SONY

Color Camera Module

1   Cover Page and Summary of Specification

Image sensor	Progressive scan CMOS image sensor 1/2.8type Exmor		
	Number of total pixels (H) x(V)	1,952 x 1,236, 2.41 M [pixels]	
	Number of effective pixels (H) x(V)	1,944 x 1,224, 2.38 M [pixels]	
	Number of recommended recording pixels (H) x(V)	1,920 x 1,080	
Lens	Focal length	4.9 [mm] to 94 [mm]	Outline Image
	Magnification	20 [times]	
	Horizontal angle of view	59.5[degree] (Wide) 3.3[degree] (Tele)	
	F value	F1.6 (Wide) to F3.5 (Tele)	
Control mechanics	Zoom motor	Stepping motor	
	Focus motor	Stepping motor	
	Iris	Meter Galvano method	
	IRCF	Meter Galvano method	
Output mode	HD	1080p/60,1080p/59.94,1080p/50,1080i/60,1080i/59.94,1080i/50,1080p/30,1080p/29.97, 1080p/25,720p/60,720p/59.94, 720p/50,720p/30, 720p/29.97, 720p/25	
	SD	NTSC, PAL *NOT standard format	
Synchronized codes	Progressive	Comparable to SMPTE 274 M, 296 M	
	Interlace	Comparable to SMPTE 274 M	
I/O pins	Image signal I/O	HD Analog component (Y/Pb/Pr) Digital (LVDS) SD Analog VBS	
	Control signal I/O	VISCA protocol (CMOS 5 [V])	
Power, others	Power supply	DC 6.0 [V] to DC 12.0 [V]	
	Power consumption	2.9W (Typ. DC IN 6-12V, Lens actuator not included, Wide Dynamic Range Off)	
	Storage temperature	-20 to +60 [degree] / 20 [%] to 95 [%] Absolute humidity: 36 [g/m3]	
	Operating temperature	-5 to +60 [degree] / 20 [%] to 80 [%] Absolute humidity: 36 [g/m3]	
	Dimensions (W) x (L) x (H)	50 [mm] x 60 [mm] x 88[mm]	
	Mass	270 [g]	

2　Function

| Exposure	Full Auto / Gain Limit Setting / Shutter Priority / Iris Priority / Manual / Bright
White Balance	Auto White Balance / ATW / Indoor / Outdoor / One Push WB / Manual WB / Outdoor Auto / Sodium Vapor Lamp Auto / Sodium Vapor Lamp / Sodium Vapor Lamp Outdoor Auto
Focus	Auto Focus / Manual Focus Mode / One Push Trigger Mode / Infinity Mode / Near Limit Mode
Wide Dynamic Range	Yes
Visibility Enhancer	Yes
Noise Reduction	3D / 2D　Noise Reduction
ICR (Day and Night)	Yes
Image Stabilizer	Yes
Slow AE	Yes
High Sensitivity	Yes
Gamma	Standard / Straight gamma
D-ZOOM	12x
Title Setting	Yes
Defog	Yes
Color Enhancement	Yes
Picture Effect	Neg. Art / Black & White
Spherical Privacy Zone Masking	Yes
E-Flip	Yes
High Light Compensation	Yes

3 Connection Specification

3.1 Connector and Pin Assignment

Digital I/O (CN401)
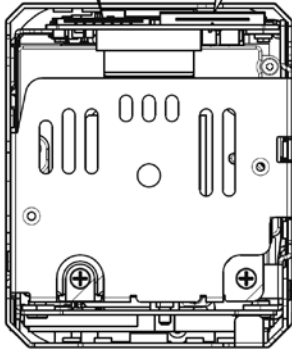
CN401
Kel.Co. USL00-30L-C

| Pin No.	Name	Level
1	TXOUT3+	
2	TXOUT3-	
3	TXCLKOUT+	
4	TXCLKOUT-	
5	TXOUT2+	
6	TXOUT2-	
7	TXOUT1+	
8	TXOUT1-	
9	TXOUT0+	
10	TXOUT0-	
11	GND	
12	TxD	CMOS 5[V](Low:Max0.1[V],High;Min4.4[V])
13	RxD	CMOS 5[V](Low:Max1.0[V],High;Min2.3[V])
14	DC IN	6 to 12[V] DC
15	DC IN	6 to 12[V] DC
16	DC IN	6 to 12[V] DC
17	DC IN	6 to 12[V] DC
18	DC IN	6 to 12[V] DC
19	GND	
20	GND	
21	TXOUT7+	Single out mode: open
22	TXOUT7-	Single out mode: open
23	TXOUT6+	Single out mode: open
24	TXOUT6-	Single out mode: open
25	NC	
26	RESET	Reset:Low(GND),Normal:Open(1.8[V])
27	TXOUT5+	Single out mode: open
28	TXOUT5-	Single out mode: open
29	TXOUT4+	Single out mode: open
30	TXOUT4-	Single out mode: open

CN501
Kyocera-elco 046240024006800+

Pin No.	Name	Level
1	GND	
2	TxD	CMOS 5[V](Low:Max0.1[V],High;Min4.4[V])
3	RxD	CMOS 5[V](Low:Max1.0[V],High;Min2.3[V])
4	RESET	Reset:Low(GND),Normal:Open(1.8[V])
5	GND	
6	NC	
7	GND	
8	NC	
9	GND	
10	VBS-OUT	
11	GND	
12	Y-OUT	HD Analog Component
13	GND	
14	Pb-OUT	HD Analog Component
15	GND	
16	Pr-OUT	HD Analog Component
17	GND	
18	DC IN	6 to 12[V] DC
19	DC IN	6 to 12[V] DC
20	DC IN	6 to 12[V] DC
21	DC IN	6 to 12[V] DC
22	GND	
23	DC IN	6 to 12[V] DC
24	GND	

