

Progressive scan CCD color camera HV-F203SCL Specifications

RoHS Compliant
Directive 2002/95/EC

1. General

The HV-F203SCL is an UXGA high precision 3CCD progressive scan color camera, which has a digital processing, a C mount prism, three 1/1.8-inch 2,000,000 pixels square CCDs.

Our original digital image signal processing technology performs the high picture quality signal processing and the picture compensating functions, beyond the capability of the other conventional analog cameras.

More ever, high frame rate 30 FPS(s) can be transmitted by miniCameraLink interface, which is of digital camera standards for FA. The two connector arrangement is considered so that the collision of cable does not occur at the time of Medium Configuration connection which enrich the pixel gradation expression.

2. Outstanding features

(1) High resolution and color fidelity

The 1/1.8-inch 2,000,000 pixels square lattice progressive scan CCD and the dichroic prism for RGB color achieve a high resolution of UXGA (1600(H) x 1200(V)) picture and good color reproduction.

(2) Small-sized camera

The new designed camera has small SDR connector for digital output. Therefore, the camera has the realization of small-sized shape of 55 (W) x 55 (H) x 89 (D) mm.

(3) mini CameraLink interface

CameraLink Version 1.13 support

It is based on the industrial camera interface standard of AIA (Automated Image Association) leadership. It is advantageous to the field, where high frame rate is needed without losing camera performance, since the transmission speed of pixel clock can be maintained by full screen output.

mini CameraLink

The SDR connector called mini CameraLink is adopted and two connectors are equipped in a small case. Additionally, when using with L type connection, it is arranged as cable collision does not occur.

Medium Configuration connection support

It supports Medium Configuration connection which enables the rich gradation expression of each color of 10 bit or 12 bit.

-	Nov.14.2017	(first edition)			
SYMBOL	DATE	DESCRIPTION		(DRAWN)	DESIGNED

MODEL HV-F203SCL				TOLERANCE	Prod. Code - Order No.	
DESIGNED	DATE	APPROVED	DATE	UNIT	TITLE HV-F203SCL Specifications	REV. 1
CHECKED	DATE	STORED	DATE			
Hitachi Kokusai Electric						

(4) C mount lens adapter

The de facto industry standard C mount lens adapter allows choosing from a various type of lenses and optical systems.

(5) Digital processing for various picture quality enhancements

- Independent six colors masking is the Hitachi innovation for optimizing color balance. The saturation and the hue of 6 colors (Red, blue, green, cyan, magenta and yellow) are adjusted independently to deliver the best color in image capture, microscope and other applications.
- It is equipped with the in out gradation control function using LUT. Other than normal gamma 0.45 conversion, the function can set the conversion of in out gradation using look up table (LUT) as a user option.

(6) Auto shading correction (ASC)

Color shading due to the aberration of C mount lens is automatically compensated (reduced).

(7) Versatile CCD drive functions

- Video frame capture on demand using external trigger signal.
- Long integration mode.
- Variable shutter mode
- Auto electronic shutter (AES) mode for stabilized video level.

(8) Versatile imaging functions

- Four application files.

User settings provided for sharpness (detail), masking etc.

- Scene color temperature is detected in dynamic for automatic white balance adjustment.

By varying the detection area in a scene, the whole white balance can be controlled in only the area. Thus, even if a light source of a different color temperature enters the scene (e.g., situation often occurs in a retail showroom suddenly exposed to outdoor lighting when the entrance door opens), white balance is not severely disturbed.

- Auto exposure (ALC : auto level control)

It can respond the changes in extremely high light by the digital measurement and AGC (Automatic gain control), AES control using micro computer. In addition, AUTO EXPOSURE (ALC) setting level and the peak/average of the AUTO EXPOSURE (ALC) characteristics can be set through menu screen.

- Gain control

AGC(Automatic gain control) and manual gain control are available to select.

- Master black, R/B black, and R/B gain are variable.

(9) LED indicators on rear frame

On and Off status of power supply is confirmable.

3. Specifications

A	(1) Imaging device (sensor type)	1/1.8-inch progressive scan interline CCD (x 3 sensors)
	Effective pixels (Active area)	1600 (H) x 1200 (V) (x 3 sensors for RGB) : Resolution
	Pixel size	4.4 μm square lattice
	- scanning area (Pixel area)	7.04mm (H) x 5.28mm (V), Diagonal 8.80mm (1/1.8 inch)
	- Readout type, Transfer type	progressive scan, Interline transfer
	(2) scanning mode	full pixel sequential scan
	(3) scanning frequency	Horizontal : 37.5kHz / Vertical : 30.00Hz / Pixel : 72MHz
	(4) Optical system	1/1.8-inch F2.8 prism with IR cut filter
B	(5) Lens mount	C mount Mount surface projection less than 4.0mm

(Lens selection guideline)

Use the lens less than 4.0mm as the projection item from the lens flange surface.

To obtain a good picture image by high resolution and few chromatic aberration, it is necessary to choose an appropriate high resolution 3CCD type lens.

When using lens other than 1/1.8 type, there may be vignetting or insufficiency of light around the image or occurrence of flare in the image, in this case combinational lens selection is necessary.

C	(6) Flange focal distance	17.526 mm (Air conversion)
	(7) Sensitivity	2000 lx, F8, light source halogen lamp temp.: 3200K Shutter : 1/30s, Gain 0dB
	(8) Gamma	0.45 / 1.0 / LUT (Look Up Table : user customizable)
	(9) Gain	Manual : 0 to 12 dB / AGC : 0 to 12 dB (with limit setting)
	(10) White balance	Manual / One-push Auto / Continuance Auto
D	(11) Video output	CaemraLink Version 1.13 standard Base configuration (only D.OUT 1) Medium configuration (using D.OUT 1 with D.OUT 2) Control : Original
	(12) Video output format	Base configuration 24bit (R:8bit, G:8bit, B:8bit) Table is described later.

