DS90UB954 FPD-Link III Deserializer Board (FPI-954-HF / NV015-C) Hardware Specification

Rev. 1.0

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Update History

Revision	Date	Note	
1.0	Sep. 1, 2021	New file (Translated Japanese rev.2)	H. Suzuki

Contents

1. Overview

This is a hardware specification of FPI-954-HF / NV015-C (FPD-Link III deserializer board). This board is mounted the TI company deserializer DS90UB954, and converts the video of the serial signal transmitted by FPD-Link III standard to MIPI signal. This is a conversion board connected with our MIPI monitoring board SVM-06.

This board has FAKRA (coaxial) and HSD (differential) connectors. The coaxial input supports PoC (Power over Coax). On the differential input side, the camera power can be output to a specific pin of the HSD connector. The output connector is a 60-pin connector that can be connected not only to our SVM-06 but also to the older model SVM-MIPI.

Block diagram
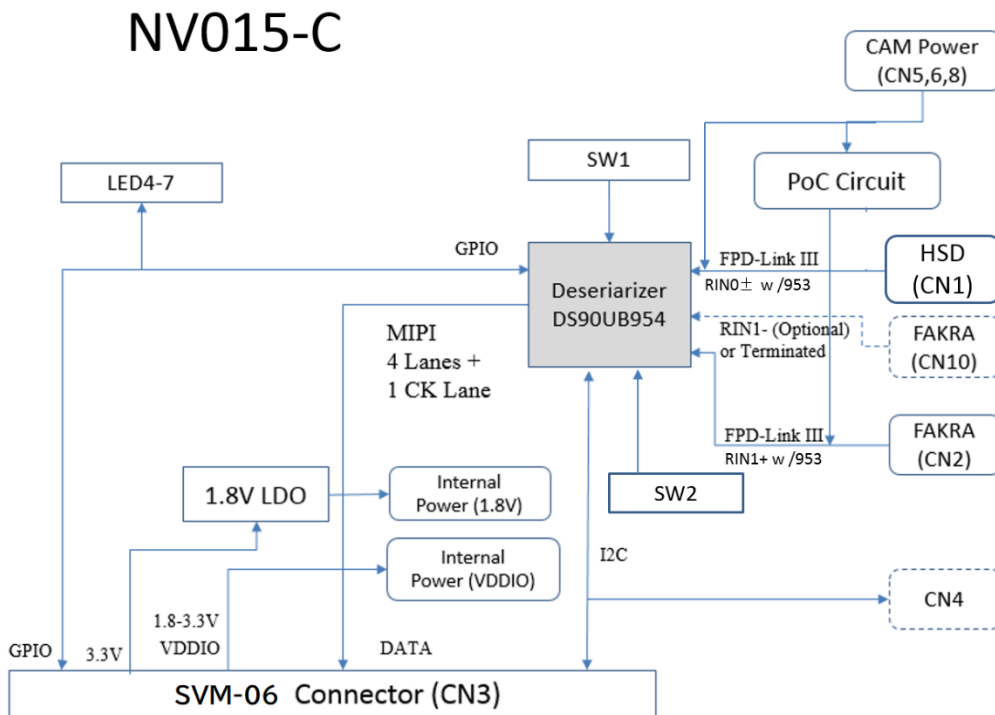
The block diagram of this board is shown above. This board is mounted the TI company deserializer IC DS90UB954, so it can receive the max. 4Gbps FPD-Link III video signal including 1080p/60fps and I2C communication through the FPD-Link III signal line. MIPI CSI-2 output of DS90UB954 is connected to the connector for MIPI monitoring board SVM-06 (CN3), so this board can be connected directly with SVM-06. The FAKRA connector and HSD connector are mounted for serial signal input and it makes ideal for automotive camera applications. The camera power is supplied from either the dedicated connector CN5, CN6, or CN8, and the coaxial side is powered by the PoC circuit on the board and the differential side is powered by a specific pin on the HSD

connector to the camera. The board power is supplied from SVM-06 or other monitoring boards through the connector CN3.

