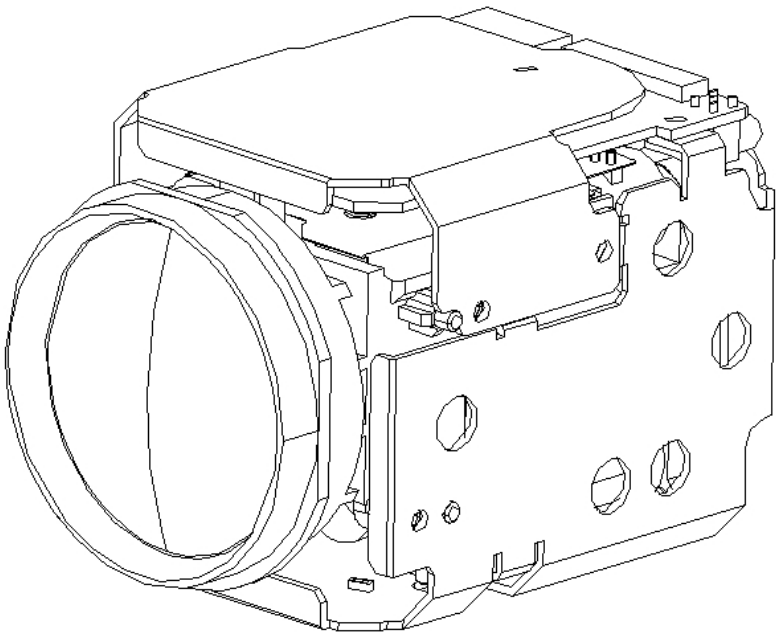
skoopia G21Z10S

Global Shutter Block Camera

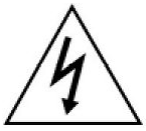
Full HD 10x optical zoom

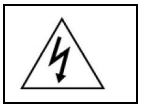
LVDS, SDI, CVBS



Revision History

Version	Date	Description	Remarks
1.00	April 1, 2023	First Release	
1.10	May 21, 2023	Added Timing of trigger / strobe	

	**CAUTION** RISK OF ELECTRIC SHOCK DO NOT OPEN	
CAUTION : TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER. ACCESSORIES SOLD DEPARATELY. CONTACT QUALIFIED SERVICE PERSONNEL FOR INFORMATION ACCESSIBLE ACCESSORIES.		



The lightning arrowhead symbol in a triangle means to watch out for live wires that might cause an electrical shock.

The exclamation symbol in a triangle indicates an important operational and service instruction.

WARNING

Please note that the user is liable for any incidents in operating the unit if it is altered or modified without manufacturer's approval.

CAUTION

To prevent electric shock and risk of fire hazards:
Do not use power sources except for that specified.
Do not expose this appliance to rain or moisture.

This installation should be made by a qualified service person and should abide to all local codes.

1. SAFETY INSTRUCTIONS

Read Instructions
Read all of the safety and operating instructions before using the product.
Retain Instructions
Save this instructions for later use.
Cleaning
Unplug this appliance form wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
Water and Moisture.
Do not use this product near water or moisture.(For example. Near a bathtub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near swimming pool, etc.)
Installation
Do not place this product on an unstable cart, stand, or table. The product may fall causing serious injury to a child or adult, and damage to the product. Use only with a cart or stand recommended by the manufacturer, or sold with the product. Mounting should follow the manufacturer's instructions, and should use a mounting accessory recommended by manufacturer.
Power source
This Product should be operated only form the type of power source indicated on marking label.
If you are not sure of the type of power supplied to your home, consult your dealer or local power company.

2. PRECAUTIONS

- **Do not use the camera in extreme temperature conditions.**
- **Do not use or store the camera in humid environment**
  It may cause poor image quality.
- **Do not use the camera in unstable lighting conditions.**
  Inconsistent lighting or flickering may cause poor image.
- **Never use the camera close to gas or oil leak.**
  It may not operate properly.
- **Do not disassemble the camera.**
  There is no user serviceable part inside.
- **Do not drop the camera or apply force on it.**
  It may cause a malfunction.
- **Never face the camera to strong light for long periods of time.**
  It may damage the CMOS sensor.
- **Do not expose the camera to rain or any types of liquid**
  If wet, wipe the moisture out immediately.
  Liquids can contain minerals that corrode the electronic components.

When this camera is installed near wireless communication devices that emits strong electromagnetic field, irregularity such as noise may appear in the image.

INDEX

3. FEATURES

- 1/2.6 inch CMOS image sensor with Global Shutter (approx. 2.3 million effective pixels)

  Progressive scan

- Video signals output

  HD LVDS : Digital ITU-R BT.1120 - YcbCr4:2:2 16bits

  Analog : SD CVBS (NTSC/ PAL), 1.0Vp-p 75Ω, Composite

  HD SDI(optional):

SMPTE 292M(1.485Gbps)	1920x1080p@25/30/29.97
	1920x1080i@50/60/59.94
	1280x720p@25/30/50/60/29.97/59.94
SMPTE 424M(2.97Gbps)	1920x1080p@50/60/59.94

- 30x optical zoom lens with F1.5 aperture(optical zoom + digital zoom = 360x)
- External trigger

  Synchronizing with an external trigger signal.

- Day and Night

  ICR for infrared cut filter

- Privacy Zone Masking function
- Communications protocol supported to be controlled remotely
  - SONY-VISCA, PELCO-P/D, etc
- High performance functions
  - 3D-DNR (Digital Noise Reduction)
  - BLC (Back Light Compensation)
  - Motion Detection
  - Defog
  - Image flip
  - HLC (High Light Compensation)

4. SPECIFICATION

		SPECIFICATIONS
Sensor	Image Sensor	1/2.6” Global shutter CMOS (2.3 mega)
	Sync. System	Internal / External
	Effective Pixel	1920(H) x 1200(V)
	Min. Illumination	0.5Lux (1/30s, Day), 0.05Lux (Night), 0.1Lux(DSS on)
	Horizontal Resolution	1000 TVL
Optics	Lens	10x optical Zoom, F=4.7~47 mm, F1.6(Wide) ~ F3.0(Tele)
	Zoom	10x optical zoom + 12x digital zoom = 120x
	Focus	Near/Far, Auto/Manual/One Push
	Angle of View(H)	60.0 degrees (wide end), 6.7 degrees (tele end)
	Min. working distance	10 mm(wide end), 1500mm(tele end)
Functions	White Balance	Auto(3,000°K~8,000°K) / ATW(1,900°K~11,000°K) / Manual
	Day & Night System	AGC / TDN(ICR)
	Shutter speed	Auto/ Manual : 1/1 ~ 1/100,000s
	Gain	Auto/ Manual : 0 ~ 44dB
	IRIS	Auto/ Manual : F1.6 ~ Close
	Functions	BLC, HLC(High Light compensation), Privacy Mask, Image Mirror, 3DNR, Sharpness, Defog, DIS(Digital Image stabilizer), NegArt, Freeze
Trigger	Synchronization	Hardware(GPI-TTL), Software trigger
	Trigger Mode	OFF(Free Run)/ ON(Edge detection, Trigger width detection)
	Trigger Noise Filter	OFF/ ON (1~2,000,000 µs)
	Special Trigger	OFF/ Bulk/ Sequential/ Burst trigger
	Trigger Polarity	ActiveLow/ ActiveHigh/ LevelLow/ LevelHigh
	Trigger Delay	1~4,194,303 µs
	User Set/ memory	16
Strobe	GPO(TTL) output	OFF/ Strobe/ Night/ Day/ Level Low/ Level High/ Ext trigger through/ Ext trigger with delay/ FVAL(CMOS)/ LVAL(CMOS)/ FVAL(ISP) LVAL(ISP)/ PWM/ Userdefine1/ Userdefine2/ Userdefine3
	Strobe Delay	1~4,194,303 µs
	Strobe Width	1~4,194,303 µs
	PWM	Pulse Duty: 1~4,194,303 µs Pulse Cycle: 10~4,194,303 µs

Video Outputs	Digital Output (LVDS) ITU-R BT.1120 YcbCr4:2:2 16bits	1920x1080p@25/30/50/60 1920x1080p@29.97/59.94 (optional) 1920x1080i@50/60 1920x1080i@59.94 (optional) 1280x720p@25/30/50/60 1280x720p@29.97/59.94 (optional)
	SDI(optional)	SMPTE 292M(1.485Gbps): 1080p@25/30/29.97 1080i@50/60/59.94 720p@25/30/29.97/50/60/59.94 SMPTE 424M(2.97Gbps): 1080p@50/60/59.94
	CVBS	Analog Composite(1V ± 0.2 Vp-p) NTSC/PAL
Control Interface	UART(5V level)	PELCO-P/D, SONY-VISCA protocol
		8bits data, 1 stop bit, no parity, 2400~115200bps
General	Operation Temperature	-20℃ ~ 60℃
	Power Input	12VDC (7V to 15VDC)
	Power consumption	Max 4W (3 W Lens inactive, 4 W Lens active)
	Mass	Approx. 140g (5 oz.)
	Dimensions	67(D) x 43.3 (W) x 45.3(H) mm

5. OPERATING CAMERA

5.1. Camera OSD menu

WB CONTROL	MODE	AWB / ATW / PUSH / INDOOR / OUTDOOR / MANUAL	
	PUSH		
	RED	0 ~ 100	
	BLUE	0 ~ 100	
AE CONTROL	MODE	AUTO/SHUT PRI/IRIS PRI/AGC PRI/BRIGHT/MANUAL	
	SHUT	/30/60/90/100/125/180/250/350/500/725/1000/1500/2K/3K/4K/6K/10K	
	IRIS	F1.6 ~ F16	
	AGC	0 dB ~	
	AGC LIMIT	0 ~ 15	
	SENS UP	OFF ~ X15	
	EXP COMP	0 ~ 14	
	FLICKERLESS	OFF/ AUTO/ ON	
FOCUS CONTROL	FOCUS MODE	AUTO/ MANUAL	
	PUSH	PRESS OK	
	AF MODE	NORMAL/ INTERVAL/ ZOOM TRIG	
	WIDE LIMIT	X1 ~X29	
	TELE LIMIT	X2 ~X30	
	DZOOM	OFF/ ON	
	ZOOM SPEED	0 ~ 7	
	NEAR LIMIT	0.5M/ 1M/ 2M/ 3M/ 5M/ 10M/ 30M	
	AF INTERVAL	0 ~ 255	
	AF AREA/SIZE	USER MODE	OFF/ ON
		WIDTH	4~24
		HEIGHT	4~16
		MOVE HOR	0~39
		MOVE VER	0~25

BACK LIGHT	BACKLIGHT	BLC	LEVEL	0~255
			DISPLAY	OFF/ ON
			WIDTH	0~48
			HEIGHT	0~33
			MOVE HOR	0~48
			MOVE VER	0~33
		HLM	AREA DISPLAY	OFF/ ON
			LEVEL	0~20
			BLACK MASK	OFF/ ON
			WIDTH	0~48
			HEIGHT	0~33
			MOVE HOR	0~48
			MOVE VER	0~33
		SPOT AE	DISPLAY	OFF/ ON
			WIDTH	0~48
			HEIGHT	0~33
			MOVE HOR	0~48
			MOVE VER	0~33
	DWDR	STRENGTH	0 ~ 16	
		SATURATION	0 ~ 16	
		LOCAL RATIO	0 ~ 16	
		SAT. SYNC	OFF/ ON	
		AUTO LEVEL	LOW/ MID/ HIGH	
	DEFOG	STRENGTH	0 ~ 16	
		THRESHOLD	0 ~ 3	
		AUTO LEVEL	LOW/ MID/ HIGH	
IMAGE CONTROL	COLOR LEVEL	0 ~ 20		
	SHARPNESS	0 ~ 20		
	CONTRAST	0 ~ 20		
	HUE	-10 ~ 0 ~ 10		
	IMAGE EFFECT	OFF/ NEGA/ GRAY		
	IMAGE FLIP	OFF/MIRROR/V-FLIP/ROTATION		
	DNR	MODE	OFF/ 2D/ 3D/ 2D+3D	
		3DNR LEVEL	LOW/MID/HIGH/AUTO	
		2DNR LEVEL	LOW/MID/HIGH/AUTO	
		APERTURE	0~4	
	GAMMA	DEFAULT/1.0 ~ 0.4		
	GAMMA OFFSET	-64 ~ 64		
	COLOR SUPPRESS	OFF/ LOW/ MID/ HIGH		
	LENS SHADING	OFF/ ON		

DISPLAY	DAY/NIGHT	MODE	AUTO/ DAY/ NIGHT
		DELAY [SEC]	0 ~ 60
		D->N LEVEL	0 ~ 28
		N->D LEVEL	0 ~ 27
		NIGHT COLOR	OFF/ ON
		COLOR BURST	OFF/ ON
	CAM TITLE	OFF/ ON	
	ZOOM MAG	OFF/ ON	
	PRIVACY	MODE	OFF/ ON
		TYPE	SQUARE/ POLYGON
		MASK NO.	MASK1 ~ MASK8
		DISPLAY	OFF/ ON
		COLOR	BLK/WHT/GRN/BLE/RED/CYAN/MAG/YEL/GRAY1~6,MOSAIC
		POLY SELECT	L-TOP/ R-TOP/ L-BOT/ R-BOT
		POSITION HOR	0~255
		POSITION VER	0~216
		WIDTH	0~120
		HEIGHT	0~68
	MOTION	AREA	1 ~ 4
		AREA ACTIVE	OFF/ ON
		AREA DISPLAY	OFF/ ON
		SIZE POSITION	
		SENSITIVITY	0 ~ 40
		MOTION VIEW	OFF/ ON
	DEFECT PIXEL	OFF/ON/STATIC/FIXED	
	IMAGE STABILIZER	OFF/ ON	
SYSTEM SETUP	RS232C	CAM ID	1 ~ 255
		ID DISPLAY	OFF/ON
		BAUDRATE	2400/4800/9600/19200/38400/115200
		SAVE	
	OUTPUT FORMAT	1080P60/59/50/30/29/25 1080I60/59/50 720P/60/59/50/30/29/25	
	DOOR MODE	INDOOR / OUTDOOR	
	VER.		
RESET	MODE	FACTORY / USER	
EXIT			

5.2. WHITE BALANCE

AWB : Color temperature is automatically adjusted to 3,000°K ~ 8,000°K

ATW : Color temperature is automatically adjusted to 1,900°K ~ 11,000°K

INDOOR : Color temperature is manually adjusted to indoor

OUTDOOR : Color temperature is manually adjusted to outdoor

MANUAL WB : Color Temperature is manually adjustable to adjusting value.

RED and BLUE gain can be changed for better pictures.

PUSH WB : Color Temperature is manually adjustable to adjusting value.

The One Push White Balance mode is a fixed white balance mode that may be automatically readjusted only at One Push Trigger, while the camera is directed at a piece of white paper to obtain the optimum state under current illumination.

One Push White Balance data is lost when the power is turned off. If the power is turned off, reset One Push White Balance.

5.3. EXPOSURE

MODE :

AUTO – Iris, gain and shutter can be controlled automatically.

MANUAL – Manual control of Iris, gain and shutter.

SHUTTER Priority – Manual control of shutter. Iris and gain can be controlled automatically.

IRIS Priority - Manual control of IRIS. Shutter and gain can be controlled automatically.

BRIGHT – Iris and gain can be controlled by control of brightness

SHUTTER :

Auto – Shutter controls exposure automatically when iris is manual.

Manual - Shutter is fixed, and gives the exposure control priority to other resources.

IRIS :

Auto - Iris controls exposure automatically, and shutter is fixed.

Manual - Iris is fixed, and gives the exposure control priority to other resources.

AGC LIMIT: To select maximum automatic gain limit.

Camera raises up gain to selected gain limit when dark conditions.

EXP COMP :

The exposure compensation function adjusts gain and iris, to keep a brightness level.

SENS UP :

Minimum slow shutter limit is down to 1/1 second.

The value means seconds.

Camera make Shutter speed longer to selected shutter limit when dark conditions.

FLICKERLESS :

This function used only for specific country to remove light flickering when light appears to flutter.

5.4. FOCUS

The camera employs a 30x optical zoom lens combined with a 12x digital zoom function. This camera allows you to zoom up to 360×.

Optical 10x, f = 4.7 mm to 47 mm (F 1.6 to F 3.0)

Digital Zoom 12x : enlarges of the subject

7 levels of zoom speed

FOCUS MODE :

Auto mode automatically adjusts the focus position.

Manual mode adjusts the focus position by manual and when zoom is changed.

AF MODE :

Normal mode automatically adjusts the focus position.

Interval mode adjusts the focus position at time interval and when zoom is changed.

Zoom trig mode adjusts the focus position when zoom is changed.

ONE PUSH : When One Push AF command is sent, camera becomes Auto Focus mode to adjust focus position for a while. After it stops, mode becomes that for Manual focus mode.

NEAR LIMIT : Priority for focusing distance. The lens moves to adjust the focus from the distance.

5.5. BACK LIGHT

BACKLIGHT : When background is too bright behind the object, the BLC make clearer object.

HLM - Highlight suppression reduce too bright light by masking it with specific color.

DWDR : Dark areas of image brightness correction.

DEFOG : This function affects the effect of fog removal. Furthermore, it improves visibility by removing fog, clouds, smoke, and dust.

5.6. IMAGE CONTROL

COLOR LEVEL

Color level is the colorfulness of a color relative to its own brightness.

SHARPNESS

As you increase this value, the picture outline becomes stronger and clearer. Adjust this value appropriately depending on the sharpness of the picture.

IMAGE FLIP

Video output is set horizontally vertically, and rotate.

DNR

2D/3DNR reduces video noises at low ambient light.

SHADING

Image center and the outskirts of brightness difference correction

GAMMA

Video out brightness correction function

COLOR SUPPRESS

Color suppress reduces color noise in low illumination conditions.

5.7. DISPLAY CONTROL

DAY / NIGHT

- **AUTO :** Auto day/night mode automatically switches between Color and Black/White depending on darkness. ICR(IR cut) filter is removed when it switches to black/white.

  D->N level – This level is threshold for switching day to night.

  N->D level – This level is threshold for switching night to day.

  Delay(Dwell) time - Checking time for condition of light to confirm changing to Color and Black/White.

  Color Burst – Color burst off makes that the color burst is removed when ICR switches to black/white.
- **DAY :** The camera keeps color mode constantly.
- **NIGHT :** The camera keeps black/white mode constantly.

CAM TITLE

OSD character camera name settings..

ZOOM MAGNIFICATION

Display the Zoom scale.

PRIVACY

It is possible to set the size of the area and a video Mask.

MOTION

Video zone settings and sensitivity can be set.

IMAGE STABILIZER

This function reduces image blurring associated with the motion of a camera.

5.8. SYSTEM SETUP

CAM ID

The camera is capable of recognizing number setting up 1 to 255.

BAUDRATE

Camera communication bit rate.

OUTPUT FORMAT

Video output specification set(NTSC/PAL) and video size settings(1080p/720p)

DOOR MODE

Set Indoor or Outdoor mode to get better video quality and auto focusing performance.

5.9. RESET

Camera returns into initial value except ID and baudrate.

6. Trigger Control

FREE RUN

- OFF
- SpecialTrigger — OFF / Bulk / Sequential / Burst

TRIGGER MODE

- ExposureDetection — Edge Detection / Width Detection
- TriggerSource — OFF / Internal / External / SOFT
- TriggerPolarity — ActiveLow / ActiveHigh / Level Low / Level High
- TriggerDelay — 1 to 4,193,304us
- TriggerRange — OFF / ON
- TriggerLowerLimit — 1 to 2,000,000us
- AcquisitionMode *1 — Continuous / SingleFrame / MultiFrame
- AcquisitionCount — 1 to 2,147,483,647 Frame

STROBE

- StrobeMode — OFF/ ON/ Night/ DAY/ LevelLow/ LevelHigh/ ExtTrgThrough/ ExtTrgWithDelay/ FVAL(CMOS)/ LVAL(CMOS)/ FVAL(ISP)/ LVAL(ISP)/ PWM/ UserDefine1/ UserDefine2/ UserDefine3
- StrobePolarity — ActiveLow / ActiveHigh
- StrobeDelay — 1 to 4,193,304us
- StrobeWidth *2 — 1 to 4,193,304us
- PulseDuty *3 — 1 to 4,193,304us
- PulseCycle *3 — 10 to 4,193,304us

*1 only for SOFT trigger source

*2 StrobeWidth can be enabled when StrobeMode is ext trigger with delay

*3 Pulse generator is only for StrobeMode is PWM.

Pulse cycle = Pulse duty(high level) + low level

6.1. Trigger Control

Free Run :

The camera operates without a trigger signal and performs the video output operation continuously after the shutter (exposure) is finished. The horizontal and vertical timing signals are generated within the camera. During the free-run operation, image pickup timing cannot be controlled. In the free-run operation, the adjustment is made automatically to achieve the maximum frame rate according to the shutter setting.

Trigger mode :

Exposure is started by detecting the externally input trigger signal. When ExposureDetection is EdgeDetection, exposure is started by detecting the rising or falling edge of the trigger signal and the trigger edge detection (exposure is performed based on the set shutter value) is performed. When ExposureDetection is WidthDetection, the trigger width detection (exposed for the period of the trigger signal width) is performed.

*** Manual Focus and manual exposure are forced when trigger mode.**

Related Command

CAM_TriggerMode: OFF(FreeRun)/ ON(Trigger mode)

TriggerSource : OFF / Internal Sync / External Trigger / SOFT (command)

ExposureDetection

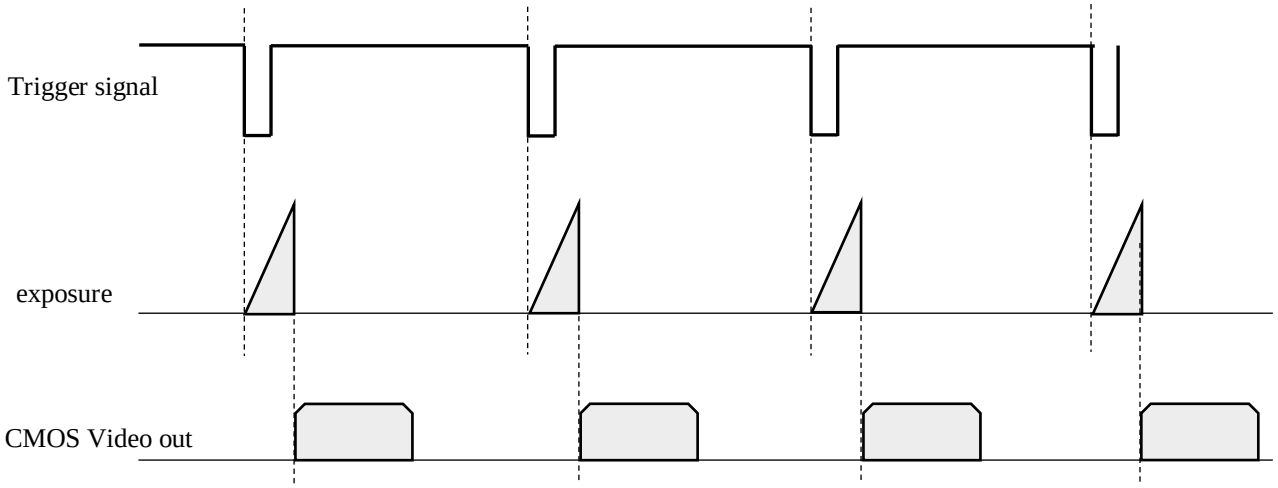
In CAM_TriggerMode is ON and TriggerSource is Ext Trigger, Exposure is started by detecting the externally input trigger signal. When ExposureDetection is EdgeDetection, exposure is started by detecting the rising or falling edge of the trigger signal and the trigger edge detection (exposure is performed based on the set shutter value) is performed. When ExposureDetection is WidthDetection, the trigger width detection (exposed for the period of the trigger signal width) is performed.