(13) Quantization level information

Video signal level	Quantization level of Digital video signal
Maximum data level	255 (8bit), 1023 (10bit), 4095 (12bit)
Video level 100% (White)	255 (8bit), 1023 (10bit), 4095 (12bit)
Video level 0% (Black)	0
Minimum signal level	0

	1	2	3	4
A	(14) Electric shutter speed		OFF / Auto (AES) / Manual (VARIABLE)	
	Variable shutter mode		Exposure time : approx. 1/100,000 to 1/30 second	
	AES mode		Exposure time : approx. 1/100,000 to 1/30(shutter OFF) second	
	Long time integration mode		Exposure time : approx. 1/30 to 10 seconds in 1 frame steps	
	(15) Sync system		Internal	
	(16) Frame on demand mode			
	Input mode		(A) Fixed shutter mode : adjustable for polarity and delay (B) ONE trigger mode : adjustable for polarity and delay	
B	Trigger input		CameraLink (CC1) or DCIN/SYNC connector	
	Input level		5Vp-p ± 0.5V	
	Output		strobe signal	
	Synchronous output		DCIN/SYNC connector	
	Output level		5Vp-p	
	(17) Registration		Full screen 0.05% (not including lens response)	
	(18) Vertical contour correction		2H	
C	(19) Sharpness (DTL)		Level, WIDTH	
	(20) Color masking		OFF / ON (6 color independent masking)	
	(21) Paint black		Adjustable	
	(22) Black level		Adjustable	
	(23) Knee		Adjustable (Knee point and Knee slope)	
	(24) Power supply		DC+12V ± 1V (input from DC IN / SYNC connector)	
	(25) Current consumption		DC+12V Approx.910mA(Approx.10.9W):All pixel read out	
D	(26) Ambient temperature		(without dew condensation)	
	Performance		0 to +40°C (+32 to +104 F), less than 90 % RH	
	Operation		-10 to +40°C (+14 to 104 F), less than 90 % RH	
	Storage		-20 to +60°C (-4 to 140 F), less than 70 % RH	
	(27) External dimensions		55(W) x 55(H) x 89(D) mm (not including protrusions)	
	(28) Mass		Approx.370g (without lens)	
E				
F				

(29) Remote control

(a) Signal system

Control system	Start-stop synchronization system
Transmission rate	115200 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. Variable shutter	10 to 1/100,000 second
2. Trigger Mode	Fixed shutter, One trigger
3. Gain	
4. AUTO EXPOSURE	
5. White balance	
6. Gamma	
7. 6 vector independent masking	
8. Paint black	
9. Sharpness	
10. Brightness	
11. 24bit / 30bit / 36bit	Factory setting: 24bit
12. Trigger pulse polarity	Factory setting: POS
13. Trigger input	CameraLink (CC1) or DCIN/SYNC connector Factory setting: CC1
14. Output signal	OFF, FLASH OUT and VD OUT Factory setting: OFF
15. Application files	

4. Composition

- (1) Camera
- (2) Lens mount sheet
- (3) DCIN/SYNC connector (HR10A-10P-12S)
- (4) Installation guide

5. Optional accessories

- (1) Junction box JU-F30
- (2) 12pin plug HR10A-10P-12S(01)
- (3) Camera cable

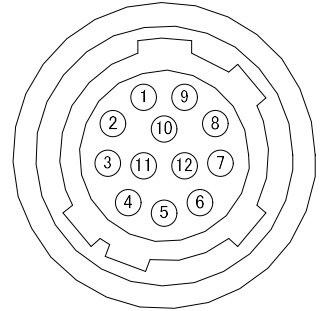
	Molded type	Shield type
2 m	C-201KSM	C-201KSS
5 m	C-501KSM	C-501KSS
10 m	C-102KSM	C-102KSS

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

6. Specification of Digital output connector

(1) DCIN connector

PIN NO.	Signal	PIN NO.	Signal
1	GND (+12V)	7	TRIG / VD IN
2	+12V	8	GND
3	GND	9	N.C.
4	N.C.	10	FLASH / VD OUT
5	GND	11	N.C.
6	N.C.	12	GND



Connector (camera side) : SAMWOO SNH-10-12 (RPCB) or equivalent
 Plug (matching cable plug) : Hirose HR10A-10P-12S (01) or equivalent

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.

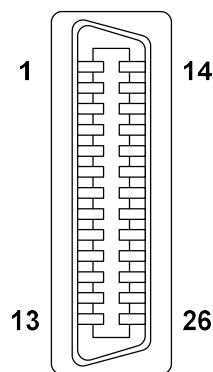
Note: Please do not input any signal to N.C. pin because machine may break down.