The figure below shows the board connection image of this board and SVM-06 board. As shown in the figure, both boards are connected with a 60-pin connector (CN3). Since the screw hole position is common, it is possible to fix both boards with a spacer. This board has the FPD-Link III input connectors (CN1, CN2), and supposes to be connected the DS90UB953 as serializer. When you choose CN2 input, you need to set the DS90UB954 register separately from the DIP SW setting. The connector model number and PIN assignment are shown later in Details section.
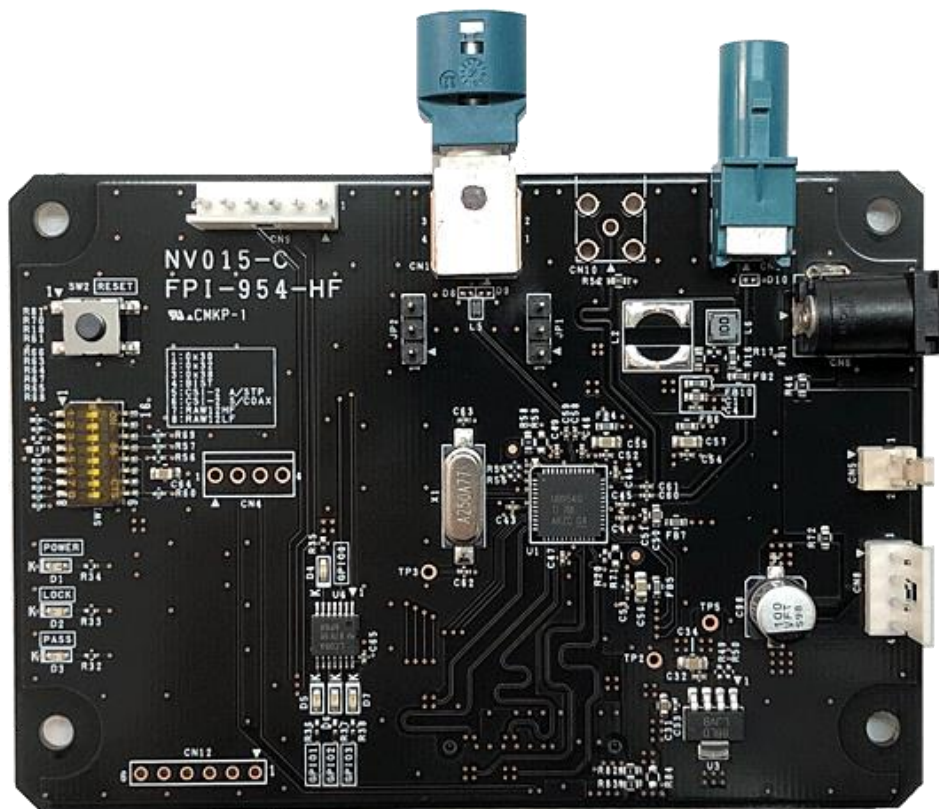
Board connection image
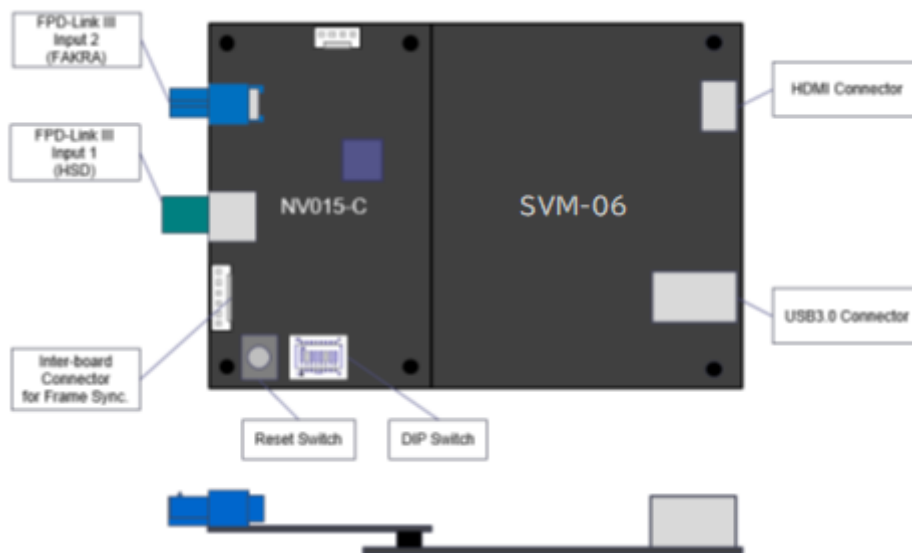
2. Board Shape

2.1. Connector Layout Diagram
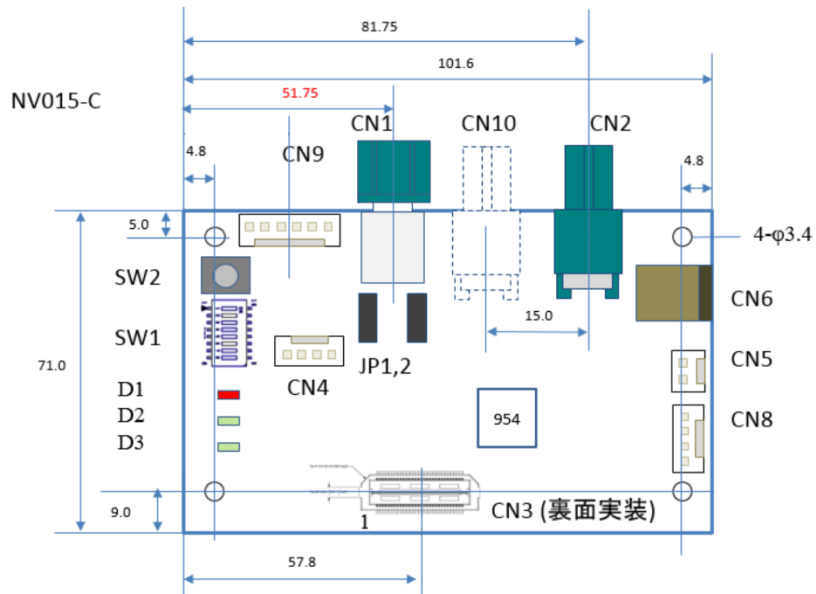
- Only the main connector is shown.

- CN4, CN6, CN10, CN12 are not mounted.

## 2.2. Board Photo

3. Details

3.1. FPD-Link III Input

The deserializer IC DS90UB954 has two inputs (RIN0+/-, RIN1+/-), which are assigned as shown in the table below.