Related Command

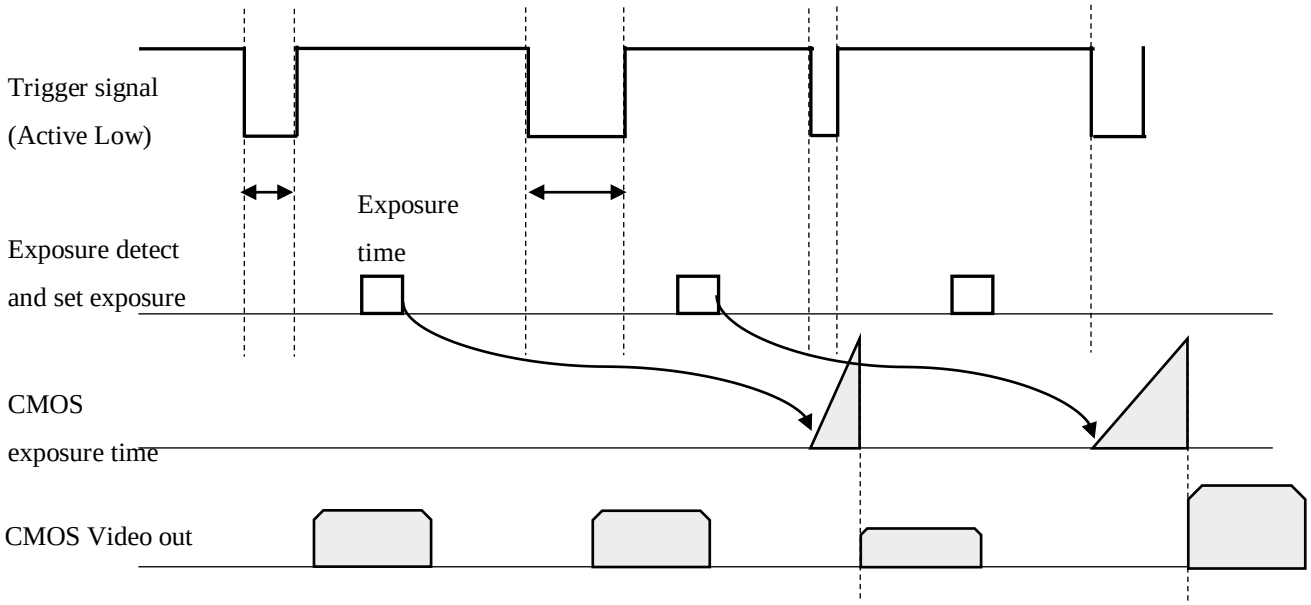
TriggerExpMode: edge detection/ width detection

Trigger Edge Detection

the camera exposure starts at the falling edge of the trigger pulse or positive edge when setting is "Trigger Polarity is ActiveLow", the camera exposure starts at the falling edge of the trigger pulse. Exposure duration time is preset by the "Electrical Shutter" settings.



Trigger Width Detection



Trigger Source

This can be input via the 9pin FFC connector, KEL 30pin connector, or software command (SOFT).

Related Command

TriggerSource: OFF / Internal Sync / External Trigger / SOFT

Trigger range limit

Only signals in the set trigger width can be accepted as the trigger signal. This functions as a noise filter, which removes chattering or disturbance noise in the trigger signal line. This also functions as a trigger selector, whereby only a specific camera can be operated by the trigger when multiple cameras share one trigger signal line. When the trigger signal is input, exposure is started immediately to increment the trigger counter; however, when trigger width is out of the range, video is not output and the trigger counter is decremented. If the shutter time is set shorter than the upper limit, triggers will be received and video is output even if the trigger signal is wider than the trigger range limit. If the trigger source is soft trigger, trigger range is not enabled.

Related Command

TriggerRange : OFF/ ON

TriggerRangeLowerLimit : 1~2,000,000 Trigger range lower limit [μs]

Trigger Delay

The camera can delay the trigger signal.

Related Command

TriggerExDelay : 1~4,194,303 μs

TriggerDelay: 0 ~ 255.9 ms

AcquisitionMode

Only signal in the SOFT trigger source can be accepted as the acquisition trigger signal.

Continuous : Continuous acquisition in SOFT trigger mode. The Frame acquisition start trigger is coming from the AcquisitionStart command. Images are picked up until AcquisitionStop command. The exposure time is performed based on the set shutter value.

SingleFrame : One Frame image pick up after AcquisitionStart command.

MultiFrame : Multiple Frame images pick up after AcquisitionStart command.

Related Command

AcquisitionMode : Continous/SingleFrame/MultiFrame

AcquisitionFrameCount : Number of frames to acquire in MultiFrame Acquisition mode.

AcquisitionStart, AcquisitionStop : Software trigger start or stop

6.2. Special Trigger

(will be supported in a future release)

When operating in trigger mode and performing image pickup in different conditions (such as the shutter, gain, and image pickup area), the setting has to be changed in advance for each trigger input. However, if the special trigger operation is enabled, the setting does not have to be changed and continuous image pick up in different conditions is facilitated. Up to 16 settings can be configured. There are the bulk operations in which images are taken consecutively by inputting the trigger signal once and the sequential operation in which images are taken each time the trigger signal is detected. The next exposure is started after the end of video output. In the sequential operation, the second and subsequent trigger signals should be input 5 ms or more after the end of video output. During the special trigger operation, the device cannot be entered to the trigger mode. The source and polarity of the special trigger signal should be defined separately from the trigger mode. Each setting should be saved in the user set.

Bulk Trigger

Different camera setting configurations are stored in memory channels beforehand, with the different settings applied to acquire multiple video images at each trigger event. In the following diagram, two images are acquired in one cycle.

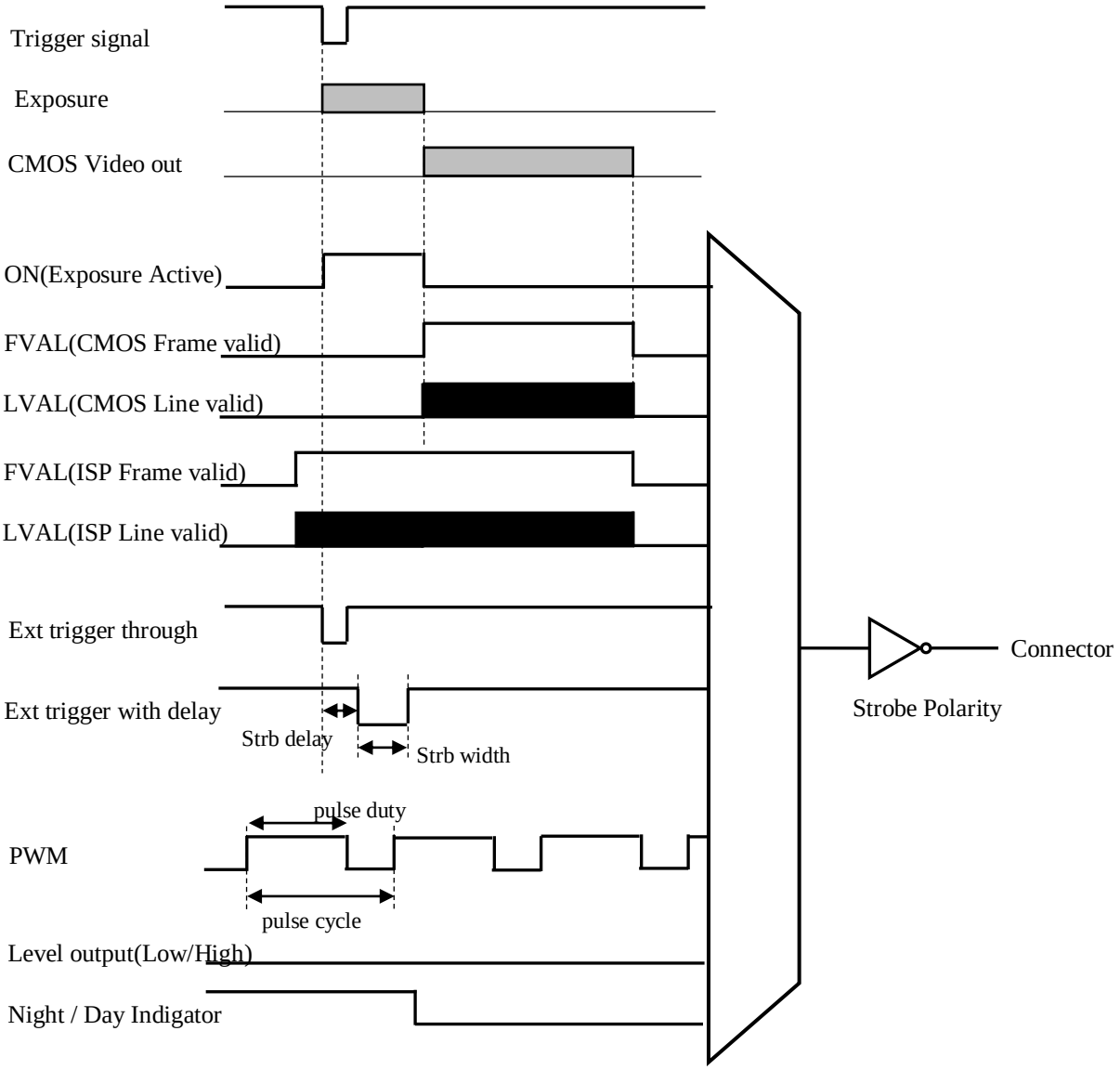
Sequential Trigger

Different camera setting configurations are stored in memory channels beforehand, with the different settings applied in sequence to acquire a different image with each trigger event. In the following diagram, two images with different exposure settings are acquired in one cycle.

Burst Trigger

This is a feature capable of continuous shooting at the trigger timing and specifying the number of exposures, exposure interval, and exposure time. Select from the mode that repeats one exposure time or the mode that switches between 2 exposure times repeatedly. Furthermore, there is another mode that repeats only while the trigger signal is on.

6.3. Strobe Control



Strobe mode :

ON : CMOS exposure active signal

Night Only : Indicate Night signal

Day Only : Indicate Day signal

Level Low : This function can set low level

Level High : This function can set high level

Ext trigger through :

Ext trigger with delay : Strobe control signal with strobe delay and strobe width.

FVAL(CMOS) : Frame Valid (CMOS Readout)

LVAL(CMOS) : Line Valid (CMOS)

FVAL(ISP) : Frame Valid (ISP output)

LVAL(ISP) : Line Valid (ISP output)

PWM : Pulse generation signal. PulseCycle, PulseDuty

USEROUTPUT1 : user defined output

USEROUTPUT2 : user defined output

USEROUTPUT3 : user defined output

Related Command

StrobeExDelay, StrobeExWidth : StrobeWidth can be enabled when StrobeMode is ext trigger with delay

PulseDuty, PulseCycle : cycle = duty(high level) + low level

StrobePolarity : ActiveLow(fallingEdge) / ActiveHigh(risingEdge)

7. Video Output Format

7.1. Video Mode

Video output :

1080p - 2200x1125@30/60/29.97/59.94 fps, 2640x1125@25/50fps

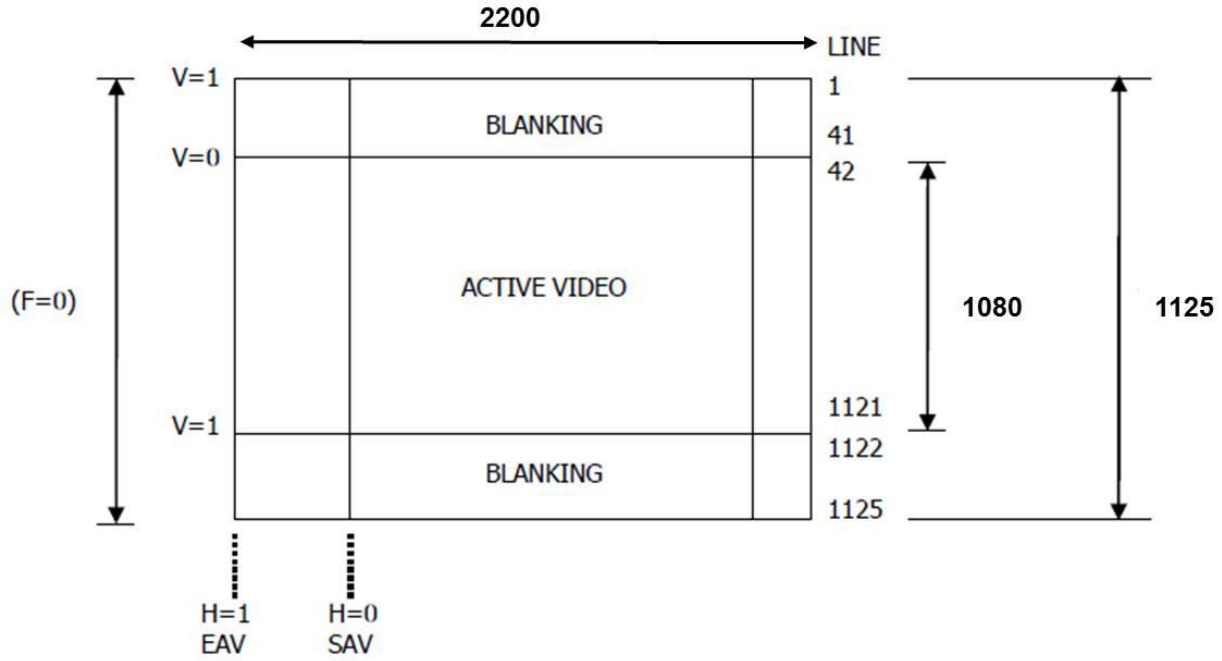
1080i - 2200x562(563)@60/59.94 fps, 2640x562(563)@50fps

720p - 1650x750@60/59.94 fps, 1980x750@50fps, 3300x750@30/29.97 fps, 3960x750@25fps

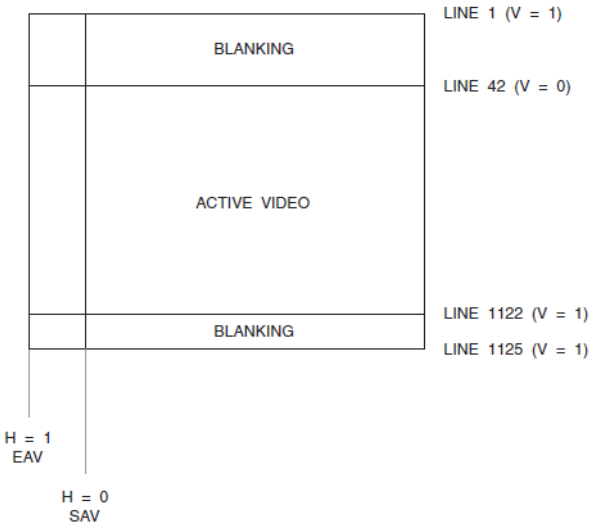
Pixel clock : 74.25MHz, 74.25/1.001 MHz, 148.5MHz, 148.5/1.001 MHz

YCbCr422 16bits data(BT.1120 format), HD, VD

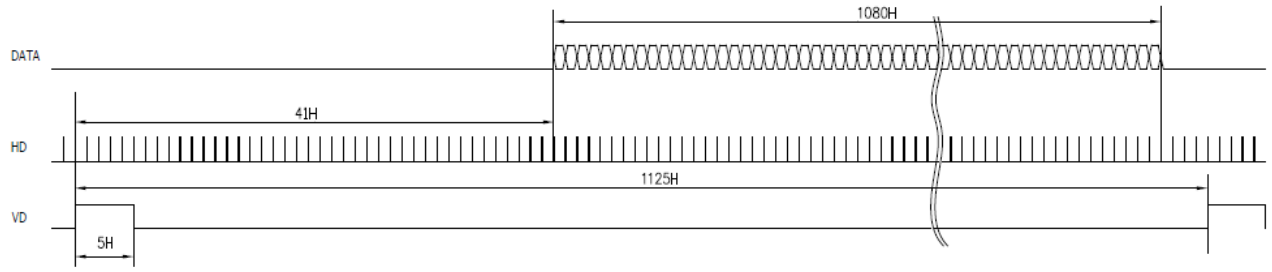
Active area (1920 x 1080)

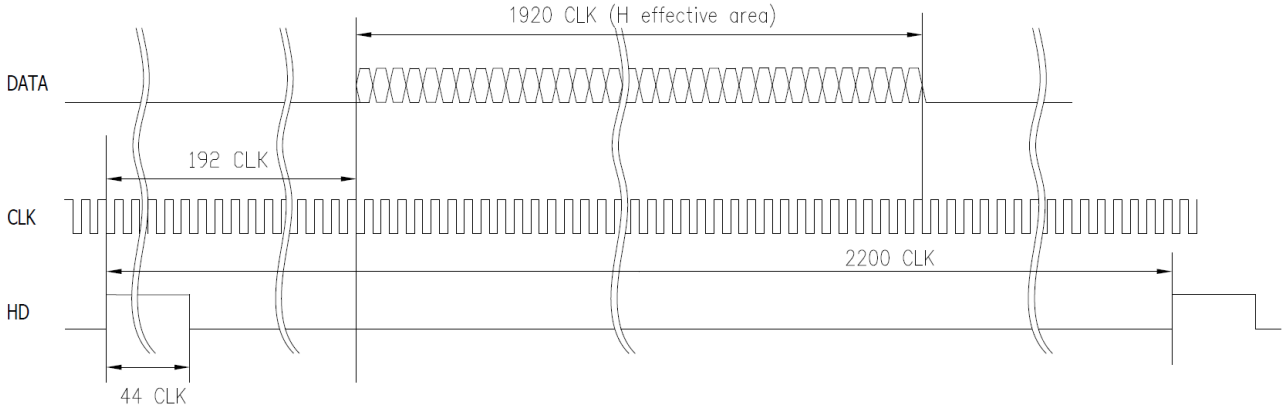


Output Timing Chart(1920x1080p@30/60/29.97/59.94)

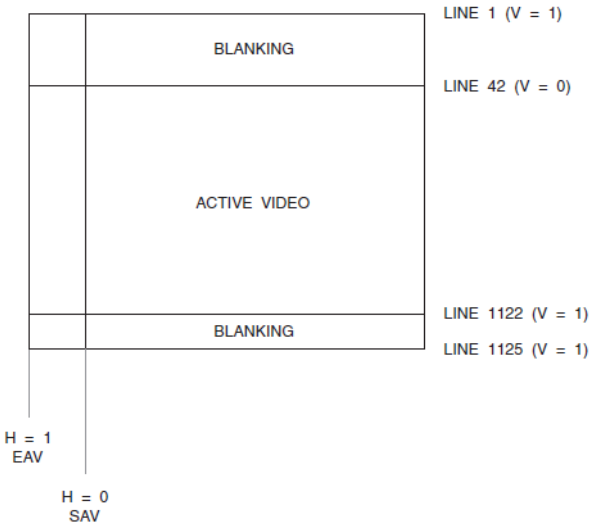


LINE NUMBER	F	V
1–41	0	1
42–1121	0	0
1122–1125	0	1

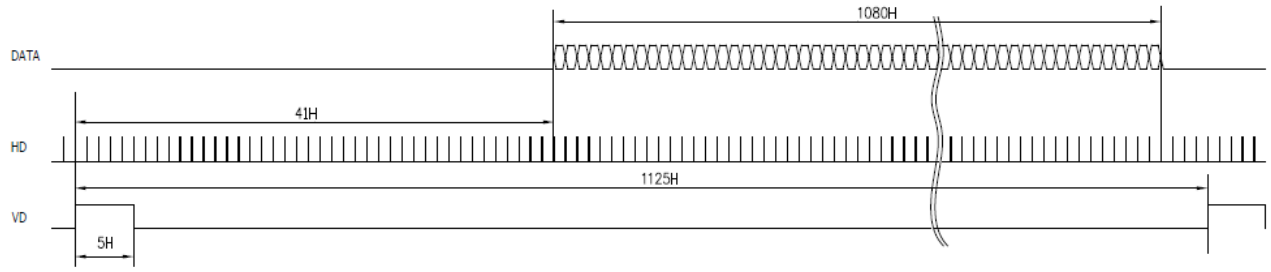


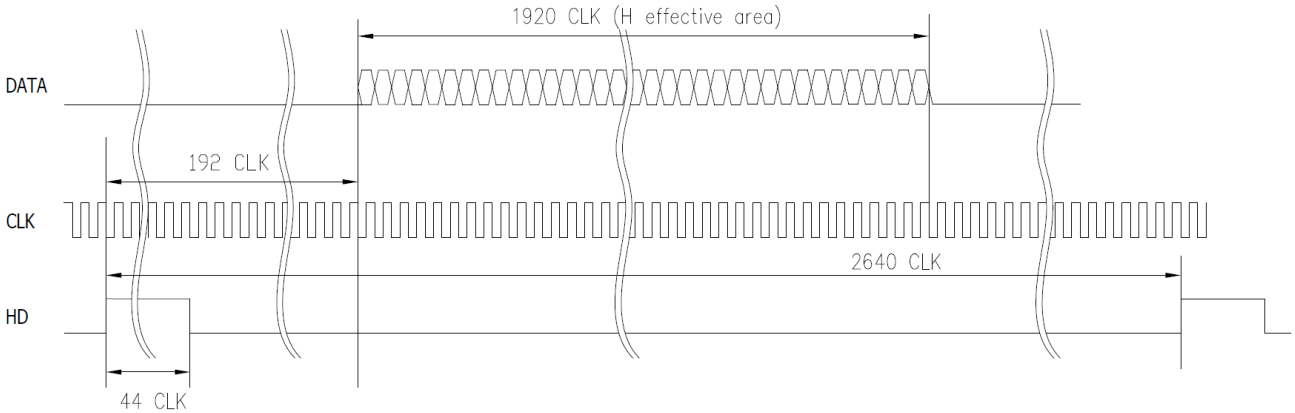


Output Timing Chart(1920x1080p@25/50)