3.2   LVDS PIXEL DATA FORMAT
3.2.1   DUAL MODE
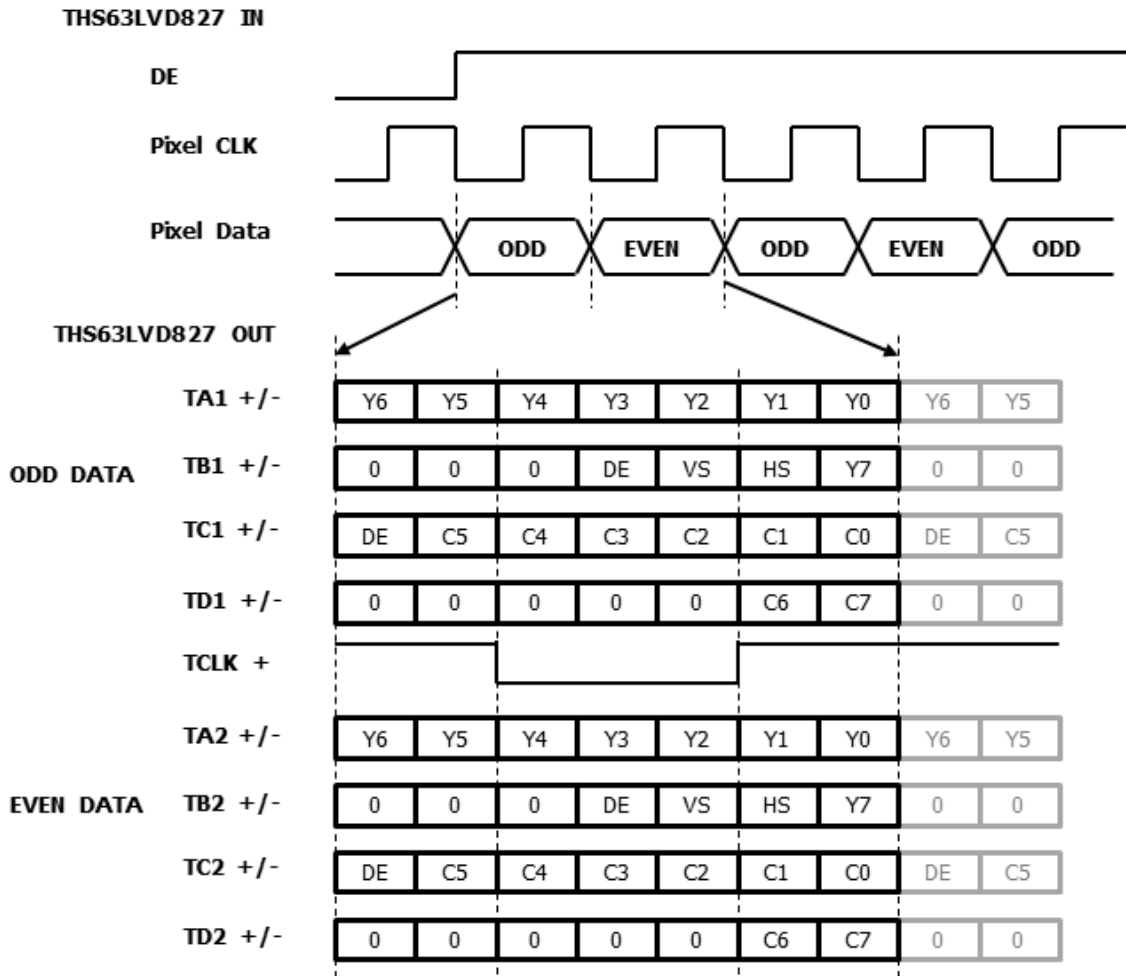
Output Format	Pixel CLK[Hz)	TCLK+[Hz]
1080p/60	148.5M	74.25M
1080p/59.94	148.5M/1.001	74.25M/1.001
1080p/50	148.5M	74.25M
1080i/60	74.25M	37.125M
1080i/59.94	74.25M/1.001	37.125M/1.001
1080i/50	74.25M	37.125M
1080p/30	74.25M	37.125M
1080p/29.97	74.25M/1.001	37.125M/1.001
1080p/25	74.25M	37.125M
720p/60	74.25M	37.125M
720p/59.94	74.25M/1.001	37.125M/1.001
720p/50	74.25M	37.125M
720p/30	74.25M	37.125M
720p/29.97	74.25M/1.001	37.125M/1.001
720p/25	74.25M	37.125M