Pin	DC coupling	Terminal	PoC circuit	Connector
RIN0+	33nF	-	-	CN1
RIN0-	33nF	-	-	CN1
RIN1+	33nF	-	Equipped（953）	CN2
RIN1-	15nF	51 Ω	-	(CN10)

This board is implemented Power over Coax (PoC) circuit for superimposing power to the coaxial cable. The PoC circuit for CN2 is shown below. The filter circuit is a constant paired with DS90UB953.

- If you need to change the component constants of the PoC circuit, please contact us before ordering.
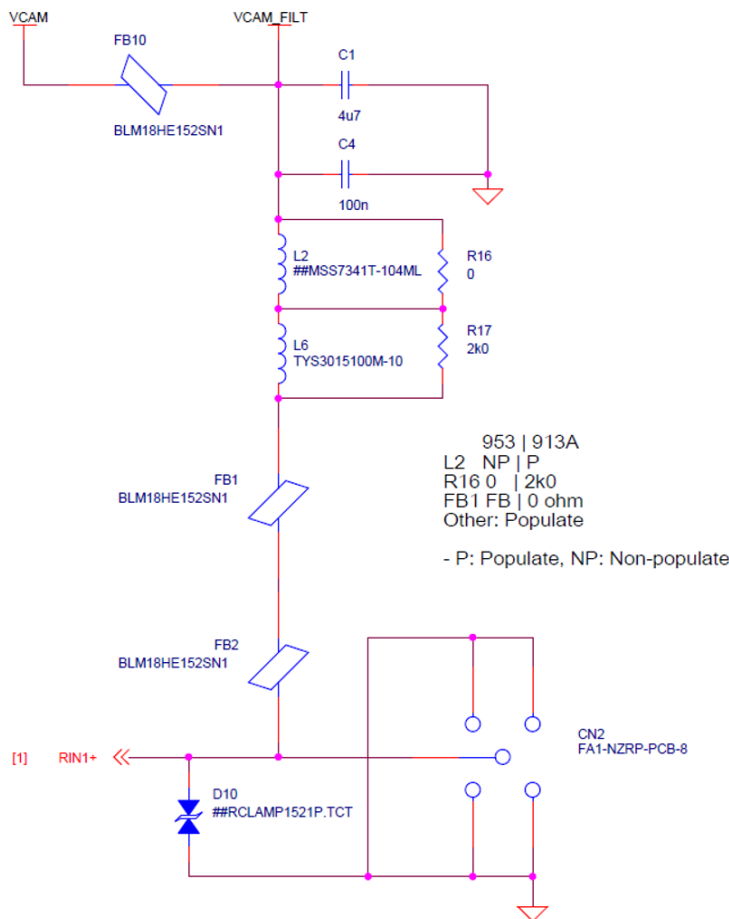
3.2. Power

The power (core power, IO Power) of the deserializer IC DS90UB954 is supplied through the CN3 from the connecting board (SVM-06, etc.). The core power supply is 1.8V and the power is supplied to the deserializer by a 1.8V regulator (LDO) on this board. The IO power supports 1.8V, 3.3V, and supplied to the VDDIO voltage of CN3.

This board can also be superimposed on the FPD-Link III cable for camera power (VCAM). This VCAM power is supplied from the connector CN5, CN6, or CN8, and is powered to the coaxial cable through the PoC circuit. The differential side is output to a specific pin of the HSD connector. Since the power supply for the camera and the NV015-C internal power supply are DC separated through capacitors, the order in which the power is turned on does not matter.

3.3.　　I2C Bus

　　The deserializer IC DS90UB954 of this board has an I2C bus, which has the function to change the configuration in the IC and the function of I2C communication between the serializer and the target device through the FPD-Link III cable. The I2C bus of DS90UB954 is pulled up to the IO voltage (VDDIO) with 4.7kΩ, and it is directly connected with the SVM-06 connector. I2C communication is possible with a PC as the standard function of SVM-06. At the same time, the I2C bus is directly connected to the I2C input/Output connector (CN4) on this board, so allowing connections to external devices and operations from an external master.

　　I2C address of DS90UB954 can be changed to four types by DIP switch (SW1). Refer to DIP Switch Settings section for more information.

3.4.　　REFCLK
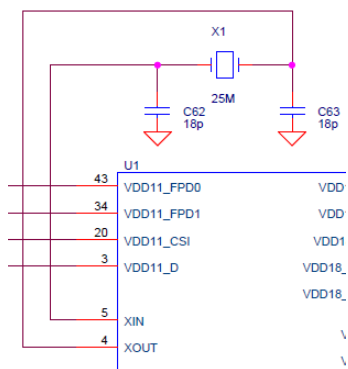
　　The 25MHz crystal oscillator is connected to this board for the DS90UB954 Reference Clock (REFCLK).

3.5. Connector List

CN#	Implementation State	Description	Model number
CN1		FPD-Link Input (HSD Differential, RIN0±)	D4S20L-40MA5-Z
CN2		FPD-Link Input (FAKRA Coax, RIN1+)	FA1-NCRP-PCB-8
CN3		SVM-06 Connector	QTH-030-01-L-D-A
CN4	Unimplemented	I2C I/O Connector	171825-4
CN5		Camera Power Input 1	22-04-1021
CN6		Camera Power Input 2	MJ-179P、Center +
CN8		Camera Power Input 3	171825-4
CN9		Expansion Connector	171825-6
CN10	Unimplemented	FPD-Link Input (Used when differential input, RIN1-)	FA1-NZRP-PCB-8
CN12	Unimplemented	GPIO I/O	A2-6PA-2.54DSA (71)

- Implementation states apply to NV015-C.