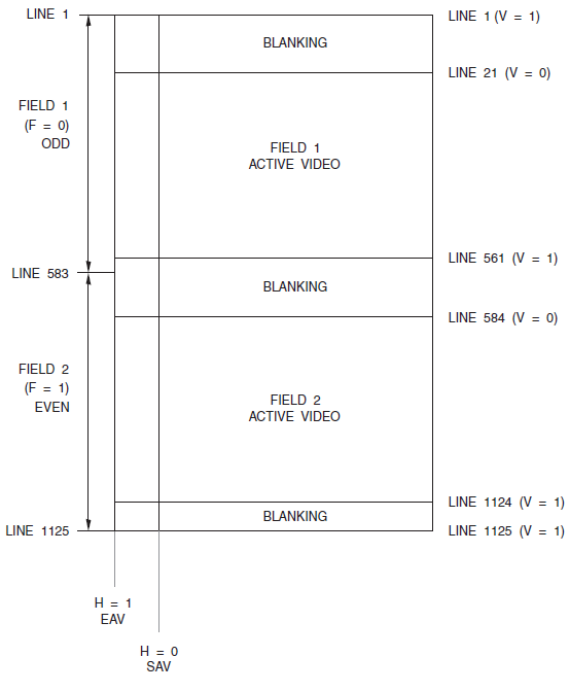


LINE NUMBER	F	V
1–41	0	1
42–1121	0	0
1122–1125	0	1

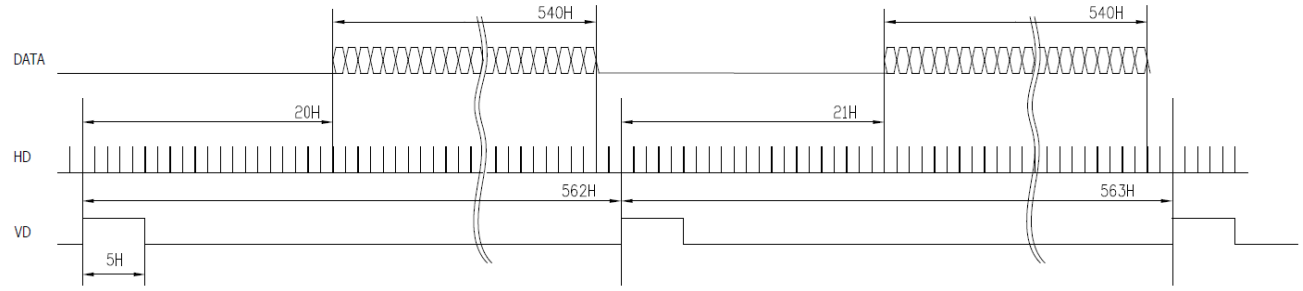


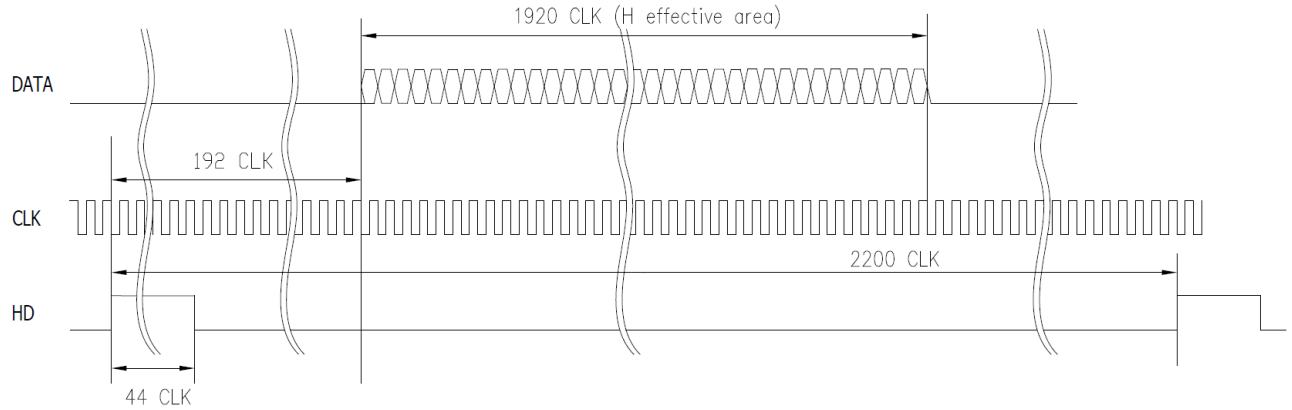


Output Timing Chart(1920x1080i@60/59.94)

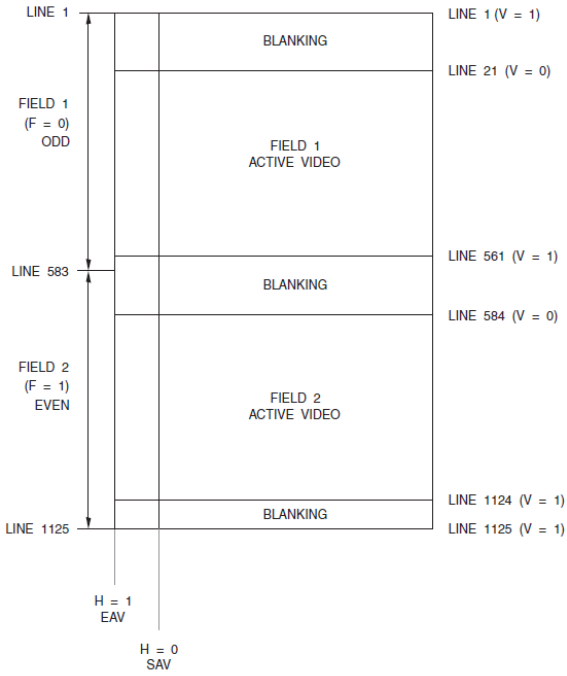


LINE NUMBER	F	V
1–20	0	1
21–560	0	0
561–562	0	1
563–583	1	1
584–1123	1	0
1124–1125	1	1

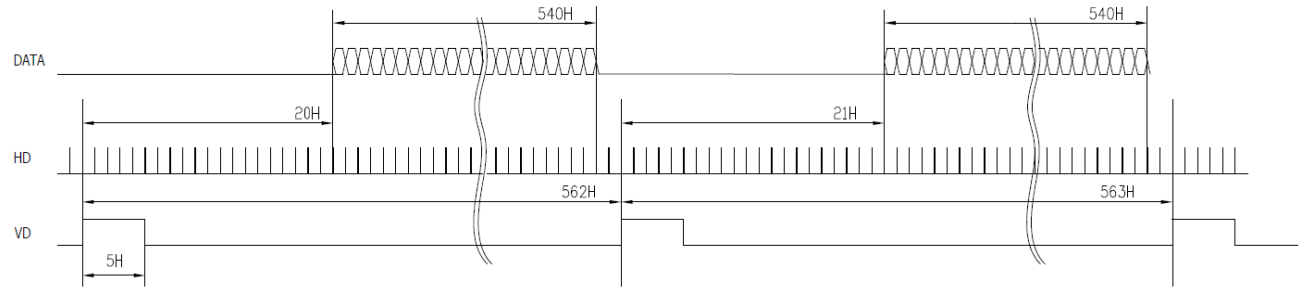


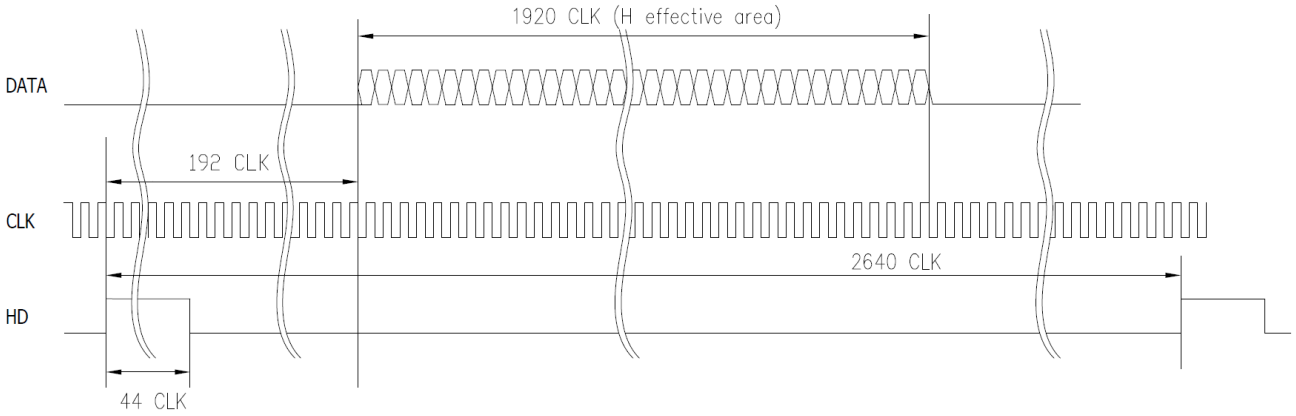


Output Timing Chart(1920x1080i@50)

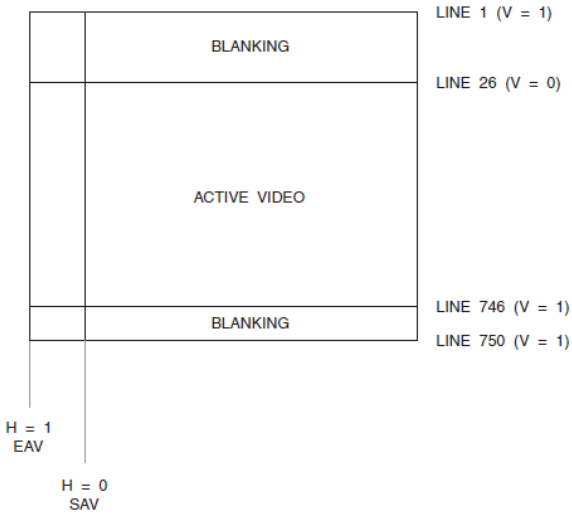


LINE NUMBER	F	V
1–20	0	1
21–560	0	0
561–562	0	1
563–583	1	1
584–1123	1	0
1124–1125	1	1

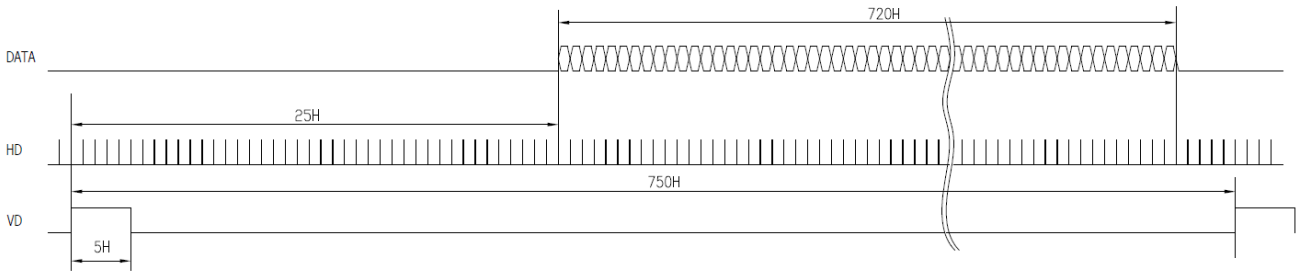


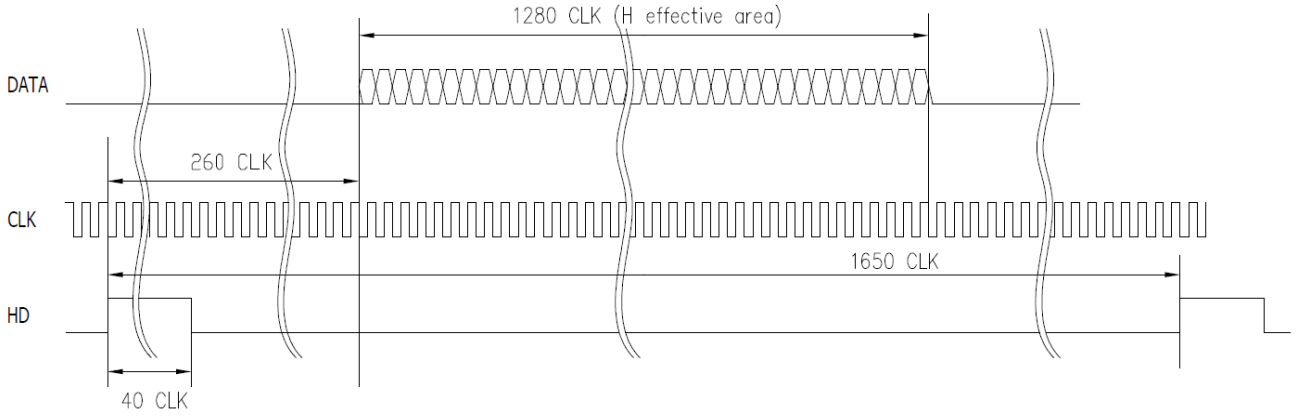


Output Timing Chart(1280x720p@60/59.94)

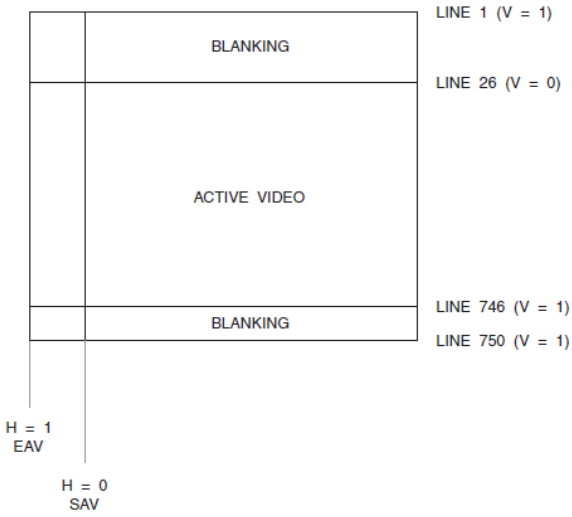


LINE NUMBER	F	V
1–25	0	1
26–745	0	0
746–750	0	1

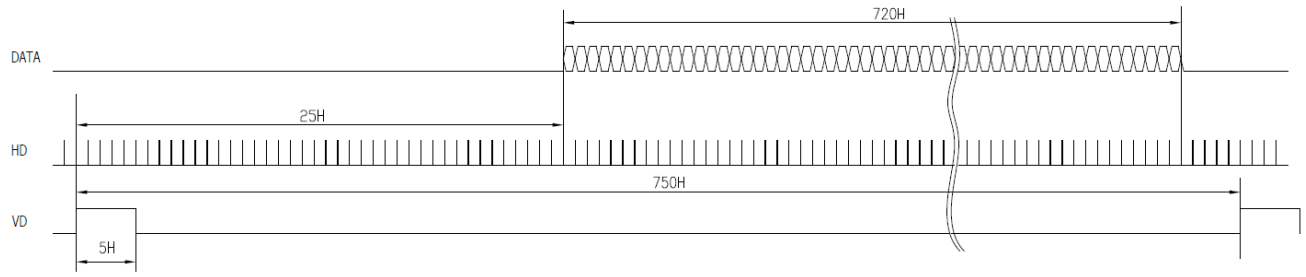


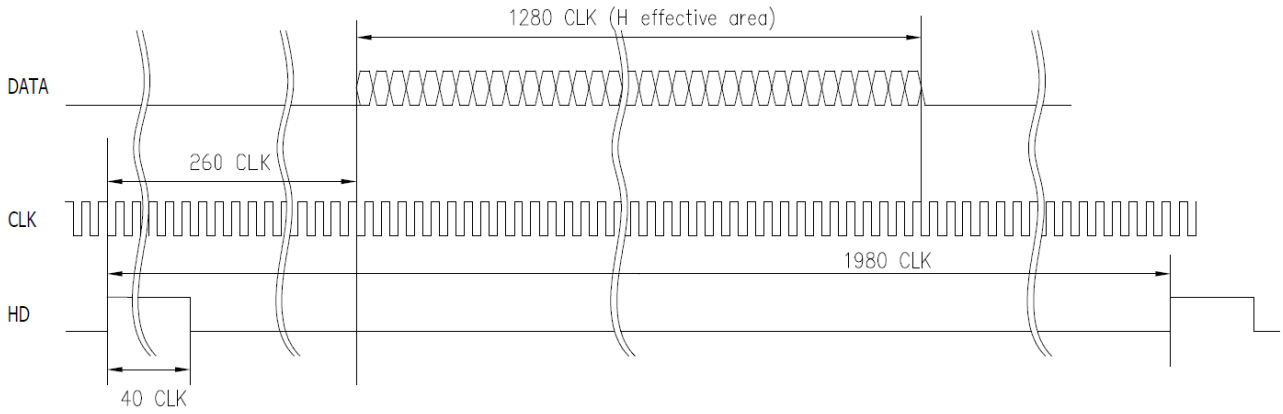


Output Timing Chart(1280x720p@50)

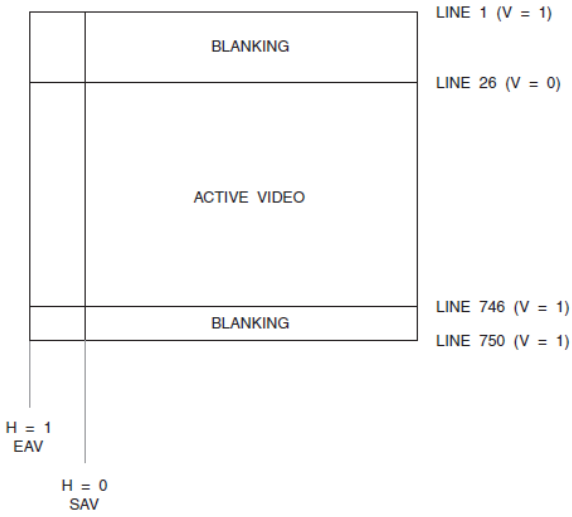


LINE NUMBER	F	V
1–25	0	1
26–745	0	0
746–750	0	1

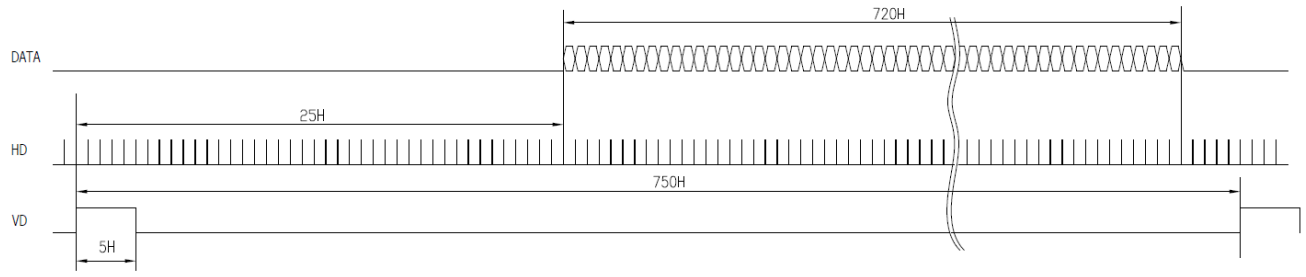


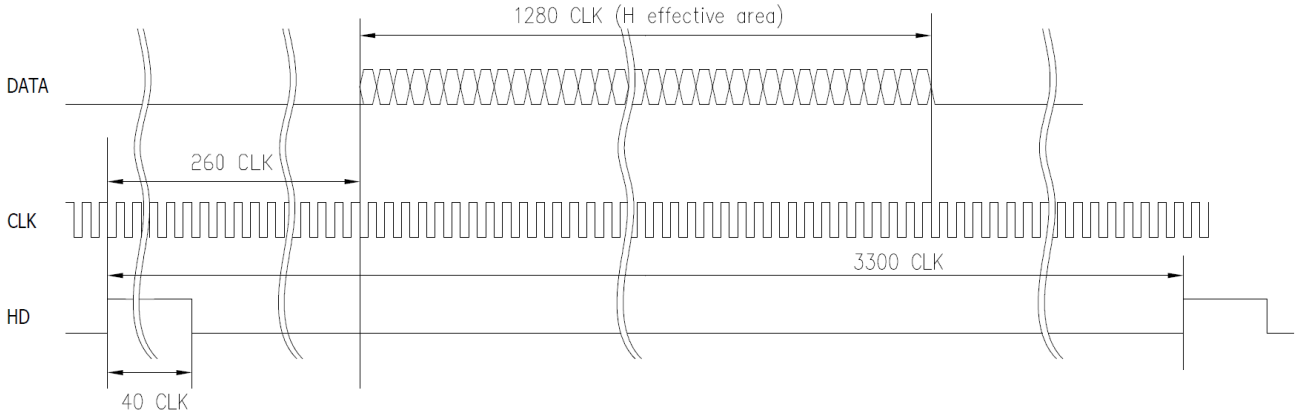


Output Timing Chart(1280x720p@30/29.97)

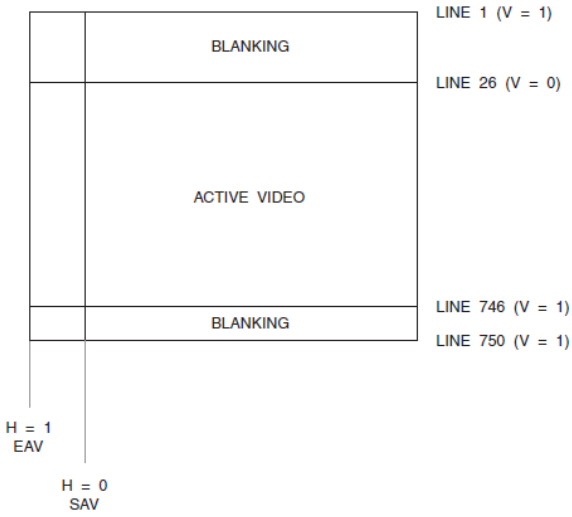


LINE NUMBER	F	V
1–25	0	1
26–745	0	0
746–750	0	1

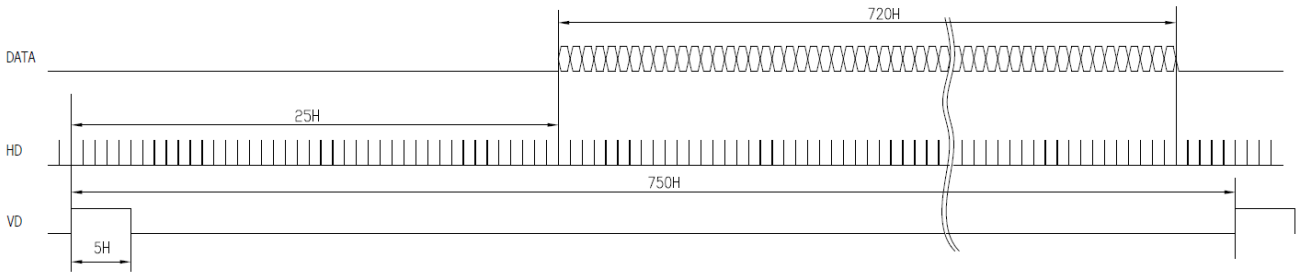


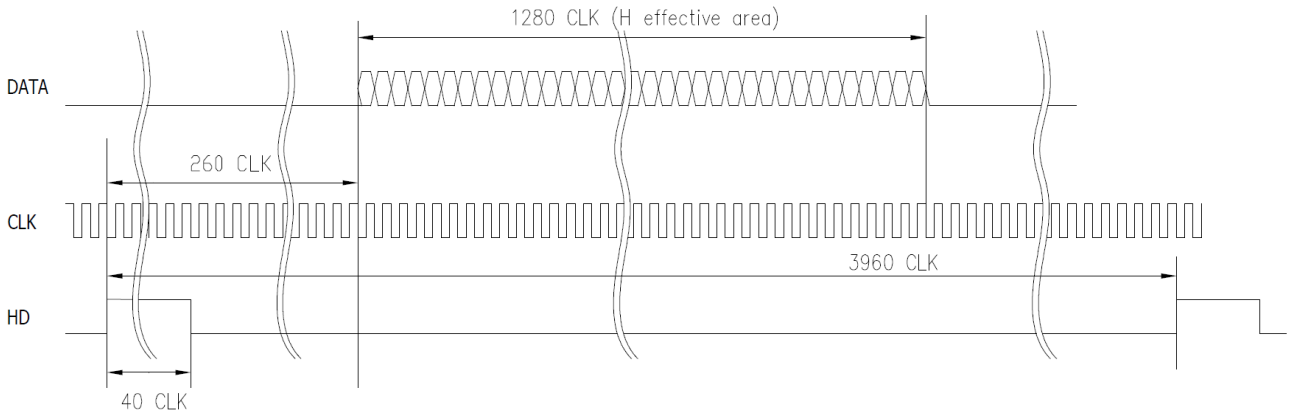


Output Timing Chart(1280x720p@25)

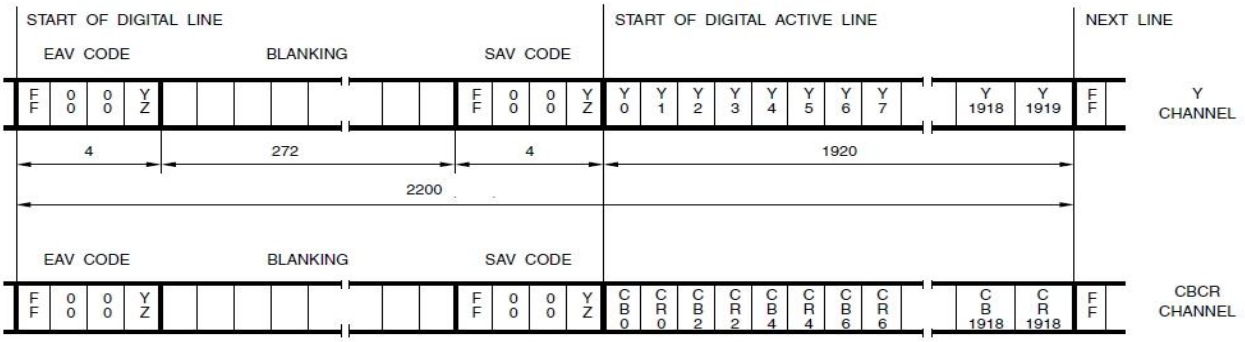


LINE NUMBER	F	V
1–25	0	1
26–745	0	0
746–750	0	1





Video Data Start/Stop Format



EAV and SAV CODE

	D7(MSB)	D6	D5	D4	D3	D2	D1	D0(LSB)
Preamble	1	1	1	1	1	1	1	1
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Status word	1	F	V	H	P3	P2	P1	P0