(2) DIGITAL OUT connector

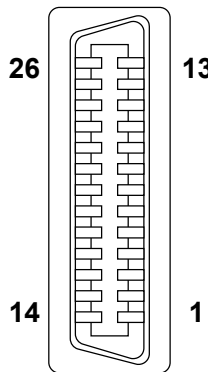
(a) Interrelation between number of DATA bits and number of used connector

	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



D.OUT1



D.OUT2

(b) Signal connection to DIGITAL OUT connector

Connector 1 (D.OUT1: 24bit / 30bit / 36bit)

Pin No.	Signal	Pin No.	Signal
1	N.U.(INNER_SHIELD/POW_IN)	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 (-) [CC1 (-)]	22	TRIG (+) [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	N.U.(INNER_SHIELD/POW_IN)

Connector 2 (D.OUT2: 30bit / 36bit)

Pin No.	Signal	Pin No.	Signal
1	N.U.(INNER_SHIELD/POW_IN)	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	N.U.(INNER_SHIELD/POW_IN)

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 PC
- RX: Transmit data from PC 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.Video output format (Typical example)

Data length	Horizontal Pixels	Vertical Pixels	FRAME RATE	support standard
R:8bit, G:8bit, B:8bit	1600	1200	Approximately 30.00FPS	Base configuration (using D.OUT1 only)
R:10bit, G:10bit, B:10bit	1600	1200	Approximately 30.00FPS	Medium configuration
R:12bit, G:12bit, B:12bit	1600	1200	Approximately 30.00FPS	Medium configuration