- The expansion connector (CN9) is for inter-boards communication and future expansion in an input system using multi boards.

- The camera power input connector (CN5, CN6, CN8) inputs the DC power supply to the target device (camera) as needed. Depending on the application or system, input the power from one of the connectors. The camera power is superimposed on the coaxial cable or is output to a specific pin of HSD connector, and is not used inside the NV015-C board. The required power capacity depends on the target device. The input voltage of the camera power should be 16V or less.

- The I2C I/O connector (CN4) is directly connected to the I2C bus of the deserializer IC (DS90UB954).
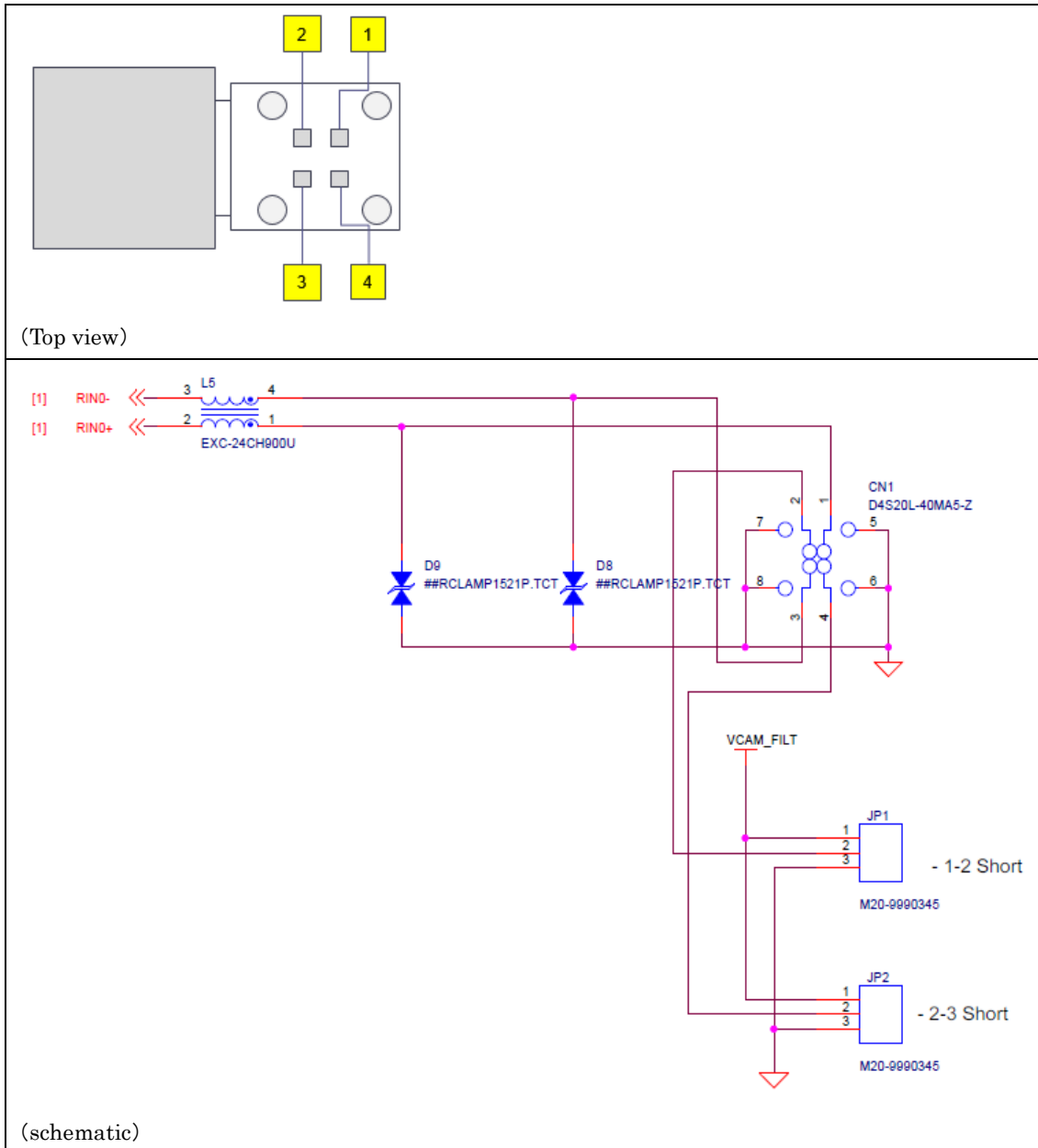
3.6. Connector Details