EAV and SAV Sequence

The EAV and SAV sequences are shown in Table A. The status word is defined as:

F = “0” or “1” (Selectable)

V = “1” during vertical blanking

H = “0” at SAV H = “1” at EAV

P3–P0 = protection bits

P3 = V ⊕H

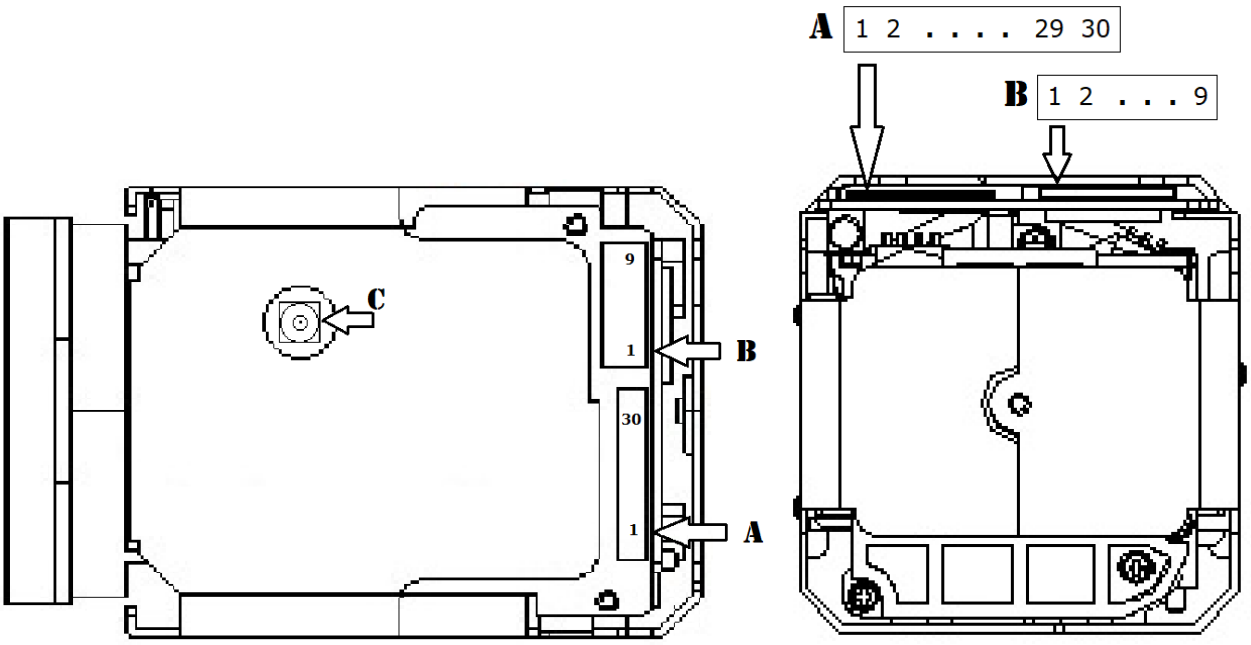
P2 = F ⊕H

P1 = F ⊕V

P0 = F ⊕V ⊕H

8. Camera Interface

8.1. Camera Interface

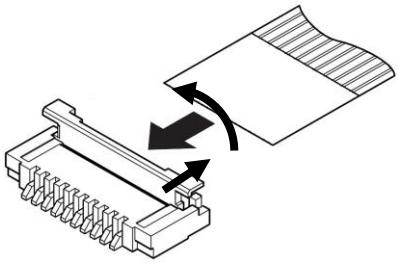


B connector:

Connector – KYOCERA 00-6200-509-130-000+ (1.0mm pitch 9pin, Bottom Contact)

Pin	Name	Level
1	RXD (UART input)	CMOS 5V (High Min. 2.5V)
2	TXD (UART output)	CMOS 5V (High Min. 4.5V)
3	GND	
4	DC power input	9 ~ 15VDC
5	GND	
6	CVBS Output	1V (p-p)
7	GPO(Strobe Output)	3.3V (**refer GPO circuit**)
8	GPI(Trigger Input)	3.3 ~12V (**refer GPI circuit**)
9	GPO(Strobe Output)	3.3 ~12V (**refer GPO circuit**)

1.0mm pitch FFC/FPC Cable (9pin)

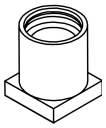


Slide actuator out

and rotate it up to insert FPC.

C connector: HD-SDI video output (optional)

Connector - MMCX (micro-miniature coaxial) femal jack special internal wiring

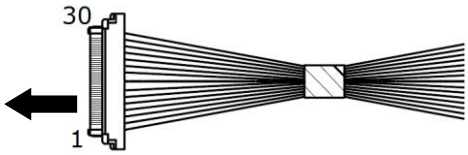


A connector : USL00-30L-C (KEL)

Recommended cable ASSY :

Cables - micro coaxial cable #42AWG

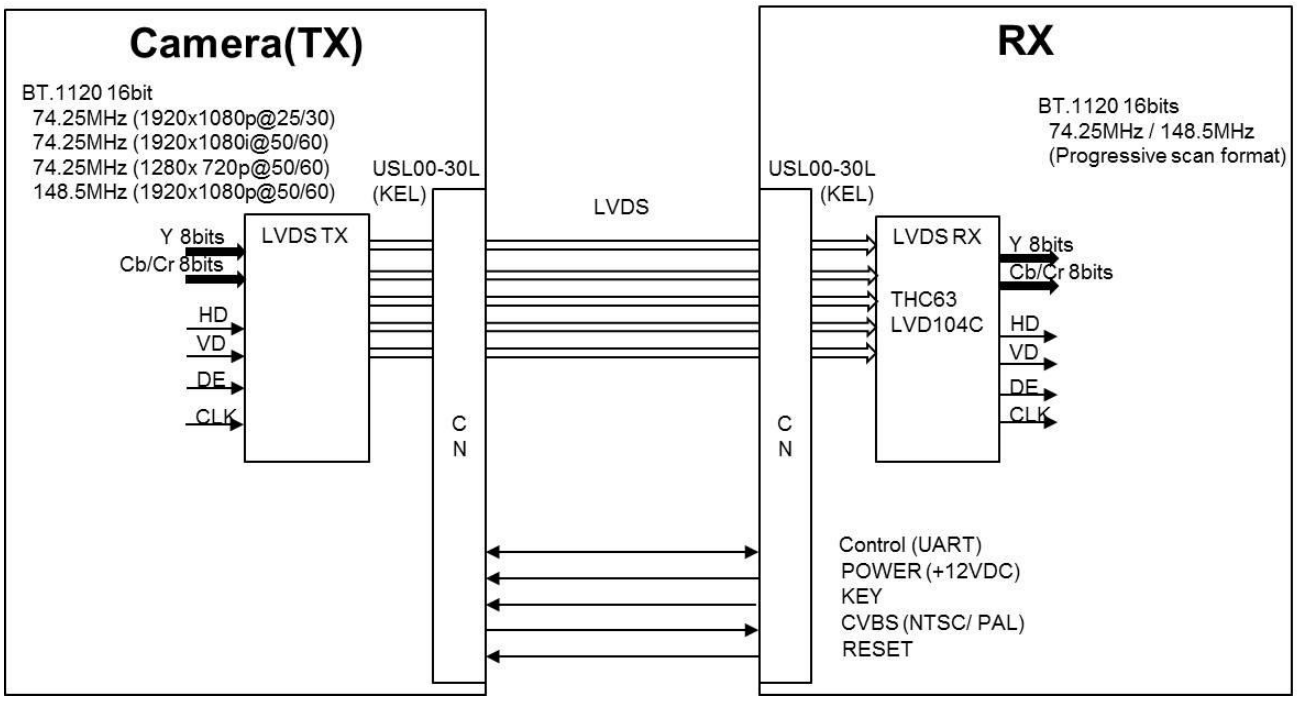
Connectors - USL20-30S (KEL)



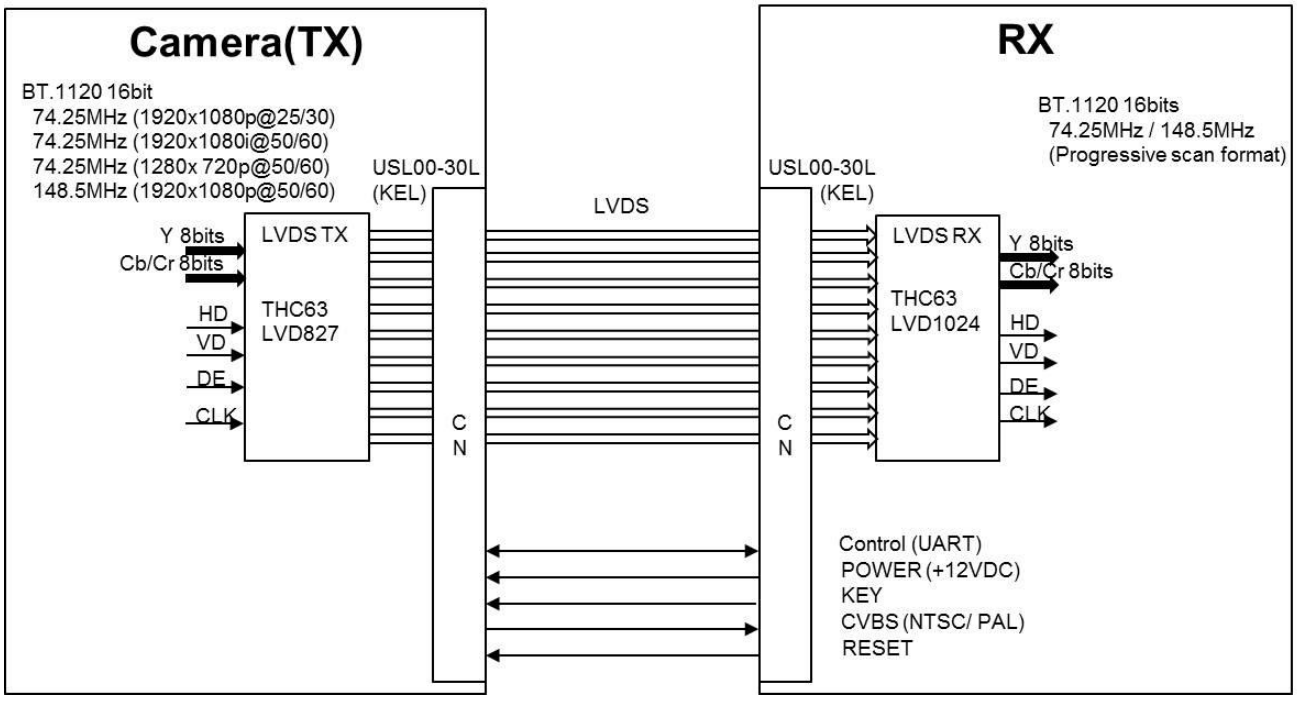
Camera Side

A connector pin assignment (KEL USL00-30L)			
1	TXOUT3+ (LVDS)	16	DC (9~15V)
2	TXOUT3- (LVDS)	17	DC (9~15V)
3	TXCLKOUT+ (LVDS)	18	DC (9~15V)
4	TXCLKOUT- (LVDS)	19	Trigger Input (3.3 ~ 12V) (**refer GPI circuit**)
5	TXOUT2+ (LVDS)	20	GND
6	TXOUT2- (LVDS)	21	TXOUT7+ (LVDS) for Dual out mode
7	TXOUT1+ (LVDS)	22	TXOUT7- (LVDS) for Dual out mode
8	TXOUT1- (LVDS)	23	TXOUT6+ (LVDS) for Dual out mode
9	TXOUT0+ (LVDS)	24	TXOUT6- (LVDS) for Dual out mode
10	TXOUT0- (LVDS)	25	Strobe Output (3.3 ~ 12V) (**refer GPO circuit**)
11	GND	26	Strobe Output (3.3V) (**refer GPO circuit**)
12	TXD (UART output) High Min. 4.5V	27	TXOUT5+ (LVDS) for Dual out mode
13	RXD (UART input) High Min. 2.5V	28	TXOUT5- (LVDS) for Dual out mode
14	DC (9~15V)	29	TXOUT4+ (LVDS) for Dual out mode
15	DC (9~15V)	30	TXOUT4- (LVDS) for Dual out mode

8.2. LVDS Interface



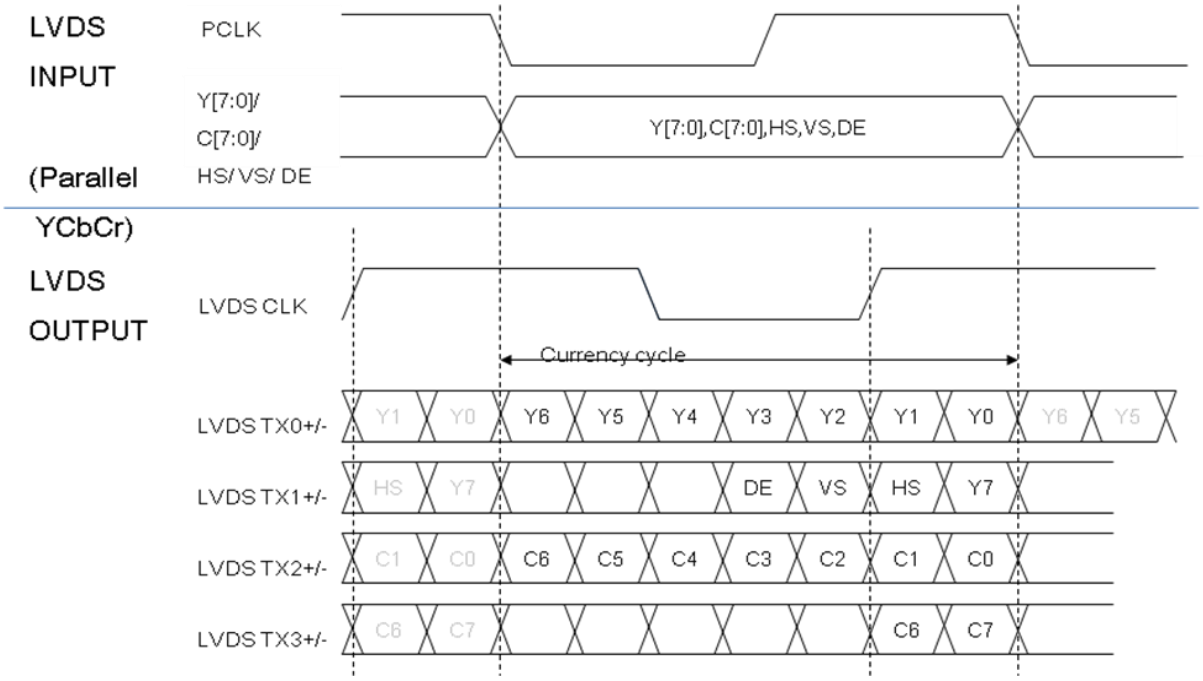
LVDS Single Output only



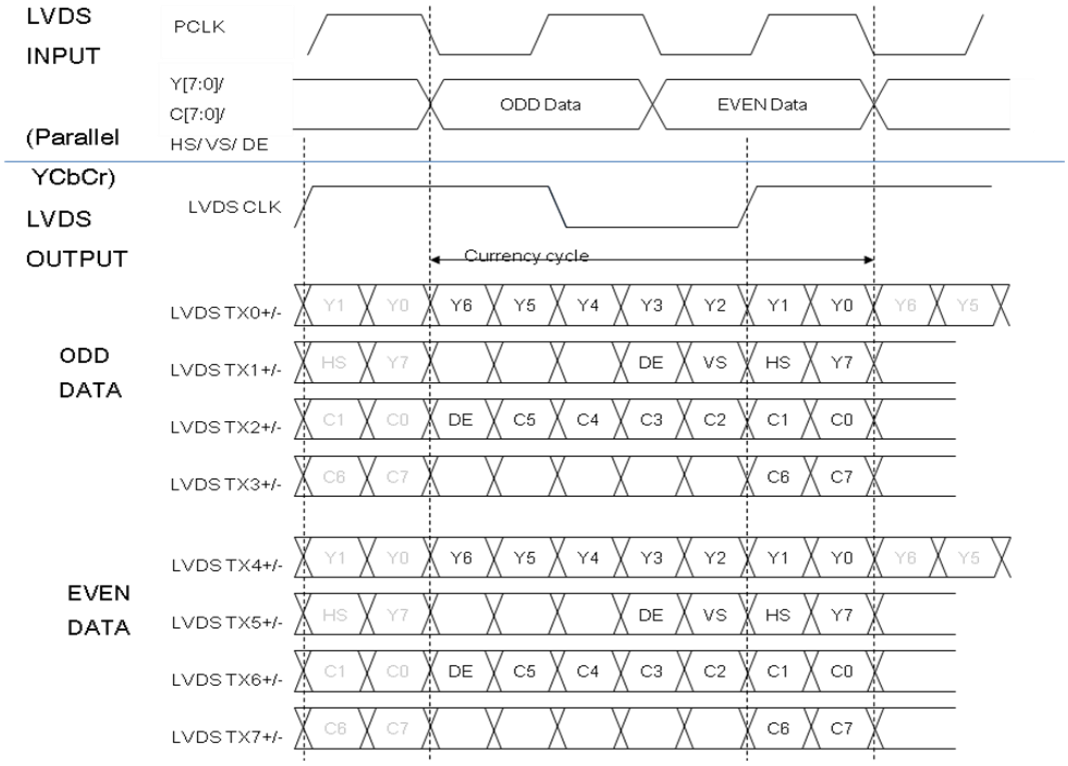
LVDS Single/Dual Output

LVDS Data Mapping

Single Mode (16bits)

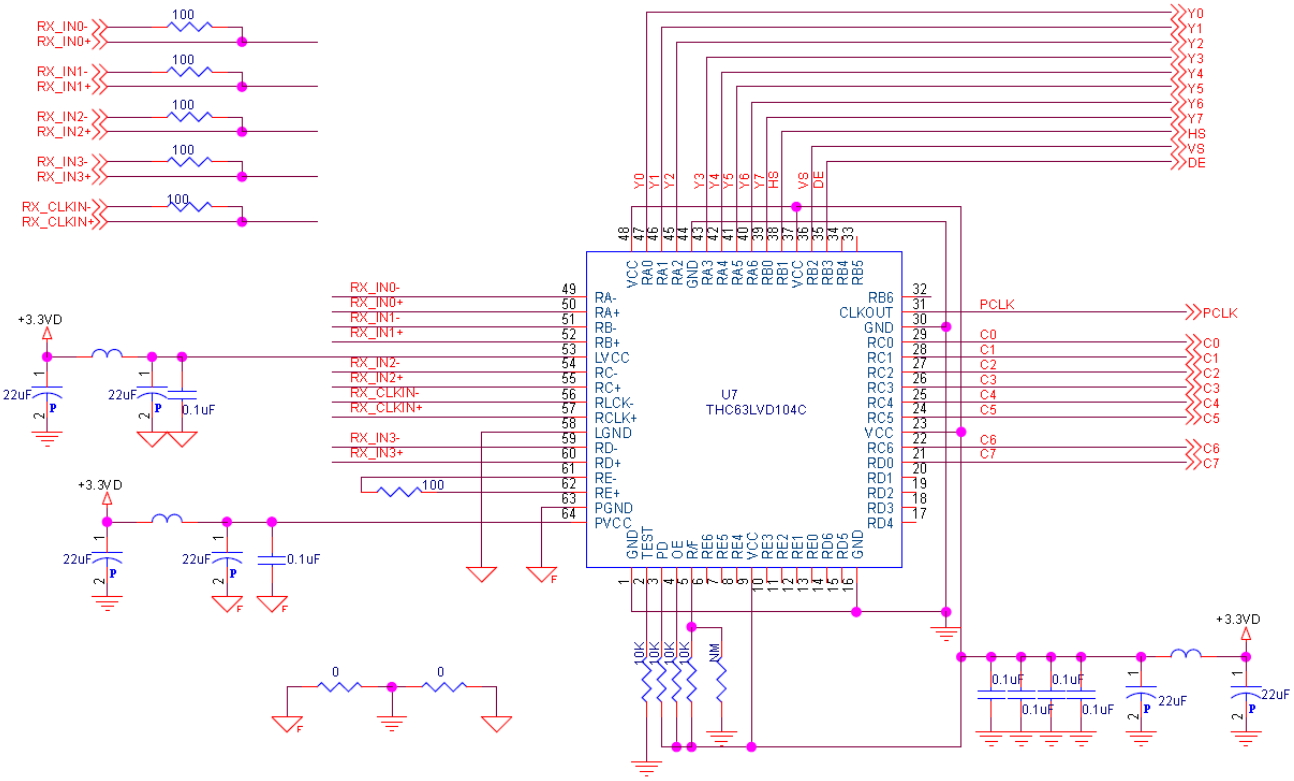


Dual Mode (16bits)

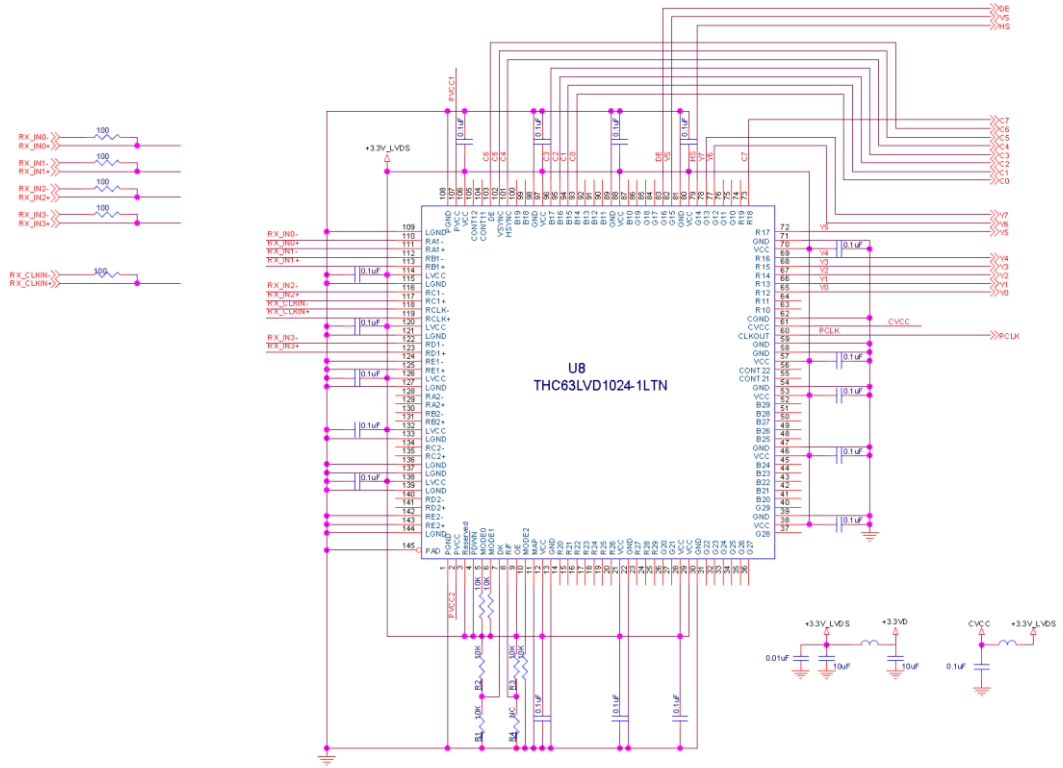


8.3. Application of recommended circuit Camera Reception

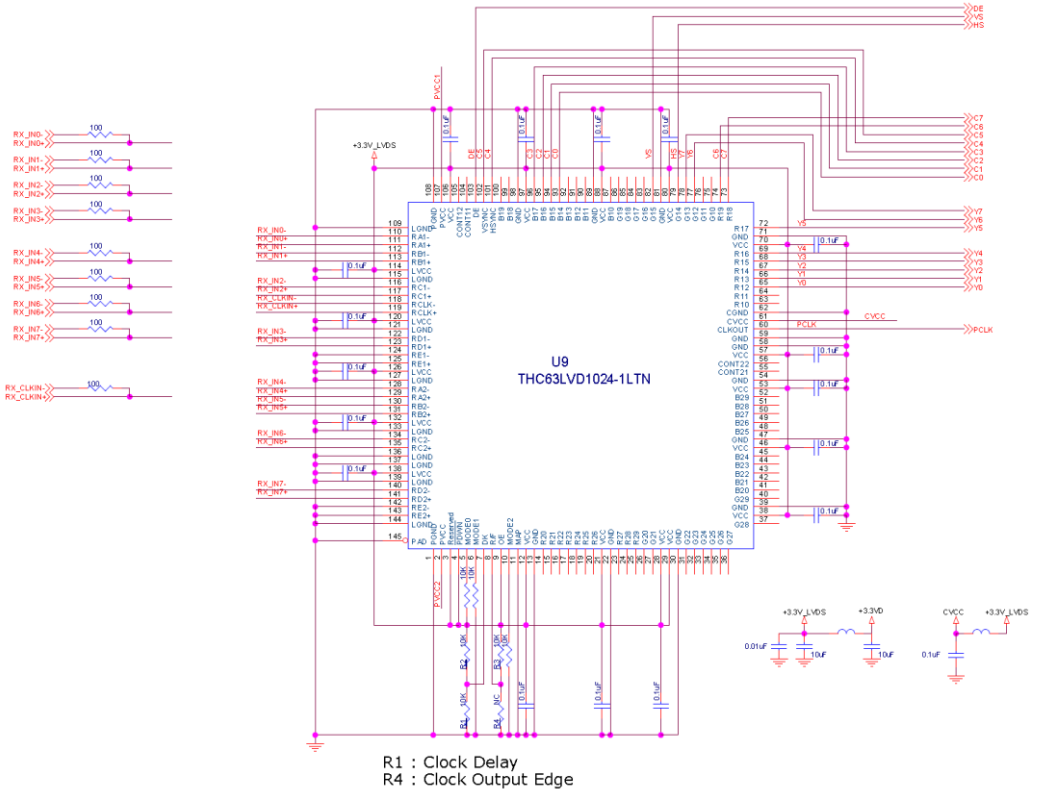
LVDS Rx(THC63LVD104C) circuit (Single Output Only)



