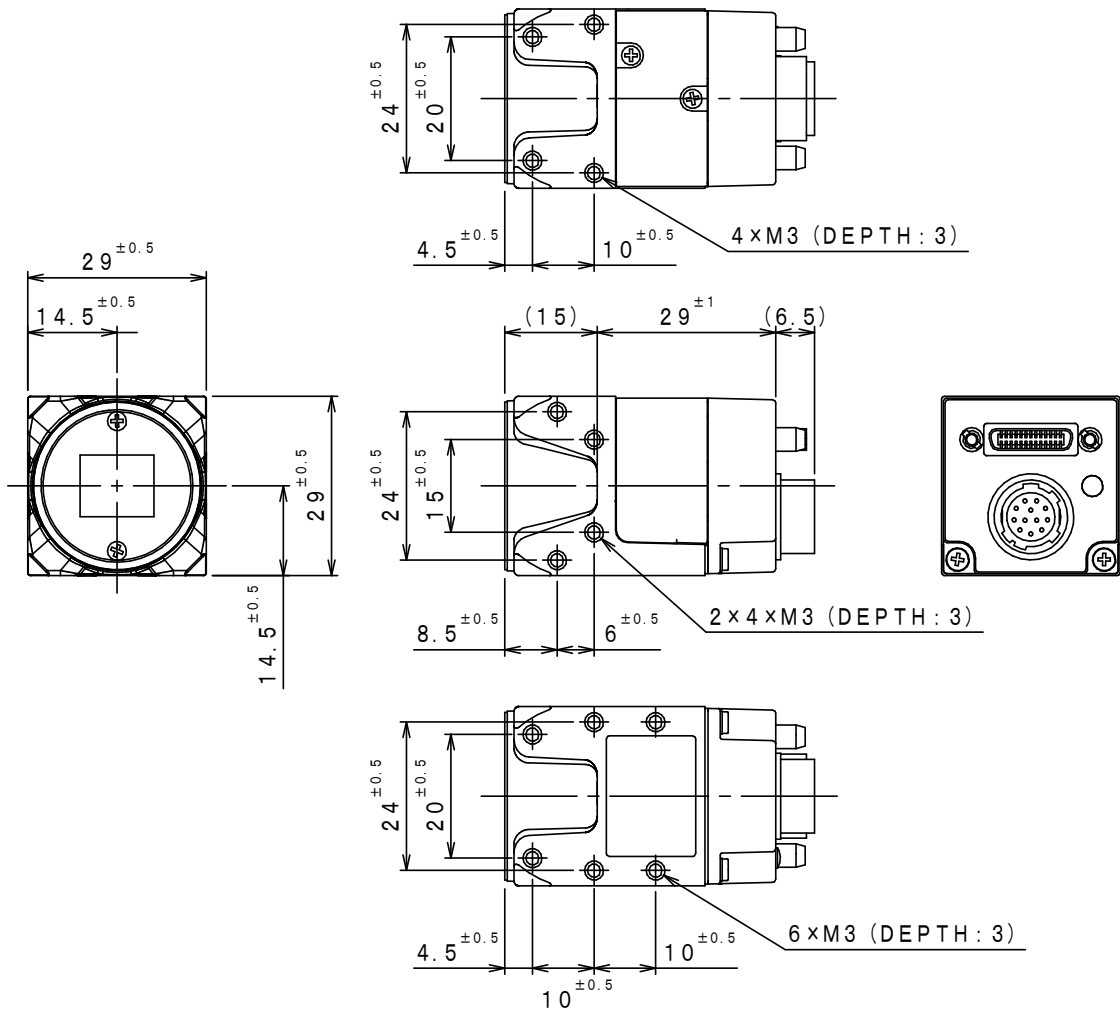
B

C

D

E

F



**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.