The top view of the connectors on this board (outline) and pin assignment (excerpts from the schematic) are shown below.
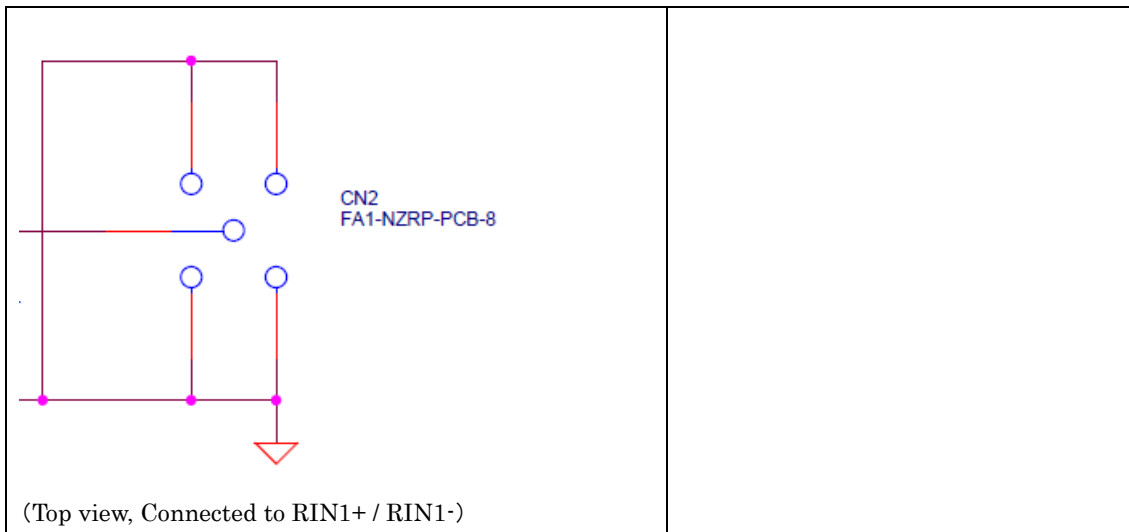
Name	Description
VDDIO	IO Power (Directly connected to CN3)
VCAM, VCAM_FILT	Camera Power Supply
MIPI_GPIO0 - 3	Connected to GPIO 0-3 of DS90UB954 (GPIO3 is connected when R71 is equipped) Connected with 14, 16, 20, 22 pins of CN3 when R74-R77 are equipped

CAM_SCL / CAM_SDA	I2C Signal Lines (Directly connected to DS90UB954)
P0_RSTIN	Connected with CN3 pin2 (GPIO0)
P1	Connected with CN3 pin4 (GPIO1)
P3_RSTOUT	Connected with CN3 pin10 (GPIO3)

・CN1 (D4S20L-40MA5-Z)

（Top view）

（schematic）

・CN2, CN10 (FA1-NCRP-PCB-8)

(Top view, Connected to RIN1+ / RIN1-)

・CN3 (QTH-030-01-L-D-A)

* Refer to the hardware specification of SVM-06 for pin assignments.
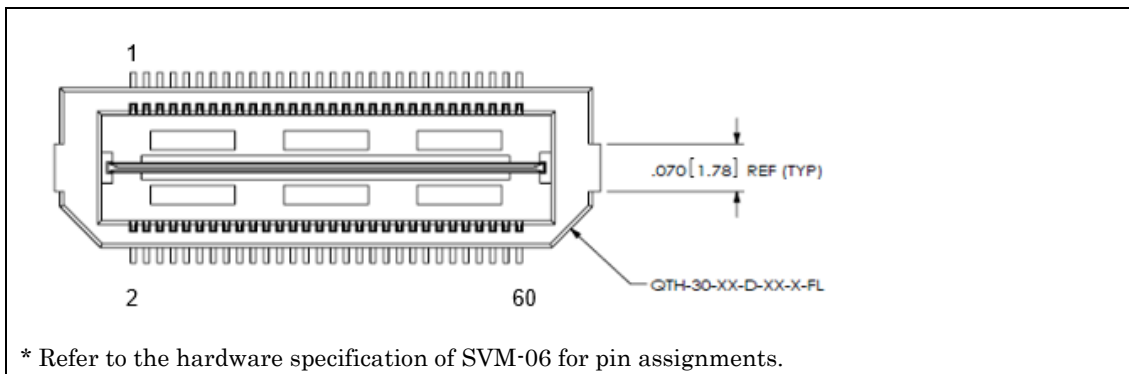
・CN4 (171825-4 / TE Connectivity)