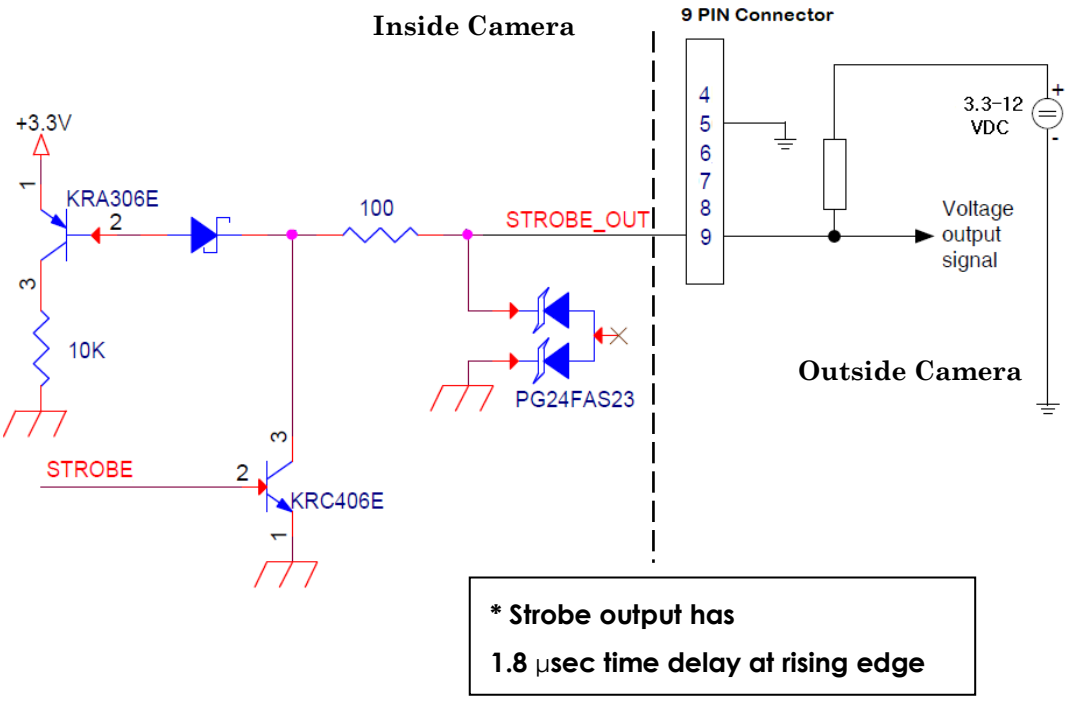
LVDS Rx(THC63LVD1024) circuit (Single output)

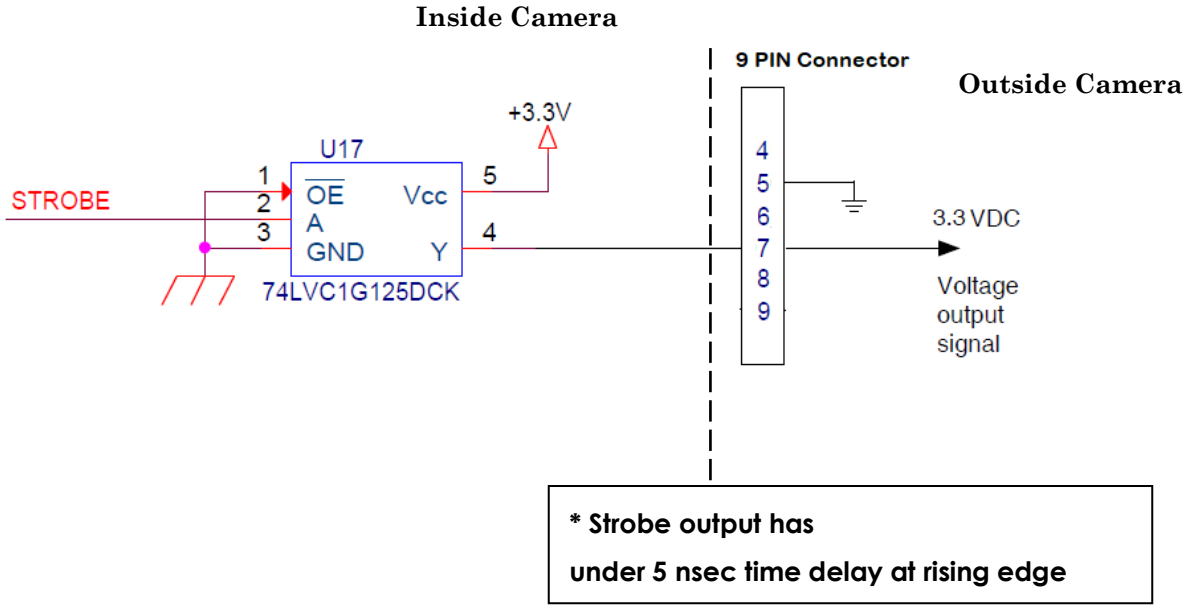


LVDS Rx(THC63LVD1024) circuit (Dual output)

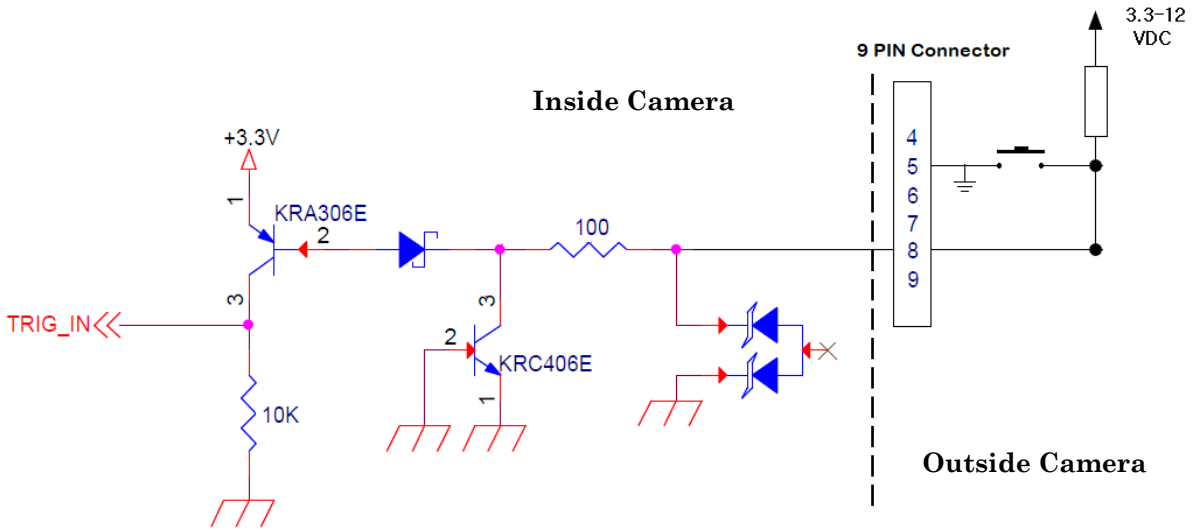


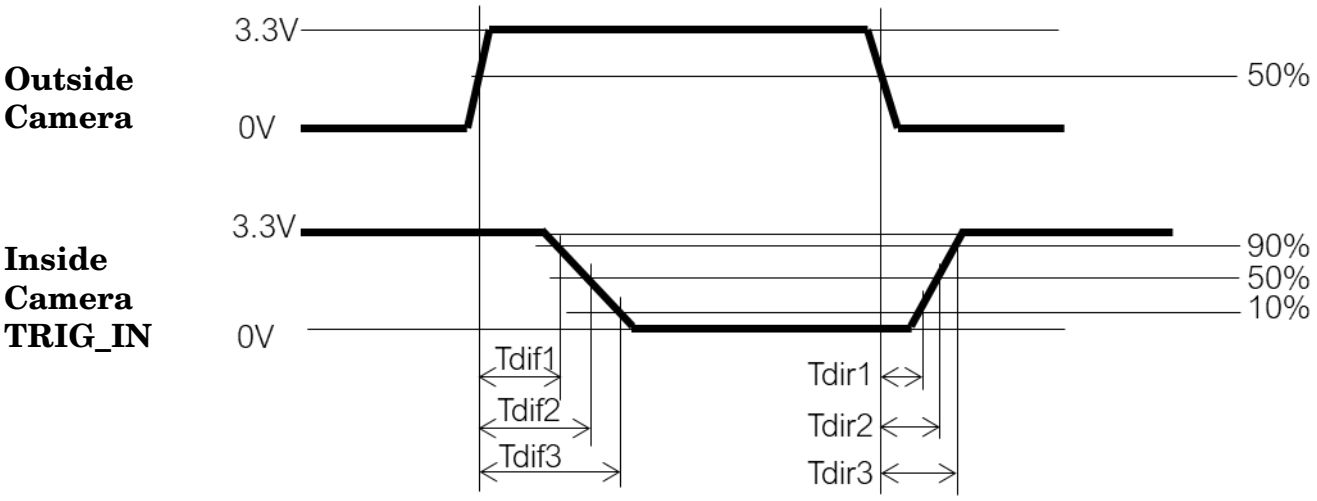
8.4. GPO circuit





8.5. GPI circuit

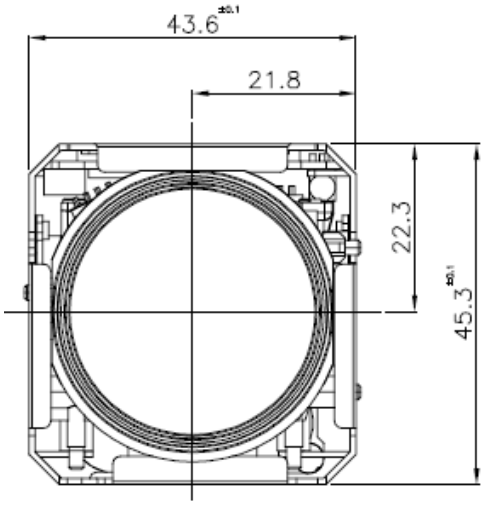




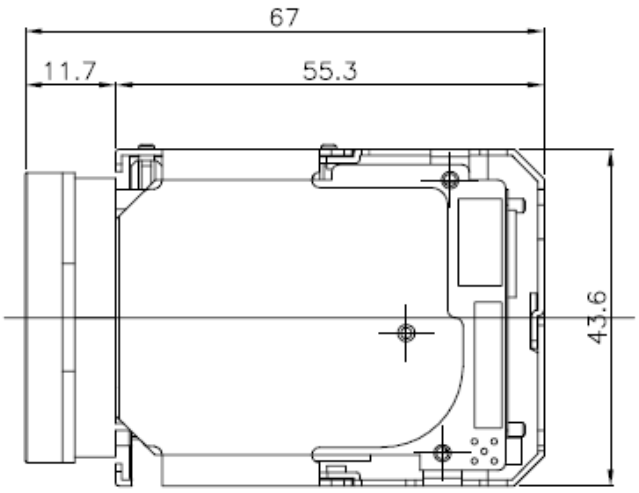
	Tdif1	Tdif2	Tdif3	Tdir1	Tdir2	Tdir3
Delay	3.14 µs	3.6 µs	4 µs	23 ns	39 ns	50 ns

9. Dimensions

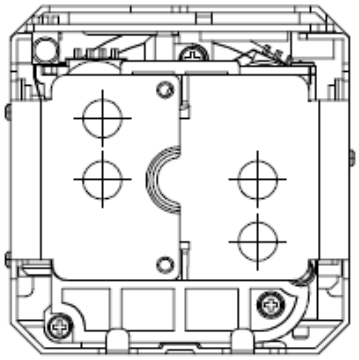
Front



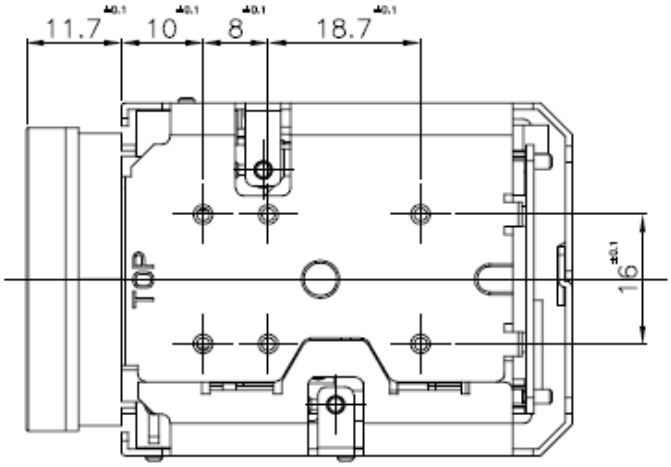
Top



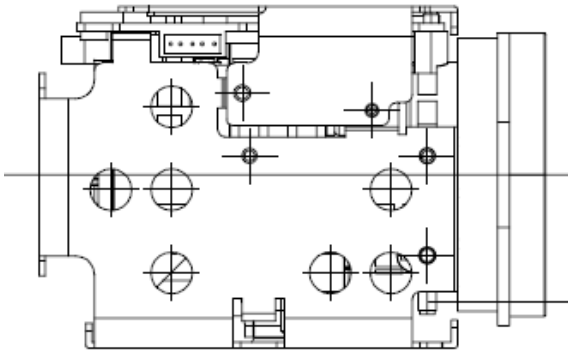
Back



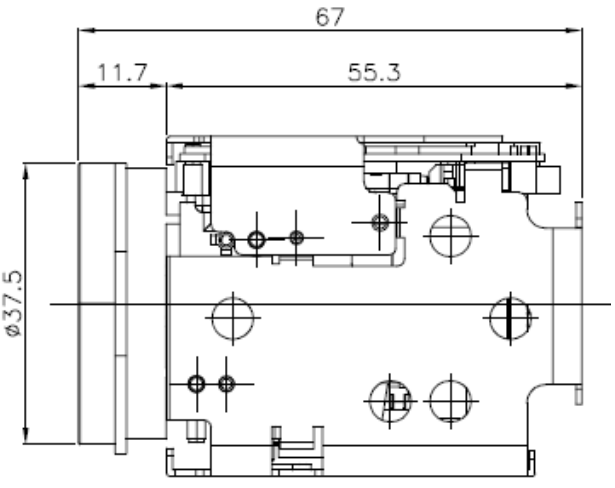
Bottom



Left



Right



10. APPENDIX A

VISCA Protocol

Specification: 9600/ 19200/ 38400/ 115200bps, 8bit data, 1stop bit, none parity

		Command Packet (3~ 16bytes)	Comments
Inquiry		8X QQ RR ... FF	8X: 0x80+ camera address X = 1 to 7 :camera address QQ: 01-Command/ 09-Inquiry RR: Category 00(Interface) 04(cam1) 06(Pan/Tilt) 07(cam2) FF: Terminator (0xff)

		Reply Packet	
Completion message	ACK	X0 4Y FF	X = 9 to F: Camera address + 8
	Completion (commands)	X0 5Y FF	Y: socket number
	Completion (Inquiries)	X0 5Y ... FF	

		Reply Packet	
Error message	Error	X0 6Y 01 FF	Message length error (>14 bytes)
		X0 6Y 02 FF	Syntax Error
		X0 6Y 03 FF	Command buffer full
		X0 6Y 04 FF	Command cancelled
		X0 6Y 05 FF	No socket (to be cancelled)
		X0 6Y 41 FF	Command not executable
			X = 9 to F: Camera address + 8, Y = socket number

Command execution cancel	cancel	8X 2Y FF	X = 1 to 7: Camera address, Y = socket number

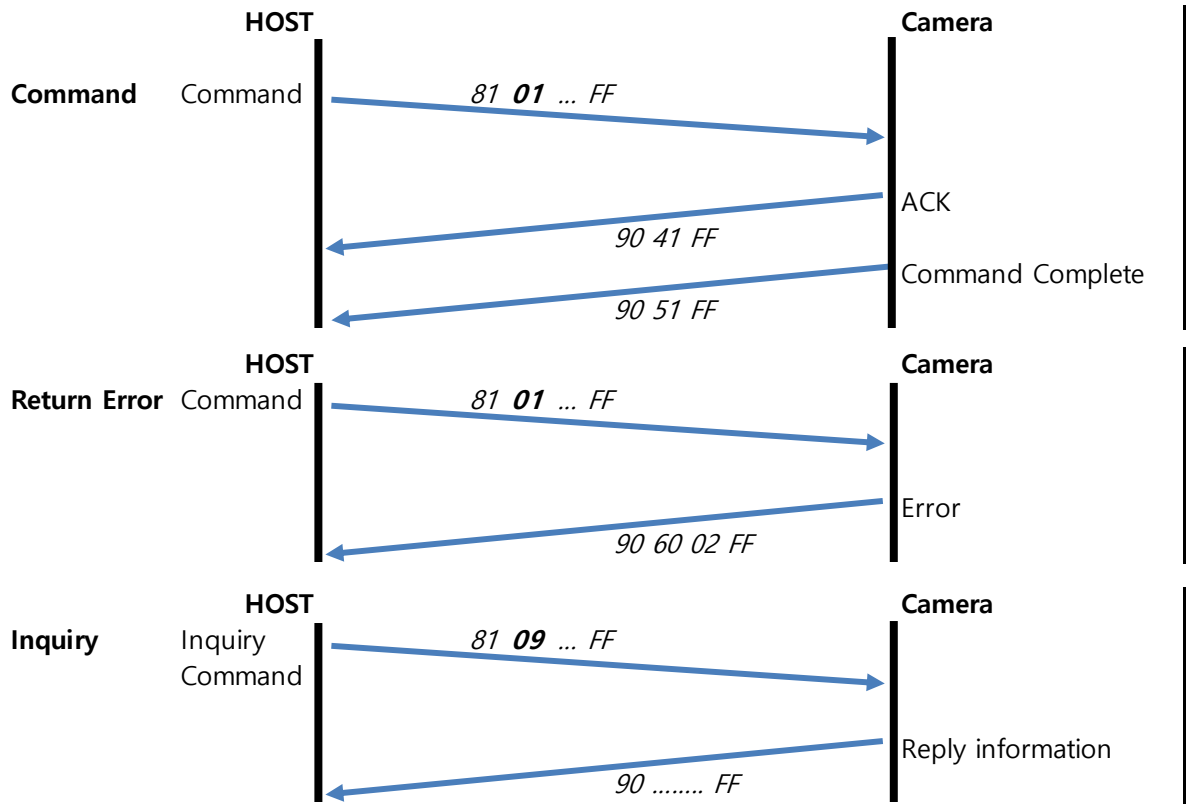
Network Change Address	Address Network Change	88 30 01 FF . X0 38 FF	Always broadcasted X = 9 to F: Camera address + 8

	Command Packet	Reply Packet
IF_Clear	8X 01 00 01FF	X0 50 FF
IF_Clear (broadcast)	88 01 00 01 FF	88 01 00 01 FF

	Inquiry Packet	Reply Packet	
CAM_VersionInq	8X 09 00 02 FF	Y0 50 GG GG HH HH JJ JJ KK FF	GGGG = 002B: Vender ID HHHH = Model ID 1023: x10 FullHD Global Shutter CMOS module JJJJ = ROM revision KK = Maximum socket #(02) X = 1 to 7: camera address Y = 9 to F: camera address + 8

	Implemented Command
	not Implemented Command

Command example



Command Set

Command Set	Command	Packet	Comments
AddressSet	Broadcast	88 30 01 FF	Address setting
IF_Clear	Broadcast	88 01 00 01 FF	I/F Clear
CAM_Power	On	8x 01 04 00 02 FF	Power ON Always On
CAM_Zoom	Stop	8x 01 04 07 00 FF	
	Tele (Standard)	8x 01 04 07 02 FF	
	Wide (Standard)	8x 01 04 07 03 FF	
	Tele (Variable) Wide (Variable)	8x 01 04 07 2p FF 8x 01 04 07 3p FF	p=0 (Low) to 7 (High)
	Direct (AF Zoom)	8x 01 04 47 0p 0q 0r 0s FF	pqrs: Zoom Position (refer Table) Auto Focusing during Zooming
	Direct (Non AF Zoom)	8x 01 04 45 0p 0q 0r 0s FF	pqrs: Zoom Position (refer Table) Non AF during Zooming
	Direct (AF Zoom) variable	8x 01 04 47 0n 0p 0q 0r 0s FF	n: zoom speed 0(low) to 7(high) pqrs: Zoom Position (refer Table) Auto Focusing during Zooming
CAM_DZoom	On Off	8x 01 04 06 02 FF 8x 01 04 06 03 FF	Digital zoom ON/OFF
	Combine Mode	8x 01 04 36 00 FF	Optical/Digital Zoom Combined
	Separate Mode	8x 01 04 36 01 FF	Optical/Digital Zoom Separate
	Stop	8x 01 04 06 00 FF	
	Tele (Variable)	8x 01 04 06 2p FF	p=0 (Low) to 7 (High)
	Wide (Variable)	8x 01 04 06 3p FF	* Enabled during Separate Mode
	x1/Max	8x 01 04 06 10 FF	x1/MAX Magnification Switchover * Enabled during Separate Mode
	Direct	8x 01 04 46 0p 0q 0r 0s FF	pq: D-Zoom Position * Enabled during Separate Mode