8. Timing chart

8-1. LVDS SERIAL DATA

(a) Base configuration 24bit

D.OUT 1

CLKX $T_{CLK} 13.89ns (72MHz)$

Previous Cycle Next Cycle

X3 R7-1 R6-1 N.U. B7 B6 G7 G6 R7 R6 1.41V 1.075V

X2 B3-1 B2-1 N.U. FVAL LVAL B5 B4 B3 B2

X1 G2-1 G1-1 B1 B0 G5 G4 G3 G2 G1

X0 R1-1 R0-1 G0 R5 R4 R3 R2 R1 R0

N.U.: Not used

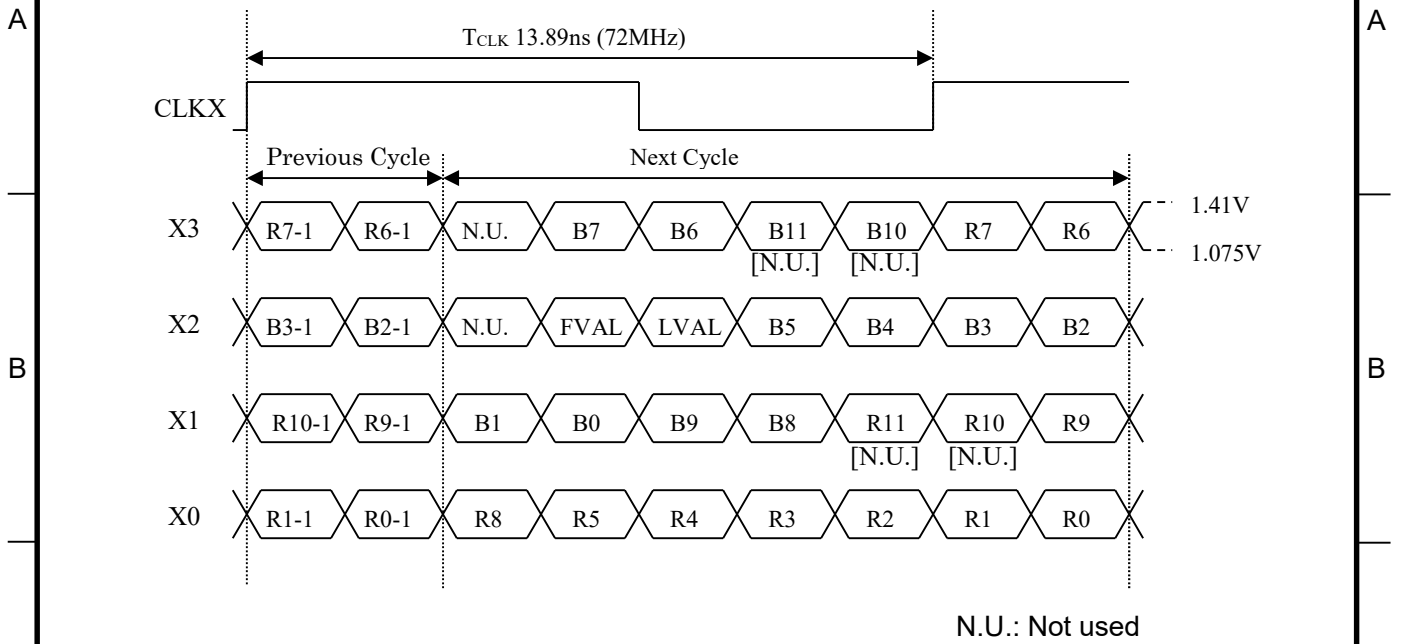
DWG. No. **E400624514**

SHEET 9 / 17

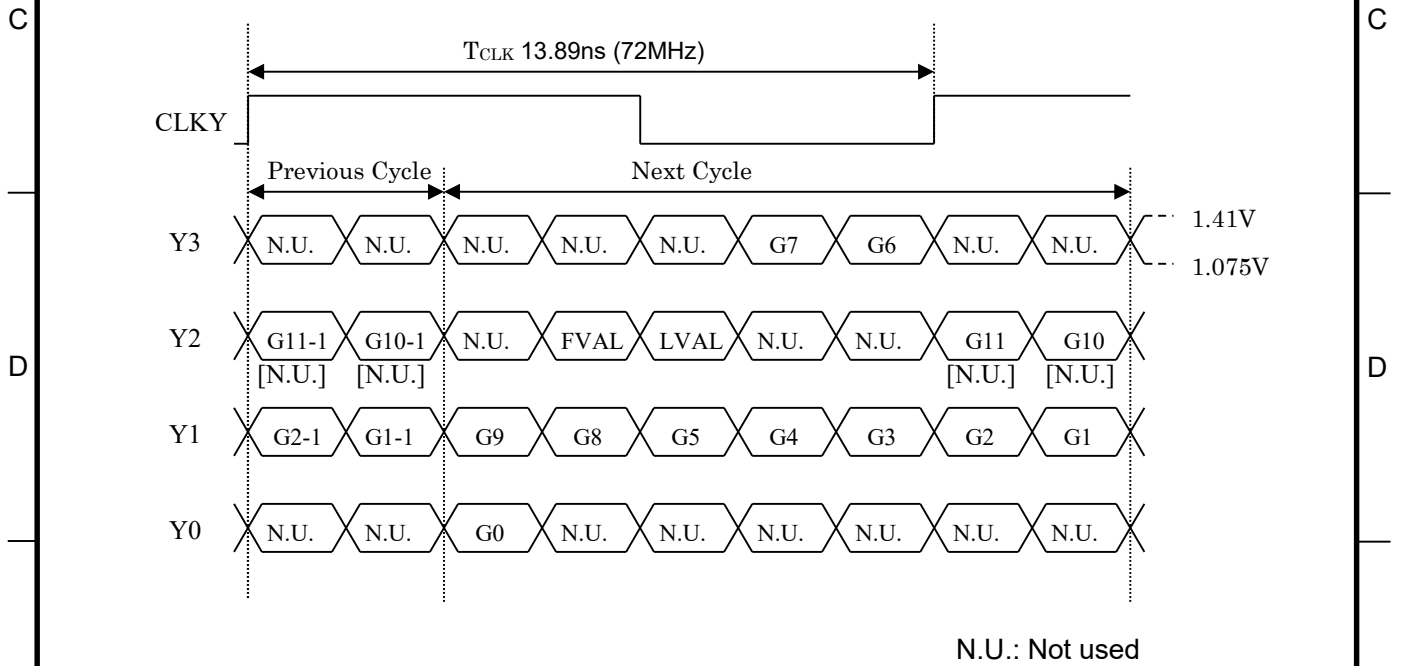
DF022-4PE-SI 4

(b) Medium configuration 36bit / [30bit]