3.2.2   SINGLE MODE

THS63LVD827 IN

DE	
Pixel CLK	
Pixel Data	

THS63LVD827 OUT

TA1 +/-	Y6	Y5	Y4	Y3	Y2	Y1	Y0	Y6	Y5
TB1 +/-	0	0	0	DE	VS	HS	Y7	0	0
TC1 +/-	C6	C5	C4	C3	C2	C1	C0	C6	C5
TD1 +/-	0	0	0	0	0	C6	C7	0	0
TCLK +									
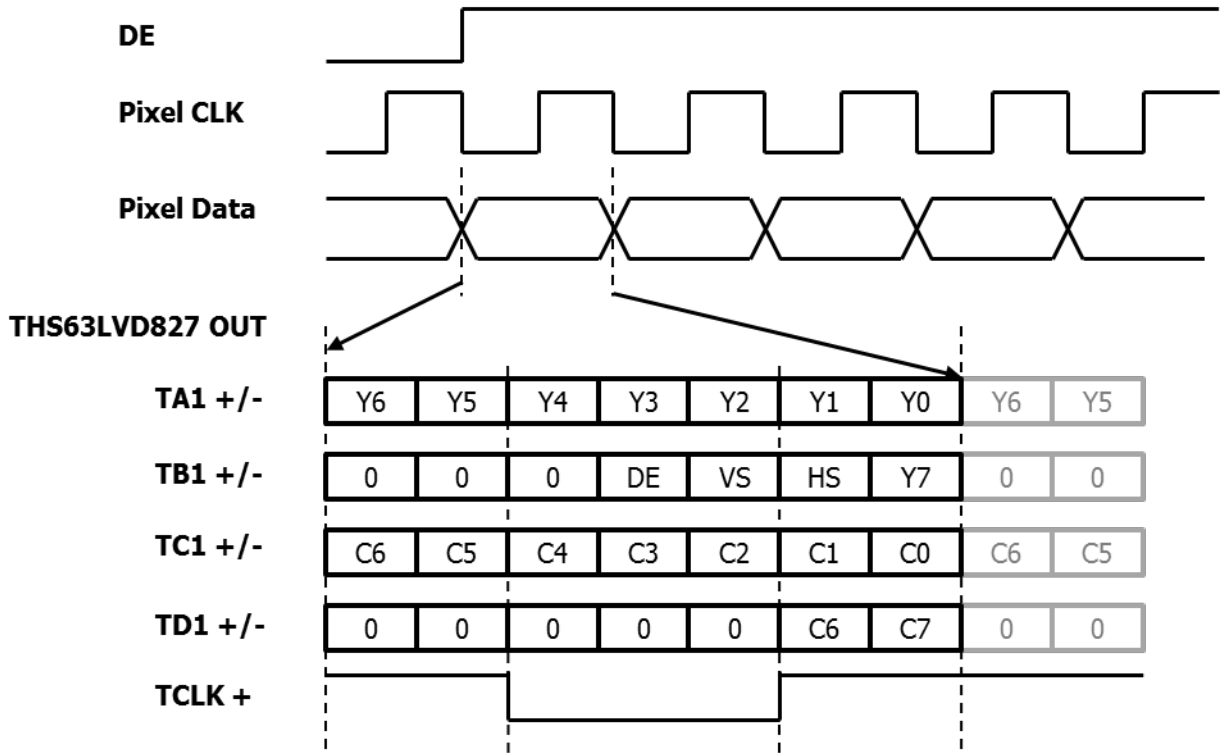
Output Format	Pixel CLK[Hz]	TCLK+[Hz]
1080p/60	148.5M	148.5M
1080p/59.94	148.5M/1.001	148.5M/1.001
1080p/50	148.5M	148.5M
1080i/60	74.25M	74.25M
1080i/59.94	74.25M/1.001	74.25M/1.001
1080i/50	74.25M	74.25M
1080p/30	74.25M	74.25M
1080p/29.97	74.25M/1.001	74.25M/1.001
1080p/25	74.25M	74.25M
720p/60	74.25M	74.25M
720p/59.94	74.25M/1.001	74.25M/1.001
720p/50	74.25M	74.25M
720p/30	74.25M	74.25M
720p/29.97	74.25M/1.001	74.25M/1.001
720p/25	74.25M	74.25M