Command Set

Command Set	Command	Packet	Comments
CAM_Focus	Stop	8x 01 04 08 00 FF	
	Far (Standard)	8x 01 04 08 02 FF	
	Near (Standard)	8x 01 04 08 03 FF	
	Far (Variable)	8x 01 04 08 2p FF	p=0 (Low) to 7 (High)
	Near (Variable)	8x 01 04 08 3p FF	
	Direct	8x 01 04 48 0p 0q 0r 0s FF	pqrs: Focus Position (0x1000 - 0xC000)
	Auto Focus	8x 01 04 38 02 FF	AF ON/OFF
	Manual Focus	8x 01 04 38 03 FF	
	Auto/Manual	8x 01 04 38 10 FF	
	One Push Trigger	8x 01 04 18 01 FF	One Push AF Trigger
	Near Limit	8x 01 04 28 0p 0q 0r 0s FF	pqrs: Focus Near Limit Position
AF Sensitivity	Normal	8x 01 04 58 02 FF	AF Sensitivity High/Low
	Low	8x 01 04 58 03 FF	
CAM_AFMode	Normal AF	8x 01 04 57 00 FF	AF Movement Mode
	Interval AF	8x 01 04 57 01 FF	
	Zoom Trigger AF	8x 01 04 57 02 FF	
	Active/Interval Time	8x 01 04 27 0p 0q 0r 0s FF	pq: Movement Time, rs: Interval
CAM_SpotFocus	On	8x 01 05 08 02 FF	
	Off	8x 01 05 08 03 FF	
	Position	8x 01 05 68 0p 0q 0r 0s FF	pq: X (0h to 27h) rs: Y (0h to 19h)
	Size	8x 01 05 78 0p 0q 0r 0s FF	pq: width (0h to 18h) rs: height (0h to 10h)
CAM_IRCorrection	Standard	8x 01 04 11 00 FF	FOCUS IR compensation data switching
	IR Light	8x 01 04 11 01 FF	
CAM_ZoomFocus	Direct	8x 01 04 47 0p 0q 0r 0s 0t 0u 0v 0w FF	pqrs: Zoom Position (refer Table) tuvw: Focus Position
CAM_ZoomFocus variable	Direct	8x 01 04 47 0n 0p 0q 0r 0s 0t 0u 0v 0w FF	n: zoom speed 0(low) to 7(high) pqrs: Zoom Position (refer Table) tuvw: Focus Position
CAM_Initialize	Lens	8x 01 04 19 01 FF	Lens Initialization Start
	Camera	8x 01 04 19 03 FF	Camera reset
	Factory Reset	8x 01 04 19 10 FF	Factory reset (without Resolution, BaudRate, LVDSmode)

Command Set

Command Set	Command	Packet	Comments
CAM_WB	Auto	8x 01 04 35 00 FF	Normal Auto
	Indoor	8x 01 04 35 01 FF	Indoor mode
	Outdoor	8x 01 04 35 02 FF	Outdoor mode
	One Push WB	8x 01 04 35 03 FF	One Push WB mode
	ATW	8x 01 04 35 04 FF	Auto Tracing White Balance
	Manual	8x 01 04 35 05 FF	Manual Control mode
	One Push Trigger	8x 01 04 10 05 FF	One Push WB Trigger
CAM_RGain	Reset	8x 01 04 03 00 FF	Manual Control of R Gain
	Up	8x 01 04 03 02 FF	
	Down	8x 01 04 03 03 FF	
	Direct	8x 01 04 43 00 00 0p 0q FF	pq: R Gain (0 to 0xFF)
CAM_BGain	Reset	8x 01 04 04 00 FF	Manual Control of B Gain
	Up	8x 01 04 04 02 FF	
	Down	8x 01 04 04 03 FF	
	Direct	8x 01 04 44 00 00 0p 0q FF	pq: B Gain (0 to 0xFF)
CAM_AE	Full Auto	8x 01 04 39 00 FF	Automatic Exposure mode
	Manual	8x 01 04 39 03 FF	Manual Control mode
	Shutter Priority	8x 01 04 39 0A FF	Shutter Priority Automatic Exposure mode
	Iris Priority	8x 01 04 39 0B FF	Iris Priority Automatic Exposure mode
	Bright	8x 01 04 39 0D FF	Bright Mode (Manual control)
CAM_AutoSlow Shutter	On	8x 01 04 5A 02 FF	Auto Slow Shutter ON/OFF
	Off	8x 01 04 5A 03 FF	
CAM_Shutter	Reset	8x 01 04 0A 00 FF	Shutter Setting
	Up	8x 01 04 0A 02 FF	
	Down	8x 01 04 0A 03 FF	
	Direct	8x 01 04 4A 00 00 0p 0q FF	pq: Shutter Position (refer Table)
CAM_Iris	Reset	8x 01 04 0B 00 FF	Iris Setting
	Up	8x 01 04 0B 02 FF	
	Down	8x 01 04 0B 03 FF	
	Direct	8x 01 04 4B 00 00 0p 0q FF	pq: Iris Position (0 to 0x11) (refer Table)

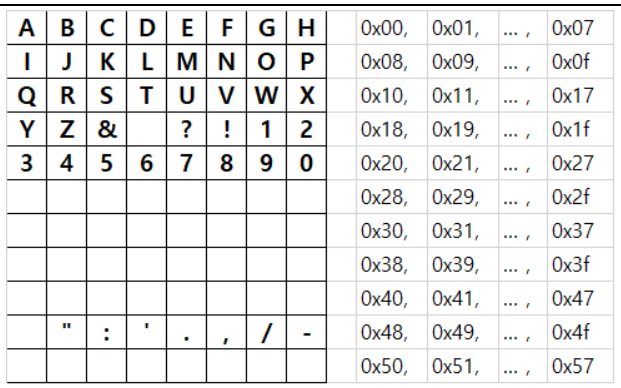
Command Set

Command Set	Command	Packet	Comments
CAM_Gain	Reset	8x 01 04 0C 00 FF	Gain Setting
	Up	8x 01 04 0C 02 FF	
	Down	8x 01 04 0C 03 FF	
	Direct	8x 01 04 4C 00 00 0p 0q FF	pq: Gain Position (1 to 0x17) (refer Table)
	Gain Limit	8x 01 04 2C pp FF	pp: Gain Position (1 to 0x17) (refer Table)
CAM_Bright	Reset	8x 01 04 0D 00 FF	Bright Setting
	Up	8x 01 04 0D 02 FF	
	Down	8x 01 04 0D 03 FF	
	Direct	8x 01 04 4D 00 00 0p 0q FF	pq: Bright Position (refer Table)
CAM_ExpComp	On	8x 01 04 3E 02 FF	Exposure Compensation ON/OFF
	Off	8x 01 04 3E 03 FF	
	Reset	8x 01 04 0E 00 FF	Exposure Compensation Amount Setting
	Up	8x 01 04 0E 02 FF	
	Down	8x 01 04 0E 03 FF	
	Direct	8x 01 04 4E 00 00 0p 0q FF	pq: ExpComp Position (0 to 0x0E)
CAM_BackLight	On	8x 01 04 33 02 FF	Back Light Compensation ON/OFF
	Off	8x 01 04 33 03 FF	
CAM_SpotAE	On	8x 01 04 59 02 FF	Spot Automatic Exposure Setting
	Off	8x 01 04 59 03 FF	
	Position	8x 01 04 29 0p 0q 0r 0s FF	pq: X (0 to F), rs: Y (0 to F)
CAM_AEResponse	Direct	8x 01 04 5D pp FF	pp: Automatic Exposure Response Setting (01 to 30)
CAM_VE	On	8x 01 04 3D 06 FF	VE ON/OFF
	Off	8x 01 04 3D 03 FF	
	Set Parameter	8x 01 04 2D 00 0q 0r 0s 00 00 00 00 FF	q: Display brightness level(0:Dark to 6:Bright) r: Brightness compensation selection (0: Very dark 1: Dark 2: Standard 3: Bright) s: Compensation level (0: L 1: M 2: H)
CAM_Aperture	Reset	8x 01 04 02 00 FF	Aperture Control
	Up	8x 01 04 02 02 FF	
	Down	8x 01 04 02 03 FF	
	Direct	8x 01 04 42 00 00 0p 0q FF	pq: Aperture Gain (0 to 0x14) (refer Table)
CAM_HR	On	8x 01 04 52 02 FF	High-Resolution Mode ON/OFF
	Off	8x 01 04 52 03 FF	

Command Set

Command Set	Command	Packet	Comments
CAM_NR	Noise Reduction	8x 01 04 53 0p FF	p: NR Setting (0:OFF 1:Low ~ 5:High)
	2D/3D NR Independent setting	8x 01 05 53 0p 0q FF	p: 2DNR level (0: OFF, 1 to 5: level 1 to 5) q: 3DNR level (0: OFF, 1 to 5: level 1 to 5)
CAM_Gamma		8x 01 04 5B 0p FF	p: Gamma setting (0~9) 0: Standard 1:Straight
	Offset	8x 01 04 1E 00 00 00 0s 0t 0u FF	s: Polarity offset (0 is plus, 1 is minus) tu: Offset s=0 (00h to 40h) Offset s=1 (00h to 40h)
CAM_LR_Reverse	On	8x 01 04 61 02 FF	Mirror Image ON/OFF
	Off	8x 01 04 61 03 FF	
CAM_Freeze	On	8x 01 04 62 02 FF	Still Image ON/OFF
	Off	8x 01 04 62 03 FF	
CAM_PictureEffect	Off	8x 01 04 63 00 FF	Picture Effect Setting
	Neg.Art	8x 01 04 63 02 FF	
	B&W	8x 01 04 63 04 FF	
CAM_Defog	On	8x 01 04 37 02 0p FF	p:Defog level (0:auto, 1:low, 2:mid, 3:high)
	Off	8x 01 04 37 03 00 FF	
CAM_PictureFlip	On	8x 01 04 66 02 FF	Picture flip ON/OFF
	Off	8x 01 04 66 03 FF	
CAM_ICR	On	8x 01 04 01 02 FF	Infrared Mode ON/OFF
	Off	8x 01 04 01 03 FF	
CAM_AutoICR	On	8x 01 04 51 02 FF	Auto dark-field mode On/Off
	Off	8x 01 04 51 03 FF	
	Threshold	8x 01 04 21 00 00 0p 0q FF	pq: ICR On/Off Threshold Level(0 to 0x14)
CAM_AutoICR AlarmReply	On	8x 01 04 31 02 FF	Auto ICR switching Alarm ON/OFF
	Off	8x 01 04 31 03 FF	
	(Reply)	y0 07 04 31 02 FF	ICR OFF -> ON
		y0 07 04 31 03 FF	ICR ON -> OFF
CAM_Stabilizer	On	8x 01 04 34 02 FF	Stabilizer ON/OFF/HOLD
	Off	8x 01 04 34 03 FF	
	Hold	8x 01 04 34 00 FF	
CAM_Memory (Preset pos)	Reset	8x 01 04 3F 00 0p FF	p: Memory Number (=0 to 6)
	Set	8x 01 04 3F 01 0p FF	
	Recall	8x 01 04 3F 02 0p FF	

Command Set

Command Set	Command	Packet	Comments
CAM_CUSTOM	Reset	8x 01 04 3F 00 7F FF	Starts up in this mode when the power is turned on.
	Set	8x 01 04 3F 01 7F FF	
	Recall	8x 01 04 3F 02 7F FF	
CAM_MemSave	Write	8x 01 04 23 0X 0p 0q 0r 0s FF	X: 00 to 07 (Address), total 16 byte pqrs: 0x0000 to 0xFFFF (Data)
CAM_Display	On	8x 01 04 15 02 FF	Display ON/OFF
	Off	8x 01 04 15 03 FF	
	On/Off	8x 01 04 15 10 FF	
CAM_MultiLineTitle	Title Set1	8x 01 04 73 1L 00 nn pp qq 00 00 00 00 00 00 FF	L: Line Number 0~0xA nn: H-position 0~0x1F pp: Color 0:WHT 1:YEL 2:MAG 3:RED qq: Blink 0:Not blink 1:Blinks
	Title Set2	8x 01 04 73 2L mm nn pp qq rr ss tt uu vv ww FF	L: Line Number, mnpqrstuvw: Setting of characters (1 to 10)
	Title Set3	8x 01 04 73 3L mm nn pp qq rr ss tt uu vv ww FF	L: Line Number, mnpqrstuvw: Setting of characters (11 to 20)
			
	Title Clear	8x 01 04 74 1p FF	Title Setting clear (p: 0 to a, f= all lines)
	On	8x 01 04 74 2p FF	Title display On/Off (0 to a, f= all lines)
	Off	8x 01 04 74 3p FF	
CAM_Mute	On	8x 01 04 75 02 FF	Muting ON/OFF
	Off	8x 01 04 75 03 FF	
	On/Off	8x 01 04 75 10 FF	

Command Set

Command Set	Command	Packet	Comments
CAM_PrivacyZone	SetMask	8x 01 04 76 mm nn 0r 0r 0s 0s FF	mm: Mask Settings nn: 00-Modify, 01-New rr: W ss: H
	Display	8x 01 04 77 pp pp pp pp FF	Mask Display ON/OFF pp pp pp pp: Mask Settings (0: OFF, 1: ON)
	SetMaskColor	8x 01 04 78 pp pp pp pp qq rr FF	pp pp pp pp: Mask Color Settings qq: Color Setting when 0 is selected rr: Color Setting when 1 is selected
	SetPanTiltAngle	8x 01 04 79 0p 0p 0p 0q 0q 0q FF	Pan/Tilt Angle Settings ppp: Pan 0~4095(0xFFF) 360/4096 Resolution qqq: Tilt 0~4095(0xFFF) 360/4096 Resolution
	SetPTZMask	8x 01 04 7B mm 0p 0p 0p 0q 0q 0q 0r 0r 0r 0r FF	Pan/Tilt/Zoom Settings for Mask ppp: Pan 0~0xFFF qqq: Tilt 0~0xFFF rrrr: Zoom pos 0~0x4000
	Non_InterlockMask	8x 01 04 6F mm 0p 0p 0q 0q 0r 0r 0s 0s FF	mm: Non_Interlock Mask Settings pp: X, q: Y, rr: W, ss: H
CAM_IDWrite		8x 01 04 22 0p 0q 0r 0s FF	pqrs: Camera ID (=0000 to FFFF)
CAM_MD	On	8x 01 04 1B 02 FF	Motion Detection On/Off
	Off	8x 01 04 1B 03 FF	
	Function Set	8x 01 04 1C 0m 0n 0p 0q 0r 0s FF	m: Display mode 0-Off 1-On n: Detection Frame Set bit0-Frame0 bit1-Frame1 bit2-Frame2 bit3-Frame3 pq: Threshold Level (00 to 0x14) *rs: Interval Time set (00 to 0xF)*
	Window Set	8x 01 04 1D 0m pp qq rr ss FF	m: Select Detection Frame (0, 1, 2, 3) pp: Start Horizontal Position (00 to 0x3C) qq: Start Vertical Position (00 to 0x28) rr: Stop Horizontal Position (01 to 0x3C) ss: Stop Vertical Position (01 to 0x28)
	Alarm (Reply)	y0 07 04 1B 0p FF	p: Detection Frame Number

Command Set

Command Set	Command	Packet	Comments
CAM_Continuous ZoomPosReply	On Off (Reply)	8x 01 04 69 02 FF 8x 01 04 69 03 FF y0 07 04 69 0p 0p 0q 0q 0q 0q FF	ZoomPosition data Continuous Output On/Off pp: D-Zoom Position * 00: When Zoom Mode is Combine qqqq: Zoom Position
CAM_ZoomPosReplyIntervalTimeSet		8x 01 04 6A 00 00 0p 0p FF	pp: Interval Time [Vertical timing]
CAM_Continuous FocusPosReply	On Off (Reply)	8x 01 04 16 02 FF 8x 01 04 16 03 FF y0 07 04 16 00 00 0p 0p 0p 0p FF	FocusPosition data Continuous Output On/Off pppp: Focus Position
CAM_FosPosReply IntervalTimeSet		8x 01 04 6A 00 00 0p 0p FF	pp: Interval Time [Vertical timing]
CAM_Register Value		8x 01 04 24 mm 0p 0p FF	mm: Register No. (=00-7F) pp: Register Value (=00-7F)
CAM_ ChromaSuppress		8x 01 04 5F pp FF	pp: Chroma Suppress setting level 00: OFF, 1 to 3: ON (3 levels). Effect increases as the level number increases.
CAM_ColorGain	Direct	8x 01 04 49 00 00 00 0p FF	p: Color Gain setting 0h (60%) to Eh (200%)
CAM_ColorHue	Direct	8x 01 04 4F 00 00 00 0p FF	p: Color Hue setting 0h (− 14 dgrees) ~ Eh (+14 degrees)
CAM_GammaOffset	Direct	8x 01 04 1E 00 00 00 0s 0t 0u FF	s: Polarity offset (0 is plus 1 is minus) tu: Offset s=0 (00h to 40h) Offset s=1 (00h to 10h)
CAM_HLC		8x 01 04 14 0p 0q FF	p: HLC level (0: OFF, 1: ON) q: HLC mask level (0 to F: from low to high level)
CAM_Menu		8x 01 06 06 pp FF	pp: 2-ON 3-OFF 0-BACK 11-UP 12-DOWN 14-LEFT 18-RIGHT
CAM_ExColorGain	Direct	8x 01 04 1F 49 00 0r 0p 0q FF	Color Gain Setting r: Color 0:All, 1:Magenta, 2:Red, 3:Yellow, 4:Green, 5:Cyan, 6:Blue pq: Color Gain setting level pq=00h (0%) to FFh (200%)
CAM_Contrast	Direct	8x 01 7E 04 51 0p 0q FF	pq: 00 - 14h

Command Set

Command Set	Command	Packet	Comments
CAM_ExColorHue	Direct	8x 01 04 1F 4F 00 0r 0p 0q FF	Color Hue Setting r: Color 0:All, 1:Magenta, 2:Red, 3:Yellow, 4:Green, 5:Cyan, 6:Blue pq: Color Phase setting level pq=00h (-14 degrees) to FFh (14 degrees)
CAM_ExExpComp	Reset	8x 01 04 1F 0E 00 00 FF	Exposure compensation reset
	Up	8x 01 04 1F 0E 02 pp FF	Exposure compensation up pp: Step number (0.19dB/step) pp=00h to 7Fh (However 00h is the same operation as 01h.)
	Down	8x 01 04 1F 0E 03 pp FF	Exposure compensation down pp: Step number (0.13dB/step) pp=00h to 7Fh (However 00h is the same operation as 01h.)
	Direct	8x 01 04 1F 4E 00 00 0p 0q FF	Set the exposure compensation to the specified level pq: Level pq=00h(-24dB) to 80h(+0dB) to FFh(+16dB)
CAM_ExGain	Reset	8x 01 04 1F 0C 00 00 FF	Gain Setting
	Up	8x 01 04 1F 0C 02 pp FF	pp: Step number
	Down	8x 01 04 1F 0C 03 pp FF	pp: Step number
	Direct	8x 01 04 1F 4C 00 00 0p 0q FF	pq: Gain Position (0.2dB/step)
	Gain Limit	8x 01 04 1F 2C 00 00 0p 0q FF	pq: Gain limit 1 ~DCh(220) (0.2dB/step)
CAM_ExIris	Reset	8x 01 04 1F 0B 00 00 FF	IRIS Setting
	Up	8x 01 04 1F 0B 02 pp FF	pp: Step number
	Down	8x 01 04 1F 0B 03 pp FF	pp: Step number
	Direct	8x 01 04 1F 4B 00 00 0p 0q FF	pq: IRIS Position 00h(MIN) to FFh(Max)
CAM_ExAperture	Reset	8x 01 04 1F 02 00 00 FF	Aperture control reset
	Up	8x 01 04 1F 02 02 pp FF	Aperture control up pp: Step number pp=00h to 7Fh (However 00h is the same operation as 01h.)
	Down	8x 01 04 1F 02 03 pp FF	Aperture control down pp: Step number pp=00h to 7Fh (However 00h is the same operation as 01h.)
	Direct	8x 01 04 1F 42 00 00 0p 0q FF	Set the aperture control to the specified level pq=00h to FFh Level

Command Set

Command Set	Command	Packet	Comments
Color Matrix	RED	8x 01 7E 01 7A 0p 0p FF	pp: 00 (–99) - 63 (00) - C6 (+99)
	MAGENTA	8x 01 7E 01 7B 0p 0p FF	pp: 00 (–99) - 63 (00) - C6 (+99)
	GREEN	8x 01 7E 01 7C 0p 0p FF	pp: 00 (–99) - 63 (00) - C6 (+99)
	YELLOW	8x 01 7E 01 7D 0p 0p FF	pp: 00 (–99) - 63 (00) - C6 (+99)
	BLUE	8x 01 7E 01 7E 0p 0p FF	pp: 00 (–99) - 63 (00) - C6 (+99)
	CYAN	8x 01 7E 01 7F 0p 0p FF	pp: 00 (–99) - 63 (00) - C6 (+99)
Color Gain	RED	8x 01 7E 01 8A 0p 0p FF	pp: 00 (-32) - 20h (00) - 40h (+32)
	MAGENTA	8x 01 7E 01 8B 0p 0p FF	pp: 00 (-32) - 20h (00) - 40h (+32)
	GREEN	8x 01 7E 01 8C 0p 0p FF	pp: 00 (-32) - 20h (00) - 40h (+32)
	YELLOW	8x 01 7E 01 8D 0p 0p FF	pp: 00 (-32) - 20h (00) - 40h (+32)
	BLUE	8x 01 7E 01 8E 0p 0p FF	pp: 00 (-32) - 20h (00) - 40h (+32)
	CYAN	8x 01 7E 01 8F 0p 0p FF	pp: 00 (-32) - 20h (00) - 40h (+32)
Color Matrix save	Reset	8x 01 7E 01 70 00 FF	Reset Color matrix, gain
	Set	8x 01 7E 01 70 02 FF	Save current Color matrix, gain

Register Set

Command Set	Command	Packet	Comments
BaudRate		8x 01 04 24 00 00 0p FF	p: 0-9600 1-19200 2-38400 3-115200
Monitoring Mode		8x 01 04 24 72 0p 0p FF	pp: 1-1080i@59.94 2-1080i@60 3- 4-1080i@50 5- 6-1080p@29.97 7-1080p@30 8-1080p@25 9-720p@59.94 A-720p@60 B- C-720p@50 D- E-720p@29.97 F-720p@30 10- 11-720p@25 12- 13-1080p@59.94 14-1080p@50 15-1080p@60
LVDS Mode		8x 01 04 24 74 00 0p FF	p: 0-LVDS Single output 1-Dual Output
Wide limit		8x 01 04 24 50 0p 0p FF	pp: 0~FF refer Table
Tele limit		8x 01 04 24 51 0p 0p FF	pp: 0~FF refer Table
D-Zoom Max		8x 01 04 24 52 0p 0p FF	pp: Max D-zoom ratio = 256/ (256-pp)
Auto Slow Shutter Limit		8x 01 04 24 59 00 0p FF	p: 1-1/30 2-1/15 3-1/8 4-1/4 5-1/2 6-1/1
AF_InOutdoor		8x 01 04 24 4B 00 0p FF	p: 0-AF Indoor Mode 1-AF Outdoor Mode