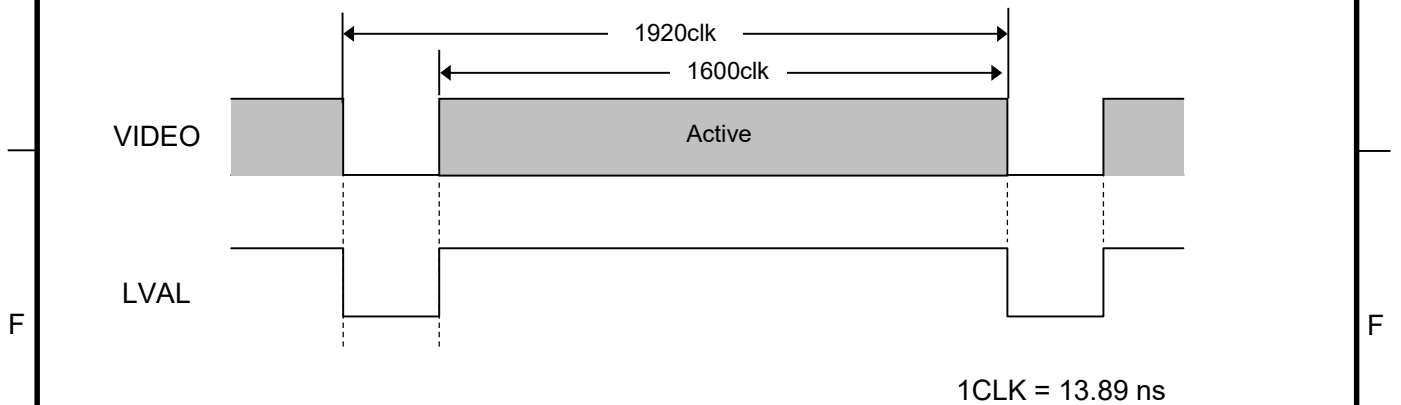
D.OUT 1



D.OUT 2

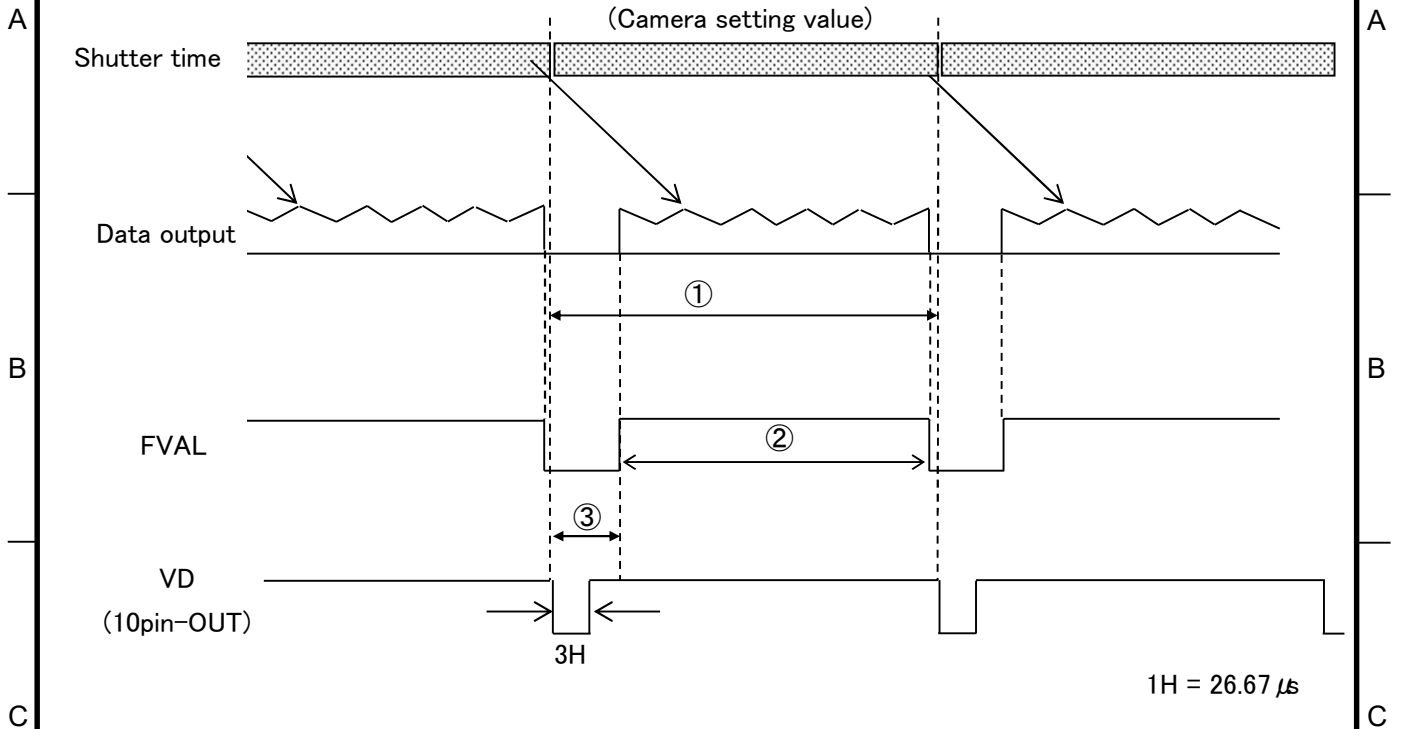


8-2. HORIZONTAL DATA TIMING



8-3. VERTICAL DATA TIMING

(a) Trigger mode : OFF



1. Shutter time \leq ①

	Partial scan OFF		Partial scan ON (Note:8-3.(a).1)	
	BinningVertical OFF	BinningVertical ON	BinningVertical OFF	BinningVertical ON
①	1250H	625H	$(2+\lceil(12+\text{OFFSET})/12\rceil +29+\text{HEIGHT} +\lceil(1207-\text{HEIGHT} -\text{OFFSET})/12\rceil+1) \text{ H}$	$(2+\lceil(8+\text{OFFSET})/12\rceil +\lceil(38+\text{HEIGHT})/2\rceil +\lceil(1202-\text{HEIGHT} -\text{OFFSET})/12\rceil+1) \text{ H}$
②	1200H	600H	$(\text{HEIGHT}) \text{ H}$	$\lceil(\text{HEIGHT}/2)\rceil \text{ H}$
③	42.2H	26.2H	$(2+\lceil(12+\text{OFFSET})/12\rceil+29) \text{ H}$	$(2+\lceil(8+\text{OFFSET})/12\rceil+17) \text{ H}$

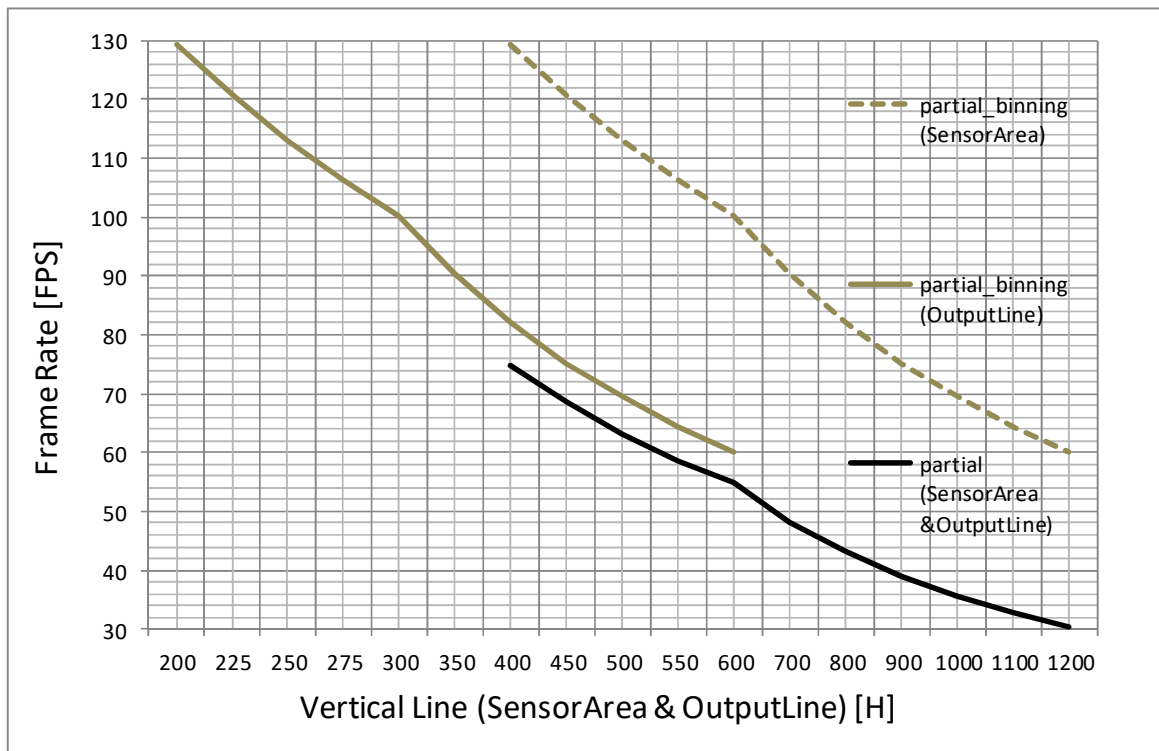
2. Shutter time $>$ The value of ① indicated in the above table for each condition