3.3 Example of Application Circuit (for Single LVDS out)
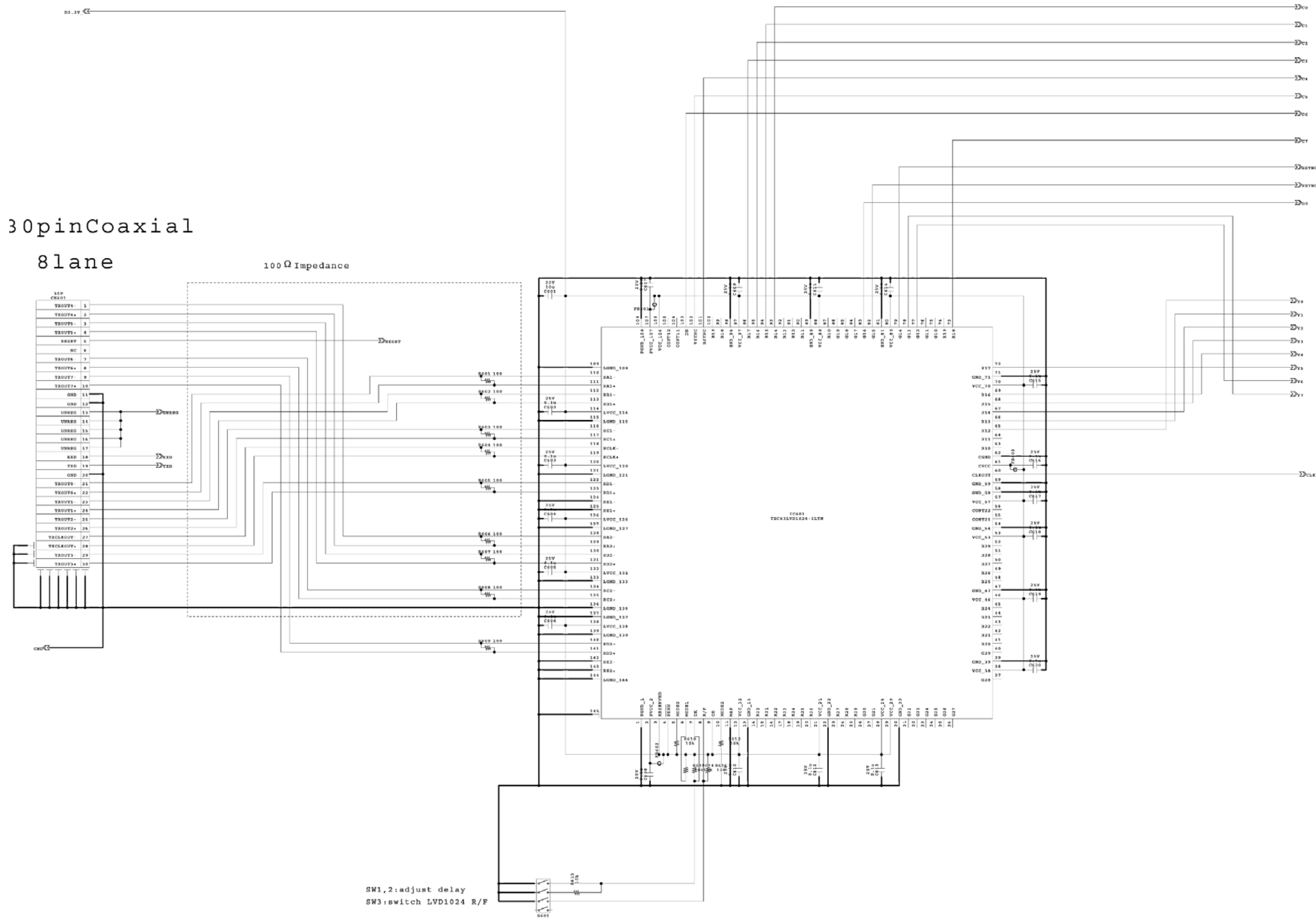
30pinCoaxial

8lane

100 Ω Impedance

TC683
TECK3LVD1024-1LTN

SW1,2:adjust delay
SW3:switch LVD1024 R/F

The application circuit is a typical example illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of this circuit.

## 3.4   Example of Application Circuit   (for Dual LVDS out)
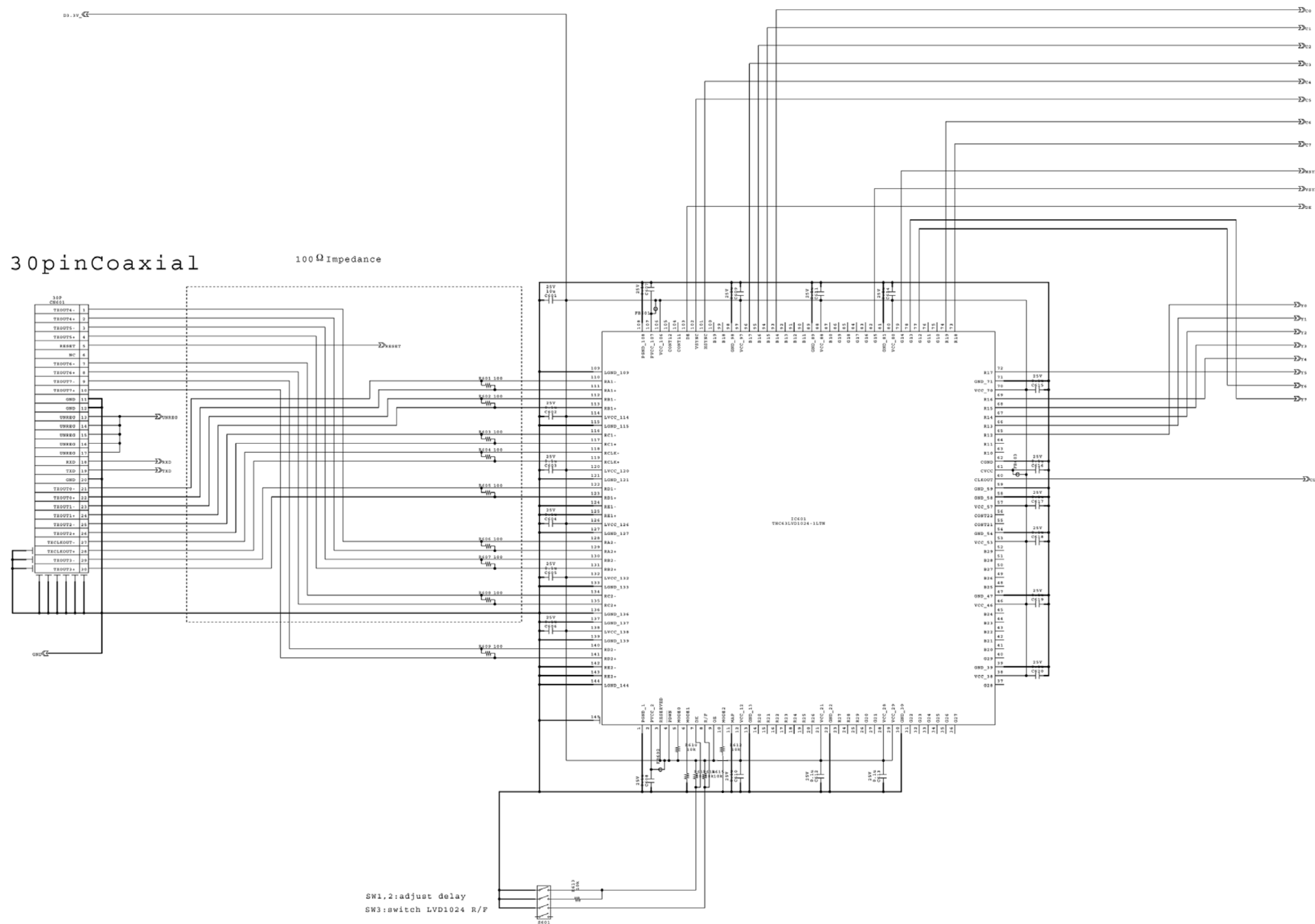
The application circuit is a typical example illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of this circuit.