Inquiry Command

Inquiry Command	Command Packet	Inquiry Packet	Comments
CAM_PowerInq	8x 09 04 00 FF	y0 50 02 FF	On (Always On)
CAM_ZoomPosInq	8x 09 04 47 FF	y0 50 0p 0q 0r 0s FF	pqrs: Zoom Position (refer Table)
CAM_DZoomModeInq	8x 09 04 06 FF	y0 50 02 FF	D-Zoom On
		y0 50 03 FF	D-Zoom Off
CAM_Dzoom C/SModeInq	8x 09 04 36 FF	y0 50 00 FF	Combine Mode
		y0 50 01 FF	Separate Mode
CAM_DZoomPosInq	8x 09 04 46 FF	y0 50 00 00 0p 0q FF	pq: D-Zoom Position
CAM_FocusModeInq	8x 09 04 38 FF	y0 50 02 FF	Auto Focus
		y0 50 03 FF	Manual Focus
CAM_FocusPosInq	8x 09 04 48 FF	y0 50 0p 0q 0r 0s FF	pqrs: Focus Position (0x1000 - 0xC000)
CAM_FocusNearLimitInq	8x 09 04 28 FF	y0 50 0p 0q 0r 0s FF	pqrs: Focus Near Limit Position
CAM_SpotFocusModeInq	8x 09 05 08 FF	y0 50 02 F	On
		y0 50 03 F	Off
CAM_AFSensitivityInq	8x 09 04 58 FF	y0 50 02 FF	AF Sensitivity Normal
		y0 50 03 FF	AF Sensitivity Low
CAM_AFModeInq	8x 09 04 57 FF	y0 50 00 FF	Normal AF
		y0 50 01 FF	Interval AF
		y0 50 02 FF	Zoom Trigger AF
CAM_AFTimeSettingInq	8x 09 04 27 FF	y0 50 0p 0q 0r 0s FF	pq: Movement Time rs: Interval Time
CAM_IRCorrectionInq	8x 09 04 11 FF	y0 50 02 FF	Standard
		y0 50 03 FF	IR Light
CAM_WBModeInq	8x 09 04 35 FF	y0 50 00 FF	Auto
		y0 50 01 FF	InDoor
		y0 50 02 FF	OutDoor
		y0 50 03 FF	One Push WB
		y0 50 04 FF	ATW
		y0 50 05 FF	Manual
CAM_RGainInq	8x 09 04 43 FF	y0 50 00 00 0p 0q FF	pq: R Gain
CAM_BGainInq	8x 09 04 44 FF	y0 50 00 00 0p 0q FF	pq: B Gain
CAM_AEModeInq	8x 09 04 39 FF	y0 50 00 FF	Full Auto
		y0 50 03 FF	Manual
		y0 50 0A FF	Shutter Priority
		y0 50 0B FF	Iris Priority
		y0 50 0D FF	Bright

Inquiry Command

Inquiry Command	Command Packet	Inquiry Packet	Comments
CAM_SlowShutterMode Inq	8x 09 04 5A FF	y0 50 02 FF y0 50 03 FF	Auto Manual
CAM_ShutterPosInq	8x 09 04 4A FF	y0 50 00 00 0p 0q FF	pq: Shutter Position
CAM_IrisPosInq	8x 09 04 4B FF	y0 50 00 00 0p 0q FF	pq: Iris Position
CAM_GainPosInq	8x 09 04 4C FF	y0 50 00 00 0p 0q FF	pq: Gain Position
CAM_GainLimitInq	8x 09 04 2C FF	y0 50 0p FF	p: Gain Limit
CAM_BrightPosInq	8x 09 04 4D FF	y0 50 00 00 0p 0q FF	pq: Bright Position
CAM_ExpCompMode Inq	8x 09 04 3E FF	y0 50 02 FF y0 50 03 FF	On Off
CAM_ExpCompPosInq	8x 09 04 4E FF	y0 50 00 00 0p 0q FF	pq: ExpComp Position
CAM_BackLightMode Inq	8x 09 04 33 FF	y0 50 02 FF y0 50 03 FF	On Off
CAM_SpotAEModeInq	8x 09 04 59 FF	y0 50 02 FF y0 50 03 FF	On Off
CAM_SpotAEPosInq	8x 09 04 29 FF	y0 50 0p 0q 0r 0s FF	pq: X position rs: Y position
CAM_AE_ResponseInq	8x 09 04 5D FF	y0 50 pp FF	pp: 01 to 0x20
CAM_WDModeInq	8x 09 04 3D FF	y0 50 06 FF y0 50 03 FF	VE On Off
CAM_WDParameter Inq	8x 09 04 2D FF	y0 50 0p 0p 0q 0r 0s 0t 0u 00 00 FF	q: Display brightness level (0: Dark to 6: Bright) r: Brightness compensation selection (0: Very dark,1: Dark, 2: Standard, 3: Bright) s: Compensation level (0: Low, 1: Mid, 2: High) tu: 0
CAM_DefogInq	8x 09 04 37 FF	y0 50 02 0p FF y0 50 03 00 FF	On p: Defog level(0:auto, 1:low, 2:mid, 3:high) Off
CAM_ApertureInq	8x 09 04 42 FF	y0 50 00 00 0p 0q FF	pq: Aperture Gain
CAM_HRModeInq	8x 09 04 52 FF	y0 50 02 FF y0 50 03 FF	On (Hi-Resolution) Off
CAM_NRModeInq	8x 09 04 53 FF	y0 50 0p FF	Noise Reduction p: (0: OFF, level 1 to 5)
CAM_NR2D3DInq	8x 09 05 53 FF	y0 50 0p 0q FF	p: 2D NR level (0: Off, 01 to 05: level 1 to 5) q: 3D NR level (0: Off, 01 to 05: level 1 to 5)
CAM_GammaInq	8x 09 04 5B FF	y0 50 0p FF	Gamma p: 0 to 9
CAM_GammaOffsetInq	8x 09 04 1E FF	y0 50 00 00 00 0s 0t 0u FF	s: Polarity offset (0 is plus, 1 is minus) tu: Offset s=0 (00h to 40h) Offset s=1 (00h to 10h)

Inquiry Command

Inquiry Command	Command Packet	Inquiry Packet	Comments
CAM_HighSensitivityInq	8x 09 04 5E FF	y0 50 02 FF	On
		y0 50 03 FF	Off
LR_ReverseModeInq	8x 09 04 61 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
FreezeModeInq	8x 09 04 62 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
PictureEffectModeInq	8x 09 04 63 FF	y0 50 00 FF	Off
		y0 50 02 FF	Neg.Art
		y0 50 04 FF	B&W
PictureFlipModeInq	8x 09 04 66 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
ICRModeInq	8x 09 04 01 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
AutoICRModeInq	8x 09 04 51 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
AutoICRThresholdInq	8x 09 04 21 FF	y0 50 00 00 0p 0q FF	pq: ICR ON - OFF Threshold Level
AutoICRAlarmReplyInq	8x 09 04 31 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
MemoryInq	8x 09 04 3F FF	y0 50 pp FF	pp: Memory number recalled last
MemSaveInq	8x 09 04 23 0X FF	y0 50 0p 0p 0q 0q FF	X: 00 to 07 (Address)
			ppqq: 0x0000 to 0xFFFF (Data)
DisplayModeInq	8x 09 04 15 FF	y0 50 02 FF	On
	(8x 09 06 06 FF)	y0 50 03 FF	Off
StabilizerModeInq	8x 09 04 34 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
		y0 50 00 FF	Hold
TitleDisplayModeInq	8x 09 04 74 FF	y0 50 02 FF	On
	(8x 09 06 06 FF)	y0 50 03 FF	Off
MuteModeInq	8x 09 04 75 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_IDInq	8x 09 04 22 FF	y0 50 0p 0q 0r 0s FF	pqrs: Camera ID
CAM_VersionInq	8x 09 00 02 FF	y0 50 gg gg mn pq rs tu vw FF	gggg: Vender ID (00bc)
			mnpq: Model Code
			rstu: ROM version
			vw: Socket Number (=02)

Inquiry Command

Inquiry Command	Command Packet	Inquiry Packet	Comments
PrivacyDisplayInq	8x 09 04 77 FF	y0 50 pp pp pp pp FF	pp pp pp pp: Mask Display (0:OFF, 1: ON)
PrivacyPanTiltInq	8x 09 04 79 FF	y0 50 0p 0p 0p 0q 0q 0q FF	ppp: Pan qqq: Tilt
PrivacyPTZInq	8x 09 04 7B mm FF	y0 50 0p 0p 0p 0q 0q 0q 0r 0r 0r FF	mm: Mask Settings ppp: Pan qqq: Tilt rrr: Zoom
PrivacyMonitorInq	8x 09 04 6F FF	y0 50 pp pp pp pp FF	pp pp pp pp: Mask is displayed now.
MDModeInq	8x 09 04 1B FF	y0 50 02 FF y0 50 03 FF	On Off
MDFunctionInq	8x 09 04 1C FF	y0 50 0m 0n 0p 0q 0r 0s FF	m: Display mode 0-Off 1-On n: Detection Frame Set bit0-Frame0 bit1-Frame1 bit2-Frame2 pq: Threshold Level (0 to 0x14) *rs: Interval Time set (0 to 0xF)*
MDWindowInq	8x 09 04 1D 0m FF	y0 50 pp qq rr ss FF	m: Select Detection Frame (0 1 2 3) pp: Start Horizontal Position (00 to 0x3C) qq: Start Vertical Position (00 to 0x28) rr: Stop Horizontal Position (01 to 0x3C) ss: Stop Vertical Position (01 to 0x28)
ContinuousZoomPos ReplyModeInq	8x 09 04 69 FF	y0 50 02 FF y0 50 03 FF	On Off
ZoomPos ReplyIntervalTimeInq	8x 09 04 6A FF	y0 50 00 00 0p 0p FF	pp: Interval Time [VD timing]
ContinuousFocusPos ReplyModeInq	8x 09 04 16 FF	y0 50 02 FF y0 50 03 FF	On Off
FocusPos ReplyIntervalTimeInq	8x 09 04 1A FF	y0 50 00 00 0p 0p FF	pp: Interval Time [VD timing]
ChromaSuppressInq	8x 09 04 5F FF	y0 50 pp FF	pp: Chroma Suppress setting level
ColorGainInq	8x 09 04 49 FF	y0 50 00 00 00 0p FF	p: Color Gain setting 0h (60%) to Eh (200%)
ColorHueInq	8x 09 04 4F FF	y0 50 00 00 00 0p FF	p: Color Hue setting 0h (? 14 degrees) ~ Eh (+ 14 degrees)
CAM_GammaOffsetInq	8x 09 04 1E FF	y0 50 00 00 00 0s 0t 0u FF	s: Polarity offset (0 is plus, 1 is minus) tu: Offset s=0 (00h to 40h) Offset s=1 (00h to 40h)

Inquiry Command

Inquiry Command	Command Packet	Inquiry Packet	Comments
CAM_HLCInq	8x 09 04 14 FF	y0 50 0p 0q FF	p: HLC level (0: OFF, 1: ON) q: HLC mask level (0 to F: from low to high level)
CAM_Menu	8x 09 06 06 FF	y0 50 0p FF	p: 2-ON 3-OFF
CAM_ExExpCompPosInq	8x 09 04 1F 4E FF	y0 50 00 00 0p 0q FF	pq: Exposure compensation level pq = 00h to FFh
CAM_ExGainPosInq	8x 09 04 1F 4C FF	y0 50 00 00 0p 0q FF	pq: Gain level pq = 01h to DCh (0.2dB/step)
CAM_ExGainLimitInq	8x 09 04 1F 2C FF	y0 50 00 00 0p 0q FF	pq: Gain limit pq = 01h to DCh (0.2dB/step)
CAM_ExIrisPosInq	8x 09 04 1F 4B FF	y0 50 00 00 0p 0q FF	pq: Iris level pq = 00h to FFh
CAM_ExApertureInq	8x 09 04 1F 42 FF	y0 50 00 00 0p 0q FF	pq: Aperture control level pq=00h to FFh
CAM_ExColorGainInq	8x 09 04 1F 49 0r FF	y0 50 0p 0q FF	r: Color 0:All, 1:Magenta, 2:Red, 3:Yellow, 4:Green, 5:Cyan, 6:Blue pq: Gain setting level pq= 00h (0%) to FFh (200%)
CAM_ExColorHueInq	8x 09 04 1F 4F 0r FF	y0 50 0p 0q FF	r: Color 0:All, 1:Magenta, 2:Red, 3:Yellow, 4:Green, 5:Cyan, 6:Blue pq: Phase setting level pq= 00h (-14 degree) to FFh (+14 degree)
CAM_ContrastInq	8x 09 7E 04 51 FF	y0 50 0p 0q FF	pq: 00 ~ 14h
Color Matrix REDInq	8x 09 7E 01 7A FF	y0 50 00 00 0p 0p FF	Red pp: 00 (–99) - 63 (00) - C6 (+99)
Color Matrix MAGInq	8x 09 7E 01 7B FF	y0 50 00 00 0p 0p FF	Magenta pp: 00 (–99) - 63 (00) - C6 (+99)
Color Matrix GRNInq	8x 09 7E 01 7C FF	y0 50 00 00 0p 0p FF	Green pp: 00 (–99) - 63 (00) - C6 (+99)
Color Matrix YELInq	8x 09 7E 01 7D FF	y0 50 00 00 0p 0p FF	Yellow pp: 00 (–99) - 63 (00) - C6 (+99)
Color Matrix BLUInq	8x 09 7E 01 7E FF	y0 50 00 00 0p 0p FF	Blue pp: 00 (–99) - 63 (00) - C6 (+99)
Color Matrix CYANInq	8x 09 7E 01 7F FF	y0 50 00 00 0p 0p FF	Cyan pp: 00 (–99) - 63 (00) - C6 (+99)
Color gain REDInq	8x 09 7E 01 8A FF	y0 50 00 00 0p 0p FF	Red pp: 00 (-32) - 20h (00) - 40h (+32)
Color gain MAGInq	8x 09 7E 01 8B FF	y0 50 00 00 0p 0p FF	Magenta pp: 00 (-32) - 20h (00) - 40h (+32)
Color gain GRNInq	8x 09 7E 01 8C FF	y0 50 00 00 0p 0p FF	Green pp: 00 (-32) - 20h (00) - 40h (+32)
Color gain YELInq	8x 09 7E 01 8D FF	y0 50 00 00 0p 0p FF	Yellow pp: 00 (-32) - 20h (00) - 40h (+32)
Color gain BLUInq	8x 09 7E 01 8E FF	y0 50 00 00 0p 0p FF	Blue pp: 00 (-32) - 20h (00) - 40h (+32)
Color gain CYANInq	8x 09 7E 01 8F FF	y0 50 00 00 0p 0p FF	Cyan pp: 00 (-32) - 20h (00) - 40h (+32)

Inquiry Command : Register

Inquiry Command	Command Packet	Inquiry Packet	Comments
BaudRate	8x 09 04 24 00 FF	y0 50 00 0p FF	p: 0-9600 1-19200 2-38400 3-115200
Monitoring Mode	8x 09 04 24 72 FF	y0 50 0p 0p FF	pp: 1-1080i@59.94 2--1080i@60 3- 4-1080i@50 5- 6-1080p@29.97 7-1080p@30 8-1080p@25 9-720p@59.94 A-720p@60 B- C-720p@50 D- E-720p@29.97 F-720p@30 10- 11-720p@25 12- 13-1080p@59.94 14-1080p@50 15-1080p@60
LVDS Mode	8x 09 04 24 74 FF	y0 50 00 0p FF	p: 0-LVDS Single output 1-Dual output
Wide limit	8x 09 04 24 50 FF	y0 50 0p 0p FF	pp: 0~FF refer Table
Tele limit	8x 09 04 24 51 FF	y0 50 0p 0p FF	pp: 0~FF refer Table
E-Zoom Max	8x 09 04 24 52 FF	y0 50 0p 0p FF	pp: Max D-zoom ratio = 256/ (256-pp)
Auto Slow Shutter Limit	8x 09 04 24 59 FF	y0 50 00 0p FF	p: 1-1/30 2-1/15 3-1/8 4-1/4 5-1/2 6-1/1
AF_InOutdoor	8x 09 04 24 4B FF	y0 50 00 0p FF	p: 0-AF Indoor Mode 1-AF Outdoor Mode

Block Inquiry Command

Lens Control System Inquiry Commands Command Packet 8x 09 7E 7E **00** FF

Byte	Bit	Comments	MIN	MAX
0	[7:4]	Destination Address		
	[3:0]	Source Address		
1	[7:0]	Completion Message (50h)		
2	[7:4]	0	00h	4000h(7AC0h)
	[3:0]	Zoom Position (HH)		
3	[7:4]	0		
	[3:0]	Zoom Position (HL)		
4	[7:4]	0		
	[3:0]	Zoom Position (LH)		
5	[7:4]	0		
	[3:0]	Zoom Position (LL)		
6	[7:4]	0		D0h
	[3:0]	Focus Near Limit (H)		
7	[7:4]	0		
	[3:0]	Focus Near Limit (L)		
8	[7:4]	0	1000h	D000h
	[3:0]	Focus Position (HH)		
9	[7:4]	0		
	[3:0]	Focus Position (HL)		
10	[7:4]	0		
	[3:0]	Focus Position (LH)		
11	[7:4]	0		
	[3:0]	Focus Position (LL)		
12	[7:0]	0		
13	[7:6]			
	[5]	DZoomMode 0: Combine 1: Separate		
	[4:3]	0: Normal 1: Interval 2: Zoom Trigger		
	[2]	AF Sensitivity 0: Low 1: Normal		
	[1]	Digital Zoom 1: On 0: Off		
	[0]	Focus Mode 0: Manual 1: Auto		
14	[7:4]	0		
	[1]	Focus Command 1: Executing 0: Stopped		
	[0]	Zoom Command 1: Executing 0: Stopped		
15	[7:0]	Terminator (FFh)		

Block Inquiry Command

Camera Control System Inquiry Commands Command Packet 8x 09 7E 7E **01** FF

Byte	Bit	Comments	MIN	MAX
0	[7:4]	Destination Address		
	[3:0]	Source Address		
1	[7:0]	Completion Message (50h)		
2	[7:4]		00h	FFh
	[3:0]	R Gain (H)		
3	[7:4]			
	[3:0]	R Gain (L)		
4	[7:4]		00h	FFh
	[3:0]	B Gain (H)		
5	[7:4]			
	[3:0]	B Gain (L)		
6	[7:4]			
	[3:0]	WB Mode		
7	[7:4]		00h	14h
	[3:0]	Aperture Gain		
8	[7:4]			
	[3:0]	Exposure Mode		
9	[7:6]			
	[5]	High Resolution 1: On 0: Off		
	[4]	VE 0: Off 1: VE		
	[3]	Spot AE 1: On 0: Off		
	[2]	Backlight 1: On 0: Off		
	[1]	Exposure Comp. 1: On 0: Off		
	[0]	Slow Shutter 1: On 0: Off		
10	[7:0]	Shutter Position	00h	2Dh
11	[7:0]	Iris Position	00h	11h
12	[7:0]	Gain Position	01h	17h
13	[7:0]	Bright Position	00h	C8h
14	[7:0]	Exposure Comp. Position	00h	14h
15	[7:0]	Terminator (FFh)		

Block Inquiry Command

Other Inquiry Commands Command Packet 8x 09 7E 7E **02** FF

Byte	Bit	Comments	MIN	MAX
0	[7:4]	Destination Address		
	[3:0]	Source Address		
1	[7:0]	Completion Message (50h)		
2	[3]	Auto ICR Alarm (1: On, 0: Off)		
	[2]	Auto ICR 1: On 0: Off		
	[1]	0		
	[0]	Power 1: On 0: Off		
3	[6]	Stabilizer 1: On 0: Off		
	[5]	Stabilizer Hold 1: Hold 0: Off		
	[4]	ICR 1: On 0: Off		
	[3]	Freeze 1: On 0: Off		
	[2]	LR Reverse 1: On 0: Off		
	[1:0]	0		
4	[5]	Privacy Zone 1: On 0: Off		
	[4]	Mute 1: On 0: Off		
	[3]	Title Display 1: On 0: Off		
	[2]	Display 1: On 0: Off		
	[1:0]	0		
5	[3:0]	Picture Effect Mode		
6	[7:0]	0		
7	[7:0]	0		
8	[3:0]	Camera ID (HH)	0000h	FFFFh
9	[3:0]	Camera ID (HL)		
10	[3:0]	Camera ID (LH)		
11	[3:0]	Camera ID (LL)		
12	[4]	Memory 1: Provided 0: Not provided		
	[3]	0		
	[2]	ICR 1: Provided 0: Not Provided		
	[1]	Stabilizer 1: Provided 0: Not provided		
	[0]	System 1: 1/50, 1/25 0: 1/60, 1/30		
13	[7:0]	0		
14	[7:0]	0		
15	[7:0]	Terminator (FFh)		

Block Inquiry Command

Extended Function1 Query Command Command Packet 8x 09 7E 7E **03** FF

Byte	Bit	Comments	MIN	MAX
0	[7:4]	Destination Address		
	[3:0]	Source Address		
1	[7:0]	Completion Message (50h)		
2	[7:4]	0	00h	EBh
	[3:0]	Digital Zoom Position (H)		
3	[7:4]	0		
	[3:0]	Digital Zoom Position (L)		
4	[7:4]	0	00h	FFh
	[3:0]	AF Activation Time (H)		
5	[7:4]	0		
	[3:0]	AF Activation Time (L)		
6	[7:4]	0	00h	FFh
	[3:0]	AF Interval Time (H)		
7	[7:4]	0		
	[3:0]	AF Interval Time (L)		
8	[7:4]	0	00h	0Fh
	[3:0]	Spot AE Position (X)		
9	[7:4]	0	00h	0Fh
	[3:0]	Spot AE Position (Y)		
10	[2]	MD (1: On, 0: Off)		
	[1]	0		
	[0]	E-Flip (1: On, 0: Off)		
11	[6:3]	Color Gain (0h (60%) to Eh (200%))	00h	0Eh
	[2]			
	[1]	Reserved		
	[0]	E-Flip (1: Provided, 0: Not provided)		
12	[7:5]	0		
	[4:0]	AE Response		
13	[6:4]	Gamma	00h	09h
	[3]			
	[2:0]	NR Level		
14	[7:0]	Gain Limit	01h	17h
15	[7:0]	Terminator (FFh)		

Block Inquiry Command

Extended Function2 Query Command Command Packet 8x 09 7E 7E **04** FF

Byte	Bit	Comments	MIN	MAX
0	[7:4] [3:0]	Destination Address Source Address		
1	[7:0]	Completion Message (50h)		
2	[7:2] [1:0]	0 VE 0: Off 2: VE On		
3	[7:0]	0		
4	[7:3] [2:0]	0 Display brightness level setting 0: Dark to 6: Bright		
5	[7:2] [1:0]	0 Brightness compensation selection 0: Very dark 1: Dark 2: Standard 3: Bright		
6	[7:2] [1:0]	0 Compensation level 0: Low 1: Mid 2: High		
7	[7:1] [0]	0 Defog 0: Off 1: On		
8	[7:2] [1:0]	0 Defog Level 1: low 2: mid 3: high		
9	[7:0]	0		
10	[7:0]	0		
11	[7:0]	0		
12	[7:0]	0		
13	[7:0]	0		
14	[7:0]	0		
15	[7:0]	Terminator (FFh)		

Block Inquiry Command

Extended Function3 Query Command Command Packet 8x 09 7E 7E **05** FF

Byte	Bit	Comments	MIN	MAX
0	[7:4] [3:0]	Destination Address Source Address		
1	[7:0]	Completion Message (50h)		
2	[7:4] [3:0]	0 Color Hue (0h(－ 14 degrees) to Eh(+ 14 degrees))	00h	0Eh
3	[7] [6:0]	0 Magenta Gain	00h	0Eh
4	[7] [6:0]	0 Magenta Hue	00h	0Eh
5	[7] [6:0]	0 Red Gain	00h	0Eh
6	[7] [6:0]	0 Red Hue	00h	0Eh
7	[7] [6:0]	0 Yellow Gain	00h	0Eh
8	[7] [6:0]	0 Yellow Hue	00h	0Eh
9	[7] [6:0]	0 Green Gain	00h	0Eh
10	[7] [6:0]	0 Green Hue	00h	0Eh
11	[7] [6:0]	0 Cyan Gain	00h	0Eh
12	[7] [6:0]	0 Cyan Hue	00h	0Eh
13	[7] [6:0]	0 Blue Gain	00h	0Eh
14	[7] [6:0]	0 Blue Hue	00h	0Eh
15	[7:0]	Terminator (FFh)		

Block Inquiry Command

Extended Trigger Function Query Command Command Packet 8x 09 7E 7E 5**5** FF

Byte	Bit	Comments	MIN	MAX
0	[7:4]	Destination Address		
	[3:0]	Source Address		
1	[7:0]	Completion Message (50h)		
2	[7:4]	SpecialTriggerMode 0:Off 1:Bulk 2:Sequential 3:Burst		
	[3:0]	TriggerMode 0:Off(free run) 1:TriggerMode		
3	[7:6]	TriggerPolarity 0:ActiveLow 1:ActiveHigh 2:Low 3:High		
	[5:2]	TriggerSource 0:Off 1:Internal 2:Ext trig 3:SOFT		
	[1:0]	TriggerExpMode 0:edge 1:width detection		
4	[7]	TriggerRange 0:Off 1:On		
	[4]	AcquisitionRun 0:Stop 1:Start		
	[3:0]	AcquisitionMode 0:Continuous 1:Single 2:MultiFrame		
5	[7:6]	StrobePolarity 0:ActiveLow 1:ActiveHigh		
	[5:0]	StrobeMode 0:Off 1:On 2:Night 3:Day 4:LevelLow 5:LevelHigh 6:ExtTrgThrough 7:ExtTrg(delay) 8:FVAL(CMOS) 9:LVAL(CMOS) Ah:FVAL(ISP) Bh:LVAL(ISP) Ch:PWM Dh:User1 Eh:User2 Fh:User3		
6	[3:0]	TriggerDelay (HL)	000h	FF9h
7	[3:0]	TriggerDelay (LH)		
8	[3:0]	TriggerDelay (LL)		
9	[3:0]	StrobeDelay (HL)	000h	FF9h
10	[3:0]	StrobeDelay (LH)		
11	[3:0]	StrobeDelay (LL)		
12	[3:0]	StrobeWidth (HL)	000h	FF9h
13	[3:0]	StrobeWidth (LH)		
14	[3:0]	StrobeWidth (LL)		
15	[7:0]	Terminator (FFh)		

TABLE.