	Partial scan OFF		Partial scan ON (Note:8-3.(a).1)	
	BinningVertical OFF	BinningVertical ON	BinningVertical OFF	BinningVertical ON
①	Shutter time	Shutter time	Shutter time	Shutter time
②	1200H	600H	$(\text{HEIGHT}) \text{ H}$	$\lceil(\text{HEIGHT}/2)\rceil \text{ H}$
③	42.2H	26.2H	$(2+\lceil(12+\text{OFFSET})/12\rceil+29) \text{ H}$	$(2+\lceil(8+\text{OFFSET})/12\rceil+17) \text{ H}$

(Note 8-3.(a).1) $\lceil x \rceil$ is Ceiling function.

The following graph is the relationship of the partial scan and "capture width", "frame rate".

A



B

C

Equation below is the formula for the "total number of lines by capture width (the decimal point is truncated)" and the "frame rate".

(1) Equation of total number of line for partial scan mode

$$\text{The total number of line} = 33 + \lfloor \text{OFFSET} / 12 \rfloor + \text{HEIGHT} + \lfloor (1207 - \text{HEIGHT} - \text{OFFSET}) / 12 \rfloor$$

(Note 8-3.(a).2)

D

(2) Equation of total number of line for partial scan and binning mode

$$\text{The total number of line} = 22 + \lfloor \text{OFFSET} / 12 \rfloor + \lfloor \text{HEIGHT} / 2 \rfloor + \lfloor (1202 - \text{HEIGHT} - \text{OFFSET}) / 12 \rfloor$$

(Note 8-3.(a).2)

$$\text{Frame rate} = (72000000 / 1920) / \text{The total number of line}$$

E

*Notes on partial scan use
(Note 8-3.(a).2) The value of OFFSET + HEIGHT, please use 1201 or less.

F

(b) Fixed shutter mode

When external trigger signal is POSITIVE (high active), 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.