4 Detailed Specifications

4.1 Sensor Specifications

Image sensor	Progressive scan CMOS image sensor
Chip size (H) x (V)	8.5 [mm] x 7.3 [mm] (Type 1/2.8)
Unit cell size (H) x (V)	2.8 [um] x 2.8 [um]
Number of total pixels (H) x (V)	1,952 x 1,236 2.41 M [pixels]
Number of effective pixels (H) x (V)	1,944 x 1,224 2.38 M [pixels]
Scan method	Progressive scan
Color filter	Primary color Bayer arrangement
Shutter	Rolling shutter (NOT Global shutter)

Spectral Sensitivity Characteristic
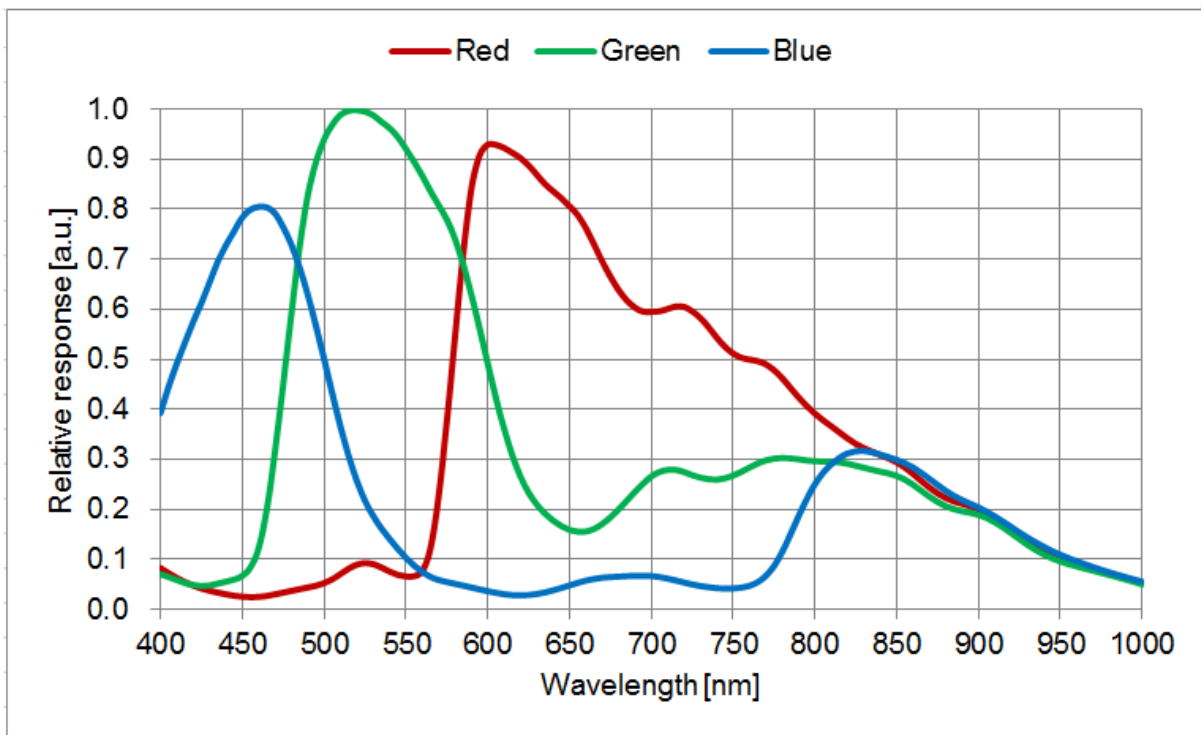
4.2 Lens Specifications (*Design Specifications)

Configuration		9 groups, 11 elements
Angle of view	Horizontal	59.5 [degrees] [1](Wide) 3.3 [degrees] [1] (Tele)
	Vertical	35.7 [degrees] [1](Wide) 1.8 [degrees] [1](Tele)
	Diagonal	66.5 [degrees] [1](Wide) 3.8 [degrees] [1] (Tele)
F number		1.6 (Wide) to 3.5 (Tele)
Focal length (35 [mm] converted)		4.7 [mm] to 94 [mm] (33.0 [mm] to 659 [mm])
TV distortion		-2.0 [%] (Wide) / +1.0 [%] (Tele) at infinity [2]
Focal range		10 [mm] to infinity (Wide) 1,000 [mm] to infinity (Tele)