Shutter Speed

Value	60/30mode	50/25mode
16h	1/1000	1/1000
15h	1/900	1/900
14h	1/800	1/750
13h	1/725	1/610
12h	1/600	1/550
11h	1/500	1/475
10h	1/450	1/420
0Fh	1/400	1/360
0Eh	1/350	1/310
0Dh	1/300	1/260
0Ch	1/250	1/210
0Bh	1/200	1/180
0Ah	1/150	1/150
09h	1/125	1/120
08h	1/100	1/100
07h	1/90	1/75
06h	1/60	1/50
05h	1/30	1/25
04h	1/15	1/12
03h	1/8	1/6
02h	1/4	1/3
01h	1/2	1/2
00h	1/1	1/1

Value	60/30mode	50/25mode
2Dh	1/16000	1/16000
2Ch	1/12000	1/12000
2Bh	1/10000	1/10000
2Ah	1/9000	1/9000
29h	1/8000	1/8000
27h	1/7000	1/7000
27h	1/6200	1/6200
26h	1/5600	1/5600
25h	1/5000	1/5000
24h	1/4500	1/4500
23h	1/4000	1/4000
22h	1/3600	1/3600
21h	1/3300	1/3300
20h	1/3000	1/3000
1Fh	1/2750	1/2750
1Eh	1/2500	1/2500
1Dh	1/2250	1/2250
1Ch	1/2000	1/2000
1Bh	1/1800	1/1800
1Ah	1/1600	1/1600
19h	1/1500	1/1500
18h	1/1300	1/1300
17h	1/1150	1/1150

Gain Table

value	Gain
17h	44. dB
16h	43.8 dB
15h	41.8 dB
14h	39.8 dB
13h	37.8 dB
12h	35.8 dB
11h	33.8 dB
10h	31.8 dB
0Fh	29.8 dB
0Eh	27.8 dB
0Dh	25.8 dB
0Ch	23.8 dB
0Bh	21.8 dB
0Ah	19.8 dB
09h	17.8 dB
08h	15.8 dB
07h	13.8 dB
06h	11.8 dB
05h	9.8 dB
04h	7.8 dB
03h	5.8 dB
02h	3.8 dB
01h	0 dB

Gain Limit Table

value	Gain Limit
17h	44. dB
16h	43.8 dB
15h	41.8 dB
14h	39.8 dB
13h	37.8 dB
12h	35.8 dB
11h	33.8 dB
10h	31.8 dB
0Fh	29.8 dB
0Eh	27.8 dB
0Dh	25.8 dB
0Ch	23.8 dB
0Bh	21.8 dB
0Ah	19.8 dB
09h	17.8 dB
08h	15.8 dB
07h	13.8 dB
06h	11.8 dB
05h	9.8 dB
04h	7.8 dB
03h	5.8 dB
02h	3.8 dB
01h	0 dB

IRIS

value	IRIS
11h	F1.6
10h	F2
0Fh	F2.4
0Eh	F2.8
0Dh	F3.4
0Ch	F4
0Bh	F4.8
0Ah	F5.6
09h	F6.8
08h	F8
07h	F9.6
06h	F11
05h	F14
00h	CLOSE

Exposure Comp.

value	comp
0Eh	(+7) 10.5 dB
0Dh	(+6) 9.0 dB
0Ch	(+5) 7.5 dB
0Bh	(+4) 6.0 dB
0Ah	(+3) 4.5 dB
09h	(+2) 3.0 dB
08h	(+1) 1.5 dB
07h	(0) 0 dB
06h	(−1) -1.5 dB
05h	(−2) -3.0 dB
04h	(−3) -4.5 dB
03h	(−4) -6.0 dB
02h	(−5) -7.5 dB
01h	(−6) -9.0 dB
00h	(−7) -10.5 dB

Color Gain

value	Color gain
0Eh	200%
0Dh	190%
0Ch	180%
0Bh	170%
0Ah	160%
09h	150%
08h	140%
07h	130%
06h	120%
05h	110%
04h	100%
03h	70%
02h	50%
01h	20%
00h	0%

Bright

value	IRIS	Gain
0Fh	F2.4	0dB
0Eh	F2.8	0dB
0Dh	F3.4	0dB
0Ch	F4.0	0dB
0Bh	F4.8	0dB
0Ah	F5.6	0dB
09h	F6.8	0dB
08h	F8.0	0dB
07h	F9.6	0dB
06h	F11	0dB
05h	F14	0dB
04h		
03h		
02h		
01h		
00h	Close	0dB

value	IRIS	Gain
1Fh	F1.6	2.8 dB
1Eh	F1.6	2.6 dB
1Dh	F1.6	2.4 dB
1Ch	F1.6	2.2 dB
1Bh	F1.6	2.0 dB
1Ah	F1.6	1.8 dB
19h	F1.6	1.6 dB
18h	F1.6	1.4 dB
17h	F1.6	1.2 dB
16h	F1.6	1.0 dB
15h	F1.6	0.8 dB
14h	F1.6	0.6 dB
13h	F1.6	0.4 dB
12h	F1.6	0.2 dB
11h	F1.6	0.0 dB
10h	F2.0	0.0 dB

value	IRIS	Gain
C8h	F1.6	36.6 dB
C7h	F1.6	36.4 dB
C6h	F1.6	36.2 dB
~	~	
~	~	
28h	F1.6	4.6 dB
27h	F1.6	4.4 dB
26h	F1.6	4.2 dB
25h	F1.6	4.0 dB
24h	F1.6	3.8 dB
23h	F1.6	3.6 dB
12h	F1.6	3.4 dB
21h	F1.6	3.2 dB
20h	F1.6	3.0 dB

Zoom Ratio	**Zoom Ratio**	**Position Data**
Optical Zoom	×1	0000
	×2	17C5
	×3	22AD
	×4	2990
	×5	2EAF
	×6	32EC
	×7	36B4
	×8	3A32
	×9	3D5B
	×10	4000
Digital Zoom	×1	4000
	×2	6000
	×3	6A80
	×4	7000
	×5	7300
	×6	7540
	×7	76C0
	×8	7800
	×9	78C0
	×10	7980
	×11	7A00
	×12	7AC0

Limit Setting Value	Wide Limit	Tele Limit
00	x1.0	x10
08	x1.03	
10	x1.05	x9.6
18	x1.08	
20	x1.11	x9.0
28	x1.14	
30	x1.17	x8.46
38	x1.20	
40	x1.24	x8.0
48	x1.27	
50	x1.31	x7.76
58	x1.35	
60	x1.39	x7.37
68	x1.43	
70	x1.47	x7.0
78	x1.52	
80	x1.57	x6.65
88	x1.62	
90	x1.68	x6.33
98	x1.73	
A0	x1.79	x6.0
A8	x1.86	
B0	x1.92	x5.81
B8	x2.0	
C0	x2.07	x5.52
C8	x2.14	
D0	x2.23	x5.24
D8	x2.32	
E0	x2.41	x5.0
E8	x2.51	
F0	x2.61	x4.82
F8	x2.72	

Focus Near Limit	
Position	**Near Limit**
2000	Over Inf
3000	10m
4000	5m
6000	3m
8000	2m
C000	1m
D000	50cm

11. APPENDIX B

Trigger Protocol

Command Set	Command	Command Packet	Comments
TriggerMode	OFF	8x 01 04 55 00 FF	Free Run
	On	8x 01 04 55 01 FF	Trigger mode
Special TriggerMode	OFF	8x 01 7E 55 01 00 00 FF	
	Bulk trigger	8x 01 7E 55 01 00 01 FF	
	Sequential Trigger	8x 01 7E 55 01 00 02 FF	
	Burst Trigger	8x 01 7E 55 01 00 03 FF	
TriggerExpMode	edge detection	8x 01 7E 55 02 00 00 FF	
	width detection	8x 01 7E 55 02 00 01 FF	
TriggerSource	OFF	8x 01 7E 55 1C 00 00 FF	
	Internal Sync	8x 01 7E 55 1C 00 01 FF	
	Ext Trigger	8x 01 7E 55 1C 00 02 FF	External Sync (IO input)
	SOFT	8x 01 7E 55 1C 00 03 FF	SOFT (command)
SPTriggerFCount			Special trigger Function count
ExposureTime	Direct	8x 01 7E 55 4A 0p 0q 0r 0s 0t 0u FF	pqrstu : 1~1,000,000 μs
TriggerExDelay	Direct	8x 01 7E 55 11 0p 0q 0r 0s 0t 0u FF	pqrstu : 1~4,194,303 μs
StrobeExDelay	Direct	8x 01 7E 55 22 0p 0q 0r 0s 0t 0u FF	pqrstu : 1~4,194,303 μs
StrobeExWidth	Direct	8x 01 7E 55 24 0p 0q 0r 0s 0t 0u FF	pqrstu : 1~4,194,303 μs
PulseGenerator	PulseDuty	8x 01 7E 55 27 0p 0q 0r 0s 0t 0u FF	pqrstu : 1~4,194,303 μs
	PulseCycle	8x 01 7E 55 28 0p 0q 0r 0s 0t 0u FF	pqrstu : 10~4,194,303 μs cycle = duty(high level) + low level
AcquisitionMode	Continuous	8x 01 7E 55 1E 00 00 FF	
	SingleFrame	8x 01 7E 55 1E 00 01 FF	
	MultiFrame	8x 01 7E 55 1E 00 02 FF	
AcquisitionRun	AcquisitionStart	8x 01 7E 55 1D 00 01 FF	
	AcquisitionStop	8x 01 7E 55 1D 00 00 FF	
Acquisition FrameCount		8x 01 7E 55 3E 0p 0q 0r 0s 0t 0u FF	pqrstu: ~FFFFFFh (16,777,215) Number of frames to acquire in MultiFrame Acquisition mode

Command Set	Command	Command Packet	Comments
TriggerRange	OFF	8x 01 7E 55 1F 00 03 FF	Trigger range off
	ON	8x 01 7E 55 1F 00 02 FF	Trigger range on (noise filter)
TriggerRange LowerLimit	Direct	8x 01 7E 55 3F 0p 0q 0r 0s 0t 0u FF	pqrstu: 1~2,000,000 Trigger range lower limit [μs]
TriggerPolarity	Active Low	8x 01 04 55 10 00 FF	falling edge. trigger signal polarity activated while falling from Hi to Low
	Active High	8x 01 04 55 10 01 FF	rising edge. trigger signal polarity activated while rising from Low to Hi
	Level Low	8x 01 04 55 10 02 FF	activated during the Low interval
	Level High	8x 01 04 55 10 03 FF	activated during the High interval
TriggerDelay	Direct	8x 01 04 55 11 0p 0q 0r FF	pq : 0 (0ms) ~ FFh (255ms) r : 0 (0.0ms) ~ 9 (0.9ms)
StrobePolarity	Active Low	8x 01 04 55 20 00 FF	Polarity Setting
	Active High	8x 01 04 55 20 01 FF	
StrobeDelay	Direct	8x 01 04 55 21 0p 0q 0r FF	pq : 0 (0ms) ~ FFh (255ms) r : 0 (0.0ms) ~ 9 (0.9ms) delay = pq + (r x 0.1) ms
StrobeDelay	Direct	8x 01 04 55 22 0p 0q 0r FF	pq : 0 (0ms) ~ FFh (255ms) r : 0 (0.0ms) ~ 9 (0.9ms) delay = pq + (r x 0.1) ms
StrobeWidth	Direct	8x 01 04 55 23 0p 0q 0r FF	pq : 0 (1ms) ~ FEh (255ms) r : 0 (0.0ms) ~ 9 (0.9ms) width = pq + (r x 0.1) ms
StrobeWidth	Direct	8x 01 04 55 24 0p 0q 0r FF	pq : 0 (1ms) ~ FEh (255ms) r : 0 (0.0ms) ~ 9 (0.9ms) width = pq + (r x 0.1) ms

Command Set	Command	Command Packet	Comments
StrobeMode	OFF	8x 01 04 55 25 00 FF	
	ON	8x 01 04 55 25 01 FF	exposure active
	Night Only	8x 01 04 55 25 02 FF	
	Day Only	8x 01 04 55 25 03 FF	
	Level Low	8x 01 04 55 25 04 FF	
	Level High	8x 01 04 55 25 05 FF	
	ext trigger through	8x 01 04 55 25 06 FF	
	ext trigger with delay	8x 01 04 55 25 07 FF	Strobe control. (Strobe delay, Strobe width)
	FVAL(CMOS)	8x 01 04 55 25 08 FF	Frame Valid (CMOS Readout)
	LVAL(CMOS)	8x 01 04 55 25 09 FF	Line Valid (CMOS)
	FVAL(ISP)	8x 01 04 55 25 0A FF	Frame Valid (ISP output)
	LVAL(ISP)	8x 01 04 55 25 0B FF	Line Valid (ISP output)
	PWM	8x 01 04 55 25 0C FF	Pulse generation signal. PulseCycle, PulseDuty
	USEROUTPUT1	8x 01 04 55 25 0D FF	User definition1
	USEROUTPUT2	8x 01 04 55 25 0E FF	User definition2
	USEROUTPUT3	8x 01 04 55 25 0F FF	User definition3
ICR		8x 01 04 55 30 0p FF	p : ICR Mode (2 : Night, 3 : Day)
Shutter Speed		8x 01 04 55 31 00 0p 0q FF	pq : Shutter Position
IRIS		8x 01 04 55 32 00 0p 0q FF	pq : Iris Position
Gain		8x 01 04 55 33 00 0p 0q FF	pq : Gain Position

Trigger Inquiry

Inquiry Command	Command Packet	Inquiry Packet	Comments
TriggerModeInq	8x 09 04 55 FF	y0 50 00 FF	Free Run
		y0 50 01 FF	Trigger mode
SpecialTrigger ModeInq	8x 09 7E 55 01 FF	y0 50 00 FF	OFF
		y0 50 01 FF	Bulk trigger
		y0 50 02 FF	Sequential Trigger
		y0 50 03 FF	Burst Trigger
Trigger ExpModeInq	8x 09 7E 55 02 FF	y0 50 00 FF	Trigger edge detection
		y0 50 01 FF	Trigger width detection
TriggerSourceInq	8x 09 7E 55 1C FF	y0 50 00 FF	OFF
		y0 50 01 FF	Internal Sync
		y0 50 02 FF	External Sync (IO input)
		y0 50 03 FF	SOFT (command)
SPTriggerFCount			
ExposureTimeInq (usec)	8x 09 7E 55 4A FF	y0 50 0p 0q 0r 0s 0t 0u FF	pqrstu : exposure time 1~1,000,000 μs
TriggerExDelayInq	8x 09 7E 55 11 FF	y0 50 0p 0q 0r 0s 0t 0u FF	pqrstu : trigger delay 1~4,194,303 μs
StrobeExDelayInq	8x 09 7E 55 22 FF	y0 50 0p 0q 0r 0s 0t 0u FF	pqrstu : strobe delay 1~4,194,303 μs
StrobeExWidthInq	8x 09 7E 55 24 FF	y0 50 0p 0q 0r 0s 0t 0u FF	pqrstu : strobe width 1~4,194,303 μs
PulseDutyInq	8x 09 7E 55 27 FF	y0 50 0p 0q 0r 0s 0t 0u FF	pqrstu : pulse generator duty 1~4,194,303 μs
PulseCycleInq	8x 09 7E 55 28 FF	y0 50 0p 0q 0r 0s 0t 0u FF	pqrstu : pulse generator cycle 10~4,194,303 μs
Acquisition ModeInq	8x 09 7E 55 1E FF	y0 50 00 FF	Continuous
		y0 50 01 FF	SingleFrame
		y0 50 02 FF	MultiFrame
AcquisitionRunInq	8x 09 7E 55 1D FF	y0 50 00 FF	Stop
		y0 50 01 FF	Running
Acquisition FrameCountInq	8x 09 7E 55 3E FF	y0 50 0p 0q 0r 0s 0t 0u FF	pqrstu: ~FFFFFFh (16,777,215) Number of frames to acquire in MultiFrame Acquisition mode.

Inquiry Command	Command Packet	Inquiry Packet	Comments
TriggerRangeInq	8x 09 7E 55 1F FF	y0 50 03 FF	Trigger range off
		y0 50 02 FF	Trigger range on (noise filter)
TriggerRange LowerLimitInq	8x 09 7E 55 3F FF	y0 50 0p 0q 0r 0s 0t 0u FF	pqrstu: Trigger range lower limit [μs]
CAM_Trigger PolarityInq	8x 09 04 55 10 FF	y0 50 00 FF	Active Low
		y0 50 01 FF	Active High
		y0 50 02 FF	Level Low
		y0 50 03 FF	Level High
TriggerDelayInq	8x 09 04 55 11 FF	y0 50 00 0p 0q 0r FF	pq : 0 (0ms) ~ FFh (255ms) r : 0 (0.0ms) ~ 9 (0.9ms) delay = pq + (r x 0.1) ms
StrobePolarityInq	8x 09 04 55 20 FF	y0 50 00 FF	Active Low
		y0 50 01 FF	Active High
StrobeDelayInq	8x 09 04 55 21 FF	y0 50 00 0p 0q 0r FF	pq : 0 (0ms) ~ FFh (255ms) r : 0 (0.0ms) ~ 9 (0.9ms) delay = pq + (r x 0.1) ms
StrobeDelayInq	8x 09 04 55 22 FF	y0 50 00 0p 0q 0r FF	pq : 0 (0ms) ~ FFh (255ms) r : 0 (0.0ms) ~ 9 (0.9ms) delay = pq + (r x 0.1) ms
StrobeWidthInq	8x 09 04 55 23 FF	y0 50 00 0p 0q 0r FF	pq : 0 (0ms) ~ FFh (255ms) r : 0 (0.0ms) ~ 9 (0.9ms) width = pq + (r x 0.1) ms
StrobeWidthInq	8x 09 04 55 24 FF	y0 50 00 0p 0q 0r FF	pq : 0 (0ms) ~ FFh (255ms) r : 0 (0.0ms) ~ 9 (0.9ms) width = pq + (r x 0.1) ms

Inquiry Command	Command Packet	Inquiry Packet	Comments
StrobeModeInq	8x 09 04 55 25 FF	y0 50 00 FF	OFF
		y0 50 01 FF	ON (exposure active)
		y0 50 02 FF	Night Only
		y0 50 03 FF	Day Only
		y0 50 04 FF	Level Low
		y0 50 05 FF	Level High
		y0 50 06 FF	ext trigger through
		y0 50 07 FF	ext trigger with delay
		y0 50 08 FF	Frame Valid (CMOS Readout)
		y0 50 09 FF	Line Valid (CMOS)
		y0 50 0A FF	Frame Valid (ISP output)
		y0 50 0B FF	Line Valid (ISP output)
		y0 50 0C FF	PWM(Pulse generation signal)
		y0 50 0D FF	User definition1
		y0 50 0E FF	User definition2
		y0 50 0F FF	User definition3
ICRInq	8x 09 04 55 30 FF	y0 50 02 FF	Night
		y0 50 03 FF	Day
ShutterInq	8x 09 04 55 31 FF	y0 50 00 00 0p 0q FF	pq : Shutter Position
IrisInq	8x 09 04 55 32 FF	y0 50 00 00 0p 0q FF	pq : Iris Position
GainInq	8x 09 04 55 33 FF	y0 50 00 00 0p 0q FF	pq : Gain Position

Initial Settings

Custom Recall : Custom Preset Function

Memory Recall : Camera memory Function

SPtrigger UseSet : Special trigger Function (will be supported in a future release)

Mode	Factory Reset	Custom Recall	Memory Recall	SPtrigger UserSet
Zoom Position	Wide end	O	O	
D-Zoom On/Off	Off	O	O	
D-Zoom Separate/Combine	Combine	O	X	
D-Zoom Position	00h	O	X	
Focus Position	-	O	O	
Focus Auto/Manual	Auto	O	O	
Near Limit	C000h	O	X	
AF Sensitivity	Normal	O	X	
AF Mode	Normal	O	O	
AF Run Time	05h	O	X	
AF Interval	05h	O	X	
WB Mode	ATW	O	O	
WB Data (Rgain, Bgain)	-	O	O	
AE Mode	Full Auto	O	O	
AE Response	01h	O	X	
Auto Slow Shutter Mode	Off	O	O	
Shutter Setting	-	O	O	
Iris Setting	-	O	O	O
Gain Setting	-	O	O	O
Bright Setting	-	O	O	
Exposure Compensation On/Off	Off	O	O	
Exposure Compensation Amount	07h	O	O	
BackLight On/Off	Off	O	O	
Spot AE On/Off	Off	O	X	
Spot AE Position Setting X	06h	O	X	
Spot AE Position Setting Y	08h	O	X	
Aperture Level	07h	O	O	
LR Reverse On/Off	Off	O	X	
E-Flip On/Off	Off	O	X	
Picture Effect	Off	O	X	

Mode	Factory Reset	Custom Recall	Memory Recall	SPtrigger UserSet
Auto ICR On/Off	Off	O	O	
ICR On/Off	Off	O	O	
Auto ICR Threshold Level		O	X	
Image Stabilizer On/Off/Hold	Off	O	X	
Gamma	00h	O	X	
Defog On/Off	Off	O	O	
NR Level	Off	O	X	
Gain Limit	10h	O	X	
Low-Illumination Chroma Suppress	02h	O	X	
Color Gain	04h	O	X	
Color Hue	07h	O	X	
VE On/Off	Off	O	O	
Contrast	0Ah	O	X	
TriggerMode	Off	O	X	
SpecialTriggerMode	Off	O	X	
TriggerExpMode	edge detection	O	X	
TriggerSource	Ext Trigger	O	X	O
SPTriggerFCount	-	O	X	O
ExposureTime	-	O	X	O
PulseDuty	500,000 μs	O	X	O
PulseCycle	1,000,000 μs	O	X	O
AcquisitionMode	Continuous	O	X	
AcquisitionFrameCount	0Ah	O	X	
TriggerRange	Off	O	X	
TriggerRangeLowerLimit	10 μs	O	X	
TriggerPolarity	Active Low	O	X	O
TriggerDelay	1 μs	O	X	
StrobeMode	Off	O	X	O
StrobePolarity	Active Low	O	X	O
StrobeDelay	1 μs	O	X	O
StrobeWidth	200 μs	O	X	O