A

B

C

D

E

F

A

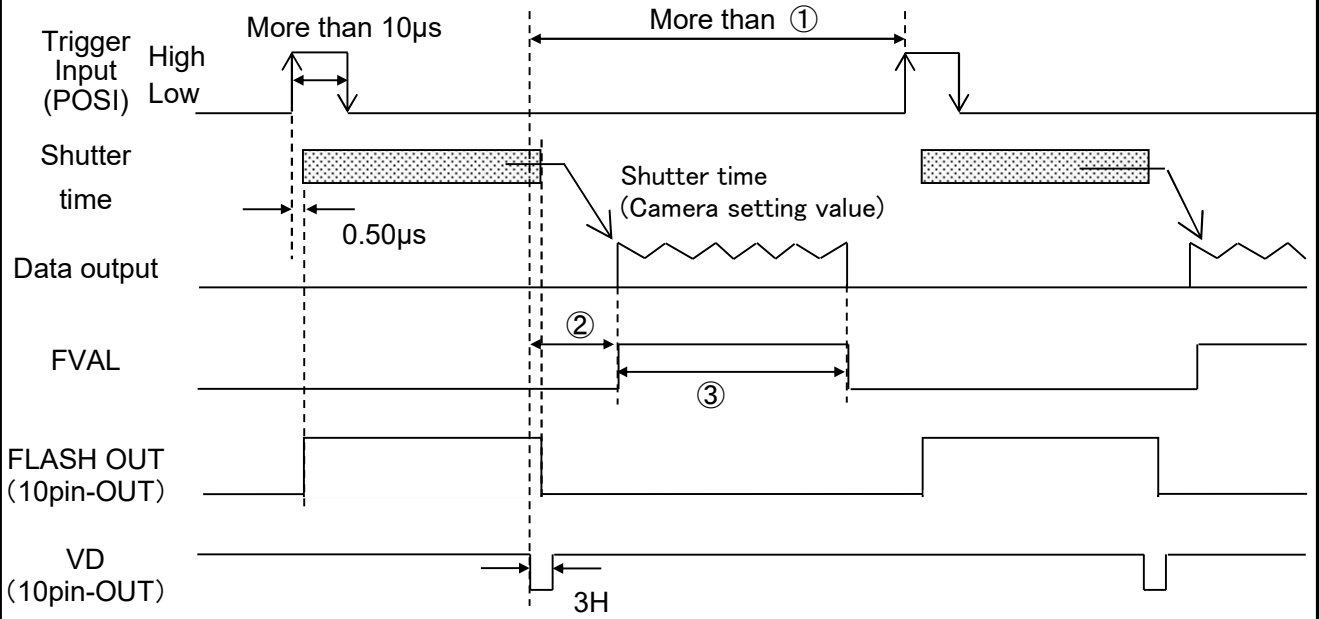
B

C

D

E

F



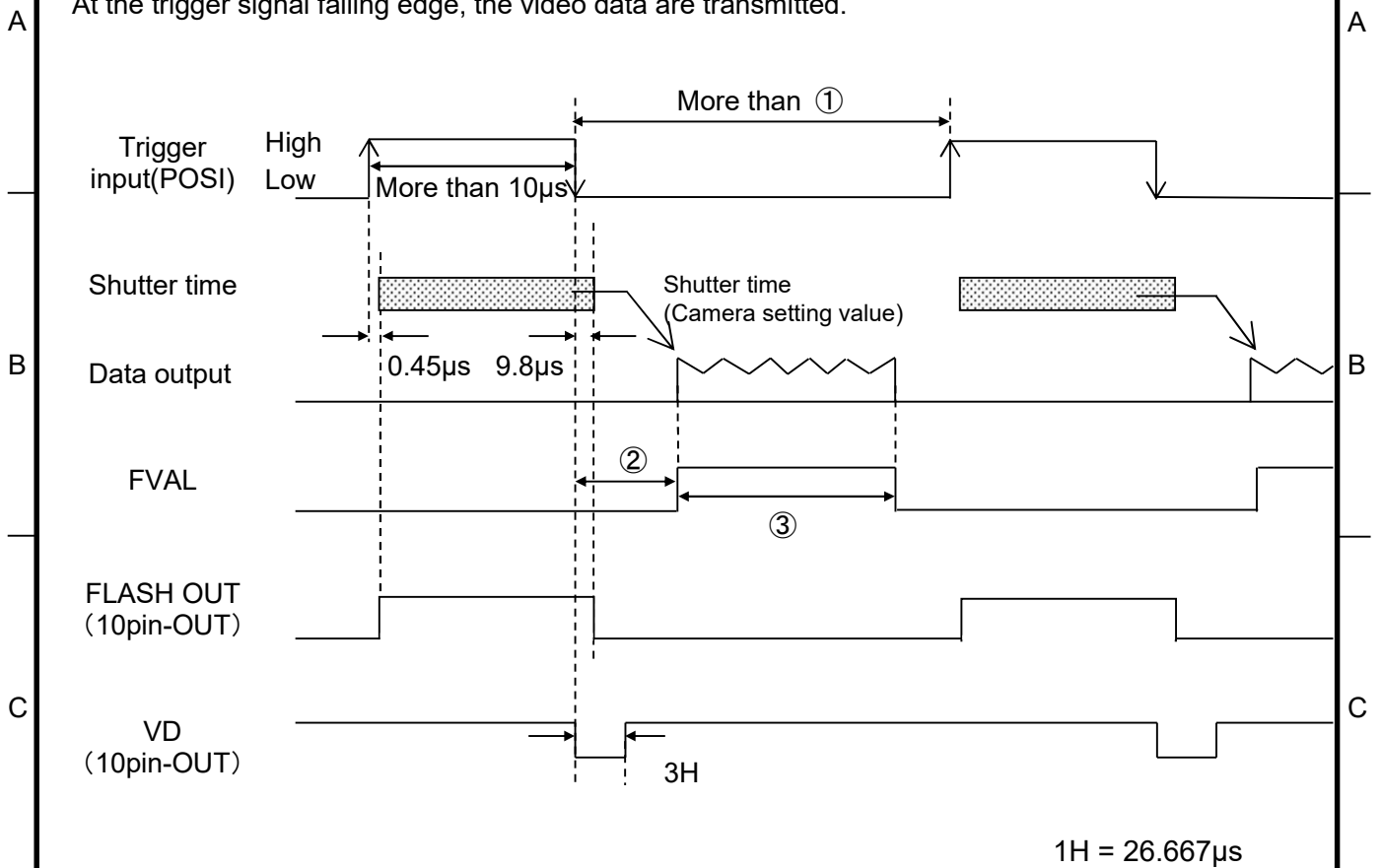
1H = 26.667µs

	Partial scan OFF		Partial scan ON (Note:8-3.(b).1)	
	BinningVertical OFF	BinningVertical ON	BinningVertical OFF	BinningVertical ON
①	1250H	625H	$(2 + \lceil (12 + \text{OFFSET}) / 12 \rceil + 29 + \text{HEIGHT} + \lceil (1207 - \text{HEIGHT} - \text{OFFSET}) / 12 \rceil + 1) \text{ H}$	$(2 + \lceil (8 + \text{OFFSET}) / 12 \rceil + \lceil (38 + \text{HEIGHT}) / 2 \rceil + \lceil (1202 - \text{HEIGHT} - \text{OFFSET}) / 12 \rceil + 1) \text{ H}$
②	42.2H	26.2H	$(2 + \lceil (12 + \text{OFFSET}) / 12 \rceil + 29) \text{ H}$	$(2 + \lceil (8 + \text{OFFSET}) / 12 \rceil + 17) \text{ H}$
③	1200H	600H	$(\text{HEIGHT}) \text{ H}$	$\lceil (\text{HEIGHT} / 2) \rceil \text{ H}$

(Note 8-3.(b).1) [x] is Ceiling function.