Note) [1] The above values of field of view are calculated based on the maximum recording pixel area of image sensor.
They differ from the ones on 2D outline drawing, which are calculated based on the effective pixel area of image sensor and include the margin for the assembly tolerance. Distortion Correction ON
[2] Distortion Correction OFF

4.3   Camera Specifications

- **S/N**
  44 [dB] (White 50 [%], AE mode "Auto")
  58[dB] (Black, Gain 0 [step])

- **Minimum Illumination**

  50 [IRE], ICR OFF, IRIS OPEN, AGC MAX(28 [step])

  Typ.value

	30[fps] mode	60[fps] mode
Hi Sens Off	0.4 [lx]	0.8 [lx]
Hi Sens ON	0.1 [lx]	0.2 [lx]

- **White Balance**
  AWB (Auto White Balance) mode   2500[k] – 7500[k]
  ATW (Auto Tracing White Balance) mode   2000[k] – 10000[k]

- **Camera Horizontal Level**

  When setting up the camera and object horizontally, screen should be ±3 [˚] of the horizontal line of the monitor.

- **Optical Axis Gap**
  When zooming from Tele end to Wide end, the gap of screen center object on Tele end is in radius circle of 8% or less of short side of monitor screen.

- **Image Vibration**

   2 [mm] or less on 21[inch] monitor. during Tele to Wide moved

- **Dirt and Scratch Specifications**
  [Conditions]
  1.   Zoom: Wide end, Focus: ∞
  2.   Aperture: F4 fixed
  3.   Light viewer (500 to 1000 [cd/m^2])
  Image on full screen
  1.   Density sample: LEE FILTERS 130 CLEAR

- **Resolution**
  (WIDE)
  Center   900 [TV lines] or more
  Corner   800 [TV lines] or more
  (TELE)
  Center   700 [TV lines] or more
  Corner   600 [TV lines] or more

- **TV Distortion (Distortion Correct ON)**

  ±2[%]

- **Vibration Correction Frequency**
  3 to 13 [Hz]

4.4 Absolute Maximum supply voltage

Item	Signal	Min.	Typ.	Max.	Unit
Supply voltage	DC IN*	-0.5	-	13.2	[V]

*FCB input terminal part

4.5 Operating Conditions

Item	Signal	Min.	Typ.	Max.	Unit
Supply voltage	DC IN*	6.0	9.0	12.0	[V]

＊FCB input terminal part

4.6 Power Consumption

(Measured conditions: Room temperature, typical voltage, high speed frame rate mode as stable operation)

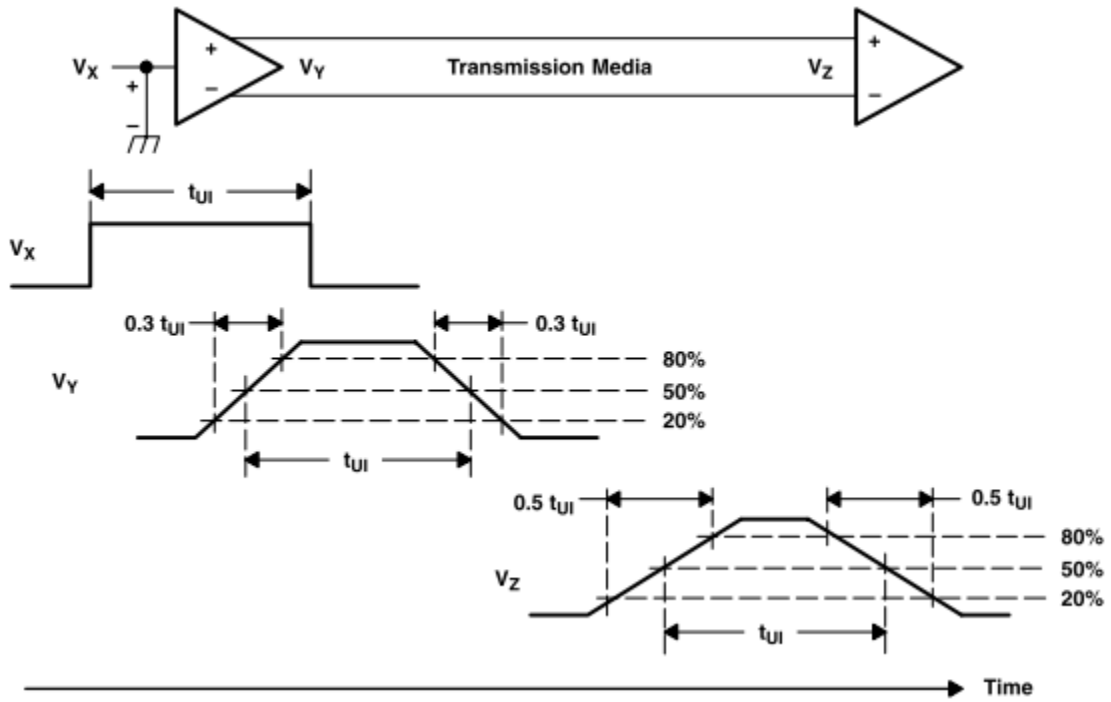| Item	Signal	Min	Ave	Max	Unit
Power Supply	DC IN 9.0 [V]	-	2.9	3.5	[W]
	DC IN 6.0 [V]	-	2.9	3.5	
	DC IN 12.0 [V]	-	2.9	3.5	