（Top view）
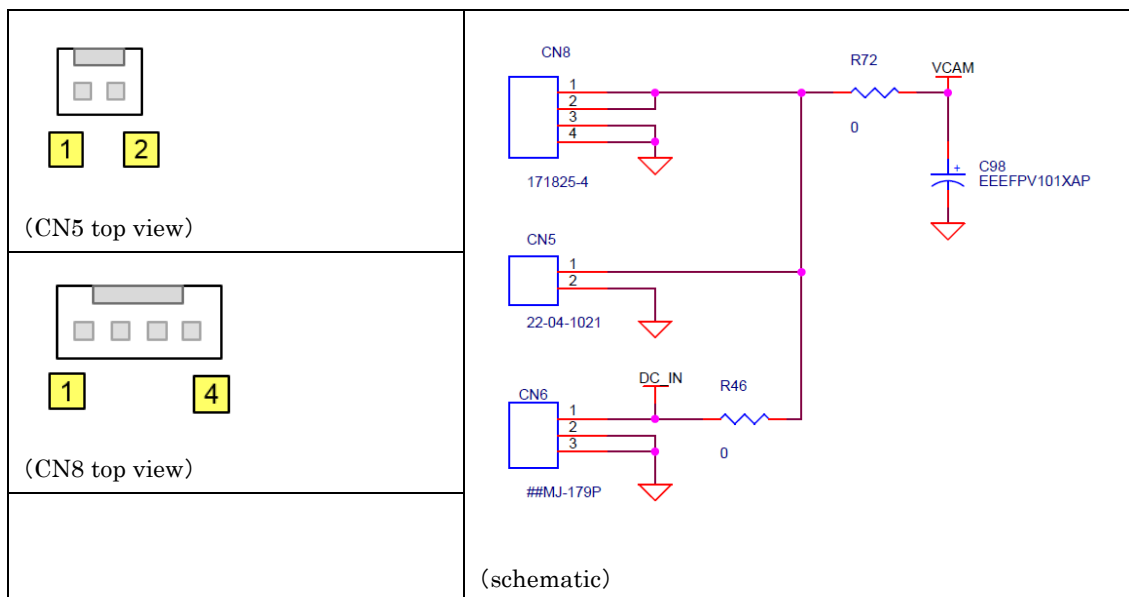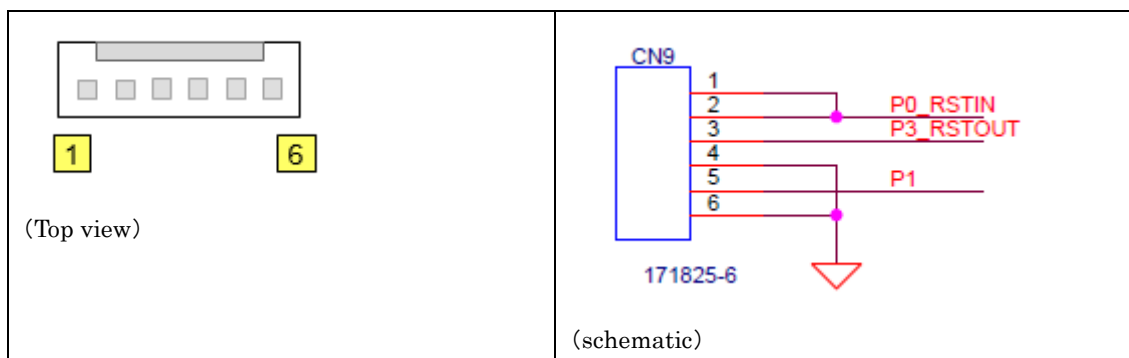
(schematic)
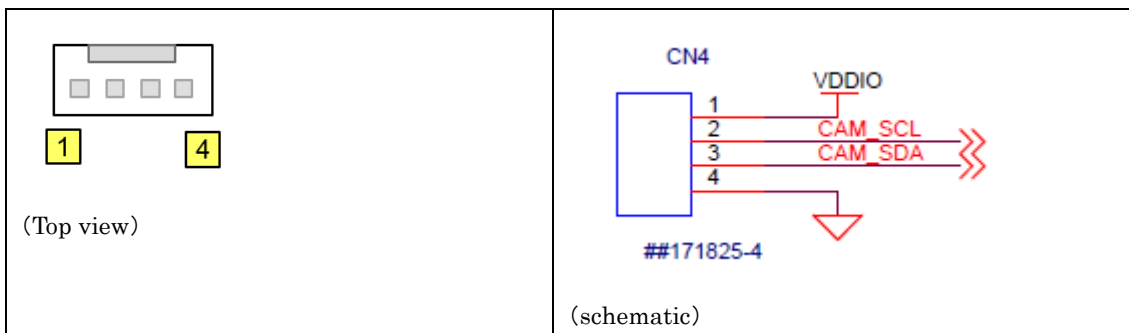
-This connector is not mounted.

・CN5 (22-04-1021 / Molex), CN6(MJ-179P / Marushin), CN8(171825-4 / TE Connectivity)

（CN5 top view）

（CN8 top view）

（schematic）

・CN9 (171825-6 / TE Connectivity)

（Top view）

（schematic）

・CN12 (A2-6PA-2.54DSA(71) / HRS)

（Top view）

（schematic）
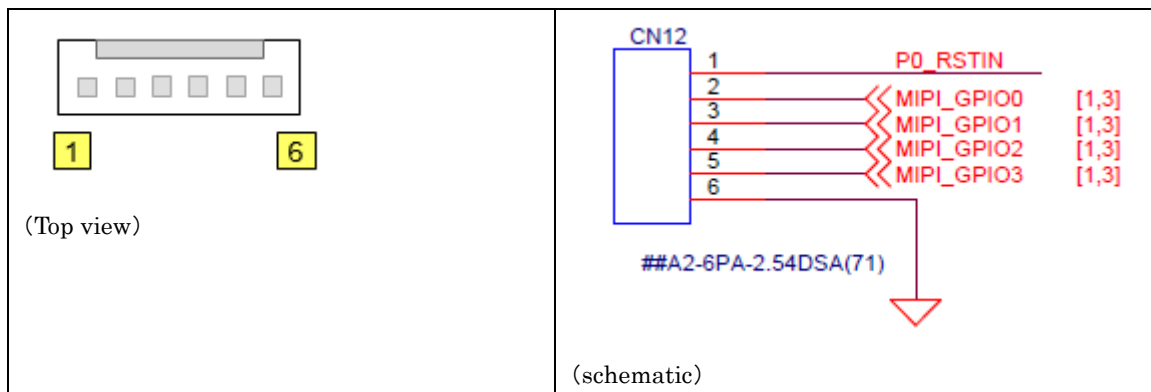
-This connector is not mounted.