(c) ONE trigger mode

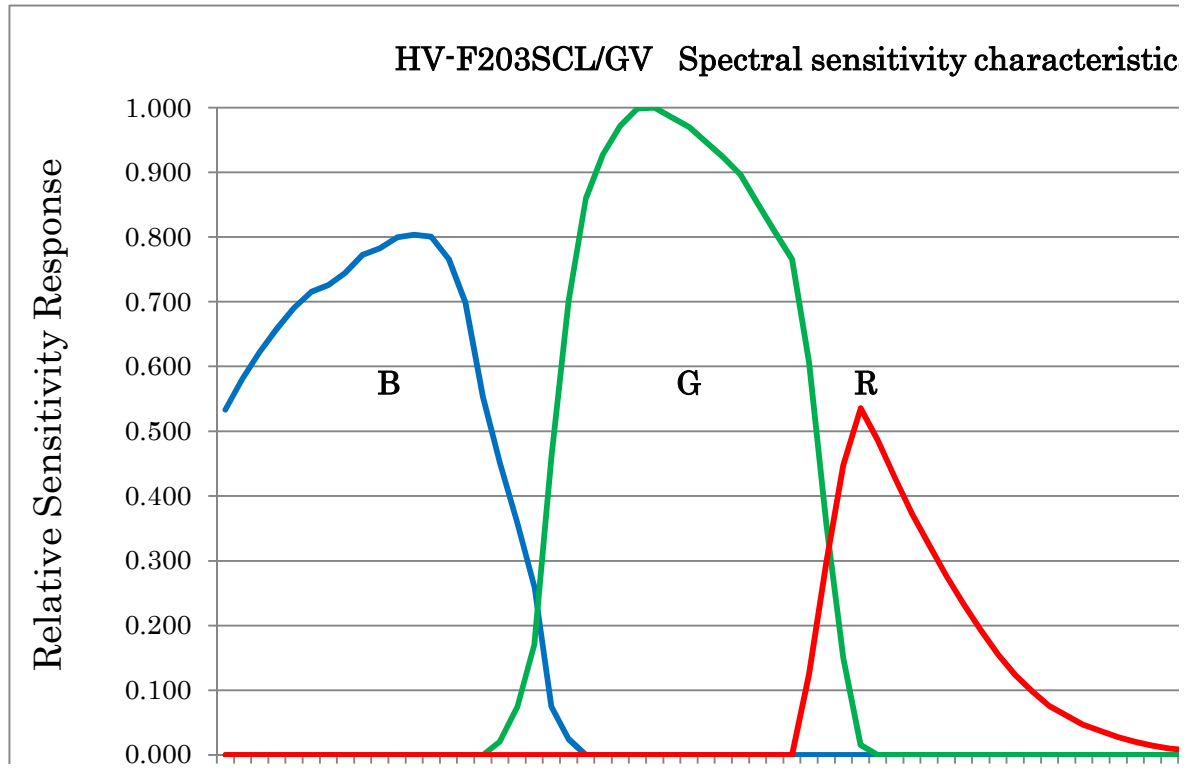
When external trigger signal is POSITIVE (high active), after the trigger signal rise, exposure is start.
At the trigger signal falling edge, the video data are transmitted.



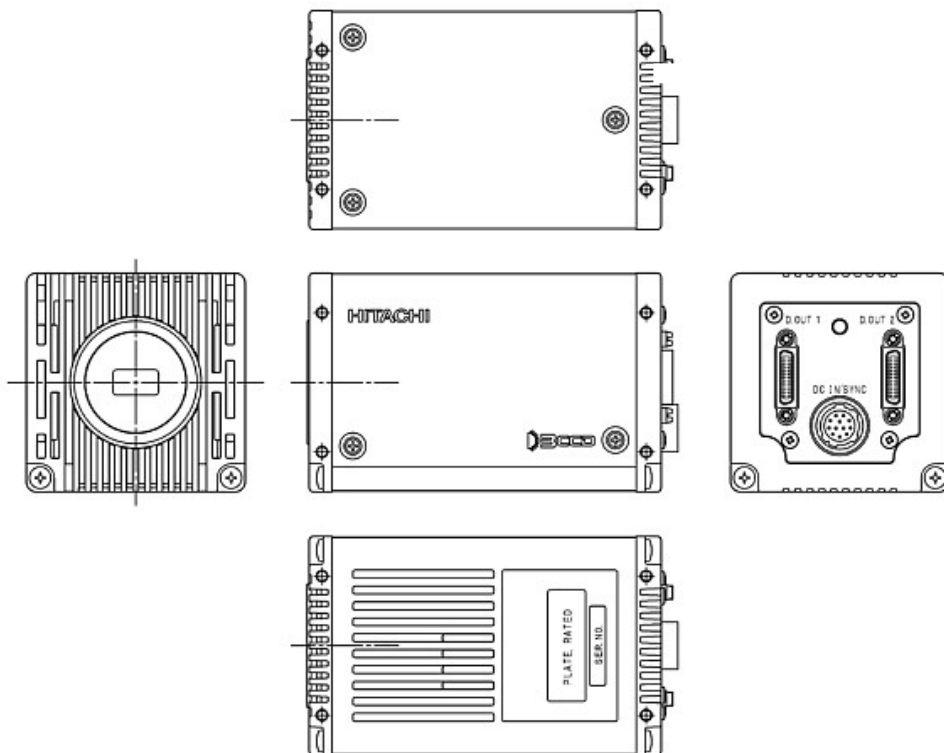
	Partial scan OFF		Partial scan ON (Note:8-3.(c).1)	
	BinningVertical OFF	BinningVertical ON	BinningVertical OFF	BinningVertical ON
①	1250H	625H	$(2 + \lceil \frac{12 + \text{OFFSET}}{12} \rceil + 29 + \text{HEIGHT} + \lceil \frac{1207 - \text{HEIGHT} - \text{OFFSET}}{12} \rceil + 1) H$	$(2 + \lceil \frac{8 + \text{OFFSET}}{12} \rceil + \lceil \frac{38 + \text{HEIGHT}}{2} \rceil + \lceil \frac{1202 - \text{HEIGHT} - \text{OFFSET}}{12} \rceil + 1) H$
②	42.2H	26.2H	$(2 + \lceil \frac{12 + \text{OFFSET}}{12} \rceil + 29) H$	$(2 + \lceil \frac{8 + \text{OFFSET}}{12} \rceil + 17) H$
③	1200H	600H	$(\text{HEIGHT}) H$	$\lceil \frac{\text{HEIGHT}}{2} \rceil H$

(Note 8-3.(c).1) [x] is Ceiling function.

9. Spectral sensitivity characteristics



10. External view



A

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

A

B

Warranty and service:

- 1) The guarantee period is two 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.

B

C

C

D

D

E

E

F

F