4.7 Lens Durability

(At Room temperature)

```
ZOOM     1,000,000 cycle [Wide-Tele    ]
FOCUS    2,000,000 cycle [Near-∞       ]
Iris       500,000 cycle   [Open-Close]
IR motor  200,000 cycle   [On-Off      ]
```

5 Electrical Characteristics

5.1   AC Characteristics of LVDS Output Part

- Data : 74.25 x7 MHz
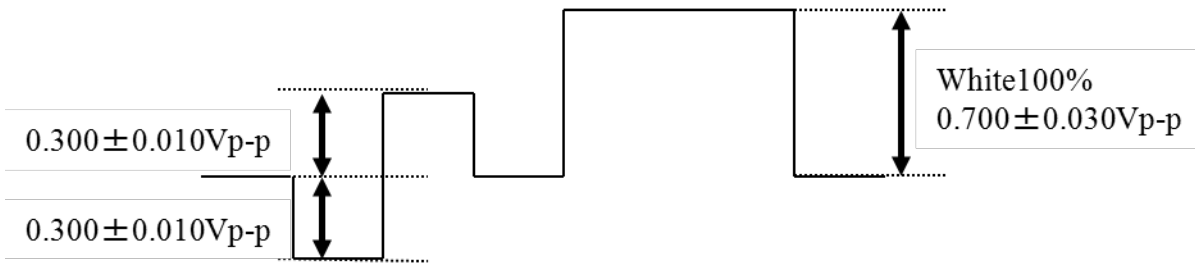
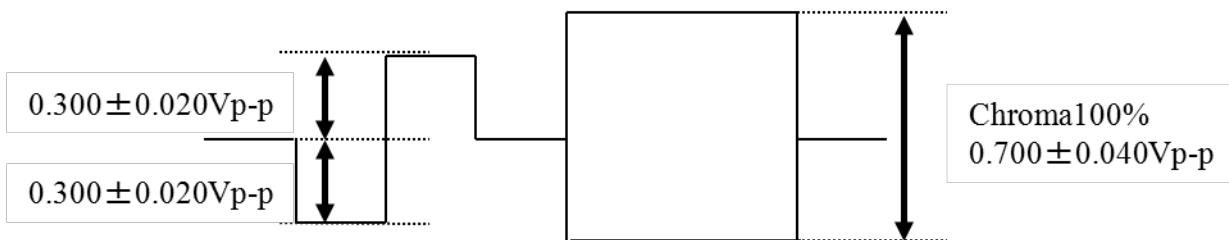DC characteristics of VISCA I/F part

5.2   VISCA (CMOS (5V))

RxD   High : 2.3 [V] or more   Low: 1.0 [V] or less
TxD   High : 4.4 [V] or more   Low: 0.1 [V] or less

5.3   Analog Video

HD(Y)

0.300±0.010Vp-p

0.300±0.010Vp-p

White100%
0.700±0.030Vp-p

HD(PbPr)

0.300±0.020Vp-p

0.300±0.020Vp-p

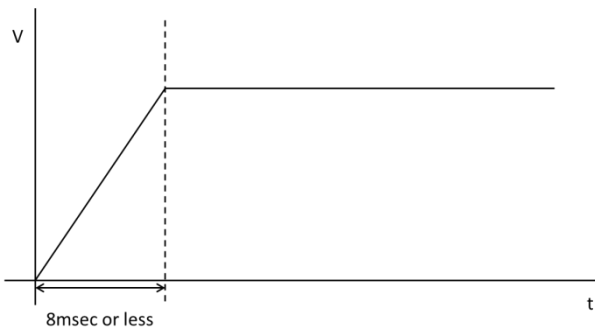Chroma100%
0.700±0.040Vp-p

5.4   MTBF

Approx. 6.0 [years] (without LENS)

5.5   Environmental Test (Under the Condition of 10 Cartons)

Drop test : Sony Technical Manual (STM-1059   level3)

5.6   Power Supply Condition

8 [msec] or less

8msec or less

6 Handling Precautions

6.1 Operating Temperature

Make sure that the temperature inside the equipment does not exceed the recommended operating temperature

6.2 Durability of the Image Sensor

The on-chip color filter of the sensor may be decolorized if a large amount of light enters into the sensor. Such conditions of use should be avoided as no product warranty is given for de-colorization. Be sure to take protective measurements against continuous exposure to intense light.

6.3 ESD Protection

Anti-ESD measures should be taken for this camera module in the same manner as semiconductor devices.

(1)   Either handle bare handed or use non-chargeable gloves, cloth or material. Also use conductive shoes.
(2)   When handling directly use a wrist strap.
(3)   Install grounded conductive mats on the floor and working table to prevent the generation of static electricity.
(4)   Discharge using ionized air or other means is recommended when handling this camera module.

6.4 Storage and Operating Environment

Avoid storage or use under high temperature, high humidity and dusty conditions.

6.5 Mechanical Strength

This camera module is a precision optical part, so care should be taken not to apply excessive mechanical shock or force.

6.6 Remodeling

Any remodeling or process at customers should be avoided. No product warranty will be granted if the product is once remodeled or processed.

6.7　　　EEPROM

The data in the EEPROM should not be modified or overwritten. Once they are modified or overwritten, no product warranty may be able to be given.