3.6.1 HSD power polarity selection jumper

JP1 and JP2 are jumpers to select the power output polarity of the HSD connector. When you need to output the power to the target through the HSD connector, set the jumper as follows.

Output to HSD	Jumper Settings
Pin 2: GND Pin 4: GND (No power output)	JP1: Short-circuit between 2 - 3 JP2: Short-circuit between 2 - 3
Pin 2: VCAM Pin 4: GND	JP1: Short-circuit between 1 - 2 JP2: Short-circuit between 2 - 3
Pin 2: GND Pin 4: VCAM	JP1: Short-circuit between 2 - 3 JP2: Short-circuit between 1 - 2

3.7. DIP Switch Settings

This board has an 8-bit DIP switch (SW1), which can be used to set the deserializer function and the I2C address.

SW#	Name	Description
1	IDX0	Specify the I2C address of DS90UB954
2	IDX1	IDX0 | IDX1 | IDX2 |
3	IDX2	OFF | OFF | OFF | I2C Address = 0x3D ON | OFF | OFF | I2C Address = 0x30 OFF | ON | OFF | I2C Address = 0x32 OFF | OFF | ON | I2C Address = 0x38
4	BISTEN	Set the BIST (Built In Self Test) Mode ON: BIST Mode Disable OFF: BIST Mode Enable
5	MODE0	Set the device mode.
6	MODE1	Refer to the datasheet of DS90UB954 for each mode details.
7	MODE2	MODE0 | MODE1 | MODE2 | MODE3 |
8	MODE3	OFF | OFF | OFF | OFF | 10-bit Mode (COAX) ON | ON | OFF | OFF | CSI-2 Synchronous Back Channel (STP) OFF | ON | OFF | OFF | CSI-2 Synchronous Back Channel (COAX) OFF | OFF | ON | OFF | 12-bit High Frequency Mode (COAX) OFF | OFF | OFF | ON | 12-bit Low Frequency Mode (COAX)

- As the default, only IDX0(1), BISTEN (4), MODE0(5), MODE1(6) are ON.

3.8.　　LED Indicator

This board has seven LEDs. Each function is shown in the table below.

LED#	Name	Description
D1	POWER	When 3.3V power is supplied, it will be lit.
D2	LOCK	When the PLL is locked, it will be lit.
D3	PASS	When there are no transfer errors, it will be lit.
D4-7	GPIO0-4	When the GPIO pins output H level, they will be lit.

3.9.　　GPIO

The GPIO0-6 pins of the deserializer IC (DS90UB954) are connected to GPIO4-11 (PIN number 14, 16, 20, 22, 26, 28, 32) of the connector CN3 via jumper resistors, and can be controlled from the SVM-06. But GPIO3 of DS90UB954 is externally pulled up by resistor R20, and it is connected to CN3 when R71 (0Ω/1005) is mounted. （Only GPIO3 is disconnected since R71 is not mounted as standard.） GPIO can also be disconnected by making R74-R80 un-mounted.

4.　　　Usage Procedure

The following procedure describes how to use this board when connected to SVM-06.

・Check that the DIP SW on this board is set appropriately. Please change the setting according to the target camera.

・Check that VDDIO selection jumper of SVM-06 is set appropriately.

・Connect this board with SVM-06.

・Insert a USB cable into SVM-06 and connect it to a PC.

・Check that the power indicator (D1) on this board is lit.

・Connect the camera to CN1.

・Supply camera power in CN5 or CN6, 8.

The procedure above completes the setup of this board. The subsequent steps are the same as those for connecting a camera to SVM-06, so follow the instructions for using SVM-06.

5.　　　Specifications

Item	Value	Description
Board Dimensions	71.0 x 101.6 mm	Value without connector
Power for Deserializer	DC +3.3V	Via CN3, Supplied from monitoring boards such as SVM-06 (3.3V), Step it down to 1.8V with internal LDO
IO Power	DC +3.3V / 1.8V	Via CN3, Supplied from monitoring boards such as SVM-06 (VDDIO).
Camera Power	DC +16v or less.	Supplied from CN5 or CN8 connector. When CN6 is mounted, AC adapter is also supported.
Imege Input	FPD-Link III max: 4Gbps	CN1： Differential （HSD connector）, connected to RIN0 CN2: Single-ended coax (FAKRA connector), connected to RIN1+ CN10: When mounted, supports differential input (RIN1)
Image Output	MIPI CSI-2 1-4 Lanes + CLK	CN3 output Interface is compatible with SVM-06 etc. Number of lanes can be set to 1-4 lanes.
Serial communication	I2C	I2C bus outputs to CN3 and CN4