6.8　　　White Pixels

The image-sensing device is vulnerable to natural radiation such as cosmic radiation that may cause incidental defect resulting in white pixel. Although these white pixels are corrected during the final inspection and adjustment process of the camera module production, a minor number of the product might be affected during the storage and shipment, and "white pixel" may appear on incoming stage at customer production site. As the occurrence of white pixels is due to natural behavior, it's beyond supplier's control.

6.9　　　Vertical line noise in low light condition

Rarely a vertical line noise may happen in the case when a gain sets up in the low light condition.
It's not a malfunction but the characteristic of CMOS Image Sensor
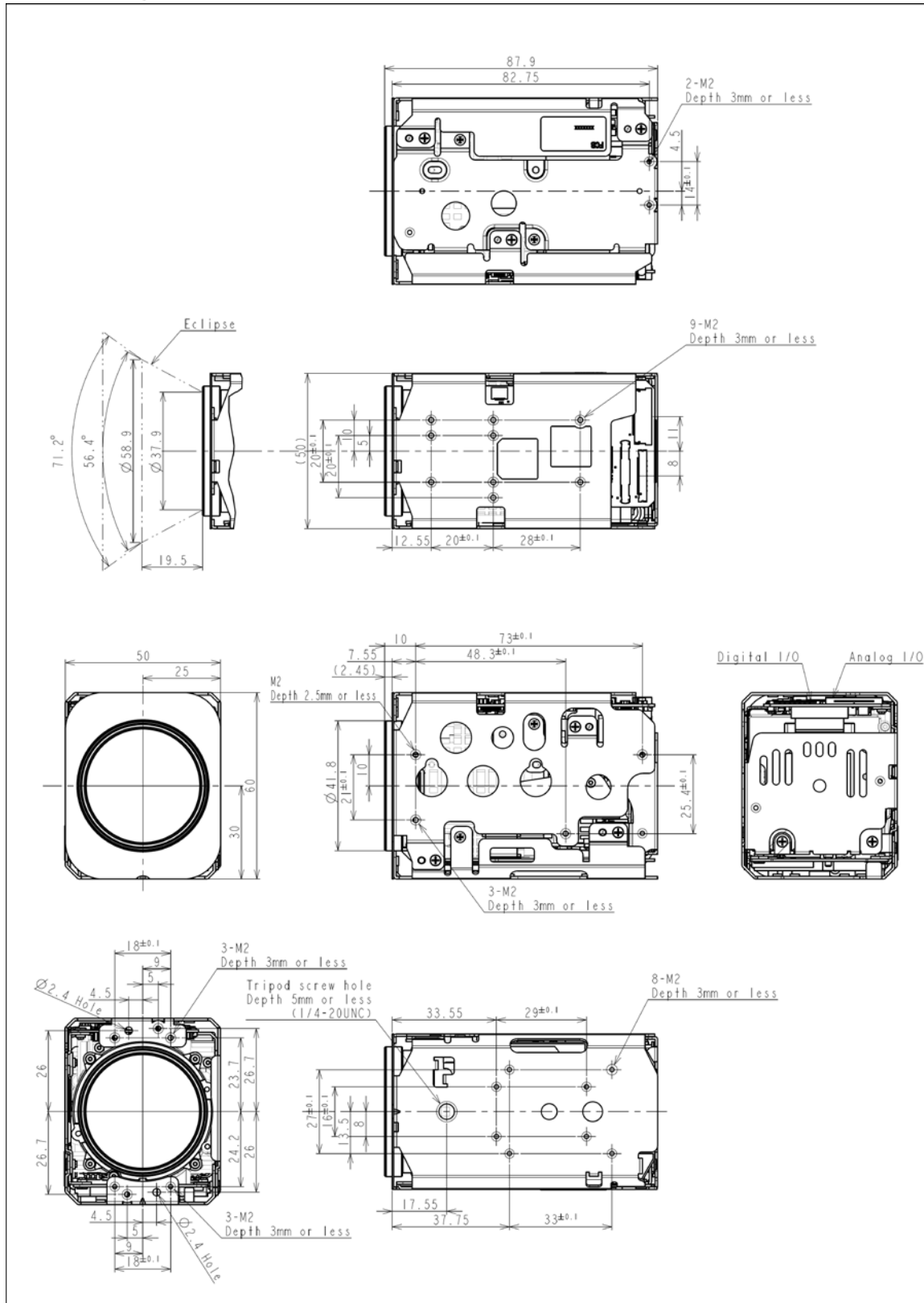
6.10　　　Safety Standards

This product is manufactured as an unfinished product and no particular safety standard is applicable to this product alone. Users should ensure that finished products using this camera module conform to applicable safety standards.

6.11　　　Location of Use and Storage

Do not shoot extremely bright objects (lights or sun) for long hours. In addition, please refrain from using or storing at the following locations.

- Extremely hot or cold place (Operating temperature: -5˚C to +60˚C(23˚F to 140˚F))
- Near TV/radio station which produces intense radio emission
- The place where is affected by reflects of fluorescent light or light from windows
- Under unstable illumination (Flickers will be generated)
- Place with intense vibration
- Where it is subject to radiation from laser beams

7 Package Outline

8 Package Specification

(Unit: mm)

level3

③Partition
(10division)

Material:
    Corrugated fiberboard)

②Conductive PE-Bub bag

Material:
    Polyethylene

④ Carton

Material:
    Corrugated fiberboard

Barcode label

Outside dimensions (L) x (W) x (H):
405 x 300 x 109

Revision History

Version	Date	Page	Description
0.10	20/May/2014	-	released.