* The above specifications apply only to NV015-C.
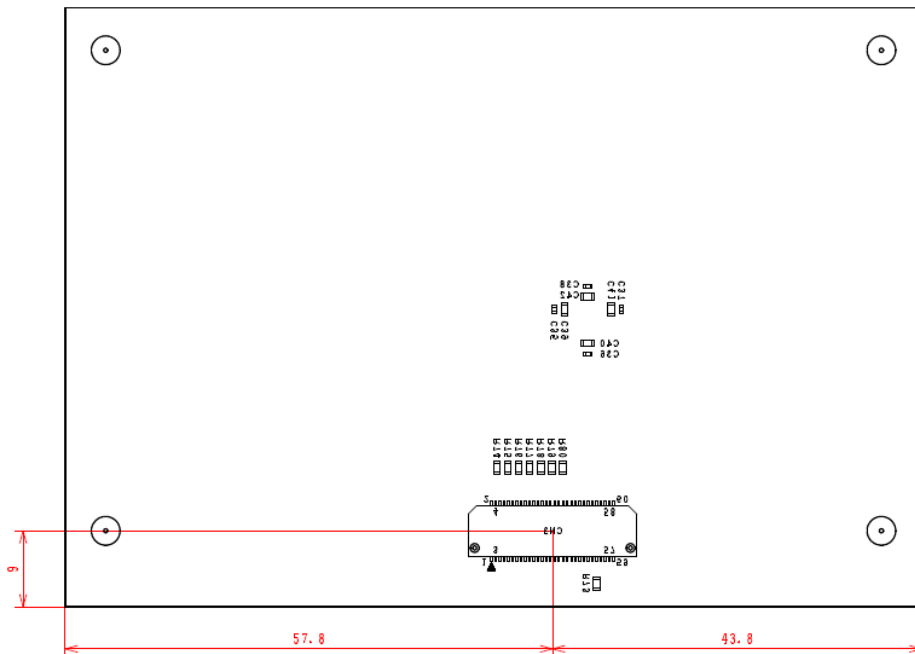
6. Appendix

6.1. Board Dimensions
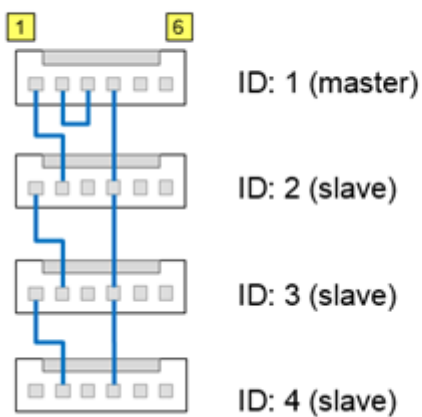
(Top side / Part view)
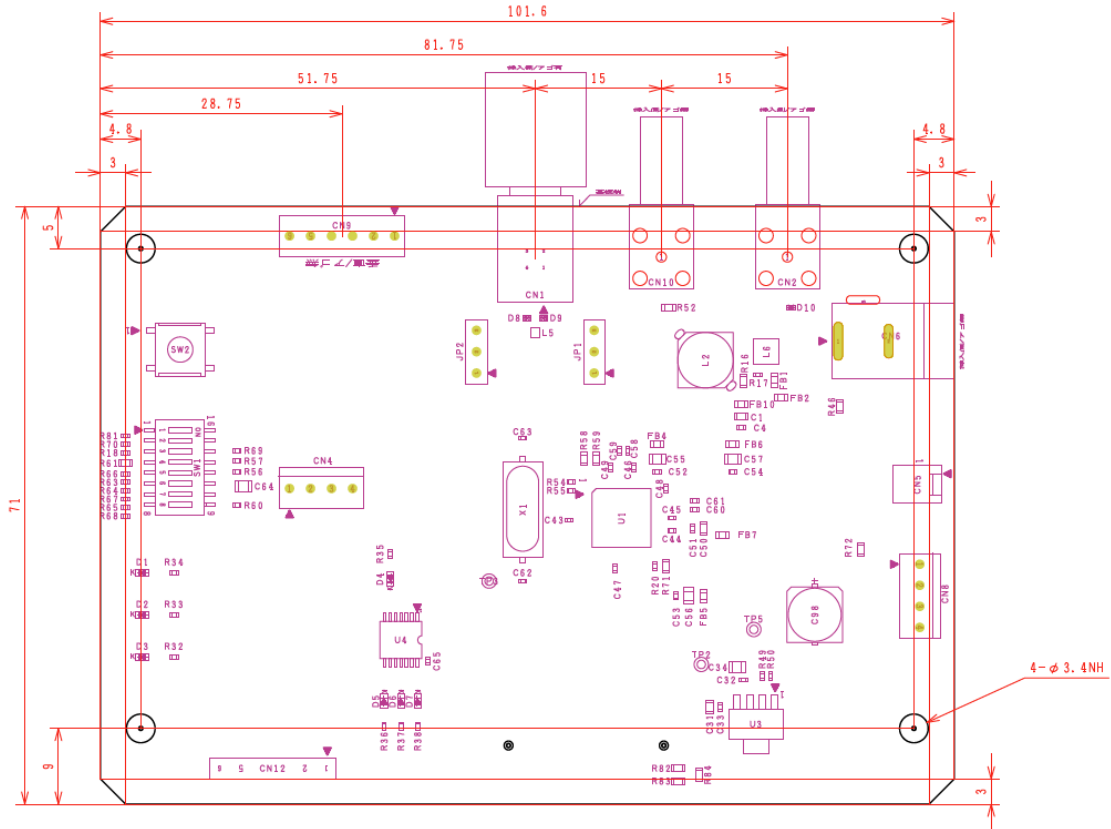
(Bottom side / Part view)

6.2.　　Wiring diagram in 4 CH synchronous capture system

The followings are references.

CN9 Boards Wiring Diagram　　　　**CN8 Power Supply Wiring Diagram (Reference)**

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